

SPREAD SLAB BEAM BRIDGE CONSTRUCTION AT TEXAS A&M
UNIVERSITY RIVERSIDE CAMPUS

Appendix E

Supplement to Report No. FHWA/TX-14/0-6722-1

DRAWING SET

May 1, 2013

Revised September 1, 2013

TxDOT PROJECT NO: 0-6722

TEXAS A&M UNIVERSITY

TEXAS A&M TRANSPORTATION INSTITUTE

COLLEGE STATION, TEXAS

Specifications and Design Summary for Superstructure Construction on TxDOT Project 0-6722

Summary:

This project is to design, construct, and test a full-scale spread prestressed slab beam bridge on the western side of Runway 17-L, Section 2 of Texas A&M University's Riverside Campus. The bridge will be instrumented with measuring devices to determine the load distribution between slab-beams and the slab beam deflections as truck loads are applied both statically and dynamically at different speeds. The purpose of the research is to determine if a spread slab beam approach is an effective and economical method for constructing a small highway bridge. The research team consists of Texas A&M University professors Dr. Mary Beth Hueste and Dr. John Mander, as well as graduate students Tefvik Terzioğlu, Dongqi Jiang, and Joel Petersen-Gauthier. This document will illustrate what has been completed in the design, and what is required of the superstructure construction.

Design Parameters that differ from TxDOT Standard Designs:

The following parameters for the prestressed slab beams are modifications of the standard details for typical slab beams.

1. The H hoop reinforcement in the 5SB15 beams shall protrude from the top surface of the beam 6" rather than 2". The thicker 8" deck permits a longer hook length for these bars. The final total height of the H bars will be 19".
2. 56 strand positions in each 5SB15 beam will be filled by GR 270, 0.5" diameter 7-wire low relaxation strands. However, within the first 6 feet at each end of each beam several strands will be debonded to reduce the tensile end stresses. All debonding will be done on the bottom row of strands. The debonding will be done in accordance with the TxDOT's typical debonding procedures. The specific debonding arrangement is provided on drawing S6722-3.

Notes:

1. General Notes

- A full-scale 46'-7" span (center-to-center of bearing pads), 34'-0" wide spread prestressed slab beam bridge will be designed, constructed, and tested.
- The bridge will be constructed on the western side of Runway 17-L, Section 2 of the Texas A&M University Riverside Campus.
- The bridge will be instrumented by measuring devices during and at the completion of the construction for data acquisition during testing.
- Generally the same procedures and design as typical TxDOT slab beam bridges are followed with a few exceptions.

2. Prestressed Beam Notes

- Four 5SB15 (15" x 5') that are a total of 48'-0" long (46'-7" span).
- High strength TxDOT Class H concrete with $f'_{ci}=6$ ksi at release and $f'_{c}=7$ ksi at 28 days.
- 56 strand locations will be filled with 0.5 in diameter, GR 270 7-wire, low relaxation strands.
- Debonding will be in the bottom row as specified in drawing S6722-3.
- Debonding shall follow TxDOT specifications for debonding requirements.
- The H hoop reinforcement in the 5SB15 beams shall protrude 6" from the top surface of the beam rather than 2", making the final height of the H bars 19".

3. Prestressed Concrete Panel (PCP) Notes

- 18 total panels required, (18 panels 8'-0" long, all with 4 in. depth and 5'-4" width).
- TxDOT Class H concrete with $f'_{ci}=4$ ksi at release and $f'_{c}=5$ ksi at 28 days.
- Standard TxDOT specifications shall be used for the panels.

4. Cast-in-Place Deck Notes

- The deck will be cast-in-place after the slab beams and PCPs are positioned.
- A target haunch of 2" will be used, but this shall not be less than 0.5" nor greater than 4" at any section.
- TxDOT Class S concrete with $f'_{c}=4$ ksi at 28 days.
- Mild steel reinforcement shall be ASTM A615 Grade 60.

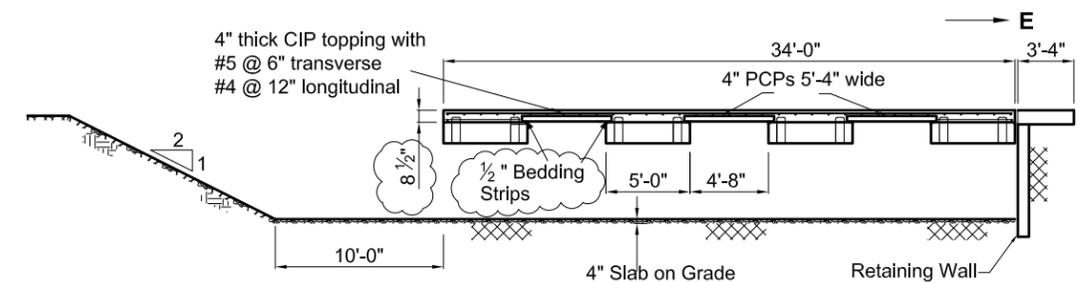
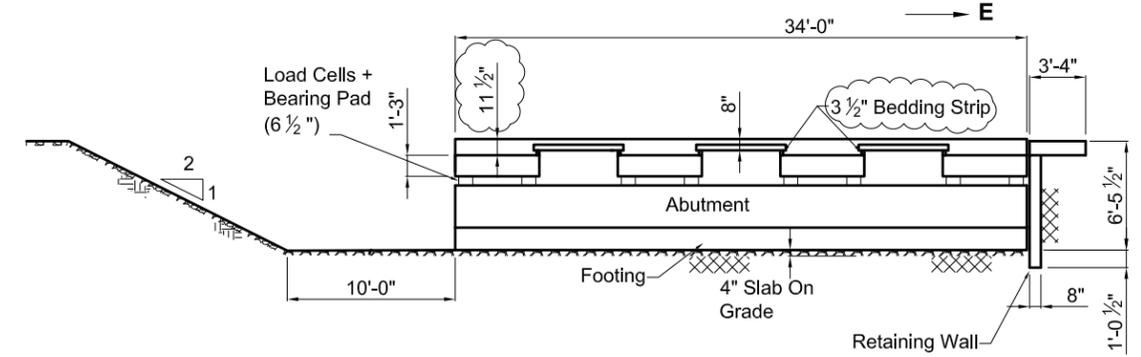
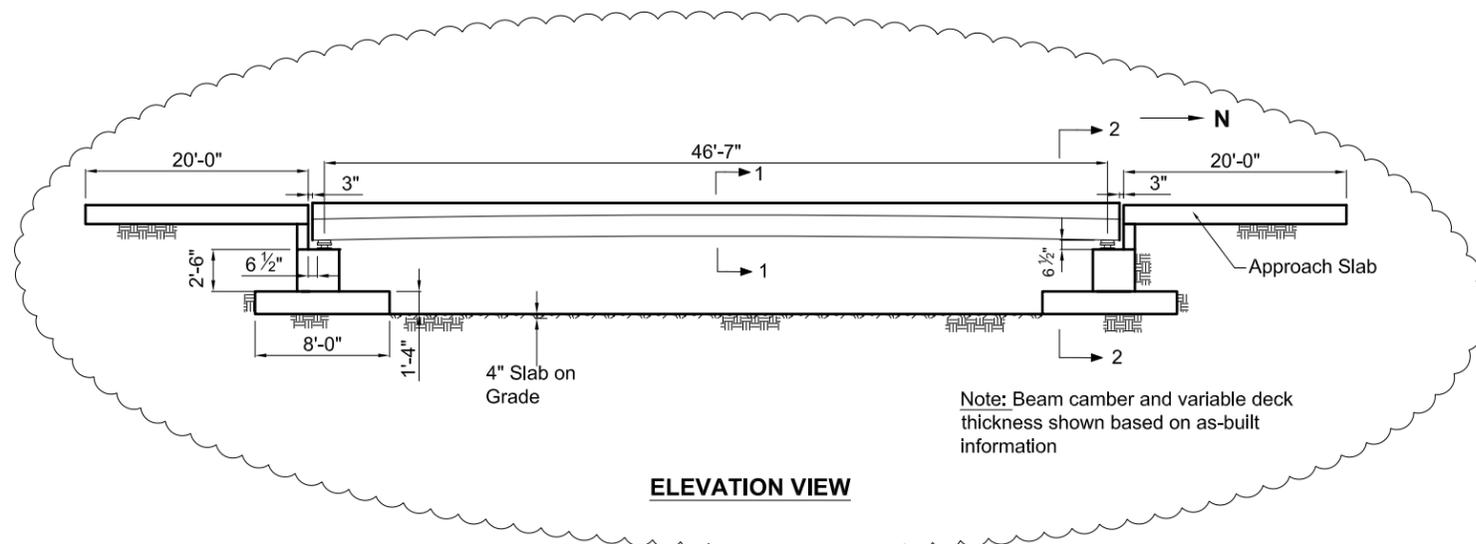
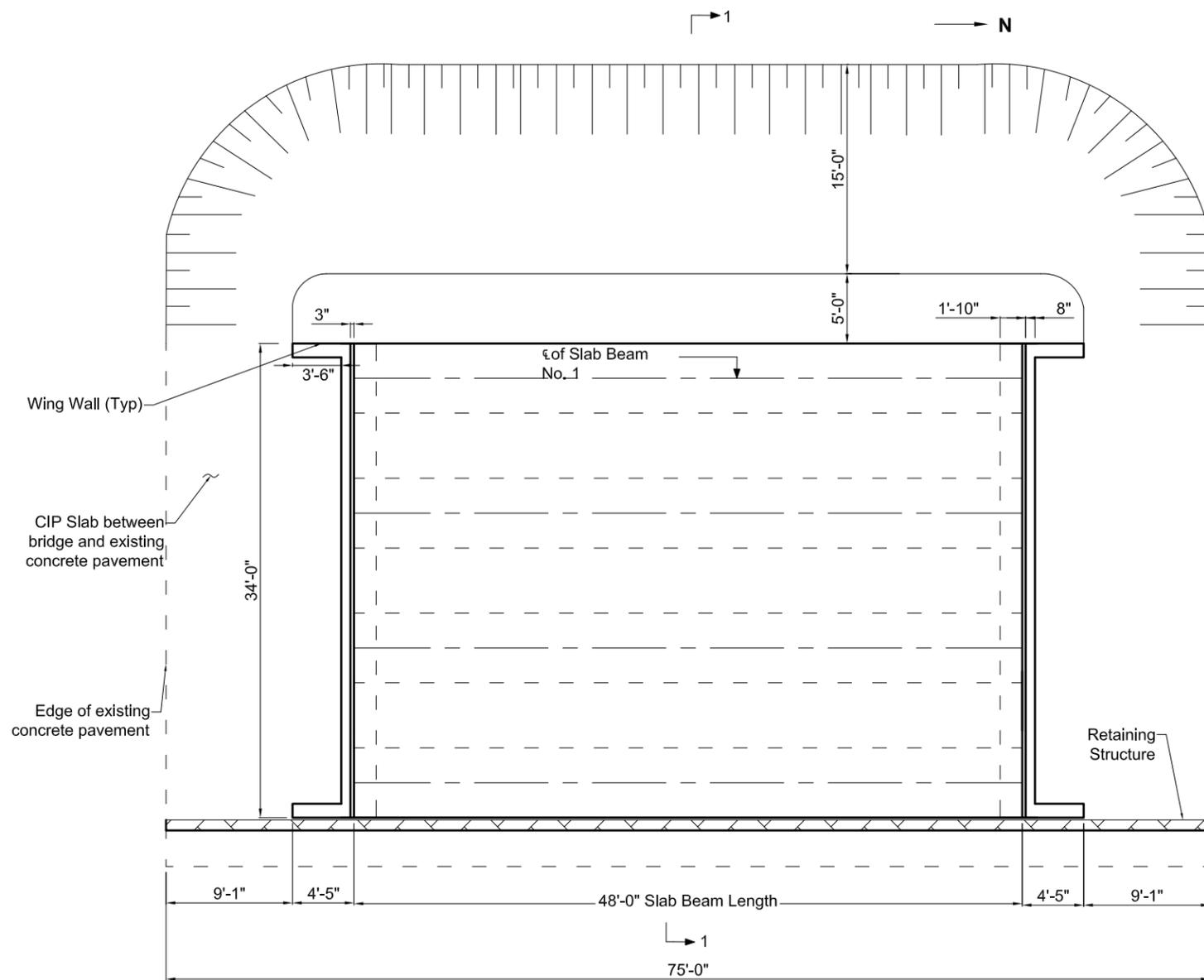
List of Design Drawings:

