PLOT SCALE - 1:10000

PLOT NAME - 1

PLOTTED FROM - TRAB17882

FILE - ...\HURON AREA TITLE SHEET.DGN

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	1	20

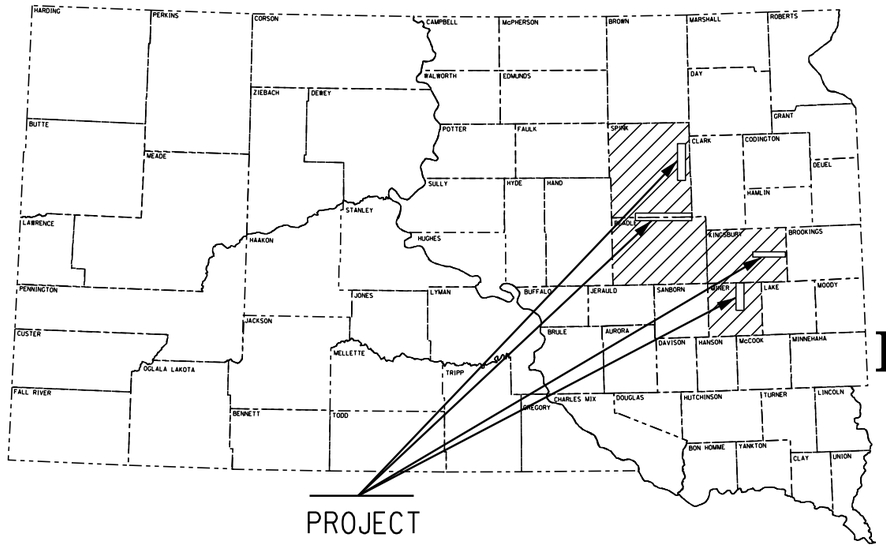
Plotting Date: 05/03/2017

STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION
PLANS FOR PROPOSED

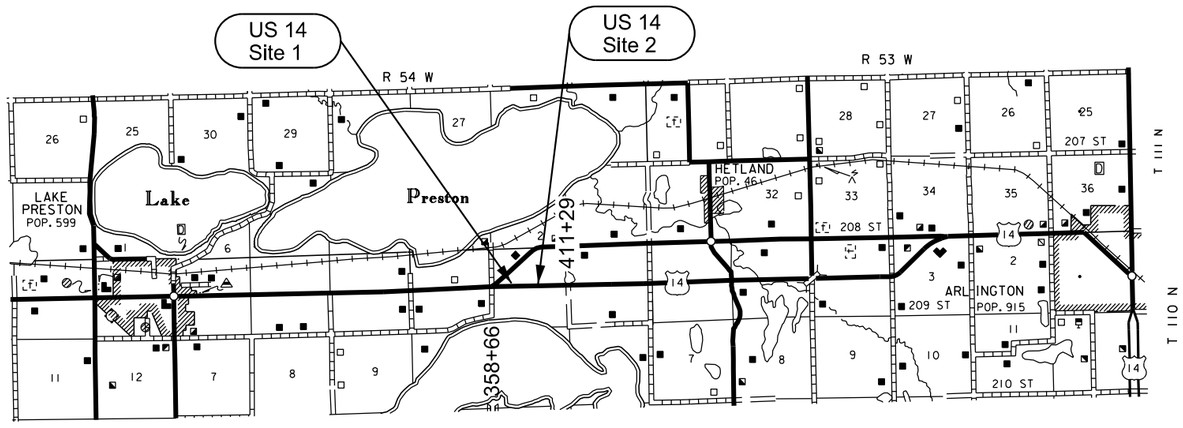
PROJECT P 0013(00)
U.S. HIGHWAY 14
S.D. HIGHWAY 25, 28 & 37
BEADLE, KINGSBURY, MINER & SPINK COUNTIES

PIPE CULVERT CLEANING, JOINT REPAIR, VOID FILLING AND CIPP LINING

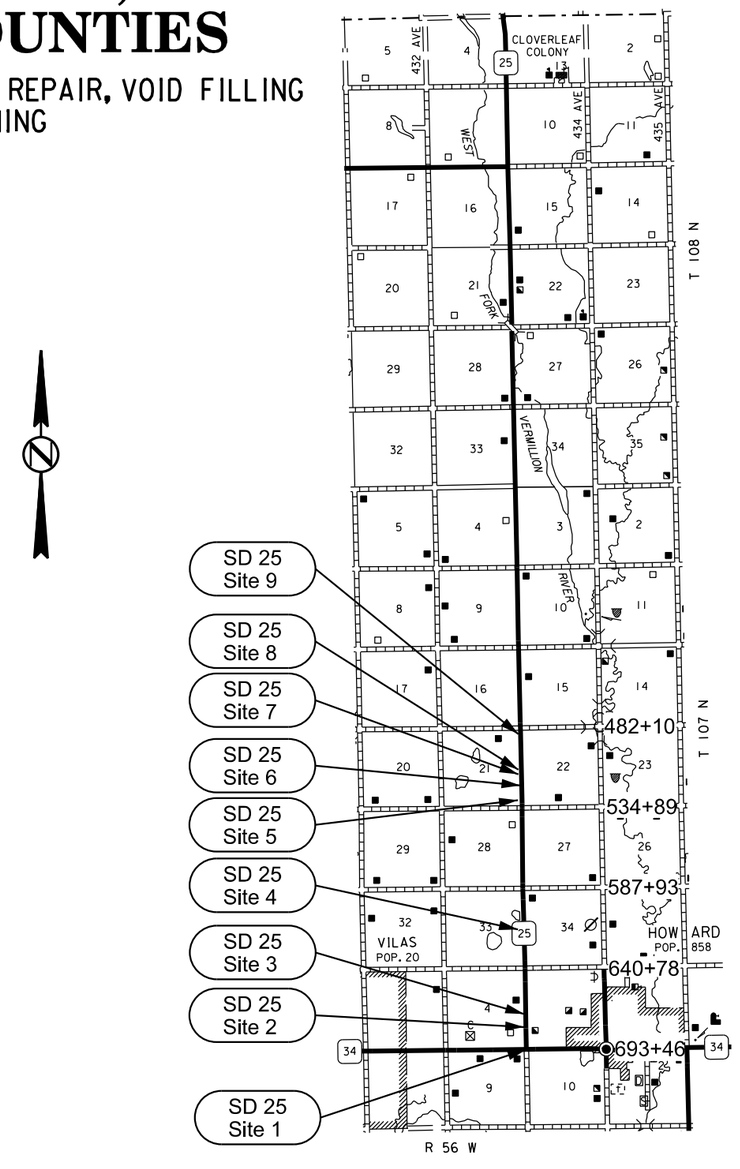
PCN 0639



INDEX OF SHEETS



ADT(2015) 1894

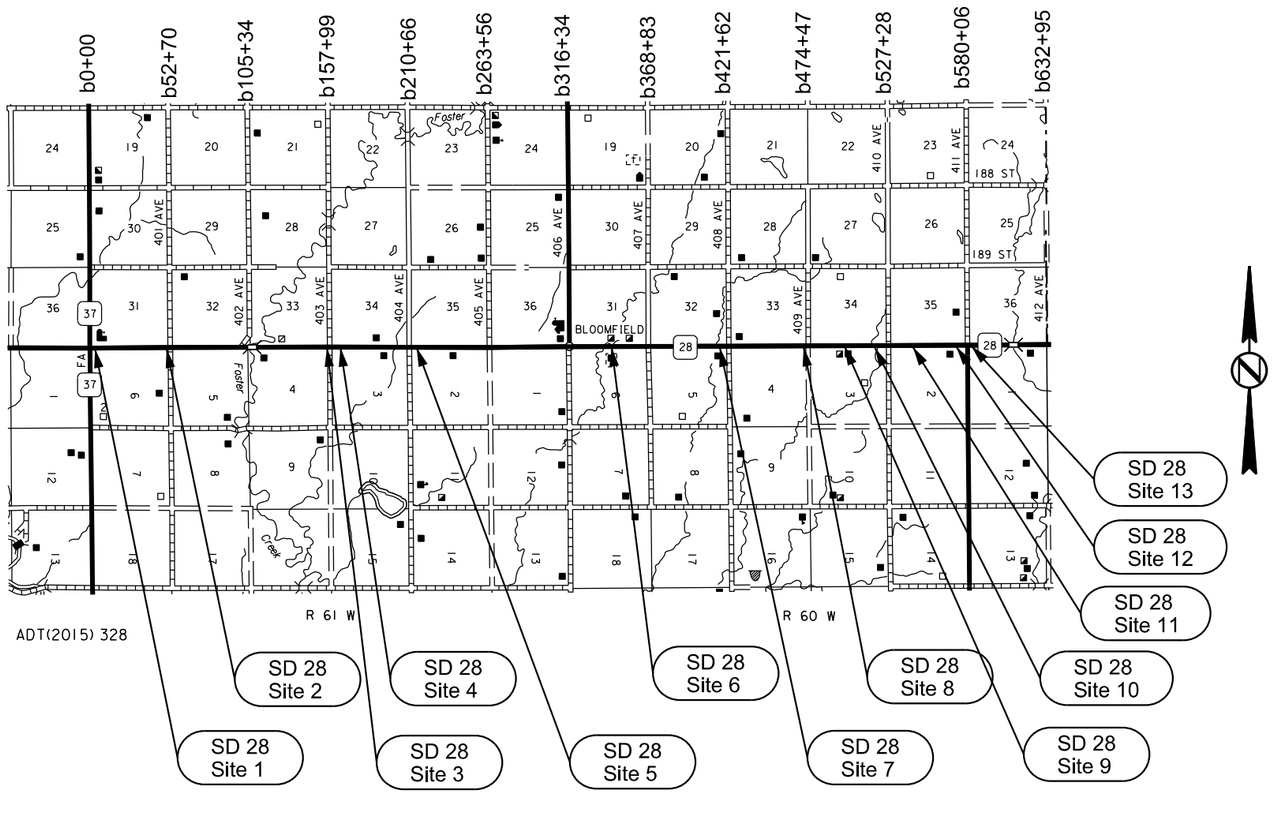


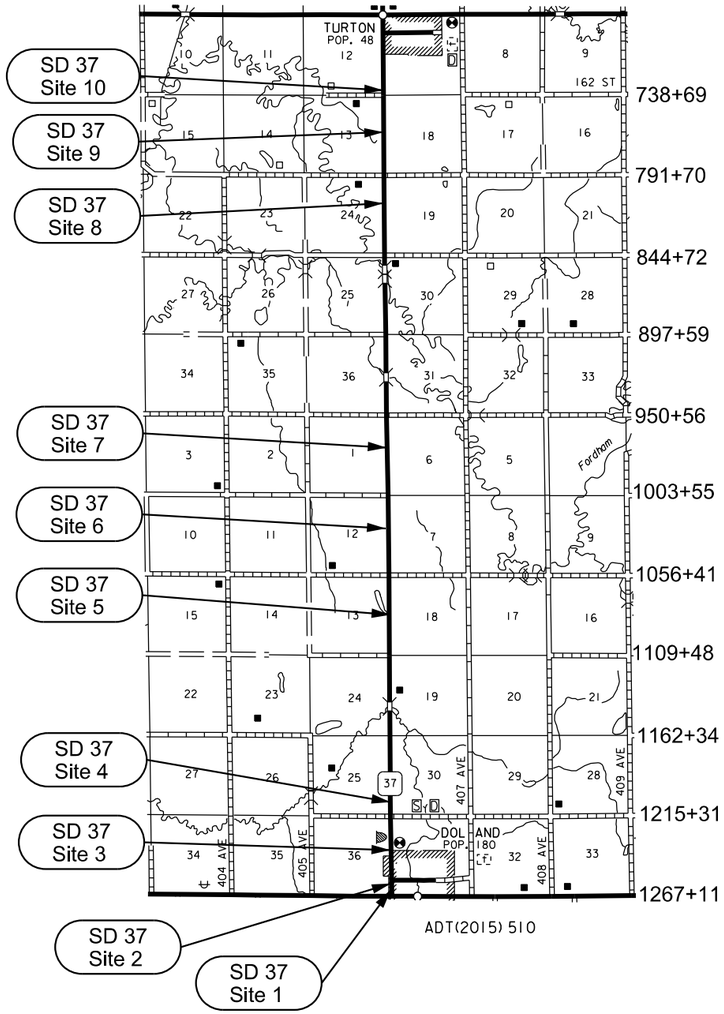
ADT(2015) 835

STORM WATER PERMIT
(NONE REQUIRED)

