Webinar | Sep 10, 2019

BrIM Applications on the Signature Wekiva Parkway Segmental Bridge

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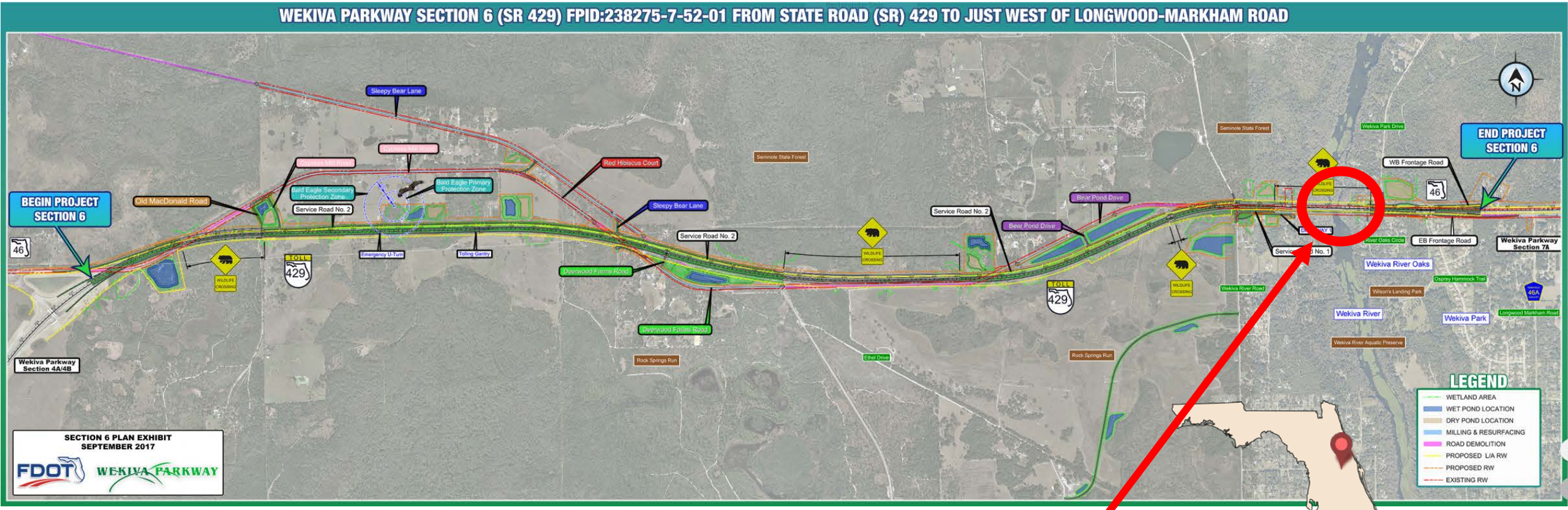
Agenda

+ Introduction to the Wekiva Parkway Project
+ Why use BrIM?
+ Construction sequencing and details
+ SOFiSTiK modeling for the design and construction engineering
+ BrIM applications during design, construction, and drawing production
+ Technical bridge innovations
+ Lessons Learned
+ Questions / Discussion

Photo courtesy of Superior Construction.

Wekiva Parkway Signature Segmental Bridge (Section 6)

Map from http://www.wekivaparkway.com/project-6.php



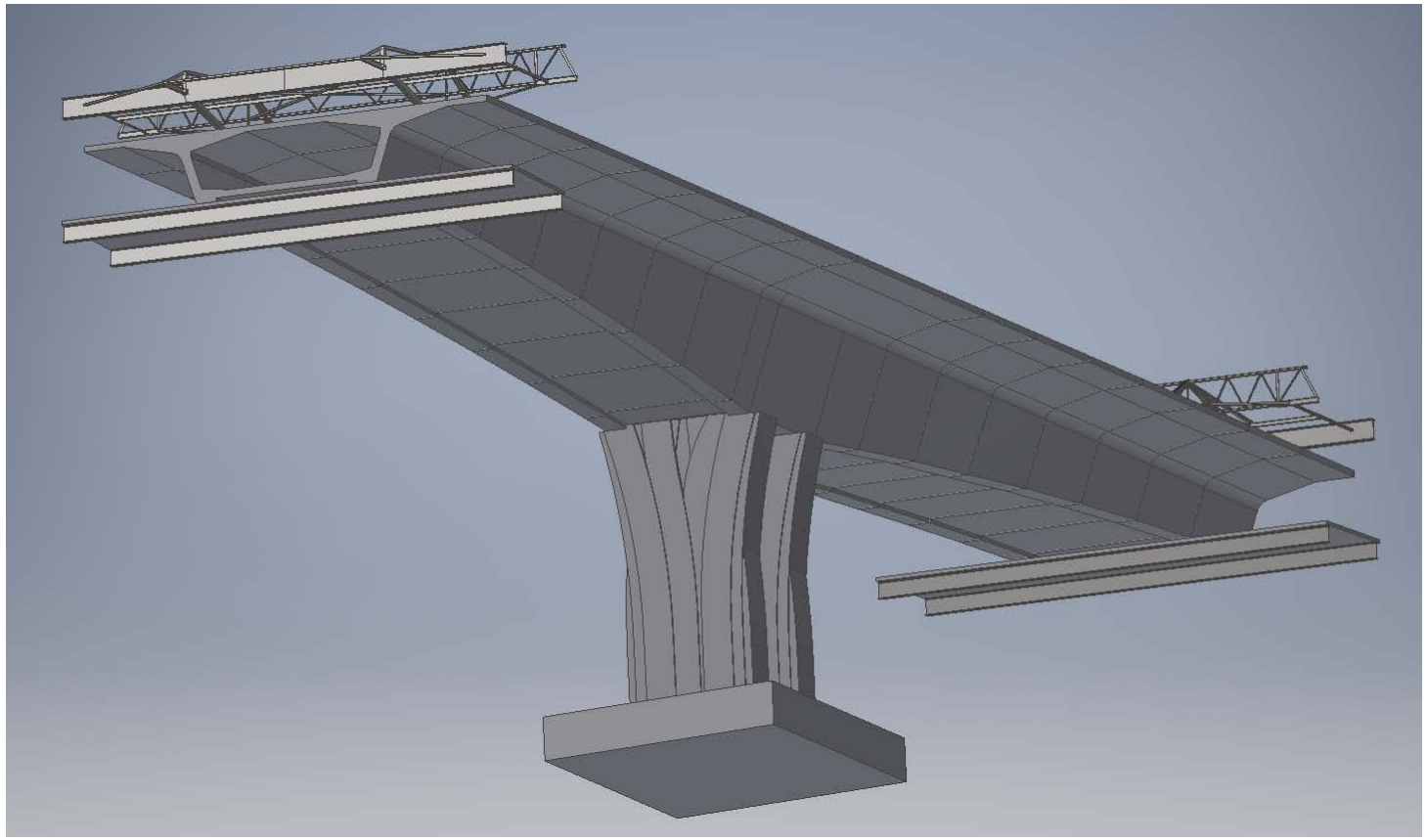
Wekiva Parkway Signature Segmental Bridge (Section 6)

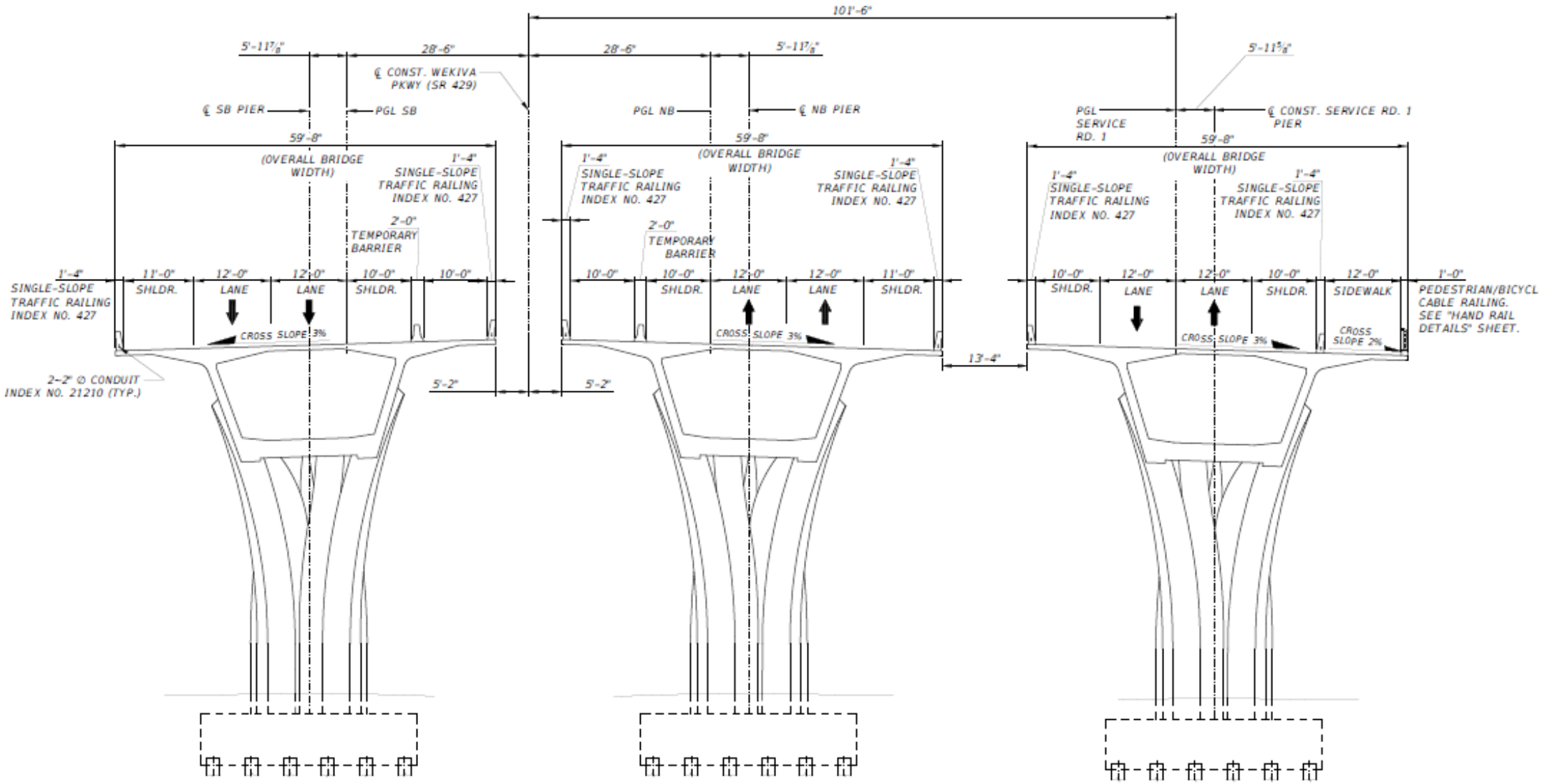
Client: Florida Department of Transportation District 5, National Park Service
Contractor: Superior Construction Company
Prime Consultant: WGI
Segmental Bridge Design & Construction Engineering: FINLEY Engineering Group, Inc.

Photo courtesy of Superior Construction.

Why use BrIM??

+ Integration of both design and construction drawings and details
+ Enhanced visualization of complex details with 3D graphics, colors, etc.
+ Enhanced Quality Control




101'-6"
5'-11 7/8"
28'-6"
28'-6"
5'-11 7/8"
5'-11 5/8"
℄ CONST. WEKIVA PKWY (SR 429)
℄ SB PIER
PGL SB
PGL NB
℄ NB PIER
PGL SERVICE RD. 1
℄ CONST. SERVICE RD. 1 PIER
59'-8"
(OVERALL BRIDGE WIDTH)
1'-4"
SINGLE-SLOPE TRAFFIC RAILING INDEX NO. 427
2'-0"
TEMPORARY BARRIER
1'-4"
11'-0"
12'-0"
12'-0"
10'-0"
10'-0"
SHLDR.
LANE
LANE
SHLDR.
CROSS SLOPE 3%
2-2" ∅ CONDUIT INDEX NO. 21210 (TYP.)
5'-2"
5'-2"
13'-4"
SIDEWALK
CROSS SLOPE 2%
1'-0"
PEDESTRIAN/BICYCL CABLE RAILING. SEE "HAND RAIL DETAILS" SHEET.

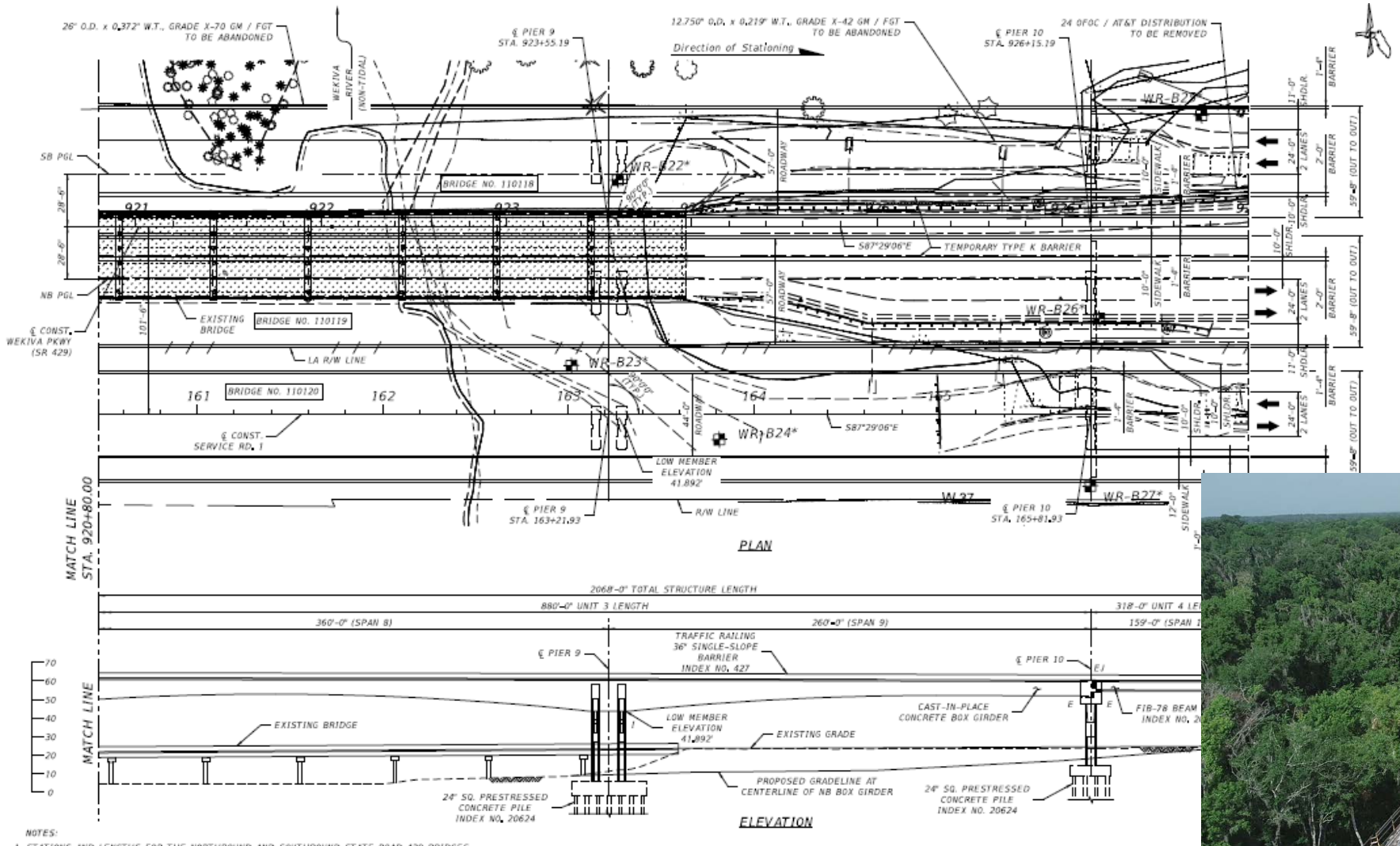
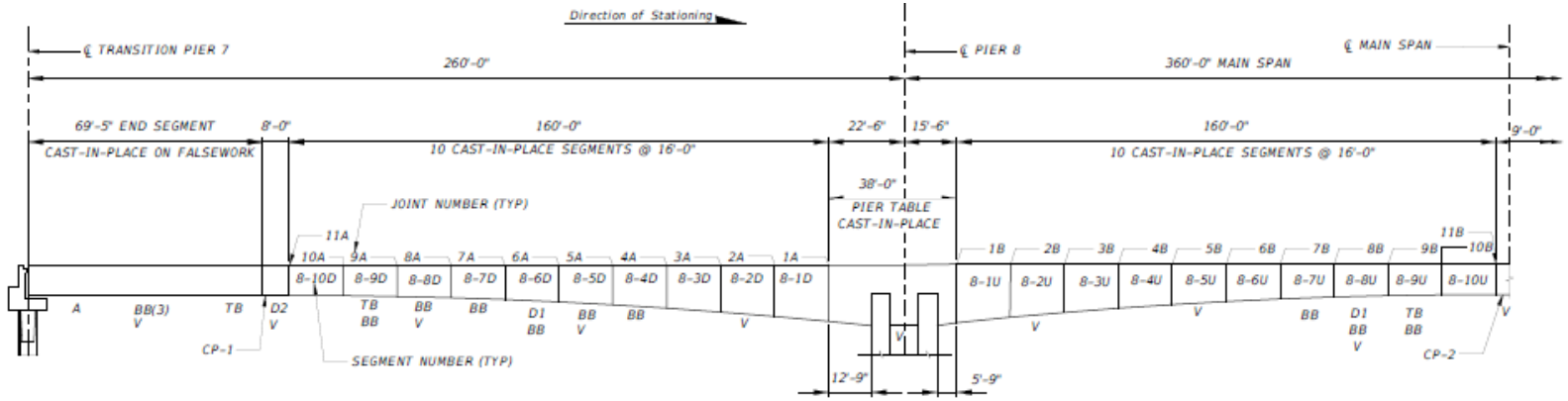
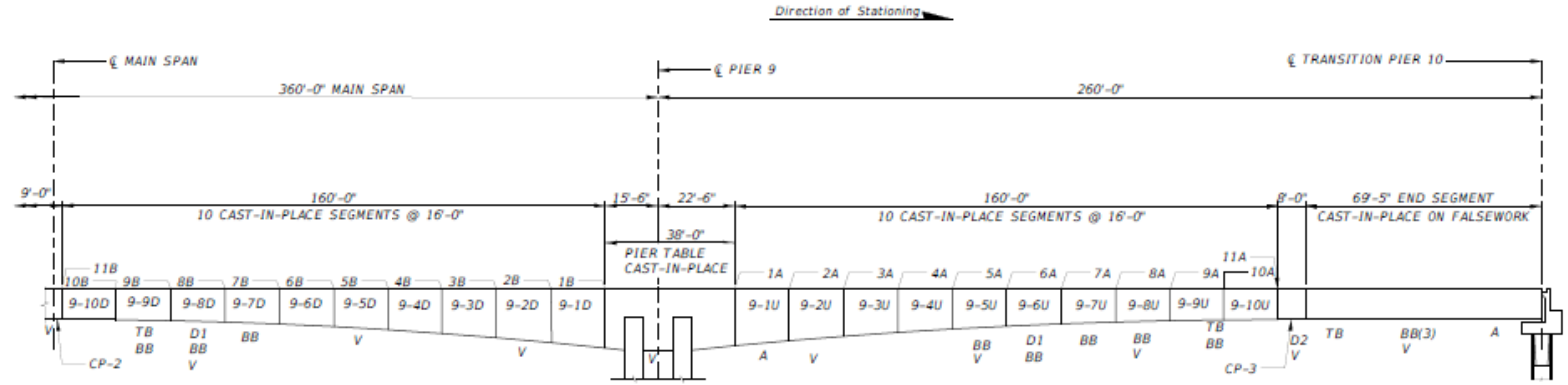


Photo courtesy of Superior Construction.