1. Specifications for Superstructure.....S6722-1
2. Superstructure.....S6722-2
3. Prestressing Details for Prestressed Concrete Slab Beam (5SB15).....S6722-3
4. Deck Reinforcement.....S6722-4
5. Bearing Pad Details.....S6722-5

List of Standard Drawings:

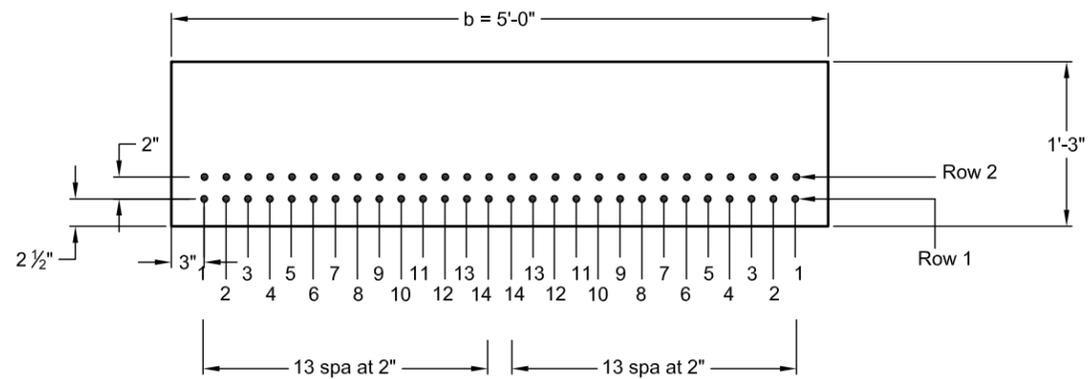
1. Prestressed Concrete Slab Beam Detail (Type 5SB15).....PSB-5SB15
2. Prestressed Concrete Panels Fabrication Details.....PCP-FAB
3. Elastomeric Bearing Details (Prestressed Concrete Slab Beam).....PSBEB

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
SPECIFICATIONS FOR SUPERSTRUCTURE	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 1



- NOTES:
1. Concrete Strength $f_c = 4$ ksi for non-prestressed components.
 2. All mild reinforcement shall be ASTM A615 Grade 60 steel.
 3. These superstructure details may be used for spread-SPSB-32 only.
 4. For abutment details see drawing S6722-3
 5. For bearing pad details see TxDOT standard drawing PSBEB.

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013 Rev. 9/1/2013
AS-BUILT SUPERSTRUCTURE	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 2

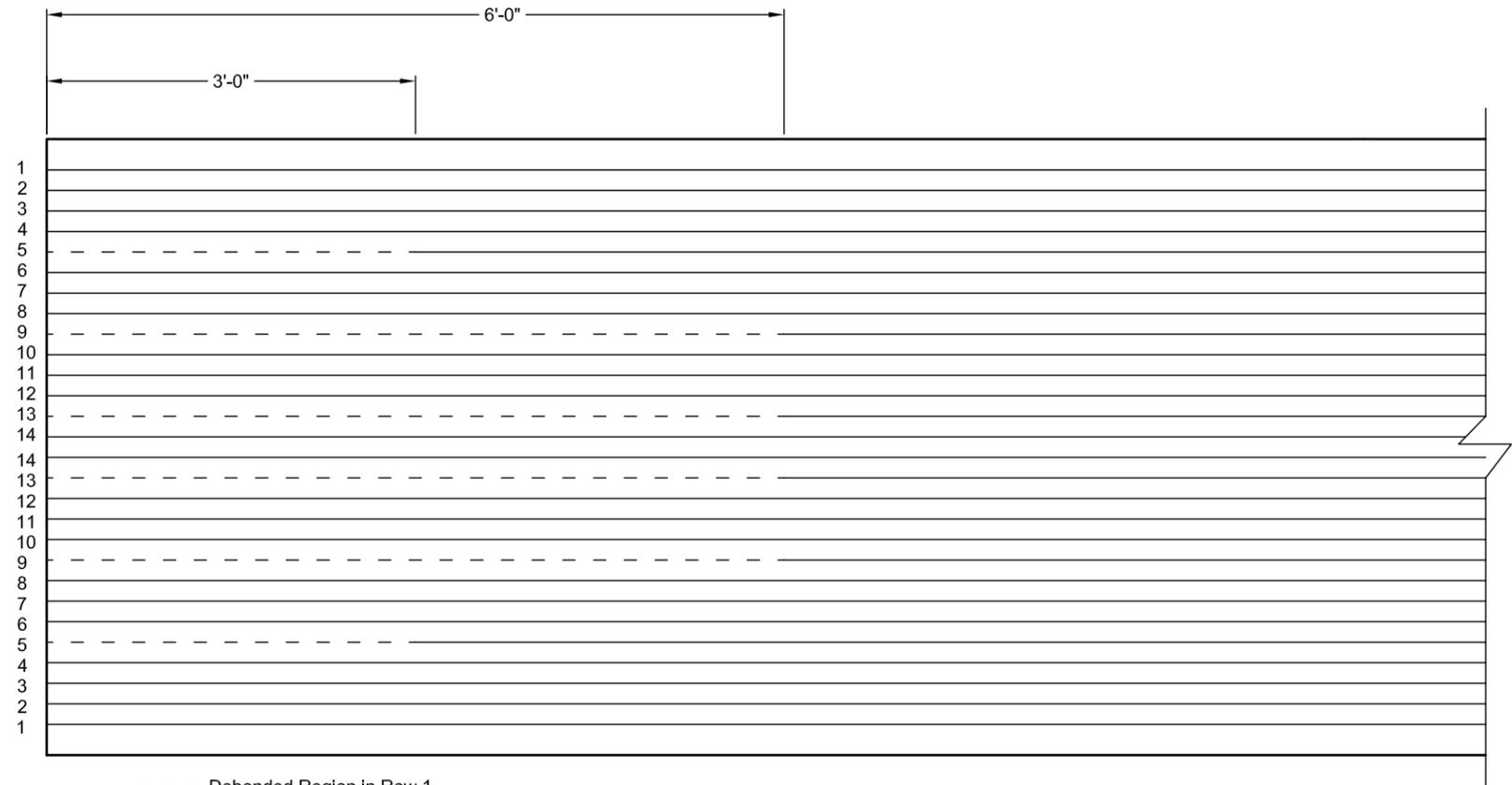


**STRAND LOCATIONS
CROSS-SECTION**

DEBONDING DATA		
Measurement from End	Strand No. (Row 1)	Number of Debonded Strands
0'-0" - 3'-0"	No.5,9,13	6
3'-0" - 6'-0"	No. 9,13	4

NOTES :

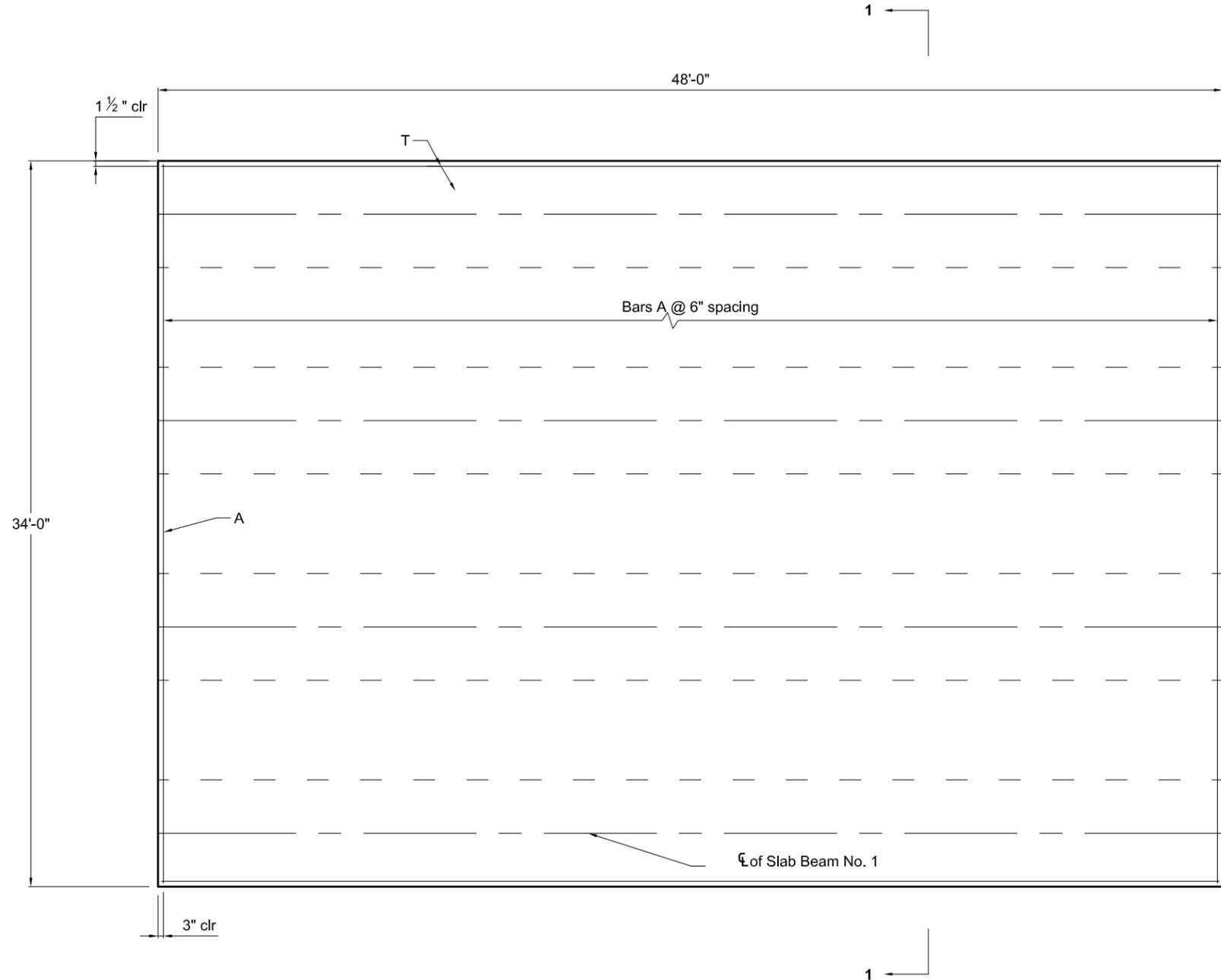
1. The slab beams are 5SB15.
2. Total of 56 strands will be used (28 strands at both rows).
3. 0.5 in. diameter seven-wire low relaxation GR 270 strands will be used.
4. Initial Force on each strand shall be 31 kips.
5. Standard TxDOT debonding procedures shall be used.
6. All concrete shall be TxDOT Class H with release strength f_{ci} = 6 ksi and minimum 28-day strength f_c = 7 ksi.
7. All mild steel reinforcing bars shall be ASTM A615 Grade 60.



