

OKLAHOMA DEPARTMENT OF TRANSPORTATION
ROADWAY DESIGN STANDARD DRAWINGS

For use with the 2019 ODOT Standard Specifications and effective April 10, 2026

SHEET NO.	DESCRIPTION	STANDARD	REV. NO.
EROSION CONTROL	R-1 BEST MANAGEMENT PRACTICE REFERENCE MATRIX	BMPR-	0
	R-2 TYPICAL TEMPORARY EROSION / SEDIMENT CONTROL APPLICATIONS	TESCA-	0
	R-3 EROSION CONTROL / TURF REINFORCEMENT MAT INSTALLATION DETAILS (1 OF 2 SHEETS)	ECTRM1-	0
	R-4 EROSION CONTROL / TURF REINFORCEMENT MAT INSTALLATION DETAILS (2 OF 2 SHEETS)	ECTRM2-	0
	R-5 INLET PROTECTION (AGGREGATE AND REINFORCED SILT FENCE APPLICATIONS)	IPD-	0
	R-6 REINFORCED SILT FENCE INSTALLATION AND APPLICATIONS	RSF-	0
	R-7 TEMPORARY SILT DIKE APPLICATIONS	TSD-	0
	R-8 TEMPORARY FIBER LOG APPLICATIONS	TFL-	0
	R-9 TEMPORARY ROCK FILTER DAM APPLICATIONS	TRFD-	0
	R-10 TEMPORARY SEDIMENT BASIN	TSB-	1
	R-11 STABILIZED CONSTRUCTION EXIT	SCE-	0
	R-12 TEMPORARY SLOPE DRAIN	SD-	0
	R-13 CONCRETE WASHOUT APPLICATIONS	CWA-	0
	R-14 SOLID SLAB SODDING	SSS-2-	1
PAVEMENTS	R-15 ASPHALT SURFACING CONSTRUCTION DETAILS	ASCD-6-	1
	R-16 CONCRETE SURFACING CONSTRUCTION DETAILS	CSCD-6-	3
	R-17 JOINTS AND SEALERS – LONGITUDINAL, EXPANSION / ISOLATION & CONTRACTION	LECS-5-	3
	R-18 LOAD TRANSFER UNITS FOR CONCRETE PAVEMENT JOINTS	LTU-5-	1
	R-19 CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DETAILS	CRCPI-4-	1
	R-20 CONTINUOUSLY REINFORCED CONCRETE PAVEMENT TERMINAL JOINTS	CRCP2-4-	1
	R-21 PAVEMENT RECONSTRUCTION DETAILS	PR-4-	1
	R-22 PORTLAND CEMENT CONCRETE PAVEMENT REPAIR	PCPR-4-	2
	R-23 PAVEMENT EDGE DRAIN	PED-4-	1
	R-24 PAVEMENT SAFETY EDGE	PSE-2-	1
	R-25 PRECAST STANDARD MEDIAN DRAIN	PSMD-2-	3
	R-26 CAST-IN-PLACE STANDARD MEDIAN DRAINS (18" TO 36" PIPES)	SMD-4-	3
	R-27 Reserved		
DRAINAGE STRUCTURES	R-28 CULVERT END TREATMENT SINGLE PIPE INSTALLATION 1 TO 3 SAFETY SLOPE	CET3S-1-	0
	R-29 CULVERT END TREATMENT SINGLE PIPE INSTALLATION 1 TO 4 SAFETY SLOPE	CET4S-4-	3
	R-30 CULVERT END TREATMENT SINGLE PIPE INSTALLATION 1 TO 6 SAFETY SLOPE	CET6S-4-	3
	R-31 CULVERT END TREATMENT DOUBLE PIPE INSTALLATION 1 TO 3 SAFETY SLOPE	CET3D-1-	0
	R-32 CULVERT END TREATMENT DOUBLE PIPE INSTALLATION 1 TO 4 SAFETY SLOPE	CET4D-4-	3
	R-33 CULVERT END TREATMENT DOUBLE PIPE INSTALLATION 1 TO 6 SAFETY SLOPE	CET6D-4-	3
	R-34 PREFABRICATED CULVERT END SECTIONS	PCES-5-	2
	R-35 SLOPED CONCRETE END SECTIONS	SCES-4-	1
	R-36 CAST-IN-PLACE CONCRETE DROP INLETS FOR R. C. BOXES (3' x 2' TO 6' x 6')	CDIB-2-	3
	R-37 CAST-IN-PLACE CONCRETE DROP INLETS FOR 30 DEG. SKEW R. C. BOXES (3' x 2' TO 6' x 6')	CDIB30-2-	3
	R-38 CAST-IN-PLACE CONCRETE DROP INLET FOR 18" TO 72" R. C. PIPES	CDIP-2-	3
	R-39 CAST-IN-PLACE CONCRETE DROP INLET FOR 30 DEG. SKEW 18" TO 72" R. C. PIPES	CDIP30-2-	3
	R-40 CAST-IN-PLACE GRATED PIPE DROP INLET (18" TO 42" PIPES)	GPI-5-	3
	R-41 STORM SEWER CONSTRUCTION DETAILS	SSCD-4-	2
	R-42 PRECAST CURB INLET (DESIGNS 1,2, AND 3)	PCI-1-	2
	R-43 PRECAST JUNCTION BOX (KEYED WITH PRECAST CURB INLETS)	PJB-	1
	R-44 PRECAST GRATED PIPE DROP INLET	PGPI-	0
	R-45 CAST-IN-PLACE CURB INLETS	CI-2-	3
	R-46 STORM SEWER INLET FRAMES (CURB INLETS)	SSIF-5-	1
	R-47 CAST IRON GRATES (CURB INLETS)	CIG-4-	1
	R-48 MANHOLE FRAME AND COVER	MFC-5-	2
SHEET NO.	DESCRIPTION	STANDARD	REV. NO.
DRAINAGE STRUCTURES	R-49 CAST-IN-PLACE MANHOLES AND JUNCTION BOXES	MJB-4-	2
	R-50 PRECAST ROUND MANHOLE	PRM-1-	3
	R-51 PRECAST SQUARE MANHOLE	PSM-1-	3
	R-52 PRECAST MANHOLE DETAILS	PMD-1-	1
	R-53 PRECAST CONCRETE DROP INLETS FOR R.C. BOXES (4'X2' TO 5'X5')	PCDIB-	0
	R-54 PRECAST CONCRETE DROP INLETS FOR 30 DEG. SKEW R.C. (4'X2' TO 5'X5')	PCDIB30-	0
	R-55 PRECAST CONCRETE DROP INLETS FOR 18" TO 36" R.C. PIPES	PCDIP-	0
	R-56 PRECAST CONCRETE DROP INLETS FOR 30 DEG. SKEW 18" TO 36" R.C. PIPES	PCDIP30-	0
	R-57 CONCRETE CULVERT INSTALLATION (1 OF 2 SHEETS)	CCI-1-	0
	R-58 CONCRETE CULVERT INSTALLATION (2 OF 2 SHEETS)	CCI-2-	0
	R-59 METAL CULVERT INSTALLATION (1 OF 3 SHEETS)	MCI-1-	0
	R-60 METAL CULVERT INSTALLATION (2 OF 3 SHEETS)	MCI-2-	0
	R-61 METAL CULVERT INSTALLATION (3 OF 3 SHEETS)	MCI-3-	0
	R-62 THERMOPLASTIC CULVERT INSTALLATION	TCI-1-	1
CULVERT INSTALLATION	R-63 PIPE BEDDING AND BACKFILL	PBB-1-	4
	R-64 STANDARD BOX INSTALLATION	SBI-5-	2
	R-65 PIPE UNDERDRAIN INSTALLATION	PUD-4-	1
	R-66 CONCRETE LONGITUDINAL BARRIER (MASH F-SHAPE)	CLB-2-	2
	R-67 MAILBOX INSTALLATION	MI-4-	2
	R-68 RURAL DRIVEWAY INSTALLATION	RDI-4-	1
	R-69 PAVED DITCHES AND FLUMES	DC-4-	2
	R-70 PAVEMENT DROP-OFF TREATMENTS	PDT-2-	3
	R-71 RIGHT-OF-WAY FENCE STYLE WWF (WOVEN WIRE FENCE)	RWF1-3-	1
	R-72 RIGHT-OF-WAY FENCE STYLE SWF (STRAND WIRE FENCE)	RWF2-3-	1
	R-73 RIGHT-OF-WAY FENCE STYLE CLF (CHAIN LINK FENCE)	RWF3-3-	2
	R-74 SUPERELEVATION	SUEL1-4-	1
	R-75 SUPERELEVATION TABLES LOW SPEED URBAN STREETS	SUEL2-4-	1
	R-76 SUPERELEVATION TABLES (e max = 6%)	SUEL3-4-	1
MISCELLANEOUS CONSTRUCTION	R-77 SUPERELEVATION TABLES (e max = 8%)	SUEL4-4-	1
	R-78 WHEELCHAIR RAMPS	WCR-4-	3
	R-79 TACTILE WARNING DEVICES	TWD-2-	3

BOTH THE 2009 AND THE 2019 ROADWAY STANDARDS ARE AVAILABLE FOR DOWNLOAD OR PRINT FROM:
<https://oklahoma.gov/odot/business-center/pre-construction-design/roadway-design.html>

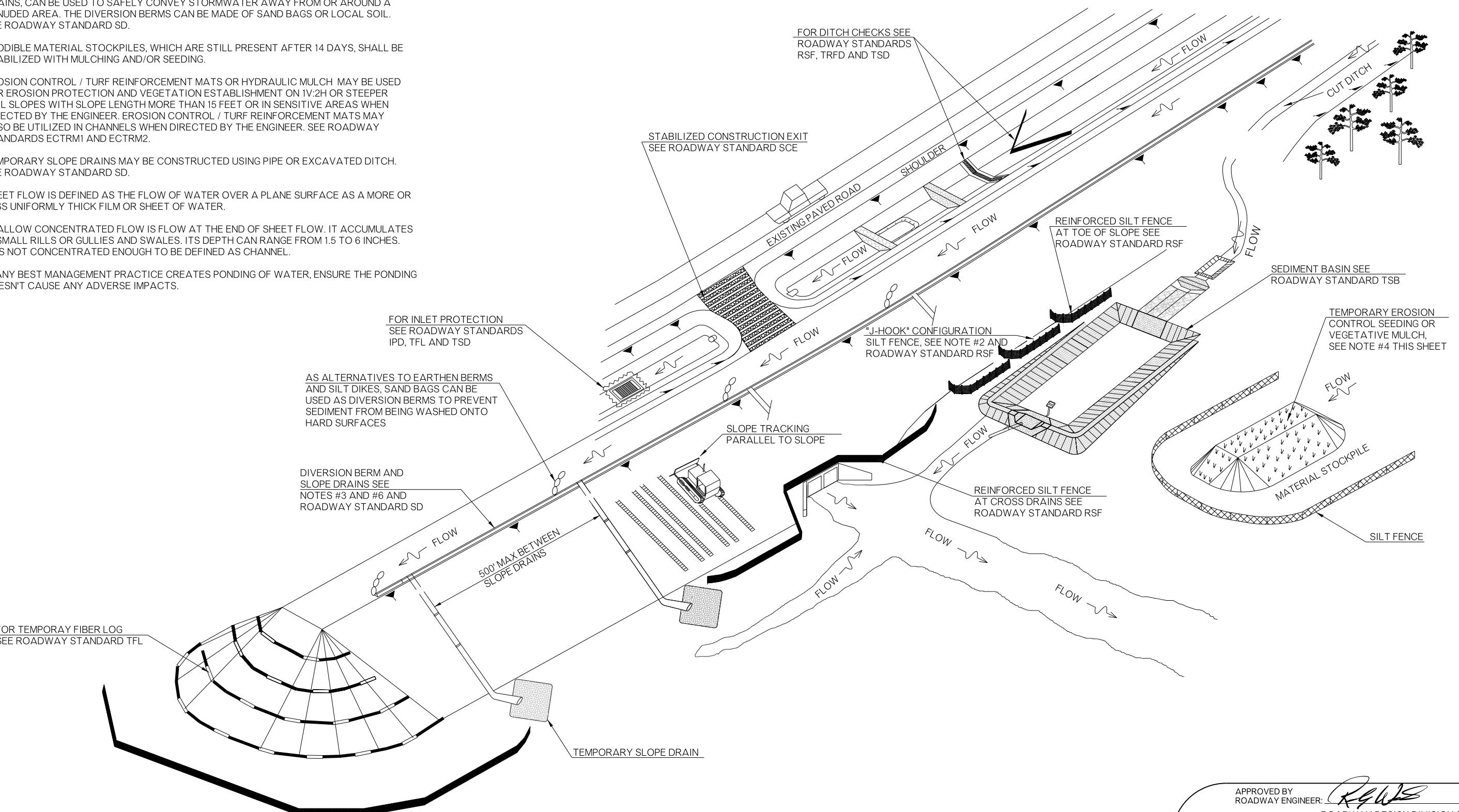
FOR DISCONTINUED STANDARDS, QUESTIONS OR COMMENTS, CONTACT THE ROADWAY STANDARDS ENGINEER
 AT (405) 215-6408 OR BY EMAIL AT RDWYSTDS@ODOT.ORG

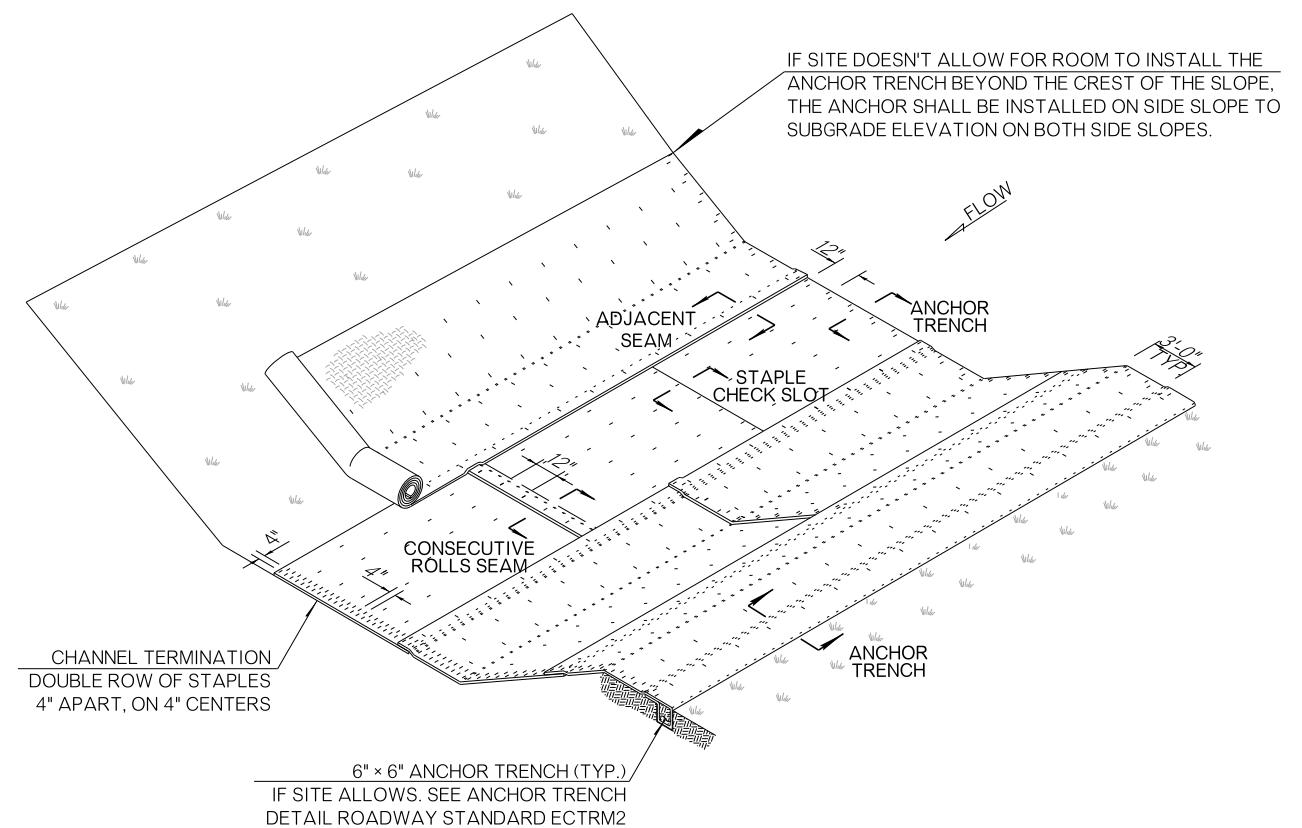
BEST MANAGEMENT PRACTICE REFERENCE MATRIX

BEST MANAGEMENT PRACTICE (BMP)	STANDARD DRAWING NUMBER	PLAN SYMBOL	MATERIAL REFERENCES	CONSTRUCTION REFERENCES	USAGE GUIDELINES
REINFORCED SILT FENCE (AS PERIMETER CONTROL)	RSF	XXXXXXX	221.02C 712.06	221.04C	REINFORCED SILT FENCE, INSTALLED AS A TEMPORARY PERIMETER CONTROL AT THE BOTTOM OF BARREN SLOPES, AROUND DISTURBED CONSTRUCTION AREAS AND TEMPORARY SOIL STOCKPILES, SHOULD RETAIN THE SOIL ON DISTURBED LAND UNTIL CONSTRUCTION ACTIVITIES ARE SUFFICIENTLY COMPLETED TO ALLOW REVEGETATION AND PERMANENT SOIL STABILIZATION.
TEMPORARY SLOPE DRAIN	SD	— TSD —	221.02A	221.04A	A TEMPORARY SLOPE DRAIN IS CONSTRUCTED WITH A FLEXIBLE PIPE OR CONDUIT EXTENDING FROM THE TOP OF A CUT OR FILL SLOPE INTO A BED OF RIP RAP DOWN SLOPE. THE PURPOSE OF THE TEMPORARY SLOPE DRAIN IS TO CONVEY STORMWATER RUNOFF DOWN THE FACE OF THE SLOPE WITHOUT CAUSING EROSION ON THE SLOPE. THE TEMPORARY EARTHEN BERM IS USED TO REDUCE SLOPE LENGTH AND DIVERT RUNOFF TO THE TEMPORARY SLOPE DRAIN PIPE. MAXIMUM DRAINAGE AREA IS 0.50 ACRE.
TEMPORARY FIBER LOG	TFL	—■■—	221.02H	221.04H	TEMPORARY FIBER LOGS ARE APPROPRIATE FOR VELOCITY REDUCTION AND CONTROL OF SEDIMENT TRANSPORT, MOST NOTABLY ON SLOPES. TEMPORARY FIBER LOGS ARE NOT TO BE USED IN ACTIVE STREAMS.
TEMPORARY SEDIMENT BASIN	TSB	TYPE #	221.02E	221.04E	TEMPORARY SEDIMENT BASINS ARE USED TO REDUCE TURBIDITY OF CONSTRUCTION STORMWATER RUNOFF DURING GRADING.
STABILIZED CONSTRUCTION EXIT	SCE	— SCE —	713.03		STABILIZED CONSTRUCTION EXITS ARE INSTALLED AT POINTS OF VEHICULAR INGRESS AND EGRESS. THE STABILIZED CONSTRUCTION ENTRANCES REDUCE THE AMOUNT OF SEDIMENT TRANSPORTED ONTO PAVED PUBLIC TRAVEL WAYS BY CONSTRUCTION EQUIPMENT AND OTHER MOTOR VEHICLES.
DITCH CHECK STRUCTURES	STANDARD DRAWING NUMBER	PLAN SYMBOL	MATERIAL REFERENCES	CONSTRUCTION REFERENCES	INSTALL DITCH CHECKS TO CONTROL RUNOFF VELOCITY, TRAP SEDIMENTS AND REDUCE EROSION. DRAINAGE AREA, DITCH GRADIENT AND SOIL TYPE AID IN SELECTING THE PROPER DITCH CHECK.
TEMPORARY ROCK FILTER DAM (AS DITCH CHECK)	TRFD	— RFD * —	221.02G 712.02, 713.03, 732.09	221.04G	TEMPORARY ROCK FILTER DAM DITCH CHECKS ARE CONSTRUCTED ACROSS THE DITCH OR SWALE TO LOWER THE VELOCITY OF CONCENTRATED WATER FLOWS AND CAPTURE SEDIMENT.
TEMPORARY ROCK FILTER DAM (WITH SEDIMENT TRAP)	TRFD	TYPE *	221.02G 712.02, 713.03, 732.09	221.04G	A TEMPORARY ROCK FILTER DAM DITCH CHECK WITH SEDIMENT TRAP IS USUALLY USED AT THE END OF A SERIES OF ROCK FILTER DAM DITCH CHECKS. THE PRIMARY PURPOSE IS TO INTERCEPT SEDIMENT AND, SECONDLY, REDUCE VELOCITY. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM EROSION, SINCE WATER WILL FLOW OVER AND AROUND THE DAM.
TEMPORARY SILT DIKE (AS DITCH CHECK)	TSD	△△△	221.02F 735.07	221.04F	THE PRIMARY PURPOSE OF A TEMPORARY SILT DIKE DITCH CHECK IS TO CONTROL THE SEDIMENT WHILE ITS SECONDARY PURPOSE IS TO SLOW THE VELOCITY OF THE WATER, THEREBY CONTROLLING THE EROSION OF THE SOILS IN THE DITCH.
REINFORCED SILT FENCE (AS DITCH CHECK)	RSF	+	221.02C AASHTO M288	221.04C	REINFORCED SILT FENCE DITCH CHECKS ARE PRIMARILY USED IN ROADSIDE DITCHES AND AREAS OF SHEET FLOW.
INLET PROTECTION STRUCTURES	STANDARD DRAWING NUMBER	PLAN SYMBOL	MATERIAL REFERENCES	CONSTRUCTION REFERENCES	CONFIGURATIONS MAY BE ADJUSTED WITH APPROVAL OF THE ENGINEER FOR TRAVELWAY SAFETY, WATER FLOW, SOIL OR INSTALLATION CHALLENGES.
FIBER LOG (AS INLET PROTECTION)	TFL	— IP1 —	221.02H	221.04H	FIBER LOG INLET PROTECTION PROVIDES SEDIMENT TRAPPING BY PONDING STORMWATER TO A DEPTH EQUAL TO OR LESS THAN THE FIBER LOG DIAMETER. ENSURE POTENTIAL PONDING WILL NOT HAVE ADVERSE IMPACTS.
AGGREGATE INLET PROTECTION	IPD	— IP2 —	221.02D	221.04D	THE ELEVATION OF THE TOP OF THE REQUIRED STONE BERM SHALL BE A MINIMUM OF 1.5 FEET ABOVE THE ELEVATION OF THE INLET WORKING POINT AND A MINIMUM OF 6 INCHES BELOW THE ELEVATION OF THE OUTSIDE EDGE OF THE INSIDE SHOULDER.
REINFORCED SILT FENCE (AS INLET PROTECTION)	IPD	— IP3 —	221.02C	221.04C	REINFORCED SILT FENCE INLET PROTECTION PROVIDES SEDIMENT TRAPPING BY PONDING STORMWATER TEMPORARILY BEFORE IT ENTERS THE INLET. ENSURE POTENTIAL PONDING WILL NOT HAVE ADVERSE IMPACTS.

GENERAL NOTES

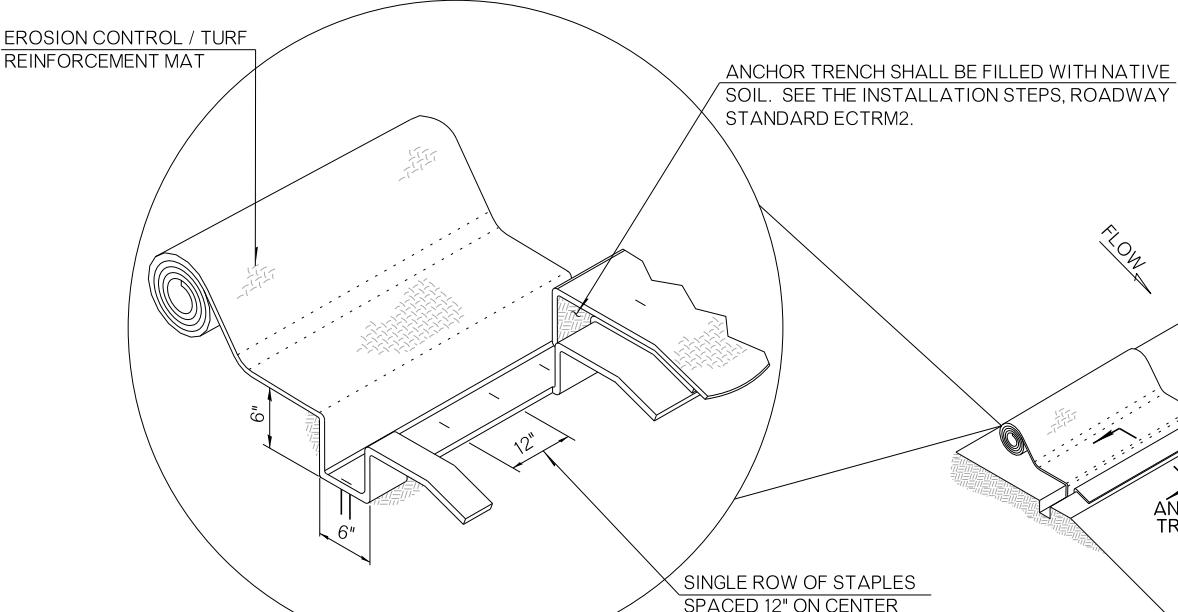
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- "J-HOOK" CONFIGURATION SILT FENCE APPLICATIONS ARE TO BE USED IN CONJUNCTION WITH PERIMETER SILT FENCE WHEN STORMWATER RUNOFF IS IN TWO DIRECTIONS (DOWN A FILL SLOPE AND DOWN GRADIENT ALONG THE RIGHT-OF-WAY).
- FOR SHEET FLOW OR NON-CONCENTRATED FLOW, DIVERSION BERMS, AS PART OF SLOPE DRAINS, CAN BE USED TO SAFELY CONVEY STORMWATER AWAY FROM OR AROUND A DENUDED AREA. THE DIVERSION BERMS CAN BE MADE OF SAND BAGS OR LOCAL SOIL. SEE ROADWAY STANDARD SD.
- ERODIBLE MATERIAL STOCKPILES, WHICH ARE STILL PRESENT AFTER 14 DAYS, SHALL BE STABILIZED WITH MULCHING AND/OR SEEDING.
- EROSION CONTROL / TURF REINFORCEMENT MATS OR HYDRAULIC MULCH MAY BE USED FOR EROSION PROTECTION AND VEGETATION ESTABLISHMENT ON 1V:2H OR STEEPER SOIL SLOPES WITH SLOPE LENGTH MORE THAN 15 FEET OR IN SENSITIVE AREAS WHEN DIRECTED BY THE ENGINEER. EROSION CONTROL / TURF REINFORCEMENT MATS MAY ALSO BE UTILIZED IN CHANNELS WHEN DIRECTED BY THE ENGINEER. SEE ROADWAY STANDARDS ECTRMI1 AND ECTRMI2.
- TEMPORARY SLOPE DRAINS MAY BE CONSTRUCTED USING PIPE OR EXCAVATED DITCH. SEE ROADWAY STANDARD SD.
- SHEET FLOW IS DEFINED AS THE FLOW OF WATER OVER A PLANE SURFACE AS A MORE OR LESS UNIFORMLY THICK FILM OR SHEET OF WATER.
- SHALLOW CONCENTRATED FLOW IS FLOW AT THE END OF SHEET FLOW. IT ACCUMULATES IN SMALL RILLS OR GULLIES AND SWALES. ITS DEPTH CAN RANGE FROM 1.5 TO 6 INCHES. IT IS NOT CONCENTRATED ENOUGH TO BE DEFINED AS CHANNEL.
- IF ANY BEST MANAGEMENT PRACTICE CREATES PONDING OF WATER, ENSURE THE PONDING DOESN'T CAUSE ANY ADVERSE IMPACTS.





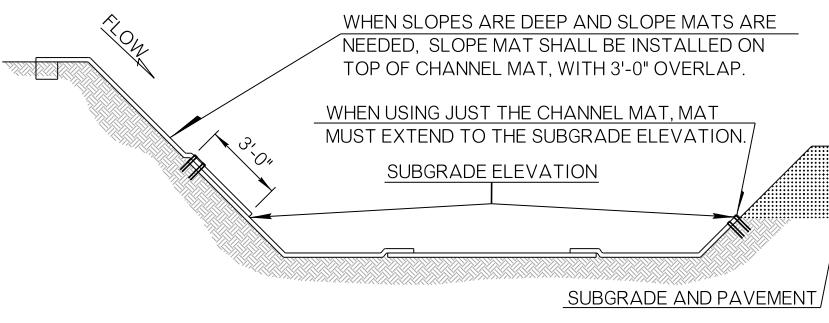
CHANNEL INSTALLATION

NOTE: FOR DETAILS OF EACH SECTION SHOWN
SEE ROADWAY STANDARD EROSION CONTROL / TURF
REINFORCEMENT MAT INSTALLATION DETAILS (2 OF 2 SHEETS)

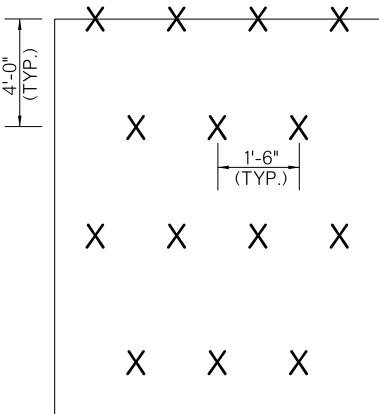


ANCHOR TRENCH DETAIL

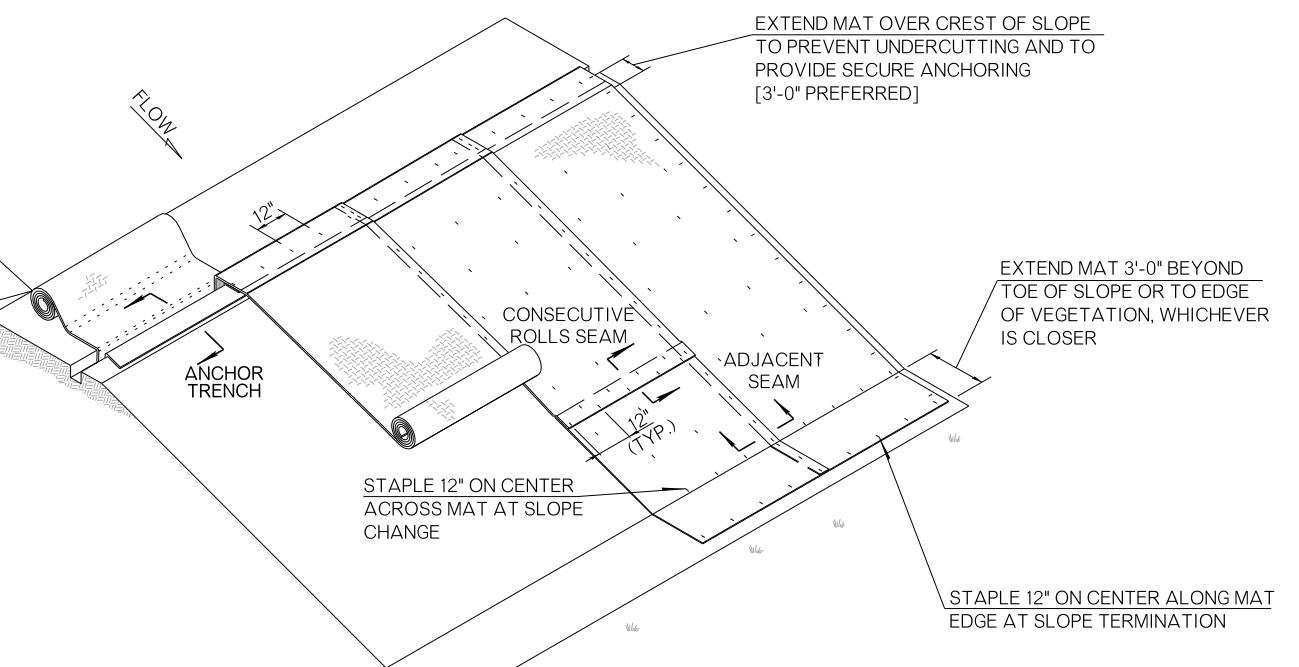
NOTE: IF SHEET FLOW WILL BE ENCOUNTERED AT THE MATTING'S
EDGE, WITHOUT AN ADJACENT OR CONSECUTIVE MAT, AN ANCHOR
TRENCH SHALL BE INSTALLED TO PREVENT UNDERMINING AND
ERODING UNDER MAT.