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	2	20

Plotting Date: 05/03/2017





PLOT SCALE - 1:10000

PLOT NAME - 2

FILE - ...\HURON AREA TITLE SHEET.DGN

PLOTTED FROM - TRAB17882

ESTIMATE OF QUANTITIES AND ENVIRONMENTAL COMMITMENTS

ESTIMATE OF QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E0010	Mobilization	Lump Sum	LS
110E0510	Remove Pipe End Section	14	Each
110E1690	Remove Sediment	1.5	CuYd
110E1693	Remove Erosion Control Wattle	90	Ft
110E1700	Remove Silt Fence	350	Ft
110E7500	Remove Pipe for Reset	132	Ft
110E7510	Remove Pipe End Section for Reset	20	Each
450E2008	18" RCP Flared End, Furnish	2	Each
450E2009	18" RCP Flared End, Install	2	Each
450E2016	24" RCP Flared End, Furnish	2	Each
450E2017	24" RCP Flared End, Install	2	Each
450E2024	30" RCP Flared End, Furnish	1	Each
450E2025	30" RCP Flared End, Install	1	Each
450E2032	42" RCP Flared End, Furnish	2	Each
450E2033	42" RCP Flared End, Install	2	Each
450E4508	30" RCP Arch Flared End, Furnish	1	Each
450E4509	30" RCP Arch Flared End, Install	1	Each
450E4512	36" RCP Arch Flared End, Furnish	2	Each
450E4513	36" RCP Arch Flared End, Install	2	Each
450E5219	30" CMP Flared End, Furnish	2	Each
450E5220	30" CMP Flared End, Install	2	Each
450E5818	42" CMP Arch Flared End, Furnish	2	Each
450E5819	42" CMP Arch Flared End, Install	2	Each
450E8300	Culvert Joint Cleaning	1,038.0	Ft
450E8305	Repair Culvert Joint	1,038.0	Ft
450E8310	Chemical Grout Void Fill	1,290.0	Gal
450E8900	Cleanout Pipe Culvert	29	Each
450E9000	Reset Pipe	132	Ft
450E9001	Reset Pipe End Section	20	Each
450E9518	18" Cured in Place Pipe	138	Ft
450E9526	30" Cured in Place Pipe	58	Ft
450E9528	36" Cured in Place Pipe	64	Ft
450E9624	24" Cured in Place Arch Pipe	70	Ft
450E9630	42" Cured in Place Arch Pipe	58	Ft
450E9632	48" Cured in Place Arch Pipe	54	Ft
634E0010	Flagging	50.0	Hour
634E0110	Traffic Control Signs	274.0	SqFt
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
734E0010	Erosion Control	Lump Sum	LS
734E0154	12" Diameter Erosion Control Wattle	500	Ft
734E0602	Low Flow Silt Fence	350	Ft
734E0610	Mucking Silt Fence	25	CuYd
734E0620	Repair Silt Fence	90	Ft

SPECIFICATIONS

Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

ENVIRONMENTAL COMMITMENTS

An Environmental Commitment is a measure that SDDOT commits to implement in order to avoid, minimize, and/or mitigate a real or potential environmental impact. Environmental commitments to various agencies and the public have been made to secure approval of this project. An agency mentioned below with permitting authority can influence a project if perceived environmental impacts have not been adequately addressed. Unless otherwise designated, the Contractor's primary contact regarding matters associated with these commitments will be the Project Engineer. These environmental commitments are not subject to change without prior written approval from the SDDOT Environmental Office. The environmental commitments associated with this project are as follows:

COMMITMENT B: FEDERALLY THREATENED, ENDANGERED, AND PROTECTED SPECIES

COMMITMENT B2: WHOOPING CRANE

The Whooping Crane is a spring and fall migratory bird in South Dakota that is about 5 feet tall and typically stops on wetlands, rivers, and agricultural lands along their migration route. An adult Whooping Crane is white with a red crown and a long, dark, pointed bill. Immature Whooping Cranes are cinnamon brown. While in flight, their long necks are kept straight and their long dark legs trail behind. Adult Whooping Cranes' black wing tips are visible during flight.

Action Taken/Required:

Harassment or other measures to cause the Whooping Crane to leave the site is a violation of the Endangered Species Act. If a Whooping Crane is sighted roosting in the vicinity of the project, borrow pit, or staging site associated with the project, cease construction activities in the affected area until the Whooping Crane departs and contact the Project Engineer. The Project Engineer will contact the Environmental Office so that the sighting can be reported to USFWS.

COMMITMENT C: WATER SOURCE

The Contractor shall not withdraw water with equipment previously used outside the State of South Dakota without prior approval from the SDDOT Environmental Office. Thoroughly wash all construction equipment before entering South Dakota to reduce the risk of invasive species introduction into the project vicinity.

The Contractor shall not withdraw water directly from streams of the James, Big Sioux, and Vermillion watersheds without prior approval from the SDDOT Environmental Office.

Action Taken/Required:

The Contractor shall obtain the necessary permits from the regulatory agencies such as the Department of Environment and Natural Resources (DENR) and the United States Army Corps of Engineers (COE) prior to executing water extraction activities.

ESTIMATE OF QUANTITIES AND ENVIRONMENTAL COMMITMENTS

COMMITMENT D: WATER QUALITY STANDARDS

COMMITMENT D2: SURFACE WATER DISCHARGE

Action Taken/Required:

If construction dewatering is required, the Contractor shall obtain a Temporary Discharge Permit from the DENR and provide a copy to the Project Engineer. Contact the DENR Surface Water Program at 605-773-3351 to apply for a permit.

COMMITMENT E: STORM WATER

Construction activities constitute less than 1 acre of disturbance.

Action Taken/Required:

At a minimum and regardless of project size, appropriate erosion and sediment control measures must be installed to control the discharge of pollutants from the construction site.

COMMITMENT H: WASTE DISPOSAL SITE

The Contractor shall furnish a site(s) for the disposal of construction and/or demolition debris generated by this project.

Action Taken/Required:

Construction and/or demolition debris may not be disposed of within the Public ROW.

The waste disposal site(s) shall be managed and reclaimed in accordance with the following from the General Permit for 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 Project 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 and/or 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 and/or demolition debris shall consist of a minimum of 1 foot of soil capable of supporting vegetation. Waste disposal sites provided outside of the Public 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 Public 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.

The above requirements will not apply to waste disposal sites that are covered by an individual solid waste permit as specified in SDCL 34A-6-58, SDCL 34A-6-1.13, and ARSD 74:27:10:06.

Failure to comply with the requirements stated above may result in civil penalties in accordance with South Dakota Solid Waste Law, SDCL 34A-6-1.31.

All costs associated with furnishing waste disposal site(s), disposing of waste, maintaining control of access (fence, gates, and signs), and reclamation of the waste disposal site(s) shall be incidental to the various contract items.

COMMITMENT I: HISTORICAL PRESERVATION OFFICE CLEARANCES

The SDDOT has obtained concurrence with the State Historical Preservation Office (SHPO or THPO) for all work included within the project limits and all department designated sources and designated option material sources, stockpile sites, storage areas, and waste sites provided within the plans.

Action Taken/Required:

All earth disturbing activities not designated within the plans require review of cultural resources impacts. This work includes, but is not limited to: Contractor furnished material sources, material processing sites, stockpile sites, storage areas, plant sites, and waste areas.

The Contractor shall arrange and pay for a cultural resource survey and/or records search. The Contractor has the option to contact the state Archaeological Research Center (ARC) at 605-394-1936 or another qualified archaeologist, to obtain either a records search or a cultural resources survey. A record search might be sufficient for review; however, a cultural resources survey may need to be conducted by a qualified archaeologist.

The Contractor shall provide ARC with the following: a topographical map or aerial view on which the site is clearly outlined, site dimensions, project number, and PCN. If applicable, provide evidence that the site has been previously disturbed by farming, mining, or construction activities with a landowner statement that artifacts have not been found on the site.

The Contractor shall submit the records search or cultural resources survey report and if the location of the site is within the current geographical or historic boundaries of any South Dakota reservation to SDDOT Environmental Engineer, 700 East Broadway Avenue, Pierre, SD 57501-2586 (605-773-3180). SDDOT will submit the information to the appropriate SHPO/THPO. Allow **30 Days** from the date this information is submitted to the Environmental Engineer for SHPO/THPO review.

If evidence for cultural resources is uncovered during project construction activities, then such activities shall cease and the Project Engineer shall be immediately notified. The Project Engineer will contact the SDDOT Environmental Engineer in order to determine an appropriate course of action.

SHPO/THPO review does not relieve the Contractor of the responsibility for obtaining any additional permits and clearances for Contractor furnished material sources, material processing sites, stockpile sites, storage areas, plant sites, and waste areas that affect wetlands, threatened and endangered species, or waterways. The Contractor shall provide the required permits and clearances to the Project Engineer at the preconstruction meeting.

COMMITMENT N: SECTION 404 PERMIT

The SDDOT has obtained a Section 404 Permit from the US Army Corps of Engineers for the permanent actions associated with this project.

Action Taken/Required:

The Contractor shall comply with all requirements contained in the Section 404 permit.

The Contractor shall also be responsible for obtaining a Section 404 permit for any dredge, excavation, or fill activities associated with staging areas, borrow sites, waste disposal sites, or material processing sites that affect wetlands or waters of the United States.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	5	20

TABLE OF MAINLINE PIPE CULVERT REPAIRS

Route	Site #	MRM	+ Disp.	In Place Culvert Information					Remove Pipe for Reset	Remove Pipe End Section	Remove Pipe End Section for Reset	18" RCP Flared End	24" RCP Flared End	30" RCP Flared End	42" RCP Flared End	30" RCP Arch Flared End	36" RCP Arch Flared End	30" CMP Flared End	42" CMP Arch Flared End	Reset Pipe	Reset Pipe End Section	Clean-out Pipe Culvert	Cured in Place Pipe						Culvert Joint Clean-ing	Repair Culvert Joint	Chemical Grout Void Fill	Comments
				Station	Size	RCP or CMP	Length (Ft)	End	(Ft)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Ft)	(Each)	(Each)	18" (Ft)	30" (Ft)	36" (Ft)	24" Arch	42" Arch (Ft)	48" Arch	(Ft)	(Ft)	(Gallons)	
US 14	1	392.00	0.40	365+00	24"	RCP	130	Flared Ends														1									105	RCP culvert is full of water and unable to inspect but AC patch over top and separation signs on the inslope so could be separated. Clean and CCTV inspect to determine if void filling around the culvert joints may be required.
	2	392.00	0.83	387+85	24"	CMP	216	Flared Ends														1										North 10 of CMP has bottom totally rusted out. Beyond that very rusty looking on the north end. On the south end the culvert looks good. Clean and CCTV to determine extent of deterioration. Work will all need to be done from north side as south side is outside of the ROW. (If culvert deterioration is only located on the north inslope, intent would be to replace portion of CMP on future project.)
SD 25	1	88.86	0.00	692+18	18"	CMP	78	Flared Ends														1										Heavy vegetation and sediment prevents visual inspection. Clean and CCTV inspect to determine if additional repairs are required.
	2	89.00	0.23	673+91	36"	RCP	54	Flared Ends																					84.6	84.6	85	9 joints at this culvert installation
	3	89.00	0.37	666+52	72"	RCP	54	Flared Ends																					188	188	85	Dips in AC surfacing over culvert. 10 joints at this culvert installation.
	4	90.00	0.47	608+35	36"	CMP	64	Flared Ends														1			64							Bottom of CMP is rusted out. Clean and CCTV inspect to verify CIPP lining is allowable.
	5	91.00	0.97	530+48	18"	CMP	68	Flared Ends														1										Clean and CCTV inspect to determine if additional repairs are required.
	6	92.00	0.10	521+81	36"	CMP	54	Flared Ends														1										Some rusting of culvert, but culvert seemed sound. Clean and CCTV inspect to determine if CIPP lining is required. If CIPP lining in required, replaced Flared End on the west side.
	7	92.00	0.25	514+00	18"	CMP	72	Flared Ends														1	72									Clean and CCTV inspect to determine if CIPP lining is allowable. Bottom of CMP is rusted out for at least 20' on the East end . On the west end CMP looked good.
	8	92.00	0.42	505+23	30"	CMP	58	Flared Ends														1		58								Clean and CCTV inspect to determine if CIPP lining is allowable. Bottom of CMP is rusted out. Riprap at west end of culvert.
	9	92.00	0.75	486+73	24" Arch	CMP	70	Flared Ends														3				70						Triple culvert installation. Clean and CCTV inspect to determine if CIPP lining is required. CIPP lining is not anticipated.