ELEVATION



ELEVATION

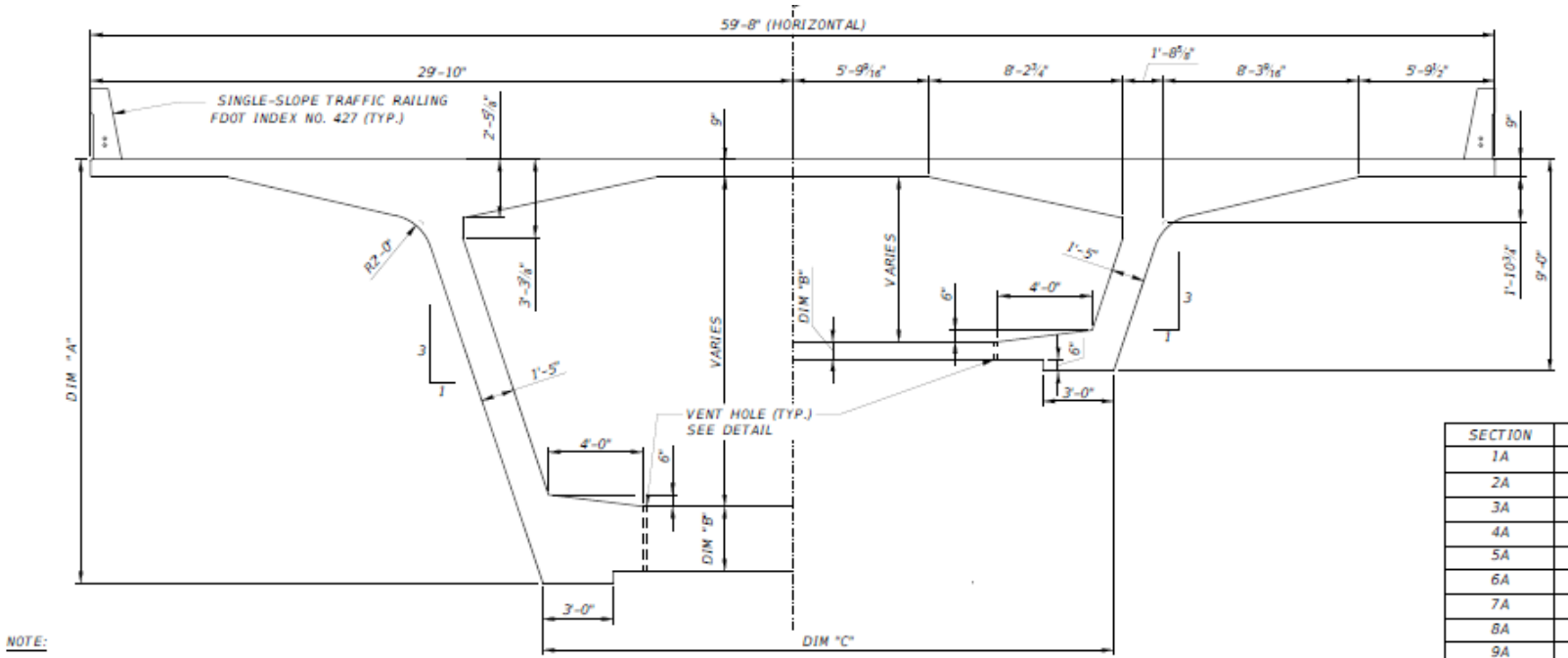
NOTES:

1. ALL SPAN AND SEGMENT LENGTHS ARE MEASURED ALONG THE ℄ BOX GIRDER.
2. WORK THIS SHEET WITH "TYPICAL SEGMENT DIMENSIONS (NORTHBOUND AND SOUTHBOUND)" AND "TYPICAL SEGMENT DIMENSIONS (SERVICE ROAD 1)" SHEETS.
3. FOR MAINTENANCE LIGHTING REQUIREMENTS REFERENCE STANDARD INDEX NO. 21240, BOX GIRDER MAINTENANCE

LEGEND:

D1	= DEVIATOR (TYPE 1)	CP	= CLOSURE POUR
D2	= DEVIATOR (TYPE 2)	V	= VENT HOLE
TB	= TOP ANCHOR BLOCK	A	= ACCESS OPENING
BB	= BOTTOM ANCHOR BLOCK		

Photo courtesy of Superior Construction.

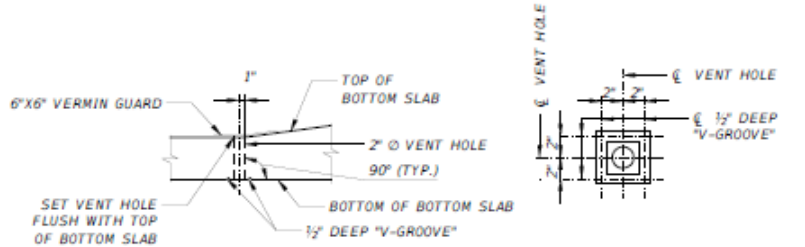


NOTE:

1. FOR SEGMENT LENGTHS, JOINT NUMBERS, AND VENT HOLE LOCATIONS SEE "SEGMENT LAYOUT" SHEETS.

HALF CROSS-SECTION
(PIER)

HALF CROSS-SECTION
(MIDSPAN)



CROSS-SECTION

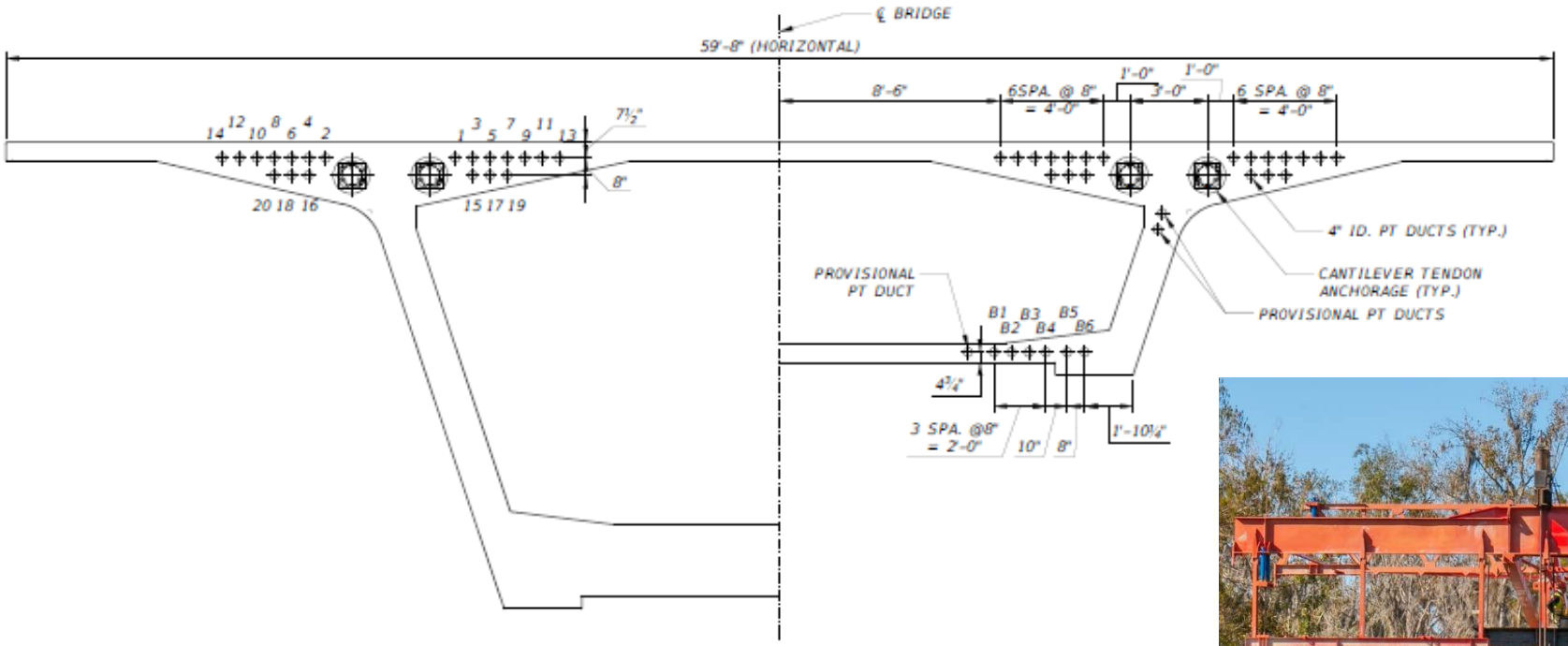
PLAN-BOTTOM OF BOTTOM SLAB

VENT HOLE DETAIL

VENT HOLE NOTES:

1. FORM VENT HOLE WITH PERMANENT PVC WITH UV INHIBITOR PIPE.
2. VERMIN GUARD SHALL BE 20 GAGE GALVANIZED WELDED METAL SCREEN WITH ¼" OPENING.
3. FASTEN VERMIN GUARDS TO TOP OF BOTTOM SLAB WITH "EPOXY FOR STRUCTURAL APPLICATIONS" IN ACCORDANCE WITH "FDOT STANDARD SPECIFICATIONS SECTION 937".

SECTION	DIM "A"	DIM "B"	DIM "C"
1A	16'-8 5/8"	2'-5 5/8"	22'-1 1/4"
2A	15'-3"	2'-1 5/8"	23'-1"
3A	13'-11 1/4"	1'-10 1/8"	23'-11 1/2"
4A	12'-9 3/8"	1'-7 1/8"	24'-8 3/4"
5A	11'-9 3/8"	1'-4 3/8"	25'-4 3/4"
6A	10'-11 1/8"	1'-2 1/8"	25'-11 5/8"
7A	10'-2 7/8"	1'-0 1/4"	26'-5 1/8"
8A	9'-8 3/8"	0'-10 7/8"	26'-9 1/2"
9A	9'-3 1/4"	0'-9 7/8"	27'-0 5/8"
10A	9'-0 7/8"	0'-9 1/4"	27'-2 3/8"
11A	9'-0"	0'-9"	27'-3"
1B	17'-4 5/8"	2'-7 3/4"	21'-8"
2B	15'-9 1/2"	2'-3 7/8"	22'-8 3/4"
3B	14'-4 3/8"	1'-11 3/8"	23'-8 5/8"
4B	13'-1 1/4"	1'-8"	24'-6 1/8"
5B	12'-0 1/4"	1'-5"	25'-2 7/8"
6B	11'-1 1/8"	1'-2 5/8"	25'-10 1/4"
7B	10'-4 1/8"	1'-0 5/8"	26'-4 1/4"
8B	9'-9"	0'-11"	26'-9"
9B	9'-4"	0'-9 7/8"	27'-0 3/8"
10B	9'-1"	0'-9 1/4"	27'-2 3/8"
11B	9'-0"	0'-9"	27'-3"



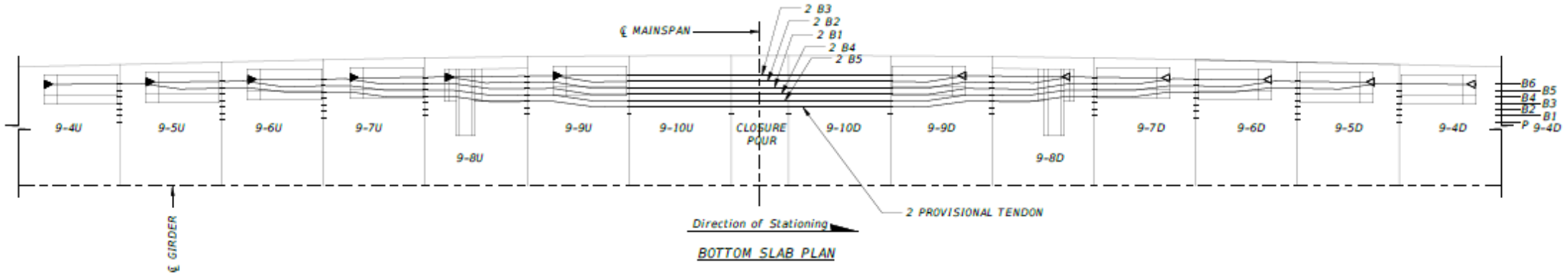
HALF-SECTION AT PIER HALF-SECTION AT MIDSPAN

SEGMENT BULKHEAD

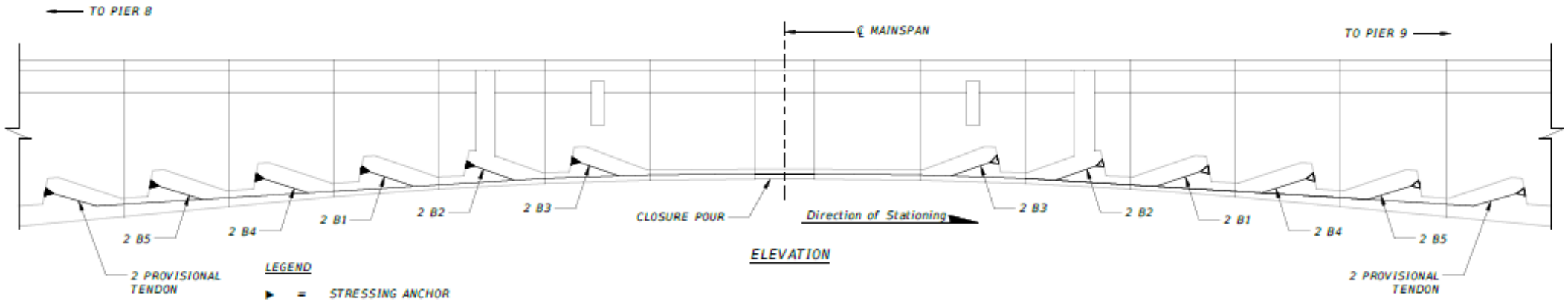
NOTE:

1. SEE "TYPICAL SEGMENT DIMENSIONS" SHEET FOR SEGMENT DIMENSIONS.

Photo courtesy of Superior Construction.