CHANNEL
ELEVATION DETAIL



STAPLE PATTERN



SLOPE INSTALLATION

INSTALLATION STEPS

INSTALL AND MAINTAIN THE MAT IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

- A. PREPARE SLOPE BY REMOVING LARGE ROCKS, VEGETATION, FIXING SURFACE RILLS AND COMPACTING SOIL SO THAT SURFACE IS RELATIVELY SMOOTH.
- B. IF INSTALLING EROSION CONTROL MAT, FERTILIZER AND SEED SHALL BE APPLIED BEFORE INSTALLING MAT ON TOP. IF INSTALLING TURF REINFORCEMENT MAT, SEED AND TOPSOIL MAY BE APPLIED ON TOP OF MAT.
- C. DIG INITIAL ANCHOR TRENCH. SET ASIDE NATIVE SOIL REMOVED FROM TRENCH. INITIAL ANCHOR TRENCHES ARE NOT NEEDED IF SITE ALLOWS FOR THE TRENCH INSTALLATION OF MORE THAN 3 FEET BEYOND THE TOP OF THE SLOPE.
- D. PLACE MAT PARALLEL WITH DIRECTION OF FLOW, AND SECURE MAT IN INITIAL ANCHOR TRENCH, STAPLING MAT AS SHOWN.
- E. REPLACE NATIVE SOIL PREVIOUSLY REMOVED FROM TRENCH.
- F. ROLL MAT PARALLEL TO THE SLOPE IN A CONTROLLED MANNER, TAKING CARE TO REMOVE EXCESS SLACK, AND TAKING CARE NOT TO STRETCH MAT. WOOD EXCELSIOR FIBER MATS MAY BE ABUTTED INSTEAD OF OVERLAPPED ON SIDE-BY-SIDE SEAMS ON SLOPES BECAUSE THE FIBERS EXPAND TOGETHER. ALL OTHER FIBER-TYPE MATS SHALL BE OVERLAPPED ON SIDE-BY-SIDE SEAMS.
- G. STAPLE MAT AS SHOWN OR PER MANUFACTURER'S STAPLE PATTERN GUIDE, SO THERE ARE NO GAPS BETWEEN THE MAT AND THE SOIL, AND MAT MAINTAINS DIRECT CONTACT WITH SOIL. STAPLE WHILE UNROLLING MAT DOWNSTREAM, TO MINIMIZE WALKING ON MAT. ENSURE MAT COVERS ENTIRE SITE, LEAVING NO BARE AREAS.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. EROSION CONTROL MATS SHALL BE CONSTRUCTED OF COCONUT FIBER, ASPEN EXCELSIOR, OR SYNTHETIC MATERIAL WITH BIODEGRADABLE OR PHOTODEGRADABLE NETTING. THEIR TEMPORARY FUNCTIONAL LONGEVITY RANGES FROM 3 MONTHS TO 36 MONTHS.
3. TURF REINFORCEMENT MATS ARE PERMANENT DEVICES MADE OF UV-STABILIZED, SYNTHETIC FIBERS, FILAMENTS, NETS, WIRE MESH AND/OR OTHER ELEMENTS PROCESSED INTO A THREE-DIMENSIONAL MATRIX WHICH MAY BE SUPPLEMENTED WITH DEGRADABLE COMPONENTS. THEY ARE USUALLY INSTALLED FIRST FOLLOWED BY A LAYER OF TOPSOIL AND SEEDING. THEY ARE INSTALLED TO STABILIZE AN OTHERWISE ERODIBLE AREA.
4. MAT SHALL BE MEASURED FOR PAYMENT OF VISIBLE SURFACE COVERED. OVERLAPS, OVERWIDTHS, AND TRENCHING WILL NOT BE MEASURED FOR PAYMENT. COST OF MAT (ALL TYPES OF EROSION CONTROL AND TURF REINFORCEMENT) SHALL INCLUDE ALL LABOR AND MATERIALS INCLUDING STAPLING AND FILLING OF TRENCHED ENDS.
5. INSTALLATION IS NOT SUITABLE ON ROCKY SITES.
6. STAPLES SHALL BE MADE OF 11 GAUGE STEEL WIRE. TYPICALLY SHAPED AS A "U", DIMENSIONS ARE 1 INCH BY 6 INCHES FOR THE EROSION CONTROL MATS AND 1 INCH BY 12 INCHES FOR THE TURF REINFORCEMENT MATS. FOR BEST RESULTS INSERT STAPLES SO THE HEADS ARE PARALLEL TO THE FLOW OF WATER. OTHER TYPES OF STAPLES MAY BE USED AS RECOMMENDED BY THE MANUFACTURER AND APPROVED BY THE ENGINEER.
7. INSTALLATION AS SHOWN ON THIS STANDARD AND ON ROADWAY STANDARD ECTRM2 IS TYPICAL IN NATURE AND DOES NOT REPRESENT A SPECIFIC MANUFACTURER. CHECK WITH THE MANUFACTURER'S INSTALLATION GUIDELINES BEFORE PLACING MATS.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
228	EROSION CONTROL MAT ●	SY
227	(SP) TURF REINFORCEMENT MAT ■	SY

● SPECIFY TYPE: 1, 2, 3 OR 4 ■ SPECIFY TYPE: 1, 2, 3 OR 4

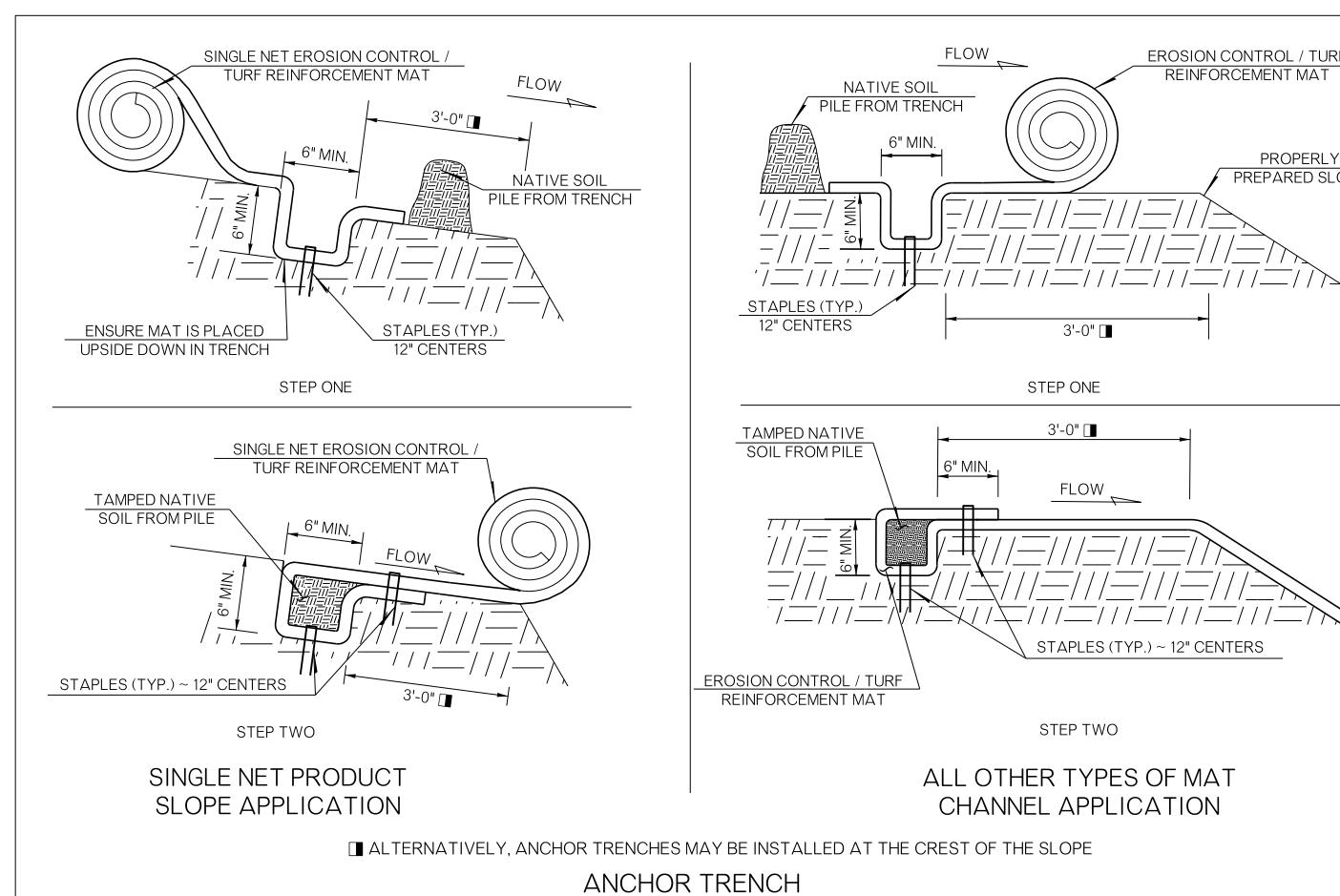
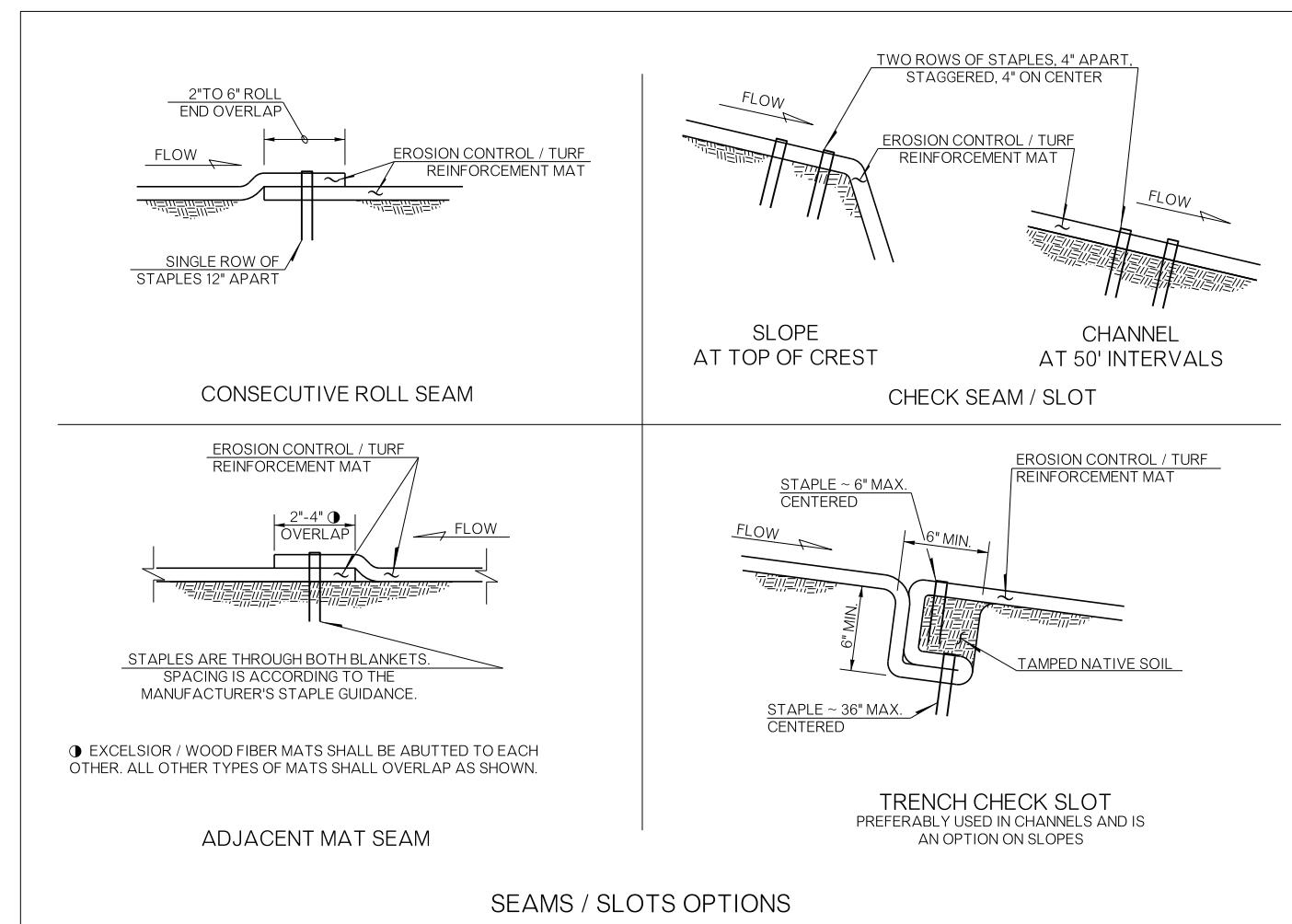
APPROVED BY
ROADWAY ENGINEER: *R. G. Lewis* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD
EROSION CONTROL / TURF REINFORCEMENT MAT
INSTALLATION DETAILS (1 OF 2 SHEETS)



2019 SPECIFICATIONS

ECTRM1 0

R-3



PROPERTY AND TEST METHOD	TYPE 1	TYPE 2	TYPE 3	TYPE 4
	SINGLE, DOUBLE OR NO NET	DOUBLE NET	DOUBLE NET	DOUBLE NET
SLOPE APPLICATION, MAXIMUM GRADIENT	4H:1V	3H:1V	3H:1V	2H:1V
FUNCTIONAL LONGEVITY ^a	3-6 MOS.	6-12 MOS.	12-24 MOS.	24-36 MOS.
MINIMUM TYPICAL TENSILE STRENGTH ASTM D 6818 *MD & TD ^b	50 LBS/ FT	75 LBS/ FT	100 LBS/ FT	125 LBS/ FT
MIN. SHEAR STRESS ^c ASTM D 6460	1.50 LBS/SF	1.75 LBS/SF	2.00 LBS/SF	2.25 LBS/SF
MAX. C-FACTOR ^d (COVER FACTOR) ASTM D6459	0.15 AT 3H:1V	0.20 AT 2H:1V	0.25 AT 1.5H:1V	0.25 AT 1H:1V

^a LONGEVITY CLASSIFICATION BY THE EROSION CONTROL TECHNOLOGY COUNCIL (ECTC).

^b VALUE SHOWN IS THE STRENGTH IN EACH DIRECTION: MD - MACHINE DIRECTION, TD=TRANSVERSE DIRECTION.

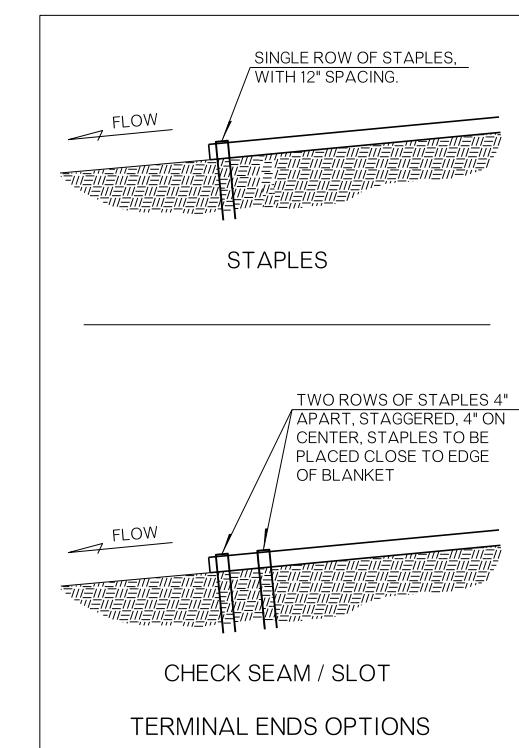
^c REQUIREDE MINIMUM SHEAR STRESS RECP (UNVEGETATED) CAN SUSTAIN WITHOUT PHYSICAL DAMAGE OR EXCESS EROSION (1/2 IN. SOIL LOSS) DURING A 30-MINUTE FLOW EVENT IN LARGE-SCALE PERFORMANCE TESTING, ASTM D6460.

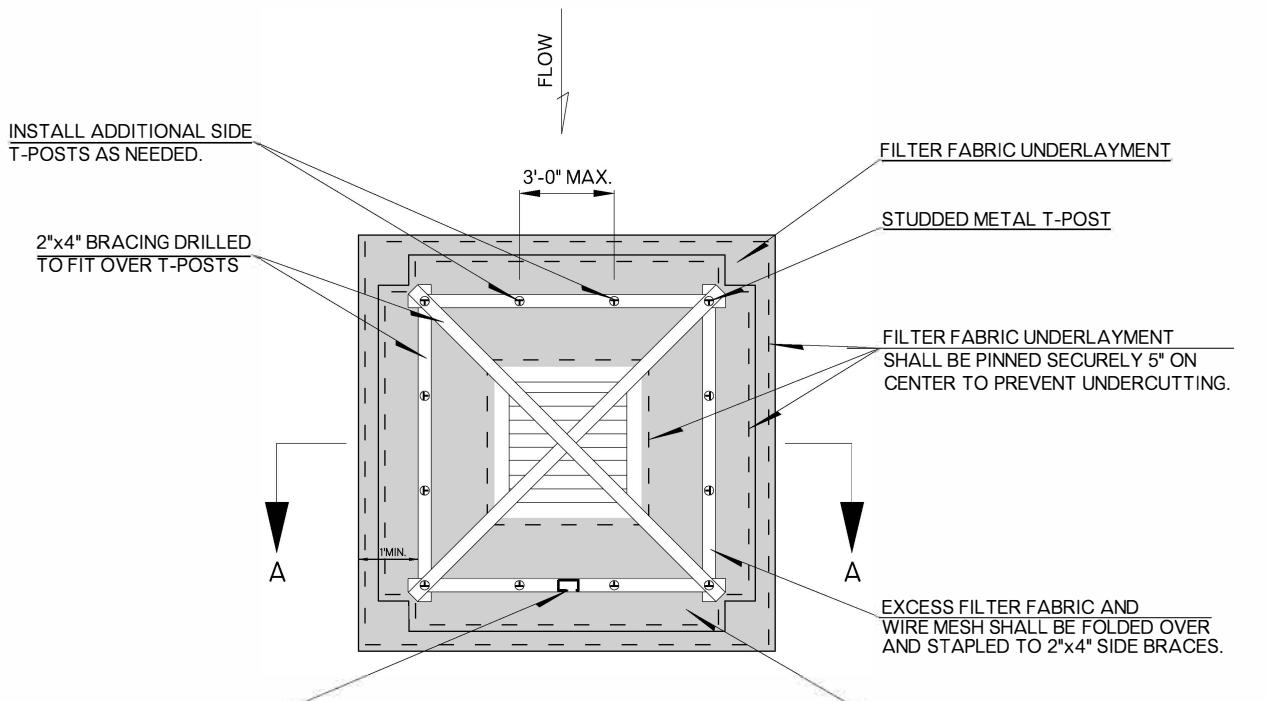
^d C-FACTOR IS THE PERCENT EFFECTIVENESS OF THE MAT IN PREVENTING SOIL LOSS FROM THE RAINFALL IMPACTING THE SLOPE. ITS VALUE IS INVERSELY PROPORTIONAL TO PERCENT EFFECTIVENESS, IN WHICH THE SMALLER THE C-FACTOR, THE GREATER THE EFFECTIVENESS.

PROPERTY AND TEST METHOD	TYPE 1	TYPE 2	TYPE 3	TYPE 4 (HIGH PERFORMANCE)
	80% AT 500 HRS.	80% AT 1000 HRS.	80% AT 1,000 HRS.	80% AT 3,000 HRS.
MIN. UV STABILITY ASTM D4355	80% AT 500 HRS.	80% AT 1000 HRS.	80% AT 1,000 HRS.	80% AT 3,000 HRS.
MINIMUM TYPICAL TENSILE STRENGTH, MACHINE DIRECTION ASTM D 6818	150 LBS/FT	200 LBS/FT	650 LBS/FT	3000 LBS/FT
MIN. SHEAR STRESS, FOR CHANNEL APPLICATIONS, VEGETATED (ASTM D 6460)	6 LBS/SF	10 LBS/SF	12 LBS/SF	14 LBS/SF
SLOPE APPLICATION MAXIMUM GRADIENT	1H:1V	1H:1V	0.5H:1V	0.5H:1V

GENERAL NOTES

1. THE LOCATION OF ALL DETAIL DRAWINGS SHOWN ON THIS SHEET ARE SHOWN ON THE 2019 ROADWAY STANDARD EROSION CONTROL / TURF REINFORCEMENT MAT INSTALLATION DETAILS (1 OF 2 SHEETS).
2. EROSION CONTROL MATS ARE TYPICALLY USED WHERE MULCHING IS NOT SUFFICIENT TO CONTROL EROSION AND SOIL STABILITY DURING VEGETATION ESTABLISHMENT. EROSION CONTROL MATS ARE USUALLY TEMPORARY IN NATURE AND ARE MADE UP OF DEGRADABLE FIBERS AND MESH.
3. TURF REINFORCEMENT MATS ARE FOR PERMANENT STABILIZATION OF ERODIBLE AREAS, EVEN AFTER VEGETATION IS ESTABLISHED. IN DITCHES WHERE THE SHEAR STRESSES ARE NEAR OR ABOVE 2 PSF, IT MAY BE MORE EFFICIENT TO USE TURF REINFORCEMENT MAT.
4. IF THERE ARE SIGNS OF RILLING UNDER THE MAT, INSTALL MORE STAPLES. IF RILLING BECOMES SEVERE ENOUGH TO PREVENT ESTABLISHMENT OF VEGETATION, REMOVE THE SECTION OF MAT WHERE THE DAMAGE HAS OCCURRED. FILL THE ERODED AREA WITH TOPSOIL, COMPACT, RESEED AND REPLACE THE SECTION OF MAT, TRENCHING AND OVERLAPPING ENDS PER MANUFACTURER'S RECOMMENDATIONS. ADDITIONAL STAKING IS RECOMMENDED NEAR WHERE RILLING WAS FILLED.
5. TRENCHING DIMENSIONS FOR ALL TYPES OF MATS SHALL BE 6 INCHES WIDE AND 6 INCHES TALL. STAPLE PATTERNS SHALL BE THE SAME FOR ALL MAT TYPES.
6. ALL INSTALLATION INFORMATION IS TYPICAL IN NATURE AND DOES NOT REPRESENT ANY SPECIFIC MAT. CONSULT WITH MANUFACTURER FOR SPECIFIC INSTALLATION PROCEDURES.



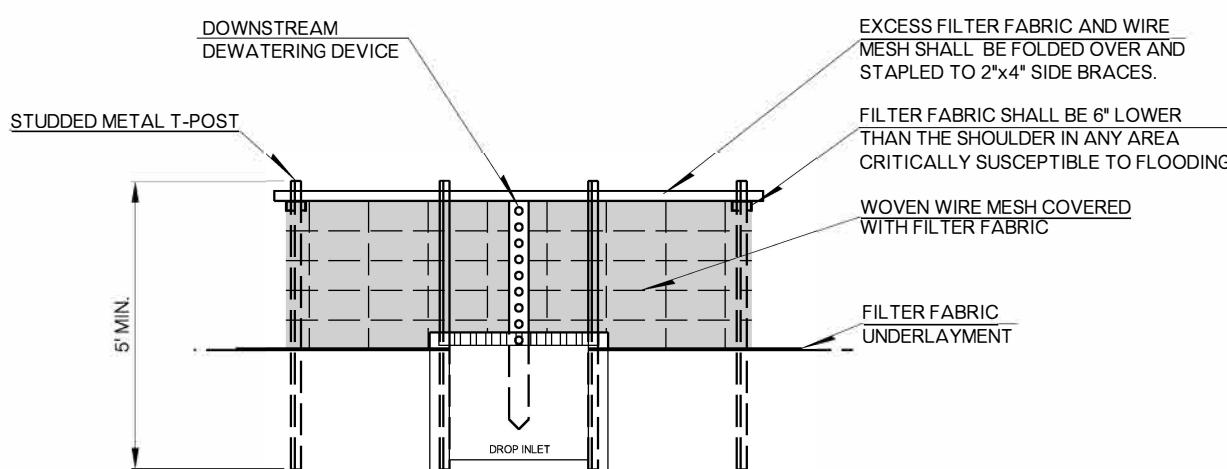


REINFORCED SILT FENCE INLET PROTECTION

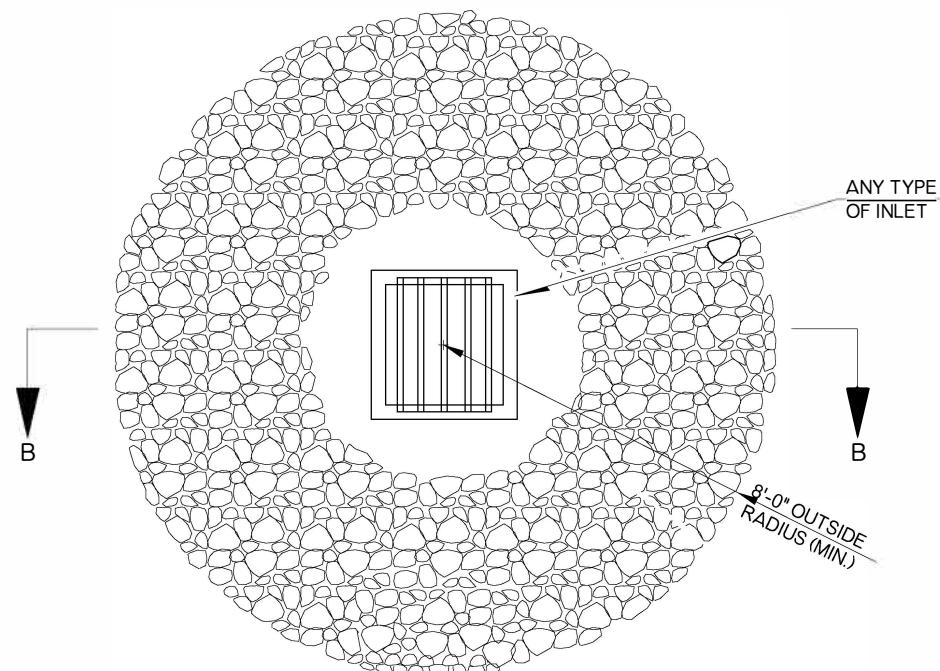
MAX. Q = 5 TO 7 CFS

MAX. DRAIN AREA = 2 ACRES

PLAN VIEW



SECTION A-A

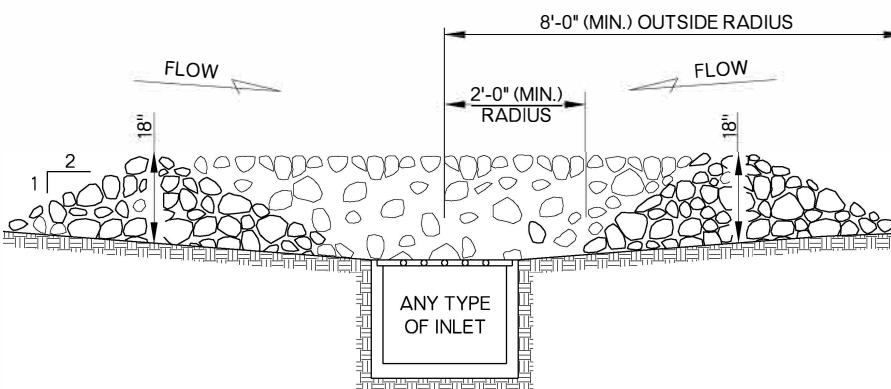


AGGREGATE INLET PROTECTION

MAX. Q = 3 TO 5 CFS

MAX. DRAIN AREA = 1 ACRE

PLAN VIEW



SECTION B-B

SYMBOL TO BE USED TO DENOTE DEVICE ON PLANS		
AGGREGATE INLET PROTECTION	IP2	
REINFORCED SILT FENCE INLET PROTECTION	IP3	

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. CONFIGURATIONS MAY BE ADJUSTED WITH APPROVAL OF THE ENGINEER FOR TRAVELWAY SAFETY, WATER FLOW, SOIL OR INSTALLATION CHALLENGES.

REINFORCED SILT FENCE MAY BE REQUIRED UPSLOPE OF THE INLET EXCAVATION AS DIRECTED BY THE ENGINEER.

4. IF REINFORCED SILT FENCE IS INSTALLED AROUND THE INLET EXCAVATION IT SHOULD BE PLACED IN A CONFIGURATION THAT WILL ALLOW INLET CONSTRUCTION.
5. DEWATERING HOLES IN THE DEWATERING DEVICE SHALL BE 1 TO 1 1/2 INCHES IN DIAMETER AND SPACED 2 TO 3 INCHES APART TO ALLOW FOR DEWATERING IN NO MORE THAN 48 HOURS. IF THIS DOESN'T FUNCTION PROPERLY, ANOTHER DEVICE CAN BE ADDED AT THE DIRECTION OF THE ENGINEER.
6. FASTEN DEWATERING DEVICE TO THE 2 INCHES BY 4 INCHES SIDE BRACE.
7. STAPLE FILTER FABRIC TO DEWATERING DEVICE AND CUT ACROSS SLITS IN THE FILTER FABRIC AT THE HOLE LOCATIONS TO ALLOW WATER TO FLOW THROUGH. PROVIDE FILTER FABRIC IN ACCORDANCE WITH AASHTO M 288 SPECIFICATION.
8. PRICE BID FOR THE REINFORCED SILT FENCE INLET PROTECTION WILL INCLUDE FILTER FABRIC, POSTS, WIRE MESH, WOOD BRACING, DEWATERING DEVICE AND ALL INCIDENTALS REQUIRED TO COMPLETE ITS INSTALLATION. THIS INLET PROTECTION DEVICE SHALL BE PAID FOR AS TEMPORARY INLET SEDIMENT FILTER, WITH UNITS OF EACH.

ROCK GRADATION FOR THE AGGREGATE INLET PROTECTION (TEMPORARY SEDIMENT FILTER) SHALL BE AS FOLLOWS:

PERCENT PASSING	SIEVE SIZE
100	4 INCH
90-100	3.5 INCH
25-60	2.5 INCH
0-15	1.5 INCH
0-5	3/4 INCH

10. COST FOR ALL MATERIALS, LABOR AND MAINTENANCE OF THE AGGREGATE INLET PROTECTION SHALL BE PAID FOR AS TEMPORARY INLET SEDIMENT FILTER, WITH UNITS OF EACH.
11. INLET PROTECTION DEVICES SHALL BE LEFT IN PLACE UNTIL THE DRAINAGE AREA IS PERMANENTLY STABILIZED WITH ESTABLISHED VEGETATION OR PAVEMENT.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(H)	(PL) TEMPORARY INLET SEDIMENT FILTER	EA

APPROVED BY
ROADWAY ENGINEER: *R. G. G.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD
INLET PROTECTION

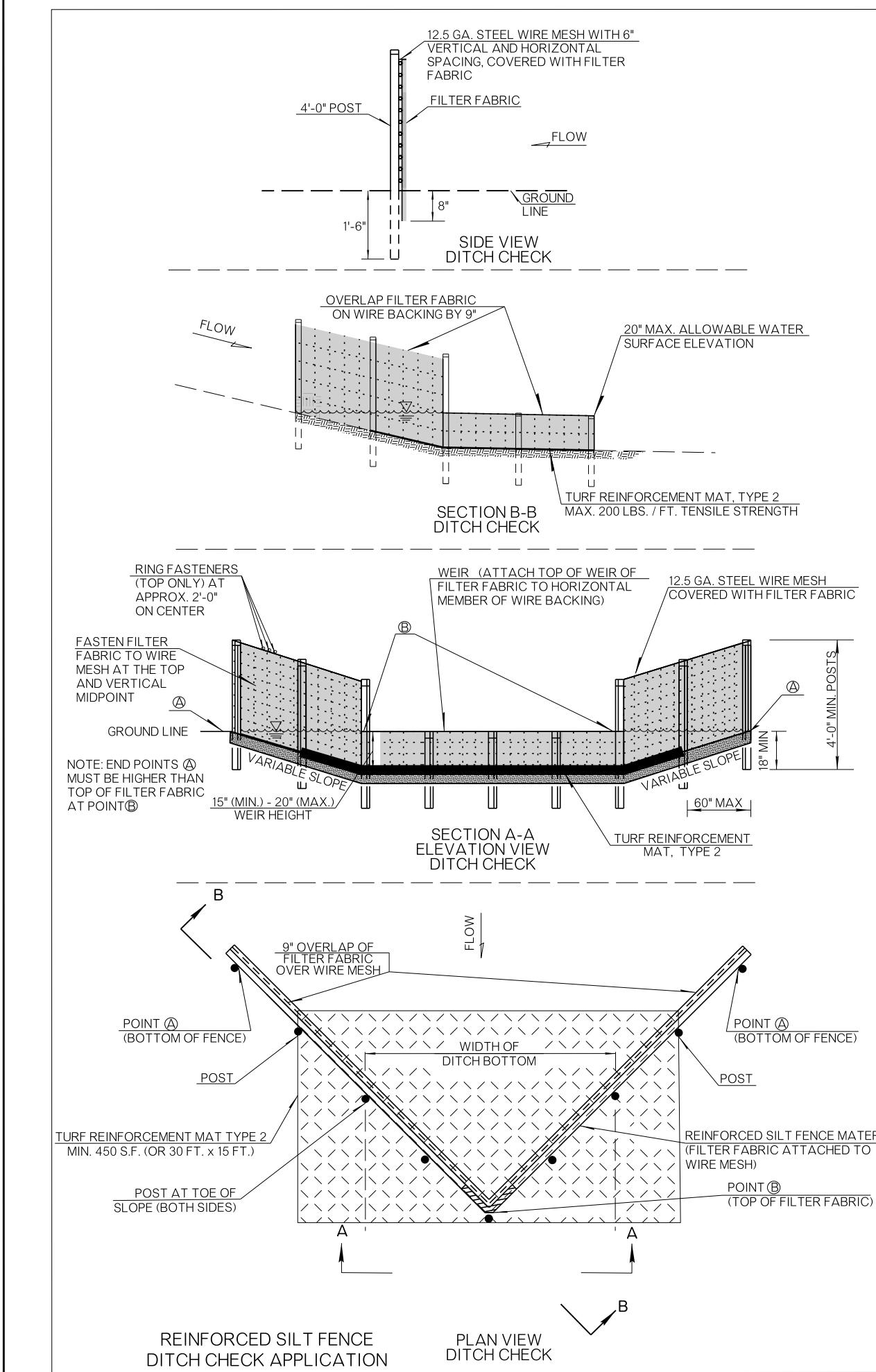
(AGGREGATE AND REINFORCED SILT
FENCE APPLICATIONS)



2019 SPECIFICATIONS

IPD 0

R-5



SUGGESTED LENGTHS OF EACH SECTION OF SILT FENCE ARE AS FOLLOWS:

LONG SLOPE	LENGTH
5%	60' MAX.
4%	75' MAX.
3%	100' MAX.
2%	150' MAX.
1%	300' MAX.

● LENGTH IS ONLY THE LONGITUDINAL LENGTH PARALLEL TO THE TOE OF SLOPE. LENGTH OF 'J-HOOK' IS DEPENDENT UPON FILL SLOPE.

ISOMETRIC VIEW AT TOE OF SLOPE PERIMETER CONTROL

SECTION C - C PERIMETER CONTROL TOE OF SLOPE

ISOMETRIC VIEW REINFORCED SILT FENCE AT CROSS DRAIN

SIDE VIEW - METHOD I
TRENCHING INSTALLATION
(PREFERRED METHOD)

SIDE VIEW - METHOD II
MECHANICAL SLICING INSTALLATION

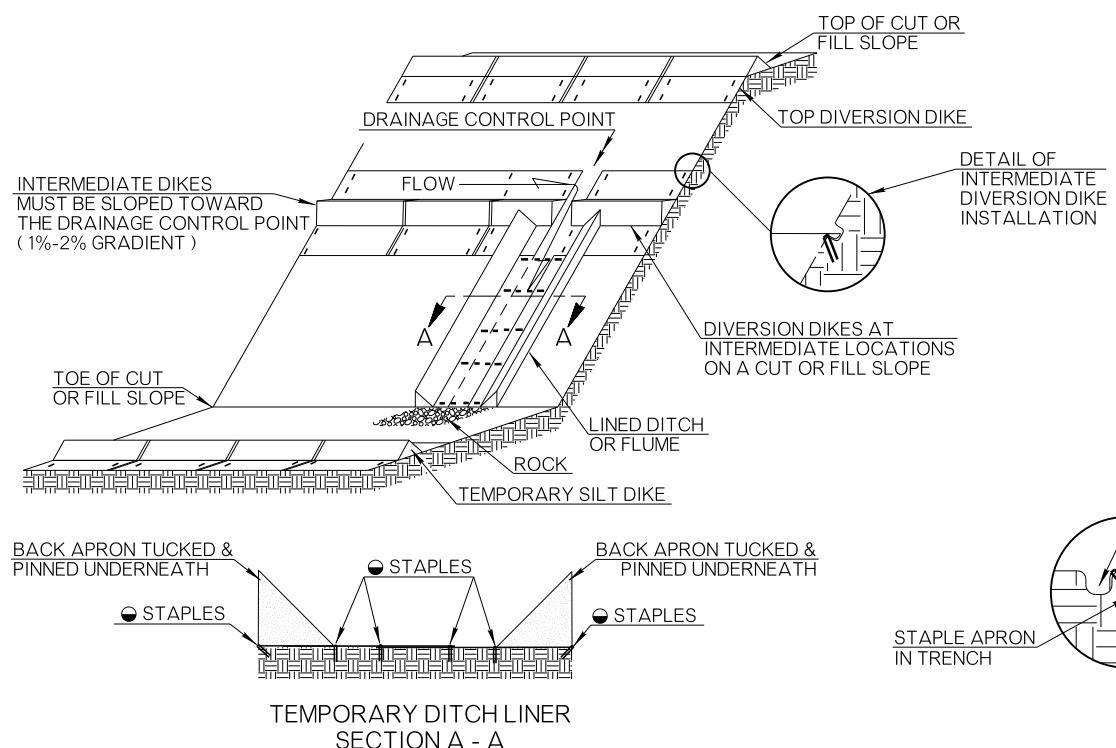
REINFORCED SILT FENCE
PERIMETER CONTROL APPLICATIONS

GENERAL NOTES

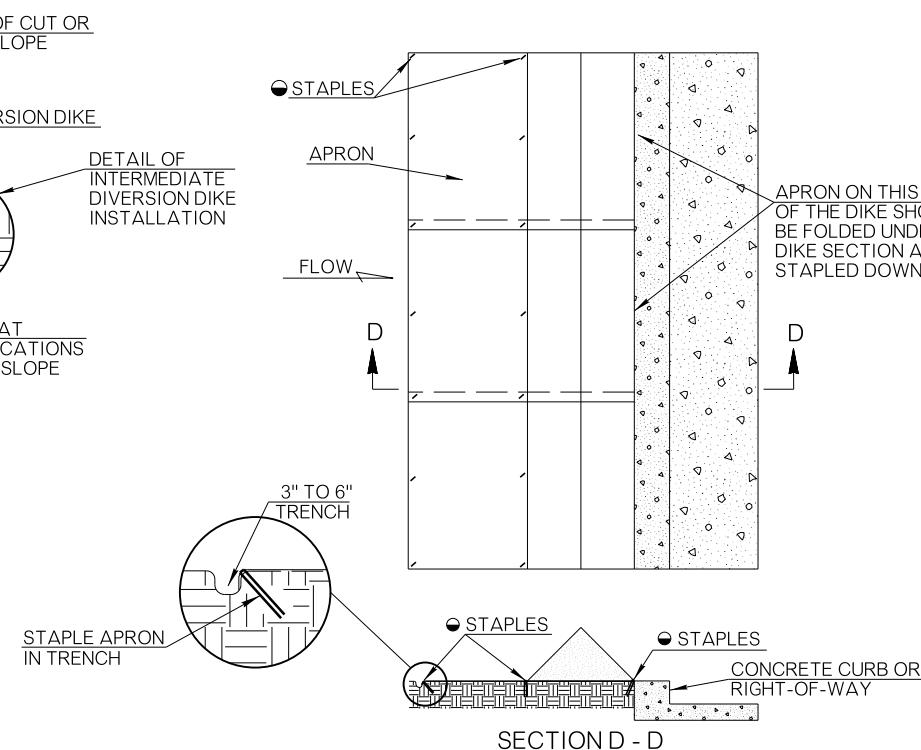
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. AFTER THE REINFORCED SILT FENCE IS INSTALLED IN THE DITCH, IF THE TOP OF THE FILTER FABRIC (WEIR) AT POINT ② IS HIGHER THAN THE BOTTOM OF THE FENCE AT POINT ① (EDGES OF FENCE) THEN NO WEIR IS REQUIRED.
3. REINFORCED SILT FENCE SHOULD BE PLACED WELL INSIDE RIGHT-OF-WAY AND ALONG EDGE OF CLEARING LIMITS. THIS WILL ALLOW ROOM FOR ADDITIONAL BEST MANAGEMENT PRACTICES SUCH AS VEGETATED BUFFERS.
4. THE CONTRACTOR MAY ELECT TO USE EITHER INSTALLATION: METHOD I OR METHOD II.
5. METHOD II INSTALLATION SHALL BE ACCOMPLISHED USING AN IMPLEMENT THAT IS MANUFACTURED FOR THE APPLICATION AND PROVIDES A CONFIGURATION MEETING THE REQUIREMENTS OF THE DETAIL.
6. REINFORCED SILT FENCE SHALL BE A FILTER FABRIC SUPPORTED BETWEEN POSTS WITH A WIRE MESH BACKING. ATTACH THE FILTER FABRIC TO THE WIRE MESH USING 16 GA. GALVANIZED STEEL C-RING STAPLES OR OTHER SIMILAR ACCEPTABLE MEANS. PROVIDE FILTER FABRIC IN ACCORDANCE WITH AASHTO M 288 SPECIFICATION.
7. WOOD POSTS SHALL BE OF SOUND QUALITY WOOD WITH A NOMINAL CROSS SECTIONAL AREA OF 1.5 X 1.5 INCHES. STEEL POSTS SHALL BE STANDARD T AND U SECTIONS WEIGHING NOT LESS THAN 1.33 POUNDS PER LINEAR FOOT OR OTHER STEEL POSTS HAVING EQUIVALENT STRENGTH AND BENDING RESISTANCE.
8. FILTER FABRIC SHALL BE FURNISHED WITH A SUITABLE WRAPPING FOR PROTECTION AGAINST MOISTURE AND EXTENDED ULTRAVIOLET EXPOSURE PRIOR TO PLACEMENT. ROLLS SHALL BE STORED IN A MANNER WHICH PROTECTS THEM FROM THE ELEMENTS. IF STORED OUTDOORS, THEY SHALL BE ELEVATED AND PROTECTED WITH A WATERPROOF COVER.
9. WIRE MESH BACKING SHALL BE MADE OF 12.5 GAUGE STEEL. THE VERTICAL AND HORIZONTAL SPACING OF THE WIRE SHALL BE 6 INCHES. ATTACH WIRE MESH TO POSTS BY MEANS OF 11 GA. ALUMINUM FENCE WIRE TIES AT 6.5 INCHES LONG, OR APPROVED SIMILAR.
10. TIEBACK DESIGNS SHOULD BE INSTALLED SUCH THAT THE BOTTOM OF THE END OF THE SILT FENCE (WHERE THE J-HOOK IS INSTALLED ON THE SLOPE), OR POINT A, SHOULD BE AT A HIGHER ELEVATION THAN THE TOP OF THE SILT FENCE AT THE TOE OF THE FILL SLOPE, OR POINT B. SEE SECTION C-C FOR VISUAL.
11. TIEBACK DESIGNS SHOULD ONLY BE USED WHEN THERE IS RUNOFF FLOW BOTH DOWN THE FILL SLOPE AND LONGITUDINALLY IN THE DIRECTION OF THE ROAD. MEASURE SILT FENCE IN PLACE, INCLUDING THE STRAIGHT SECTION AND THE 'J-HOOK' SECTION.
12. PRICE BID FOR REINFORCED SILT FENCE SHALL INCLUDE COST OF ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE AND REMOVAL, REGARDLESS OF APPLICATION.
13. TEMPORARY (STANDARD) SILT FENCE MAY BE USED IN LIEU OF REINFORCED SILT FENCE IF APPROVED BY THE ENGINEER. TEMPORARY SILT FENCE IS TYPICALLY USED WHERE SHEET FLOW OCCURS. REINFORCED SILT FENCE IS USUALLY USED WHERE CONCENTRATION FLOW OCCURS.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(B)	TEMPORARY SILT FENCE	LF
221(C)	REINFORCED SILT FENCE	LF