PLOTTED FROM - TRAB17882

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	6	20

TABLE OF MAINLINE PIPE CULVERT REPAIRS

Route	Site #	MRM	+ Disp.	In Place Culvert Information					Remove Pipe for Reset	Remove Pipe End Section	Remove Pipe End Section for Reset	18" RCP Flared End	24" RCP Flared End	30" RCP Flared End	42" RCP Flared End	30" RCP Arch Flared End	36" RCP Arch Flared End	30" CMP Flared End	42" CMP Arch Flared End	Reset Pipe	Reset Pipe End Section	Clean-out Pipe Culvert	Cured in Place Pipe						Culvert Joint Clean-ing	Repair Culvert Joint	Chemical Grout Void Fill	Comments
				Station	Size	RCP or CMP	Length (Ft)	End	(Ft)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Ft)	(Each)	(Each)	18" (Ft)	30" (Ft)	36" (Ft)	24" Arch	42" Arch (Ft)	48" Arch	(Ft)	(Ft)	(Gallons)	
SD 37	1	169.41	0.03	1265+50	18"	RCP	70?	Flared Ends			2										2	1										Clean and CCTV inspect to determine if additional repairs are required. At a minimum need to reset both Flared Ends. Full of sediment and vegetation. Culverts under roadway are older than culverts on the inslopes. Water over top of culvert on 10-3-16.
	2	169.41	0.05	1264+28	18"	RCP	70?	Flared Ends			2										2	1										Clean and CCTV inspect to determine if additional repairs are required. At a minimum need to reset both Flared Ends. Full of sediment and vegetation. Culverts under roadway are older than culverts on the inslopes. 1/2 full of water on 10-3-16.
	3	169.41	0.58	1236+62	36" Arch	RCP	80	Flared Ends	12	2							2			12		1									80	Remove and Reset 6' of culvert barrel section at both ends of the culvert. Replace both Flared Ends. Appear to have infiltration through joints. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	4	170.00	0.63	1203+76	18"	RCP	60	Flared Ends	6		2									6	2	1										Reset both Flared Ends and 6' of barrel section on the east side. Clean and CCTV inspect to determine is additional repairs are required.
	5	172.00	0.91	1083+65	30"	CMP	60	Flared Ends		2								2				1										Ends of CMP are crushed and will need to removed 1' to 2' of the barrel section along with replacing the Flared Ends. Culvert full of sediment on 10-3-16. Clean and CCTV inspect to determine if additional repairs are required.
	6	173.00	0.99	1026+19	48" Arch	CMP	54?	Flared Ends														1					54					CMP seems sound and do not anticipate additional repairs. 6" to 12" of sediment in culvert on 10-3-16. Clean and CCTV inspect to determine if additional repairs are required.
	7	174.00	0.97	973+55	42"	RCP	42	Flared Ends	12		2									12	2								88	88	65	Reset Flared End and 6' of barrel section on both ends.
	8	178.00	0.16	805+95	18"	CMP	66	Flared Ends														1	66									Rust holes along bottom of culvert. Clean and CCTV inspect to verify that CIPP lining is possible.
	9	178.00	0.97	762+76	42" Arch	CMP	58	Flared Ends		2									2			1					58					Heavy Rusting and flaking rust. A dip in top of pipe, likely at a joint. Replace both Flared Ends. 2" to 4" of sediment in culvert on 10-3-16. Clean and CCTV to verify that CIPP lining is possible.
	10	179.00	0.43	738+09	18"	RCP	58	Flared Ends	8		1									8	1	1									45	Reset Flared End and 8' of barrel section on east side of road. Appear to have joint infiltration under roadway. Clean and CCTV inspect to verify void filling around the culvert joints is required.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	7	20

TABLE OF MAINLINE PIPE CULVERT REPAIRS

Route	Site #	MRM	+ Disp.	In Place Culvert Information					Remove Pipe for Reset	Remove Pipe End Section	Remove Pipe End Section for Reset	18" RCP Flared End	24" RCP Flared End	30" RCP Flared End	42" RCP Flared End	30" RCP Arch Flared End	36" RCP Arch Flared End	30" CMP Flared End	42" CMP Arch Flared End	Reset Pipe	Reset Pipe End Section	Clean-out Pipe Culvert	Cured in Place Pipe						Culvert Joint Clean-ing	Repair Culvert Joint	Chemical Grout Void Fill	Comments
				Station	Size	RCP or CMP	Length (Ft)	End	(Ft)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Ft)	(Each)	(Each)	18" (Ft)	30" (Ft)	36" (Ft)	24" Arch	42" Arch (Ft)	48" Arch	(Ft)	(Ft)	(Gallons)	
SD 28	1	284.00	0.05	b3+91	30"	RCP	52	Flared & Sloped Ends	10		2									10	2	1									50	Reset 4' of barrel section on the north side and 6' on the south side along with both end treatments. Looked to be major infiltration under middle of roadway. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	2	284.00	0.96	b51+83	36" Arch	RCP	56	Flared Ends	14		2									14	2	1									55	Reset 8' of barrel section on the north side and 6' on the south side along with both end treatments. Looked to be infiltration under middle of roadway. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	3	286.00	0.92	b157+07	24"	RCP	56	Flared Ends	14	1	1		1							14	1	1									45	Reset 8' of barrel section on the north side and 6' on the south side along with the end treatment on the north side. Replace Flared End on the south side. Looked to be infiltration under middle of roadway. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	4	286.00	0.08	b165+44	42" Arch	RCP	50	Flared Ends	12		2									12	2									110	110	80	Reset 6' of barrel section along with the end treatments on both sides. 10 joints total.
	5	288.00	0.08	b215+36	30" Arch	RCP	46	Flared Ends		1						1						2									90	Twin Pipes. Replace Eastern Flared End on the south side of roadway. 9 joints total. Looked to be major infiltration between joints. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	6	290.00	0.41	b338+85	72" Arch	RCP	48	Flared Ends																						171	171	75	9 joints to seal. Some infiltration through all joints.
	7	291.00	0.80	b412+79	72" Arch	RCP	60	Flared Ends																						209	209	95	11 joints to seal. Very recent asphalt patch over top of culvert.
	8	292.00	0.95	b473+47	24"	RCP	56	Flared Ends	12		2									12	2	1									45	Reset 6' of barrel section along with the end treatments on both sides. Clean and CCTV inspect to verify void filling around the culvert joints is required.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	P 0013(00)	8	20

TABLE OF MAINLINE PIPE CULVERT REPAIRS

Route	Site #	MRM	+ Disp.	In Place Culvert Information					Remove Pipe for Reset	Remove Pipe End Section	Remove Pipe End Section for Reset	18" RCP Flared End	24" RCP Flared End	30" RCP Flared End	42" RCP Flared End	30" RCP Arch Flared End	36" RCP Arch Flared End	30" CMP Flared End	42" CMP Arch Flared End	Reset Pipe	Reset Pipe End Section	Clean-out Pipe Culvert	Cured in Place Pipe						Culvert Joint Clean-ing	Repair Culvert Joint	Chemical Grout Void Fill	Comments
				Station	Size	RCP or CMP	Length (Ft)	End															18"	30"	36"	24" Arch	42" Arch	48" Arch				
									(Ft)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Each)	(Ft)	(Each)	(Each)	(Ft)	(Ft)	(Ft)		(Ft)			(Ft)	(Ft)	(Gallons)	
SD 28 Cont	9	293.00	0.30	b491+27	30"	RCP	62	Flared Ends	18	1	1			1						18	1	1									60	Reset 6' of barrel section on the north side and 12' on the south side along with the end treatment on the north side. Replace Flared End on the south side. Looked to be infiltration under middle of roadway. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	10	293.00	0.84	b519+91	42"	RCP	46	Flared Ends																					99	99	75	9 joints to seal. Very recent asphalt patch over culvert.
	11	294.00	0.47	b553+00	24"	RCP	58	Flared Ends	14	1	1		1							14	1	1									45	Reset 8' of barrel section on the north side and 6' on the south side along with the end treatment on the south side. Replace Flared End on the north side. Looked to be infiltration. Clean and CCTV inspect to verify void filling around the culvert joints is required.
	12	294.00	0.85	b572+79	42"	RCP	42	Flared Ends		2					2														88	88	65	8 joints to seal. Replace both Flared Ends.
	13	295.00	0.02	b580+66	18"	RCP	56	Flared Ends		2		2										1									45	Replace both Flared Ends. Looked to be infiltration. Clean and CCTV inspect to verify void filling around the culvert joints is required.
								TOTALS	**132**	**14**	**20**	**2**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**132**	**20**	**29**	**138**	**58**	**64**	**70**	**58**	**54**	**1038**	**1038**	**1290**	

PLOTTED FROM - TRAB17882

SCOPE OF WORK

Work on this project involves cleaning and inspection of pipe culverts. Subsequent to the cleaning and inspection additional repairs are anticipated which include lining of the pipe culverts, sealing of joints between pipe culvert sections and void filling around exterior of pipe culverts.

UTILITIES

Utilities are not planned to be affected on this project. If utilities are identified near the improvement area through the SD One Call Process as required by South Dakota Codified Law 49-7A and Administrative Rule Article 20:25, the Contractor shall contact the Project Engineer to determine modifications that will be necessary to avoid utility impacts.

SEQUENCE OF OPERATIONS

The Contractor shall submit to the Area Engineer a minimum of 1 week prior to the Preconstruction Meeting a detailed plan of how the pipe culvert cleaning and inspection will be staged. The plan shall show how the Contractor is going to maintain traffic at each pipe culvert site, where equipment is going to be stored, the total length of the work space if a lane of traffic needs to be closed to traffic, and the methods used to prevent material removed from the pipe culverts from entering the waterway. These plans shall be approved by the Area Engineer prior to starting work on the pipe culvert cleaning and inspection.

TRAFFIC CONTROL

The roadways shall remain open to traffic at all times. One lane of traffic may be closed during work hours, with traffic control being handled with the use of Flaggers as per Standard Plate 634.23.

If work can safely be performed from the shoulder of the roadway or beyond the shoulder, traffic control shall be as per Standard Plates 634.03 or 634.01.

Flaggers and FLAGGER symbol signs shall be in place when work activities or equipment present a hazard to workers, through traffic, or encroaches into driving lanes open to traffic.

Traffic control devices shall be placed beyond the surfaced edge of the roadway when not in use.
Removing, relocating, covering, salvaging and resetting of existing traffic control devices, including delineation, shall be the responsibility of the Contractor. Cost of this work shall be incidental to the various contract items unless otherwise specified in the plans. Delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.

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.

Work activities during non-daylight hours are subject to prior approval.

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 location, ground mounted, breakaway supports.

The Contractor will be responsible for maintaining all existing traffic control signing for the safety of the traveling public.

Traffic Control signs, as shown in the Itemized List for Traffic Control Signs, are estimates. Contractor's operation may require adjustments in quantities, either more or less. Payment will be for those signs actually ordered by the Engineer and used.

CLOSED-CIRCUIT TELEVISION (CCTV) CAMERA

The CCTV camera shall be mounted on a crawler. The crawler shall be capable of traveling the entire length of the pipe culvert.

The CCTV camera shall have the ability to pan and tilt. Lighting for the CCTV camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The CCTV monitor and other components of the CCTV system shall be capable of producing a clear color picture/CCTV image.

A DVD recording of each CCTV camera inspection of each pipe culvert shall be provided to the Engineer. Other methods of transferring video recordings may be considered and approved by the Engineer.

CLEANOUT PIPE CULVERTS

Cleanout of pipe culverts shall be done in advance of pipe culvert repair operations. Following cleaning, pipe inspection shall be completed with a CCTV camera. The inspection shall determine any deviations in the vertical and horizontal alignments, location and size of any gaps in joints, and location of any damage.

At those locations where further evaluation of pipe culvert repairs are required, the pipe culvert cleaning and inspection shall be scheduled such that there is adequate time to evaluate what repairs are required and allow for ordering and delivery of pipe culvert repair materials.

