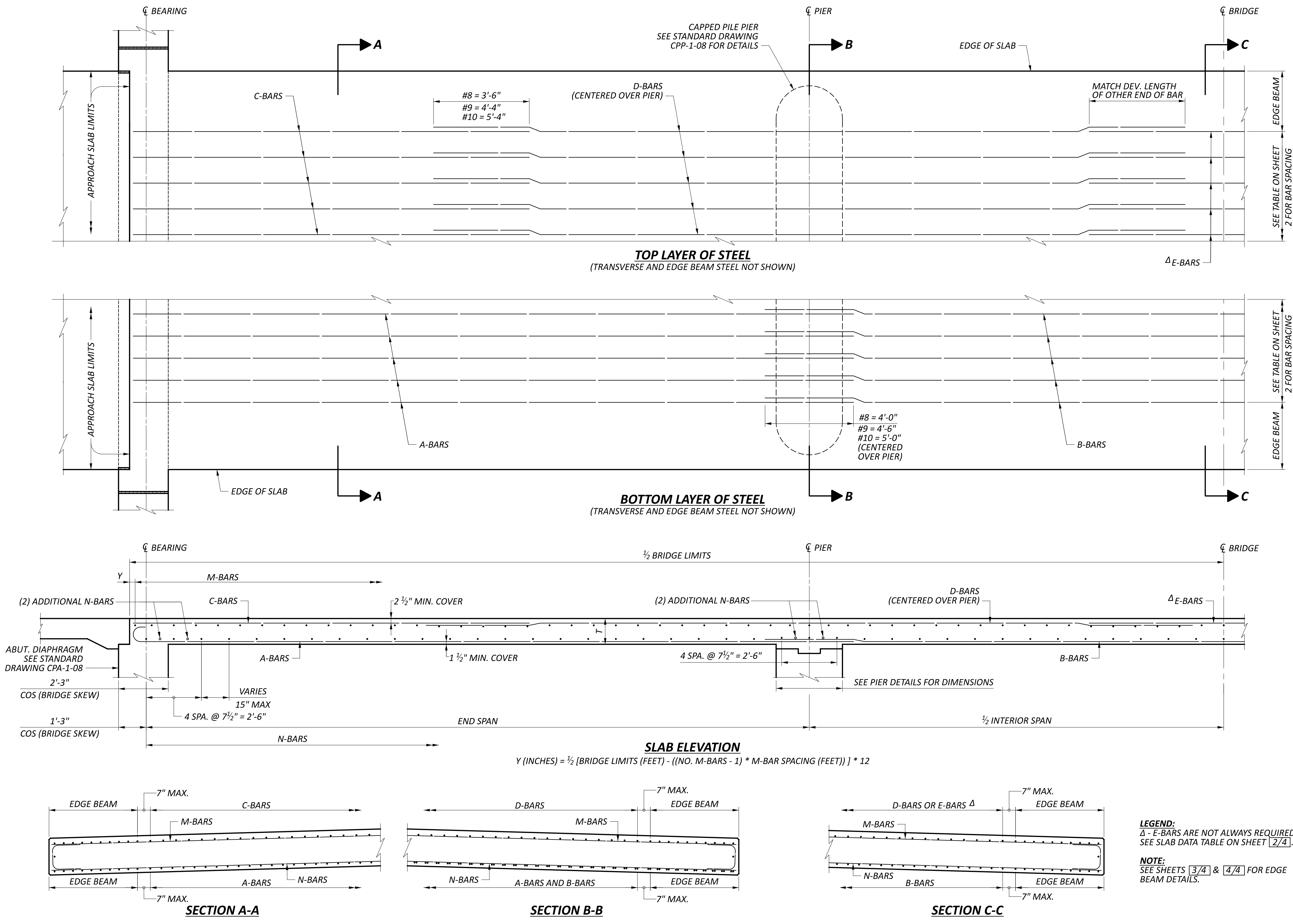




SLAB DATA																										
				LONGINTUDINAL															TRANSVERSE							
				BOTTOM BARS						TOP-BARS									BOTTOM			TOP			U-BARS*	
SPANS		T	A-BARS				B-BARS			C-BARS			D-BARS			E-BARS			N-BARS			M-BARS			(LAP WITH N-BARS)	
(FEET)		(INCHES)	SIZE	SPA	a	LENGTH	SIZE	SPA	LENGTH	SIZE	SPA	LENGTH	SIZE	SPA	LENGTH	SIZE	SPA	LENGTH	SIZE	SPA	NO.**	SIZE	SPA	NO.		
14 -	17.50	- 14	11	8	7 in.	16'-7"	17'-6"	8	7 in.	21'-6"	5	7 in.	7'-6"	8	7 in.	21'-2"	N/A	N/A	N/A	6	15 in.	47	4	12 in.	47	78
15 -	18.75	- 15	11 ½	8	7 in.	17'-7"	18'-6"	8	7 in.	22'-9"	5	7 in.	7'-10"	8	7 in.	22'-6"	N/A	N/A	N/A	6	15 in.	49	4	12 in.	50	82
16 -	20.00	- 16	12	8	7 in.	18'-7"	19'-6"	8	7 in.	24'-0"	5	7 in.	8'-3"	8	7 in.	23'-8"	N/A	N/A	N/A	6	15 in.	52	4	12 in.	53	88
17 -	21.25	- 17	12 ½	8	7 in.	19'-7"	20'-6"	8	7 in.	25'-3"	5	7 in.	8'-7"	8	7 in.	25'-0"	N/A	N/A	N/A	6	15 in.	54	4	12 in.	56	92
18 -	22.50	- 18	13	8	7 in.	20'-7"	21'-6"	8	7 in.	26'-6"	5	7 in.	9'-0"	8	7 in.	26'-2"	N/A	N/A	N/A	6	15 in.	57	4	12 in.	60	98
19 -	23.75	- 19	13 ½	8	7 in.	21'-7"	22'-6"	8	7 in.	27'-9"	5	7 in.	9'-4"	8	7 in.	27'-6"	N/A	N/A	N/A	6	15 in.	60	4	12 in.	63	104
20 -	25.00	- 20	14	8	7 in.	22'-7"	23'-6"	8	7 in.	29'-0"	5	7 in.	9'-9"	8	7 in.	28'-8"	N/A	N/A	N/A	6	15 in.	62	4	12 in.	66	108
21 -	26.25	- 21	14 ½	8	7 in.	23'-7"	24'-6"	8	7 in.	30'-3"	5	7 in.	10'-1"	8	7 in.	30'-0"	N/A	N/A	N/A	6	15 in.	65	4	12 in.	69	114
22 -	27.50	- 22	15	8	7 in.	24'-7"	25'-6"	8	7 in.	31'-6"	5	7 in.	13'-8"	8	7 in.	24'-10"	5	7 in.	9'-11"	6	15 in.	67	4	12 in.	73	118
23 -	28.75	- 23	15 ½	8	7 in.	25'-7"	26'-6"	8	7 in.	32'-9"	5	7 in.	14'-3"	8	7 in.	25'-8"	5	7 in.	10'-4"	6	15 in.	70	4	12 in.	76	124
24 -	30.00	- 24	16	8	7 in.	26'-7"	27'-6"	8	7 in.	34'-0"	5	6 in.	14'-10"	8	6 in.	26'-7"	5	6 in.	10'-10"	6	15 in.	73	4	12 in.	79	130
25 -	31.25	- 25	16 ½	8	7 in.	27'-7"	28'-6"	8	7 in.	35'-3"	5	6 in.	15'-5"	8	6 in.	27'-4"	5	6 in.	11'-3"	6	15 in.	75	4	12 in.	82	134
26 -	32.50	- 26	17	8	7 in.	28'-7"	29'-6"	8	7 in.	36'-6"	5	6 in.	16'-1"	8	6 in.	28'-1"	5	6 in.	11'-8"	6	15 in.	78	4	12 in.	86	140
27 -	33.75	- 27	17 ½	8	7 in.	29'-7"	30'-6"	8	7 in.	37'-9"	5	6 in.	16'-8"	8	6 in.	28'-10"	5	6 in.	12'-2"	6	15 in.	80	4	12 in.	89	144
28 -	35.00	- 28	18	8	6 in.	30'-7"	31'-6"	8	6 in.	39'-0"	5	6 in.	17'-3"	8	6 in.	29'-8"	5	6 in.	12'-7"	6	15 in.	83	4	12 in.	92	150
29 -	36.25	- 29	18 ½	8	6 in.	31'-7"	32'-6"	8	6 in.	40'-3"	5	6 in.	17'-10"	8	6 in.	30'-7"	5	6 in.	13'-0"	6	15 in.	86	4	12 in.	95	156
30 -	37.50	- 30	19	8	6 in.	32'-7"	33'-6"	8	6 in.	41'-6"	5	7 in.	18'-5"	9	7 in.	33'-0"	5	7 in.	13'-6"	6	15 in.	88	4	12 in.	99	160
31 -	38.75	- 31	19 ½	8	6 in.	33'-7"	34'-6"	8	6 in.	42'-9"	5	7 in.	19'-0"	9	7 in.	33'-10"	5	7 in.	13'-11"	6	15 in.	91	4	12 in.	102	166
32 -	40.00	- 32	20	8	6 in.	34'-7"	35'-6"	8	6 in.	44'-0"	5	7 in.	19'-8"	9	7 in.	34'-6"	5	7 in.	14'-4"	6	15 in.	93	5	12 in.	105	170
33 -	41.25	- 33	20 ½	8	6 in.	35'-7"	36'-6"	8	6 in.	45'-3"	5	6 in.	20'-3"	9	6 in.	35'-4"	5	6 in.	14'-9"	6	15 in.	96	5	12 in.	108	176
34 -	42.50	- 34	21	8	6 in.	36'-7"	37'-6"	8	6 in.	46'-6"	5	6 in.	20'-10"	9	6 in.	36'-3"	5	6 in.	15'-2"	6	15 in.	99	5	12 in.	112	182
35 -	43.75	- 35	21 ½	9	7 in.	37'-10"	39'-1"	9	7 in.	48'-3"	5	6 in.	21'-5"	9	6 in.	37'-0"	5	6 in.	15'-8"	6	15 in.	101	5	12 in.	115	186
36 -	45.00	- 36	22	9	7 in.	38'-10"	40'-1"	9	7 in.	49'-6"	5	6 in.	22'-0"	9	6 in.	37'-10"	5	6 in.	16'-1"	6	15 in.	104	5	12 in.	118	192
37 -	46.25	- 37	22 ½	9	7 in.	39'-10"	41'-1"	9	7 in.	50'-9"	5	6 in.	22'-7"	9	6 in.	38'-9"	5	6 in.	16'-7"	6	15 in.	106	5	12 in.	121	196
38 -	47.50	- 38	23	9	7 in.	40'-10"	42'-1"	9	7 in.	52'-0"	5	7 in.	23'-3"	10	7 in.	41'-4"	5	7 in.	17'-0"	6	15 in.	109	5	12 in.	125	202
39 -	48.75	- 39	23 ½	9	7 in.	41'-10"	43'-1"	9	7 in.	53'-3"	5	7 in.	23'-10"	10	7 in.	42'-3"	5	7 in.	17'-6"	6	15 in.	112	5	12 in.	128	208
40 -	50.00	- 40	24	9	7 in.	42'-10"	44'-1"	9	7 in.	54'-6"	5	7 in.	24'-5"	10	7 in.	43'-0"	5	7 in.	17'-11"	6	15 in.	114	5	12 in.	131	212
41 -	51.25	- 41	24 ½	9	6 in.	43'-10"	45'-1"	9	6 in.	55'-9"	5	6 in.	25'-0"	10	6 in.	43'-10"	5	6 in.	18'-5"	6	15 in.	117	5	12 in.	134	218
42 -	52.50	- 42	25	9	6 in.	44'-10"	46'-1"	9	6 in.	57'-0"	5	6 in.	25'-8"	10	6 in.	44'-6"	5	6 in.	18'-10"	6	15 in.	119	5	12 in.	138	222
43 -	53.75	- 43	25 ½	9	6 in.	45'-10"	47'-1"	9	6 in.	58'-3"	5	6 in.	26'-3"	10	6 in.	45'-4"	5	6 in.	19'-3"	6	15 in.	122	5	12 in.	141	228
44 -	55.00	- 44	26	9	6 in.	46'-10"	48'-1"	9	6 in.	59'-6"	5	6 in.	26'-10"	10	6 in.	46'-3"	5	6 in.	19'-8"	6	15 in.	125	5	12 in.	144	234
45 -	56.25	- 45	26 ½	10	7 in.	48'-1"	49'-6"	10	7 in.	61'-3"	5	6 in.	27'-5"	10	6 in.	47'-0"	5	6 in.	20'-2"	6	15 in.	127	5	12 in.	147	238
46 -	57.50	- 46	27	10	7 in.	49'-1"	50'-6"	10	7 in.	62'-6"	5	6 in.	28'-1"	10	6 in.	47'-9"	5	6 in.	20'-8"	6	15 in.	130	5	12 in.	151	244

GENERAL:
THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS FOR THREE SPAN SLAB BRIDGES. THE PROJECT PLANS FOR EACH STRUCTURES WILL SHOW SPAN LENGTHS, ROADWAY WIDTHS, SKEW, CURVE AND SUPERELEVATION (IF ANY), ELEVATIONS, SLAB REINFORCEMENT DETAILS IN PLAN AND TRANSVERSE SECTIONS, SUBSTRUCTURE DETAILS, ESTIMATED QUANTITIES, REINFORCING STEEL LIST AND OTHER NECESSARY DETAILS AND SPECIAL NOTES.

ADDITIONAL INTERIOR SPANS, THE SAME LENGTH AS THE MIDDLE SPAN, MAY BE INCORPORATED INTO THE STRUCTURE WITHOUT CHANGE IN SLAB THICKNESS OR AREA OF REINFORCING STEEL. WHEN SPANS ARE ADDED, THE PROJECT PLANS WILL SHOW THE REVISED DETAILS.

ROADWAY WIDTH:
THE SLAB DESIGNS SHOWN IN THIS STANDARD ARE APPLICABLE FOR ROADWAY WIDTHS 24 FT OR GREATER, MEASURED OUT TO OUT OF BRIDGE DECK.

SKEW:
THE SLAB DESIGNS SHOWN IN THIS STANDARD ARE APPLICABLE FOR BRIDGES WITH SKEW UP TO 25°.

FOR BRIDGES WITH SKEW
0° < θ ≤ 25°, PLACE LONGITUDINAL BARS PARALLEL TO THE CENTERLINE OF THE ROADWAY AND TRANSVERSE BARS PARALLEL TO THE CENTERLINE OF PIERS AND ABUTMENTS.

DESIGN SPECIFICATIONS:
THIS DRAWING CONFORMS TO THE "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS NINTH EDITION" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2020 AND THE OHIO BRIDGE DESIGN MANUAL, JULY 2023.

DESIGN DATA:
DESIGN METHOD - LOAD AND RESISTANCE FACTOR DESIGN
DESIGN LOADING - HL-93
FUTURE WEARING SURFACE - 60 LB/FT²
WEARING SURFACE - ONE INCH MONOLITHIC
DESIGN STRESSES:
CONCRETE - COMPRESSIVE STRENGTH
= 4500 PSI
REINFORCING STEEL - MIN. YIELD STRENGTH
= 60,000 PSI

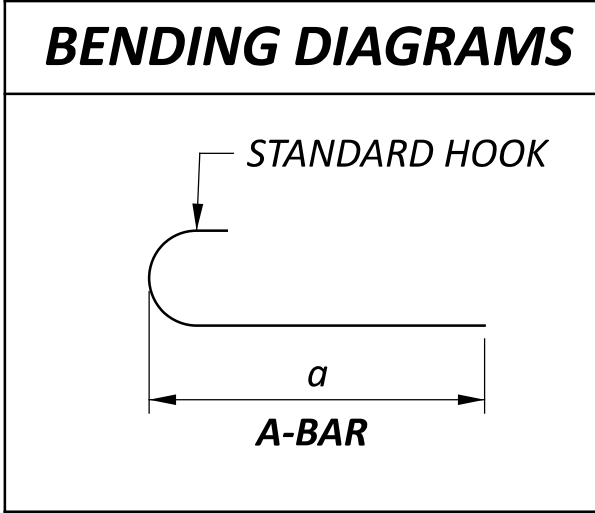
EDGE BEAM OPTION:
IN LIEU OF FORMING AN EDGE BEAM, AT NO ADDITIONAL COST TO THE OWNER, THE CONTRACTOR MAY FURNISH A 20" SLAB OR A SLAB VARYING IN THICKNESS FROM 20" AT THE EDGE, TO "T" AT THE CENTER OF THE ROADWAY. WHEN THE BRIDGE BARRIER BEING CONSTRUCTED IS A CONCRETE PARAPET, THE SLAB EDGE OF DECK SHALL BE REDUCED TO 18" MIN. SEE SHEETS [3/4] AND [4/4] FOR EDGE BEAM DETAILS.

CAMBER:
TO COMPENSATE FOR FALSEWORK DEFLECTION AND FOR THE DEFLECTION OF THE SLAB AFTER THE FALSEWORK IS REMOVED, BUILD CAMBER INTO THE FALSEWORK ACCORDING TO CMS 508.02.

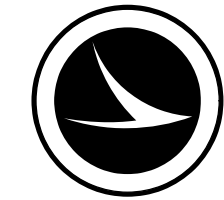
REINFORCING STEEL:
SLAB REINFORCMENT STEEL SHALL BE EPOXY COATED STEEL UNLESS SPECIFIED OTHERWISE IN THE SCOPE OF SERVICES. FURNISH THE REINFORCEMENT STEEL LENGTHS AS INDICATED IN THE TABLE OR STANDARD DRAWINGS. IF THE CONTRACTOR ELECTS TO UTILIZE SHORTER BAR LENGTHS, PROVIDE THE MINIMUM LAP LENGTHS SHOWN BELOW AT NO ADDITIONAL COST TO THE STATE. LAP LENGTHS SHOWN BELOW ARE FOR EPOXY COATED STEEL. SHORTER LAP LENGTHS MAY BE UTILIZED FOR DIFFERENT REINFORCING TYPES.

NO. 4 LAP = 3'-0"
NO. 5 LAP = 3'-10"
NO. 6 LAP = 4'-4"
NO. 8 LAP = (TOP) 6'-7"
NO. 8 LAP = (BOT) 7'-3"
NO. 9 LAP = (TOP) 7'-4"
NO. 9 LAP = (BOT) 8'-11"
NO. 10 LAP = (TOP) 8'-9"
NO. 10 LAP = (BOT) 10'-11"

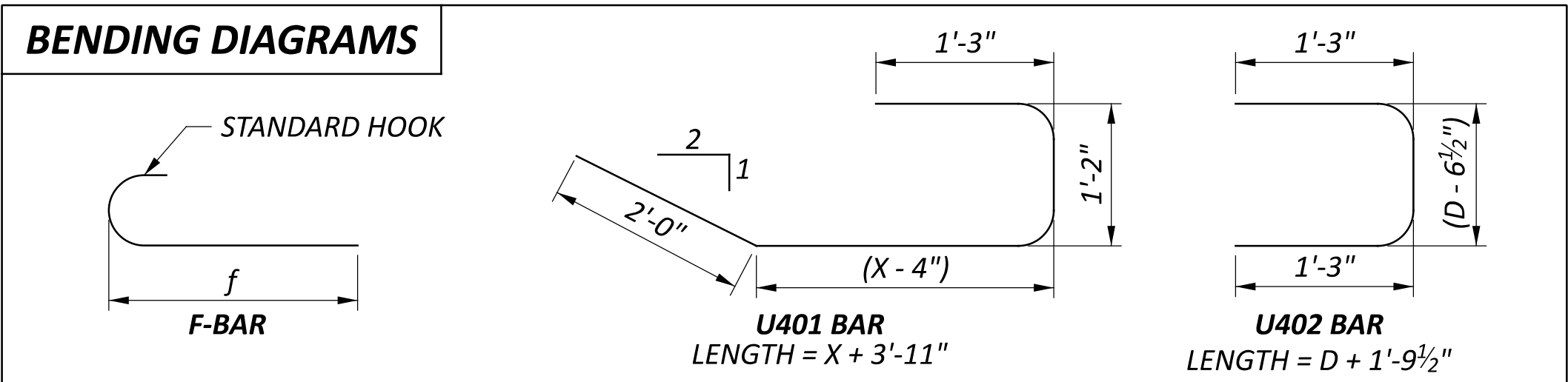
THE LOCATIONS OF THE SPLICES SHALL BE APPROVED BY THE ENGINEER.



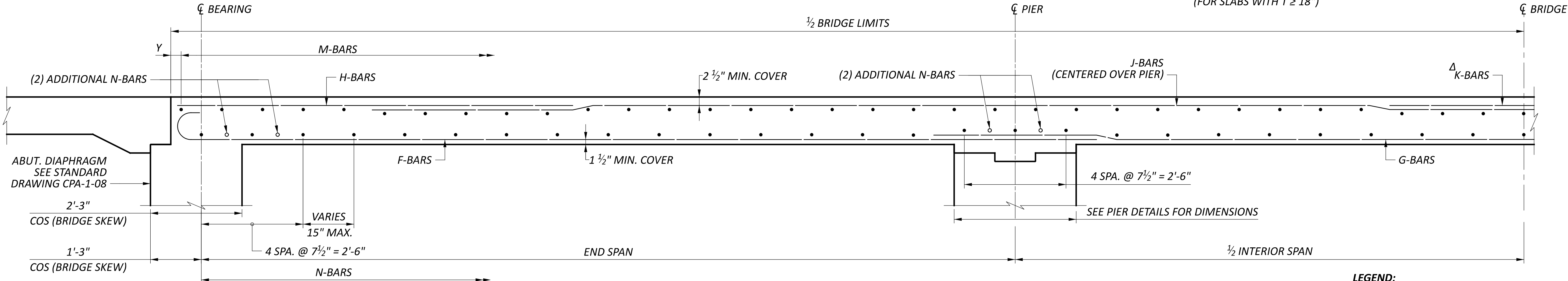
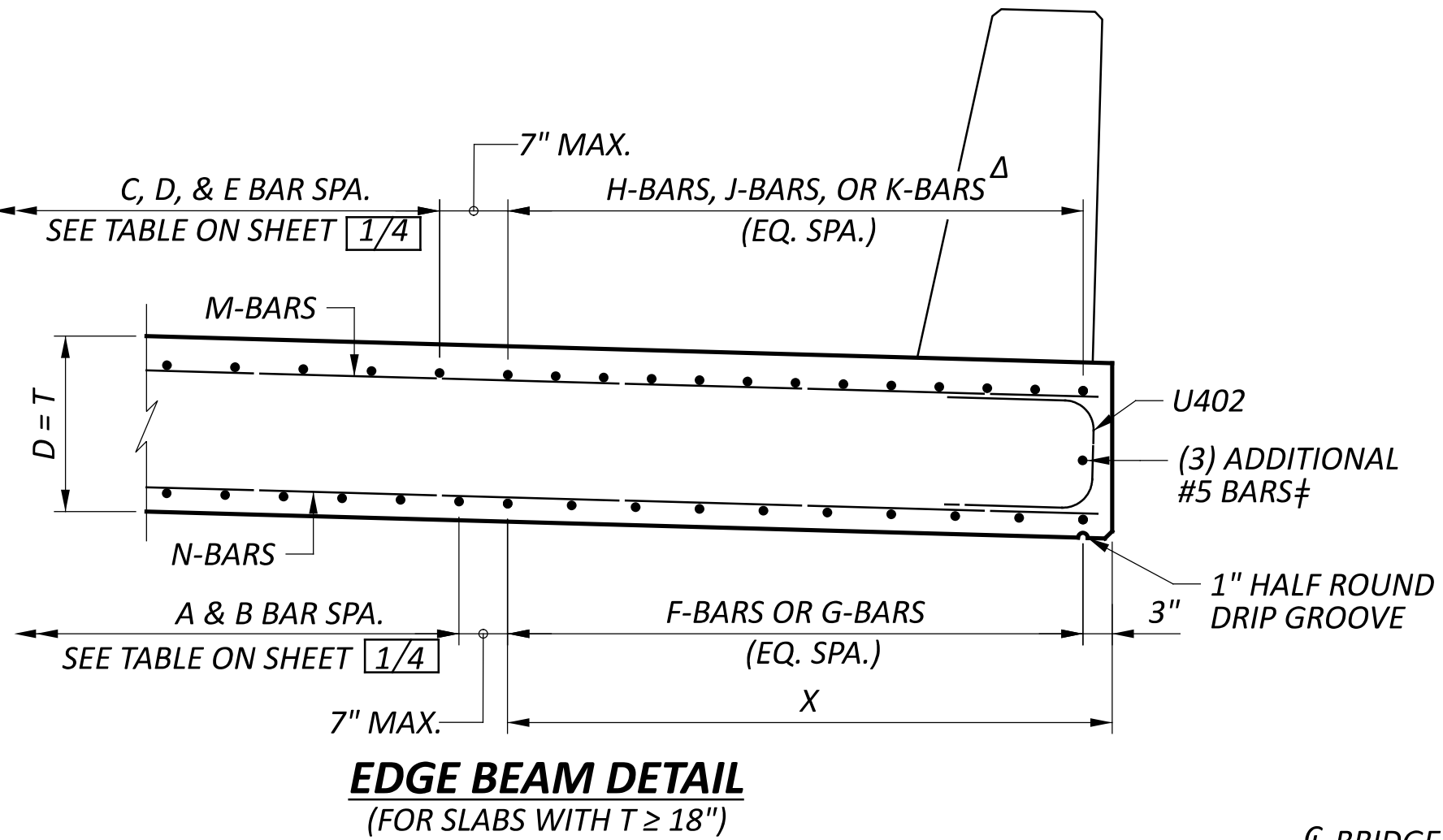
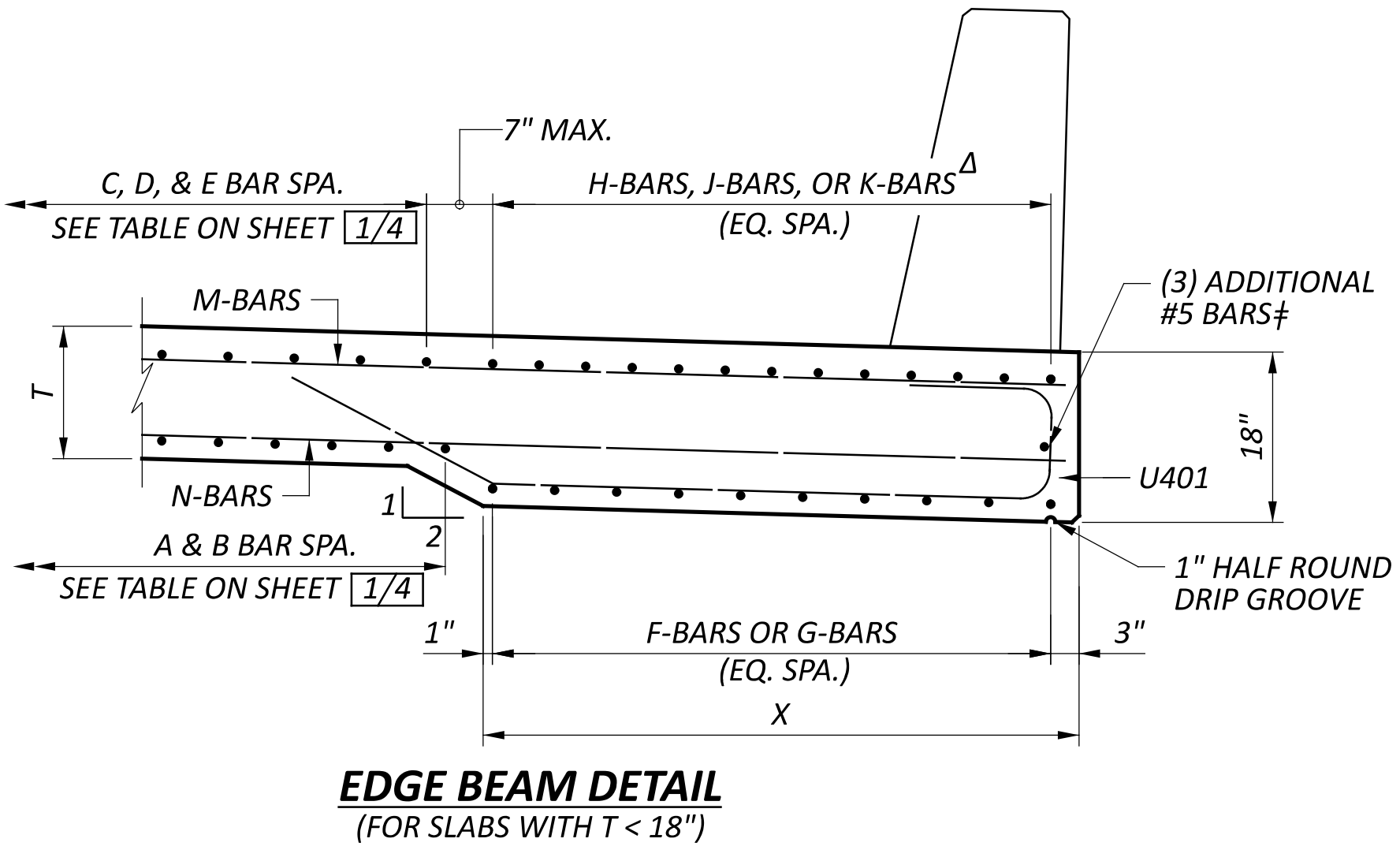
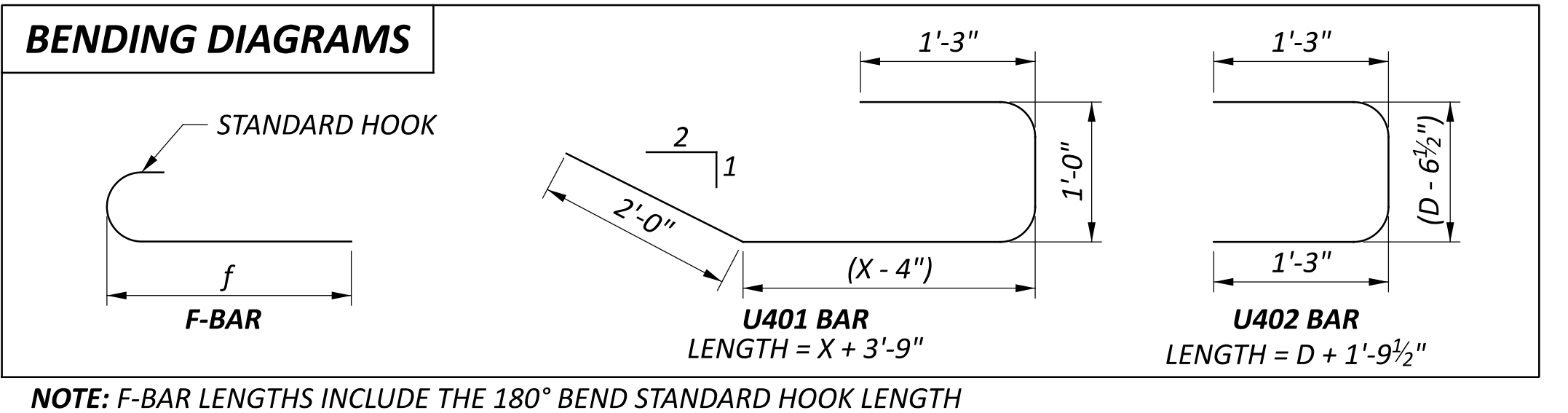
NOTE: A-BAR LENGTHS INCLUDE THE 180° BEND STANDARD HOOK LENGTH



EDGE BEAM SLAB DETAIL - OVER THE SIDE DRAINAGE																
SPANS (FEET)			LONGINTUDINAL													
			BOTTOM BARS						TOP-BARS							
			F-BARS		G-BARS		H-BARS		J-BARS		K-BARS					
	D	X	SIZE	NO.	f	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	
14 - 17.50 - 14	20	3'-9"	8	7	16'-7"	17'-6"	8	7	21'-6"	5	7	7'-6"	8	7	21'-2"	N/A N/A N/A
15 - 18.75 - 15	20	4'-0"	8	7	17'-7"	18'-6"	8	7	22'-9"	5	7	7'-10"	8	7	22'-6"	N/A N/A N/A
16 - 20.00 - 16	20	4'-0"	8	7	18'-7"	19'-6"	8	7	24'-0"	5	7	8'-3"	8	7	23'-8"	N/A N/A N/A
17 - 21.25 - 17	20	4'-0"	8	8	19'-7"	20'-6"	8	8	25'-3"	5	8	8'-7"	8	8	25'-0"	N/A N/A N/A
18 - 22.50 - 18	20	4'-0"	8	8	20'-7"	21'-6"	8	8	26'-6"	5	8	9'-0"	8	8	26'-2"	N/A N/A N/A
19 - 23.75 - 19	20	4'-0"	8	8	21'-7"	22'-6"	8	8	27'-9"	5	8	9'-4"	8	8	27'-6"	N/A N/A N/A
20 - 25.00 - 20	20	4'-0"	8	8	22'-7"	23'-6"	8	8	29'-0"	5	8	9'-9"	8	8	28'-8"	N/A N/A N/A
21 - 26.25 - 21	20	4'-0"	8	8	23'-7"	24'-6"	8	8	30'-3"	5	8	10'-1"	8	8	30'-0"	N/A N/A N/A
22 - 27.50 - 22	20	4'-0"	8	8	24'-7"	25'-6"	8	8	31'-6"	5	8	13'-8"	8	8	24'-10"	5 8 9'-11"
23 - 28.75 - 23	20	4'-0"	8	8	25'-7"	26'-6"	8	8	32'-9"	5	8	14'-3"	8	8	25'-8"	5 8 10'-4"
24 - 30.00 - 24	20	4'-0"	8	9	26'-7"	27'-6"	8	9	34'-0"	5	9	14'-10"	8	9	26'-7"	5 9 10'-10"
25 - 31.25 - 25	20	4'-0"	8	9	27'-7"	28'-6"	8	9	35'-3"	5	9	15'-5"	8	9	27'-4"	5 9 11'-3"
26 - 32.50 - 26	20	4'-0"	8	10	28'-7"	29'-6"	8	10	36'-6"	5	10	16'-1"	8	10	28'-1"	5 10 11'-8"
27 - 33.75 - 27	20	4'-0"	8	10	29'-7"	30'-6"	8	10	37'-9"	5	10	16'-8"	8	10	28'-10"	5 10 12'-2"
28 - 35.00 - 28	20	4'-0"	9	9	30'-10"	32'-1"	9	9	39'-6"	5	9	17'-3"	9	9	31'-4"	5 9 12'-7"
29 - 36.25 - 29	20	4'-0"	9	9	31'-10"	33'-1"	9	9	40'-9"	5	9	17'-10"	9	9	32'-3"	5 9 13'-0"
30 - 37.50 - 30	20	4'-0"	9	9	32'-10"	34'-1"	9	9	42'-0"	5	10	18'-5"	9	10	33'-0"	5 10 13'-6"
31 - 38.75 - 31	20	4'-0"	9	9	33'-10"	35'-1"	9	9	43'-3"	5	10	19'-0"	9	10	33'-10"	5 10 13'-11"
32 - 40.00 - 32	20	4'-0"	9	10	34'-10"	36'-1"	9	10	44'-6"	5	11	19'-8"	9	11	34'-6"	5 11 14'-4"
33 - 41.25 - 33	20 ½	4'-3"	10	9	36'-1"	37'-6"	10	9	46'-3"	5	10	20'-3"	10	10	37'-4"	5 10 14'-9"
34 - 42.50 - 34	21	4'-3"	10	9	37'-1"	38'-6"	10	9	47'-6"	5	10	20'-10"	10	10	38'-3"	5 10 15'-2"
35 - 43.75 - 35	21 ½	4'-3"	10	9	38'-1"	39'-6"	10	9	48'-9"	5	10	21'-5"	10	10	39'-0"	5 10 15'-8"
36 - 45.00 - 36	22	4'-3"	10	9	39'-1"	40'-6"	10	9	50'-0"	5	10	22'-0"	10	10	39'-10"	5 10 16'-1"
37 - 46.25 - 37	22 ½	4'-3"	10	9	40'-1"	41'-6"	10	9	51'-3"	5	10	22'-7"	10	10	40'-9"	5 10 16'-7"
38 - 47.50 - 38	23	4'-3"	10	9	41'-1"	42'-6"	10	9	52'-6"	5	11	23'-3"	10	11	41'-4"	5 11 17'-0"
39 - 48.75 - 39	23 ½	4'-3"	10	9	42'-1"	43'-6"	10	9	53'-9"	5	11	23'-10"	10	11	42'-3"	5 11 17'-6"
40 - 50.00 - 40	24	4'-6"	10	10	43'-1"	44'-6"	10	10	55'-0"	5	12	24'-5"	10	12	43'-0"	5 12 17'-11"
41 - 51.25 - 41	24 ½	4'-6"	10	10	44'-1"	45'-6"	10	10	56'-3"	5	12	25'-0"	10	12	43'-10"	5 12 18'-5"
42 - 52.50 - 42	25	4'-6"	10	10	45'-1"	46'-6"	10	10	57'-6"	5	12	25'-8"	10	12	44'-6"	5 12 18'-10"
43 - 53.75 - 43	25 ½	4'-6"	10	10	46'-1"	47'-6"	10	10	58'-9"	5	12	26'-3"	10	12	45'-4"	5 12 19'-3"
44 - 55.00 - 44	26	4'-6"	10	11	47'-1"	48'-6"	10	11	60'-0"	5	12	26'-10"	10	12	46'-3"	5 12 19'-8"
45 - 56.25 - 45	26 ½	4'-6"	10	11	48'-1"	49'-6"	10	11	61'-3"	5	13	27'-5"	10	13	47'-0"	5 13 20'-2"
46 - 57.50 - 46	27	4'-9"	10	11	49'-1"	50'-6"	10	11	62'-6"	5	13	28'-1"	10	13	47'-9"	5 13 20'-8"



EDGE BEAM SLAB DETAIL - PARAPET																		
SPANS (FEET)			LONGINTUDINAL															
			BOTTOM BARS								TOP-BARS							
			F-BARS				G-BARS				H-BARS			J-BARS			K-BARS	
	D (INCHES)	X (FT-IN)	SIZE	NO.	f	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH
14 - 17.50 - 14	18	5'-0"	8	9	16'-7"	17'-6"	8	9	21'-6"	5	9	7'-6"	8	9	21'-2"	N/A	N/A	N/A
15 - 18.75 - 15	18	5'-0"	8	9	17'-7"	18'-6"	8	9	22'-9"	5	9	7'-10"	8	9	22'-6"	N/A	N/A	N/A
16 - 20.00 - 16	18	5'-0"	8	9	18'-7"	19'-6"	8	9	24'-0"	5	9	8'-3"	8	9	23'-8"	N/A	N/A	N/A
17 - 21.25 - 17	18	5'-0"	8	9	19'-7"	20'-6"	8	9	25'-3"	5	9	8'-7"	8	9	25'-0"	N/A	N/A	N/A
18 - 22.50 - 18	18	5'-0"	8	9	20'-7"	21'-6"	8	9	26'-6"	5	9	9'-0"	8	9	26'-2"	N/A	N/A	N/A
19 - 23.75 - 19	18	5'-0"	8	9	21'-7"	22'-6"	8	9	27'-9"	5	9	9'-4"	8	9	27'-6"	N/A	N/A	N/A
20 - 25.00 - 20	18	5'-0"	8	9	22'-7"	23'-6"	8	9	29'-0"	5	9	9'-9"	8	9	28'-8"	N/A	N/A	N/A
21 - 26.25 - 21	18	5'-3"	8	10	23'-7"	24'-6"	8	10	30'-3"	5	10	10'-1"	8	10	30'-0"	N/A	N/A	N/A
22 - 27.50 - 22	18	5'-3"	8	10	24'-7"	25'-6"	8	10	31'-6"	5	10	13'-8"	8	10	24'-10"	5	10	9'-11"
23 - 28.75 - 23	18	5'-3"	8	10	25'-7"	26'-6"	8	10	32'-9"	5	10	14'-3"	8	10	25'-8"	5	10	10'-4"
24 - 30.00 - 24	18	5'-3"	8	10	26'-7"	27'-6"	8	10	34'-0"	5	11	14'-10"	8	11	26'-7"	5	11	10'-10"
25 - 31.25 - 25	18	5'-3"	8	10	27'-7"	28'-6"	8	10	35'-3"	5	12	15'-5"	8	12	27'-4"	5	12	11'-3"
26 - 32.50 - 26	18	5'-3"	8	11	28'-7"	29'-6"	8	11	36'-6"	5	12	16'-1"	8	12	28'-1"	5	12	11'-8"
27 - 33.75 - 27	18	5'-3"	9	9	29'-10"	31'-1"	9	9	38'-3"	5	11	16'-8"	9	11	30'-6"	5	11	12'-2"
28 - 35.00 - 28	18	5'-3"	9	10	30'-10"	32'-1"	9	10	39'-6"	5	11	17'-3"	9	11	31'-4"	5	11	12'-7"
29 - 36.25 - 29	18 1/2	5'-6"	9	10	31'-10"	33'-1"	9	10	40'-9"	5	12	17'-10"	9	12	32'-3"	5	12	13'-0"
30 - 37.50 - 30	19	5'-6"	9	10	32'-10"	34'-1"	9	10	42'-0"	5	13	18'-5"	9	13	33'-0"	5	13	13'-6"
31 - 38.75 - 31	19 1/2	5'-6"	9	11	33'-10"	35'-1"	9	11	43'-3"	5	13	19'-0"	9	13	33'-10"	5	13	13'-11"
32 - 40.00 - 32	20	5'-6"	9	11	34'-10"	36'-1"	9	11	44'-6"	5	13	19'-8"	9	13	34'-6"	5	13	14'-4"
33 - 41.25 - 33	20 1/2	5'-6"	9	11	35'-10"	37'-1"	9	11	45'-9"	5	13	20'-3"	9	13	35'-4"	5	13	14'-9"
34 - 42.50 - 34	21	5'-6"	9	11	36'-10"	38'-1"	9	11	47'-0"	5	11	20'-10"	10	11	38'-3"	5	11	15'-2"
35 - 43.75 - 35	21 1/2	5'-6"	10	9	38'-1"	39'-6"	10	9	48'-9"	5	12	21'-5"	10	12	39'-0"	5	12	15'-8"
36 - 45.00 - 36	22	5'-6"	10	9	39'-1"	40'-6"	10	9	50'-0"	5	12	22'-0"	10	12	39'-10"	5	12	16'-1"
37 - 46.25 - 37	22 1/2	5'-6"	10	10	40'-1"	41'-6"	10	10	51'-3"	5	12	22'-7"	10	12	40'-9"	5	12	16'-7"
38 - 47.50 - 38	23	5'-6"	10	10	41'-1"	42'-6"	10	10	52'-6"	5	12	23'-3"	10	12	41'-4"	5	12	17'-0"
39 - 48.75 - 39	23 1/2	5'-6"	10	10	42'-1"	43'-6"	10	10	53'-9"	5	13	23'-10"	10	13	42'-3"	5	13	17'-6"
40 - 50.00 - 40	24	5'-6"	10	10	43'-1"	44'-6"	10	10	55'-0"	5	13	24'-5"	10	13	43'-0"	5	13	17'-11"
41 - 51.25 - 41	24 1/2	5'-6"	10	10	44'-1"	45'-6"	10	10	56'-3"	5	13	25'-0"	10	13	43'-10"	5	13	18'-5"
42 - 52.50 - 42	25	5'-6"	10	11	45'-1"	46'-6"	10	11	57'-6"	5	13	25'-8"	10	13	44'-6"	5	13	18'-10"
43 - 53.75 - 43	25 1/2	5'-6"	10	11	46'-1"	47'-6"	10	11	58'-9"	5	14	26'-3"	10	14	45'-4"	5	14	19'-3"
44 - 55.00 - 44	26	5'-9"	10	11	47'-1"	48'-6"	10	11	60'-0"	5	15	26'-10"	10	15	46'-3"	5	15	19'-8"
45 - 56.25 - 45	26 1/2	5'-9"	10	12	48'-1"	49'-6"	10	12	61'-3"	5	15	27'-5"	10	15	47'-0"	5	15	20'-2"
46 - 57.50 - 46	27	5'-9"	10	12	49'-1"	50'-6"	10	12	62'-6"	5	15	28'-1"	10	15	47'-9"	5	15	20'-8"



LEGEND:

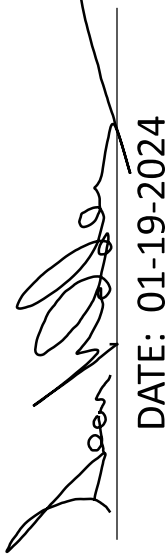
Δ - K-BARS ARE NOT ALWAYS REQUIRED;
SEE SLAB DATA TABLE ON SHEET [2/4].

† - LENGTH =
1/3 * [BRIDGE LIMITS (FEET) + 6.0].

OFFICE OF
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REVISIONS
07-19-2024
01-16-2026

STATE OF OHIO OFFICE OF STRUCTURAL
ENGINEERING ADMINISTRATOR



DATE: 01-19-2024

STANDARD BRIDGE DRAWING

CONTINUOUS SLAB BRIDGE

DESIGN AGENCY



SCD NUMBER
CS-1-24

SHEET
4

TOTAL
4

GENERAL NOTES

THIS STANDARD DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS FOR PRESTRESSED CONCRETE BOX BEAM BRIDGES. THE DETAILS IN THIS STANDARD ARE APPLICABLE TO STRUCTURES WITH SKEW ANGLES OF 30° OR LESS. STANDARD PRESTRESSED BOX BEAM DESIGNS AND LOAD RATINGS ARE PROVIDED IN DESIGN DATA SHEET PSBDD-1-25.

AS A MINIMUM, THE PROJECT PLANS FOR EACH STRUCTURE SHALL INCLUDE THE FOLLOWING DETAILS:

1. THE DESIGNER SHALL CHOOSE A 28-DAY CONCRETE STRENGTH BETWEEN 5500 PSI AND 7000 PSI; A RELEASE STRENGTH BETWEEN 4000 PSI AND 5000 PSI; AND A NOMINAL STRAND AREA OF 0.153 IN OR 0.167 IN. THE DESIGNER SHALL USE THESE VALUES IN THE DESIGN AND LIST THESE VALUES IN THE STRUCTURE GENERAL NOTES.
2. A BEAM LAYOUT PLAN SHOWING: SPAN LENGTH; BEAM LENGTH; SKEW ANGLE; FIXED AND/OR EXPANSION ENDS OF BEAMS; LOCATION OF ANCHOR DOWELS; SIZE, LOCATION AND HARDNESS OF ELASTOMERIC BEARING PADS; LOCATION OF DIAPHRAGM CENTERLINES; AND LOCATIONS OF RAILING POSTS (IF APPLICABLE).
3. A TRANSVERSE CROSS SECTION THROUGH THE DECK.
4. A BEAM ELEVATION/LONGITUDINAL CROSS SECTION SHOWING THE STIRRUP SPACING AND VARIABLE TOPPING THICKNESS IN SUFFICIENT DETAIL.
5. A CROSS SECTION OF THE BEAM SHOWING BEAM TYPE AND AND SIZE; SIZE, NUMBER, STRENGTH AND LOCATION OF STRANDS; DEBONDED STRAND REQUIREMENTS; ALL REINFORCING STEEL DETAILS; AND THE DESIGN DATA.
6. CAMBER AND DEFLECTION DATA.
7. EXPANSION JOINT DETAILS.
8. ALL PLAN QUANTITY PAY ITEMS REQUIRED TO PROPERLY COVER THE COST OF FABRICATION, ERECTION AND CONSTRUCTION OF THE BEAMS.
9. DETAILS OF ABUTMENTS AND PIERS.
10. SEALING OF CONCRETE SURFACE LIMITS AND SEALER TYPE.
11. ALL OTHER DETAILS AND INFORMATION NECESSARY TO COMPLETE THE PLANS.

IT IS NOT INTENDED THAT DETAILS SHOWN ON THIS STANDARD DRAWING BE REPEATED ON THE PROJECT PLANS EXCEPT AS MAY BE REQUIRED FOR CLARITY.

DESIGN STRESSES:

PRESTRESSED CONCRETE - $F'c = *$ (28-DAY)

$F'ci = **$ (RELEASE)

CAST-IN-PLACE CONCRETE - $F'c = 4500$ PSI

REINFORCING STEEL - MIN. YIELD STRENGTH = 60,000 PSI.
ALL REINFORCING STEEL IN THE COM-
POSITE SLAB AND BARS PROJECTING
FROM THE PRESTRESSED BOX BEAMS
SHALL CONFORM TO C&MS 709.00.

PRESTRESSING STRAND - FURNISH MATERIAL CONFORMING TO C&MS 711.27 (ASTM A416), GRADE 270,
LOW RELAXATION, UNCOATED, SEVEN
WIRE STRAND. STRANDS SHALL BE
0.5 INCH DIAMETER WITH A TOTAL
CROSS-SECTIONAL AREA 0.167 IN² ***

* - THE DESIGNER SHALL SPECIFY A 28-DAY COMPRESSIVE STRENGTH IN THE RANGE OF 5500 PSI MINIMUM TO 7000 PSI MAXIMUM AND LIST THE VALUE IN THE STRUCTURE'S GENERAL NOTES.

** - THE DESIGNER SHALL SPECIFY A RELEASE STRENGTH IN THE RANGE OF 4000 PSI MINIMUM TO 5000 PSI MAXIMUM AND LIST THE VALUE IN THE STRUCTURE'S GENERAL NOTES.