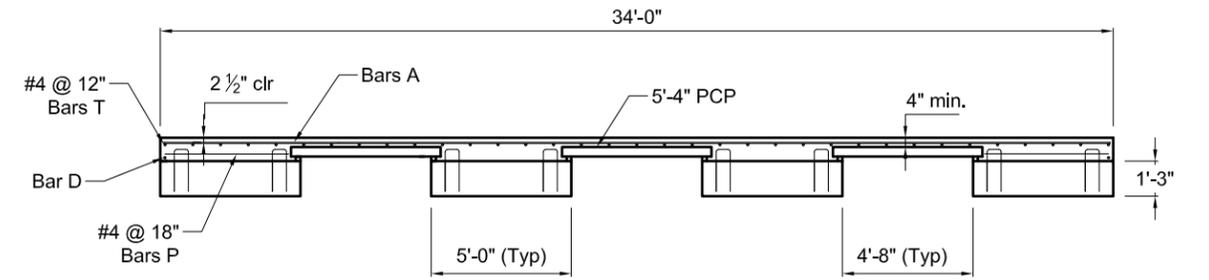
----- Debonded Region in Row 1

**DEBONDING PLAN VIEW
(BOTTOM ROW)**

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
PRESTRESSING DETAILS FOR PRESTRESSED CONCRETE SLAB BEAM (5SB15)	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 3



PLAN VIEW



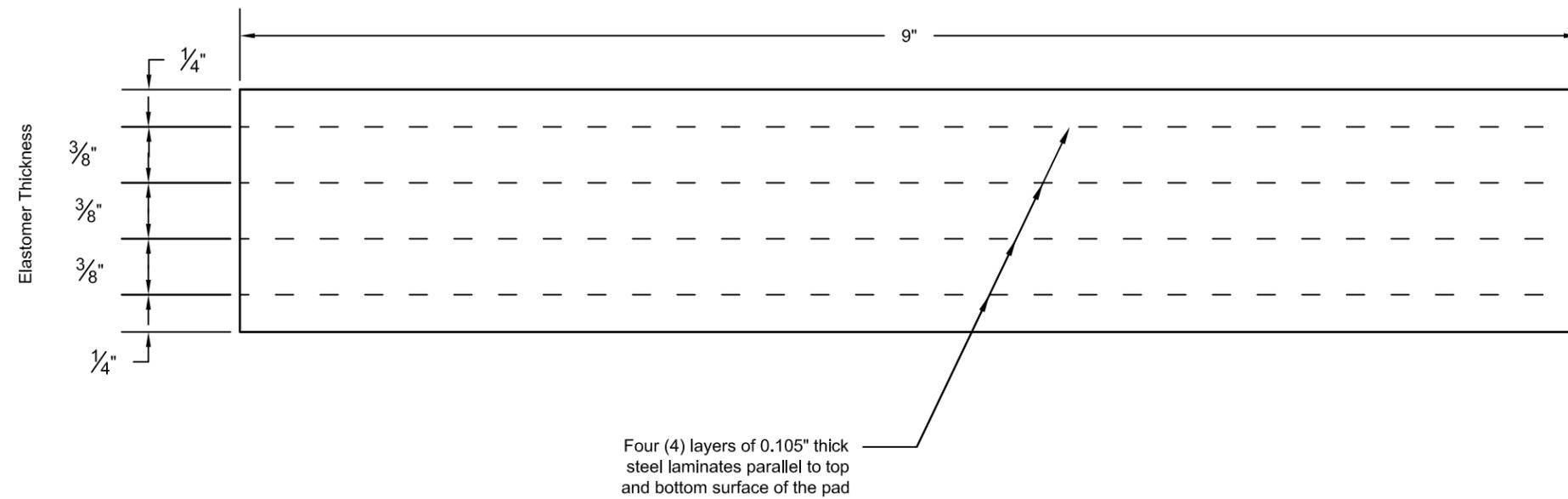
SECTION 1-1

BAR TABLE			
Bar	Size	Length	Quantity
A	#5	33'-8"	100
T	#4	47'-8"	35
P	#4	4'-5"	68
D	#5	33'-8"	2

NOTES:

1. TxDOT Class S concrete with strength $f'c = 4$ ksi at 28 days shall be used for deck.
2. All mild reinforcement shall be ASTM A615 Grade 60 steel.
3. Longitudinal slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
DECK REINFORCEMENT	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 4



ELEVATION

NOTES:

1. Elastomers shall be 50 durometer neoprene
2. The use of polyisoprene (natural rubber) for the manufacture of the bearing pads is not permitted

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
BEARING PAD DETAILS	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 5

Specifications and Design Summary for Substructure Construction on TxDOT Project 0-6722

Summary:

This project is to design, construct, and test a full-scale spread prestressed slab beam bridge on the western side of runway 17-L, section-2 of Texas A&M University's Riverside campus. The substructure construction will include the construction of retaining structure, reinforced concrete spread footings, abutments and wingwalls.

Notes:

1. General Notes

- A full-scale 46'-7" span (center-to-center of bearing pads), 34'-0" wide spread prestressed slab beam bridge will be designed, constructed, and tested.
- The major excavation job is removing 500 cyd of clay soil.
- The east side runway will be supported by a retaining structure
- 4" thick slab on grade will be poured below the bridge in order to provide smooth surface during construction and testing

2. Slab on Grade Notes

- 58'-10" long, 34'-0" wide and 4" thick slab-on-grade concrete will be provided at the bottom of the excavated pit. The thickness of the slab-on-grade will be 12" under the spread footings.
- TxDOT Class C concrete with 3600 psi compressive strength at 28 days and 7 in. slump

3. Spread Footing Notes

- 34'-0" long, 8'-0" wide and 1'-4" high spread reinforced concrete footing will be constructed at both ends of the bridge
- TxDOT Class C concrete with 3600 psi compressive strength at 28 days and 5" slump
- Backfill material will be placed after casting the footings before placing the wing wall and abutment formwork

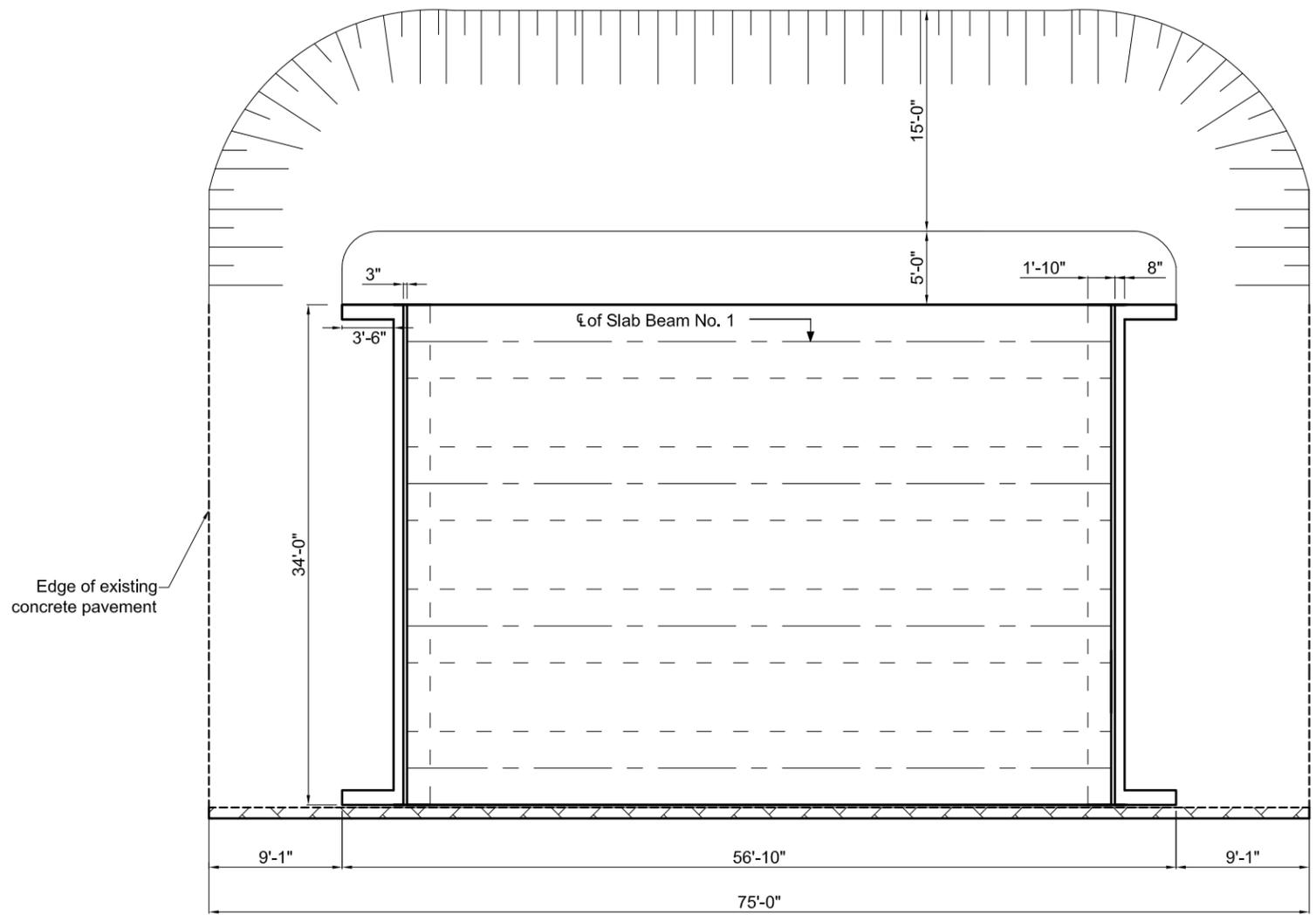
4. Abutment Notes

- 34'-0" long having 2'-6" x 2'-6" cross-section.
- TxDOT Class C concrete having 3600 psi compressive strength at 28 days and 5" slump
- The abutment will be cast in two pours; first pour will be abutment + lower part of the wingwalls, and Second pour will be Back-wall, elevated pedestals + upper part of the wingwalls

