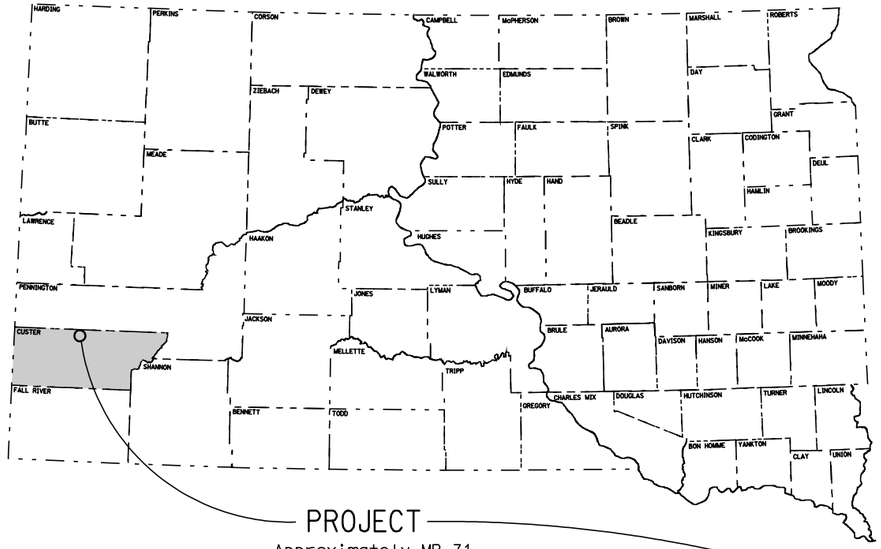


STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION
PLANS FOR PROPOSED

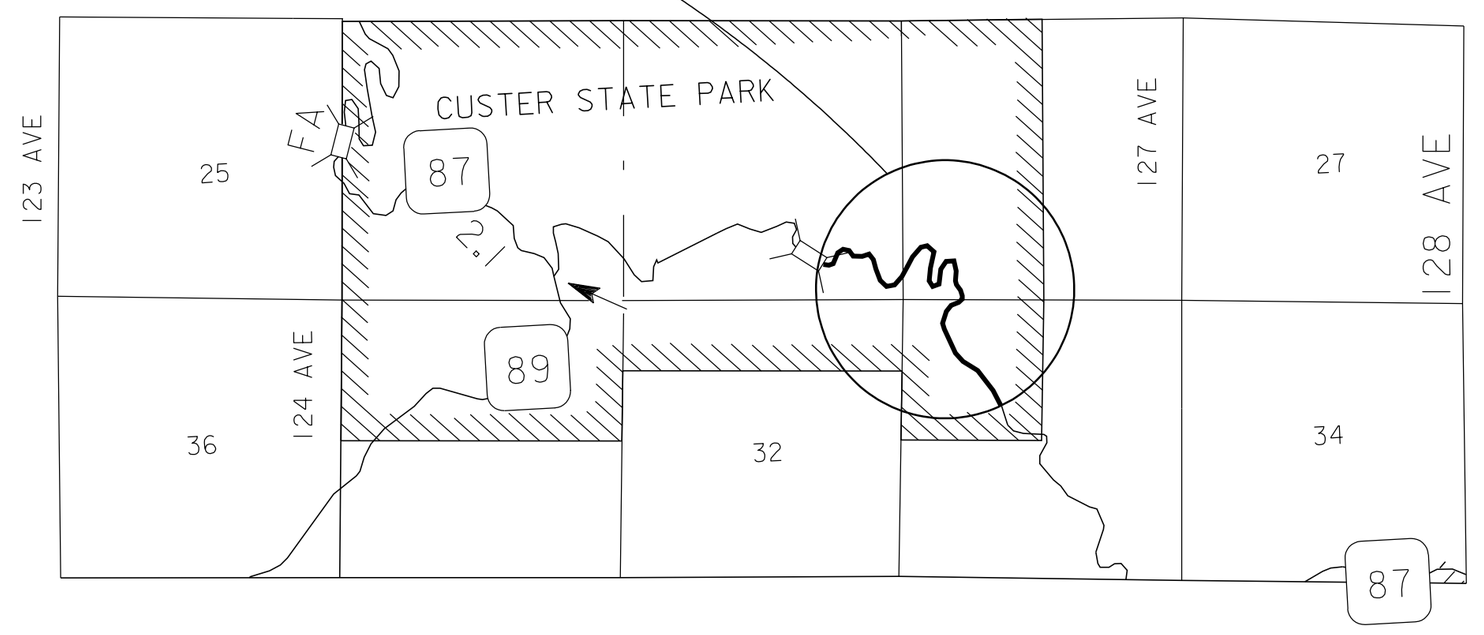
PROJECT NO. 087–491
SD HIGHWAY 87
CUSTER COUNTY

RETAINING WALL REPLACEMENT
PCN I0W3

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	087–491	1	17

Plotting Date: 27–MAY–2009
Flown Date:
Photo Not to Scale

INDEX OF SHEETS



DESIGN DESIGNATION

ADT (2008)	450
ADT (2028)	590
DHV	90
D	50%
T DHV	3.6%
T ADT	8.0%
V	35 mph

SCALES

		RURAL	SUBURBAN	URBAN
PLAN		1"=200'	1"=100'	1"=40'
PROFILE,	HORIZONTAL:	1"=200'	1"=100'	1"=40'
	VERTICAL:	1"=20'	1"=20'	1"=10'
CROSS SECTIONS	HORIZONTAL:	1"=40'	1"=20'	1"=20'
	VERTICAL:	1"=20'	1"=10'	1"=10'

STORM WATER PERMIT

Major Receiving
Body of Water: Iron Creek
Area Disturbed: 0.16 ac
Total Project Area: 0.16 ac

ESTIMATE OF QUANTITIES

Base Bid

Bid Item Number	Item	Quantity	Unit
009E0010	Mobilization	Lump Sum	LS
100E0100	Clearing	Lump Sum	LS
110E1305	Remove Timber Retaining Wall	95.0	Ft
250E0010	Incidental Work	Lump Sum	LS
260E1010	Base Course	66.0	Ton
320E1200	Asphalt Concrete Composite	35.0	Ton
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
420E0300	Structure Excavation, Retaining Wall	373	CuYd
460E0100	Class A45 Concrete, Miscellaneous	74.1	CuYd
460E5050	7/8" Threaded Rod, Adhesive Anchor	18	Each
480E0100	Reinforcing Steel	13,456	Lb
634E0100	Traffic Control	408	Unit
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
680E0040	4" Underdrain Pipe	116	Ft
680E2010	Precast Concrete Headwall for Drain	1	Each
900E0900	Curb Stop	7	Each

Alternate 1

Bid Item Number	Item	Quantity	Unit
900E0100	Stone Facing	1,180	SqFt

SPECIFICATIONS

Standard Specifications for Roads & Bridges, 2004 Edition and Required Provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

WORK DESCRIPTION

Work on this project will proceed in accordance with the Sequence of Operations. Work on this project will consist of the removal of the existing timber retaining wall and replacement with a new concrete retaining wall.

SEQUENCE OF OPERATIONS - GENERAL

The intent of the plan sequence of operations is to have the least amount of impact on the traveling public and adjacent landowners. Requests to deviate from the sequence of operations shall be submitted in writing to the Engineer for review. Approval of an alternate sequence of operations will only be allowed when the proposed changes meet with the Department's intent for traffic control and sequencing of the work. An alternate sequence shall be submitted for review a minimum of two weeks prior to potential implementation.

During the prosecution of the work, all vehicles, equipment and material shall be located in the area that is closed to traffic. Temporary parking or material storage within the part of the roadway used by traffic shall not be permitted.

All Contractors' vehicles or equipment entering or leaving a closed work area shall display a flashing amber light.

SEQUENCE OF OPERATIONS

Variations from this sequence shall be submitted to the Engineer for approval.

1. Set up traffic control.
2. Remove existing curb stops for reset and remove and dispose of pedestrian rail.
3. Remove small trees and brush from face of existing wall.
4. Saw-cut and remove pavement from required areas.
5. Remove existing timber wall.
6. Excavate for new wall.
7. Construct new wall and stone facing.
8. Place asphalt concrete composite.
9. Reset existing curb stops and install new curb stops.
10. Remove traffic control.

GENERAL MAINTENANCE OF TRAFFIC

Removing, relocating, covering, salvaging and resetting of existing traffic control devices, including delineation, shall be the responsibility of the Contractor. Cost for this work shall be incidental to the contract unit prices for the various items unless otherwise specified in the plans. Any delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.

The bottom of signs on portable or temporary supports shall not be less than seven feet above the pavement in urban areas and one foot above the pavement in rural areas. Portable sign supports may be used as long as the duration is less than 3 days. If the duration is more than 3 days the signs shall be on fixed supports.

Storage of vehicles and equipment shall be outside the clear zone and as near as possible to the right-of-way line. Contractor's employees should mobilize at a location off the right-of-way and arrive at the work sites in a minimum number of vehicles necessary to perform the work.

Indiscriminate driving and parking of vehicles within the right-of-way will not be permitted. Any damage to the vegetation, surfacing, embankment, delineators and existing signs resulting from such indiscriminate use shall be repaired and/or restored by the Contractor, at no expense to the State, and to the satisfaction of the Engineer.

When open to traffic, the excavated area shall be protected with orange fence during periods of no work.

INVENTORY OF TRAFFIC CONTROL DEVICES

SIGN CODE	SIGN SIZE	DESCRIPTION	NUMBER REQUIRED	UNITS PER SIGN	UNITS
G20-2	36" x 18"	END ROAD WORK	4	17	68
W20-1	48" x 48"	ROAD WORK #### FT. OR AHEAD	4	34	136
W20-4	48" x 48"	ONE LANE ROAD #### FT. OR AHEAD	2	34	68
W20-7a	48" x 48"	FLAGGER	2	34	68
W21-5	48" x 48"	SHOULDER WORK	2	34	68
				TOTAL UNITS	408

SAW-CUTTING IN-PLACE ASPHALT CONCRETE

In areas where required due to the reconstruction of the wall, the existing asphalt surfacing shall be saw-cut vertically and removed.

The cost for saw-cutting, removing, and disposal of in-place material shall be included in incidental work.

ASPHALT CONCRETE COMPOSITE

Mineral aggregate for the Asphalt Concrete Composite shall conform to the requirements of the Standard Specifications for Class E, Type 1.

In areas where in-place material has been removed, Asphalt Concrete Composite shall be placed 4" deep or as directed by the Engineer.

Before the Asphalt Concrete Composite is placed, the Contractor shall ensure that there will be 8" of base course under the new asphalt.

All other requirements in the Standard Specifications for Asphalt Concrete Composite shall apply.

The asphalt binder used in the mixture shall be PG 64-28. Asphalt Binder.

INCIDENTAL WORK

Incidental work includes, but is not limited to the following:

1. Saw-cutting, removing, and disposal of in-place asphalt material.
2. Removal and disposal of wooden pedestrian railing.
3. Removal and reset of existing curb stops above wall to the satisfaction of the Engineer.
4. Restoration of all disturbed area to the satisfaction of the Engineer.

CLEARING

All costs for the removal and disposal of any small trees and vegetation required to build the retaining wall shall be incidental to the contract lump sum price for Clearing.

REMOVE TIMBER RETAINING WALL

All costs associated with the removal and disposal of the existing timber retaining wall shall be incidental to the contract unit price per foot for Remove Timber Retaining Wall.

CURB STOPS

Seven new curb stops will be required. These curb stops will be placed along the face of the wall on the lower section such that vehicles will be prevented from hitting the wall. Placement will be to the satisfaction of the Engineer. All costs associated with furnishing and placing the new curb stops shall be incidental to the contract unit price per each for Curb Stop.

Additionally, there are several curb stops in-place above the wall. These shall be removed for reset and reset as directed by the Engineer. Cost for removing and resetting the in-place curb stops shall be considered incidental work.

WASTE DISPOSAL SITE

The Contractor will be required to furnish a site(s) for the disposal of construction/demolition debris generated by this project.

Construction/demolition debris may not be disposed of within the State ROW.

The waste disposal site(s) shall be managed and reclaimed in accordance with the following from the General Permit for Highway, Road, and Railway Construction/Demolition Debris Disposal Under the South Dakota Waste Management Program issued by the Department of Environment and Natural Resources.

The waste disposal site(s) shall not be located in a wetland, within 200 feet of surface water, or in an area that adversely affects wildlife, recreation, aesthetic value of an area, or any threatened or endangered species, as approved by the Engineer.

If the waste disposal site(s) is located such that it is within view of any ROW, the following additional requirements shall apply:

1. Construction/demolition debris consisting of concrete, asphalt concrete, or other similar materials shall be buried in a trench completely separate from wood debris. The final cover over the construction/demolition debris shall consist of a minimum of 1 foot of soil capable of supporting vegetation. Waste disposal sites provided outside of the State ROW shall be seeded in accordance with Natural Resources Conservation Service recommendations. The seeding recommendations may be obtained through the appropriate County NRCS Office. The Contractor shall control the access to waste disposal sites not within the State ROW through the use of fences, gates, and placement of a sign or signs at the entrance to the site stating “No Dumping Allowed”.

