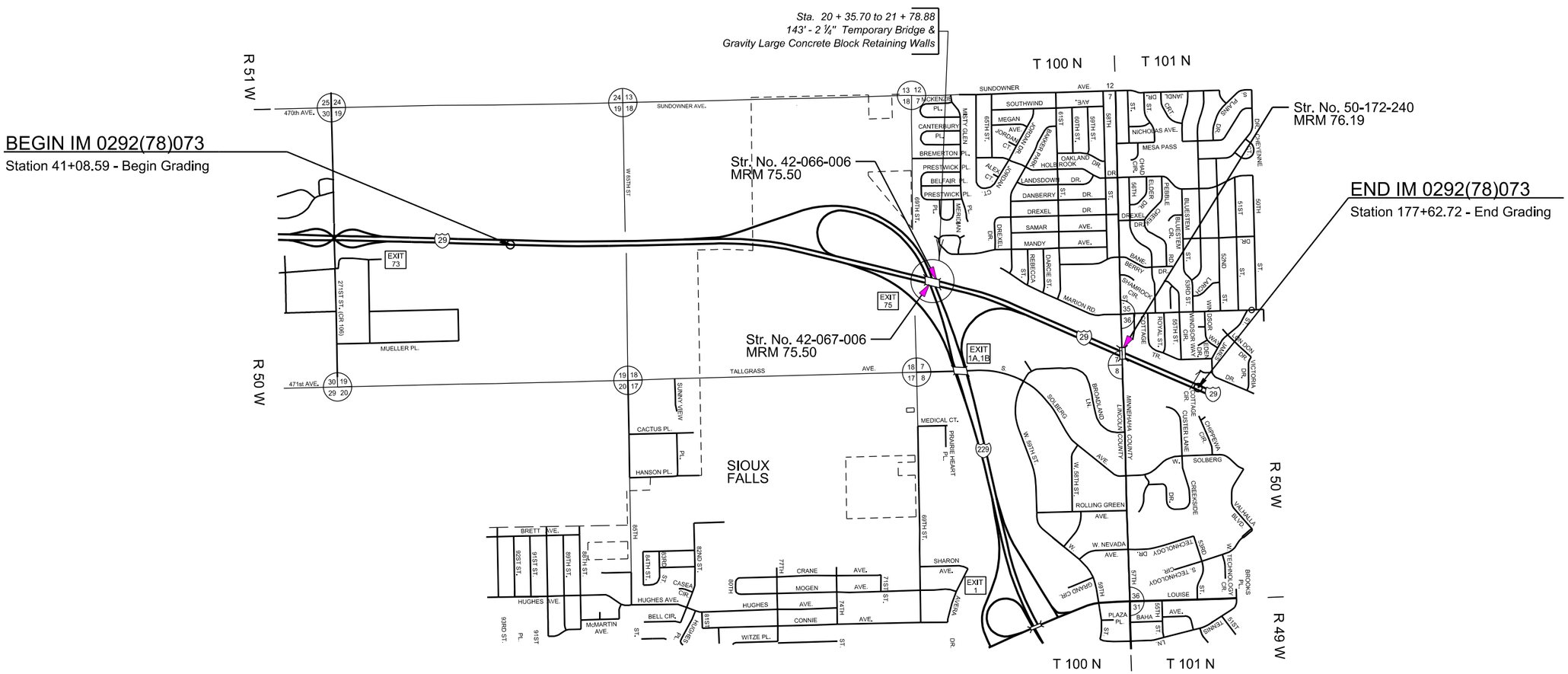
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E1	E9

Section E: Structure Plans

INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities
Sheet E3 to E7	143' - 2 1/4" Temporary Bridge
Sheet E8 to E9	Gravity Large Concrete Block Retaining Walls



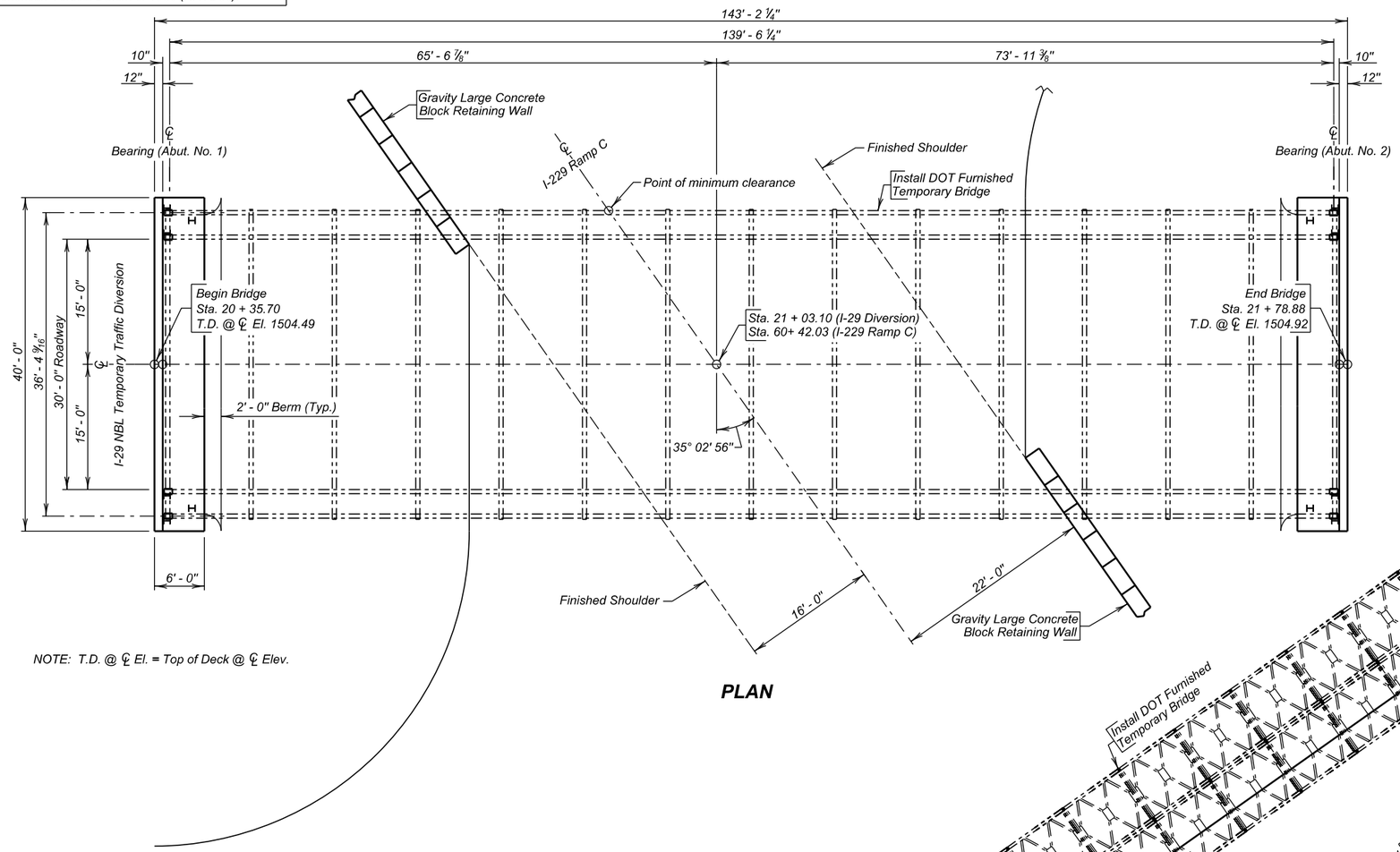
SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