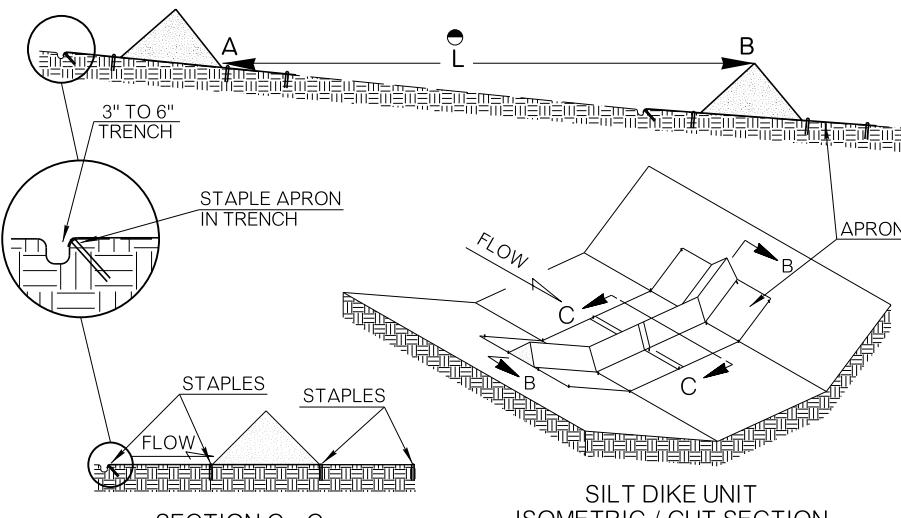
APPROVED BY
ROADWAY ENGINEER: *R. G. W.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD



TEMPORARY SILT DIKE INSTALLATION
AS
DIVERSION DIKE AND / OR DITCH CHECK



TEMPORARY SILT DIKE INSTALLATION
AS
PERIMETER CONTROL



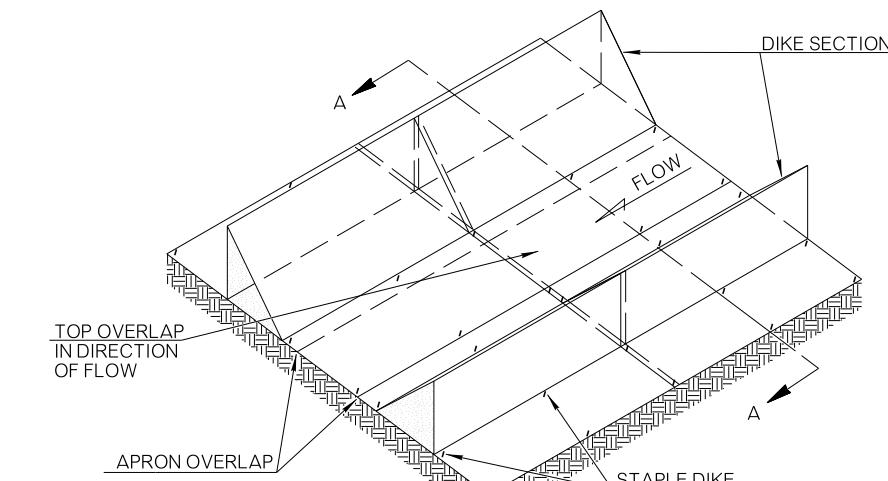
TEMPORARY SILT DIKE INSTALLATION
AS
ROADWAY DITCH OR DRAINAGE DITCH CHECK

- POINT "1" MUST BE HIGHER THAN POINT "2" TO ENSURE THAT WATER FLOWS OVER THE DIKE AND NOT AROUND THE ENDS.
- STAPLES SHALL BE PLACED WHERE THE UNITS OVERLAP AND IN THE CENTER OF THE UNIT AS SHOWN ON THE DIAGRAM.
- L = THE DISTANCE SUCH THAT POINTS 'A' AND 'B' ARE OF EQUAL ELEVATION

DITCH CHECK SPACING FORMULA:	
SPACING, IN FT. =	DITCH CHECK HEIGHT, IN FT. / SLOPE, IN DECIMALS

TEMPORARY SILT DIKE INSTALLATION
FOR
DROP INLETS

NOTE: SILT DIKE SHOULD ONLY BE USED FOR DROP INLETS IN SUMP LOCATIONS. FOR DROP INLETS ON GRADE, USE SEDIMENT TRAPS OR OTHER CONTROLS.



TEMPORARY SILT DIKE INSTALLATION
AS
TEMPORARY DITCH LINER

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. THIS WORK SHALL CONSIST OF FURNISHING, INSTALLING, AND MAINTAINING THE TEMPORARY SILT DIKE. THE DIKES SHALL BE USED AS A CONTINUOUS LINE BARRIER AT THE TOE OF SLOPE OR ACROSS THE ROADWAY DITCH TO CONTAIN SEDIMENT AND MINIMIZE EROSION, OR AS DIRECTED BY THE ENGINEER. THESE DIKES SHALL BE INSTALLED AND LOCATED AS SOON AS CONSTRUCTION WILL ALLOW OR AS DIRECTED BY THE ENGINEER.
3. TEMPORARY SILT DIKE SHALL BE TRIANGULAR SHAPED HAVING A HEIGHT OF AT LEAST 8 TO 10 INCHES IN THE CENTER WITH EQUAL SIDES AND A 16 TO 20 INCH BASE. THE TRIANGULAR SHAPED INNER MATERIAL SHALL BE URETHANE FOAM MEETING THE REQUIREMENTS FOR ASTM D3574. THE OUTER COVER SHALL BE A WOVEN GEOTEXTILE FABRIC PLACED AROUND THE INNER MATERIAL AND ALLOWED TO EXTEND BEYOND BOTH SIDES OF THE TRIANGLE 24 INCHES TO 36 INCHES. THIS FABRIC SHOULD BE MILDEW RESISTANT, ROT-PROOF RESISTANT TO HEAT AND ULTRAVIOLET RADIATION AND MEETING REQUIREMENTS FOR SEDIMENT CONTROL IN AASHTO M 288. THE DIKES SHALL BE ATTACHED TO THE GROUND WITH WIRE STAPLES. THE STAPLES SHALL BE NO. 11 GAUGE WIRE AND BE AT LEAST 6 TO 8 INCHES LONG. STAPLES SHALL BE PLACED AS SHOWN ON THESE DETAILS.
4. SILT DIKES ARE FURNISHED IN 7 FOOT INCREMENTS. TOP OVERLAPS SHALL BE INSTALLED IN THE DIRECTION OF FLOW.
5. SILT DIKE DITCH CHECKS SHOULD BE SPACED SO THAT THE ELEVATION OF THE TOE OF THE UPSTREAM DEVICE IS EQUAL TO THE ELEVATION OF THE CREST OF THE DOWNSTREAM DEVICE. THIS ALLOWS THE WATER BETWEEN EACH DITCH CHECK TO POOL, GREATLY REDUCING THE FLOW VELOCITY.
6. ACCEPTED TEMPORARY SILT DIKE, MEASURED AS PROVIDED ABOVE, WILL BE PAID FOR AT THE CONTRACT UNIT PRICE BID FOR TEMPORARY SILT DIKE. PRICE BID WILL INCLUDE THE COST OF FURNISHING THE DIKES, INSTALLING, MAINTAINING AND REMOVAL WHEN DIRECTED BY THE ENGINEER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(E)	TEMPORARY SILT DIKE	LF

APPROVED BY
ROADWAY ENGINEER: *R. G. Lewis* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

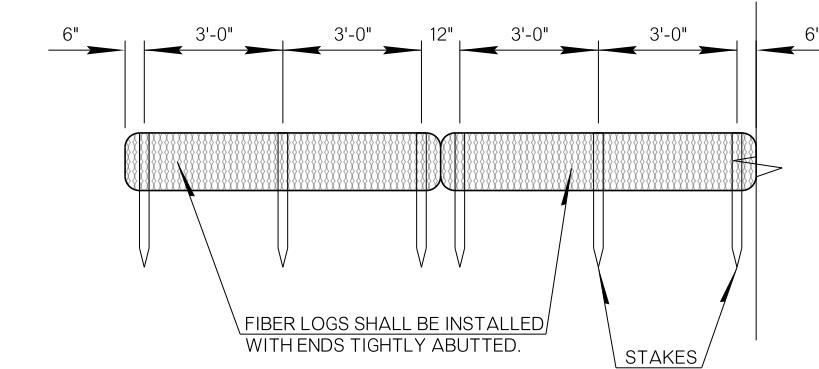
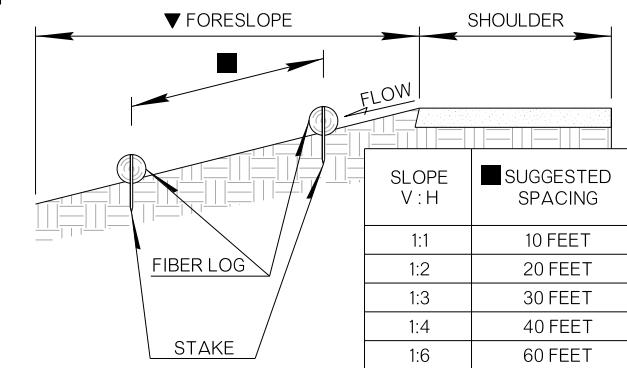
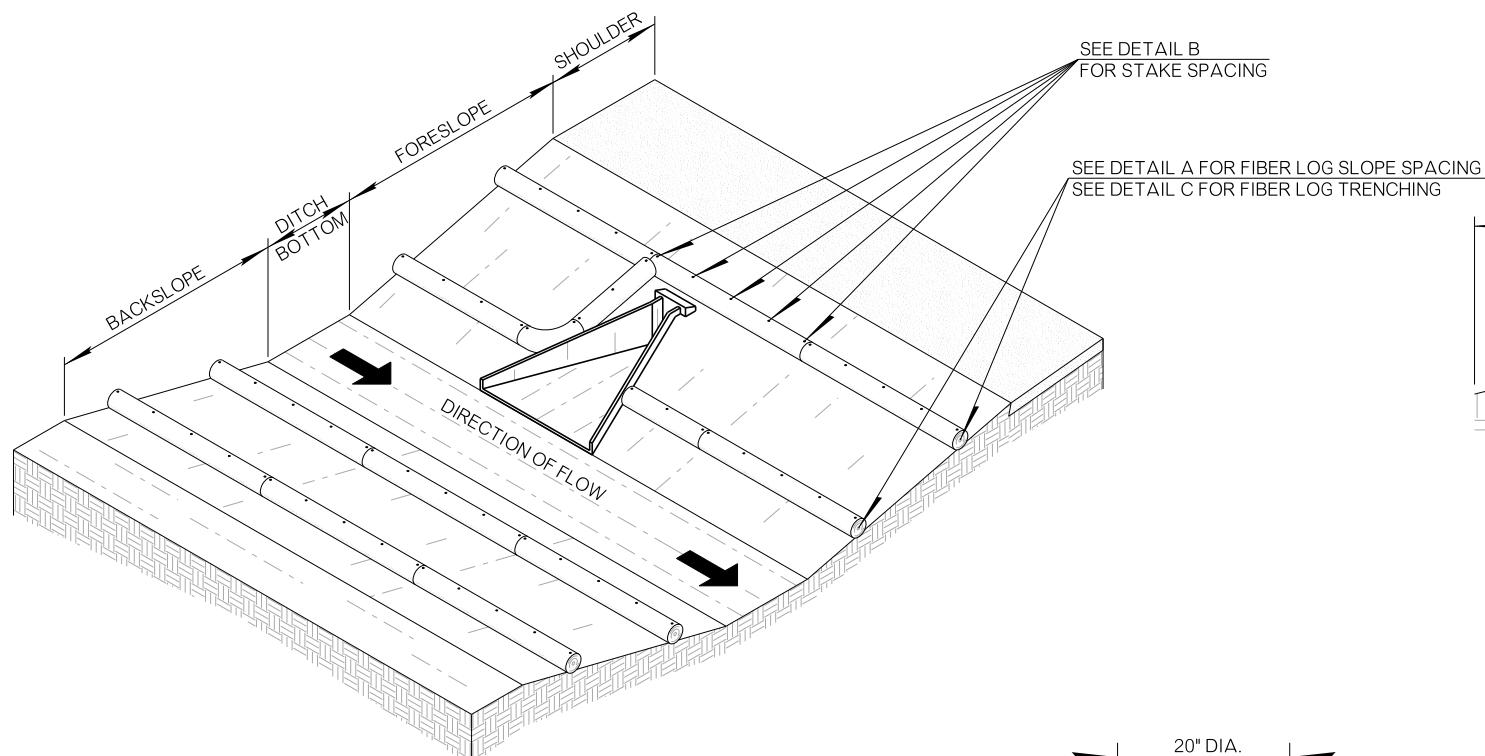
TEMPORARY SILT DIKE APPLICATIONS



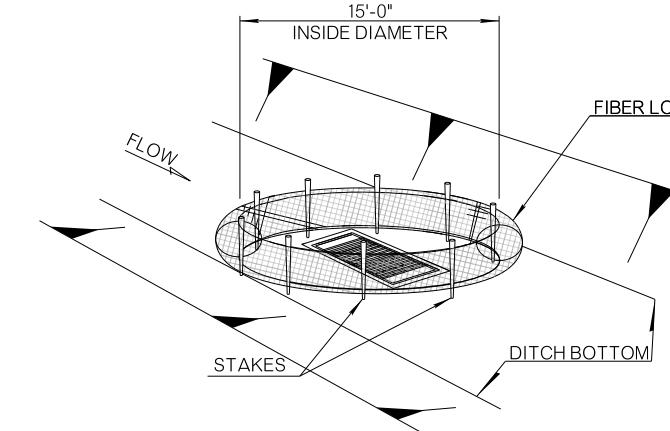
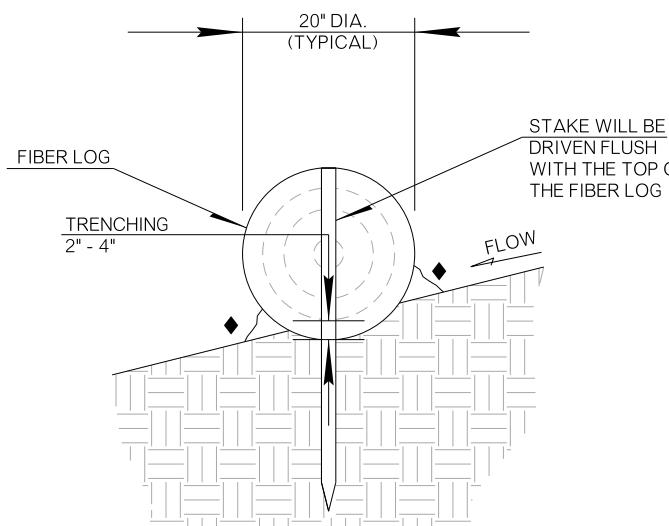
2019 SPECIFICATIONS

TSD 0

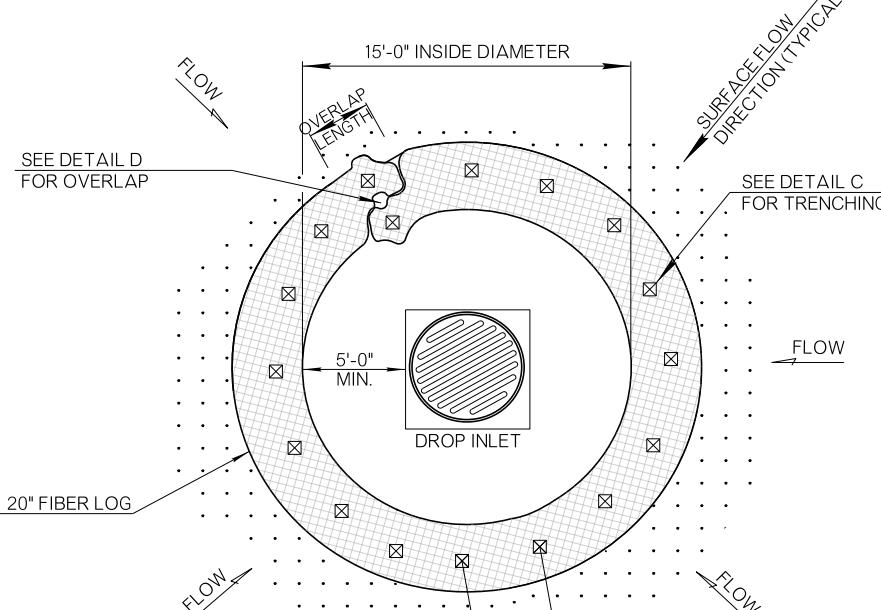
R-7



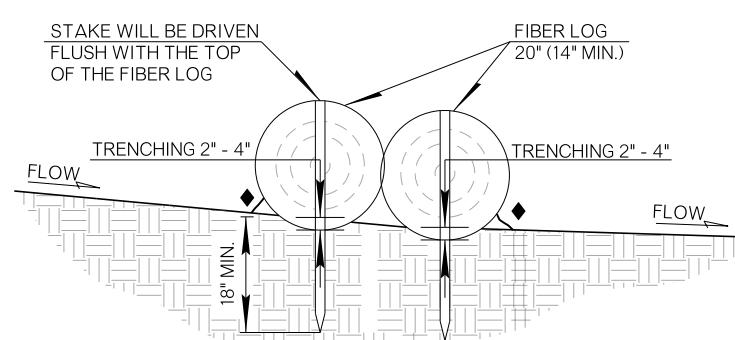
SUGGESTED PLACEMENT AROUND
CROSSDRAINS AND ON SLOPES.



FIBER LOG INLET PROTECTION
(AFTER INLET IS CONSTRUCTED AND BACKFILLED)



FIBER LOG INLET PROTECTION
PLAN VIEW



DETAIL D - OVERLAP

◆ AREAS TO BE FILLED WITH COMPACTED SOIL
TAKEN FROM THE EXCAVATED TRENCH.

SYMBOL TO BE USED TO DENOTE DEVICE ON PLANS		
FIBER LOG INLET PROTECTION	IP1	
TEMPORARY FIBER LOG TO BE USED ON SLOPES		

DETAIL A - CROSS SECTION VIEW

ALTHOUGH FIBER LOGS CAN BE APPLIED ON SLOPES OF 1:1,
THEY BEGIN TO LOSE THEIR EFFECTIVENESS AT SLOPES OF 1:2.

▼ NOTE: SPACING APPLIES FOR BACKSLOPES,
AS WELL AS FORESLOPES.

DETAIL B - FIBER LOG FRONT VIEW

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FIBER LOGS ARE TO BE INSTALLED AND MAINTAINED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.
3. CONFIGURATIONS MAY BE ADJUSTED WITH APPROVAL OF THE ENGINEER FOR TRAVELWAY SAFETY, WATER FLOW, SOIL OR INSTALLATION CHALLENGES.
4. TRENCHING OF LOGS SHALL BE 2 TO 4 INCHES INTO SOIL. BEFORE TRENCHING, REMOVE ALL ROCKS, VEGETATION OR OTHER OBSTRUCTIONS SO THAT THE INSTALLED LOGS WILL HAVE DIRECT CONTACT WITH SOIL. THERE SHALL NOT BE ANY GAPS BETWEEN THE LOGS AND THE SOIL.
5. STAKES DRIVEN INTO LOGS SHOULD BE MADE OF WOOD. METAL STAKES MAY BE USED IN PLACE OF WOOD STAKES IN AREAS WHERE WOOD STAKES ARE UNABLE TO BE DRIVEN, OR IF APPROVED BY THE ENGINEER AT NO ADDITIONAL COST TO THE DEPARTMENT. WOOD STAKES SHALL BE 3/4 INCHES BY 3/4 INCHES, MINIMUM. LENGTH OF STAKES SHALL BE TWICE THE DIAMETER OF THE LOG.
6. THE FILLING INSIDE THE LOGS MAY BE MADE OF STRAW, EXCELSIOR, COIR OR OTHER SIMILAR MATERIAL AS APPROVED BY THE ENGINEER. FIBER NET SURROUNDING THE LOG MAY BE SYNTHETIC MATERIAL OR A NATURAL FIBER.
7. OVERLAP ENDS OF FIBER LOG SO THAT ONE END IS IMMEDIATELY UPSTREAM OF THE OTHER AND TOUCHING EACH OTHER. OVERLAP DISTANCE SHALL BE 18 TO 24 INCHES OR PER MANUFACTURER'S RECOMMENDATION.
8. MAINTENANCE SHALL INCLUDE THE REMOVAL OF SEDIMENT WHEN HALF OF THE HEIGHT OF THE FIBER LOG HAS BEEN FILLED OR AS DIRECTED BY THE ENGINEER.
9. COST OF TEMPORARY FIBER LOG SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR THE INSTALLATION AND MAINTENANCE.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
221(G)	TEMPORARY FIBER LOG	LF

APPROVED BY
ROADWAY ENGINEER: *R. G. W.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

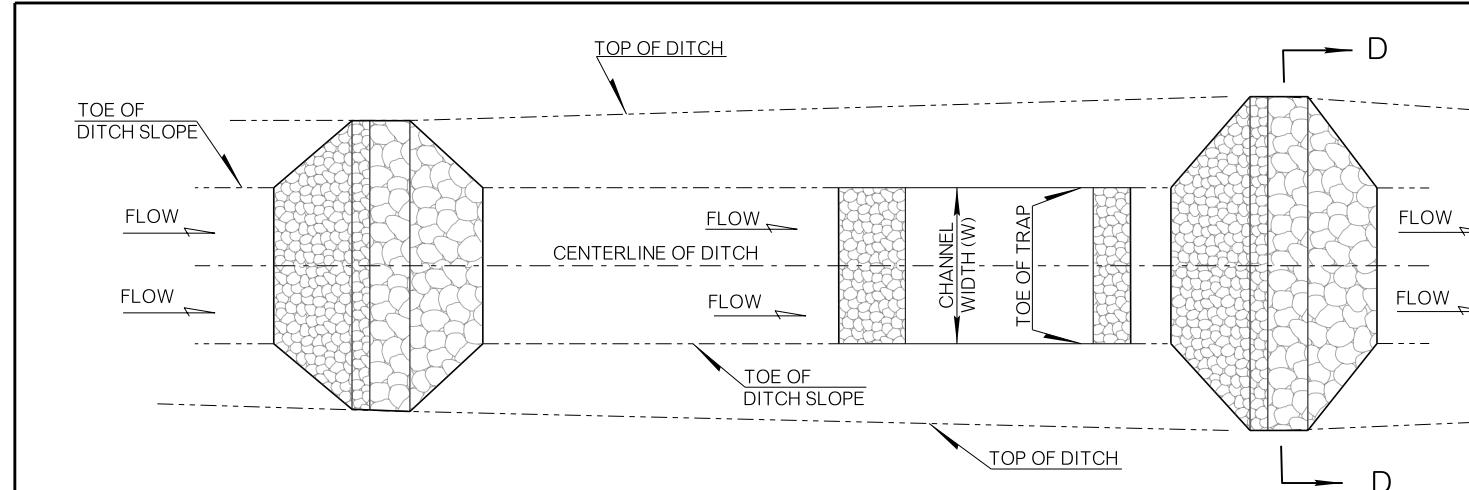
TEMPORARY FIBER LOG APPLICATIONS



2019 SPECIFICATIONS

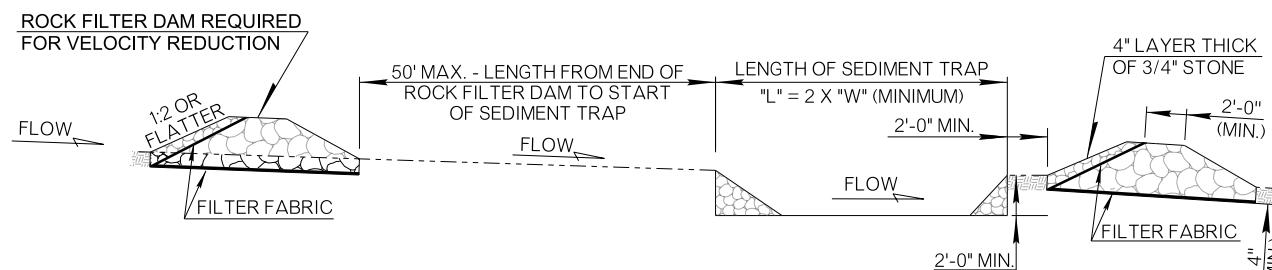
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R-8

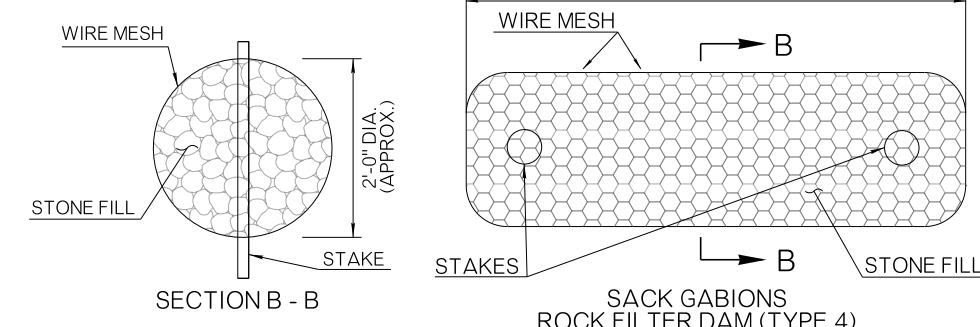


ROCK FILTER DAM WITH SEDIMENT TRAP
PLAN VIEW

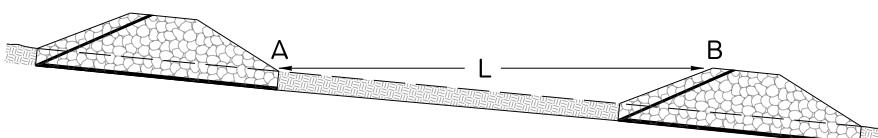
CAN BE USED IMMEDIATELY UPSTREAM OF A SEDIMENT BASIN OR ANOTHER BMP, TO SETTLE LARGER SOIL PARTICLES AND EASE SEDIMENT LOAD IN SEDIMENT BASIN



PROFILE VIEW



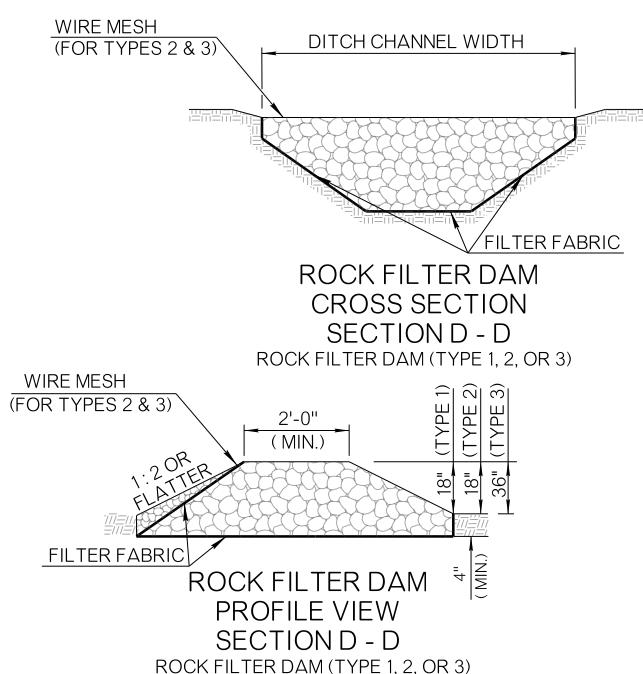
DITCH CHANNEL
PLAN VIEW



ROCK FILTER DAM DITCH CHECK
L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION

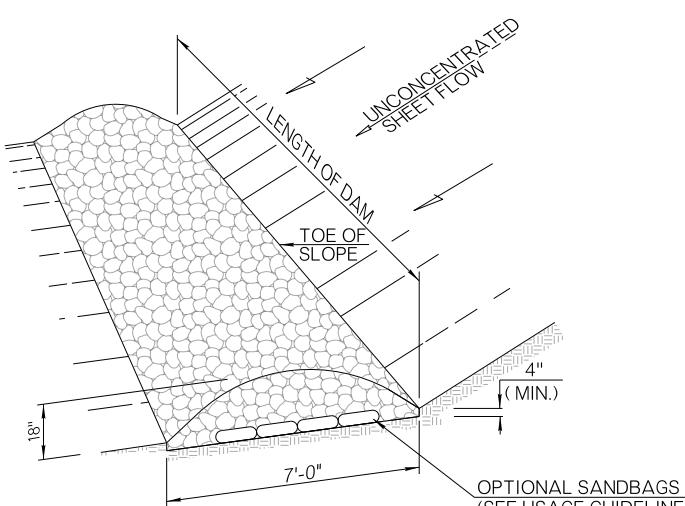
$$\text{DITCH CHECK SPACING FORMULA:}$$

$$\text{SPACING, IN FT.} = \frac{\text{DITCH CHECK HEIGHT, IN FT.}}{\text{SLOPE, IN DECIMALS}}$$



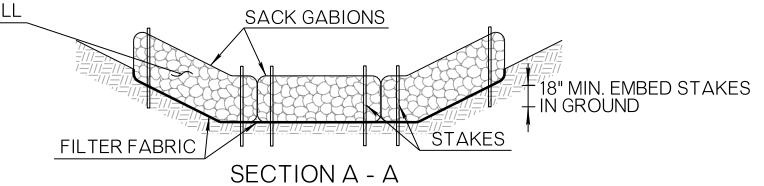
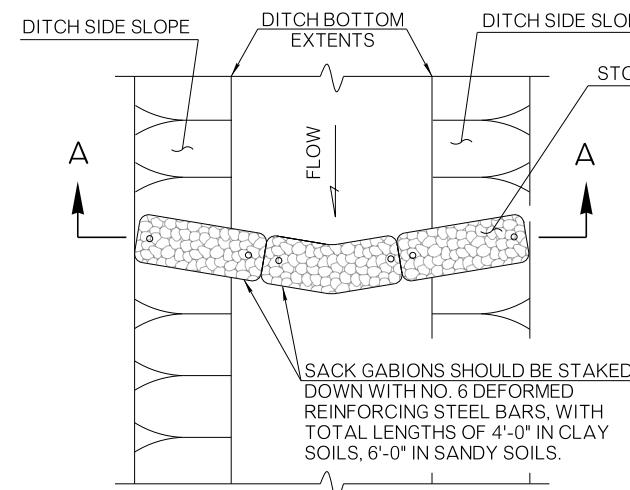
ROCK FILTER DAM
CROSS SECTION
SECTION D - D

ROCK FILTER DAM (TYPE 1, 2, OR 3)



ROCK FILTER DAM AT TOE OF SLOPE

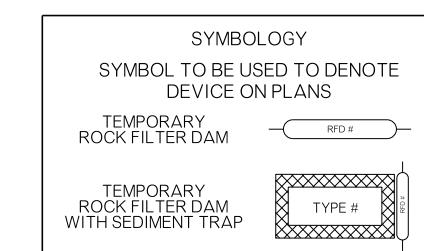
CAN BE USED WHEN REINFORCED SILT FENCE IS INADEQUATE.
USED WITH ROCK FILTER DAM (TYPE 1) ONLY.
ESTIMATED QTY. = 0.28 C.Y. PER FOOT OF LENGTH.



GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. MATERIALS SPECIFICATIONS FOR FILTER FABRIC, STONE FILL FOR GABIONS (ROCK) AND WIRE MESH, SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATION SECTIONS 712.02, 713.03 AND 732.09, RESPECTIVELY. STONE FILL CONVERSION FACTOR SHALL BE 150 - 160 LBS. PER CU. FT.
3. SPECIFIC DIMENSIONS OF ROCK FILTER DAMS AND/OR SEDIMENT TRAPS SHALL BE SHOWN ON THE PLANS.
4. ROCK FILTER DAM WITH SEDIMENT TRAP TO BE USED AT THE END, OR DOWNSLOPE OF SERIES OF ROCK FILTER DAMS AND IN AN EASILY ACCESSIBLE AREA TO REMOVE SEDIMENT. COST OF MATERIALS AND CONSTRUCTION OF SEDIMENT TRAP SHALL BE INCLUDED IN COST OF ROCK FILTER DAM.
5. ROCK FILTER DAM DITCH CHECKS SHOULD BE SPACED SO THAT THE ELEVATION OF THE TOE OF THE UPSTREAM DAM IS EQUAL TO THE ELEVATION OF THE CREST OF THE DOWNSTREAM DAM. THIS ALLOWS THE WATER BETWEEN EACH CHECK DAM TO POOL, GREATLY REDUCING THE FLOW VELOCITY.
6. ROCK FILTER DAM TYPES 2 AND 3 SHALL BE SECURED WITH WIRE MESH. THE ROCK SHALL BE PLACED ON THE MESH TO THE HEIGHT AND SLOPES SPECIFIED, THE MESH SHALL BE FOLDED AT THE UPSTREAM SIDE OVER THE ROCK AND TIGHTLY SECURED TO ITSELF ON THE DOWNSTREAM SIDE USING WIRE TIES OR HOG RINGS. IN CHANNEL USE, THE MESH SHALL BE SECURED OR STAKED TO THE CHANNEL BED PRIOR TO ROCK PLACEMENT.
7. ROCK FILTER DAMS SHALL BE EMBEDDED A MINIMUM OF 4 INCHES INTO THE EXISTING GROUND. FILTER FABRIC SHALL BE INSTALLED ON TOP OF EXISTING GROUND, BEFORE INSTALLING THE ROCK FILTER DAMS.
8. TOES OF SEDIMENT TRAP EXCAVATION ARE TO FIT THE DITCH BOTTOM.
9. MAXIMUM DRAINAGE AREA OF DISTURBED SOIL SHALL BE 5 ACRES AND LONGITUDINAL SLOPE SHALL NOT BE GREATER THAN 10%.
10. COST OF ROCK FILTER DAM (ALL TYPES) TO INCLUDE ALL MATERIAL AND LABOR REQUIRED FOR CONSTRUCTION AND MAINTENANCE. ROCK FILTER DAM TYPES 1, 2 OR 3 SHALL INCLUDE COST OF FILTER FABRIC. MAINTENANCE SHALL INCLUDE THE REMOVAL OF SEDIMENT WHEN HALF OF THE HEIGHT OF THE DAM HAS BEEN FILLED OR AS DIRECTED BY THE ENGINEER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 1)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 2)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 3)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 4)	CY



APPROVED BY
ROADWAY ENGINEER: *R. G. Lewis* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

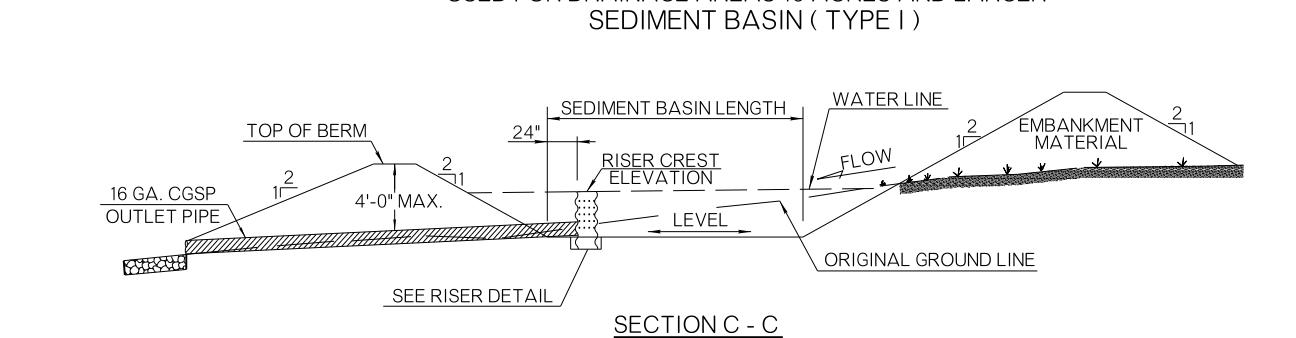
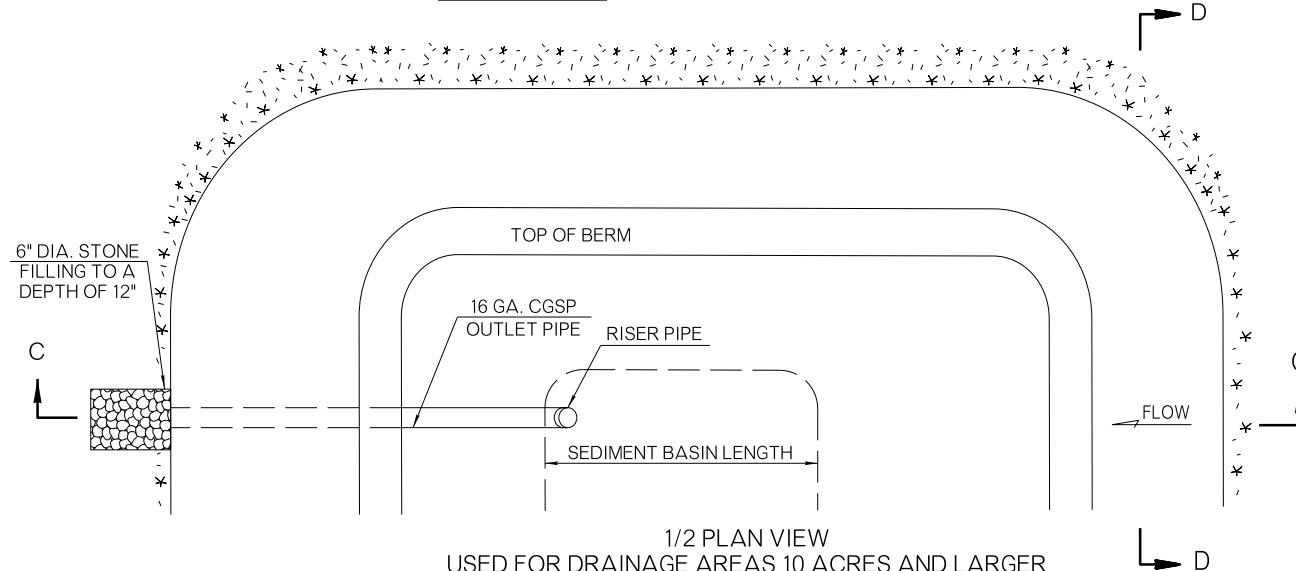
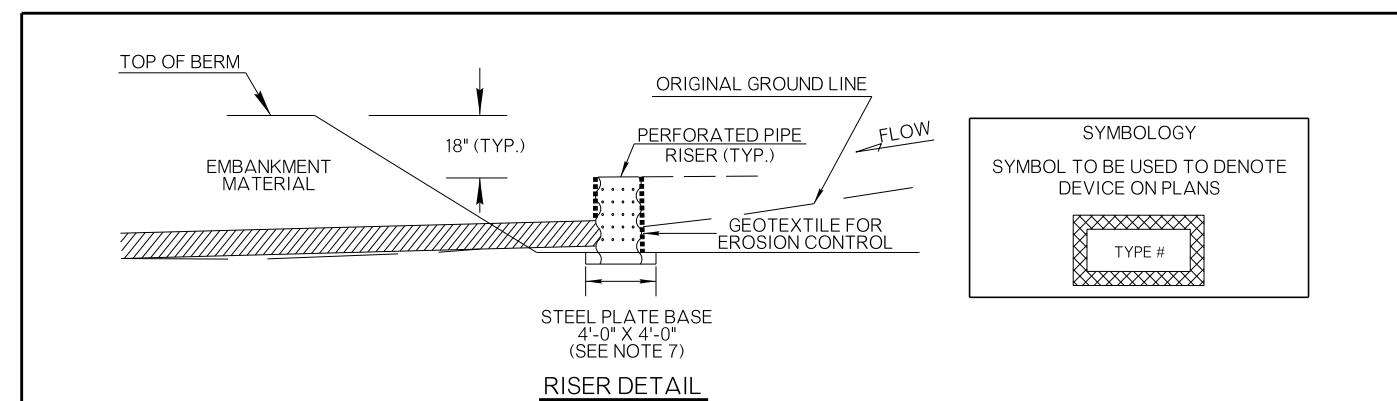
TEMPORARY ROCK FILTER DAM APPLICATIONS



2019 SPECIFICATIONS

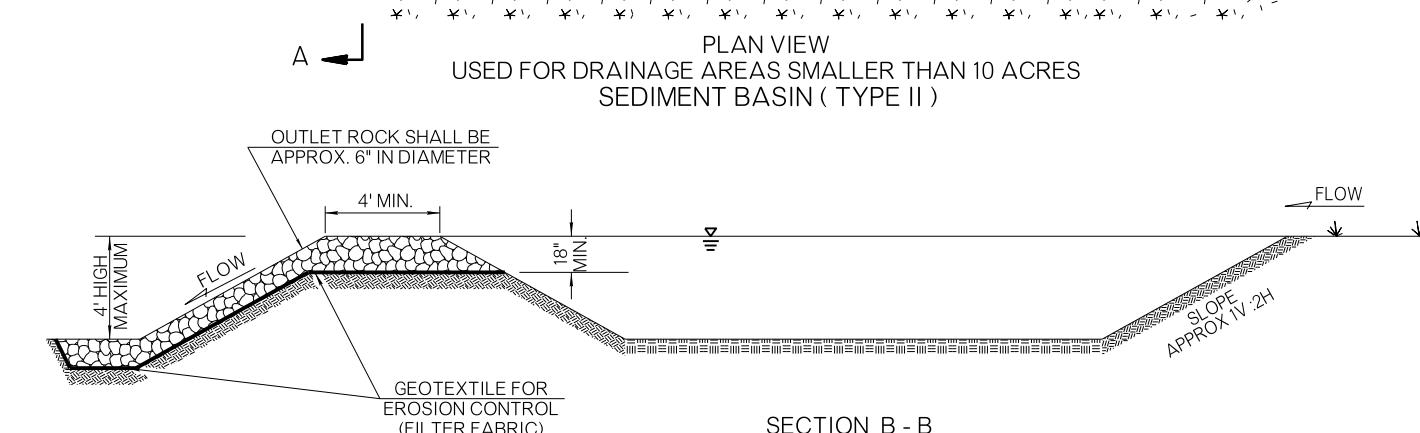
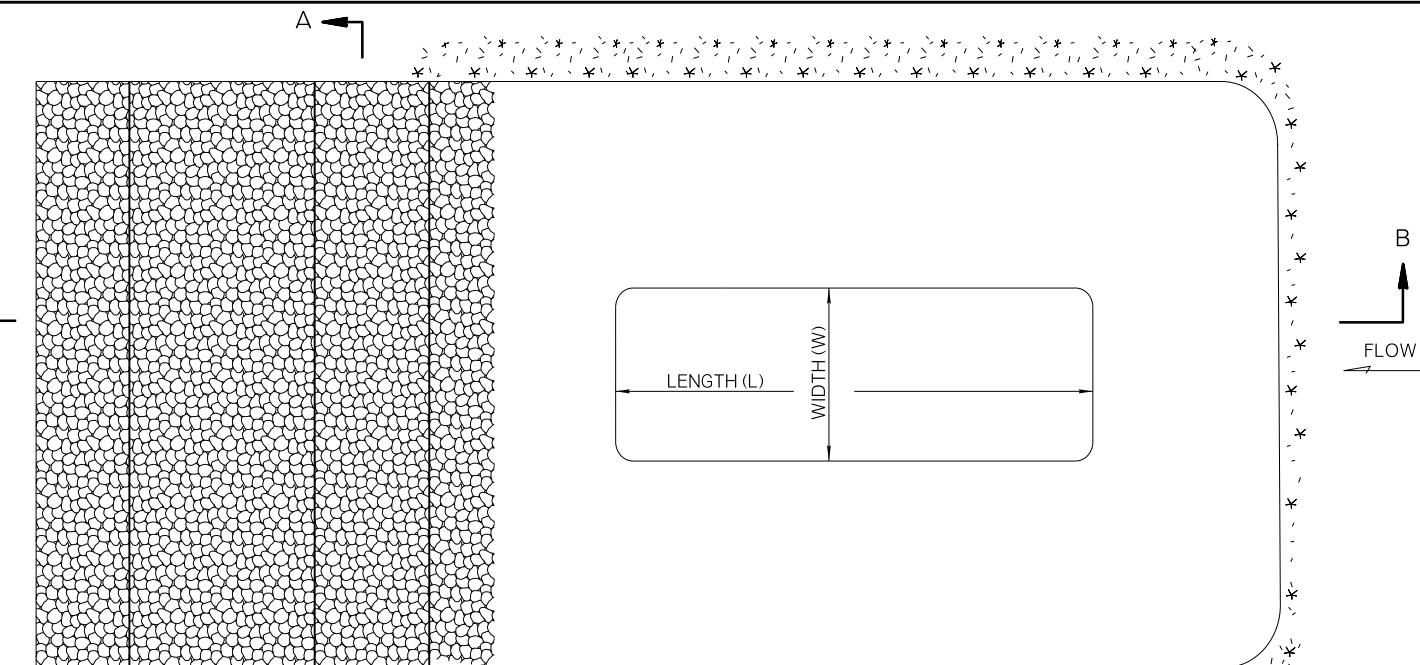
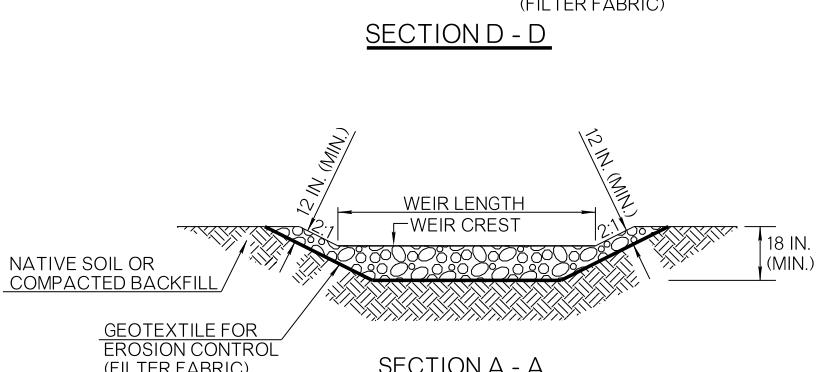
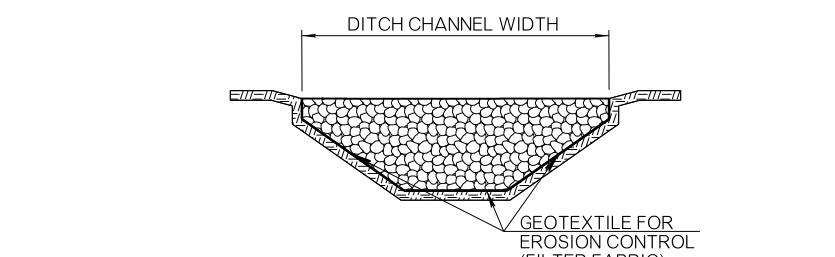
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R-9



OUTLET AND RISER PIPE DIAMETER SIZES		
OUTLET DIAMETER (IN.)	RISER DIAMETER (IN.)	MAX. DRAIN AREA (AC.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

WEIR LENGTH TABLE	
DRAINAGE AREA (ACRES)	WEIR LENGTH (FEET)
1	4
2	6
3	8
4	10
5	12

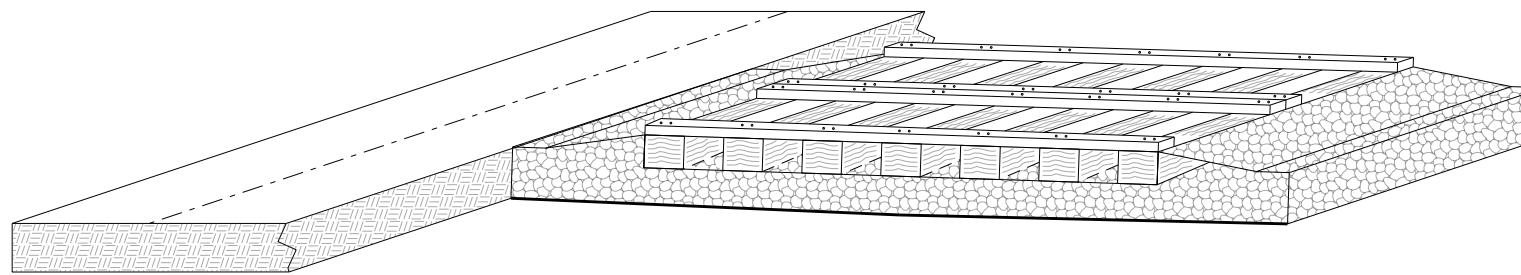


GENERAL NOTES

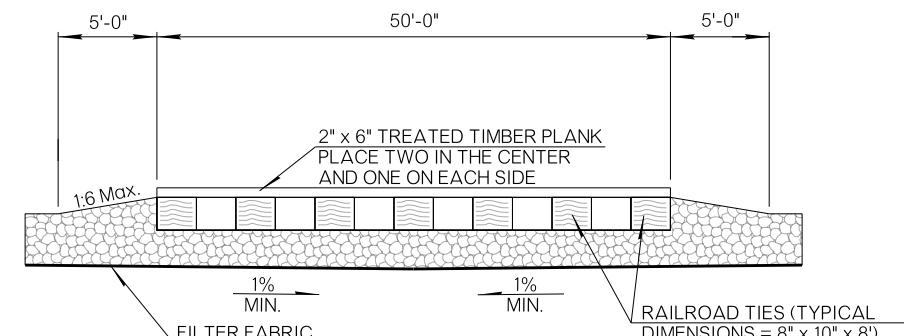
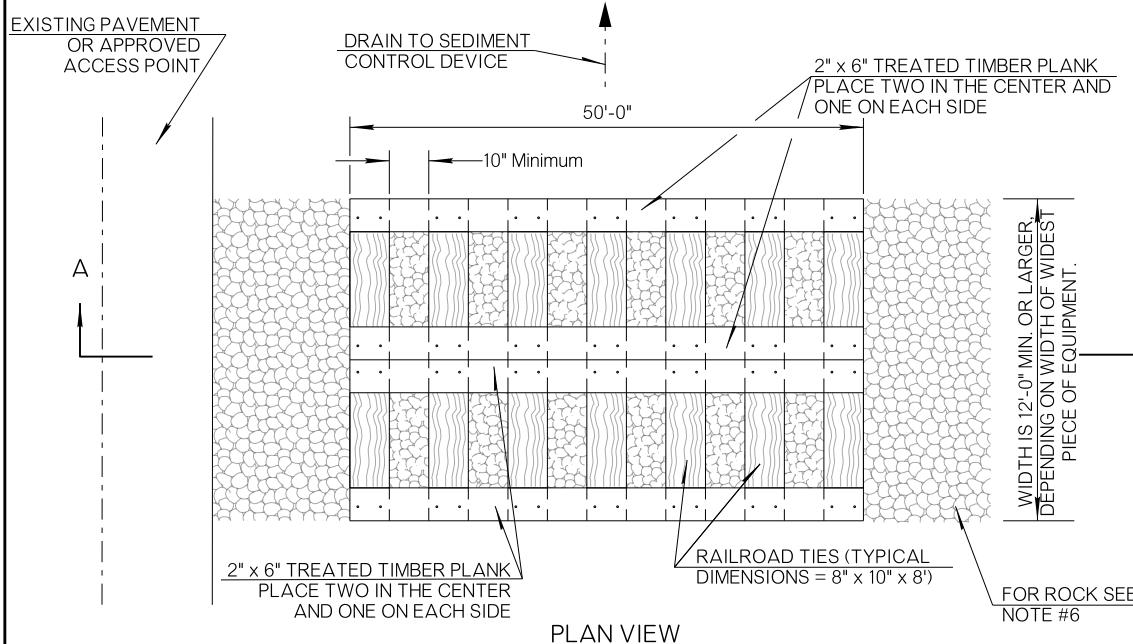
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTIONS 221.02E AND 221.04E OF THE 2019 ODOT STANDARD SPECIFICATIONS.
- ALL INSTALLATION, MATERIALS AND MAINTENANCE FOR EACH OF TWO TYPES ARE TO BE PAID FOR AS "TEMPORARY SEDIMENT BASIN." THE TYPE OF BASIN SHALL BE NOTED IN THE PLANS.
- SEDIMENT BASINS SHOULD BE CONSTRUCTED PRIOR TO DISTURBANCE OF UPSLOPE AREAS, IF POSSIBLE, AND CONTINUE FUNCTIONING UNTIL THE CONTRIBUTING DRAINAGE AREA IS FULLY AND PERMANENTLY STABILIZED. BASIN SELECTION BASED ON ODEQ HIGH PRIORITY SITES, AS DETERMINED IN OKR10 PERMIT. IF THE SITE IS A HIGH PRIORITY SITE, INSTALL BASIN DOWNSTREAM OF DISTURBED DRAINAGE AREAS OF 5 ACRES OR MORE. OTHERWISE, INSTALL BASIN DOWNSTREAM OF DISTURBED DRAINAGE AREAS OF 10 ACRES OR MORE. BASINS SHALL NOT BE CONSTRUCTED IN WATERS OF THE STATE OR IN U.S.G.S. BLUE-LINE STREAMS.
- SEDIMENT BASINS SHOULD BE LARGE ENOUGH TO STORE 3600 C.F. OF WATER PER ACRE OF DRAINAGE AREA. LENGTH TO WIDTH RATIOS ARE USUALLY 1:2 TO 1:3. SEDIMENT BASINS SHOULD LAST AS LONG AS 18 MONTHS.
- FILL MATERIAL FOR BERMS SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, OR OTHER NON-SUITABLE MATERIAL. THE EARTH BERM SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
- RISER PIPE SHALL BE PERFORATED WITH 1 INCH DIAMETER HOLES OR SLOTS SPACED 6 INCHES VERTICALLY AND 6 INCHES HORIZONTALLY. NO PERFORATIONS SHALL BE ALLOWED WITHIN 6 INCHES OF OUTLET PIPE. RISER PIPE SHALL BE WRAPPED IN GEOTEXTILE FOR EROSION CONTROL (FILTER FABRIC). WHERE ENDS OF THE GEOTEXTILE COME TOGETHER, THEY SHALL BE OVERLAPPED, FOLDED, AND STAPLED TO PREVENT BYPASS FLOW.
- RISER SHALL BE ANCHORED IN PLACE WITH A STEEL PLATE BASE TO PREVENT FLOTATION. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED AND SEALED TO THE RISER PIPE BY A CONTINUOUS WELD TO FORM A WATERTIGHT CONNECTION. TWO FEET OF COMPACTED EARTH SHALL BE PLACED ON TOP OF THE PLATE.
- THE OUTLET PIPE AND ITS CONNECTIONS SHALL BE WATERTIGHT. FILL MATERIAL AROUND OUTLET PIPE SHALL BE CONSTRUCTED IN 4 INCH LAYERS. A MINIMUM OF 24 INCHES OF COMPACTED FILL SHALL BE PLACED OVER THE OUTLET PIPE BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
- MAINTENANCE OF THE SEDIMENT BASIN SHALL INCLUDE REPAIR AND REBUILDING OF THE BERMS, PIPES, AND OTHER FEATURES AS NEEDED TO ENSURE THAT THE TRAP PERFORMS AS ORIGINALLY INTENDED. TORN, PUNCTURED, OR CLOGGED GEOTEXTILE FOR EROSION CONTROL SHALL BE REPLACED AS NEEDED.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(D)	TEMPORARY SEDIMENT BASIN	EA

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 3/31/2025
ROADWAY DESIGN DIVISION STANDARD
TEMPORARY SEDIMENT BASIN
OKLAHOMA Transportation
2019 SPECIFICATIONS
TSB 1
R-10



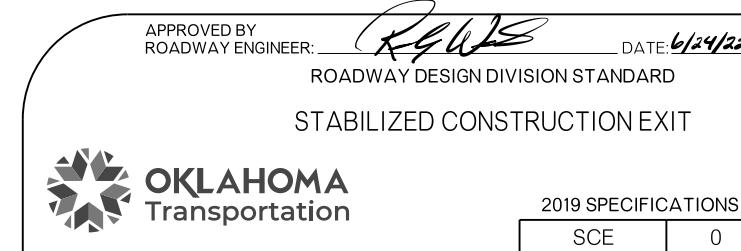
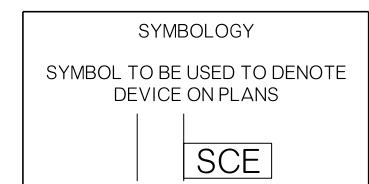
STABILIZED CONSTRUCTION EXIT

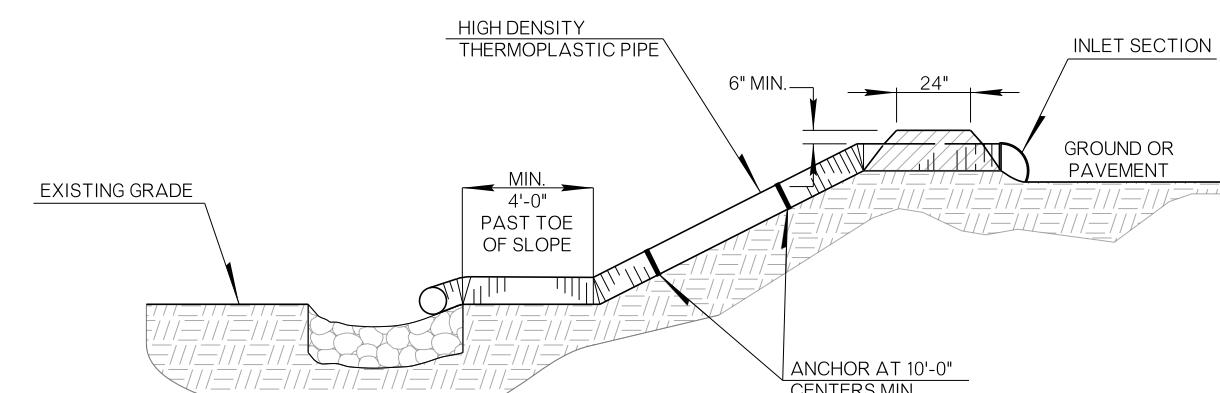
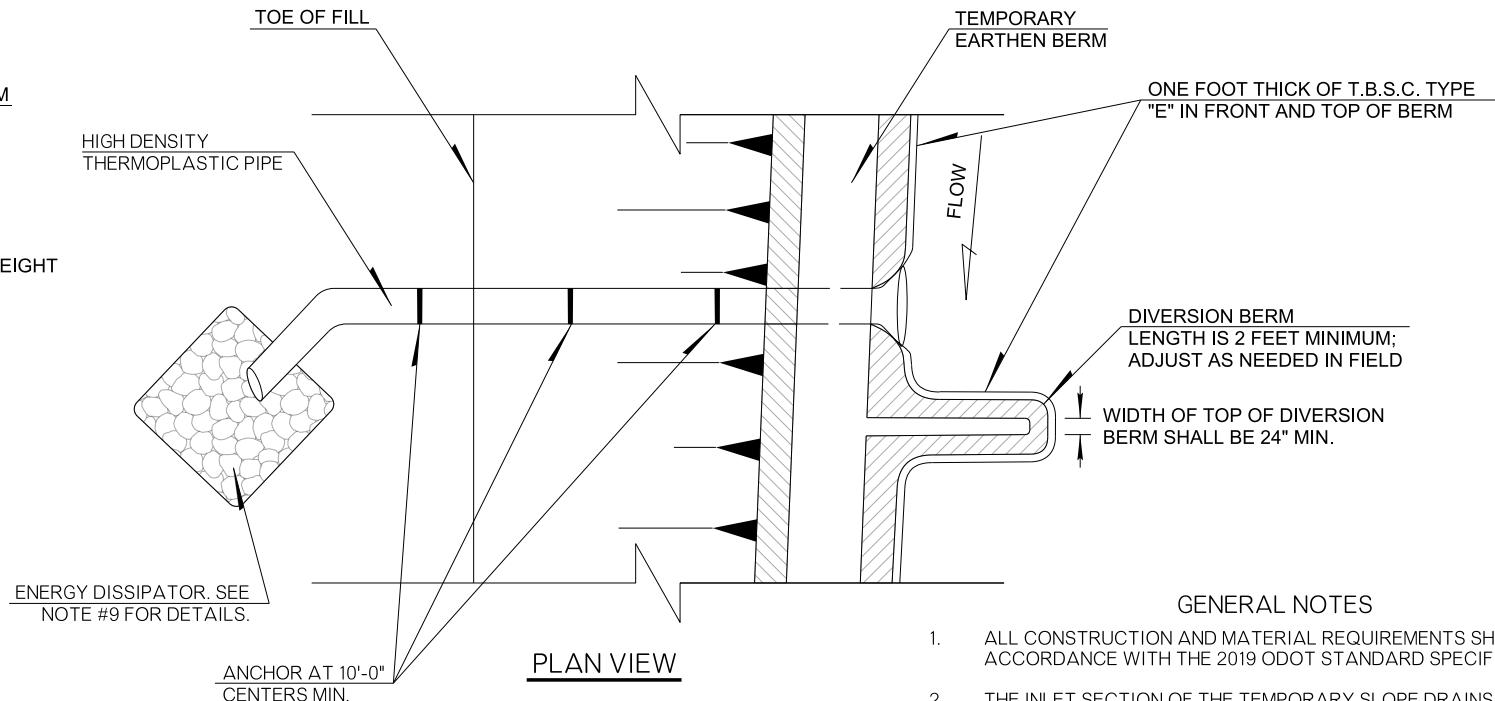
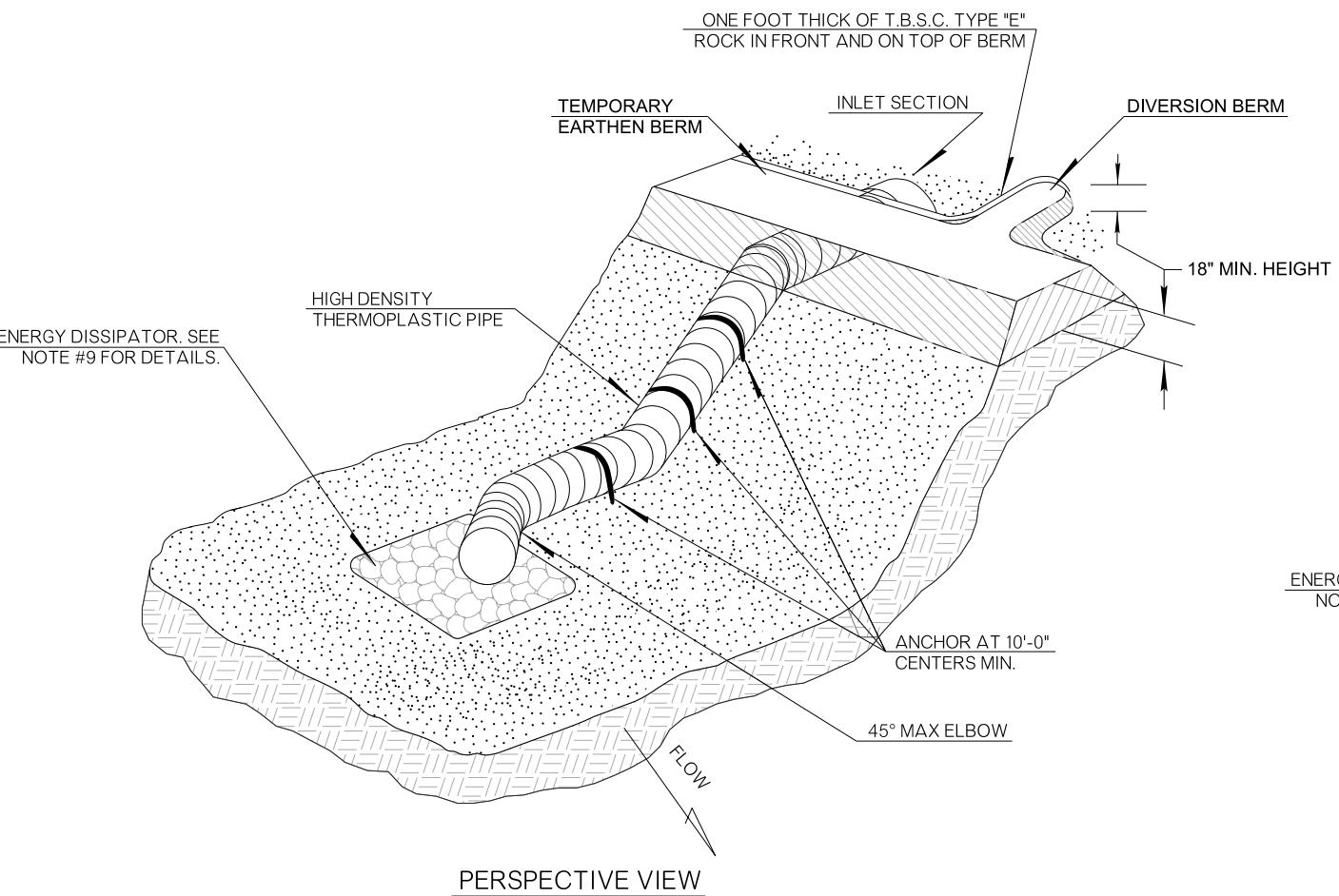


GENERAL NOTES

- LOCATION OF STABILIZED CONSTRUCTION EXIT TO BE AS SHOWN ON THE PLANS OR AS APPROVED BY THE ENGINEER.
- THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 1:6 OR AS DIRECTED BY THE ENGINEER.
- RUNOFF FROM THE CONSTRUCTION EXIT SHALL BE DIRECTED TO AN APPROPRIATE SEDIMENT CONTROL DEVICE AS APPROVED BY THE ENGINEER.
- THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MINIMUM, AND SHOULD BE FREE FROM LARGE OR LOOSE KNOTS.
- THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH 1/2 IN. X 6 IN. LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE ENGINEER.
- MATERIALS FOR THE ROCK BASE SHALL BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS, SEC. 713.03 "GABIONS, REVETMENT MATTRESSES, AND ROCK FILTER DAMS."
- ALL MATERIALS, LABOR AND MAINTENANCE TO COMPLETE THE STABILIZED CONSTRUCTION EXIT SHALL BE INCLUDED IN THE COST OF WORK, INCLUDED IN THE BID AND NOT PAID FOR SEPARATELY.
- MAINTENANCE INCLUDING SEDIMENT REMOVAL AND ROUTINE INSPECTION OF THE DEVICE, SHALL BE INCLUDED IN THE COST OF WORK AND PERFORMED AT THE DISCRETION OF THE ENGINEER.
- AN ALTERNATE DESIGN MAY BE USED, DUE TO PROJECT SPACE CONSTRAINTS, IF APPROVED BY ENGINEER. ALL MATERIALS, LABOR, INSTALLATION AND MAINTENANCE NEEDED FOR THE ALTERNATE DEVICE SHALL BE PAID FOR "STABILIZED CONSTRUCTION EXIT."

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
242	STABILIZED CONSTRUCTION EXIT	EA

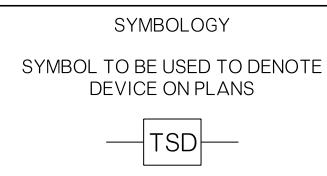


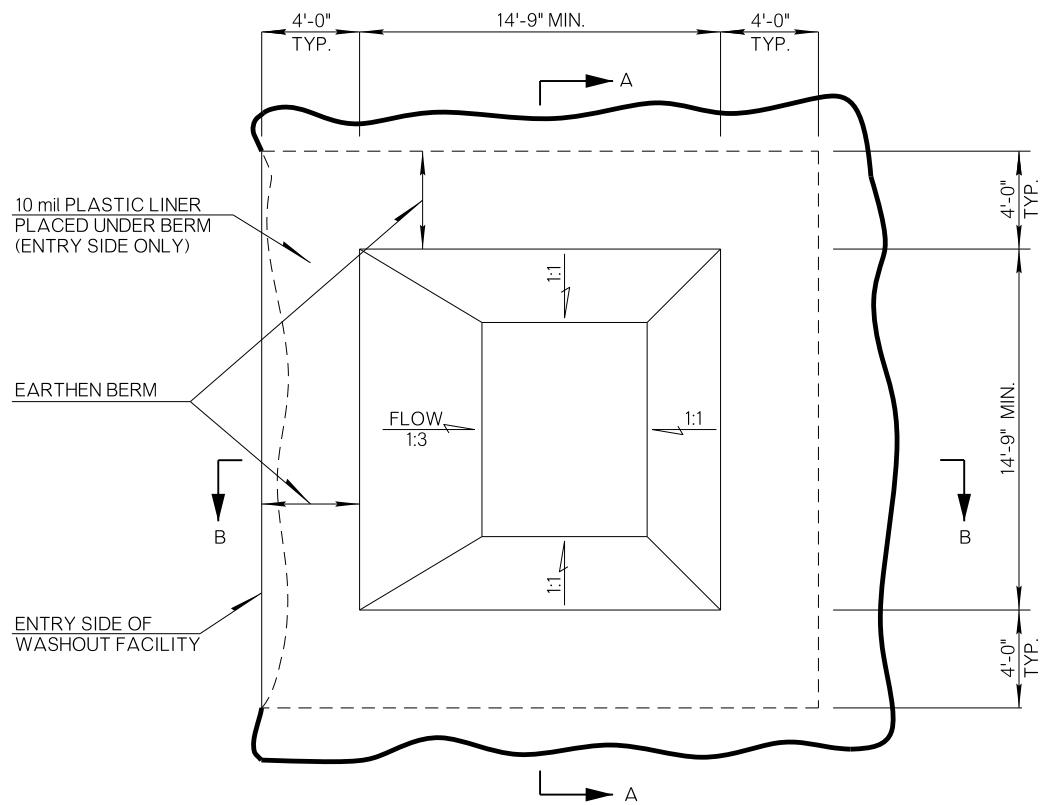


GENERAL NOTES

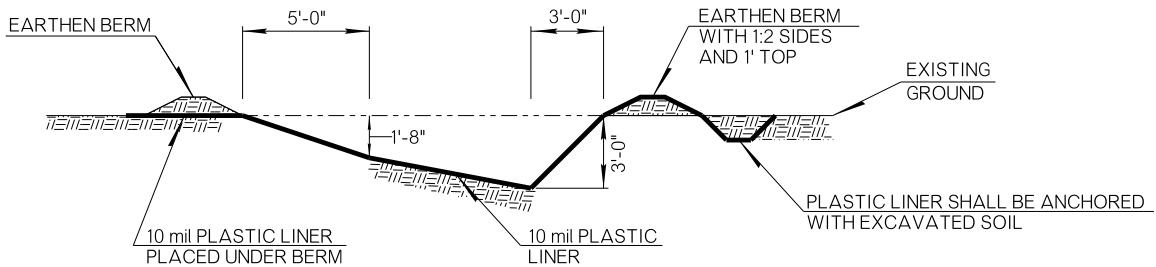
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. THE INLET SECTION OF THE TEMPORARY SLOPE DRAINS SHALL BE PLACED IN SUMP LOCATIONS OR AS DIRECTED BY THE ENGINEER, WITH A MAXIMUM SPACING OF 500 FEET BETWEEN SLOPE DRAINS.
3. NOT INTENDED FOR USE ON CUT AND FILL SLOPES STEEPER THAN 1:2 (V:H).
4. DIAMETER OF PIPES SHALL BE A MINIMUM OF 12 INCHES AND MAXIMUM OF 18 INCHES. PIPES SHOULD BE UNIFORM THROUGHOUT THE SLOPE.
5. ENTRANCE SECTION MUST BE SECURELY ENTRENCHED AND ALL CONNECTIONS WATERTIGHT.
6. THE CONDUIT SHOULD BE SECURELY STAKED TO THE SLOPE.
7. INLET PIPE SHOULD HAVE A MINIMUM SLOPE OF 2%.
8. SLOPE DRAIN SHOULD EXTEND A MINIMUM OF 4 FEET PAST THE TOE OF SLOPE AND OUTLET SHOULD HAVE LESS THAN 1% SLOPE.
9. ENERGY DISSIPATOR SHALL BE 5 FT. X 5 FT. X 1 FT. OR AS DIRECTED BY THE ENGINEER. STONE FOR ENERGY DISSIPATOR SHALL BE RIPRAP STONE OR MATERIAL MADE OF CRUSHED NON-EROSIVE ROCK THAT IS FREE OF ALL FINES, CLAYS AND SILTS AND OF SUFFICIENT SIZE TO PREVENT DOWNSTREAM MOVEMENT.
10. THE SOIL AROUND AND UNDER THE INLET PIPE AND ENTRANCE SECTION SHALL BE HAND TAMPED IN 4 INCH LIFTS TO THE TOP OF THE TEMPORARY EARTHEN BERM.
11. DIVERSION BERMS, INSTALLED PERPENDICULAR TO THE LONGITUDINAL DIRECTION OF THE HIGHWAY, MAY BE MADE OF SOIL, SAND BAGS, OR SILT DIKE. SIDE SLOPES OF THE DIVERSION BERM SHALL BE 2H:1V OR FLATTER.
12. PRICE BID FOR TEMPORARY SLOPE DRAIN SHALL INCLUDE COST OF ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE AND REMOVAL.
13. IF DIVERSION BERMS ARE LEFT IN PLACE LONGER THAN 14 CALENDAR DAYS, THEY SHALL BE STABILIZED TO PREVENT SEDIMENT RUNOFF.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(A)	TEMPORARY SLOPE DRAIN	LF