2. Concrete and asphalt concrete debris may be stockpiled within view of the ROW for a period of time not to exceed the duration of the project. Prior to project completion, the waste shall be removed from view of the ROW or buried and the waste disposal site reclaimed as noted above.

HISTORICAL PRESERVATION OFFICE CLEARANCES

To obtain SHPO clearance, a cultural resources survey may need to be conducted by a qualified archaeologist. The Contractor shall arrange and pay for this survey. In lieu of a cultural resources survey, the Contractor could request a literature search on the site and provide evidence that the site has been previously disturbed by farming, mining, or construction activities with a landowner statement that no artifacts have been found on the site. Jim Donohue, State Archaeological Research Center at 605-394-1937 shall be contacted for a literature search.

If borrow material is furnished from within the current geographical reservation boundaries or historic boundaries of the Lake Traverse, Yankton, or Flandreau-Santee reservations, the Contractor shall obtain THPO (Tribal Historical Preservation Office) clearance from the Tribal Cultural Resources Officer. This requirement is in addition to the SHPO clearance. If no Tribal contact exists, the required SHPO clearance shall suffice, with documentation of Tribal contact efforts provided to SHPO.

To facilitate SHPO and THPO responses, the Contractor should submit a cultural resources survey report or the results of the literature search along with a legal description of the site, a topographical map with the site clearly marked, and evidence of prior site disturbance to Terrence G. Keller, DOT Environmental Supervisor, 700 East Broadway Avenue, Pierre, SD 57501-2586 (605-773-3721). Allow 30 days from the date this information is submitted to the Environmental Supervisor for SHPO approval. The Contractor is responsible for obtaining all required permits and clearances for the borrow and/or waste disposal site(s) prior to commencing construction activities at the borrow and/or waste disposal site(s). The Contractor shall provide the required permits and clearances to the Engineer at the preconstruction meeting.

UTILITIES

It is not anticipated that any utilities will be found within the boundaries of the project. The Contractor, however, will be responsible for locating and protecting any utility that would conflict with any work. Any damage done to a utility will be the Contractor’s responsibility to repair at no cost to the State.

STONE FACING

A stone facing is to be used to cover the exposed portions of the retaining wall.

The required stone for Stone Facing will be a local granite material as specified by Custer State Park (Contact Person: Jayme Severyn (605) 255-4515 Ext. 205). Stones shall be of variable diameter no greater than one foot in diameter on the exposed face and no greater than approximately six inches in thickness.

It is estimated that 1180 SqFt of stone facing will be required.

Mortar

The material for the mortar shall conform to the following requirements:

1. Cementitious Materials:

   Portland Cement shall be Type I conforming to Section 750
   Hydrated Lime shall be Type S conforming to ASTM C207

2. Aggregate:

   Aggregate for mortar shall conform to Section 810 except that the gradation shall conform to the following:

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	95 to 100
No. 16 (1.18 mm)	60 to 100
No. 30 (600 µm)	35 to 70
No. 50 (300 µm)	15 to 35
No. 100 (150 µm)	2 to 15
No. 200 (75 µm)	0 to 2

3. Admixtures:

   No air-entraining admixtures or cementitious materials containing air-entraining admixtures or agents shall be used in the mortar.

   No anti-freeze compounds, accelerators, retarders, water repellent agents, calcium or admixtures containing calcium chloride, or other admixtures shall be used in the mortar.

4. Water:

   Water used in mortar shall conform to Section 790.

5. All mortar shall comply with the requirements of ASTM C270 and the Brick Industry Association Technical Notes 8A.

6. Proportioning of mortar materials shall be with a container such as a bucket or other similar container. Proportioning with a shovel will not be allowed.

STONE FACING (CONTINUED)

7. Mortar shall be Type 'M', shall be by volume, and shall consist of (1) part Portland Cement, (1/4) part Hydrated Lime, and not less than (3) nor more than (3 3/4) parts aggregate measured in a damp, loose condition.

8. Mixing:

   Materials for mortar shall be mixed in the following order:

   Place approximately half of the required water and sand into the mixer while the mixer is running. Then add lime, cement, and the remainder of the water and sand.

   Mixing shall be for not less than 3 minutes after all ingredients are added and not more than 5 minutes with the maximum amount of water to produce a workable consistency.

9. Re-tempering:

   Mortars that have stiffened because of evaporation of water from the mortar shall be re-tempered by adding water as frequently as needed to restore the required consistency. Mortars shall be used and placed in the final position within 2 1/2 hours of initial mixing.

10. When the ambient air temperature exceeds 90^{O} F, mortar beds shall not be spread more than 4 ft. ahead of masonry units. Units shall be laid within 1 minute of spreading mortar. Attention should be given to proper curing of mortar and grout.

11. Curing shall be accomplished by continuous dampening with a light fog-spray for a period of three days. In lieu of the light fog spray, curing may be achieved by covering with wet burlap and polyethylene sheeting, provided that the burlap is kept continuously wet for the full three day curing period.

Stone Facing:

1. The Stone shall be free from defects and be impervious to weather exposure. Stone is to be carefully selected at the job site so that various colors are evenly distributed throughout the work. Sufficient stone is to be at the site at all times to permit proper selection and blending of colors.

2. Before setting, stone shall be brushed free of dust or other foreign matter and wetted sufficiently to take up surface absorption. No stone shall be set with a film of water or frost on the surface. If necessary to prevent displacement of mortar, plastic spacers may be used.

3. After setting, mortar shall be raked out approximately 3/4 inch to allow for pointing mortar. The stone shall be sponged completely free of mortar immediately after setting.

4. Stone shall be tied to concrete masonry unit backup by means of horizontal joint reinforcement spaced at 16" centers vertically. All anchors and dowels are to be non-corrosive metal.

STONE FACING (CONTINUED)

5. Stone shall be laid up in a random pattern. Stone shall be laid in a nominal 6" wall with approximately 25% of the pieces projecting from the wall face in varying amounts up to 2". A minimum of hand tooling is desired.

6. Joints shall be carefully brushed out before pointing. After wetting stone to take up surface absorption, pointing mortar shall be worked into joints, and compacted thoroughly. The joints shall be tooled to slightly concave.

7. Stone work shall be kept as clean as possible as work progresses. Upon completion, any foreign material and mortar shall be removed from the stone. Cleaning shall be performed with scrub brushes using soap and water. Fine white sand may be added to the water to facilitate cleaning. The stone shall be thoroughly rinsed with clean water immediately after scrubbing. The use of wire brushes or acid solutions shall not be used.

8. Masonry work shall not be laid when the ambient temperature is below 40^{o} F or is likely to fall below 40^{o} F in the 24 hour period after laying. Temperature of the masonry materials, including water, shall not exceed 140^{o} F. When mortar or grout is being used, it shall have a temperature of between 50^{o} F and 90^{o} F at the time of placement. All finished work shall be maintained between 50^{o} F and 100^{0} F for a period not less than 48 hours after placement.

9. Stone Facing shall be measured in accordance with the neat line dimensions shown on the plans of the concrete on which the Stone Facing is applied. Stone Facing will be computed to the nearest square foot.

10. The accepted quantity of Stone Facing will be paid for at the contract unit price per square foot. Payment will be full compensation for all labor, materials, equipment, and all other items incidental to the work required.

EXPLANATION OF ALTERNATE

Alternate 1

The Contractor shall provide a unit price added to the base bid that it would cost to provide all materials, labor, equipment, etc. to provide and install stone facing on the concrete retaining wall.

Method of Award

If the combined bid consisting of the base bid plus the additive bid is within the amount of funds available to finance the full, combined construction contract, and the State wishes to accept the alternate additive bid, then award will be made to that responsible bidder submitting the low combined bid.

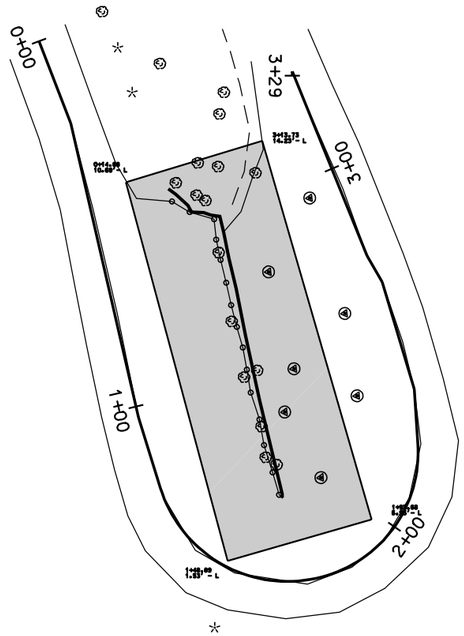
If the combined bid consisting of the base bid plus the additive bid is not within the amount of funds available to finance the full construction contract, the State reserves the right to make an award based on the low base bid only, and reject the alternate additive bid. The contract award will then be made to that responsible bidder submitting the low base bid.

If the base bid alone is not within the amount of funds available to construct the project, the State reserves the right to reject the base bid.

TEMPORARY EASEMENT

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	087-491	5	17

Plotting Date: 27-MAY-2009

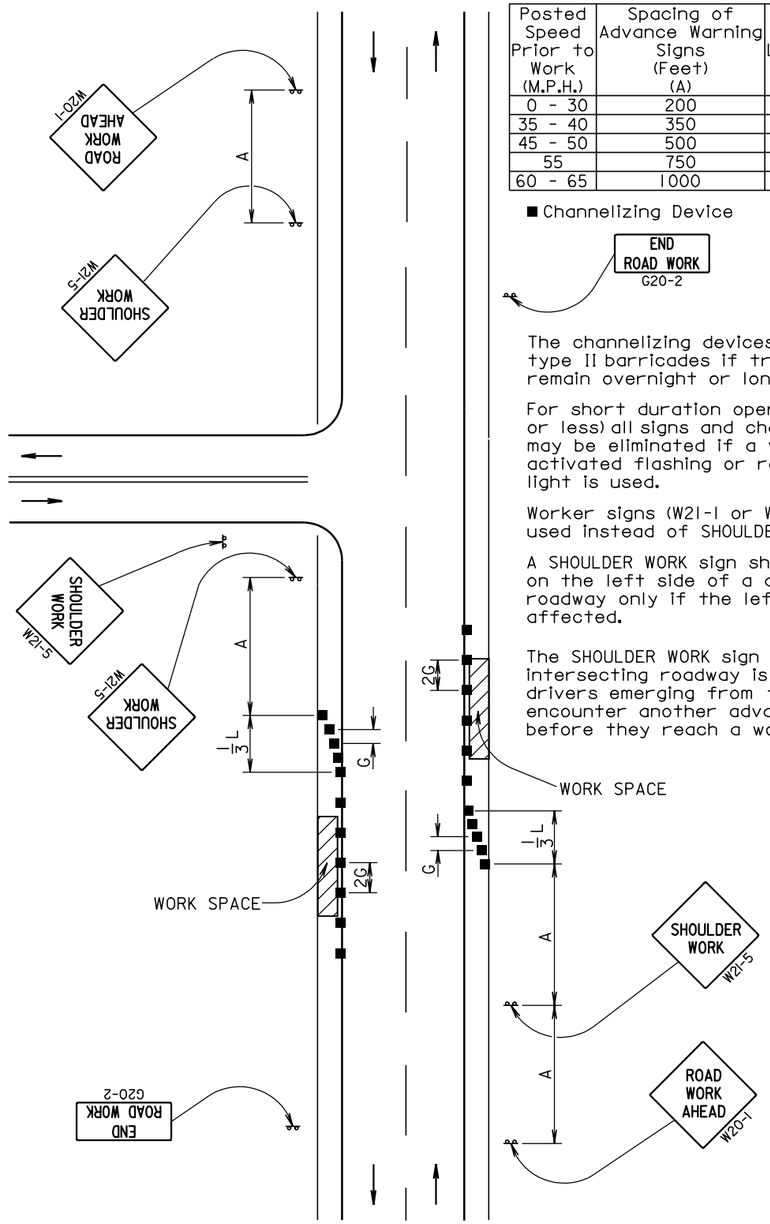


HORIZONTAL ALIGNMENT DATA

Type	Station			Northing	Easting
POB	0+00.00			565862.093	1123973.463
		TL= 23.26	N 13° 58' 53" E		
PI	0+23.26			565884.663	1123979.083
		TL= 79.66	N 22° 02' 22" E		
PI	1+02.92			565958.505	1124008.976
		TL= 19.64	N 17° 40' 07" E		
PC	1+22.56			565977.221	1124014.938
PI	1+53.10	R = 35.00	Delta = 82° 11' 49" L	566006.312	1124024.204
PT	1+72.78			566019.442	1123996.641
		TL= 0.44	N 64° 31' 43" W		
PC	1+73.22			566019.631	1123996.244
PI	2+03.99	R = 34.00	Delta = 84° 17' 50" L	566032.866	1123968.462
PT	2+23.24			566006.536	1123952.532
		TL= 14.44	S 31° 10' 27" W		
PI	2+37.68			565994.177	1123945.055
		TL= 29.51	S 18° 24' 32" W		
PI	2+67.19			565966.182	1123935.737
		TL= 8.05	S 5° 08' 13" W		
PI	2+75.24			565958.166	1123935.017
		TL= 52.49	S 12° 53' 50" W		
PI	3+27.73			565906.998	1123923.300
		TL= 1.10	N 35° 04' 24" E		
POE	3+28.83			565907.900	11123923.934

Parcel A1

0+14.68 to 3+13.73 L
Temporary easement for
retaining wall construction
containing 0.1 acres, more or less



Posted Speed Prior to Work (M.P.H.)	Spacing of Advance Warning Signs (Feet) (A)	Taper Length (Feet) (L)	Spacing of Channelizing Devices (Feet) (G)
0 - 30	200	180	25
35 - 40	350	320	25
45 - 50	500	600	50
55	750	660	50
60 - 65	1000	780	50

■ Channelizing Device

END ROAD WORK G20-2

The channelizing devices shall be drums or type II barricades if traffic control must remain overnight or longer.