BOTTOM SLAB PLAN

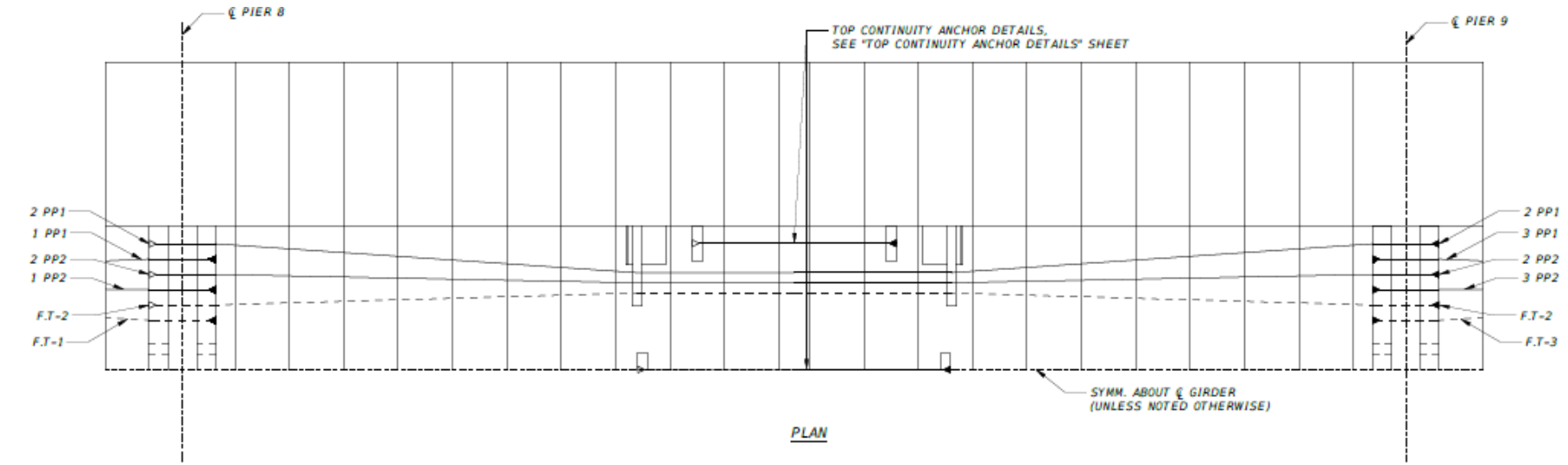


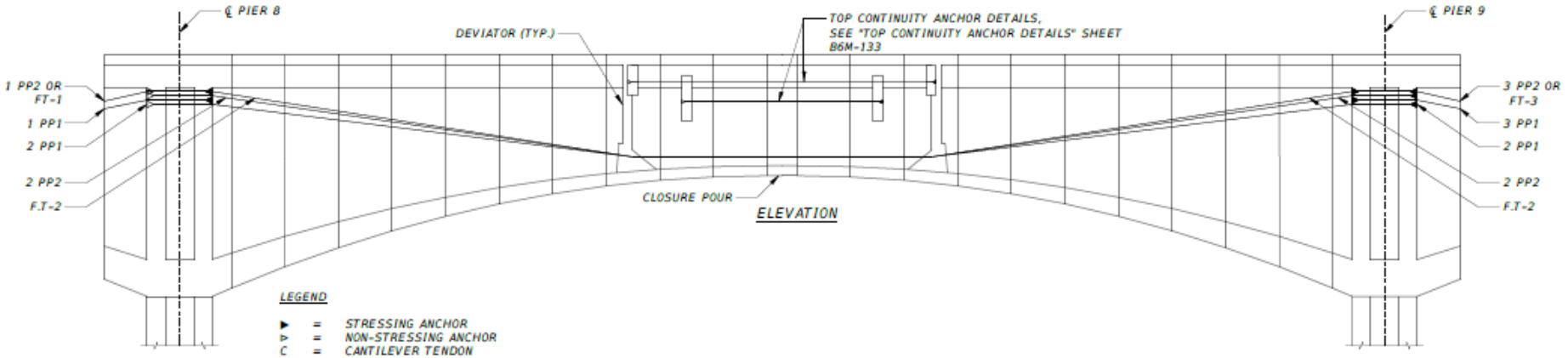
ELEVATION

LEGEND

▶ = STRESSING ANCHOR
▷ = NON-STRESSING ANCHOR
B = BOTTOM CONTINUITY TENDONS
P = PROVISIONAL PT DUCT

NOTES:
1. FOR POST-TENSIONING SYSTEM, SEE "POST-TENSIONING QUANTITIES AND STRESSING SCHEDULE" SHEETS.
2. FOR ALL SECTIONS, SEE "LONGITUDINAL POST TENSIONING DETAILS (3 OF 4) AND (4 OF 4)" SHEETS.





LEGEND

▶	=	STRESSING ANCHOR
▷	=	NON-STRESSING ANCHOR
C	=	CANTILEVER TENDON
PP	=	LONGITUDINAL DRAPED TENDON
S	=	LONGITUDINAL SPAN TENDON
F.T	=	FUTURE TENDON

NOTES:
1. FOR TENDON SIZE AND POST-TENSIONING SYSTEM, SEE "POST-TENSIONING QUANTITIES AND STRESSING SCHEDULE" SHEETS.
2. FOR ALL SECTIONS, SEE "LONGITUDINAL POST TENSIONING DETAILS (3 OF 4) AND (4 OF 4)" SHEETS.

What are flexible fillers?

+ Microcrystalline wax
+ Provides strand protection
+ Enable tendon strand replacement
+ Provides zero bond of the strand to the surrounding concrete

- Current Code does not provide for ‘hinge’ locations for internal unbonded tendons
- Experimental tests show localized crack distribution

Ref. Brenkus UF Ph.D. dissertation

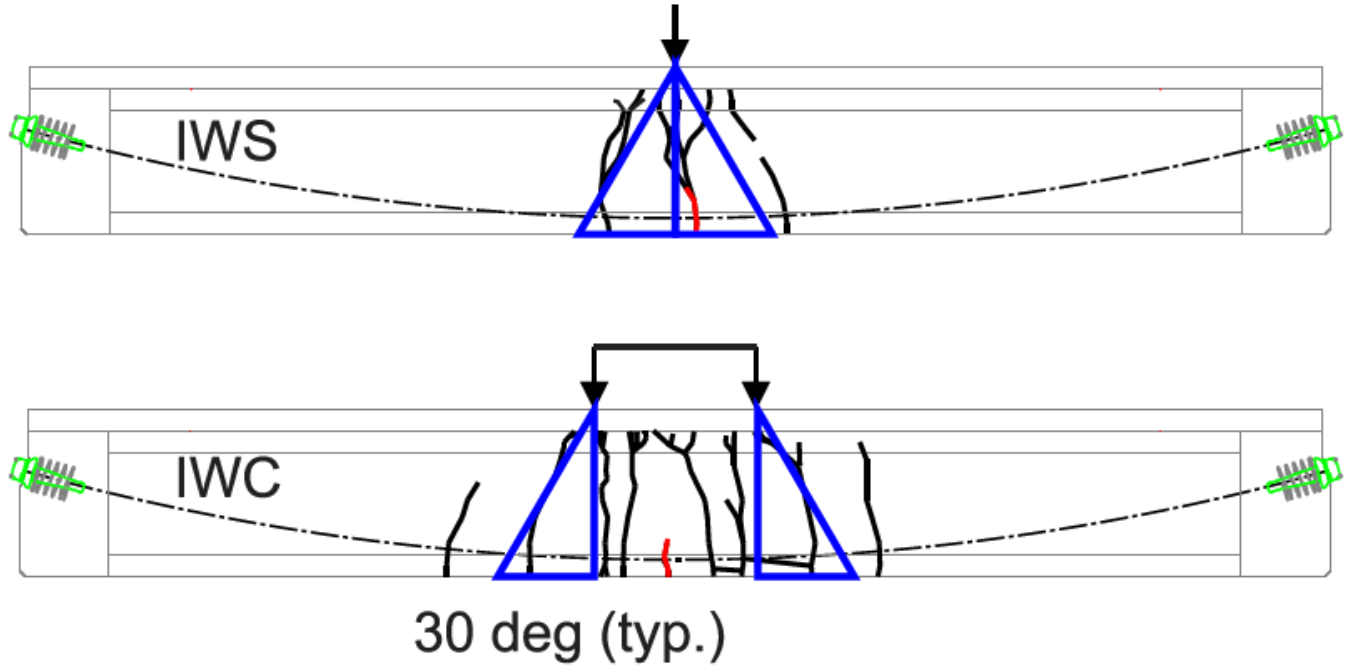


Figure 8-7. 30 degree cone of influence

+ Wekiva continuity tendon design

$$f_{ps} = f_{pe} + 900\left(\frac{d_p - c}{\ell_e}\right) \leq f_{py}$$

in which:

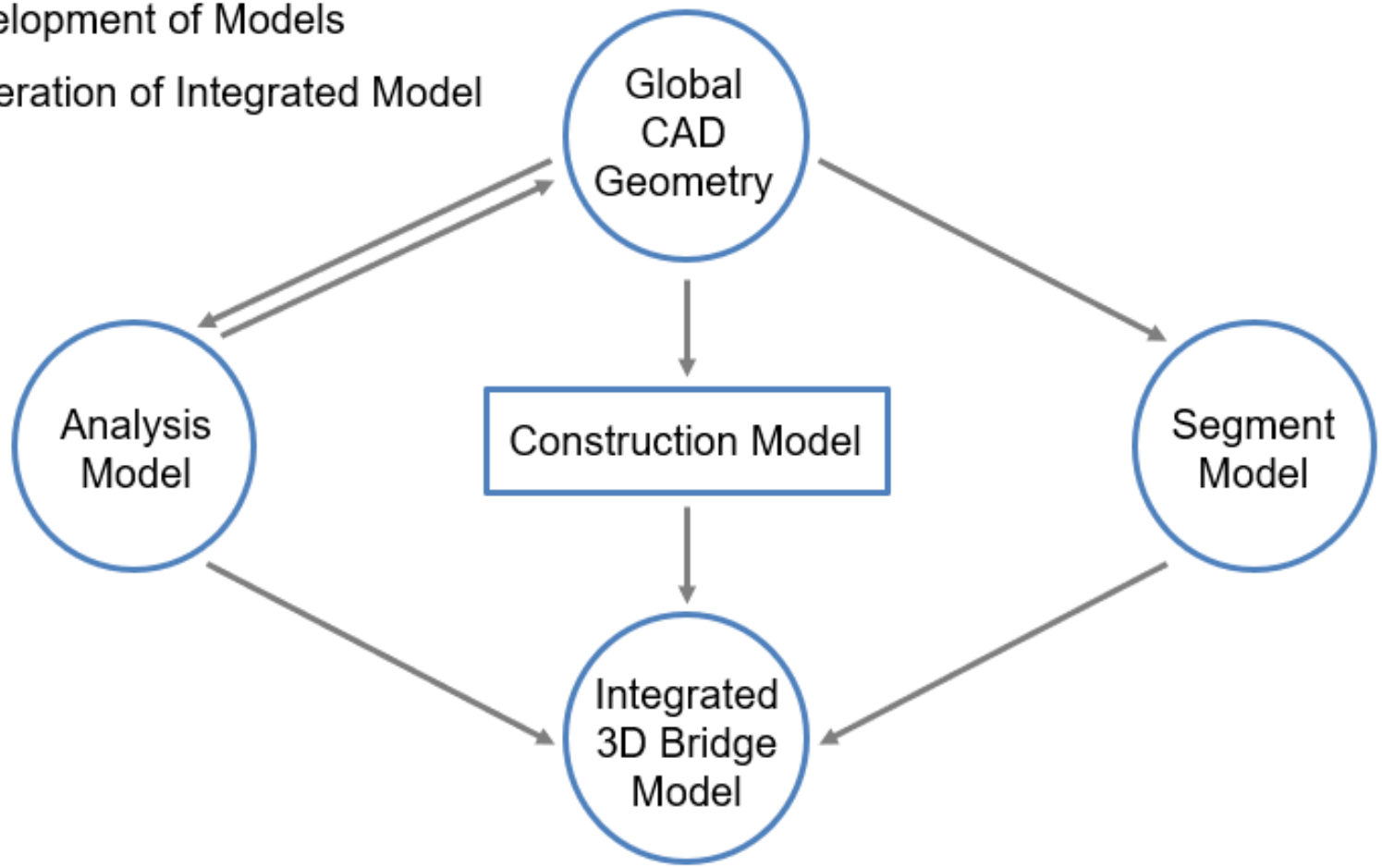
$$\ell_e = \left(\frac{2\,\ell_i}{2 + N_s}\right)$$

BrIM = Bridge *Integration* Modeling

Phase 1 → Input of Global CAD Geometry

Phase 2 → Development of Models

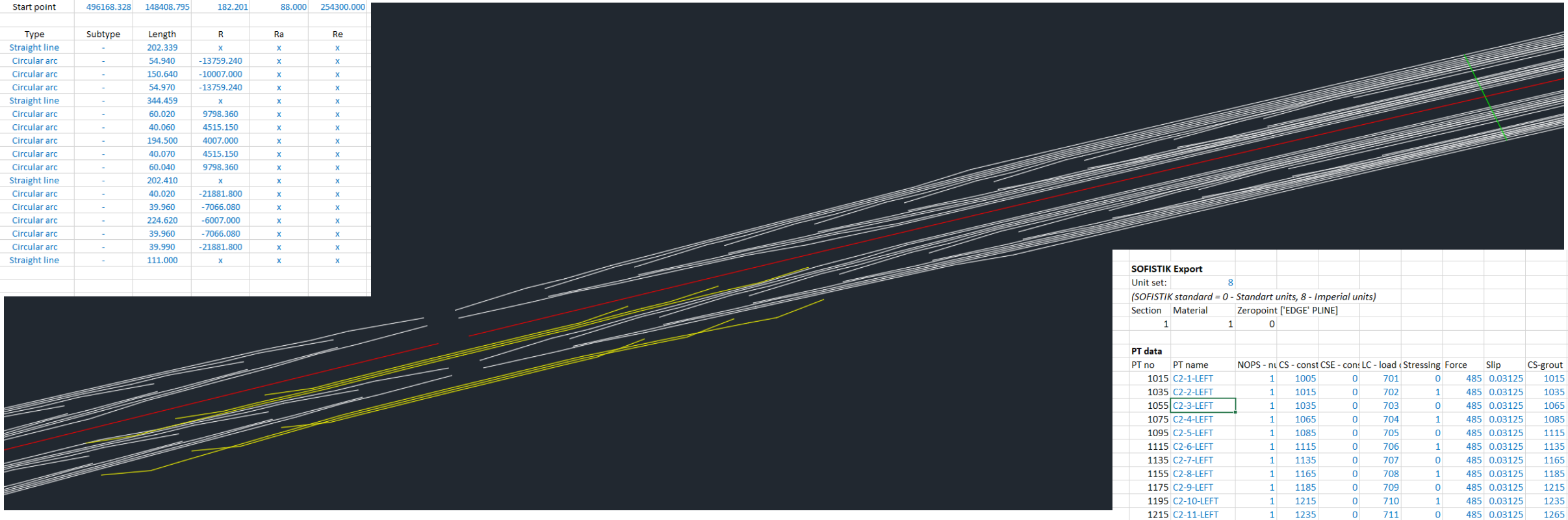
Phase 3 → Generation of Integrated Model



Global CAD Geometry

Horizontal Alignment

	X	Y	DX	DY	Station
Start point	496168.328	148408.795	182.201	88.000	254300.000
Type	Subtype	Length	R	Ra	Re
Straight line	-	202.339	x	x	x
Circular arc	-	54.940	-13759.240	x	x
Circular arc	-	150.640	-10007.000	x	x
Circular arc	-	54.970	-13759.240	x	x
Straight line	-	344.459	x	x	x
Circular arc	-	60.020	9798.360	x	x
Circular arc	-	40.060	4515.150	x	x
Circular arc	-	194.500	4007.000	x	x
Circular arc	-	40.070	4515.150	x	x
Circular arc	-	60.040	9798.360	x	x
Straight line	-	202.410	x	x	x
Circular arc	-	40.020	-21881.800	x	x
Circular arc	-	39.960	-7066.080	x	x
Circular arc	-	224.620	-6007.000	x	x
Circular arc	-	39.960	-7066.080	x	x
Circular arc	-	39.990	-21881.800	x	x
Straight line	-	111.000	x	x	x



SOFISTIK Export

Unit set: 8

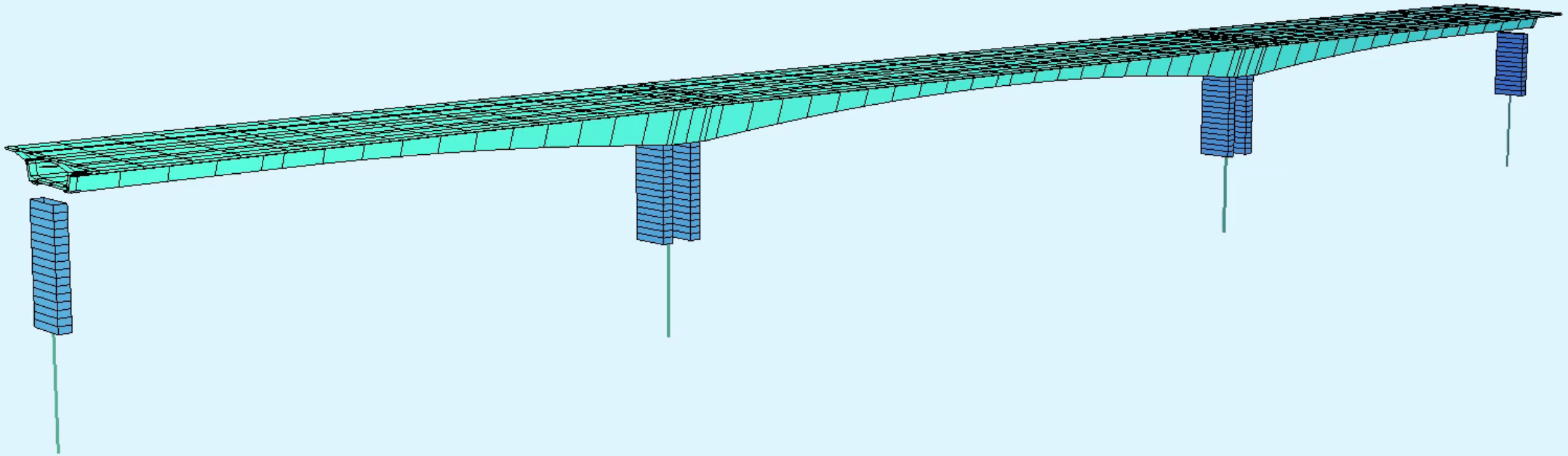
(SOFISTIK standard = 0 - Standart units, 8 - Imperial units)