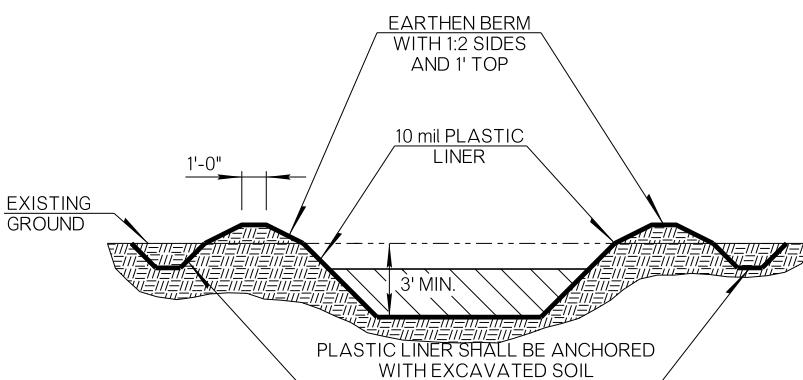




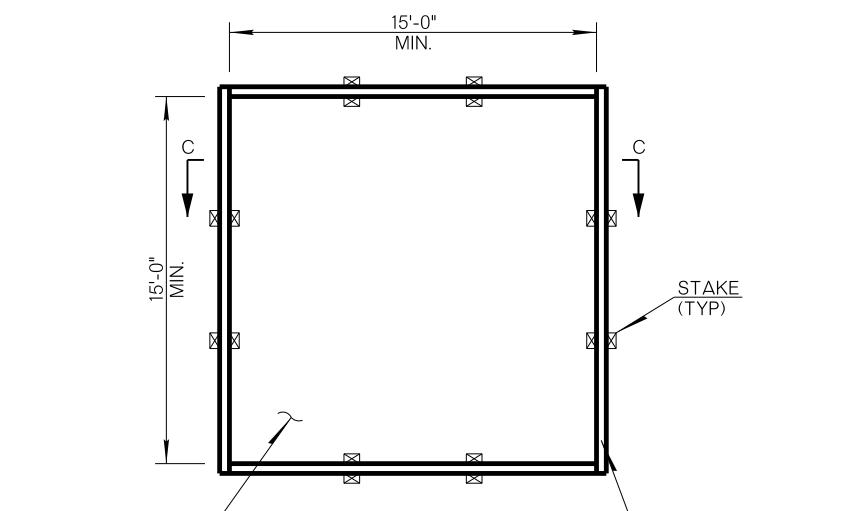
PLAN VIEW
"BELOW GRADE" TYPE



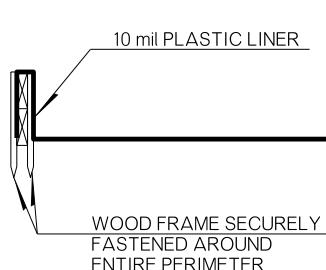
SECTION B-B



SECTION A-A



PLAN VIEW
"ABOVE GRADE" TYPE



SECTION C-C

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTION 220.04.H(2) OF THE 2019 ODOT STANDARD SPECIFICATIONS.
2. TEMPORARY CONCRETE WASHOUT DEVICES SHOULD BE CONSTRUCTED ABOVE GRADE OR BELOW GRADE AT THE OPTION OF THE CONTRACTOR. WASHOUT DEVICE SHOULD BE CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS.
3. PROVIDE A WASHOUT AREA A MINIMUM OF 50 FEET AWAY FROM INLETS, SWALES, DRAINAGE WAYS AND CHANNELS, IF THE SITE CONFIGURATION PROVIDES SUFFICIENT SPACE TO DO SO. IN NO CASE SHALL THE CONCRETE WASHOUT DEVICE BE INSTALLED CLOSER THAN 20 FEET FROM INLETS, SWALES, DRAINAGE WAYS AND CHANNELS.
4. PLASTIC LINER SHALL CONFORM TO ASTM D-4397, BE A MINIMUM OF 10 MIL (0.10 INCHES) THICK, AND FREE OF ALL TEARS AND HOLES AND BE IMPERMEABLE.
5. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE LOCATION OF THE CONCRETE WASHOUT DEVICE, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE FACILITY TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.
6. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.
7. THE CONCRETE WASHOUT DEVICE SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE, AND SHOULD REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
8. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED, ALONG WITH THE PLASTIC LINER, ONCE THE PIT HAS REACHED 50% CAPACITY, USING SUITABLE WATER TIGHT CONTAINERS AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS OR IN A MANNER APPROVED BY THE RESIDENT ENGINEER.
9. ALL MATERIALS, LABOR AND SIGNS NEEDED TO CONSTRUCT AND MAINTAIN THE CONCRETE WASHOUT DEVICE SHALL BE INCLUDED IN OTHER ITEMS OF WORK.
10. ALTERNATE DESIGNS OF THE CONCRETE WASHOUT DEVICE MAY BE USED IF APPROVED BY THE ENGINEER.

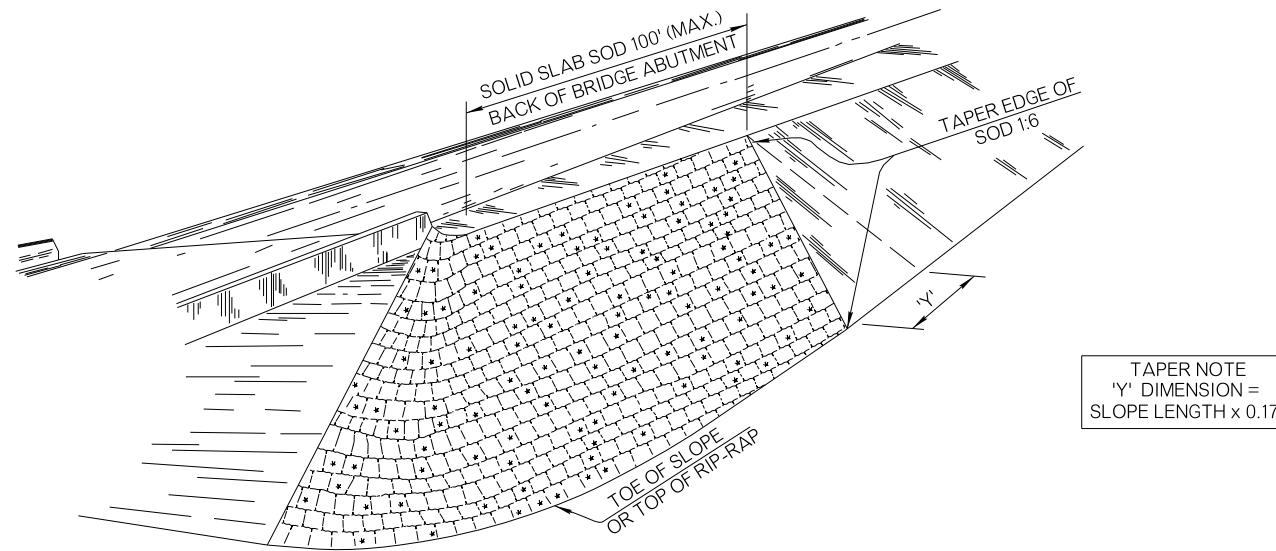
APPROVED BY
ROADWAY ENGINEER: *R. G. Lewis* DATE: *6/24/22*
ROADWAY DESIGN DIVISION STANDARD

CONCRETE WASHOUT APPLICATIONS

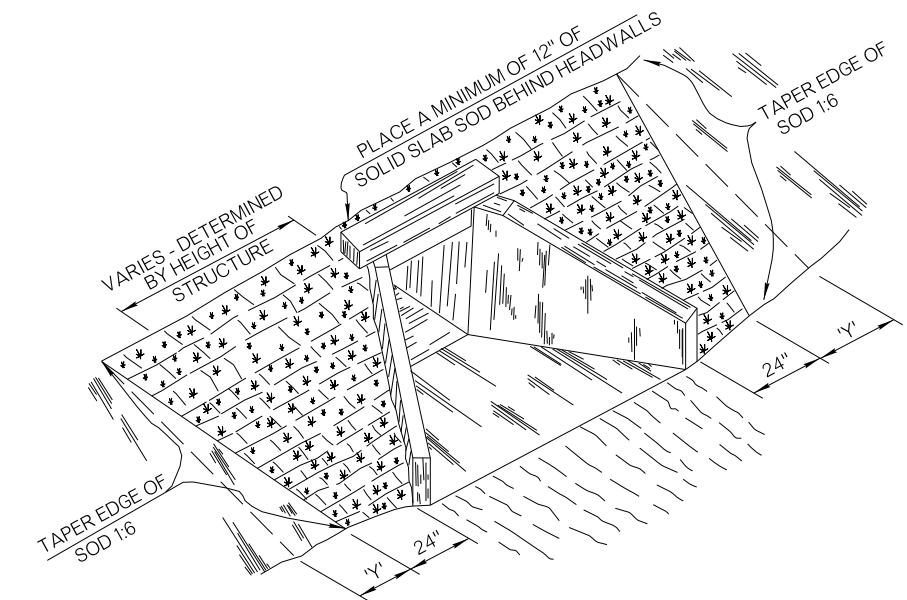


2019 SPECIFICATIONS

CWA	0
	R-13



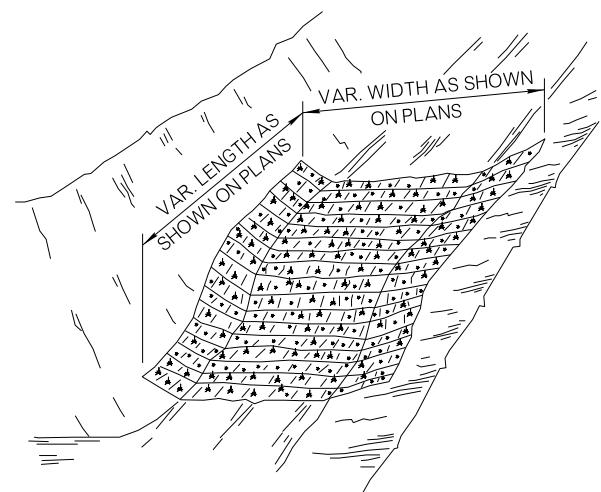
TYPICAL PLACEMENT OF SOLID SLAB SODDING OR APPROVED STABILIZING MAT ON FILL SLOPES, APPROACHES TO OVERPASSES AND BRIDGES



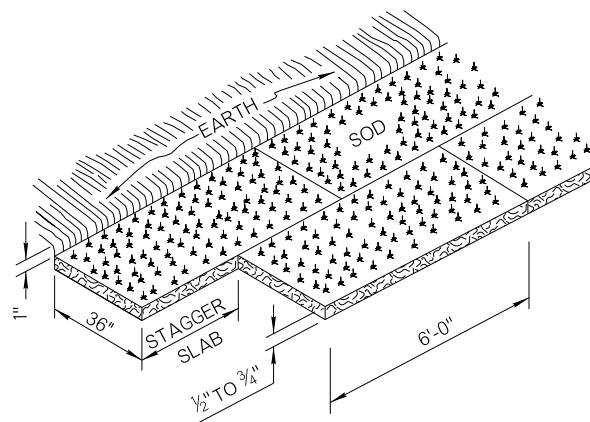
TYPICAL PLACEMENT OF SOLID SLAB SODDING AT STRUCTURE HEADWALLS

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. SOLID SLAB SOD SHALL BE PLACED IN HORIZONTAL ROWS WITH THE LONGEST SIDE OF EACH SLAB RUNNING PARALLEL TO THE ROADWAY, AND THE SLABS IN ALTERNATE ROWS STAGGERED HALF THE LENGTH OF EACH INDIVIDUAL SLAB. ENSURE THE ROWS RUN PARALLEL TO THE ROADWAY.
3. SLABS SHALL BE CUT AND HARVESTED WITH A COMMERCIAL SOD CUTTER TO THE DIMENSIONS SHOWN, THEN LOADED, TRANSPORTED AND HANDLED ON PALLETS.
4. AFTER PLACEMENT OF SOLID SLAB SOD, EARTH AT THE OUTER EDGES OF THE PLACEMENT SHALL BE BACKFILLED AND LOOSELY COMPACTION TO AT LEAST 1 INCH ABOVE THE TOP OF THE SOLID SLAB SODDING.
5. WATER THE SOD IMMEDIATELY AFTER INSTALLATION, TO AN APPROPRIATE DEPTH SO AS TO ENCOURAGE HEALTHY GROWTH. SOD SHALL BE ESTABLISHED BEFORE BEING MOWED.
6. ON SLOPES STEEPER THAN ONE UNIT VERTICAL TO 4 UNITS HORIZONTAL (1:4), STAKE THE SOD WITH STAKES SPACED AS THE SOIL NATURE AND SLOPE STEEPNESS DICTATE, 24 INCHES APART ALONG THE LENGTH OF THE SOD STRIP. MAXIMUM SLOPE OF USING STAKED SOD IS 1:3; STEEPER SLOPES WILL REQUIRE AN APPROVED STABILIZING MAT. AFTER INSTALLING, STAKES SHOULD HOLD THE SOD FIRMLY IN PLACE AND PRESENT NO DANGER TO PEDESTRIANS OR MOWING CREWS. STAKES CAN BE MADE OF SOUND WOOD APPROXIMATELY 1 INCH SQUARE OR 1 INCH IN DIAMETER AND AT LEAST 6 INCHES LONG, OR METAL STAPLES IN PLACE OF WOODEN STAKES.



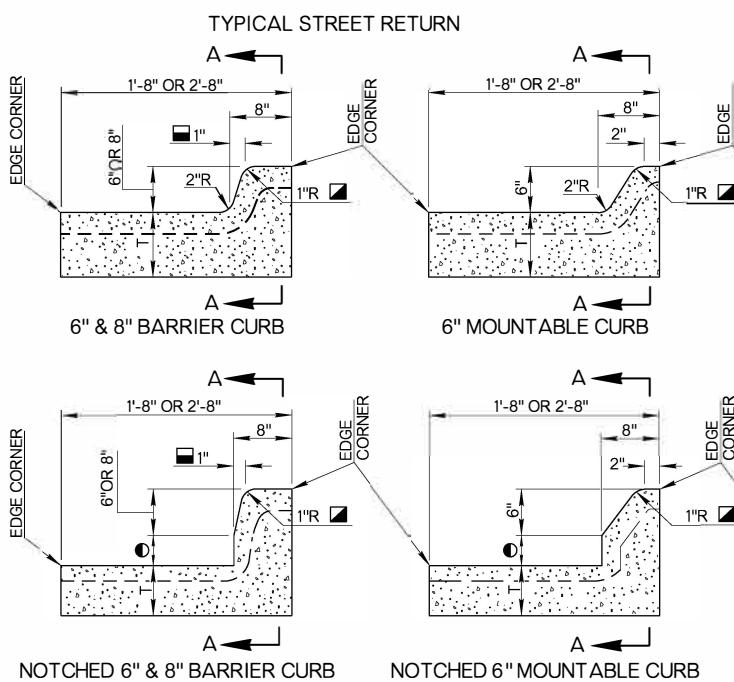
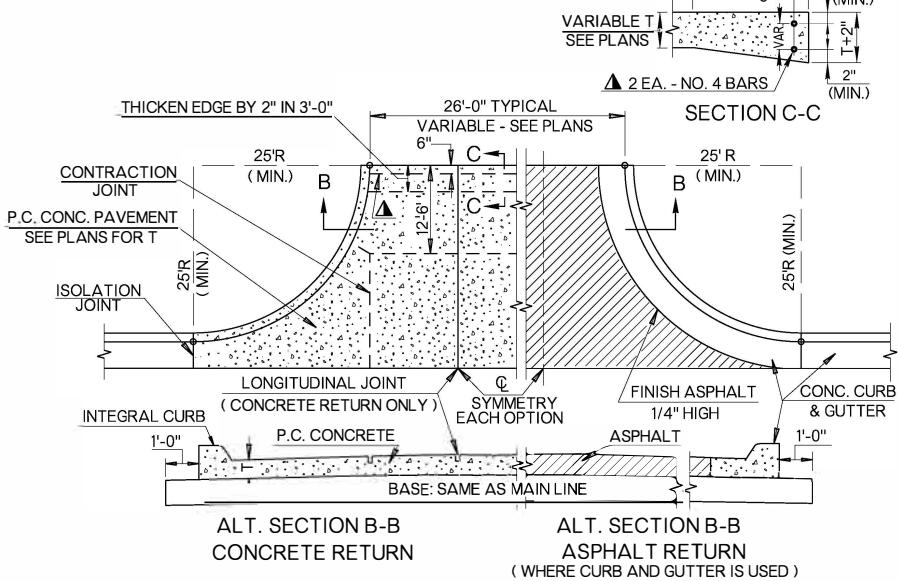
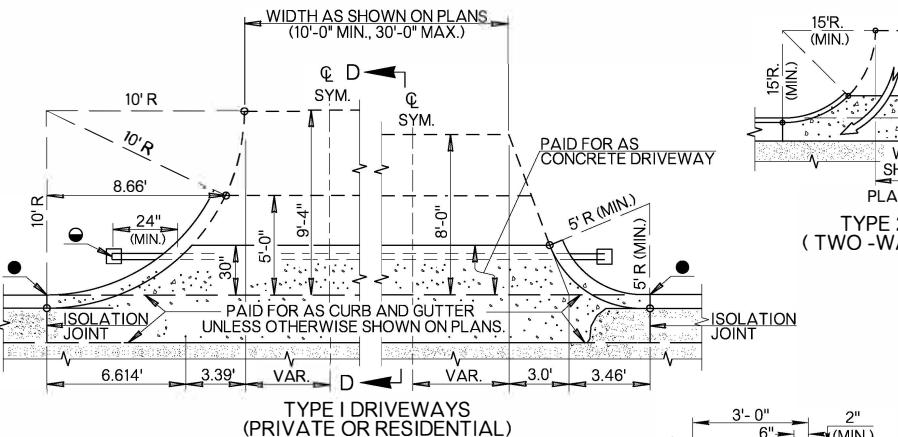
TYPICAL PLACEMENT OF SOLID SLAB SODDING IN DITCHES



THE PLACEMENT OF SOLID SLAB SOD SHALL BE RESTRICTED TO THE PERIOD FROM MARCH 1 THRU AUGUST 31, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
230(A)	SOLID SLAB SODDING	SY

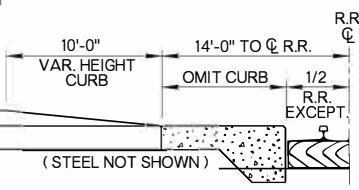
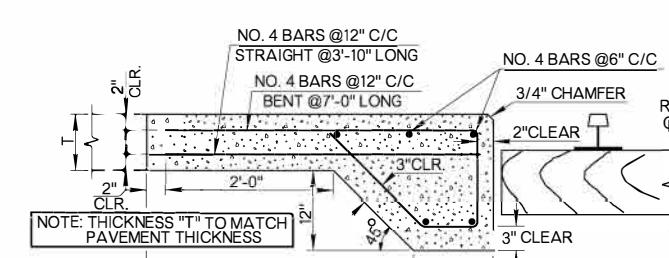
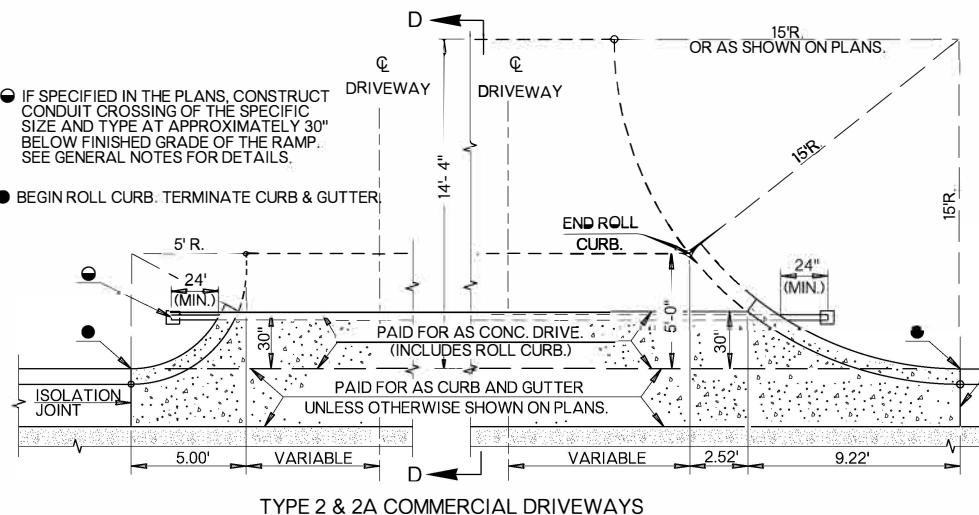
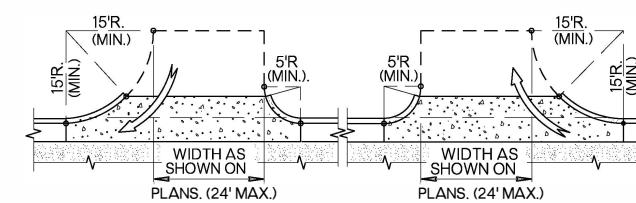
APPROVED BY
ROADWAY ENGINEER: *R. G. W.* DATE: *6/24/22*
ROADWAY DESIGN DIVISION STANDARD



COMBINED CURB & GUTTER TYPICAL SECTIONS

NOTE: T DIMENSION EQUALS THE THICKNESS SHOWN ON TYPICAL SECTION. (MIN.=6")

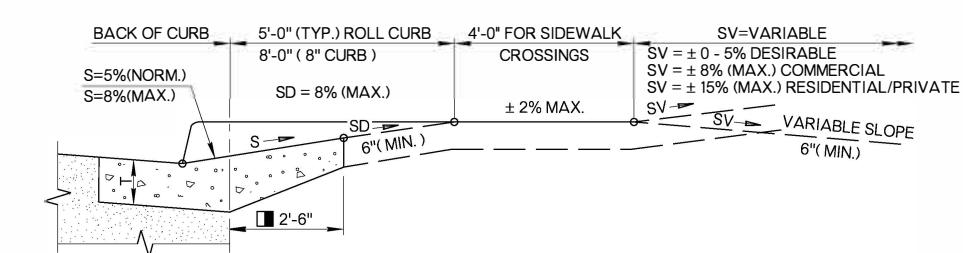
- DIMENSION EQUALS THE THICKNESS ASPHALT CONC. SHOWN ON TYPICAL SECTION. (MIN.=2"; MAX.=4")
- RADIUS OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.
- BATTER OF 2" MAY BE USED IF APPROVED BY THE ENGINEER.



DETAIL OF CURBS ADJACENT TO RAILROAD CROSSINGS

P.C. RAILROAD APPROACH SLAB WITH THICKENED EDGE AT RAILROAD CROSSING

THICKENED EDGE OF CONCRETE RAILROAD APPROACH SLAB SHALL EXTEND FROM OUTSIDE TO OUTSIDE OF SHOULDERS. COST OF CLASS A CONCRETE & REINFORCING STEEL TO BE INCLUDED IN THE PRICE BID FOR RAILROAD APPROACH SLAB.

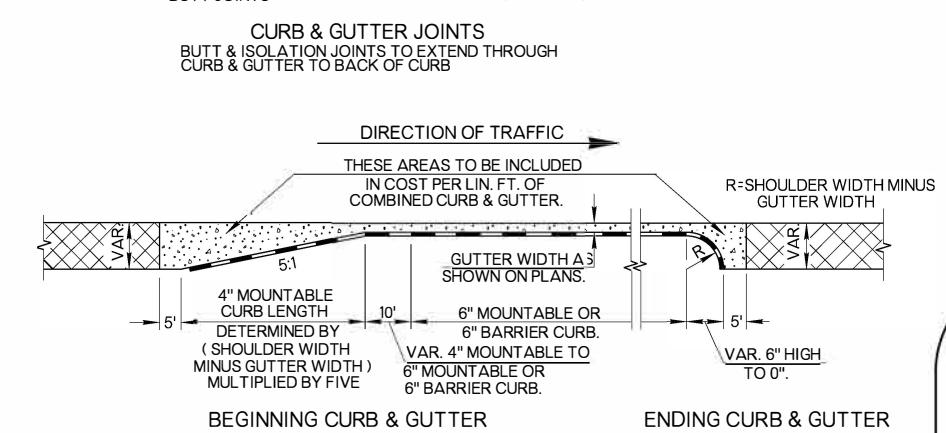
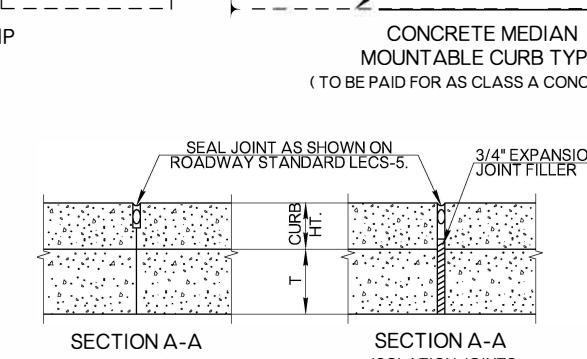
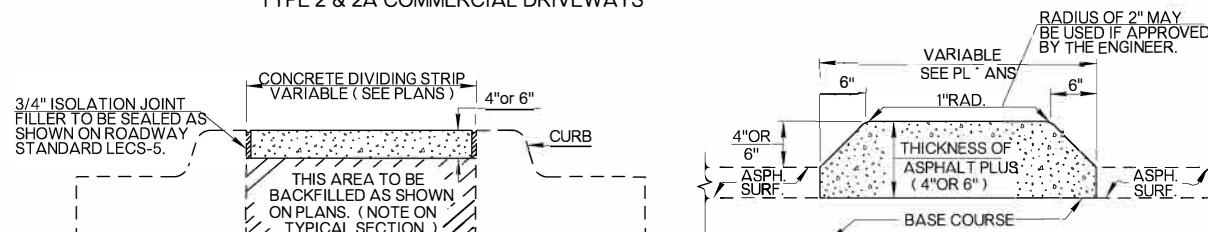


SECTION D-D ALONG ♀ DRIVE

■ WHEN SIDEWALK IS BUILT DIRECTLY BEHIND CURB, THE CONCRETE DRIVEWAY SHOULD BE CONSTRUCTED & EXTENDED TO THE BACK EDGE OF SIDEWALK.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. COST OF JOINT FILLERS, SEALING AND REINFORCING STEEL SHALL BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.
3. TRANSVERSE ISOLATION JOINTS FOR CONCRETE DIVIDING STRIP AND CONCRETE MEDIAN (MOUNTABLE CURB TYPE) TO BE 1/2" ISOLATION JOINT FILLER AT 50' C/C, 1/4" ISOLATION JOINT MATERIAL AT 1/3 POINTS BETWEEN 1/2" ISOLATION JOINTS. FILLER MATERIAL TO BE PREMOLDED AND JOINTS TO BE SEALED AS SHOWN ON ROADWAY STANDARD LECS-5.
4. COMBINED CURB & GUTTER SHALL HAVE 3/4" ISOLATION JOINTS AT DRAINAGE STRUCTURES, STREET CURB RETURNS AND AT THOSE LOCATIONS SHOWN ON THE PLANS. BUTT OR SAWED JOINTS SHALL BE SPACED AT 20'-0" CENTERS MAX. JOINT FILLER IN THE CURBS SHALL EXTEND TO WITHIN 2" OF THE FACE & TOP OF CURB. ALL JOINTS SHALL BE SEALED AS SHOWN ON ROADWAY STANDARD LECS-5.
5. ALL CONDUIT CROSSINGS ARE TO BE TRENCHED, PLACED, BACKFILLED AND COMPAKTED PRIOR TO SURFACING. BORING OR PUSHING PROCEDURES MAY BE USED WHERE SURFACING IS ALREADY IN PLACE AND IF APPROVED BY THE ENGINEER.
6. IF CONDUIT IS NOT CONTINUOUS BETWEEN DRIVEWAYS OR RAMPS, CAP BOTH ENDS OF EACH CONDUIT CROSSING AND PLACE MARKER TO PREVENT DAMAGE DURING CONSTRUCTION.
7. CONDUIT SHALL NOT TERMINATE BELOW A SURFACED AREA, BUT SHALL EXTEND A MINIMUM OF 2'-0" PAST EDGE OF PAVING.
8. FOR PULL BOX INSTALLATION DETAILS, SEE TRAFFIC STANDARD PBD1-1 (PULL BOX DETAILS).



BASIS OF PAYMENT

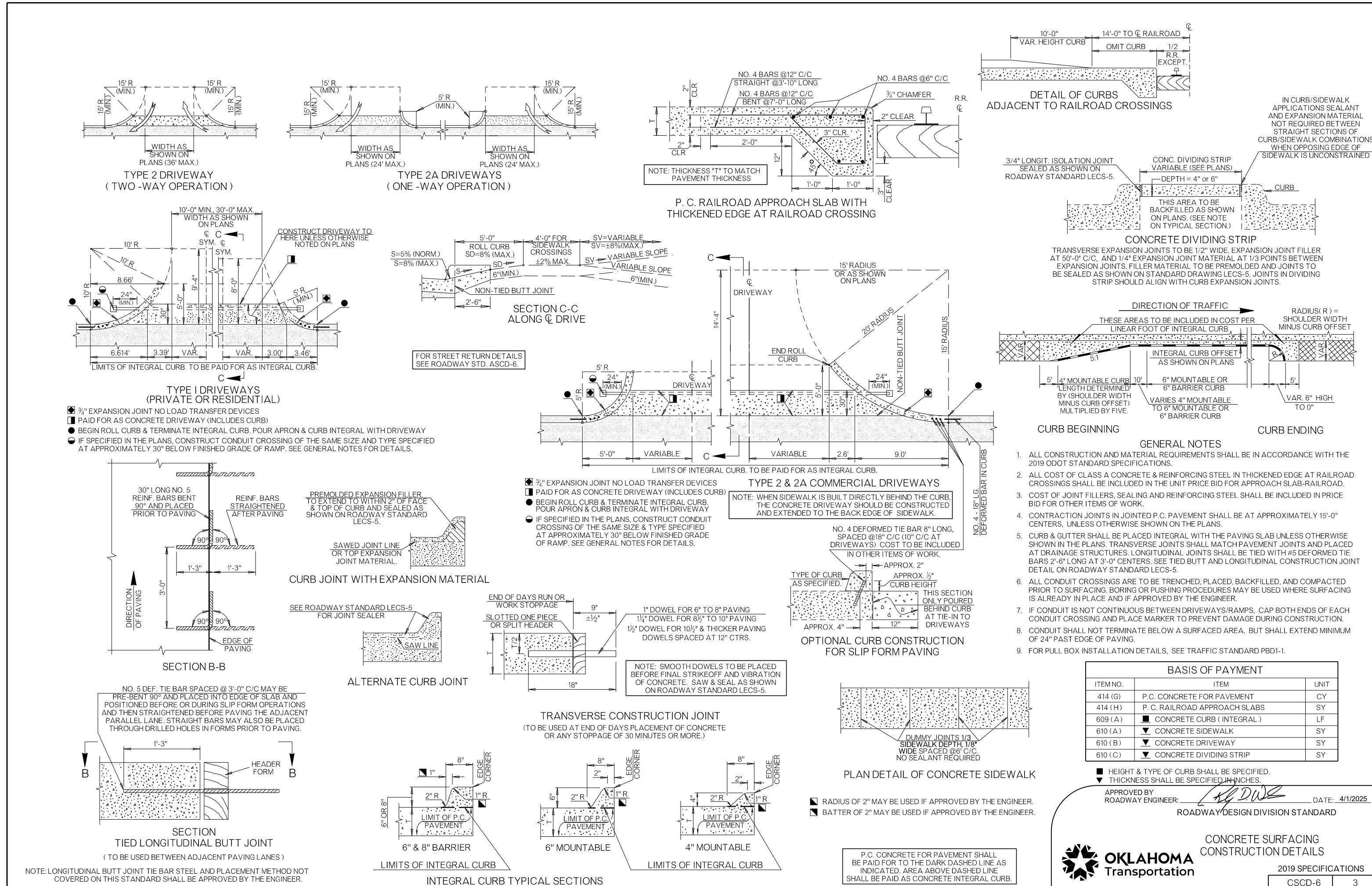
ITEM NO.	ITEM	UNIT
414 (H)	P. C. RAILROAD APPROACH SLABS	SY
509 (B)	CLASS A CONCRETE	CY
609 (B)	■ COMBINED CURB & GUTTER (▲)	LF
610 (B)	▼ CONCRETE DRIVEWAY	SY
610 (C)	▼ CONCRETE DIVIDING STRIP	SY
610 (H)	▼ ASPHALT DIVIDING STRIP	SY

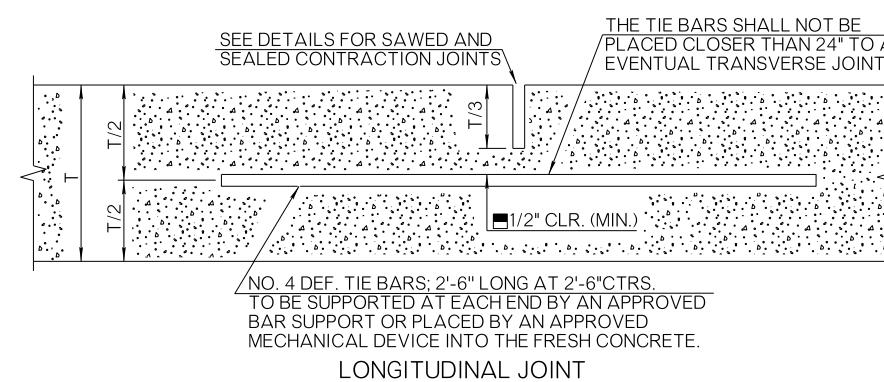
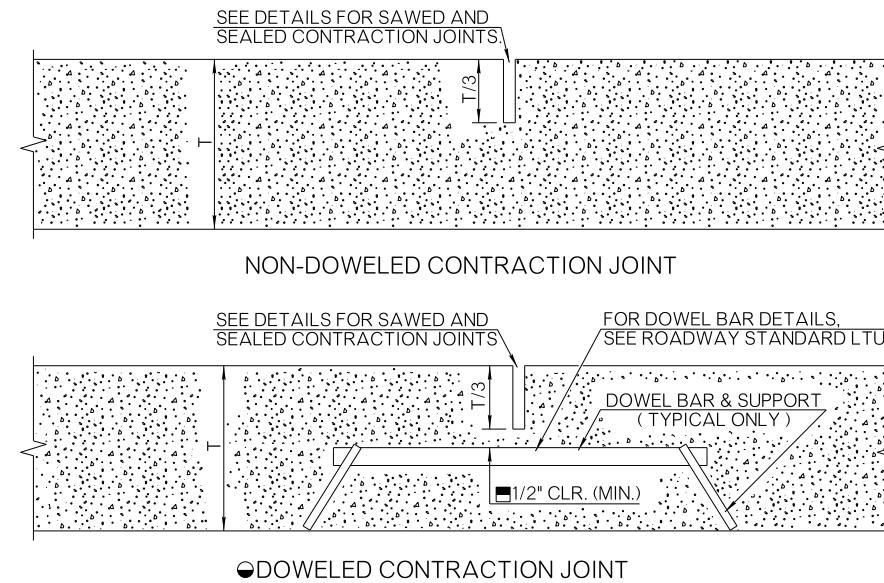
■ WIDTH OF CURB & GUTTER WILL BE SPECIFIED.
▲ HEIGHT & TYPE OF CURB SHALL BE SPECIFIED.
▼ THICKNESS WILL BE SPECIFIED.

APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

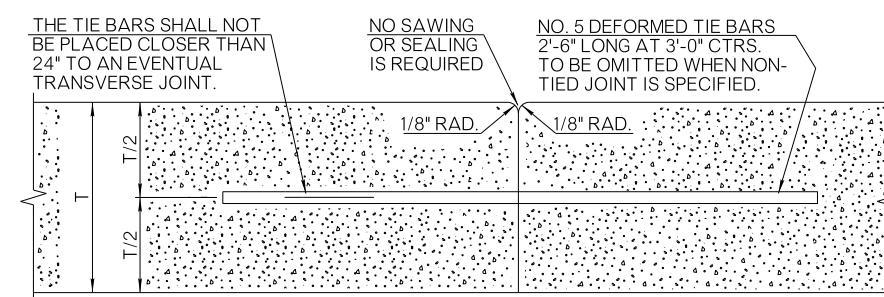
ASPHALT SURFACING CONSTRUCTION DETAILS

2019 SPECIFICATIONS ASCD-6 1

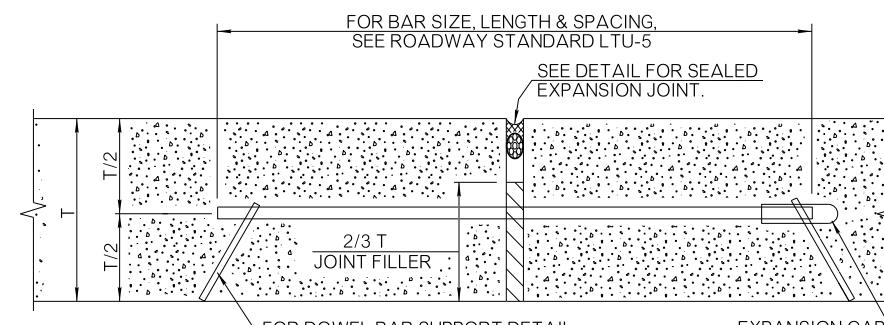




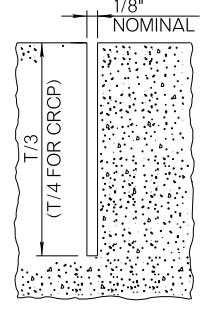
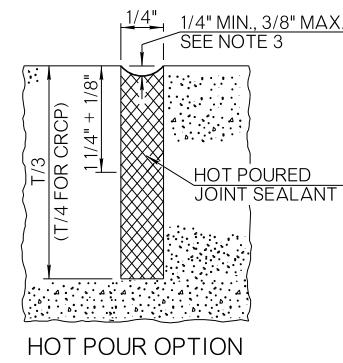
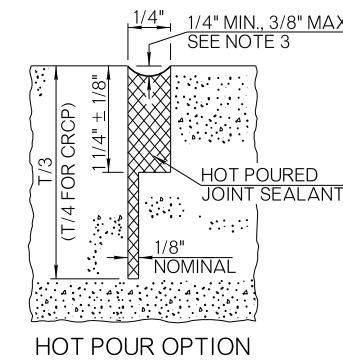
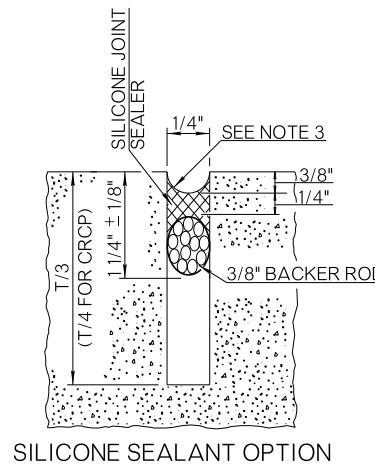
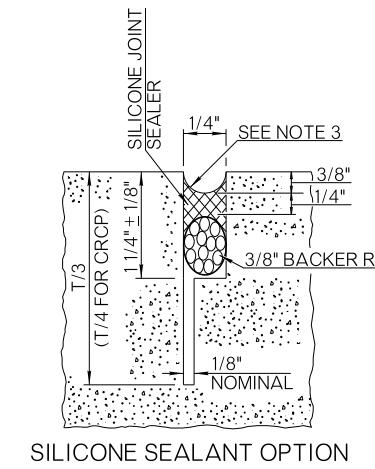
LONGITUDINAL JOINT



TIED BUTT JOINT AND LONGITUDINAL CONSTRUCTION JOINT

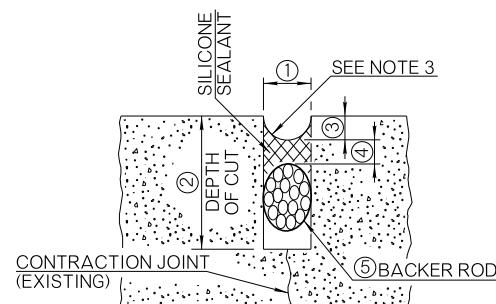


EXPANSION JOINT / ISOLATION JOINT
OMIT DOWEL BARS, CAPS & SUPPORTS FOR ISOLATION JOINTS

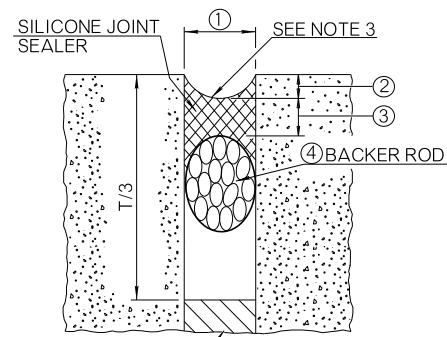


SAWED AND SEALED, CONTRACTION AND LONGITUDINAL JOINTS ALTERNATE DETAILS

UNLESS OTHERWISE SPECIFIED IN THE PLANS, ONLY THE SILICONE SEALANT OPTIONS WILL BE ALLOWED.



JOINT REHABILITATION DETAILS



PREFORMED EXPANSION JOINT FILLER

EXPANSION JOINTS / ISOLATION JOINTS

HOT Poured JOINT SEALANT MAY BE USED IN LIEU OF BACKER ROD AND SILICONE SEALANT, IF APPROVED BY THE ENGINEER

EXPANSION JOINT / ISOLATION JOINT TREATMENT TABLE

JOINT WIDTH ①	SEALANT RECESS DEPTH ②	SILICONE SEALANT THICKNESS ③	BACKER ROD DIAMETER ④
1/2"	3/8"	1/4"	5/8"
3/4"	3/8"	3/8"	7/8"
1"	3/8"	1/2"	1 1/4"
1 1/2"	1/2"	3/4"	2"
2"	1/2"	3/4"	2 1/2"

EXPANSION OR ISOLATION JOINT WIDTH SHALL BE 1/2", UNLESS OTHERWISE SPECIFIED ON THE PLANS. TABLE VALUES, AS SHOWN THIS TABLE, SHALL BE USED IN THOSE SPECIFIED CASES.

JOINT REHABILITATION TREATMENT TABLE				
SILICONE SEALANT				
JOINT WIDTH ①	DEPTH OF CUT ②	SEALANT RECESS DEPTH ③	SEALANT THICKNESS ④	BACKER ROD DIAMETER ⑤
3/8"	1 1/4"	3/8"	3/16"	1/2"
1/2"	1 3/4"	3/8"	1/4"	5/8"
3/4"	1 3/4"	3/8"	3/8"	7/8"
7/8"	1 3/4"	1/2"	7/16"	1"
1"	2"	1/2"	1/2"	11/8"
OVER 1"	OVER 2"	1/2"	1/2"	1 1/4"

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- ALL CONCRETE JOINT SEALING SHALL BE IN ACCORDANCE WITH SECTION 415 OF THE SPECIFICATIONS.
- THE SHAPE FACTOR, COMBINED WITH THE JOINT CLEANLINESS, IS THE CRITICAL COMBINATION NECESSARY TO GUARANTEE DESIRED BONDING AND FUNCTION OF SEALED JOINTS. THE JOINT SHAPE FACTOR IS DEFINED AS THE FINAL PRESSED SHAPE OF THE SILICONE MATERIAL. THE TOOLING OPERATION WILL FIRMLY PRESS THE FRESHLY APPLIED MATERIAL INTIMATELY AGAINST THE CUT SIDES OF THE RECESS AND THE BACKER ROD SURFACES. THE ROUNDED SHAPE ON TOP AND BOTTOM OF THE SILICONE ALLOWS THE SEALANT TO PROPERLY FLEX BUT MAINTAIN ADHERENCE TO THE PAVING. SELF LEVELING SEALANTS WILL BE INSTALLED TO BE FLUSH WITH THE PAVEMENT SURFACE.
- ON JOINTED PORTLAND CEMENT CONCRETE PAVEMENTS, DOWELED CONTRACTION JOINTS SHALL BE USED ON DRIVING LANES ONLY. CONCRETE SHOULDERS SHALL NOT BE DOWELED UNLESS SPECIFIED ON THE PLANS.
- LONGITUDINAL JOINTS BETWEEN PAVEMENT AND TIED CONCRETE SHOULDERS SHALL NOT BE SAWED OR SEALED UNLESS OTHERWISE SHOWN ON THE PLANS.
- ON ALL SAWED JOINTS, THE KERF DEPTH SHALL CLEAR DOWEL BARS, TIE BARS AND/OR REINFORCING STEEL BY A MINIMUM OF 1/2".
- CONTRACTION JOINTS IN JOINTED P. C. PAVEMENT SHALL BE AT APPROXIMATELY 15'-0" CENTERS, UNLESS OTHERWISE SPECIFIED ON THE PLANS.
- LONGITUDINALLY TINE THE PAVEMENT UNLESS OTHERWISE SPECIFIED, OR AS DIRECTED BY THE ENGINEER. CONSTRUCT LONGITUDINAL GROOVING TO THE FOLLOWING DIMENSIONS: $\frac{1}{8}$ " TO $\frac{3}{16}$ " WIDE, $\frac{1}{8}$ " TO $\frac{3}{16}$ " DEEP, AND EQUALLY SPACED AT $\frac{1}{2}$ " TO 1" APART. ENSURE GROOVES ARE NEAT IN APPEARANCE AND OF UNIFORM DEPTH. ALTERNATIVELY, IF TRANSVERSE GROOVING IS APPROVED BY THE RESIDENT ENGINEER, CONSTRUCT TRANSVERSE GROOVING TO THE FOLLOWING DIMENSIONS: $\frac{1}{8}$ " TO $\frac{3}{16}$ " WIDE, $\frac{1}{8}$ " TO $\frac{3}{16}$ " DEEP, AND EQUALLY SPACED AT $\frac{1}{2}$ " TO 1" APART.
- CONCRETE PAVEMENTS (SUCH AS DETOURS AND CROSSOVERS) THAT ARE INTENDED TO BE REMOVED BY THE END OF THE PROJECT SHALL NOT BE SEALED.

APPROVED BY
ROADWAY ENGINEER: *R. D. D. W.* DATE: 3/31/2025

ROADWAY DESIGN DIVISION STANDARD

JOINTS AND SEALERS - LONGITUDINAL, EXPANSION / ISOLATION, & CONTRACTION

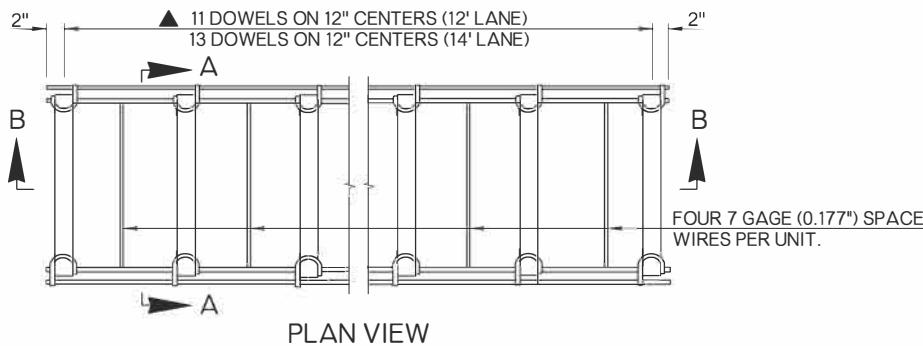
OKLAHOMA
Transportation

2019 SPECIFICATIONS

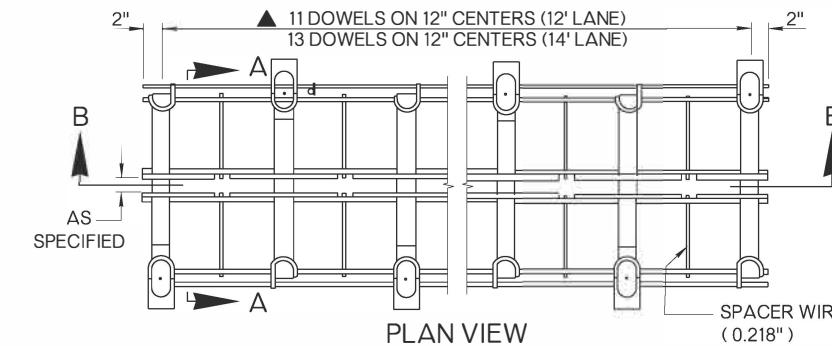
LECS-5

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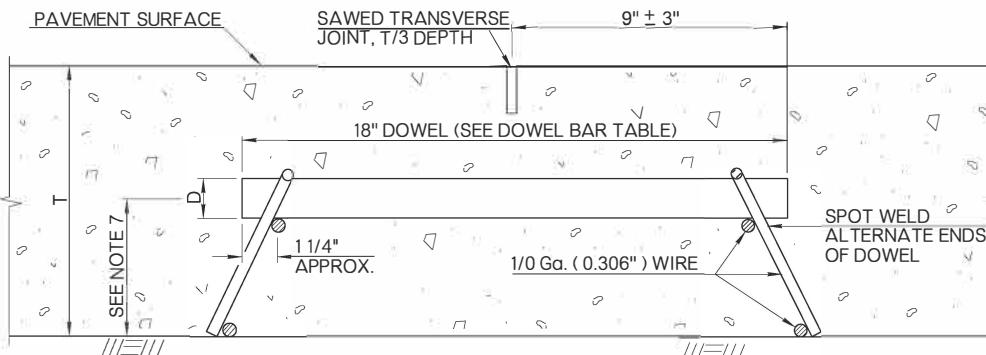


PLAN VIEW

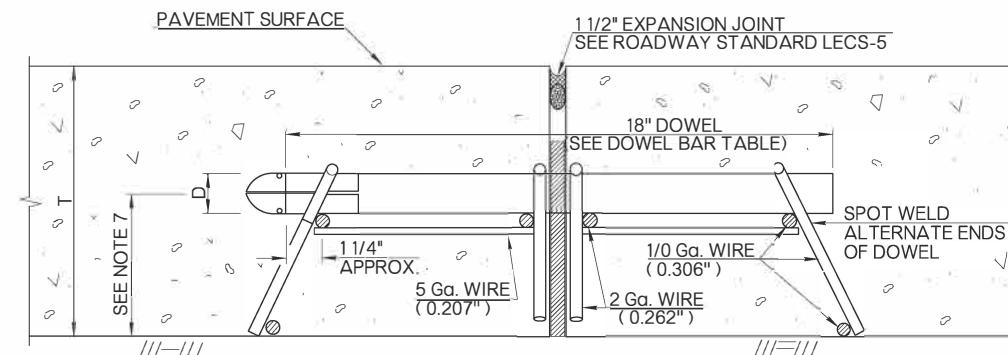


DOWEL BAR TABLE			
▲ SPACING & SIZE DATA			
(T) SLAB DEPTH	DOWEL DIA.	TOTAL DOWEL LENGTH	C/C DOWEL SPACING
6' - 8"	1"	18"	12"
8 1/2" - 10"	1 1/4"	18"	12"
10 1/2" & UP	1 1/2"	18"	12"

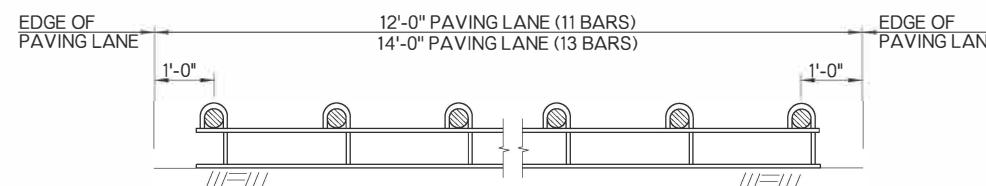
DOWEL DIAMETER WILL BE DETERMINED BY THE SLAB DEPTH (T) OR THE NOMINAL DEPTH WHEN SLAB DEPTH VARIES. WHEN NOMINAL DEPTH VALUE IS TO BE USED, THE CALCULATED NOMINAL DEPTH WILL BE SHOWN ON THE PLANS.



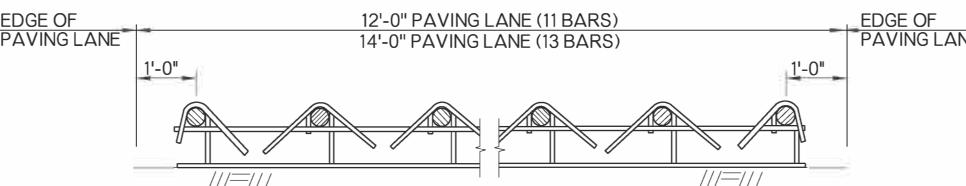
SECTION A - A



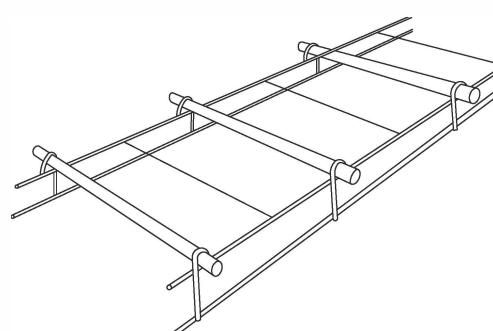
SECTION A - A



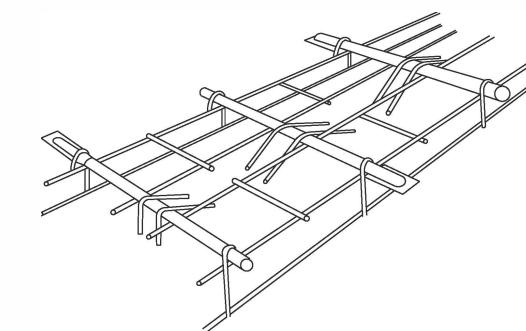
SECTION B - B



SECTION B - B



WELDED CONTRACTION JOINT ASSEMBLY



WELDED EXPANSION JOINT ASSEMBLY

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ANY DEVICE USED FOR SUPPORTING DOWELS SHALL HAVE SUFFICIENT RIGIDITY AND BE HELD IN PLACE DURING CONCRETE PLACEMENT SO THAT DOWELS WILL BE IN SPECIFIED POSITION IN THE FINISHED PAVEMENT. ANY DEVICE NOT PRODUCING THE SPECIFIED RESULTS SHALL BE REJECTED.
3. PRODUCER AND CONTRACTOR SHALL AVOID PATENT INFRINGEMENT OF THE BASKET AND SHALL SAVE THE STATE HARMLESS IN THE USE OF ANY BASKET.
4. THE CONTRACTOR MAY SELECT THE TYPE OF BASKET TO BE USED. AFTER THE SELECTION IS MADE, THE SAME TYPE BASKET SHALL BE USED THROUGHOUT THE PROJECT, UNLESS APPROVED OTHERWISE BY THE ENGINEER.
5. COLD-DRAWN STEEL WIRE, USED FOR DOWEL BASKETS, SHALL BE ACCEPTED BY VISUAL FIELD INSPECTION, AS PROVIDING SUFFICIENT DOWEL BAR SUPPORT DURING PAVING PROCESS.
6. DOWEL BARS SHALL BE GRADE 60 PLAIN BARS, IN ACCORDANCE WITH SECTION 723.01 OF THE SPECIFICATIONS. DOWEL BARS SHALL BE CENTERED ON THE BASKET REGARDLESS OF THE WIDTH OF THE BASKET OR THE LENGTH OF THE DOWEL BAR.
7. THE HEIGHT OF THE LOAD TRANSFER UNIT (MEASURED TO THE CENTER OF THE DOWEL BAR FROM THE PAVEMENT SURFACE) SHALL BE 1/2 THE THICKNESS OF THE PAVEMENT, PLUS OR MINUS 1/2 THE DIAMETER OF DOWEL BAR OF THE UNIT.
8. DOWEL BARS SHALL HAVE A SHOP APPLIED EPOXY COATING OVER THEIR ENTIRE LENGTH (ENDS EXCEPTED). ADDITIONALLY, DOWELS SHALL BE COMPLETELY COATED WITH A FORM RELEASE AGENT (OR APPROVED EQUIVALENT BOND BREAKER) APPLIED IN THE FIELD, IMMEDIATELY PRIOR TO PAVING. THE FORM RELEASE AGENT SHALL NOT BE ALLOWED TO EVAPORATE FROM THE BARS PRIOR TO PAVING.
9. FOR EXPANSION JOINTS, THE DOWEL BARS SHALL HAVE EXPANSION CAPS WITH A MINIMUM 1" AND A MAXIMUM 2" AIR SPACE IN THE END OF THE EXPANSION CAPS (EXPANSION JOINT ASSEMBLIES).
10. THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER A STAKING PATTERN THAT SHALL SECURE ALL DOWEL BASKETS SUCH THAT THE FINAL DOWEL POSITION IS WITHIN SPECIFICATION LIMITS.
11. FOR EXPANSION JOINTS, IN ADDITION TO THE SUPPORTS INDICATED, THE CONTRACTOR SHALL PROVIDE SUITABLE INSTALLING DEVICES AND SUCH ADDITIONAL STAKES AS MAY BE REQUIRED TO HOLD THE JOINT FILLER VERTICAL AND SECURELY IN LINE AND POSITION. THE CONTRACTOR WILL ALSO BE REQUIRED TO SATISFACTORILY FORM THE UPPER PORTION OF THE JOINT FOR RECEIVING THE SEAL. SEE ROADWAY STANDARD LECS-5.

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22

ROADWAY DESIGN DIVISION STANDARD

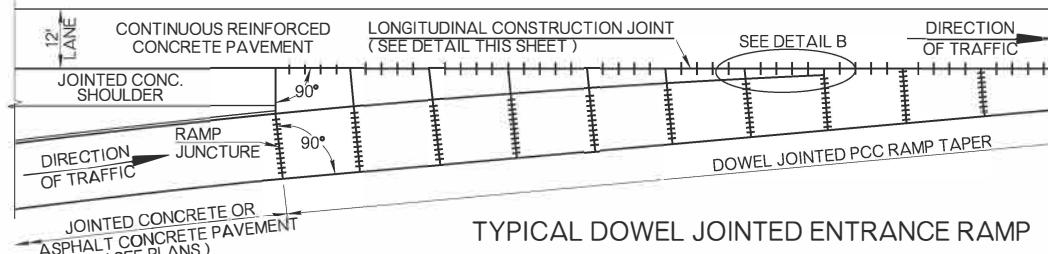


LOAD TRANSFER UNITS FOR
CONCRETE PAVEMENT JOINTS

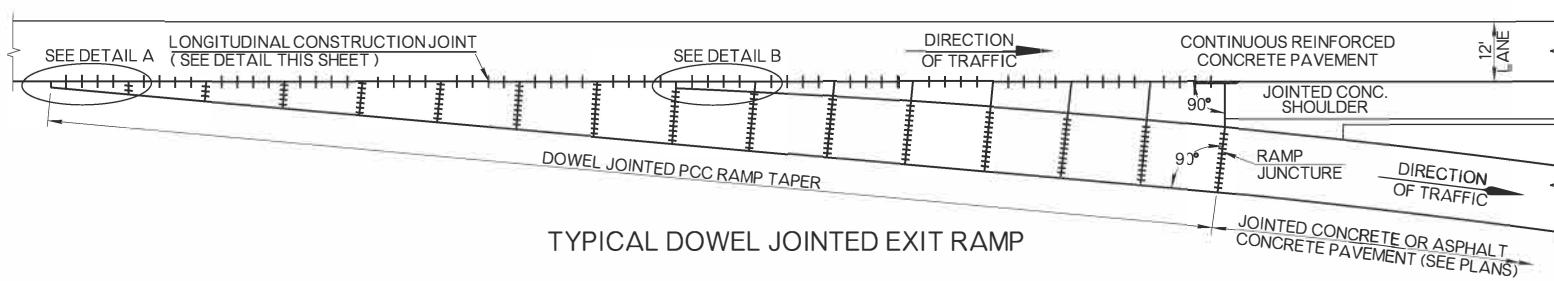
2019 SPECIFICATIONS

LTU-5 1

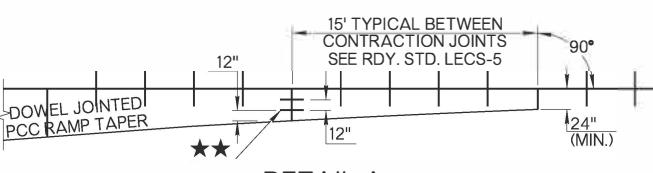
R-18



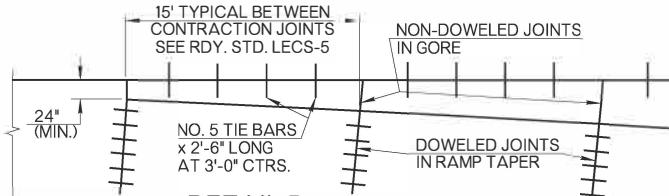
TYPICAL DOWEL JOINTED ENTRANCE RAMP



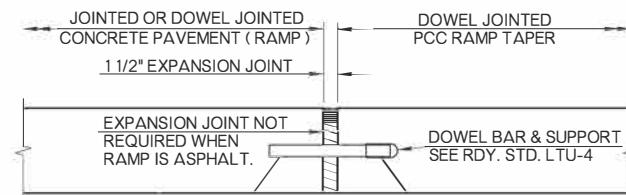
TYPICAL DOWEL JOINTED EXIT RAMP



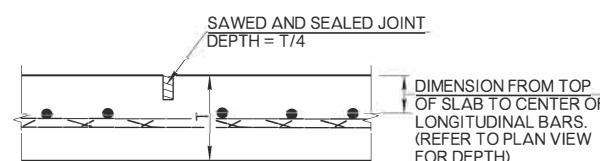
DETAIL A



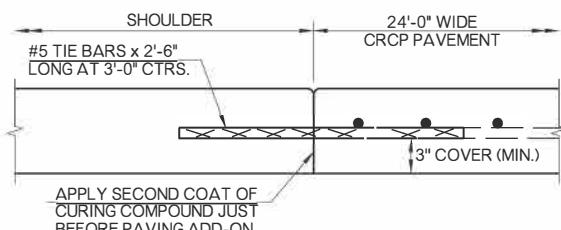
DETAIL B
TIE BARS SHALL NOT BE PLACED CLOSER THAN 24" TO AN EVENTUAL SAWED CONTRACTION JOINT.



JOINT AT RAMP JUNCTURE

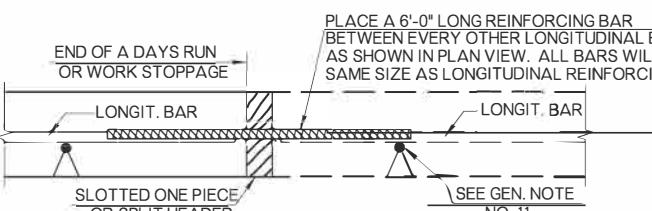


LONGITUDINAL CONTRACTION JOINT
TO BE AS SHOWN ON ROADWAY STANDARD LECS-4
EXCEPT FOR WHEN OTHERWISE SHOWN IN THIS DETAIL.



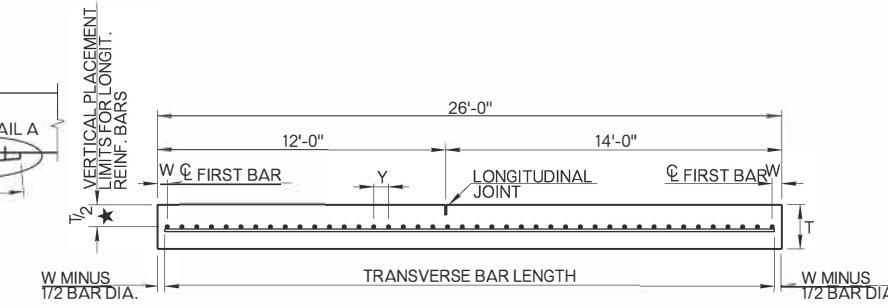
LONGITUDINAL CONSTRUCTION JOINT

TO BE AS SHOWN ON ROADWAY STANDARD LECS-5
AND AS SHOWN IN THIS DETAIL. HEIGHT OF REINFORCING
AND TIE BARS MAY BE ADJUSTED TO AVOID CONFLICT, AS
APPROVED BY THE ENGINEER.

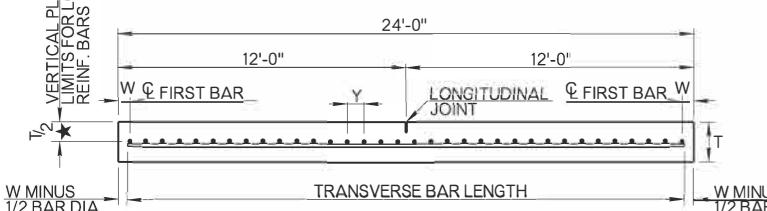


TRANSVERSE CONSTRUCTION HEADER JOINT

TO BE USED AT THE END OF EACH DAYS CONCRETE PLACEMENT
OR AT ANY WORK STOPPAGE OF 30 MINUTES OR LONGER.



26'-0" WIDE PAVEMENT SECTION
DIMENSIONS SHOWN TO Ⓜ OF BAR UNLESS MARKED "CLR."



24'-0" WIDE PAVEMENT SECTION
DIMENSIONS SHOWN TO Ⓜ OF BAR UNLESS MARKED "CLR."

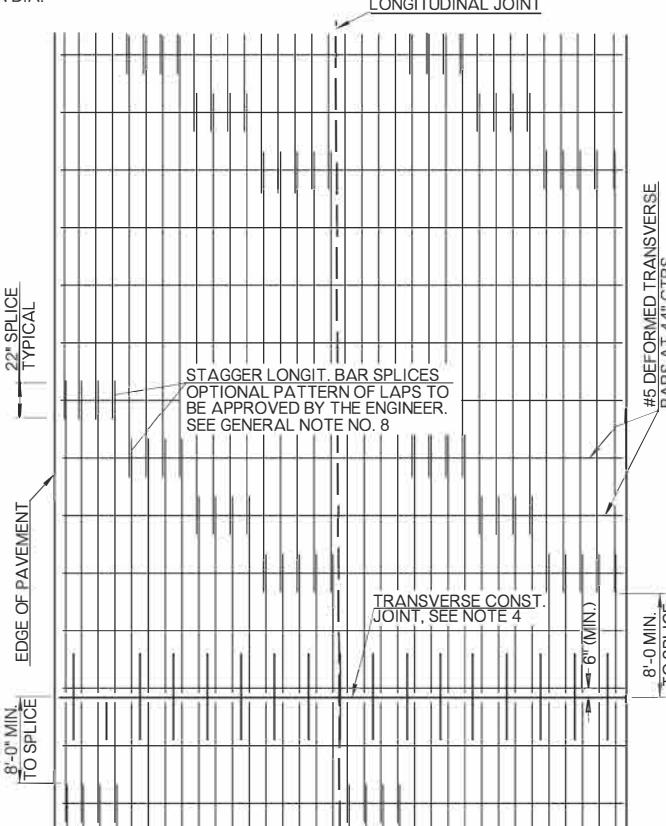
★ TOLERANCE FOR PLACEMENT OF LONGITUDINAL STEEL:
UPPER LIMIT = T/2 + 1" (UP FROM T/2)
LOWER LIMIT = T/2 - 1/2" (DOWN FROM T/2)
PLACEMENT IS MEASURED AT CENTERLINE OF BARS.
TRANSVERSE PLACEMENT LIMITS EQUALS PLANS LOCATION
OF EACH BAR PLUS OR MINUS 2 INCHES.

★★ DOWEL BARS LOCATED IN RAMP TAPER SHALL BE PLACED
ON 12 INCH CENTERS SUCH THAT DOWEL BARS ARE NO
CLOSER THAN 12 INCHES OR FARTHER THAN 24 INCHES
FROM THE LONGITUDINAL SHOULDER JOINT. DOWEL BAR
DETAILS ARE SHOWN ON ROADWAY STANDARD LTU-5.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ALL LONGITUDINAL BARS SHALL BE SPliced A MINIMUM OF 22" AND HAVE A MINIMUM LENGTH OF 30'-0". LONGITUDINAL BARS SHORTER THAN THE 30'-0" WILL BE NECESSARY FOR THE PURPOSE OF STARTING OR ENDING THE STAGGERED LAP PATTERN. MECHANICAL CONNECTORS WILL BE ALLOWED, IF THEIR TENSILE STRENGTH EQUALS OR EXCEEDS THAT OF THE REINFORCING STEEL.
3. EXPANSION JOINTS WILL NOT BE USED, EXCEPT AT TERMINAL POINTS AS SHOWN IN THE PLANS, FOR MAINLINE AND/OR SHOULDER PAVEMENT.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY HEADERS OTHER THAN SHOWN, BUT ONLY WITH PRIOR APPROVAL OF THE ENGINEER.
5. COST OF ALL STEEL, INCLUDING ADDITIONAL STEEL REQUIRED AT TRANSVERSE JOINTS, WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE INCLUDED IN THE UNIT PRICE BID PER SQUARE YARD OF CONTINUOUSLY REINFORCED P. C. C. PAVEMENT (PLACEMENT).
6. VIBRATORY EQUIPMENT WILL BE REQUIRED TO ENSURE COMPLETE AND UNIFORM CONSOLIDATION OF CONCRETE AROUND THE CLOSELY SPACED STEEL MEMBERS. THE CONCRETE ADJACENT TO TRANSVERSE CONSTRUCTION JOINTS AND EXPANSION JOINTS SHALL BE VIBRATED WITH HAND MANIPULATED MECHANICAL VIBRATORS.
7. CHAIR ASSEMBLIES SHALL BE OF A TYPE APPROVED BY THE ENGINEER AND AT LEAST ONE CHAIR WILL BE REQUIRED FOR EACH 16 SQUARE FEET OF PAVEMENT.
8. NOT OVER 30 PERCENT OF THE REGULAR LONGITUDINAL STEEL SHALL BE SPlices WITHIN ANY GIVEN AREA MEASURED 12'-0" TRANSVERSELY BY 2'-6" LONGITUDINALLY.
9. 'LEAVE OUT' SECTIONS (OMISSIONS) WILL NOT BE PERMITTED. TEMPORARY BRIDGES WILL BE USED WHERE REQUIRED. COST TO BE INCLUDED IN OTHER ITEMS OF WORK.
10. LONGITUDINAL CONSTRUCTION JOINT IS TO BE USED ON PAVEMENT EDGES WHERE TIED SHOULDERS ARE CALLED FOR, AS WELL AS RAMP TERMINALS AND STREET INTERSECTIONS, UNLESS OTHERWISE NOTED.
11. IN ALL DETAILS THE TRANSVERSE STEEL IS SHOWN BELOW THE LONGITUDINAL STEEL. THIS IS THE RECOMMENDED PLACEMENT FOR LONGITUDINAL STEEL SUPPORTED ON TRANSVERSE STEEL & CHAIR ASSEMBLIES. CHAIR ASSEMBLIES MUST BE USED. MECHANICAL PLACEMENT USING TUBE FEEDERS WILL NOT BE ALLOWED.
12. SAW CUTS SHOULD BE MADE AS SOON AS POSSIBLE, WITHOUT RAVELLING THE CUT JOINT EDGE. IF A RAPID TEMPERATURE DROP IS EXPECTED, WHICH WILL CAUSE AN AIR TEMPERATURE DIFFERENTIAL OVER 20°F, OR WILL MOVE THE AIR TEMPERATURE BELOW 40°F WITH PROSPECTS OF IT REMAINING THERE OVER 3 HOURS, SAWING THE JOINT MUST BE CARRIED OUT PRIOR TO THE TEMPERATURE DROP.
13. SAW JOINTS FOR THE INSIDE AND OUTSIDE SHOULDERS WILL MATCH TRANSVERSELY ACROSS THE CONT. REINF. CONC. PAVEMENT. THE JOINTS SHALL BE MARKED AND LOCATED PRIOR TO PLACING THE CRCP SO THAT THE TIE BARS ARE NOT PLACED WITHIN 24" OF THE TRANSVERSE CONTRACTION JOINTS IN THE SHOULDERS.