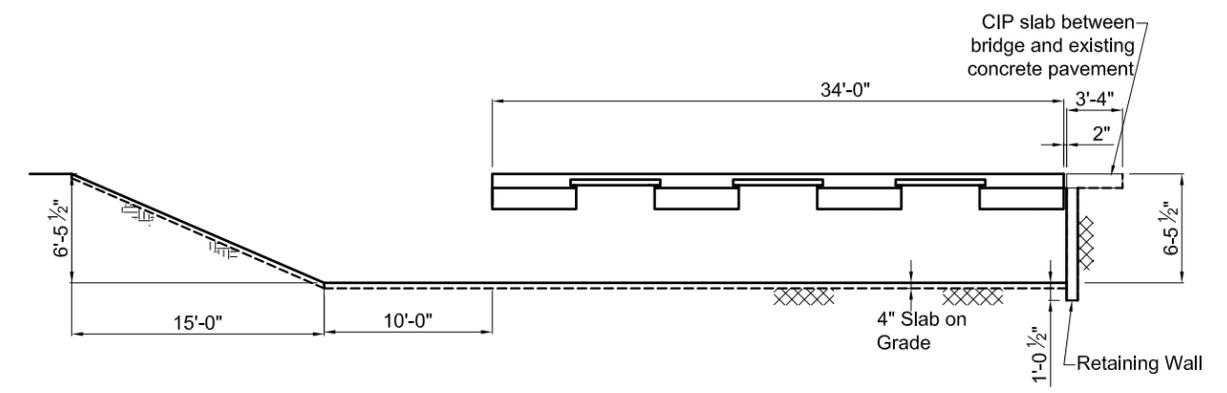
List of Design Drawings:

- 1. Specifications for Substructure.....S6722-6
- 2. Excavation.....S6722-7
- 3. Spread Footing.....S6722-8
- 4. Abutment.....S6722-9
- 5. Retaining Wall.....S6722-10
- 6. Slab on Grade.....S6722-11
- 7. Bridge Layout.....S6722-12
- 8. Slab on Grade Elevations.....S6722-13

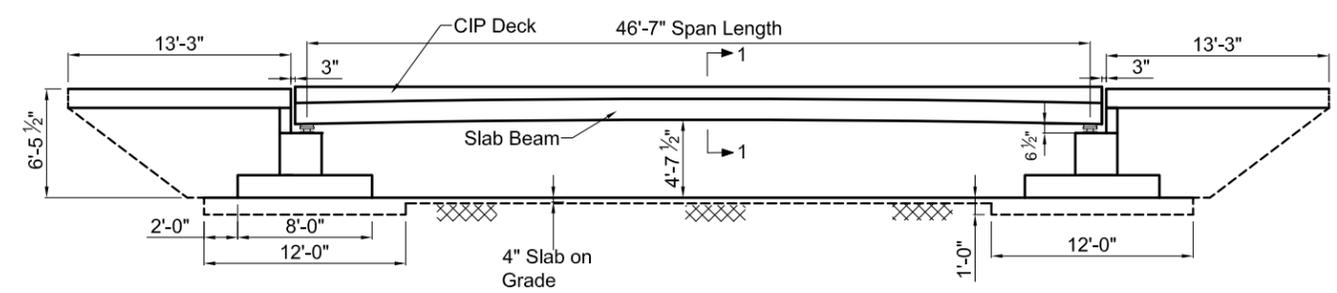
SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
SPECIFICATIONS FOR SUBSTRUCTURE	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 6



PLAN VIEW



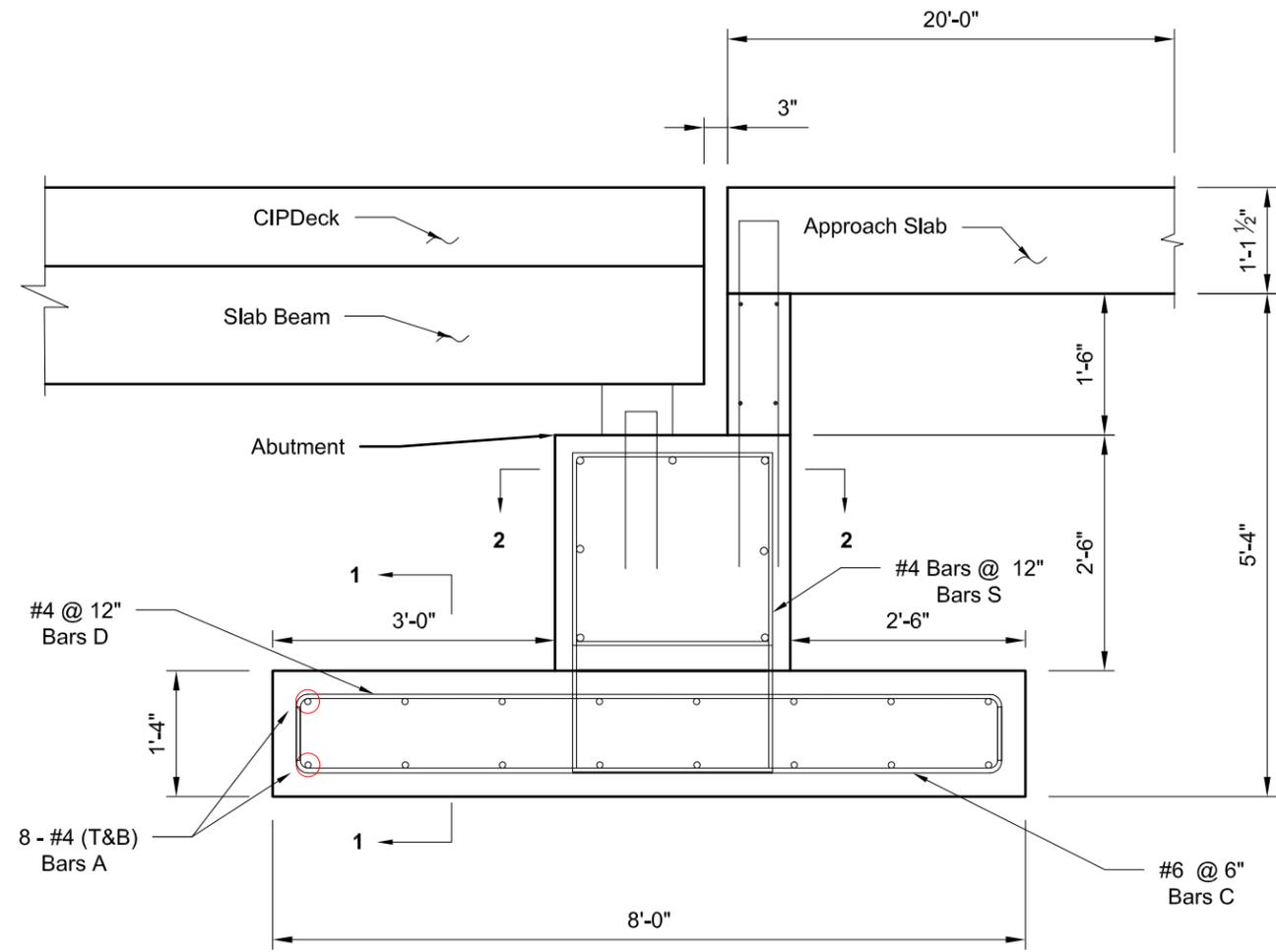
SECTION 1-1



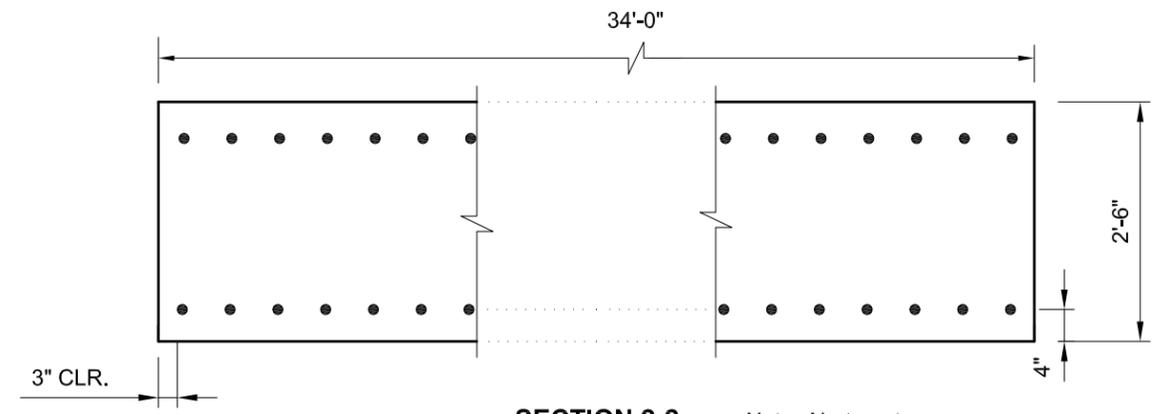
ELEVATION VIEW

----- EXCAVATION LINE

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
EXCAVATION	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 7



CROSS-SECTION

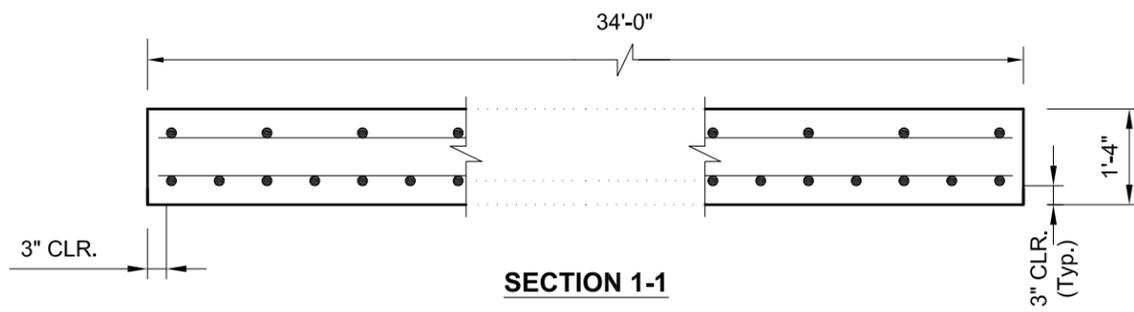


SECTION 2-2

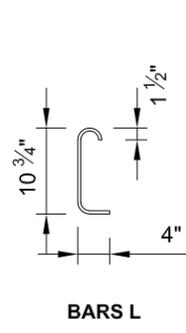
Note: Abutment reinforcement not shown

FOOTING REINFORCING BAR TABLE			
Bar	Size	Length	Quantity
A	#4	33'-6"	16
C	#6	9'-2"	70
D	#4	9'-2"	35
L	#3	1'-5"	52
S	#4	11'-10 1/2"	40
X	#11	33'-8"	1

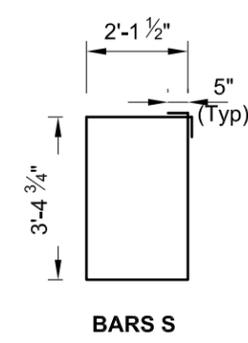
Notes: 1- X is a straight bar for the abutment
 2- Footing Reinforcing Bar Table lists quantities for only 1 footing.
 Contractor should provide a quote for twice the amount listed in the table