Section	Material	Zeropoint ['EDGE' PLINE]
1	1	0

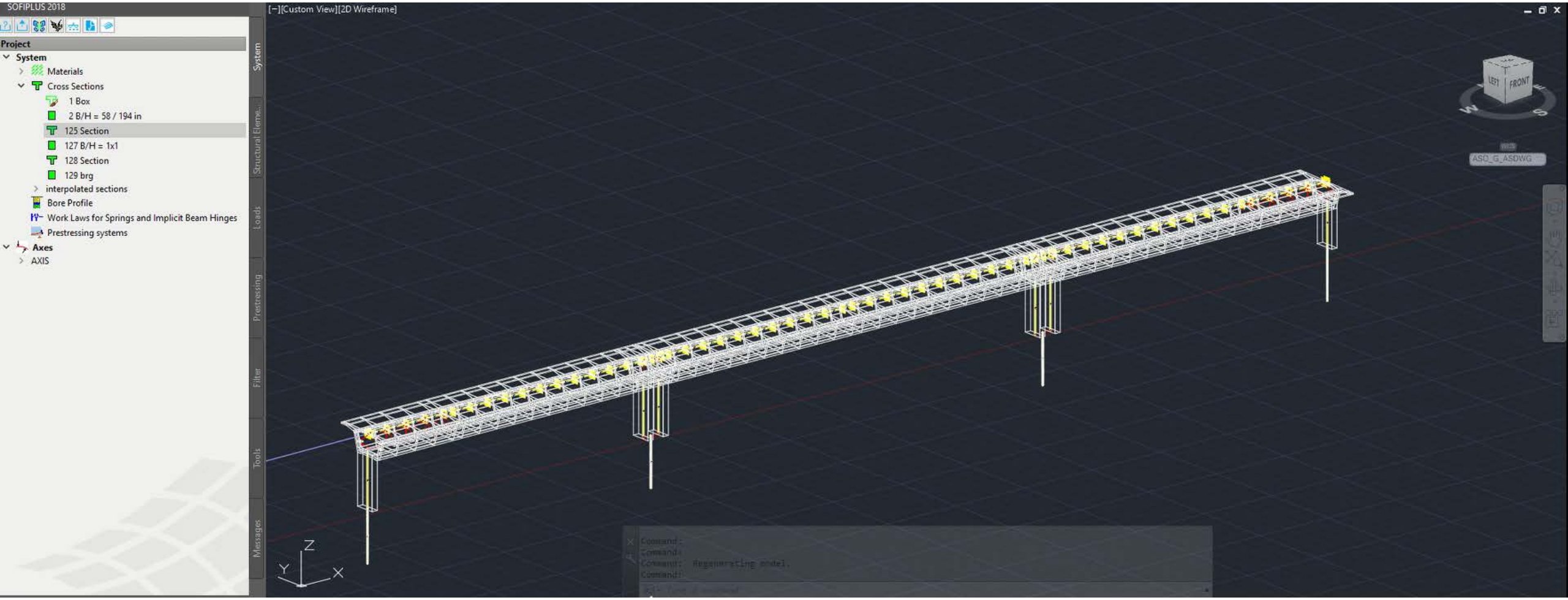
PT data

PT no	PT name	NOPS - nu	CS - const	CSE - cons	LC - load	Stressing	Force	Slip	CS-grout
1015	C2-1-LEFT	1	1005	0	701	0	485	0.03125	1015
1035	C2-2-LEFT	1	1015	0	702	1	485	0.03125	1035
1055	C2-3-LEFT	1	1035	0	703	0	485	0.03125	1065
1075	C2-4-LEFT	1	1065	0	704	1	485	0.03125	1085
1095	C2-5-LEFT	1	1085	0	705	0	485	0.03125	1115
1115	C2-6-LEFT	1	1115	0	706	1	485	0.03125	1135
1135	C2-7-LEFT	1	1135	0	707	0	485	0.03125	1165
1155	C2-8-LEFT	1	1165	0	708	1	485	0.03125	1185
1175	C2-9-LEFT	1	1185	0	709	0	485	0.03125	1215
1195	C2-10-LEFT	1	1215	0	710	1	485	0.03125	1235
1215	C2-11-LEFT	1	1235	0	711	0	485	0.03125	1265
1235	C2-12-LEFT	1	1265	0	712	1	485	0.03125	1285
1255	C2-13-LEFT	1	1285	0	713	0	485	0.03125	1315
1275	C2-14-LEFT	1	1315	0	714	1	485	0.03125	1335
1295	C2-15-LEFT	1	1335	0	715	0	485	0.03125	1365

SOFiSTiK Analysis Modeling

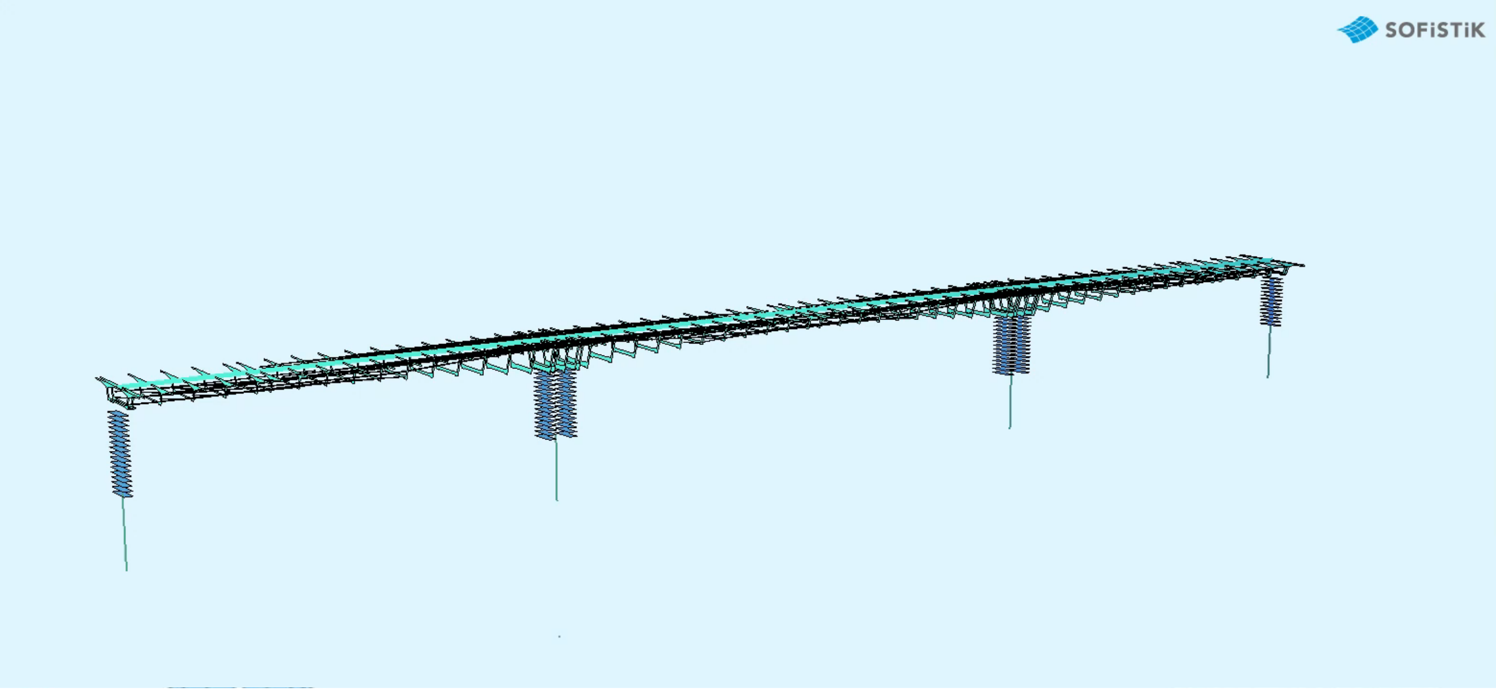


SOFiPlus Interface



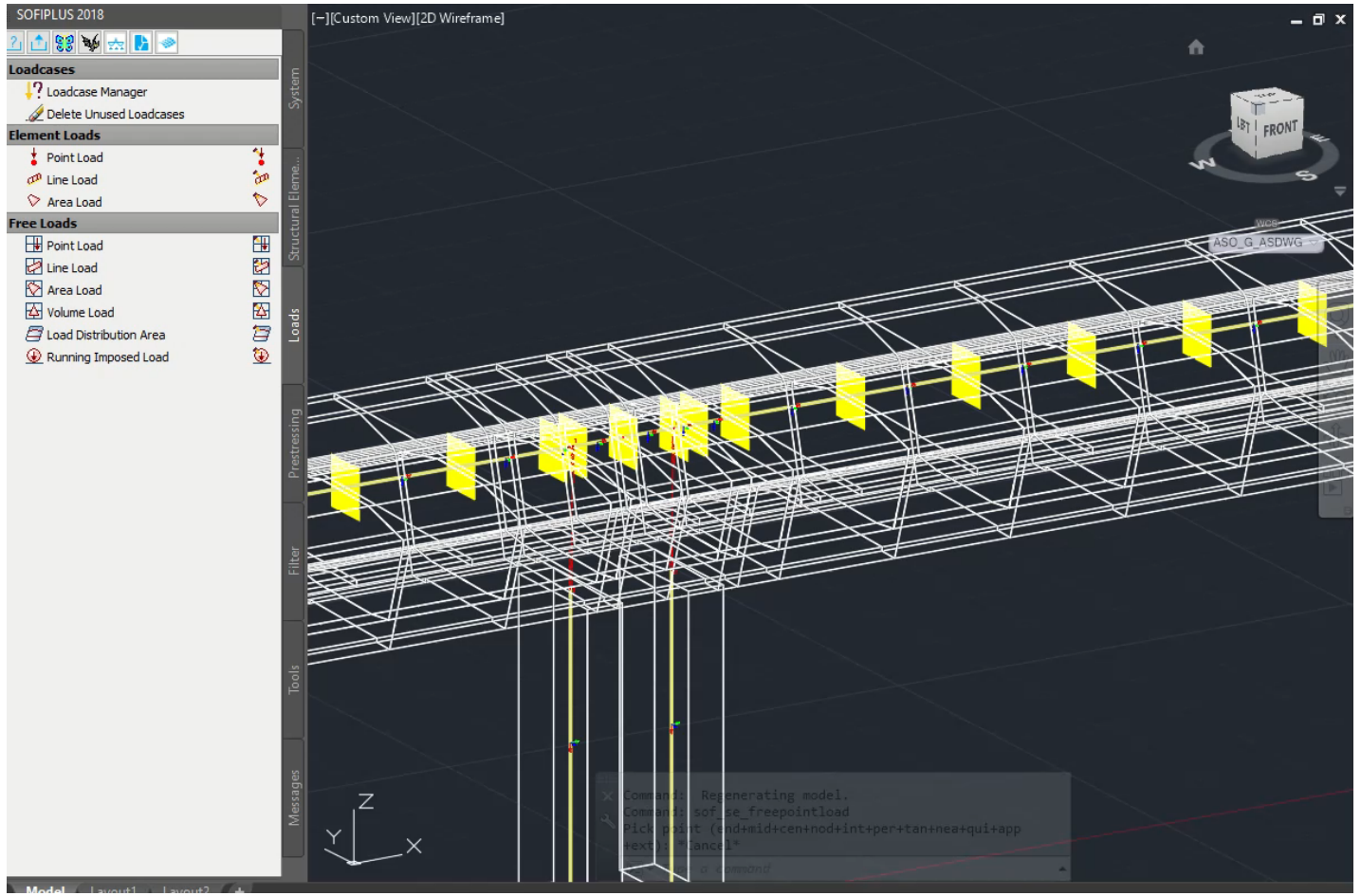
Tendon Generation

```
  $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
  $ 6TH TENDON $$ 6TH TENDON $$ 6TH TENDON $  1055 1057
  $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

 IF #N_SEG_CANT(#I)>=6
  LET#N_TEND #N_TEND+10

  TGEO NOG #N_TEND NOH 1 NOPS 1
  PTUV    S                                         U                         V              DL             DR             DUS                 DVS            KIND    TYPE=REFX
          (#S_SUP(#I)-54.5*#VVV)/#FT+#C2_S(0)*#VVV     #U*(17.5-#C2_H(0)*#FT)    #C2_V(0)*#FT   #C2_DLR*#FT    -                      #U*#C2_DUS*#VVV   -#C2_DVS*#VVV   FIX
          (#S_SUP(#I)-54.5*#VVV)/#FT+#C2_S(2)*#VVV     #U*(17.5-#C2_H(2)*#FT)    #C2_V(2)*#FT   -              -              -            -            -

$          (#S_SUP(#I)-38.5*#VVV)/#FT+#C3_S(0)*#VVV     #U*(18.166-#C3_H(0)*#FT)  #C3_V(0)*#FT
$          (#S_SUP(#I)-38.5*#VVV)/#FT+#C3_S(2)*#VVV     #U*(18.166-#C3_H(2)*#FT)  #C3_V(2)*#FT

          (#S_SUP(#I)-38.5*#VVV)/#FT                   #U*(17.5)    #C2_V(2)*#FT   -

          (#S_SUP(#I)-22.5*#VVV)/#FT                   #U*(18.166)    #C2_V(2)*#FT   -

          (#S_SUP(#I)+15.5*#VVV)/#FT                   #U*(18.166)    #C2_V(2)*#FT   -

          (#S_SUP(#I)+31.5*#VVV)/#FT                   #U*(18.166)    #C2_V(2)*#FT   -

          (#S_SUP(#I)+47.5*#VVV)/#FT                   #U*(17.5)      #C2_V(2)*#FT   -

$          (#S_SUP(#I)+47.5*#VVV)/#FT-#C3_S(2)*#VVV     #U*(18.166-#C3_H(2)*#FT)  #C3_V(2)*#FT
$          (#S_SUP(#I)+47.5*#VVV)/#FT-#C3_S(0)*#VVV     #U*(18.166-#C3_H(0)*#FT)  #C3_V(0)*#FT

          (#S_SUP(#I)+63.5*#VVV)/#FT-#C2_S(2)*#VVV     #U*(17.5-#C2_H(2)*#FT)    #C2_V(2)*#FT
          (#S_SUP(#I)+63.5*#VVV)/#FT-#C2_S(0)*#VVV     #U*(17.5-#C2_H(0)*#FT)    #C2_V(0)*#FT


  CS ICS1 1*1000+#WWW+10*(6-2) ICS2 -  $#SEQ2(#I)*1000+#GROUT
  PSIG #STRESSINGEND_RIGHT ANWS 'TS' KAPA #KAPA K1 #K1

  TEND NOT #N_TEND NOG #N_TEND NTEN 1 LC #N_TEND

  IF #SEQ(#I)<=2
   STO#N_CSPS #N_CSPS+1
   STO#CSPS(#N_CSPS) 1*1000+#WWW+10*(6-2)
  ENDIF
```



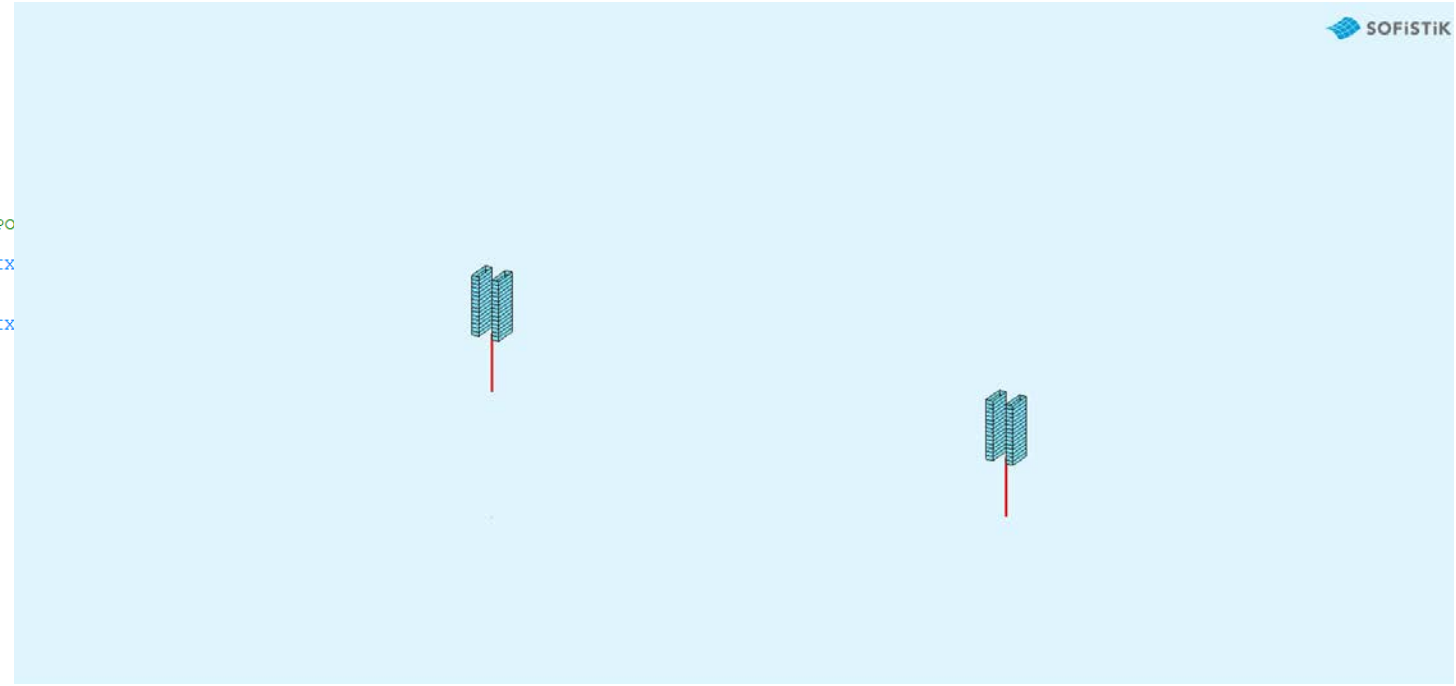
Load Creation

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$ CANTILEVER FORM TRAVELLER LOADS $
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$


$$ UPSTATION TRAVELLER LOADS

$LET#TRAV_P 0  $ KIP FORM TRAVELLER WEIGHT

$LET#TRAV_M 0  $ KIP*FT FORM TRAVELLER COG ECCENTRICITY FROM BH FACE MOMENT

LET#TRAV_P 172  $ KIP FORM TRAVELLER WEIGHT

LET#TRAV_M 1011  $ KIP*FT FORM TRAVELLER COG ECCENTRICITY FROM BH FACE MOMENT

LET#I 0

LOOP #N_CANT
 LET#J 0

 LOOP #N_UP(#SEQ(#I)-1)  $has been modified since the Design Phase

  LC #N(#I)*1000+(2*#J+1)*10+1 TYPE 'D_1' TITL 'FORM_TRAVELLER'
        BEPL FROM GRP #SEQ(#I)*100+(2*#J+1) TYPE PG P #TRAV_P
        BEPL FROM GRP #SEQ(#I)*100+(2*#J+1) TYPE MY P -1*#TRAV_M

