NORTH CAROLINA
Department of Transportation







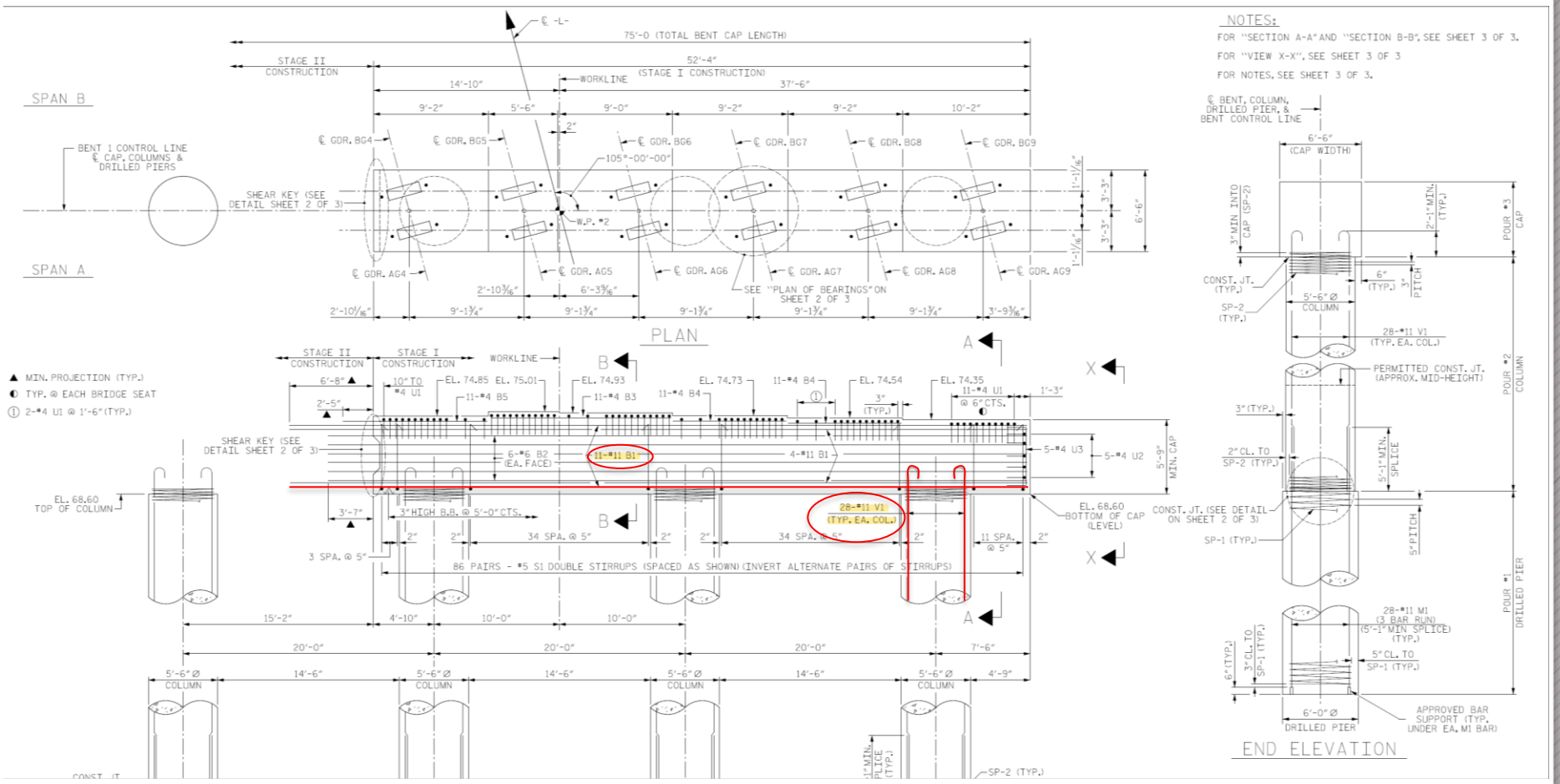


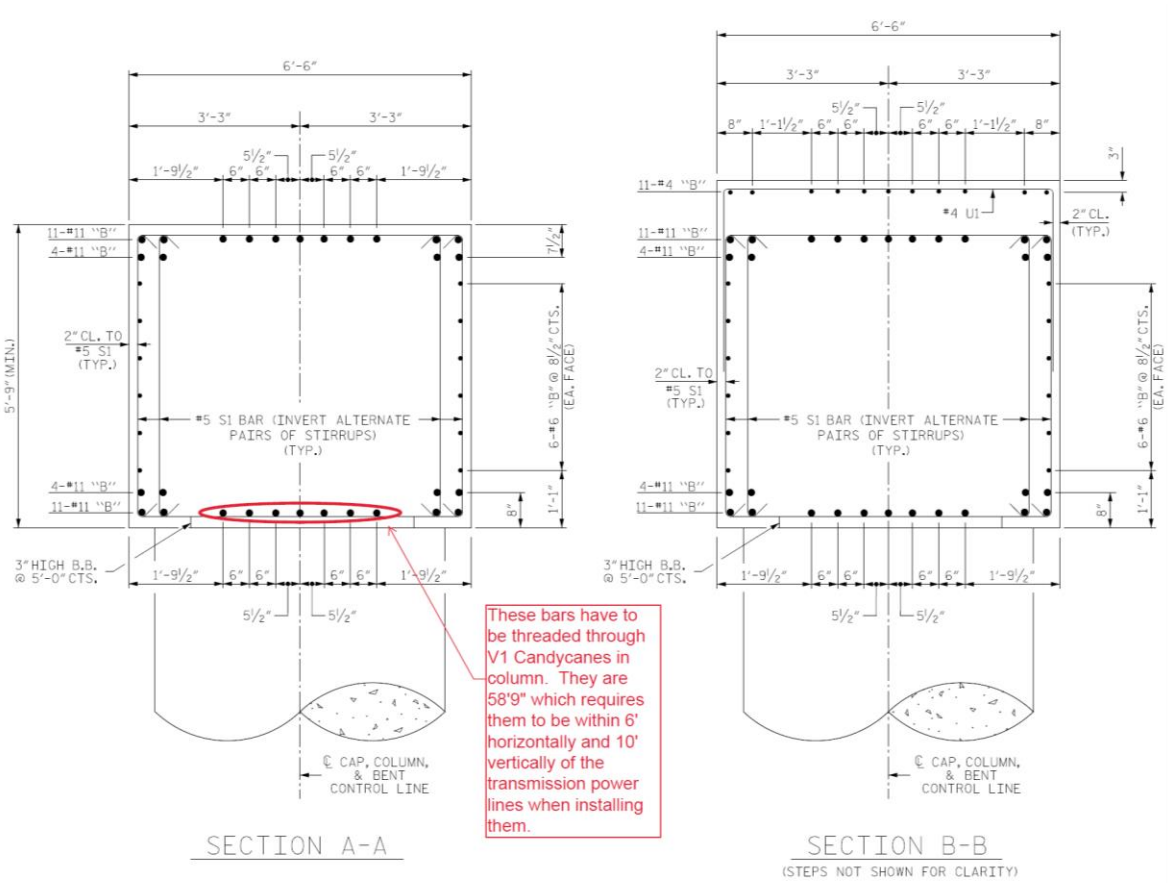
Structures Constructability

Aaron Earwood, PE

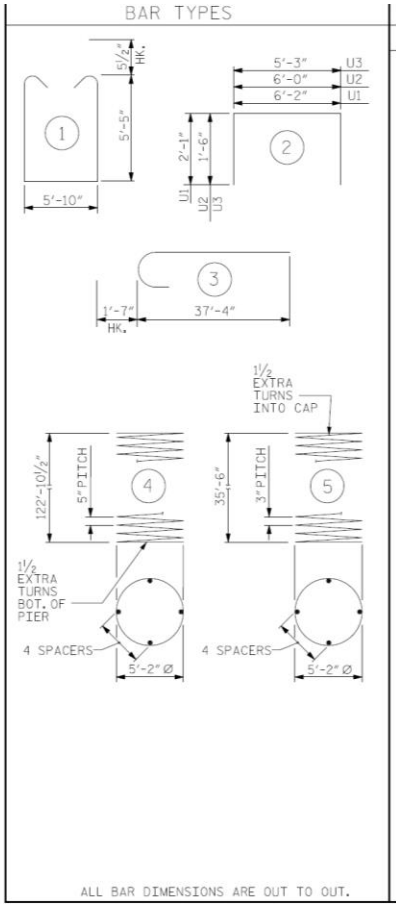
May 24, 2022

Cap Rebar Constraints


SPAN B
SPAN A
BENT 1 CONTROL LINE
℄ CAP, COLUMNS &
DRILLED PIERS
SHEAR KEY (SEE
DETAIL SHEET 2 OF 3)
75'-0 (TOTAL BENT CAP LENGTH)
STAGE II
CONSTRUCTION
52'-4"
(STAGE I CONSTRUCTION)
WORKLINE
105°-00'-00"
W.P. #2
SEE "PLAN OF BEARINGS" ON
SHEET 2 OF 3
PLAN
STAGE II
CONSTRUCTION
STAGE I
CONSTRUCTION
WORKLINE
▲ MIN. PROJECTION (TYP.)
◐ TYP. @ EACH BRIDGE SEAT
① 2-#4 U1 @ 1'-6" (TYP.)
6-#6 B2
(EA. FACE)
11-#11 B1
4-#11 B1
5-#4 U3
5-#4 U2
5'-9"
MIN. CAP
EL. 68.60
TOP OF COLUMN
EL. 68.60
BOTTOM OF CAP
(LEVEL)
3"HIGH B.B. @ 5'-0"CTS.
28-#11 V1
(TYP. EA. COL.)
34 SPA. @ 5"
3 SPA. @ 5"
11 SPA.
@ 5"
86 PAIRS - #5 S1 DOUBLE STIRRUPS (SPACED AS SHOWN) (INVERT ALTERNATE PAIRS OF STIRRUPS)
5'-6"Ø
COLUMN
14'-6"
SP-2 (TYP.)
CONST. JT.
NOTES:
FOR "SECTION A-A" AND "SECTION B-B", SEE SHEET 3 OF 3.
FOR "VIEW X-X", SEE SHEET 3 OF 3
FOR NOTES, SEE SHEET 3 OF 3.
℄ BENT, COLUMN,
DRILLED PIER, &
BENT CONTROL LINE
6'-6"
(CAP WIDTH)
3"MIN INTO
CAP (SP-2)
2'-1"MIN.
(TYP.)
POUR #3
CAP
CONST. JT.
(TYP.)
6"
(TYP.)
3"
PITCH
SP-2
(TYP.)
5'-6"Ø
COLUMN
28-#11 V1
(TYP. EA. COL.)
PERMITTED CONST. JT.
(APPROX. MID-HEIGHT)
3"(TYP.)
2"CL. TO
SP-2 (TYP.)
5'-1"MIN.
SPLICE
POUR #2
COLUMN
CONST. JT. (SEE DETAIL
ON SHEET 2 OF 3)
SP-1 (TYP.)
5"PITCH
28-#11 M1
(3 BAR RUN)
(5'-1" MIN SPLICE)
(TYP.)
5"CL. TO
SP-1 (TYP.)
6"(TYP.)
3"CL. TO
SP-1 (TYP.)
6'-0"Ø
DRILLED PIER
APPROVED BAR
SUPPORT (TYP.
UNDER EA. M1 BAR)
POUR #1
DRILLED PIER
END ELEVATION



These bars have to be threaded through V1 Candycanes in column. They are 58'9" which requires them to be within 6' horizontally and 10' vertically of the transmission power lines when installing them.



BILL

BENT 1 - STAGE I

BAR	NO.	SIZE	TYPE	LENGTH
B1	30	11	STR	58' - 9"
B2	12	6	STR	55' - 9"
B3	11	4	STR	14' - 4"
B4	22	4	STR	9' - 0"
B5	11	4	STR	11' - 6"
M1	336	11	STR	47' - 1"
S1	172	5	1	17' - 7"
U1	74	4	2	10' - 4"
U2	5	4	2	9' - 0"
U3	5	4	2	8' - 3"
V1	112	11	3	38' - 11"
* SP-1	4	5	4	4760' - 11"
** SP-2	4	4	5	2308' - 5"

REINFORCING STEEL LBS.

SPIRAL COLUMN REINFORCING STEEL LBS.

CLASS "A" CONCRETE BREAKDOWN

POUR #2 - COLUMNS C.Y.

POUR #3 - CAP C.Y.

TOTAL CLASS "A" CONCRETE C.Y.

DRILLED PIERS

POUR #1 - DRILLED PIERS C.Y.

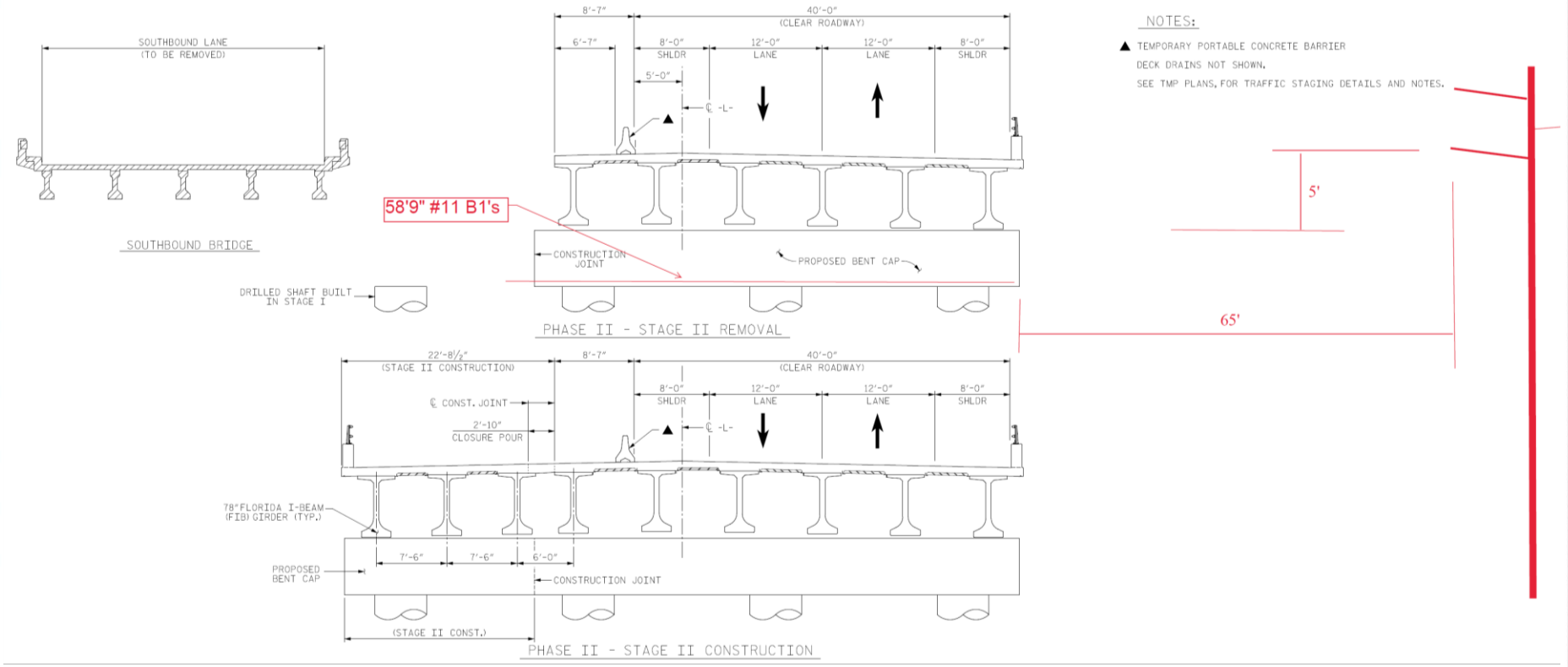
6'-0" Ø DRILLED PIERS LIN. FT.

PERMANENT STEEL CASING FOR 6'-0" Ø DRILLED PIERS LIN. FT.

SID INSPECTIONS EA.

CSL TUBES LIN. FT.

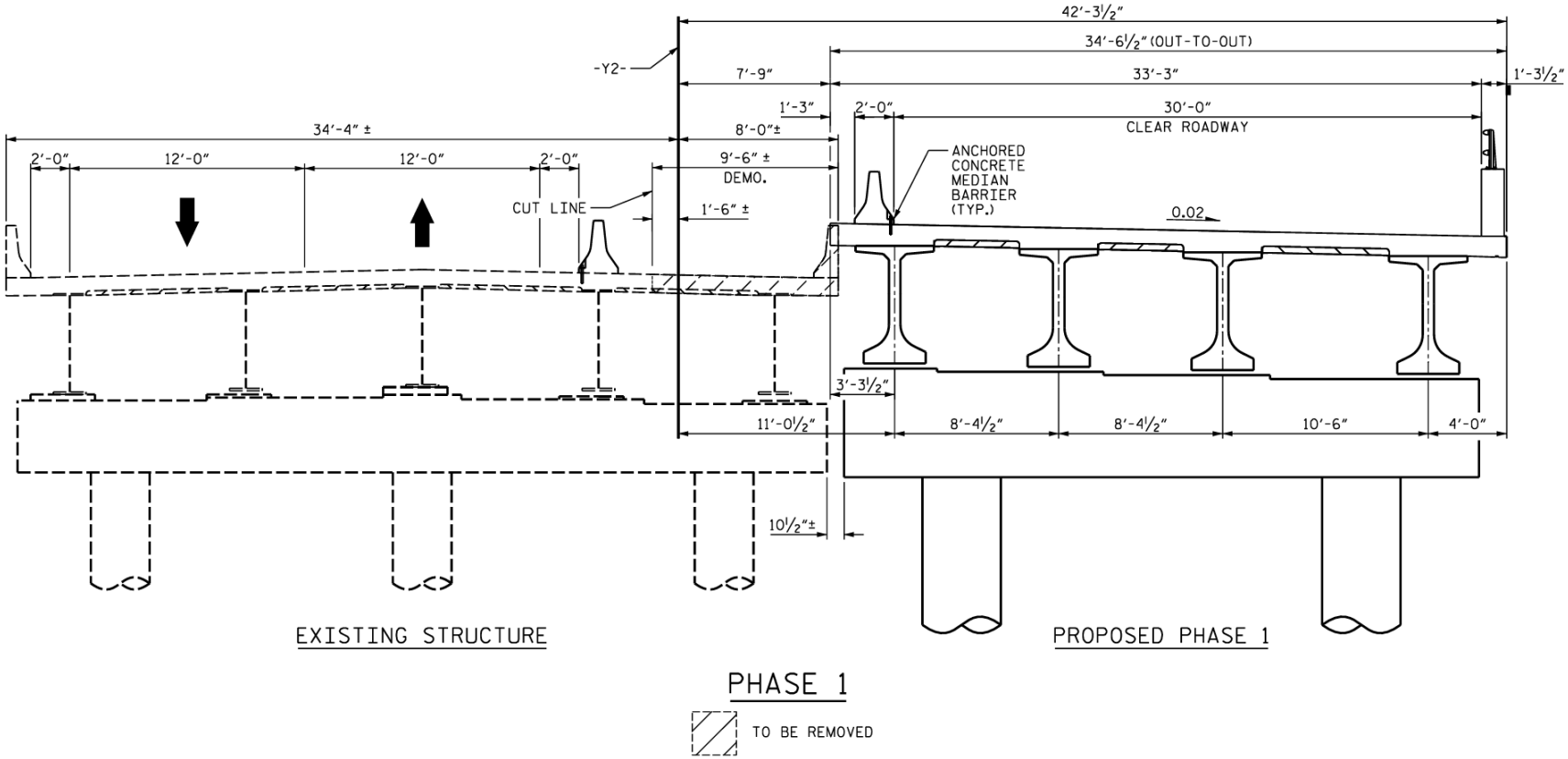
CSL TESTING EA.

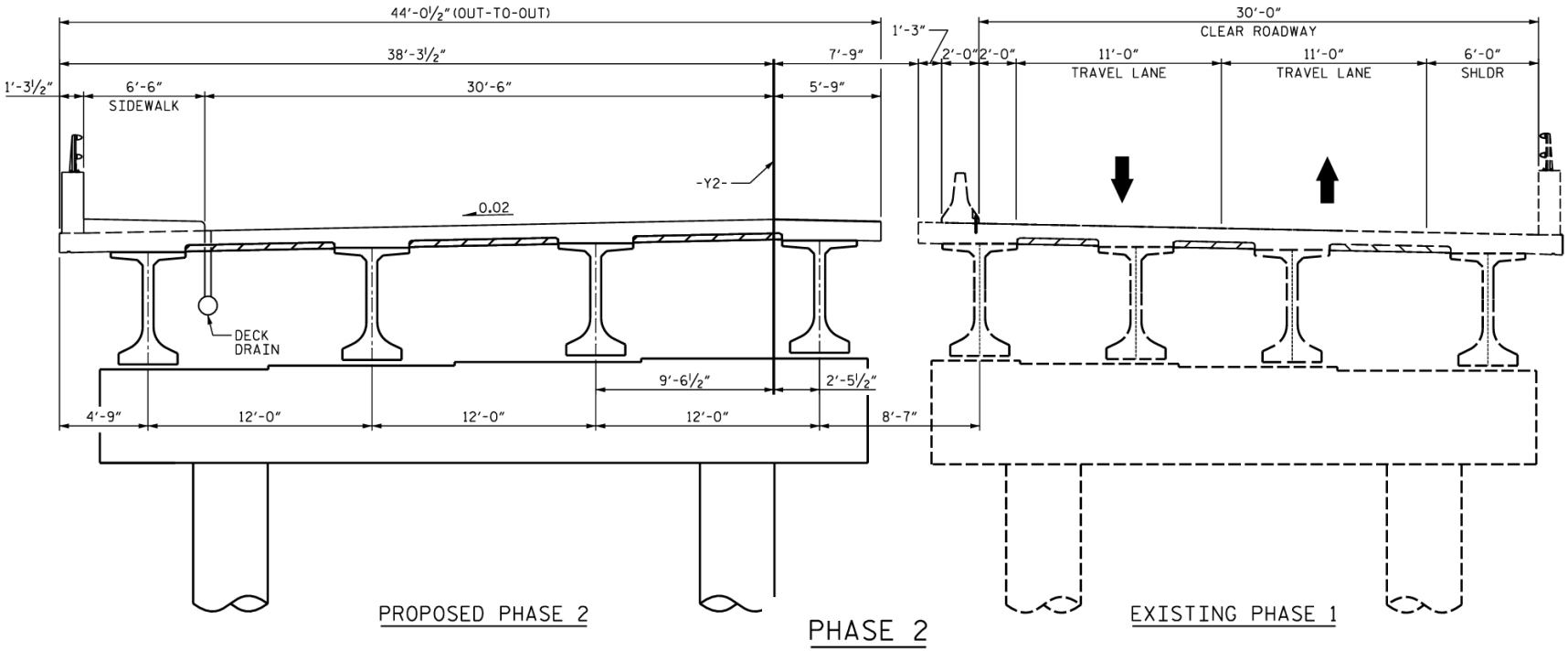


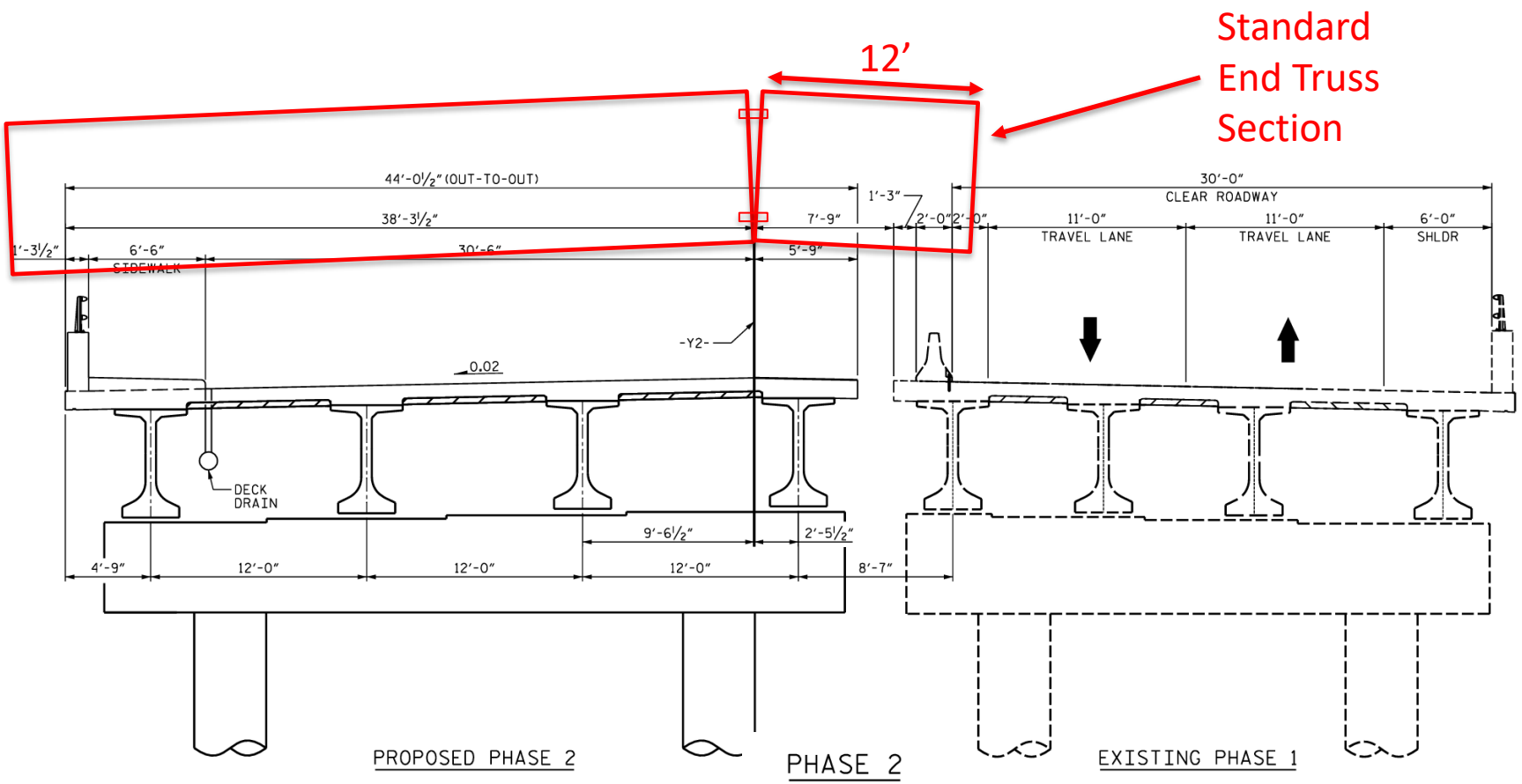
Solutions

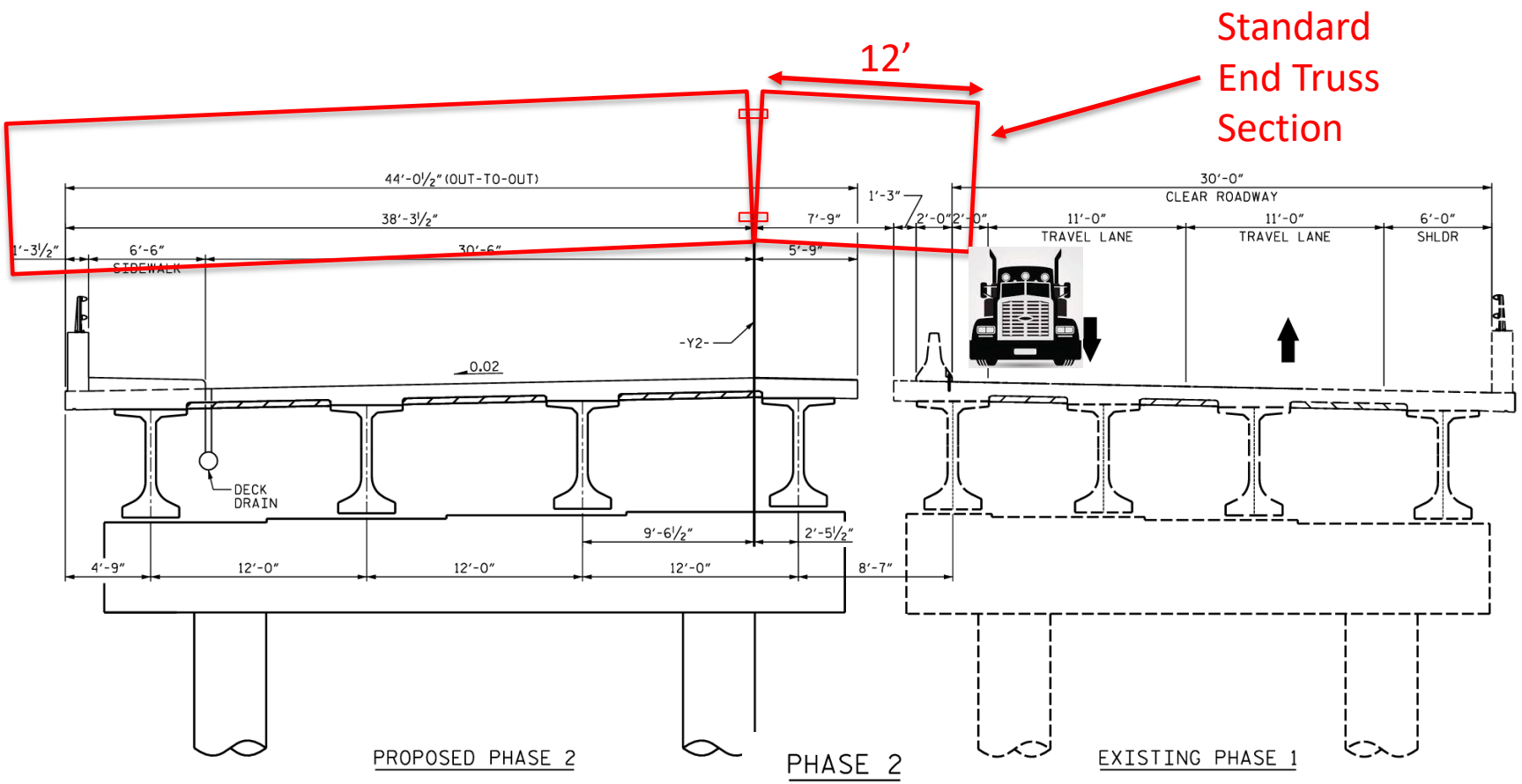
- Add splice in #11 B1's to limit length of bars
- Evaluate if hook bars from column can be eliminated