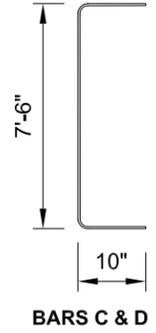
SECTION 1-1



BARS L



BARS S

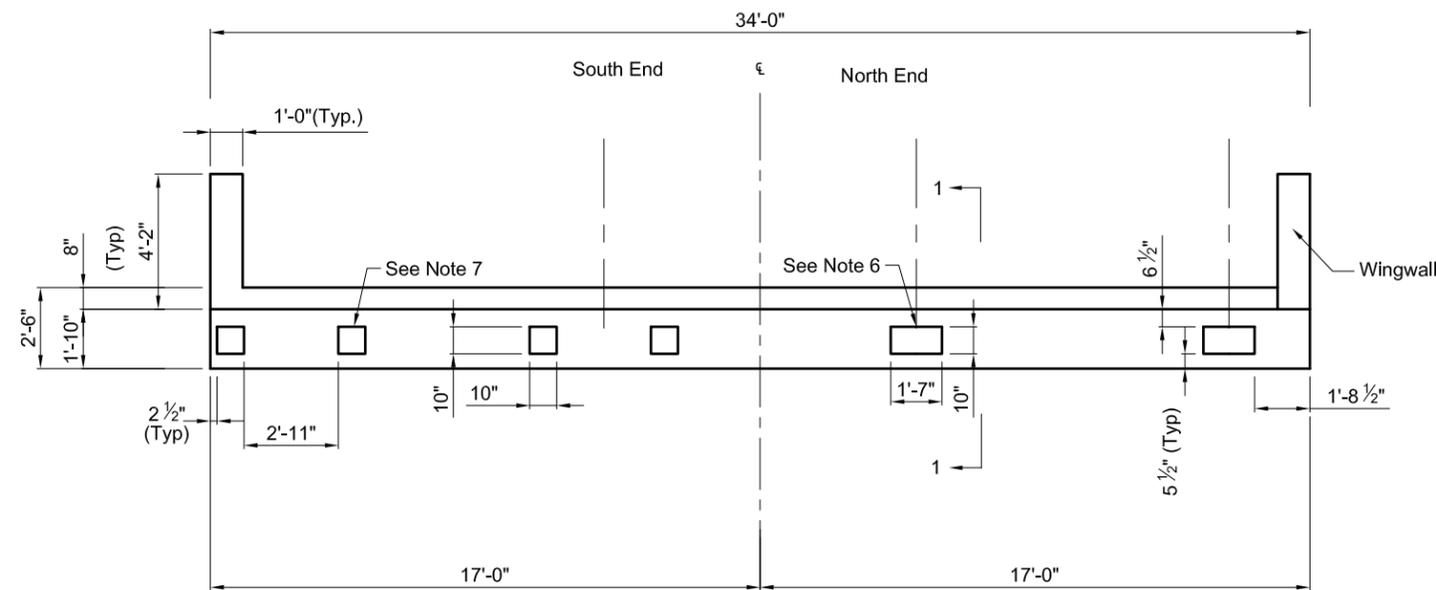


BARS C & D

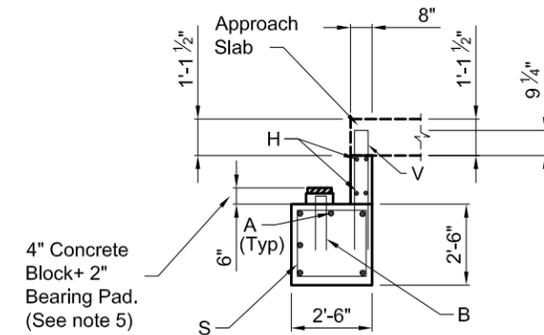
NOTES: 1. All mild steel reinforcement shall be deformed bars meeting ASTM A615 Grade 60 requirements

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
SPREAD FOOTING	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 8

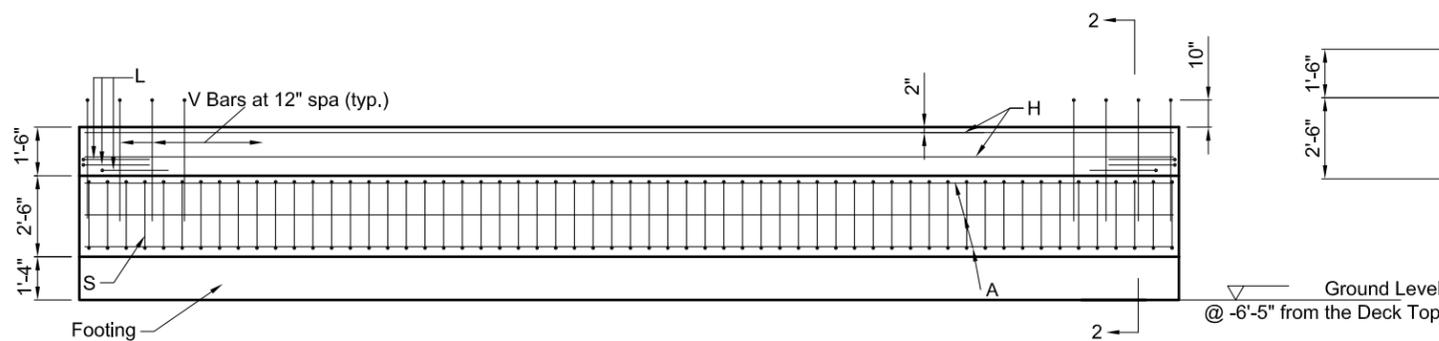
Bar	No.	Size	Length
A	6	#11	33'-8"
E	8	#4	2'-2"
F	12	#4	10'-0"
H	4	#5	33'-8"
L	6	#6	4'-0"
S	59	#4	9'-2"
U	4	#6	7'-3"
V	37	#5	7'-10"
wH1	12	#6	3'-10"
wH2	8	#6	5'-8"
wU	12	#4	1'-7"
wV	28	#5	4'-9"
B	28	#5	2'-0"



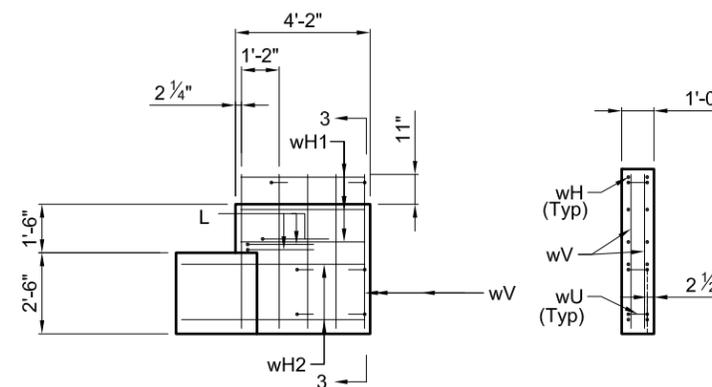
PLAN



SECTION 1-1



ELEVATION ~ PIER ABUTMENT

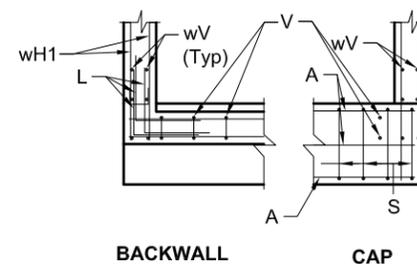
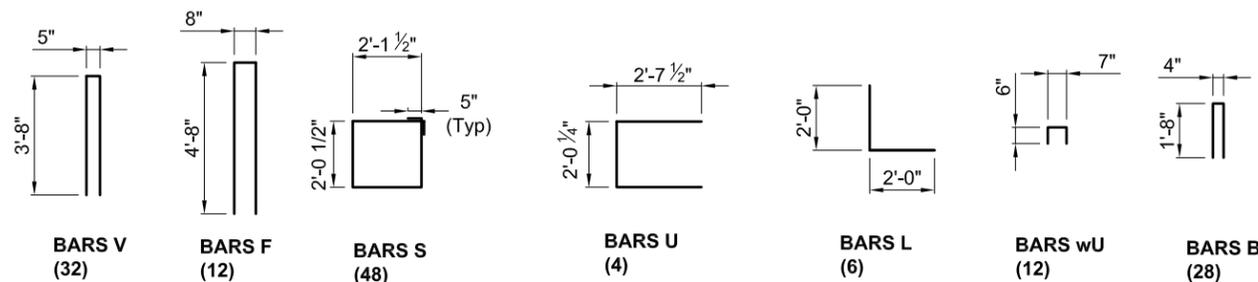


SECTION 2-2

SECTION 3-3

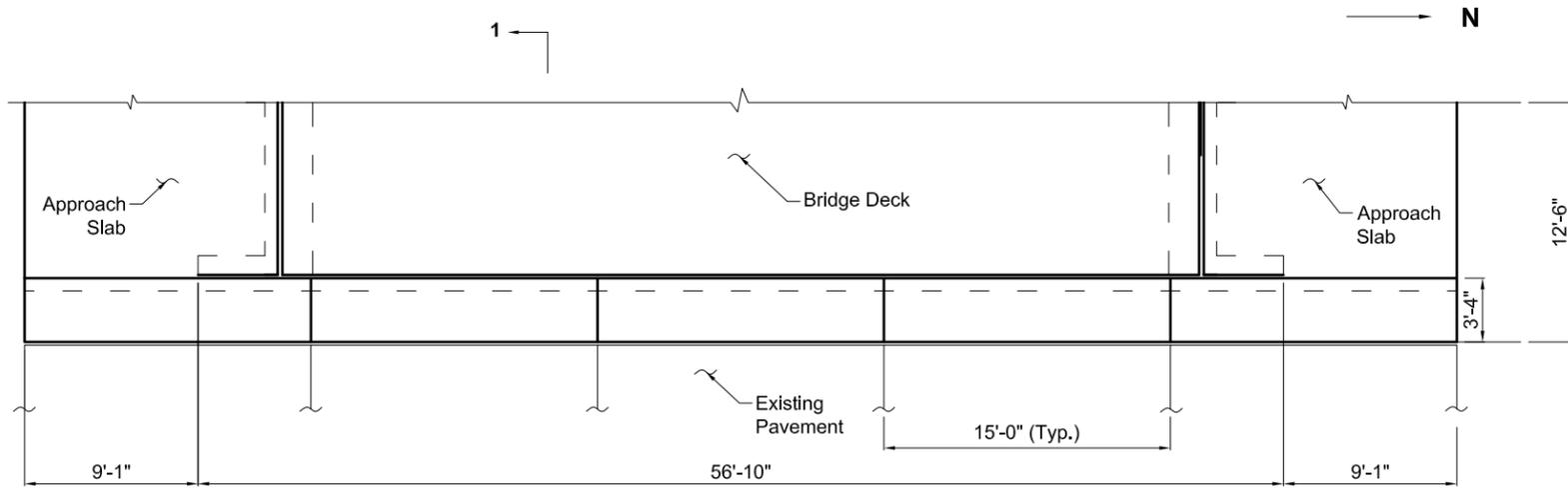
NOTES:

1. TxDOT Class C concrete with 28-day compressive strength $f'c = 3600$ psi.
2. All reinforcement shall be Grade 60.
3. Designed for a maximum span length of 48'-7".
4. Pedestals to be installed as future support location following removal of load cells.
5. For north end of the span, provide 10x19 in. concrete pedestals elevated underneath each slab beam, as shown.
6. For south end, provide two 10x10 in. pedestals elevated underneath each slab beam, as shown.

