
*Bridge Preliminary Design Report
Addendum*

**Ramp C over Fairground Road
SCI-823-1595**

**SCI-823-10.13
PID No. 79977**

Prepared for
Ohio Department of Transportation

May 2011

CH2MHILL

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ATTACHMENTS

- Detailed Cost Estimate
- Responses to previous ODOT comments
- Final Structure Site Plan (Sheet 1 of 3)
- Revised Typical Transverse Section (Sheet 2 of 3)
- Revised Abutment Section and Framing Plan (Sheet 3 of 3)

1. Introduction

Per the agreed upon scope of services CH2M HILL was tasked with addressing all review comments pertaining to the Bridge Preliminary Design Reports that were submitted to ODOT in November 2007. This addendum addresses one review comment in particular that required additional engineering investigation on CH2M HILL's part. The review comment was related to the number and depth of beams proposed for this bridge. The Preliminary Design Report proposed five - 60" Modified AASHTO Type 4 Concrete Beams. ODOT requested that four - 66" or 72" Modified AASHTO Type 4 Concrete Beams be investigated.

2. Design Requirements / Specifications

All structural design on this project has been done in accordance with both the AASHTO Standard Design Specifications (LFD) and the 2004 ODOT Bridge Design Manual (LFD). Per an email received from ODOT on October 14, 2010, LFD will continue to be used on this project. All design criteria as stated in the Bridge Preliminary Design Report remains accurate.

3. Beam Selection and Cost Analysis

The November 2007 Bridge Preliminary Design Report proposed five - 60" Modified AASHTO Type 4 Concrete Beams spaced at 6'-9" centers with an 8.5 inch thick reinforced concrete deck. This beam depth provided 19'-0" of vertical clearance which is greater than the required vertical clearance of 15'-0". This beam requires a 28 day concrete strength of 7,000 psi and a release strength of 5,500 psi. The 5,500 psi release strength is greater than the 5,000 psi limit stated in Section 302.5.2.8 of the ODOT Bridge Manual. CH2M HILL contacted the Ohio Prestressers Association regarding the concrete strengths and was informed that their member companies could produce beams with those strengths at no additional cost.

As an alternative to five - 60" beams, CH2M HILL investigated four - 66" Modified AASHTO Type 4 Concrete Beams spaced at 9'-0" centers. An 8.5 inch thick reinforced concrete deck is adequate for 9'-0" beam spacing. The 6" deeper beams reduce the vertical clearance from 19'-0" for the 60" deep beams to 18'-6" for the 66" beams. The reduced clearance still exceeds the minimum required clearance of 15'-0". The 66" deep beam requires the same concrete strengths as the 60" beam which are a 28 day compressive concrete strength of 7,000 psi and a compressive concrete strength of 5,500 psi at release.

A cost analysis was completed. A unit price of \$22,250 was used for each 60" deep beam and \$26,530 for each 66" beam. The beams have a span of 104'-8" from centerline bearing to centerline bearing. The total estimated cost of the five - 60" beams is \$111,250 and \$106,120 for four 66" beams. A summary of the two alternatives is presented in Table 1.

Table 1: Beam Alternative Comparison

	Alternative 1	Alternative 2
Depth of Mod. AASHTO Type 4 Concrete Beams	60"	66"
Number of beams required	5	4
Beam Spacing	6'-9"	9'-0"
Minimum Required Concrete Deck Thickness	8.5"	8.5"
Vertical Clearance Provided	19'-0"	18'-6"
Vertical Clearance Required	15'-0"	15'-0"
Required Concrete Strength at 28 days	7,000 psi	7,000 psi
Required Concrete Strength at Release	5,500 psi	5,500 psi
Estimated Cost Per Beam	\$22,250	\$26,530
Total Estimated Cost for All Beams	\$111,250	\$106,120

4. Cost Estimate

Table 2: Opinion of Probable Construction Cost

	Updated costs for bridge proposed in the November 2007 Preliminary Design Report (104.67' Span)
Bridge Cost (initial)	\$641,574
Bridge Life Cycle Cost	\$282,726
Bridge Cost (initial plus life cycle)	\$924,300

The updated cost for the bridge is presented in Table 2. The updated detailed bridge cost estimate is included as an attachment to this addendum. CH2M HILL established all unit prices for the cost estimate by using ODOT's online CMS portal and then working with ODOT estimating staff to verify all estimated unit prices. All comments and revisions that were received from ODOT estimating staff were incorporated into the unit prices.

5. Recommendation

All design criteria are met with the four - 66" Modified AASHTO Type 4 Concrete Beams spaced at 9'-0" centers. Furthermore, the cost analysis shows that the four-66" Modified AASHTO Type 4 Concrete Beams are the least expensive alternative. Therefore, it is recommended that four - 66" Modified AASHTO Type 4 Concrete Beams be used. The revised preliminary drawings are included as an attachment to this addendum.