Crown Points on Staged Construction



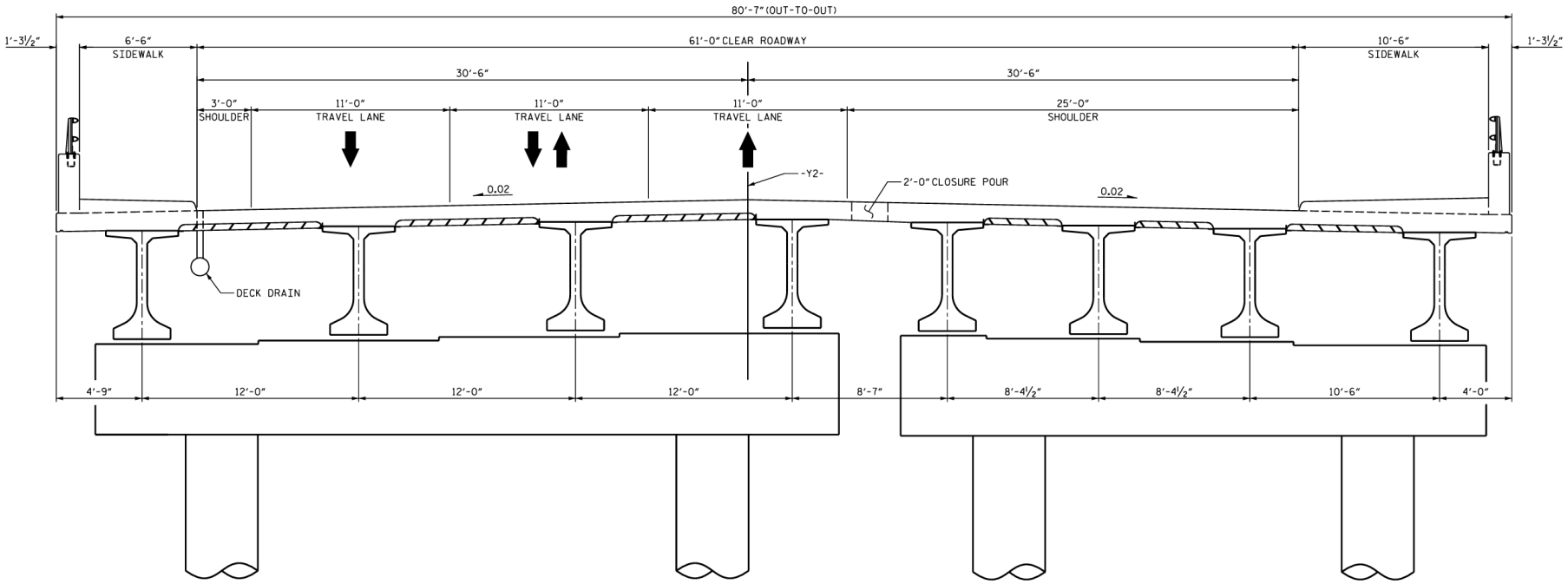

44'-0½" (OUT-TO-OUT)
38'-3½"
1'-3½"
6'-6"
SIDEWALK
30'-6"
7'-9"
5'-9"
1'-3"
2'-0"
2'-0"
30'-0"
CLEAR ROADWAY
11'-0"
TRAVEL LANE
11'-0"
TRAVEL LANE
6'-0"
SHLDR
-Y2-
0.02
DECK
DRAIN
9'-6½"
2'-5½"
4'-9"
12'-0"
12'-0"
12'-0"
8'-7"
PROPOSED PHASE 2
PHASE 2
EXISTING PHASE 1


12’
Standard
End Truss
Section
44’-0½” (OUT-TO-OUT)
38’-3½”
1’-3½”
6’-6”
SIDEWALK
30’-6”
7’-9”
5’-9”
1’-3”
2’-0”
2’-0”
30’-0”
CLEAR ROADWAY
11’-0”
TRAVEL LANE
11’-0”
TRAVEL LANE
6’-0”
SHLDR
-Y2-
0.02
DECK
DRAIN
9’-6½”
2’-5½”
4’-9”
12’-0”
12’-0”
12’-0”
8’-7”
PROPOSED PHASE 2
PHASE 2
EXISTING PHASE 1

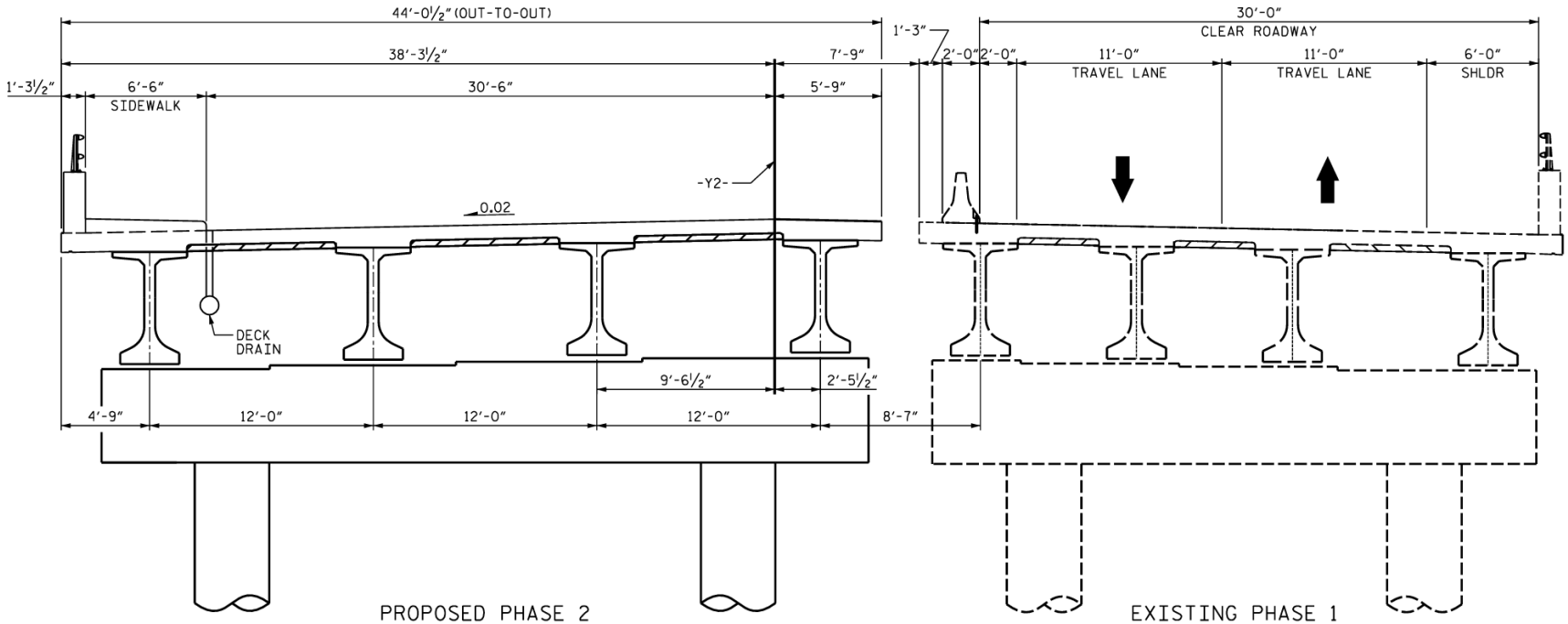

12’
Standard
End Truss
Section
44’-0½” (OUT-TO-OUT)
38’-3½”
1’-3½”
6’-6”
SIDEWALK
30’-6”
7’-9”
5’-9”
1’-3”
2’-0”
2’-0”
30’-0”
CLEAR ROADWAY
11’-0”
TRAVEL LANE
11’-0”
TRAVEL LANE
6’-0”
SHLDR
-Y2-
0.02
DECK
DRAIN
9’-6½”
2’-5½”
4’-9”
12’-0”
12’-0”
12’-0”
8’-7”
PROPOSED PHASE 2
PHASE 2
EXISTING PHASE 1


COASTAL CAROLINA PUMPING

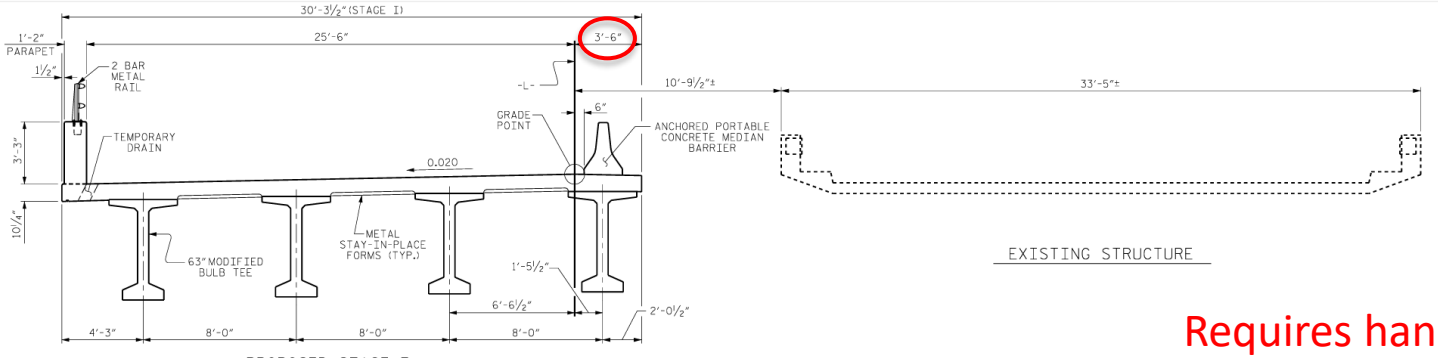

Plan Crown Point

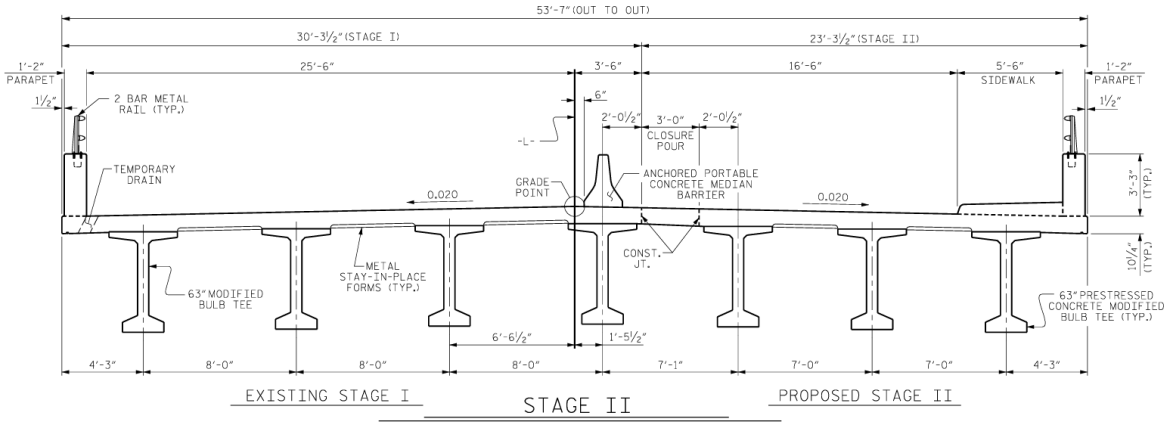


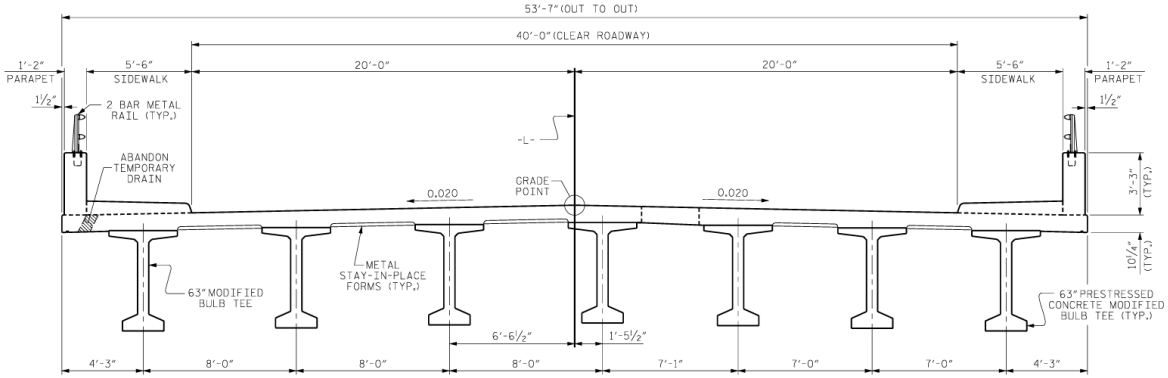
FINAL CONDITION


44'-0½" (OUT-TO-OUT)
38'-3½"
7'-9"
1'-3½"
6'-6"
SIDEWALK
30'-6"
5'-9"
-Y2-
0.02
DECK
DRAIN
9'-6½"
2'-5½"
4'-9"
12'-0"
12'-0"
12'-0"
8'-7"
1'-3"
30'-0"
CLEAR ROADWAY
2'-0"
2'-0"
11'-0"
TRAVEL LANE
11'-0"
TRAVEL LANE
6'-0"
SHLDR
PROPOSED PHASE 2
EXISTING PHASE 1

PHASE 2



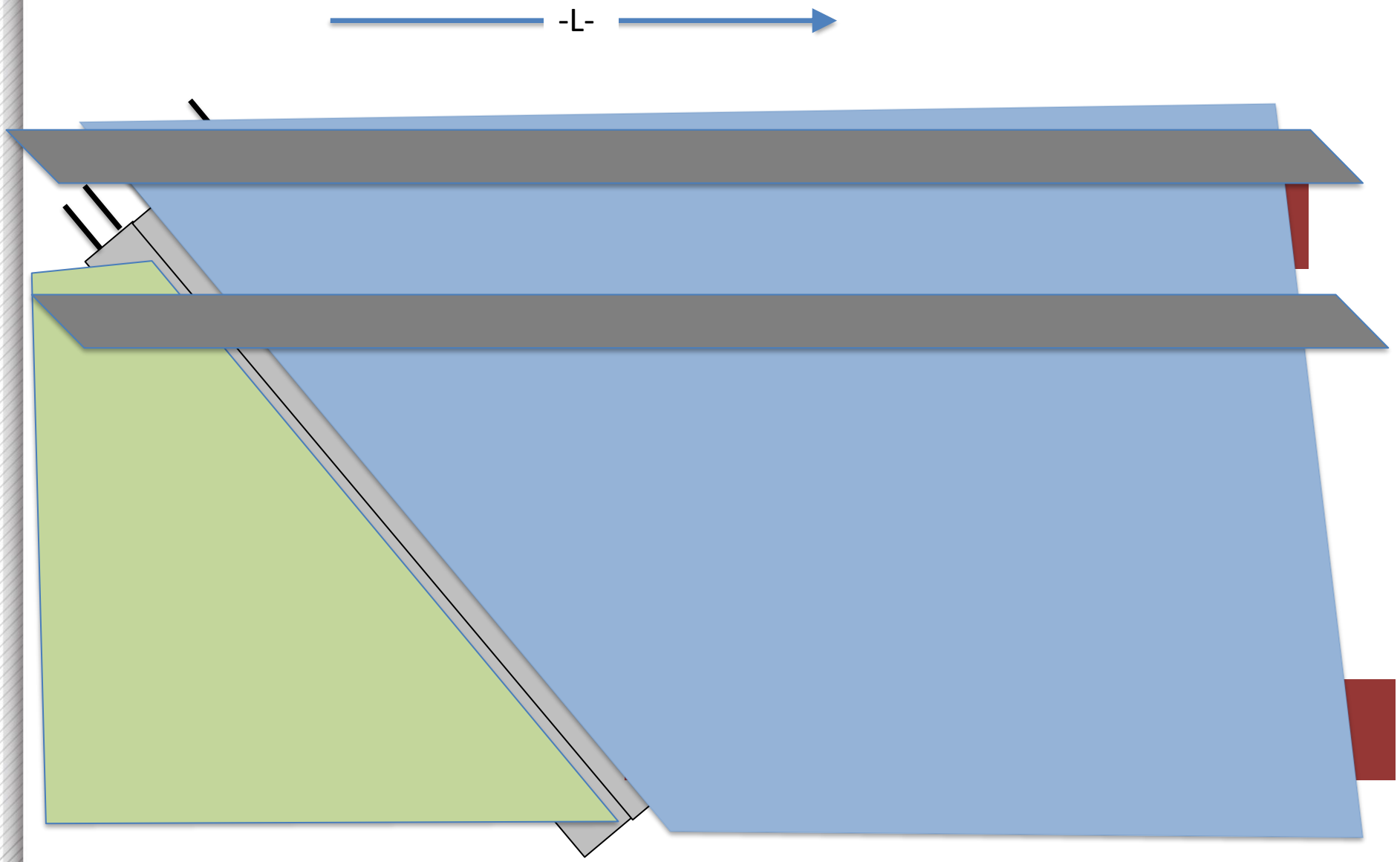


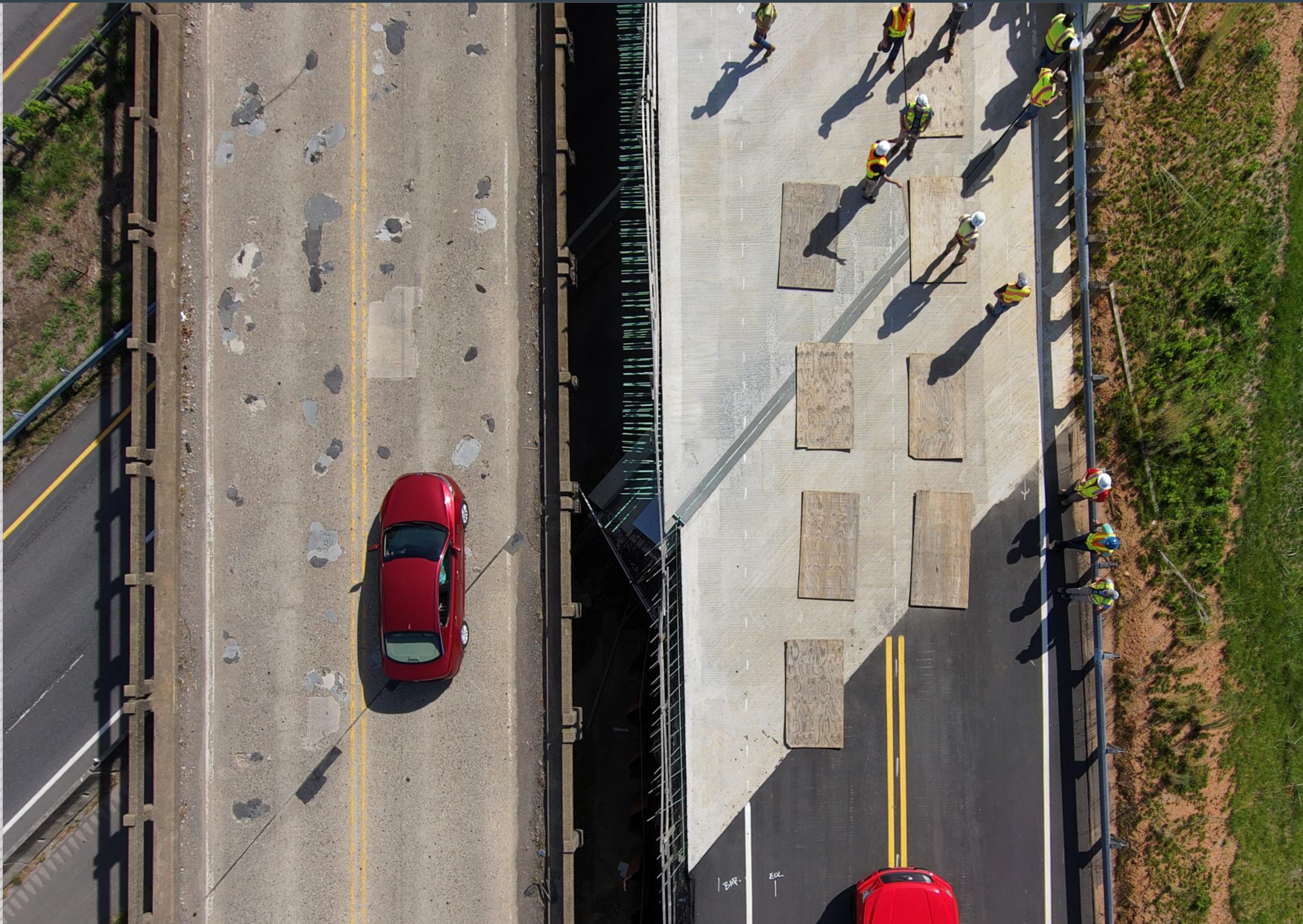


Requires hand finishing roll-over. Not enough room for screed to do the work.

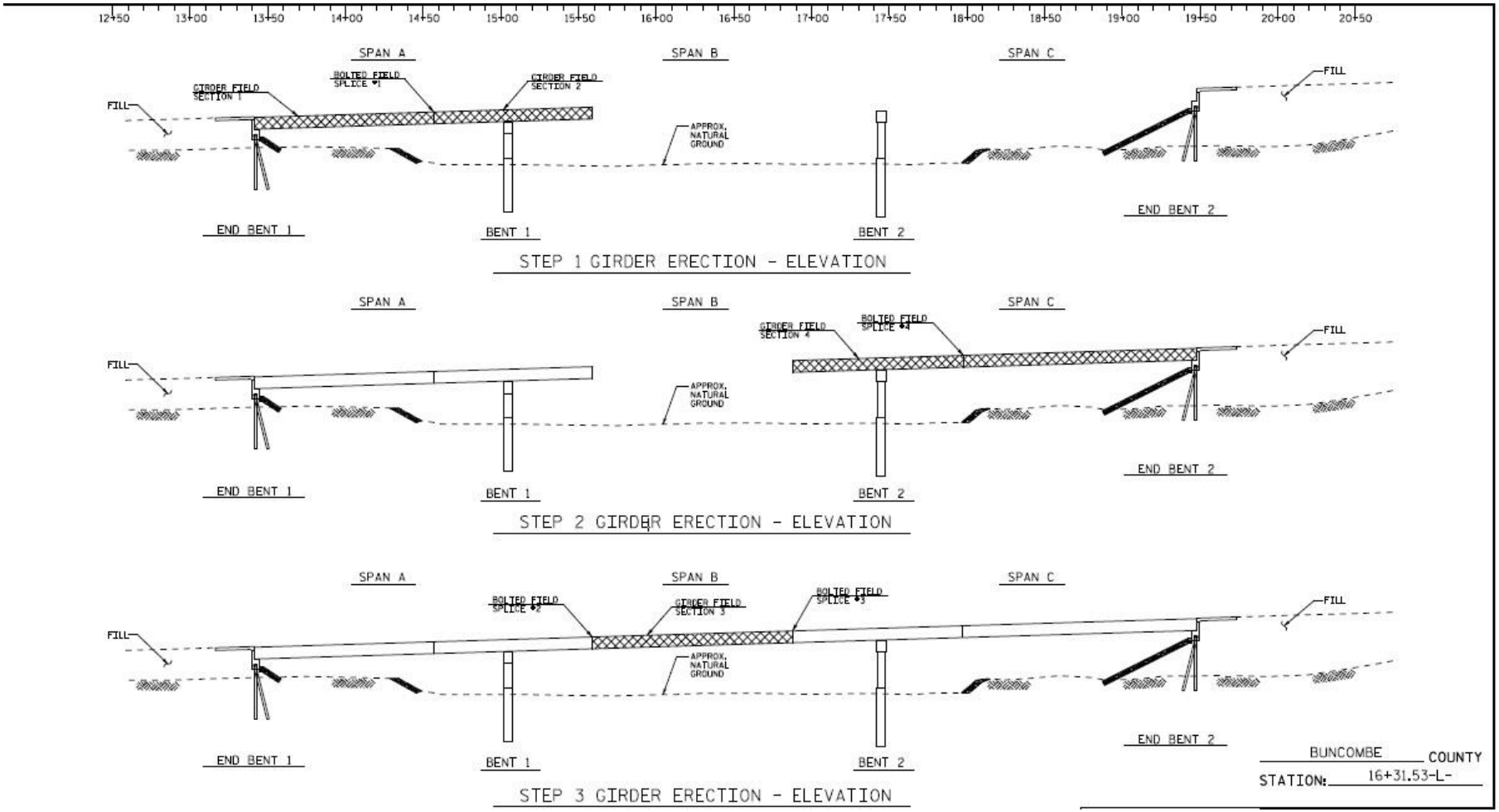
Things to consider…..

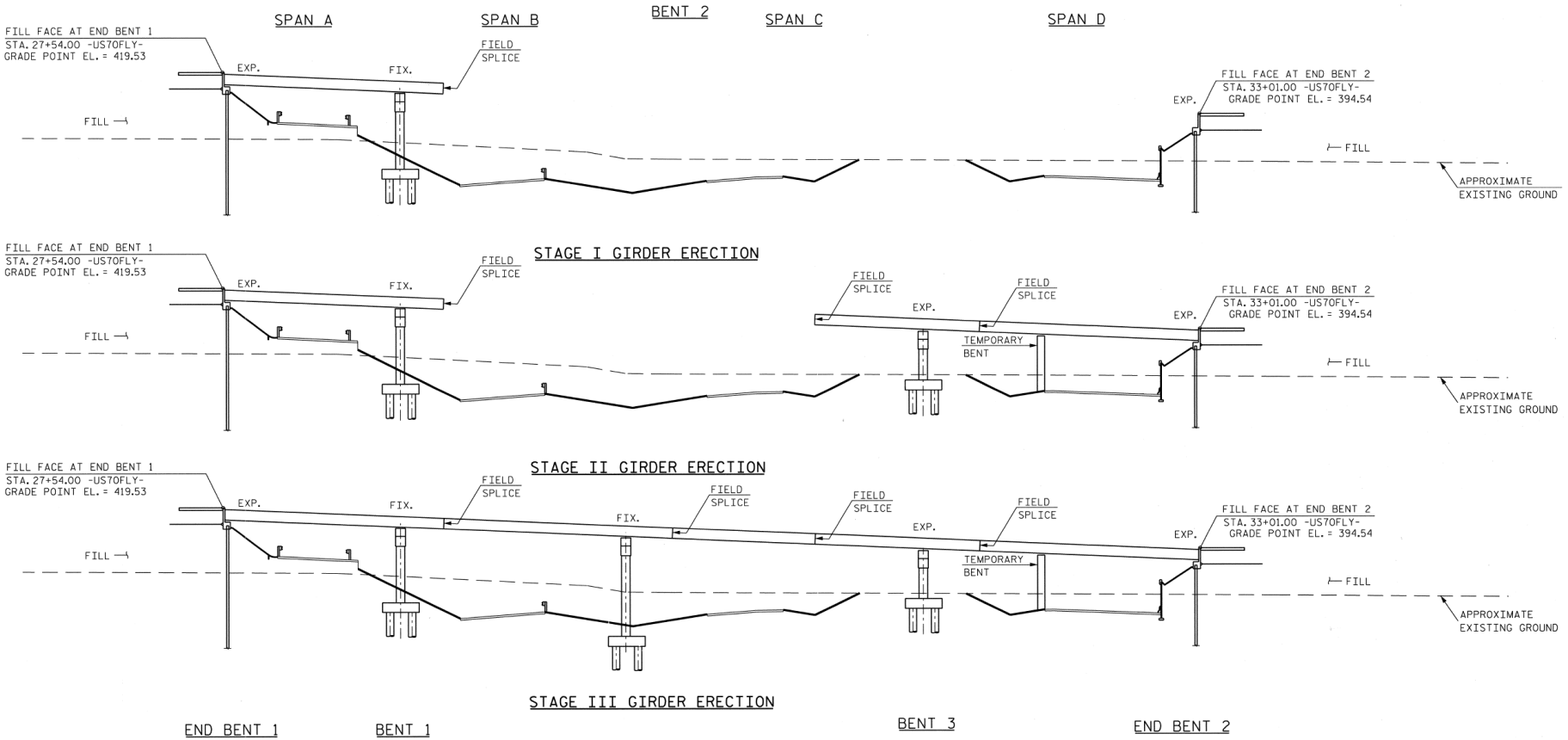
- Prefer stage line to be at crown point (if possible)
- Can screed finish the crown roll-over?
- Will screed stick out into traffic (w/o special inserts)?
- Where will longitudinal construction joints be in relation to wheel paths?