For short duration operations (1 hour or less) all signs and channelizing devices may be eliminated if a vehicle with an activated flashing or revolving yellow light is used.

Worker signs (W21-1 or W21-1a) may be used instead of SHOULDER WORK signs.

A SHOULDER WORK sign should be placed on the left side of a divided or one-way roadway only if the left shoulder is affected.

The SHOULDER WORK sign on an intersecting roadway is not required if drivers emerging from that roadway will encounter another advance warning sign before they reach a work activity area.

July 1, 2005

Published Date: 2nd Qtr. 2009

SDDOT

GUIDES FOR TRAFFIC CONTROL DEVICES
WORK ON SHOULDERS

PLATE NUMBER 634.03

Sheet 1 of 1

Posted Speed Prior to Work (M.P.H.)	Spacing of Advance Warning Signs (Feet) (A)	Spacing of Channelizing Devices (Feet) (G)
0 - 30	200	25
35 - 40	350	25
45 - 50	500	50
55	750	50
60 - 65	1000	50

Flagger

■ Channelizing Device

For low-volume traffic situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger may be used.

The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short duration operations (1 hour or less).

For tack and/or flush seal operations, when flaggers are not being used, the FRESH OIL sign (W21-2) shall be displayed in advance of the liquid asphalt areas.

Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

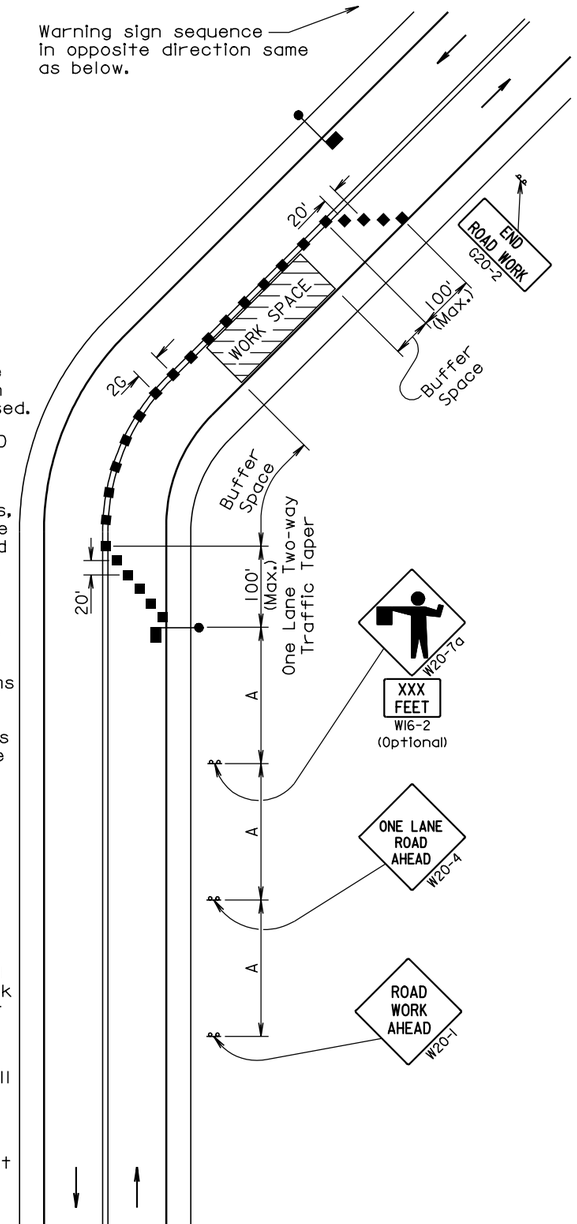
The channelizing devices shall be drums or type II barricades if traffic control must remain overnight or longer. During daylight hours, 42" cones may be used in lieu of drums or type II barricades along the centerline.

END ROAD WORK G20-2

Channelizing devices are not required along the centerline adjacent to work area when pilot cars are utilized for escorting traffic through the work area.

Channelizing devices and flaggers shall be used at intersecting roads to control intersecting road traffic as required.

The buffer space shall be a sufficient length so that the channelizing devices are visible to approaching traffic.



June 26, 2006

Published Date: 2nd Qtr. 2009

SDDOT

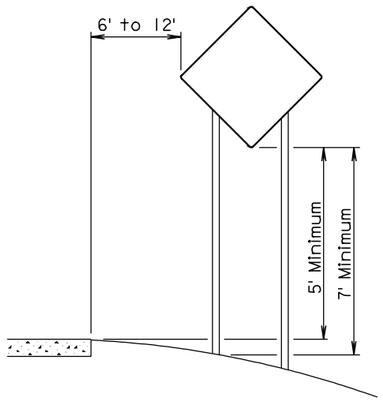
GUIDES FOR TRAFFIC CONTROL DEVICES
LANE CLOSURE WITH FLAGGER PROVIDED

PLATE NUMBER 634.23

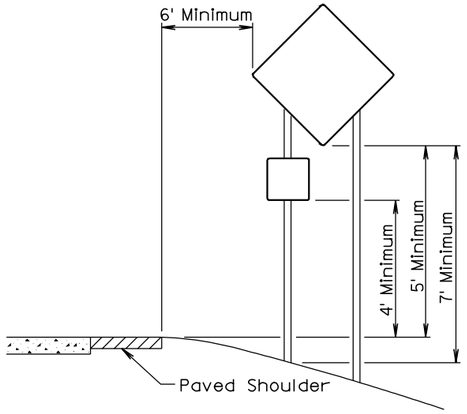
Sheet 1 of 1

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	087-491	7	17

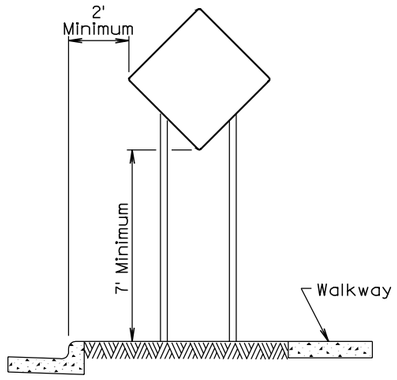
Plotting Date: 27-MAY-2009



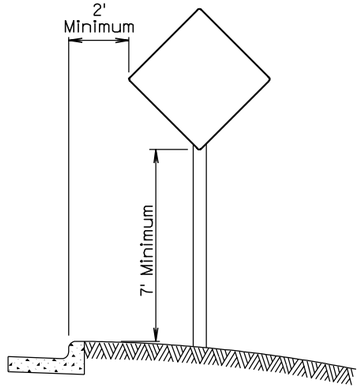
RURAL DISTRICT



RURAL DISTRICT WITH SUPPLEMENTAL PLATE



URBAN DISTRICT



URBAN DISTRICT

December 23, 2003

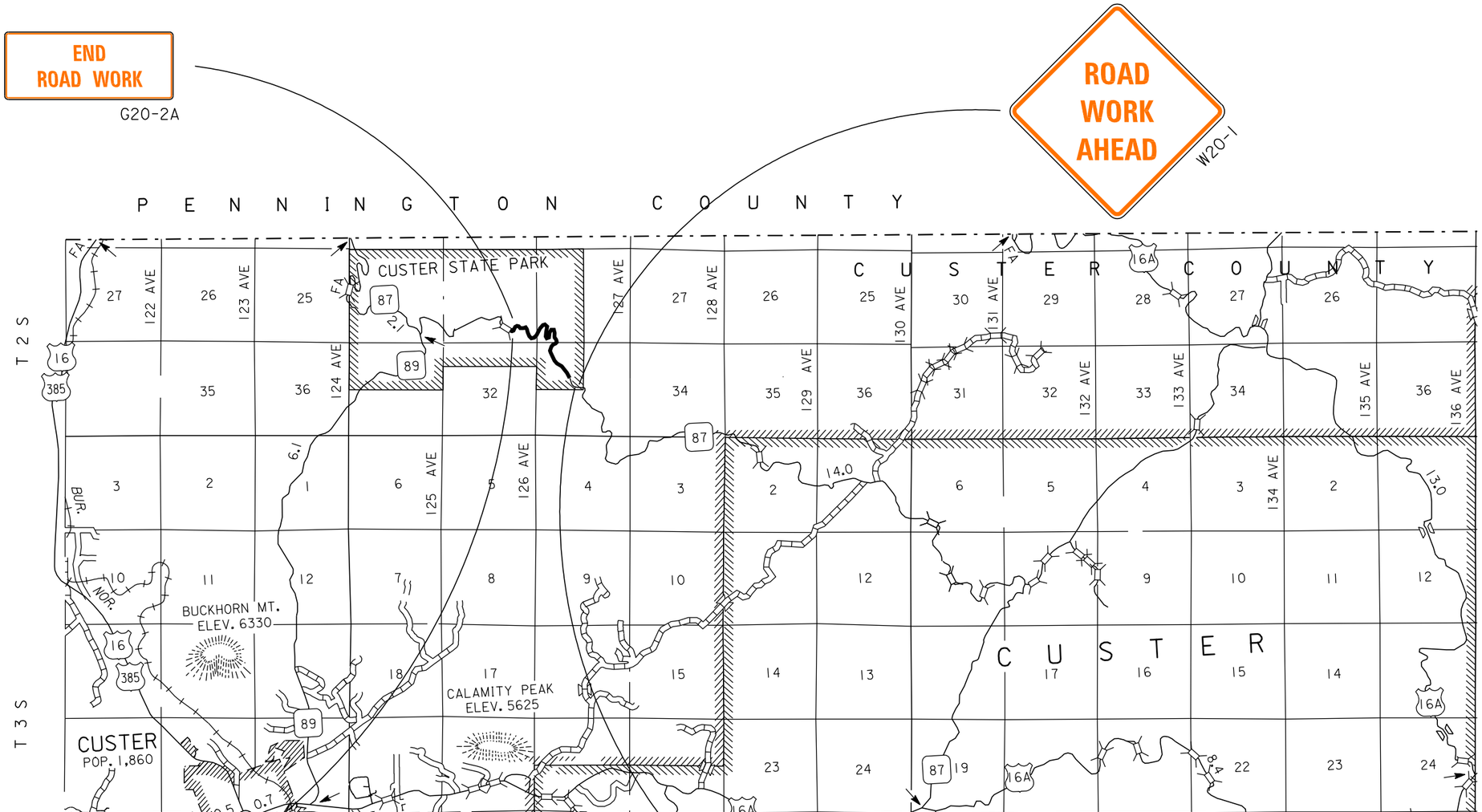
Published Date: 2nd Qtr. 2009	SDDOT	BREAKAWAY SIGN SUPPORTS (Typical Construction Signing)	PLATE NUMBER 634.85
			Sheet 1 of 1