Material in all existing pipe culverts shall be cleaned out by water flushing or other approved methods.

Material removed from the pipe culverts shall become the property of the Contractor for disposal.

The Contractor shall implement appropriate sediment control measures prior to water flushing in order to prevent discharges from the project boundaries to comply with the Storm Water Permit.

Pipe culverts may need to be dewatered to allow for CCTV inspection.

The pipe culvert shall be cleaned to the satisfaction of the Engineer and the cleaning shall be adequate to determine pipe condition and potential repair techniques.

All costs to dewater, clean pipes, dispose of removed materials and CCTV camera inspect pipe culverts shall be incidental to the contract unit price per each for CLEANOUT PIPE CULVERT.

The contract item CLEANOUT PIPE CULVERT shall be paid for a maximum of one time for each pipe culvert. This contract item shall only be paid for:

- When indicated in the Table of Mainline Pipe culvert Repairs,
- When cleaning and CCTV inspection is required to determine or verify what repairs are required,
- When CIPP lining a pipe.

Cleanout Pipe Culvert will not be paid for at pipe culvert locations where Culvert Joint Cleaning has been predetermined to be required.

RCP AND CMP CULVERT REPAIRS FOR MAINLINE PIPE CULVERTS

Resetting and replacement of RCP shall be completed prior to Reinforced Concrete Pipe Joint Repair and Void Grouting.

All pipe and end treatments designated for removal shall become the property of the Contractor for his disposal.

Tie bolts shall be installed at all joint locations where existing pipe sections and end treatments are being reset or installed new. This may require drilling holes into the existing pipe sections and end treatments. Tie bolts shall be installed in accordance with Standard Plate No. 450.18.

When necessary to remove end sections of CMP culverts, they may be cut with a torch. If the pipe culvert is cut the damaged area shall be painted with a galvanizing paint approved by the Engineer. All costs associated with cutting and painting shall be incidental to the various contract items.

The Contractor is advised of the risk of lead exposure when cutting galvanized paint. The Contractor should plan his/her operations accordingly, and inform employees of hazards of lead exposure.

Joints between concrete pipe culvert sections shall be protected against infiltration as indicated in Section 450.3 A of the Specifications. If an existing concrete pipe culvert section has a damaged joint or there is poor alignment of the joints, 2 layers of drainage fabric shall be placed over the joint.

TABLE OF MAINLINE PIPE CULVERT REPAIR

Pipe culvert lengths shown in the Table of Mainline Pipe Culvert Repairs were obtained from the original grading plans and were not verified in the field.

The total number of pipe culvert joints listed in the Comments column is based upon a visual estimate. If no information is provided on the number of joints, quantities were estimated based upon a typical pipe culvert barrel section length of 6 ft.

It is the Contractors responsibility to investigate each pipe culvert pipe repair site to determine the pipe culvert size, length, and number of pipe culvert joints along with other information needed to prepare a bid.

SEDIMENT CONTROL

Sediment control may be required if water is flowing through the pipe culvert at the time of cleaning. Otherwise sediment control is not anticipated.

The Contractor shall implement appropriate sediment control measures prior to water flushing in order to prevent discharges beyond the project boundaries.

Wattles and Silt Fence have been provided in the Estimate of Quantities and shall be used to capture pipe cleanout material. Placement of the wattles and Silt Fence shall be as directed by the Engineer.

EROSION CONTROL WATTLE

Erosion control wattles for restraining the flow and sediment shall be installed at locations determined by the Engineer during construction. Refer to Standard Plate 734.06 for details.

The Contractor shall provide certification that the erosion control wattles do not contain noxious weed seeds.

An estimated quantity of erosion control wattles shall remain on the project until vegetation has been established. It is estimated that some of the erosion control wattles will remain on the project to decompose.

An additional quantity of 150 ft of 12” Diameter Erosion Control Wattles has been added to the Estimate of Quantities for temporary erosion and sediment control in highway ditch channels where earth disturbing activities have occurred at wetland areas adjacent to the highway.

The erosion control wattle provided shall be from the approved product list. The approved product list for erosion control wattle may be viewed at the following internet site:

http://sddot.com/business/certification/products/Default.aspx

LOW FLOW SILT FENCE

The low flow silt fence fabric provided shall be from the approved product list. The approved product list for low flow silt fence may be viewed at the following internet site:

http://sddot.com/business/certification/products/Default.aspx

Low flow silt fence shall be placed at the locations that will minimize siltation of adjacent streams, lakes, dams, or drainage areas as determined by the Engineer during construction. Refer to Standard Plate 734.04 for details.

EROSION CONTROL

The areas to be seeded consist of areas at pipe culvert locations where resetting or replacement of pipe culvert sections or end treatments are required. In addition, any location where vegetation was destroyed, such that quick revegetation is not expected shall be reseeded.

The estimated area requiring erosion control is 0.3 acres at locations where pipe culverts were reset or replaced. All costs for the erosion control work for furnishing, placing, and maintaining erosion control including equipment, labor, and seeding shall be incidental to the contract lump sum price for EROSION CONTROL.

The limits of erosion control work will be determined by the Engineer during construction.

Type C Permanent Seed Mixture shall be used on this project.

Application of fertilizer will not be required on this project.

Type C Permanent Seed Mixture shall consist of the following:

Grass Species	Variety	Pure Live Seed (PLS) (Pounds/Acre)
Western Wheatgrass	Arriba, Flintlock, Rodan, Rosana	16
Canada Wildrye	Mandan	2
	Total:	18

REINFORCED CONCRETE PIPE JOINT REPAIR AND VOID GROUTING

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	P 0013(00)	11	20

REINFORCED CONCRETE PIPE JOINT REPAIR AND VOID GROUTING

The Contractor shall provide a notarized statement, from the Manufacturer, that the products used for culvert joint repair meet the specified requirements, along with the Manufacturer's current product specification and installation instructions.

The Contractor shall be an Approved Contractor of the Manufacturer of the specified product and shall provide written certification from the Manufacturer attesting to their Approved Contractor status.

All product documentation and Contractor submittals must be submitted to the Engineer prior to or at the preconstruction conference. The Contractor must have the Engineer's approval prior to commencing any of this work.

The Contractor shall follow the Manufacturer's installation instructions and specifications throughout the repair process

Temperature of the specified products is critical from the point of pumping to the point of injection. All polyurethanes react faster at higher temperatures. Drum heaters and heated hoses are required when ambient or ground temperatures are below 70 degrees Fahrenheit. The optimum hose temperature will vary with the weather conditions and the particular job site conditions with the minimum hose temperature being 75 degrees Fahrenheit and the maximum hose temperature being 95 degrees Fahrenheit and the drum temperature not to exceed 90 degrees Fahrenheit.

The Contractor shall provide worker and inspector safety protective gear in accordance with the manufacturer, including but not limited to chemical goggles, face shields, eye wash system and NBR gloves.

The Contractor shall provide safe storage and handling of materials prior to delivery and at the project site. All material installation, handling and storage shall be in accordance with the Manufacturer's recommendations.

The Contractor shall visit the project to determine the extent of culvert joints to be cleaned and filled, prior to bidding.

Culvert Joint Cleaning and Repair Culvert Joint quantities shall be based upon the following table showing circumference of joints based upon culvert size and shape.

Pipe Diameter	Round Pipe Circumference per Joint	Arch Pipe Circumference per Joint
(In)	(Ft)	(Ft)
36	9.4	
42	11.0	11.0
48	12.6	
54	14.1	
60	15.7	
66	17.3	
72	18.8	19.0
78	20.4	
84	22.0	

CULVERT JOINT CLEANING

This work shall consist of cleaning of the culvert joints, washing the entire culvert and joints with a high pressure washer, and if needed, wire brush cleaning of each joint to be repaired as directed by the Engineer. The entire culvert shall be clean and dry and most notably the specified joints shall be thoroughly cleaned to the satisfaction of the Engineer using a power washer with water pressure of at least 2500 psi. The culvert must be in a clean condition so that no deleterious material is trapped in the joints that are being repaired. The Contractor shall dispose of all debris removed from the culverts during the cleaning operation as approved by the Engineer.

All costs for equipment, material and labor for the culvert joint cleaning work shall be incidental to the contract unit price per foot for Culvert Joint Cleaning. Culvert Pipe Cleaning will be measured to the nearest 0.1 foot of joint which is cleaned for joint repair.

REPAIR CULVERT JOINT

The culvert joints shall be repaired in accordance with the Chemical Grout Manufacturer's directions to prevent future infiltration/exfiltration of soils and water and to keep the chemical grout from expanding back into the structure during injection.

The culvert joint will be repaired with a sealant comprised of water reactive hydrophilic polyurethane resin and dry oil free oakum. All grout will be injected under such pressure so as not to damage the existing drainage structure or roadway structure.

The Contractor shall submit to the Engineer for approval a detailed procedure for the installation of the polyurethane grout.

The work shall include, but is not limited to sealing each pipe joint with a hydrophilic polyurethane grout meeting the following specifications:

GEL FOAM II (Saturated Oakum Rope Joint Packing) as manufactured by Green Mountain International, LLC or equal.

ULTRA (Single Component Grout for Joint Injection) as manufactured by Green Mountain International, LLC or equal.

Excess grout and oakum shall be trimmed from the interior face of the joint prior to applying the UV Protection (Gel Coat). The epoxy gel coat compound shall be as recommended by the Manufacturer for both surface sealing and protecting the hydrophilic grout from UV exposure. The epoxy gel compound shall be mixed and handled in accordance with the Manufacturer's recommendations and shall meet the following requirements:

Epoxy gel sealant compounds manufactured by Green Mountain Grouts, LLC or equal.

All costs for all equipment, material and labor required to complete the work shall be incidental to the contract unit price per foot for Repair Culvert Joint. Completion of the work includes initial saturated oakum rope packing of each joint, follow up injection of grout into the back side of each joint, trimming the excess grout and oakum from the interior face of the joint, application of the epoxy gel coat and site clean-up. Payment will be made per 0.1 foot of culvert joint repaired.

DUAL COMPONENT CHEMICAL GROUT FOR VOID FILLING FOR CIRCULAR RCP OVER 30" AND ARCH RCP OVER 36"

The external voids surrounding the culvert will be filled with an injected high expansion chemical grout compound. Holes shall be strategically drilled as required and grout injected throughout the structure to effectively fill all voids that have developed outside of the structure due to the infiltration of external soils and materials into the culvert and "piping" (water running outside and under the structure due to separated joints). It is the Contractor's responsibility to locate reinforcing bars and conduit prior to drilling any grout holes. All grout shall be injected under such pressure so as not to damage the existing drainage structure or roadway structure. All joints shall be appropriately cleaned and sealed, with appropriate recommended cure time, prior to the injection of the void grouting. After completion of the void filling, all holes shall be properly sealed.

The typical method consists of placing a layer of chemical grout behind or around the structure. The Contractor shall submit for approval by the Engineer a detailed grouting plan showing the spacing, orientation and depth of the grout holes, as well as type of polyurethane grout to be used, range of gel times, equipment, mixing procedures, recommended injection pressure, technique for monitoring grout travel and any other pertinent information. The grouting plan should address the prevention of overfilling and prevention of damage to structures or roadway. The Contractor shall submit this detailed procedure for the installation of the expansion grout to the Engineer for approval. The holes are drilled with a rotary percussion hammer drill using a sharp masonry bit with a minimum diameter of 3/8 inch to a maximum diameter of 5/8 inch. Care must be taken to prevent holes from causing damage to reinforcing bars or utility conduits. Drilled holes should be vacuumed and flushed. Use injection grout and methods as recommended by Manufacturer.

Injection can be monitored by either applicator's visual inspection or by pumping a specific amount of injection grout into each hole. The work will start at the inlet end of the pipe and proceed downstream to the outlet. Inject bottom row every other hole. When material appears at the adjacent port, discontinue injection at entry port and begin injection at the adjacent port. Continue injection process section by section from bottom of pipe to top of pipe in a continuous manner to next pipe section. Injection pressure will vary from 200 psi to 3000 psi depending on the width of the joint, thickness of the structure, and condition of the concrete.

REINFORCED CONCRETE PIPE JOINT REPAIR AND VOID GROUTING

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	P 0013(00)	12	20

DUAL COMPONENT CHEMICAL GROUT FOR VOID FILLING FOR CIRCULAR RCP UNDER 36" AND ARCH RCP UNDER 42"

Void filling shall be completed at joints between sections of pipe culverts, where CCTV camera inspection indicates open joints, or where evidence of roadway distress would indicate a void under the pavement surface.