-L-



Girder Erection Sequence


12+50
13+00
13+50
14+00
14+50
15+00
15+50
16+00
16+50
17+00
17+50
18+00
18+50
19+00
19+50
20+00
20+50
SPAN A
SPAN B
SPAN C
GIRDER FIELD SECTION 1
BOLTED FIELD SPLICE #1
GIRDER FIELD SECTION 2
FILL
APPROX. NATURAL GROUND
END BENT 1
BENT 1
BENT 2
END BENT 2
STEP 1 GIRDER ERECTION - ELEVATION
GIRDER FIELD SECTION 4
BOLTED FIELD SPLICE #4
STEP 2 GIRDER ERECTION - ELEVATION
BOLTED FIELD SPLICE #2
GIRDER FIELD SECTION 3
BOLTED FIELD SPLICE #3
STEP 3 GIRDER ERECTION - ELEVATION
BUNCOMBE COUNTY
STATION: 16+31.53-L-

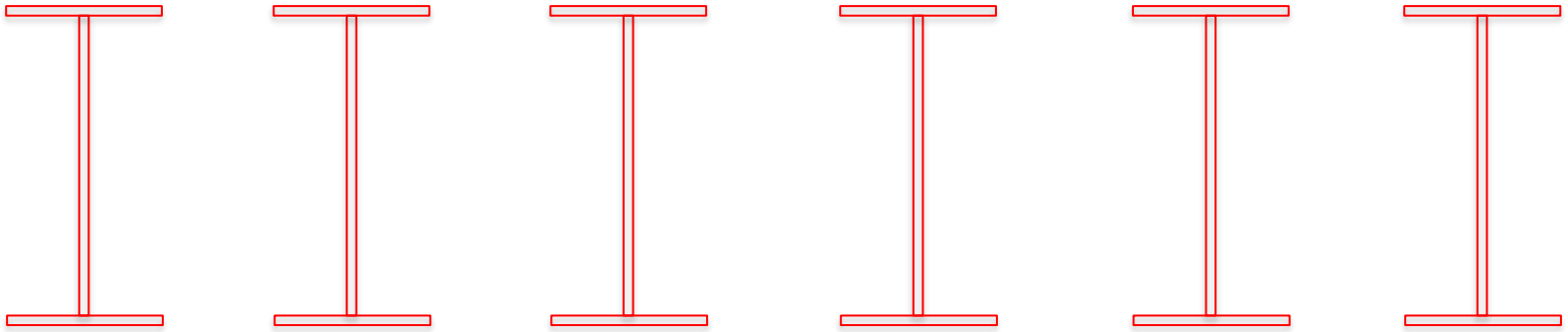

SPAN A
SPAN B
BENT 2
SPAN C
SPAN D
FILL FACE AT END BENT 1
STA. 27+54.00 -US70FLY-
GRADE POINT EL. = 419.53
EXP.
FIX.
FIELD SPLICE
FILL
FILL FACE AT END BENT 2
STA. 33+01.00 -US70FLY-
GRADE POINT EL. = 394.54
APPROXIMATE EXISTING GROUND
STAGE I GIRDER ERECTION
TEMPORARY BENT
STAGE II GIRDER ERECTION
STAGE III GIRDER ERECTION
END BENT 1
BENT 1
BENT 3
END BENT 2


238 WO GRUBB

Girder Erection Sequence

- Avoid drop-in section if possible
- Plan splice locations to allow linear erection
- Consider phasing/location of temporary bents
- Can pieces be spliced in advance?
- How much room does Contractor have for cranes?

Differential Deflections



DEAD LOAD DEFLECTION TABLE FOR GIRDERS

SPAN B

EXTERIOR GIRDERS

SIXTIETH POINTS	℄ BRG.	0.017	0.033	0.050	0.067	0.084	0.100	0.117	0.133	0.150	0.167	0.184	0.200	0.217	0.233	0.250	0.267	0.284	0.300	0.317	0.333	0.350	0.367	0.384	0.400	0.417	0.433	0.450	0.467	0.484
DEFLECTION DUE TO WEIGHT OF GIRDER	0.000	0.003	0.007	0.011	0.016	0.022	0.027	0.034	0.040	0.047	0.055	0.062	0.070	0.077	0.085	0.092	0.099	0.106	0.112	0.118	0.124	0.129	0.134	0.137	0.141	0.143	0.145	0.146	0.147	0.147
DEFLECTION DUE TO WEIGHT OF SLAB *	0.000	0.009	0.018	0.031	0.044	0.059	0.075	0.094	0.113	0.134	0.155	0.177	0.199	0.222	0.245	0.267	0.288	0.308	0.328	0.346	0.364	0.379	0.394	0.405	0.417	0.424	0.432	0.435	0.439	0.438
DEFLECTION DUE TO WEIGHT OF PARAPET	0.000	0.002	0.004	0.007	0.009	0.013	0.016	0.020	0.024	0.028	0.032	0.036	0.040	0.045	0.049	0.053	0.057	0.060	0.064	0.067	0.070	0.073	0.075	0.077	0.079	0.081	0.082	0.083	0.083	0.083
TOTAL DEAD LOAD DEFLECTION	0.000	0.014	0.029	0.049	0.069	0.094	0.118	0.148	0.177	0.209	0.242	0.276	0.309	0.344	0.378	0.411	0.444	0.474	0.505	0.531	0.558	0.580	0.603	0.620	0.637	0.648	0.659	0.664	0.669	0.668
REQUIRED CAMBER	0	3/16"	5/16"	5/16"	13/16"	1 1/8"	1 7/16"	1 3/4"	2 1/8"	2 1/2"	2 7/8"	3 5/16"	3 11/16"	4 1/8"	4 9/16"	4 15/16"	5 5/16"	5 11/16"	6 1/16"	6 3/8"	6 11/16"	6 15/16"	7 1/4"	7 7/16"	7 5/8"	7 3/4"	7 15/16"	8"	8 1/16"	8"

DEAD LOAD DEFLECTION TABLE FOR GIRDERS

SPAN B

EXTERIOR GIRDERS

SIXTIETH POINTS	0.500	0.517	0.533	0.550	0.567	0.584	0.600	0.617	0.633	0.650	0.667	0.684	0.700	0.717	0.733	0.750	0.767	0.784	0.800	0.817	0.833	0.850	0.867	0.884	0.900	0.917	0.933	0.950	0.967	0.984	℄ BRG.
DEFLECTION DUE TO WEIGHT OF GIRDER	0.146	0.144	0.143	0.140	0.136	0.132	0.128	0.122	0.117	0.111	0.104	0.097	0.090	0.083	0.076	0.068	0.061	0.053	0.046	0.040	0.033	0.027	0.021	0.017	0.012	0.009	0.005	0.003	0.001	0.002	0.000
DEFLECTION DUE TO WEIGHT OF SLAB *	0.438	0.433	0.429	0.420	0.411	0.399	0.386	0.371	0.355	0.337	0.319	0.298	0.277	0.256	0.234	0.212	0.190	0.168	0.146	0.126	0.106	0.088	0.070	0.055	0.041	0.030	0.019	0.012	0.006	0.003	0.000
DEFLECTION DUE TO WEIGHT OF PARAPET	0.083	0.083	0.082	0.080	0.079	0.077	0.075	0.072	0.070	0.066	0.063	0.060	0.056	0.052	0.048	0.044	0.040	0.036	0.032	0.027	0.023	0.020	0.016	0.013	0.010	0.007	0.005	0.003	0.002	0.001	0.000
TOTAL DEAD LOAD DEFLECTION	0.667	0.660	0.653	0.640	0.627	0.608	0.589	0.565	0.542	0.514	0.486	0.455	0.424	0.391	0.358	0.324	0.290	0.257	0.223	0.193	0.162	0.135	0.107	0.085	0.063	0.046	0.030	0.019	0.008	0.005	0.000
REQUIRED CAMBER	8"	7 15/16"	7 13/16"	7 11/16"	7 1/2"	7 5/16"	7 1/16"	6 13/16"	6 1/2"	6 3/16"	5 13/16"	5 7/16"	5 1/16"	4 11/16"	4 5/16"	3 7/8"	3 1/2"	3 1/16"	2 11/16"	2 5/16"	1 15/16"	1 5/8"	1 5/16"	1"	3/4"	5/16"	3/8"	1/4"	1/8"	1/16"	0

DEAD LOAD DEFLECTION TABLE FOR GIRDERS

SPAN B

INTERIOR GIRDERS

SIXTIETH POINTS	℄ BRG.	0.017	0.033	0.050	0.067	0.084	0.100	0.117	0.133	0.150	0.167	0.184	0.200	0.217	0.233	0.250	0.267	0.284	0.300	0.317	0.333	0.350	0.367	0.384	0.400	0.417	0.433	0.450	0.467	0.484
DEFLECTION DUE TO WEIGHT OF GIRDER	0.000	0.004	0.008	0.013	0.018	0.024	0.030	0.037	0.045	0.053	0.061	0.069	0.077	0.086	0.094	0.102	0.110	0.118	0.125	0.132	0.138	0.143	0.149	0.153	0.157	0.159	0.162	0.163	0.164	0.164
DEFLECTION DUE TO WEIGHT OF SLAB *	0.000	0.011	0.022	0.038	0.053	0.073	0.093	0.116	0.139	0.165	0.191	0.218	0.245	0.273	0.301	0.328	0.354	0.379	0.404	0.426	0.448	0.466	0.484	0.498	0.512	0.521	0.531	0.535	0.539	0.539
DEFLECTION DUE TO WEIGHT OF PARAPET	0.000	0.002	0.004	0.007	0.009	0.012	0.016	0.019	0.023	0.027	0.031	0.036	0.040	0.044	0.048	0.052	0.055	0.059	0.062	0.065	0.069	0.071	0.074	0.075	0.077	0.079	0.080	0.081	0.081	0.081
TOTAL DEAD LOAD DEFLECTION	0.000	0.017	0.034	0.057	0.080	0.109	0.138	0.173	0.207	0.245	0.283	0.322	0.362	0.402	0.443	0.481	0.520	0.555	0.591	0.622	0.654	0.680	0.706	0.726	0.746	0.759	0.773	0.779	0.785	0.784
REQUIRED CAMBER	0	3/16"	3/8"	11/16"	15/16"	1 5/16"	1 11/16"	2 1/16"	2 1/2"	2 15/16"	3 3/8"	3 7/8"	4 5/16"	4 13/16"	5 5/16"	5 3/4"	6 1/4"	6 11/16"	7 1/16"	7 1/2"	7 7/8"	8 3/16"	8 1/2"	8 11/16"	8 15/16"	9 1/8"	9 1/4"	9 3/8"	9 7/16"	9 3/8"

DEAD LOAD DEFLECTION TABLE FOR GIRDERS

SPAN B

INTERIOR GIRDERS

SIXTIETH POINTS	0.500	0.517	0.533	0.550	0.567	0.584	0.600	0.617	0.633	0.650	0.667	0.684	0.700	0.717	0.733	0.750	0.767	0.784	0.800	0.817	0.833	0.850	0.867	0.884	0.900	0.917	0.933	0.950	0.967	0.984	℄ BRG.
DEFLECTION DUE TO WEIGHT OF GIRDER	0.163	0.161	0.159	0.156	0.152	0.147	0.143	0.137	0.131	0.124	0.117	0.109	0.101	0.093	0.085	0.076	0.068	0.060	0.052	0.044	0.037	0.031	0.024	0.019	0.014	0.010	0.006	0.004	0.001	0.001	0.000
DEFLECTION DUE TO WEIGHT OF SLAB *	0.538	0.532	0.527	0.516	0.505	0.490	0.475	0.456	0.437	0.414	0.392	0.366	0.341	0.314	0.288	0.260	0.233	0.206	0.179	0.154	0.130	0.108	0.086	0.068	0.050	0.037	0.024	0.015	0.007	0.003	0.000
DEFLECTION DUE TO WEIGHT OF PARAPET	0.081	0.081	0.080	0.079	0.077	0.075	0.073	0.071	0.068	0.065	0.062	0.059	0.055	0.051	0.048	0.044	0.040	0.035	0.031	0.027	0.023	0.020	0.016	0.013	0.010	0.007	0.005	0.003	0.002	0.001	0.000
TOTAL DEAD LOAD DEFLECTION	0.782	0.774	0.766	0.750	0.735	0.713	0.691	0.663	0.635	0.603	0.570	0.534	0.497	0.458	0.420	0.380	0.340	0.301	0.262	0.226	0.190	0.158	0.126	0.100	0.074	0.054	0.035	0.022	0.010	0.005	0.000
REQUIRED CAMBER	9 3/8"	9 5/16"	9 3/16"	9"	8 13/16"	8 3/8"	8 5/16"	7 15/16"	7 5/8"	7 1/4"	6 13/16"	6 3/8"	5 15/16"	5 1/2"	5 1/16"	4 5/8"	4 1/16"	3 5/8"	3 1/8"	2 11/16"	2 1/4"	1 7/8"	1 1/2"	1 13/16"	7/8"	5/8"	7/16"	1/4"	1/8"	1/16"	0

* INCLUDES SLAB, BUILDUPS & STAY-IN-PLACE FORMS.
ALL VALUES ARE SHOWN IN FEET (DECIMAL FORM). EXCEPT "REQUIRED CAMBER", WHICH IS GIVEN IN INCHES (FRACTION FORM).

EXTERIOR GIRDERS

SIXTIETH POINTS	0.500
DEFLECTION DUE TO WEIGHT OF GIRDER ↓	0.146
DEFLECTION DUE TO WEIGHT OF SLAB * ↓	0.438
DEFLECTION DUE TO WEIGHT OF PARAPET ↓	0.083
TOTAL DEAD LOAD DEFLECTION	0.667
REQUIRED CAMBER ↑	8"

INTERIOR GIRDERS

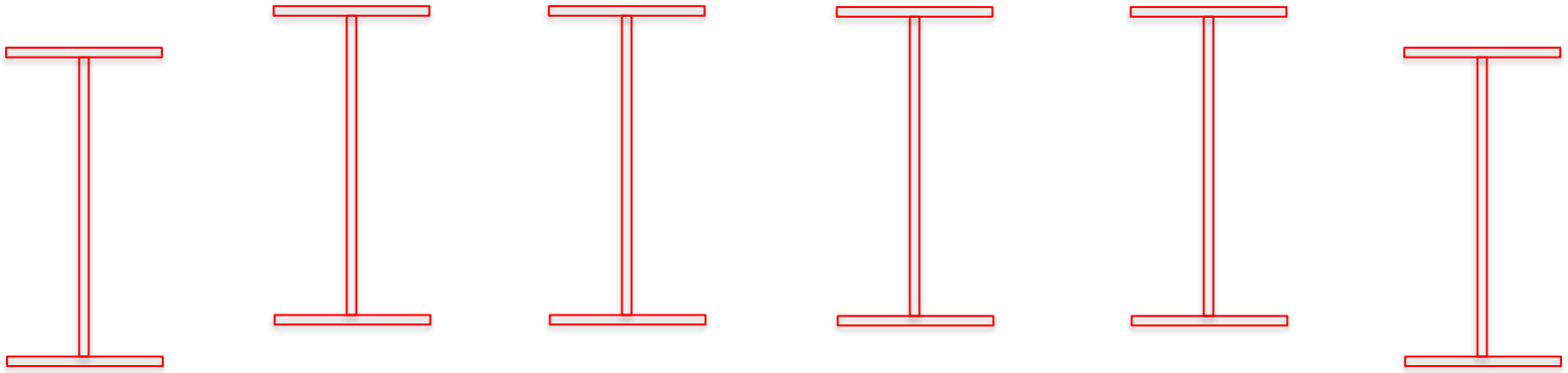
SIXTIETH POINTS	0.500
DEFLECTION DUE TO WEIGHT OF GIRDER ↓	0.163
DEFLECTION DUE TO WEIGHT OF SLAB * ↓	0.538
DEFLECTION DUE TO WEIGHT OF PARAPET ↓	0.081
TOTAL DEAD LOAD DEFLECTION	0.782
REQUIRED CAMBER ↑	9⅜"

0.438
+0.083
0.521’

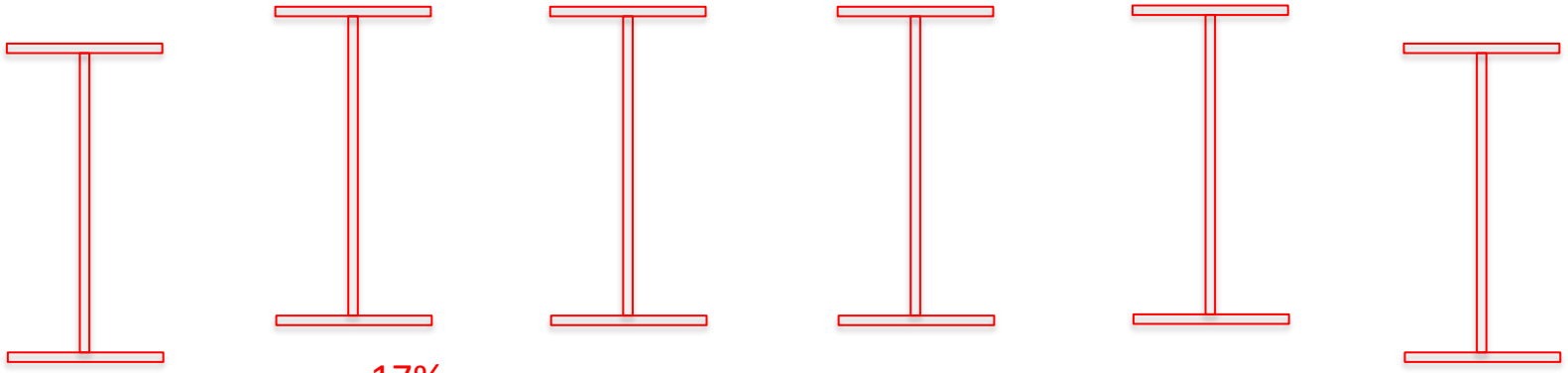
0.538
+0.081
0.619’

Interior girders deflect 0.098’ (1-3/16”) more than exterior girders at mid-span

Differential Deflections

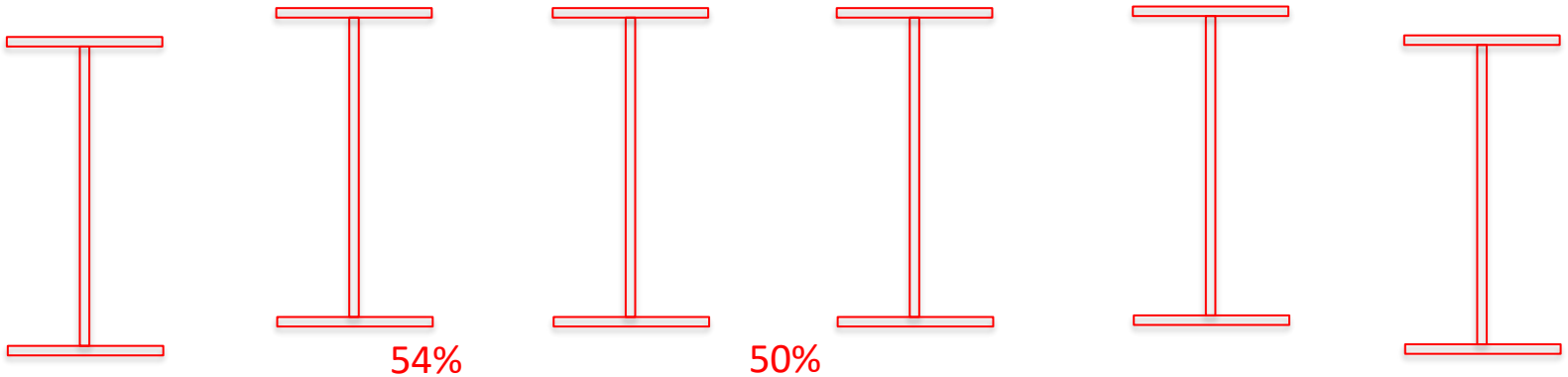


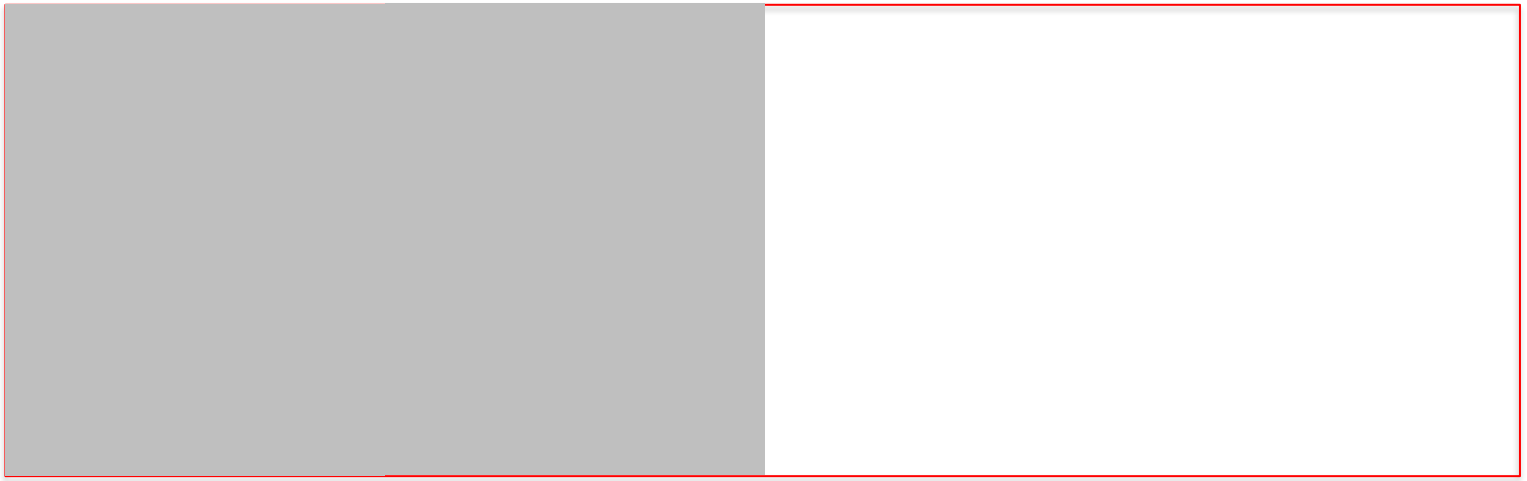
Bridge Deck (Plan View)