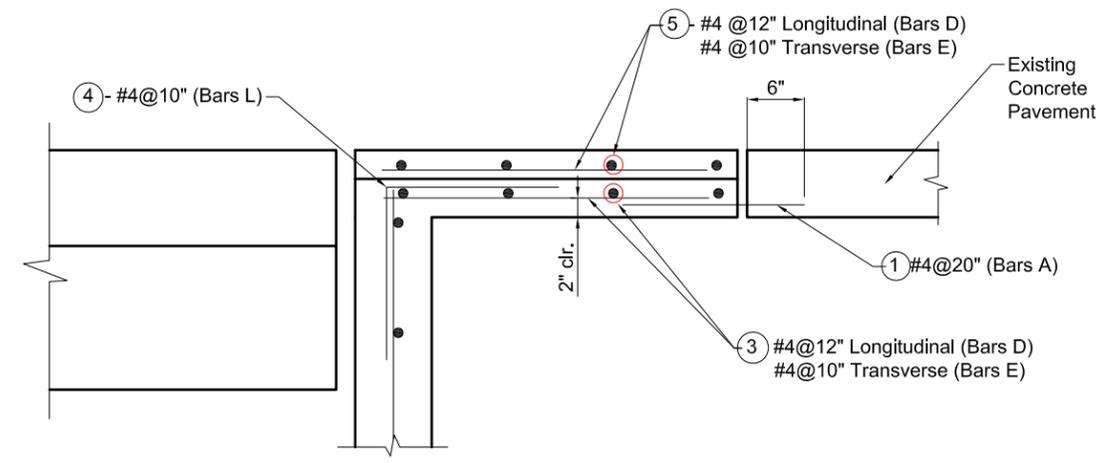


CORNER DETAILS

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
ABUTMENT	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 9

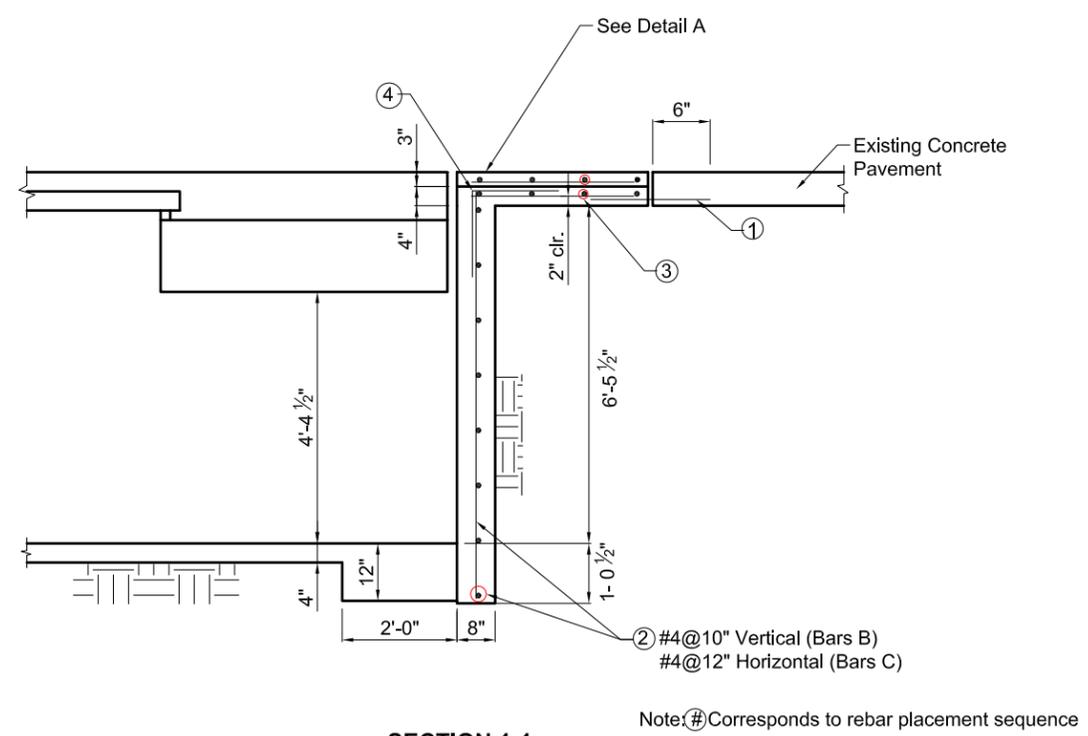


PLAN VIEW



DETAIL A

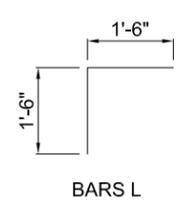
- Notes:**
- Item 5 will be placed after the bridge constructed.
 - TxDOT Class C concrete with 28-day compressive strength $f'c = 3600$ psi.
 - High Strength Hilti HIT-RE 500 Epoxy



SECTION 1-1

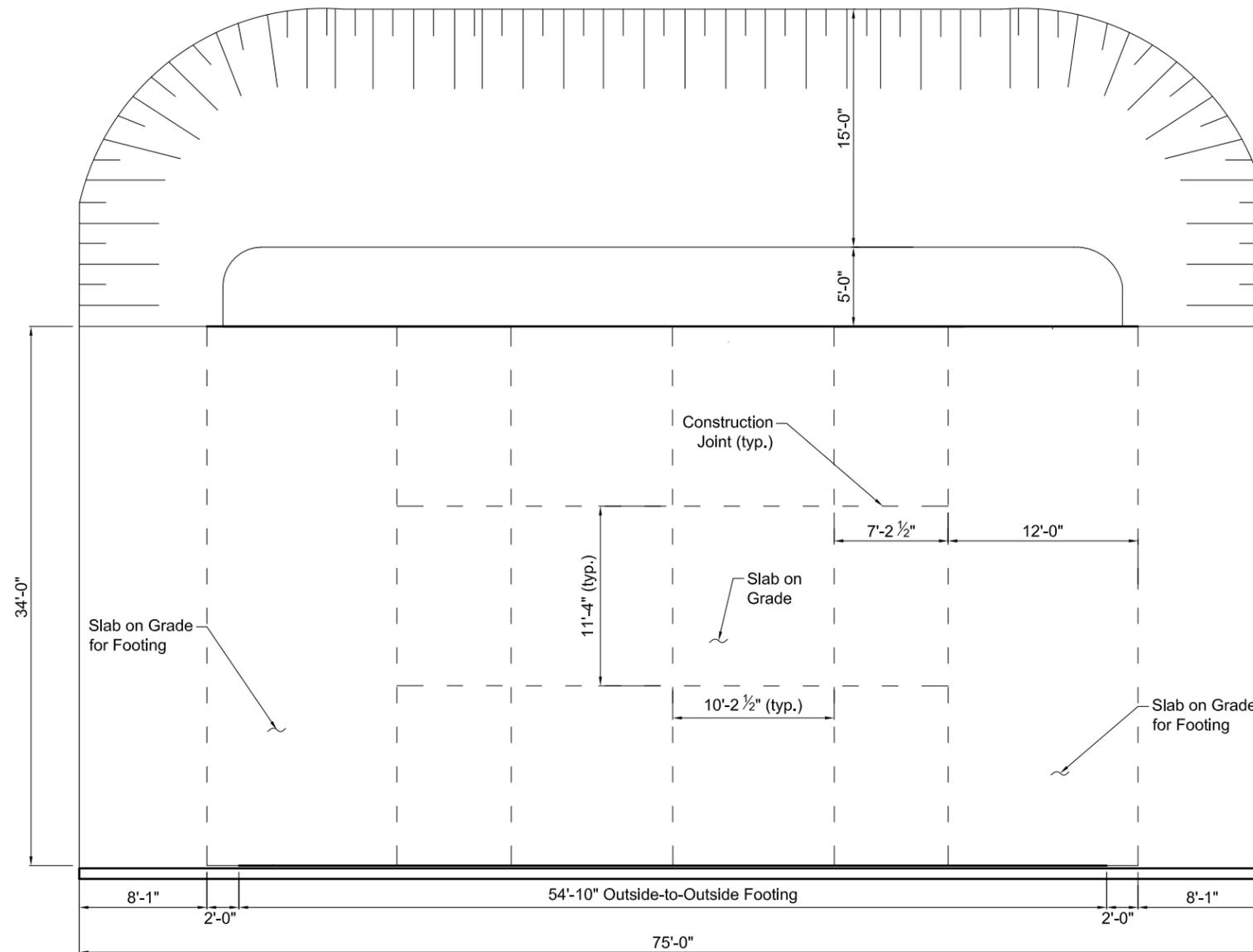
Note: # corresponds to rebar placement sequence

RETAINING STRUCTURE REINFORCING BAR TABLE			
Bar	Size	Length	Quantity
A	#4	2'-0"	40
B	#4	8'-0"	82
C	#4	20'-0"	30
D	#4	14'-8"	44
E	#4	3'-0"	200
L	#4	3'-0"	82



- Notes:**
- All mild steel reinforcement shall be deformed bars meeting ASTM A615 Grade 60 requirements
 - 60 - 3" DSSS (Side-form Spacer-wired) (D shape Pier Sled)
 - 40 - 3" DSBB (Bottom Bolster) (Pier Bolster)
 - 10 - 2" high, 5 ft long slab bolster

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
RETAINING WALL	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 10



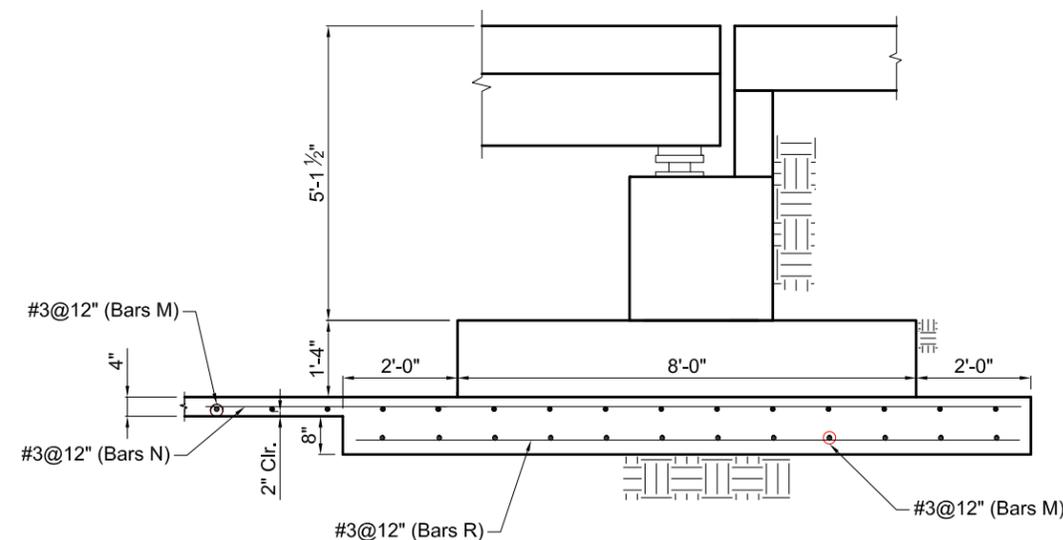
**SLAB ON GRADE
PLAN VIEW**

- Notes:
1. Elevations at each construction joint are given relative to benchmark point BE.
 2. Given elevation profile provides about 1% slope through NW corner of the bridge
 3. The slab on grade thickness is 12" under each footing and 4" everywhere else