143' – 2 $^{1}/_{4}$" Temporary Bridge
Sta. 20+35.70 to Sta. 21+78.88 (Diversion) &
Gravity Large Concrete Block Retaining Walls

Bid Item Number	Item	Quantity	Unit
004E0060	Temporary Detour Structure	1	Each
420E0100	Structure Excavation, Bridge	29	CuYd
420E0300	Structure Excavation, Retaining Wall	26	CuYd
421E1000	Footing Undercut	11	CuYd
460E0050	Class A45 Concrete, Bridge	63.0	CuYd
480E0100	Reinforcing Steel	4,783	Lb
510E3365	HP 10x42 Steel Bearing Pile, Furnish and Drive	1,260	Ft
530E0470	Gravity Large Concrete Block Wall	555	SqFt
680E0040	4" Underdrain Pipe	160	Ft

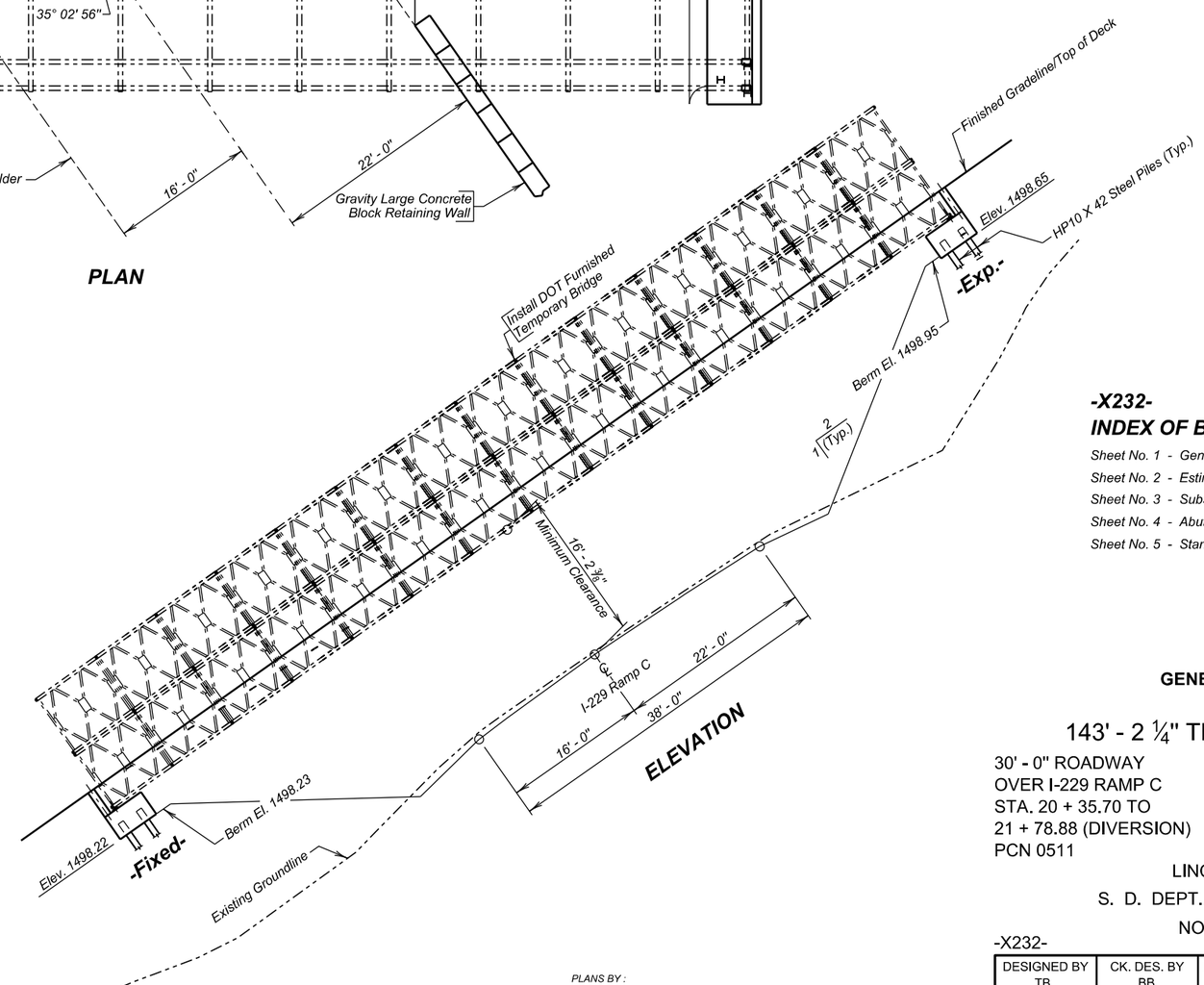
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

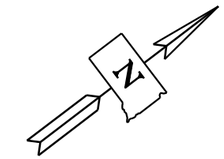
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E3	E9

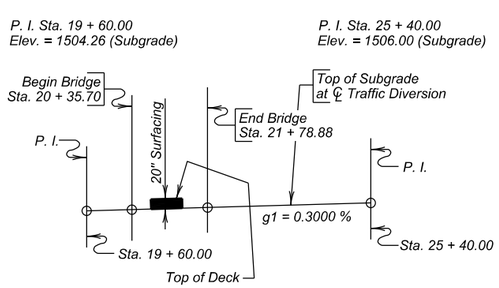


NOTE: T.D. @ ℄ El. = Top of Deck @ ℄ Elev.

PLAN







GRADELINE DATA
(I-29 NBL Traffic Diversion)

-X232-
INDEX OF BRIDGE SHEETS -

Sheet No. 1 - General Drawing
Sheet No. 2 - Estimate of Structure Quantities & Notes
Sheet No. 3 - Subsurface Investigation & Piling Layout
Sheet No. 4 - Abutment Details
Sheet No. 5 - Standard Plate No. 510.40

GENERAL DRAWING
FOR
143' - 2 ¼" TEMPORARY BRIDGE

30' - 0" ROADWAY — 0° SKEW
OVER I-229 RAMP C — SEC. 7-T100N-R50W
STA. 20 + 35.70 TO — IM 0292(78)073
21 + 78.88 (DIVERSION) — HS 20-44
PCN 0511 — (& ALT.)