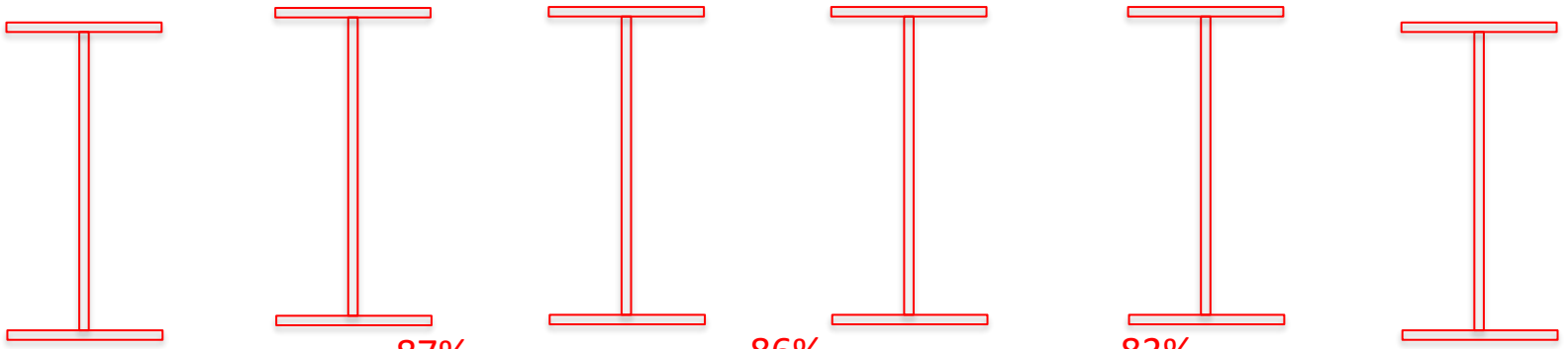


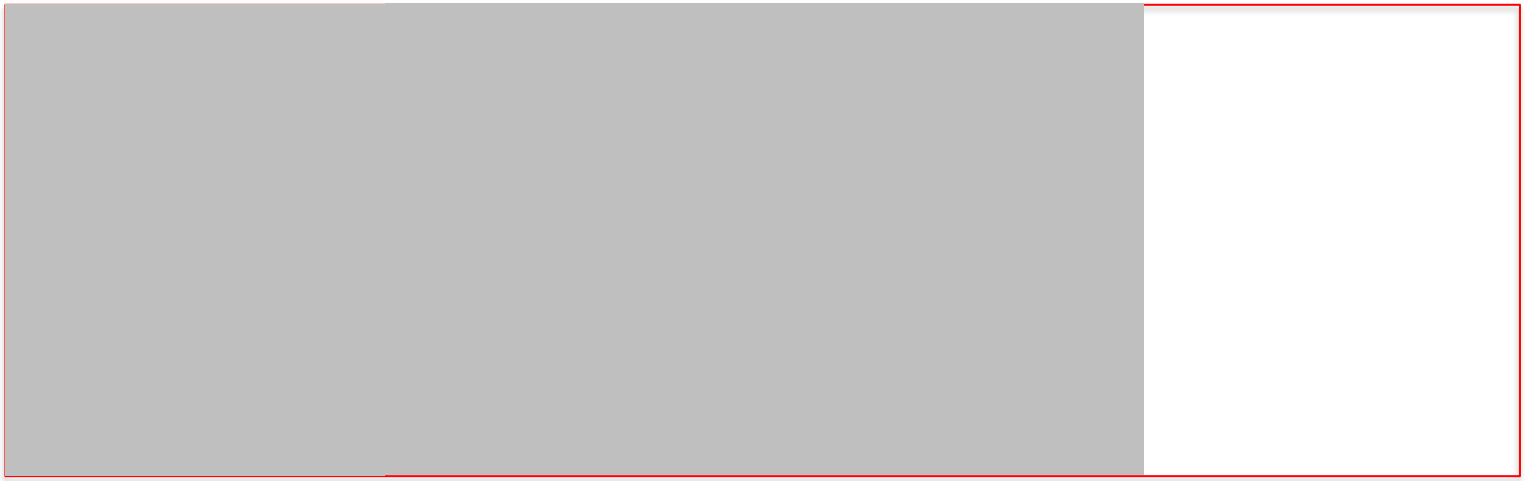
17%
Deflection

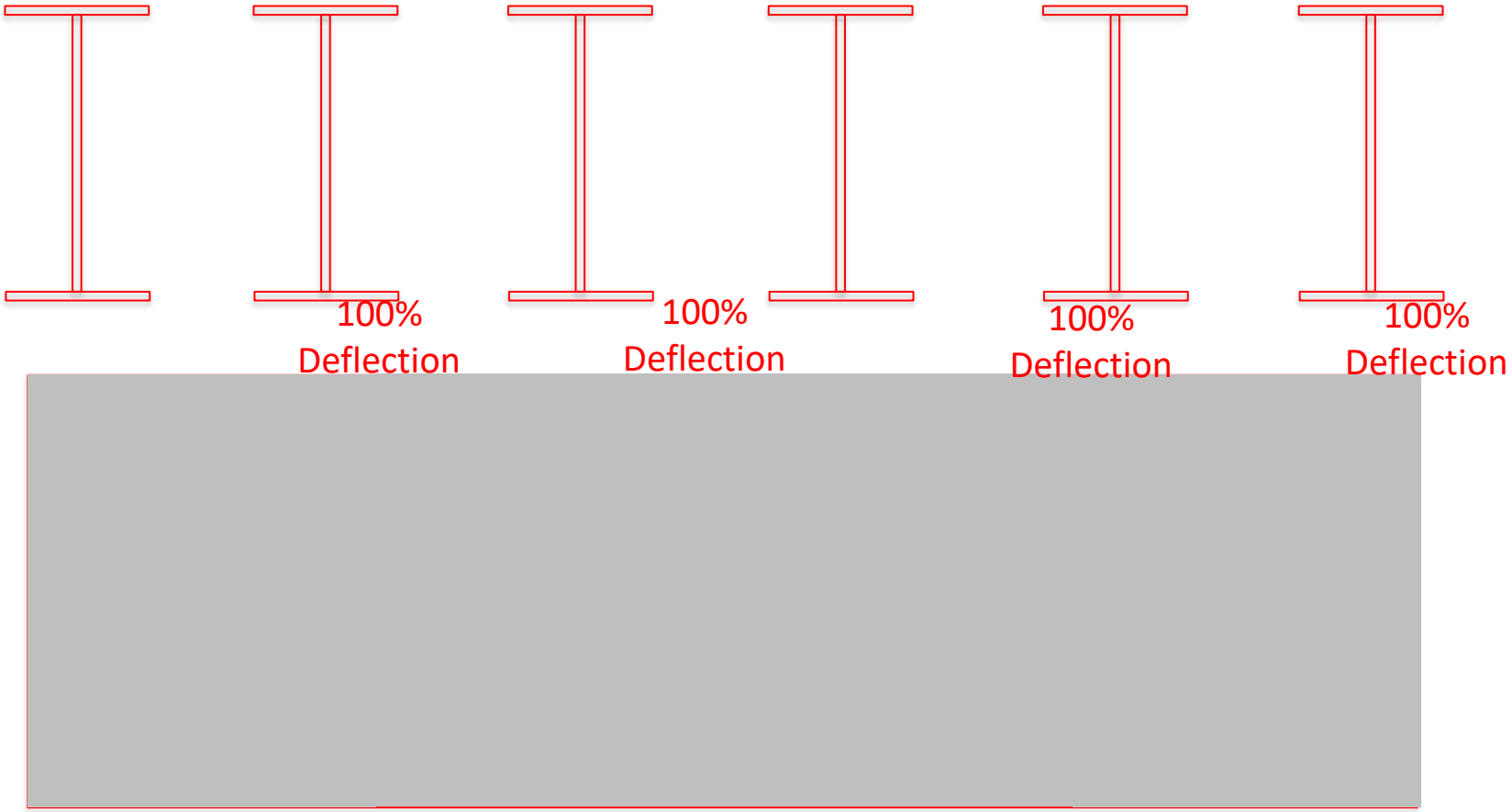
1/4


54%
Deflection
50%
Deflection

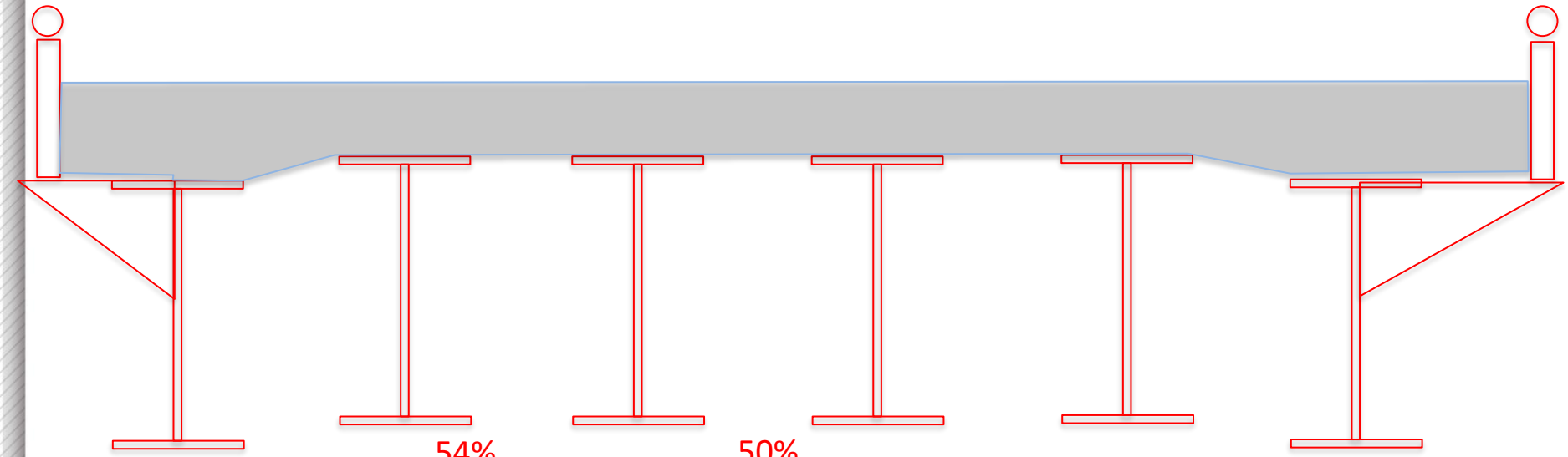

1/4
1/2


87%
Deflection
86%
Deflection
83%
Deflection


1/4
1/2
3/4

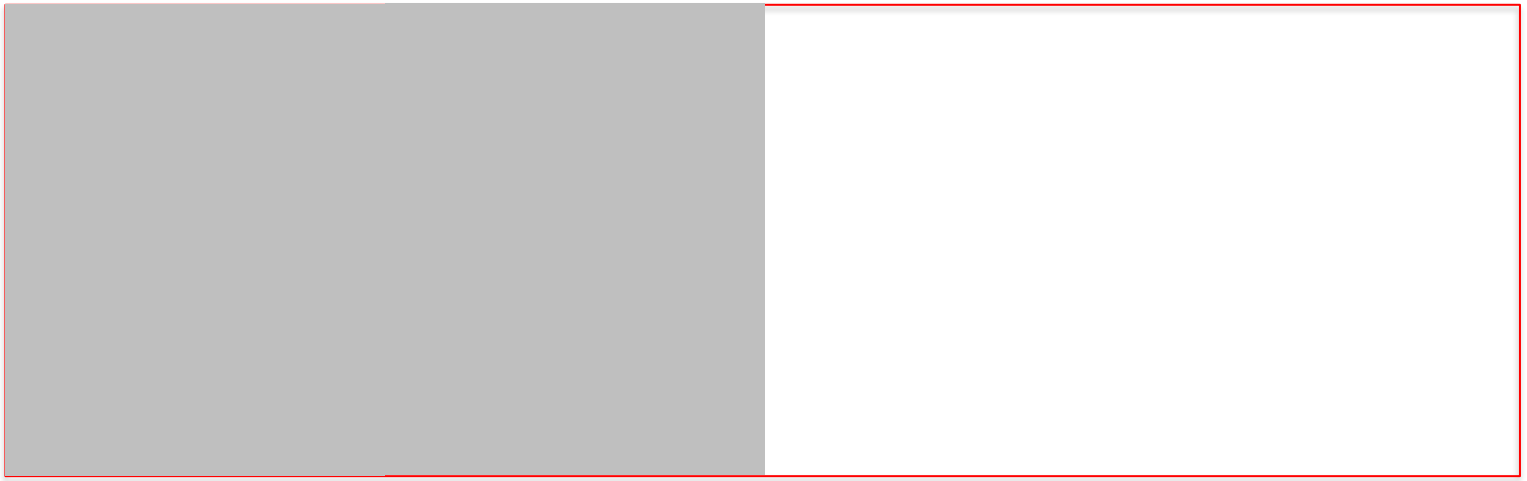

100%
Deflection
100%
Deflection
100%
Deflection
100%
Deflection
1/4
1/2
3/4

Worst Case – Mid Span



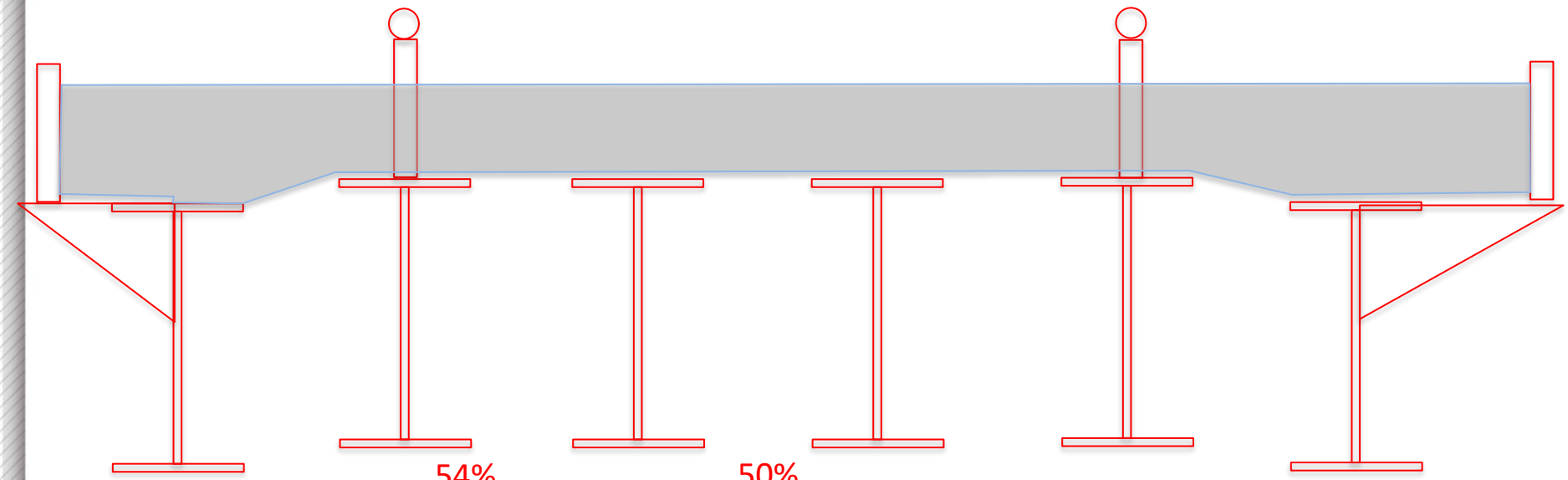
54% Deflection

50% Deflection



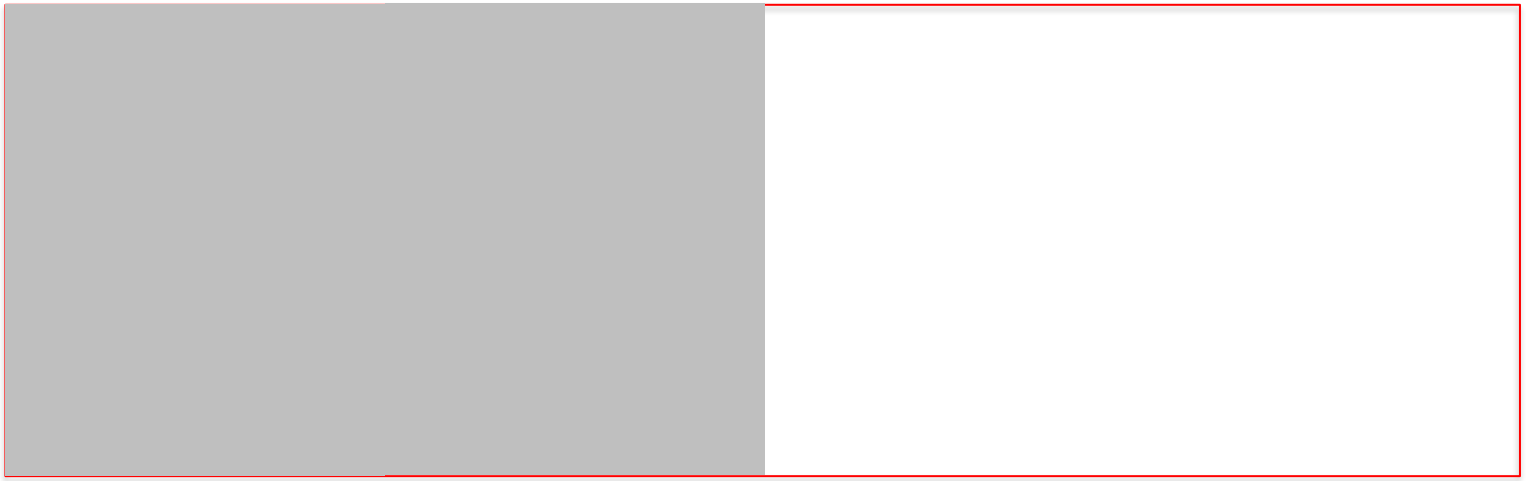
1/4

1/2



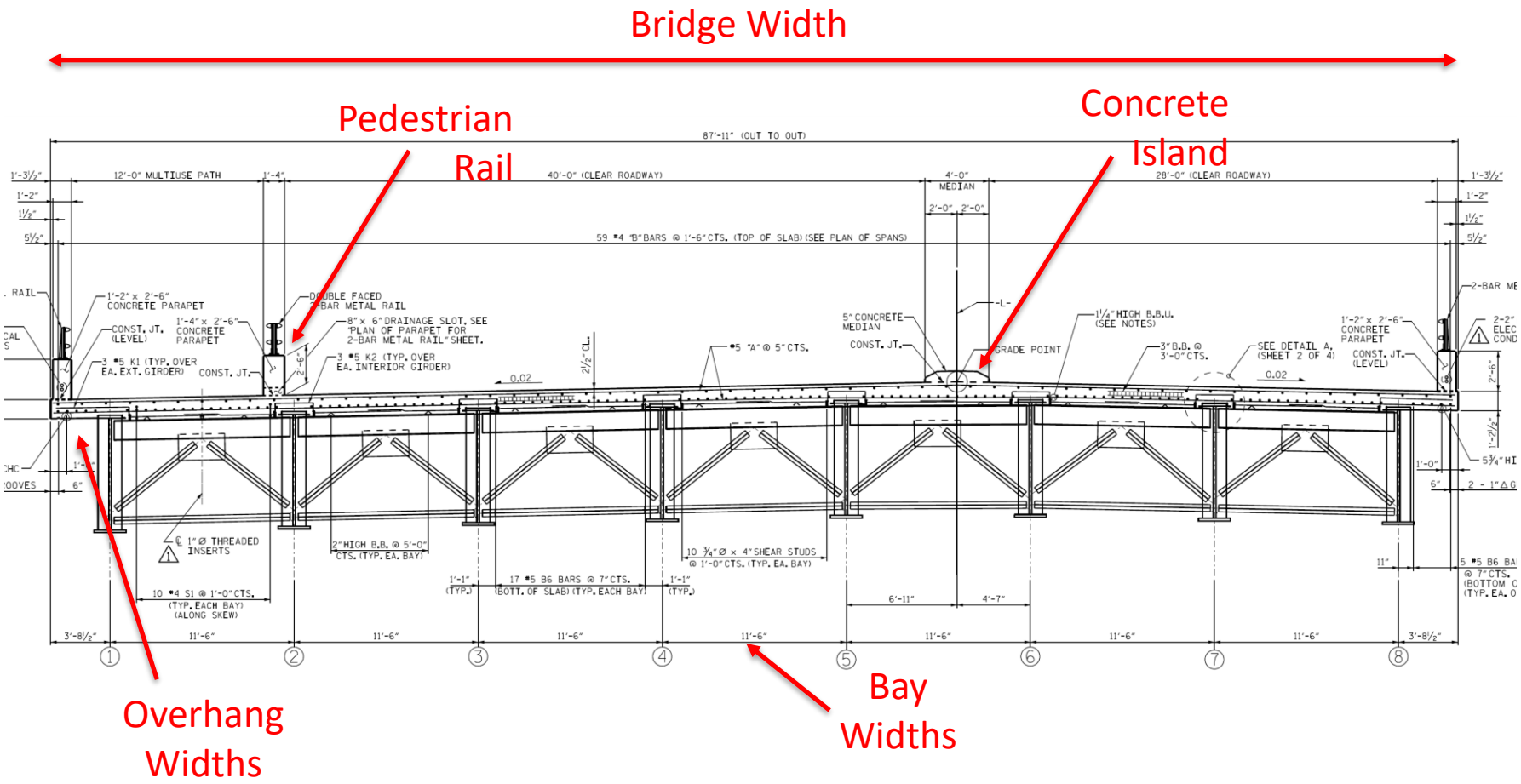
54%
Deflection

50%
Deflection



1/4

1/2



½” Differential is typical and acceptable. Anything above this, contact the ACE or RBCE to discuss

Bridge Deck Geometry Factors

- Skew ✓
- Crowns or Superelevations ✓
- Vertical Curves ✓
- Horizontal Curves ✓

Problem Geometries

SMU Design Manual (6.2.2.9)

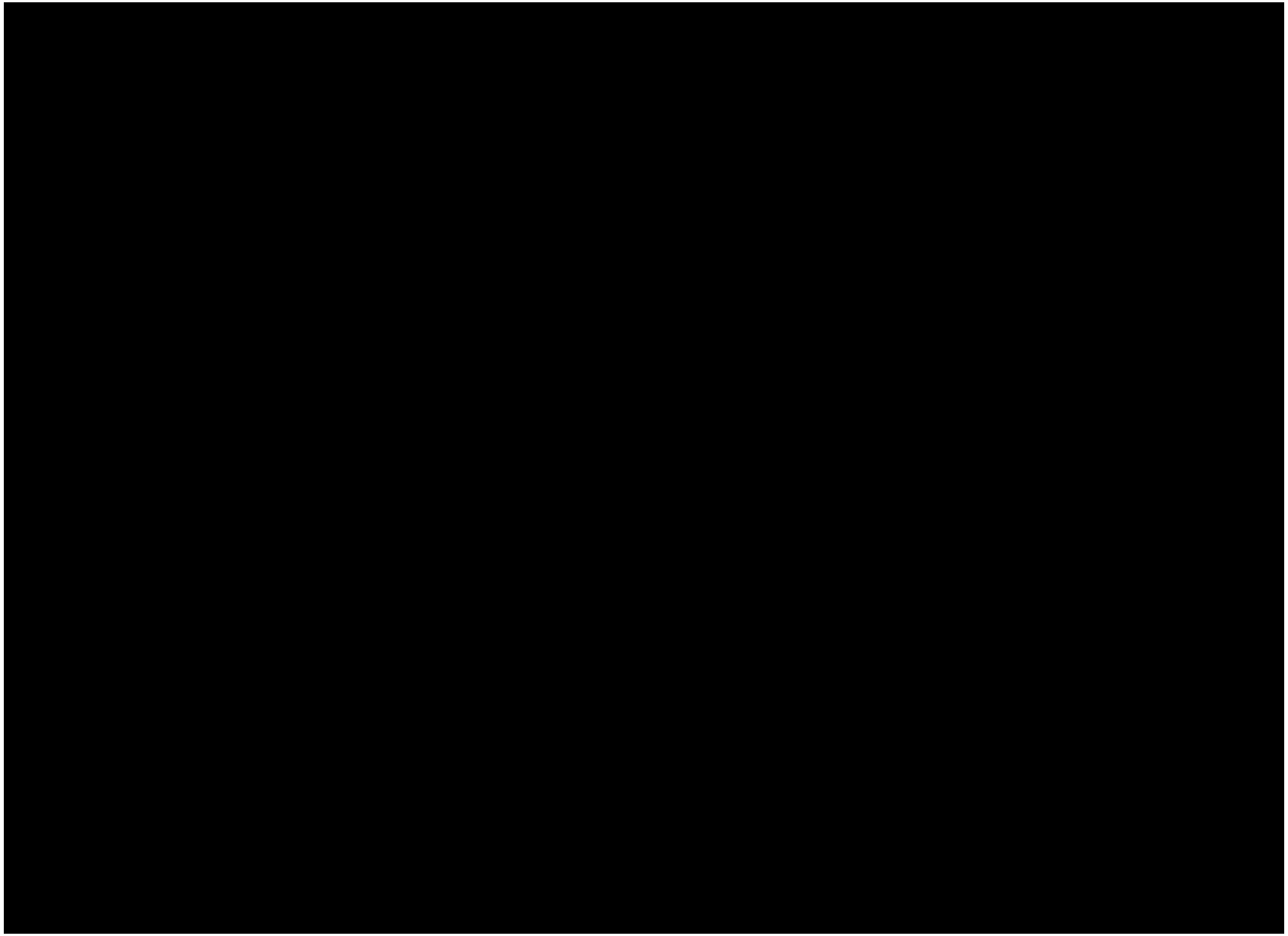
Bridges with 2 or more of the following:

- Skew ≤ 75º or ≥ 105º
- Vertical Curve
- Transitioning Superelevation
- Crown

Also crown transitions pose problems.

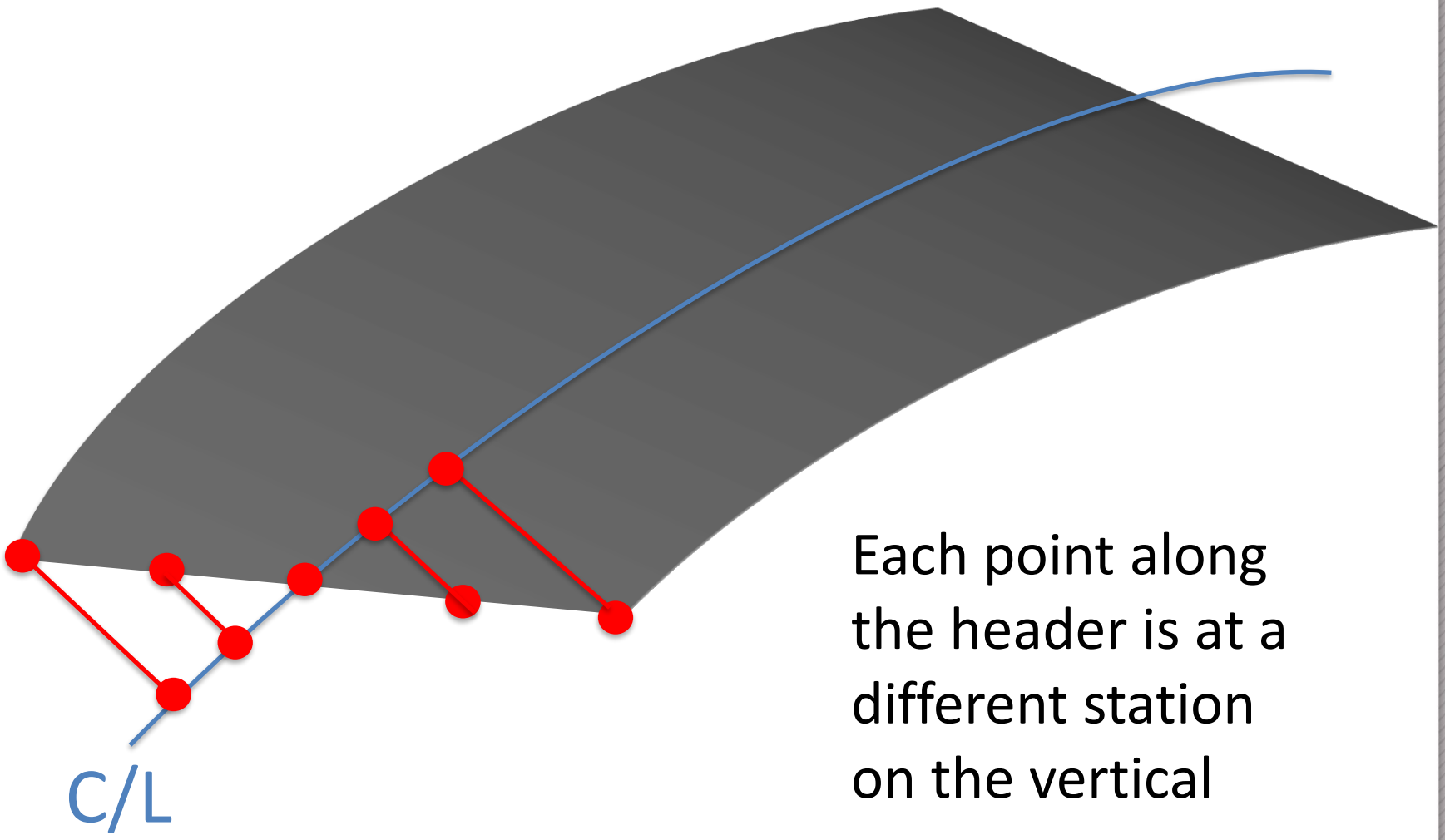
Skew + Crown

- Screed bogey wobbles across the crown point. This will round off the crown.
- Very difficult to get a good dry run
- One side of the deck will likely have low cover and will be low at the joint

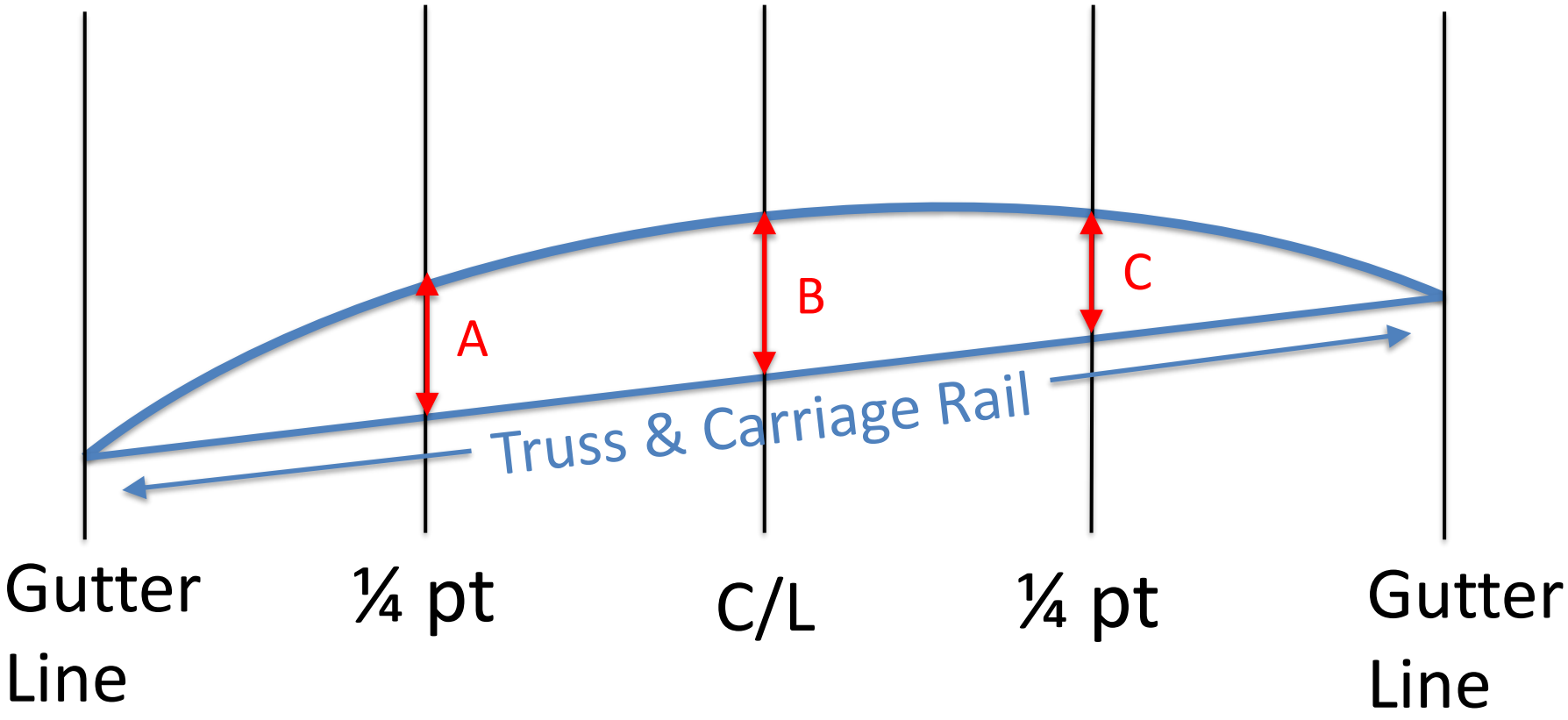


Skew + Vertical = Impossible

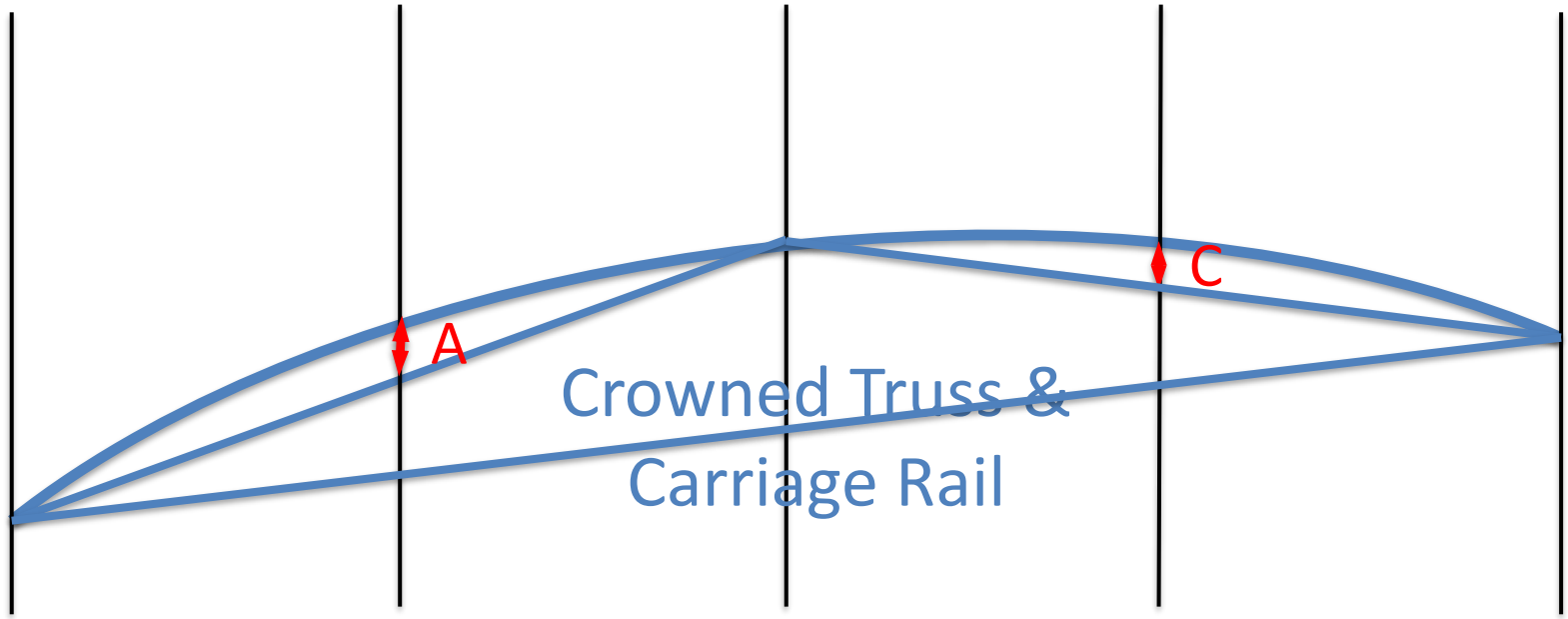
- You can not set up a screed to finish correctly across the whole deck with this geometry, but we can minimize the effects



Each point along the header is at a different station on the vertical curve.