*** - THE DESIGNER SHALL SPECIFY THE STRAND AREA IN THE STRUCTURE'S GENERAL NOTES.

TRANSVERSE TIE RODS:

TRANSVERSE TIE RODS SHALL BE 1" DIAMETER STEEL RODS CONFORMING TO ASTM F1554, GRADE 55, AND THREADED AT EACH END. PROVIDE A NUT AND WASHER AT EACH END. THREADS MAY BE CUT OR ROLLED. IF ROLLED THREADS ARE USED, THE MINIMUM DIAMETER AT THE ROOT OF THE THREADS SHALL BE 0.838". INSTALL AND TORQUE RODS TO APPROXIMATELY 250 FT-LBS. AFTER TIGHTENING, FILL THE RECESSES IN THE FASCIA BEAMS WITH NON SHRINK MORTAR OF THE SAME COLOR AS THE BEAM. TIE NO MORE THAN THREE BEAMS TOGETHER WITH ONE TRANSVERSE TIE ROD.

GALVANIZING:

GALVALIZE ANCHOR DOWEL BARS, INSERTS, TIE RODS, NUTS, AND WASHERS ACCORDING TO C&MS 711.02

ANCHOR DOWELS:

ANCHOR DOWELS SHALL BE 1" DIAMETER SMOOTH STEEL RODS CONFORMING TO ASTM A615, GRADE 60. THE DESIGNER SHALL INDICATE ON THE PLANS WHICH BEAM ENDS ARE TO BE ANCHORED AND IF THE ANCHOR IS FIXED OR EXPANSION. LOCATE THE ANCHOR DOWEL HOLES AND PRESTRESSING STRANDS TO AVOID MUTUAL INTERFERENCE. THE LATERAL SPACING OF THE HOLES IN THE BEAM SHALL BE SUCH THAT THE ANCHOR DOWELS CLEAR THE ELASTOMERIC BEARING AND ARE AS CLOSE TO THE CENTERLINE OF BEAM AS POSSIBLE.

AFTER TENSIONING OF THE TRANSVERSE TIE RODS, DRILL 1^{1⁄16}" MINIMUM DIAMETER DOWEL HOLES FOR FIXED DOWELS OR 1^{1⁄4}" MINIMUM DIAMETER HOLES FOR EXPANSION DOWELS INTO THE ABUTMENT OR PIER SEAT. CLEAN AND DRY DOWEL HOLES AND INSTALL DOWELS.

ELASTOMERIC BEARINGS:

FOUR ELASTOMERIC BEARINGS ARE REQUIRED PER BEAM. POSITION AS SHOWN ON SHEET 6 OF 6.

PREFORMED BEARING PADS:

WHERE THE ENGINEER DEEMS THAT SHIMS ARE REQUIRED, INSTALL ¹/₈" THICK PREFORMED BEARING PADS OF THE SAME PLAN DIMENSIONS AS THE ELASTOMERIC BEARINGS PER C&MS 711.21

BEAM ENDS:

FIELD APPLY ITEM 512 TYPE B WATERPROOFING TO THE BOX BEAM ENDS THAT ARE NOT COMPLETELY ENCASED IN CONCRETE. SEAL ALL STRANDS WITH A SHOP APPLIED TYPE E WATERPROOFING PER C&MS 512.08. WATERPROOFING SHALL EXTEND A MINIMUM OF 2 INCHES SURROUNDING EACH STRAND END.

PROVIDE A 1" DEEP SHEAR KEY CENTERED IN THE BEAM END FOR BOX BEAMS ON INTEGRAL/SEMI-INTEGRAL ABUTMENTS. THE SHEAR KEY HEIGHT SHALL BE ONE-HALF OF THE BOX BEAM HEIGHT AND THE WIDTH SHALL BE 38".

NOTCHES:

PROVIDE NOTCHES IN THE BEAM ENDS AT ABUTMENTS TO ACCOMMODATE EXPANSION JOINT ANCHORAGES AS SHOWN ON STANDARD BRIDGE DRAWINGS EXJ-3-82 AND EXJ-5-93 AND AT PIERS TO ACCOMMODATE CONTINUITY AS SHOWN ON SHEET 4 OF 6.

DRIP GROOVES ON THE UNDERSIDE OF THE FASCIA BEAM ARE NOT PERMITTED.

SURFACE PREPARATION FOR MORTAR:

THE FABRICATOR SHALL SANDBLAST THE KEYWAY SURFACES WITHIN FOUR DAYS OF SHIPMENT TO THE PROJECT SITE. THE SANDBLASTING SHALL YIELD A CONCRETE SURFACE PROFILE OF 4 OR ROUGHER (APPROX. 60 GRIT) OVER THE ENTIRE KEYWAY SURFACE. WHEN STAINS ARE VISIBLE BEFORE BLASTING THE CONCRETE, USE A DEGREASER TO ENSURE REMOVAL OF GREASE, OILS AND OTHER SIMILAR CONTAMINATES. THE DEGREASER SHALL BE WATER SOLUBLE SO IT CAN BE REMOVED BEFORE THE BLASTING BEGINS. BEFORE MORTARING, REMOVE ALL DIRT, DUST, GREASE, OIL AND OTHER FOREIGN MATERIAL FROM THE SURFACES USING A HIGH PRESSURE WASH OF AT LEAST 1000 PSI AT A DELIVERY RATE OF AT LEAST 4 GAL/MIN.

MORTAR:

MORTAR OR GROUT FOR TIE ROD RECESSES, ANCHOR DOWEL HOLES AND KEYWAYS BETWEEN PRESTRESSED CONCRETE BOX BEAMS, SHALL BE A NON-SHRINK TYPE AS DESCRIBED IN THE ALTERNATES BELOW. DURING THE GROUTING OPERATION, PREPARE AT LEAST THREE, 3" DIAMETER BY 6" LONG TEST CYLINDERS OF THE GROUTING MATERIAL. SUBMIT THE CYLINDERS TO THE LABORATORY TO DETERMINE THE MINIMUM COMPRESSIVE STRENGTH OF THE GROUT.

ALTERNATE 1 - OPEN TO TRAFFIC LATER THAN 7 DAYS AFTER GROUTING:

FURNISH MORTAR CONFORMING TO C&MS 705.22 OR TO PROPOSAL NOTE FOR HIGH EARLY STRENGTH KEYWAY GROUT. AFTER THE TIE RODS ARE TIGHTENED, PREPARE PLACE AND CURE THE MORTAR ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. PLACE MORTAR IN A MANNER THAT ENSURES COMPLETE AND SOLID FILLING. THE MINIMUM STRENGTH OF THE MORTAR SHALL BE 5000 PSI BEFORE CONSTRUCTION OR VEHICULAR TRAFFIC IS ALLOWED ON THE BEAMS.

ALTERNATE 2 - PART WIDTH CONSTRUCTION OR OPEN TO TRAFFIC WITHIN 7 DAYS AFTER GROUTING:

FURNISH MORTAR CONFORMING TO PROPOSAL NOTE FOR HIGH EARLY STRENGTH GROUT. AFTER THE TIE RODS ARE TIGHTENED, PREPARE PLACE AND CURE THE MORTAR ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. PLACE MORTAR IN A MANNER THAT ENSURES COMPLETE AND SOLID FILLING. THE MINIMUM STRENGTH OF THE MORTAR SHALL BE 5000 PSI BEFORE CONSTRUCTION OR VEHICULAR TRAFFIC IS ALLOWED ON THE BEAMS.

SHEAR KEYS:

FILL SHEAR KEYS BETWEEN BEAMS WITH MORTAR TO BOTTOM OF THROAT, 5" FROM THE TOP OF THE BEAM.

COMPOSITE BEAMS:

INSERT A 2" MIN. BACKER ROD TO BOTTOM OF THROAT. DO NOT FILL THE REMAINDER OF THE KEYWAY WITH GROUT, KEEP EMPTY AND CLEAR OF DEBRIS UNTIL COMPOSITE TOPPING SLAB IS INSTALLED. SEE TYPICAL SHEAR KEY GROUTING DETAIL A, SHEET 5 OF 6.

NON-COMPOSITE BEAMS:

DO NOT FILL THE THROAT OF THE KEYWAY WITH GROUT, KEEP IT EMPTY AND CLEAR OF DEBRIS. ALLOW GROUT TO CURE 24 HOURS, THEN FILL THE THROAT OF THE SHEAR KEY WITH HOT APPLIED JOINT SEALER CONFORMING TO C&MS 705.04 BEFORE INSTALLING WATER PROOFING MEMBRANE. SEE TYPICAL SHEAR KEY GROUTING DETAIL B, SHEET 5 OF 6.

COMPOSITE BRIDGES:

1. SURFACE PREPARATION: THOROUGHLY CLEAN THE TOP SURFACE OF THE BEAMS OF ALL DIRT, DUST AND OTHER FOREIGN MATERIALS WITH WATER, AIR UNDER PRESSURE OR ANY OTHER METHOD THAT PRODUCES SATISFACTORY RESULTS. THOROUGHLY DRENCH THE SURFACE WITH CLEAN WATER. BEFORE PLACING THE CONCRETE, ALLOW THE SURFACE TO DRY TO A DAMP CONDITION.
2. SLAB PLACEMENT: COMPOSITE SLAB POURS ON MULTISPAN BRIDGES SHALL BE AS LONG AS PRACTICAL. IF NECESSARY, PLACE CONSTRUCTION JOINTS NEAR MIDSPAN, PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY. WHEN STRUCTURAL EXPANSION JOINTS ARE LOCATED AT THE PIERS, PLACE COMPOSITE SLAB BETWEEN JOINTS WITHOUT ADDITIONAL CONSTRUCTION JOINTS EXCEPT AS NOTED IN C&MS 511.

BASIS OF PAYMENT:

ALL COSTS ASSOCIATED WITH FURNISHING AND INSTALLING THE KEYWAY GROUT, BACKER RODS, HOT APPLIED JOINT SEALER, ANCHOR DOWELS AND PREFORMED EXPANSION JOINT FILLER BETWEEN BEARINGS, IS CONSIDERED INCIDENTAL TO THE BOX BEAMS.

THE DEPARTMENT WILL PAY FOR FURNISHING AND INSTALLING TYPE B WATERPROOFING SEPARATELY.

OFFICE OF
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REVISIONS
01-16-2026

STATE OF OHIO OFFICE OF STRUCTURAL
ENGINEERING ADMINISTRATOR

DATE: 07-18-2025

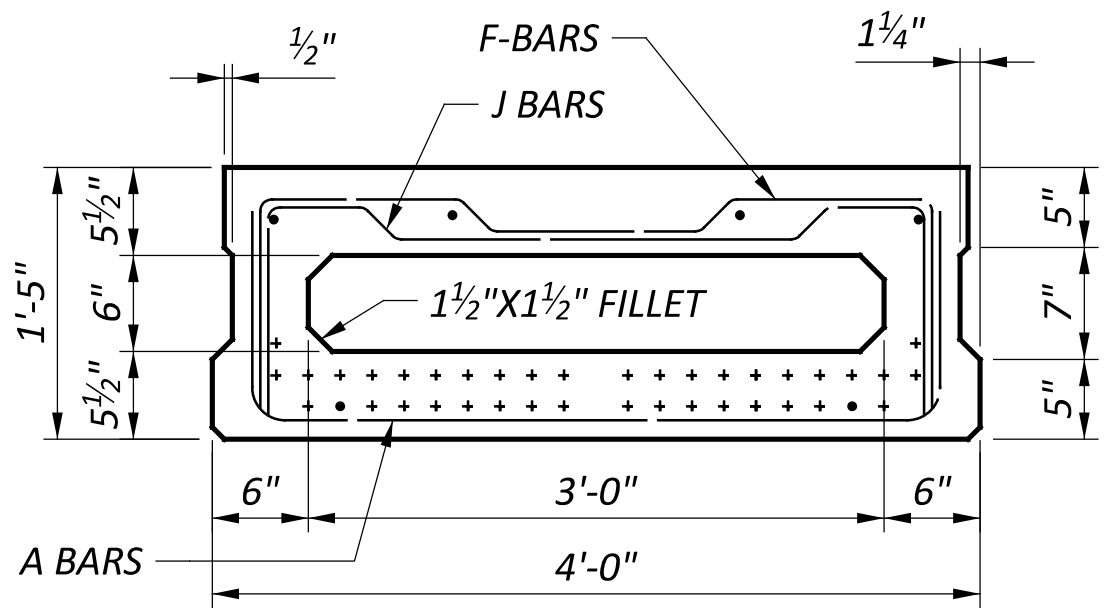
STANDARD BRIDGE DRAWING
PRESTRESSED CONCRETE
BOX BEAM DETAILS

DESIGN AGENCY

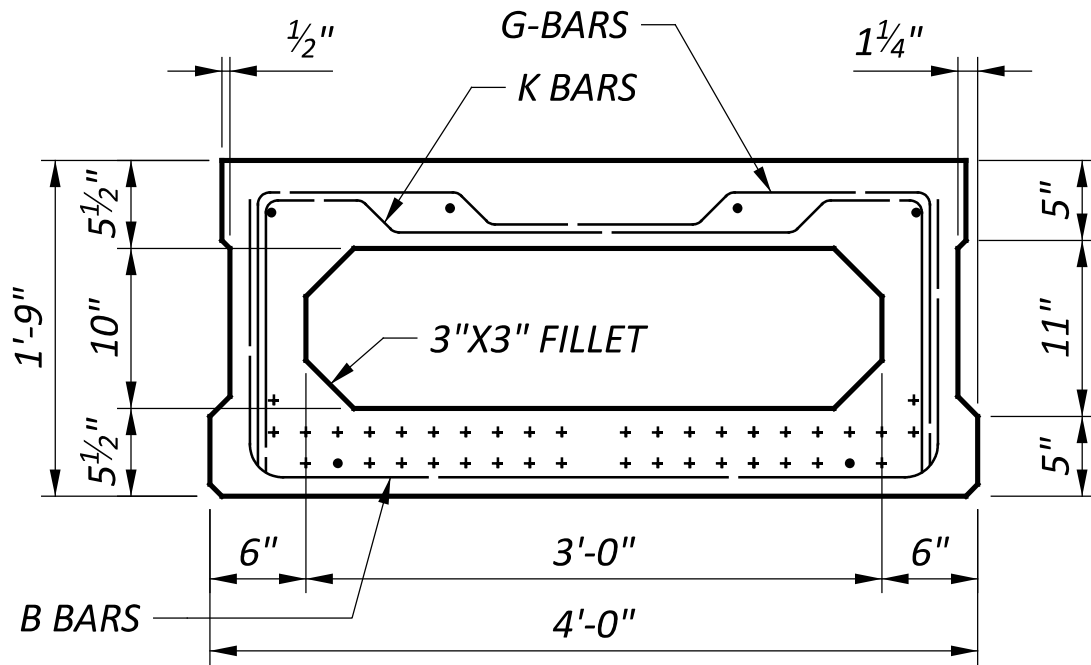


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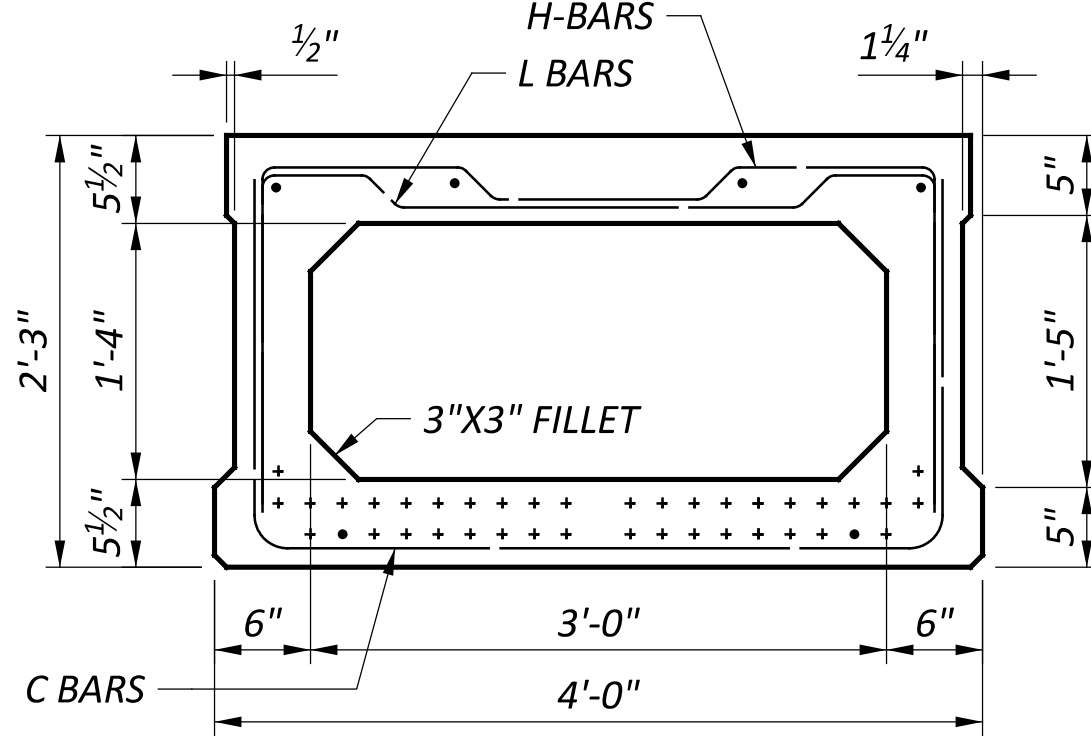
SHEET 1 TOTAL 6



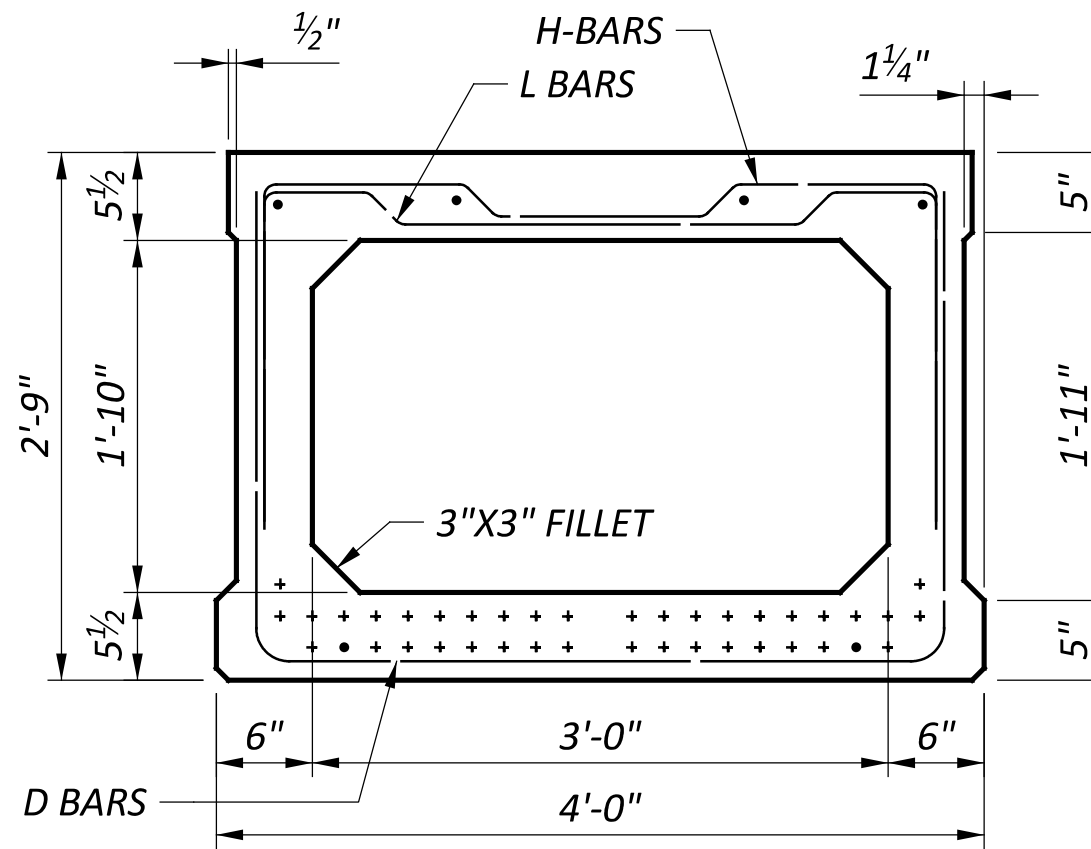
B17-48



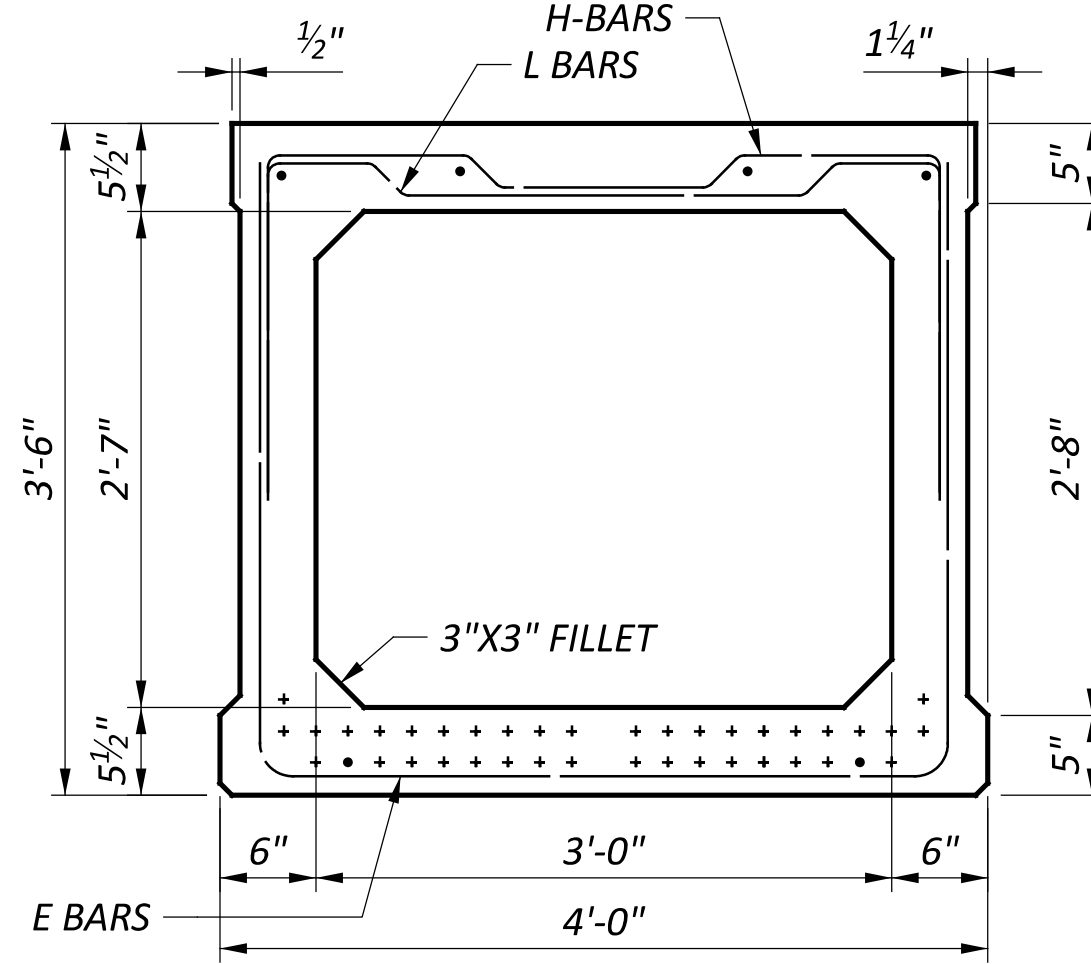
B21-48



B27-48

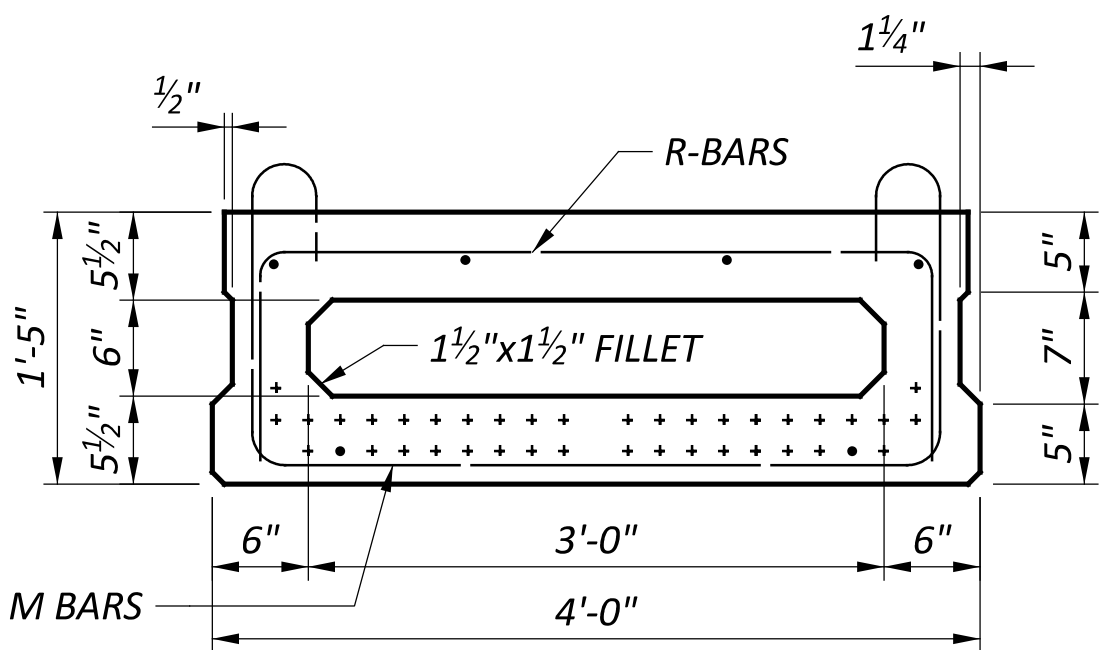


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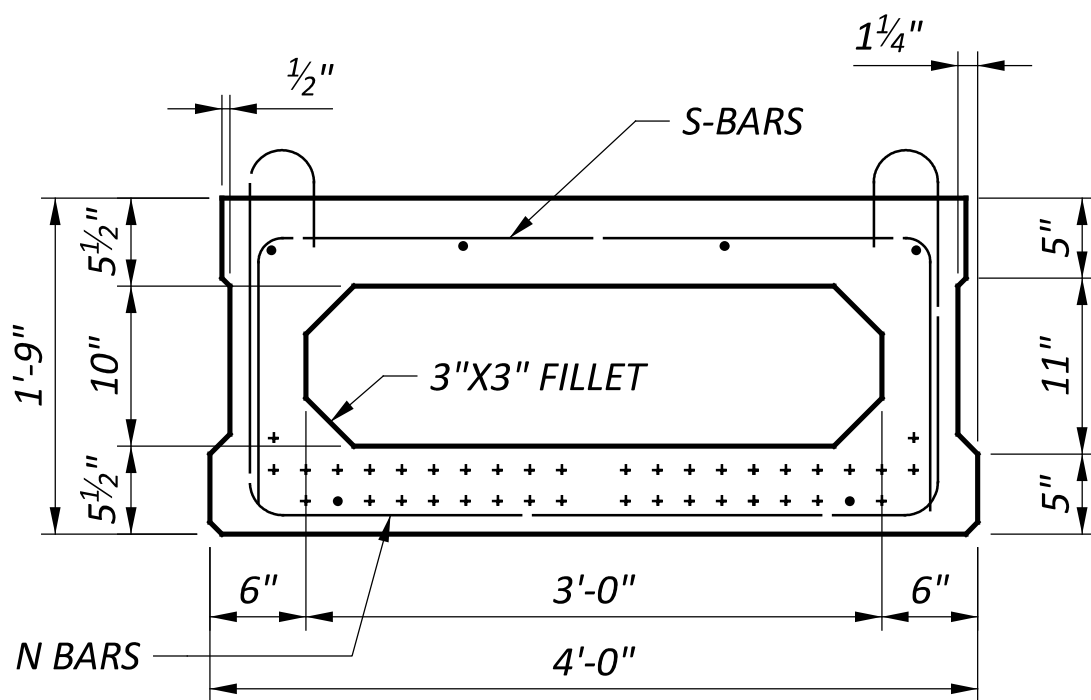


B42-48

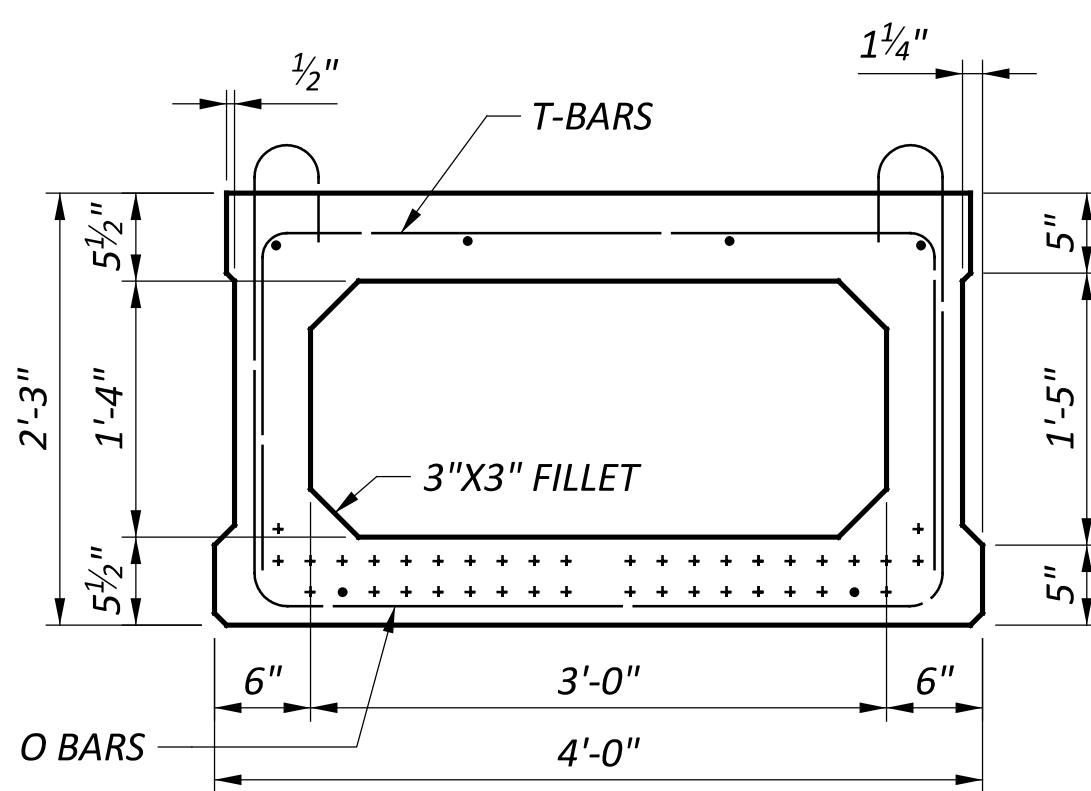
48" NON-COMPOSITE BEAMS



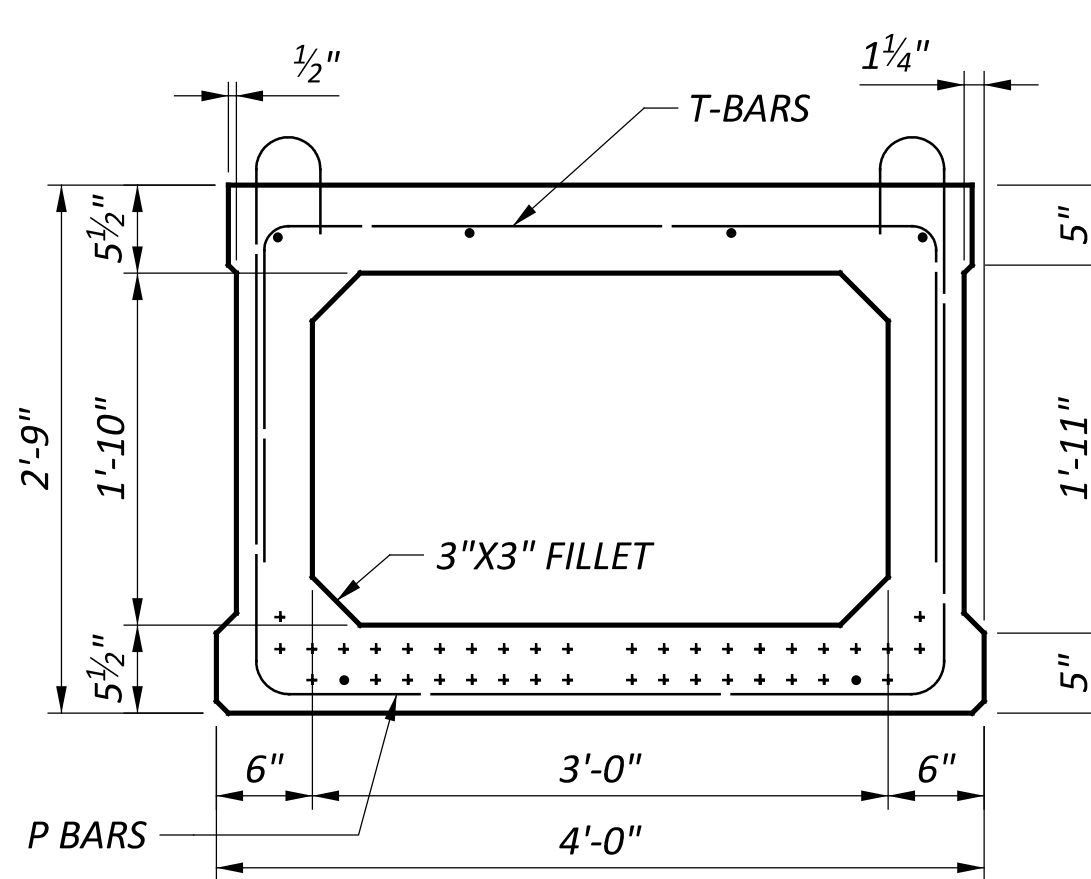
CB17-48



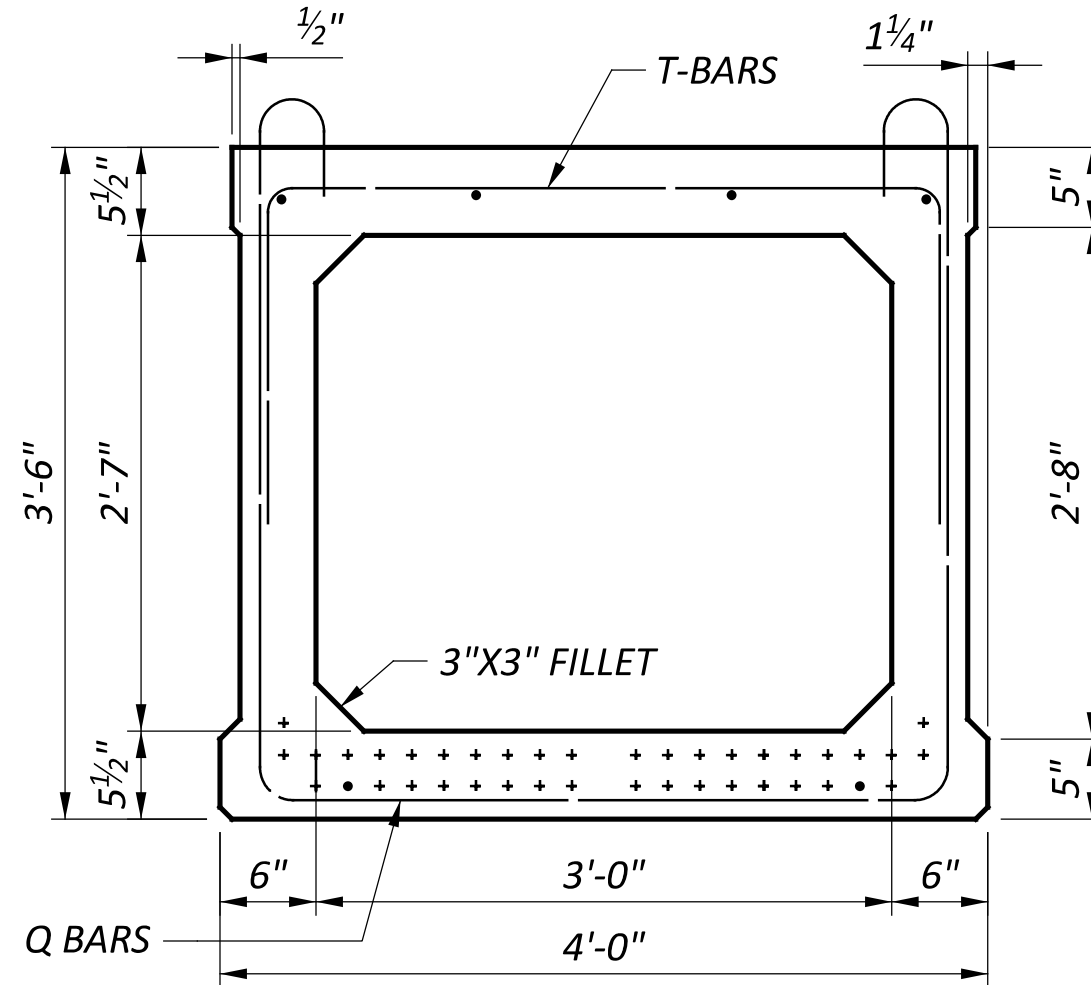
CB21-48



CB27-48

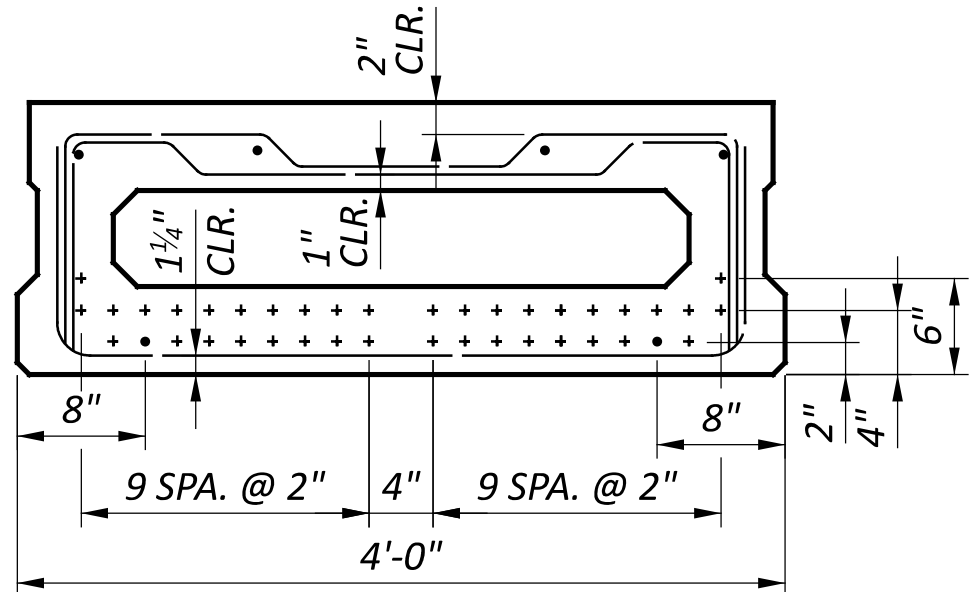


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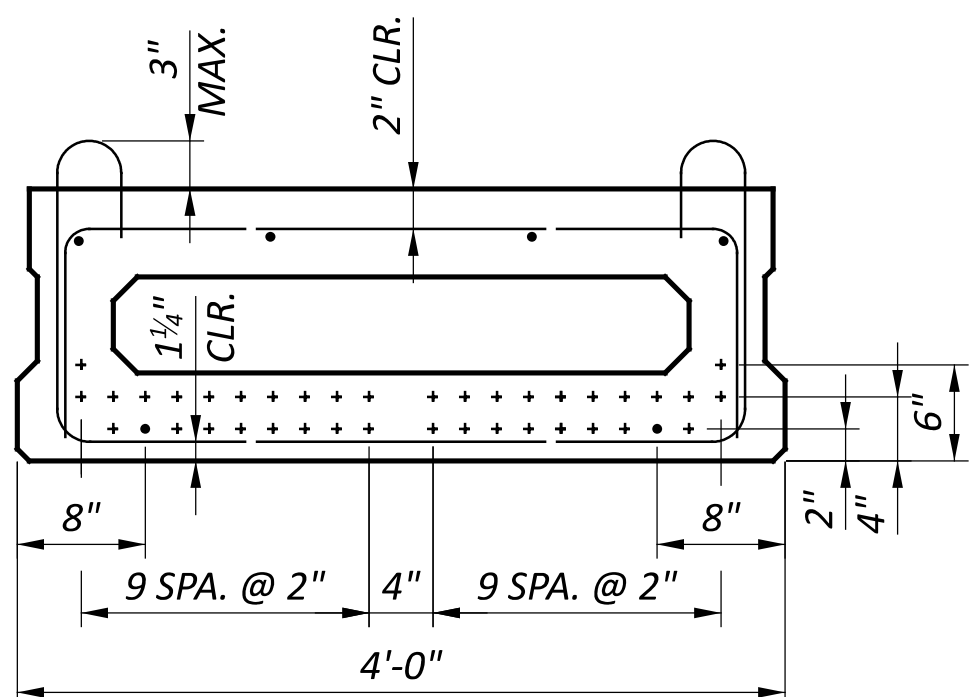


CB42-48

48" COMPOSITE BEAMS



STRAND LAYOUT AND BAR SPACING
TYPICAL FOR ALL NON-COMPOSITE BEAMS



STRAND LAYOUT AND BAR SPACING
TYPICAL FOR ALL COMPOSITE BEAMS

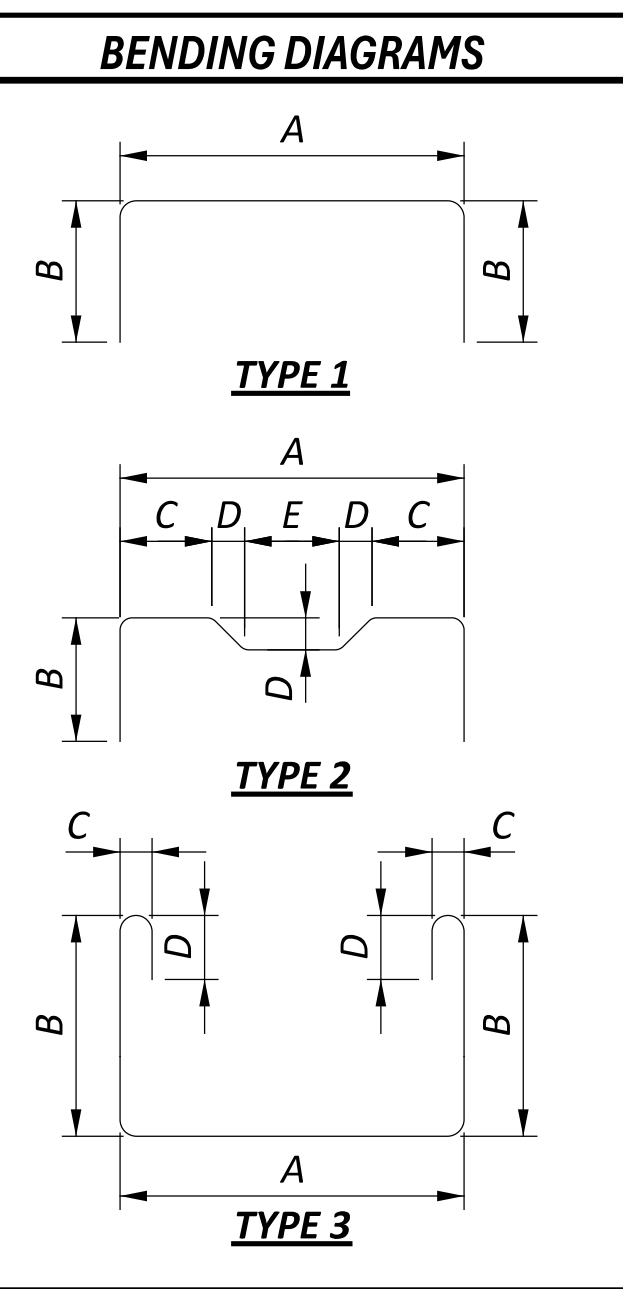
BOX BEAM SECTION PROPERTIES						
BEAM ONLY	D	17"	21"	27"	33"	42"
	A _b	580.8	632.3	689.3	746.2	831.8
	I _b	18652	34834	65398	109652	201537
	Y _b	8.42	10.40	13.38	16.36	20.82
	S _t	2175	3286	4802	6590	9515
COMPOSITE SECTION	S _b	2214	3349	4888	6702	9680
	I _c	39505	65264	111083	175131	303890
	Y _{bc}	11.59	13.92	17.45	20.90	26.00
	S _{tc}	7302	9218	11632	14474	18993
	S _{bc}	3409	4689	6366	8379	11688

NOTES:

- STRANDS SHALL BE PLACED IN THE LOCATIONS SHOWN AND SHALL BE DISTRIBUTED SYMMETRICALLY OVER THE BEAM WIDTH. STRAND PATTERN AND THE DEBOND LENGTH SHALL BE SYMMETRICAL ABOUT THE VERTICAL C OF THE BEAM. DEBONDED STRANDS SHALL FOLLOW THE DIRECTION PROVIDED IN THE ODOT BRIDGE DESIGN MANUAL.
- THE MINIMUM TOP LONGITUDINAL REINFORCING STEEL SHALL BE (4) #5 BARS AND THE BOTTOM LONGITUDINAL REINFORCING STEEL SHALL BE (2) #5 BARS. SEE PROJECT PLANS FOR ADDITIONAL REQUIREMENTS.
- FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF BEAM REINFORCING.

REINFORCING BAR SCHEDULE						
MARK	TYPE	A	B	C	D	E
A	1	42"	13"			
B	1	42"	17"			
C	1	42"	23"			
D	1	42"	29"			
E	1	42"	38"			
F	2	42"	13"	13"	2"	12"
G	2	42"	17"	13"	2"	12"
H	2	42"	21"	13"	2"	12"
J	2	42"	13"	7"	2"	24"
K	2	42"	17"	7"	2"	24"
L	2	42"	21"	7"	2"	24"
M	3	42"	18 1/2"	4"	6"	
N	3	42"	22 1/2"	4"	6"	
O	3	42"	28 1/2"	4"	6"	
P	3	42"	34 1/2"	4"	6"	
Q	3	42"	43 1/2"	4"	6"	
R	1	42"	13"			
S	1	42"	17"			
T	1	42"	21"			

NOTE: ALL BARS IN TABLE ARE #4

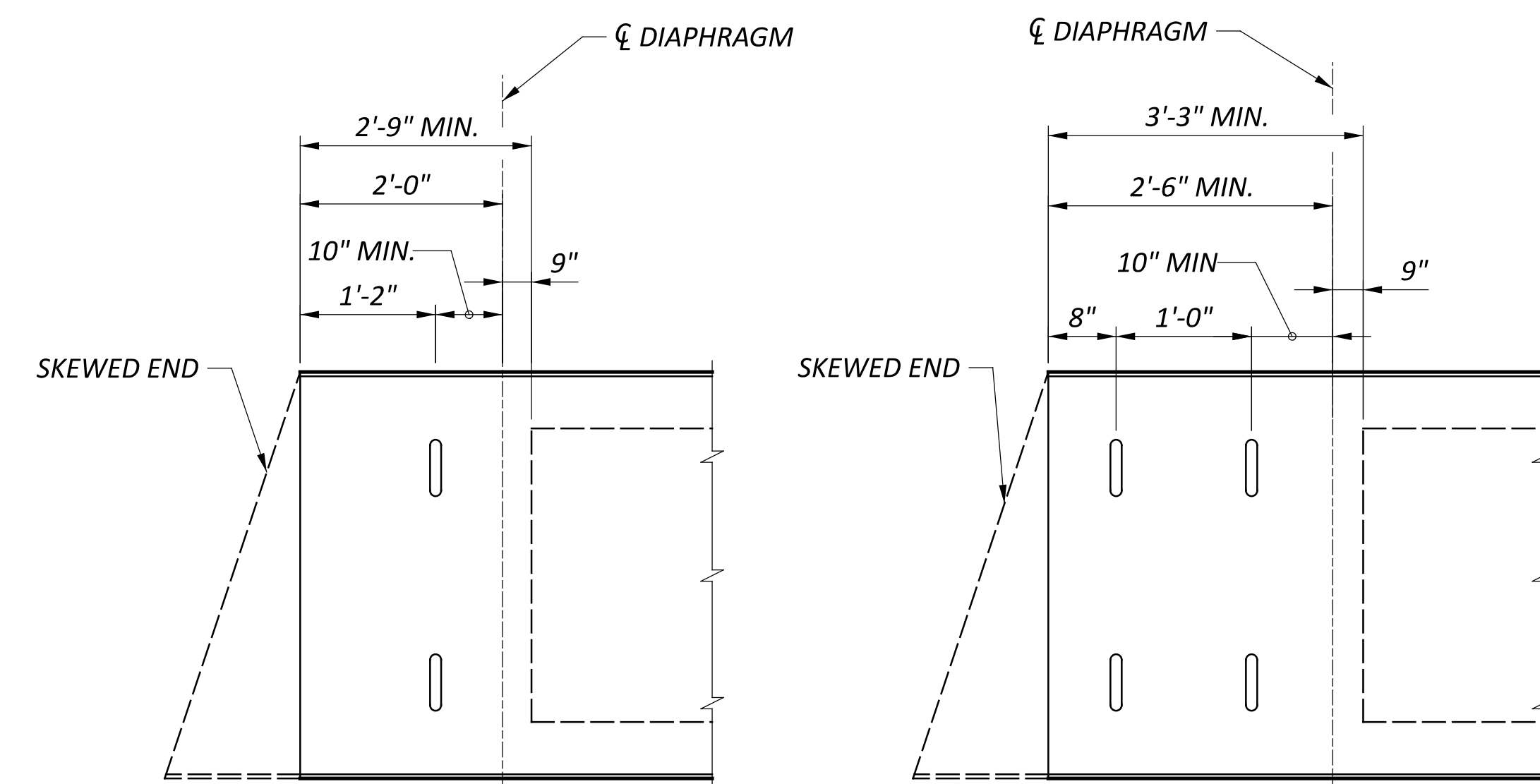


NOTE:

COMPOSITE SECTION PROPERTIES ASSUME A 5" FULLY COMPOSITE CONCRETE DECK.