LINCOLN COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2014

-X232-

PLANS BY :
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Goeden
LINC0511	0511TA01		BRIDGE ENGINEER

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
Temporary Detour Structure	1	Each	
Structure Excavation, Bridge	29	CuYd	
Class A45 Concrete, Bridge	63.0	CuYd	
Reinforcing Steel	4783	Lb	
HP10x42 Steel Bearing Pile, Furnish and Drive	1260	Ft	

SPECIFICATIONS FOR BRIDGE

1. Design Specifications: AASHTO Standard Specifications for Highway Bridges 2002 Edition. Service Load Design was used for the abutments and pile design.

2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2004 Edition and required provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

BRIDGE DESIGN LOADING

AASHTO HS20-44 & Alternate.

UNIT DESIGN STRESSES

1. Design Material Strengths:

Class A45 Concrete	f'c = 4500 psi
Reinforcing Steel (ASTM A615 Gr. 60)	fy = 60000 psi
Structural Steel (ASTM A709 Gr. 36)	fy = 36000 psi
Piling (ASTM A572 Grade 50)	fy = 50000 psi

2. Design unit stresses shall be as set forth in the Design Specifications.

DESIGN MIX OF CONCRETE

1. All structural concrete shall be Class A45 unless otherwise indicated.

2. Type II cement conforming to Section 750 is required.

3. The mix shall produce a concrete having a minimum 28 day compressive strength of 4500 psi.

3. Coarse Aggregate to be used in concrete shall consist of either crushed quartzite or other crushed ledge rock. If crushed ledge rock other than quartzite is to be used, it shall be from a source approved by the Engineer.

ABUTMENTS

1. Estimated pile lengths are shown in the Table of Estimated Quantities on the Abutment Details sheet.

2. The HP10x42 Piling were designed using a factored bearing resistance of 77 tons per pile. Piling shall develop a field verified nominal bearing resistance of 192 tons per pile.

3. All mild reinforcing steel shall conform to ASTM A615, Grade 60.

4. All exposed concrete corners and edges shall be chamfered ¾" unless noted otherwise.

5. Use 1" clear cover on all reinforcing steel except as shown.

STRUCTURAL STEEL

Anchor bolts shall conform to ASTM A307 or F1554. All costs for nuts, bolts and wedge type anchors shall be incidental to the contract unit price per cubic yard for Class A45 Concrete, Bridge.

DELIVERY AND ERECTION OF TEMPORARY STRUCTURE

1. The Acrow temporary bridge will be supplied by and remain the property of the SDDOT.

2. An Acrow construction advisor will be hired by the Contractor to assist in erection of the temporary bridge. The Contractor shall notify the Department a minimum of 14 days prior to construction.

3. The Contractor will be required to load and transport the bridge from the SDDOT yard in Sioux Falls located at the intersection of SD38 and Marion Road to the erection site. Contact the Sioux Falls Area Engineer Travis Dressen at (605)367-4970 ext. 2110.

4. The Contractor shall be responsible for any damage to the temporary bridge that occurs during the handling and erection operations, as well as during transportation from the SDDOT yard.

5. All costs for delivery from the SDDOT yard and erection of the temporary structure shall be incidental to the contract unit price per each for Temporary Detour Structure.

6. A bridge assembly scope with approximate assembly times, crew requirements, tools and equipment needed is available upon request from Acrow (phone 303-279-9088).

SDDOT's LRFD PILE DRIVING EQUATIONS

To determine the field verified nominal pile bearing resistance of driven piles the SDDOT uses the formulas below for timber, concrete, steel H-piling and shell type piles.

For double action steam or air hammers and closed cylinder top diesel hammers:

$$Q\ (\text{drive}) = \frac{10.5E}{S + 0.1} \times \frac{W}{W + M}$$

For single action steam or air hammers and open cylinder top diesel hammers:

$$Q\ (\text{drive}) = \frac{10.5WH}{S + 0.1} \times \frac{W}{W + M}$$

Where:
Q = the field verified nominal pile bearing resistance in tons.
W = the weight of a gravity hammer, or the ram of an energy hammer in tons.
H = the height of free fall of the hammer or ram in feet.
M = the weight in tons of the driven mass and shall include the weight of the pile, the weight of the driving cap and the weight of the anvil, if used.
E = the energy per blow in foot-tons.
S = the average penetration in inches of the pile per blow for the last 10 blows for energy hammers.

PILE DRIVING

1. A drivability analysis was performed using the wave equation analysis program (GRLWEAP). A list of acceptable hammers is provided below. Based on initial analysis, the hammers listed will need to be operated no higher than the second fuel setting in order to prevent overstressing of the pile during driving operations. If during actual driving operations an adequate hammer drop to obtain design bearing is not achieved, contact the Geotechnical Engineering Activity prior to increasing the fuel setting.

   Delmag D25-32 Delmag D30-32 SPI D-30

2. Pile hammers not listed will require evaluation and approval prior to use from the Geotechnical Engineering Activity.

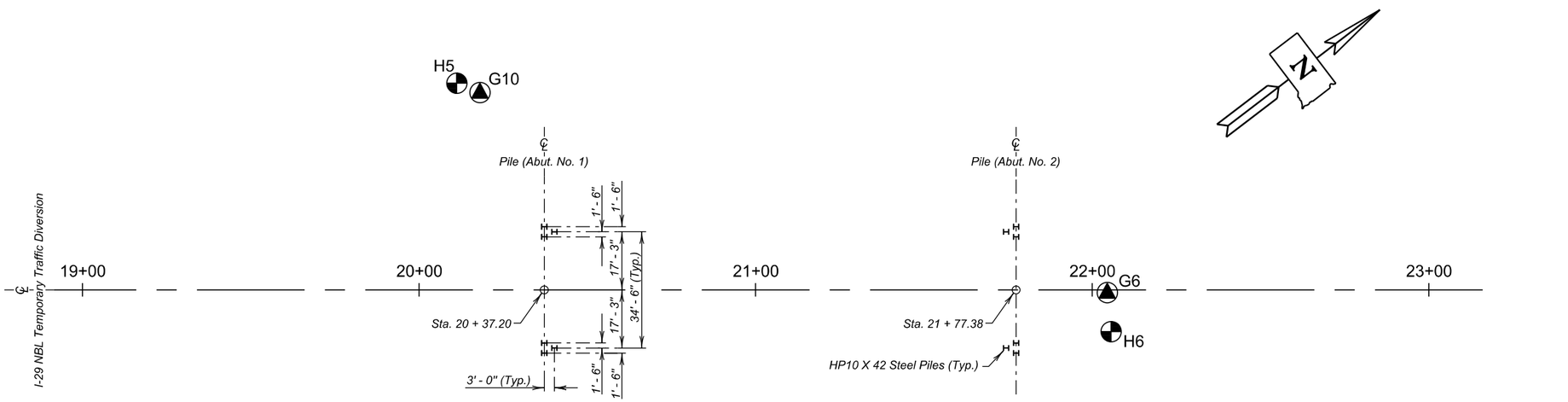
3. If design bearing is not obtained during pile driving operations the contractor shall perform a delayed bearing test. If bearing still is not obtained, the Geotechnical Engineering Activity shall be contacted prior to driving any piling below elevation 1397 feet.