Header plots as a parabolic curve



Header plots as a parabolic curve

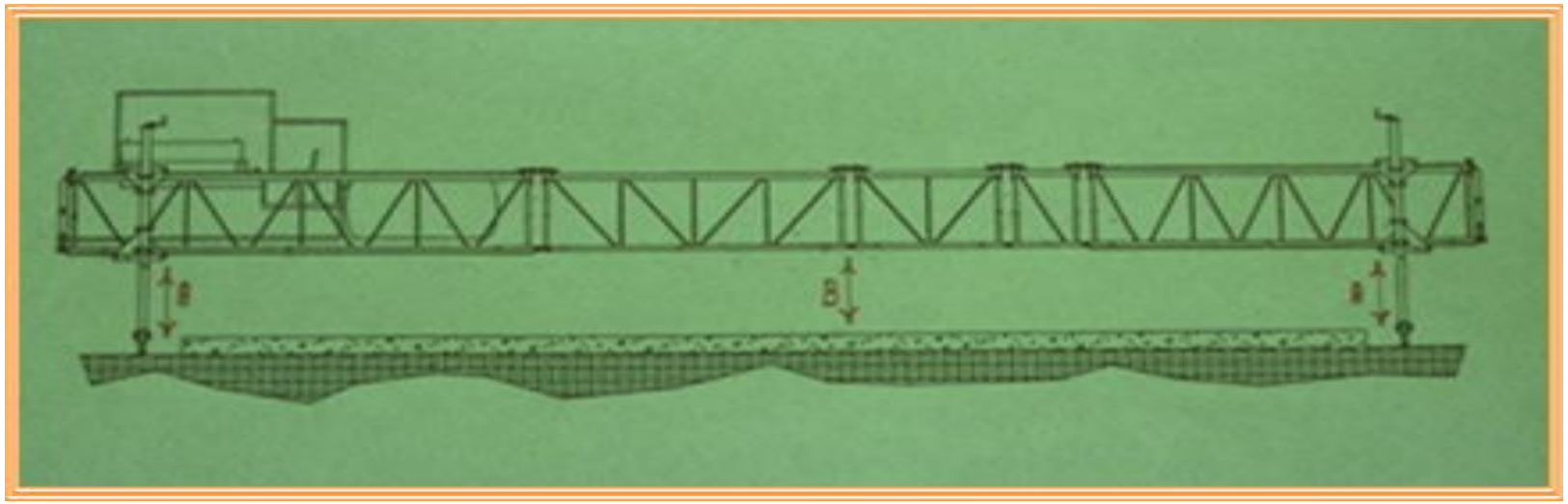
EB2 CL of Jt.								
Location	Control Point	Offset From Control	Header Station	Top of Slab El. (A)	Dist Along Header	Screed El. (B)	B-A (ft.)	B-A (in.)
	1	-49.6250	45+09.3741	396.6223	0.0000			
Gutterline	2	-48.0000	45+08.6003	396.6104	1.7977	396.6104	0.0000	0"
	3	-46.0000	45+07.6486	396.6558	2.2124	396.6554	-0.0004	-0
	4	-44.0000	45+06.6973	396.7011	2.2123	396.7003	-0.0008	-0
	5	-42.0000	45+05.7467	396.7464	2.2122	396.7452	-0.0012	-0
	6	-40.0000	45+04.7966	396.7916	2.2120	396.7902	-0.0014	-0
	7	-38.0000	45+03.8470	396.8369	2.2119	396.8351	-0.0018	-0
	8	-36.0000	45+02.8980	396.8821	2.2118	396.8801	-0.0020	-0
	9	-34.0000	45+01.9496	396.9272	2.2116	396.9250	-0.0022	-0
	10	-32.0000	45+01.0017	396.9724	2.2115	396.9699	-0.0025	-0
	11	-30.0000	45+00.0544	397.0175	2.2114	397.0149	-0.0026	- 1/16
	12	-28.0000	44+99.1076	397.0626	2.2112	397.0598	-0.0028	- 1/16
	13	-26.0000	44+98.1614	397.1077	2.2111	397.1047	-0.0030	- 1/16
	14	-24.0000	44+97.2157	397.1527	2.2110	397.1496	-0.0031	- 1/16
	15	-22.0000	44+96.2705	397.1977	2.2109	397.1946	-0.0031	- 1/16
	16	-20.0000	44+95.3260	397.2490	2.2107	397.2395	-0.0095	- 2/16
	17	-18.0000	44+94.3819	397.2970	2.2106	397.2844	-0.0126	- 2/16
	18	-16.0000	44+93.4385	397.3392	2.2105	397.3293	-0.0099	- 2/16
	19	-14.0000	44+92.4955	397.3830	2.2103	397.3742	-0.0088	- 2/16
	20	-12.0000	44+91.5532	397.4224	2.2102	397.4191	-0.0033	- 1/16
	21	-10.0000	44+90.6113	397.4672	2.2101	397.4640	-0.0032	- 1/16
	22	-8.0000	44+89.6701	397.5121	2.2100	397.5089	-0.0032	- 1/16
	23	-6.0000	44+88.7293	397.5569	2.2098	397.5538	-0.0031	- 1/16
	24	-4.0000	44+87.7891	397.6016	2.2097	397.5987	-0.0029	- 1/16
	25	-2.0000	44+86.8495	397.6464	2.2096	397.6436	-0.0028	- 1/16
	26	0.0000	44+85.9104	397.6911	2.2094	397.6885	-0.0026	-0
	27	2.0000	44+84.9719	397.7358	2.2093	397.7334	-0.0024	-0
	28	4.0000	44+84.0338	397.7805	2.2092	397.7783	-0.0022	-0
	29	6.0000	44+83.0964	397.8251	2.2091	397.8232	-0.0019	-0
	30	8.0000	44+82.1595	397.8697	2.2089	397.8680	-0.0017	-0
	31	10.0000	44+81.2231	397.9143	2.2088	397.9129	-0.0014	-0
	32	12.0000	44+80.2873	397.9589	2.2087	397.9578	-0.0011	-0

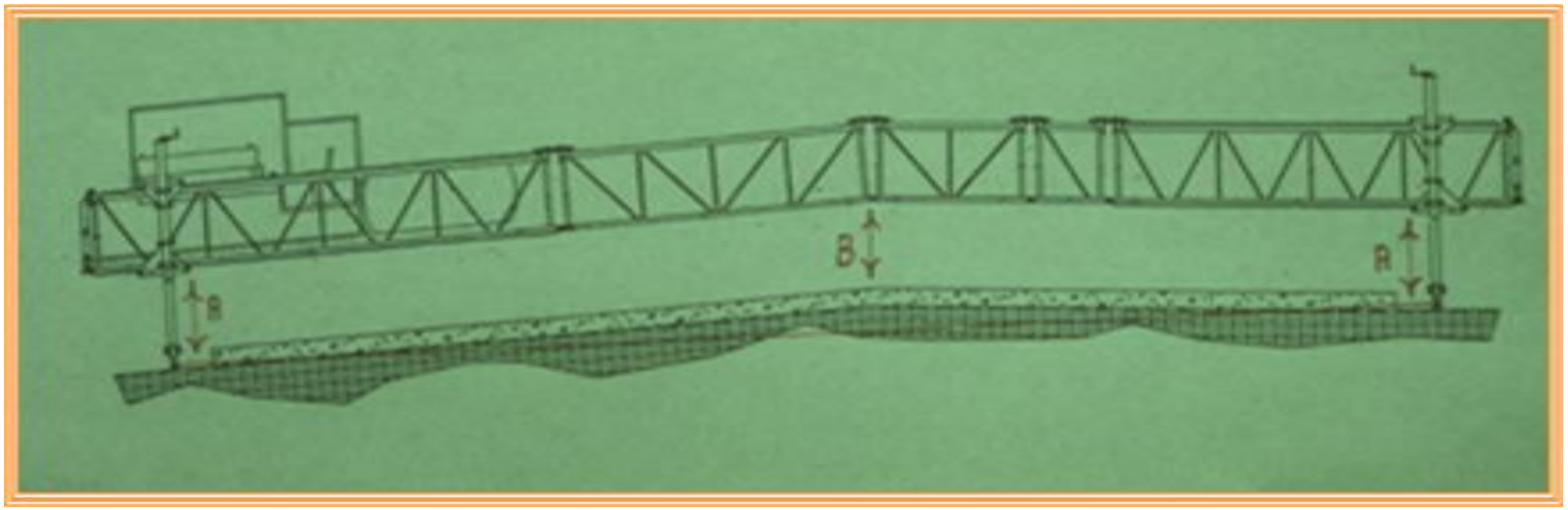
Worst Case

Skew + Vertical = Impossible

- Parabolic curve is different at every point along the vertical curve. Therefore, even if modifications to the carriage rail could be made, it will still not be perfect.

Transitioning Super/Crown



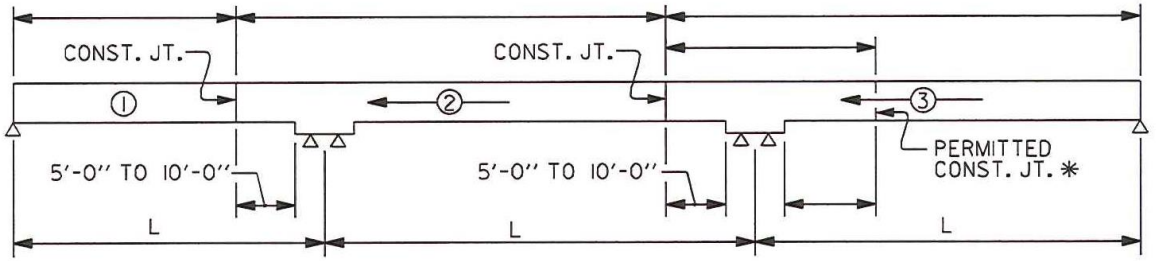


Transitioning Super/Crown

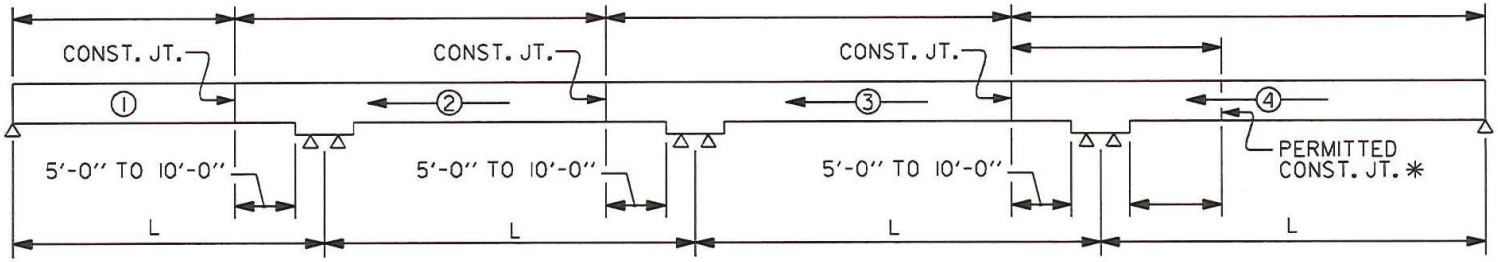
Problem Geometries

Problem geometries can be mitigated for in many situations. If they are necessary, contact the RBCE to discuss.

Pour Sequences



3 SPANS

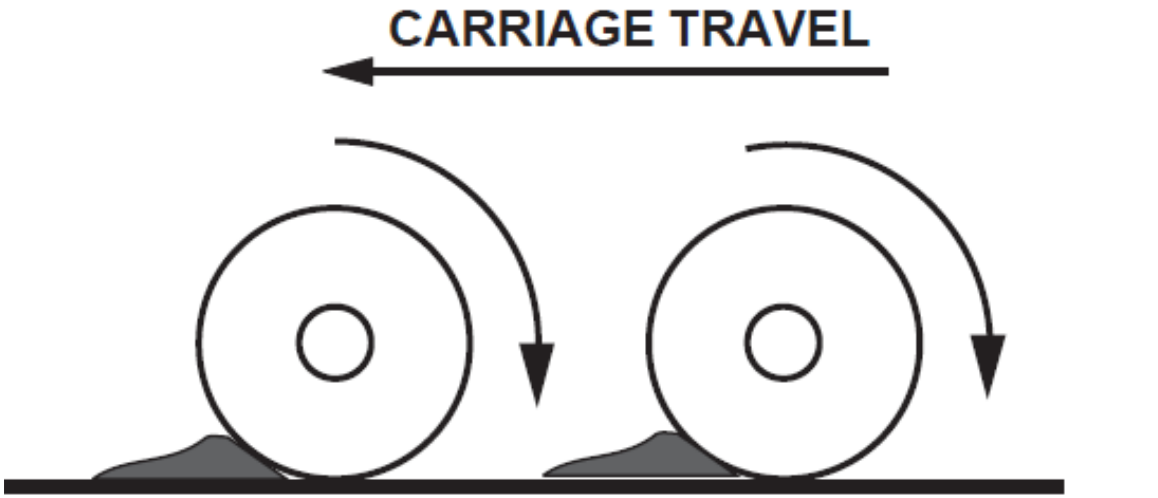


4 SPANS

POURING SEQUENCE-PRESTRESSED CONCRETE SUPERSTRUCTURE

(CONTINUOUS FOR LIVE LOAD)

What is a “finishing pass”?



Screed Setup Rules For Skews
(in order of importance)

1. Finish from leading edge to trailing edge
2. Finish up the superelevation
3. Finish downhill

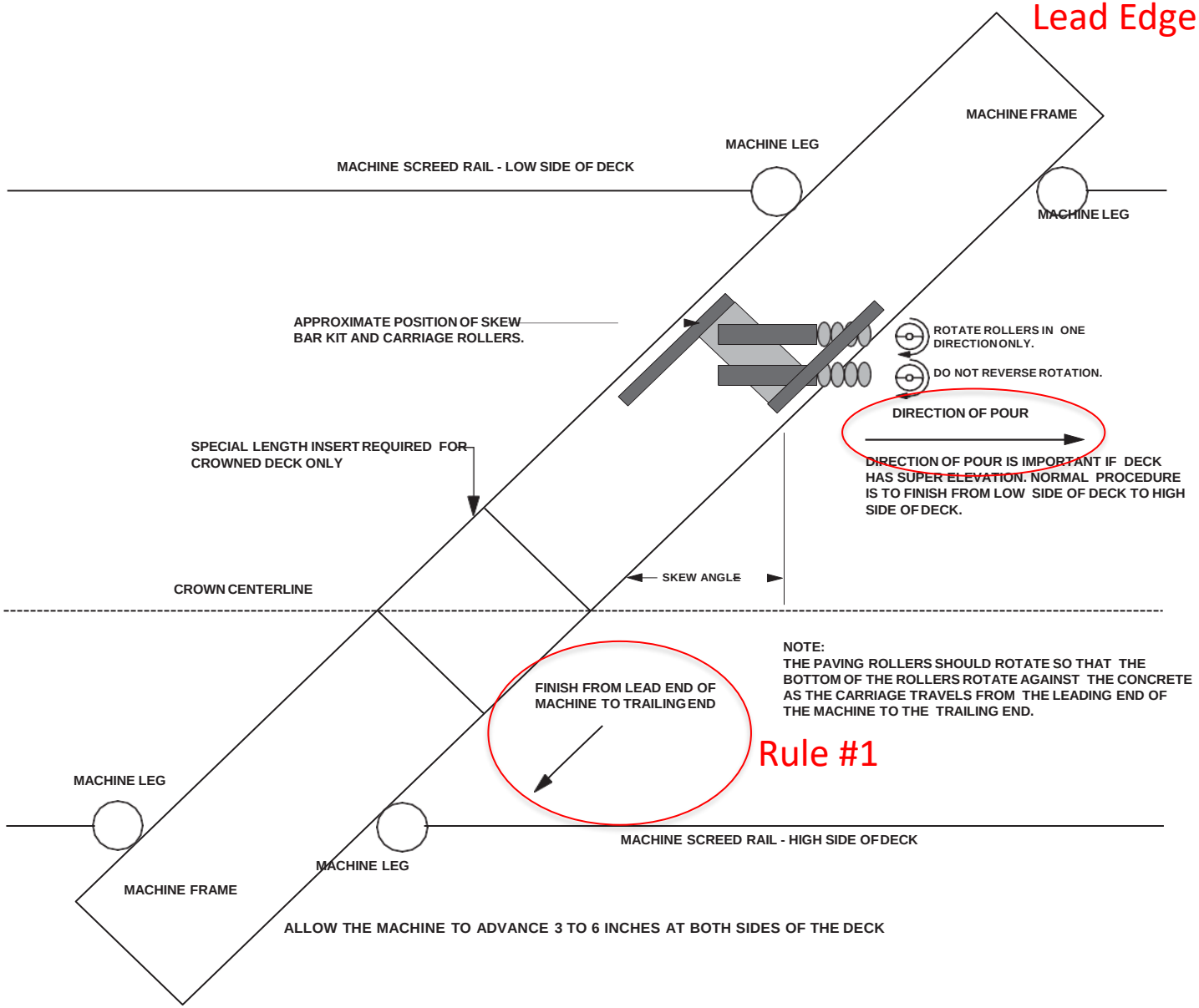


Figure 2 – Paving Skewed decks

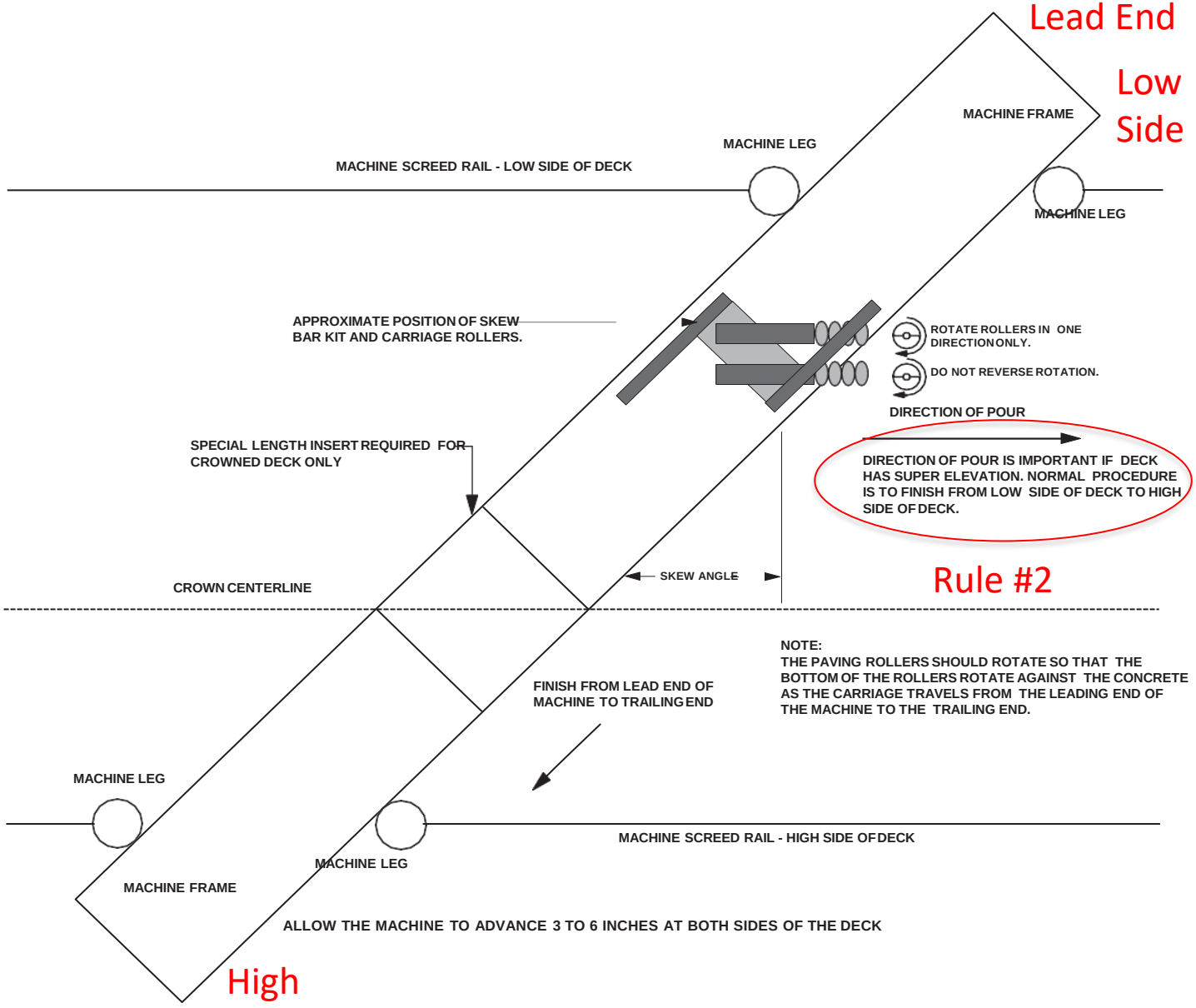
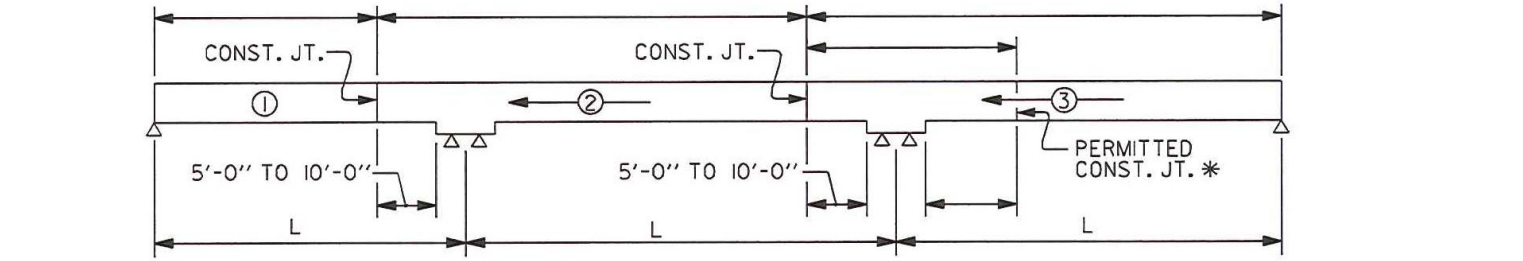
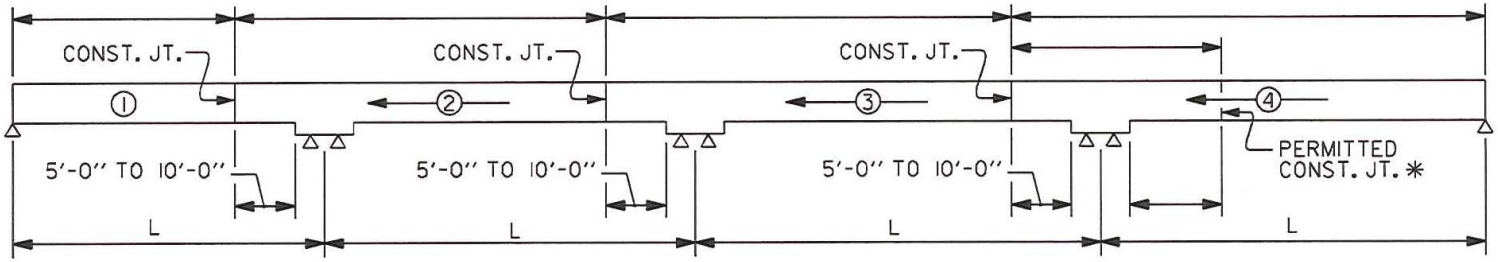