SCI-823-1595: Ramp C over Fairground Road
DETAILED COST ESTIMATE

Alternative A: 104.67' Bridge proposed in Bridge Preliminary Design Report (Nov. 2007) with 5 - Mod. AASHTO Type 4 (60") P.S. Concrete Beams
Alternative B: 104.67' Bridge with 4 - Mod. AASHTO Type 4 (66") P.S. Concrete Beams

Description	Unit Cost	Unit	Alternative A		Alternative B	
			Quantity	Cost	Quantity	Cost
QC/QA Concrete, Class QSC2, Superstructure (Parapet):	\$540.00	CY	33.7	\$18,198	33.7	\$18,198
QC/QA Concrete, Class QSC2, Superstructure:	\$550.00	CY	101.6	\$55,880	101.6	\$55,880
QC/QA Concrete, Class QSC2, Superstructure (Approach Slab), (T=17"), As Per Plan	\$225.00	SY	220	\$49,500	220	\$49,500
QC/QA Concrete, Class QSC1, Substructure:	\$570.00	CY	191.1	\$108,927	191.1	\$108,927
Epoxy Coated Reinforcing Steel (superstructure):	\$1.10	LB	38,561	\$42,417	38,561	\$42,417
Epoxy Coated Reinforcing Steel (substructure):	\$1.10	LB	17,199	\$18,919	17,199	\$18,919
Prestressed Concrete Bridge I-Beam Members, Type 4	\$18,000.00	EA		\$0		\$0
Prestressed Concrete Bridge I-Beam Members, Type 4 Mod. (60 in.)	\$22,250.00	EA	5	\$111,250		\$0
Prestressed Concrete Bridge I-Beam Members, Type 4 Mod. (66 in.)	\$26,530.00	EA		\$0	4	\$106,120
Intermediate Diaphragms	\$1,000.00	EA	12	\$12,000	9	\$9,000
Steel Piles HP12x53, Furnished:	\$25.00	FT		\$0		\$0
Steel Piles HP12x53, Driven:	\$13.00	FT		\$0		\$0
Steel Piles HP14x73, Furnished:	\$35.00	FT	1,120	\$39,200	1,120	\$39,200
Steel Piles HP14x73, Driven:	\$13.00	FT	980	\$12,740	980	\$12,740
Cofferdams and Excavation Bracing:	\$15.00	SF		\$0		\$0
Structure Incidental Cost (Note 1)	16%			\$75,045		\$73,744
Contingency	20%			\$108,815		\$106,929
TOTAL INITIAL BRIDGE COST				\$652,891		\$641,574
LIFE CYCLE COSTS:						
Concrete Beam Sealing:	\$12.10	SY	3,720	\$45,012	3,160	\$38,236
Superplasticized Dense Concrete Overlay Using Hydrodemolition:	\$95.00	SY	712	\$67,640	712	\$67,640
Full Depth Repair:	\$23.61	SF	320	\$7,555	320	\$7,555
Portions of Structure Removed, As Per Plan (for deck removal):	\$15.00	SF	3,520	\$52,800	3,520	\$52,800
QC/QA Concrete, Class QSC2, Superstructure (Parapet):	\$540.00	CY	33.7	\$18,198	33.7	\$18,198
QC/QA Concrete, Class QSC2, Superstructure:	\$550.00	SY	101.6	\$55,880	101.6	\$55,880
Epoxy Coated Reinforcing Steel (superstructure):	\$1.10	LB	38,561	\$42,417	38,561	\$42,417
TOTAL LIFE CYCLE COST				\$289,502		\$282,726
TOTAL RELATIVE OWNERSHIP COST				\$942,393		\$924,300

Notes:

1. Structure incidental cost allowance includes provision for structure excavation, porous backfill & drainage pipe, sealing of concrete surfaces, falsework bents, bearings, (minor) temporary shoring, crushed aggregate slope protection, pile driving equipment mobilization, shear connectors, settlement platforms, expansion joints, joint sealers, and joint fillers costs.

2. Quantities for life cycle costs are from the Bridge Preliminary Design Report dated November 2007.



inter-office communication

to:	James A. Brushart, District 9 Deputy Director	date:	Apr. 7, 2008
from:	Timothy J. Keller, Administrator, Office of Structural Engineering by: Ananda Dharma, P.E.		
subject:	SCI-823-10.17; PID 79977; Bridge No. SCI-823-1595; Ramp C over Fairground Road; Preliminary Design Review		

Attn.: Thomas M. Barnitz, District 9 Project Manager

We have briefly reviewed Preliminary Design submission from CH2MHill for the proposed bridge along Ramp C over Fairground Road. Our comments are shown below.