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES
FOR
143' - 2 ¼" TEMPORARY BRIDGE

NOVEMBER 2014

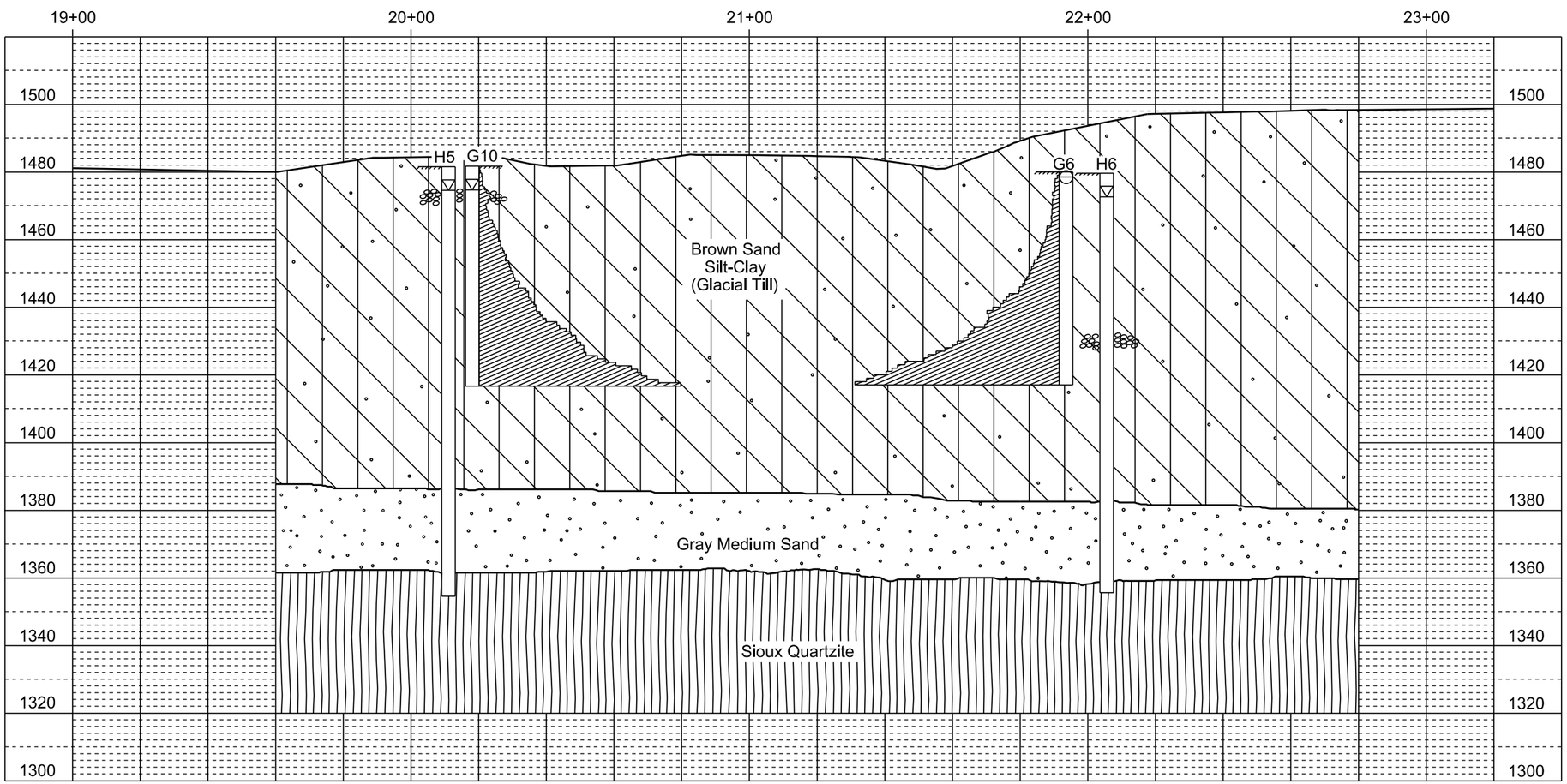
DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Goeden
LINC0511	0511TA02		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E5	E9



PILING LAYOUT

G6 Drive was moved in profile view for clarity.



Glaciated Terrain contains all sizes of natural mineral sediment ranging from clay to boulders. Streams originating in or flowing through glaciated topography contain sediment loads derived from glaciated sources. Stream and river crossings contain sediment naturally sorted and randomly concentrated. Alluvial sediment located at this project location may have concentrated coarser gravel such as pebbles, cobbles and boulders. The subsurface conditions shown only represent material that was found at the exact location of the small diameter drill hole. Coarse granular material may be present in areas not penetrated by the depicted borings.

The Geotechnical Engineering Activity has on file all of the boring logs for this project. These logs and additional results of laboratory test, if any, are available for review at the Central Office in Pierre.

LEGEND

Auger Test
Drive Test
Water
Caved
Sample Zone

All auger holes are drilled with a 4½ inch diameter continuous flight auger. Drive tests are conducted by dropping a 490 pound hammer 30 inches to drive a 2⅞ inch drill stem to measure the resistance to penetration of the soil.