Figure 2 – Paving Skewed decks

Pour Sequences



3 SPANS

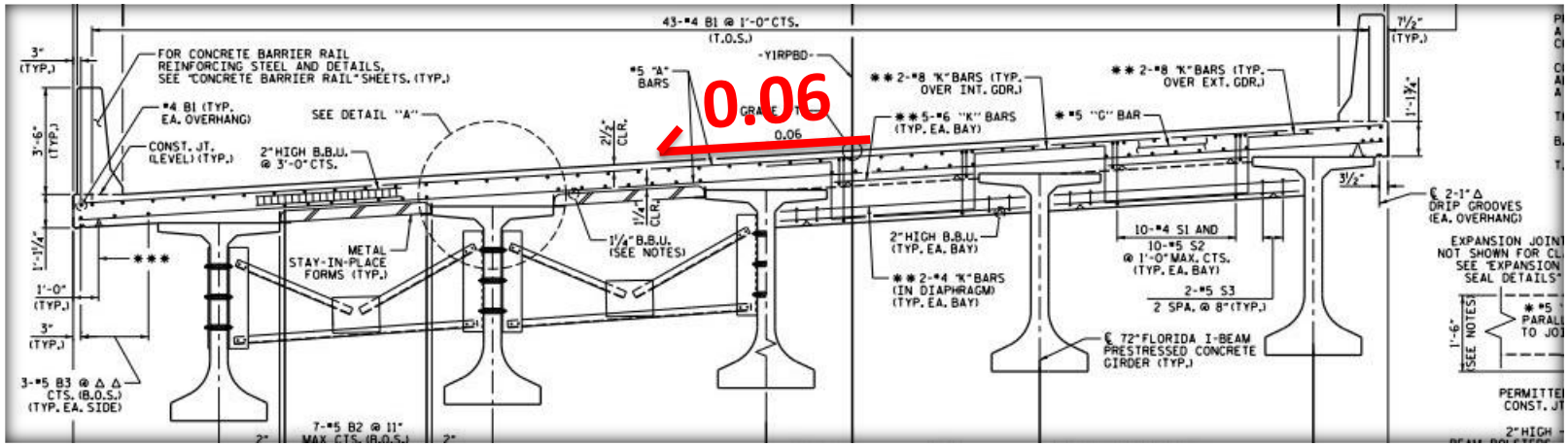


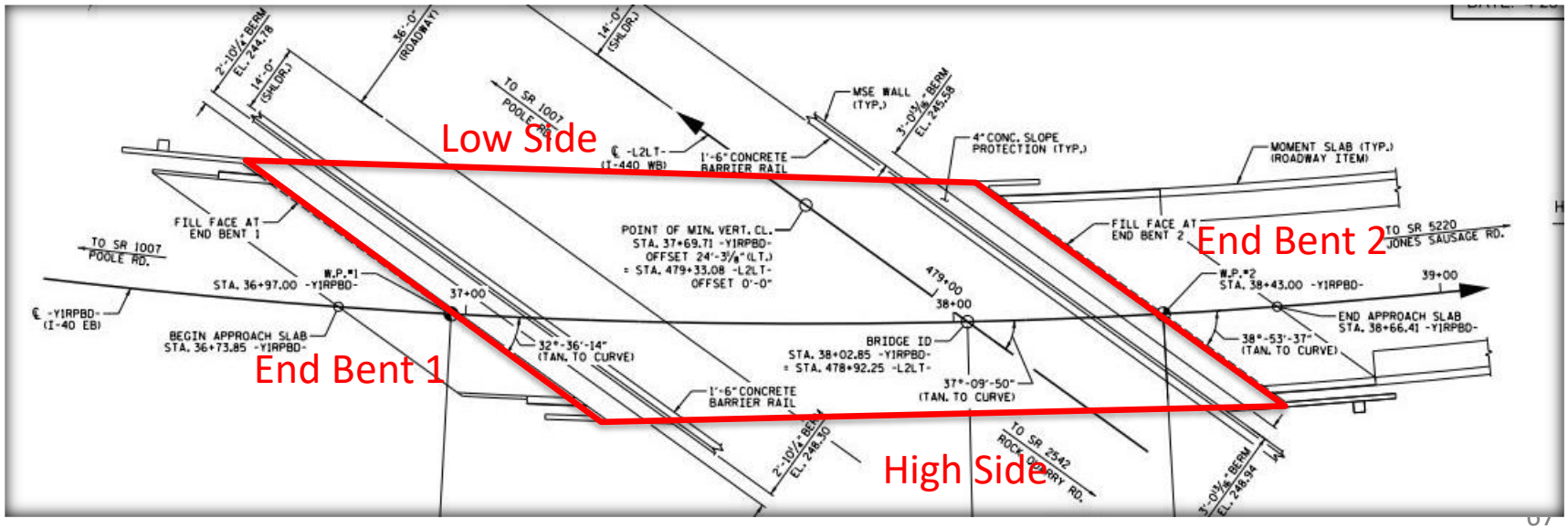
4 SPANS

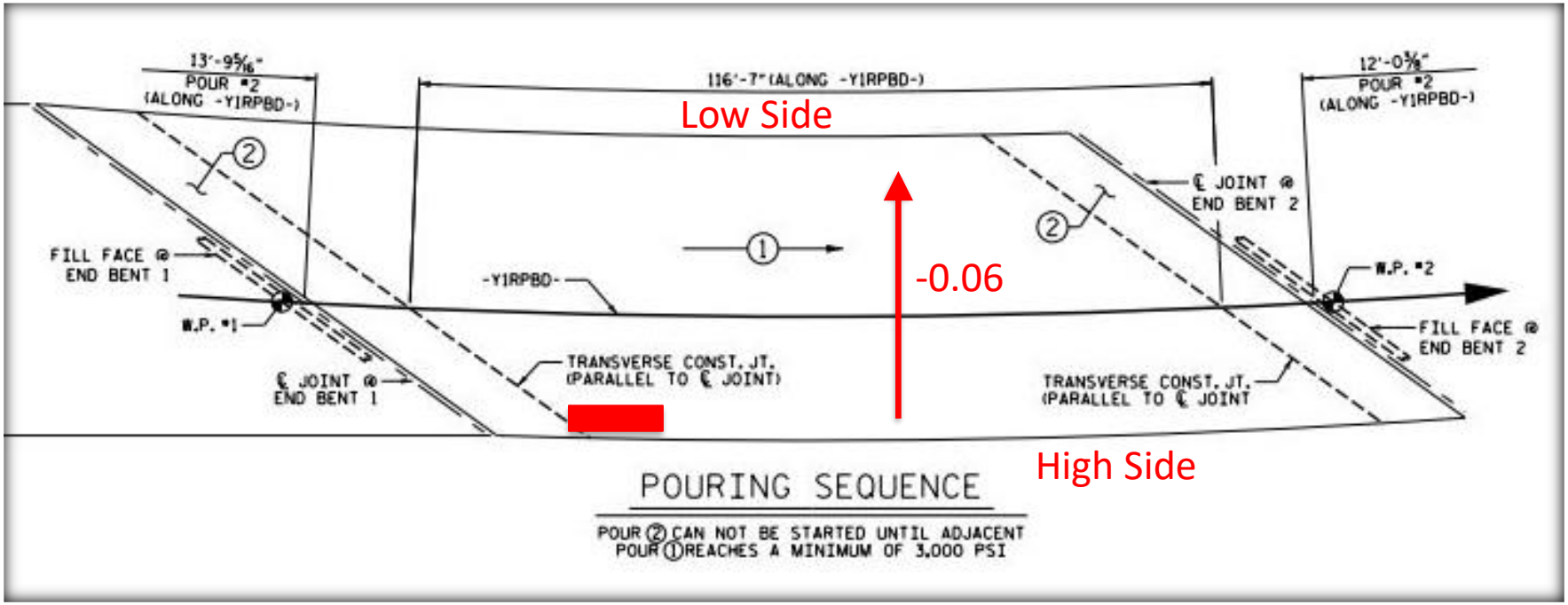
POURING SEQUENCE-PRESTRESSED CONCRETE SUPERSTRUCTURE

(CONTINUOUS FOR LIVE LOAD)

Pour Sequence Example



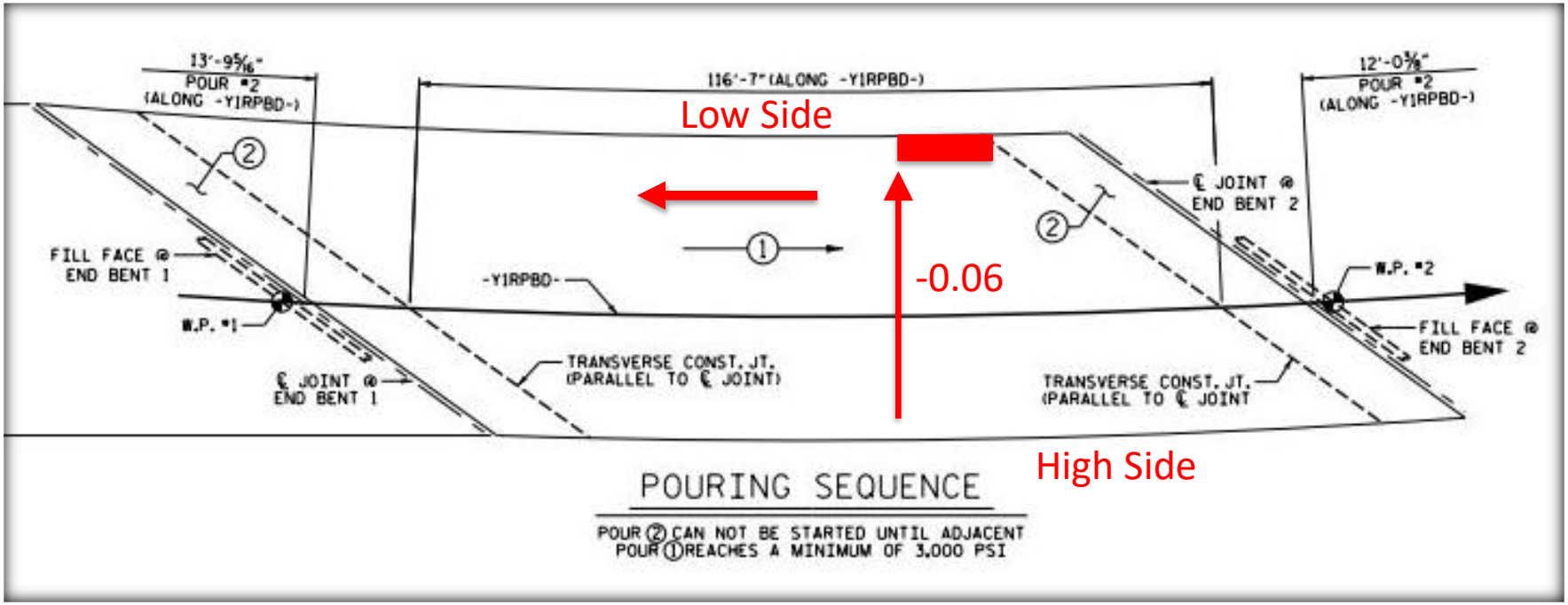




Is the Pour Direction Correct?

1) Finish from leading edge of skew to trailing edge ✓

2) Finish from low side of super to high side ✗



Is the Pour Direction Correct?

1) Finish from leading edge of skew to trailing edge ✓

2) Finish from low side of super to high side ✓

Screed Setup Rules For Skews
(in order of importance)

✓1. Finish from leading edge to trailing edge

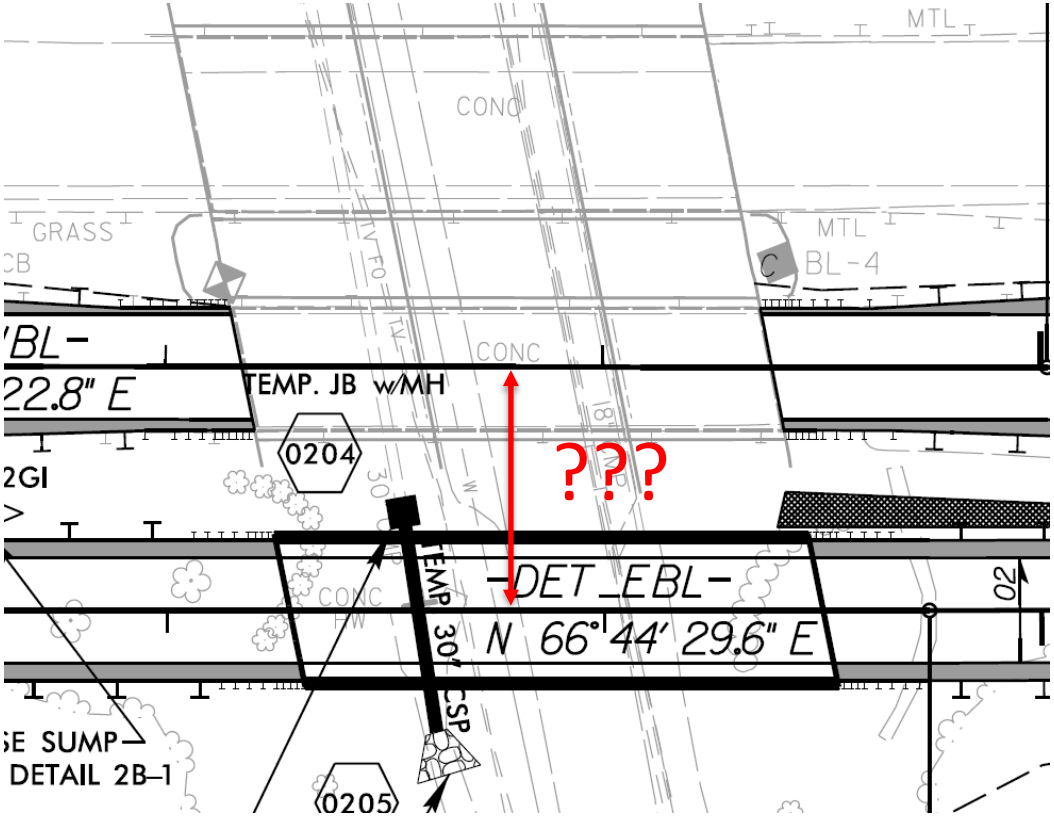
✓2. Finish up the superelevation

3. Finish downhill
   - Change from Past (Design Manual Being Updated)
   - Least Important of the 3 Rules

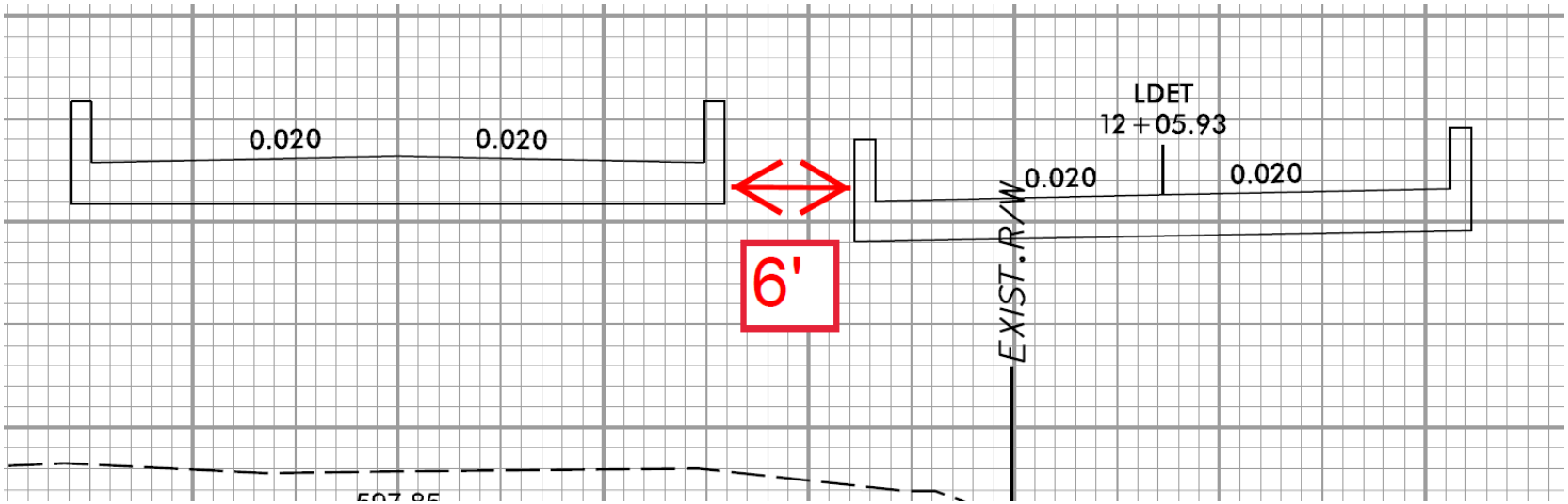
Detour Bridge Offsets

Temporary Bridge Clearance

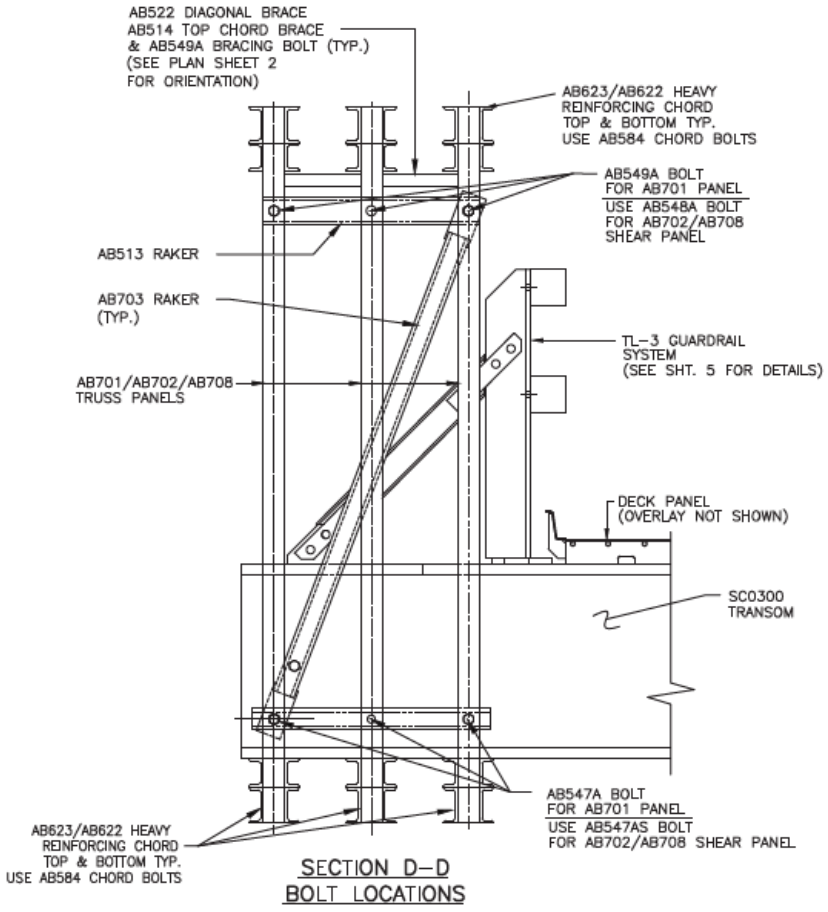
- How much room do we need between the temporary bridge and the work?



Is this enough?



Is The Truss Width Accounted For?

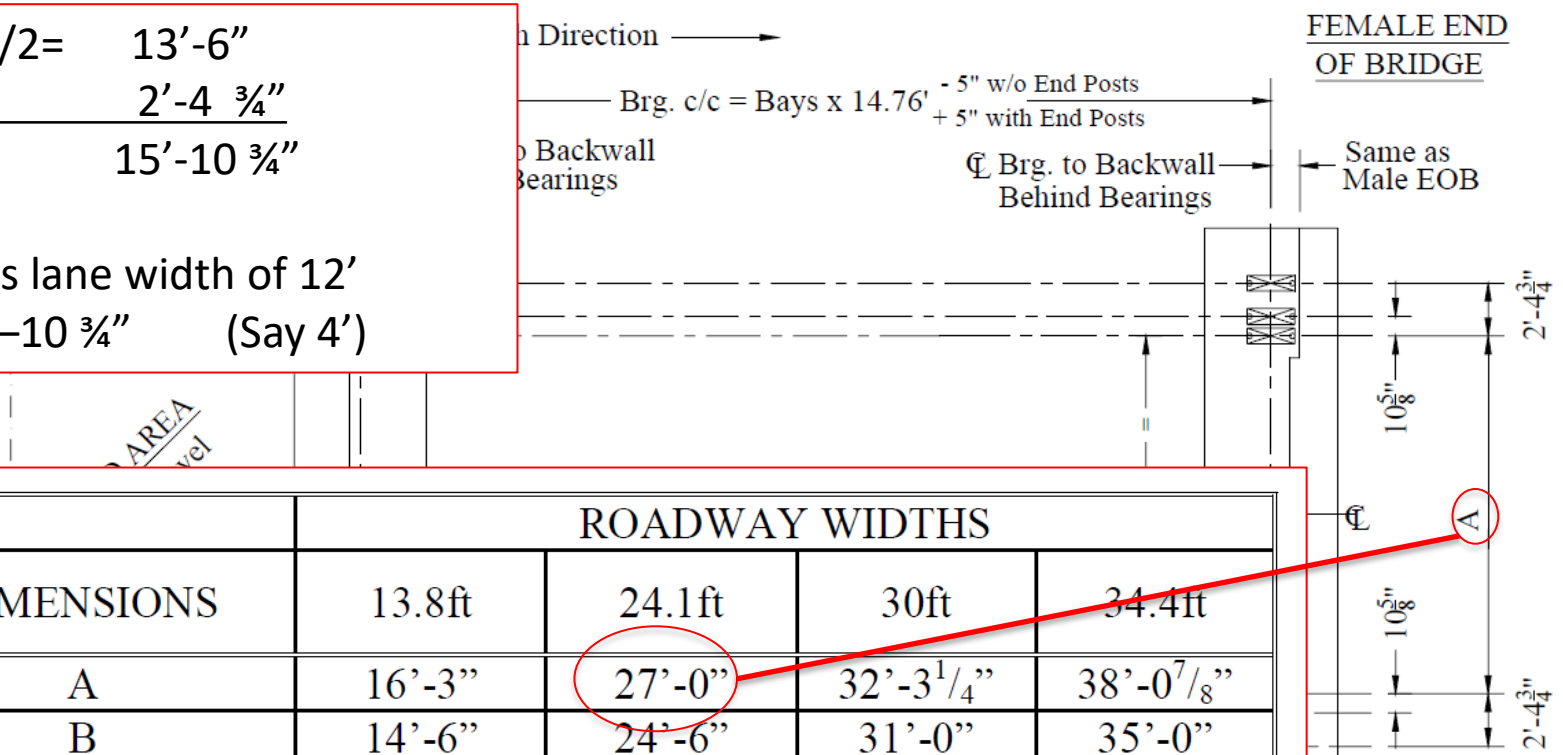


Mabey Measurements

TYPICAL FOUNDATION LAYOUT

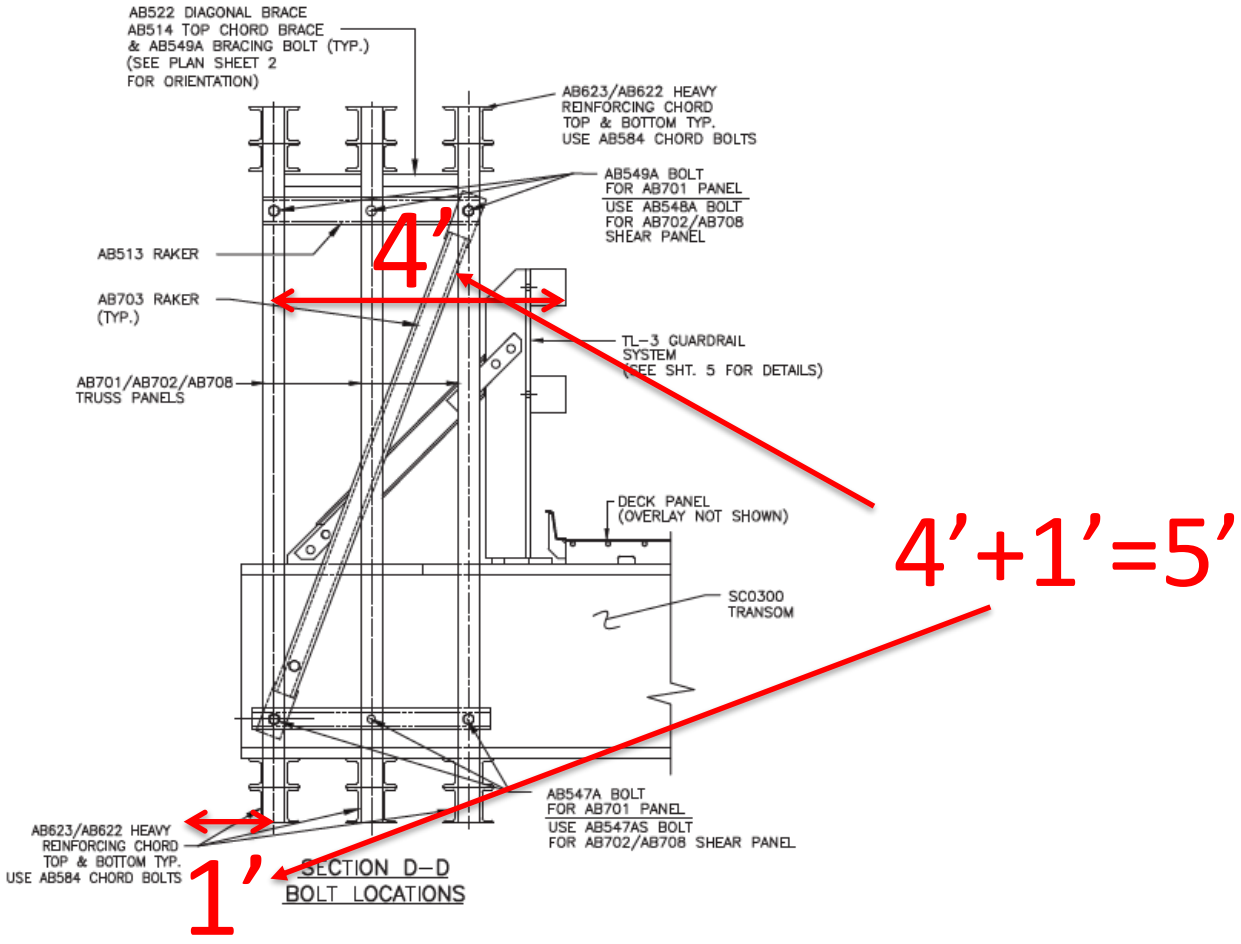
27’/2= 13’-6”
+ 2’-4 ¾”
15’-10 ¾”

Less lane width of 12’
3’–10 ¾” (Say 4’)

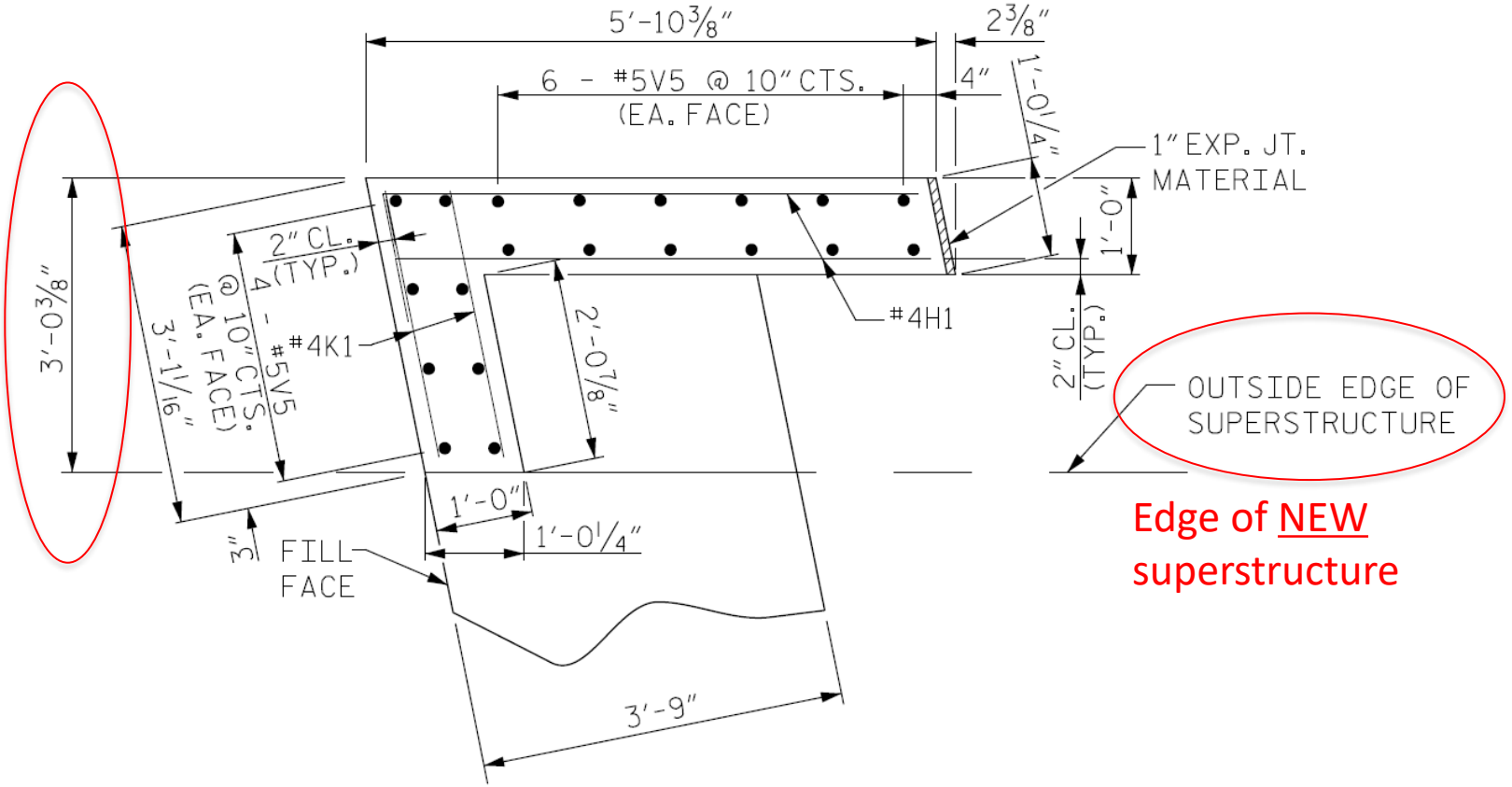


DIMENSIONS	ROADWAY WIDTHS			
	13.8ft	24.1ft	30ft	34.4ft
A	16’-3”	27’-0”	32’-3 1/4”	38’-0 7/8”
B	14’-6”	24’-6”	31’-0”	35’-0”
C	2’-10 1/4”	3’-6”	3’-6 3/8”	3’-9 1/2”
D	5 3/4”*	6 1/8”*	6 3/16”*	6 3/4”*
E	9 5/8”*	9 13/16”*	9 13/16”*	10 5/16”*

Is The Truss Width Accounted For?