General Comments

1. We agree that the proposed structure should consist of single span composite prestressed concrete I-beams with reinforced concrete deck and semi-integral abutments supported on MSE walls. However, the number of proposed prestressed concrete I-beams has been increased by one beam. In the Structure Type Study submitted in March 2007, the Design Consultant proposed four (4) AASHTO Type 4 prestressed concrete I-beams spaced at 9'-0" c/c. In this Preliminary Design submission, five (5) Modified AASHTO Type 4 (60") prestressed concrete I-beams are being proposed. Since vertical clearance is not going to be an issue at this particular location, we would like to know if the Design Consultant investigated and also performed cost comparisons for using four (4) Modified AASHTO Type 4 (66" or 72") prestressed concrete I-beams spaced at 9'-0" c/c. We request the Design Consultant to provide us with additional information prior to proceeding with Detail Design. Review comments pertaining to the MSE wall will be submitted separately. Please incorporate MSE wall comments prior to proceeding with Detail Design.
2. The cost estimate shown in the Preliminary Design Report submission was based upon year 2006 costs. In the future, please update the cost estimate to reflect the costs at the time of the submission or the time of construction as stated in the ODOT's Project Development Process (PDP).
3. As stated in the e-mail from Rick Bruce in the ODOT – Office of Roadway Engineering Services dated May 30, 2007, the Design Consultant shall submit design exceptions for speed related deficiencies. The Technical Memorandum from CH2Mhill dated June 21, 2005 stated that design exceptions for speed related items were not required for ramps. However, Ramp C is considered to be a freeway to freeway connection which connects S.R. 823 to U.S.R. 23.

Site Plan - Sheet 1 of 3

4. Please check if the 45-degree turnback wingwall can be utilized at the Northwest and Northeast wingwalls similar to what is being proposed at the Southwest and Southeast wingwalls.
5. The actual unfactored design load of 95 tons corresponds to HP12x53 instead of HP 14x73 piles. Please refer to BDM 202.2.3.2.a which was updated in the 2007 Fourth Quarter Revisions. The increase in the maximum allowable design loads for H-piles driven to refusal is to take advantage of the Grade 50 steel that is now used for steel piles.
6. Please provide the location and description of benchmarks in the next submittal. (BDM 202.2.1)
7. In the Proposed Structure data block, Length of Span on curved alignments should be measured along a reference line which a chord drawn from centerline of abutment bearings at the centerline of survey or baseline construction. (BDM 202.2.1)

Our office recommends that the District approves the Preliminary Design submission subject to resolution of these comments. Your concurrence with the above comments submitted in writing constitutes compliance.

Nothing in these comments is to be construed as authorizing extra work for which additional compensation may be claimed. If you have reason to believe that these comments require work outside the limits of your Scope of Services, please contact this office before proceeding.

Should you have any questions concerning our review comments for the above referenced project, please contact our office.

TJK:JS:ad

c: Gary E. Cochenour, ODOT District 9
Lawrence A. Wills, ODOT District 9
Timothy J. Keller, Office of Structural Engineering
Jawdat Siddiqi, Office of Structural Engineering
Richard A. Bruce, Office of Roadway Engineering Services
file



Portsmouth Bypass – Stage I Comments

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: 408549.08.ST.CM

REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),
Inter-office communication to ODOT D9 dated April 7, 2008** PHASE: Preliminary Design

Step 8 – Major PDP

Comment No.	Review Comment	Designer Response
	Preliminary Design Review: SCI-823-1595 Ramp C over Fairground Road	
1	<p>We agree that the proposed structure should consist of single span composite prestressed concrete I-beams with reinforced concrete deck and semi-integral abutments supported on MSE walls. However, the number of proposed prestressed concrete I-beams has been increased by one beam. In the Structure Type Study submitted in March 2007, the Design Consultant proposed four (4) AASHTO Type 4 prestressed concrete I-beams spaced at 9'-0" c/c. In this Preliminary Design submission, five (5) Modified AASHTO Type 4 (60") prestressed concrete I-beams are being proposed. Since vertical clearance is not going to be an issue at this particular location, we would like to know if the Design Consultant investigated and also performed cost comparisons for using four (4) Modified AASHTO Type 4 (66" or 72") prestressed concrete I-beams spaced at 9'-0" c/c. We request the Design Consultant to provide us with additional information prior to proceeding with Detail Design. Review comments pertaining to the MSE wall will be submitted separately. Please incorporate MSE wall comments prior to proceeding with Detail Design.</p>	<p>Beam study has been completed. Four AASHTO Modified AASHTO Type 4 (66") Beams at 9'-0" centers are adequate. However, the preliminary analysis indicates that a concrete strength of 5,500 psi at release is required. This exceeds ODOT's recommended maximum of 5,000 psi. We have coordinated with suppliers through PCI and they have indicated that a 5,500 psi requirement is not a problem. It is recommended that four AASHTO Modified AASHTO Type 4 (66") Beams at 9'-0" centers be used for this bridge.</p>