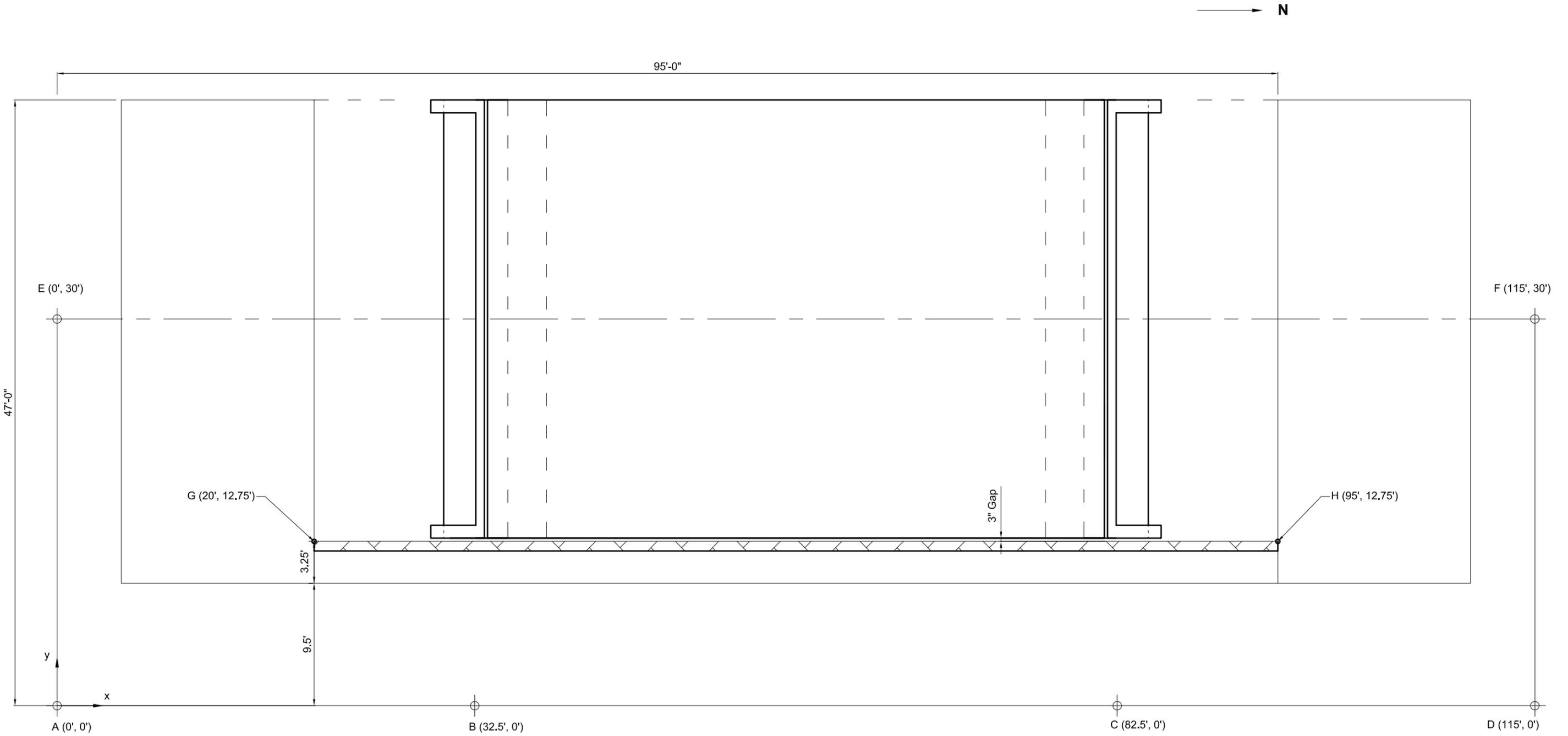
SLAB ON GRADE REINFORCING BAR TABLE			
Bar	Size	Length	Quantity
M	#3	11'-0"	270
N	#3	9'-10"	220
R	#3	11'-6"	75

- Notes:
1. All mild steel reinforcement shall be deformed bars meeting ASTM A615 Grade 60 requirements
 2. 70 - 2" high, 10 ft long Slab Bolster
 3. 40 - 10" individual High Chair
 4. TxDOT Class C concrete with 28-day compressive strength $f'c = 3600$ psi.
 5. 10 mil visqueen plastic sheeting under Slab on Grade



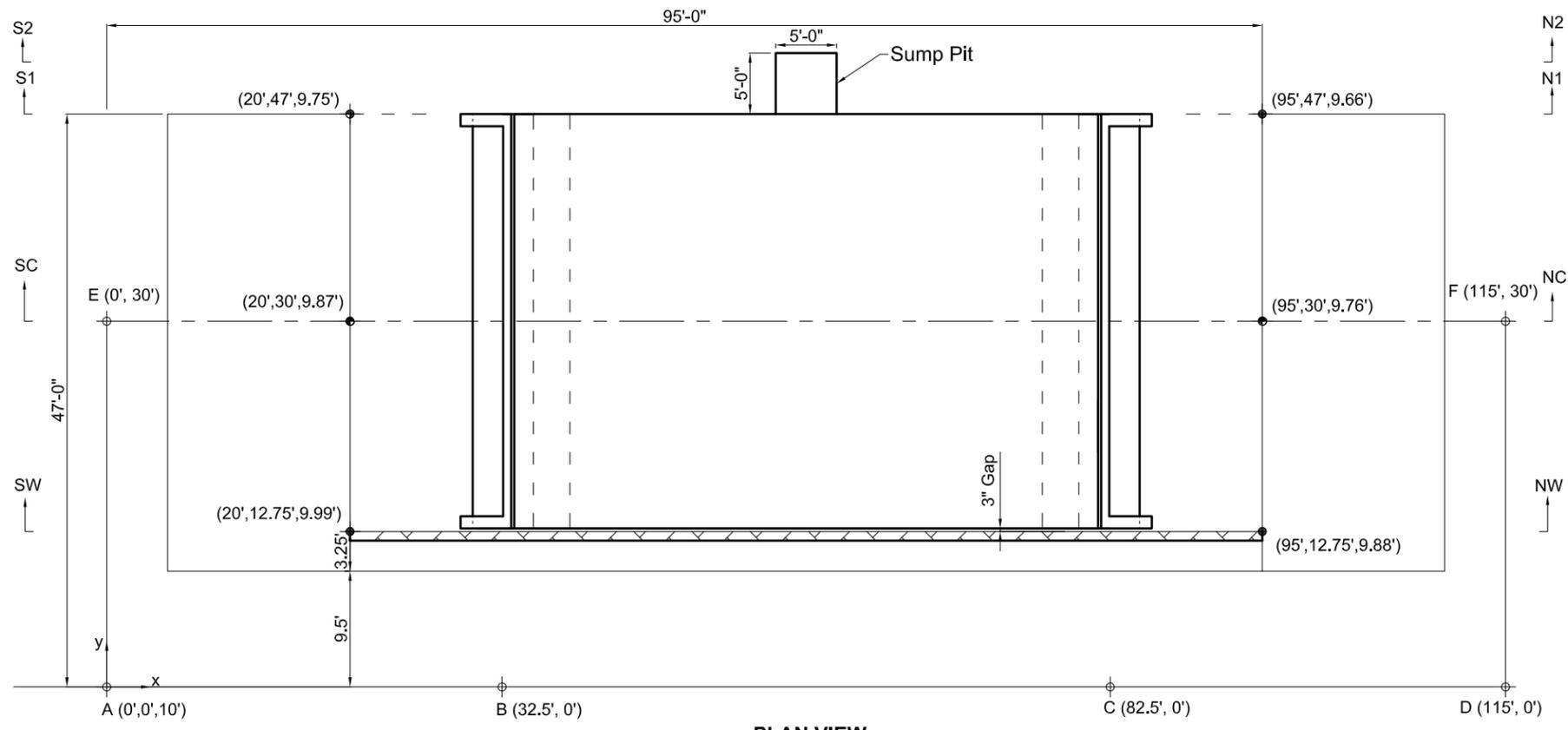
CROSS-SECTION

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
SLAB ON GRADE	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 11

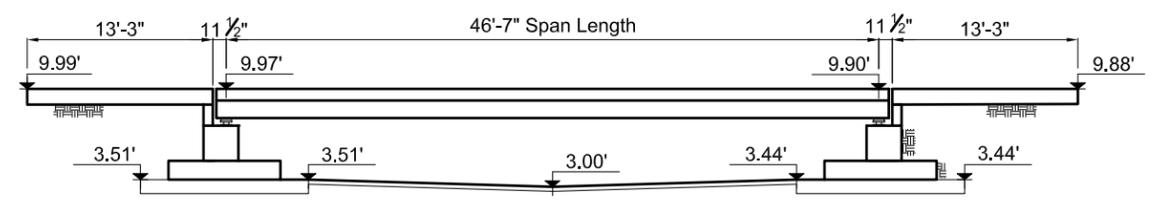


PLAN VIEW

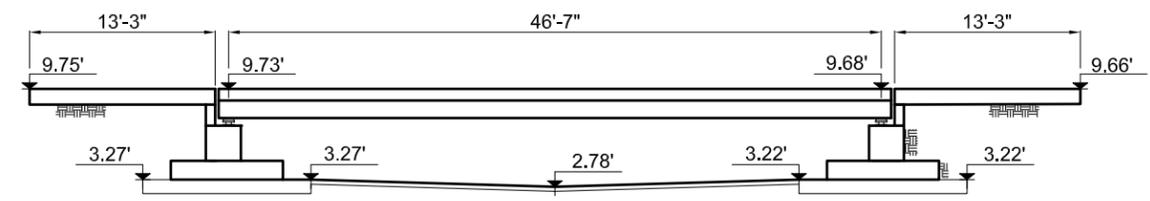
SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
BRIDGE LAYOUT	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 12