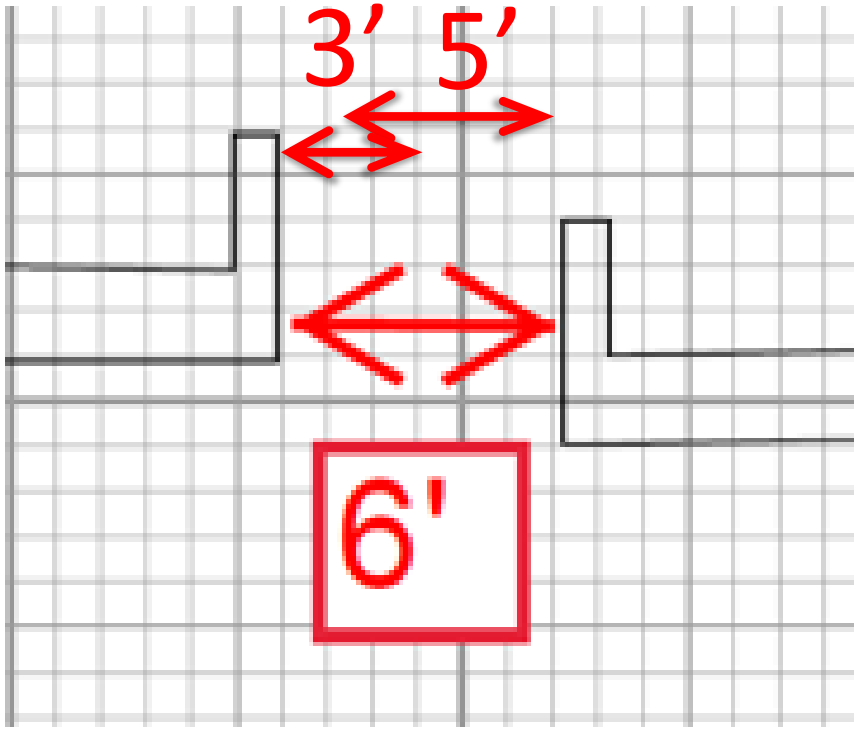


New Wing Outside Superstructure

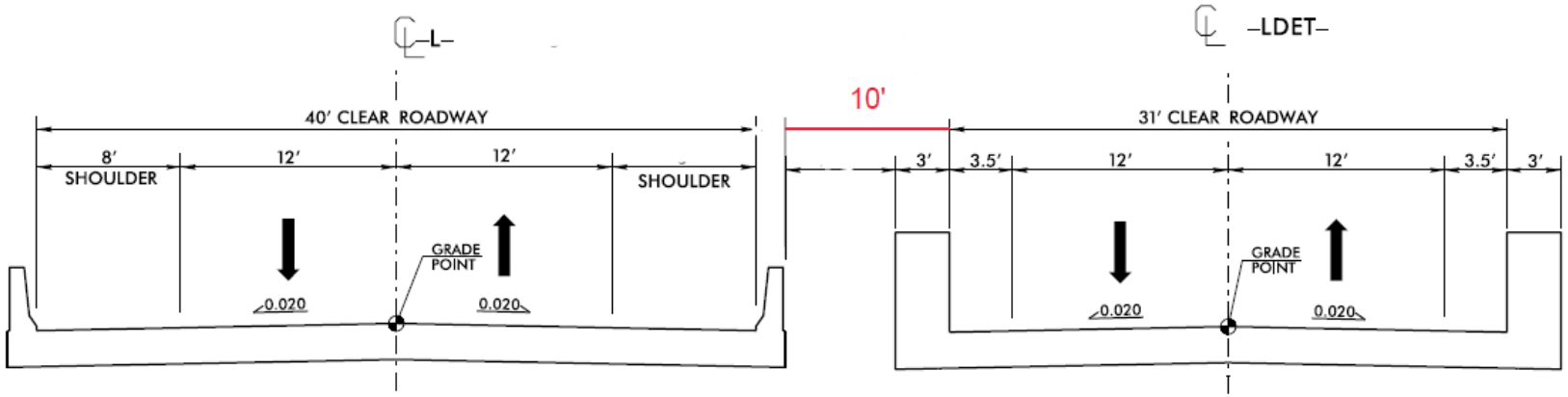


Edge of NEW superstructure

Is this enough?

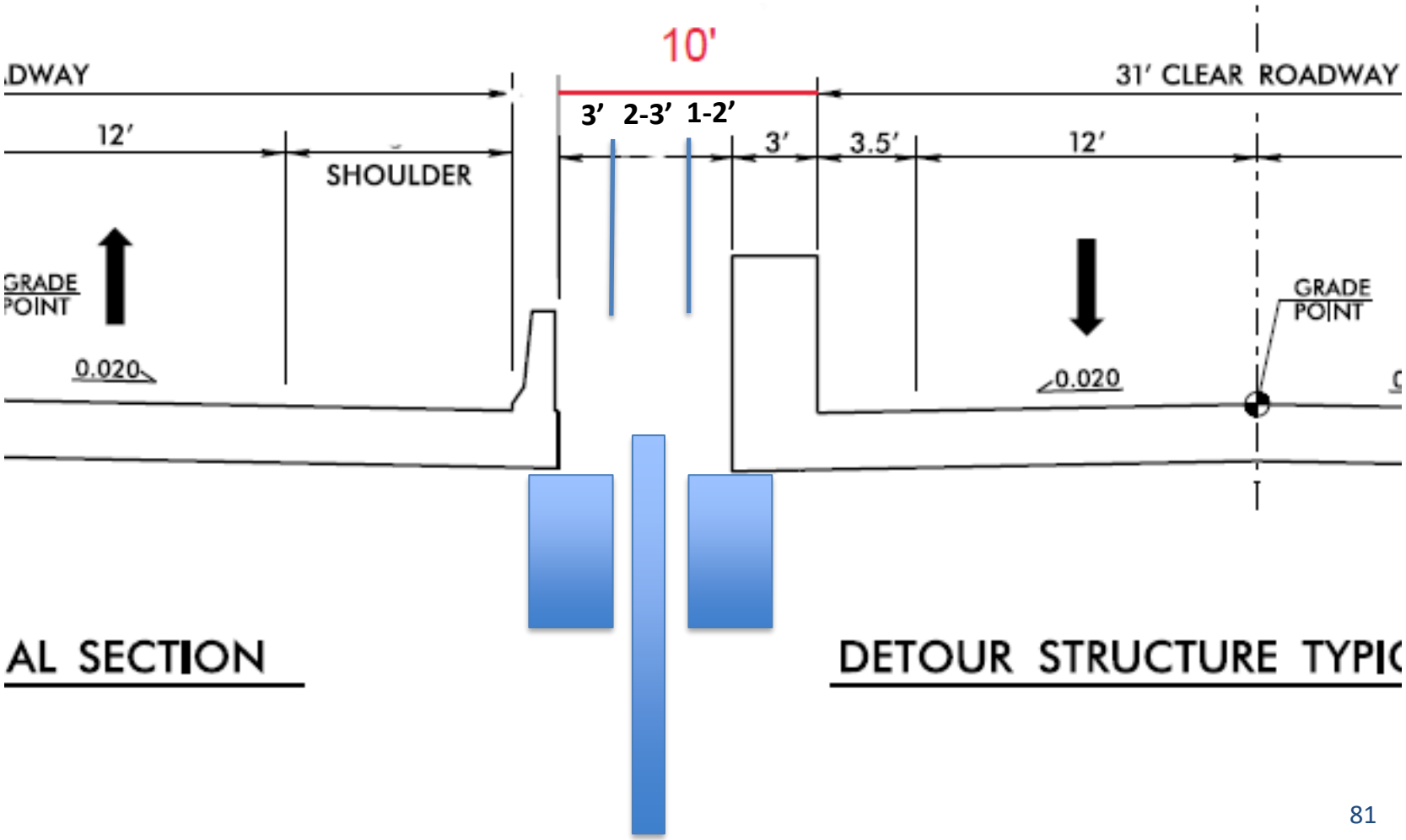


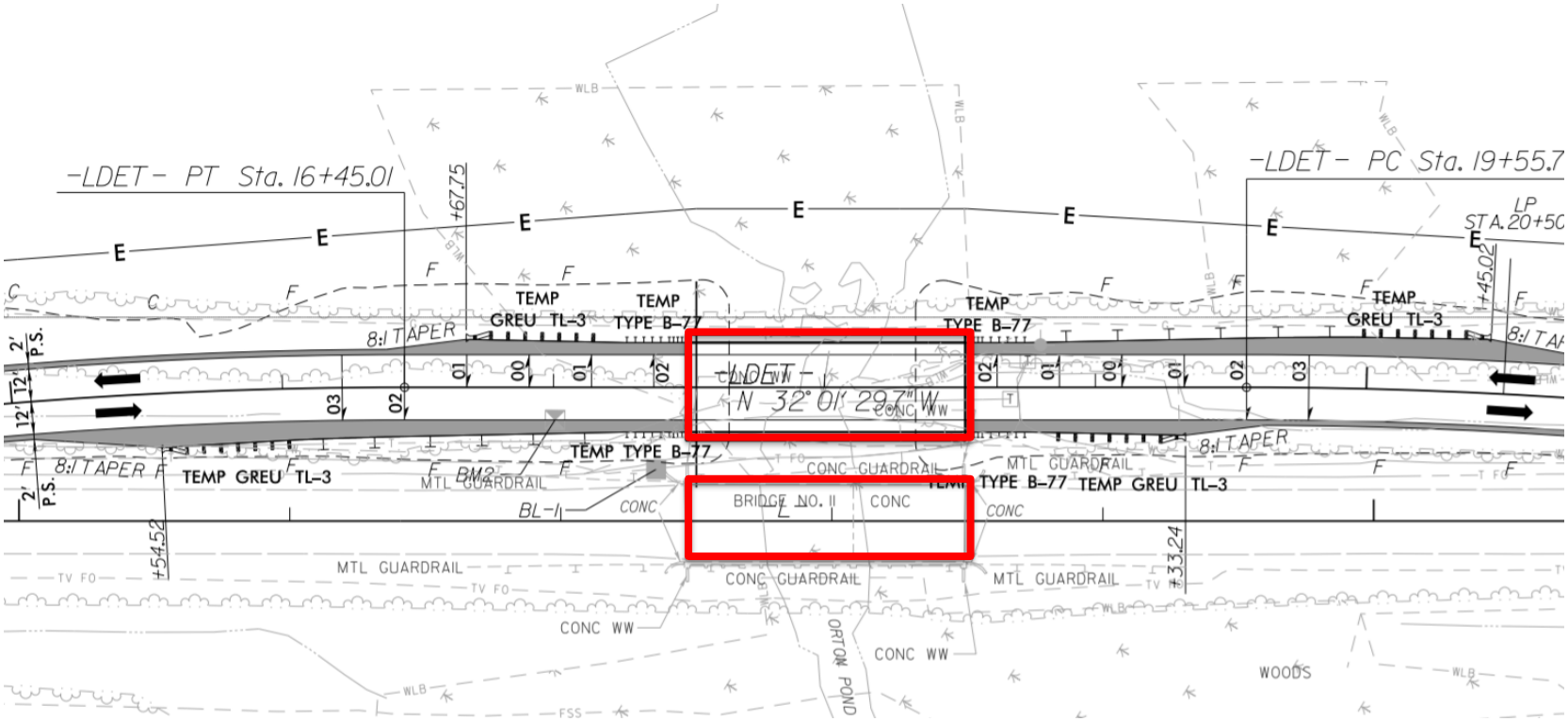
Where do we put the shoring?

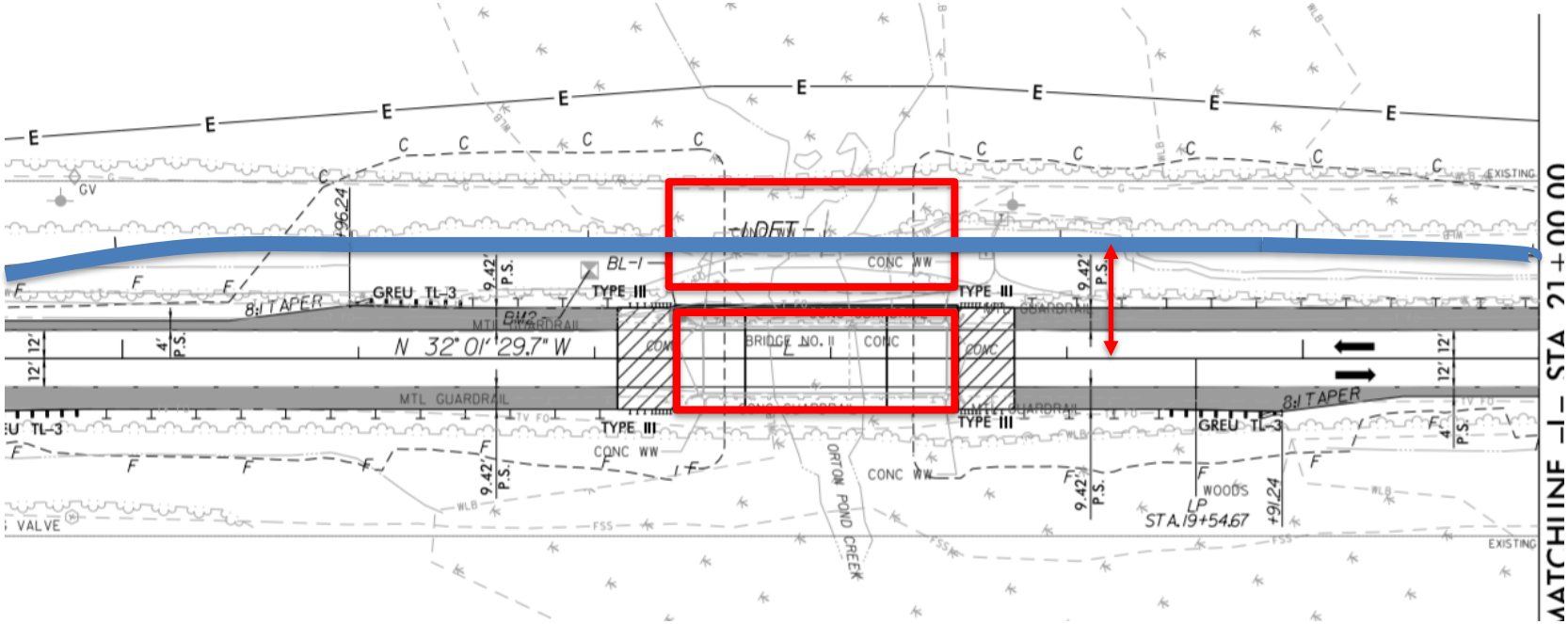


STRUCTURE TYPICAL SECTION

DETOUR STRUCTURE TYPICAL SECTION


10'
DWAY
31' CLEAR ROADWAY
12'
SHOULDER
3' 2-3' 1-2'
3'
3.5'
12'
GRADE POINT
0.020
0.020
GRADE POINT
AL SECTION
DETOUR STRUCTURE TYPI


-LDET- PT Sta. 16+45.01
-LDET- PC Sta. 19+55.7
LP STA. 20+50
-LDET-
N 32° 01' 29.7"W
TEMP GREU TL-3
TEMP TYPE B-77
8:1 TAPER
MTL GUARDRAIL
CONC GUARDRAIL
CONC WW
BRIDGE NO. 11
CONC
BL-1
BM2
+67.75
+54.52
+45.02
+33.24
TV FO
WLB
FSS
ORTON POND
WOODS


-L- OFFSET
BL-1
GREU TL-3
8:1 TAPER
TYPE III
CONC WW
MTL GUARDRAIL
BM2
N 32° 01' 29.7" W
BRIDGE NO. 11
CONC
9.42' P.S.
12'
4' P.S.
ORTON POND CREEK
WOODS
LP
STA. 19+54.67
+91.24
EXISTING
MATCH LINE -L- STA. 21+00.00
GV
VALVE
WLB
FSS

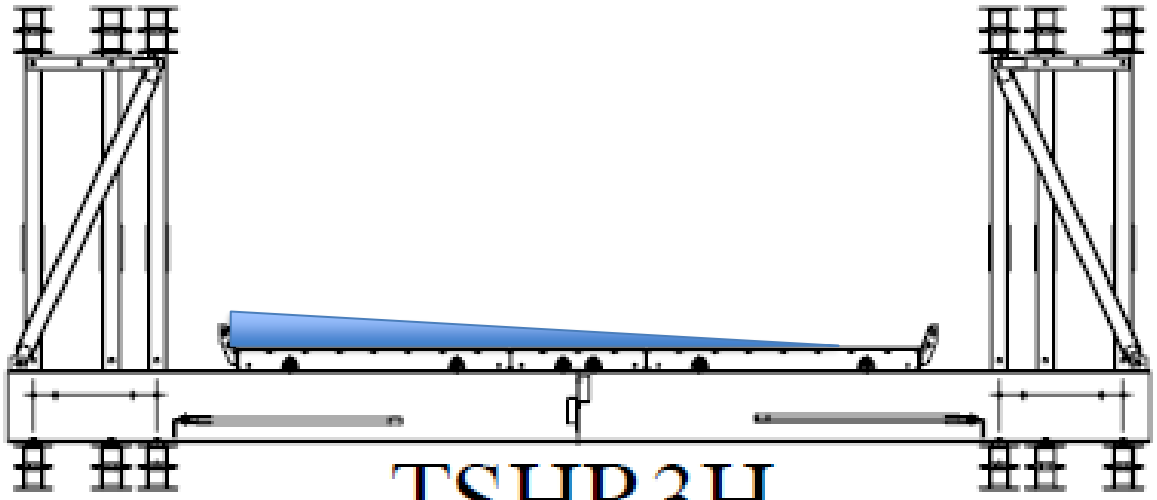
Acrow

- Standard Clear Roadway Widths
  - Acrow (12’, 24’, 30’, 36’, 42’)
    - Customized (26’, 32’) **limited inventory*

Deck Cross-Slope

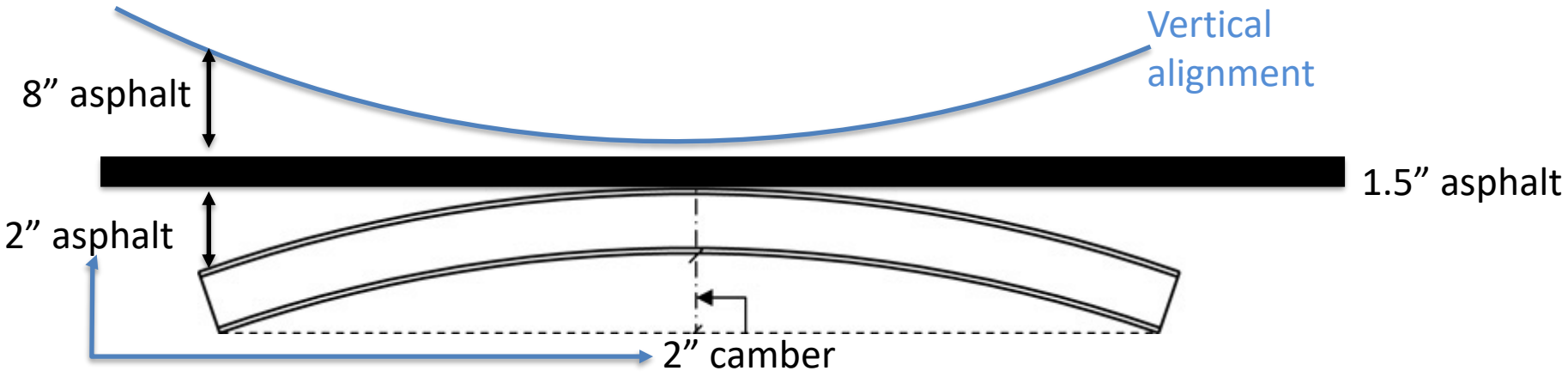
- Level Preferred
- Super-Elevation Discouraged
- Methods to Achieve Super-Elevation
  - Asphalt on Level Deck (Curb Height Limitations)
  - Tilted Bridge (1% Max; +1% Asphalt X-Slope)
    - Single spans less than 100’
  - Custom Sloping Transoms ($$)
- Crown Achieved with Asphalt Overlay (Min 2” at Curb)