DESCRIPTION:

- D = TOTAL DEPTH OF THE NON-COMPOSITE BEAM (IN)
- A_b = CROSS-SECTIONAL AREA OF THE NON-COMPOSITE BEAM (IN²)
- I_b = MOMENT OF INERTIA OF THE NON-COMPOSITE BEAM ABOUT THE X-X AXIS (IN⁴)
- Y_b = LOCATION OF THE NEUTRAL AXIS OF THE NON-COMPOSITE SECTION MEASURED FROM THE EXTREME BOTTOM FIBER (IN)
- S_t = SECTION MODULUS FOR THE EXTREME TOP FIBER OF THE NON-COMPOSITE BEAM (IN³)
- S_b = SECTION MODULUS FOR THE EXTREME BOTTOM FIBER OF THE NON-COMPOSITE BEAM (IN³)
- I_c = MOMENT OF INERTIA OF THE COMPOSITE BEAM ABOUT THE X-X AXIS (IN⁴)
- Y_{bc} = LOCATION OF THE NEUTRAL AXIS OF THE COMPOSITE SECTION MEASURED FROM THE EXTREME BOTTOM FIBER (IN)
- S_{tc} = SECTION MODULUS FOR THE EXTREME TOP FIBER OF THE COMPOSITE BEAM (IN³)
- S_{bc} = SECTION MODULUS FOR THE EXTREME BOTTOM FIBER OF THE COMPOSITE BEAM (IN³)

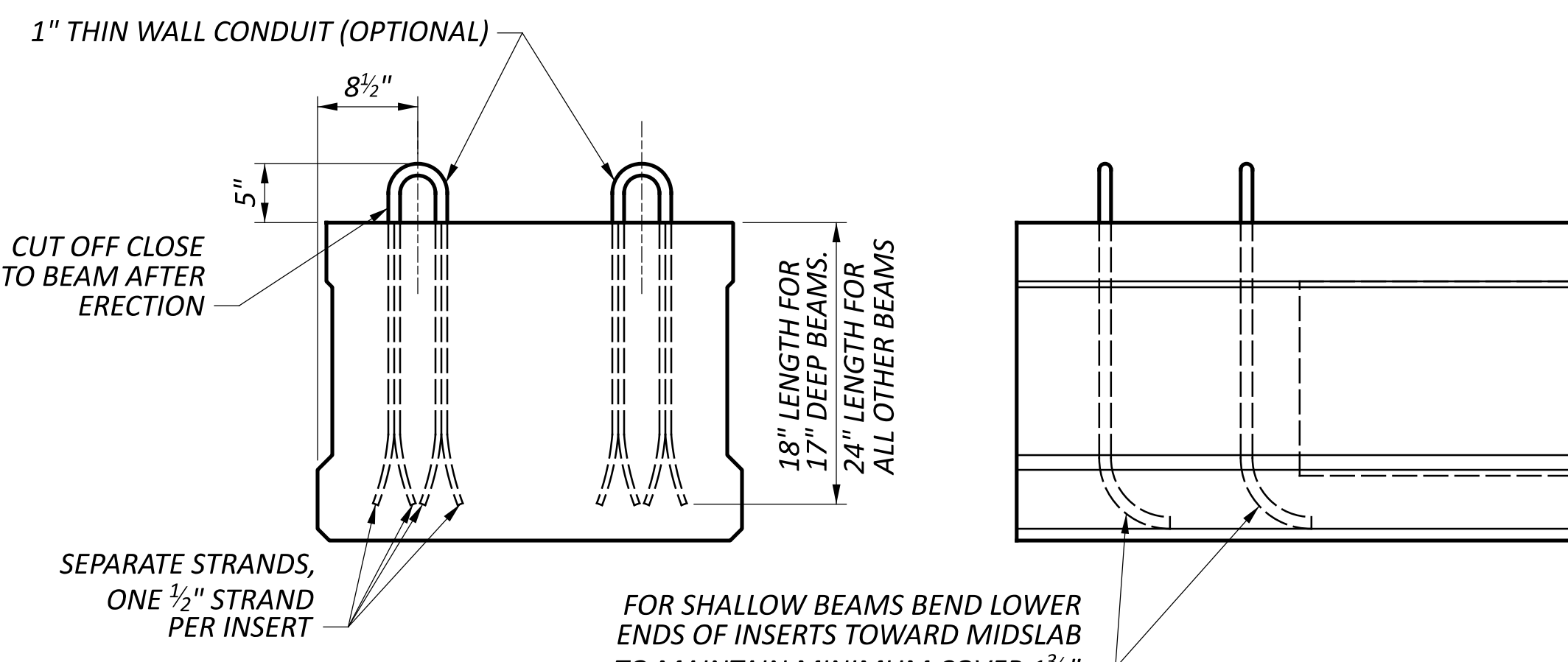


PLAN

FOR 17" AND 21" DEEP BEAMS

PLAN
FOR 27", 33" AND 42" DEEP BEAMS

BEAM LIFTING INSERTS AT ABUTMENT

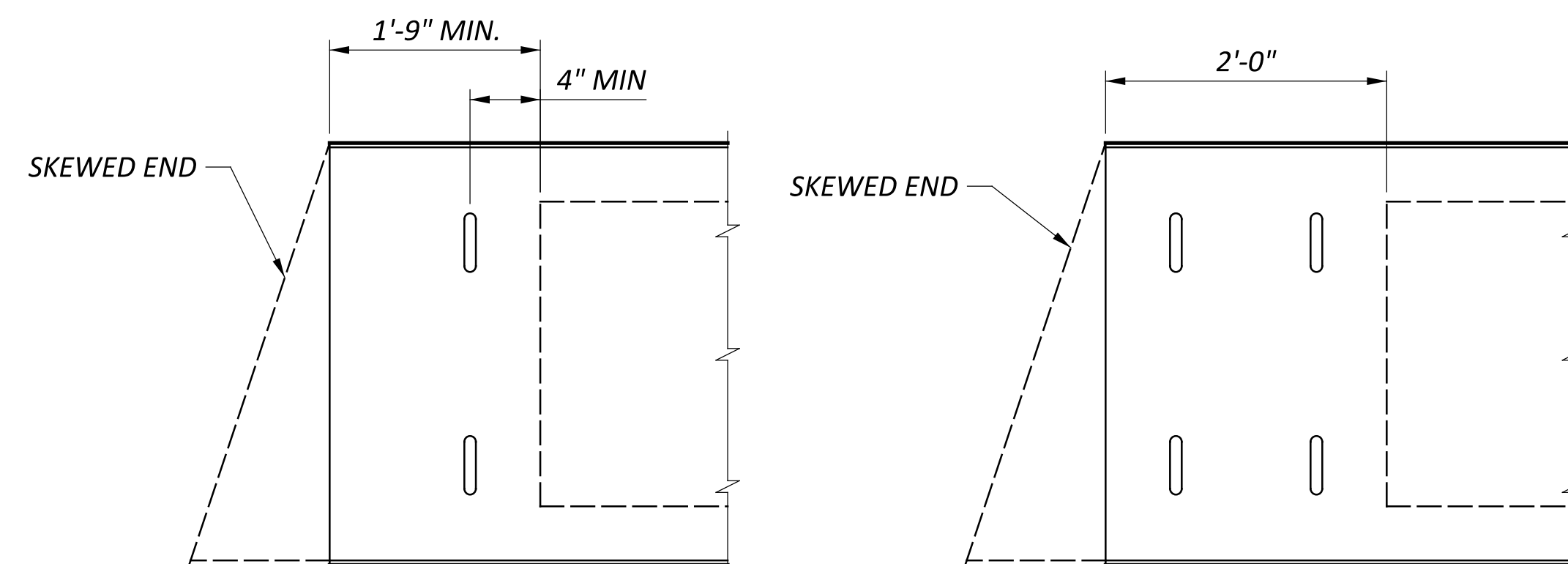


END VIEW

ELEVATION

NOTES:

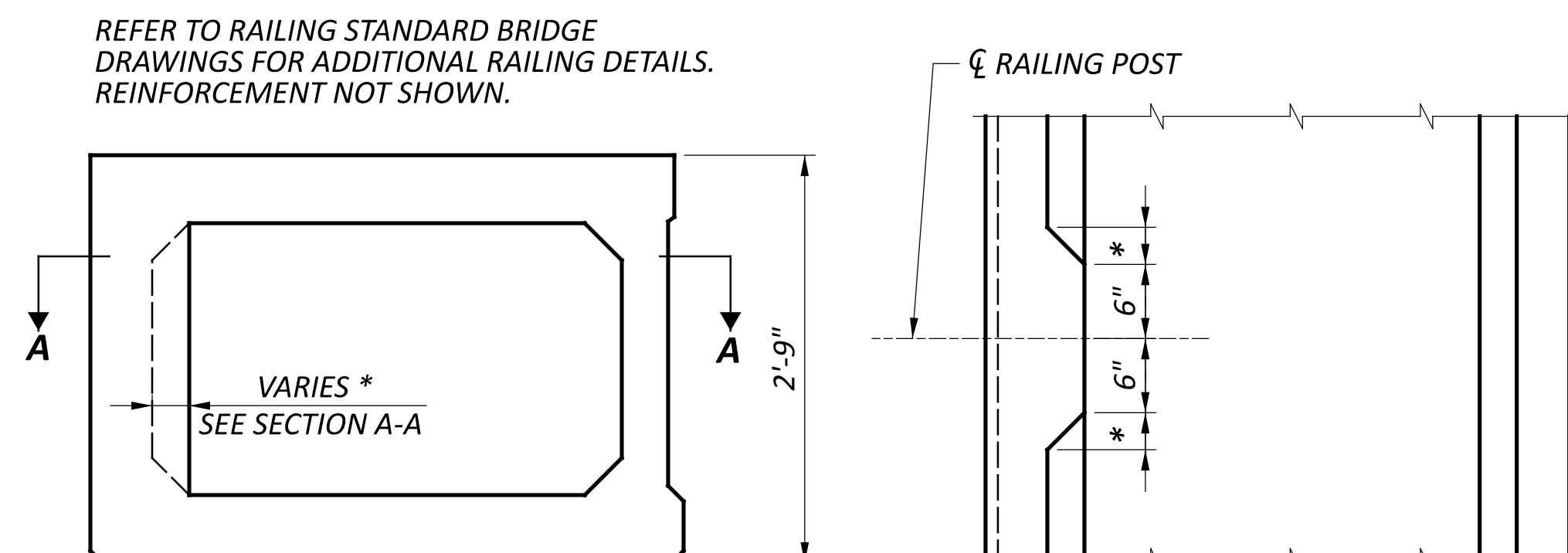
1. AN ALTERNATE LIFTING INSERT DESIGN CONFORMING TO C&M'S 515 MAY BE USED.
2. SHIFT LIFTING INSERTS SLIGHTLY WHERE NECESSARY TO CLEAR REINFORCEMENT, ANCHOR DOWEL HOLES, OR TIE RODS.
3. ALL LIFTING INSERTS MUST BE UNIFORMLY ENGAGED DURING HANDLING.
4. THE FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF THE BEAM REINFORCING.



PLAN
FOR 17" AND 21" DEEP BEAMS

PLAN
FOR 27", 33" AND 42" DEEP BEAMS

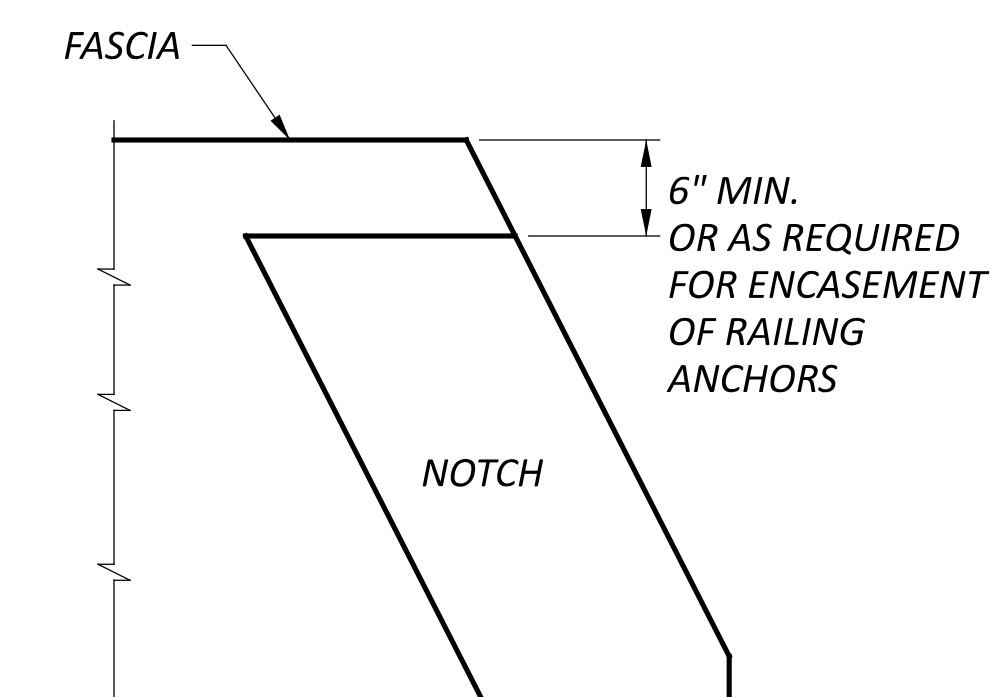
BEAM LIFTING INSERTS AT PIER



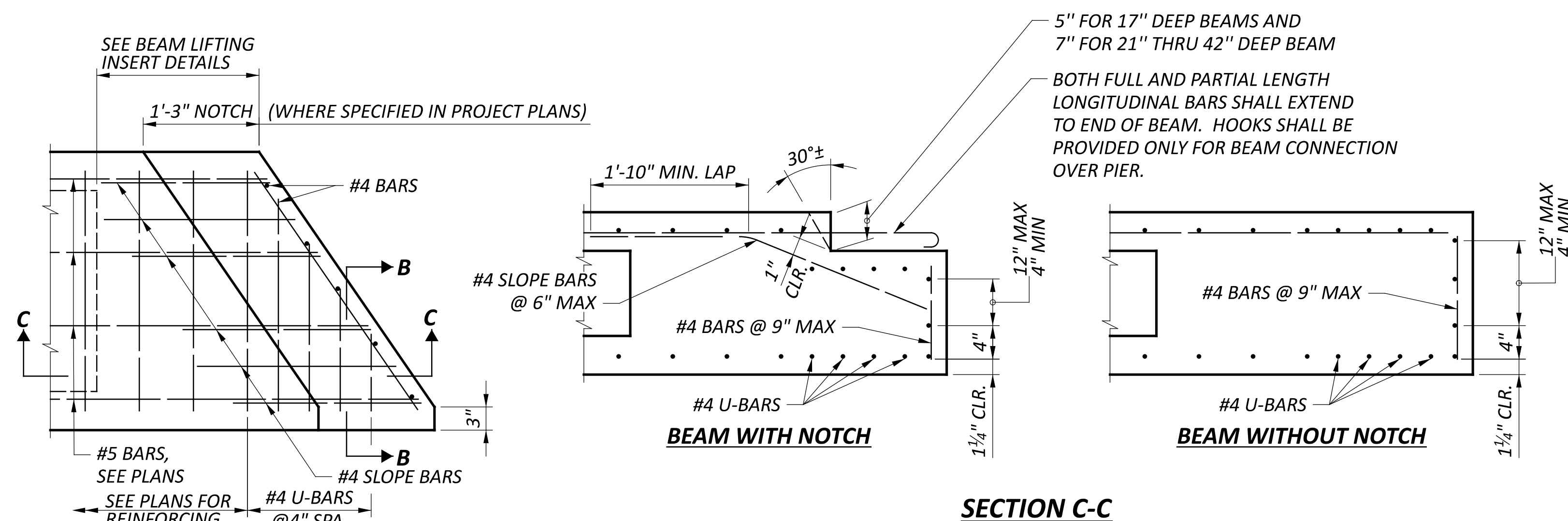
SECTION
(WALL THICKENING AT RAILING ANCHORS)

SECTION A-A

* MATCH WIDTH OF FILLET IN VOID



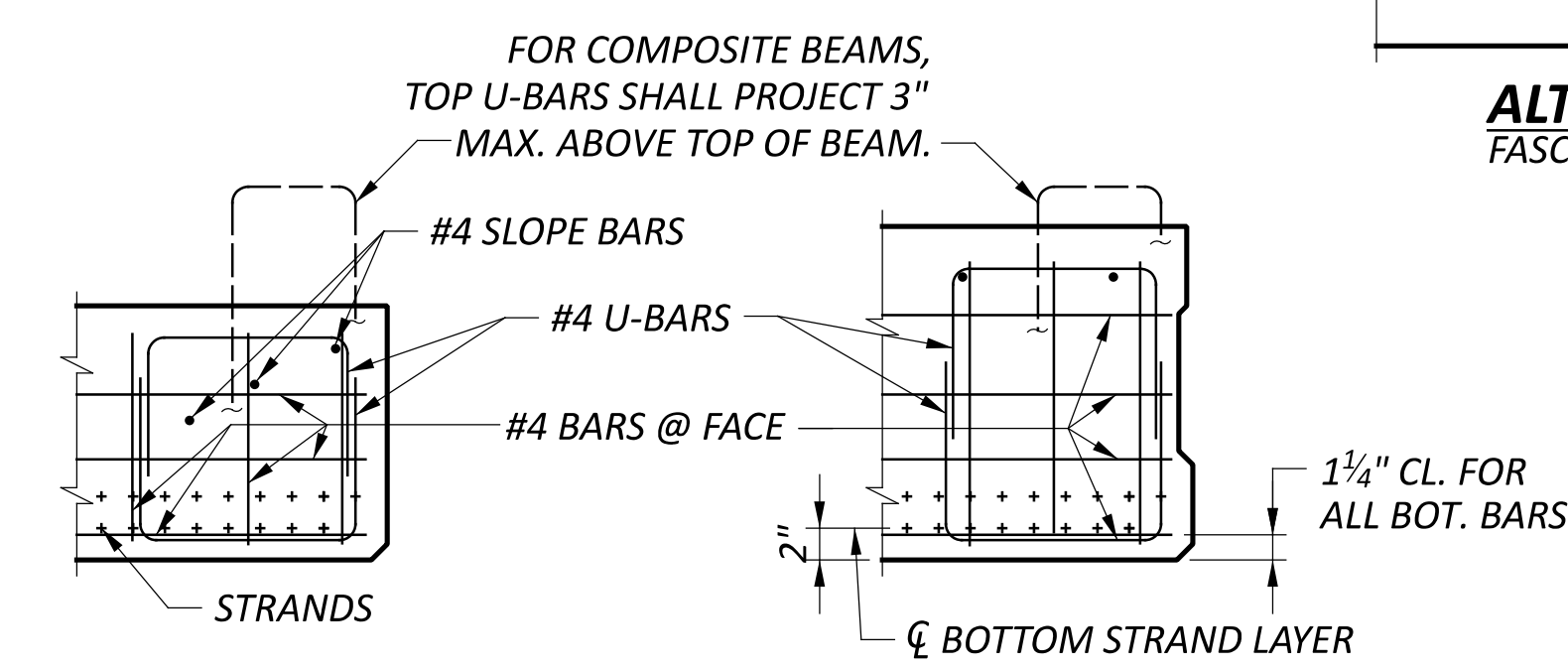
ALTERNATE PLAN
FASCIA BEAM WITH NOTCH



PLAN

SECTION C-C

DETAILS AND REINFORCEMENT OF BEAM ENDS

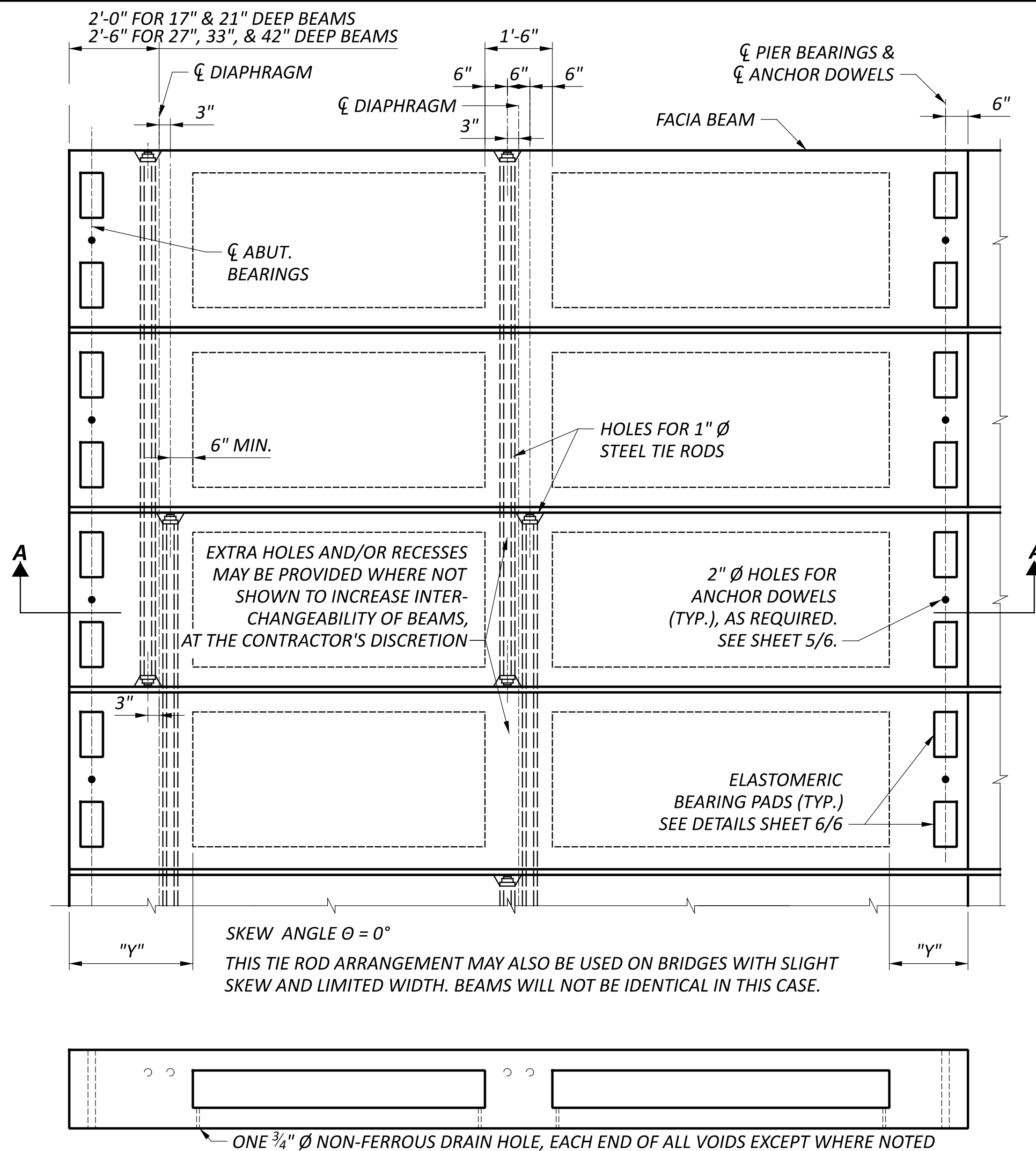


BEAM WITH NOTCH

BEAM WITHOUT NOTCH

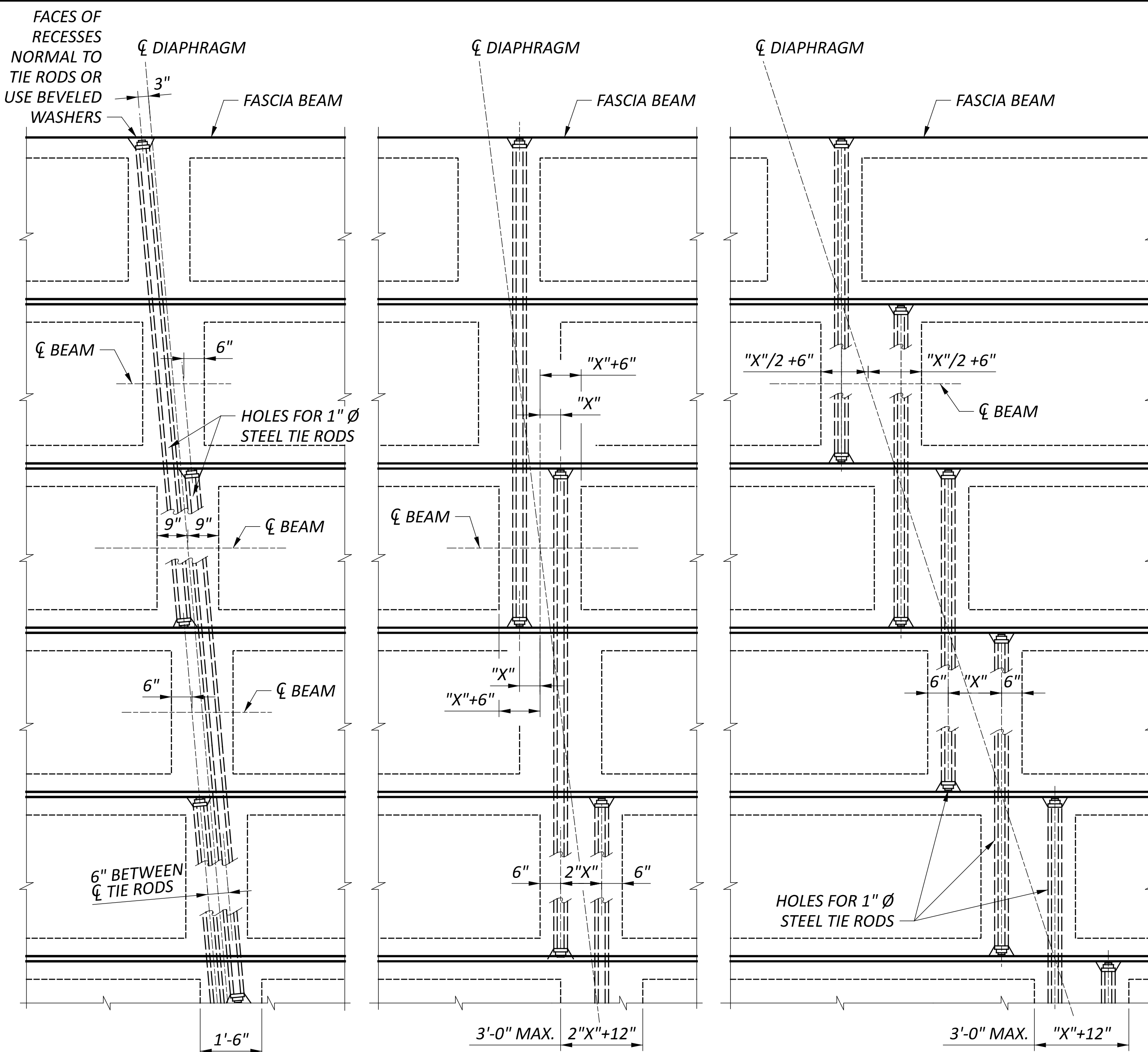
SECTION B-B

INTERIOR BEAM WITH NOTCH AND INTERIOR/EXTERIOR BEAM WITHOUT NOTCH SHOWN. SEE ALTERNATE PLAN FOR FASCIA BEAM WITH NOTCH.



SECTION A-A

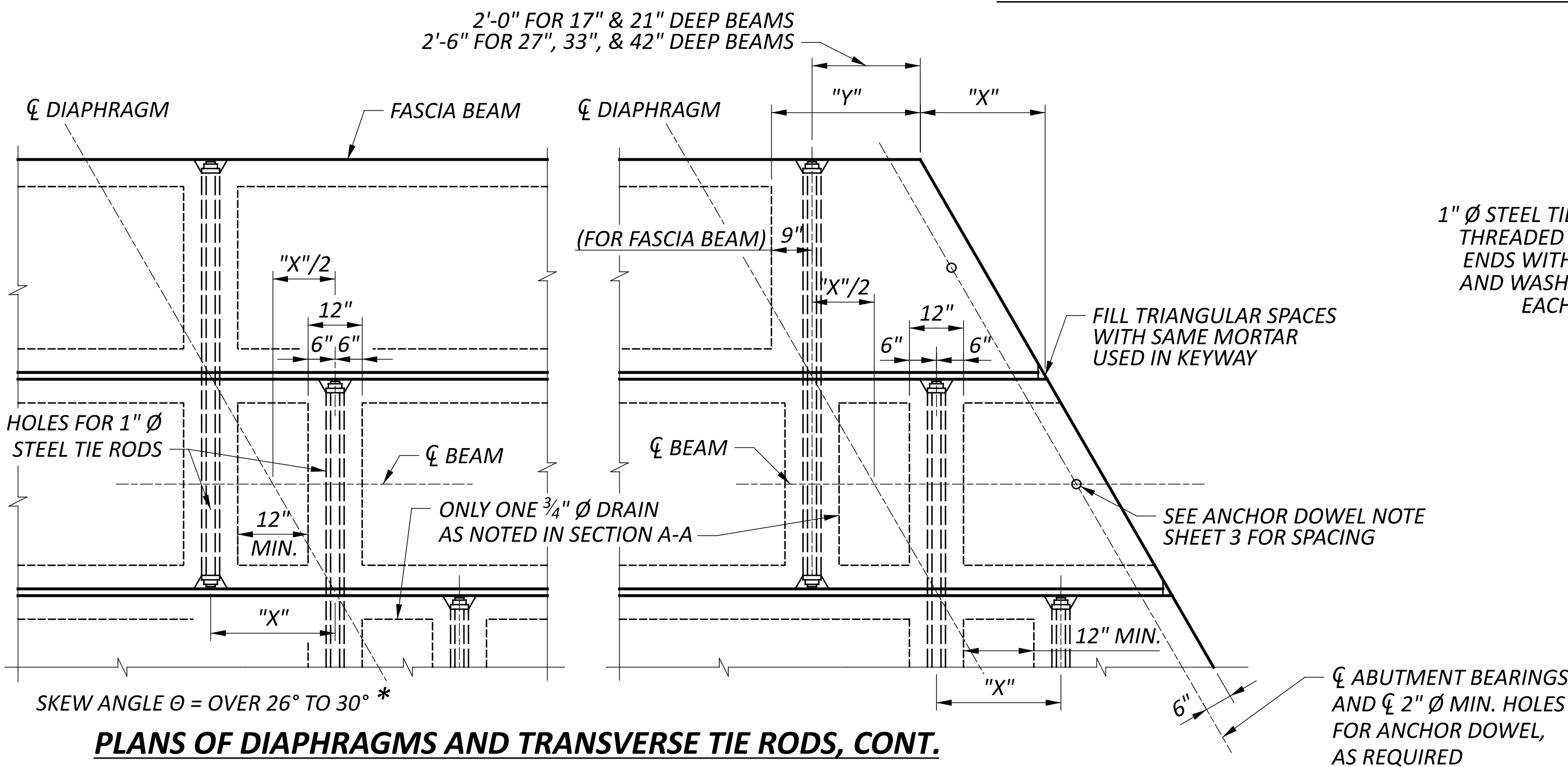
TYPICAL PLANS OF DIAPHRAGMS AND TRANSVERSE TIE RODS



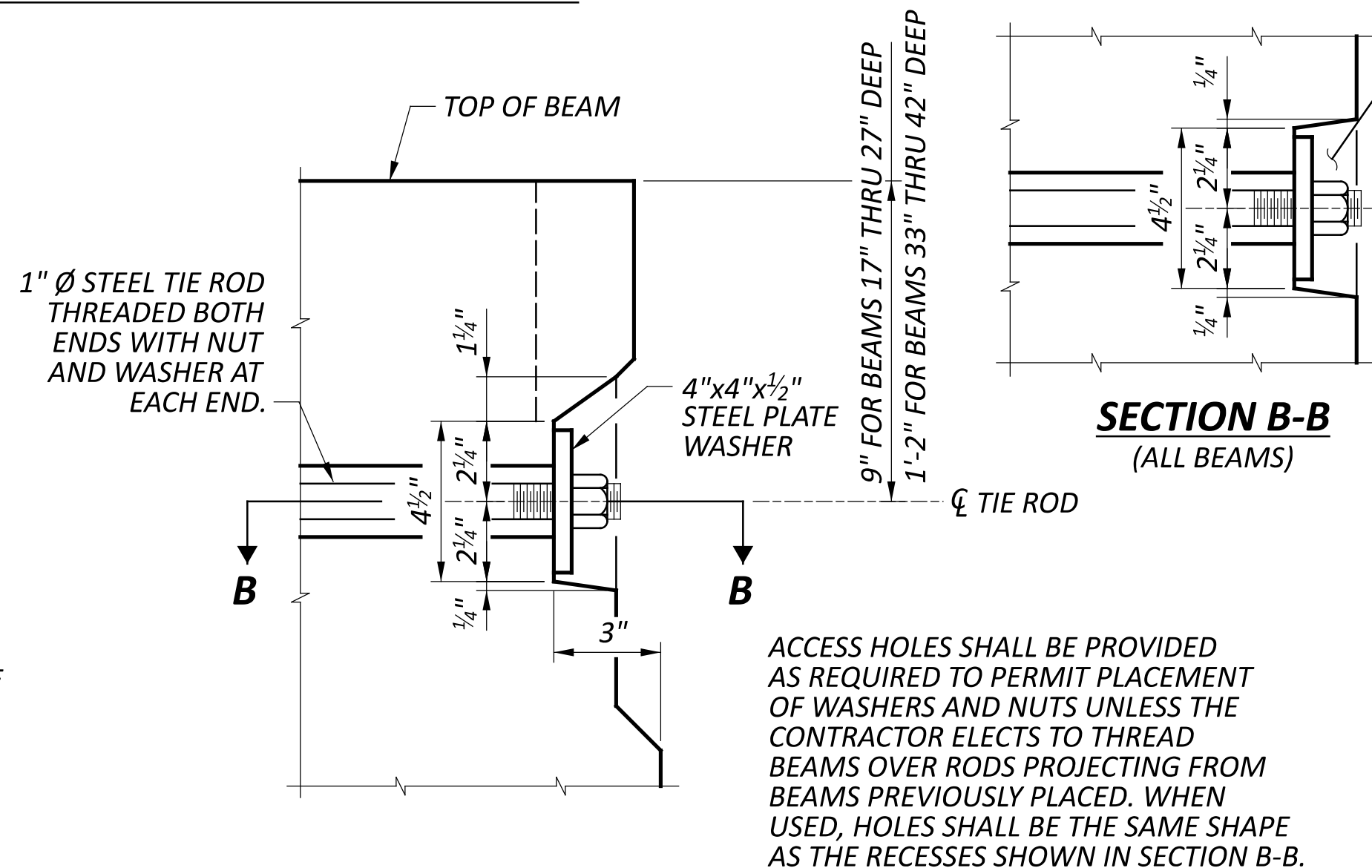
SKEW ANGLE $\theta = 0^\circ$ TO 4° *

SKEW ANGLE $\theta = \text{OVER } 4^\circ$ TO 14° *

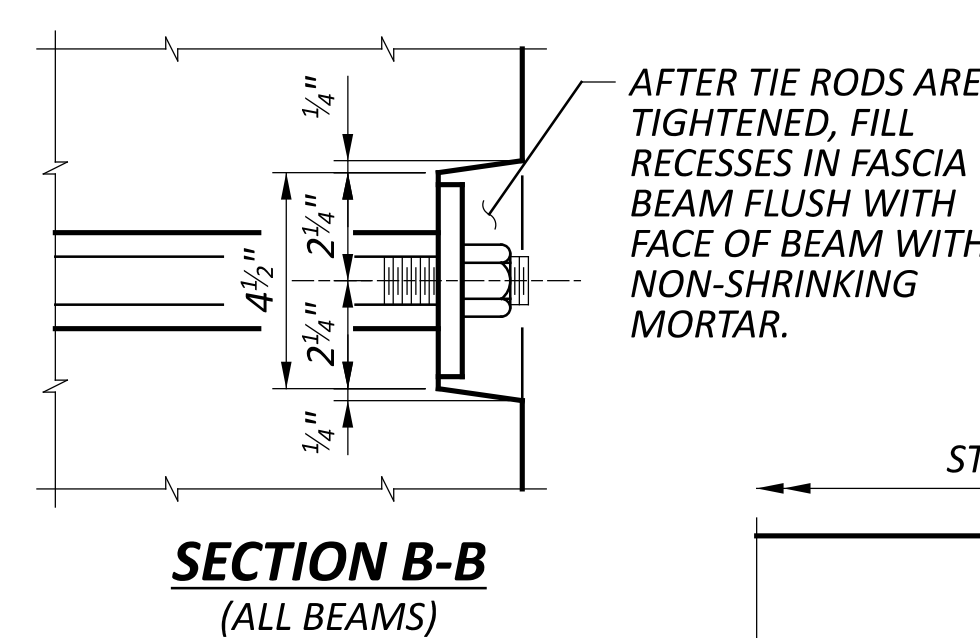
SKEW ANGLE $\theta = \text{OVER } 14^\circ$ TO 26° *



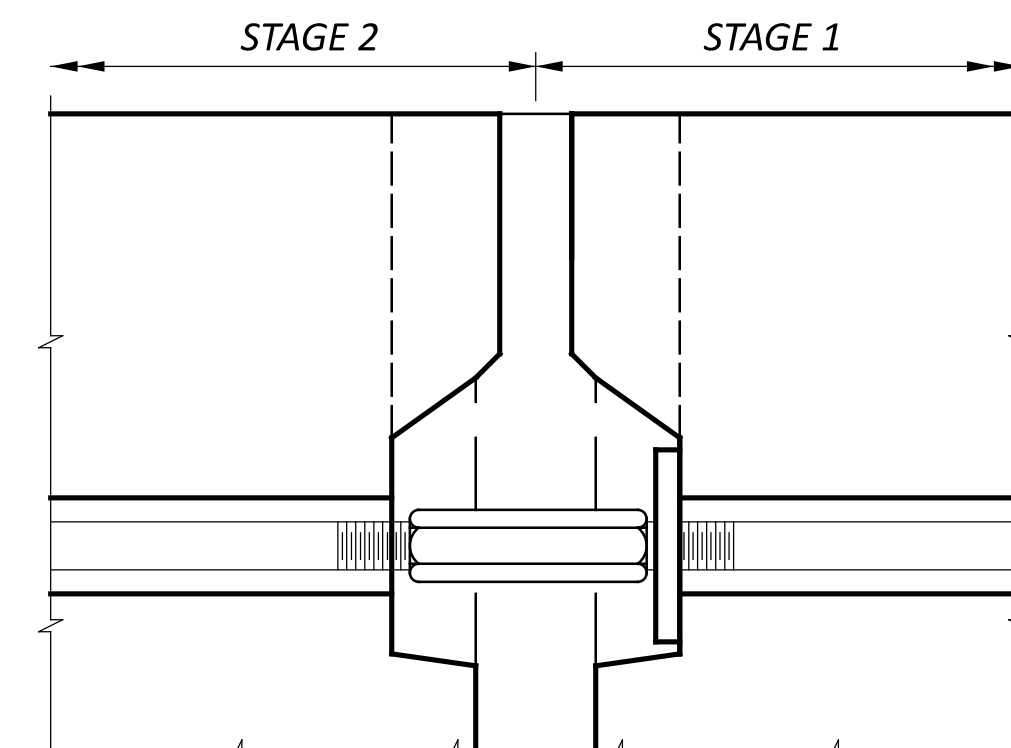
PLANS OF DIAPHRAGMS AND TRANSVERSE TIE RODS, CONT.



END DETAILS OF TRANSVERSE TIE ROD ANCHORAGE



SECTION B-B (ALL BEAMS)



SLEEVE NUT 3" OR 5" LONG, WITH RIGHT HAND THREADS. (MADE FROM HEX. OR SQUARE STOCK, 1/2" MIN. ACROSS FLATS)

DETAIL FOR STAGE CONSTRUCTION

"Y": SEE SHEET 3 OF 5 FOR DETAILS OF BEAM ENDS

"X": BEAM WIDTH MULTIPLIED BY TAN(θ)

SEE PROJECT PLANS FOR THE NUMBER AND LOCATION OF DIAPHRAGMS.

VOIDS SHALL BE VENTED TO PREVENT HEAVING OF THE TOP FLANGE DURING CURING.