Portsmouth Bypass – Stage I Comments

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: **408549.08.ST.CM**

REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),
Inter-office communication to ODOT D9 dated April 7, 2008** PHASE: **Preliminary Design**

2	The cost estimate shown in the Preliminary Design Report submission was based upon year 2006 costs. In the future, please update the cost estimate to reflect the costs at the time of the submission or the time of construction as stated in the ODOT's Project Development Process (PDP).	Acknowledged. The cost estimate for the preferred alternative for this structure is being updated as part of our current work on the project.
3	As stated in the e-mail from Rick Bruce in the ODOT – Office of Roadway Engineering Services dated May 30, 2007, the Design Consultant shall submit design exceptions for speed related deficiencies. The Technical Memorandum from CH2Mhill dated June 21, 2005 stated that design exceptions for speed related items were not required for ramps. However, Ramp C is considered to be a freeway to freeway connection which connects S.R. 823 to U.S.R. 23.	Acknowledged. The design exception is being prepared and will be submitted to ODOT.
4	Please check if the 45-degree turnback wingwall can be utilized at the Northwest and Northeast wingwalls similar to what is being proposed at the Southwest and Southeast wingwalls.	The northeast and northwest wingwalls are turned back at a ±45-degree angle. The wingwalls at the southeast and southwest corners cannot be bent back at a 45-degree angle. These wingwalls butt up against the wingwalls from SCI-823-1594 (SR 823 over Fairground Rd) to form a continuous retaining wall. This wall retains soil so that this area can drain away from the MSE walls. We do not propose to change the layout of the southeast or southwest wingwalls.