The external voids surrounding the culvert will be filled with an injected high expansion chemical grout compound. Holes shall be strategically drilled as required and grout injected throughout the structure to effectively fill all voids that have developed outside of the structure due to the infiltration of external soils and materials into the culvert and "piping" (water running outside and under the structure due to separated joints). All grout shall be injected under such pressure so as not to damage the existing drainage structure or roadway structure. All joints shall be appropriately cleaned and sealed, with appropriate recommended cure time, prior to the injection of the void grouting. After completion of the void filling, all holes shall be properly sealed.

The typical method consists of placing a layer of chemical grout behind or around the structure. The Contractor shall submit for approval by the Engineer a detailed grouting plan showing the spacing, orientation and depth of the grout holes, as well as type of polyurethane grout to be used, range of gel times, equipment, mixing procedures, recommended injection pressure, technique for monitoring grout travel and any other pertinent information. The grouting plan should address the prevention of overfilling and prevention of damage to structures or roadway. The Contractor shall submit this detailed procedure for the installation of the expansion grout to the Engineer for approval. The injection holes through the pavement shall be a maximum diameter of 5/8 inch. Care must be taken to prevent holes from causing damage to the pipe culvert or utility conduits. Use injection grout and methods as recommended by Manufacturer. The injection holes shall be sealed on the surface using materials compatible with the chemical grout and the surface drilled through. The sealing of the injection holes shall leave the surface flush and smooth.

DUAL COMPONENT CHEMICAL GROUT FOR VOID FILLING FOR ALL CULVERTS

The Contractor must supply the Engineer with three (3) prior job references of projects where they have successfully injected urethane resin for subgrade void filling applications, or soil stabilization.

The chemical grout shall be a dual component hydrophobic polyurethane grout compound which is non-flammable and non-toxic when cured.

The chemical grout mixture shall have expansion properties listed in the data sheets of greater than twenty (20) times its original volume and cure to rigid closed cell polyurethane foam. The grout shall expand to fill any voids and must bond to the exterior surface of the structure. The chemical grout shall be VF dual component polyurethane grouts as manufactured by Green Mountain International LLC or equal.

All costs for equipment, material, and labor required to fill external voids surrounding the culvert shall be incidental to the contract unit price per gallon for Chemical Grout Void Fill. Any overfilling of voids that results in damage to overlying pavement, highway user ride quality, or drainage structure integrity shall be corrected and paid for by the Contractor. All corrections shall be approved by the Engineer. Payment shall be to the 0.1 gallon of chemical grout used, prior to expansion of the material.

A calibrated metering device shall be used to measure the chemical grout and to assure proper mixing ratio of components.

After the grout cures, excess material shall be removed flush with the pipe interior wall and the pipe left clean.

CURED-IN-PLACE PIPE (CIPP)

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	P 0013(00)	13	20

A. CIPP LINER MATERIAL

The CIPP liner shall be manufactured in accordance to ASTM F2019. In addition, the liner shall meet the following requirements:

1. fit the host pipe tightly
2. have a maximum thickness of ½ inch
3. provide a continuously lining of the host pipe
4. use a nontoxic curing process
5. is nontoxic when cured
6. have a minimum 50 year design life.

CIPP liner shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer.

B. CIPP LINER SUBMITALS

The following shall be submitted for each host pipe to be lined. Provide the information into the category breakdown as shown below:

1. Liner Data

The following information shall be provided with the CIPP liner structural data:

a. pipe liner material type and trade name
b. nominal inside and outside pipe liner diameters
c. manufacturer's recommended maximum and minimum fill heights for the identified liner
d. certification that liner meets specifications
e. include calculations showing that the liner is designed for AASHTO HL-93 live loading when the pipe is considered to be fully deteriorated

Provide copy of engineering drawing and calculations, signed and sealed by a Professional Engineer registered in the state of South Dakota.

2. Work Area Plan

Provide a work area plans that includes the following:

a. the work area required for the liner installation
b. method of preventing water from interfering with the installation
c. a site restoration plan

3. Pipe Cleaning

Provide a plan that includes the cleaning of the host pipe and disposal of the debris

4. Liner Installation

Provide a liner installation plan which shall include the following:

a. method of liner installation
b. curing method identifying required cure times, temperatures, and pressures
c. containment plan for collection of contaminated water
d. management and disposal plan for contaminated materials resulting from the liner installation

5. Training Certification and Experience

Provide written proof that at least 1 member of the installation team has attended training and been certified by the manufacture on the liner material being installed.

The installer must supply the Engineer with 5 prior job references of projects where they have successfully install CIPP liners.

C. HOST PIPE PREPARATION AND INSPECTION

The host pipe shall be thoroughly cleaned using a high-pressure water jet or hydro-mechanical methods. The cleaning method shall produce a clean, sound surface that demonstrates no evidence of loose material, debris or contaminates. The host pipe shall be cleaned just prior to insertion of the CIPP liner. The Contractor shall implement appropriate sediment control measures prior to cleaning in order to prevent discharges from the project boundaries to comply with the Storm Water Permit.

Host pipe inspection shall be completed with a CCTV camera. A DVD recording of the inspection shall be provided to the Engineer. The inspection shall determine the suitability of the liner for the host pipe including such items as the horizontal and vertical alignments, location of gaps in the joints and pipe damage. The Engineer shall be notified if any pipe sections are impassible or the pipe cannot be lined.

Any intrusions into the pipe shall be cut or ground off flush with the host pipe interior wall before installing the liner. Cut off existing pipe tie bolts flush with the nut or as per the manufacturer's recommendation, if manufacturer's recommendations are more stringent.

Control groundwater infiltration that will interfere with installation of the CIPP liner. Dewatering may be necessary. Host pipe shall be in a dry condition as prescribed by the CIPP liner manufacturer.

The Engineer shall inspect host pipes prior to lining to determine the pipes acceptance for lining including if additional cleaning is required. The host pipe shall be clean and in a dry condition prior to commencing the lining process.

D. PIPE LINER INSTALLATION

The manufacturer's representative shall be on site to provide training to Contractor's staff. A manufacturer's representative shall be present for at least one complete liner installation and until the Engineer is satisfied that the Contractor's staff is competent in performing this work. A manufacturer's representative shall also provide education to the Engineer on the liner installation and curing process.

Prior to inserting the CIPP liner, a sliding foil protector shall be pulled into the host pipe to protect the CIPP liner from damage.

Installation of the liner into the host pipe shall be in accordance with ASTM F2019.

CCTV camera inspection shall be completed after inflation and prior to curing.

The cured CIPP liner shall be continuous over the entire length of an installation run and be free of material defects. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

Trim the liner to length according to the manufacturer's recommendations. The liner shall provide a smooth transition taper at each end of the pipe liner. There shall not be any gaps between the liner and the host pipe. The ends shall be sealed with an epoxy or resin mixture compatible with the liner and resin system, providing a watertight seal.

E. FINAL ACCEPTANCE AND PAYMENT

Host pipe inspection shall be completed with a CCTV crawler after the liner has been cured. A DVD recording of the inspection shall be provided to the Engineer.

Defects which will or could affect the structural integrity, strength, capacity, or future maintenance of the installed CIPP liner shall be repaired at the Contractor's expense, in a manner approved by the Engineer.

Any disrupted areas shall be restored and stabilized to the satisfaction of the Engineer.

All costs for equipment, material and labor for the CIPP liner work shall be incidental to the contract unit price per foot for the various sizes of CURED IN PLACE PIPE.

F. VOID FILLING

Filling of annular space between the host pipe and the CIPP liner with grout may be required. Filling of annular spaces is not anticipated, however if required, follow the REINFORCED CONCRETE PIPE JOINT REPAIR AND VOID GROUTING section of plan notes on the previous pages and the following:

- Provide sufficient gauges, monitoring devices, and tests to determine the effectiveness of the grout placement
- Do not exceed the pipe liner maximum specified grouting pressure

All costs for filling annular spaces shall be incidental to the contract unit price per gallon for CHEMICAL GROUT VOID FILL for all equipment, intermediate and post cleanup, material and labor required to complete the work. Any overfilling that results in damage to overlying pavement, highway user ride quality, or drainage structure integrity shall be corrected by the Contractor at no expense to the Owner. All corrections shall be approved by the Engineer.

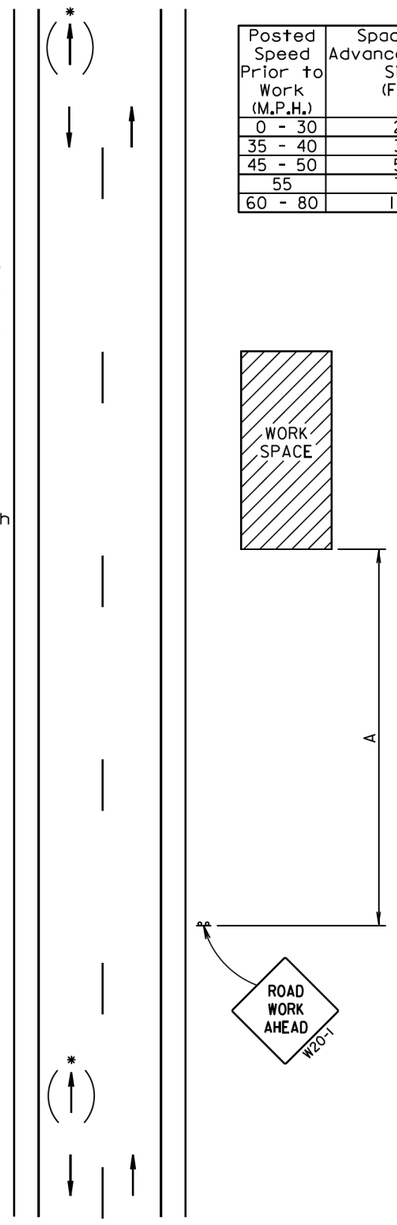
The signs illustrated are not required if the work space is behind a barrier, more than 2 feet behind the curb, or 15 feet or more from the edge of any roadway.

The signs illustrated shall be used where there are distracting situations; such as: vehicles parked on shoulder, vehicles accessing the work site via the highway, and equipment traveling on or crossing the roadway to perform work operations.

The ROAD WORK AHEAD sign may be replaced with other appropriate signs, such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.

* If the work space is on a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.

For short term, short duration, or mobile operations, all signs and channelizing devices may be eliminated if a vehicle with an activated flashing or revolving yellow light is used.



Posted Speed Prior to Work (M.P.H.)	Spacing of Advance Warning Signs (Feet) (A)
0 - 30	200
35 - 40	350
45 - 50	500
55	750
60 - 80	1000

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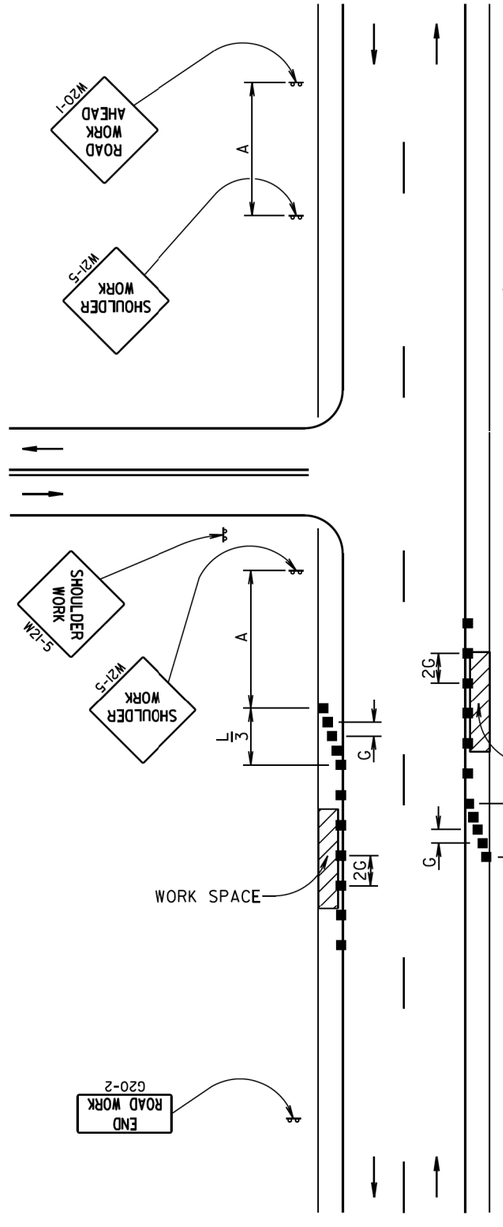
SDDOT

GUIDES FOR TRAFFIC CONTROL DEVICES
WORK BEYOND THE SHOULDER

PLATE NUMBER 634.01

Sheet 1 Of 1



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	500	600	25
50	500	600	50
55	750	660	50
60 - 65	1000	780	50

■ Channelizing Device

The channelizing devices shall be drums or 42" cones if traffic control must remain overnight.