DIAPHRAGM PLACEMENT

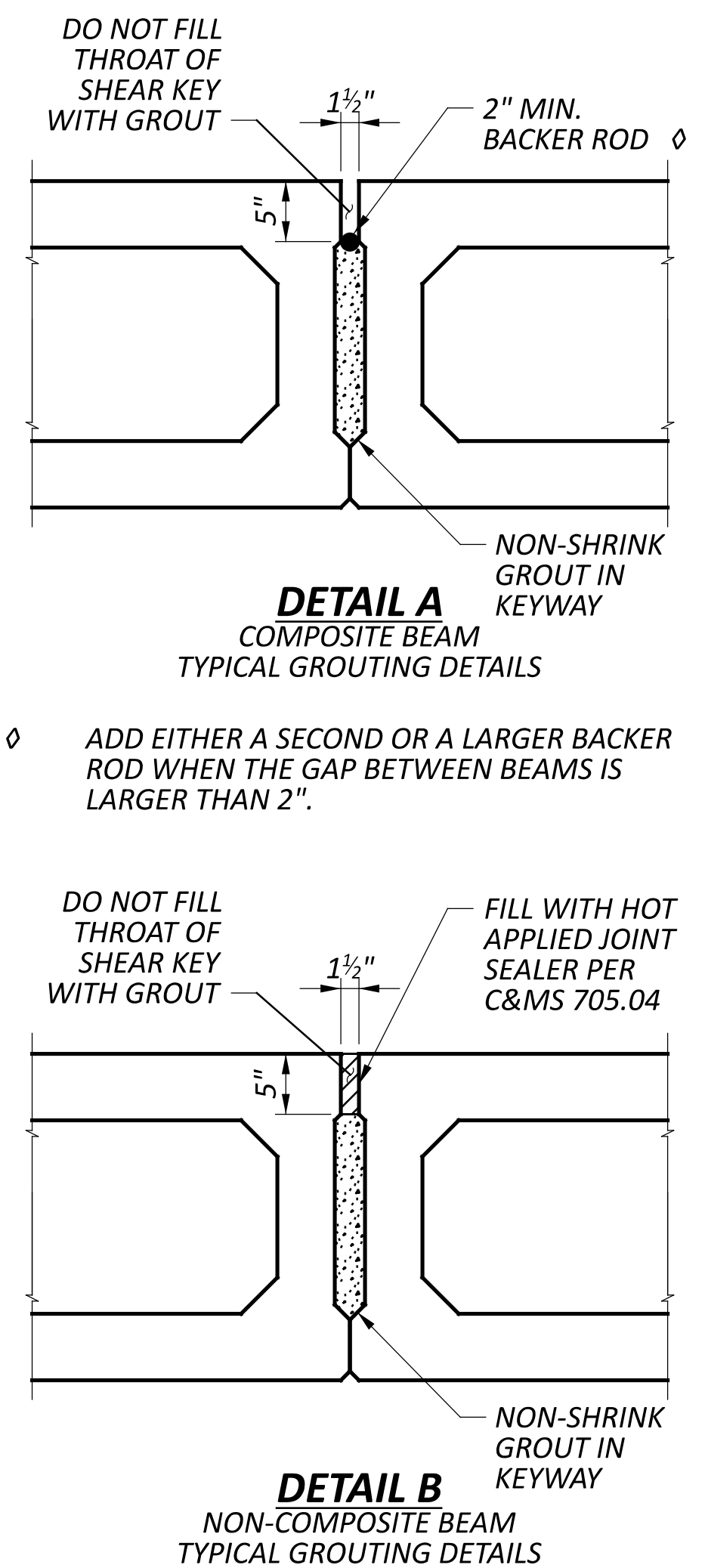
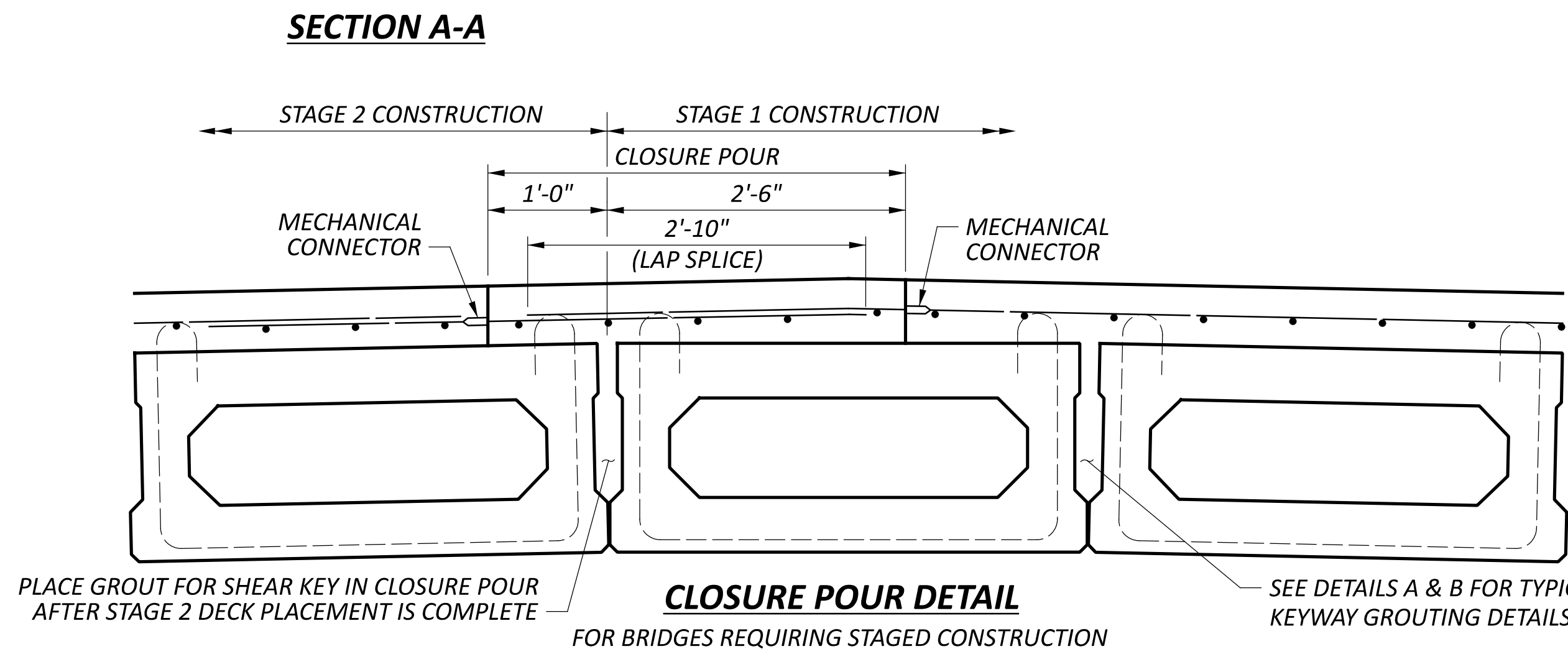
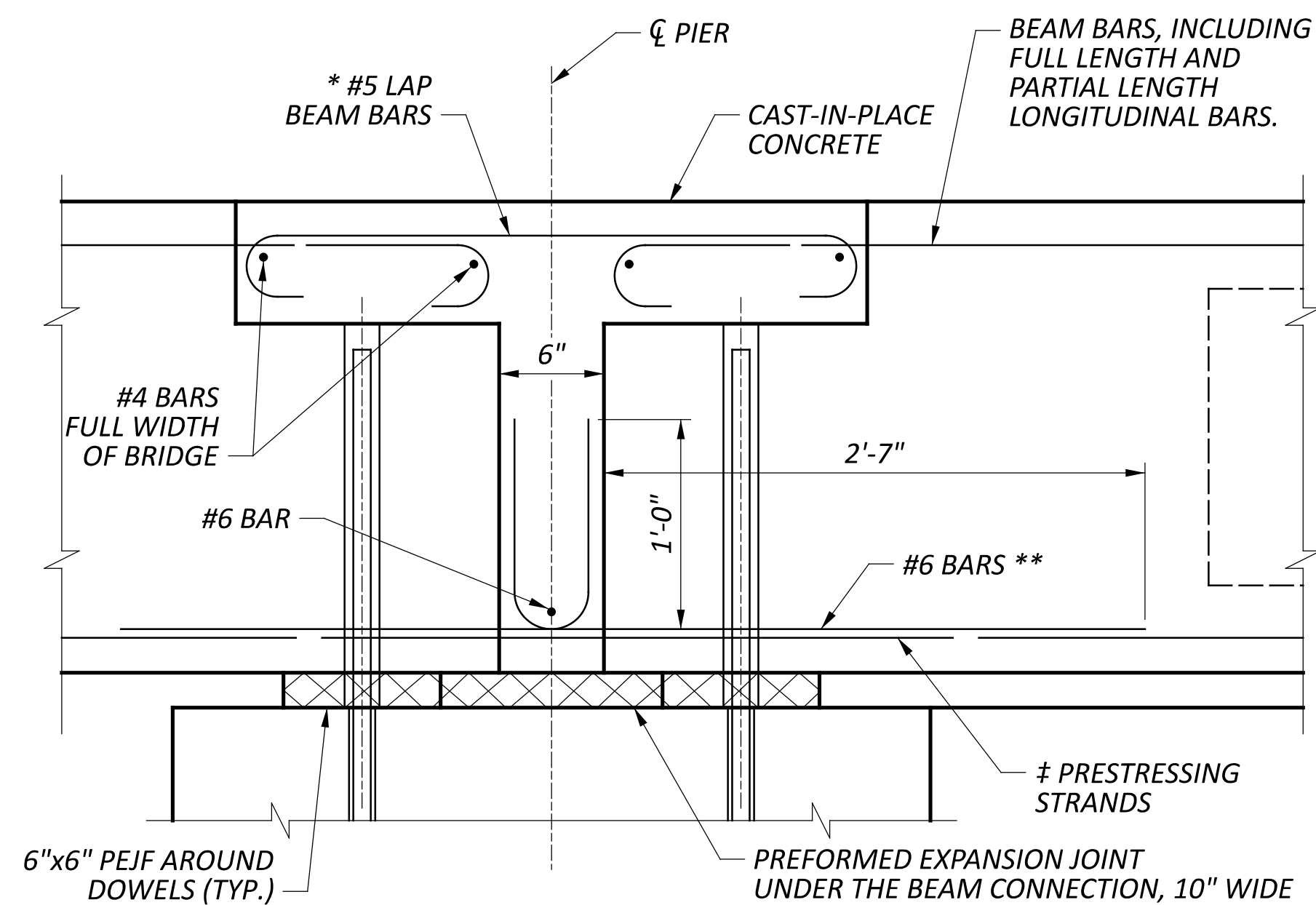
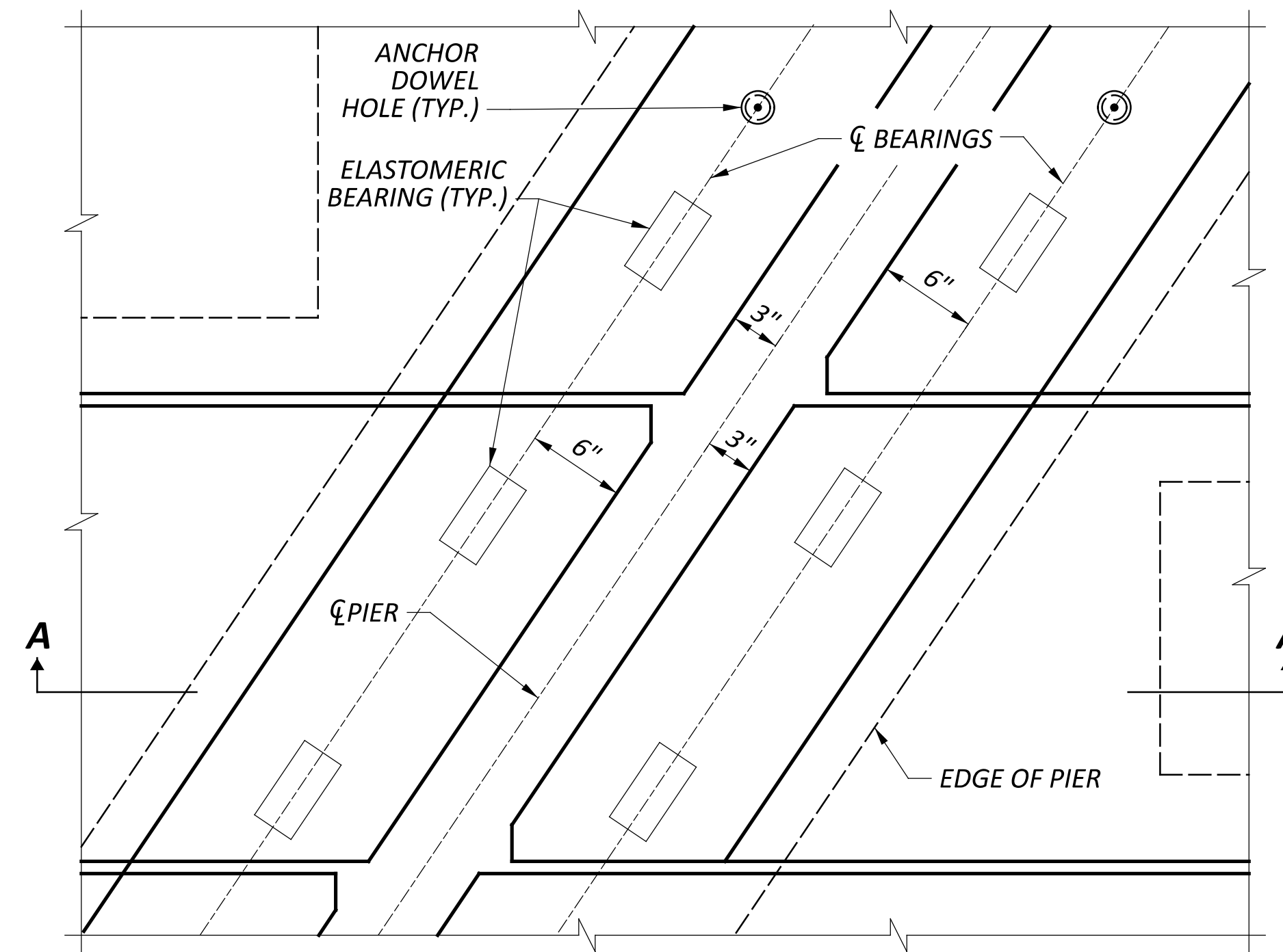
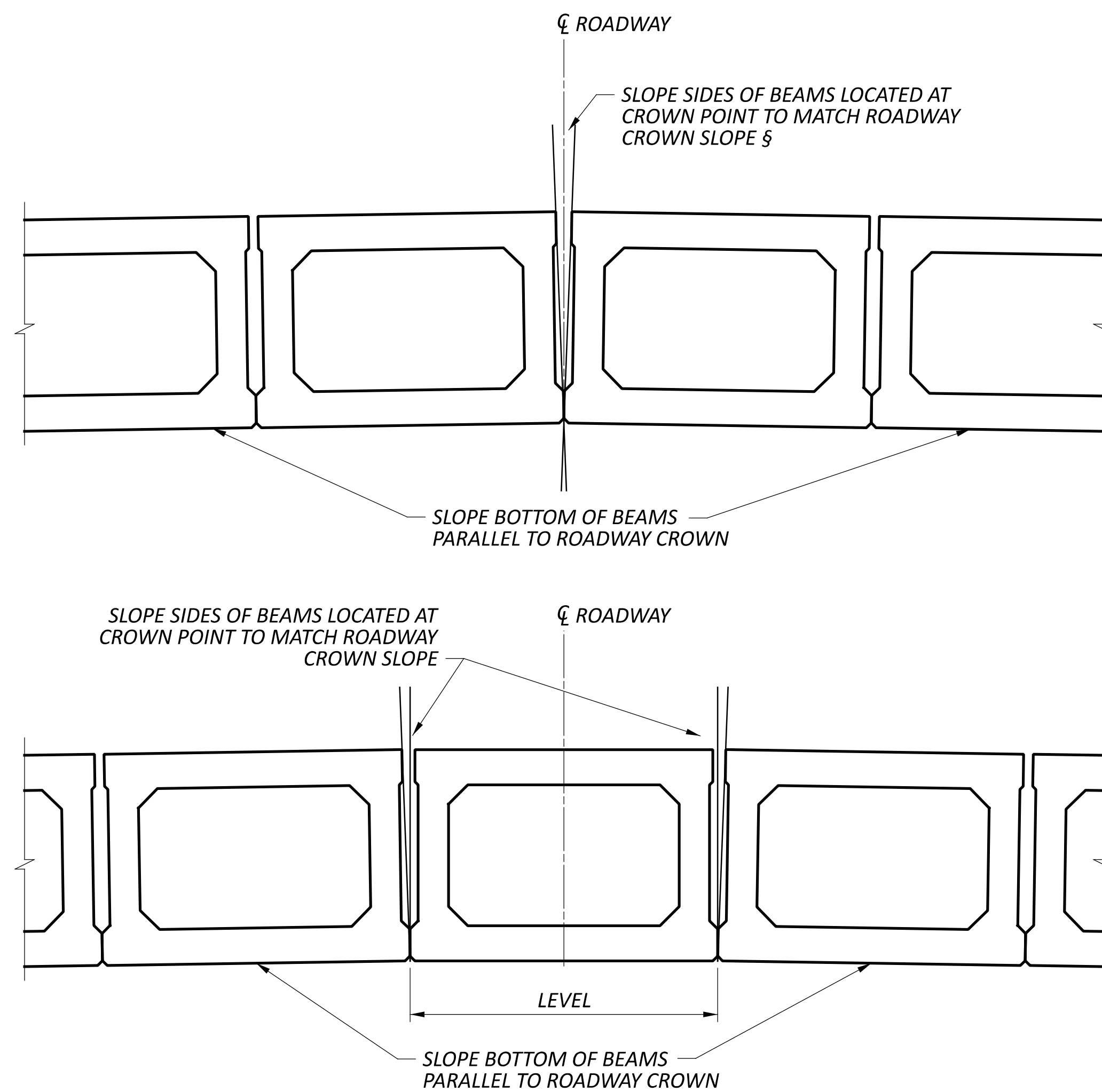
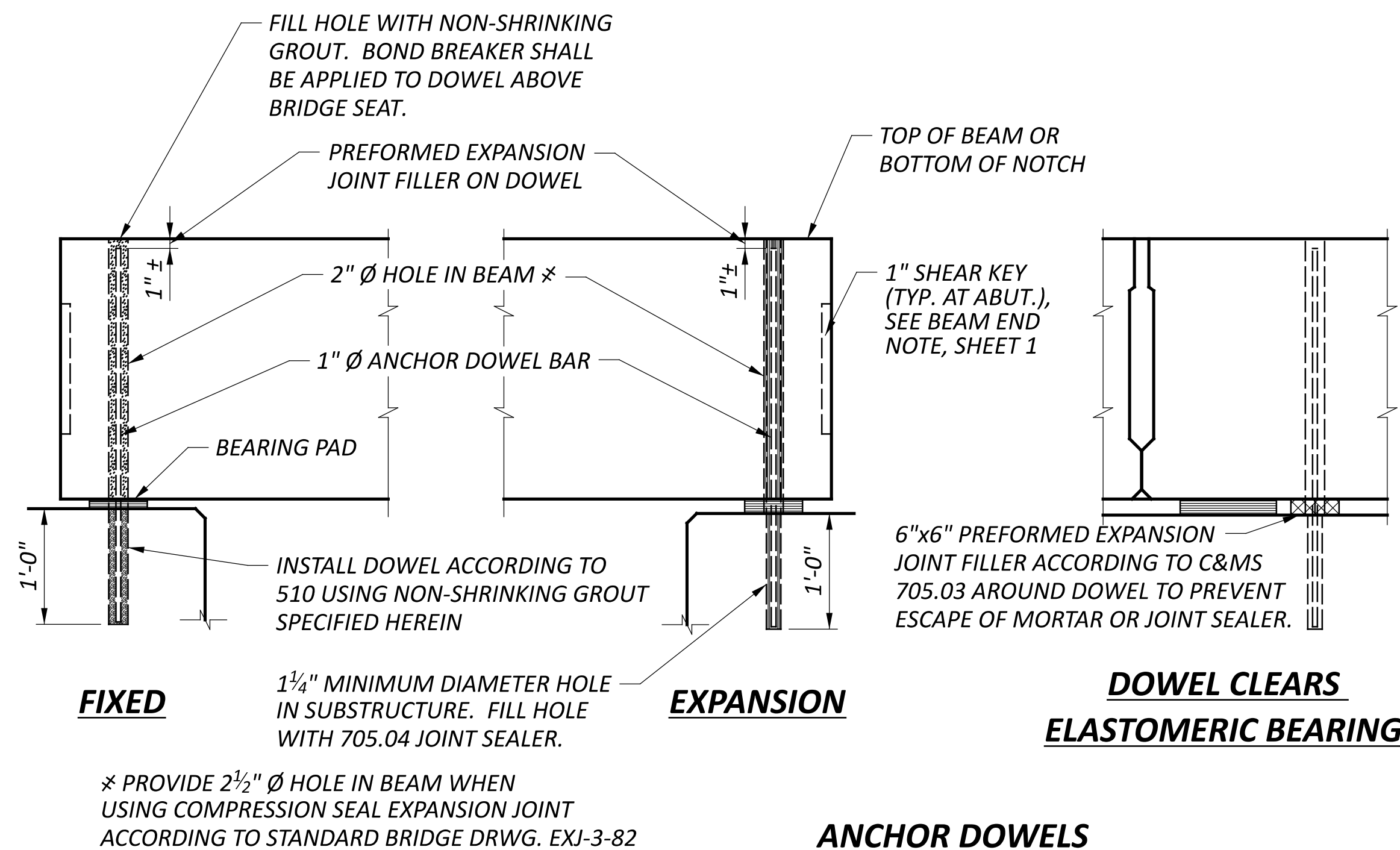
PROVIDE INTERMEDIATE DIAPHRAGMS AS FOLLOWS:

- SPAN $\leq 50'-0"$, ONE DIAPHRAGM
- $50'-0" < \text{SPAN} \leq 75'-0"$, TWO DIAPHRAGMS
- SPAN $> 75'-0"$, THREE DIAPHRAGMS

* AS AN OPTION, THE FABRICATOR MAY MAKE PROVISIONS FOR GREATER INTERCHANGEABILITY OF INTERIOR BEAMS BY FURNISHING DOUBLE TIE ROD HOLES IN THE DIAPHRAGMS AND PERMITTING ONE TIE ROD TO TIE TWO BEAMS TOGETHER.

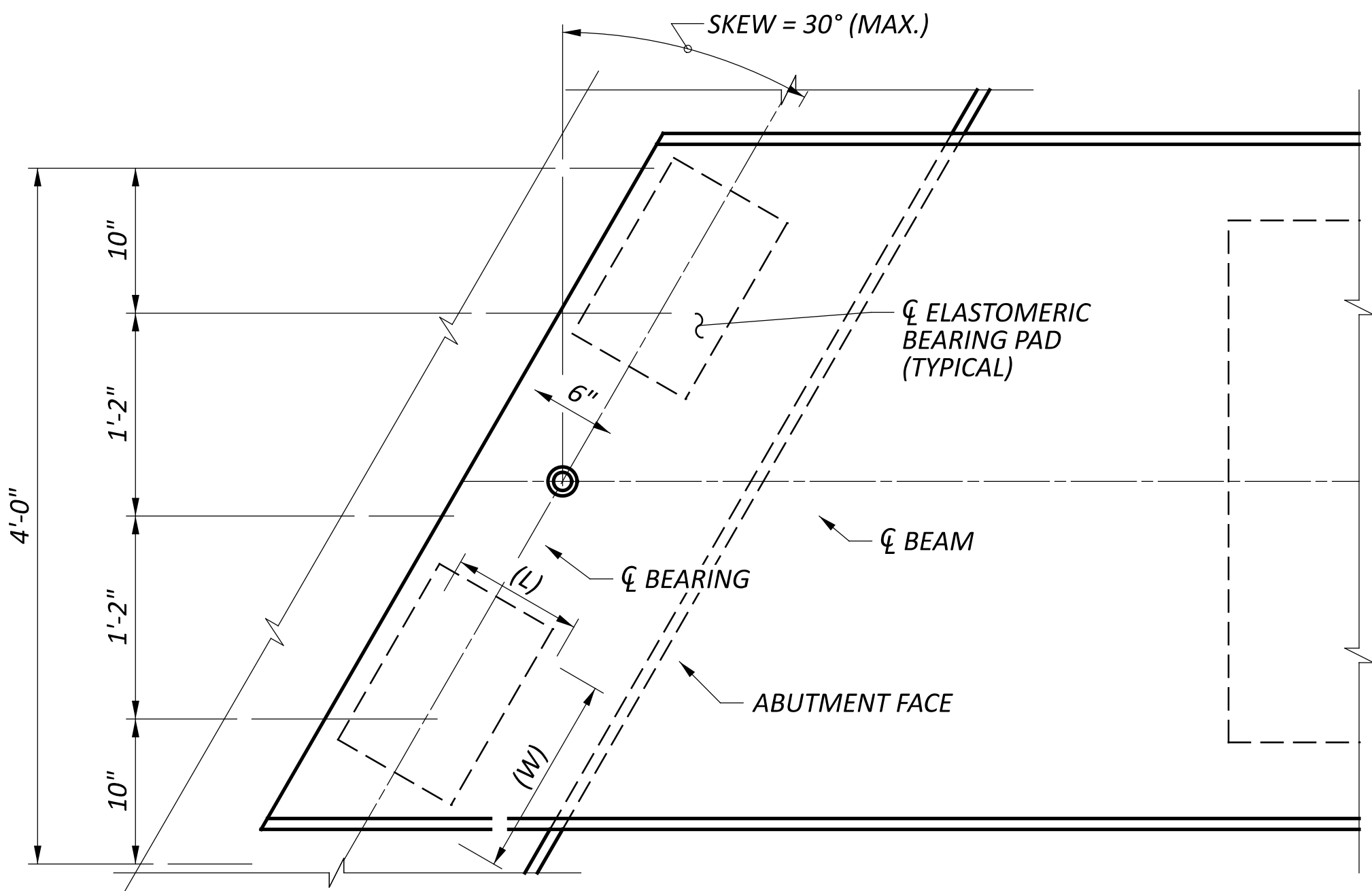
NOTES:
HOLES IN BEAMS FOR TRANSVERSE TIE RODS SHALL BE NOT LESS THAN 2" Ø AND NOT MORE THAN 3" Ø.

DIMENSIONS OF RECESSES IN FASCIA BEAMS AND SHEAR KEYS, AND VERTICAL LOCATION OF TRANSVERSE TIE RODS MAY VARY FROM DIMENSIONS SHOWN, FINAL DIMENSIONS SUBJECT TO APPROVAL BY PROJECT MANAGER.

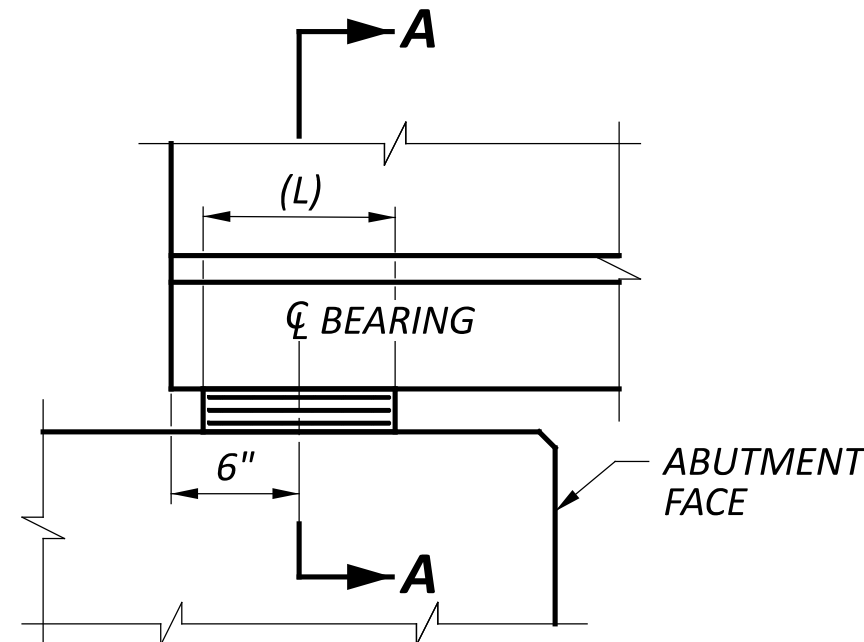


- * LAP BARS SAME SIZE AND NUMBER AS BEAM BARS. HOOKS MAY BE ROTATED FROM THE VERTICAL POSITION TO PROVIDE THE REQUIRED CLEARANCE.
- ** PROVIDE (6) #6 BARS EACH BEAM END IN 48" WIDE BEAMS. #6 BARS SHALL BE LOCATED ON TOP OF STIRRUPS AND SHALL BE UNIFORMLY SPACED ACROSS BEAM.
- ‡ AT THE FABRICATOR'S OPTION, STRANDS MAY BE EXTENDED AND BENT UP IN LIEU OF #6 BARS. 48" WIDE BEAMS WITH A TOTAL OF 12 OR MORE STRANDS SHALL HAVE A MINIMUM OF (6) STRANDS BENT UP. BEAMS WITH LESS THAN 12 STRANDS TOTAL SHALL HAVE APPROXIMATELY ONE HALF OF THE TOTAL STRANDS BENT UP.
- NOTE: THE PRESTRESSING STRANDS WHICH ARE BENT UP SHALL BE STAGGERED WITH STRANDS IN ABUTTING BEAM ENDS TO AVOID INTERFERENCE.

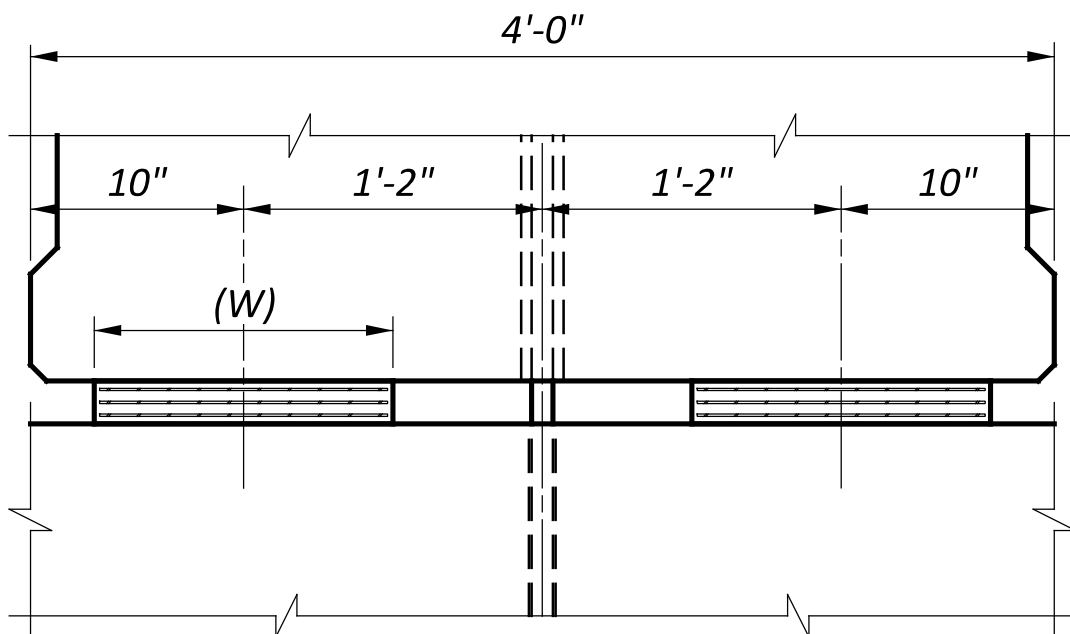




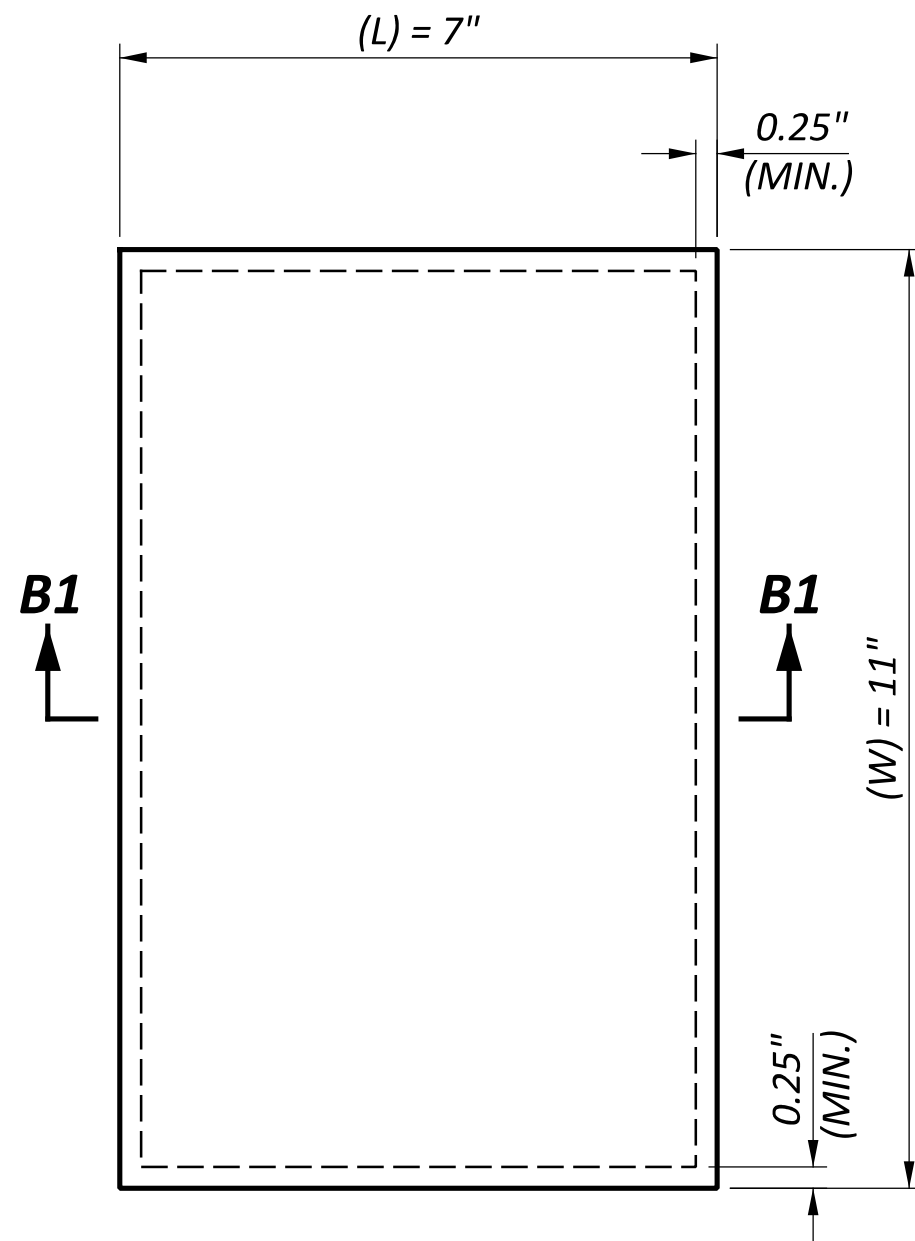
BEARING DETAIL AT ABUTMENT
(PLAN VIEW)



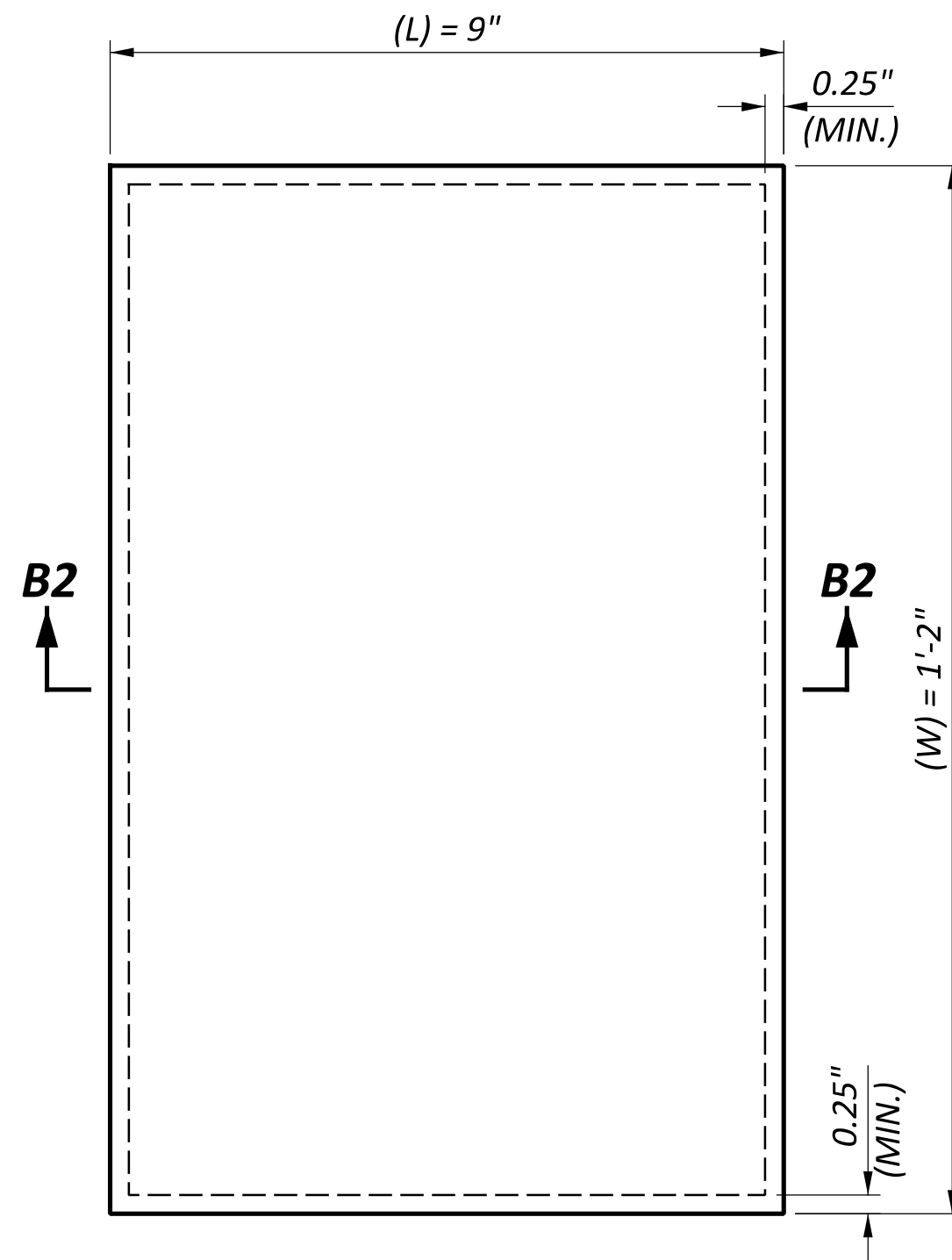
BEARING DETAIL AT ABUTMENT
(ELEVATION VIEW)



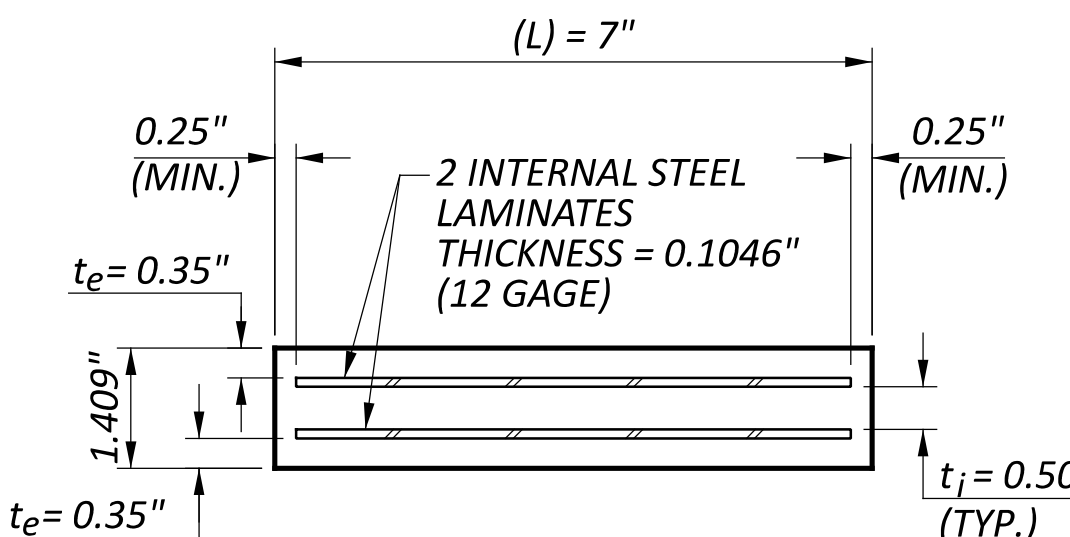
SECTION A-A



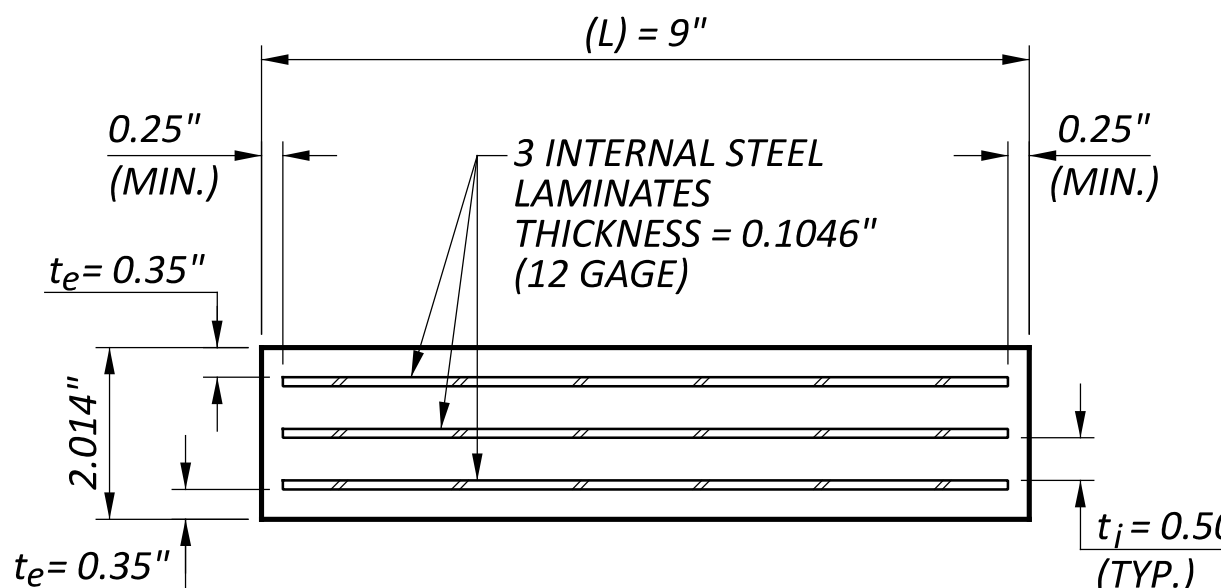
(B1) BEARING DETAIL



(B2) BEARING DETAIL



SECTION (B1)



SECTION (B2)

DESIGN SPECIFICATIONS:
THIS DRAWING CONFORMS TO THE "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS TENTH EDITION" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2024 AND THE LATEST VERSION OF THE OHIO BRIDGE DESIGN MANUAL.

ELASTOMERIC BEARINGS SHALL BE LOW TEMPERATURE GRADE 3 WITH A DUROMETER HARDNESS OF 50 AND SUBJECTED TO THE LOAD TESTING REQUIREMENTS CORRESPONDING TO DESIGN METHOD A.

STEEL LAMINATES SHALL BE ACCORDING TO ASTM A709, GRADE 36 OR ASTM A1011 GRADE 36.

DESIGN LOADING:
MAXIMUM LOAD = TOTAL DEAD LOAD + LIVE LOAD (WITHOUT IMPACT.) [SERVICE I LOAD REACTIONS]

DESIGNER NOTE:
INCLUDE THE UNFACTORED DEAD LOAD, LIVE LOAD (WITHOUT IMPACT) AND TOTAL LOAD REACTIONS FOR EACH ELASTOMERIC BEARING DESIGN IN THE PLANS.

LIMITATIONS:
BEARING PADS B1 & B2 MAY BE USED WHEN THE TOTAL REACTIONS ARE WITHIN THE LIMITS SHOWN & THE SKEW IS 30° OR LESS. OTHERWISE THE LAMINATED ELASTOMERIC BEARING BEARING SHALL BE INDEPENDENTLY DESIGNED.

BEARING PAD SHIMS, SKEWED BRIDGES:
TO ENSURE PROPER SEATING OF PRESTRESSED CONCRETE BOX BEAMS FOR SKEWED BRIDGES, FURNISH TWO 3/8" THICK PREFORMED BEARING PAD SHIMS FOR EACH BEAM, ONE FOR EACH BEAM END. STACKING MULTIPLE BEARING PAD SHIMS UNDER A SINGLE BEARING PAD IS NOT PERMITTED. THE PLAN AREA OF THE SHIM PAD SHALL BE THE SAME AS THE ELASTOMERIC BEARING PADS. PAYMENT WILL BE MADE AT THE CONTRACT PRICE BID FOR THE ITEM 516, EACH, 3/8" PREFORMED BEARING PAD, TYPE CDP.

ROTATION:
THE B1 AND B2 BEARINGS ARE ABLE TO WITHSTAND THE FOLLOWING ROTATION IN RADIANS AT THE MAXIMUM TOTAL LOAD/MOVEMENT LIMITS SHOWN IN THE STEEL-REINFORCED ELASTOMERIC BEARING TABLE:

B1: 0.024 RADIANS
B2: 0.024 RADIANS

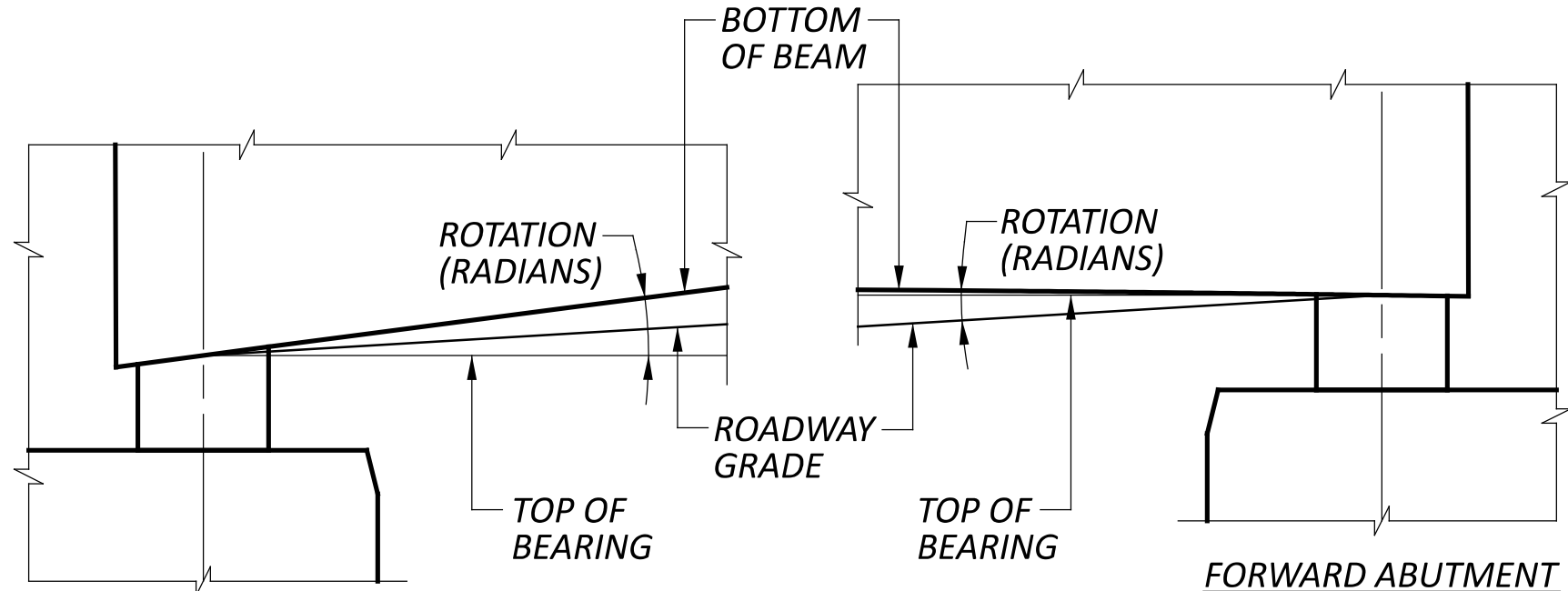
ROTATION IS TAKEN AS THE SUM OF THE ROADWAY SLOPE AND BEAM CAMBER EXPRESSED IN RADIANS AT THE BEARING LOCATION.

IF THE TOTAL ROTATION EXCEEDS THE LIMITATIONS ABOVE, USE BEVELED LOAD PLATES AS SHOWN IN STANDARD DRAWING BD-1-11.

BASIS OF PAYMENT:
THE UNIT BID PRICE SHALL INCLUDE ALL MATERIALS, LABOR, TESTING, AND INCIDENTALS NECESSARY TO FURNISH AND INSTALL LAMINATED ELASTOMERIC BEARINGS, EITHER FIXED OR EXPANSION. PAYMENT WILL BE MADE AT THE CONTRACT PRICE BID FOR THE ITEM 516, EACH, ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE).

OR WITH BEVELED LOAD PLATE/STD. DWG. BD-1-11:

ITEM 516, EACH, ELASTOMERIC BEARING WITH INTERNAL LAMINATES WITH LOAD PLATES (NEOPRENE).



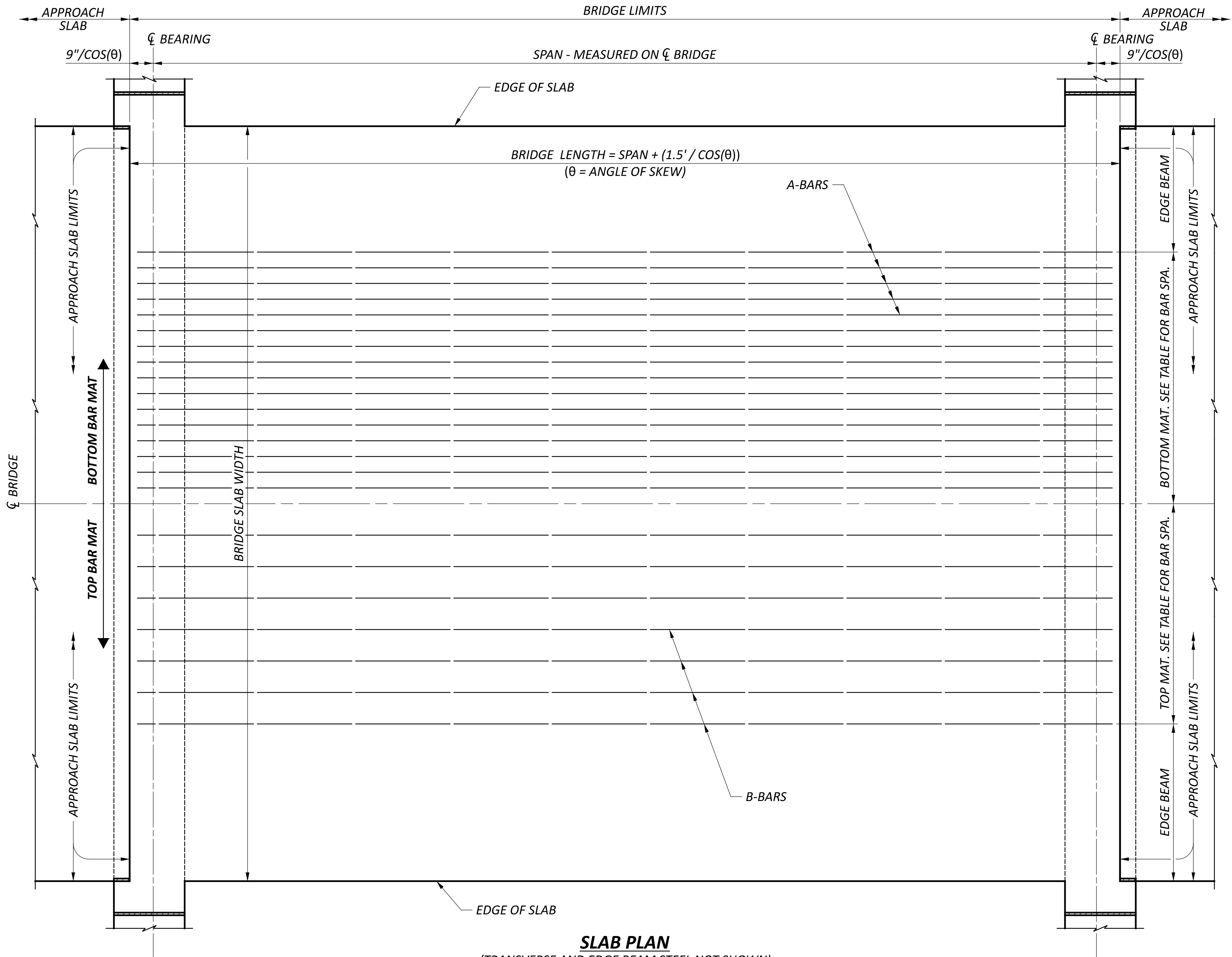
REAR ABUTMENT

ROTATION DETAIL

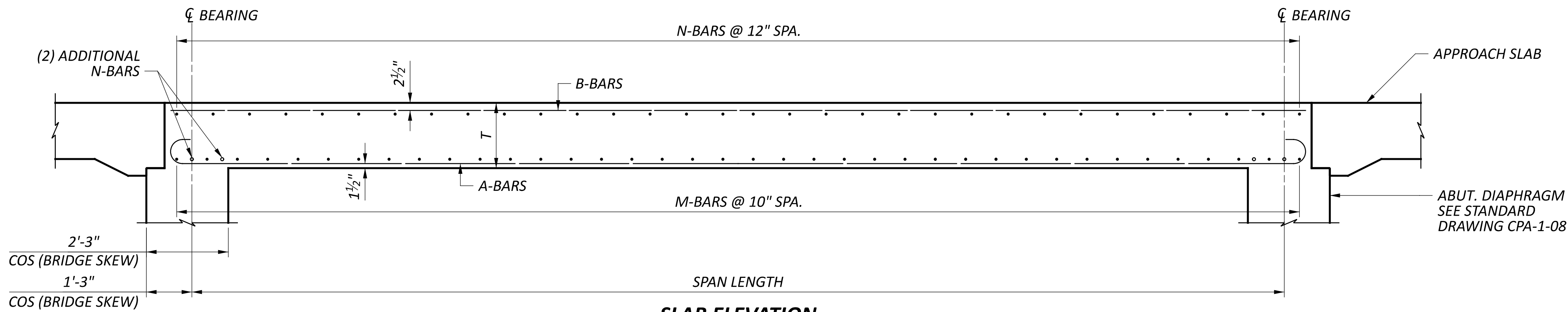
DESIGN DATA	
DUROMETER (HARDNESS)	50
ALLOWABLE COMPRESSIVE STRESS FOR BEARINGS, σ_c (KSI)	1.25
SHEAR MODULUS AT 73°F FOR MAXIMUM COMPRESSIVE STRENGTH, G_c (KSI)	0.095
SHEAR MODULUS AT 73°F FOR HORIZONTAL FORCES, G_h (KSI)	0.130
DEFLECTION DUE TO CREEP AT 25 YEAR DIVIDED BY THE INSTANTEOUS DEFLECTION (%)	25

STEEL-REINFORCED ELASTOMERIC BEARING PADS										
BEARING PAD	LENGTH (L)	WIDTH (W)	TOTAL THICKNESS (T)	t_e	t_i	t_s (12 GAGE)	N	MAXIMUM TOTAL LOAD	MAXIMUM EXPANSION LENGTH	MAXIMUM MOVEMENT (ONE DIRECTION)
	(IN.)	(IN.)	(IN.)	(IN.)	(IN.)	(IN.)	(EACH)	(KIPS)	(FEET)	(IN.)
B1	7	11	1.409	0.35	0.50	0.1046	2	36	92	0.530
B2	9	14	2.014	0.35	0.50	0.1046	3	74	147	0.847

LEGEND
 t_e - EXTERNAL ELASTOMER THICKNESS
 t_i - INTERNAL ELASTOMER THICKNESS
 t_s - INTERNAL STEEL LAMINATE THICKNESS
N - NUMBER OF INTERNAL STEEL LAMINATES

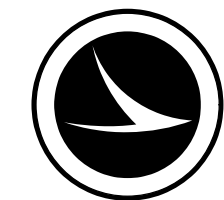
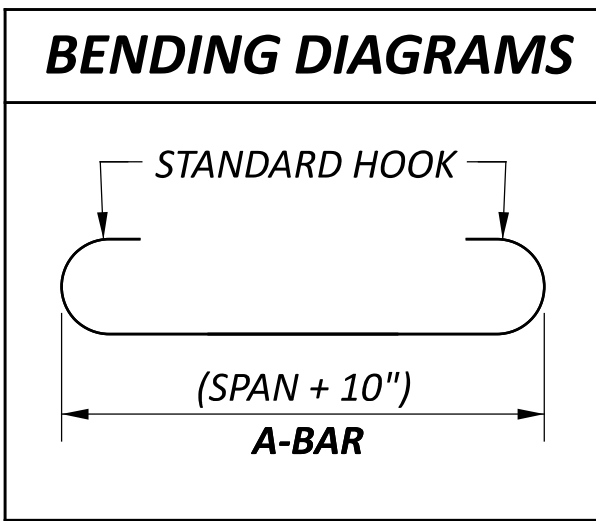


SLAB PLAN
(TRANSVERSE AND EDGE BEAM STEEL NOT SHOWN)



SLAB ELEVATION

SLAB DATA									
SPAN (FT.)	THICKNESS (IN.)	A-BARS		B-BARS		M-BARS		N-BARS	
		SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	SIZE	SPACING (IN.)	BAR SIZE
11	11 1/4	6	7	12	5	10	5	12	5
12	11 3/4	6	7	12	5	10	5	12	5
13	12 1/2	6	7	12	5	10	5	12	5
14	13	6	7	12	5	10	5	12	5
15	13 1/2	6	7	12	5	10	5	12	5
16	14	6	7	12	5	10	5	12	5
17	14 3/4	7	8	12	5	10	5	12	5
18	15 1/4	7	8	12	5	10	5	12	5
19	15 3/4	7	8	12	5	10	5	12	5
20	16 1/4	7	8	12	5	10	5	12	5
21	16 3/4	6	8	12	5	10	5	12	5
22	17 1/4	6	8	12	5	10	5	12	5
23	17 3/4	6	8	12	5	10	5	12	5
24	18 1/4	6	8	12	5	10	5	12	5
25	18 3/4	6	8	12	5	10	5	12	5
26	19 1/4	7	9	12	5	10	5	12	5
27	19 3/4	7	9	12	5	10	5	12	5
28	20 1/2	7	9	12	5	10	5	12	5
29	21	7	9	12	5	10	5	12	5
30	21 1/2	6	9	12	5	10	5	12	5
31	22 1/4	6	9	12	5	10	5	12	5
32	22 3/4	6	9	12	5	10	5	12	5
33	23 1/4	6	9	12	5	10	5	12	5
34	23 3/4	6	9	12	5	10	5	12	5
35	24 1/4	6	9	12	5	10	5	12	5
36	25	7	10	12	5	10	5	12	5
37	25 1/2	7	10	12	5	10	5	12	5
38	26	7	10	12	5	10	5	12	5



GENERAL:
THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS FOR SINGLE SPAN SLAB BRIDGES. THE PROJECT PLANS FOR EACH STRUCTURES WILL SHOW SPAN LENGTHS, ROADWAY WIDTHS, SKEW, CURVE AND SUPERELEVATION (IF ANY), ELEVATIONS, SLAB REINFORCEMENT DETAILS IN PLAN AND TRANSVERSE SECTIONS, SUBSTRUCTURE DETAILS, ESTIMATED QUANTITIES, REINFORCING STEEL LIST AND OTHER NECESSARY DETAILS AND SPECIAL NOTES.