 LET#J #J+1
 ENDLOOP

if #N_UP(#SEQ(#I)-1)==10

 LET#J #N_UP(#SEQ(#I)-1)-1 $final traveler advancement

  LC #N(#I)*1000+(2*(#J+1)+1)*10+1 TYPE 'D_1' TITL 'FORM_TRAVELLER_final_advancement'
        BEPL FROM GRP #SEQ(#I)*100+(2*#J+1) TYPE PG P #TRAV_P  A 16
        BEPL FROM GRP #SEQ(#I)*100+(2*#J+1) TYPE MY P -1*#TRAV_M  A 16
ENDIF

 LET#I #I+1
ENDLOOP

$$ DOWNSTATION TRAVELLER LOADS
```



Construction Staging

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$ DOWNSTATION SEGMENTS OF PIER 2 / UPSTATION SEGMENTS OF PIER 3 $
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

LET#J 0

LOOP 9 $#N_DOWN(#SEQ(#I)-1)

 CS #N(#I)*1000+(2*#J+2)*10 TYPE D_1 TITL '2DN/3UP+'
  $ THE NEXT LINE IS USED FOR THE ACTUAL ACTIVATION OF EACH GROUP (ELEMENT) AND THE CORRESPO
  $PIER 2 DOWNSTATION
  GRP 2*100+(2*#J+2) ICS1 #N(#I)*1000+(2*#J+2)*10 ICSD #N(#I)*1000+(2*#J+2)*10+2 ATIL - HFIX

  $PIER 3 UPSTATION
  GRP 3*100+(2*#J+1) ICS1 #N(#I)*1000+(2*#J+2)*10 ICSD #N(#I)*1000+(2*#J+2)*10+2 ATIL - HFIX

     $UPDATE STAGE MATRIX (DEFINE CS# IN LOAD ACTION CALCULATED)
     STO#STAGE #N(#I)*1000+(2*#J+2)*10
     STO#STG(#STAGE)     #STAGE
     STO#CSD_1(#STAGE)   #STAGE
     STO#CSD_3(#STAGE)   0
     STO#CSD_4(#STAGE)   0
     STO#CSPS_1(#STAGE)  0
     STO#CSPS_2(#STAGE)  0
     STO#CSPB(#STAGE)    0
     STO#CSZP(#STAGE)    0
     STO#CSCR_1(#STAGE)  0
     STO#CSCR_2(#STAGE)  0
     STO#CSD_7(#STAGE)   0
     STO#CSSL(#STAGE)   0
     STO#CSSL_2(#STAGE)   0
     STO#N_STAGE #N_STAGE+1 $STAGE COUNT

 CS #N(#I)*1000+(2*#J+2)*10+1 TYPE D_7 TITL '2DN/3UP FORM_TRAVELLER'
  $ THE NEXT LINE DEFINES THE FORM TRAVELLER LOAD AND CORRESPONDING CS WHEN THE LOAD WILL BE APPLIED
  $PIER 2 DOWNSTATION
  IF #J<8
   LC 1*1000+(2*#J+2)*10+1 ICS1 #N(#I)*1000+(2*#J+2)*10+1 ATIL #N(#I)*1000+(2*(#J+1)+2)*10  $typical form traveler
  ELSE
   LC 1*1000+(2*#J+2)*10+1 ICS1 #N(#I)*1000+(2*#J+2)*10+1 ATIL 1250  $REMOVE LOAD AT 8-10D DOWN+ STAGE
  ENDIF
```

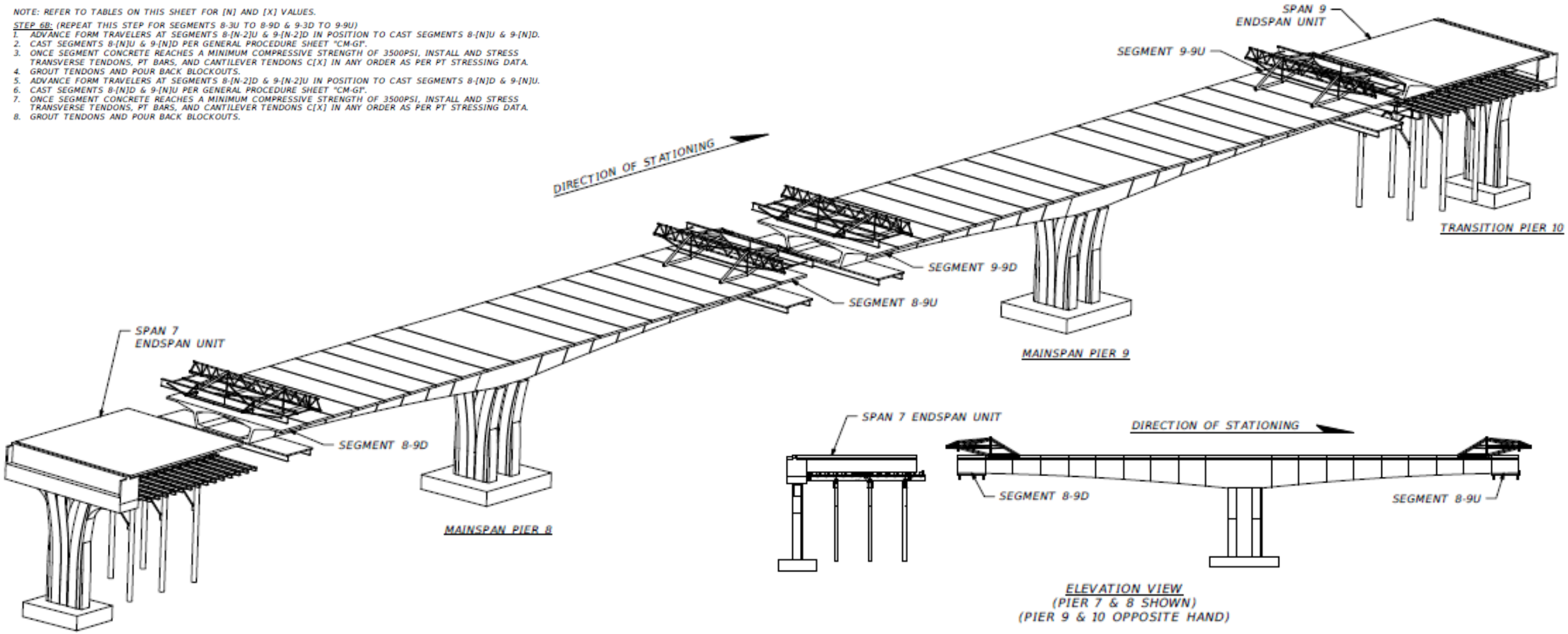


Integrated 3D Bridge Model

STEP 6A:
SPAN 7 AND SPAN 9 ENDSPAN UNITS MAY BE CAST AT THIS TIME.

NOTE: REFER TO TABLES ON THIS SHEET FOR [N] AND [X] VALUES.

STEP 6B: (REPEAT THIS STEP FOR SEGMENTS 8-3U TO 8-9D & 9-3D TO 9-9U)
1. ADVANCE FORM TRAVELERS AT SEGMENTS 8-[N-2]U & 9-[N-2]D IN POSITION TO CAST SEGMENTS 8-[N]U & 9-[N]D.
2. CAST SEGMENTS 8-[N]U & 9-[N]D PER GENERAL PROCEDURE SHEET "CM-GI".
3. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI, INSTALL AND STRESS TRANSVERSE TENDONS, PT BARS, AND CANTILEVER TENDONS C[X] IN ANY ORDER AS PER PT STRESSING DATA.
4. GROUT TENDONS AND POUR BACK BLOCKOUTS.
5. ADVANCE FORM TRAVELERS AT SEGMENTS 8-[N-2]D & 9-[N-2]U IN POSITION TO CAST SEGMENTS 8-[N]D & 9-[N]U.
6. CAST SEGMENTS 8-[N]D & 9-[N]U PER GENERAL PROCEDURE SHEET "CM-GI".
7. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI, INSTALL AND STRESS TRANSVERSE TENDONS, PT BARS, AND CANTILEVER TENDONS C[X] IN ANY ORDER AS PER PT STRESSING DATA.
8. GROUT TENDONS AND POUR BACK BLOCKOUTS.



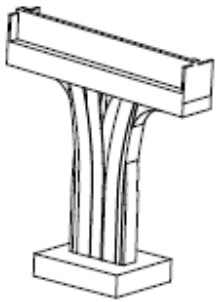
ELEVATION VIEW
(PIER 7 & 8 SHOWN)
(PIER 9 & 10 OPPOSITE HAND)

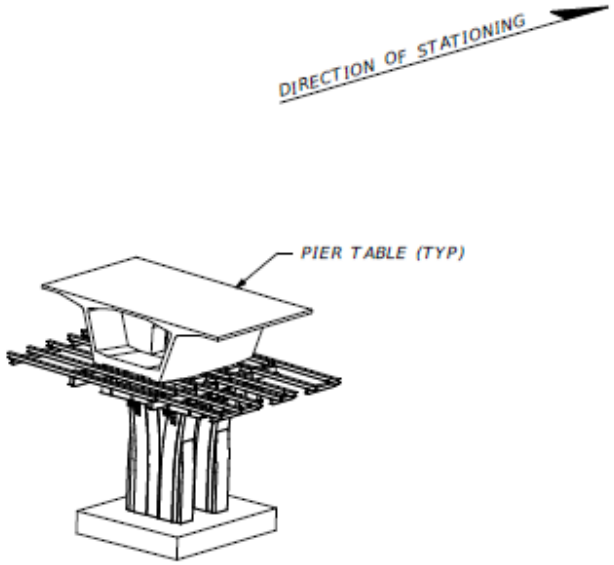
TRANSITION PIER 7

STEP 3:

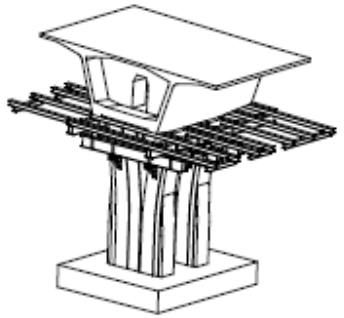
1. CONSTRUCT PIER TABLE FORMWORK.
2. CAST PIER TABLE AT PIERS 8 & 9 ON FALSEWORK.
3. ONCE PIER TABLE CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
4. ONCE PIER TABLE CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C1 IN ANY ORDER AS PER PT STRESSING DATA.
5. GROUT TENDONS AND POUR BACK BLOCKOUTS.*

* THIS STEP MAY BE COMPLETED AT ANY TIME WITHIN THE TIME FRAME ALLOWED BY THE SPECIFICATIONS.

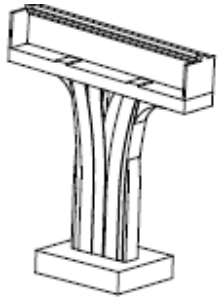




MAINSPAN PIER 8



MAINSPAN PIER 9



TRANSITION PIER 10

DIRECTION OF STATIONING

Pier Table Falsework

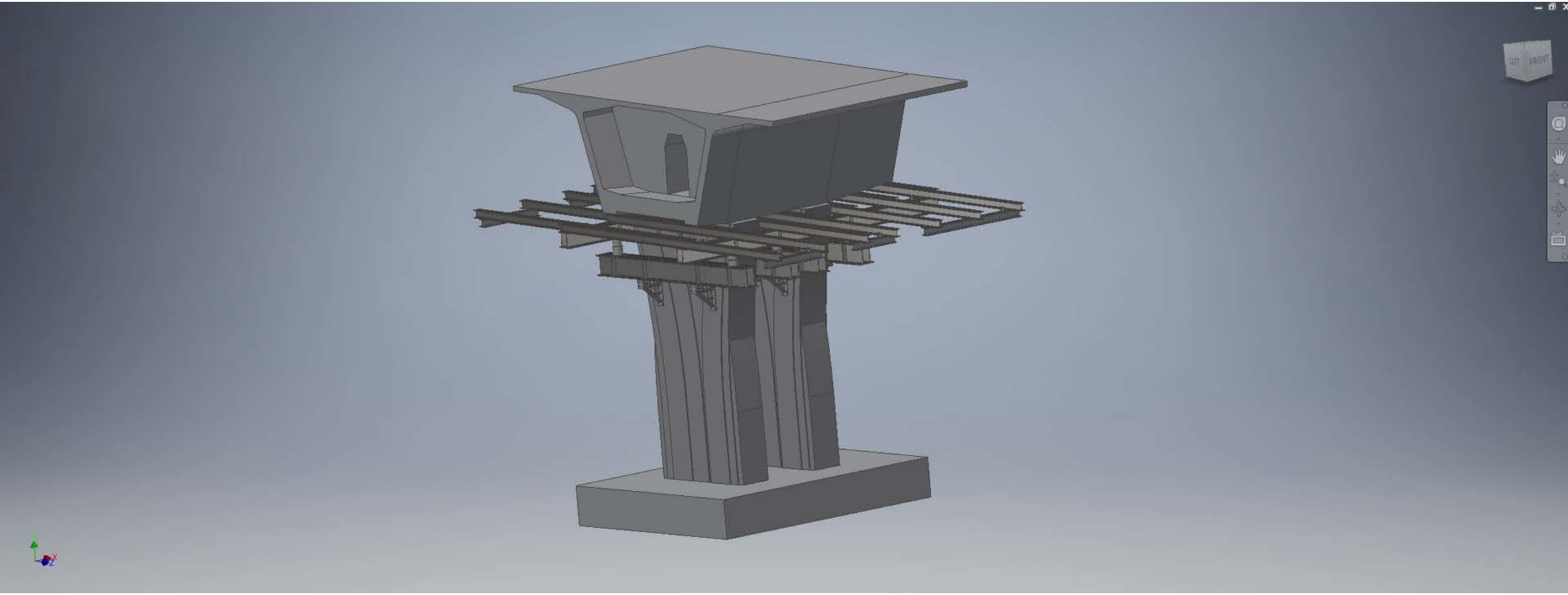
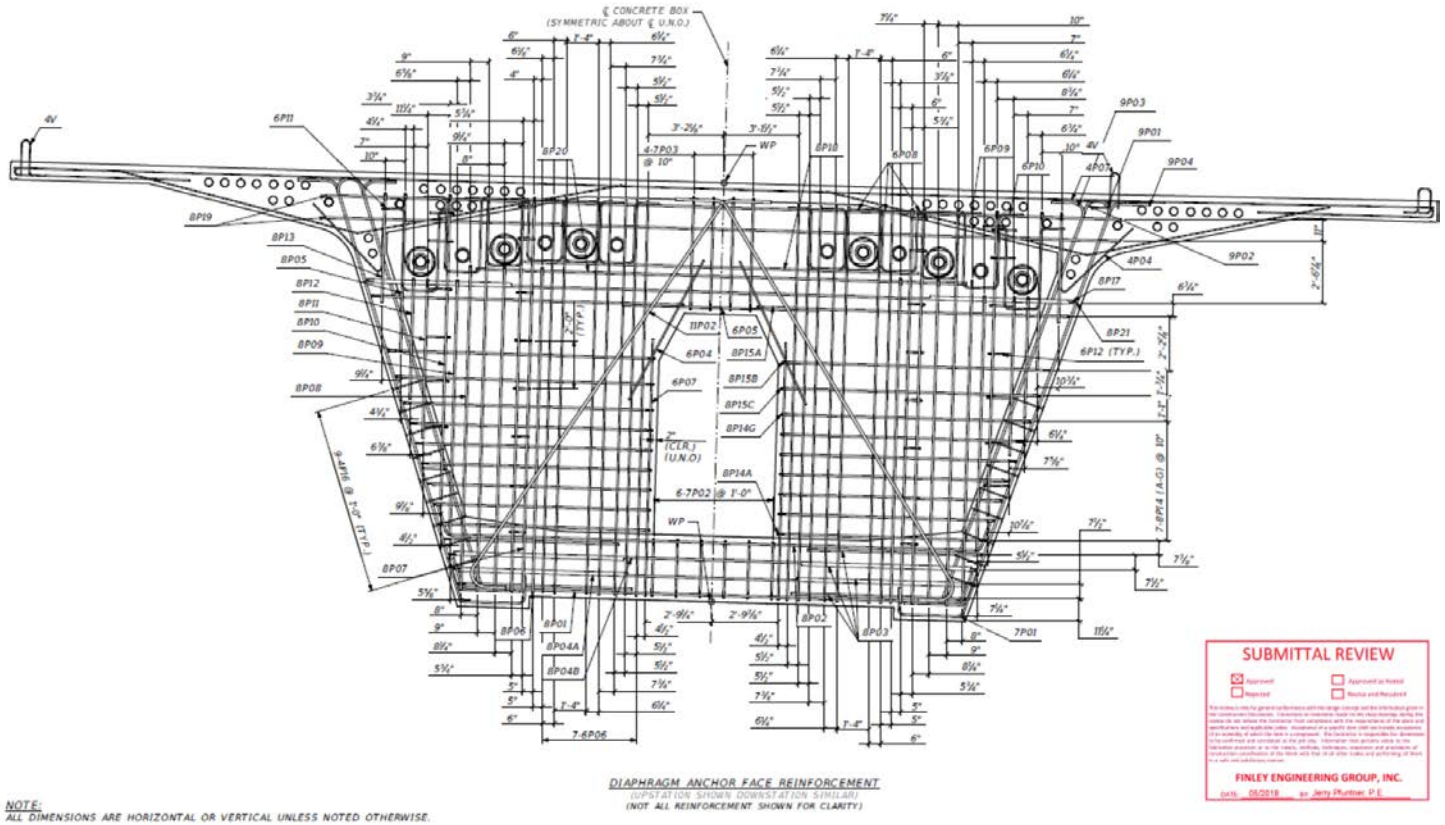


Photo courtesy of Superior Construction.