For short duration operations (1 hour or less) all 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.

June 3, 2016

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SDDOT

GUIDES FOR TRAFFIC CONTROL DEVICES
WORK ON SHOULDERS

PLATE NUMBER 634.03

Sheet 1 of 1

PLOT SCALE - 1:200

PLOT NAME - 3

FILE - ...\BEAD0639\634.01 & 634.03.DGN

-PLOTTED FROM - TRAB17982

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	500	25
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.

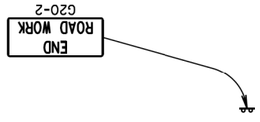
The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short duration operations (1 hour or less).

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 42" cones.

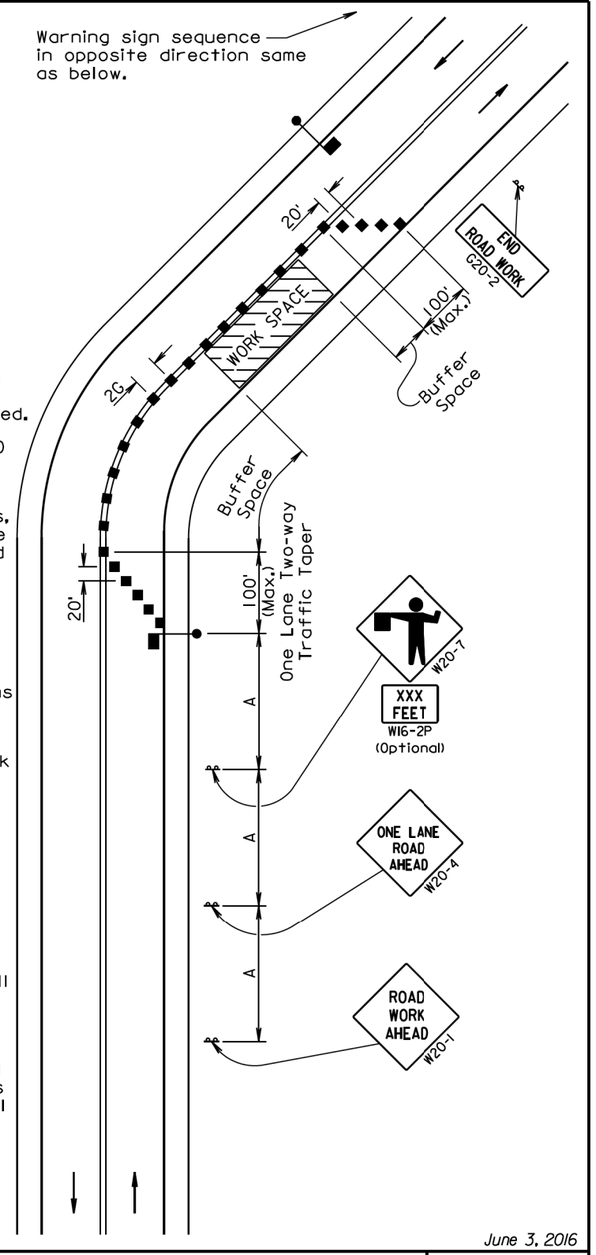
Channelizing devices are not required along the centerline adjacent to work area when pilot cars are utilized for escorting traffic through the work area.



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

The buffer space should be extended so that the two-way traffic taper is placed before a horizontal or vertical curve to provide adequate sight distance for the flagger and queue of stopped vehicles.

The length of A may be adjusted to fit field conditions.

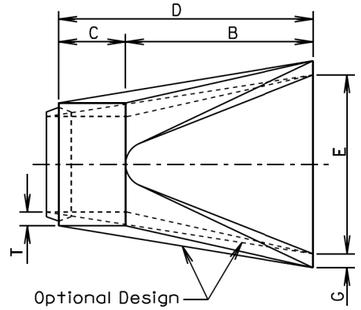


June 3, 2016

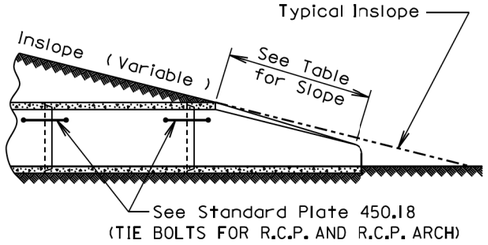
Published Date: 2nd Qtr. 2017	SDDOT	GUIDES FOR TRAFFIC CONTROL DEVICES LANE CLOSURE WITH FLAGGER PROVIDED	PLATE NUMBER 634.23 Sheet 1 of 1

ITEMIZED LIST FOR TRAFFIC CONTROL SIGNS

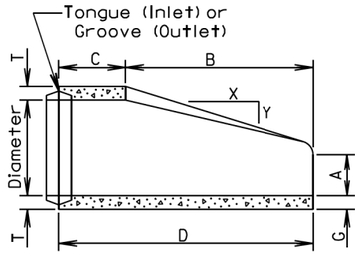
SIGN CODE	SIGN DESCRIPTION	CONVENTIONAL ROAD NUMBER	SIGN SIZE	SQFT PER SIGN	SQFT
W20-1	ROAD WORK AHEAD	4	48" x 48"	16.0	64.0
W20-4	ONE LANE ROAD AHEAD	4	48" x 48"	16.0	64.0
W20-7	FLAGGER (symbol)	4	48" x 48"	16.0	64.0
W21-5	SHOULDER WORK	4	48" x 48"	16.0	64.0
G20-2	END ROAD WORK	4	36" x 18"	4.5	18.0
		CONVENTIONAL ROAD TRAFFIC CONTROL SIGNS SQFT			274.0



TOP VIEW



SLOPE DETAIL

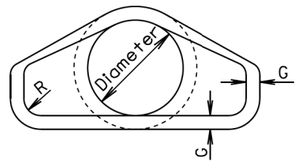


LONGITUDINAL SECTION

GENERAL NOTES:

Lengths of concrete pipe shown on plan sheets are between flared ends only.

Construction of R.C.P. Flared End shall conform to the requirements of Section 990 of the Specifications.

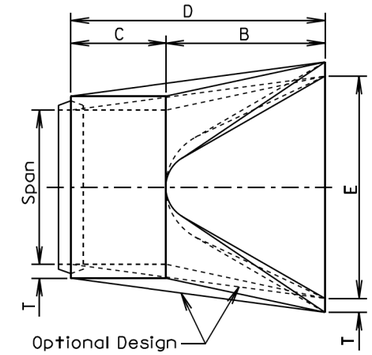


END VIEW

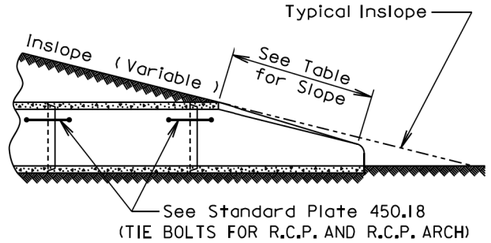
Dia. (in.)	Approx. Wt. of Section (lbs.)	Approx. Slope (X to Y)	T (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	G (in.)	R (in.)
12	530	2.4:1	2	4	24	48 7/8	72 7/8	24	2	1 1/2
15	740	2.4:1	2 1/4	6	27	46	73	30	2 1/4	1 1/2
18	990	2.3:1	2 1/2	9	27	46	73	36	2 1/2	1 1/2
21	1280	2.4:1	2 3/4	9	36	37 1/2	73 1/2	42	2 3/4	1 1/2
24	1520	2.5:1	3	9 1/2	43 1/2	30	73 1/2	48	3	1 1/2
27	1930	2.5:1	3 1/4	10 1/2	49 1/2	24	73 1/2	54	3 1/4	1 1/2
30	2190	2.5:1	3 1/2	12	54	19 3/4	73 3/4	60	3 1/2	1 1/2
36	4100	2.5:1	4	15	63	34 3/4	97 3/4	72	4	1 1/2
42	5380	2.5:1	4 1/2	21	63	35	98	78	4 1/2	1 1/2
48	6550	2.5:1	5	24	72	26	98	84	5	1 1/2
54	8240	2:1	5 1/2	27	65	33 1/4	98 1/4	90	5 1/2	1 1/2
60	8730	1.9:1	6	35	60	39	99	96	5	1 1/2
66	10710	1.7:1	6 1/2	30	72	27	99	102	5 1/2	1 1/2
72	12520	1.8:1	7	36	78	21	99	108	6	1 1/2
78	14770	1.8:1	7 1/2	36	90	21	111	114	6 1/2	1 1/2
84	18160	1.6:1	8	36	90 1/2	21	111 1/2	120	6 1/2	1 1/2
90	20900	1.5:1	8 1/2	41	87 1/2	24	111 1/2	132	6 1/2	6

June 26, 2015

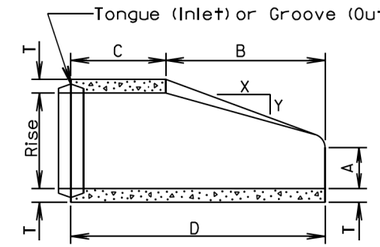
Published Date: 2nd Qtr. 2017	SDDOT	R. C. P. FLARED ENDS	PLATE NUMBER 450.10
			Sheet 1 of 1



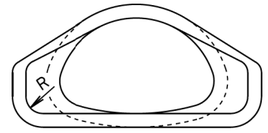
TOP VIEW



SLOPE DETAIL



LONGITUDINAL SECTION



END VIEW

GENERAL NOTES:

Lengths of concrete pipe shown on plan sheets are between flared ends only.

Construction of R.C.P. Arch Flared End shall conform to the requirements of Section 990 of the Specifications.

* Size (in.)	Approximate Weight of Section (lbs.)	Rise (in.)	Span (in.)	Slope (X:Y)	T (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	R (in.)
18	1100	13 1/2	22	3:1	2 1/2	7	27	45	72	36	2
24	1750	18	28 1/2	3:1	3 1/2	8 1/2	39	33	72	48	3
30	3300	22 1/2	36 1/4	3:1	4	9 1/2	50	46	96	60	3
36	4350	26 5/8	43 3/4	3:1	4 1/2	1 1 1/8	60	36	96	72	6
42	5250	31 5/16	51 1/8	3:1	4 1/2	15 13/16	60	36	96	78	6
48	6400	36	58 1/2	3:1	5	21	60	36	96	84	6
54	7850	40	65	3:1	5 1/2	25 1/2	60	36	96	90	6
60	9500	45	73 1/2	3:1	6	31	60	36	96	96	6
72	13550	54	88	2:1	7	31	60	39	99	120	6
84	17950	62	102	2:1	8	28 1/2	83	19	102	144	6

*Equivalent Diameter of Circular R. C. P.

June 26, 2015

Published Date: 2nd Qtr. 2017	SDDOT	R. C. P. ARCH FLARED ENDS	PLATE NUMBER 450.11
			Sheet 1 of 1

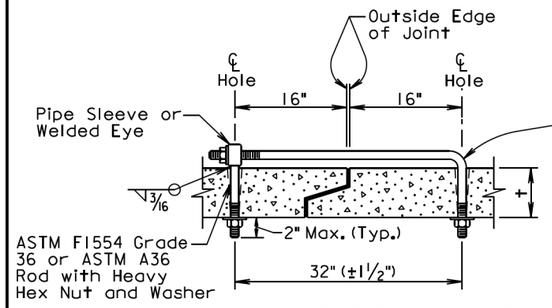
PLOT SCALE - 1:200

PLOT NAME - 5

FILE - ...\BEA00639\450.10 & 450.11.DGN

-PLOTTED FROM - TRAB17882

Wall "t" (in.)	Rod Dia. (in.)	Pipe Sleeve Dia. (nominal)
≤ 3 1/4	5/8	3/4
3 1/2-6 1/2	3/4	1
≥ 7	1	1 1/4



ADJUSTABLE EYE BOLT TIE

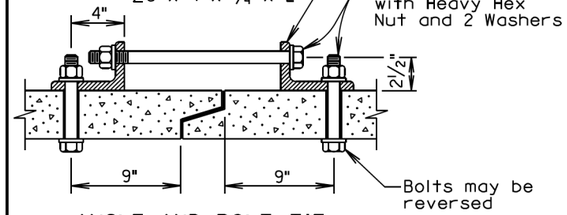
GENERAL NOTES:

Tie bolts shall conform to ASTM F1554 Grade 36 or ASTM A36. Nuts shall be heavy hex conforming to ASTM A563. Washers shall conform to ASTM F436.