ROADWAY WIDTH:
THE SLAB DESIGNS SHOWN IN THIS STANDARD ARE APPLICABLE FOR ROADWAY WIDTHS 24 FT OR GREATER, MEASURED OUT TO OUT OF BRIDGE DECK.

SKEW:
THE SLAB DESIGNS SHOWN IN THIS STANDARD ARE APPLICABLE FOR BRIDGES WITH SKEW UP TO 25°.

FOR BRIDGES WITH SKEW
0 < $\phi \geq 25^\circ$, PLACE LONGITUDINAL BARS PARALLEL TO THE CENTERLINE OF THE ROADWAY AND TRANSVERSE BARS PARALLEL TO THE CENTERLINE OF PIERS AND ABUTMENTS.

DESIGN SPECIFICATIONS:
THIS DRAWING CONFORMS TO THE "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS NINTH EDITION" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2020 AND THE OHIO BRIDGE DESIGN MANUAL, JULY 2023.

DESIGN DATA:
DESIGN METHOD - LOAD AND RESISTANCE FACTOR DESIGN
DESIGN LOADING - HL-93
FUTURE WEARING SURFACE - 60 LB/FT²
WEARING SURFACE - ONE INCH MONOLITHIC
DESIGN STRESSES:
CONCRETE - COMPRESSIVE STRENGTH
= 4500 PSI
REINFORCING STEEL - MIN. YIELD STRENGTH
= 60,000 PSI

EDGE BEAM OPTION:
IN LIEU OF FORMING AN EDGE BEAM, AT NO ADDITIONAL COST TO THE OWNER, THE CONTRACTOR MAY FURNISH A 20" SLAB OR A SLAB VARYING IN THICKNESS FROM 20" AT THE EDGE TO "T" AT THE CENTER OF THE ROADWAY.

WHEN THE BRIDGE BARRIER BEING CONSTRUCTED IS A CONCRETE PARAPET, THE SLAB EDGE OF DECK SHALL BE REDUCED TO 18" MIN. SEE DETAILS THIS SHEET.

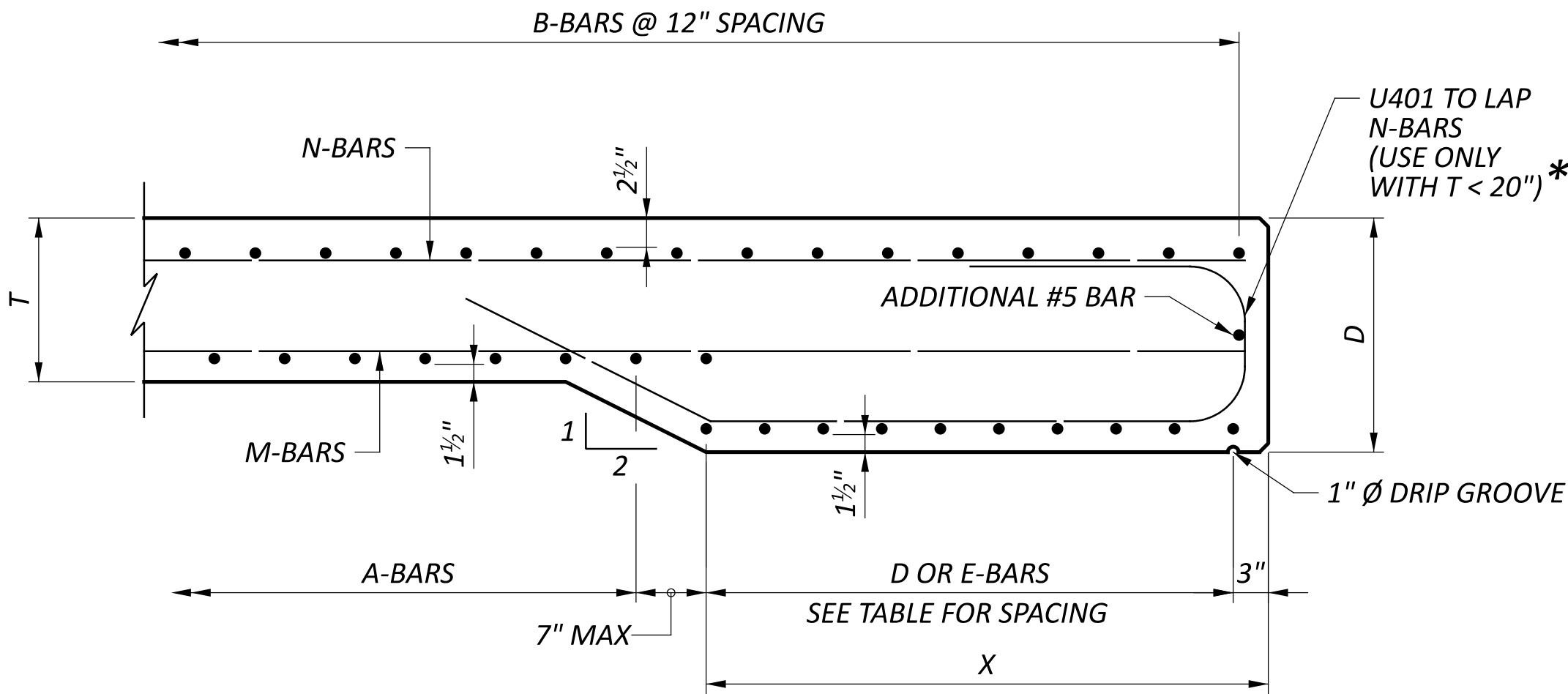
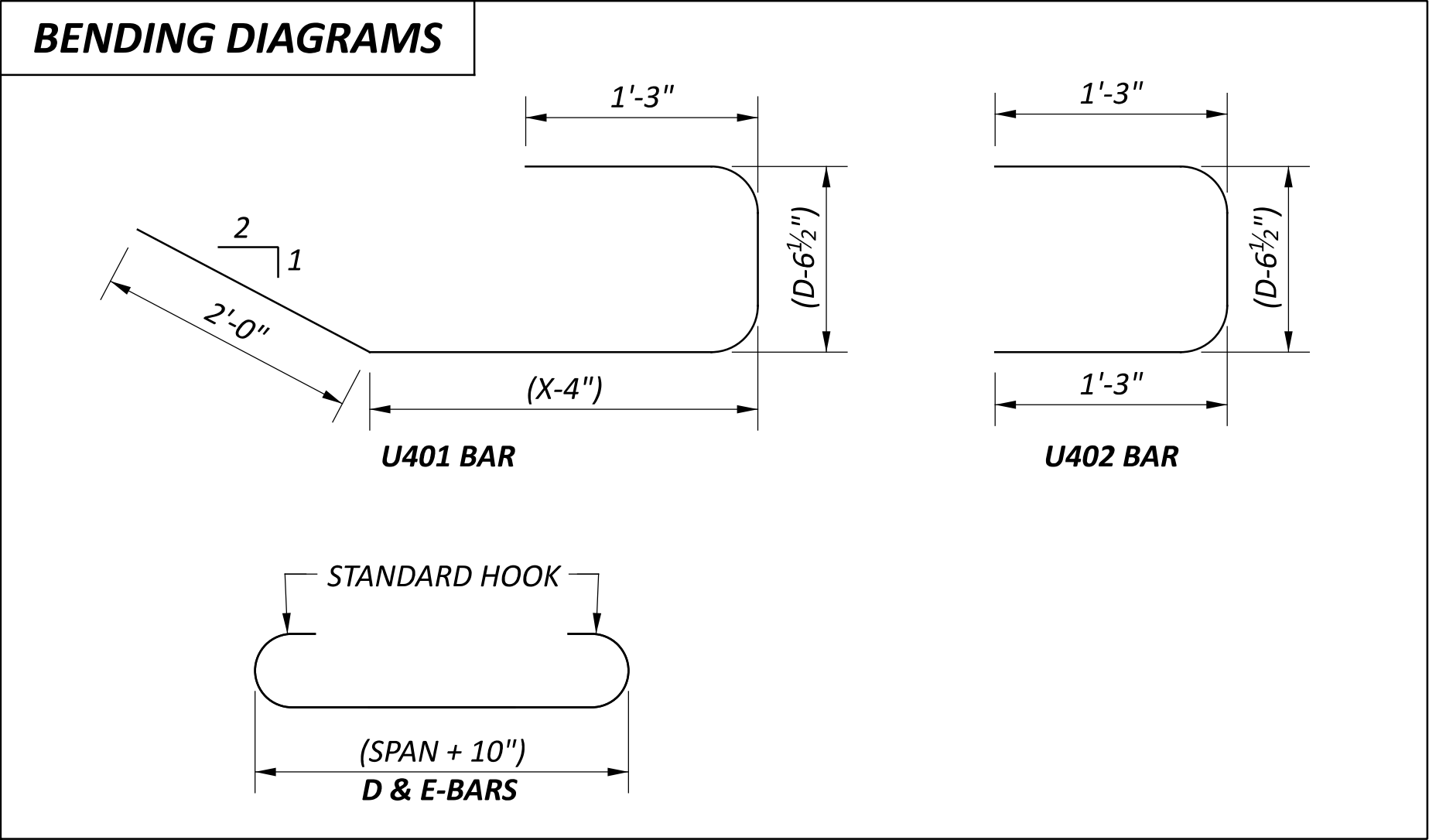
CAMBER:
TO COMPENSATE FOR FALSEWORK DEFLECTION AND FOR THE DEFLECTION OF THE SLAB AFTER THE FALSEWORK IS REMOVED, BUILD CAMBER INTO THE FALSEWORK ACCORDING TO C&MS 508.02.

REINFORCING STEEL:
REINFORCING STEEL SHALL BE EPOXY COATED STEEL UNLESS SPECIFIED OTHERWISE IN THE SCOPE OF SERVICES. FURNISH THE REINFORCEMENT STEEL LENGTHS AS INDICATED IN THE TABLE OR STANDARD DRAWINGS. IF THE CONTRACTOR ELECTS TO UTILIZE SHORTER BAR LENGTHS, PROVIDE THE MINIMUM LAP LENGTHS SHOWN BELOW AT NO ADDITIONAL COST TO THE STATE. LAP LENGTHS SHOWN BELOW ARE FOR EPOXY COATED STEEL. SHORTER LAP LENGTHS MAY BE UTILIZED FOR DIFFERENT REINFORCEMENT TYPES.

NO. 5 LAP = (TOP) 3'-10"
NO. 5 LAP = (BOT) 3'-8"
NO. 7 LAP = (BOT) 4'-5"
NO. 8 LAP = (BOT) 7'-3"
NO. 9 LAP = (BOT) 8'-11"
NO. 10 LAP = (BOT) 10'-11"

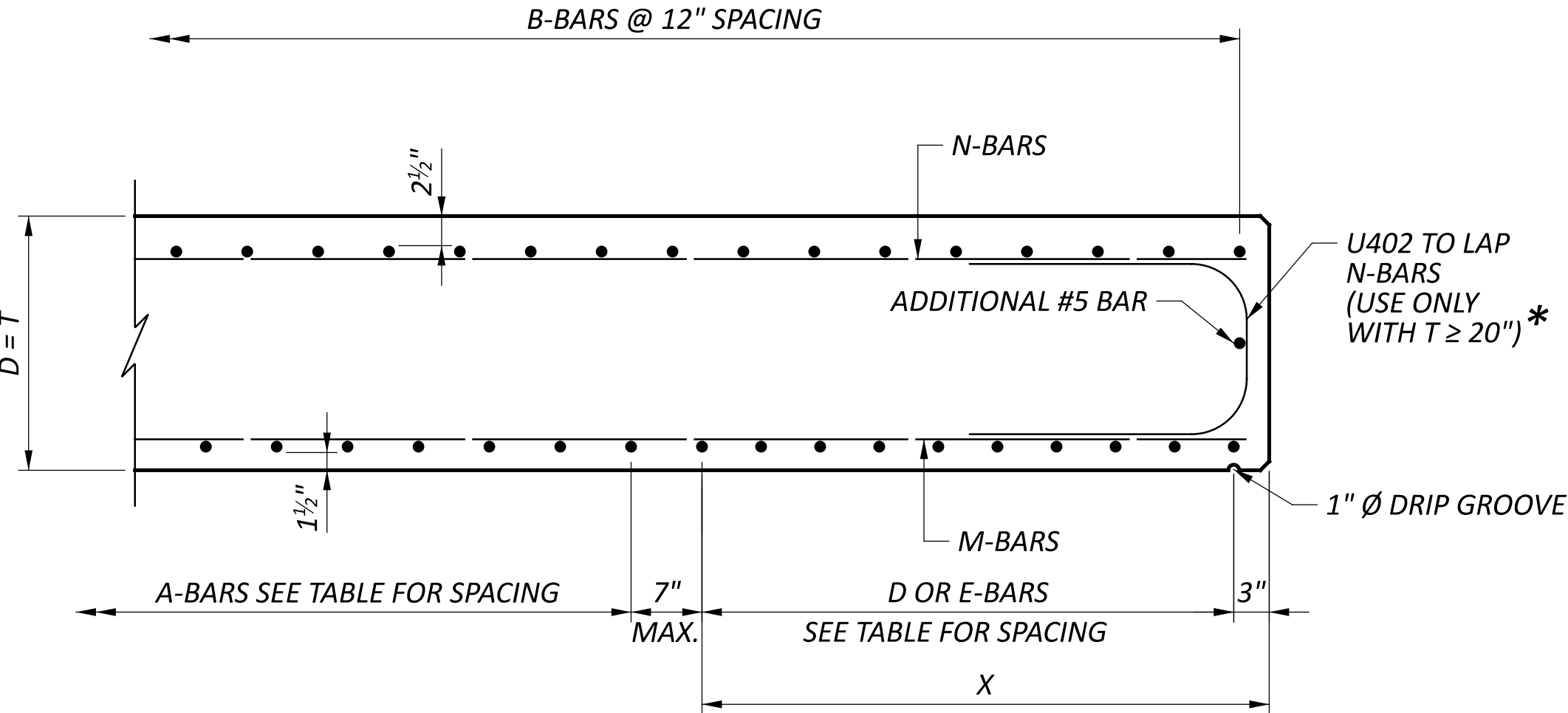
THE LOCATIONS OF THE SPLICES SHALL BE APPROVED BY THE ENGINEER.

EDGE BEAM SLAB DATA								
SPAN (FT.)	OVER THE SIDE DRAINAGE				PARAPET			
	D (IN.)	X (IN.)	D BARS		D (IN.)	X (IN.)	E BARS	
			SIZE	NO. BARS			SIZE	NO. BARS
11	20	45	7	8	18	57	7	8
12	20	45	7	8	18	57	7	8
13	20	45	7	8	18	57	7	8
14	20	45	7	8	18	57	7	8
15	20	45	7	8	18	57	7	8
16	20	45	7	8	18	57	8	7
17	20	45	8	7	18	57	8	8
18	20	45	8	7	18	57	8	8
19	20	48	8	8	18	60	8	9
20	20	48	8	8	18	60	8	10
21	20	48	9	8	18	60	8	10
22	20	48	9	8	18	60	9	9
23	20	48	9	8	18	60	9	10
24	20	48	9	9	18 ¼	60	9	10
25	20	48	9	9	18 ¾	60	9	10
26	20	48	10	8	19 ¼	60	9	11
27	20	48	10	8	19 ¾	63	10	9
28	20 ½	48	10	9	20 ½	63	10	10
29	21	48	10	9	21	63	10	10
30	21 ½	48	10	9	21 ½	63	10	10
31	22 ¼	48	10	9	22	63	10	10
32	22 ¾	48	10	9	22 ¾	63	10	10
33	23 ¼	48	10	9	23 ¼	63	10	11
34	23 ¾	48	10	10	23 ¾	63	10	11
35	24 ¼	48	10	10	24 ¼	63	10	11
36	25	48	10	10	25	63	10	11
37	25 ½	48	10	10	25 ½	63	10	12
38	26	48	10	10	26	63	10	12



EDGE BEAM DETAIL

*(FOR SLABS WITH T < 20")



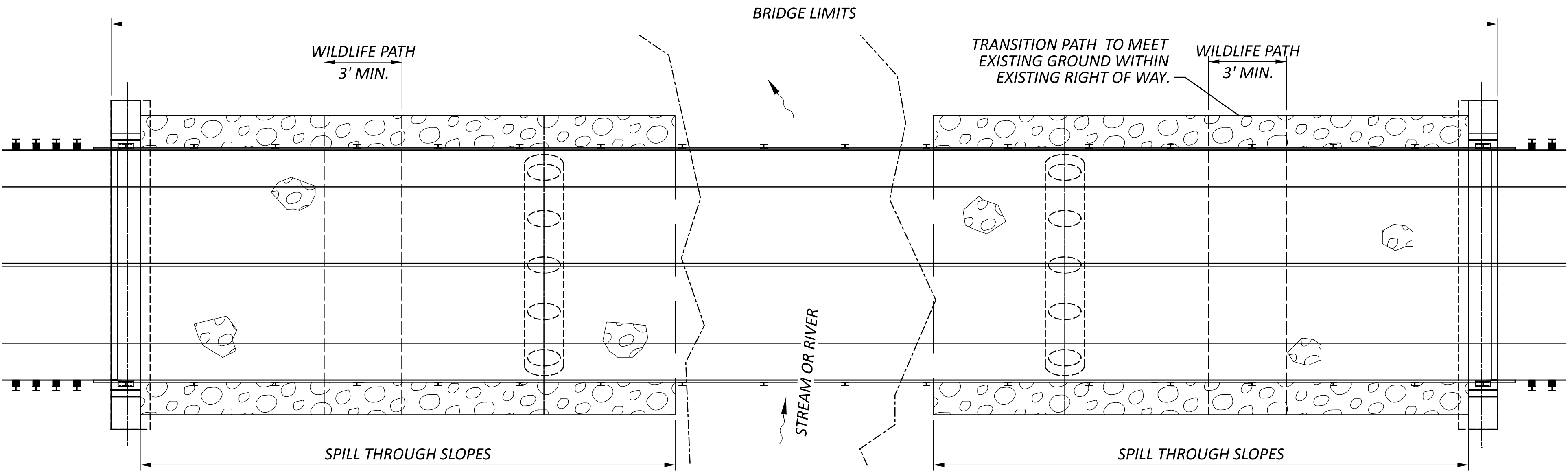
EDGE BEAM DETAIL

*(FOR SLABS WITH T ≥ 20")

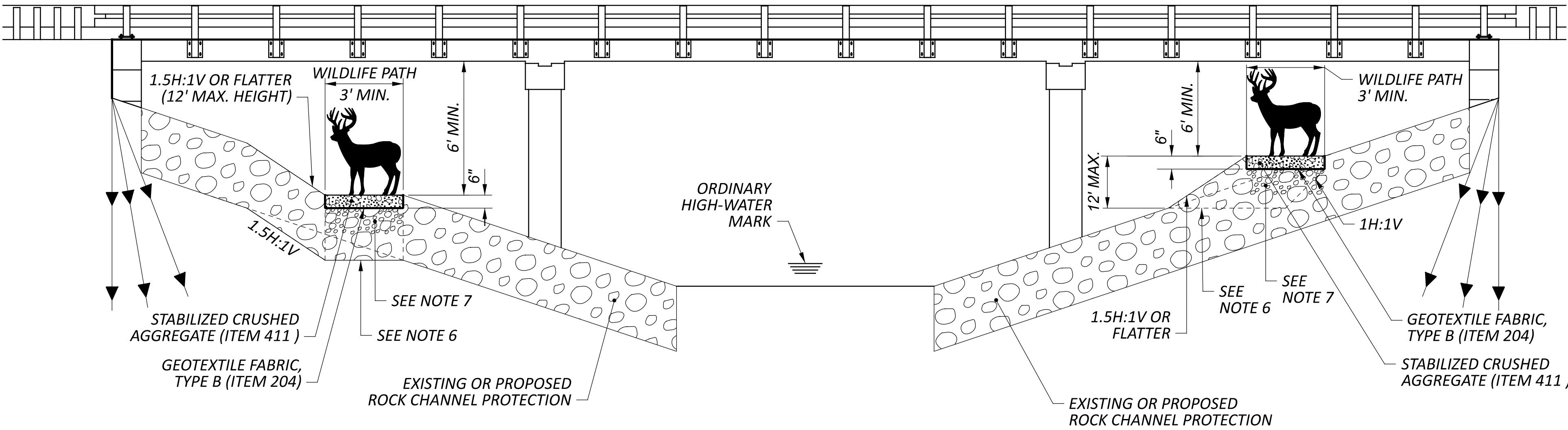
NOTE:

* - MINIMUM DEPTH OF EDGE BEAM "D" CAN BE REDUCED TO 18" FOR PARAPET DESIGN.





PLAN



ELEVATION

GENERAL:

THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS FOR A WILDLIFE PATH UNDER AN EXISTING OR PROPOSED BRIDGE ACROSS THE SPILL THROUGH SLOPE. THE PROJECT PLANS SHALL SHOW THE VERTICAL CLEARANCE, WIDTH OF THE WILDLIFE PATH, ELEVATIONS AT THE ORDINARY HIGH-WATER MARK AND AT THE SURFACE OF THE WILDLIFE PATH, ROCK CHANNEL PROTECTION SLOPE, AND OTHER NECESSARY DETAILS AND SPECIAL NOTES.

NOTES:

1. MINIMUM VERTICAL CLEARANCE SHALL BE AT LEAST 6 FEET BETWEEN PATH SURFACE AND LOW CHORD. ADDITIONAL VERTICAL CLEARANCE OF 2 FEET IS RECOMMENDED TO FACILITATE ACCESS FOR CONSTRUCTION EQUIPMENT. KEEP PATH A MINIMUM OF 1 FOOT AWAY FROM THE PIER.
2. PASSAGE SHALL FOLLOW ALONG NATURAL STREAM BANK AND HAVE A NATURAL "LOOK AND FEEL" OF APPROACHES WITH MINIMAL OBSTRUCTIONS.
3. WILDLIFE PATH CONNECTIVITY SHOULD EXTEND TO HABITATS ON BOTH SIDES OF BARRIER (ROAD).
4. WORKING BELOW THE ORDINARY HIGH WATER MARK SHOULD BE AVOIDED. IF UNAVOIDABLE, ADDITIONAL PERMITTING MAY BE NEEDED.
5. IN AREAS WHERE AN EXISTING OPENING IS SUFFICIENT AND NATURAL PATHWAYS EXIST, WILDLIFE UNDERPASSES CAN BE PROVIDED BY CLEARING VEGETATION OR OTHER OBSTACLES TO A MINIMUM WIDTH OF 3' TO ENHANCE UNDERPASS CONNECTIVITY WITH THE SURROUNDING LANDSCAPE.
6. BENCHING MAY BE NECESSARY TO IMPROVE STABILITY AND MAINTAIN THE REQUIRED THICKNESS OF THE ROCK CHANNEL PROTECTION. REPLACE ANY REMOVED ROCK CHANNEL PROTECTION MATERIAL IN KIND. BENCH DETAILS CAN BE FOUND ON THE PROJECT PLANS.
7. FILL THE VOIDS UP TO 12 INCHES WITH GRANULAR MATERIAL, TYPE C AS PER ODOT C&MS 703.19 TO CREATE A RELATIVELY FLAT SURFACE THAT ADEQUATELY SUPPORTS THE GEOTEXTILE FABRIC.

MEASUREMENT & PAYMENT:

THE DEPARTMENT WILL PAY FOR CLEARING, GRUBBING, AND TRIMMING TREES, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 201 LUMP SUM CLEARING AND GRUBBING

THE DEPARTMENT WILL PAY FOR EXCAVATION, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 203 PER CUBIC YARD EXCAVATION

A GRANULAR MATERIAL, TYPE C SHALL BE PLACED TO A MAXIMUM DEPTH OF 12 INCHES, AS SHOWN IN THE ELEVATION VIEW. THE DEPARTMENT WILL PAY FOR A GRANULAR MATERIAL, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 203 PER CUBIC YARD GRANULAR MATERIAL, TYPE C

GEOTEXTILE FABRIC SHALL BE PLACED UNDER AND ON BOTH SIDES OF THE STABILIZED CRUSHED AGGREGATE. THE DEPARTMENT WILL PAY FOR GEOTEXTILE FABRIC, TYPE B, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 204 PER SQUARE YARD GEOTEXTILE FABRIC, TYPE B

STABILIZED CRUSHED AGGREGATE SHALL BE PLACED TO A MINIMUM DEPTH OF 6 INCHES AND A WIDTH OF 3 FEET, AS SHOWN IN THE ELEVATION VIEW AND DETAILED IN THE PLANS. THE DEPARTMENT WILL PAY FOR STABILIZED CRUSHED AGGREGATE, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 411 PER CUBIC YARD STABILIZED CRUSHED AGGREGATE

ROCK CHANNEL PROTECTION SHALL BE PLACED AS SHOWN IN THE ELEVATION VIEW AND DETAILED IN THE PLANS. THE TYPE AND THICKNESS SHALL MATCH THE EXISTING OR SIZED PER THE LOCATION AND DESIGN MANUAL VOLUME 2. THE DEPARTMENT WILL PAY FOR ACCEPTED ROCK CHANNEL PROTECTION, INCLUDING ALL LABOR AND MATERIALS REQUIRED, AT THE CONTRACT PRICE AS FOLLOWS:

ITEM 601 PER CUBIC YARD ROCK CHANNEL PROTECTION

GENERAL NOTES

DESIGN SPECIFICATION:

THIS DRAWING CONFORMS TO THE "LRFD BRIDGE DESIGN SPECIFICATION" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, AND THE LATEST VERSION OF THE ODOT BRIDGE DESIGN MANUAL.

DESIGN DATA: THE FOLLOWING DESIGN DATA IS ASSUMED:

INTERNAL ANGLE OF FRICTION OF BACKFILL SOIL, $\phi_{bf} = 30^\circ$
TOTAL UNIT WEIGHT OF BACKFILL SOIL = 120 PCF
INTERNAL ANGLE OF FRICTION (DRAINED), FOUNDATION SOIL, $\phi_f = 28^\circ$
UNDRAINED SHEAR STRENGTH (COHESIVE), FOUNDATION SOIL, $S_{uf} = 1500$ PSF
UNIT WEIGHT OF CONCRETE = 150 PCF
SLOPE OF BACKFILL = 2:1 (TYPE A & B HEADWALLS)
HEIGHT OF LIVE LOAD SURCHARGE = 2 FT (TYPE C HEADWALLS)

CONCRETE CLASS QC1 - COMPRESSIVE STRENGTH 4000 PSI
(FOOTING, WINGWALL AND FORESLOPE WALL)

REINFORCING STEEL - ASTM A615, A616, OR A617
GRADE 60 MINIMUM YIELD STRENGTH
60,000 PSI (ALL REINFORCING SHALL BE
EPOXY COATED)

BASED ON THE ASSUMED DESIGN DATA, THE WINGWALLS ACHIEVE FACTORED BEARING RESISTANCES THAT ARE GREATER THAN THEIR RESPECTIVE BEARING PRESSURES. IF A BACKFILL MATERIAL WITH A HIGHER INTERNAL ANGLE OF FRICTION OR A LIGHTER TOTAL UNIT WEIGHT IS USED; OR IF A FOUNDATION SOIL WITH A HIGHER DRAINED INTERNAL ANGLE OF FRICTION OR A HIGHER UNDRAINED SHEAR STRENGTH IS ENCOUNTERED; THEN THE STABILITY OF THE WINGWALLS IS SATISFACTORY.

USE TYPE A, B AND C HEADWALLS AS FOLLOWS:

USE TYPE A HEADWALLS WHEN THE CENTERLINE OF THE CULVERT IS NORMAL TO THE ROADWAY. BOTH WINGWALLS FOR TYPE A HEADWALLS ARE SKEWED AT 45° FROM THE CULVERT CENTERLINE.

USE TYPE B HEADWALLS FOR ROADWAY SKEWS OF 15, 30 OR 45 DEGREES, OR WITH NO SKEW IF SITE CONDITIONS DICTATE A STRAIGHT WINGWALL AND A WINGWALL WITH A 45 DEGREE SKEW.

USE TYPE C HEADWALLS ONLY WHERE SITE CONSTRAINTS SUCH AS RIGHT-OF-WAY OR UTILITIES PREVENT EXTENDING THE WINGWALLS TO INTERCEPT THE GRADED SLOPE. BOTH WINGWALLS FOR TYPE C HEADWALLS ARE PARALLEL TO THE ROADWAY.

CULVERT SIZE LIMITATIONS:

LIMIT USE OF THIS STANDARD DRAWING TO PRECAST BOX CULVERTS WITH SPANS RANGING FROM 8 FEET TO 20 FEET (IN 2 FEET INCREMENTS ONLY), AND RISES RANGING FROM 4 FEET TO 10 FEET (IN 1 FOOT INCREMENTS). MAKE REFERENCE ON THE PLANS TO ASTM C1577 FOR SPANS UP TO AND INCLUDING 12 FEET. FOR SPANS GREATER THAN 12 FEET AND UP TO AND INCLUDING 20 FEET, REFER TO SUPPLEMENTAL SPECIFICATION SS940 AND PROVIDE DETAILS IN THE PLANS. ANY CULVERT WITH A SPAN OR RISE EXCEEDING THESE LIMITS REQUIRES A SPECIAL WALL DESIGN. USE A 12" BOX THICKNESS FOR SPANS IN EXCESS OF 12 FEET.

FORESLOPE WALL HEIGHT:

THE FORESLOPE WALL HEIGHT WILL BE EITHER 6" OR 1'-6" ABOVE THE TOP OF THE CULVERT.

STEM HEIGHT:

CALCULATE THE STEM HEIGHT, MEASURED FROM THE TOP OF THE FOOTING TO THE TOP OF THE WALL, AS FOLLOWS:

$$H = \text{BOX RISE} + 2 (\text{BOX SLAB THICKNESS}) + \text{REQUIRED FORESLOPE WALL HEIGHT}$$

SELECT THE DESIGN HEIGHT (H) BY ROUNDING UP TO THE NEAREST VALUE SHOWN IN THE TYPE A, B OR C HEADWALL TABLES. SHOW THE "DESIGN HEIGHT" ON THE PLANS.

USE OF DESIGN DATA SHEETS:

- CALCULATE THE REQUIRED DESIGN HEIGHT "H" PER THE "STEM HEIGHT" NOTE ON THIS SHEET.
- SELECT HEADWALL TYPE "A", "B" OR "C" PER THE "WHEN TO USE" NOTE ON THIS SHEET.
- FOR TYPE "A" HEADWALLS, USE THE TABLE ON SHEET 2/6. FOR TYPE "B" HEADWALLS, IDENTIFY THE SKEW ANGLE OF THE CULVERT WITH RESPECT TO THE ROADWAY "THETA ANGLE" (SEE GEOMETRIC DIAGRAM ON SHEET 3/6) AND USE THE TABLES ON SHEETS 3/6 AND 4/6. FOR TYPE "C" HEADWALLS, USE THE TABLE ON SHEET 5/6.
- IN THE APPROPRIATE TABLE, SELECT THE REQUIRED DESIGN HEIGHT "H" FROM THE LEFTMOST COLUMN. FROM LEFT TO RIGHT FIND THE WINGWALL DIMENSIONS, FOOTING DIMENSIONS, WINGWALL REINFORCING DATA AND ESTIMATED QUANTITIES FOR YOUR DESIGN. MULTIPLY ESTIMATED QUANTITIES WITHIN THE LIMITS OF THE BOX CULVERT BY [BOX SPAN + 2x (BOX WALL THICKNESS)].
- IN THE SECOND COLUMN, IDENTIFY THE FOOTING DESIGN NUMBER. REFER TO THE "FOOTING REINFORCING" TABLE ON SHEET 6/6 FOR THE FOOTING REINFORCING DATA.
- IDENTIFY THE REQUIRED FORESLOPE WALL HEIGHT ABOVE THE TOP OF THE BOX CULVERT. REFER TO THE "FORESLOPE WALL QUANTITIES" TABLE ON SHEET 6/6. MULTIPLY ESTIMATED QUANTITIES BY [BOX SPAN + 2x (BOX WALL THICKNESS)].
- FOR STANDARD HEADWALL DETAILS, SEE SHEET 6/6.
- PROVIDE THE CULVERT & WINGWALL LAYOUT AND ELEVATION VIEWS OF THE INLET AND OUTLET ENDS ON SHEET 2 OF THE PLAN INSERTS. (THIS MAY BE ACCOMPLISHED BY COPYING AND PASTING THE APPROPRIATE DETAILS FROM THE DESIGN DATA SHEETS.)
- USE THE ELECTRONIC SPREADSHEETS TO GENERATE REINFORCING SCHEDULES.

AUTOTABLE METHOD:
THE EXCEL WORKSHEET CELLS USE ODOT AUTOTABLE STANDARD ROW HEIGHT AND FONTS. SELECT THE REINFORCING SCHEDULE ON THE EXCEL WORKSHEET AND USE 'RANGE IMPORT' COMMAND ON AUTOTABLE TAB. SEE ADDITIONAL AUTOTABLE INFORMATION ON CADD SUPPORT WEBSITE.

PASTE METHOD:
PASTE THE TABLE INTO THE CAD FILE. USE THE 'PASTE SPECIAL' COMMAND IN MICROSTATION, SELECT 'PICTURE OF MICRO-SOFT EXCEL WORKSHEET', AND SET THE METHOD TO 'BY 2 CORNER POINTS'. SELECT THE TWO CORNERS OF THE BOX ON THE APPROPRIATE REINFORCING SHEET.
- EDIT ALL DIMENSIONS ON THE DETAILS ACCORDING TO THE TABLES ON THE DESIGN DATA SHEETS. ON THE DETAILS SHOWING REINFORCING, USE INFORMATION PICKED FROM THE DESIGN DATA SHEETS TO COMPLETE AN UNDERSCORE () OR ASTERISK (*).
- FILL IN THE ESTIMATED QUANTITIES ON SHEET 1 OF THE PLAN INSERTS.
- ADD APPROPRIATE NOTES TO THE GENERAL NOTES SECTION ON SHEET 1 OF THE PLAN INSERTS.
- FOR STRUCTURES WITH SPANS GREATER THAN 12 FEET, REFER TO SUPPLEMENTAL SPECIFICATION SS940 FOR REINFORCING DETAILS TO INCLUDE ON THE APPROPRIATE SHEET.

NOTES TO DESIGNER:
ELECTRONIC SPREADSHEETS ARE AVAILABLE TO PRODUCE REINFORCING SCHEDULES FOR THESE STANDARD HEADWALLS. MATCH THE HEADWALL TYPE A, B OR C WHEN USING THESE SHEETS.

THE DETAILS PROVIDED SHOWING SECTIONS THROUGH THE CULVERT ENDS ARE DETAILED FOR THE INLET END. MAKE APPROPRIATE MODIFICATIONS TO SHOW THE OUTLET ENDS.





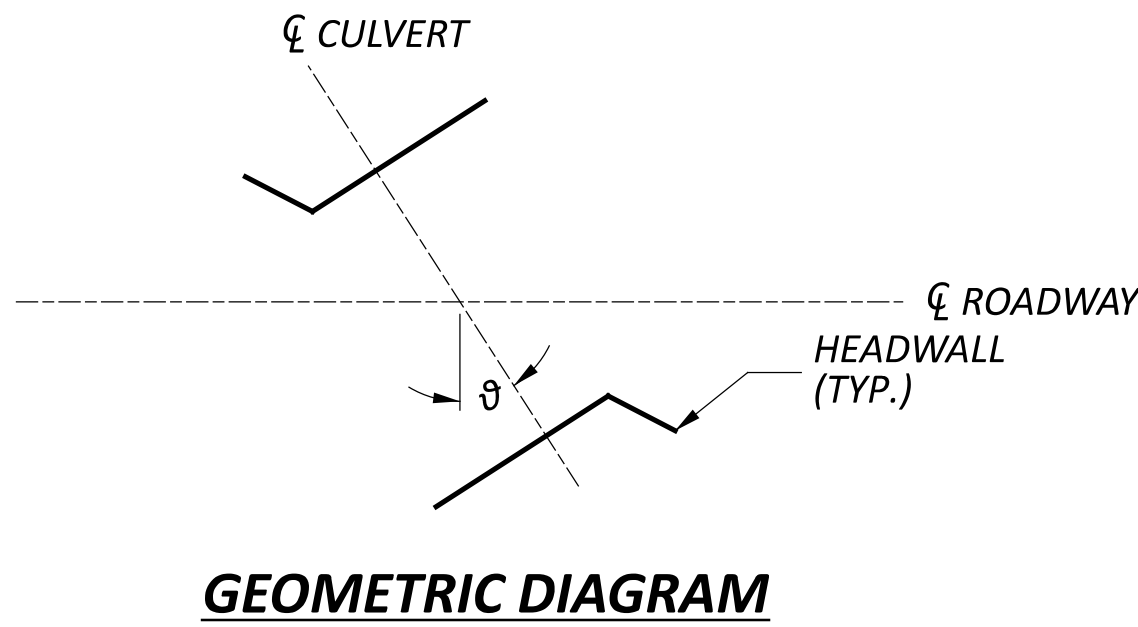
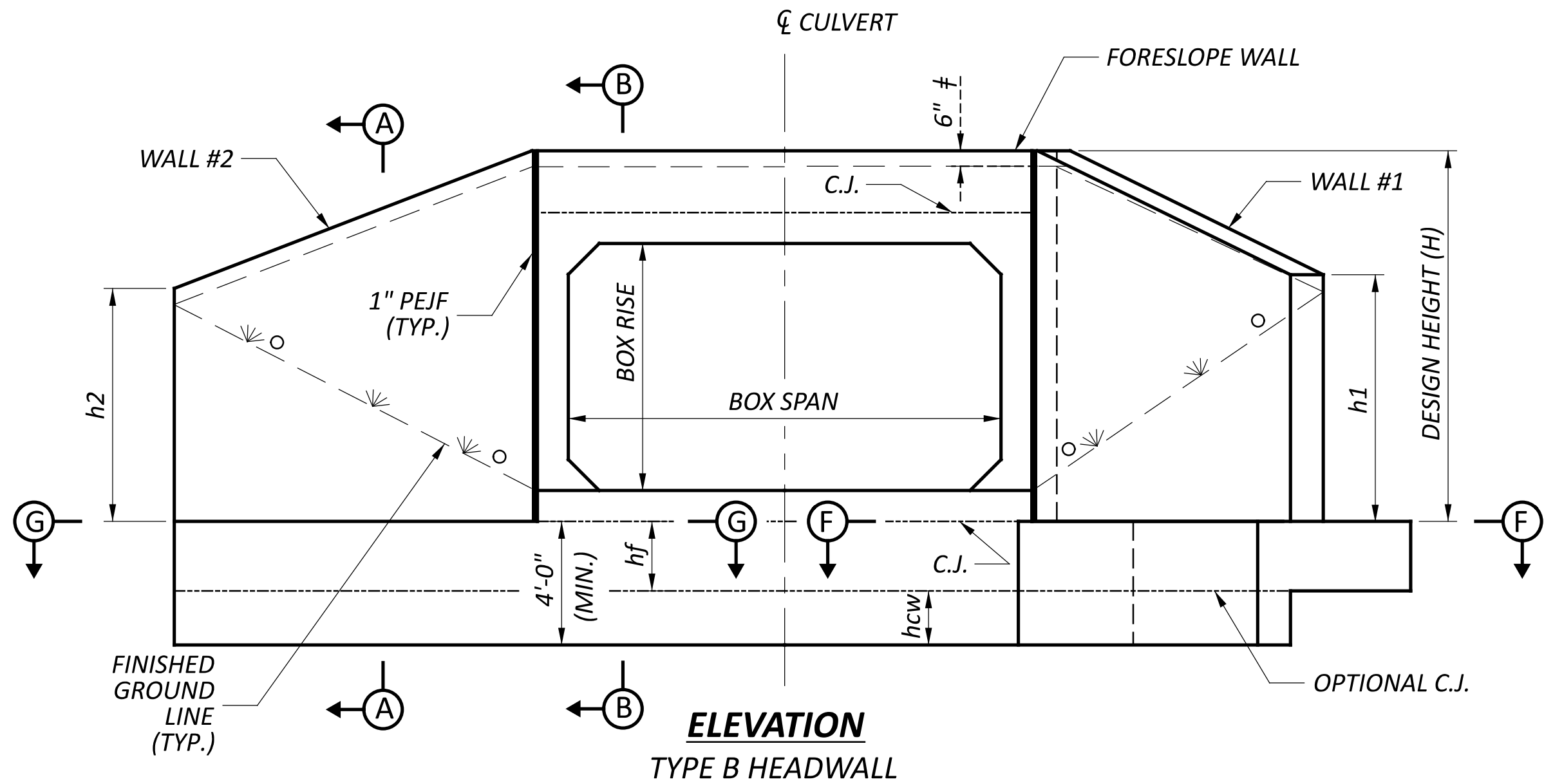
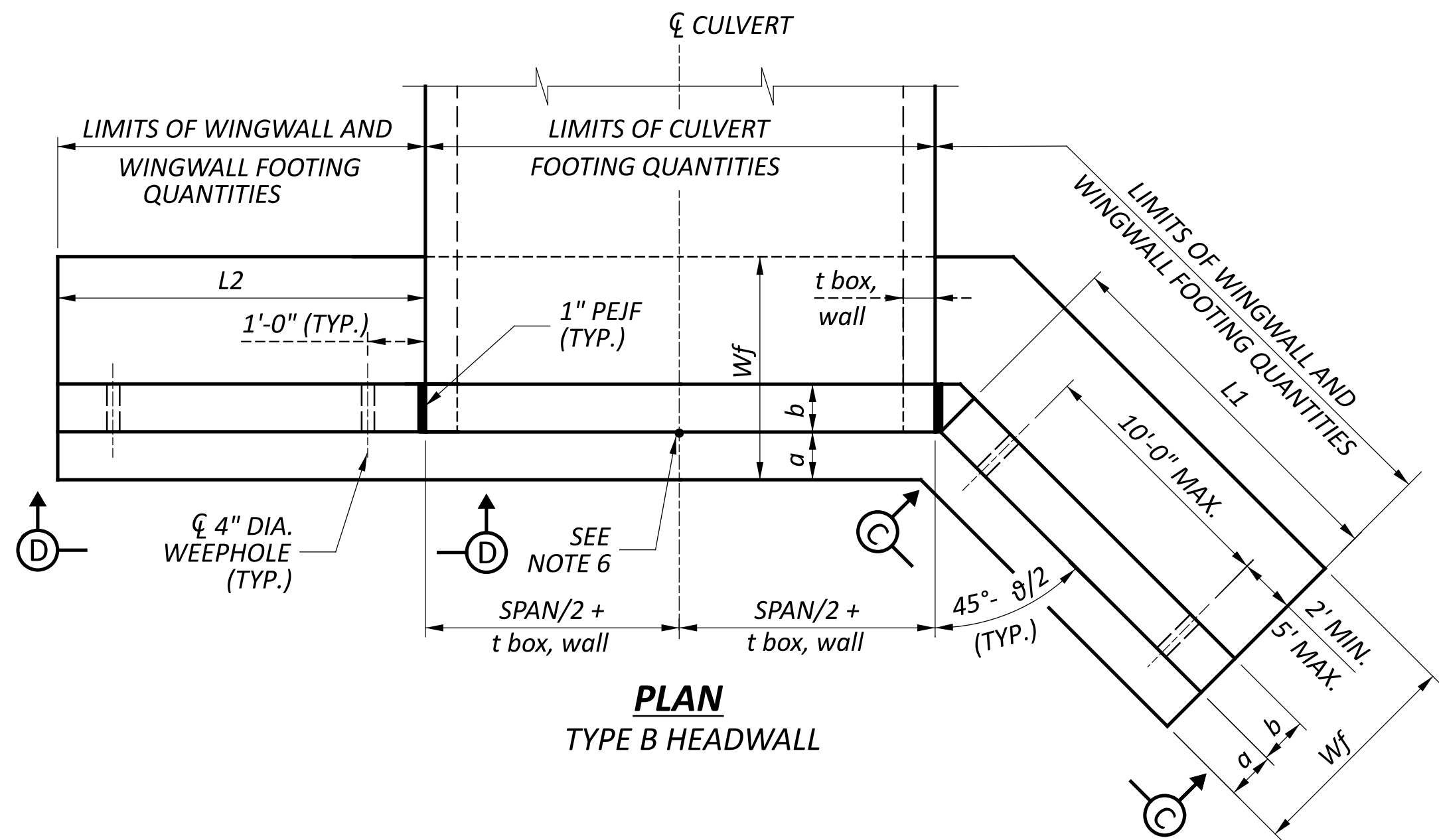
C.J.	CONSTRUCTION JOINT	PEJF	PREFORMED EXPANSION
CL.	CENTER LINE		JOINT FILLER
CLR.	CLEAR	QTY.	QUANTITY
CONC.	CONCRETE	REINF.	REINFORCING
DIA.	DIAMETER	SER.	SERIES
DIM.	DIMENSION	SHT.	SHEET
EXTEN.	EXTENSION	SPA.	SPACING
E.F.	EACH FACE	T&B	TOP AND BOTTOM
F.F.	FAR FACE	TYP.	TYPICAL
MAX.	MAXIMUM		
MIN.	MINIMUM		
N.F.	NEAR FACE		

1. FOR SECTIONS A-A, B-B AND F-F AND VIEW C-C, SEE SHEET 6/6.
2. FOR FOOTING DESIGNS, SEE SHEET 6/6.
3. FOR FORESLOPE WALL REINFORCING AND QUANTITIES, SEE SHEET 6/6.
4. POROUS BACKFILL NOT SHOWN FOR CLARITY.
5. THESE WALLS SHOULD BE USED ONLY FOR WALL CONFIGURATIONS SHOWN IN THESE STANDARDS.
6. SHOW THE STATION AND OFFSET WITH RESPECT TO THE CENTERLINE OF SURVEY ON THE PLANS.

* INCLUDES FOOTING AND CUTOFF WALL CONCRETE AND REINFORCING WITHIN THE LIMITS OF THE BOX CULVERT PER LINEAR FOOT. TO OBTAIN THE TOTAL QUANTITY, MULTIPLY THIS VALUE/FOOT BY [BOX SPAN + 2x (BOX WALL THICKNESS)]

‡ WHEN UTILIZING MGS-2.3 LONG SPAN GUARDRAIL AND THE HEADWALL AND/OR WINGWALL IS WITHIN THE 8'-0" OFFSET FROM THE BACK OF THE RAIL, THE EMBANKMENT SHALL BE FLUSH WITH THE TOP OF THE HEADWALLS AND WINGWALLS. THE EMBANKMENT SHALL BE 6" LOWER THAN THE TOP OF THE HEADWALLS AND WINGWALLS FOR ALL OTHER LOCATIONS.