Keep cross section as flat as possible

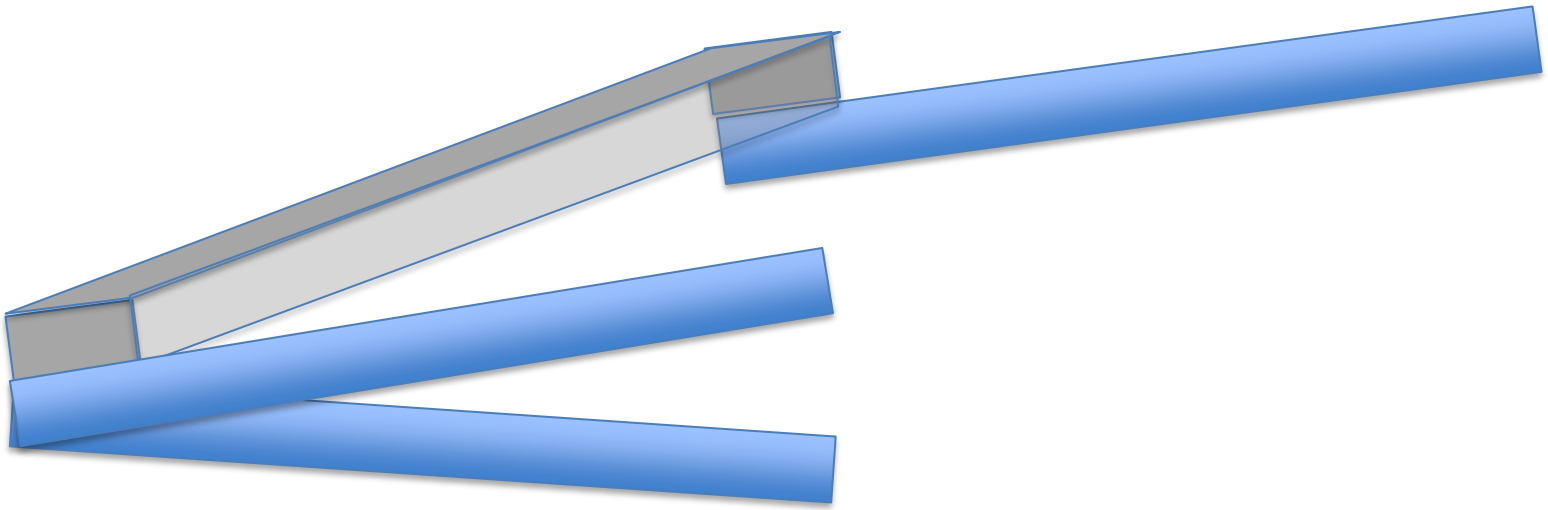


Tapered Transom

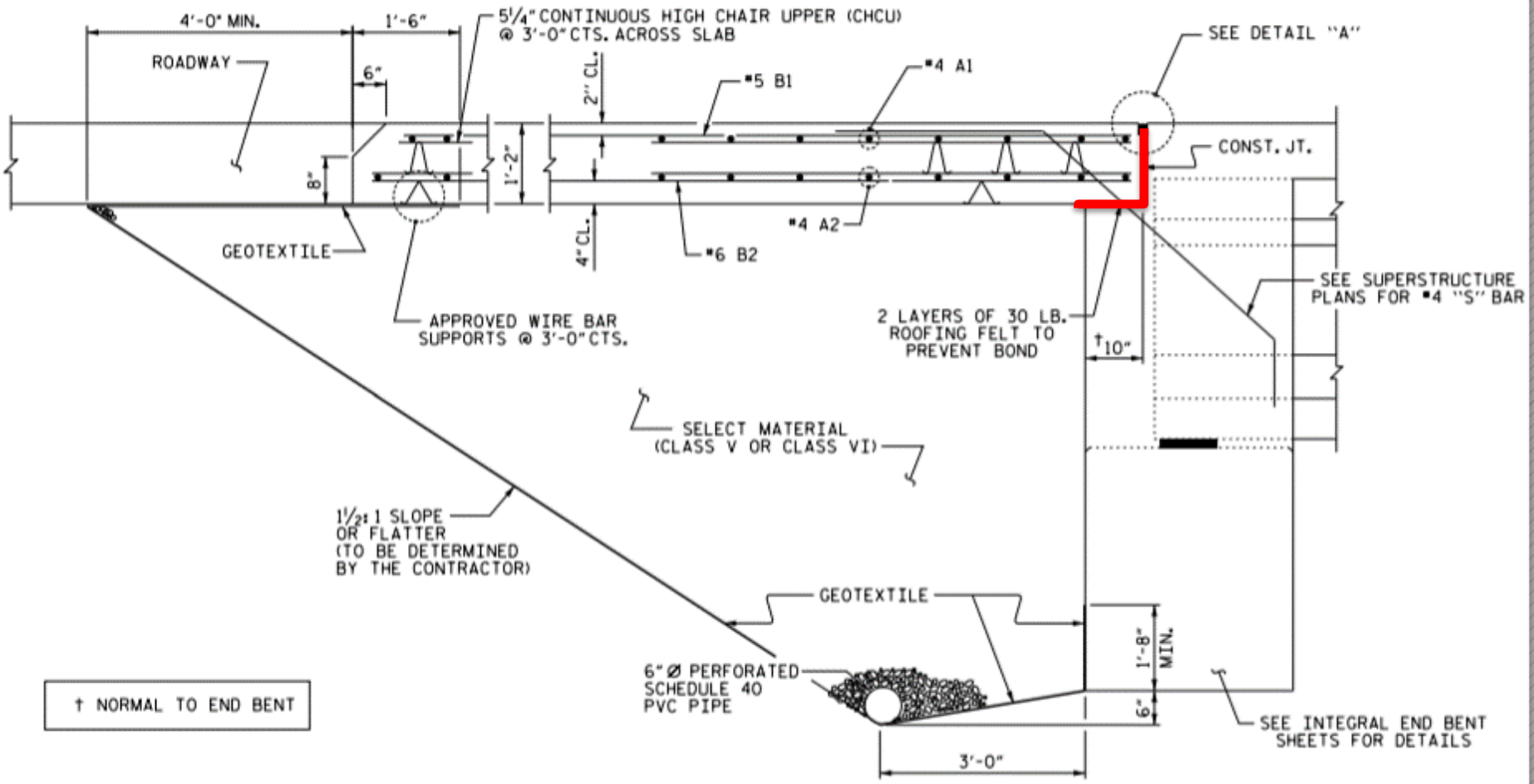
Vertical Curves on Cored Slabs

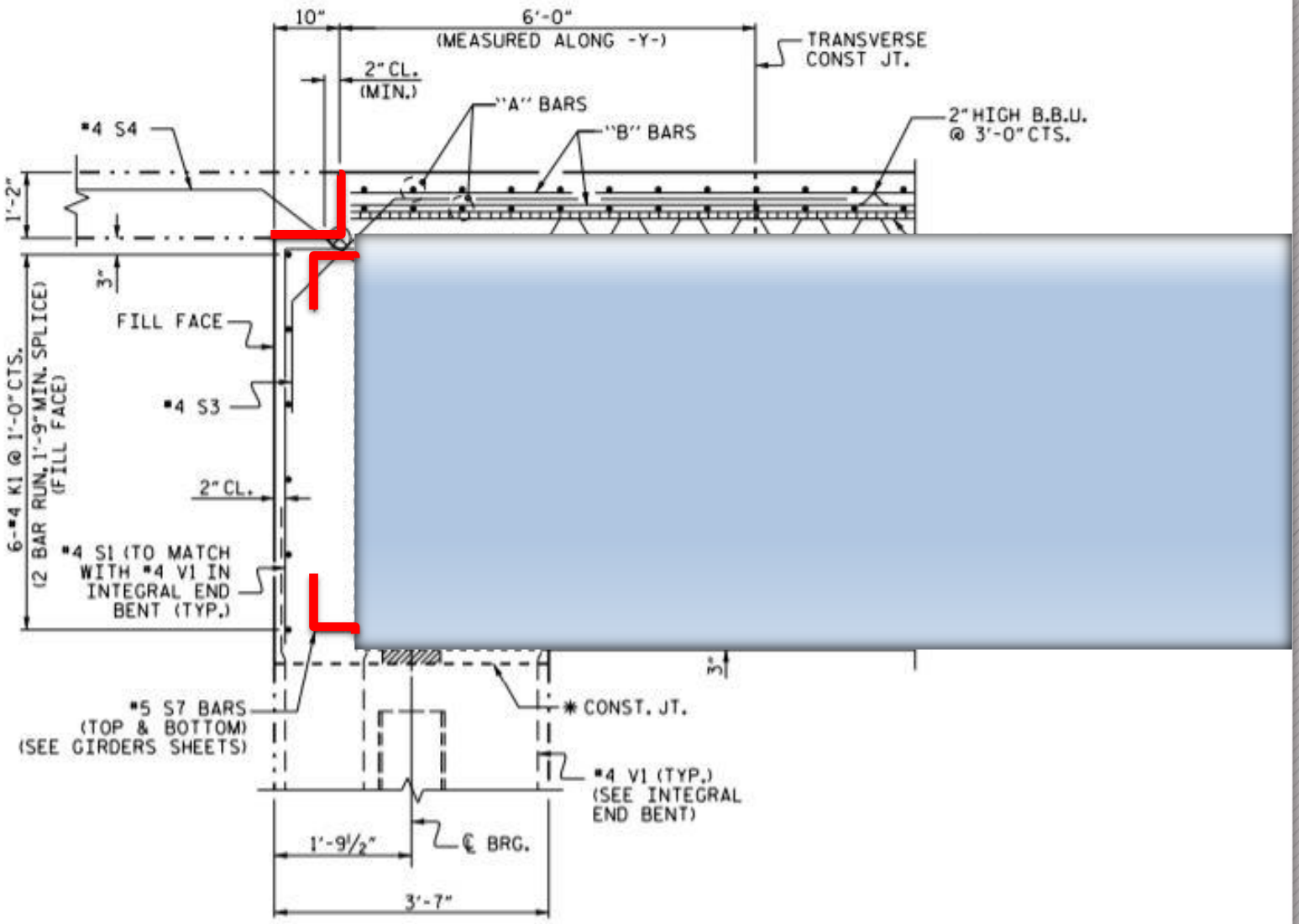


Cap Slopes on Cored Slabs

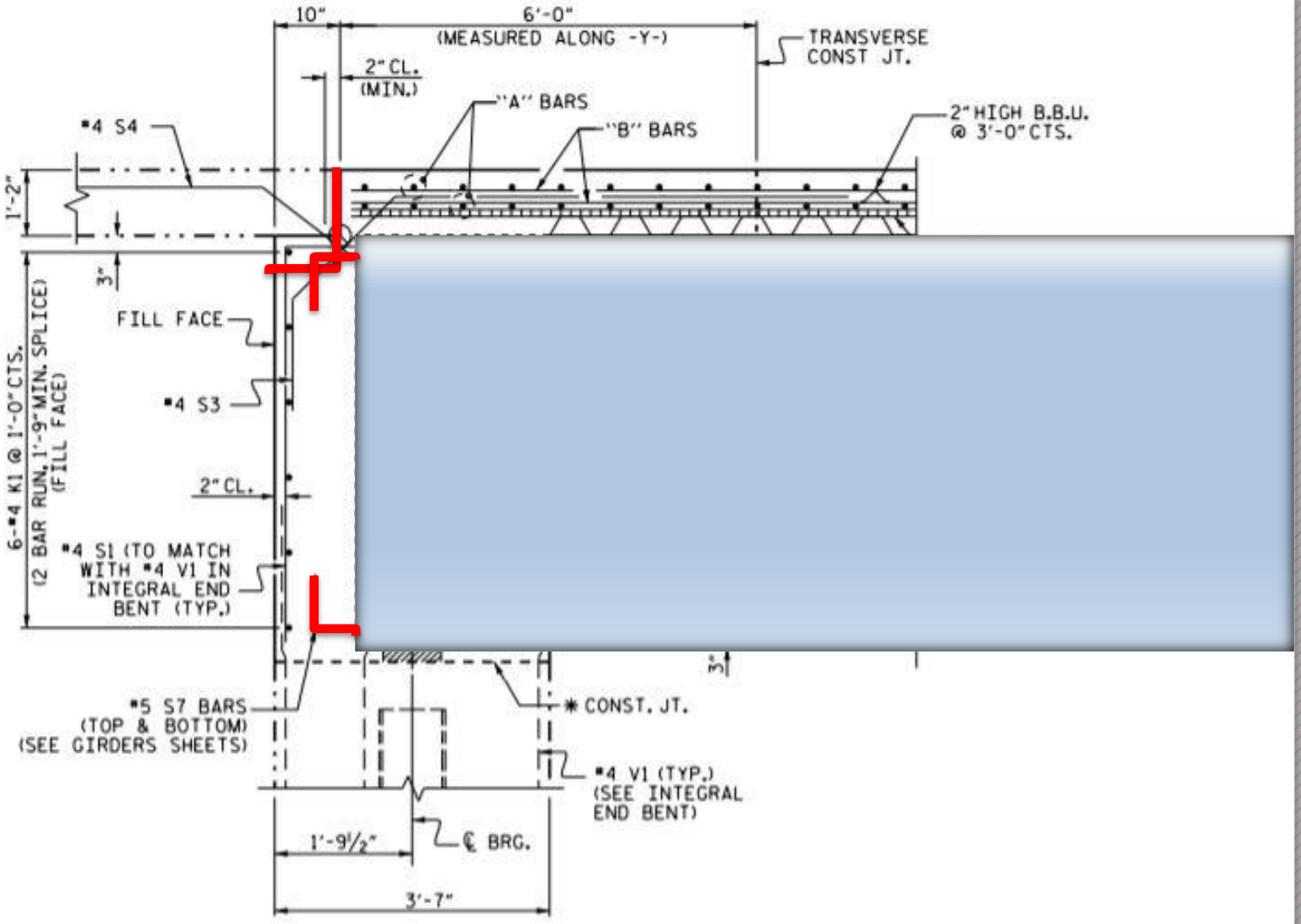


Girder Conflict On Integral Abutments

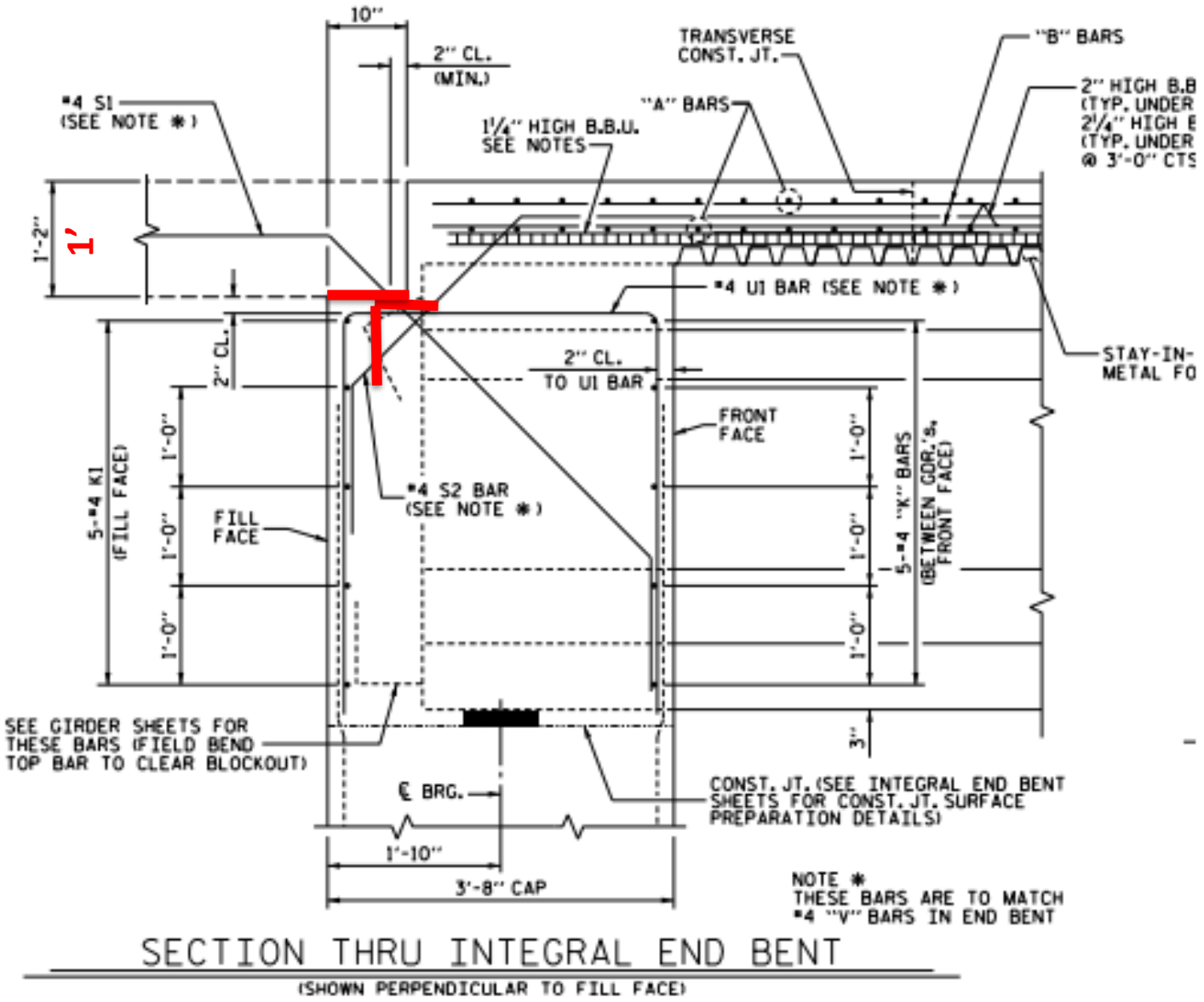

4'-0" MIN.
1'-6"
5¼" CONTINUOUS HIGH CHAIR UPPER (CHCU) @ 3'-0" CTS. ACROSS SLAB
SEE DETAIL "A"
ROADWAY
6"
2" CL.
#5 B1
#4 A1
8"
1'-2"
CONST. JT.
#4 A2
4" CL.
#6 B2
GEOTEXTILE
APPROVED WIRE BAR SUPPORTS @ 3'-0" CTS.
SEE SUPERSTRUCTURE PLANS FOR #4 "S" BAR
2 LAYERS OF 30 LB. ROOFING FELT TO PREVENT BOND
†10"
SELECT MATERIAL (CLASS V OR CLASS VI)
1½:1 SLOPE OR FLATTER (TO BE DETERMINED BY THE CONTRACTOR)
GEOTEXTILE
1'-8" MIN.
6"
6" Ø PERFORATED SCHEDULE 40 PVC PIPE
SEE INTEGRAL END BENT SHEETS FOR DETAILS
3'-0"
† NORMAL TO END BENT



SECTION THRU INTEGRAL END BENT



SECTION THRU INTEGRAL END BENT

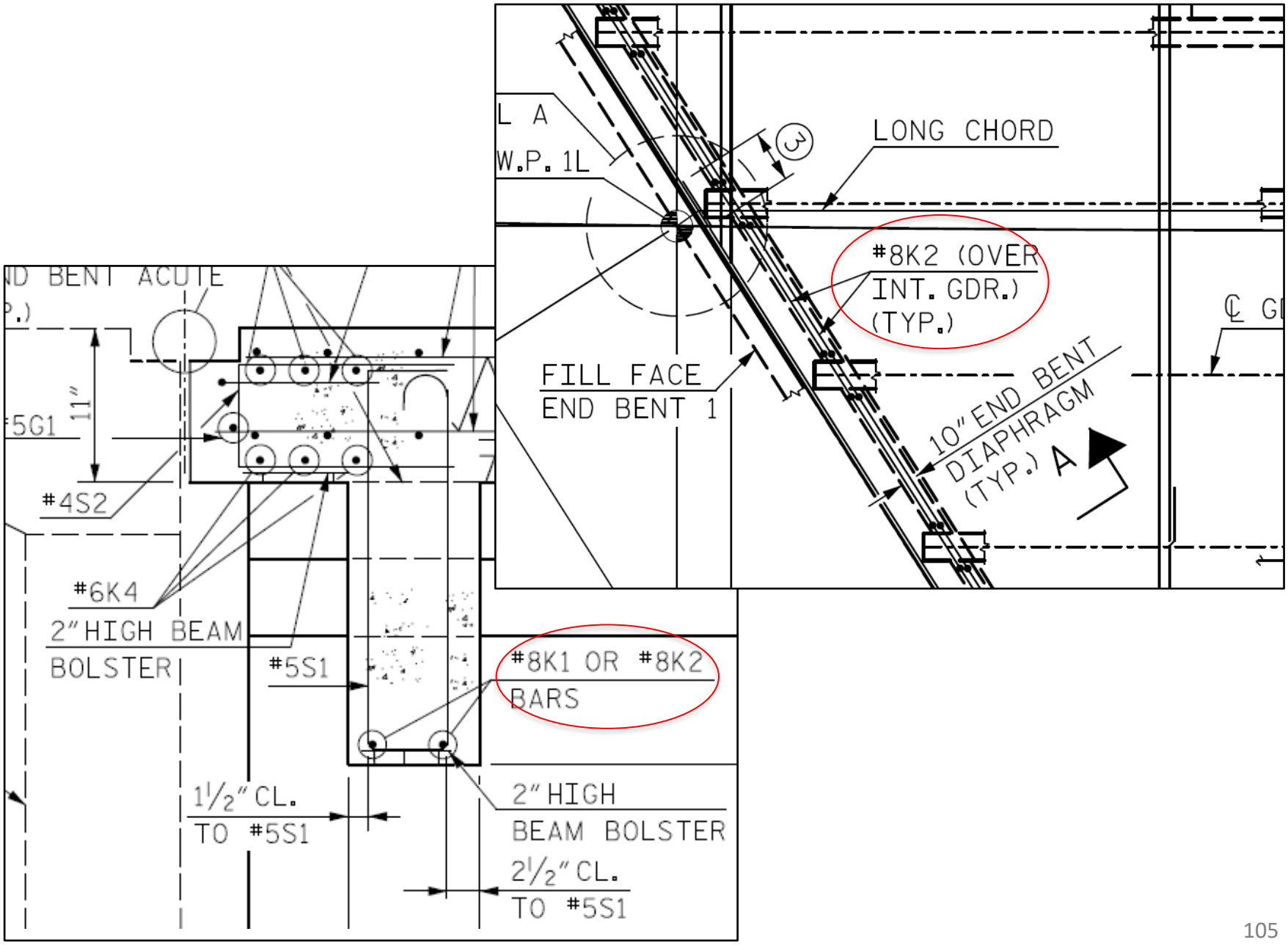


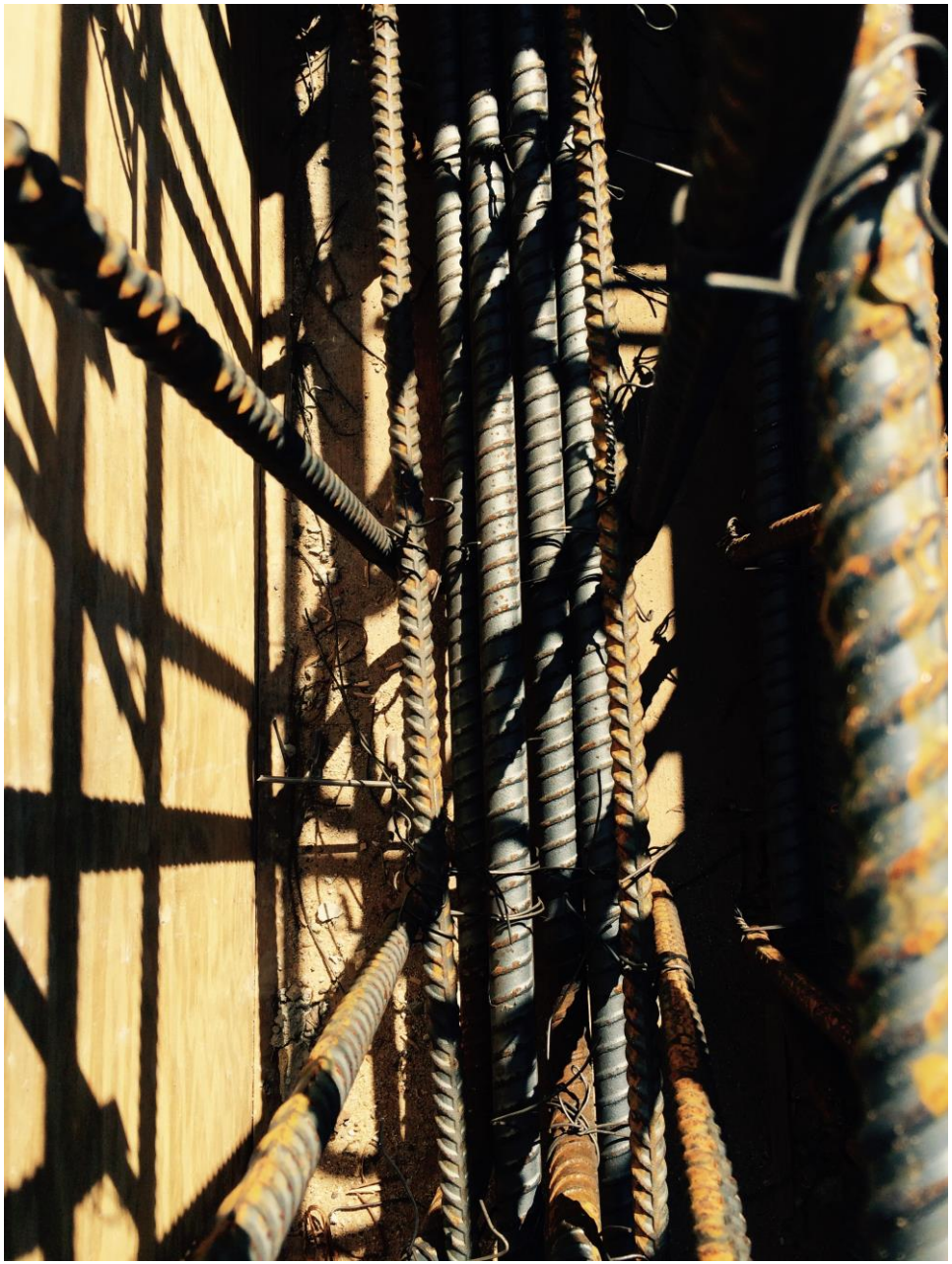
SECTION THRU INTEGRAL END BENT

(SHOWN PERPENDICULAR TO FILL FACE)

Girder Conflict On Integrals


CAMPBELL

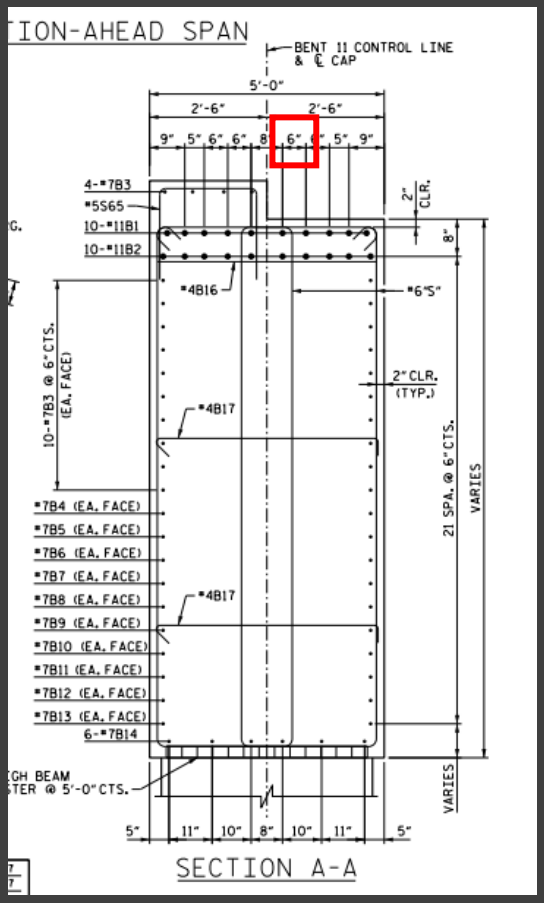

L A
W.P. 1L
3
LONG CHORD
#8K2 (OVER INT. GDR.) (TYP.)
FILL FACE
END BENT 1
10" END BENT DIAPHRAGM (TYP.)
A
ND BENT ACUTE
P.)
11"
#5G1
#4S2
#6K4
2" HIGH BEAM BOLSTER
#5S1
#8K1 OR #8K2 BARS
1½" CL. TO #5S1
2" HIGH BEAM BOLSTER
2½" CL. TO #5S1

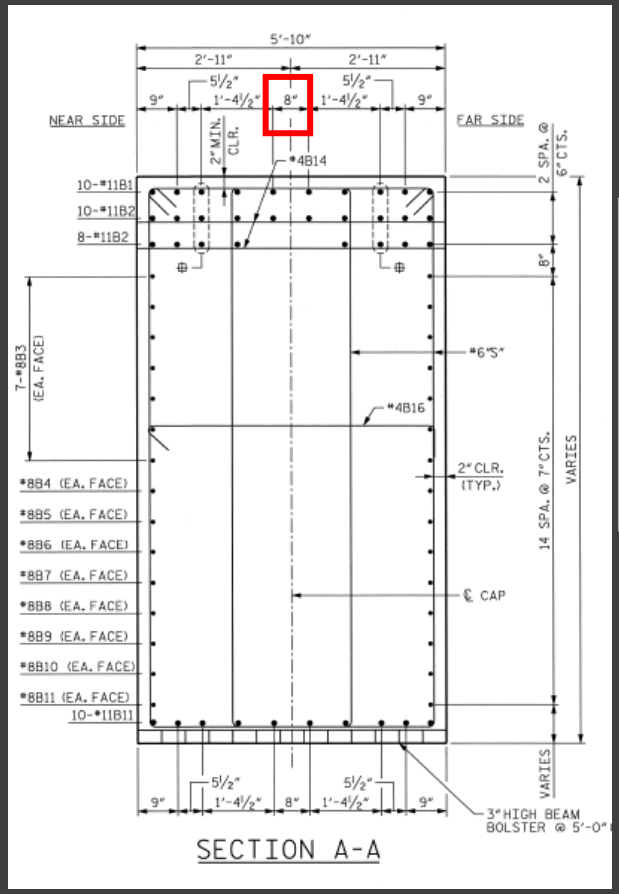


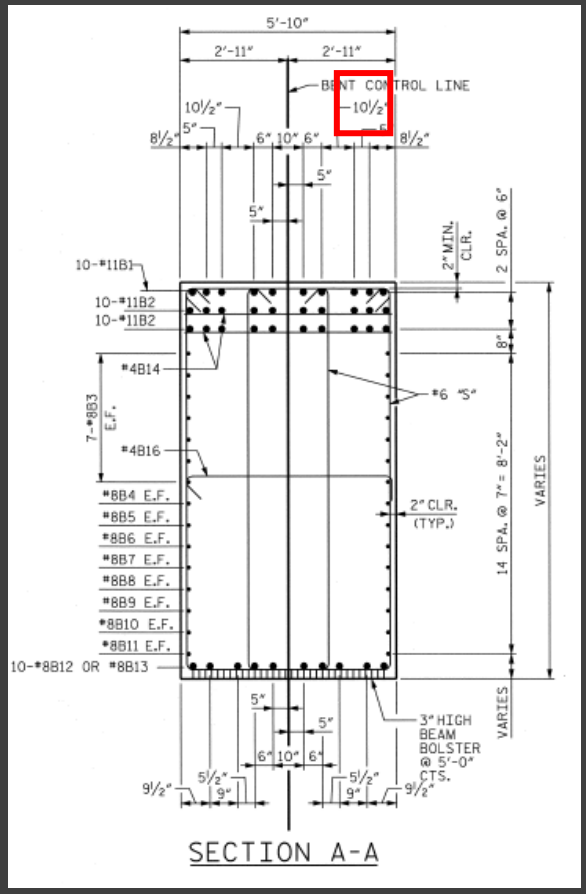
6” – Too Tight

8” – Better

10 ½” – Best



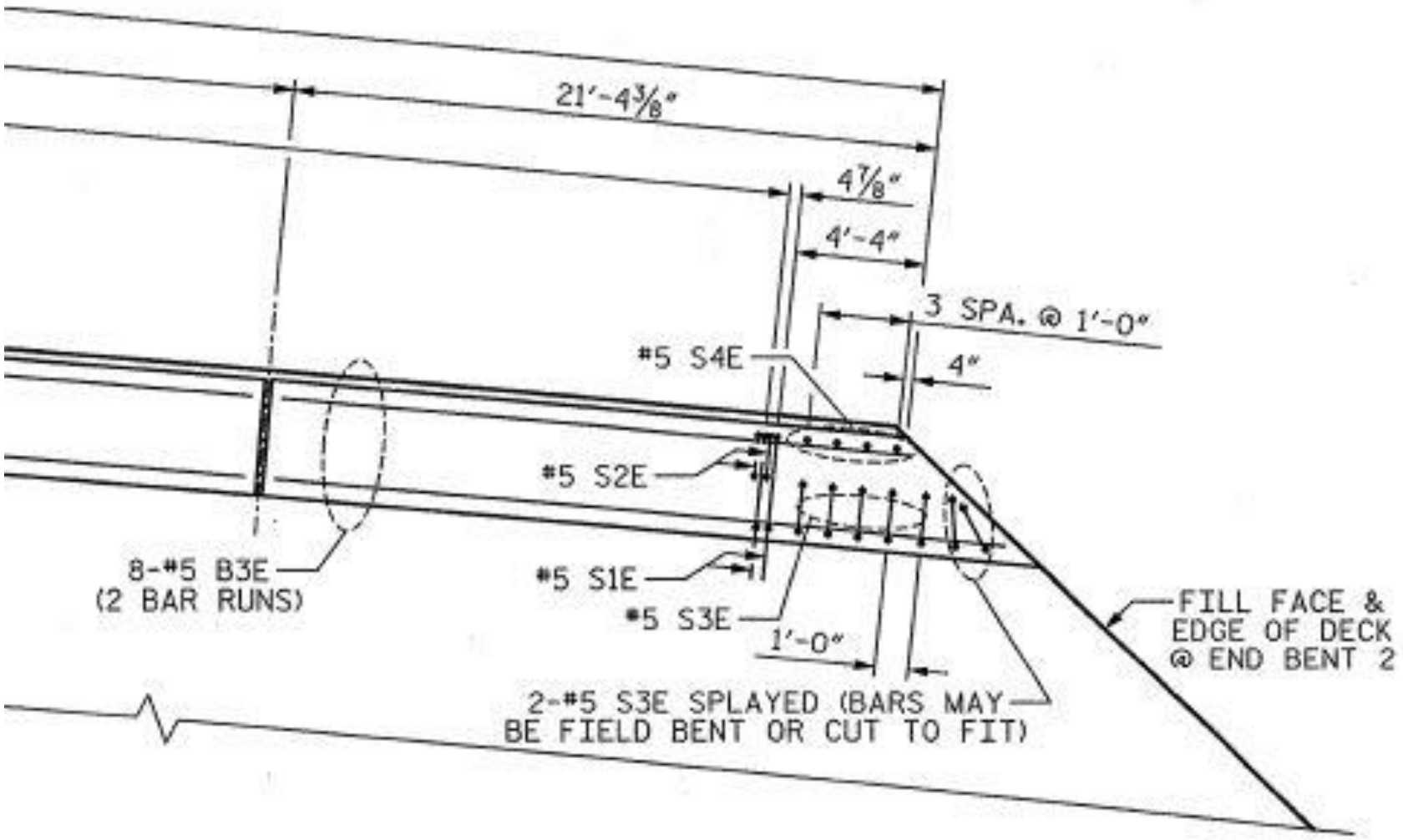




Hammer Head Rebar Clearance

Rebar Congestion

- Identify designs with congested rebar
- Upsize member if necessary
- Stagger lap splices
- Think about how the concrete will be vibrated
  - Potential for vibrators to get stuck
- Special Concrete Mixtures
- Additives/Aggregate Sizes?


21'-4 3/8"
4 7/8"
4'-4"
3 SPA. @ 1'-0"
4"
#5 S4E
#5 S2E
8-#5 B3E
(2 BAR RUNS)
#5 S1E
#5 S3E
1'-0"
FILL FACE &
EDGE OF DECK
@ END BENT 2
2-#5 S3E SPLAYED (BARS MAY
BE FIELD BENT OR CUT TO FIT)

Questions?