GROUND WATER ELEVATIONS
as of SEPTEMBER 2013

H5	1474.6
H6	1472.7
G6	1478.6
G10	1474.7

MEASURED SKIN FRICTION

	ELEV.	PSF
G6	1417.1	667
G10	1416.7	438

SUBSURFACE INVESTIGATION & PILING LAYOUT
FOR
143' - 2 ¼" TEMPORARY BRIDGE

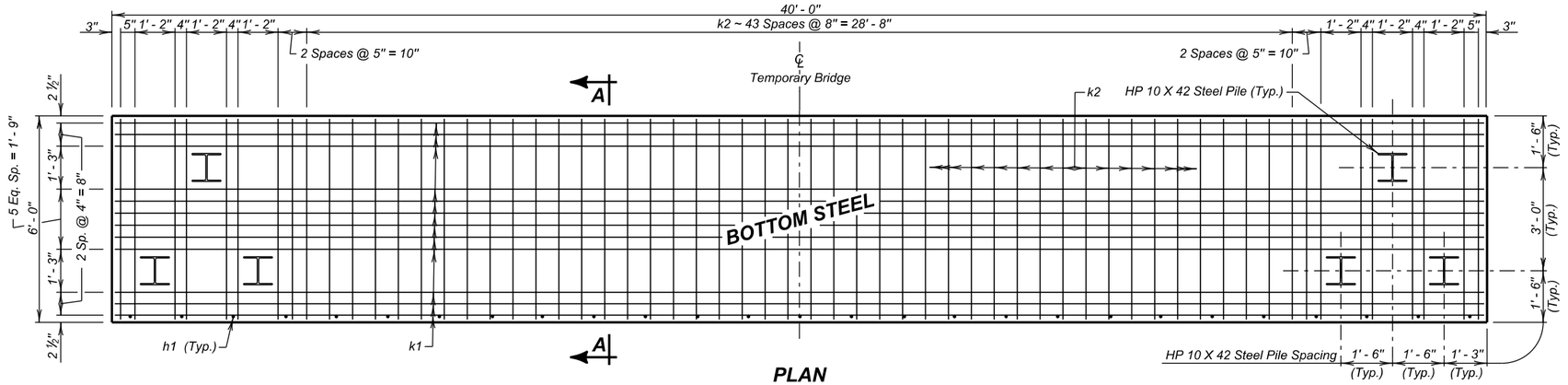
30' - 0" ROADWAY
OVER I-229 RAMP C
STA. 20 + 35.70 TO
21 + 78.88 (DIVERSION)

0° SKEW
SEC. 7-T100N-R50W
IM 0292(78)073
HS 20-44
(& ALT.)

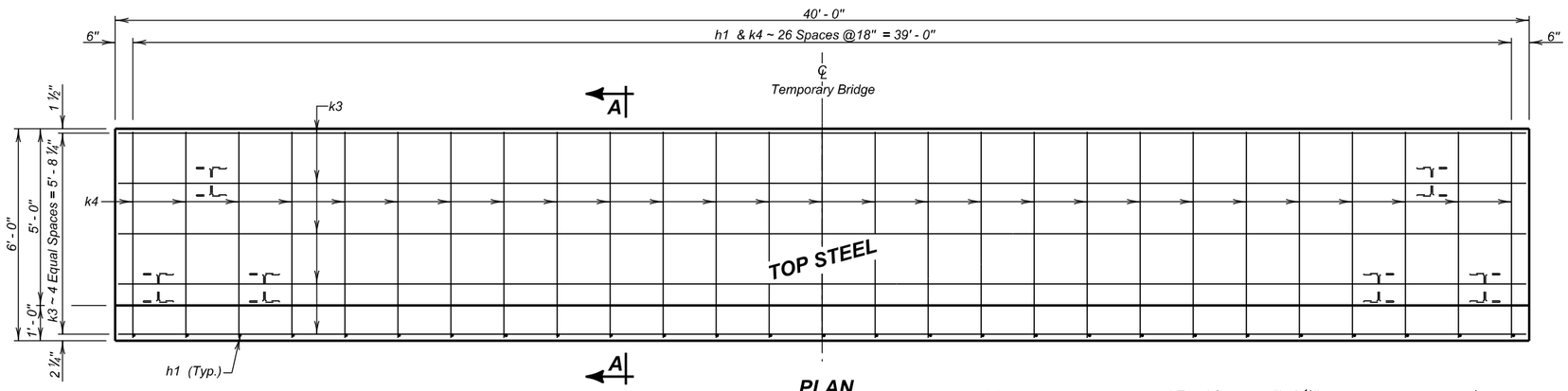
LINCOLN COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2014

DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Goeden
LINC0511	0511TA03		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E6	E9



PLAN



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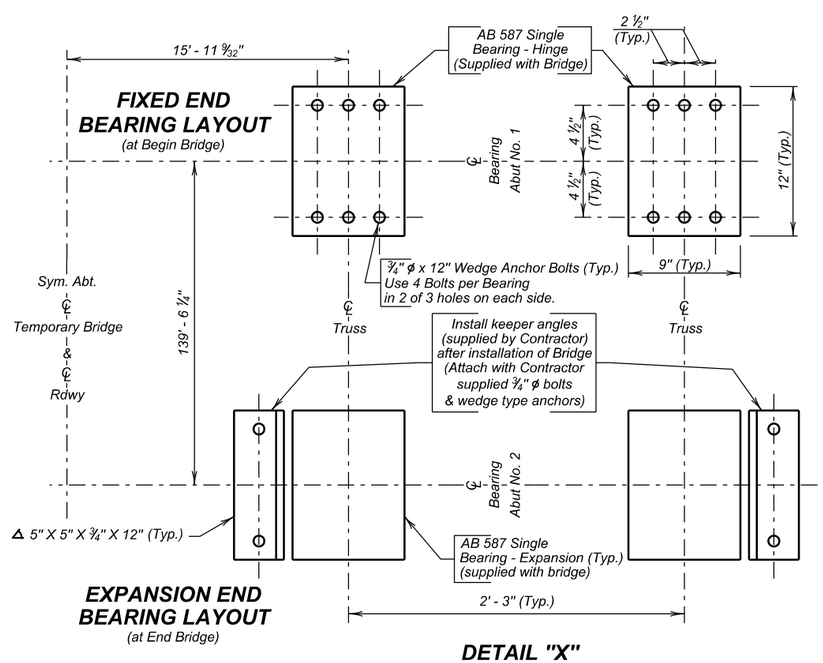
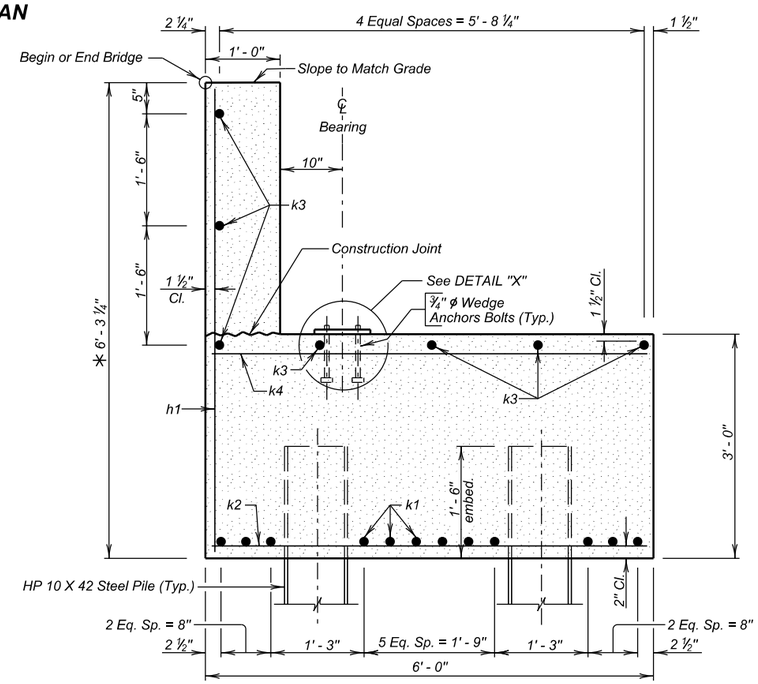


DETAIL "X"
PLAN



✳ Dimension at back of Abutment.