PAVEMENT DESIGN DATA - (C.R.C.P.)								
DESIGN TYPE	T SLAB THICKNESS	TRANS. #5 BAR LENGTH	BAR SIZE	SPACING		NO. OF BARS	LBS. PER SY	DES. (%)
				W	Y			
A1	8"	25'-1 1/2"	#6	4 7/8"	7 3/4"	40	25.3	0.71
A	9"	25'-0 3/16"	#6	5 9/16"	6 11/16"	46	27.7	0.72
B	10"	24'-11 3/4"	#7	5 11/16"	8 1/8"	38	30.2	0.73
B1	11"	25'-1 1/2"	#7	4 13/16"	7 3/8"	42	33.5	0.73
C	12"	25'-2 13/16"	#7	4 3/16"	7 1/16"	44	36.8	0.71
A1	8"	23'-0 3/4"	#6	5 1/4"	7 1/2"	38	25.3	0.73
A	9"	23'-0"	#6	5 5/8"	6 3/4"	42	27.7	0.71
B	10"	22'-11 1/2"	#7	5 13/16"	8 3/8"	34	30.2	0.71
B1	11"	23'-0 5/8"	#7	5 1/4"	7 1/2"	38	33.5	0.72
C	12"	22'-11 7/8"	#7	5 5/8"	6 3/4"	42	36.8	0.73

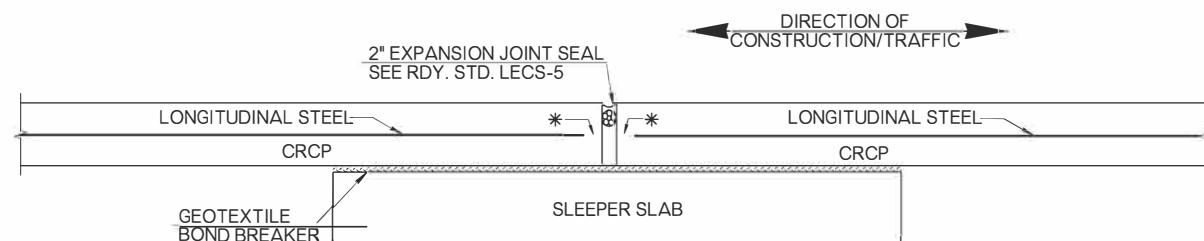


24'-0" WIDE PAVEMENT PLAN

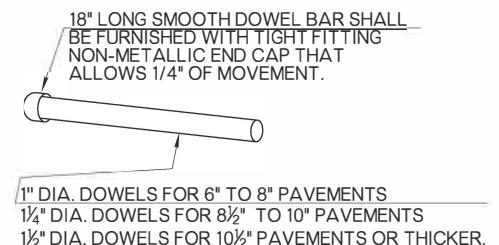
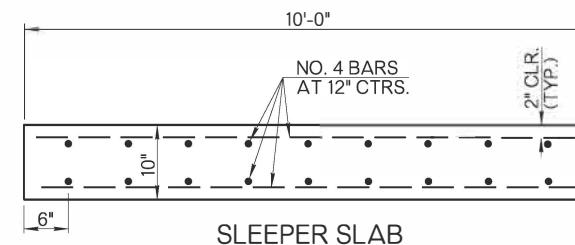
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
414 (C)	CONT. REINF. P. C. C. PAVT. (PLACEMENT)	SY
414 (G)	P. C. CONCRETE FOR PAVEMENT	CY

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

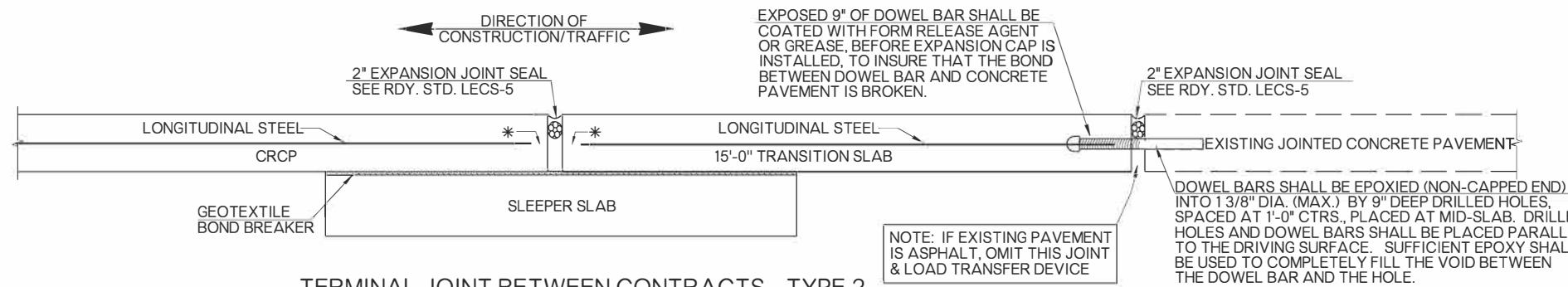
CONTINUOUSLY REINFORCED CONCRETE
PAVEMENT DETAILS



TERMINAL JOINT BETWEEN CONTRACTS - TYPE 1



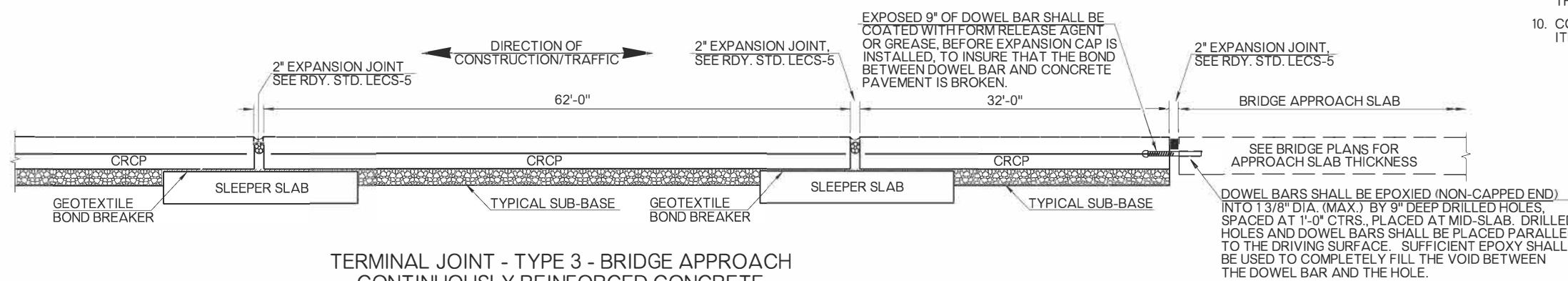
DETAIL OF DOWEL BAR WITH CAP



TERMINAL JOINT BETWEEN CONTRACTS - TYPE 2

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. THE BOND BREAKER SHALL BE A NON WOVEN GEOTEXTILE MEETING THE REQUIREMENTS OF AASHTO M 288 CLASS 1, AND SHALL HAVE A MINIMUM WEIGHT OF 15 OUNCES PER SQ. YD.
3. LONGITUDINAL STEEL REINFORCEMENT MAY BE PLACED WITHIN 1" ABOVE T/2 TO 1/2" BELOW T/2. DIMENSION FOR PLACEMENT IS MEASURED AT THE CENTERLINE OF THE REINFORCING BAR.
4. TYPE 1 TERMINAL JOINT ONLY TO BE USED BETWEEN CRCP CONTRACTS AND/OR WHERE THE PAVING OPERATION IS DELAYED SEVEN OR MORE DAYS. THE CONTRACTOR SHALL PROTECT THE EXPOSED END OF PAVEMENT AND SLEEPER SLAB FROM PERMANENT DAMAGE DURING ALL WORK STOPPAGES IN A MANNER APPROVED BY THE ENGINEER.
5. TYPE 2 TERMINAL JOINT TO BE USED WHEN CRCP PAVEMENT TERMINATES AT LOCATIONS OTHER THAN AT BRIDGES. TRANSITION SLAB MAY BE TEMPORARY OR PERMANENT.
6. THE 15 FOOT TRANSITION SECTION OF REINFORCED PAVEMENT ADJACENT TO THE TYPE 2 TERMINAL JOINT SHALL BE PAID FOR AS CONTINUOUSLY REINFORCED CONCRETE PAVEMENT.
7. THE TRANSITION SLAB SHALL BE REINFORCED WITH THE SAME SIZE BARS AND SPACED THE SAME AS THE CONTINUOUSLY REINFORCED CONCRETE PAVEMENT. SEE PLANS FOR VALUE OF PAVEMENT THICKNESS "T".
- * 8. THE LONGITUDINAL REINFORCING STEEL SHALL HAVE 3" TO 4" OF CONCRETE COVER BETWEEN THE END OF THE REINFORCING STEEL AND THE JOINT OPENING FACE.
9. SLEEPER SLAB SHALL EXTEND 2'-0" BEYOND THE OUTSIDE LATERAL EDGES OF THE CRCP PAVED LANES.
10. COST OF LOAD TRANSFER DEVICE RETROFIT TO BE INCLUDED IN OTHER ITEMS OF WORK.



TERMINAL JOINT - TYPE 3 - BRIDGE APPROACH
CONTINUOUSLY REINFORCED CONCRETE

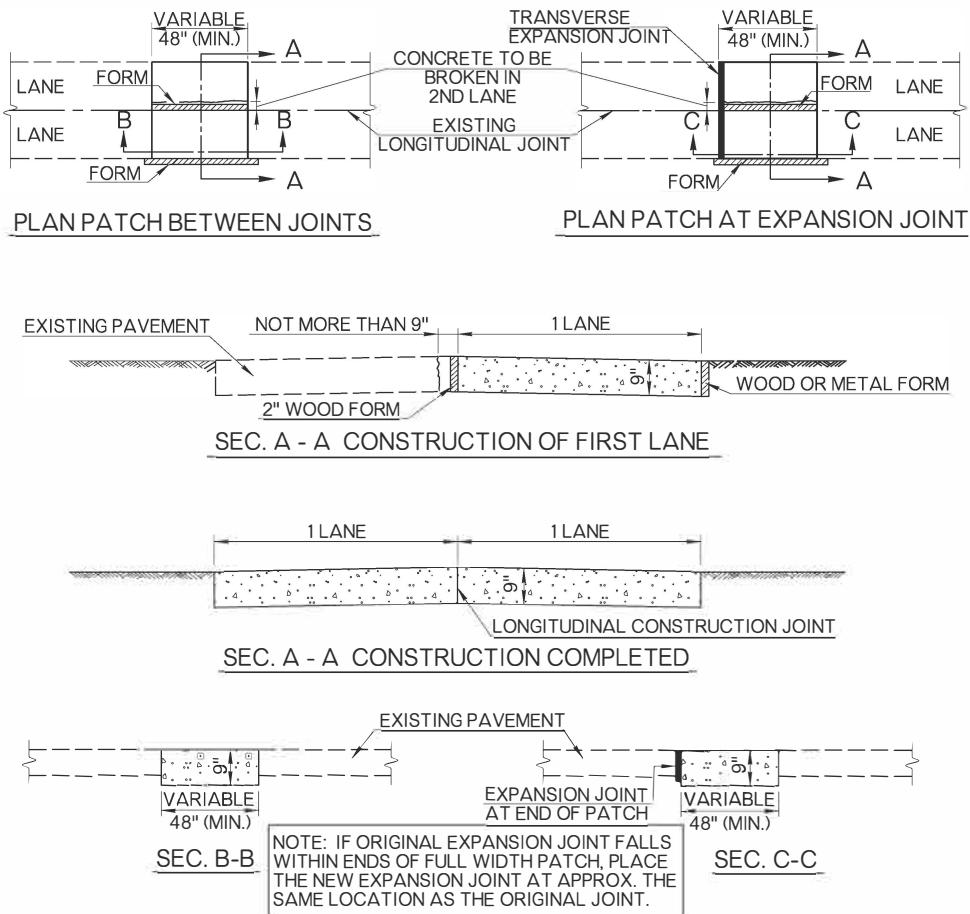
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
414 (I)	■ TERMINAL JOINT	EA
414 (J)	■ TERMINAL JOINT SLEEPER SLAB	SY

■ SCHEDULE OF TYPE 1, TYPE 2 AND/OR TYPE 3 TERMINAL JOINTS SHALL BE SPECIFIED ON THE PLANS.

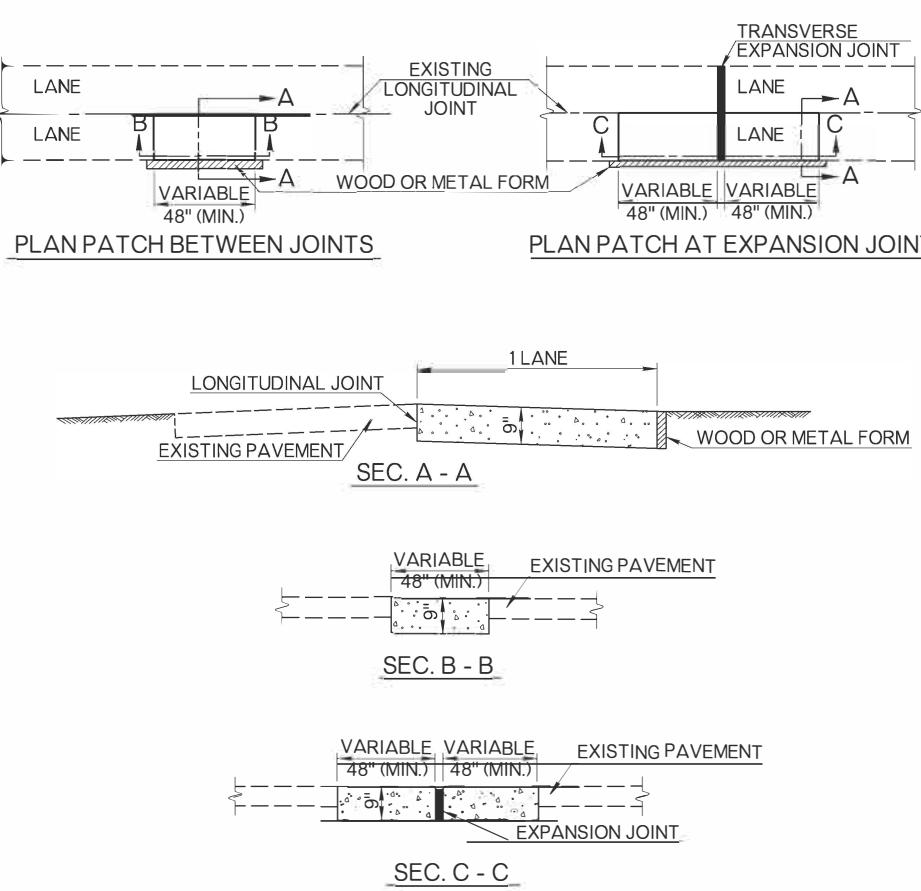
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CONTINUOUSLY REINFORCED CONCRETE
PAVEMENT TERMINAL JOINTS

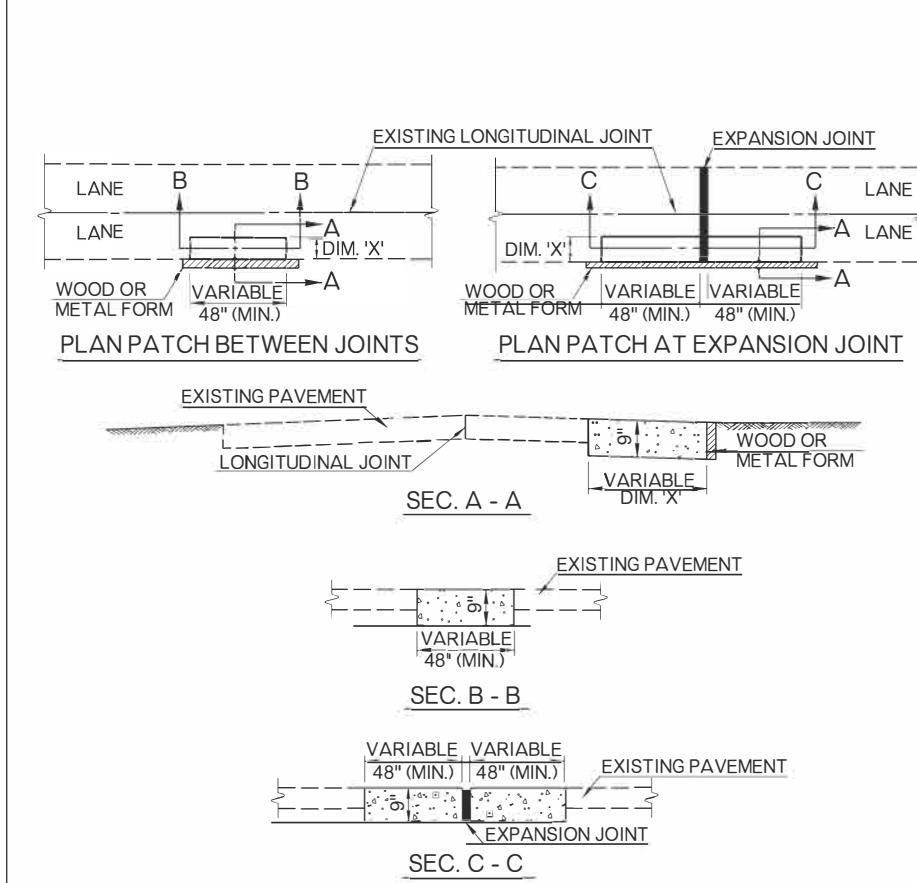




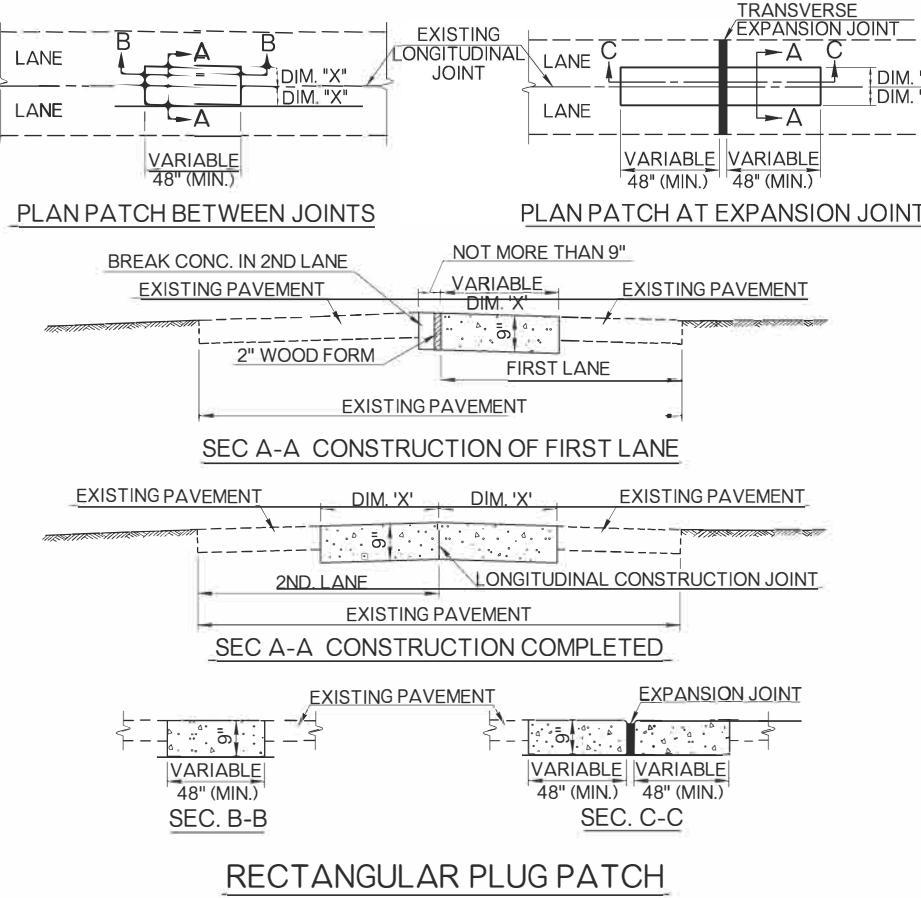
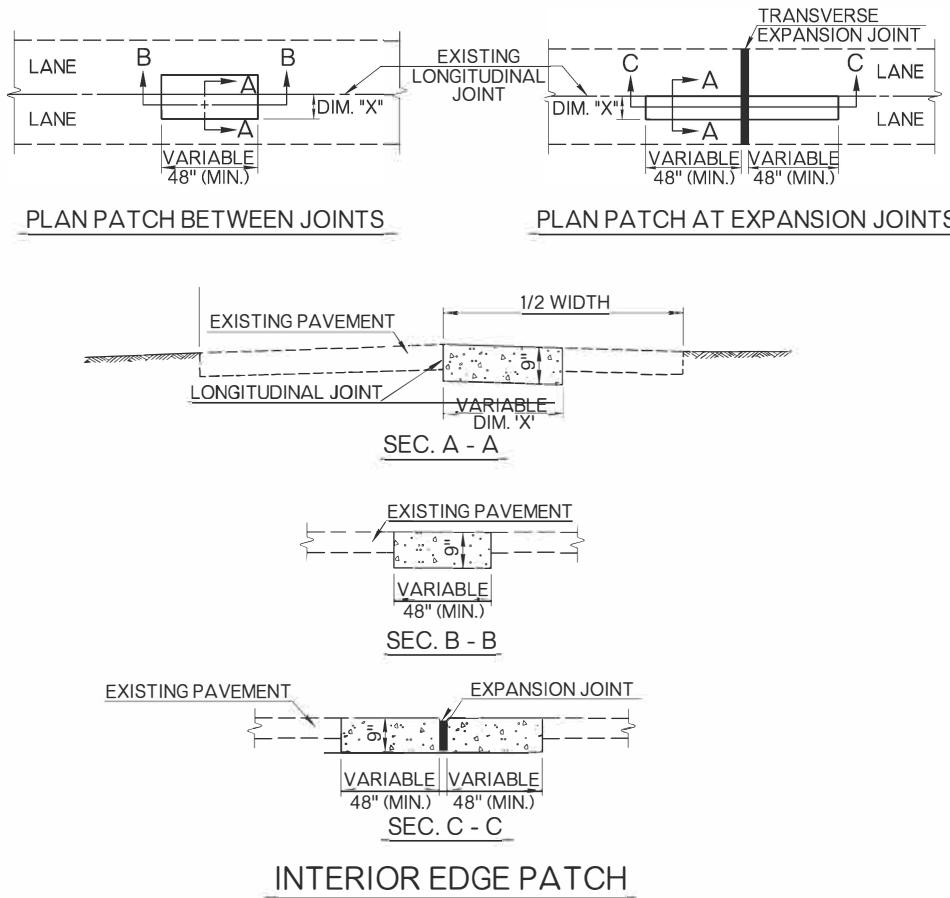
MULTI LANE PATCH (CONSTRUCTED ONE LANE AT A TIME)



SINGLE LANE PATCH

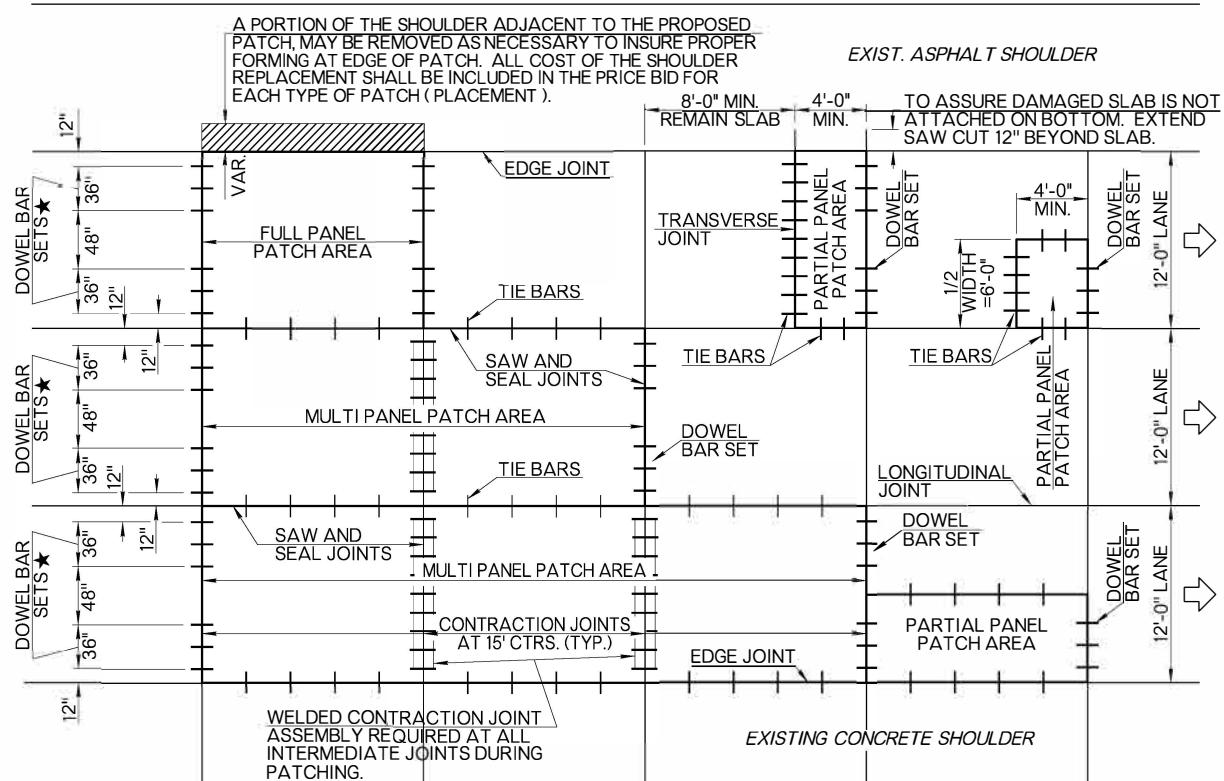


EXTERIOR EDGE PATCH



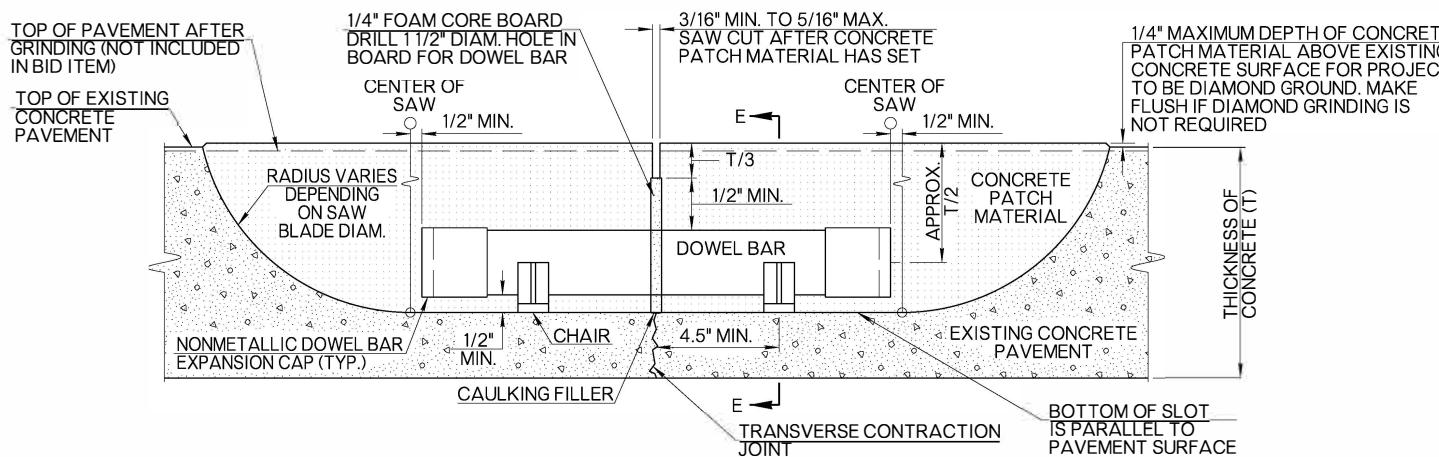
GENERAL NOTES

1. CROWN OF PATCH TO MATCH CROWN OF EXISTING PAVEMENT.
2. EDGES OF PAVEMENT SLAB, OPEN JOINTS AND CONSTRUCTION JOINTS SHALL BE EDGED WITH AN EDGER HAVING A 1/2" RADIUS. JOINT ALONG A BROKEN EDGE OF THE EXISTING PAVEMENT SHALL NOT BE EDGED.
3. CONCRETE FOR PATCHES SHALL BE HIGH-EARLY-STRENGTH CONCRETE PAVEMENT MADE WITH THE USE OF HIGH-EARLY-STRENGTH PORTLAND CEMENT OR 25% ADDITIONAL STANDARD PORTLAND CEMENT. TRAFFIC SHALL NOT BE ALLOWED ON THE PATCH FOR THE FIRST 24 HOURS, OR FOR LONGER WHEN DIRECTED BY THE RESIDENT ENGINEER.
4. DIMENSION 'X' TO BE NOT LESS THAN 4 FEET, NOR SHALL IT EXCEED 5 FEET FOR 18 FOOT PAVEMENT OR EXCEED 6 FEET FOR 20 FOOT PAVEMENT. IF EITHER OF THESE LIMITS ARE EXCEEDED USE A HALF WIDTH PATCH.
5. PAVEMENT SECTION DEPTH TO BE SHOWN ON PLANS.
6. IN AREAS WHERE PATCHING IS REQUIRED, UNDERCUTTING AND BACK FILLING OF SUBGRADE SHALL BE DONE IN A MANNER APPROVED BY THE ENGINEER. BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 95% OF STANDARD DENSITY. COST OF UNDERCUTTING AND BACKFILLING TO BE INCLUDED IN OTHER ITEMS OF WORK.
7. FOR DETAILS OF JOINTS AND SEALERS, SEE ROADWAY STANDARD LECS-5.

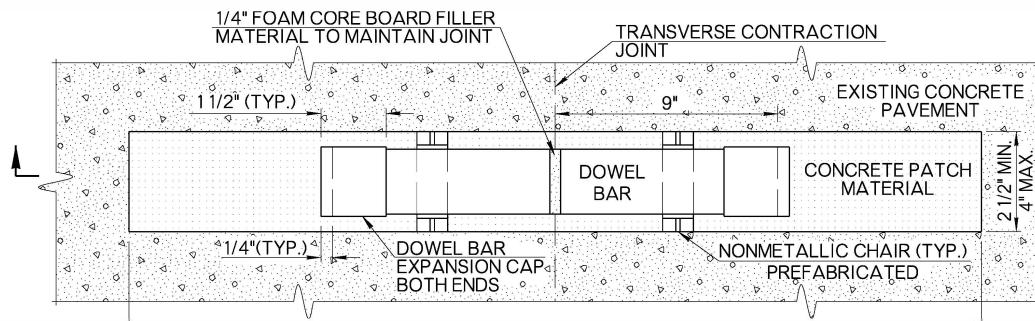


★ DOWEL BAR SETS (FOUR BARS AT 12" CTRS.) SHALL BE USED AS SHOWN FOR ALL CONTRACTION JOINTS. IF PATCH EXTENDS IN BOTH DIRECTIONS, FROM A CONTRACTION JOINT, THEN APPROVED LOAD TRANSFER DEVICES MEETING THE REQUIREMENTS OF SECTION 414.04, AND AS SHOWN ON ROADWAY STANDARD LTU-5 SHALL BE USED IN LIEU OF DOWEL BAR SETS. IF PARTIAL PANEL PATCH IS GOING TO EXCEED 7' (FOR 15' JOINTED PAVEMENT) OR 15' (FOR 62' JOINTED PAVEMENT), THEN USE A FULL PANEL PATCH.

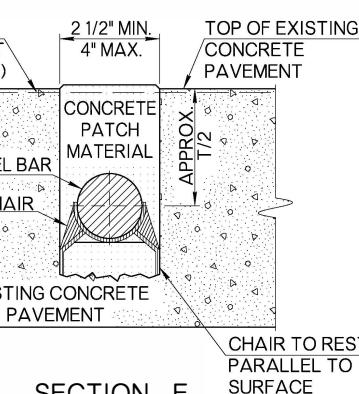
FULL DEPTH PATCHING DETAIL



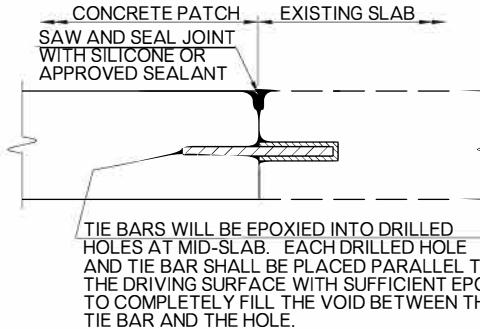
SECTION - A DOWEL BAR RETROFIT PLACEMENT DETAIL



PLAN VIEW
DOWEL BAR RETROFIT INSTALLATION



SECTION - E



GENERAL SEQUENCE OF PAVEMENT REPAIR STEP 1 CONCRETE PATCHING

- (1) AREAS TO BE PATCHED WILL BE DESIGNATED BY THE ENGINEER
- (2) FOR REMOVAL OF FULL DEPTH PATCHES, SAWING IS TO BE FULL DEPTH. LIFT OUT DAMAGED PAVEMENT WHENEVER PRACTICAL.
- (3) THE FLOW OF TRAFFIC MAY BE RESTRICTED TO ONE LANE DUE TO PATCHING OPERATION FOR A MAXIMUM DISTANCE OF ONE MILE.

STEP 2 DOWEL BAR RETROFIT INSTALLATION

- (1) INSTALL DOWEL BARS AS SHOWN. BAR PLACEMENT SHALL CONSIST OF 3 BARS PER WHEEL PATH, PLACED 12" TO 15" APART, AND 18" FROM EDGE OF DRIVING LANE.
- (2) DOWEL BARS SHALL NOT BE PLACED ON TOP OF A LONGITUDINAL CRACK.
- (3) PAYMENT FOR 'DOWEL BAR RETROFIT' SHALL ONLY BE MADE FOR DOWELS PLACED BY THE PROCESS OF CUTTING A SLOT.
- (4) IF SLOTS ARE SAWED BUT NOT RETROFITTED WITH A BAR, THE SAW CUTS SHALL BE CLEANED AND SEALED WITH AN EPOXY RESIN.

STEP 3 DIAMOND GRINDING CONCRETE PAVEMENT

- (1) AFTER SLAB STABILIZATION AND/OR DOWEL BAR RETROFIT INSTALLATION, & APPROPRIATE CURE TIME HAS BEEN DETERMINED, GRINDING OPERATIONS MAY BEGIN.

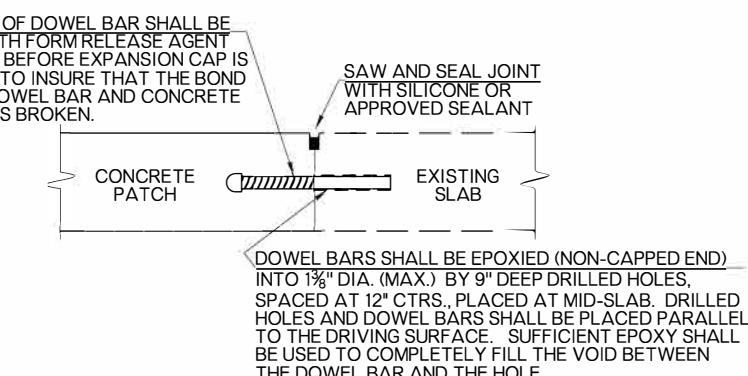
STEP 4 CONCRETE JOINT SEALING

- (1) CUT SHALL BEGIN AT THE LOW EDGE OF THE DRIVING LANES AND MOVE TOWARD THE INITIAL JOINT.
- (2) INSTALLATION OF BOND BREAKER AND SILICONE JOINT SEALANT SHALL BE FROM THE END OF THE INITIAL JOINT TO THE LOW EDGE OF THE DRIVING LANES.

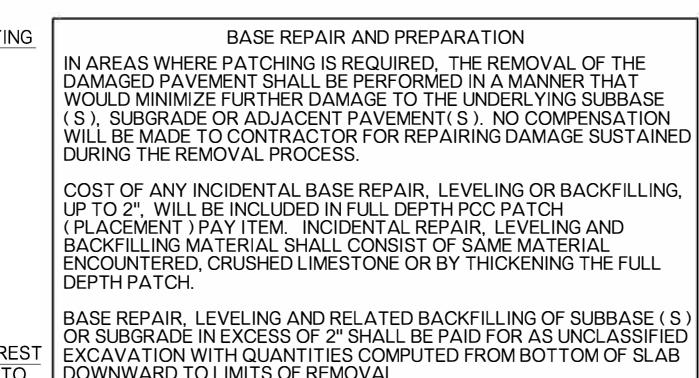
GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. COST OF SAWING AND REMOVAL OF PAVEMENT FOR FULL DEPTH PATCHING, COST OF DOWEL BARS, TIE BARS AND ANY/ALL INCIDENTALS REQUIRED FOR INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR FULL DEPTH PCC PATCH (PLACEMENT), UNLESS OTHERWISE SHOWN ON THE PLANS.
3. HIGH EARLY STRENGTH (HES) CONCRETE, WHEN USED FOR FULL DEPTH PATCHING, WILL BE PAID FOR AS PC CONCRETE FOR PAVEMENT.
4. BID ITEM FOR CONCRETE JOINT SEALING (JOINT REHABILITATION) WILL INCLUDE SAWING, CLEANING OF JOINT, BACKER ROD, SILICONE SEALANT AND ANY/ALL INCIDENTALS REQUIRED TO COMPLETE THE WORK.
5. FOR SKEWED TRANSVERSE JOINTS, DOWEL BARS SHALL ALWAYS BE PLACED PARALLEL TO THE ROADWAY.

DETAIL OF DOWEL BAR WITH CAP



DETAIL OF DOWEL BAR AT CONSTRUCTION JOINT



BASE REPAIR AND PREPARATION

IN AREAS WHERE PATCHING IS REQUIRED, THE REMOVAL OF THE DAMAGED PAVEMENT SHALL BE PERFORMED IN A MANNER THAT WOULD MINIMIZE FURTHER DAMAGE TO THE UNDERLYING SUBBASE (S), SUBGRADE OR ADJACENT PAVEMENT (S). NO COMPENSATION WILL BE MADE TO CONTRACTOR FOR REPAIRING DAMAGE SUSTAINED DURING THE REMOVAL PROCESS.

COST OF ANY INCIDENTAL BASE REPAIR, LEVELING OR BACKFILLING, UP TO 2", WILL BE INCLUDED IN FULL DEPTH PCC PATCH (PLACEMENT) PAY ITEM. INCIDENTAL REPAIR, LEVELING AND BACKFILLING MATERIAL SHALL CONSIST OF SAME MATERIAL ENCOUNTERED, CRUSHED LIMESTONE OR BY THICKENING THE FULL DEPTH PATCH.