Username - trrcl2608

FIXED LOCATION SIGNS

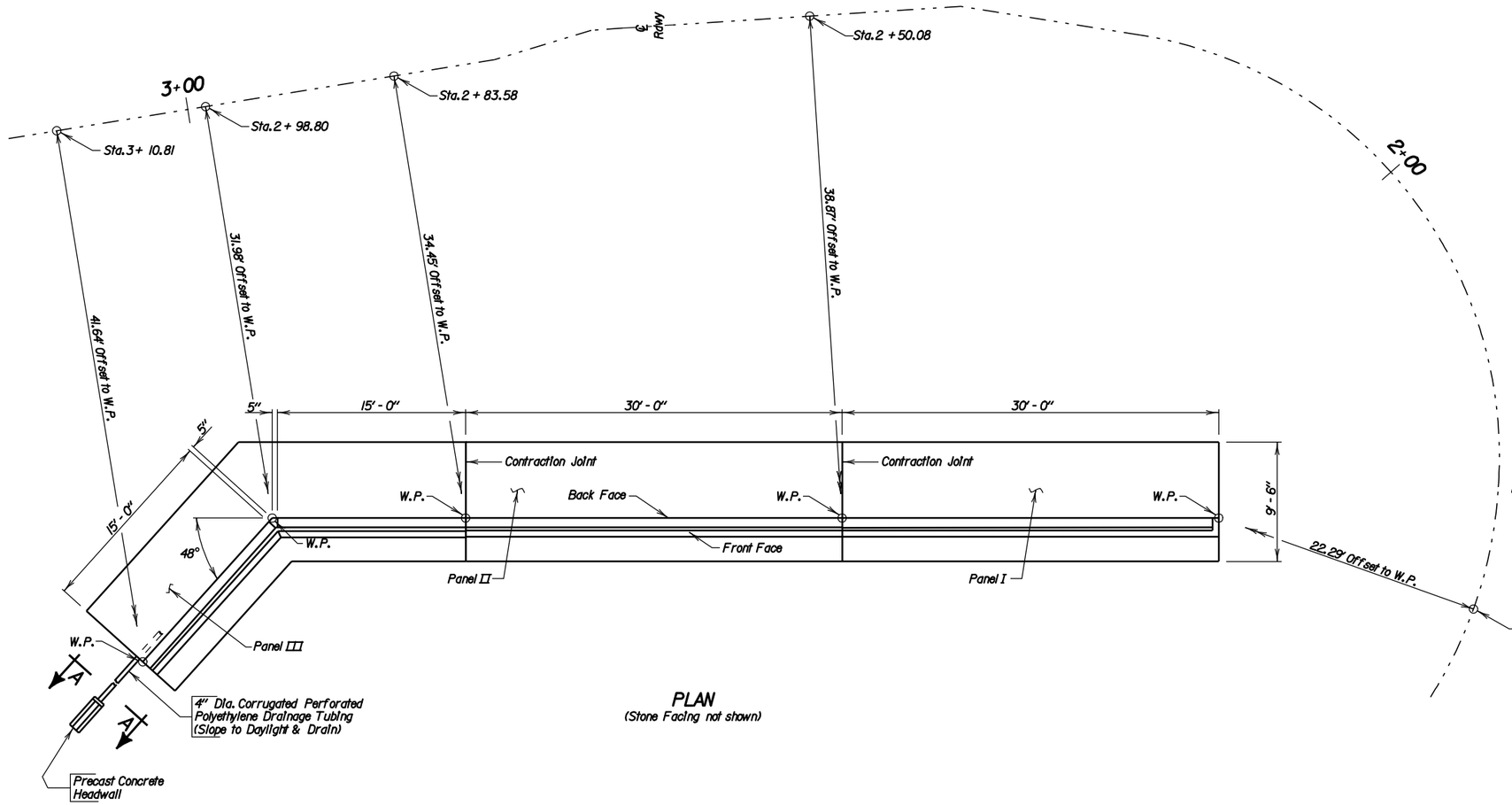
STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	087-491	8	17

Plotting Date: 27-MAY-2009
Flown Date:
Photo Not to Scale

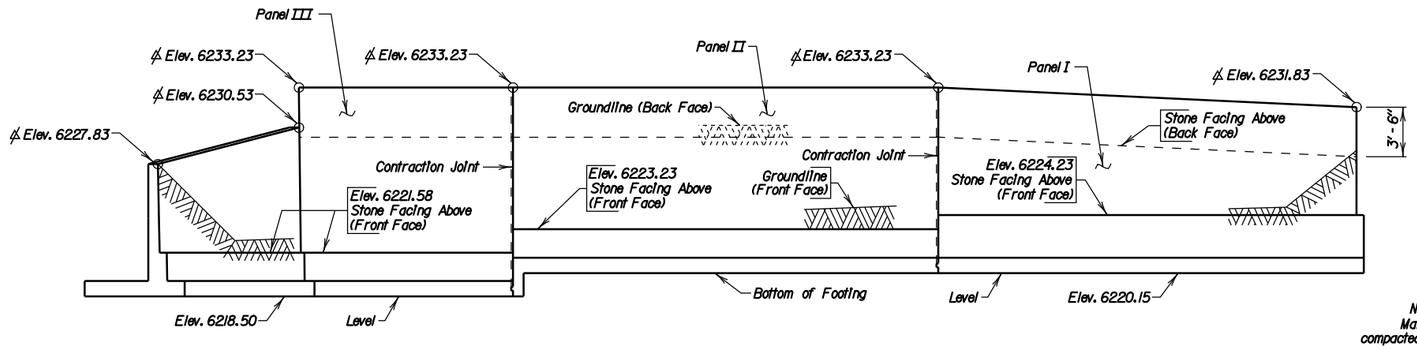


The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

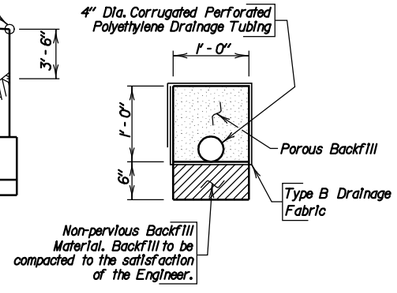
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	9	17



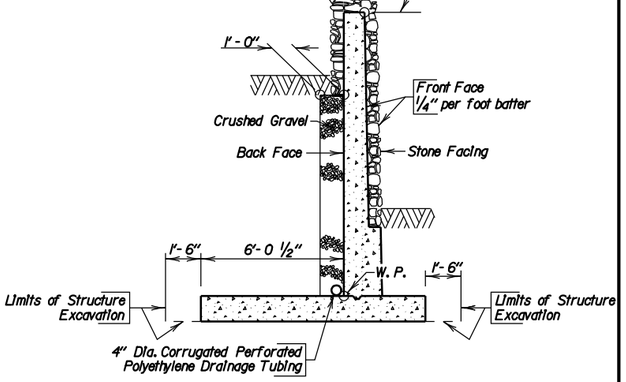
PLAN
(Stone Facing not shown)



ELEVATION
(Stone Facing not shown)



SECTION A - A



TYPICAL SECTION

INDEX OF RETAINING WALL SHEETS-

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Miscellaneous	Cu. Yd.	74.1
	Reinforcing Steel	Lb.	13456
	Structure Excavation, Retaining Wall	Cu. Yd.	373
☆	Stone Facing	Sq. Ft.	1180
	Structural Steel, Miscellaneous	Lump Sum	L.S.
	7/8" Threaded Rod, Adhesive Anchor	Each	18
	Precast Concrete Headwall for Drain	Each	1
	4" Underdrain Pipe	Ft.	116

☆ See sheet 4 of 17 for Alternate Bidding Explanation.

GENERAL LAYOUT AND QUANTITIES
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87
STA. 1+65.48 TO
STA. 3+10.81
PCN 10W3

SEC. 28-T2S-R5E
087-491

CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

1 OF 8

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

DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden
CUSTI0W3	I0W3TA01		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	10	17

SPECIFICATIONS

1. Design Specifications: AASHTO Standard Specifications for Highway Bridges, 2002 Edition (Service Load).
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.

GENERAL NOTES

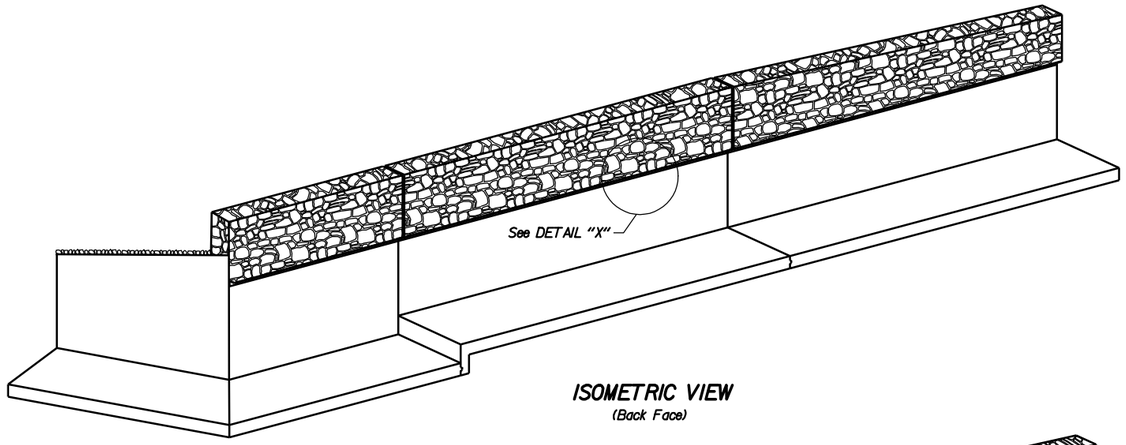
1. All exposed edges shall be chamfered ¾".
2. Unit Stresses: Concrete fc = 1800 p.s.i.
   Reinforcing Steel fs = 24000 p.s.i.
3. All reinforcing steel shall conform to ASTM A615 Grade 60. All reinforcing steel except the d bars, shall be deformed bars.
4. Use 2 inch clear cover on all reinforcing steel EXCEPT as shown.
5. Care shall be taken to establish Working Points (W.P.) as shown.
6. All costs involved in furnishing and installing the drainage fabric and porous backfill shall be incidental to the contract unit price for 4" Underdrain Pipe.
7. The borings for the foundation investigation were placed using a CME-55 and 4 ½ inch continuous flight augers. The density of the schist varied from fair to firm as recorded in the drill logs. Even in this hard formation the above equipment was still able to penetrate the schist formation. To obtain the proper footing elevation, a contractor excavating for the wall footing could expect to use extra effort at times to remove portions of the bedrock material.
8. A representative from the Geotechnical Engineering Activity shall be present to observe the placement of the wall footing. The contractor shall notify this office a minimum of two weeks prior to the commencement of footing operations.
9. The rock surface shall be cleaned of all soil and debris prior to placing reinforcing steel for the footing. Cleaning shall be accomplished by water washing and/or air jetting. Material washed from the rock surface shall be directed into a sump or low area and physically removed from the exposed rock surface.
10. Vertical fractures in the foundation rock the Geotechnical Engineer determines to be detrimental to the integrity of the foundation shall be repaired. Designated fractures shall be repaired by cleaning to remove soil and other relatively weak material to a depth of 1.5 to 2 times the width of the fracture. The cleaned opening shall then be filled with grout or a lean concrete mix.
11. The cost of cleaning the rock shall be included in the contract unit price per cubic yard for Structure Excavation, Retaining Wall. Payment shall be considered full compensation for all materials, labor, equipment and incidentals necessary to satisfactorily complete the work.
12. If cleaning and filling rock fractures is ordered, the work shall be paid for as EXTRA WORK, in accordance with Section 4.3 of the South Dakota Standard Specifications.
13. All costs involved in furnishing and installing waterstops shall be incidental to the contract unit price per cubic yard Class A45 Concrete, Miscellaneous.
14. Backfill wall with local material. Use 1'-0" crushed gravel adjacent to the back face of the wall.
15. Compact the backfill material according to Section 120.3.B.3.a with the exception that compaction within 3 feet of the base of the wall shall be achieved by at least 3 passes of a lightweight mechanical tamper, roller, or vibratory system. All costs for equipment, labor, tools, and incidentals for furnishing, placing, watering, and compacting backfill materials shall be incidental to other Contract items.
16. Steel for the angle shall conform to ASTM A36 and shall be galvanized in accordance with ASTM A123. Angle shall not continue across contraction joint. The angle and corresponding adhesive anchors would only be fabricated and installed if the stone facing portion of the bid is awarded.
17. Restore existing rock outcropping at south end of wall to limit pedestrian access in this area.

DESIGN MIX OF CONCRETE

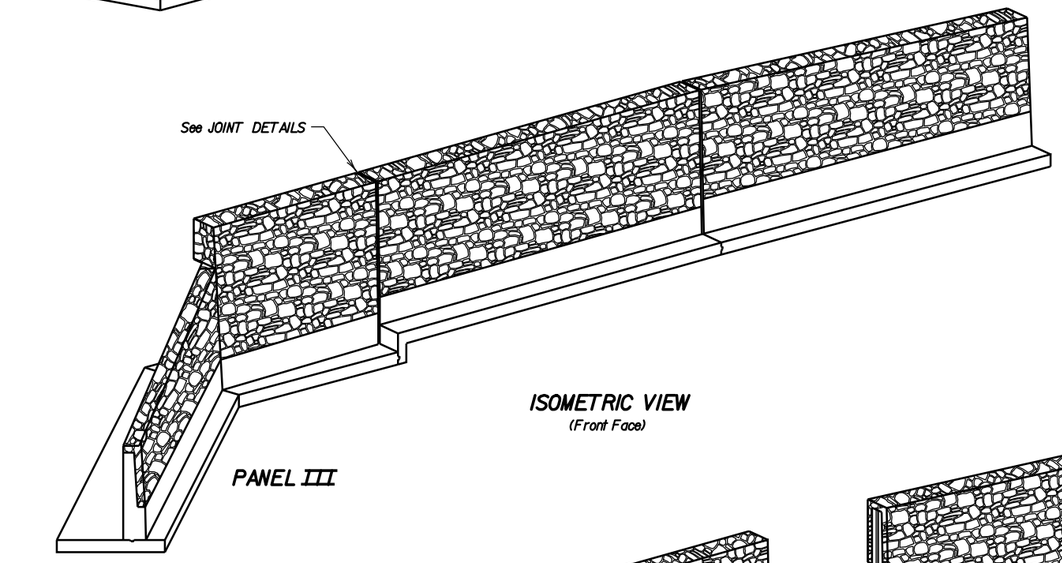
1. Concrete mix shall produce a concrete having a minimum compressive strength of 4500 p.s.i. at 28 days.
2. Type II cement is required.