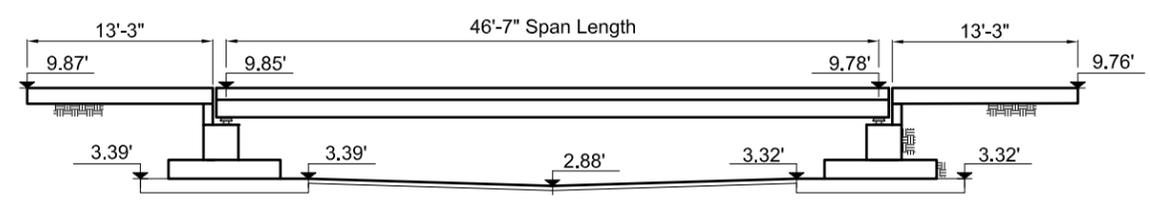
PLAN VIEW



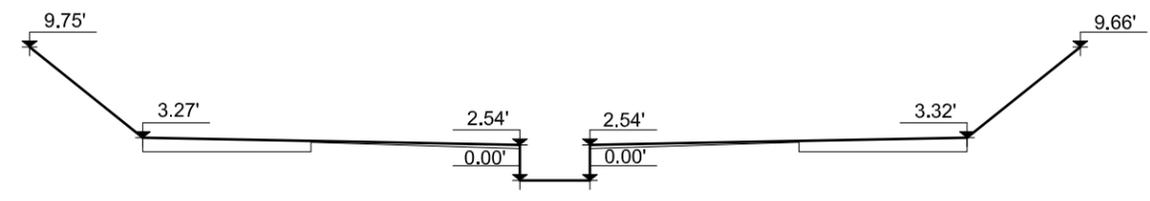
SECTION SW-NW



SECTION S1-N1



SECTION SC-NC



SECTION S2-N2

- Notes:
- Bridge Deck Slope:
 - S - N Slope : 1.5:1000
 - E - W Slope : 7.0:1000
 - Slab On Grade Slope:
 - S - C Slope : 3.0:100
 - N - C Slope : 2.5:100
 - E - W Slope : 7.0:1000

SPREAD PRESTRESSED CONCRETE SLAB BEAM BRIDGE	TEXAS A&M TRANSPORTATION INSTITUTE	5/1/2013
SLAB ON GRADE ELEVATIONS	TxDOT PROJECT NO: 0-6722	Drawing No: S6722 - 13

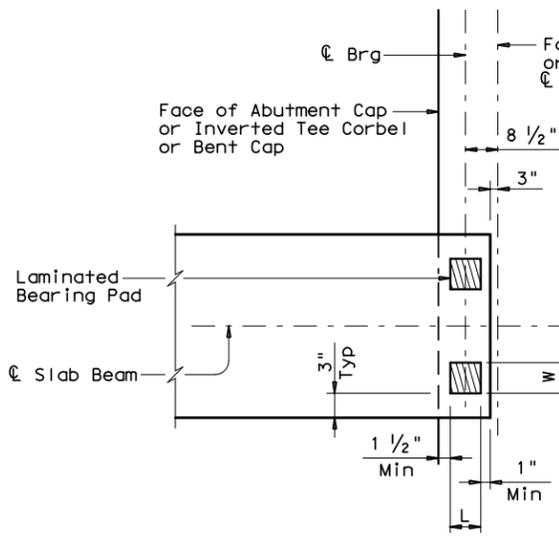
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LEVELS DISPLAYED	PATH:
1	

TABLE OF ELASTOMERIC BEARING PAD DIMENSIONS (ALL PRESTR CONC SLAB BM TYPES)					
One-Pad (Ty SB1-"N") ⁽²⁾			Two-Pad (Ty SB2-"N") ⁽²⁾		
W	L	T	W	L	T
18"	9"	2"	9"	9"	2"

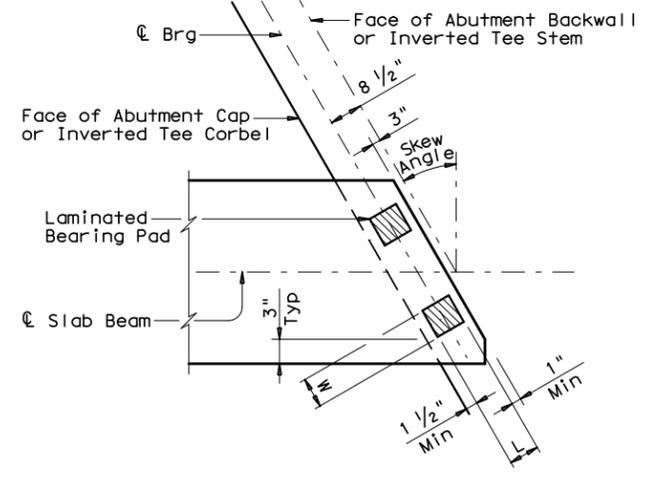
Pad sizes shown are applicable for the following conditions:

- (1) All one, two and three span units where the minimum span length is not less than 25' and the maximum span is not more than 50'.
- (2) Skews less than or equal to 30°.



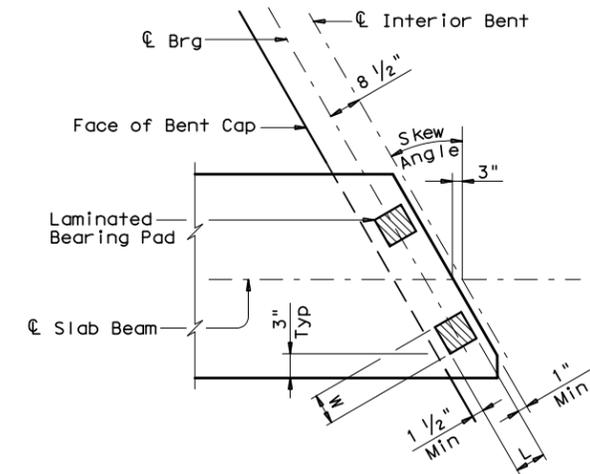
TWO-PAD DETAIL PLAN

(At Abutment or Inverted Tee Cap or at Interior Bent)



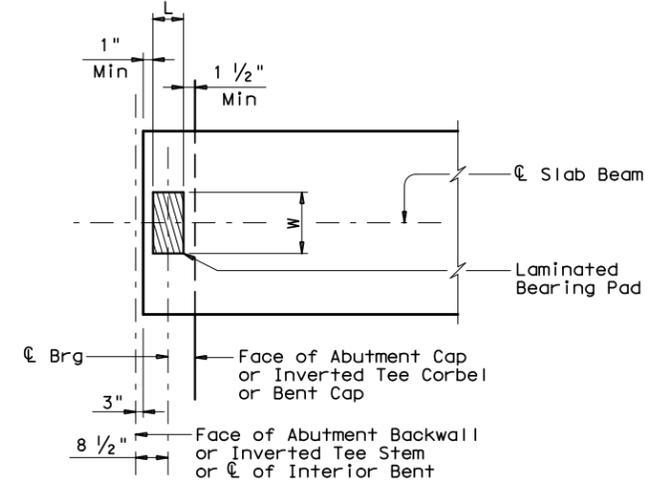
TWO-PAD DETAIL SKEW PLAN

(At Abutment or Inverted Tee Cap)



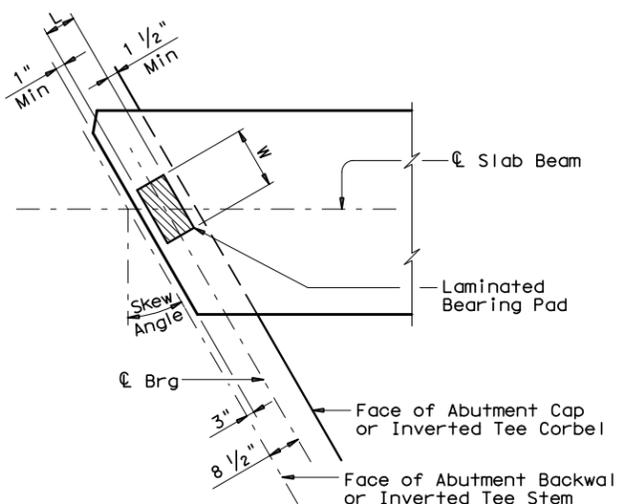
TWO-PAD DETAIL SKEW PLAN

(At Interior Bent)



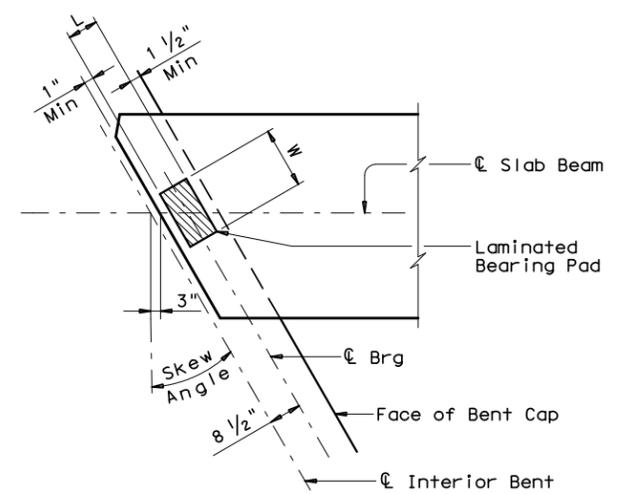
ONE-PAD DETAIL PLAN

(At Abutment or Inverted Tee Cap or at Interior Bent)



ONE-PAD DETAIL SKEW PLAN

(At Abutment or Inverted Tee Cap)



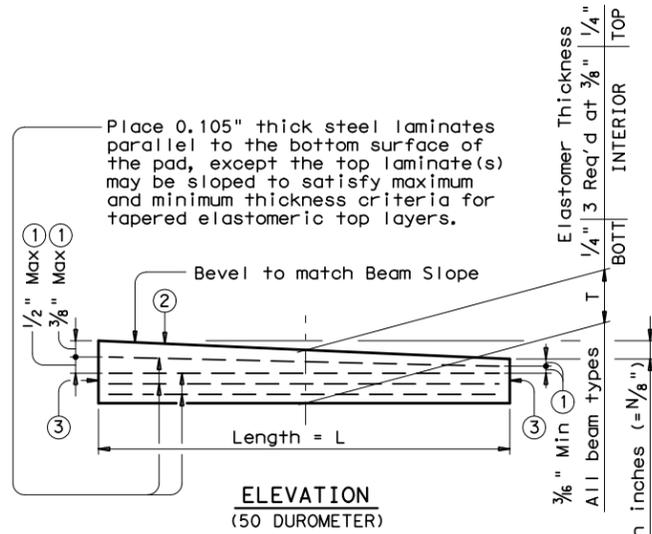
ONE-PAD DETAIL SKEW PLAN

(At Interior Bent)

GENERAL NOTES:
 Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings shall be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings shall be included in unit price bid for "Prestressed Concrete Slab Beams".

ELASTOMERIC BEARING PLACEMENT DIAGRAMS

Place one bearing at forward station beam end.
 Place two bearings at back station beam end.



LAMINATED BEARING PAD

NOTE: The use of Polyisoprene (natural rubber), for the manufacture of bearing pads, is not permitted.

- ① Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- ② BEARING TYPE shall be indicated on all pads. For tapered pads, BEARING TYPE shall be located on the high side. The Fabricator shall include the value of "N" (amount of taper in 1/8" increments) in this mark.
 Examples: N=0, (for 0" taper)
 N=1, (for 1/8" taper)
 N=2, (for 1/4" taper)
 (etc.)
 Fabricated pad top surface slope shall not vary from plan beam slope by more than (0.0625" / Length) IN/IN.
- ③ Locate Permanent Mark here.

HL93 LOADING

Texas Department of Transportation
 Bridge Division

ELASTOMERIC BEARING DETAILS
 SKEWS FROM 0° TO 30°
 PRESTR CONCRETE SLAB BEAM

PSBEB

FILE: psbste06.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
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REVISIONS				
COUNTY	CONTROL	SECT	JOB	HIGHWAY