TYPE A HEADWALL																			
DESIGN HEIGHT H	FOOTING DESIGN	WINGWALL LENGTH	WINGWALL HEIGHT	FOOTING DIM.		CUTOFF WALL Ht.	DIMENSIONS		WINGWALL REINFORCING (SEE SHEET 6/6)					WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *
									"X" BAR	MAX. SPA. (in)	"Y" BAR	MAX. SPA. (in)	EXTEN. LENGTH						
		L	h	Wf	hf	hcw	a	b	SIZE	x	SIZE	y	c						
6'-6"	1	7'-3"	4'-0"	4'-6"	1'-6"	2'-6"	1'-2"	1'-0"	5	18.0	5	18	2'-5"	3.02	446	6.00	598	0.43	24.55
7'-6"	1	8'-6"	4'-6"	5'-0"	1'-6"	2'-6"	1'-6"	1'-0"	5	18.0	5	18	2'-5"	4.01	533	7.38	733	0.48	27.58
8'-6"	1	10'-0"	5'-0"	5'-6"	1'-6"	2'-6"	1'-11"	1'-0"	5	16.5	5	16.5	2'-5"	5.27	726	9.05	830	0.52	28.61
9'-6"	2	11'-6"	5'-6"	6'-3"	1'-6"	2'-6"	2'-3"	1'-0"	5	18.0	5	9	3'-10"	6.69	934	11.35	1,113	0.57	30.11
10'-6"	1	12'-9"	6'-0"	7'-0"	2'-0"	2'-0"	2'-11"	1'-3"	5	18.0	5	9	4'-2"	10.25	1,104	16.19	1,087	0.74	33.95
11'-6"	1	14'-3"	6'-6"	7'-6"	2'-0"	2'-0"	3'-5"	1'-3"	5	17.0	5	8.5	5'-0"	12.43	1,404	18.87	1,205	0.80	35.06
12'-6"	8	15'-9"	7'-0"	8'-9"	2'-0"	2'-0"	3'-6"	1'-3"	5	17.0	5	8.5	5'-3"	14.82	1,580	24.41	2,246	0.89	52.90
13'-6"	8	17'-0"	7'-6"	9'-6"	2'-0"	2'-0"	3'-11"	1'-3"	6	18.0	6	9	6'-2"	17.18	2,139	28.17	2,630	0.97	56.94

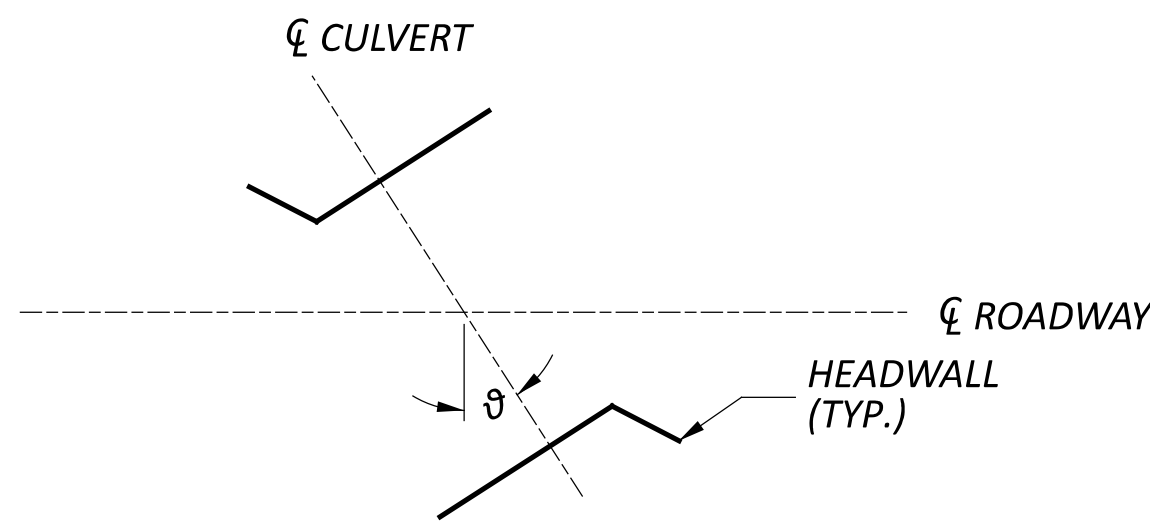


NOTES

- FOR SECTIONS A-A, B-B AND F-F AND VIEW C-C, SEE SHEET 6/6.
 - FOR FOOTING DESIGNS, SEE SHEET 6/6.
 - FOR FORESLOPE WALL REINFORCING AND QUANTITIES, SEE SHEET 6/6.
 - POROUS BACKFILL NOT SHOWN FOR CLARITY.
 - THESE WALLS SHOULD BE USED ONLY FOR WALL CONFIGURATIONS SHOWN IN THESE STANDARDS.
 - SHOW THE STATION AND OFFSET WITH RESPECT TO THE CENTERLINE OF SURVEY ON THE PLANS.
- * INCLUDES FOOTING AND CUTOFF WALL CONCRETE AND REINFORCING WITHIN THE LIMITS OF THE BOX CULVERT PER LINEAR FOOT. TO OBTAIN THE TOTAL QUANTITY, MULTIPLY THIS VALUE/FOOT BY [BOX SPAN + 2x (BOX WALL THICKNESS)].
- † WHEN UTILIZING MGS-2.3 LONG SPAN GUARDRAIL AND THE HEADWALL AND/OR WINGWALL IS WITHIN THE 8'-0" OFFSET FROM THE BACK OF THE RAIL, THE EMBANKMENT SHALL BE FLUSH WITH THE TOP OF THE HEADWALLS AND WINGWALLS. THE EMBANKMENT SHALL BE 6" LOWER THAN THE TOP OF THE HEADWALLS AND WINGWALLS FOR ALL OTHER LOCATIONS.

TYPE B HEADWALL																															
FOR ALL VALUES OF "θ"												θ = 0° **										θ = 15° **									
DESIGN HEIGHT H	FOOTING DESIGN	FOOTING DIM.		CUTOFF WALL Ht.	DIMENSIONS		WINGWALL REINFORCING (SEE SHEET 6/6)					WINGWALL LENGTHS		WINGWALL HEIGHTS		WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *	WINGWALL LENGTHS		WINGWALL HEIGHTS		WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *
		"X" BAR	MAX. SPA. (in)				"Y" BAR	MAX. SPA. (in)	EXTEN. LENGTH	L1	L2																				
6'-6"	1	4'-9"	1'-6"	2'-6"	1'-8"	1'-0"	5	18.0	5	18.0	2'-5"	7'-1"	10'-0"	4'-0"	6'-6"	3.89	512	6.94	552	0.47	25.31	8'-3"	6'-4"	4'-0"	4'-9"	3.05	422	5.94	493	0.47	25.31
7'-6"	1	5'-6"	1'-6"	2'-6"	2'-1"	1'-0"	5	15.0	5	15.0	2'-5"	8'-6"	12'-0"	4'-6"	7'-6"	5.34	667	9.13	684	0.53	28.77	9'-11"	7'-11"	4'-6"	5'-6"	4.05	582	7.95	631	0.53	28.77
8'-6"	2	6'-3"	1'-6"	2'-6"	2'-6"	1'-0"	5	18.0	5	9.0	2'-10"	9'-11"	14'-0"	5'-0"	8'-6"	7.02	921	11.62	1,028	0.58	30.40	11'-6"	9'-6"	5'-0"	6'-3"	5.63	783	10.20	935	0.58	30.40
9'-6"	3	7'-0"	1'-6"	2'-6"	2'-11"	1'-0"	5	18.0	5	9.0	3'-2"	11'-4"	16'-0"	5'-6"	9'-6"	8.93	1,118	14.39	1,373	0.64	36.79	13'-2"	11'-1"	5'-6"	7'-0"	7.22	960	12.76	1,240	0.64	36.79
10'-6"	3	8'-0"	2'-0"	2'-0"	3'-9"	1'-3"	5	14.5	5	7.25	3'-7"	12'-9"	18'-0"	6'-0"	10'-6"	13.88	1,464	21.52	1,677	0.85	41.10	14'-10"	12'-8"	6'-0"	7'-9"	11.32	1,245	19.23	1,517	0.85	41.10
11'-6"	7	9'-0"	2'-0"	2'-0"	4'-1"	1'-3"	5	14.5	5	7.25	3'-9"	14'-2"	20'-0"	6'-6"	11'-6"	16.83	1,787	26.54	2,144	0.93	50.56	16'-6"	14'-3"	6'-6"	8'-9"	13.89	1,535	23.91	1,947	0.93	50.56
12'-6"	9	10'-0"	2'-0"	2'-0"	4'-6"	1'-3"	6	16.0	6	8.0	4'-9"	15'-7"	22'-0"	7'-0"	12'-6"	20.07	2,321	32.04	3,030	1.03	67.81	18'-1"	15'-10"	7'-0"	9'-6"	16.59	2,020	28.96	2,722	1.03	67.81
13'-6"	10	11'-3"	2'-0"	2'-0"	4'-10"	1'-3"	6	12.5	6	6.25	4'-11"	17'-0"	24'-0"	7'-6"	13'-6"	23.59	2,928	38.97	4,023	1.13	84.51	19'-9"	17'-6"	7'-6"	10'-3"	19.61	2,587	35.52	3,669	1.13	84.51

** SEE "GEOMETRIC DIAGRAM"



GEOMETRIC DIAGRAM

LEGEND:

C.J.	CONSTRUCTION JOINT	PEJF	PREFORMED EXPANSION
CL	CENTER LINE		JOINT FILLER
CLR.	CLEAR	QTY.	QUANTITY
CONC.	CONCRETE	REINF.	REINFORCING
DIA.	DIAMETER	SER.	SERIES
DIM.	DIMENSION	SHT.	SHEET
EXTEN.	EXTENSION	SPA.	SPACING
E.F.	EACH FACE	T&B	TOP AND BOTTOM
F.F.	FAR FACE	TYP.	TYPICAL
MAX.	MAXIMUM		
MIN.	MINIMUM		
N.F.	NEAR FACE		

NOTES

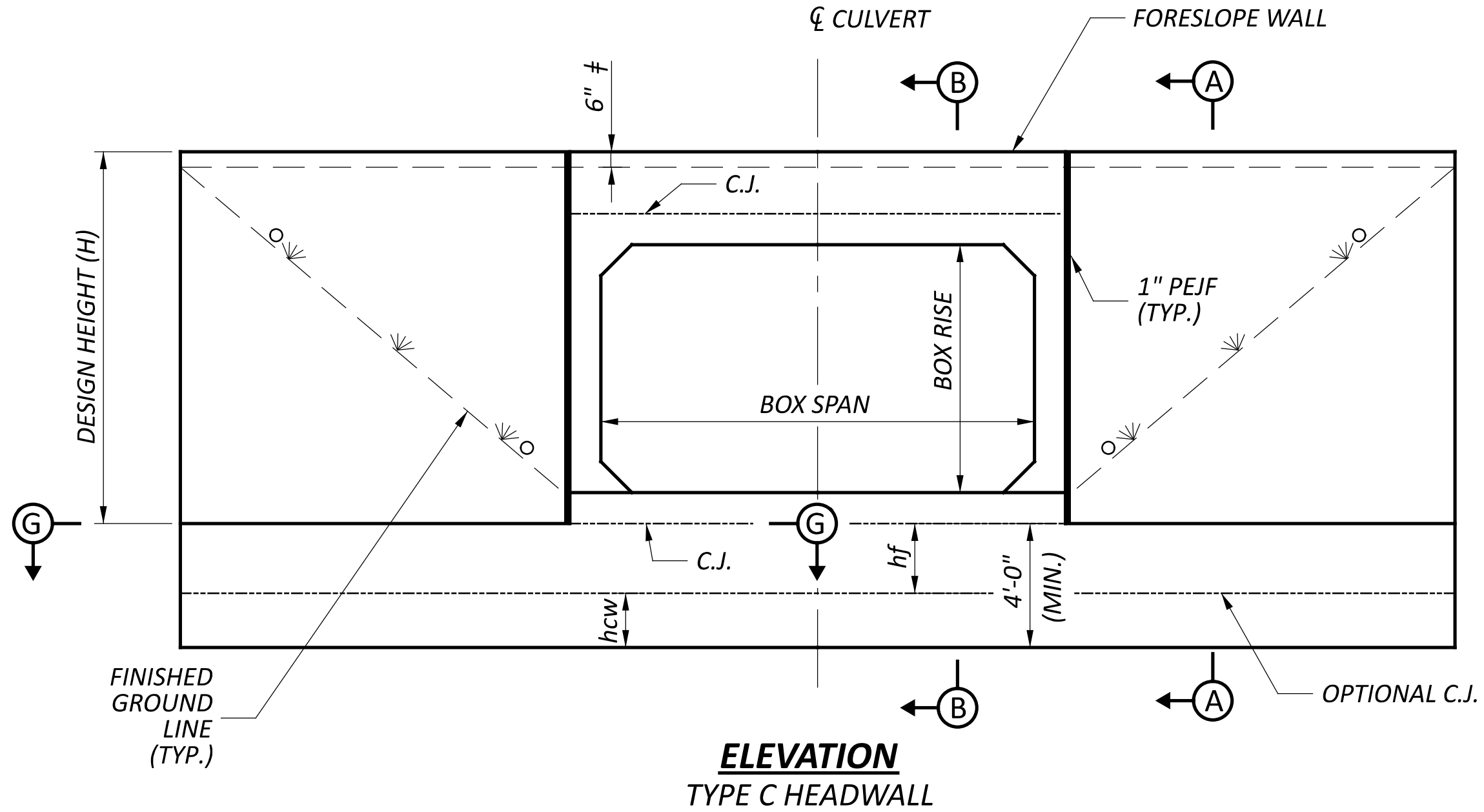
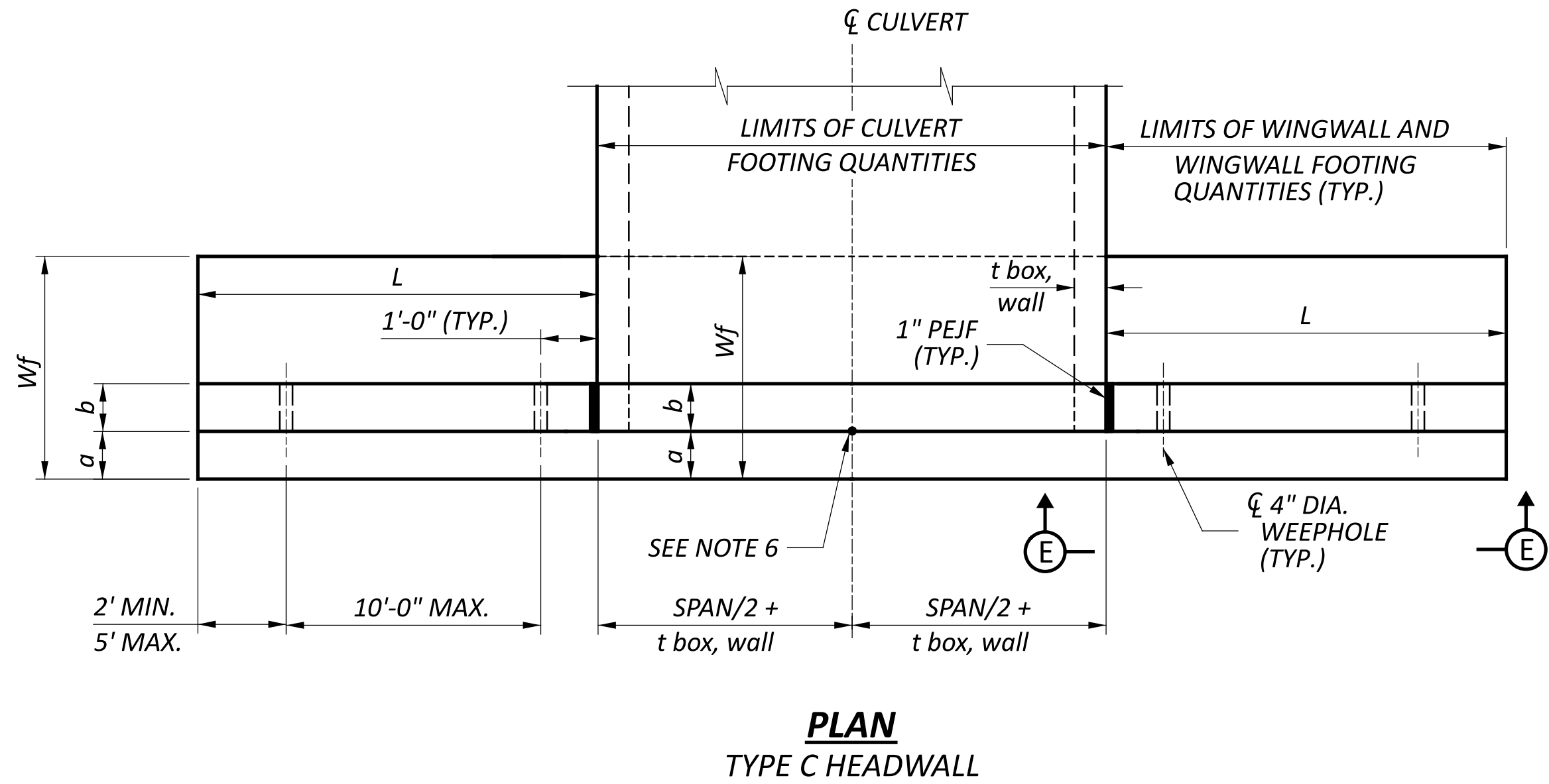
1. FOR NOTES, SEE SHEET 3/6.

* INCLUDES FOOTING AND CUTOFF WALL CONCRETE AND REINFORCING WITHIN THE LIMITS OF THE BOX CULVERT PER LINEAR FOOT. TO OBTAIN THE TOTAL QUANTITY, MULTIPLY THIS VALUE/FOOT BY [BOX SPAN + 2x (BOX WALL THICKNESS)].

TYPE B HEADWALL																															
FOR ALL VALUES OF "θ"												θ = 30° **								θ = 45° **											
DESIGN HEIGHT H	FOOTING DESIGN	FOOTING DIM.		CUTOFF WALL Ht.	DIMENSIONS		WINGWALL REINFORCING (SEE SHEET 6/6)					WINGWALL LENGTHS		WINGWALL HEIGHTS		WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *	WINGWALL LENGTHS		WINGWALL HEIGHTS		WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *
							"X" BAR	MAX. SPA. (in)	"Y" BAR	MAX. SPA. (in)	EXTEN. LENGTH																				
		Wf	hf	hcw	a	b	SIZE	x	SIZE	y	c																				
6'-6"	1	4'-9"	1'-6"	2'-6"	1'-8"	1'-0"	5	18.0	5	18.0	2'-5"	10'-0"	4'-0"	4'-0"	3'-6"	2.83	407	5.71	468	0.47	25.31	13'-1"	4'-0"	4'-0"	2'-9"	3.40	469	6.97	535	0.47	25.31
7'-6"	1	5'-6"	1'-6"	2'-6"	2'-1"	1'-0"	5	15.0	5	15.0	2'-5"	12'-0"	5'-4"	4'-6"	4'-3"	3.99	531	7.74	625	0.53	28.77	15'-9"	4'-0"	4'-6"	3'-6"	4.51	590	8.82	676	0.53	28.77
8'-6"	2	6'-3"	1'-6"	2'-6"	2'-6"	1'-0"	5	18.0	5	9.0	2'-10"	14'-0"	6'-8"	5'-0"	5'-0"	5.35	772	10.05	922	0.58	30.40	18'-4"	4'-11"	5'-0"	4'-0"	5.94	825	11.32	982	0.58	30.40
9'-6"	3	7'-0"	1'-6"	2'-6"	2'-11"	1'-0"	5	18.0	5	9.0	3'-2"	16'-0"	8'-0"	5'-6"	5'-6"	6.87	917	12.64	1,229	0.64	36.79	20'-11"	6'-1"	5'-6"	4'-6"	7.63	983	14.26	1,337	0.64	36.79
10'-6"	3	8'-0"	2'-0"	2'-0"	3'-9"	1'-3"	5	14.5	5	7.25	3'-7"	18'-0"	9'-4"	6'-0"	6'-3"	10.85	1,189	19.13	1,487	0.85	41.10	23'-7"	7'-3"	6'-0"	5'-3"	12.06	1,325	21.66	1,628	0.85	41.10
11'-6"	7	9'-0"	2'-0"	2'-0"	4'-1"	1'-3"	5	14.5	5	7.25	3'-9"	20'-0"	10'-8"	6'-6"	7'-0"	13.29	1,483	23.89	1,908	0.93	50.56	26'-2"	8'-5"	6'-6"	5'-9"	14.71	1,622	27.05	2,116	0.93	50.56
12'-6"	9	10'-0"	2'-0"	2'-0"	4'-6"	1'-3"	6	16.0	6	8.0	4'-9"	22'-0"	12'-0"	7'-0"	7'-6"	15.91	1,957	29.11	2,683	1.03	67.81	28'-9"	9'-7"	7'-0"	6'-3"	17.63	2,157	32.96	2,995	1.03	67.81
13'-6"	10	11'-3"	2'-0"	2'-0"	4'-10"	1'-3"	6	12.5	6	6.25	4'-11"	24'-0"	13'-4"	7'-6"	8'-3"	18.84	2,520	35.74	3,674	1.13	84.51	31'-5"	10'-9"	7'-6"	6'-9"	20.84	2,772	40.55	4,064	1.13	84.51

** SEE "GEOMETRIC DIAGRAM"





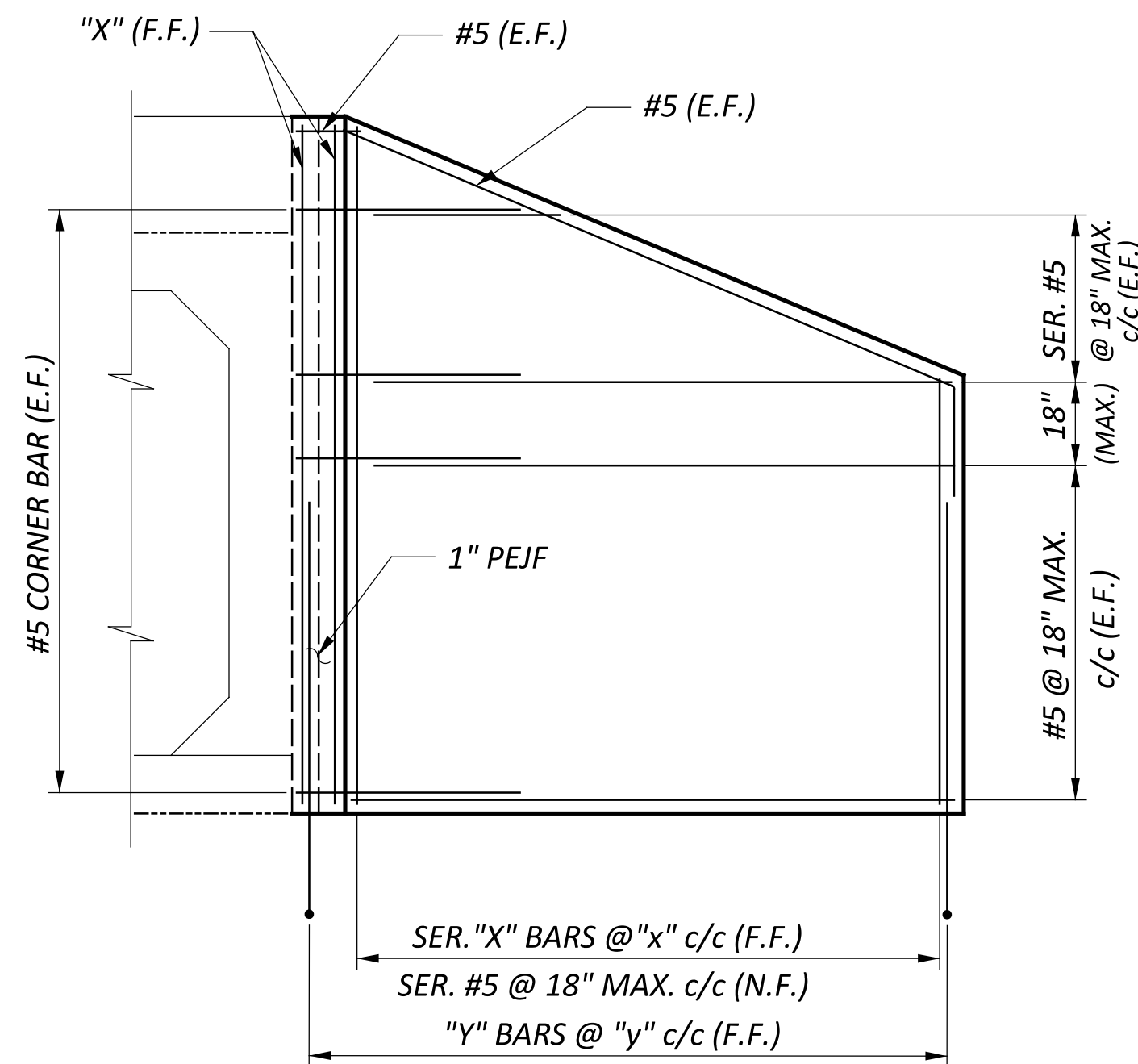
NOTES

- FOR SECTIONS A-A, B-B AND F-F AND VIEW C-C, SEE SHEET 6/6.
 - FOR FOOTING DESIGNS, SEE SHEET 6/6.
 - FOR FORESLOPE WALL REINFORCING AND QUANTITIES, SEE SHEET 6/6.
 - POROUS BACKFILL NOT SHOWN FOR CLARITY.
 - THESE WALLS SHOULD BE USED ONLY FOR WALL CONFIGURATIONS SHOWN IN THESE STANDARDS.
 - SHOW THE STATION AND OFFSET WITH RESPECT TO THE CENTERLINE OF SURVEY ON THE PLANS.
- * INCLUDES FOOTING AND CUTOFF WALL CONCRETE AND REINFORCING WITHIN THE LIMITS OF THE BOX CULVERT PER LINEAR FOOT. TO OBTAIN THE TOTAL QUANTITY, MULTIPLY THIS VALUE/FOOT BY [BOX SPAN + 2x (BOX WALL THICKNESS)].
- ± WHEN UTILIZING MGS-2.3 LONG SPAN GUARDRAIL AND THE HEADWALL AND/OR WINGWALL IS WITHIN THE 8'-0" OFFSET FROM THE BACK OF THE RAIL, THE EMBANKMENT SHALL BE FLUSH WITH THE TOP OF THE HEADWALLS AND WINGWALLS. THE EMBANKMENT SHALL BE 6" LOWER THAN THE TOP OF THE HEADWALLS AND WINGWALLS FOR ALL OTHER LOCATIONS.

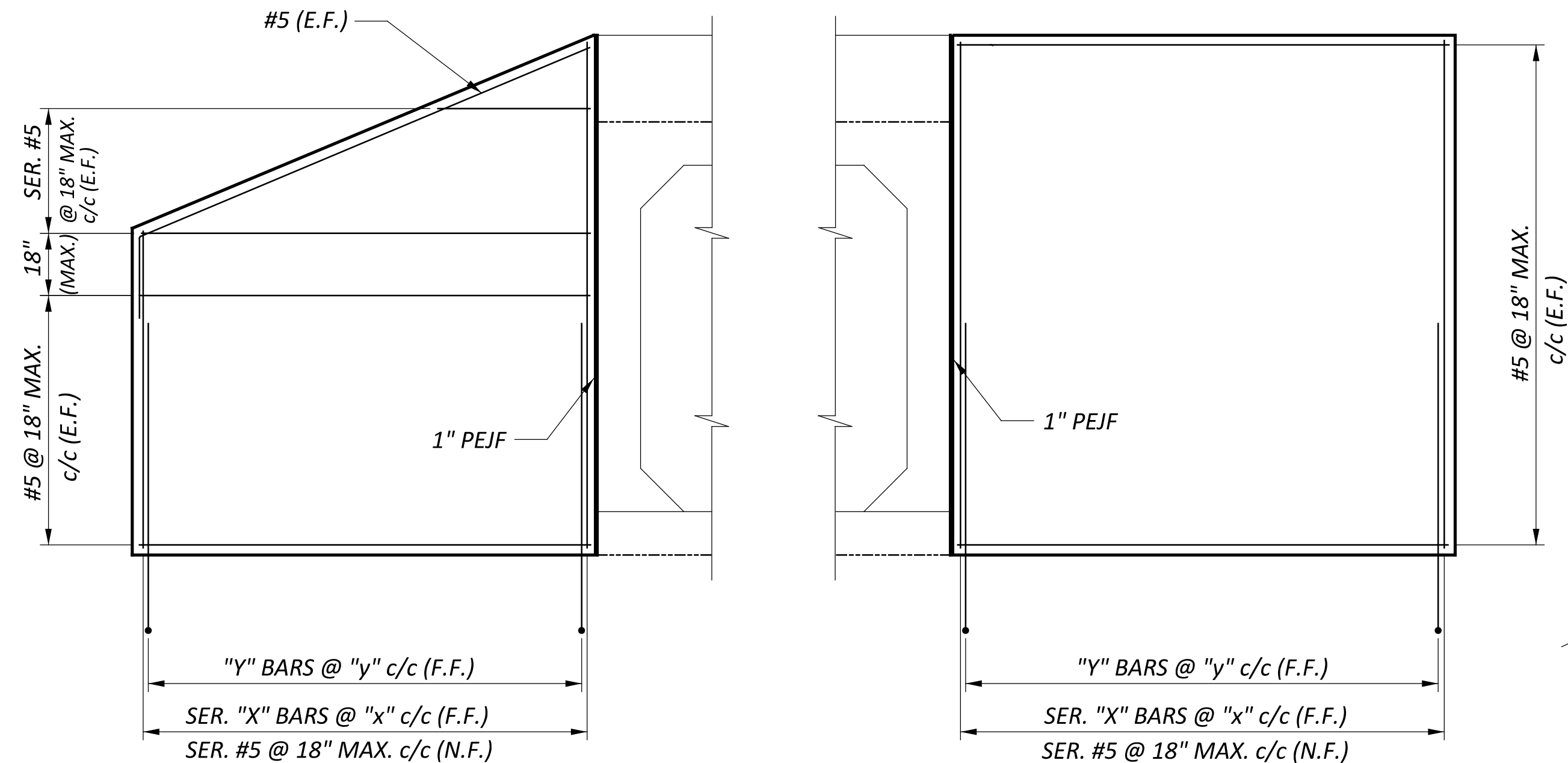
LEGEND:

C.J.	CONSTRUCTION JOINT	PEJF	PREFORMED EXPANSION
CLR.	CLEAR	QTY.	JOINT FILLER
CONC.	CONCRETE	REINF.	QUANTITY
DIA.	DIAMETER	SER.	REINFORCING
DIM.	DIMENSION	SHT.	SERIES
EXTEN.	EXTENSION	SPA.	SHEET
E.F.	EACH FACE	T&B	SPACING
F.F.	FAR FACE	TYP.	TOP AND BOTTOM
MAX.	MAXIMUM		TYPICAL
MIN.	MINIMUM		
N.F.	NEAR FACE		

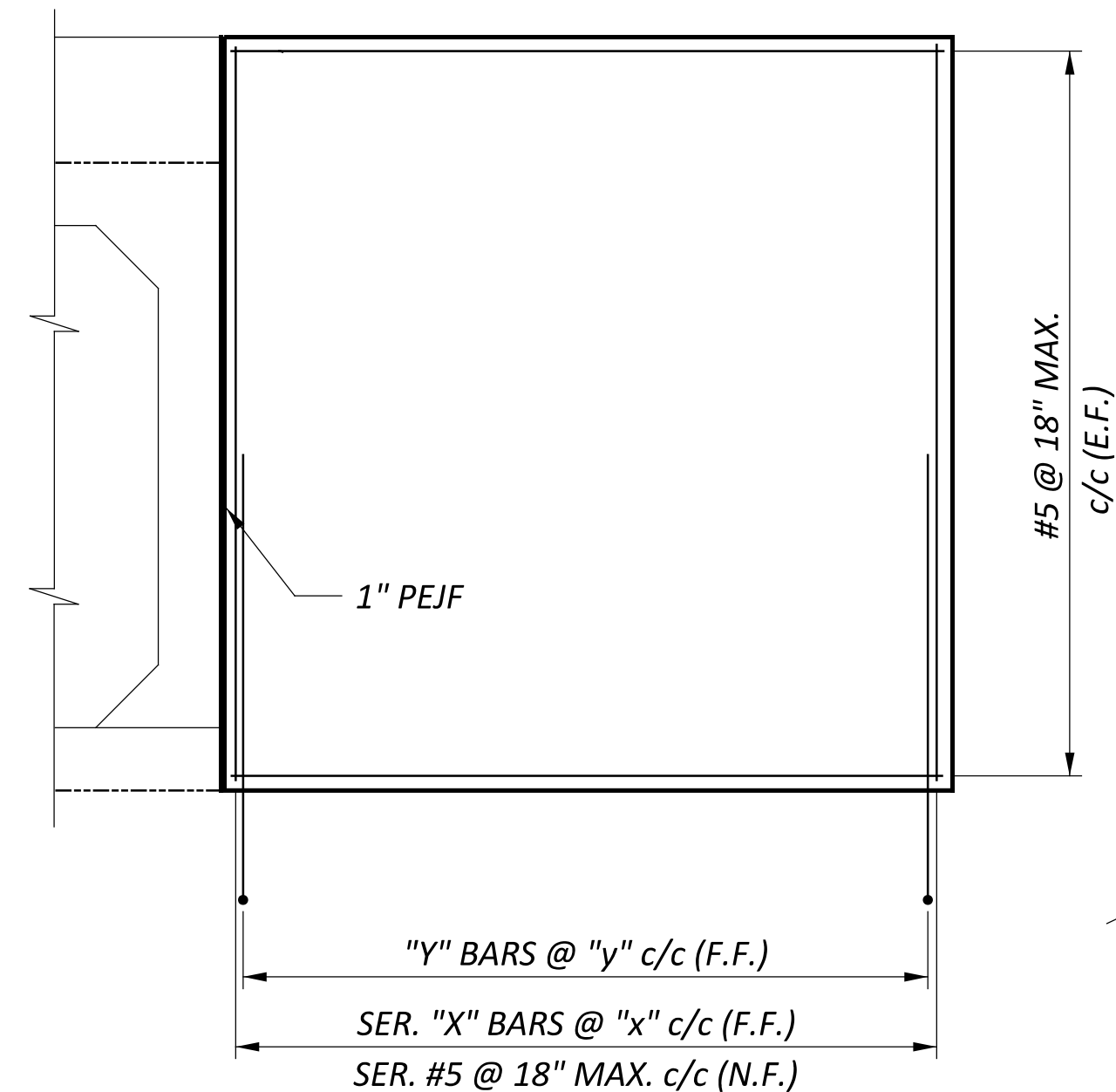
TYPE C HEADWALL																		
DESIGN HEIGHT H	FOOTING DESIGN	WINGWALL LENGTH L	FOOTING DIM.			CUTOFF WALL Ht.		WINGWALL REINFORCING (SEE SHEET 6/6)					WINGWALL CONC. QTY. (cy)	WINGWALL REINF. QTY. (lbs)	WINGWALL FOOTING CONC. QTY. (cy)	WINGWALL FOOTING REINF. QTY. (lbs)	CULVERT FOOTING CONC. QTY. (cy/ft) *	CULVERT FOOTING REINF. QTY. (lbs/ft) *
								"X" BAR	MAX. SPA. (in)	"Y" BAR	MAX. SPA. (in)	EXTEN. LENGTH						
			L	Wf	hf	h _{cw}	a	b	SIZE	x	SIZE	y	c					
6'-6"	1	10'-0"	5'-3"	1'-6"	2'-6"	1'-5"	1'-0"	5	17.5	5	17.5	2'-5"	4.82	528	8.62	587	0.49	27.84
7'-6"	1	12'-0"	5'-9"	1'-6"	2'-6"	2'-0"	1'-0"	5	12.0	5	12.0	2'-5"	6.67	749	11.00	695	0.55	29.04
8'-6"	1	14'-0"	6'-3"	1'-6"	2'-6"	2'-7"	1'-0"	5	17.5	5	8.75	3'-6"	8.82	1,012	13.62	823	0.59	30.15
9'-6"	3	16'-0"	7'-0"	1'-6"	2'-6"	2'-11"	1'-0"	5	17.5	5	8.75	3'-8"	11.26	1,261	16.89	1,448	0.64	36.68
10'-6"	3	18'-0"	8'-0"	2'-0"	2'-0"	3'-8"	1'-3"	5	18.0	5	9.0	3'-11"	17.50	1,485	25.34	1,803	0.85	40.93
11'-6"	7	20'-0"	9'-0"	2'-0"	2'-0"	3'-10"	1'-3"	6	18.0	6	9.0	4'-6"	21.30	2,201	31.12	2,250	0.92	46.94
12'-6"	9	22'-0"	9'-9"	2'-0"	2'-0"	4'-3"	1'-3"	6	16.0	6	8.0	5'-2"	25.47	2,775	36.67	3,378	1.00	66.64
13'-6"	9	24'-0"	10'-6"	2'-0"	2'-0"	4'-8"	1'-3"	6	13.0	6	6.5	5'-4"	30.00	3,454	42.67	3,789	1.06	69.56



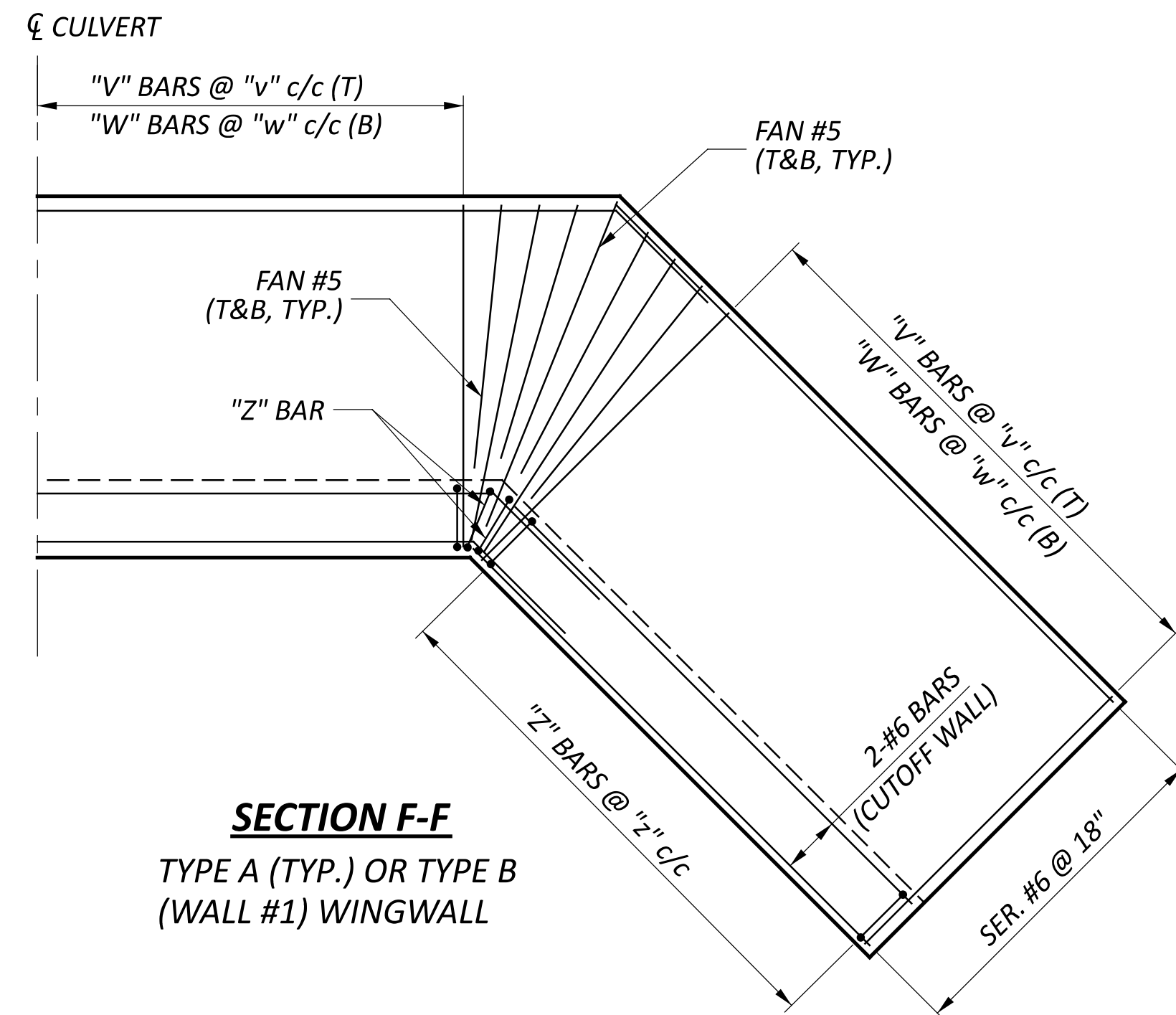
VIEW C-C
TYPE A (TYP.) OR TYPE B (WINGWALL #1)



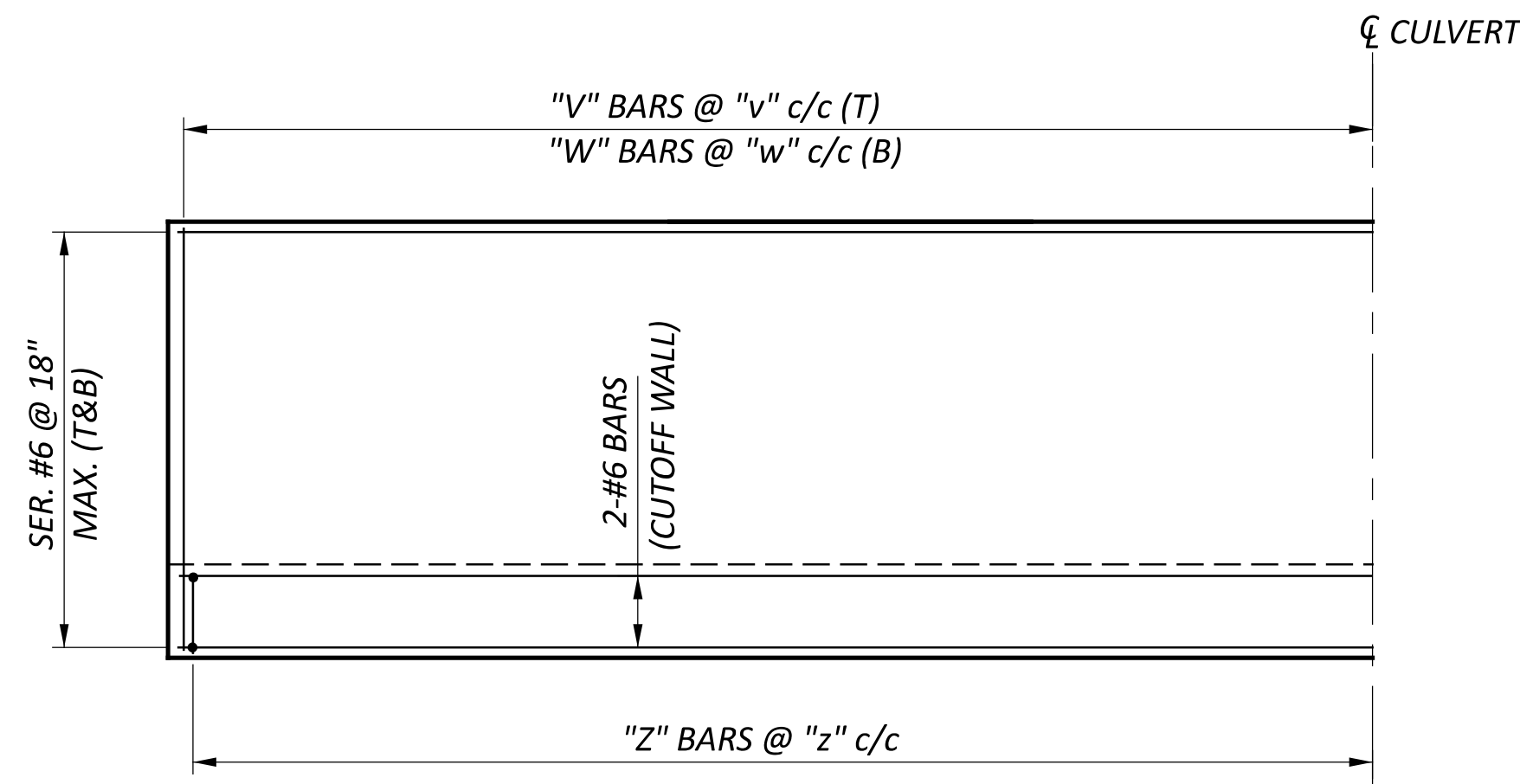
VIEW D-D
TYPE B WINGWALL #2



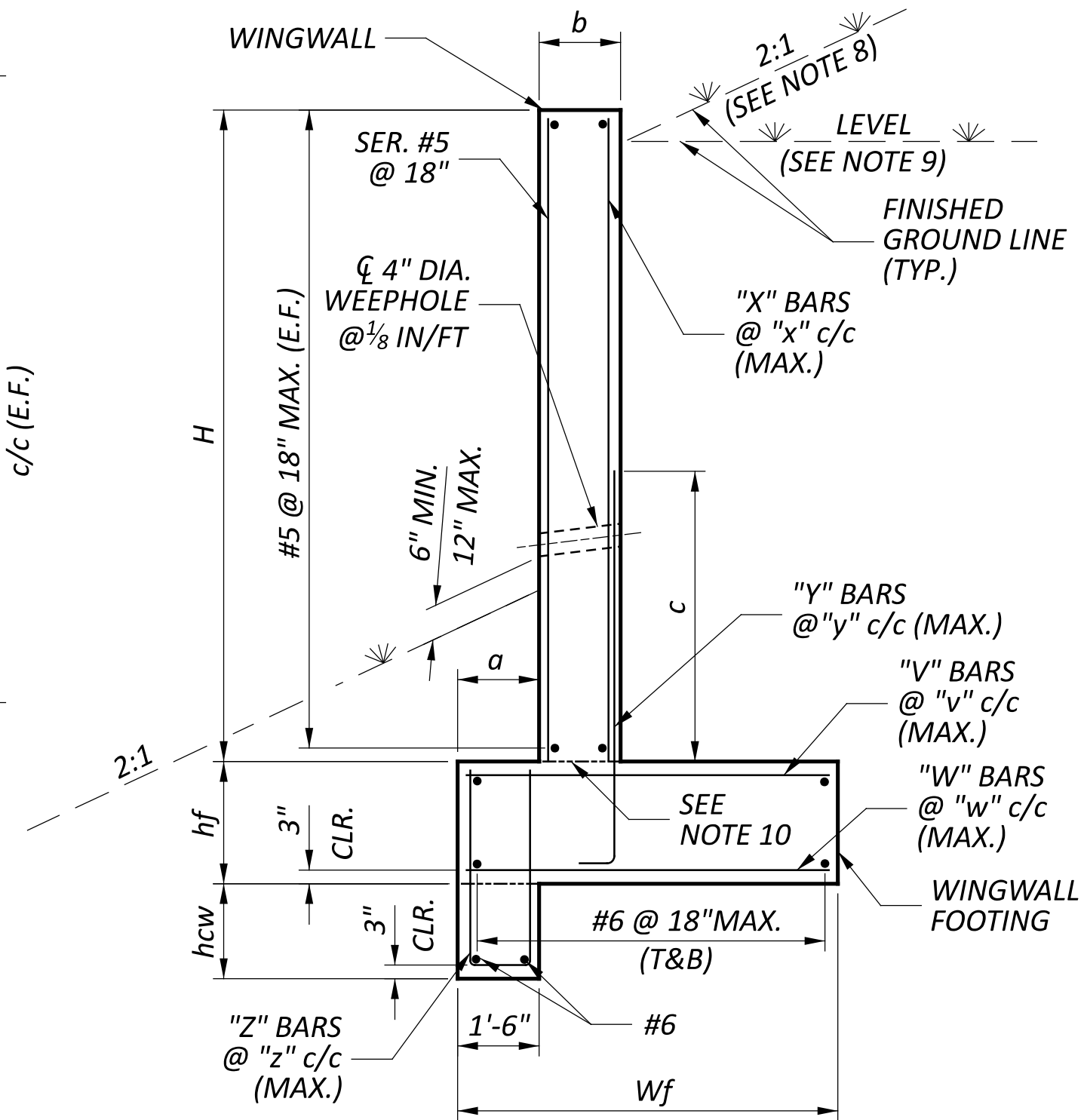
VIEW E-E
TYPE C WINGWALL



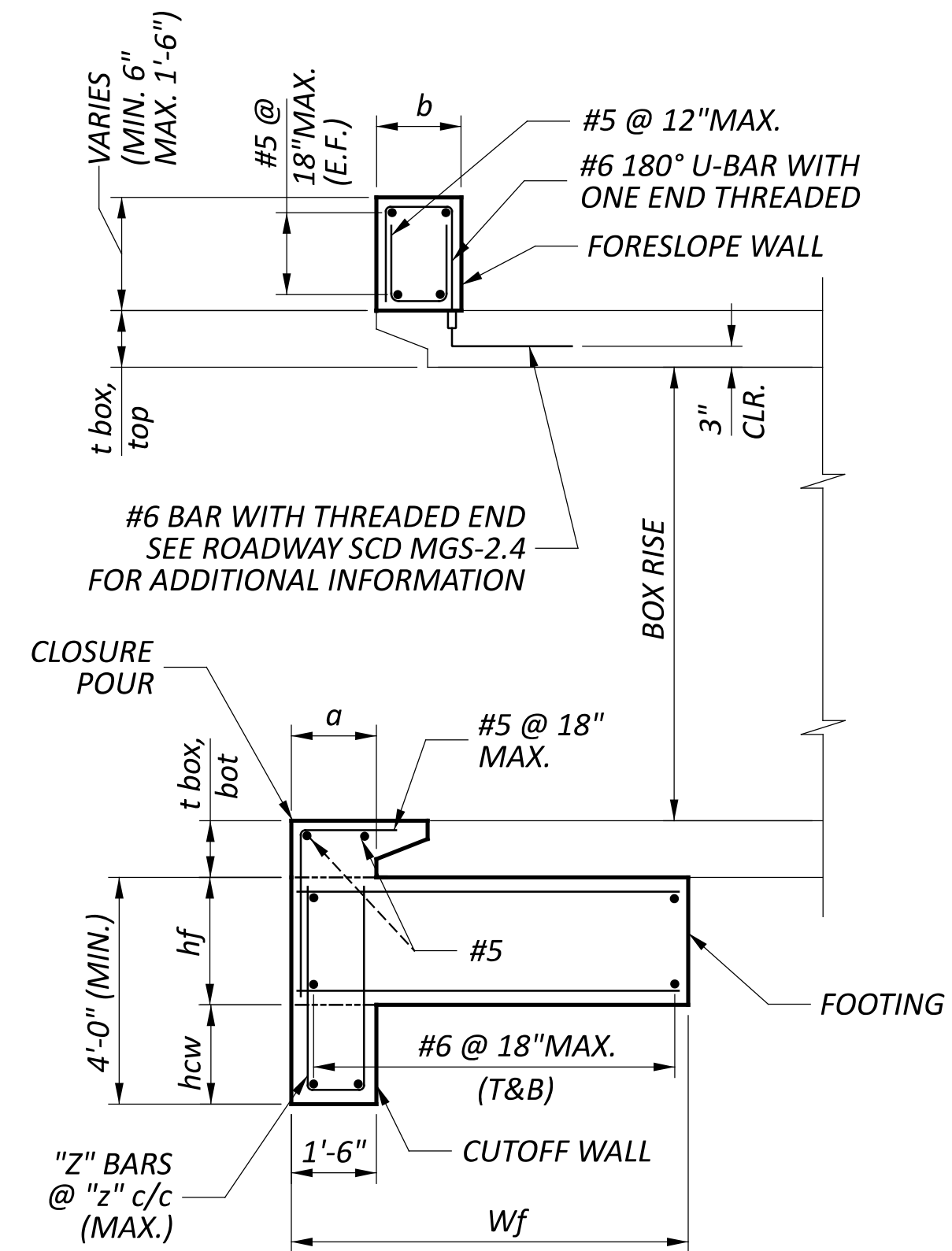
SECTION F-F
TYPE A (TYP.) OR TYPE B
(WALL #1) WINGWALL



SECTION G-G
TYPE B (WALL #2) OR TYPE C WINGWALL (TYP.)