STONE FACING

Face retaining wall with stone as depicted in these plans.

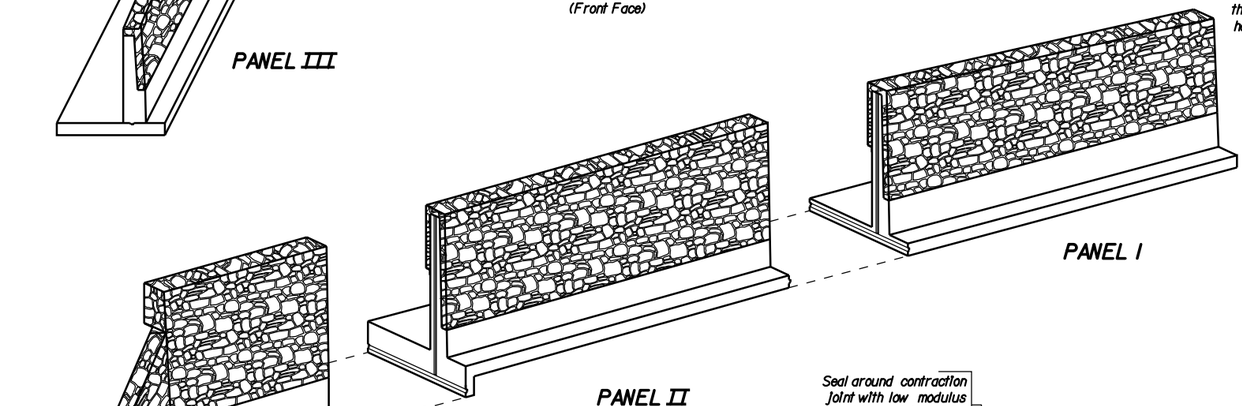


ISOMETRIC VIEW
(Back Face)



ISOMETRIC VIEW
(Front Face)

PANEL III

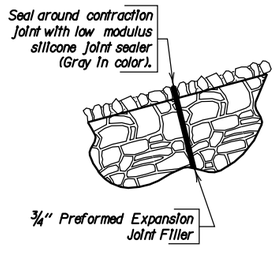


PANEL I

PANEL II

PANEL III

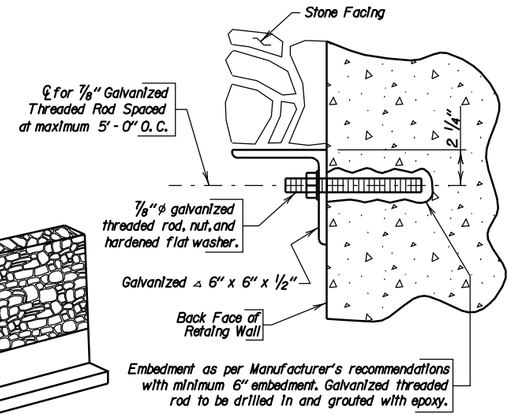
ISOMETRIC VIEW
(Front Face)



JOINT DETAILS

INSTALLING THREADED RODS IN CONCRETE

1. The epoxy resin mixture shall be of a type for bonding steel to hardened concrete and shall conform to AASHTO M235 Type IV, Grade 3 (Equivalent to ASTM C881, Type IV, Grade 3).
2. The diameter of the drilled holes shall not be less than ⅛ inch greater, nor more than ⅜ inch greater than the diameter of the threaded rods or as per the manufacturer's recommendations. The drilled holes shall be blown out with compressed air using a device that will reach the back of the hole to ensure that all debris or loose material has been removed prior to epoxy injection.
3. Mix epoxy resin as recommended by the Manufacturer and apply by an injection method approved by the Engineer. Beginning at the back of the drilled holes, fill the holes 1/3 to 1/2 full of epoxy or as recommended by the Manufacturer, prior to insertion of the steel rod. Use epoxy resin for intended for horizontal rod installation. Rotate the steel rod during installation to eliminate voids and ensure complete bonding of the rod. Insertion of the rods by the dipping method will not be allowed.
4. No loads shall be applied to the epoxy grouted threaded rods until the epoxy resin has had sufficient time to cure as specified by the epoxy resin manufacturer.
5. Embed threaded rods a minimum of 6 inches into existing concrete.
6. The ⅞"ϕ threaded rods shall conform to ASTM F1554 Grade 36.
7. The threaded rods, nuts and washers shall be galvanized in accordance with ASTM F2329 or ASTM A153 as applicable.
8. Include the cost of drilling holes, epoxy resin, galvanized threaded rods, nuts, and washers as well as installation and other incidental items in the contract unit price per each for ⅞" Threaded Rod, Adhesive Anchor.



DETAIL "X"

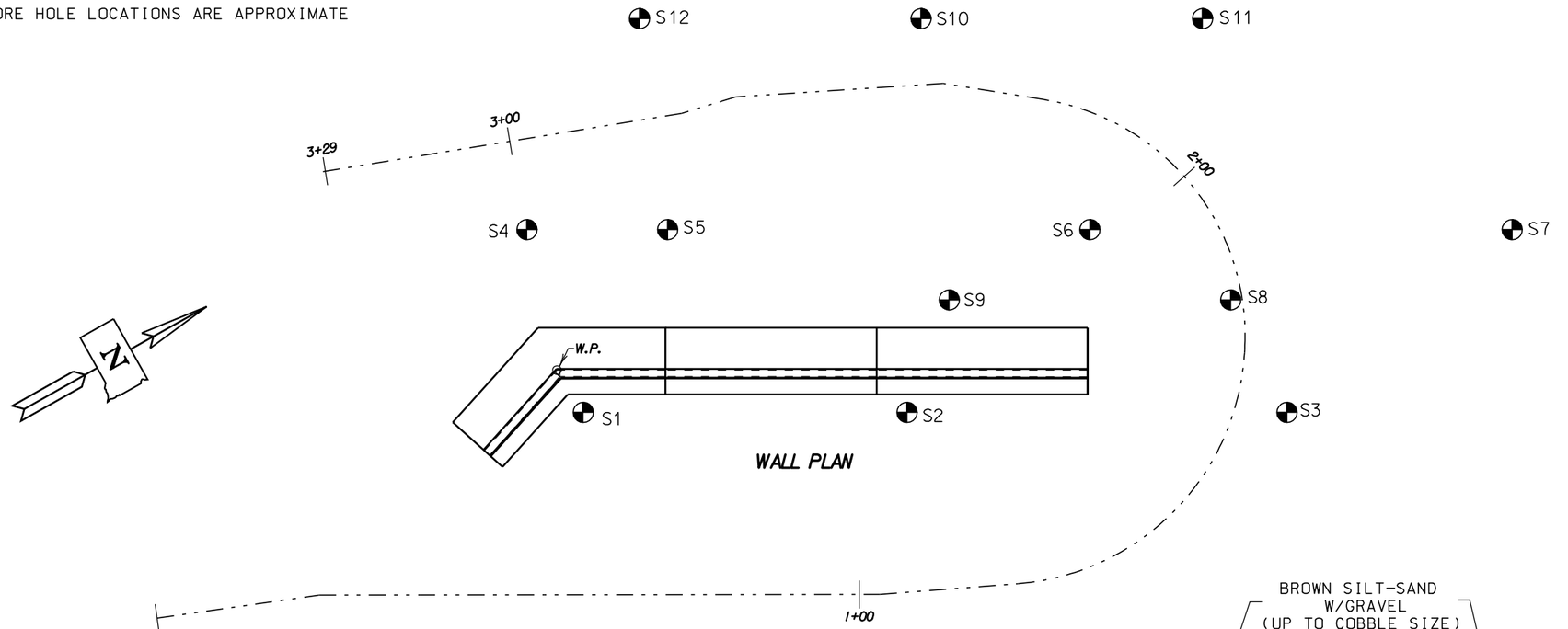
NOTES AND ISOMETRIC VIEW
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87
STA. 1+65.48 TO STA. 3+10.81
SEC. 28-T2S-R5E
087-491

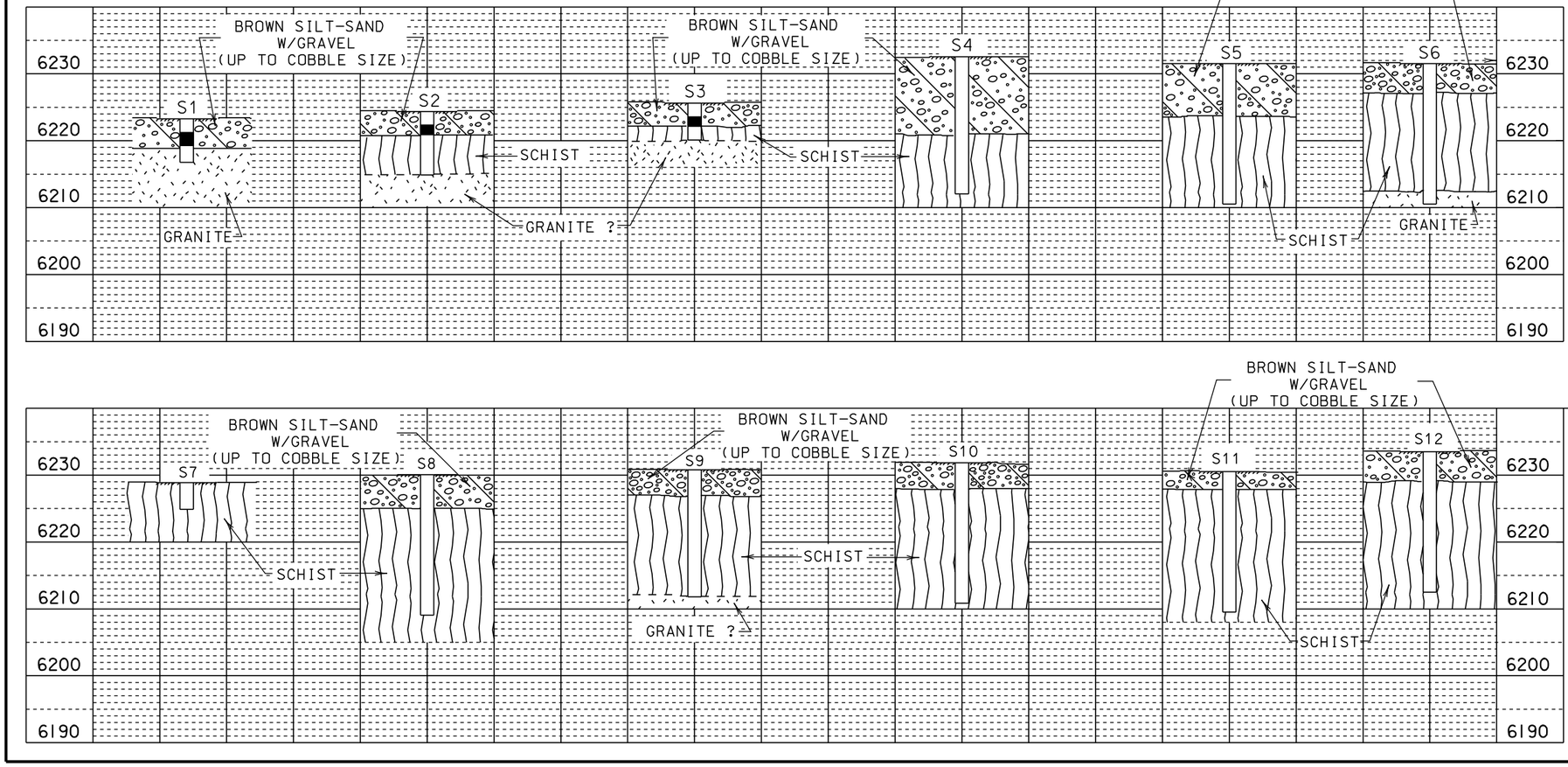
CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden BRIDGE ENGINEER
CUSTIOW3	IOW3TA02		

BORE HOLE LOCATIONS ARE APPROXIMATE



WALL PLAN



SCHIST IS DEFINED AS A FINE GRAINED CRYSTALLINE ROCK THAT CAN BE READILY PARTED OR SPLIT BECAUSE IT HAS A FOLIATED OR PARALLEL STRUCTURE. IT IS ANTICIPATED THAT THE SCHIST IS JOINTED AND FRACTURED BUT PIECES AND BLOCKS WILL BE TIGHTLY INTERLOCKED. FIELD HARDNESS IS CLASSIFIED AS MEDIUM TO SOFT ROCK. WEATHERING IS CLASSIFIED AS MODERATELY TO SEVERE. THE SCHIST MAY ALSO CONTAIN MINOR DIKES OF QUARTZ.