SEC. A - A

INCREASING STATIONS
Abut. No. 1

INCREASING STATIONS
Abut. No. 2

REINFORCING SCHEDULE
(For 2 Abutments)

Mk.	No.	Size	Length	Type
h1	54	4	6' - 0"	Str.
k1	24	8	39' - 10"	Str.
k2	120	7	5' - 10"	Str.
k3	14	4	39' - 10"	Str.
k4	54	4	5' - 10"	Str.

ESTIMATED QUANTITIES
(For 2 Abutments)

ITEM	UNIT	QUANTITY
Class A45 Concrete, Bridge	Cu. Yd.	63.0
Reinforcing Steel	Lb.	4783
Structure Excavation, Bridge	Cu. Yd.	29
HP 10 x 42 Steel Bearing Pile, Furnish & Drive	Ft.	12 @ 105' = 1260'
Temporary Detour Structure	Each	1

ABUTMENT DETAILS

FOR

143' - 2 ¼" TEMPORARY BRIDGE

30' - 0" ROADWAY
OVER I-229 RAMP C
STA. 20 + 35.70 TO
21 + 78.88 (DIVERSION)

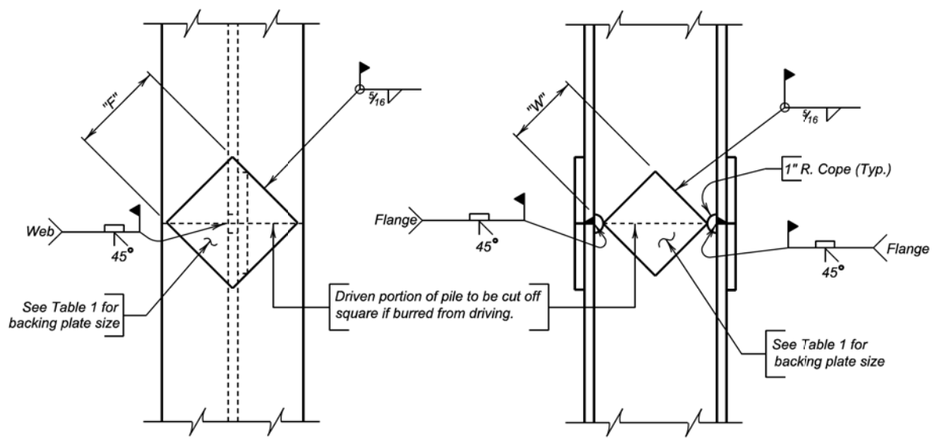
0° SKEW
SEC. 7-T100N-R50W
IM 0292(78)073
HS 20-44
(& ALT.)

LINCOLN COUNTY

S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2014

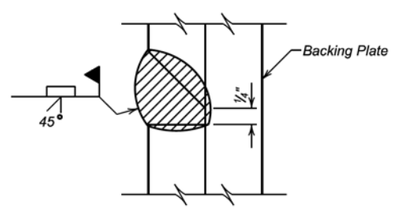
DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Goeden
LINC0511	0511TA04		BRIDGE ENGINEER



NOTE:

Prepare joint surfaces lower end of upper section on the ground and weld on backing plates; then place upper section on lower section and weld.

COMPLETE JOINT PENETRATION WELD DETAIL



GENERAL NOTES:

1. Steel for backing plates shall conform to ASTM A709 Grade 50.
2. Welding and weld inspection shall be in conformance with AWS D1.5 (Current Year) Bridge Welding Code - Steel.
3. Welder must be certified and registered with the SDDOT.
4. Backing plate shall at a minimum be as thick as the web of the pile being spliced.
5. Web must be coped with 1 inch radius.
6. Submit Welding Procedure Specification (WPS) to Bridge Construction Engineer for approval prior to pile driving.

TABLE 1
(BACKING PLATES)

PILE	10"	12"	14"
"F" FLANGE	6 ½"	8"	10"
"W" WEB	4 ¾"	6 ¼"	7 ½"