SECTION A-A
(POROUS BACKFILL NOT SHOWN FOR CLARITY)



SECTION B-B
(CULVERT INLET BEVEL SHOWN)

FOOTING REINFORCEMENT				
FOOTING DESIGN	"V" BAR	MAX. SPA (in)	"W", "Z" BARS	MAX. SPA (in)
	SIZE	v	SIZE	w, z
1	5	18	5	18
2	5	15	5	18
3	5	12	5	15
4	5	18	5	12
5	5	15	5	9
6	6	18	6	18
7	6	15	6	15
8	6	9	6	18
9	6	9	6	12
10	7	12	7	12

FORESLOPE WALL QUANTITIES			
WIDTH b>	HEIGHT OF FORESLOPE WALL (ft)	FORESLOPE WALL REINF. QTY. (lbs/ft) *	FORESLOPE WALL CONC. QTY. (cy/ft) *
1'-0"	6"	6.70	0.02
	1'-6"	10.87	0.06
1'-3"	6"	7.22	0.03
	1'-6"	11.39	0.07

* INCLUDES FORESLOPE WALL CONCRETE AND REINFORCING WITHIN THE LIMITS OF THE BOX CULVERT PER LINEAR FOOT. TO OBTAIN THE TOTAL QUANTITY, MULTIPLY THIS VALUE/FOOT BY [BOX SPAN + 2x (BOX WALL THICKNESS)].

NOTES

- FOR THE GENERAL NOTES SEE SHEET 1/6.
- FOR THE LOCATIONS OF SECTIONS A-A AND B-B, SEE SHEETS 2/6, 3/6 AND 5/6.
- FOR THE LOCATIONS OF VIEW C-C AND SECTION F-F, SEE SHEETS 2/6 AND 3/6.
- FOR THE LOCATION OF VIEW D-D SEE SHEET 3/6.
- FOR THE LOCATION OF VIEW E-E, SEE SHEET 5/6.
- FOR THE LOCATION OF SECTION G-G, SEE SHEETS 3/6 AND 5/6.
- FOR SIZE AND SPACING OF "X" AND "Y" BARS SEE SHEETS 2/6 TO 5/6.
- 2:1 BACKSLOPE, NORMAL TO CULVERT, IS FOR TYPE A WINGWALLS AND TYPE B WINGWALLS.
- LEVEL SURFACE WITH 2 FOOT LIVE LOAD SURCHARGE IS FOR TYPE C WINGWALLS.
- THE INTERFACE BETWEEN THE TOP OF FOOTING AND BASE OF WINGWALL STEM IS INTENTIONALLY ROUGHENED TO A FULL AMPLITUDE OF APPROXIMATELY 1/4" BY MEANS OF A SERRATED TROWEL.
- WALL THICKNESS (t box, wall) FOR PRECAST BOX CULVERT IS AS FOLLOWS:
SPAN = 8'-0" WALL THICKNESS = 8"
SPAN = 10'-0" WALL THICKNESS = 10"
SPAN ≥ 12'-0" WALL THICKNESS = 12"



DESIGN NOTES

1. THIS DRAWING PROVIDES INFORMATION FOR THE DESIGNER AND IS NOT INTENDED FOR USE AS A STANDARD DRAWING. REFERENCE SHALL BE MADE TO STANDARD DRAWING PSBD-1-25 FOR DETAILS OF BEAMS.
2. DESIGN SPECIFICATIONS: "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 10TH EDITION, 2024" AND THE LATEST EDITION OF THE ODOT BRIDGE DESIGN MANUAL.
3. DESIGN DATA:

SKREW - THE DESIGN DATA ARE APPLICABLE TO STRUCTURES WITH SKEW ANGLES OF 30° OR LESS.

LIVE LOADING - HL-93

LIVE LOAD - THE APPROXIMATE METHODS OF ANALYSIS GIVEN IN AASHTO LRFD ARTICLE 4.6.2.2 HAVE BEEN USED. THE APPLICABLE CROSS SECTION ON TABLE 4.6.2.2.1-1 IS "J". THE DESIGNS ARE FOR BRIDGES WITHOUT TRANSVERSE POST-TENSIONING (I.E. BEAMS ARE CONNECTED ONLY ENOUGH TO PREVENT RELATIVE VERTICAL DISPLACEMENT AT THE INTERFACE). ALL DESIGNS SHOWN HEREIN ARE BASED ON EXTERIOR BEAMS (HIGHER DISTRIBUTION FACTORS). THESE DESIGNS MAY ALSO BE USED FOR INTERIOR BEAMS (LOWER DISTRIBUTION FACTORS).

SUPERIMPOSED DEAD LOADS -
CONCRETE DECK = 6" THICK
RAILING WEIGHT = 0.10 KLF PER RAIL
FWS = 0.060 KSF

DEAD LOAD - INTERMEDIATE DIAPHRAGM WEIGHT IS BASED ON 3'-0" LONG DIAPHRAGMS AND NUMBER OF DIAPHRAGMS SHOWN ON STANDARD DRAWING PSBD-1-25.

CONCRETE - MIN. COMPRESSIVE STRENGTH AT 28 DAYS: $f'_c = 7$ KSI
MIN. COMPRESSIVE STRENGTH AT TIME OF INITIAL PRESTRESS: $f'_{ci} = 5$ KSI

REINFORCING STEEL- GRADE 60
MINIMUM YIELD STRENGTH = 60 KSI

PRESTRESSING STEEL- ASTM A416 LOW RELAXATION STRANDS
 $\frac{1}{2}$ " DIAMETER
 $A_{ps} = 0.167$ SQ. IN. PER STRAND
 $f_{pu} = 270$ KSI
 $E_p = 28,500$ KSI
RELATIVE HUMIDITY, $H = 70\%$

INITIAL STRESS $0.75 f_{pu} = 202.5$ KSI
INITIAL TENSION LOAD = 33.82 KIPS/STRAND

A SEVERE CORROSIVE ENVIRONMENT WAS ASSUMED IN DETERMINING THE TENSILE STRESS LIMITS AFTER LOSSES (AASHTO LRFD ARTICLE 5.9.2.3.2).

LOAD MODIFIERS FOR DUCTILITY, REDUNDANCY, AND OPERATIONAL IMPORTANCE WERE TAKEN AS 1.0 (AASHTO LRFD ARTICLE 1.3).

STRAND AREAS WERE NOT TRANSFORMED IN SECTION PROPERTY CALCULATIONS.

MILD REINFORCING BARS WERE NOT CONSIDERED IN DETERMINING THE STRENGTH OF THE SECTIONS.

ALL DESIGNS MEET THE CRITERIA FOR DEFLECTION GIVEN IN AASHTO LRFD ARTICLE 2.5.2.6.2 AND THE CRITERIA FOR SPAN-TO-DEPTH RATIOS GIVEN IN AASHTO LRFD ARTICLE 2.5.2.6.3.

4. PRESTRESS LOSSES HAVE BEEN COMPUTED IN ACCORDANCE WITH AASHTO LRFD EQUATIONS 5.9.3.1-1, 5.9.3.2.3a-1, AND 5.9.3.3-1 (APPROXIMATE ESTIMATE OF TIME-DEPENDENT LOSSES).

5. CAMBER DATA GIVEN IS THE CALCULATED CAMBER AT TIME OF RELEASE (D_0), AND CAMBER AT TIME OF ERECTION (D_{90}). Δ = CALCULATED DEFLECTION AT MIDSPAN DUE TO REMAINING DEAD LOAD (RAILINGS, DIAPHRAGMS, AND CONCRETE DECK). PROVIDE THESE VALUES FOR CAMBER AT RELEASE, CAMBER AT ERECTION, AND DEFLECTION IN THE PLANS.

6. ROADWAY WIDTH: THE BEAMS ON THIS SHEET ARE DESIGNED FOR THE FOLLOWING ROADWAY WIDTHS, MEASURED BETWEEN FACE OF BRIDGE RAILS:

24 FT. $\leq$ WIDTH $\leq$ 32 FT.

THESE DESIGNS SHALL NOT BE USED FOR ROADWAY WIDTHS LESS THAN 24 FT. OR GREATER THAN 32 FT. SPECIAL DESIGN IS REQUIRED FOR ROADWAY WIDTHS LESS THAN 24 FT. OR GREATER THAN 32 FT.

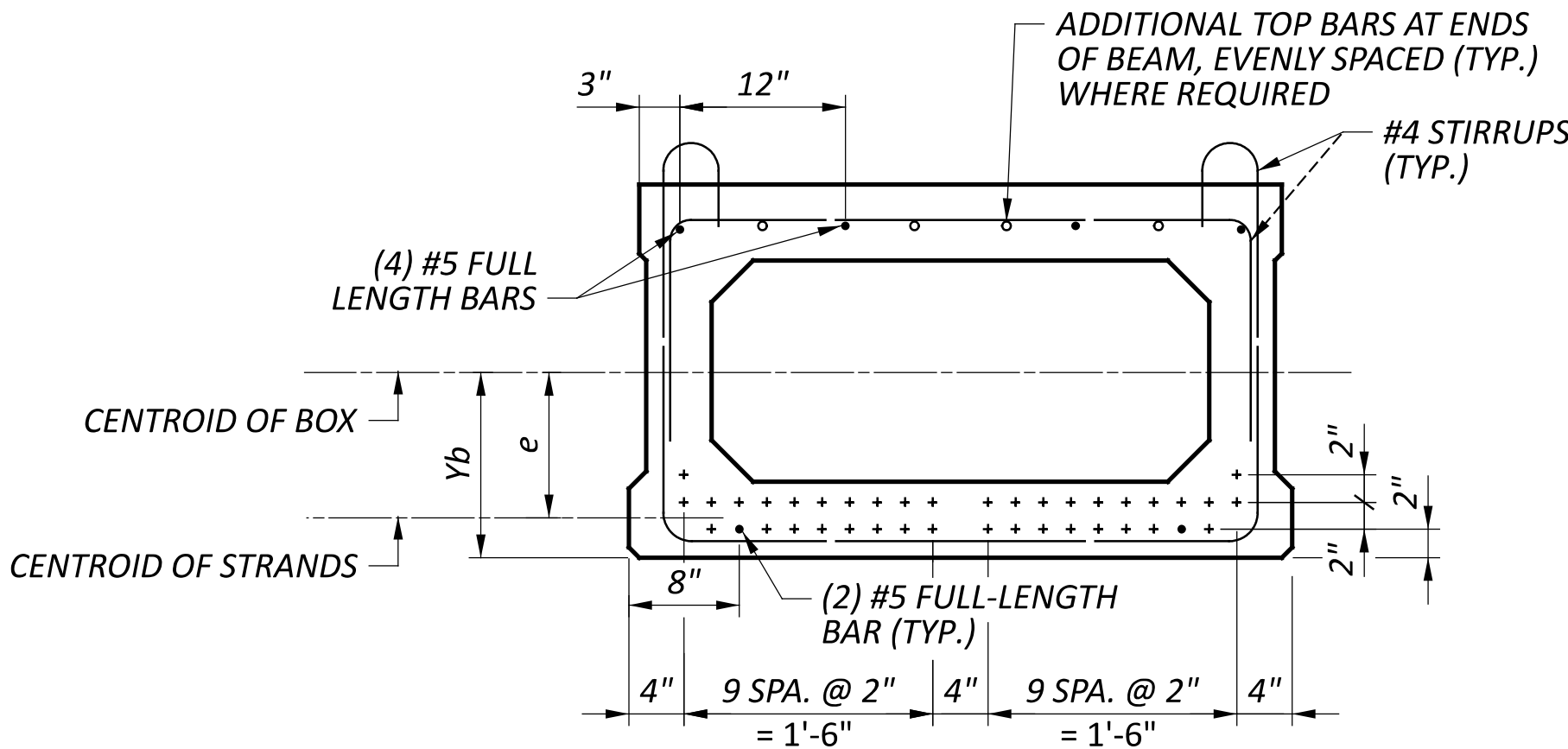
7. INTERPOLATION: FOR BEAM SPANS NOT SPECIFICALLY LISTED IN THE DESIGN DATA TABLE, THE DESIGN DATA MAY BE OBTAINED FROM THE TABLE BY USING STRAIGHT LINE INTERPOLATION BETWEEN GIVEN VALUES. HOWEVER, THE NUMBER OF STRANDS USED SHALL ALWAYS BE ROUNDED UP TO THE NEAREST EVEN NUMBER. DO NOT EXTRAPOLATE BEYOND THE GIVEN DATA.

8. STEEL-REINFORCED ELASTOMERIC BEARING PADS: BEARING TYPES WERE DETERMINED FOR EACH BEAM ASSUMING A SINGLE SPAN CONFIGURATION. IF THE MAXIMUM GRADE AT THE BEARING LOCATION EXCEEDS 2%, SEE STANDARD DRAWING BD-1-11.

THE FOLLOWING ADDITIONAL DEAD LOADS, SEMI-INTEGRAL WITH FWS, WERE ASSUMED FOR EACH BEARING PAD:

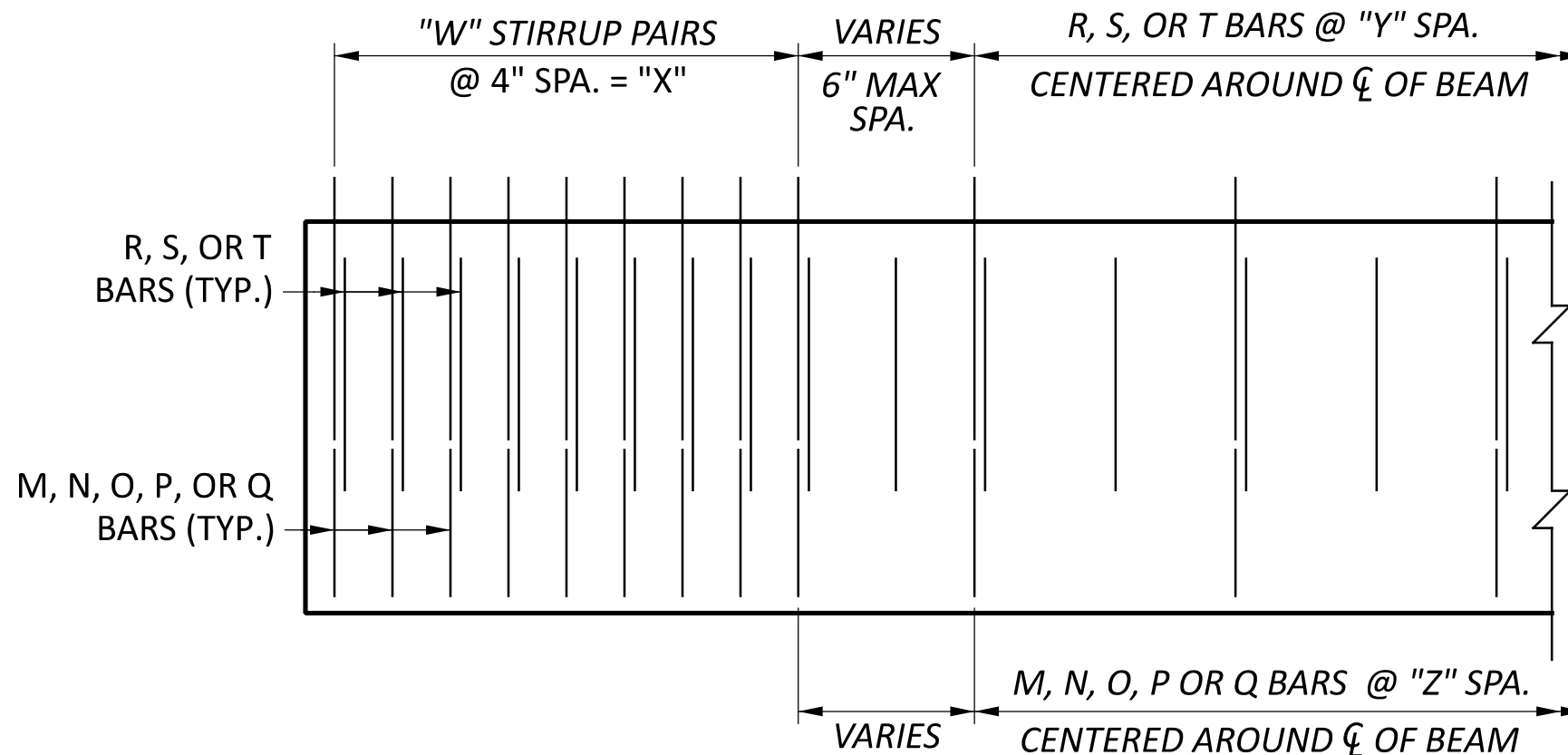
CB17-48, 4.99 KIPS
CB21-48, 5.14 KIPS
CB27-48, 5.36 KIPS
CB33-48, 5.59 KIPS
CB42-48, 5.93 KIPS

DESIGN DATA (COMPOSITE BEAMS)																										
BOX	SPAN c/c BRG. (FT)	MIDSPAN e (IN)		NO. OF STRANDS	STRAND LOC. DIST. FROM BOTTOM			NUMBER AND LENGTH OF STRANDS DEBONDED				TENSILE BARS AT BOTTOM		TENSILE BARS AT TOP					STIRRUP LAYOUT				CAMBER/DEFLECTION DATA (IN)			BEARING PADS
														FULL LENGTH		ADDITIONAL BARS EACH END							D0	D30	Δ	BEARING TYPE †
		BEAM	COMPOSITE		2"	4"	6"	2'-6"	5'-0"	7'-6"	15'-0"	NO.	SIZE	NO.	SIZE	NO.	SIZE	LENGTH*	"W"	"X"	"Y" (in)	"Z" (in)				
CB17-48	20	5.78	8.07	12	8	4						2	5	4	5				9	2'-8"	12	12	0.125	0.250	0.000	B1
	25	5.88	8.17	14	10	4						2	5	4	5				9	2'-8"	12	12	0.250	0.375	0.000	B1
	30	5.45	7.74	16	10	6						2	5	4	5				9	2'-8"	12	12	0.500	0.875	0.125	B1
	35	5.78	8.07	18	12	6						2	5	4	5				9	2'-8"	12	12	0.625	1.000	0.125	B1
	40	5.54	7.83	22	12	10						2	5	4	5				16	5'-0"	12	12	0.875	1.500	0.250	B1
	45	5.45	7.74	24	12	12						2	5	4	5				16	5'-0"	12	12	1.125	1.875	0.375	B1
CB21-48	30	7.67	10.94	16	10	6						2	5	4	5				9	2'-8"	12	12	0.375	0.625	0.125	B1
	35	7.53	10.80	18	10	8						2	5	4	5				9	2'-8"	12	12	0.500	0.875	0.125	B1
	40	7.75	11.02	18	12	6						2	5	4	5				9	2'-8"	12	12	0.500	0.875	0.125	B1
	45	7.75	11.02	18	12	6						2	5	4	5				9	2'-8"	12	12	0.625	1.000	0.250	B1
	50	7.69	10.96	22	14	8		2				2	5	4	5				9	2'-8"	12	12	1.375	2.375	0.500	B1
	55	7.65	10.92	26	16	10		4				2	5	4	5				9	2'-8"	12	12	1.375	2.375	0.500	B2
60	7.49	10.76	30	16	14		4	4			2	5	4	5				16	5'-0"	12	12	1.750	3.000	0.750	B2	
CB27-48	40	10.88	14.61	16	12	4						2	5	4	5				9	2'-8"	9	18	0.375	0.625	0.125	B1
	45	10.88	14.61	16	12	4						2	5	4	5				9	2'-8"	9	18	0.500	0.875	0.125	B1
	50	10.71	14.44	18	12	6						2	5	4	5				9	2'-8"	9	18	0.625	1.000	0.250	B1
	55	10.78	14.51	20	14	6		2				2	5	4	5				9	2'-8"	9	18	0.750	1.250	0.250	B2
	60	10.83	14.56	24	16	8		4				2	5	4	5				16	5'-0"	9	18	1.125	1.875	0.375	B2
	65	10.52	14.25	28	16	12		6				2	5	4	5				16	5'-0"	9	18	1.375	2.375	0.625	B2
70	10.38	14.11	32	16	16		4	4			2	5	4	5	2	5	10	16	5'-0"	9	18	1.750	3.000	0.750	B2	
CB33-48	50	13.73	17.99	14	10	4						2	5	4	5				9	2'-8"	9	18	0.375	0.625	0.125	B2
	55	13.55	17.81	16	10	6						2	5	4	5				9	2'-8"	9	18	0.500	0.875	0.250	B2
	60	13.63	17.89	18	12	6		2				2	5	4	5				9	2'-8"	9	18	0.625	1.000	0.250	B2
	65	13.57	17.83	22	14	8		4				2	5	4	5				16	5'-0"	9	18	0.875	1.500	0.375	B2
	70	13.38	17.64	26	14	12		4	4			2	5	4	5				16	5'-0"	9	18	1.125	1.875	0.500	B2
	75	13.37	17.63	30	16	14		4	4			2	5	4	5	2	5	10	16	5'-0"	9	18	1.500	2.500	0.625	B2
80	13.24	17.50	34	16	18			6	6		2	5	4	5	2	5	10	16	5'-0"	9	18	1.750	3.000	0.875	B2	
85	13.08	17.34	36	16	18	2		6	6		2	5	4	5	2	5	10	16	5'-0"	9	18	2.000	3.375	1.125	B2	
CB42-48	65	18.32	23.05	16	12	4						2	5	4	5	2	5	10	16	5'-0"	9	18	0.375	0.625	0.250	B2
	70	18.22	22.95	20	14	6		4				2	5	4	5	2	5	10	16	5'-0"	9	18	0.625	1.000	0.250	B2
	75	18.09	22.82	22	14	8		4				2	5	4	5	2	5	10	16	5'-0"	9	18	0.750	1.250	0.375	B2
	80	17.82	22.55	28	14	14		4	4			2	5	4	5	2	5	10	16	5'-0"	9	18	1.125	1.875	0.500	B2
	85	17.82	22.55	32	16	16		6	6			2	5	4	5	4	5	10	16	5'-0"	9	18	1.375	2.375	0.625	B2
	90	17.76	22.49	34	16	18		4	4	4		2	5	4	5	4	5	10	16	5'-0"	9	18	1.625	2.750	0.750	B2
95	17.60	22.33	36	16	18	2		4	4	6	2	5	4	5	4	5	10	16	5'-0"	9	18	1.750	3.000	1.000	B2	



TYPICAL STRAND LOCATION & STIRRUP SPACING

STRANDS SHALL BE PLACED AS SHOWN AND SHALL BE DISTRIBUTED SYMMETRICALLY OVER THE BEAM WIDTH. STRAND PATTERN AND THE DEBONDED LENGTHS SHALL BE SYMMETRICAL ABOUT VERTICAL ζ OF BEAM. DEBONDED STRANDS SHALL FOLLOW THE RESTRICTIONS IN BDM SECTION 308.2.3.3.a. LENGTH OF STRANDS TO BE DEBONDED IS MEASURED FROM ENDS OF BEAM. TWO BOTTOM REINFORCING BARS (#5, FULL LENGTH OF BEAM) SHALL BE LOCATED AS SHOWN. A LAP OF 3'-3" FOR BOTTOM BARS SHOULD BE PROVIDED WITHIN THE OUTER QUARTER OF THE SPAN, IF NEEDED. FOUR TOP REINFORCING BARS (#5, FULL LENGTH OF BEAM) SHALL BE LOCATED AT THE STIRRUP CORNERS AS SHOWN. A LAP OF 3'-8" FOR TOP BARS SHOULD BE PROVIDED WITHIN THE MIDDLE HALF OF THE SPAN, IF NEEDED. ADDITIONAL TOP REINFORCING BARS AT ENDS OF BEAM, WHERE REQUIRED, SHALL BE PLACED SYMMETRICALLY OVER THE BEAM WIDTH AND SHALL BE PLACED MIDWAY BETWEEN FULL LENGTH BARS.



PARTIAL ELEVATION AT BEAM END

LEGEND

* - MEASURED FROM END OF BEAM.

‡ - SEE STANDARD DRAWING PSBD-1-25 AND NOTE 8 OF THIS SHEET FOR BEARING PAD DETAILS.

LOAD RATING FOR COMPOSITE BEAMS

BOX	SPAN c/c BRG. (FT)	24' WIDTH (6 BEAMS)															
		VEHICLE															
		INV. (HL-93)	OP. (HL-93)	EV2	EV3	S-2F1	S-3F1	S-5C1	S-PL60T	S-PL65T	SU4	SU5	SU6	SU7	Type 3	Type 3-3	Type 3S2
CB17-48	20	1.93	2.50	3.17	2.47	4.66	3.55	3.72	3.50	3.28	3.28	3.10	3.10	3.10	3.72	4.52	3.99
	25	1.75	2.26	2.66	2.22	4.20	3.07	3.18	3.05	2.82	2.87	2.72	2.75	2.75	3.34	4.16	3.45
	30	1.60	2.08	2.35	1.95	3.87	2.76	2.84	2.74	2.48	2.53	2.41	2.45	2.45	2.89	3.52	3.10
	35	1.34	1.74	2.05	1.69	3.52	2.45	2.50	2.42	2.16	2.20	2.04	2.04	2.04	2.47	2.95	2.76
	40	1.39	1.80	2.13	1.75	3.66	2.54	2.59	2.49	2.22	2.28	2.11	2.10	2.13	2.56	3.05	2.86
CB21-48	45	1.29	1.67	2.03	1.67	3.54	2.44	2.49	2.28	2.02	2.17	1.99	1.96	1.94	2.43	2.84	2.67
	30	2.05	2.65	3.00	2.49	4.93	3.52	3.62	3.50	3.16	3.23	3.07	3.12	3.12	3.69	4.50	3.96
	35	1.83	2.37	2.79	2.30	4.74	3.33	3.40	3.29	2.93	2.99	2.77	2.77	2.77	3.36	4.01	3.75
	40	1.43	1.85	2.25	1.85	3.92	2.71	2.75	2.64	2.35	2.41	2.21	2.16	2.15	2.69	3.15	2.95
	45	1.31	1.70	2.12	1.74	3.75	2.57	2.61	2.39	1.98	2.27	2.07	2.00	1.96	2.53	2.80	2.64
CB27-48	50	1.19	1.54	1.97	1.61	3.52	2.40	2.43	2.21	1.71	2.11	1.91	1.83	1.77	2.34	2.43	2.30
	55	1.11	1.44	1.88	1.54	3.38	2.29	2.27	2.08	1.53	2.01	1.81	1.72	1.65	2.22	2.21	2.08
	60	1.10	1.43	1.89	1.54	3.41	2.31	2.21	2.01	1.49	2.02	1.82	1.72	1.64	2.23	2.17	2.05
	40	2.20	2.85	3.47	2.85	6.05	4.17	4.24	4.08	3.63	3.71	3.41	3.34	3.32	4.15	4.86	4.55
	45	1.79	2.32	2.90	2.38	5.12	3.51	3.56	3.26	2.71	3.11	2.83	2.74	2.68	3.45	3.83	3.61
CB33-48	50	1.67	2.16	2.76	2.26	4.92	3.35	3.39	3.09	2.40	2.95	2.67	2.56	2.48	3.27	3.42	3.23
	55	1.52	1.97	2.57	2.10	4.63	3.14	3.11	2.84	2.09	2.75	2.48	2.35	2.25	3.04	3.02	2.85
	60	1.64	2.41	3.12	2.55	5.58	3.79	3.74	3.14	2.52	3.33	3.01	2.87	2.75	3.69	3.69	3.49
	65	1.55	2.05	2.77	2.26	5.02	3.38	3.03	2.54	2.07	2.96	2.65	2.49	2.35	3.25	3.00	2.89
	70	1.30	1.68	2.31	1.88	4.21	2.83	2.43	2.04	1.68	2.47	2.21	2.07	1.95	2.72	2.41	2.36
CB42-48	50	1.88	2.75	3.51	2.87	6.08	4.11	4.22	3.71	3.05	3.66	3.38	3.04	2.81	4.16	4.35	4.11
	55	1.64	2.58	3.40	2.75	5.91	3.98	4.07	3.61	2.79	3.52	3.23	2.90	2.68	4.01	4.02	3.80
	60	1.48	2.45	3.26	2.66	5.82	3.91	3.75	3.15	2.54	3.44	3.13	2.82	2.60	3.84	3.71	3.51
	65	1.58	2.62	3.70	2.92	6.38	4.27	4.30	3.61	2.94	3.76	3.42	3.06	2.81	4.24	4.26	4.03
	70	1.62	2.52	3.46	2.82	6.30	4.24	3.64	3.05	2.51	3.69	3.31	3.09	2.91	4.06	3.61	3.53
CB42-48	75	1.56	2.07	2.90	2.36	5.30	3.55	2.94	2.45	2.05	3.09	2.76	2.57	2.41	3.39	2.92	2.90
	80	1.45	1.94	2.75	2.24	5.05	3.38	2.72	2.24	1.90	2.94	2.62	2.43	2.27	3.22	2.70	2.70
	85	1.40	1.82	2.62	2.13	4.81	3.22	2.53	2.06	1.78	2.79	2.48	2.30	2.15	3.06	2.51	2.53
	65	1.45	2.40	3.39	2.67	5.84	3.91	3.98	3.30	2.73	3.43	3.12	2.80	2.57	3.88	3.93	3.69
	70	1.62	2.70	3.87	3.06	6.74	4.50	4.41	3.81	3.01	3.95	3.58	3.20	2.93	4.44	4.32	4.09
CB42-48	75	1.47	2.57	3.76	2.97	6.58	4.39	4.13	3.57	2.82	3.84	3.47	3.11	2.84	4.31	4.02	3.87
	80	1.66	2.73	3.87	3.15	7.11	4.76	3.83	3.15	2.68	4.14	3.69	3.42	3.20	4.54	3.81	3.81
	85	1.70	2.52	3.63	2.95	6.67	4.46	3.50	2.86	2.46	3.87	3.44	3.19	2.97	4.24	3.48	3.51
	90	1.51	2.42	3.54	2.88	6.53	4.36	3.35	2.71	2.36	3.78	3.36	3.10	2.88	4.13	3.33	3.39
	95	1.50	2.32	3.44	2.79	6.35	4.24	3.20	2.57	2.27	3.67	3.26	3.00	2.79	4.01	3.18	3.25

BOX	SPAN c/c BRG. (FT)	32' WIDTH (8 BEAMS)															
		VEHICLE															
		INV. (HL-93)	OP. (HL-93)	EV2	EV3	S-2F1	S-3F1	S-5C1	S-PL60T	S-PL65T	SU4	SU5	SU6	SU7	Type 3	Type 3-3	Type 3S2
CB17-48	20	1.93	2.50	3.17	2.47	4.67	3.55	3.73	3.51	3.28	3.28	3.10	3.10	3.10	3.73	4.52	3.99
	25	1.75	2.26	2.66	2.23	4.20	3.07	3.18	3.05	2.82	2.87	2.72	2.75	2.75	3.34	4.17	3.45
	30	1.60	2.08	2.35	1.95	3.87	2.76	2.84	2.74	2.48	2.53	2.41	2.45	2.45	2.90	3.53	3.11
	35	1.35	1.74	2.05	1.69	3.53	2.46	2.51	2.42	2.16	2.20	2.04	2.04	2.04	2.48	2.95	2.76
	40	1.39	1.80	2.13	1.75	3.66	2.55	2.60	2.50	2.22	2.28	2.11	2.10	2.13	2.56	3.05	2.86
	45	1.29	1.67	2.03	1.67	3.55	2.45	2.49	2.28	2.03	2.18	2.00	1.96	1.95	2.43	2.85	2.67
CB21-48	30	2.05	2.65	3.00	2.49	4.94	3.53	3.63	3.50	3.17	3.23	3.07	3.13	3.13	3.70	4.50	3.96
	35	1.83	2.37	2.79	2.30	4.74	3.34	3.41	3.29	2.94	2.99	2.77	2.77	2.77	3.37	4.01	3.75
	40	1.43	1.85	2.25	1.85	3.93	2.71	2.76	2.65	2.35	2.41	2.21	2.17	2.16	2.69	3.15	2.95
	45	1.31	1.70	2.12	1.74	3.75	2.57	2.61	2.39	1.99	2.27	2.07	2.00	1.96	2.53	2.81	2.65
	50	1.19	1.55	1.98	1.62	3.53	2.41	2.44	2.22	1.71	2.12	1.92	1.83	1.77	2.35	2.44	2.31
	55	1.10	1.43	1.87	1.53	3.37	2.28	2.26	2.07	1.52	2.00	1.81	1.71	1.64	2.21	2.20	2.08
CB27-48	60	1.10	1.43	1.89	1.55	3.42	2.31	2.21	1.86	1.49	2.02	1.82	1.72	1.64	2.23	2.17	2.06
	40	2.20	2.85	3.47	2.85	6.05	4.18	4.25	4.08	3.63	3.72	3.41	3.34	3.32	4.15	4.86	4.56
	45	1.80	2.33	2.90	2.38	5.13	3.51	3.57	3.27	2.71	3.11	2.83	2.74	2.68	3.46	3.84	3.62
	50	1.67	2.16	2.76	2.26	4.92	3.35	3.40	3.10	2.40	2.96	2.68	2.56	2.48	3.28	3.43	3.24
	55	1.52	1.97	2.58	2.11	4.63	3.14	3.11	2.85	2.09	2.76	2.48	2.36	2.25	3.04	3.02	2.86
	60	1.74	2.41	3.12	2.55	5.59	3.80	3.74	3.14	2.53	3.34	3.01	2.87	2.76	3.69	3.70	3.50
CB33-48	65	1.58	2.05	2.77	2.26	5.03	3.39	3.04	2.55	2.08	2.96	2.65	2.49	2.36	3.26	3.01	2.90
	70	1.30	1.69	2.32	1.89	4.22	2.84	2.44	2.04	1.68	2.48	2.21	2.07	1.95	2.72	2.42	2.37
	50	2.00	2.93	3.90	3.05	6.46	4.37	4.48	3.94	3.50	3.88	3.59	3.23	2.99	4.46	5.33	4.88
	55	1.74	2.61	3.40	2.78	6.10	4.14	4.14	3.78	2.79	3.64	3.28	3.08	2.84	4.02	4.02	3.80
	60	1.58	2.45	3.26	2.66	5.89	3.98	3.76	3.15	2.54	3.49	3.13	2.96	2.76	3.84	3.72	3.51
	65	1.69	2.79	3.84	3.10	6.78	4.54	4.31	3.62	2.95	3.99	3.63	3.25	2.99	4.51	4.27	4.11
CB42-48	70	1.72	2.52	3.46	2.82	6.31	4.24	3.64	3.05	2.51	3.70	3.31	3.09	2.91	4.07	3.61	3.54
	75	1.60	2.08	2.90	2.36	5.31	3.56	2.95	2.45	2.05	3.10	2.77	2.58	2.42	3.40	2.93	2.90
	80	1.50	1.94	2.76	2.24	5.06	3.39	2.73	2.24	1.91	2.94	2.62	2.44	2.28	3.23	2.71	2.71
	85	1.41	1.82	2.62	2.13	4.82	3.23	2.53	2.06	1.78	2.80	2.49	2.31	2.15	3.07	2.52	2.54
	65	1.55	2.55	3.60	2.84	6.20	4.15	4.23	3.51	2.91	3.65	3.32	2.98	2.73	4.12	4.18	3.92
	70	1.72	2.87	4.12	3.25	7.16	4.78	4.69	3.94	3.20	4.19	3.80	3.41	3.12	4.72	4.60	4.35
CB42-48	75	1.53	2.74	3.99	3.16	7.00	4.67	4.29	3.58	2.97	4.08	3.69	3.30	3.02	4.58	4.26	4.11
	80	1.77	2.74	3.88	3.16	7.12	4.77	3.84	3.16	2.69	4.14	3.69	3.43	3.21	4.54	3.81	3.82
	85	1.82	2.52	3.63	2.95	6.68	4.47	3.51	2.86	2.47	3.88	3.45	3.20	2.98	4.25	3.49	3.52
	90	1.62	2.43	3.54	2.88	6.54	4.36	3.35	2.71	2.37	3.78	3.36	3.11	2.89	4.14	3.33	3.39
	95	1.60	2.33	3.44	2.80	6.37	4.25	3.20	2.57	2.27	3.68	3.26	3.01	2.79	4.02	3.19	3.26

DESIGN NOTES

1. THIS DRAWING PROVIDES INFORMATION FOR THE DESIGNER AND IS NOT INTENDED FOR USE AS A STANDARD DRAWING. REFERENCE SHALL BE MADE TO STANDARD DRAWING PSBD-1-25 FOR DETAILS OF BEAMS.
2. DESIGN SPECIFICATIONS: "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 10TH EDITION, 2024" AND THE LATEST EDITION OF THE ODOT BRIDGE DESIGN MANUAL.
3. DESIGN DATA:

SKEW - THE DESIGN DATA ARE APPLICABLE TO STRUCTURES WITH SKEW ANGLES OF 30° OR LESS.

LIVE LOADING - HL-93

LIVE LOAD - THE APPROXIMATE METHODS OF ANALYSIS GIVEN IN AASHTO LRFD ARTICLE 4.6.2.2 HAVE BEEN USED. THE APPLICABLE CROSS SECTION ON TABLE 4.6.2.2.1-1 IS "g". THE DESIGNS ARE FOR BRIDGES WITHOUT TRANSVERSE POST-TENSIONING (i.e. BEAMS ARE CONNECTED ONLY ENOUGH TO PREVENT RELATIVE VERTICAL DISPLACEMENT AT THE INTERFACE). ALL DESIGNS SHOWN HEREIN ARE BASED EXTERIOR BEAMS (HIGHER DISTRIBUTION FACTORS). THESE DESIGNS MAY ALSO BE USED FOR INTERIOR BEAMS (LOWER DISTRIBUTION FACTORS).

SUPERIMPOSED DEAD LOADS
ASPHALT OVERLAY= 3½" THICK (AVG.)
RAILING WEIGHT = 0.10 KLF PER RAIL
FWS = 0.060 KSF

DEAD LOAD - INTERMEDIATE DIAPHRAGM WEIGHT IS BASED ON 3'-0" LONG DIAPHRAGMS AND NUMBER OF DIAPHRAGMS SHOWN ON STANDARD DRAWING PSBD-1-25.

CONCRETE - MIN. COMPRESSIVE STRENGTH AT 28 DAYS: $f'c = 7$ KSI
MIN. COMPRESSIVE STRENGTH AT TIME OF INITIAL PRESTRESS: $f'ci = 5$ KSI

REINFORCING STEEL- GRADE 60
MINIMUM YIELD STRENGTH = 60 KSI

PRESTRESSING STEEL- ASTM A416 LOW RELAXATION STRANDS
½" DIAMETER
 $A_{ps} = 0.167$ SQ. IN. PER STRAND
 $f_{pu} = 270$ KSI
 $E_p = 28,500$ KSI
RELATIVE HUMIDITY, $H = 70\%$

INITIAL STRESS $0.75 f_{pu} = 202.5$ KSI
INITIAL TENSION LOAD = 33.82 KIPS/STRAND

A SEVERE CORROSIVE ENVIRONMENT WAS ASSUMED IN DETERMINING THE TENSILE STRESS LIMITS AFTER LOSSES (AASHTO LRFD ARTICLE 5.9.2.3.2).

LOAD MODIFIERS FOR DUCTILITY, REDUNDANCY, AND OPERATIONAL IMPORTANCE WERE TAKEN AS 1.0 (AASHTO LRFD ARTICLE 1.3).

STRAND AREAS WERE NOT TRANSFORMED IN SECTION PROPERTY CALCULATIONS.

MILD REINFORCING BARS WERE NOT CONSIDERED IN DETERMINING THE STRENGTH OF THE SECTIONS.

ALL DESIGNS MEET THE CRITERIA FOR DEFLECTION GIVEN IN AASHTO LRFD ARTICLE 2.5.2.6.2 AND THE CRITERIA FOR SPAN-TO-DEPTH RATIOS GIVEN IN AASHTO LRFD ARTICLE 2.5.2.6.3.

4. PRESTRESS LOSSES HAVE BEEN COMPUTED IN ACCORDANCE WITH AASHTO LRFD EQUATIONS 5.9.3.1-1, 5.9.3.2.3a-1, AND 5.9.3.4-1 (REFINED ESTIMATE OF TIME-DEPENDENT LOSSES), USING VALUES TAKEN FROM THE ODOT BDM SECTION 1005.10.

5. CAMBER DATA GIVEN IS THE CALCULATED CAMBER AT TIME OF RELEASE (D_0), AND CAMBER AT TIME OF ERECTION (D_{30}). Δ = CALCULATED DEFLECTION AT MIDSPAN DUE TO REMAINING DEAD LOAD (RAILINGS, DIAPHRAGMS, AND ASPHALT OVERLAY). PROVIDE THESE VALUES FOR CAMBER AT RELEASE, CAMBER AT ERECTION, AND DEFLECTION IN THE PLANS.

6. ROADWAY WIDTH: THE BEAMS ON THIS SHEET ARE DESIGNED FOR THE FOLLOWING ROADWAY WIDTHS, MEASURED BETWEEN FACE OF BRIDGE RAILS:

24 FT. $\leq$ WIDTH $\leq$ 32 FT.

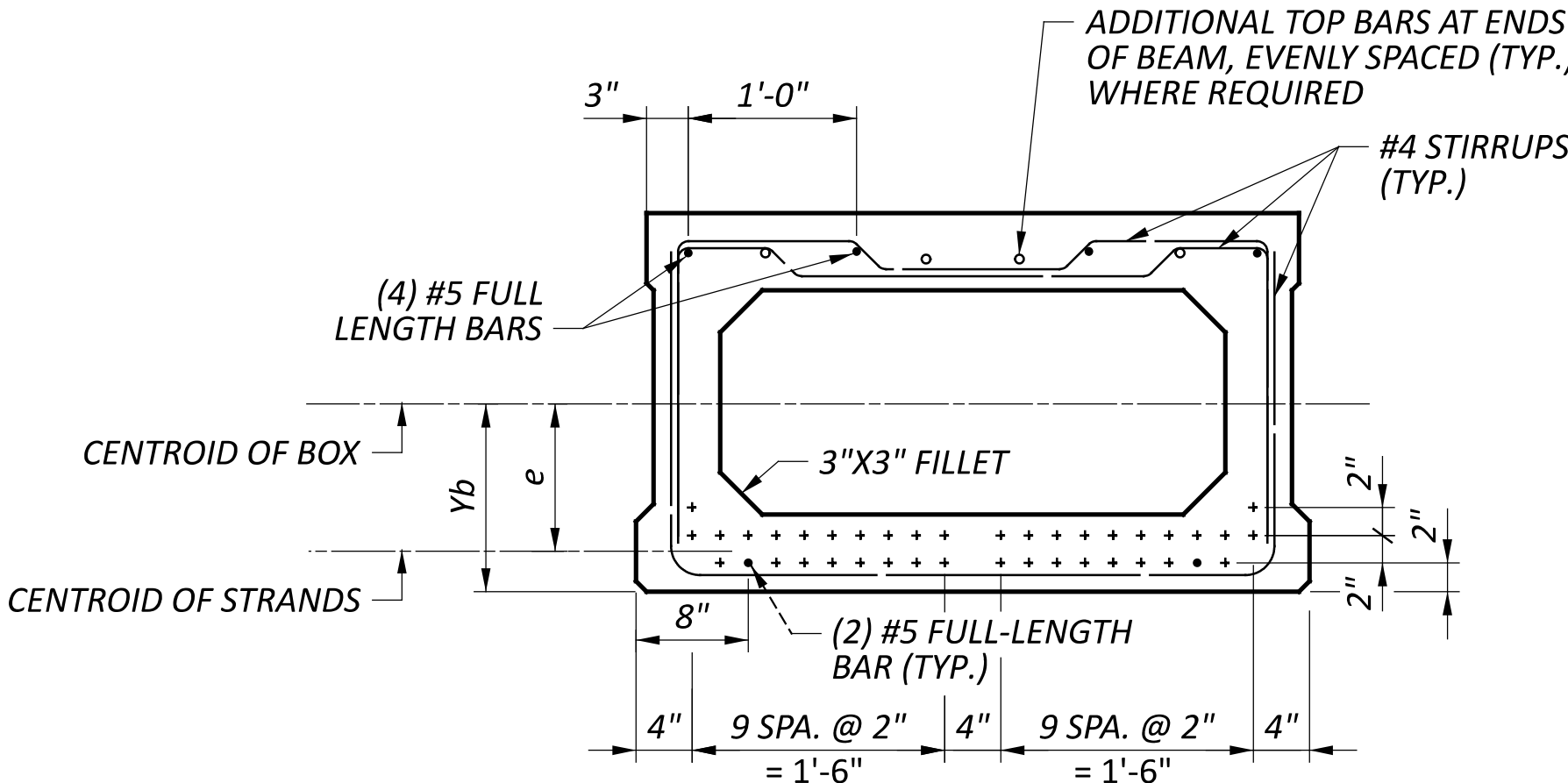
THESE DESIGNS SHALL NOT BE USED FOR ROADWAY WIDTHS LESS THAN 24 FT. OR GREATER THAN 32 FT. SPECIAL DESIGN IS REQUIRED FOR ROADWAY WIDTHS LESS THAN 24 FT. OR GREATER THAN 32 FT.

7. INTERPOLATION: FOR BEAM SPANS NOT SPECIFICALLY LISTED IN THE DESIGN DATA TABLE, THE DESIGN DATA MAY BE OBTAINED FROM THE TABLE BY USING STRAIGHT LINE INTERPOLATION BETWEEN GIVEN VALUES. HOWEVER, THE NUMBER OF STRANDS USED SHALL ALWAYS BE ROUNDED UP TO THE NEAREST EVEN NUMBER. DO NOT EXTRAPOLATE BEYOND THE GIVEN DATA.

8. STEEL-REINFORCED ELASTOMERIC BEARING PADS: BEARING TYPES WERE DETERMINED FOR EACH BEARING ASSUMING A SINGLE SPAN CONFIGURATION. IF THE MAXIMUM GRADE AT THE BEARING LOCATION EXCEEDS 2%, SEE STANDARD DRAWING BD-1-11.