THE GEOTECHNICAL ENGINEERING ACTIVITY HAS ON FILE ALL OF THE BORING LOGS FOR THIS PROJECT. THESE LOGS AND ADDITIONAL RESULTS OF LABORATORY TESTS, IF ANY, ARE AVAILABLE FOR REVIEW AT THE CENTRAL OFFICE IN PIERRE.

LEGEND

AUGER TEST

SAMPLE ZONE

ALL AUGER HOLES ARE DRILLED WITH A $4^{1}/_{2}$ INCH DIAMETER CONTINUOUS FLIGHT AUGER. PUSH CORE SAMPLES ARE OBTAINED BY HYDRAULICALLY RAMMING A 2.0 FT. LONG LINED SPLIT SPOON SAMPLER INTO THE SOIL TO OBTAIN 2.0 IN. NOMINAL DIAMETER UNDISTURBED SOIL SAMPLES.

GROUND WATER ELEVATIONS AS OF DECEMBER 2006

S1	DRY
S2	DRY
S3	DRY
S4	DRY
S5	DRY
S6	DRY
S7	DRY
S8	DRY
S9	DRY
S10	DRY
S11	DRY
S12	DRY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	11	17

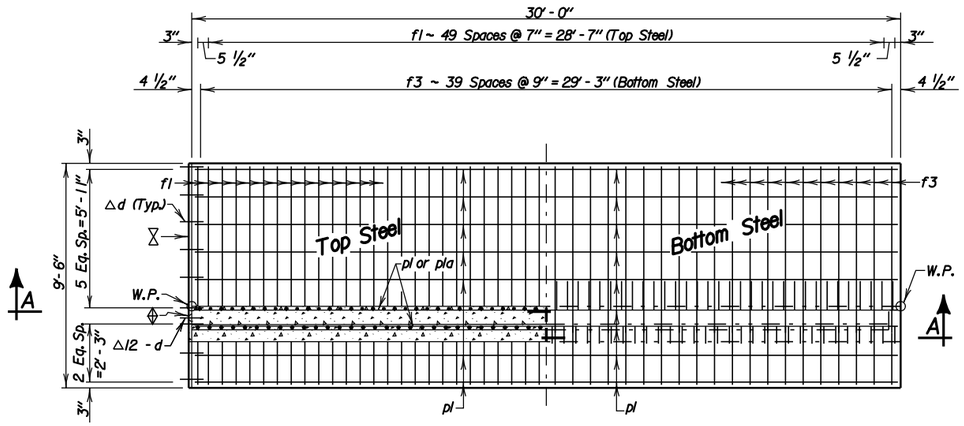
WALL PLAN AND SUBSURFACE PROFILE
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87
STA. 1+65.48 TO STA. 3+10.81
SEC. 28-T2S-R5E
087-491

CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

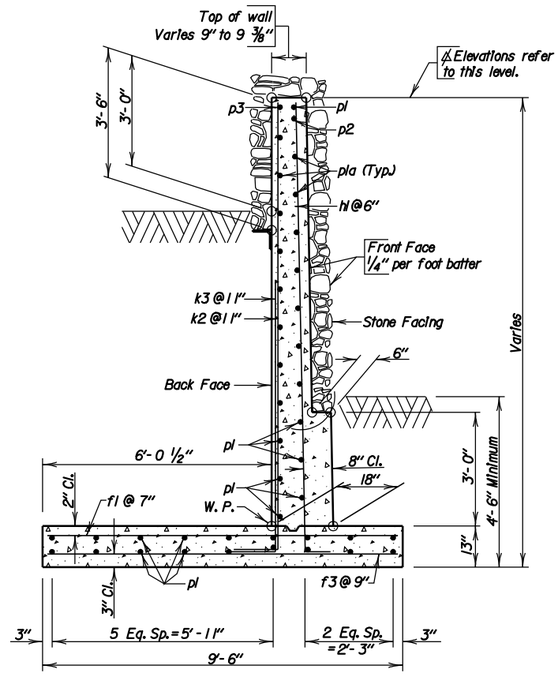
DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Boeder
CUSTIOW3	IOW3TA03		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	12	17



PLAN
(Panel I)
(Stone Facing not shown)

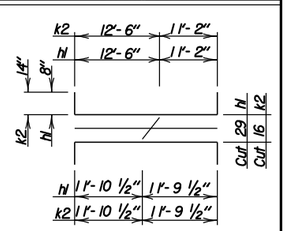
⧖ 2" x 4" Keyway
⧫ 2" x 3" Keyway



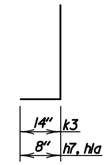
SEC. B-B

REINFORCING SCHEDULE
(For Panel I)

	Mk.	No.	Size	Length	Type	Bending Details
△	d	21	5	1'-0"	Str.	
	f1	52	8	9'-2"	Str.	
	f3	40	5	9'-2"	Str.	
⧫	h1	29	4	25'-0"	17A	
	h1a	1	4	11'-10"	17A	
	h1'	2	4	4'-2"	17A	
⧫	k2	16	7	26'-0"	17A	
	k3	32	7	8'-5"	17A	
	pl	24	4	29'-7"	Str.	
	p1a	16	4	29'-1"	Str.	
	p2	1	4	15'-3"	Str.	
	p3	1	4	12'-3"	Str.	



Type 17A



Type 17A

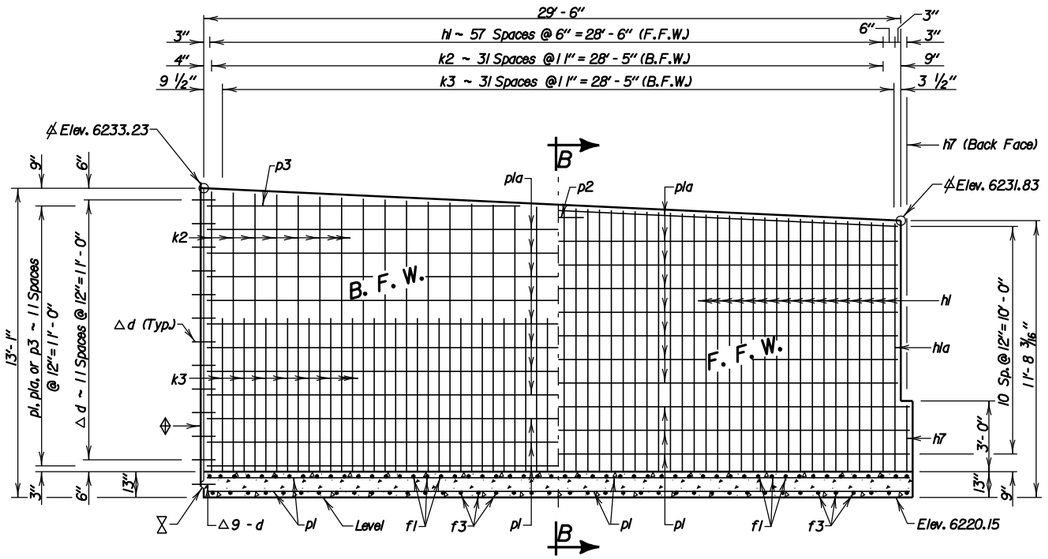
NOTE –
All dimensions are out to out of bars.
⧫ See Cutting Diagram
△ d bars shall be smooth bars

ESTIMATED QUANTITIES
(For Panel I)

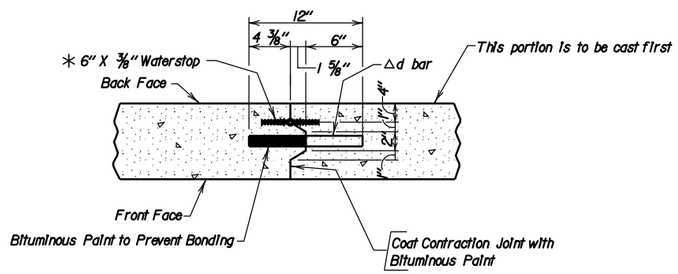
ITEM	UNIT	QUANTITY
Class A45 Concrete, Miscellaneous	Cu. Yd.	24.2
Reinforcing Steel	Lb.	4379
7/8" Threaded Rod, Adhesive Anchor	Each	6

LEGEND FOR PLACING RE-STEEL

B. F. W. - Back Face of Wall
F. F. W. - Front Face of Wall

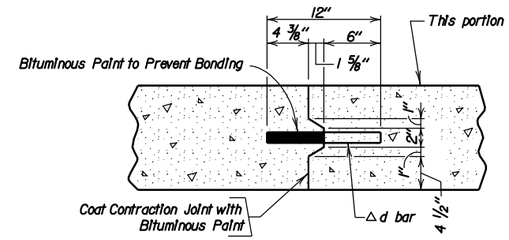


SEC. A-A
(Panel I)
(Stone Facing not shown)



CONTRACTION JOINT
(Wall)
(Joint may be reversed at the option of the Contractor)

* Waterstop is to be placed in one continuous strip to within one inch of the top.



CONTRACTION JOINT
(Footing)
(Joint may be reversed at the option of the Contractor)

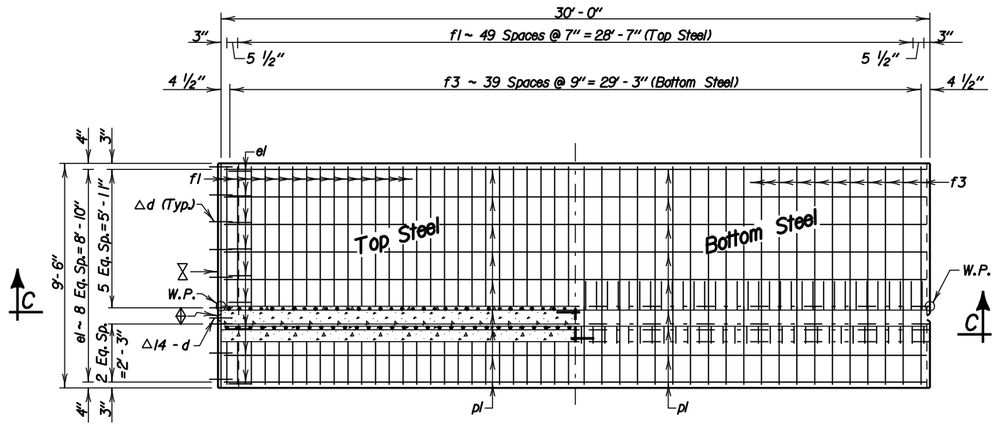
PANEL I & CONTRACTION JOINT DETAILS
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87 **SEC. 28-T2S-R5E**
STA. 1+65.48 TO **087-491**
STA. 2+50.08

CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008 (4) OF (8)

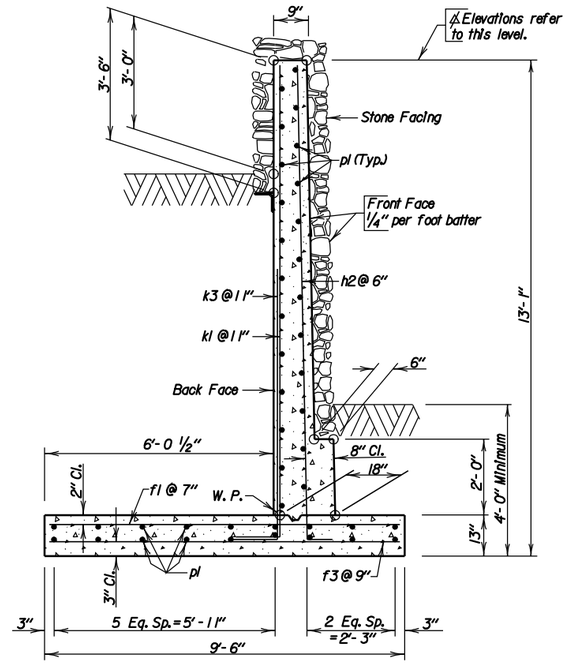
DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Coeden
CUSTIOW3	IOW3TA04		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	13	17



PLAN
(Panel II)
(Stone Facing not shown)

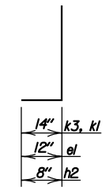
⧖ 2" x 4" Keyway
⧫ 2" x 3" Keyway



SEC. D-D

REINFORCING SCHEDULE
(For Panel II)

	Mk.	No.	Size	Length	Type	Bending Details
△	d	23	5	1'-0"	Str.	
	el	9	4	3'-3"	17A	
	f1	52	8	9'-2"	Str.	
	f3	42	5	9'-2"	Str.	
	h2	60	4	13'-2"	17A	
	k1	33	7	13'-8"	17A	
	k3	32	7	8'-5"	17A	
	pl	42	4	29'-7"	Str.	