Photos courtesy of Superior Construction.

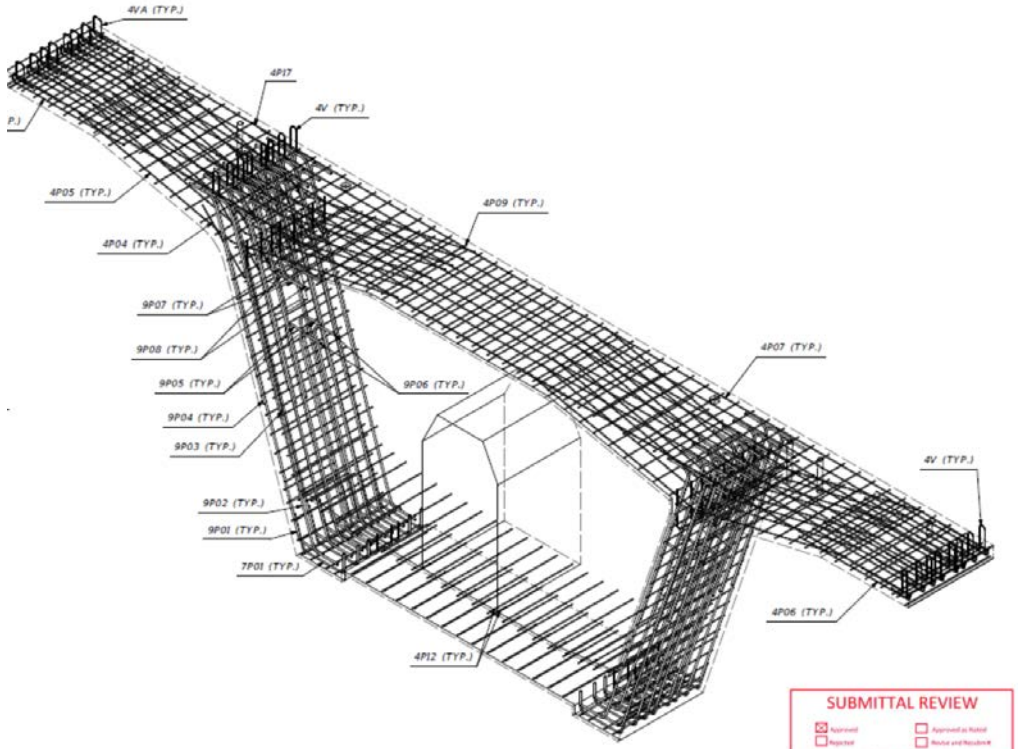
Pier Table Segment Model



DIAPHRAGM ANCHOR FACE REINFORCEMENT
(UPSTATION SHOWN, DOWNSTATION SIMILAR)
(NOT ALL REINFORCEMENT SHOWN FOR CLARITY)

NOTE:
ALL DIMENSIONS ARE HORIZONTAL OR VERTICAL UNLESS NOTED OTHERWISE.

SUBMITTAL REVIEW
FINLEY ENGINEERING GROUP, INC.



DETAIL D2 ISOMETRIC VIEW

CKOUT BAR 9P04 CAN BE MOVED TO THE OPPOSITE SIDE OF THE TYPICAL SET AS SHOWN IN DETAIL D2.

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FINLEY ENGINEERING GROUP, INC.

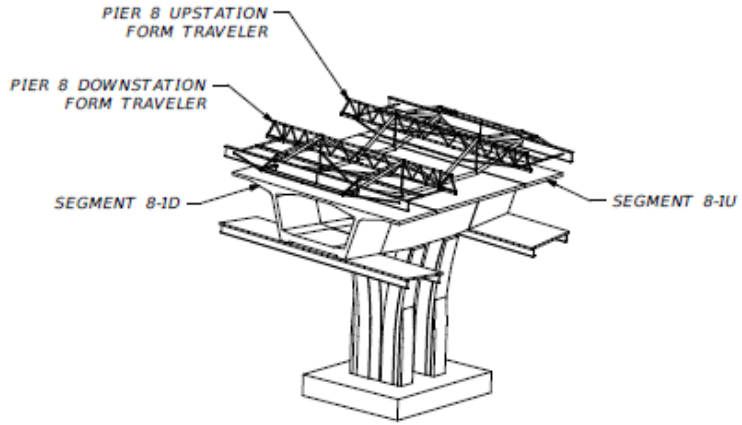
STEP 4:
1. DISASSEMBLE AND REMOVE PIER TABLE FALSEWORK AT PIERS 8 & 9.
2. STRESS THE TRANSVERSE DIAPHRAGM TENDONS AT ALTERNATING ENDS.*
3. ERECT FORM TRAVELERS IN POSITION TO CAST SEGMENTS 8-1D/8-1U & 9-1D/9-1U.
4. CAST SEGMENTS 8-1U & 9-1D PER GENERAL PROCEDURE SHEET "CM-G1".**
5. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
6. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C2 IN ANY ORDER AS PER PT STRESSING DATA.
7. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 4250PSI, FORM TRAVELERS AT 8-1U AND 9-1D MAY BE ADVANCED.
8. GROUT TENDONS AND POUR BACK BLOCKOUTS.***
9. CAST SEGMENTS 8-1D & 9-1U PER GENERAL PROCEDURE SHEET "CM-G1".**
10. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
11. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C3 IN ANY ORDER AS PER PT STRESSING DATA.
12. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 4250PSI, FORM TRAVELERS AT 8-1D AND 9-1U MAY BE ADVANCED.
13. GROUT TENDONS AND POUR BACK BLOCKOUTS.***

* AT THE CONTRACTORS OPTION, ALL TRANSVERSE DIAPHRAGM TENDONS MAY BE DISCARDED AND RESTRESSED TO COMPLY WITH THE TIME FRAME ALLOWED BY THE SPECIFICATIONS TO COMPLETE THE FLEXIBLE FILLER INJECTION. THE TENDONS MAY BE DESTRESSED PER THE FOLLOWING SEQUENCE (THIS STEP MUST BE COMPLETED PRIOR TO THE FORM TRAVELER LOAD TEST OPERATION.):
- PIER 8 DIAPHRAGM TENDONS: AFTER CLOSURE TENDONS STRESSED IN SPAN 7
- PIER 9 DIAPHRAGM TENDONS: AFTER CLOSURE TENDONS STRESSED IN SPAN 9

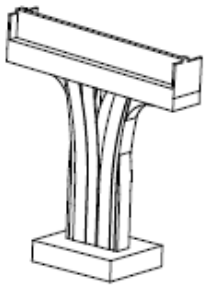
** CONSTRUCTION OF CANTILEVER 8 AND 9 MAY BE CONDUCTED INDEPENDENTLY.
*** THIS STEP MAY BE COMPLETED AT ANY TIME WITHIN THE TIME FRAME ALLOWED BY THE SPECIFICATIONS.

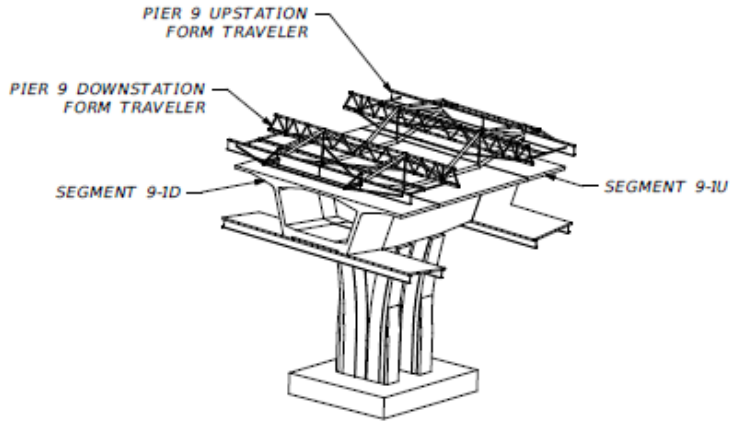
SEGM

DIRECTION OF STATIONING

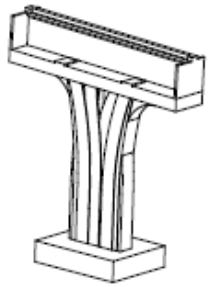


MAINSPAN PIER 8





MAINSPAN PIER 9



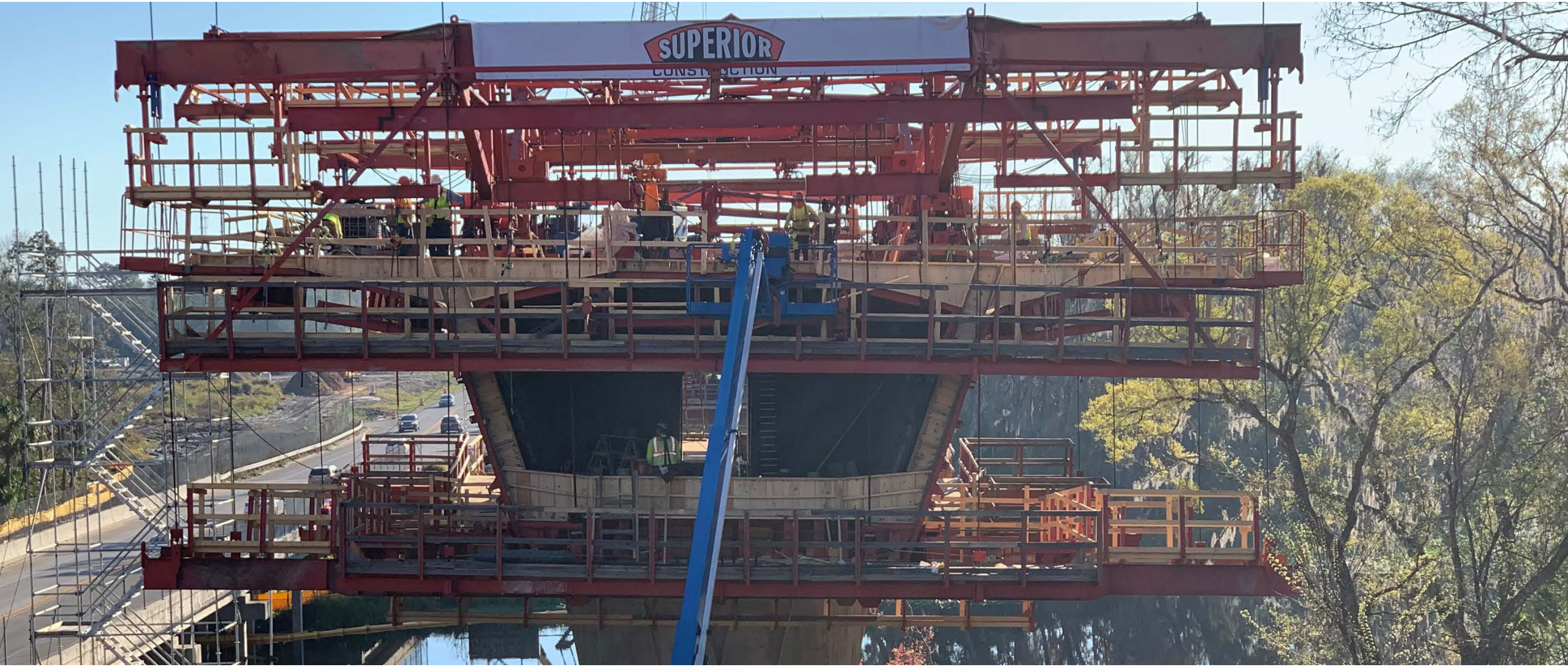
TRANSITION PIER 10

DIRECTION OF STATIONING

PIER 8 DOWNSTATION
FORM TRAVELER (TYP)

PIER 8 UPSTATION
FORM TRAVELER (TYP)

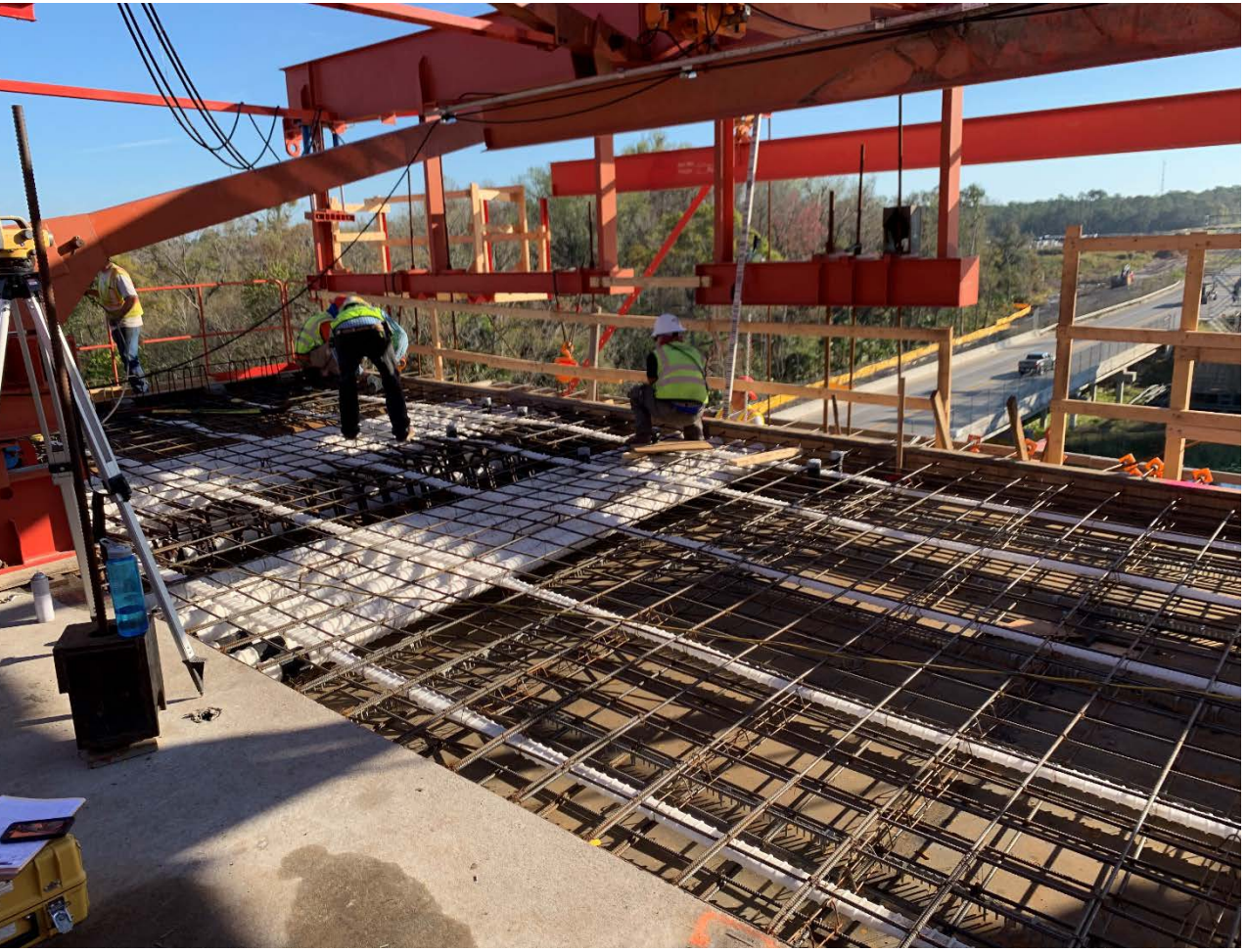
Photo courtesy of Superior Construction.