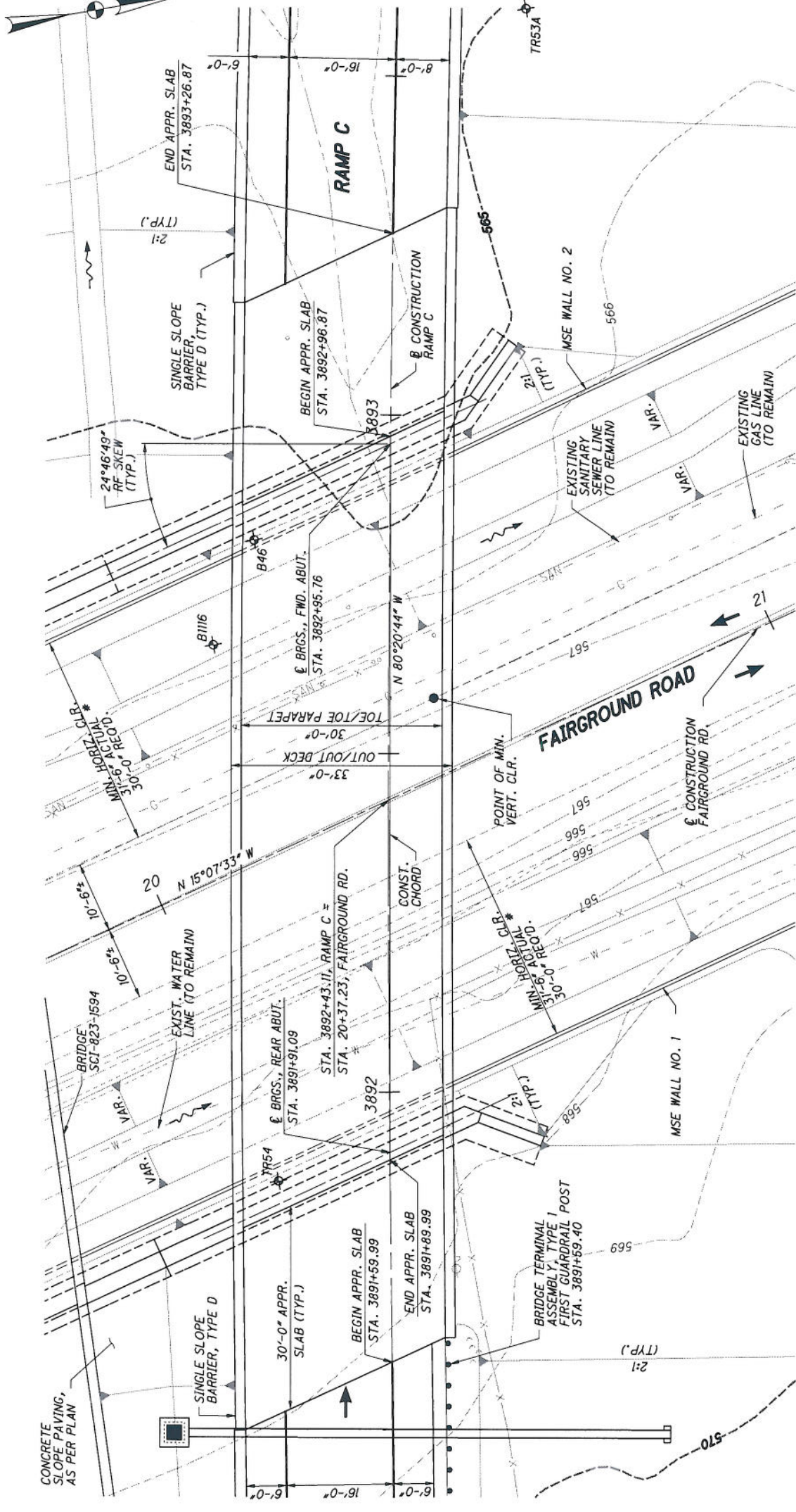


Portsmouth Bypass – Stage I Comments

PROJECT: **SCI-823-10.13: Portsmouth Bypass; PID 79977** PROJ. NO: **408549.08.ST.CM**

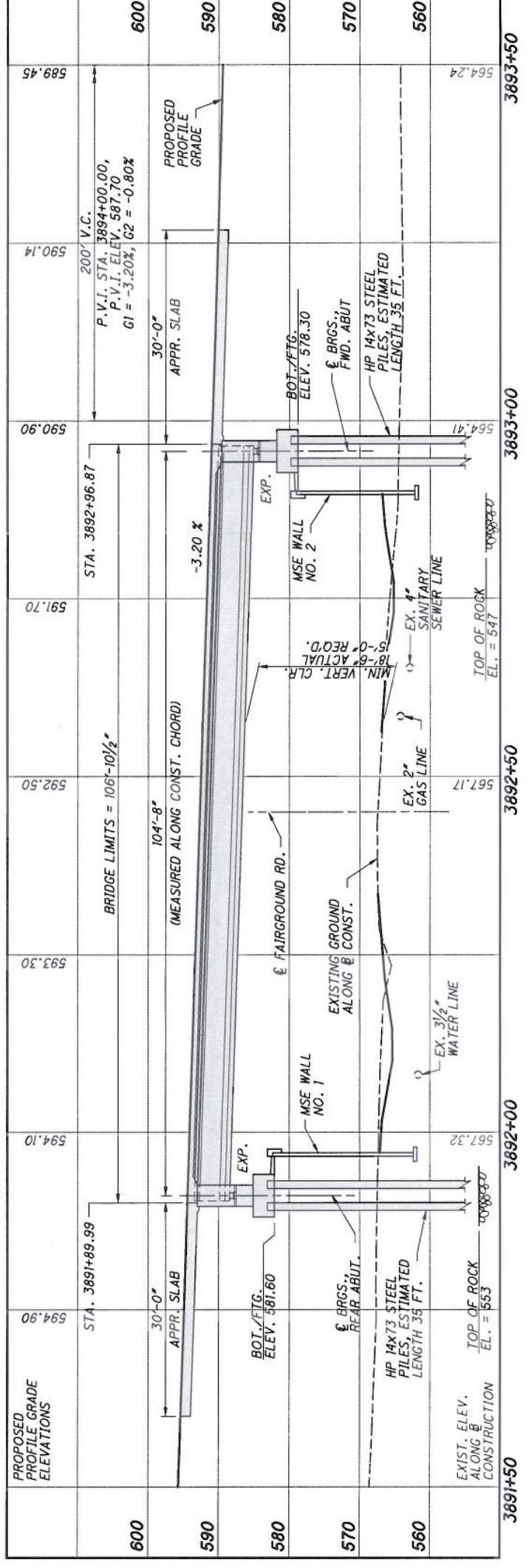
REVIEWER: **Comments by ODOT OSE (Reviewer: Ananda Dharma, PE),
Inter-office communication to ODOT D9 dated April 7, 2008** PHASE: **Preliminary Design**

5	The actual unfactored design load of 95 tons corresponds to HP12x53 instead of HP 14x73 piles. Please refer to BDM 202.2.3.2.a which was updated in the 2007 Fourth Quarter Revisions. The increase in the maximum allowable design loads for H-piles driven to refusal is to take advantage of the Grade 50 steel that is now used for steel piles.	Acknowledged.
6	Please provide the location and description of benchmarks in the next submittal. (BDM 202.2.1)	Benchmark information will be provided as soon as that information is available.
7	In the Proposed Structure data block, Length of Span on curved alignments should be measured along a reference line which a chord drawn from centerline of abutment bearings at the centerline of survey or baseline construction. (BDM 202.2.1)	Acknowledged. Span length will be measured along the baseline which is a chord drawn from the Centerline Rear Abutment Bearing to Centerline Forward Abutment Bearing.