December 23, 2012

Published Date: 4th Qtr. 2014

SDDOT

STEEL PILE SPLICE DETAILS

PLATE NUMBER
510.40

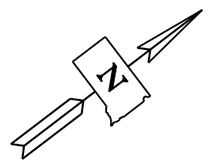
Sheet 1 of 1

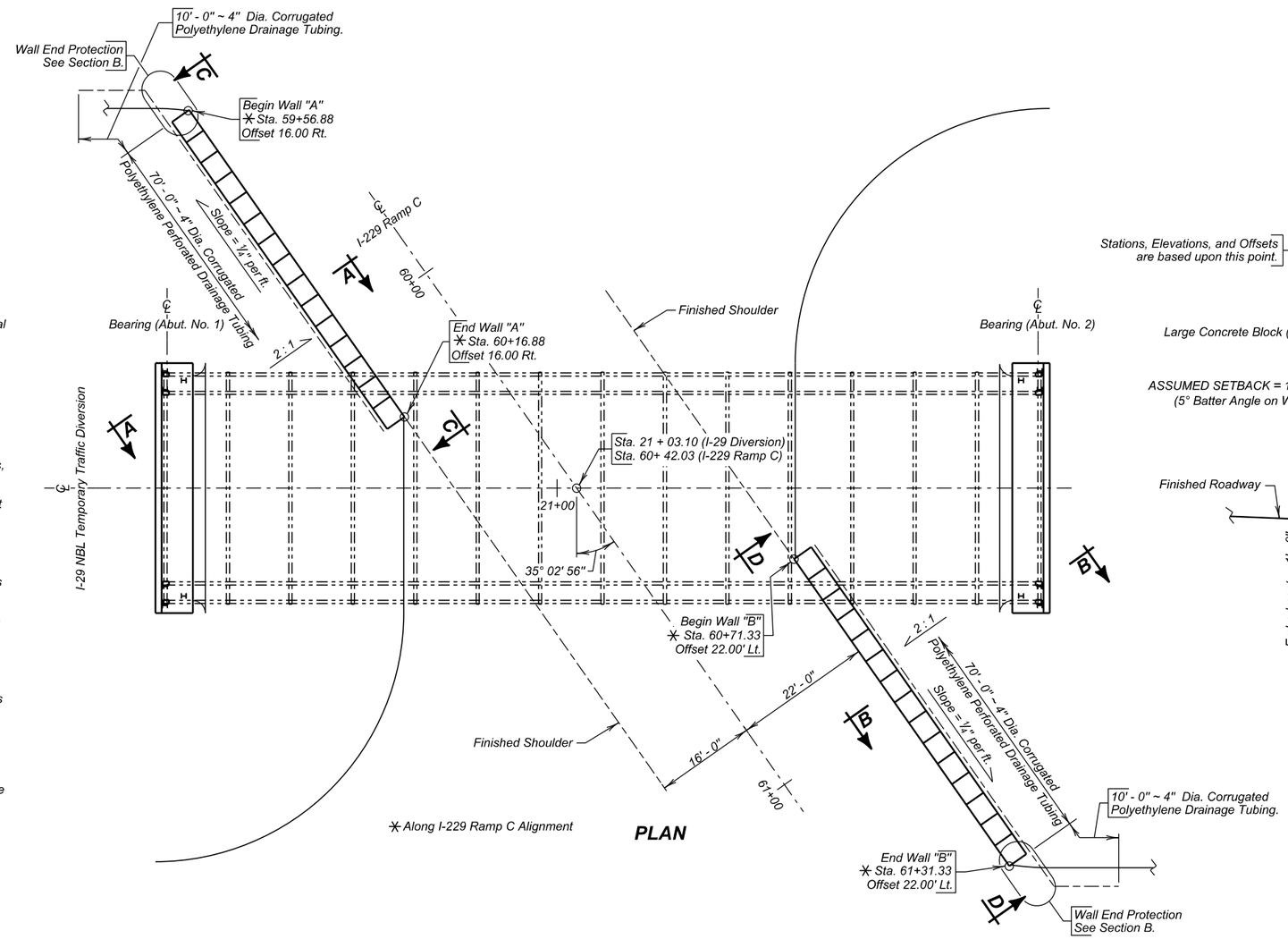
143' - 2 ¼" TEMPORARY BRIDGE

NOVEMBER 2014

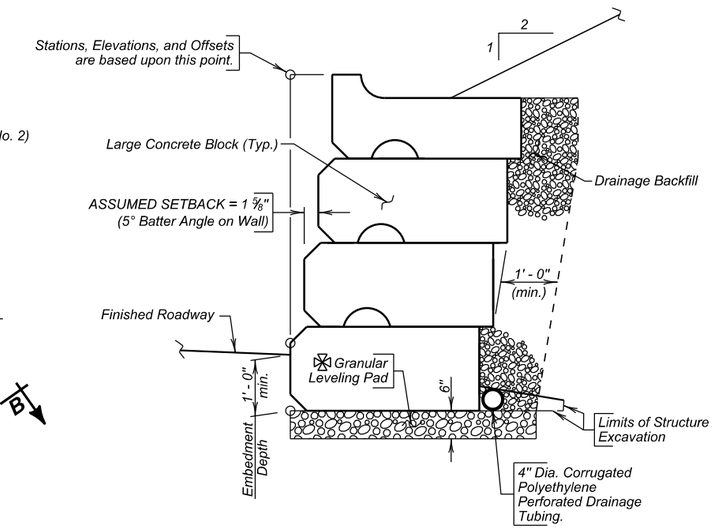
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E8	E9





PLAN



TYPICAL SECTION

✳ 6" minimum or as per Manufacturer's recommendations, whichever is greater.

SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2014 Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2004 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

RETAINING WALL

1. The Gravity Large Concrete Block Retaining Wall shall be on the current approved products list located at the following website address: http://apps.sd.gov/applications/HC60ApprovedProducts/main.aspx
2. The design of these walls has been pre approved. The Contractor shall obtain and provide to the Engineer any applicable installation instructions, specifications, and details from the wall manufacturer.
3. The concrete used in casting the gravity large concrete blocks shall meet or exceed the block system specifications for the concrete design mix including fresh concrete properties and concrete strength. Blocks shall be given a lot number for tracking purposes that is associated with test results for fresh concrete properties and compressive strength. Each lot number shall be certified by the block manufacturer that the fresh concrete properties and the compressive strength met the block system's minimum specifications.
4. Foundation preparation shall consist of placing the gravity large concrete block retaining wall system on a granular leveling pad. Prior to placement of the granular leveling pad all spoil or loose material shall be removed and the area wetted then proof rolled to ensure adequate density. Material for the leveling pad shall conform to the specifications for aggregate base course in Section 882 of the Specifications. Compaction shall be governed by the Specified Density Method. All costs for equipment, labor, tools, and incidentals required for the undercutting and use or disposal of the excavated material and for furnishing, placing, watering, and compacting the granular material used in the foundation preparation shall be paid for at the contract unit price per cubic yard for Footing Undercut.
5. The minimum embedment depth to the bottom of the wall for gravity large concrete block retaining wall shall be 1.0 ft.
6. Construction of the wall shall begin at the lowest course and proceed upwards. The underdrain shall be placed prior to wall backfill placement. The underdrain shall also be functional to prevent water from backing up into the wall backfill. The lowest course must be placed and backfilled in its entirety prior to construction of any subsequent courses. Backfill placement must be placed in successive horizontal lifts.
7. Drainage fill for the gravity large concrete block retaining wall system shall meet the criteria as set by the wall block manufacturer and shall be incidental to contract unit price per square foot for "Gravity Large Concrete Block Retaining Wall".
8. The embankment and retaining wall shall be brought up in horizontal lifts simultaneously. Compaction behind the retaining wall shall be in accordance with Section 120 of the Specifications.
9. The retaining wall shall be installed in accordance to the selected wall companies' instructions, specifications and approved shop drawings.
10. The exposed face of the Gravity Large Concrete Block Wall shall be smooth faced.
11. Quantities for Gravity Large Concrete Block Wall, Structure Excavation, Retaining Wall and Footing Undercut bid items will be full compensation for the construction of the gravity large concrete block wall.

UNDERDRAIN

1. An underdrain system shall be installed behind the wall. The underdrain system shall consist of 4 inch diameter slotted corrugated polyethylene tubing installed behind the wall and 4 inch diameter corrugated polyethylene tubing from the back of the wall to the outlet area as shown.
2. The polyethylene tubing shall conform to Section 990 of the Specifications.
3. All costs involved in furnishing and installing the 4 inch diameter slotted corrugated polyethylene tubing and 4 inch diameter corrugated polyethylene tubing shall be included in the contract unit price per foot for 4 Inch Underdrain Pipe.