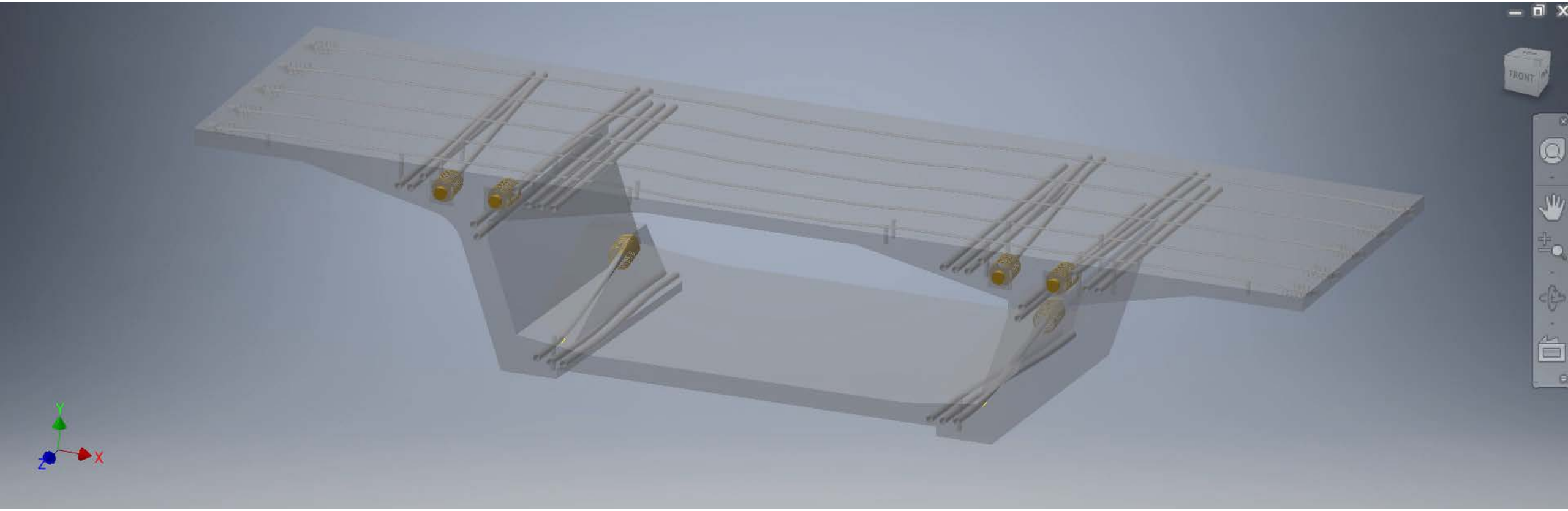
Photos courtesy of Superior Construction.

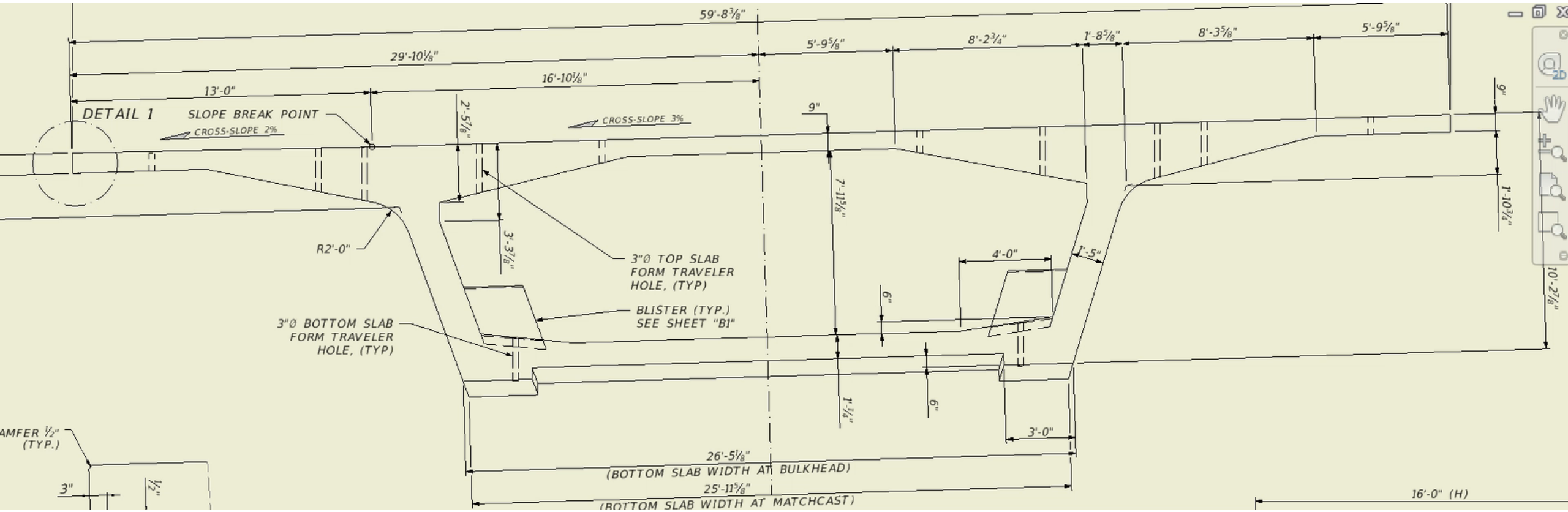
Photos courtesy of Superior Construction.

Photos courtesy of Superior Construction.



Typical Segment Model




DETAIL 1
SLOPE BREAK POINT
CROSS-SLOPE 2%
CROSS-SLOPE 3%
59'-8 3/8"
29'-10 1/8"
16'-10 1/8"
13'-0"
5'-9 5/8"
8'-2 3/4"
1'-8 5/8"
8'-3 5/8"
5'-9 5/8"
2'-5 1/8"
3'-3 7/8"
9"
7'-11 5/8"
R2'-0"
3"Ø TOP SLAB FORM TRAVELER HOLE, (TYP)
BLISTER (TYP.) SEE SHEET "B1"
3"Ø BOTTOM SLAB FORM TRAVELER HOLE, (TYP)
4'-0"
1'-5"
6"
1'-1/4"
6"
3'-0"
9"
1'-10 3/4"
10'-2 7/8"
AMFER 1/2" (TYP.)
3"
1/2"
26'-5 1/8"
(BOTTOM SLAB WIDTH AT BULKHEAD)
25'-11 5/8"
(BOTTOM SLAB WIDTH AT MATCHCAST)
16'-0" (H)

REINFORCEMENT QUANTITIES

BARMARK	DESCRIPTION	ITEM QTY	SIZE	TYPE	LENGTH	A	B	C	D	E	F	G	H	I	J	K	L	N	O	R	DIM LIMIT	TOTAL LBS
4TS01a	Bottom Slab Bott	1	#4	13	27'-8 3/4"		26'-6"	8"	8"									71.57	71.57			18.5
4TS01b	Bottom Slab Bott	1	#4	13	27'-8 1/2"		26'-6"	8"	8"									71.57	71.57			18.5
4TS01c	Bottom Slab Bott	1	#4	13	27'-8 1/4"		26'-5 3/4"	8"	8"									71.57	71.57			18.5
4TS01d	Bottom Slab Bott	1	#4	13	27'-8"		26'-5 1/4"	8"	8"									71.57	71.57			18.5
4TS01e	Bottom Slab Bott	1	#4	13	27'-7 3/4"		26'-5 1/4"	8"	8"									71.57	71.57			18.5
4TS01f	Bottom Slab Bott	1	#4	13	27'-7 1/2"		26'-5"	8"	8"									71.57	71.57			18.5
4TS01g	Bottom Slab Bott	1	#4	13	27'-7 1/4"		26'-4 3/4"	8"	8"									71.57	71.57			18.4
4TS01h	Bottom Slab Bott	1	#4	13	27'-7"		26'-4 1/2"	8"	8"									71.57	71.57			18.4
4TS01i	Bottom Slab Bott	1	#4	13	27'-7"		26'-4 1/4"	8"	8"									71.57	71.57			18.4
4TS01j	Bottom Slab Bott	1	#4	13	27'-6 3/4"		26'-4"	8"	8"									71.57	71.57			18.4
4TS01k	Bottom Slab Bott	1	#4	13	27'-6 1/2"		26'-3 3/4"	8"	8"									71.57	71.57			18.4
4TS01l	Bottom Slab Bott	1	#4	13	27'-6 1/4"		26'-3 1/2"	8"	8"									71.57	71.57			18.4
4TS01m	Bottom Slab Bott	1	#4	13	27'-6"		26'-3 1/4"	8"	8"									71.57	71.57			18.4
4TS01n	Bottom Slab Bott	1	#4	13	27'-5 3/4"		26'-3 1/4"	8"	8"									71.57	71.57			18.4
4TS01o	Bottom Slab Bott	1	#4	13	27'-5 1/2"		26'-3"	8"	8"									71.57	71.57			18.3
4TS01p	Bottom Slab Bott	1	#4	13	27'-5 1/4"		26'-2 3/4"	8"	8"									71.57	71.57			18.3
4TS01q	Bottom Slab Bott	1	#4	13	27'-5"		26'-2 1/2"	8"	8"									71.57	71.57			18.3
4TS01r	Bottom Slab Bott	1	#4	13	27'-4 3/4"		26'-2 1/4"	8"	8"									71.57	71.57			18.3
4TS02s	Bottom Slab Top	1	#4	13	27'-10 3/4"		26'-8 1/4"	8"	8"									71.57	71.57			18.6
4TS02t	Bottom Slab Top	1	#4	13	27'-10 1/2"		26'-8"	8"	8"									71.57	71.57			18.6
4TS02u	Bottom Slab Top	1	#4	13	27'-10 1/2"		26'-7 3/4"	8"	8"									71.57	71.57			18.6
4TS02v	Bottom Slab Top	1	#4	13	27'-10 1/4"		26'-7 1/2"	8"	8"									71.57	71.57			18.6
4TS02w	Bottom Slab Top	1	#4	13	27'-10"		26'-7 1/2"	8"	8"									71.57	71.57			18.6
4TS02x	Bottom Slab Top	1	#4	13	27'-9 3/4"		26'-7 1/4"	8"	8"									71.57	71.57			18.6
4TS03	Bottom Slab Haunch	40	#4	12	8'-7 1/2"		8'-0"	8"											64.44			230.5
4TS04	Haunch	48	#4	14	6'-1 1/2"		4'-2 1/4"	2'-4 3/4"											45.00			196.4
4TS05	Top Slab Haunch	48	#4	14	21'-6 1/2"		10'-4"	11'-2 3/4"											155.19			690.7
4TS06	Wing Tip	14	#4	35	10'-7 3/4"		3'-2"	4"	0'-0"	7'-4 1/4"												99.6
4TS08	Top Slab Bott	24	#4	1	14'-7 1/4"		14'-7 1/4"															234.1
4TS09	Longitudinal bar	206	#4	01	18'-4"		18'-4"															2522.8
4TS10	Top Slab Thick End	14	#4	35	10'-9 1/4"		7'-4 1/4"	5 1/2"	1/4"	3'-2"												100.7
4TS11	Bottom Slab Corner	48	#4	15	5'-1 1/2"		2'-8 1/2"	8"	1'-11"									71.57	90.00			164.3

SUBMITTAL REVIEW

☒ Approved ☐ Approved as Noted

☐ Rejected ☐ Revise and Resubmit

This review is only for general conformance with the design concept and the information given in the Construction Documents. Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with the requirements of the plans and specifications and applicable codes. Acceptance of a specific item shall not include acceptance of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the Work with that of all other trades and performing all Work in a safe and satisfactory manner.

FINLEY ENGINEERING GROUP, INC.

DATE: 06/2018 BY: Jerry Pfuntner, P.E.

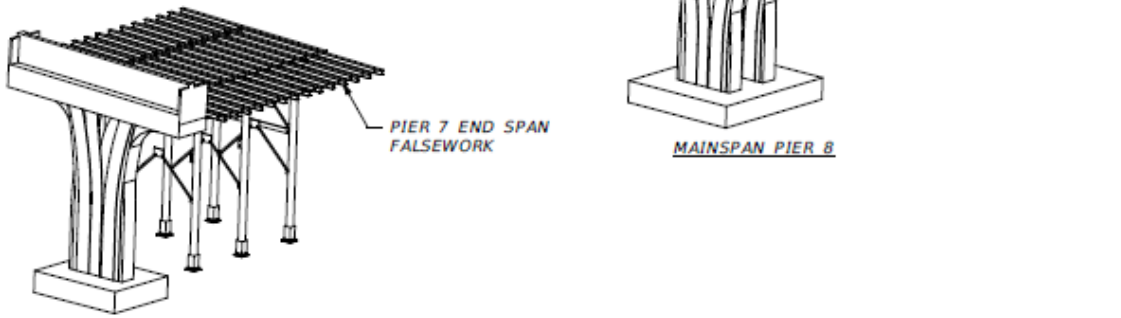
BAR LIST NOTES:

1. ALL BAR BEND DIMENSIONS ARE OUT TO OUT.
2. LENGTH GIVEN IS ACTUAL BAR LENGTH.
3. FOR BAR BENDING DETAILS REFER TO FDOT STANDARD INDEX.
4. DIMENSIONAL LIMITATIONS (DIM LIMIT) DENOTE DIMENSIONS WITH A TOLERANCE OF 0" LONG TO -1" SHORT.
5. REBAR WEIGHTS ARE BASED ON ACTUAL BAR LENGTHS.

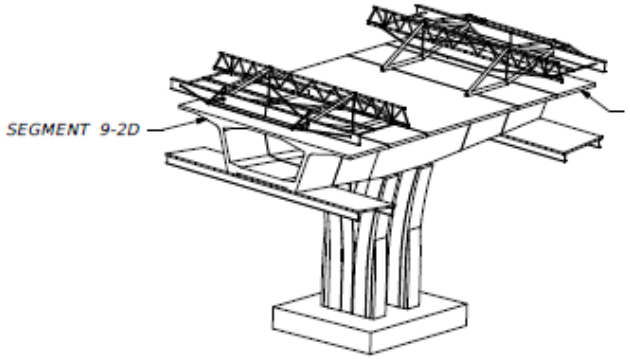
STEP 5B:

1. ADVANCE FORM TRAVELERS AT PIER TABLE IN POSITION TO CAST SEGMENTS 8-2U & 9-2D.
2. CAST SEGMENTS 8-2U & 9-2D PER GENERAL PROCEDURE SHEET "CM-G1".*
3. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
4. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C4 IN ANY ORDER AS PER PT STRESSING DATA.
5. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 4250PSI, FORM TRAVELERS AT 8-2U AND 9-2D MAY BE ADVANCED.
6. GROUT TENDONS AND POUR BACK BLOCKOUTS.**
7. ADVANCE FORM TRAVELERS AT PIER TABLE IN POSITION TO CAST SEGMENTS 8-2D & 9-2U.
8. CAST SEGMENTS 8-2D & 9-2U PER GENERAL PROCEDURE SHEET "CM-G1".*
9. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
10. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C5 IN ANY ORDER AS PER PT STRESSING DATA.
11. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 4250PSI, FORM TRAVELERS AT 8-2D & 9-2U MAY BE ADVANCED.
12. GROUT TENDONS AND POUR BACK BLOCKOUTS.**