PLAN

* 31'-6" PROVIDED TO PERMIT FUTURE 12'-0" LANE



PROFILE ALONG CONSTRUCTION, RAMP C

BENCHMARKS

CURVE DATA - RAMP C
 P.I. STA = 3889+21.16
 $\frac{1}{2}P = 9^{\circ} 37' 49" (RT)$
 $DC = 1^{\circ} 00' 00"$
 $R = 5,729.58'$
 $T = 482.65'$
 $L = 963.03'$
 $E = 20.29'$

TRAFFIC DATA

CURRENT ADT (2010) = 6200
 DESIGN ADT (2030) = 9400
 DESIGN ADTT = 1320

LEGEND

◆ INDICATES BORING LOCATION

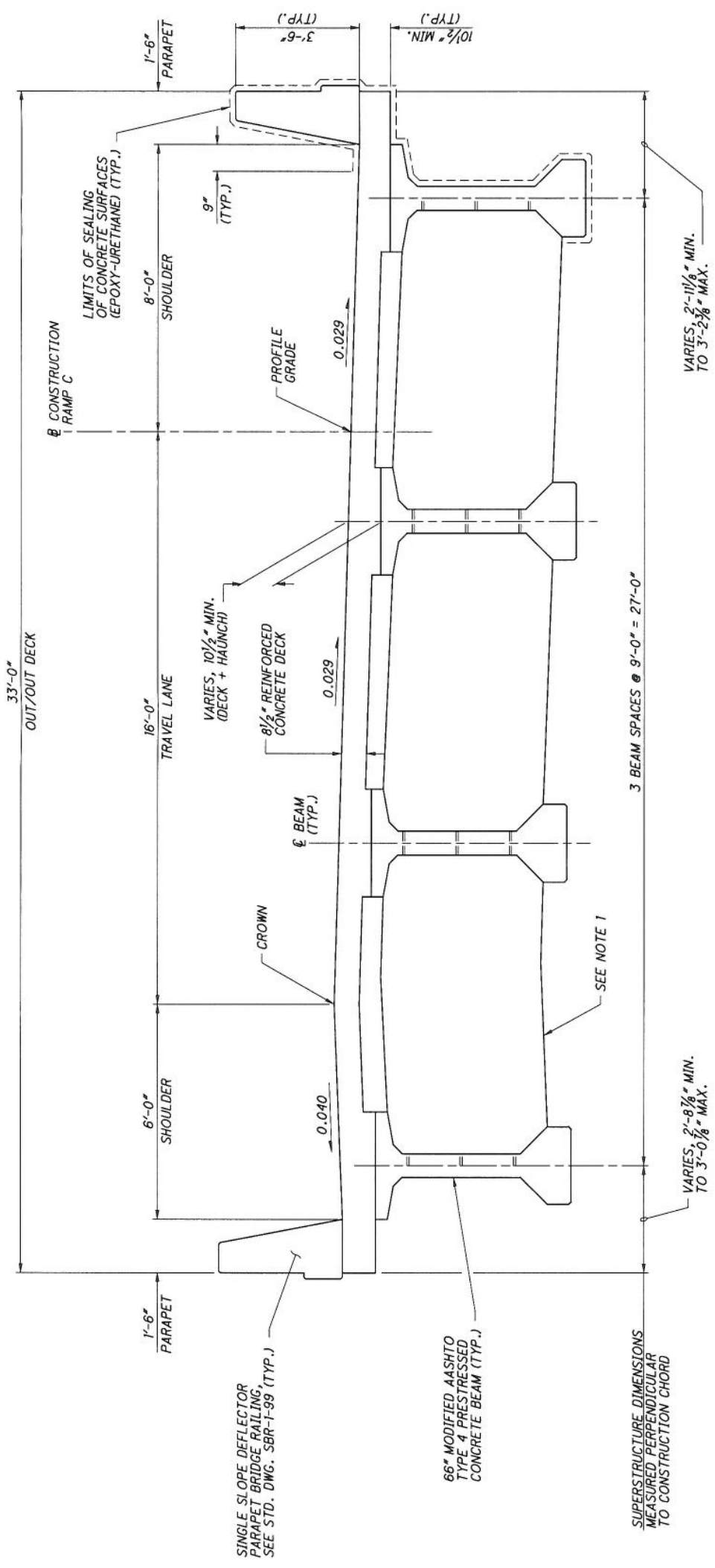
NOTES

EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
 POWER AND TELEPHONE LINES TO BE RELOCATED

PROPOSED STRUCTURE

TYPE: SINGLE SPAN COMPOSITE PRESTRESSED CONCRETE I-BEAMS WITH REINFORCED CONCRETE DECK AND SEMI-INTEGRAL ABUTMENTS ON MSE WALLS
LENGTH OF SPAN: 104'-8" C-C BEARINGS, MEASURED ALONG CONST. CHORD
ROADWAY: 30'-0" TOE/TOE PARAPETS
SIDEWALK: NONE
DESIGN LOADING: HS25 AND THE ALTERNATE MILITARY LOADING, FWS = 60 LB/FT²
SKEW: 24°46'49" RIGHT FORWARD, MEASURED FROM THE NORMAL TO THE CONSTRUCTION CHORD
WEARING SURFACE: MONOLITHIC CONCRETE
APPROACH SLABS: AS-I-81 (30'-0" LONG)
ALIGNMENT: HORIZONTALLY CURVED (RADIUS = 5729.58')
SUPERELEVATION: 0.029 FT/FT
LATITUDE: N 38°53'33"
LONGITUDE: W 82°59'52"