Type 17A

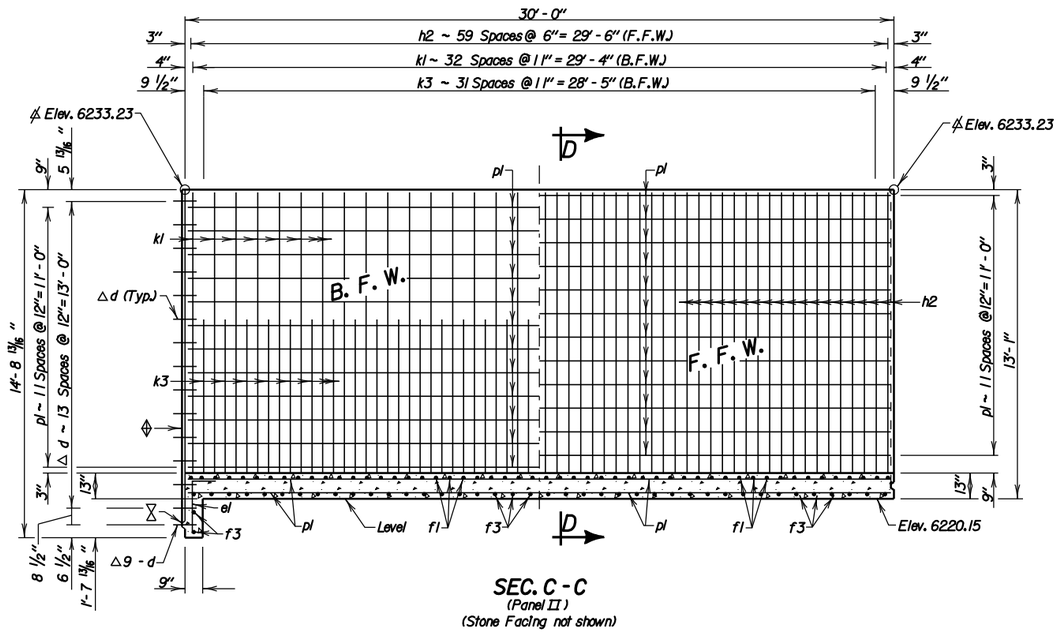
NOTE –
All dimensions are out to out of bars.
△ d bars shall be smooth bars

ESTIMATED QUANTITIES
(For Panel II)

ITEM	UNIT	QUANTITY
Class A45 Concrete, Miscellaneous	Cu. Yd.	24.6
Reinforcing Steel	Lb.	4548
7/8" Threaded Rod, Adhesive Anchor	Each	6

LEGEND FOR PLACING RE-STEEL

B. F. W. - Back Face of Wall
F. F. W. - Front Face of Wall



SEC. C - C
(Panel II)
(Stone Facing not shown)

NOTE:
See CONTRACTION JOINT DETAILS on PANEL I & CONTRACTION JOINT DETAILS Sheet.

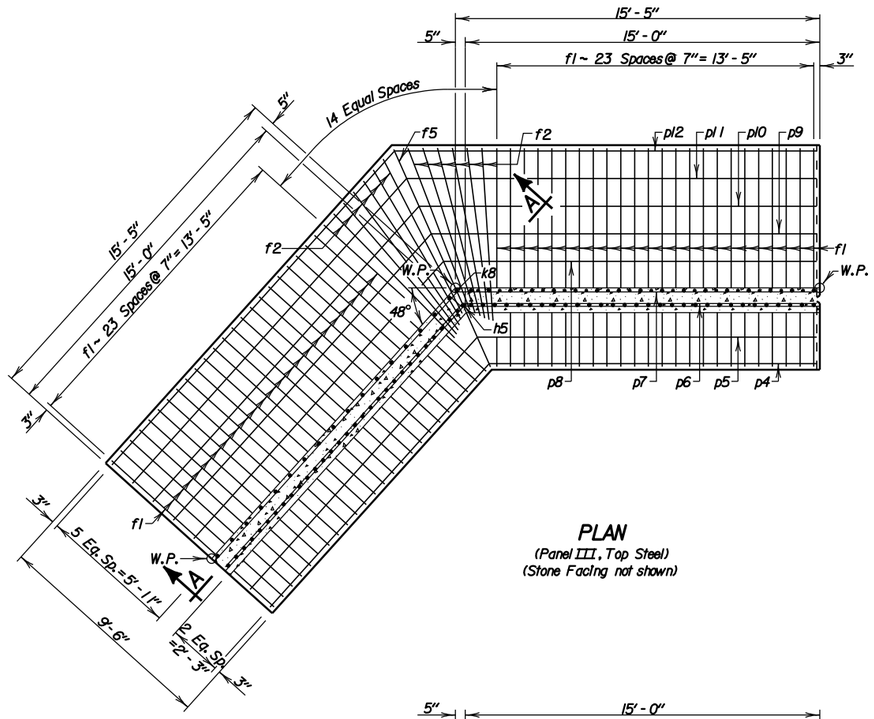
PANEL II DETAILS
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87 **SEC. 28-T2S-R5E**
STA. 2+50.08 TO **087-491**
STA. 2+83.58

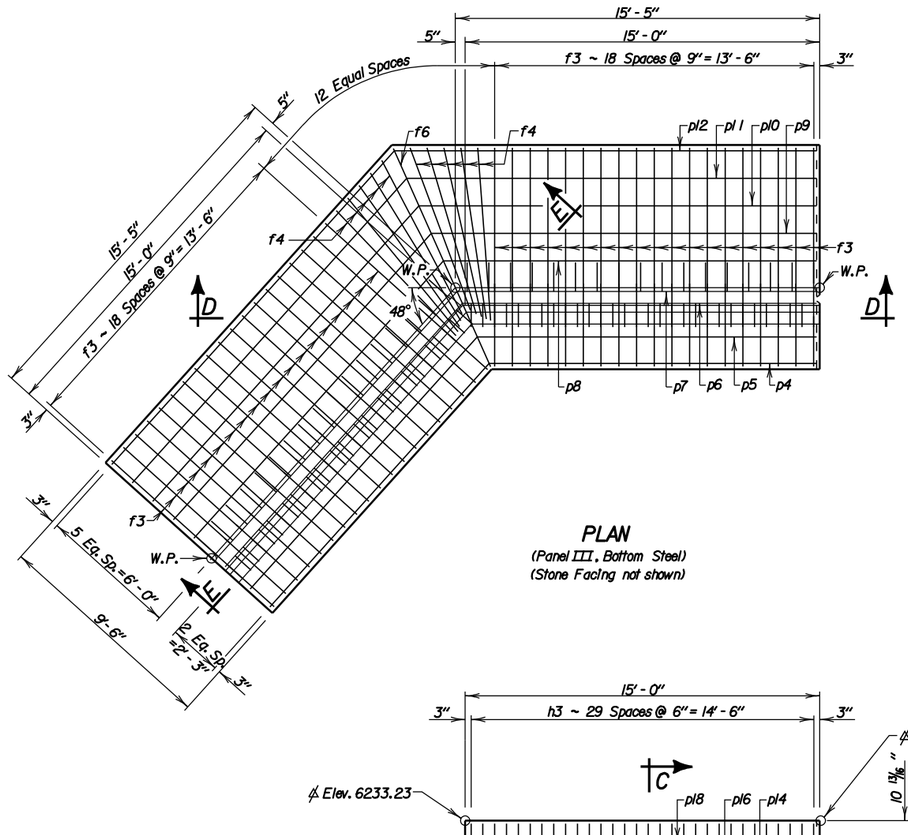
CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008 (5) OF (8)

DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden
CUSTIOW3	IOW3TA05		BRIDGE ENGINEER

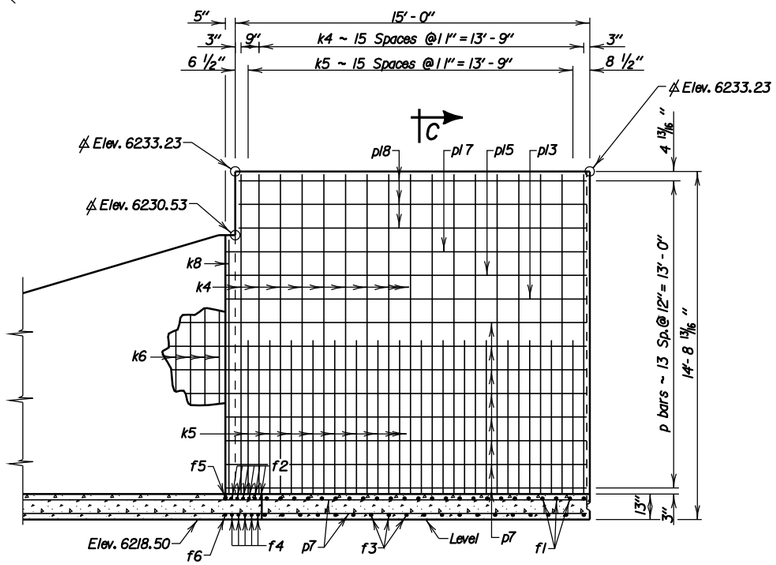
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	14	17



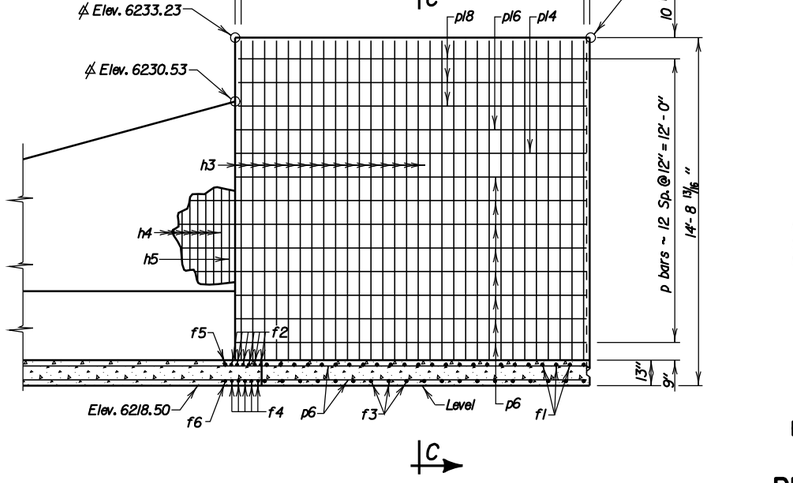
PLAN
(Panel III, Top Steel)
(Stone Facing not shown)



PLAN
(Panel III, Bottom Steel)
(Stone Facing not shown)



ELEVATION
(Panel III, Back Face)
(Stone Facing not shown)



SEC. D - D
(Panel III, Front Face)
(Stone Facing not shown)

NOTE:
See CONTRACTION JOINT DETAILS on PANEL I & CONTRACTION JOINT DETAILS Sheet.

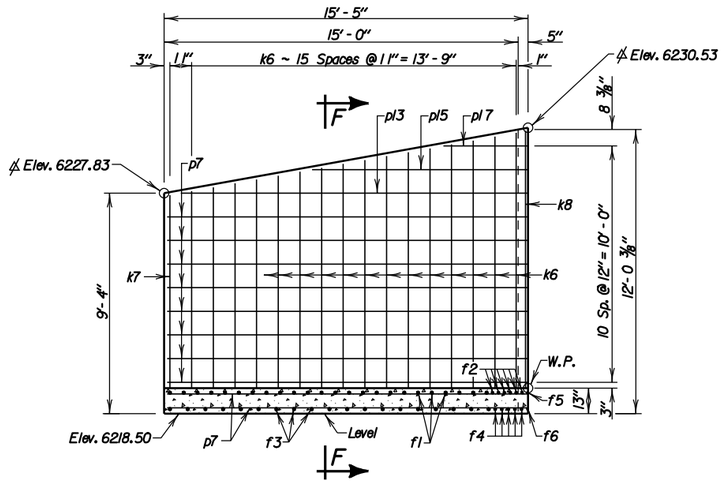
PANEL III DETAILS FOR RETAINING WALL

ADJ. TO HIGHWAY 87 SEC. 28-T2S-R5E
STA. 2+83.58 TO 087-491
STA. 3+10.81

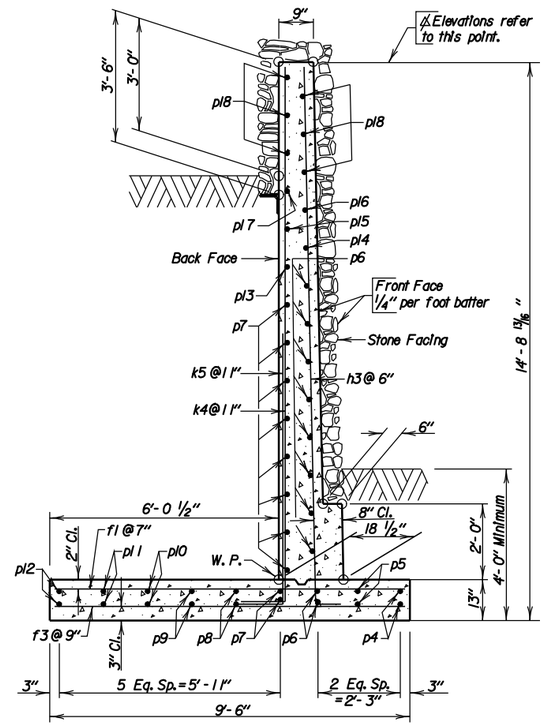
CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden BRIDGE ENGINEER
CUSTIOW3	IOW3TA06		