Pipe Sleeve shall conform to ASTM A500 or A53, Grade B.

Galvanize adjustible eye bolt tie assembly in accordance with ASTM A153.

Pipe Dia. (in.)	"L" (in.)	Bolt Dia. (in.)
≤ 48	4	3/4
> 48	6	1



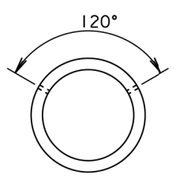
ANGLE AND BOLT TIE

GENERAL NOTES:

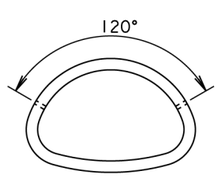
Angles shall conform to ASTM A36.

Bolts shall conform to ASTM A307. Nuts shall be heavy hex conforming to ASTM A563. Washers shall conform to ASTM F436.

Galvanize angles, bolts, nuts, and washers in accordance with ASTM A153.



END VIEW "CIRCULAR"



END VIEW "ARCH"

GENERAL NOTES:

In lieu of the tie bolts detailed above other types of tie bolt connections may be installed as approved by the Office of Bridge Design.

All pipe sections of R.C.P. and R.C.P. Arch shall be tied with tie bolts except for pipe located between drop inlets, manholes, and junction boxes. All pipe sections of pipes that only enter or exit drop inlets, manhole, and junction boxes shall be tied with tie bolts.

There will be no separate measurement or payment for the tie bolts. The cost for furnishing and installing the tie bolts shall be incidental to the contract unit price per foot for the corresponding bid item for R.C.P. or R.C.P. Arch.

February 28, 2013

Published Date: 2nd Qtr. 2017	SDDOT	*TIE BOLTS FOR R.C.P. AND R.C.P. ARCH*	*PLATE NUMBER* 450.18
			Sheet 1 of 1

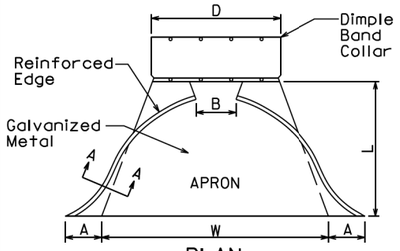
PLOT SCALE - 1:200

PLOT NAME - 6

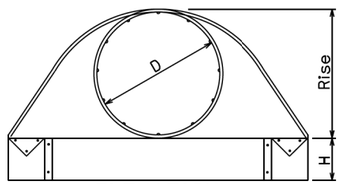
FILE - ...\BEA00639\BLANK & 450.18.DGN

-PLOTTED FROM - TRAB17882

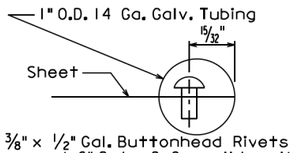
Alternate Type Connector Sections may be used with approval of the Engineer.



PLAN



ELEVATION

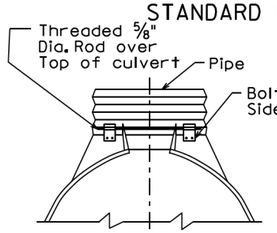


3/8" x 1/2" Gal. Buttonhead Rivets spaced 6" C. to C. Overall length of rivets=0.78"

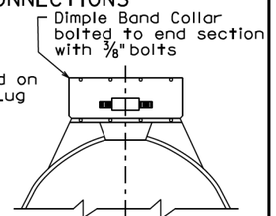
TUBING ATTACHMENT DETAILS
SECTION A-A

Dia. D (in.)	Ga.	DIMENSIONS (in.) A	B	H	L	W	Approx. Slope	Body
12	16	6	6	6	21	24	2½:1	1 Pc.
15	16	7	8	6	26	30	2½:1	1 Pc.
18	16	8	10	6	31	36	2½:1	1 Pc.
21	16	9	12	6	36	42	2½:1	1 Pc.
24	16	10	13	6	41	48	2½:1	1 Pc.
30	14	12	16	8	46	60	2½:1	1 Pc.
36	14	14	19	9	51	72	2½:1	2 Pc.
42	12	16	22	11	60	84	2½:1	2 Pc.
48	12	18	27	12	69	90	2¼:1	2 Pc.
54	12	18	30	12	78	102	2:1	3 Pc.
60	12	18	33	12	84	114	1¾:1	3 Pc.
66	12	18	36	12	87	120	1½:1	3 Pc.
72	12	18	39	12	87	126	1⅓:1	3 Pc.
78	12	18	42	12	87	132	1¼:1	3 Pc.
84	12	18	45	12	87	138	1⅙:1	3 Pc.

STANDARD CONNECTIONS

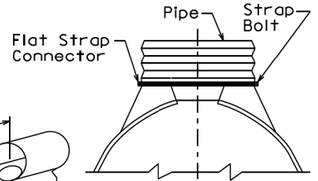


For 30" through 84"

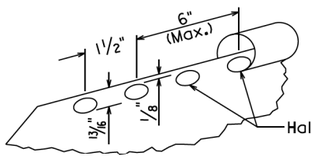


Alternate for all sizes

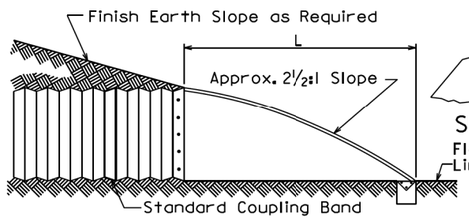
NOTE:
Tubing is slipped over the sheet and rivets or lugs prior to forming operations of the apron.



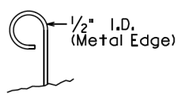
For 12" through 24" only



SECTION A-A (alternate)



TYPICAL CROSS-SECTION



SECTION A-A (alternate)

GENERAL NOTES:

All 3 pc. bodies shall have 12 Ga. sides and 10 Ga. center panels. Width of center panels shall be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams tightly joined by 3/8" Dia. galvanized rivets or bolts.

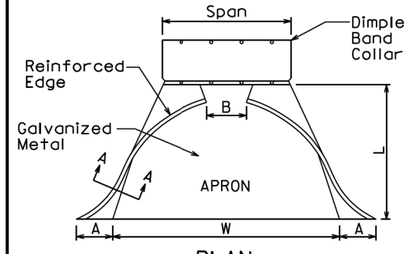
For 60" through 84" sizes, reinforced edges shall be supplemented with galvanized stiffener angles. The angles will be 2" x 2" x 1/4" for 60" through 72" diameters and 2½" x 2½" x 1/4" for 78" and 84" diameters. The angles shall be attached by 3/8" diameter galvanized nuts and bolts.

Rivets and Bolts shall be 3/8" Dia. Min. for 10 Ga. and 12 Ga. sheet, and 5/16" Dia. Min. for 14 Ga. and 16 Ga. sheets. Tighten nuts with torque wrench to 25 lbs. torque.

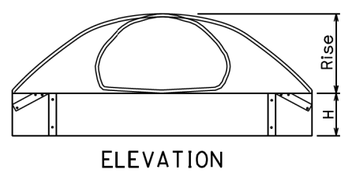
March 31, 2000

Published Date: 2nd Qtr. 2017	SDDOT	C.M.P. FLARED ENDS	PLATE NUMBER 450.35
			Sheet 1 of 1

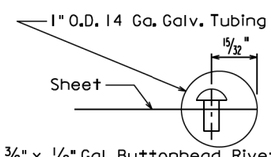
Alternate Type Connector Sections may be used with approval of the Engineer.



PLAN



ELEVATION

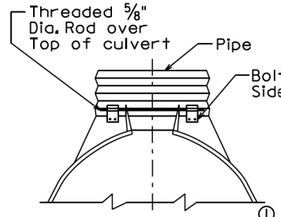


3/8" x 1/2" Gal. Buttonhead Rivets spaced 6" C. to C. Overall length of rivets=0.78"

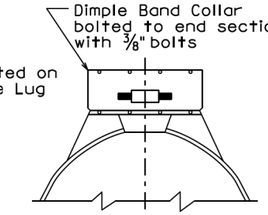
TUBING ATTACHMENT DETAILS
SECTION A-A

Span x Rise (in.)x(in.)	Equiv. Dia. (in.)	Ga.	APPROX. DIMENSIONS (in.) A	B	H	L	W	Approx. Slope	Body
17x13	15	16	7	9	6	19	30	2½:1	1 Pc.
21x15	18	16	7	10	6	23	36	2½:1	1 Pc.
24x18	21	16	8	12	6	28	42	2½:1	1 Pc.
28x20	24	16	9	14	6	32	48	2½:1	1 Pc.
35x24	30	14	10	16	6	39	60	2½:1	1 Pc.
42x29	36	14	12	18	8	46	75	2½:1	1 Pc.
49x33	42	12	13	21	9	53	85	2½:1	2 Pc.
57x38	48	12	16	26	12	63	90	2½:1	2 Pc.
64x43	54	12	18	30	12	70	102	2¼:1	2 Pc.
71x47	60	12	18	33	12	77	114	2¼:1	3 Pc.
77x52	66	12	18	36	12	77	126	2:1	3 Pc.
83x57	72	12	18	39	12	77	133	2:1	3 Pc.

STANDARD CONNECTIONS



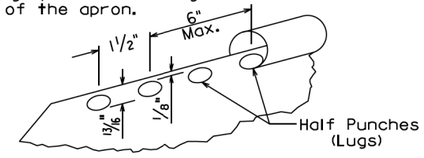
For 17"x13" through 83"x57" ①



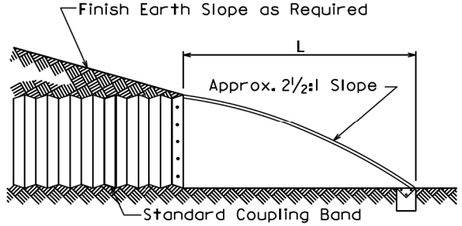
Alternate for all sizes

① For 17" through 28" span pipe-arches a flat strap connector may be used in place of the rod connection. Strap connector shall be 1" wide, 12 ga. strap with standard 6" long x 1/2" dia. bond bolt and nut.

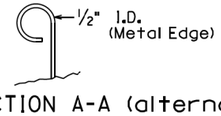
NOTE:
Tubing is slipped over the sheet and rivets or lugs prior to forming operations of the apron.



SECTION A-A (alternate)



TYPICAL CROSS-SECTION



SECTION A-A (alternate)

GENERAL NOTES:

All 3 pc. bodies shall have 12 Ga. sides and 10 Ga. center panels. Width of center panels shall be greater than 20% of the pipe periphery. Multiple panel bodies shall have lap seams tightly joined by 3/8" Dia. galvanized rivets or bolts.

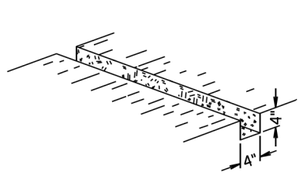
For 77" x 52" and 83" x 57" sizes, reinforced edges shall be supplemented with galvanized stiffener angles. The angles will be 2" x 2" x 1/4" for both the 77" x 52" size and the 83" x 57" size. The angles shall be attached by 3/8" Dia. galvanized nuts and bolts.

Rivets and Bolts shall be 3/8" Dia. Min. for 10 Ga. and 12 Ga. sheet, and 5/16" Dia. Min. for 14 Ga. and 16 Ga. sheets. Tighten nuts with torque wrench to 25 lbs. torque.