INDEX OF RETAINING WALL SHEETS-

Sheet No. 1 - General Drawing and Notes
Sheet No. 2 - Wall Details

ESTIMATED QUANTITIES

(For Two Walls)

ITEM	UNIT	QUANTITY
Gravity Large Concrete Block Wall	Sq. Ft.	555
Structure Excavation, Retaining Wall	Cu. Yd.	26
4" Underdrain Pipe	Ft.	160
Footing Undercut	Cu. Yd.	11

1. 120 ft. 4" dia. Corrugated Polyethylene Perforated Drainage Tubing.
2. 40 ft. 4" dia. Corrugated Polyethylene Drainage Tubing.

Items 1 and 2 are approximate quantities contained in the 4" Underdrain Pipe and are for information only.

GENERAL DRAWING AND NOTES

FOR

GRAVITY LARGE CONCRETE BLOCK RETAINING WALLS

ADJ.TO I-229 RAMP C — SEC. 7-T100N-R50W
STA. 59 + 56.88 TO — IM 0292(78)073
STA. 60 + 16.88 &
STA. 60 + 71.33 TO
STA. 61 + 31.33
PCN 0511

LINCOLN COUNTY

S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2014

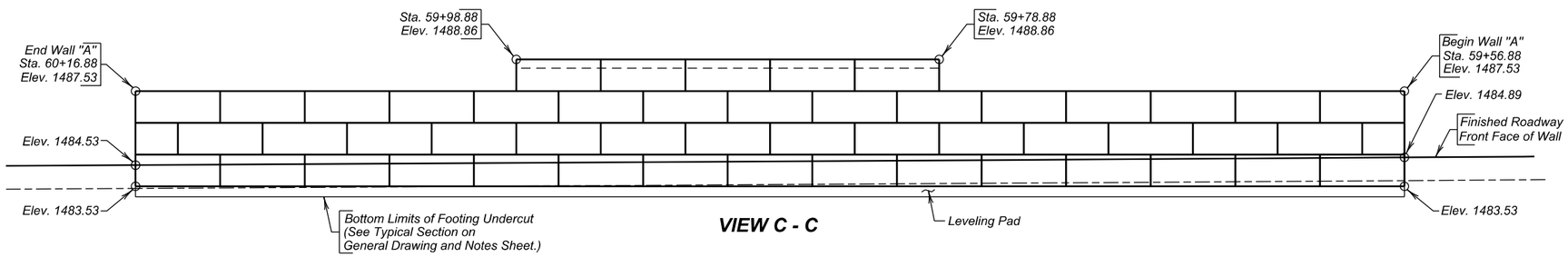
1 OF 2

PLANS BY :
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

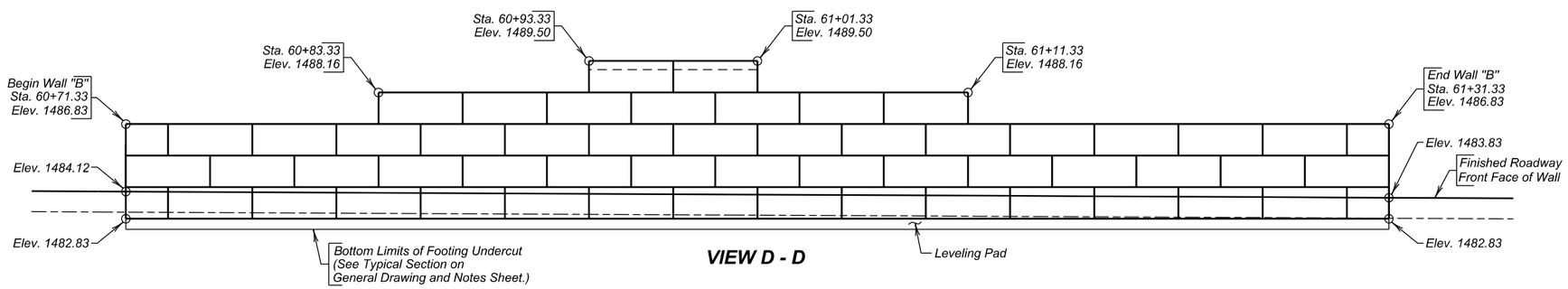
DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Goeden
LINC0511	0511TA01		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0292(78)073	E9	E9

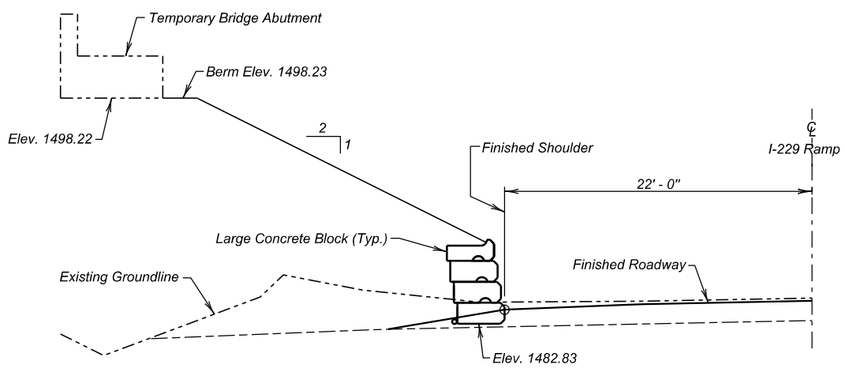
NOTE: Wall height assumes 16" high blocks.



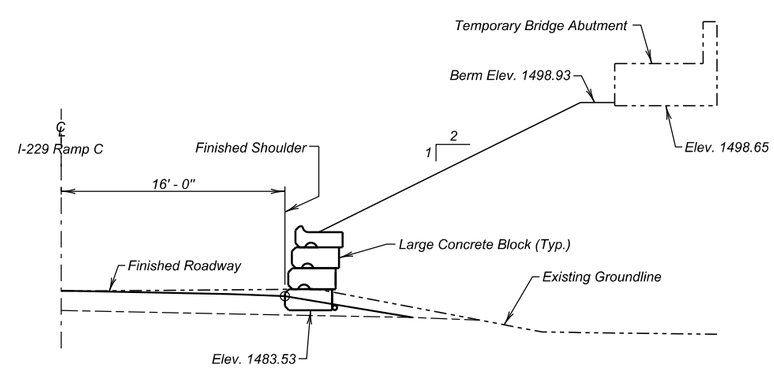
VIEW C - C



VIEW D - D



SEC. B - B



SEC. A - A

WALL DETAILS

FOR

GRAVITY LARGE CONCRETE
BLOCK RETAINING WALLS

ADJ.TO I-229 RAMP C
STA. 59 + 56.88 TO
STA. 60 + 16.88 &
STA. 60 + 71.33 TO
STA. 61 + 31.33

SEC. 7-T100N-R50W
IM 0292(78)073

LINCOLN COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2014

2 OF 2

DESIGNED BY	CK. DES. BY	DRAFTED BY	
TB	BB	BT	Kevin N. Boeden
LINC0511	0511TA02		BRIDGE ENGINEER