DESIGNED	DGS	JBA	REVIEWED	DATE
CHECKED	SCJ	SCJ	REVIEWED	04/11
SKT	SCJ/DGS	SCJ	STRUCTURE FILE NUMBER	7306733

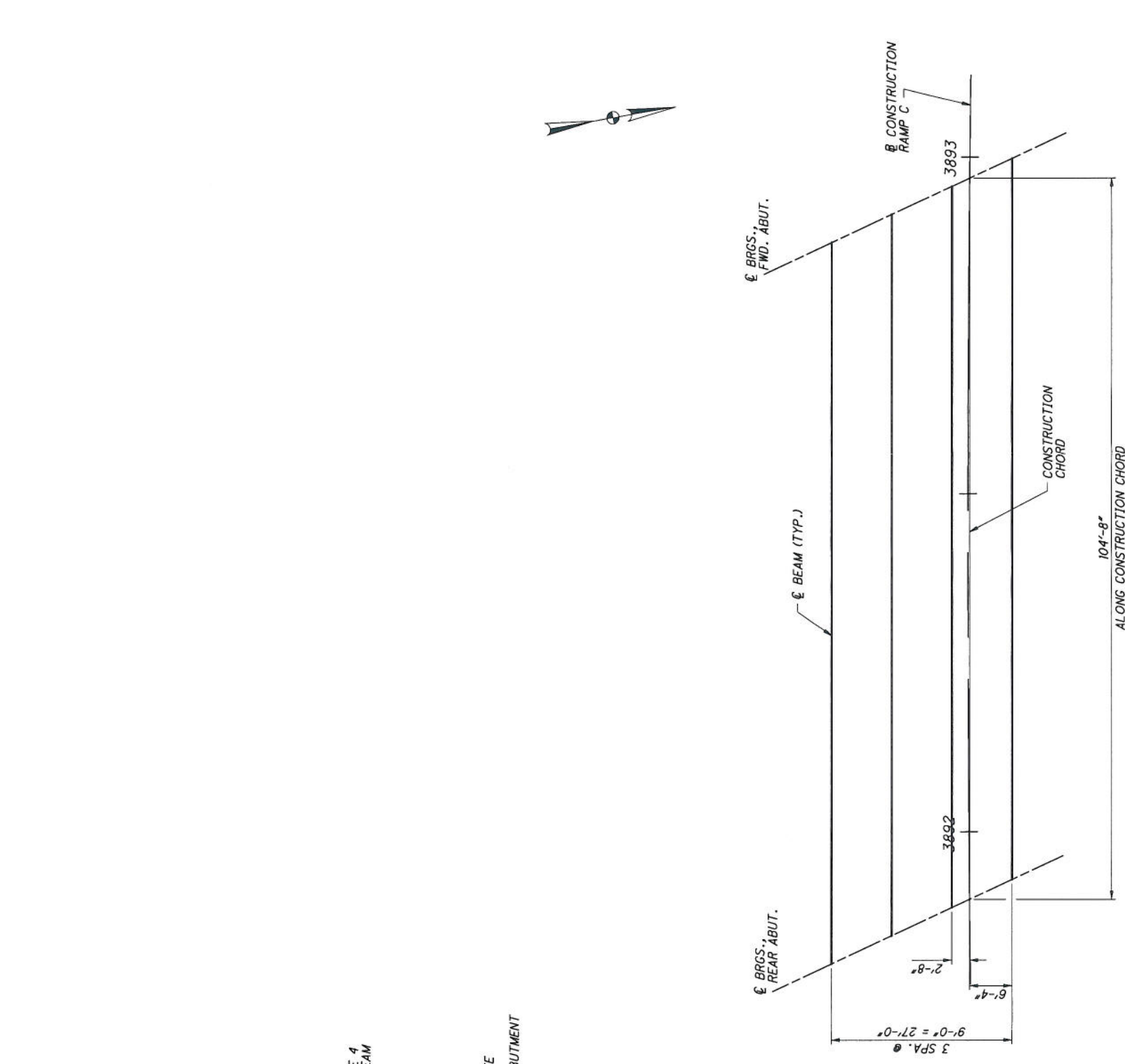


TYPICAL TRANSVERSE SECTION

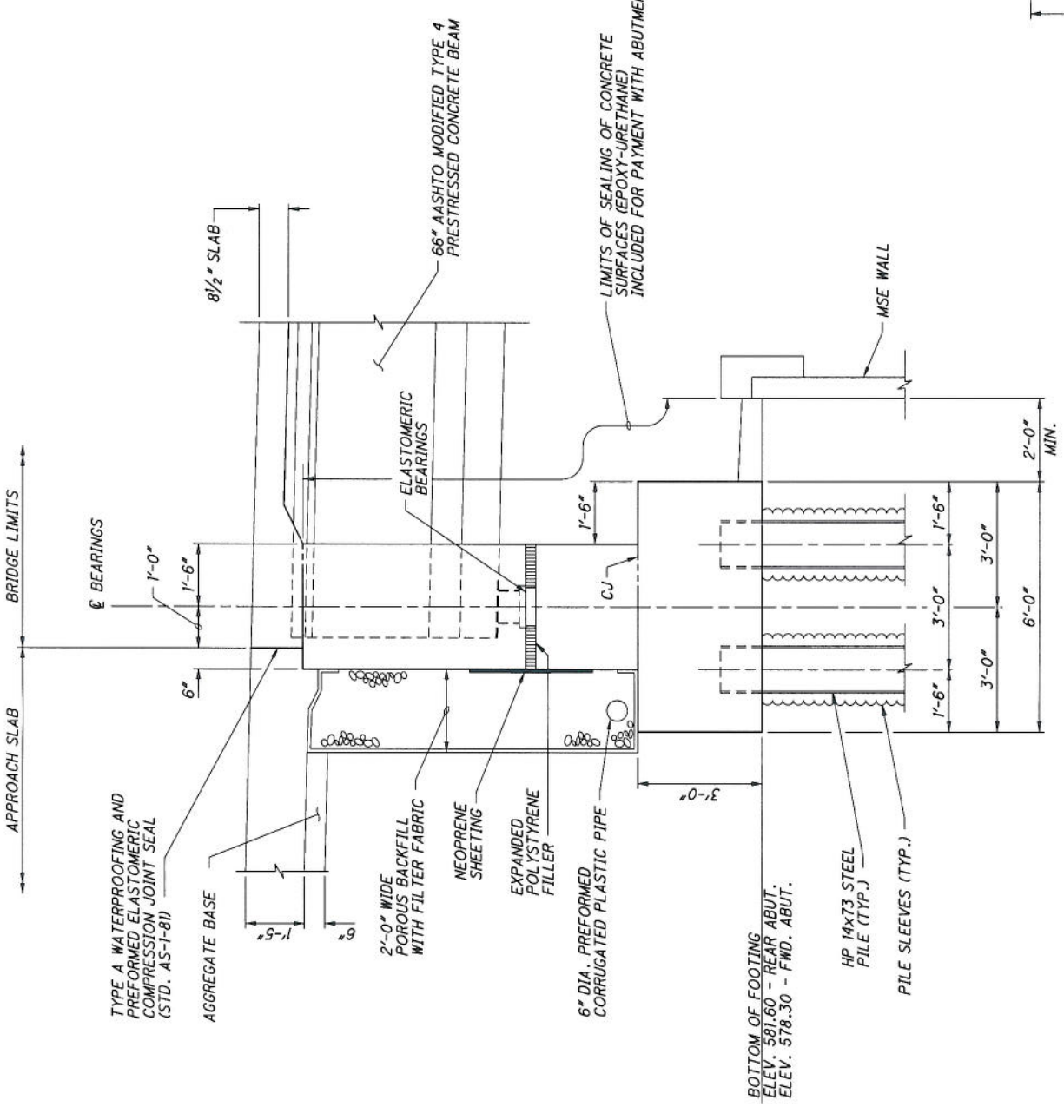
NOTES:

- INTERMEDIATE DIAPHRAGMS MAY BE CAST-IN-PLACE CONCRETE OR GALVANIZED STEEL. FOR DETAILS OF BOTH DIAPHRAGM TYPES, SEE STANDARD CONSTRUCTION DRAWING PSID-T-99.

DESIGNED	DGS	JBA	SCJ	DATE
CHECKED	SCJ/DGS	REVIEWED	SCJ	04/11
SKT	REVISED	STRUCTURE FILE NUMBER	7306733	



FRAMING PLAN



REAR AND FORWARD ABUTMENT SECTION