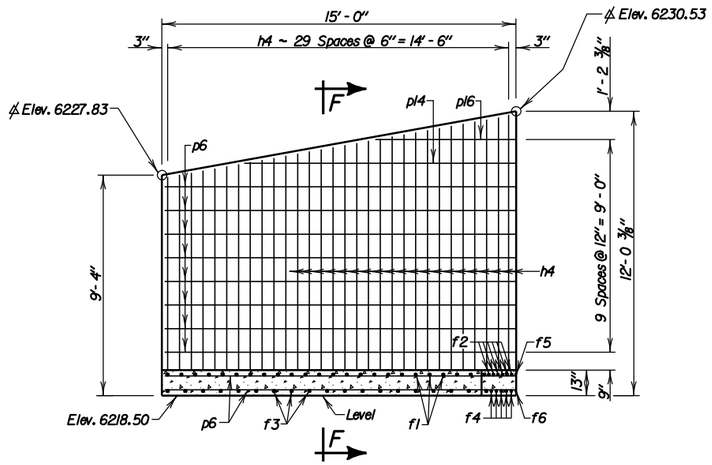
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	15	17



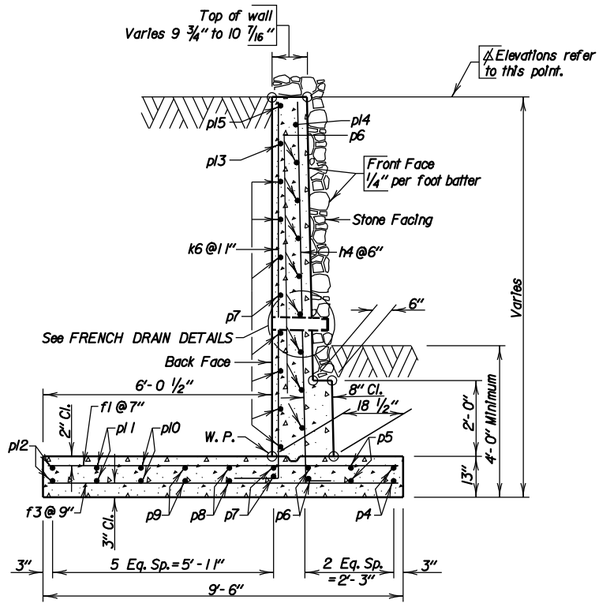
SEC. A-A
(Panel III, Back Face)
(Stone Facing not shown)



SEC. C-C



SEC. E-E
(Panel III, Front Face)
(Stone Facing not shown)



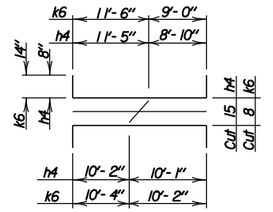
SEC. F-F

REINFORCING SCHEDULE
(For Panel III)

Mk.	No.	Size	Length	Type
f1	48	8	9'-2"	Str.
f2	12	8	7'-4"	Str.
f3	38	5	9'-2"	Str.
f4	10	5	7'-9"	Str.
f5	1	8	10'-0"	Str.
f6	1	5	10'-0"	Str.
h3	30	4	14'-10"	17A
℄ h4	15	4	21'-7"	17A
h5	1	4	12'-1"	17A
k4	17	7	15'-4"	17A
k5	16	7	10'-1"	17A
℄ k6	8	7	22'-10"	17A
k7	1	7	10'-0"	17A
k8	1	7	12'-8"	17A
p4	2	4	27'-6"	19B
p5	2	4	28'-6"	19B
p6	10	4	29'-6"	19B
p7	10	4	30'-2"	19B
p8	2	4	31'-4"	19B
p9	2	4	32'-5"	19B
pl0	2	4	33'-6"	19B
pl1	2	4	34'-6"	19B
pl2	2	4	35'-6"	19B
pl3	1	4	29'-3"	19B
pl4	1	4	25'-11"	19B
pl5	1	4	23'-8"	19B
pl6	1	4	20'-5"	19B
pl7	1	4	18'-2"	19B
pl8	6	4	14'-8"	Str.

Type 19B
12
10 13/16
13'-9" p4
14'-3" p5
14'-9" p6, pl4, pl6
15'-1" p7, pl3, pl5, pl7
15'-8" p8
16'-2 1/2" p9
16'-9" pl0
17'-3" pl1
17'-9" pl2

14" k4, k5, k7, k8
8" h3, h5
Type 17A



Type 17A

NOTE –
All dimensions are out to out of bars.
℄ See Cutting Diagram

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Miscellaneous	Cu. Yd.	25.3
Reinforcing Steel	Lb.	4529
7/8" Threaded Rod, Adhesive Anchor	Each	6

PANEL III DETAILS (CONTINUED)
FOR
RETAINING WALL

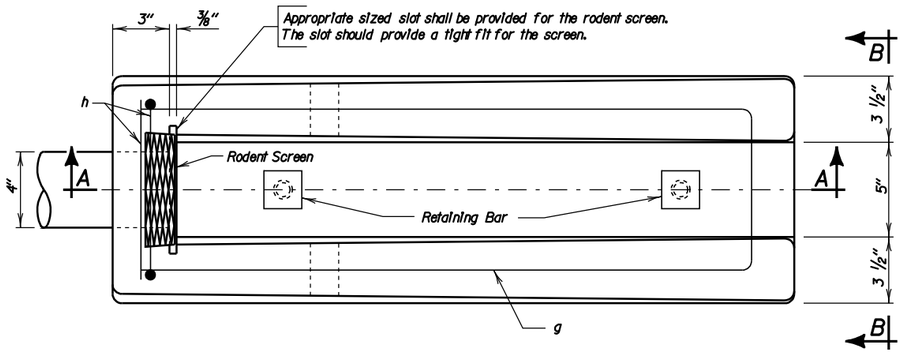
ADJ. TO HIGHWAY 87
STA. 2+83.58 TO
STA. 3+10.81

SEC. 28-T2S-R5E
087-491

CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden
CUSTIOW3	IOW3TA07		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	087-491	16	17



PLAN

GENERAL NOTES:

The concrete shall be Class M6. The concrete shall conform to the requirements of section 462 of the Construction Specifications. It is estimated that each unit weighs approximately 210 pounds.

All reinforcing steel shall conform to ASTM A615 Grade 60 and shall be epoxy coated. The reinforcing steel shall be securely retained to prevent displacement during placement of concrete. It is estimated that 7.3 pounds of reinforcing steel is required for each unit.

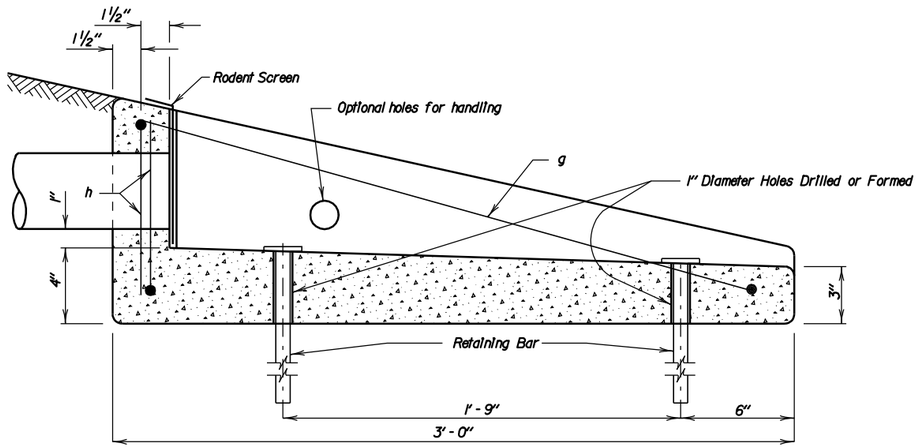
The pipe shall be placed in the concrete headwall with the pipe end flush with the concrete surface adjacent to the rodent screen.

The rodent screen shall be galvinized 13 Gauge steel with a diamond shaped flattened mesh pattern. The size shall be ½". The size refers to the measurement across the smallest diamond shaped opening measured from the centers of the wires.

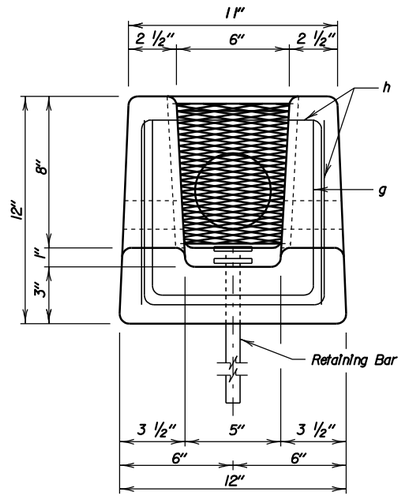
The drawing indicates using ½" fillets; however, ¾" chamfers may be substituted for the ½" fillets.

The ¾" Diameter Retaining Bar shall have a ¼" x 2" x 2" steel plate end welded to one end and be galvanized in accordance with ASTM A123 after all shop welding has been completed.

All costs for furnishing and installing the concrete headwall including equipment, labor, and materials including concrete, reinforcing steel, retaining bar and rodent screen shall be incidental to the contract unit price per each for "Precast Concrete Headwall for Drain".



SEC. A - A



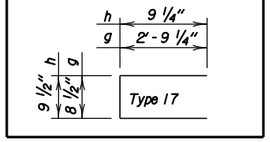
VIEW B - B

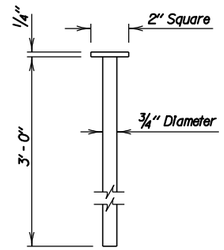
REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type
g	1	4	6'-3"	17
h	2	4	2'-4"	17

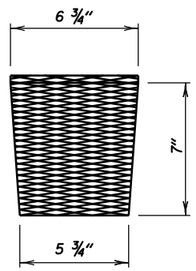
NOTE-
All Dimensions are out to out of bars.

Bending Details

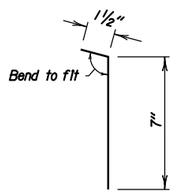




RETAINING BAR



FRONT VIEW
(RODENT SCREEN)



SIDE VIEW
(RODENT SCREEN)

PRECAST CONCRETE HEADWALL UNDERDRAIN
FOR
RETAINING WALL

ADJ. TO HIGHWAY 87
STA. 1+65.48 TO
STA. 3+10.81

SEC. 28-T2S-R5E
087-491

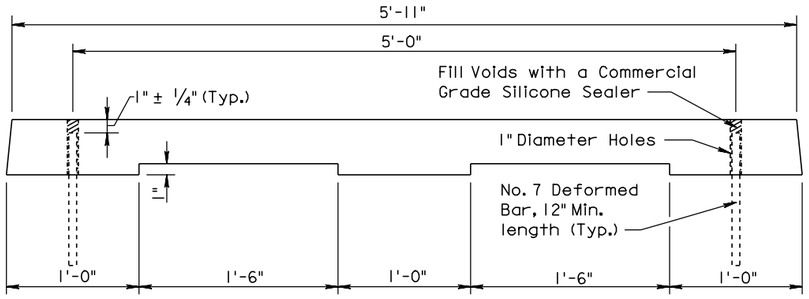
CUSTER COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2008

(8) OF (8)

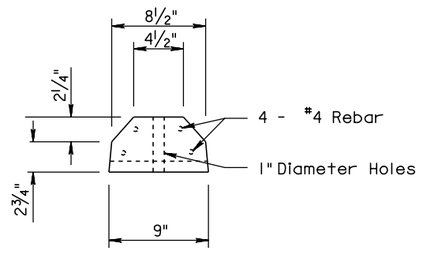
DESIGNED BY	DRAWN BY	CHECKED BY	
DC/MM	BT	DC/MM	Kevin N. Goeden
CUSTIOW3	IOW3TA08		BRIDGE ENGINEER

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	087-491	17	17

Plotting Date: 27-MAY-2009



SIDE VIEW



END VIEW

GENERAL NOTES:

Concrete shall be Class M6.

Reinforcing Steel shall conform to ASTM AG615, Grade 60.

Maintain 1" clearance on reinforcing steel.

The weight of the Curb Stop shall be 220 lbs. ±10 lbs.

March 31, 2000

Published Date: 2nd Qtr. 2009	SDDOT	PRECAST CONCRETE CURB STOP	PLATE NUMBER 900.10
			Sheet 1 of 1

Username - trrc12608