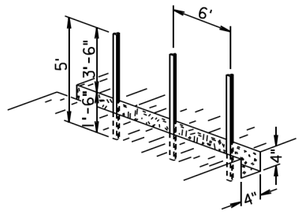
March 31, 2000

Published Date: 2nd Qtr. 2017	SDDOT	C.M.P. ARCH FLARED ENDS	PLATE NUMBER 450.36
			Sheet 1 of 1

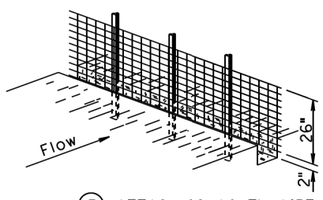
MANUAL LOW FLOW SILT FENCE INSTALLATION



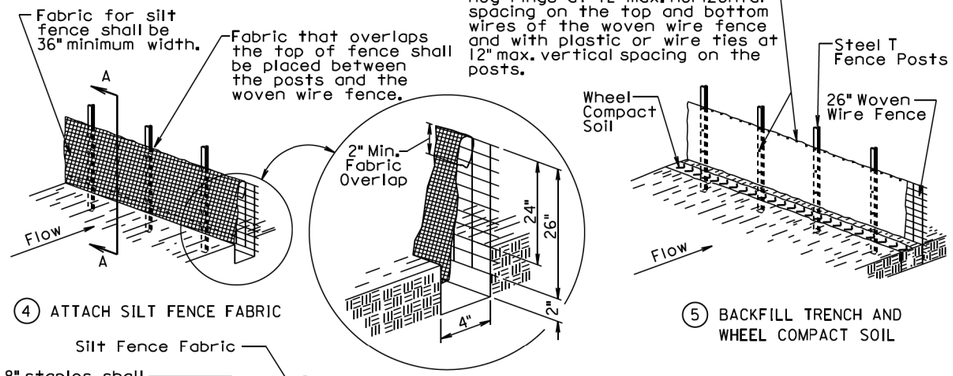
(1) EXCAVATE TRENCH



(2) DRIVE STEEL T FENCE POSTS

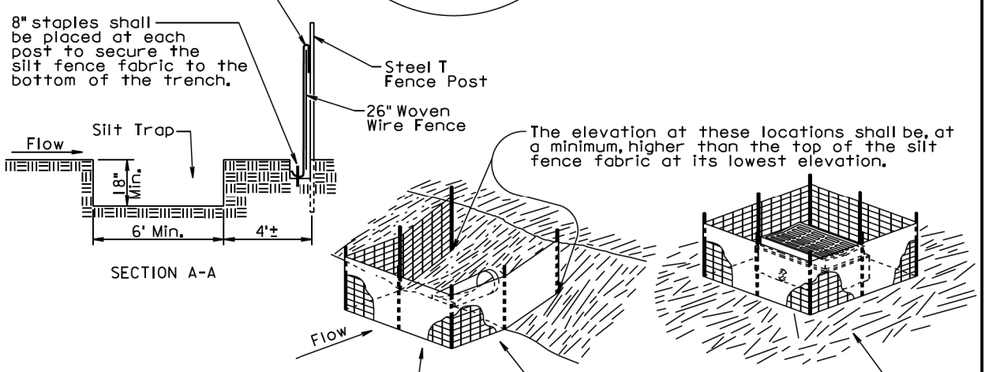


(3) ATTACH 26" WOVEN WIRE FENCE TO POSTS



(4) ATTACH SILT FENCE FABRIC

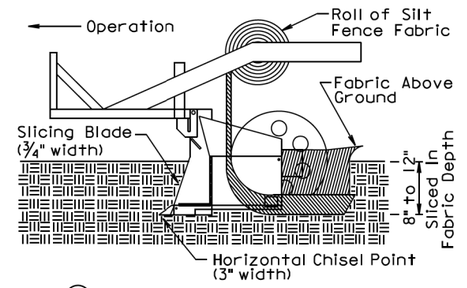
(5) BACKFILL TRENCH AND WHEEL COMPACT SOIL



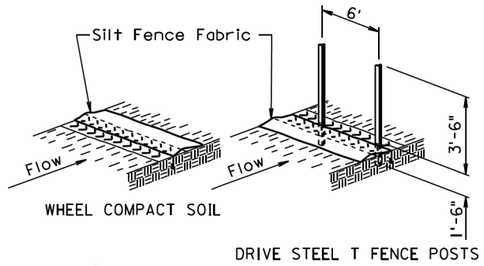
December 23, 2003

Published Date: 2nd Qtr. 2017	SDDOT	LOW FLOW SILT FENCE AND SILT TRAP	PLATE NUMBER 734.04 Sheet 1 of 2

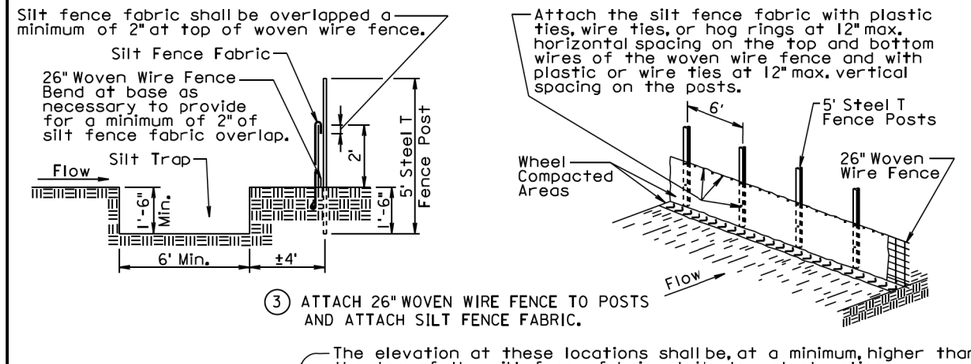
MACHINE SLICED LOW FLOW SILT FENCE INSTALLATION



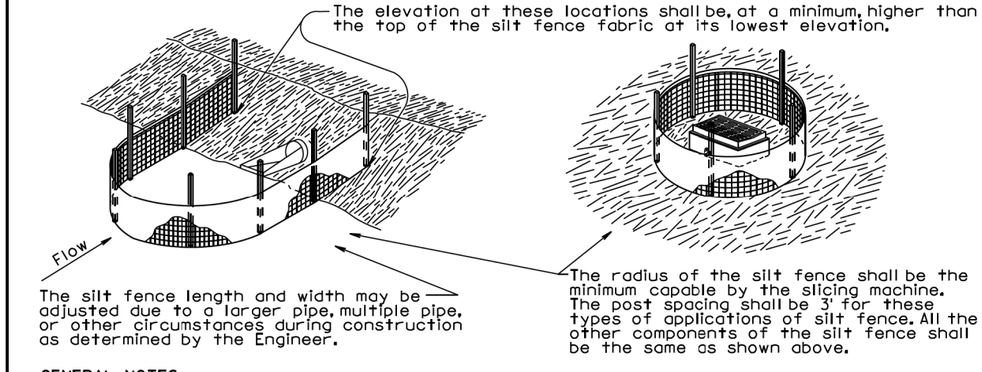
(1) INSTALL SILT FENCE FABRIC BY MACHINE SLICING METHOD.



(2) WHEEL COMPACT SOIL ABOVE SLICED IN PORTION OF FABRIC AND THEN DRIVE STEEL T FENCE POSTS.



(3) ATTACH 26" WOVEN WIRE FENCE TO POSTS AND ATTACH SILT FENCE FABRIC.



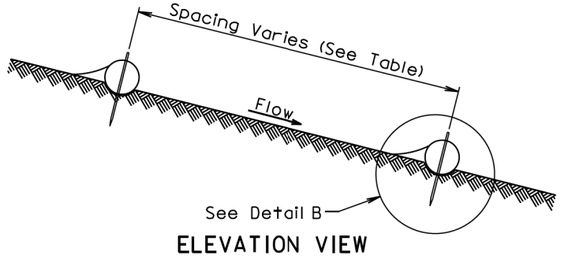
GENERAL NOTES:

A silt trap shall be provided when specified by a plan note. All costs for constructing the silt trap shall be incidental to the contract unit price per cubic yard for "Silt Trap".

If a trench can not be dug or the silt fence fabric can not be sliced in due to the type of earthen material (such as rock), then a row of 30 to 40 pound sandbags butted end to end shall be provided on top of the extra length of silt fence fabric to prevent underflow.

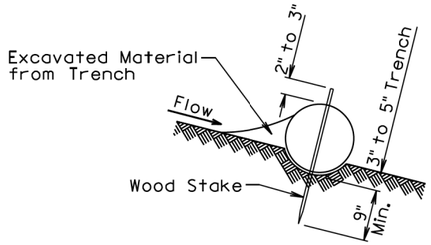
December 23, 2003

Published Date: 2nd Qtr. 2017	SDDOT	LOW FLOW SILT FENCE AND SILT TRAP	PLATE NUMBER 734.04 Sheet 2 of 2

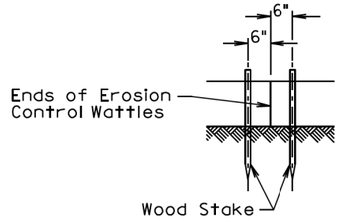


ELEVATION VIEW
CUT OR FILL SLOPE INSTALLATION

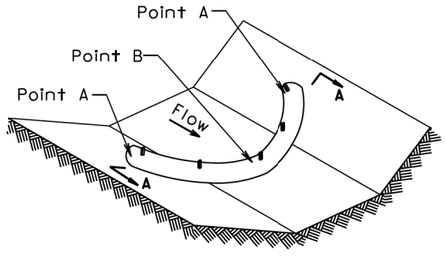
CUT OR FILL SLOPE INSTALLATION	
Slope	Spacing (Ft)
1:1	10
2:1	20
3:1	30
4:1	40



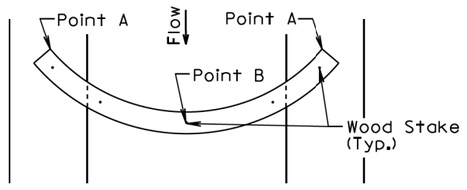
DETAIL B
(TYPICAL OF ALL INSTALLATIONS)



DETAIL C

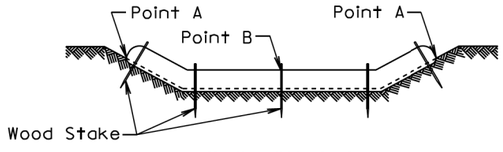


ISOMETRIC VIEW
DITCH INSTALLATION



PLAN VIEW
DITCH INSTALLATION

DITCH INSTALLATION	
Grade	Spacing (Ft)
2%	150
3%	100
4%	75
5%	50



SECTION A-A

December 23, 2004

Published Date: 2nd Qtr. 2017	SDDOT	EROSION CONTROL WATTLE	PLATE NUMBER 734.06
			Sheet 1 of 2

GENERAL NOTES:

At cut or fill slope installations, wattles shall be installed along the contour and perpendicular to the water flow.

At ditch installations, point A must be higher than point B to ensure that water flows over the wattle and not around the ends.

The Contractor shall dig a 3" to 5" trench, install the wattle tightly in the trench so that daylight can not be seen under the wattle, and then compact the soil excavated from the trench against the wattle on the uphill side. See Detail B.

The stakes shall be 1"x2" or 2"x2" wood stakes, however, other types of stakes such as rebar may be used only if approved by the Engineer. The stakes shall be placed 6" from the ends of the wattles and the spacing of the stakes along the wattles shall be 3' to 4'.

Where installing running lengths of wattles, the Contractor shall butt the second wattle tightly against the first and shall not overlap the ends. See Detail C.

The Contractor and Engineer shall inspect the erosion control wattles once every week and within 24 hours after every rainfall event greater than ½". The Contractor shall remove, dispose, or reshape the accumulated sediment when necessary as determined by the Engineer.

Sediment removal, disposal, or necessary shaping shall be as directed by the Engineer. All costs for removing accumulated sediment, disposal of sediment, and necessary shaping shall be incidental to the contract unit price per cubic yard for "Remove Sediment".

All costs for furnishing and installing the erosion control wattles including labor, equipment, and materials shall be incidental to the contract unit price per foot for the corresponding erosion control wattle bid item.

All costs for removing the erosion control wattle from the project including labor, equipment, and materials shall be incidental to the contract unit price per foot for "Remove Erosion Control Wattle".

December 23, 2004

Published Date: 2nd Qtr. 2017	SDDOT	EROSION CONTROL WATTLE	PLATE NUMBER 734.06
			Sheet 2 of 2