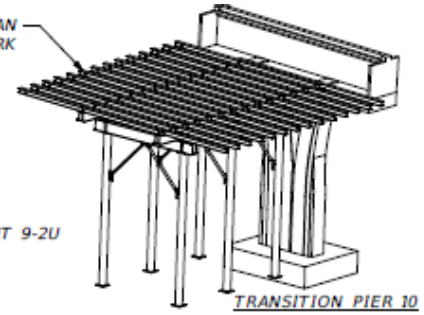
SEGMENT 8-1D



MAINSPAN PIER 8



MAINSPAN PIER 9



TRANSITION PIER 10

DIRECTION OF STATIONING

DIRECTION OF STATIONING

SEGMENT 8-2U

End Span Falsework

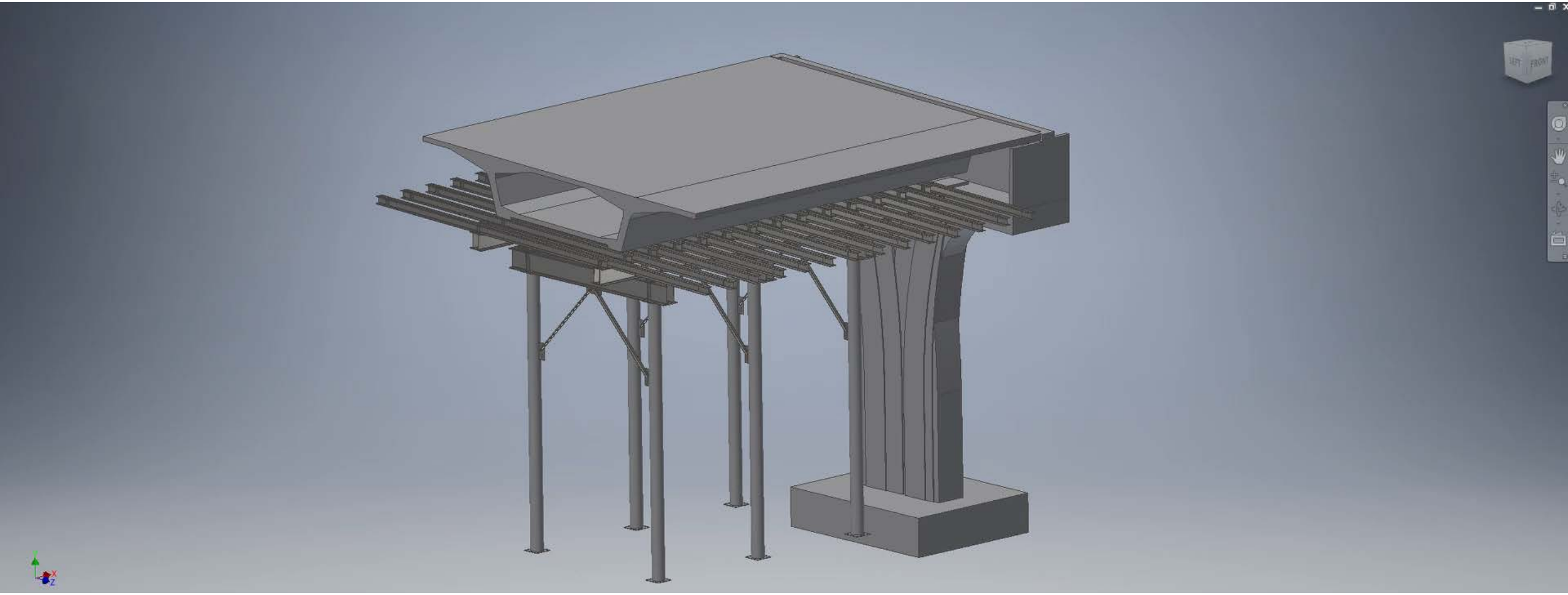


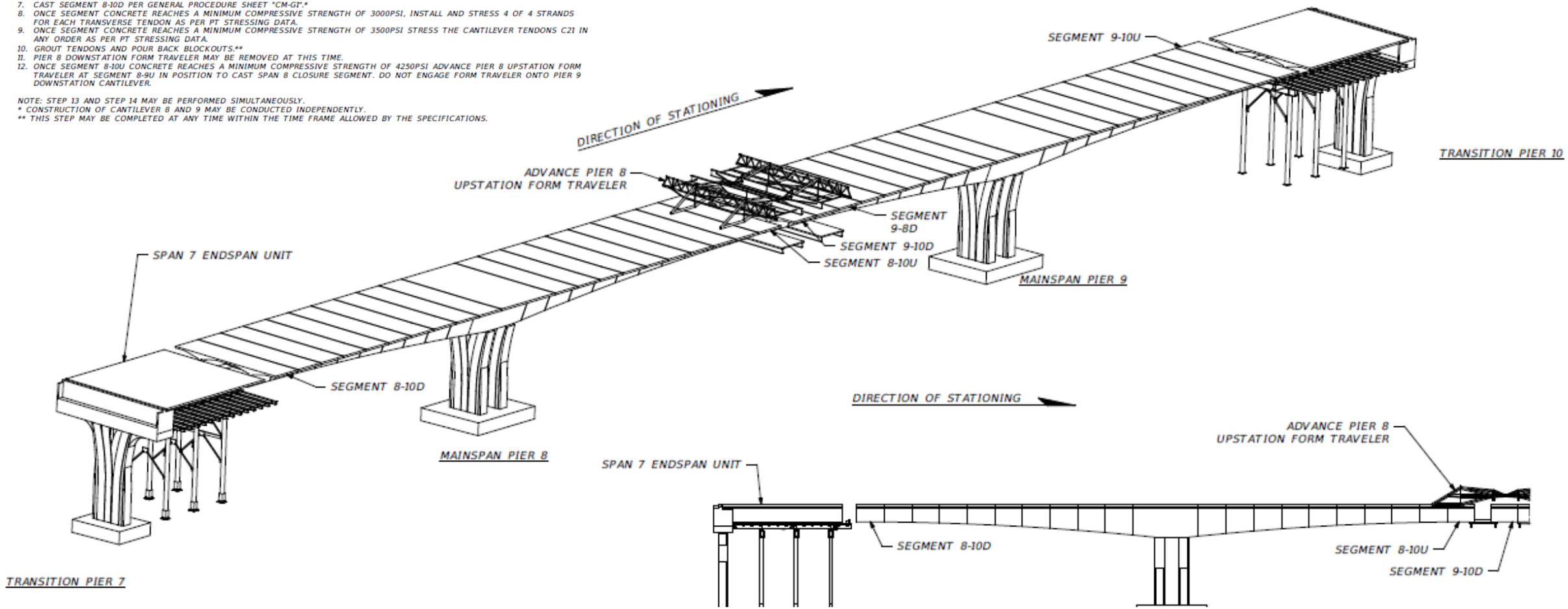
Photo courtesy of Superior Construction.

Photos courtesy of Superior Construction.

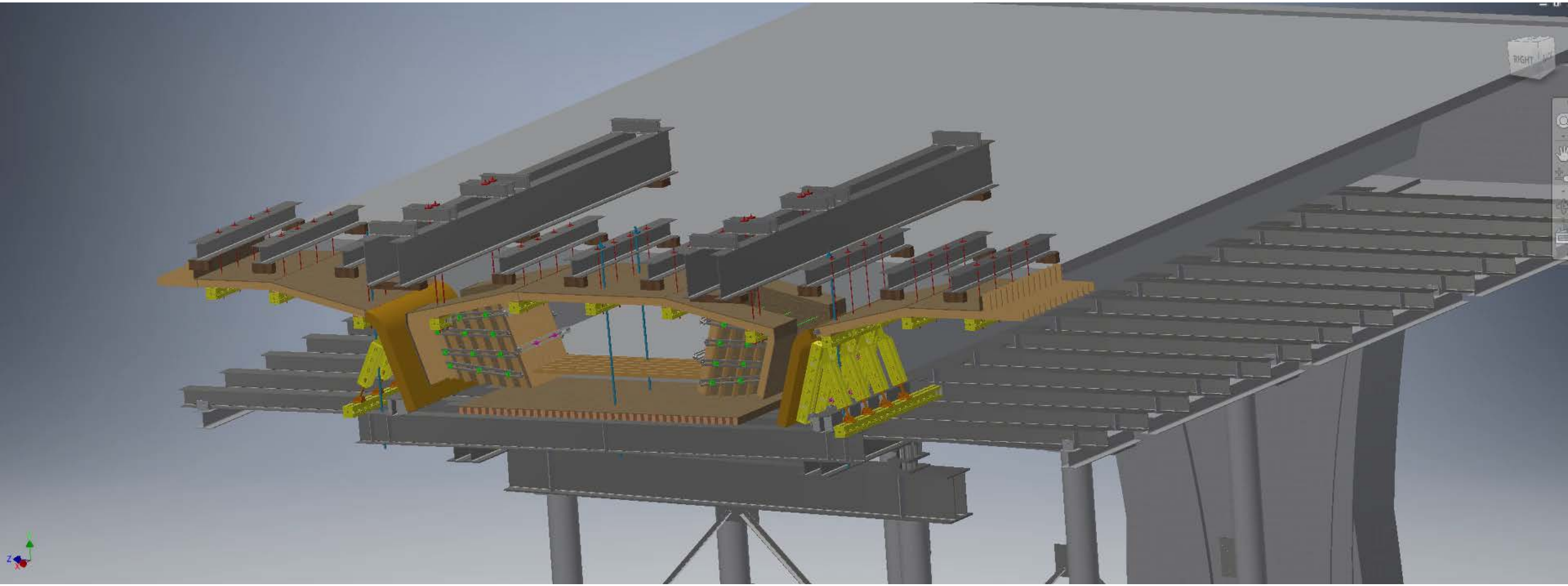
STEP 9:

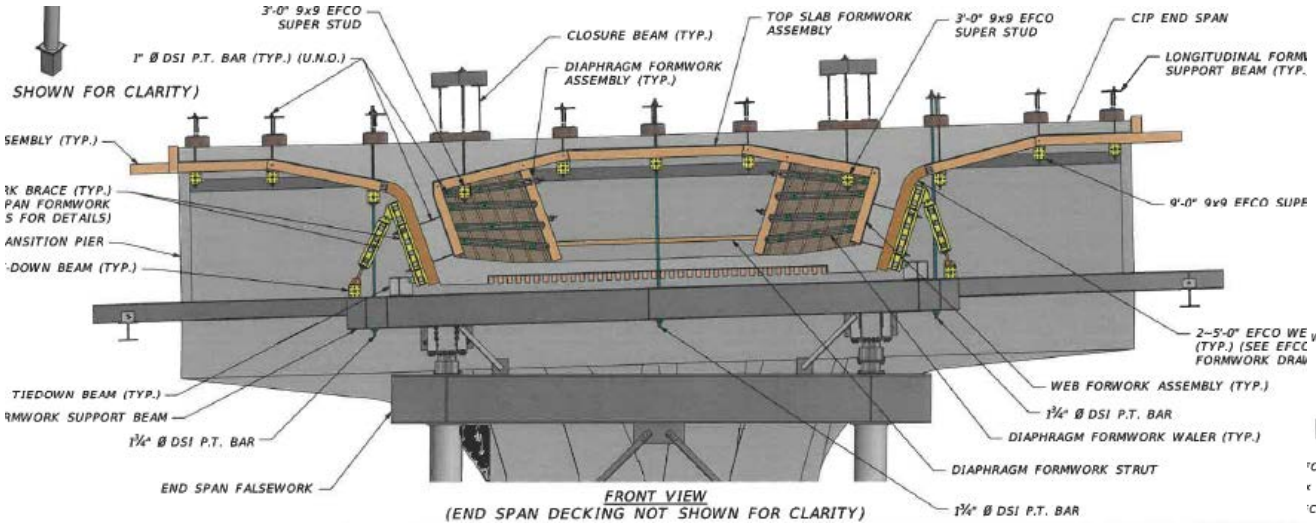
1. ADVANCE PIER 8 UPSTATION FORM TRAVELER AT SEGMENT 8-8U IN POSITION TO CAST SEGMENT 8-10U.
2. CAST SEGMENT 8-10U PER GENERAL PROCEDURE SHEET "CM-G1".*
3. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
4. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C20 IN ANY ORDER AS PER PT STRESSING DATA.
5. GROUT TENDONS AND POUR BACK BLOCKOUTS.**
6. ADVANCE PIER 8 DOWNSTATION FORM TRAVELER AT SEGMENT 8-8D IN POSITION TO CAST SEGMENT 8-10D.
7. CAST SEGMENT 8-10D PER GENERAL PROCEDURE SHEET "CM-G1".*
8. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3000PSI, INSTALL AND STRESS 4 OF 4 STRANDS FOR EACH TRANSVERSE TENDON AS PER PT STRESSING DATA.
9. ONCE SEGMENT CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 3500PSI STRESS THE CANTILEVER TENDONS C21 IN ANY ORDER AS PER PT STRESSING DATA.
10. GROUT TENDONS AND POUR BACK BLOCKOUTS.**
11. PIER 8 DOWNSTATION FORM TRAVELER MAY BE REMOVED AT THIS TIME.
12. ONCE SEGMENT 8-10U CONCRETE REACHES A MINIMUM COMPRESSIVE STRENGTH OF 4250PSI ADVANCE PIER 8 UPSTATION FORM TRAVELER AT SEGMENT 8-9U IN POSITION TO CAST SPAN 8 CLOSURE SEGMENT. DO NOT ENGAGE FORM TRAVELER ONTO PIER 9 DOWNSTATION CANTILEVER.

NOTE: STEP 13 AND STEP 14 MAY BE PERFORMED SIMULTANEOUSLY.
* CONSTRUCTION OF CANTILEVER 8 AND 9 MAY BE CONDUCTED INDEPENDENTLY.
** THIS STEP MAY BE COMPLETED AT ANY TIME WITHIN THE TIME FRAME ALLOWED BY THE SPECIFICATIONS.

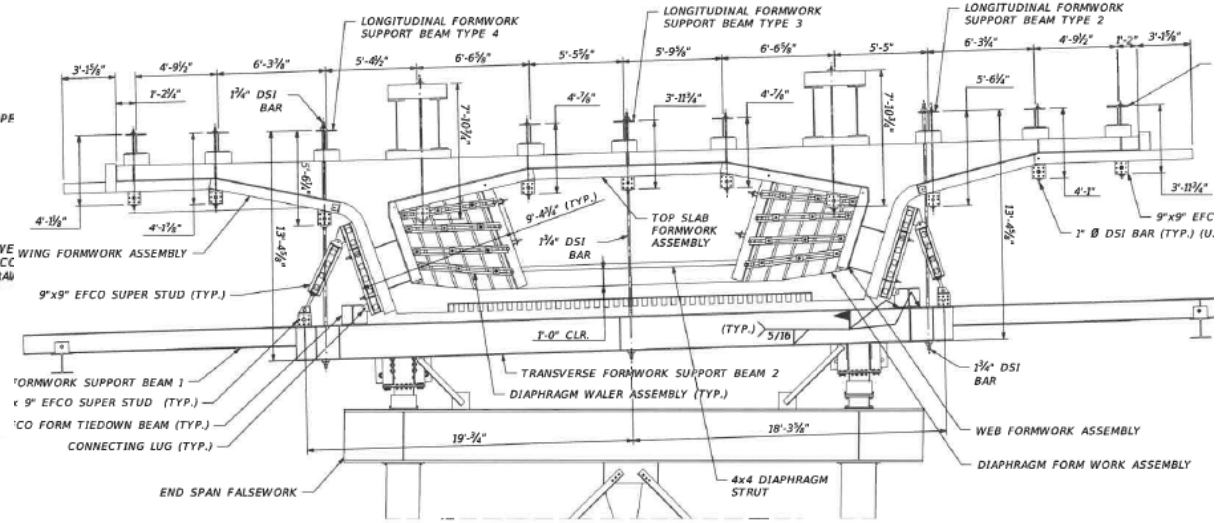


Closure Pour Formwork

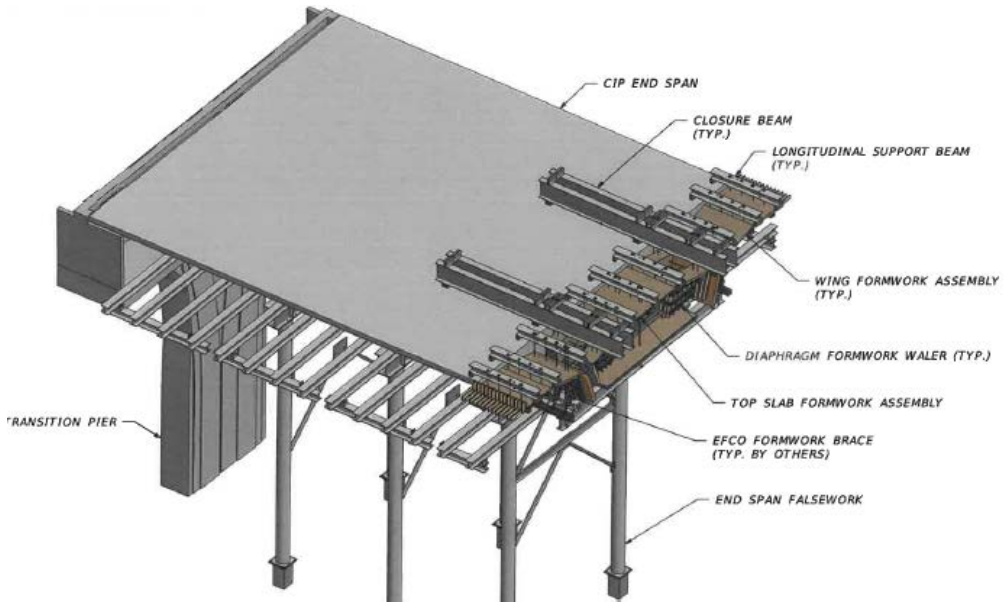


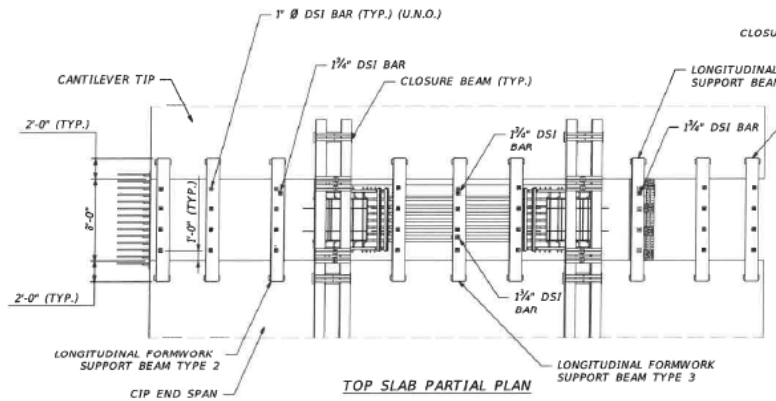


FRONT VIEW
(END SPAN DECKING NOT SHOWN FOR CLARITY)



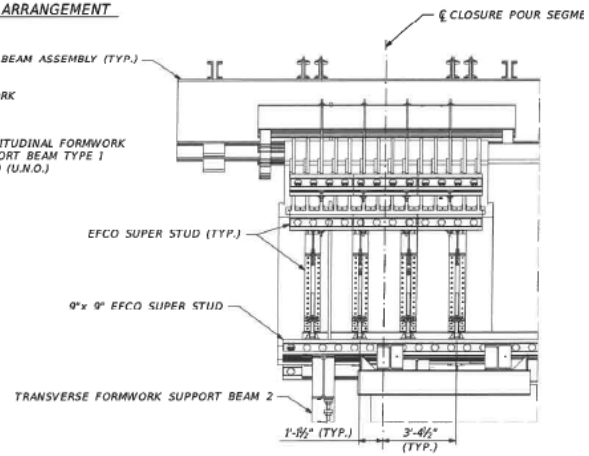
STEEL MEMBER ARRANGEMENT





TOP SLAB PARTIAL PLAN

NOTE:
1. FOR CLOSURE BEAM DETAILS SEE CLOSURE BEAM DRAWING SUBMITTAL



VIEW A1-A1

Technical Bridge Innovations

+ Use of single geometry source to integrate design modelling and construction engineering
+ Ultimate moment resistance design of unbonded internal continuity tendon, unbonded external continuity tendons and bonded mild reinforcement
+ Use of BrIM modelling throughout the design and construction process

Lessons Learned

+ Remember that the precision of 3D modelling does not continue out into the field…. Allow for construction tolerances

+ Quality Control with BrIM modelling requires new processes

+ “Drawings“ from BrIM models do not have to look like traditional 2D plans – use colors, ISO views, etc. to help visualize the details

Photo courtesy of Superior Construction.

Come see the Wekiva Segmental Bridges at the **ASBI Convention Bridge Tour!**

November 6th, 2019

Photo courtesy of Superior Construction.

Wekiva Parkway Signature Segmental Bridge (Section 6)

Questions?

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Andrés von Breymann