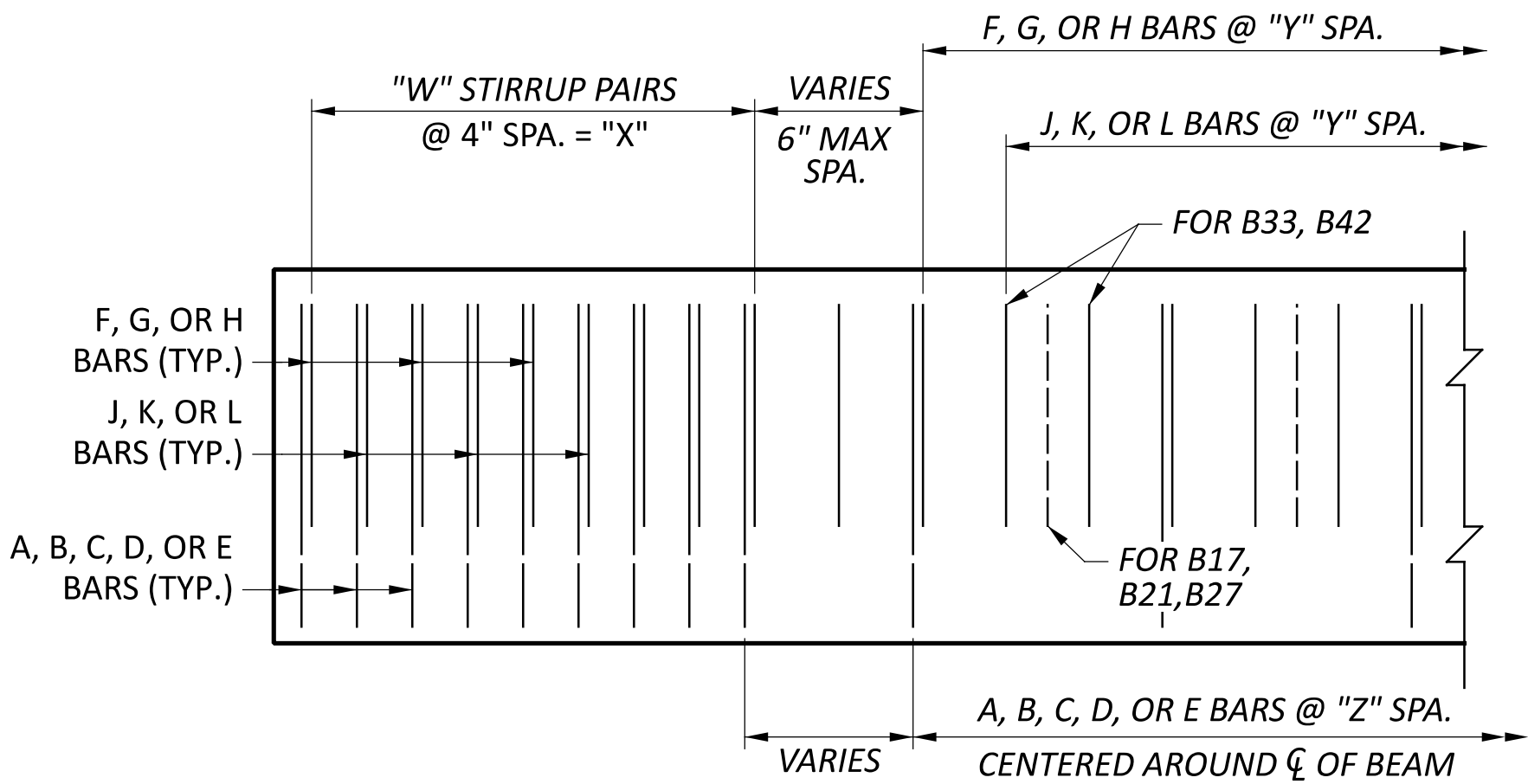
THE FOLLOWING ADDITIONAL DEAD LOADS, SEMI-INTEGRAL WITH FWS, WERE ASSUMED FOR EACH BEARING PAD:
B17-48, 5.70 KIPS
B21-48, 5.85 KIPS
B27-48, 6.08 KIPS
B33-48, 6.30 KIPS
B42-48, 6.64 KIPS

DESIGN DATA (NON-COMPOSITE)																								
BOX	SPAN c/c BRG. (FT)	MIDSPAN e (IN)	NO. OF STRANDS	STRAND LOC. DIST. FROM BOTTOM			NUMBER AND LENGTH OF STRANDS DEBONDED		TENSILE BARS AT BOTTOM		TENSILE BARS AT TOP						STIRRUP LAYOUT				CAMBER/DEFLECTION DATA (IN)			BEARING PADS
				2"	4"	6"	2'-6"	5'-0"	NO.	SIZE	FULL LENGTH		ADDITIONAL BARS EACH END								D0	D30	Δ	BEARING TYPE ±
											NO.	SIZE	NO.	SIZE	LENGTH*	"W"	"X"	"Y" (in)	"Z" (in)					
B17-48	20	6.45	12	12					2	5	4	5					9	2'-8"	10	10	0.250	0.375	0.000	B1
	25	6.45	14	14					2	5	4	5					9	2'-8"	10	10	0.375	0.625	0.000	B1
	30	5.85	20	14	6				2	5	4	5					16	5'-0"	10	10	0.625	1.000	0.000	B1
	35	6.05	20	16	4				2	5	4	5					16	5'-0"	10	10	0.750	1.250	0.125	B1
B21-48	30	7.62	16	12	4				2	5	4	5					9	2'-8"	12	12	0.375	0.625	0.000	B1
	35	7.98	18	14	4				2	5	4	5					9	2'-8"	12	12	0.625	1.000	0.125	B1
	40	7.98	18	14	4				2	5	4	5					9	2'-8"	12	12	0.625	1.000	0.125	B1
	45	7.82	22	14	8		4		2	5	4	5					16	5'-0"	12	12	0.875	1.500	0.125	B1
	50	7.87	22	16	6		4		2	5	4	5					16	5'-0"	12	12	1.000	1.750	0.250	B2
B27-48	40	10.49	14	10	4				2	5	4	5					9	2'-8"	12	12	0.500	0.875	0.000	B1
	45	10.88	16	12	4				2	5	4	5					9	2'-8"	12	12	0.500	0.875	0.125	B1
	50	10.71	18	12	6				2	5	4	5					9	2'-8"	12	12	0.625	1.000	0.125	B1
	55	10.78	20	14	6		2		2	5	4	5					16	5'-0"	12	12	0.625	1.000	0.250	B2
	60	10.71	24	16	8		4		2	5	4	5					16	5'-0"	12	12	1.125	1.875	0.375	B2
	65	10.45	30	16	14		6		2	5	4	5	2	5	10	16	5'-0"	12	12	1.500	2.500	0.500	B2	
B33-48	50	13.73	14	10	4				2	5	4	5					9	2'-8"	12	18	0.375	0.625	0.125	B1
	55	13.55	16	10	6				2	5	4	5					16	5'-0"	12	18	0.500	0.875	0.125	B2
	60	13.39	22	12	10		4		2	5	4	5					16	5'-0"	12	18	0.750	1.250	0.250	B2
	65	13.57	22	14	8		4		2	5	4	5	2	5	10	16	5'-0"	12	18	0.875	1.500	0.250	B2	
	70	13.53	26	16	10		4	2	2	5	4	5	2	5	10	16	5'-0"	12	18	1.125	1.875	0.375	B2	
	75	13.37	30	16	14		4	2	2	5	4	5	2	5	10	16	5'-0"	12	18	1.500	2.500	0.500	B2	
	80	13.24	34	16	18		4	4	2	5	4	5	2	5	10	16	5'-0"	12	18	1.875	3.125	0.625	B2	
B42-48	65	18.15	18	12	6				2	5	4	5	2	5	10	16	5'-0"	12	18	0.500	0.875	0.125	B2	
	70	18.22	20	14	6		2	2	2	5	4	5	2	5	10	16	5'-0"	12	18	0.625	1.000	0.250	B2	
	75	18.09	22	14	8		2	2	2	5	4	5	2	5	10	16	5'-0"	12	18	0.750	1.250	0.250	B2	
	80	17.90	26	14	12		4	2	2	5	4	5	2	5	10	16	5'-0"	12	18	1.000	1.750	0.375	B2	
	90	17.76	34	16	18		6	4	2	5	4	5	4	5	10	16	5'-0"	12	18	1.625	2.750	0.625	B2	



TYPICAL STRAND LOCATION & STIRRUP SPACING

STRANDS SHALL BE PLACED AS SHOWN AND SHALL BE DISTRIBUTED SYMMETRICALLY OVER THE BEAM WIDTH. STRAND PATTERN AND THE DEBONDED LENGTHS SHALL BE SYMMETRICAL ABOUT VERTICAL $\bar{C}$ OF BEAM. DEBONDED STRANDS SHALL FOLLOW THE RESTRICTIONS IN BDM SECTION 308.2.3.3.a. LENGTH OF STRANDS TO BE DEBONDED IS MEASURED FROM ENDS OF BEAM. TWO BOTTOM REINFORCING BARS (#5, FULL LENGTH OF BEAM) SHALL BE LOCATED AS SHOWN. A LAP OF 3'-3" FOR BOTTOM BARS SHOULD BE PROVIDED WITHIN THE OUTER QUARTER OF THE SPAN, IF NEEDED. FOUR TOP REINFORCING BARS (#5, FULL LENGTH OF BEAM) SHALL BE LOCATED AT THE STIRRUP CORNERS AS SHOWN. A LAP OF 3'-8" FOR TOP BARS SHOULD BE PROVIDED WITHIN THE MIDDLE HALF OF THE SPAN, IF NEEDED. ADDITIONAL TOP REINFORCING BARS AT ENDS OF BEAM, WHERE REQUIRED, SHALL BE PLACED SYMMETRICALLY OVER THE BEAM WIDTH AND SHALL BE PLACED MIDWAY BETWEEN FULL LENGTH BARS.



PARTIAL ELEVATION AT BEAM END

LEGEND

* - LENGTH MEASURED FROM END OF BEAM

‡ - SEE STANDARD DRAWING PSBD-1-25 AND NOTE 8 OF THIS SHEET FOR BEARING PAD DETAILS.

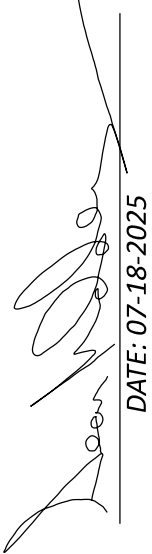
LOAD RATING FOR NON-COMPOSITE BEAMS

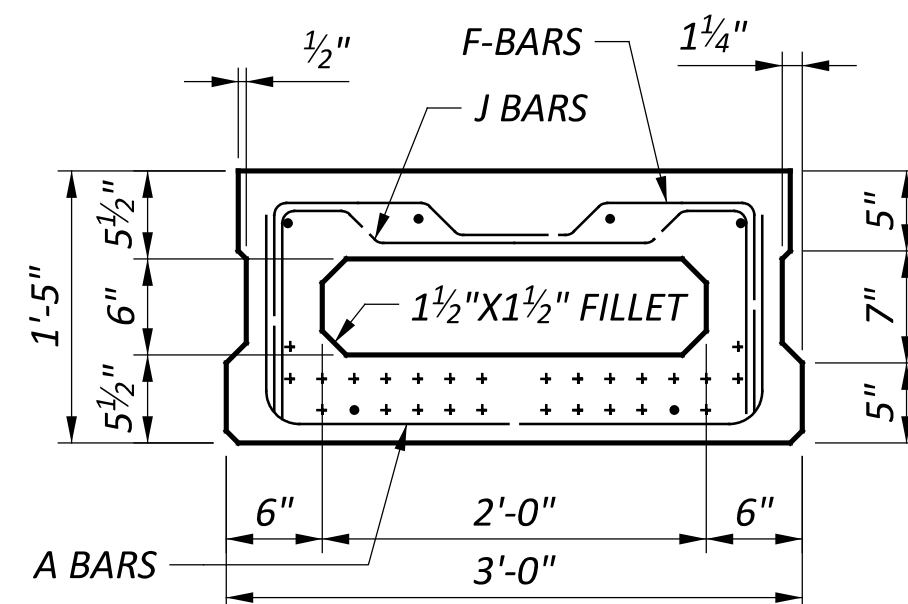
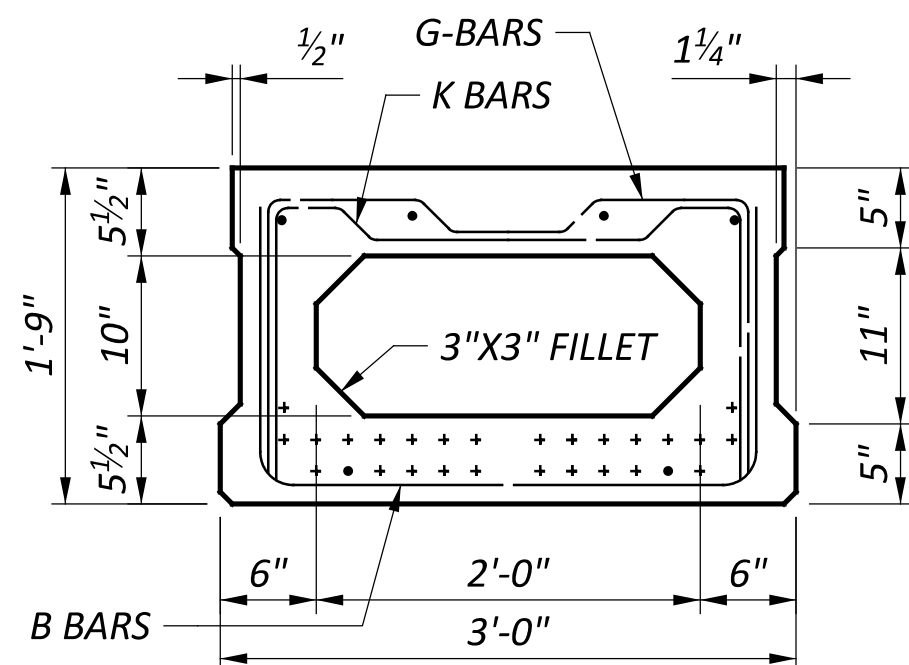
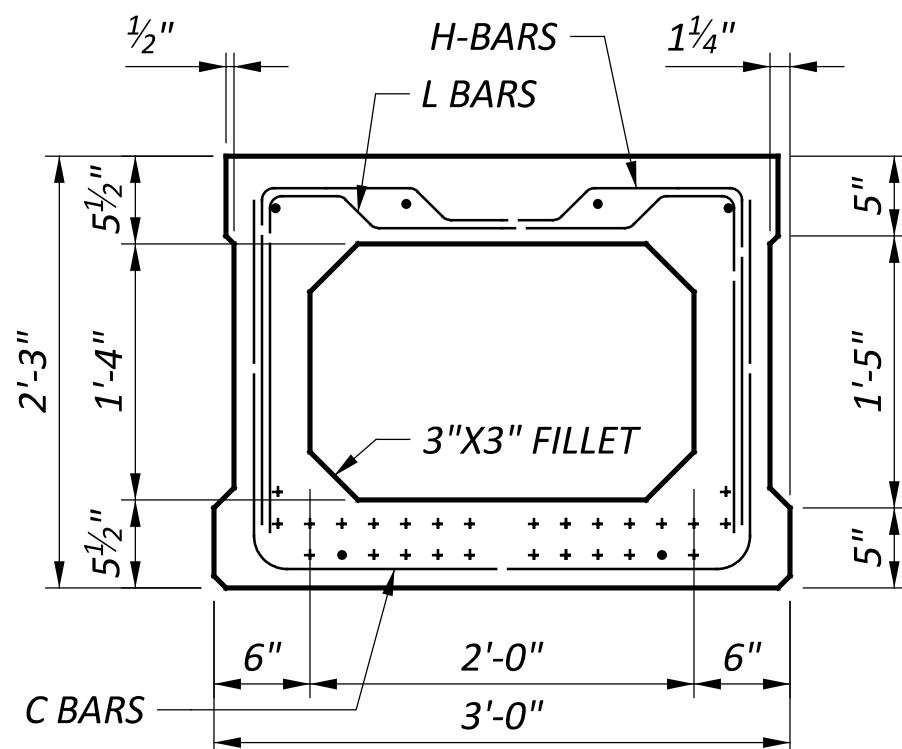
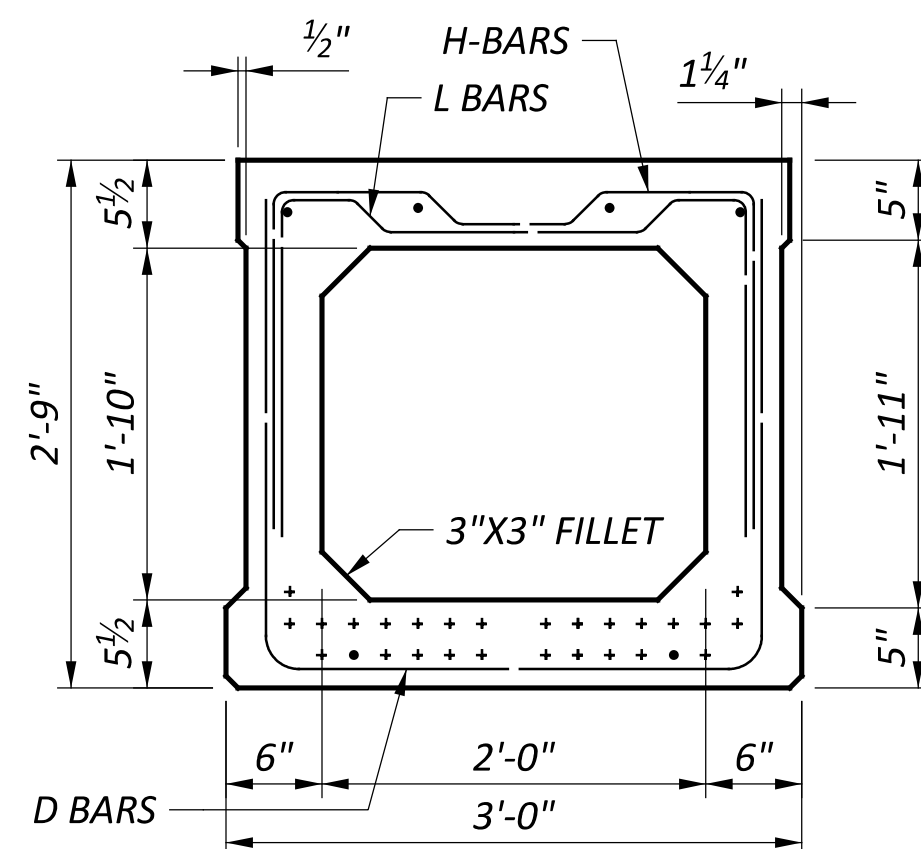
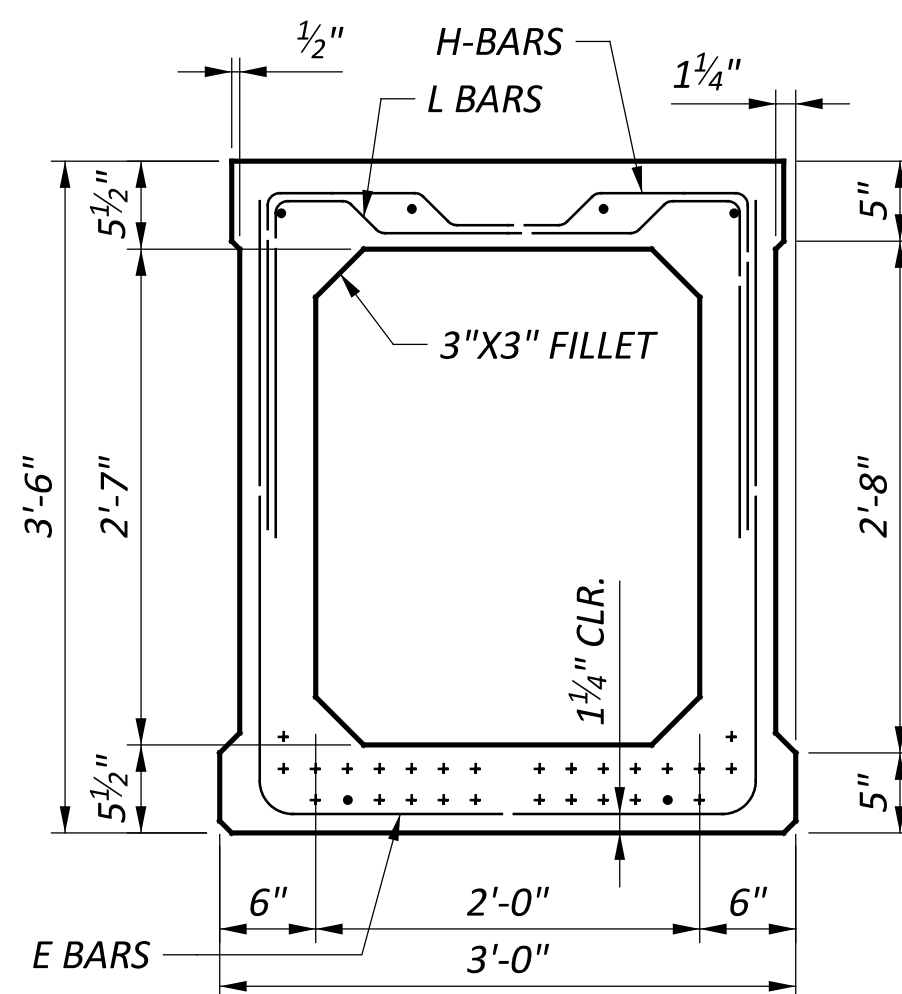
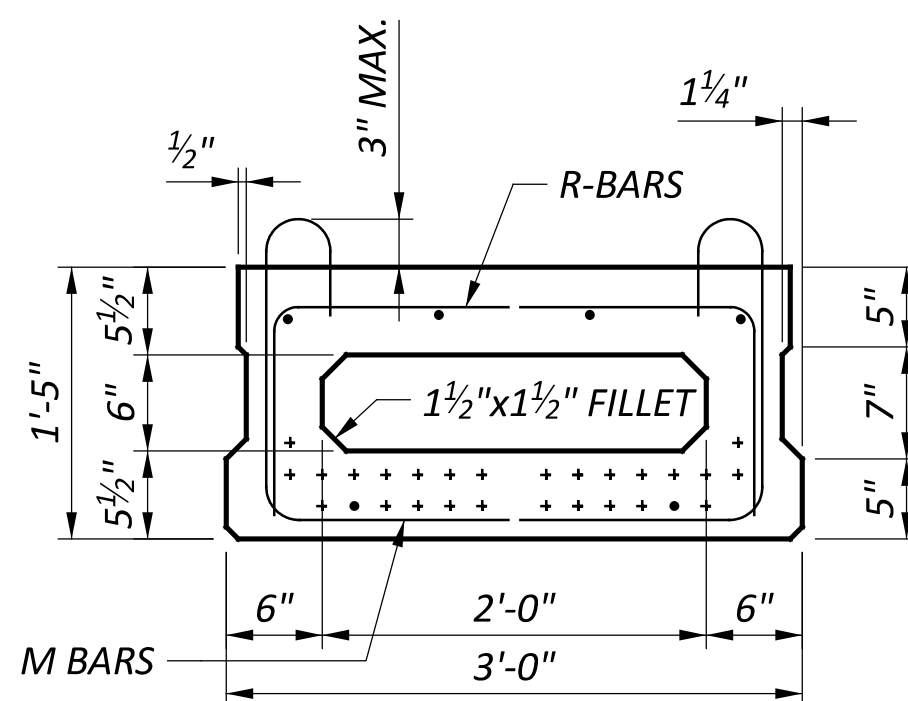
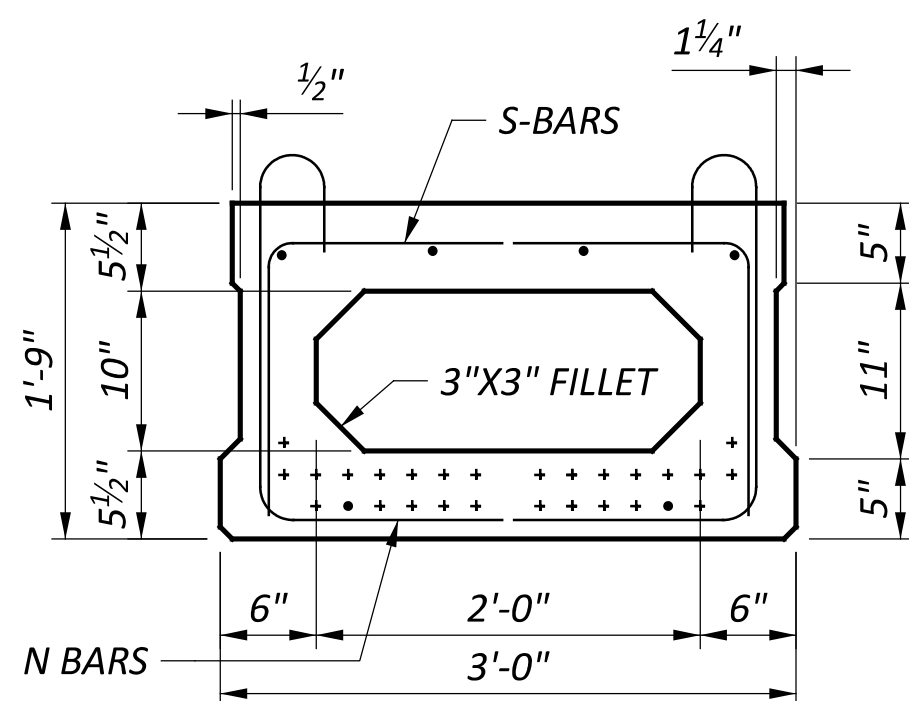
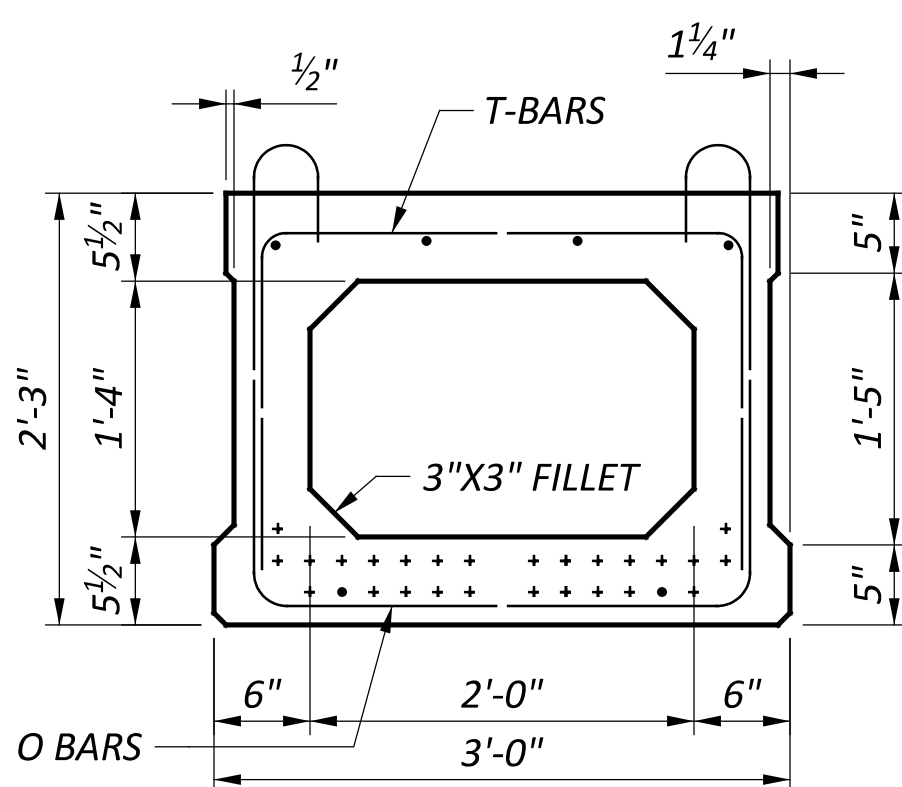
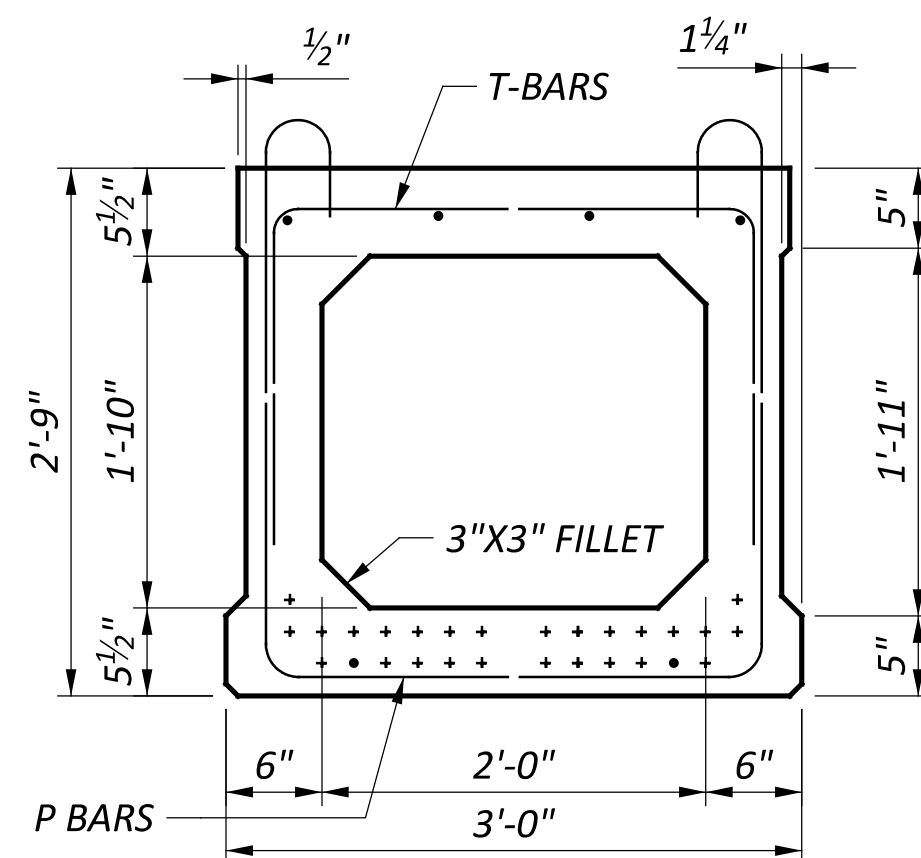
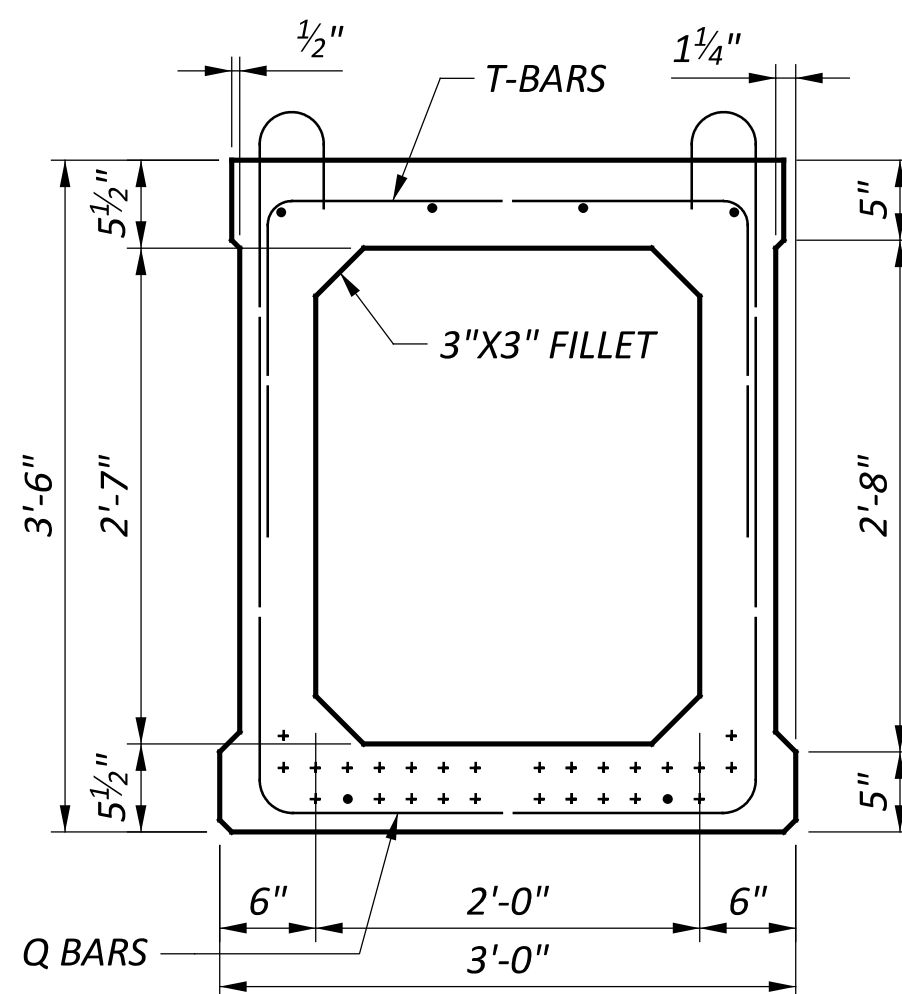
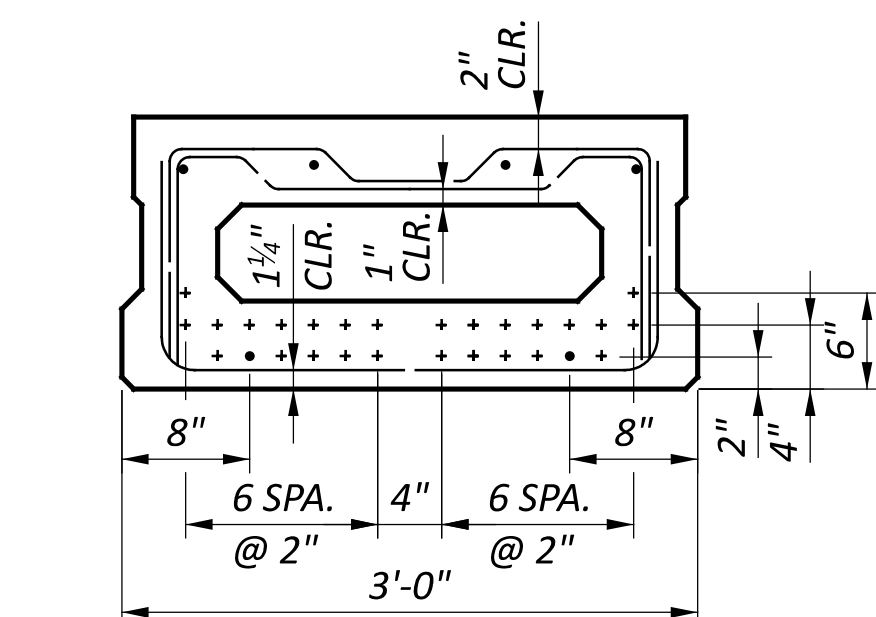
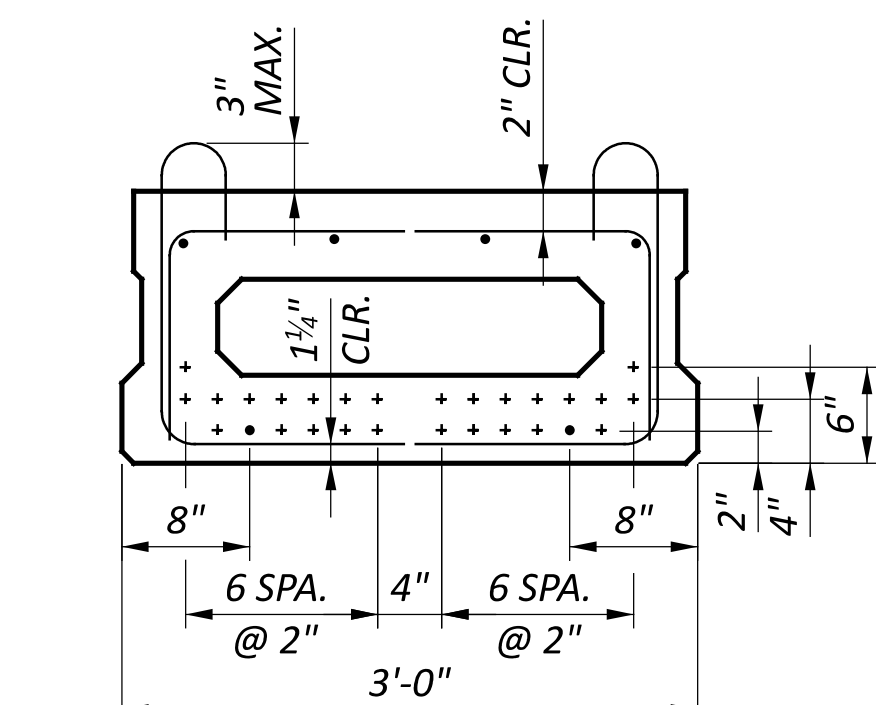
		24' WIDTH (6 BEAMS)															
BOX	SPAN c/c BRG. (FT)	VEHICLE															
		INV. (HL-93)	OP. (HL-93)	EV2	EV3	S-2F1	S-3F1	S-5C1	S-PL60T	S-PL65T	SU4	SU5	SU6	SU7	TYPE 3	TYPE 3-3	TYPE 3S2
B17-48	20	1.56	2.02	2.56	2.00	3.78	2.87	3.01	3.23	3.02	2.66	2.51	2.51	2.51	3.01	3.66	3.23
	25	1.38	1.79	2.10	1.76	3.32	2.43	2.51	2.77	2.56	2.27	2.15	2.17	2.17	2.64	3.29	2.73
	30	1.18	1.53	1.73	1.44	2.85	2.04	2.09	2.34	2.12	1.86	1.77	1.80	1.80	2.13	2.60	2.29
	35	1.09	1.41	1.61	1.33	2.73	1.92	1.96	2.22	1.98	1.73	1.62	1.66	1.66	1.96	2.36	2.16
B21-48	30	1.58	2.05	2.32	1.93	3.82	2.73	2.81	3.14	2.84	2.50	2.38	2.42	2.42	2.86	3.48	3.07
	35	1.29	1.67	1.96	1.62	3.37	2.35	2.40	2.71	2.42	2.11	1.95	1.95	1.95	2.37	2.82	2.64
	40	1.12	1.45	1.76	1.44	3.06	2.11	2.15	2.43	2.16	1.88	1.73	1.69	1.68	2.10	2.46	2.31
	45	1.21	1.56	1.90	1.56	3.31	2.29	2.33	2.52	2.24	2.03	1.87	1.83	1.82	2.27	2.66	2.49
	50	1.13	1.47	1.83	1.50	3.22	2.21	2.24	2.43	2.04	1.96	1.78	1.73	1.69	2.18	2.43	2.29
B27-48	40	1.60	2.08	2.52	2.07	4.40	3.04	3.09	2.97	2.64	2.70	2.48	2.43	2.42	3.02	3.53	3.31
	45	1.50	1.95	2.43	1.99	4.29	2.94	2.98	2.73	2.27	2.60	2.37	2.29	2.24	2.89	3.21	3.03
	50	1.34	1.73	2.21	1.81	3.94	2.68	2.72	2.48	1.92	2.37	2.14	2.05	1.98	2.62	2.74	2.59
	55	1.38	2.06	2.62	2.15	4.66	3.18	3.23	2.92	2.30	2.81	2.54	2.34	2.16	3.11	3.29	3.11
	60	1.40	1.81	2.41	1.97	4.35	2.94	2.78	2.33	1.88	2.58	2.32	2.19	2.08	2.84	2.75	2.60
	65	1.16	1.50	2.03	1.65	3.68	2.48	2.22	1.86	1.52	2.16	1.94	1.82	1.72	2.38	2.20	2.12
B33-48	50	1.63	2.25	2.96	2.34	4.97	3.36	3.44	3.03	2.57	2.99	2.76	2.48	2.30	3.43	3.67	3.47
	55	1.45	2.12	2.88	2.26	4.86	3.27	3.34	2.97	2.57	2.89	2.66	2.39	2.20	3.30	3.68	3.41
	60	1.63	2.12	2.80	2.29	5.05	3.42	3.27	2.75	2.20	2.99	2.69	2.55	2.43	3.31	3.22	3.04
	65	1.43	2.16	2.89	2.36	5.23	3.53	3.27	2.75	2.22	3.09	2.78	2.58	2.36	3.41	3.23	3.08
	70	1.48	1.94	2.67	2.18	4.87	3.27	2.81	2.35	1.94	2.85	2.55	2.39	2.25	3.14	2.79	2.73
	75	1.34	1.73	2.42	1.97	4.43	2.97	2.46	2.04	1.71	2.59	2.31	2.15	2.02	2.84	2.44	2.42
	80	1.24	1.61	2.28	1.85	4.18	2.80	2.25	1.85	1.58	2.43	2.17	2.01	1.88	2.67	2.24	2.24
B42-48	65	1.64	2.43	3.43	2.71	5.92	3.96	4.03	3.35	2.77	3.48	3.17	2.84	2.60	3.93	3.99	3.74
	70	1.54	2.37	3.41	2.70	5.93	3.96	3.89	3.36	2.65	3.47	3.15	2.82	2.58	3.91	3.81	3.60
	75	1.43	2.29	3.35	2.65	5.86	3.91	3.59	2.99	2.50	3.42	3.09	2.77	2.53	3.83	3.56	3.45
	80	1.43	2.38	3.38	2.75	6.20	4.15	3.34	2.75	2.34	3.61	3.21	2.94	2.68	3.95	3.32	3.32
	85	1.51	2.24	3.22	2.62	5.92	3.96	3.11	2.53	2.19	3.43	3.06	2.83	2.64	3.76	3.09	3.12
	90	1.54	2.13	3.10	2.52	5.72	3.82	2.94	2.38	2.07	3.31	2.94	2.72	2.53	3.63	2.92	2.97

		32' WIDTH (8 BEAMS)															
BOX	SPAN c/c BRG. (FT)	VEHICLE															
		INV. (HL-93)	OP. (HL-93)	EV2	EV3	S-2F1	S-3F1	S-5C1	S-PL60T	S-PL65T	SU4	SU5	SU6	SU7	TYPE 3	TYPE 3-3	TYPE 3S2
B17-48	20	1.56	2.03	2.56	2.00	3.78	2.87	3.02	3.23	3.02	2.66	2.51	2.51	2.51	3.02	3.66	3.23
	25	1.38	1.79	2.10	1.76	3.32	2.43	2.52	2.77	2.57	2.27	2.15	2.17	2.17	2.65	3.30	2.73
	30	1.18	1.53	1.73	1.44	2.85	2.04	2.10	2.35	2.12	1.87	1.78	1.81	1.81	2.14	2.60	2.29
	35	1.08	1.39	1.59	1.32	2.69	1.89	1.94	2.19	1.95	1.71	1.60	1.63	1.64	1.94	2.32	2.13
B21-48	30	1.59	2.06	2.32	1.93	3.82	2.73	2.81	3.14	2.85	2.50	2.38	2.42	2.42	2.86	3.49	3.07
	35	1.29	1.67	1.97	1.62	3.38	2.35	2.40	2.71	2.42	2.11	1.95	1.95	1.95	2.37	2.82	2.64
	40	1.12	1.45	1.76	1.44	3.07	2.12	2.15	2.44	2.17	1.88	1.73	1.69	1.69	2.11	2.47	2.31
	45	1.21	1.57	1.90	1.56	3.32	2.29	2.33	2.53	2.25	2.04	1.87	1.83	1.82	2.28	2.67	2.50
	50	1.14	1.47	1.83	1.50	3.23	2.21	2.25	2.44	2.04	1.96	1.79	1.73	1.70	2.18	2.44	2.29
B27-48	40	1.60	2.08	2.53	2.07	4.41	3.04	3.09	2.97	2.64	2.71	2.48	2.43	2.42	3.02	3.54	3.32
	45	1.50	1.95	2.43	1.99	4.30	2.94	2.99	2.74	2.27	2.61	2.37	2.29	2.25	2.90	3.22	3.03
	50	1.35	1.75	2.23	1.83	3.98	2.71	2.75	2.50	1.94	2.39	2.16	2.07	2.00	2.65	2.77	2.62
	55	1.47	2.07	2.63	2.15	4.67	3.19	3.23	2.93	2.30	2.81	2.55	2.44	2.30	3.12	3.30	3.12
	60	1.40	1.82	2.42	1.97	4.36	2.95	2.78	2.34	1.88	2.58	2.32	2.19	2.08	2.85	2.75	2.60
	65	1.16	1.50	2.03	1.66	3.69	2.48	2.22	1.87	1.52	2.17	1.95	1.83	1.73	2.39	2.20	2.12
B33-48	50	1.74	2.32	2.96	2.42	5.28	3.57	3.65	3.22	2.58	3.17	2.87	2.64	2.44	3.51	3.67	3.47
	55	1.54	2.25	3.07	2.41	5.16	3.48	3.56	3.16	2.73	3.08	2.83	2.54	2.34	3.51	3.91	3.62
	60	1.64	2.12	2.81	2.29	5.06	3.42	3.28	2.75	2.21	3.00	2.70	2.55	2.43	3.31	3.22	3.05
	65	1.53	2.17	2.89	2.36	5.24	3.54	3.28	2.75	2.23	3.09	2.78	2.62	2.49	3.41	3.23	3.09
	70	1.50	1.95	2.68	2.18	4.88	3.28	2.81	2.36	1.94	2.86	2.56	2.39	2.25	3.14	2.79	2.73
	75	1.59	2.50	3.49	2.84	6.39	4.28	3.54	2.94	2.46	3.73	3.33	3.03	2.77	4.10	3.51	3.49
	80	1.24	1.61	2.28	1.86	4.19	2.80	2.26	1.86	1.58	2.44	2.17	2.02	1.89	2.67	2.24	2.24
B42-48	65	1.75	2.58	3.65	2.88	6.29	4.21	4.29	3.56	2.94	3.70	3.37	3.02	2.77	4.18	4.24	3.98
	70	1.65	2.52	3.63	2.87	6.31	4.21	4.14	3.48	2.82	3.69	3.35	3.00	2.75	4.16	4.05	3.83
	75	1.53	2.44	3.53	2.82	6.24	4.16	3.59	2.99	2.50	3.64	3.29	2.94	2.69	4.08	3.57	3.53
	80	1.53	2.39	3.38	2.75	6.21	4.16	3.35	2.75	2.34	3.61	3.22	2.99	2.80	3.96	3.32	3.33
	85	1.61	2.24	3.22	2.62	5.93	3.97	3.11	2.54	2.19	3.44	3.06	2.84	2.64	3.77	3.09	3.12
	90	1.64	2.13	3.11	2.53	5.74	3.83	2.94	2.38	2.08	3.32	2.95	2.73	2.53	3.63	2.93	2.98

LOAD RATING NOTES

1. THIS TABLE PROVIDES LOAD RATING RESULTS FOR THE STANDARD BOX BEAMS DESIGNS SHOWN IN PSBD-1-25. ALL LOAD RATINGS WERE CALCULATED USING LRFR WITH ADJUSTED LOAD FACTORS FOR MAINLINE INTERSTATE BRIDGES.
2. LOAD FACTORS PROVIDED ARE FOR BRIDGE WIDTHS OF 24FT THRU 32FT. SPECIAL DESIGN IS REQUIRED FOR ROADWAY WIDTHS LESS THAN 24FT OR GREATER THAN 32FT.



**B17-36****B21-36****B27-36****B33-36****B42-36****36" NON-COMPOSITE BEAMS****CB17-36****CB21-36****CB27-36****CB33-36****CB42-36****36" COMPOSITE BEAMS****STRAND LAYOUT AND BAR SPACING**
TYPICAL FOR ALL NON-COMPOSITE BEAMS**STRAND LAYOUT AND BAR SPACING**
TYPICAL FOR ALL COMPOSITE BEAMS

	BOX BEAM SECTION PROPERTIES					
	D	17"	21"	27"	33"	42"
BEAM ONLY	Ab	420.4	469.0	522.9	576.7	657.5
	Ib	12334	22360	44059	74656	139211
	Yb	8.16	10.09	13.04	15.86	20.21
	St	1395	2049	3156	4356	6389
	Sb	1512	2216	3379	4707	6888
COMPOSITE SECTION	Ic	26224	90774	74778	118789	208349
	Y'c	11.16	13.36	13.12	19.93	24.74
	S't	4490	11881	5387	9089	12071
	S'b	2350	6794	5700	5960	8422

NOTES:

- STRANDS SHALL BE PLACED IN THE LOCATIONS SHOWN AND SHALL BE DISTRIBUTED SYMMETRICALLY OVER THE BEAM WIDTH. STRAND PATTERN AND THE DEBOND LENGTH SHALL BE SYMMETRICAL ABOUT THE VERTICAL ζ OF THE BEAM. DEBONDED STRANDS SHALL FOLLOW THE DIRECTION PROVIDED IN THE ODOT BRIDGE DESIGN MANUAL.
- THE MINIMUM TOP LONGITUDINAL REINFORCING STEEL SHALL BE (4) #5 BARS AND THE BOTTOM LONGITUDINAL REINFORCING STEEL SHALL BE (2) #5 BARS. SEE PROJECT PLANS FOR ADDITIONAL REQUIREMENTS.
- FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF BEAM REINFORCING.

REINFORCING BAR SCHEDULE						
MARK	TYPE	A	B	C	D	E
A	1	30"	13"			
B	1	30"	17"			
C	1	30"	23"			
D	1	30"	29"			
E	1	30"	38"			
F	2	30"	13"	10"	2"	6"
G	2	30"	17"	10"	2"	6"
H	2	30"	21"	10"	2"	6"
J	2	30"	13"	5"	2"	16"
K	2	30"	17"	5"	2"	16"
L	2	30"	21"	5"	2"	16"
M	3	30"	18 1/2"	4"	6"	
N	3	30"	22 1/2"	4"	6"	
O	3	30"	28 1/2"	4"	6"	
P	3	30"	34 1/2"	4"	6"	
Q	3	30"	43 1/2"	4"	6"	
R	1	30"	13"			
S	1	30"	17"			
T	1	30"	21"			

NOTE: ALL BARS IN TABLE ARE #4

DESCRIPTION**NOTE:** COMPOSITE SECTION PROPERTIES ARE BASED ON A 5" EFFECTIVE DECK THICKNESS D = TOTAL DEPTH OF THE NON-COMPOSITE BEAM (IN) A^b = CROSS-SECTIONAL AREA OF THE NON-COMPOSITE BEAM (IN²) I^b = MOMENT OF INERTIA OF THE NON-COMPOSITE BEAM ABOUT THE X-X AXIS (IN⁴) Y^b = LOCATION OF THE NEUTRAL AXIS OF THE NON-COMPOSITE SECTION MEASURED FROM THE EXTREME BOTTOM FIBER (IN) S^t = SECTION MODULUS FOR THE EXTREME TOP FIBER OF THE NON-COMPOSITE BEAM (IN³) S^b = SECTION MODULUS FOR THE EXTREME BOTTOM FIBER OF THE NON-COMPOSITE BEAM (IN³) I^c = MOMENT OF INERTIA OF THE COMPOSITE BEAM ABOUT THE X-X AXIS (IN⁴) Y^c = LOCATION OF THE NEUTRAL AXIS OF THE COMPOSITE SECTION MEASURED FROM THE EXTREME BOTTOM FIBER (IN) S^c = SECTION MODULUS FOR THE EXTREME TOP FIBER OF THE COMPOSITE BEAM (IN³) S^c = SECTION MODULUS FOR THE EXTREME BOTTOM FIBER OF THE COMPOSITE BEAM (IN³)