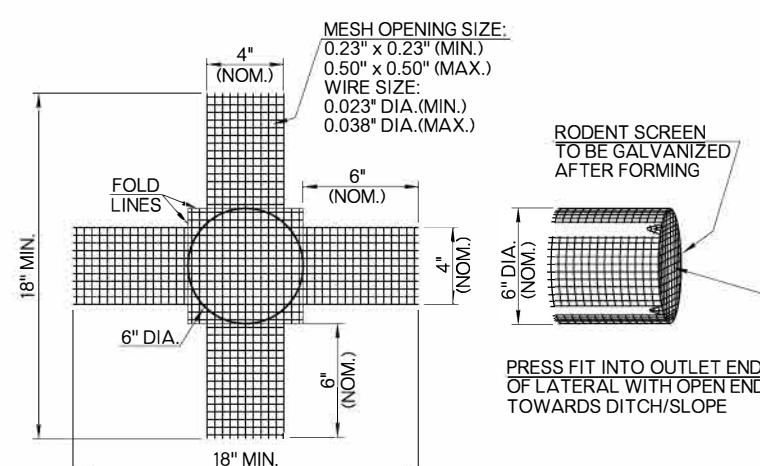
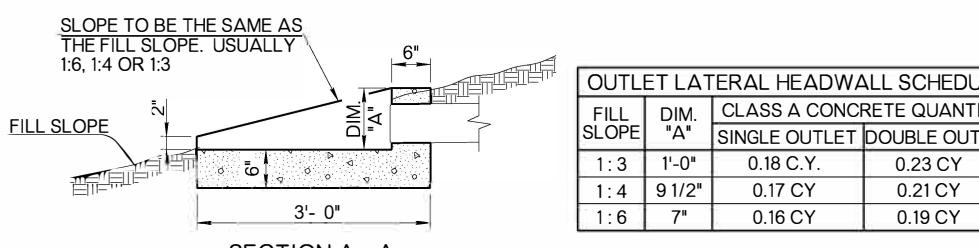
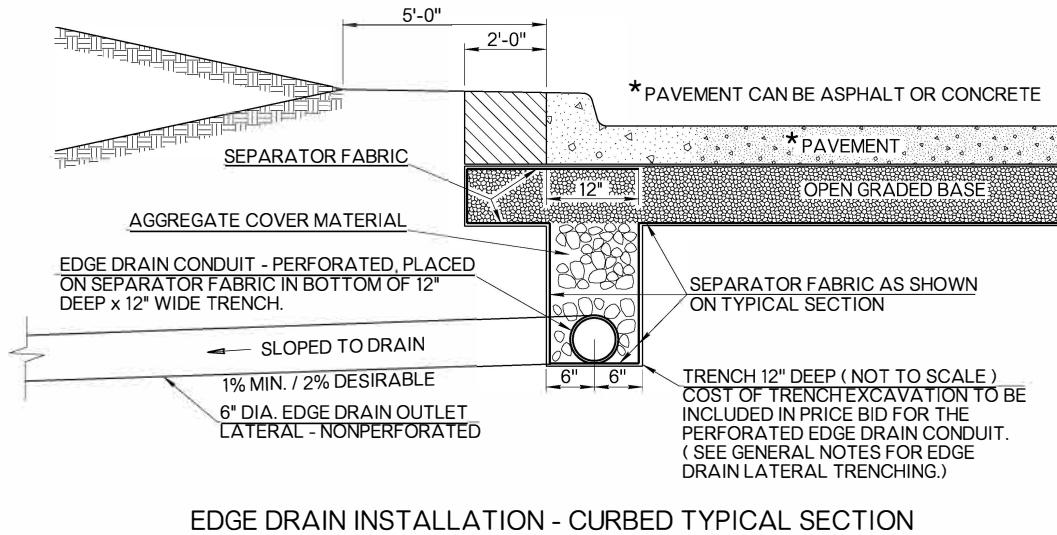
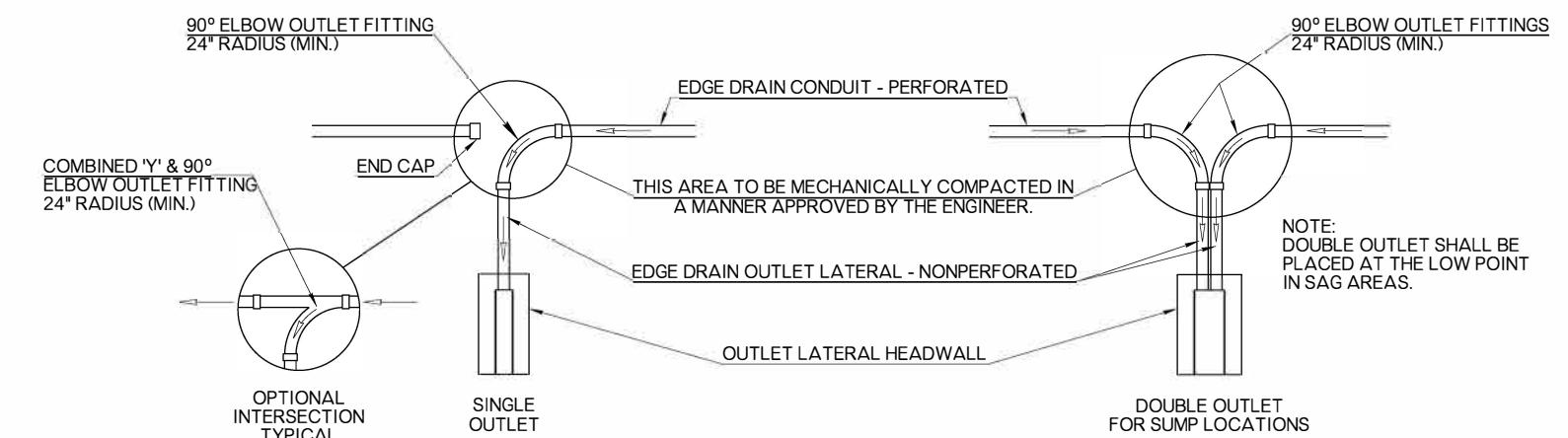
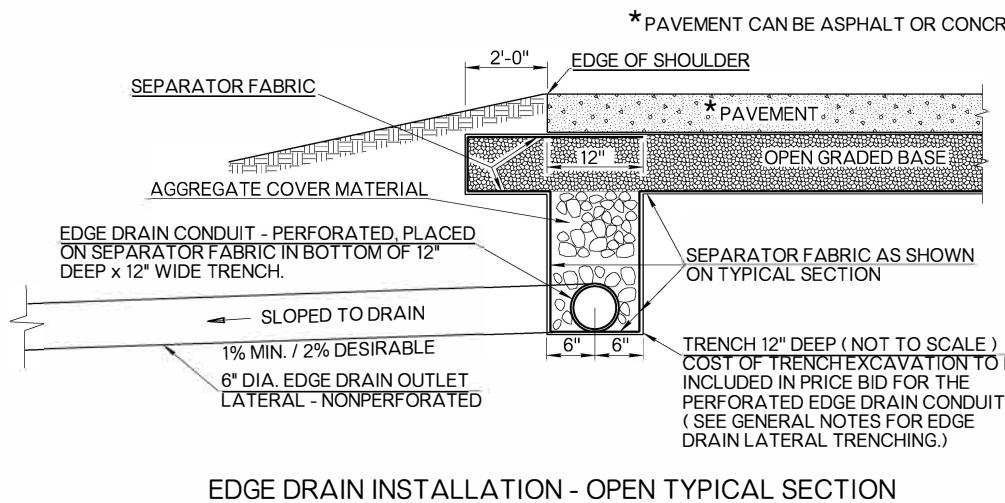
BASE REPAIR, LEVELING AND RELATED BACKFILLING OF SUBBASE (S) OR SUBGRADE IN EXCESS OF 2" SHALL BE PAID FOR AS UNCLASSIFIED EXCAVATION WITH QUANTITIES COMPUTED FROM BOTTOM OF SLAB DOWNWARD TO LIMITS OF REMOVAL.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
202 (A)	UNCLASSIFIED EXCAVATION	CY
414 (E)	FULL DEPTH P. C. C. PATCH (PLACEMENT)	SY
414 (G)	P. C. CONCRETE FOR PAVEMENT	CY
415	CONCRETE JOINT SEALING	LF
416	DOWEL BAR RETROFIT	EA
425	DIAMOND GRINDING CONCRETE PAVEMENT	SY

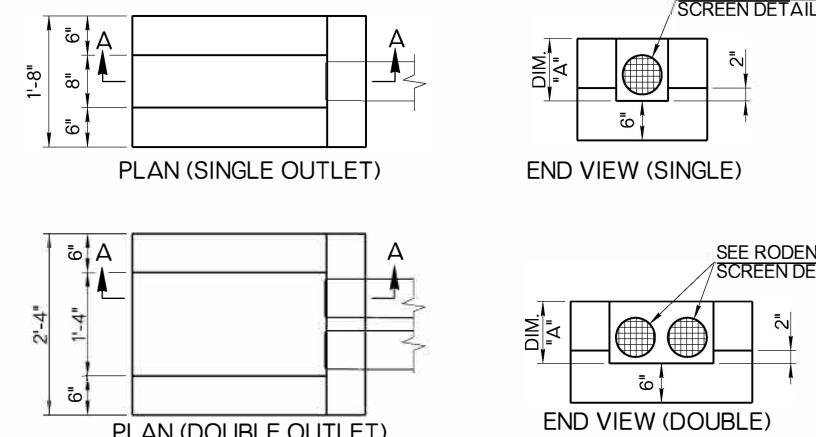
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ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

PORTLAND CEMENT CONCRETE
PAVEMENT REPAIR



RODENT SCREEN DETAIL

THIS RODENT SCREEN DETAIL IS TYPICAL ONLY AND OTHER DESIGN LAYOUT PATTERNS MAY BE ALLOWED IF APPROVED BY THE ENGINEER. NO TOLERANCE SHALL BE ALLOWED ON MATERIAL SPECIFICATIONS. RODENT SCREEN DIMENSIONS WILL CHANGE PROPORTIONATELY FOR ALTERNATE SIZE OUTLET LATERAL CONDUIT.



OUTLET LATERAL HEADWALL

NOTE: OPENING FOR LATERAL PIPE WILL VARY IN SIZE AND SHAPE, DEPENDING ON THE SIZE OF THE OUTLET LATERAL PIPE AND THE SLOPE OF THE STRUCTURE. THE OUTLET LATERAL PIPE SHALL BE CUT TO CONFORM TO THE TOP SURFACE OF THE OUTLET HEADWALL.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. INSTALLATION OF OUTLET LATERAL PIPES SHOULD BE SCHEDULED CONCURRENT WITH THE INSTALLATION OF PAVEMENT EDGE DRAIN.
3. PAVEMENT EDGE DRAIN CONDUIT SHALL NOT BE LEFT IN PLACE LONGER THAN 48 HOURS WITHOUT BEING CONNECTED TO OUTLET LATERAL PIPES.
4. OUTLET ELBOWS (90°) SHALL BE USED WHEN PIPE EDGE DRAIN SLOPE EXCEEDS TWO (2) PERCENT.
5. CONNECTION OF THE OUTLET LATERAL PIPE TO THE OUTLET FITTING SHALL BE DONE IN A MANNER APPROVED BY THE ENGINEER. COST OF ALL CAPS, FITTINGS, LATERAL PIPE, BONDING MATERIALS, RODENT SCREENS, TRENCHING AND BACKFILLING NEEDED TO INSTALL OUTLET LATERAL PIPE SHALL BE INCLUDED IN THE PRICE BID FOR EDGE DRAIN OUTLET LATERAL (NON-PERFORATED).
6. EDGE DRAINS AND OUTLET LATERALS SHALL BE LOCATED ON LOW SIDE OF SUPER ELEVATED SECTIONS AT CURVES. OUTLET LATERALS ARE TO BE PLACED AT 300' INTERVALS ON GRADE OR AS APPROVED BY THE ENGINEER.
7. PRICE BID FOR OUTLET LATERAL HEADWALL INCLUDES SURFACE PREPARATION, CLASS A CONCRETE, LABOR AND ANY INCIDENTALS NECESSARY FOR CONSTRUCTION.
8. CLASS A CONCRETE SHALL MEET REQUIREMENTS OF SECTION 509 OF THE SPECIFICATIONS.
9. AGGREGATE COVER MATERIAL SHALL MEET THE REQUIREMENTS OF SECTION 701.06 OF THE SPECIFICATIONS, AGGREGATE NO. 57. COST OF AGGREGATE COVER MATERIAL TO BE INCLUDED IN PRICE BID FOR EDGE DRAIN CONDUIT - PERFORATED.
10. DETAILS ON THIS SHEET ARE BASED ON 6" DIA. EDGE DRAIN CONDUIT. THE CONTRACTOR SHALL MAKE ALL NECESSARY ADJUSTMENTS TO ACCOMMODATE OTHER SIZE EDGE DRAINS.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (J)	EDGE DRAIN CONDUIT - PERFORATED	LF
613 (K)	EDGE DRAIN OUTLET LATERAL - NONPERFORATED	LF
613 (Q)	OUTLET LATERAL HEADWALL	EA

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ROADWAY ENGINEER: *[Signature]*
ROADWAY DESIGN DIVISION STANDARD
DATE: 6/30/22

PAVEMENT EDGE DRAIN



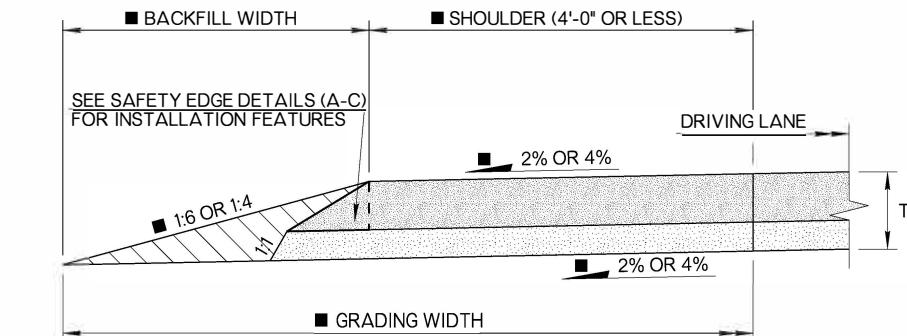
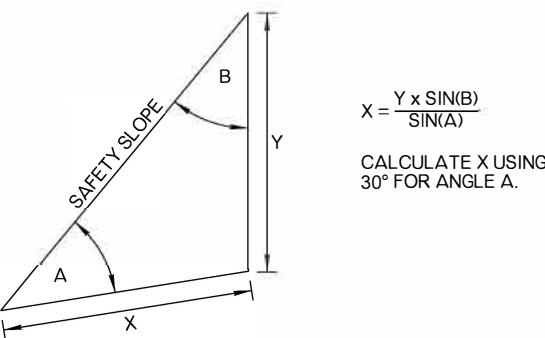
2019 SPECIFICATIONS

PED-4

1

R-23

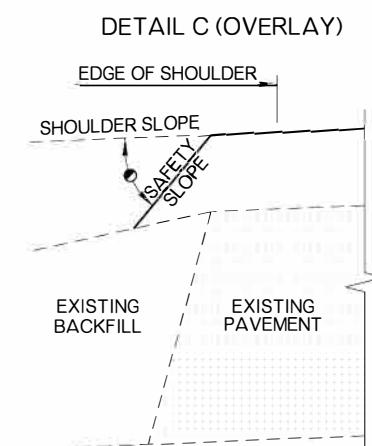
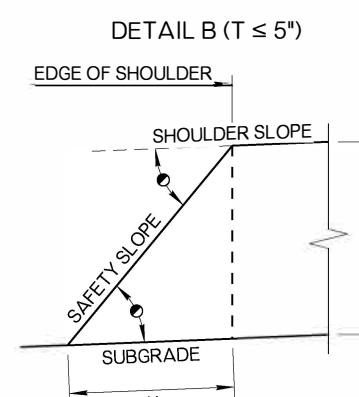
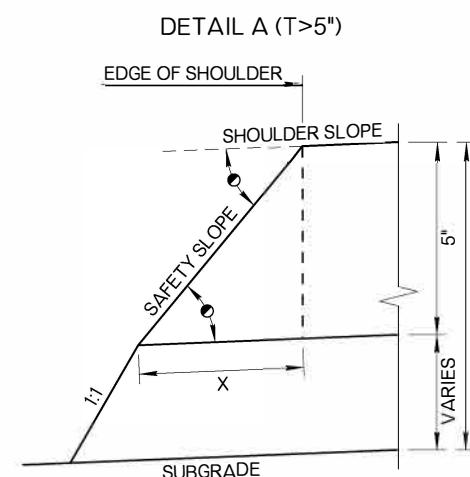
X - ASPHALT PAVEMENT SAFETY EDGE WIDTH			
Y	X (2% SLOPE)	X (-4% SLOPE)	X
IN	IN	IN	IN
0.50	0.86	0.88	0.89
0.75	1.28	1.31	1.33
1.00	1.71	1.75	1.77
1.50	2.57	2.63	2.66
2.00	3.42	3.50	3.54
2.50	4.28	4.38	4.43
3.00	5.14	5.26	5.31
3.50	5.99	6.13	6.20
4.00	6.85	7.01	7.08
4.50	7.70	7.88	7.97
5.00	8.56	8.76	8.85



TYPICAL SECTION VIEW OF AN ASPHALT PAVEMENT SAFETY EDGE

NOTE: SAFETY EDGE SHALL BE INSTALLED ON SHOULDERS OF WIDTH 4'-0" OR LESS.

■ SEE TYPICAL SECTION FOR DIMENSIONS AND SLOPES.



SAFETY EDGE DETAILS (A-C)

- VARIES BETWEEN 2" AND 5" WITH A MAXIMUM 5" HEIGHT
- 30°±5° (ANGLE IS MEASURED FROM SLOPED EDGE OF SHOULDER)

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. SAFETY EDGE SHALL BE CONSTRUCTED IN UNION WITH THE ASPHALT CONCRETE PAVEMENT.
3. THE SAFETY EDGE, AS SHOWN, CAN BE APPLIED TO NEW CONSTRUCTION AND TO OVERLAYS OF AT LEAST 2".
4. INSTALLATION OF SAFETY EDGE IS NOT REQUIRED IN CURB AND GUTTER AREAS.
5. ALL SAFETY EDGES MUST MEET THE APPROVAL OF THE ENGINEER. THE ENGINEER MAY REQUIRE PROOF THAT THE SYSTEM HAS BEEN USED ON PREVIOUS PROJECTS WITH ACCEPTABLE RESULTS OR MAY REQUIRE THAT A TEST SECTION BE CONSTRUCTED PRIOR TO THE BEGINNING OF WORK TO DEMONSTRATE THAT THE EDGE SHAPE AND COMPACTION IS TO THE SATISFACTION OF THE ENGINEER.
6. PRIOR TO PAVING SAFETY EDGE, GRADE AN AREA 10" WIDE BEGINNING AT EDGE OF PAVED SHOULDER TO PROVIDE A LEVEL SURFACE FREE OF VEGETATION.

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PAVEMENT SAFETY EDGE

2019 SPECIFICATIONS

PSE-2

1

R-24

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

C. E. T. TYPE	CULVERT TYPE			SIDE DRAIN		CROSS DRAIN		
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE X SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)
A3	18"				2	36"		NONE
	22" x 13"	14" x 23"		21" x 15"	2	42"		NONE
				24" x 18"	2	45"		NONE
B3	24"				2	45"		NONE
	28" x 18"	19" x 30"		28" x 20"	2	48"	1	8'-0"
	36" x 22"	22" x 34"		35" x 24"	3	54"	1	8'-9"
				24" x 38"	3	54"	1	9'-4"
	30"				3	50"		NONE
C3	43" x 26"			42" x 29"	3	64"	1	9'-10"
				29" x 45"	3	64"	1	10'-8"
	51" x 31"			49" x 33"	4	70"	1	11'-2"
				34" x 53"	4	72"	1	12'-0"
	36"				4	54"	1	12'-6"
D3	42"				4	61"	1	14'-1"
	58" x 36"	38" x 60"	57" x 38"	4	78"	1	13'-0"	
	65" x 40"				4	84"	2	13'-6"
				64" x 43"	4	84"	2	14'-4"
E3	48"				5	68"	1	15'-8"
				43" x 68"	4	88"	2	14'-4"
	73" x 45"			71" x 47"	4	92"	2	15'-5"
	48" x 76"				5	99"	2	15'-8"

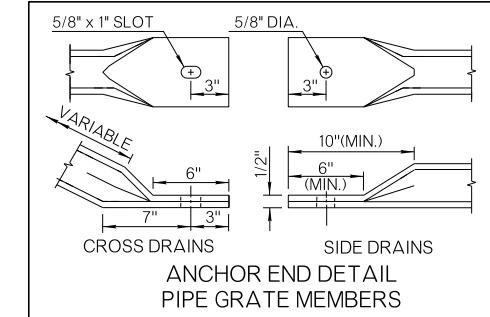
TABLE B - SCHEDULE OF DIMENSIONS

C.E.T. TYPE	LENGTH A	R WIDTH B	A WIDTH B	LENGTH C	HEIGHT H	HEIGHT K	R CONC. CY	A CONC. CY	STEEL LENGTH			
									(R) H-BARS	(A) H-BARS	S-BARS	Z-BARS
A3	7'-11"	5'- 6"	6'- 2"	4'- 3"	21"	9"	1.67	1.82	5'- 2"	5'- 8"	10'- 3"	4'- 0"
B3	9'-6"	6'- 0"	7'- 2"	4'- 5"	22"	14"	2.05	2.44	5'- 8"	6'-10"	11'-10"	4'- 0"
C3	12'-2"	6'- 6"	8'- 5"	5'- 5"	26"	20"	2.96	3.83	6'- 2"	10'- 9"	14'- 5"	4'- 0"
D3	14'-6"	7'- 6"	9'- 5"	6'- 0"	28"	27"	3.99	5.01	7'- 2"	9'- 1"	16'- 10"	4'- 0"
E3	15'-10"	8'- 0"	10'- 4"	6'- 5"	30"	30"	4.79	6.19	7'- 8"	10'- 0"	18'- 2"	4'- 0"

(R) ROUND SHAPE CULVERT OPTIONS

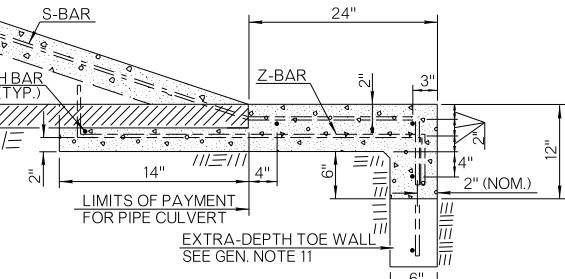
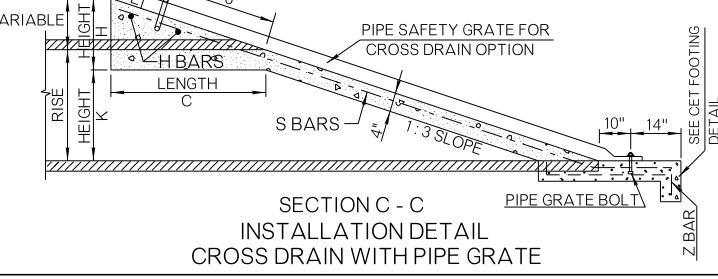
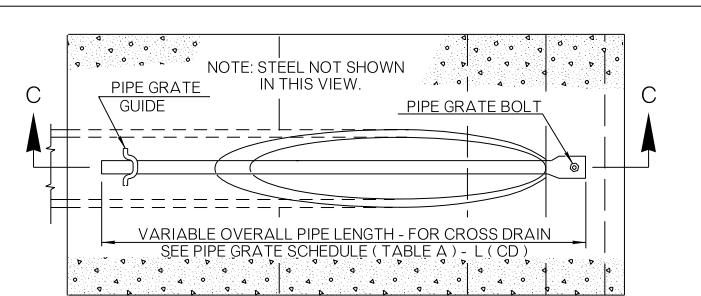
(A) ARCH SHAPE CULVERT OPTIONS

(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS



GENERAL NOTES

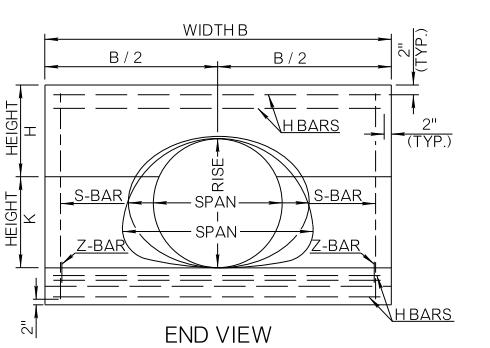
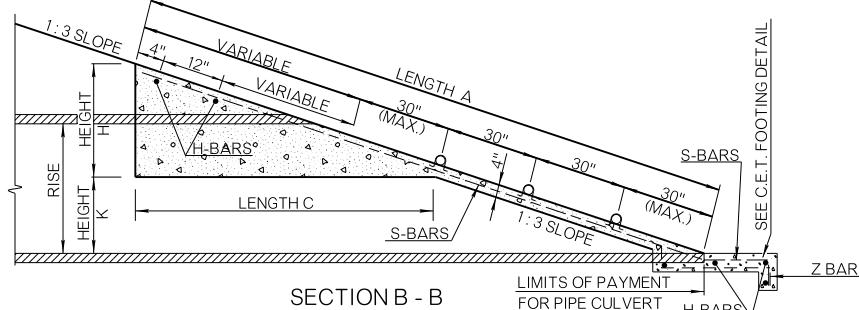
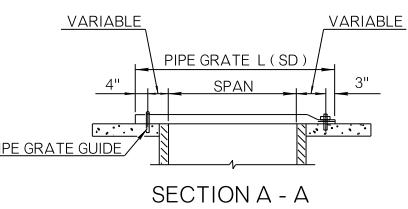
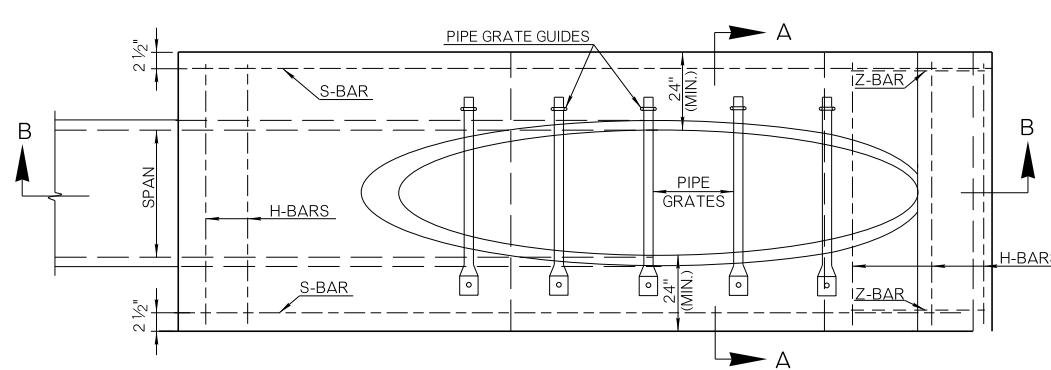
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS "A" CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE ODOT SPECIFICATIONS.
- TYPES A3 THROUGH E3 END TREATMENTS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM AND CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END TREATMENT QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED CULVERT ROUND OR ARCH WITHIN SAME TYPE.
- COAT THE FIELD OR SHOP CUT EDGES OF THE METAL PIPE CULVERT WITH TWO COATS OF COLD GALVANIZATION. COAT THE FIELD OR SHOP CUT EDGES OF THE CONCRETE PIPE CULVERT WITH CONCRETE OR AN APPROVED CORROSION INHIBITOR. IF THE PIPE CULVERT IS CUT AFTER THE CONSTRUCTION OF THE CULVERT END TREATMENT, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME FOR THE PROPER CURING OF THE CONCRETE. INCLUDE THE COST OF CUTTING AND COATING IN THE PRICE BID FOR THE METAL AND/OR CONCRETE PIPE CULVERT.
- ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 3 SLOPE.
- PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES SHALL BE INCLUDED IN THE PRICE BID FOR CULVERT END TREATMENT.
- ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT.
- REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
- CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBER:
 - ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
 - ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.
 - ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME, AND SIZE OF CULVERT.
 NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES
- ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 1 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
- FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B (TABLE B) TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.



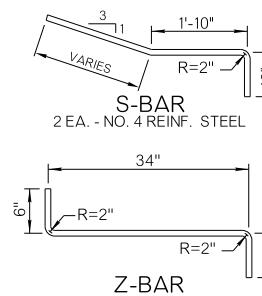
C.E.T. FOOTING DETAIL

TYPICAL ABBREVIATIONS
 RS - ROUND SIDE DRAIN
 RC - ROUND CROSS DRAIN
 AS - ARCH SIDE DRAIN
 AC - ARCH CROSS DRAIN
 GR - GRATED
 NG - NON-GRATED

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.



PIPE GRATE GUIDE (U-BOLT)



PIPE GRATE GUIDE (U-BOLT)

ITEM NO.	ITEM	UNIT
613 (M)	CULVERT END TREATMENT	EA

- Specify type of end treatment (example: type B3 culvert end treatment)
- CET orientation and safety grate requirements shall be specified on the summary of drainage structures (see typical abbreviations)

APPROVED BY
 ROADWAY ENGINEER: *R. D. D. W.* DATE: 4/3/2025
 ROADWAY DESIGN DIVISION STANDARD
 CULVERT END TREATMENT
 SINGLE PIPE INSTALLATION
 1 TO 3 SAFETY SLOPE

OKLAHOMA
 Transportation

2019 SPECIFICATIONS

CET 3S-1

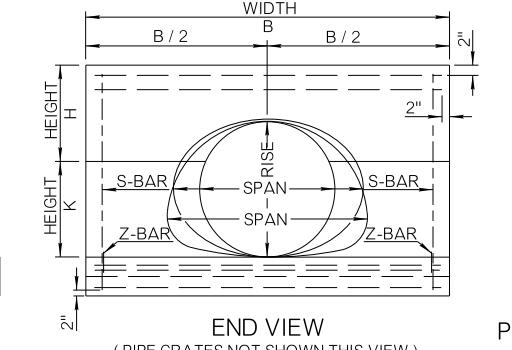
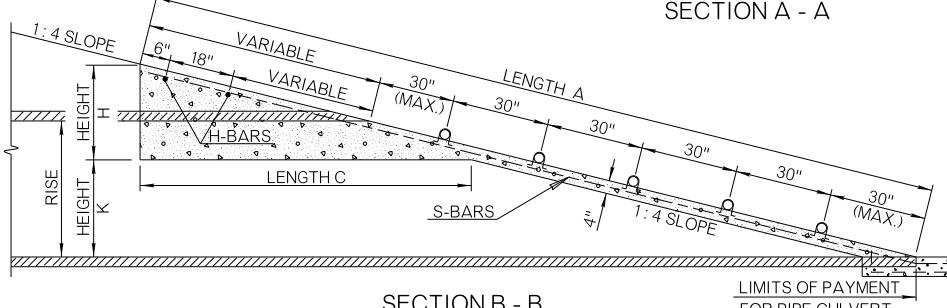
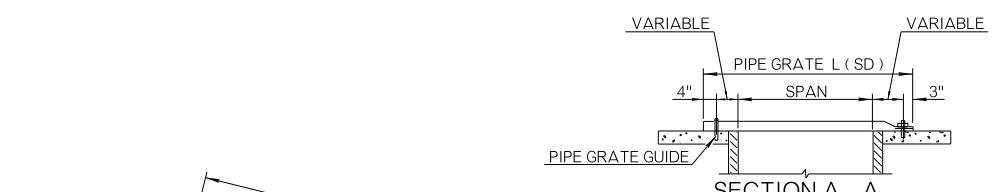
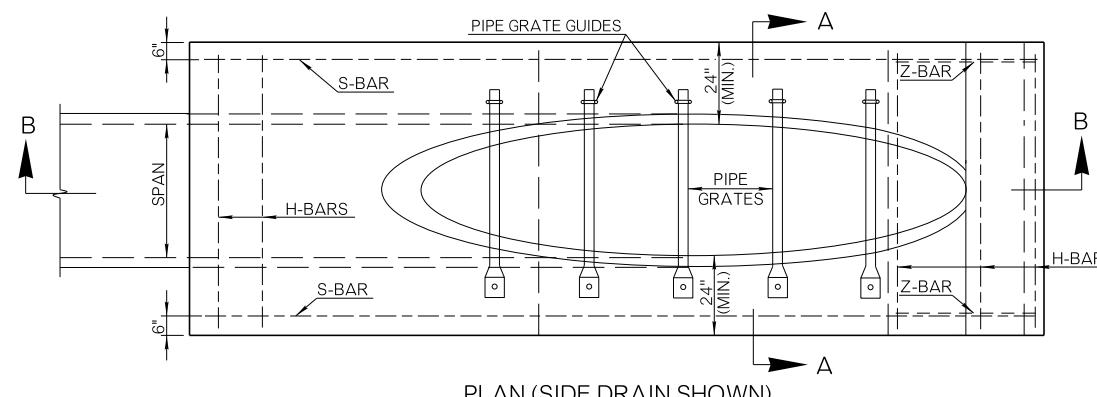
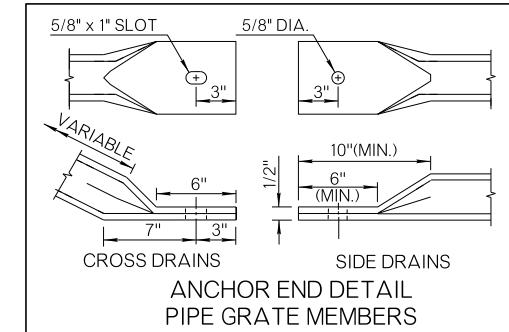
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TABLE A - SCHEDULE OF PIPE SAFETY GRATES								
C.E.T. TYPE	CULVERT TYPE			SIDE DRAIN		CROSS DRAIN		
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)
A4	18"				2	36"		NONE
		22" x 13"	14" x 23"	21" x 15"	2	42"		NONE
				24" x 18"	2	45"		NONE
B4	24"				3	45"		NONE
		28" x 18"	19" x 30"		2	48"	1	10'-9"
				28" x 20"	2	48"		NONE
	36" x 22"	22" x 34"			3	54"	1	12'-0"
				35" x 24"	3	54"	1	12'-6"
C4	30"				3	50"		NONE
		43" x 26"			3	64"	1	13'-6"
			42" x 29"		3	64"	1	14'-3"
			29" x 45"		3	64"	1	14'-3"
	51" x 31"				4	70"	1	15'-3"
			49" x 33"		4	70"	1	15'-9"
D4	36"				4	54"	1	16'-6"
	42"				5	61"	1	18'-9"
		58" x 36"	38" x 60"	57" x 38"	5	78"	1	17'-3"
		65" x 40"			5	86"	2	18'-0"
E4				64" x 43"	5	84"	2	19'-0"
	48"				6	68"	1	20'-9"
		43" x 68"			5	90"	2	19'-0"
	73" x 45"		71" x 47"		6	92"	2	20'-6"
		48" x 76"			6	99"	2	20'-9"

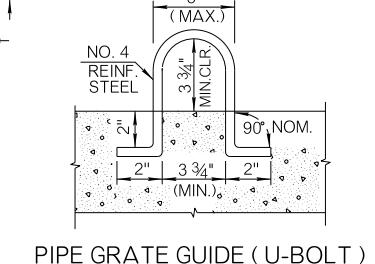
C.E.T. TYPE	LENGTH A	① WIDTH B	④ WIDTH B	LENGTH C	HEIGHT H	HEIGHT K	① CONC. CY	④ CONC. CY	STEEL LENGTH			
									① H-BARS	④ H-BARS	S-BARS	Z-BARS
A4	10'-4"	5'-6"	6'-2"	5'-8"	21"	9"	1.70	2.00	5'-2"	5'-10"	12'-4"	4'-4"
B4	12'-4"	6'-0"	7'-2"	6'-0"	22"	14"	2.00	2.60	5'-8"	6'-10"	15'-4"	4'-4"
C4	15'-9"	6'-6"	8'-5"	7'-4"	26"	20"	2.85	3.95	6'-2"	8'-1"	19'-6"	4'-4"
D4	19'-3"	7'-6"	9'-6"	8'-0"	28"	27"	3.50	5.05	7'-2"	9'-2"	21'-6"	4'-4"
E4	20'-8"	8'-0"	10'-4"	8'-8"	30"	30"	4.05	5.75	7'-8"	10'-0"	23'-4"	4'-4"

① ROUND SHAPE CULVERT OPTIONS
④ ARCH SHAPE CULVERT OPTIONS
④ HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

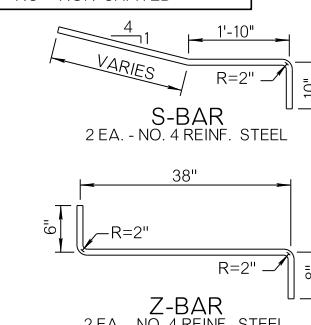


C.E.T. FOOTING DETAIL

TYPICAL ABBREVIATIONS
RS - ROUND SIDE DRAIN
RC - ROUND CROSS DRAIN
AS - ARCH SIDE DRAIN
AC - ARCH CROSS DRAIN
GR - GRATED
NG - NON-GRATED



PIPE GRATE GUIDE (U-BOLT)



Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

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4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

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S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

38" R=2" 8"

Z-BAR 2 EA. - NO. 4 REINF. STEEL

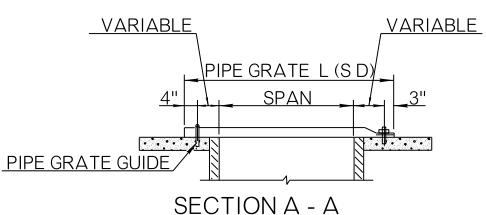
S-BAR 2 EA. - NO. 4 REINF. STEEL

4" 1'-10" R=2" 10"

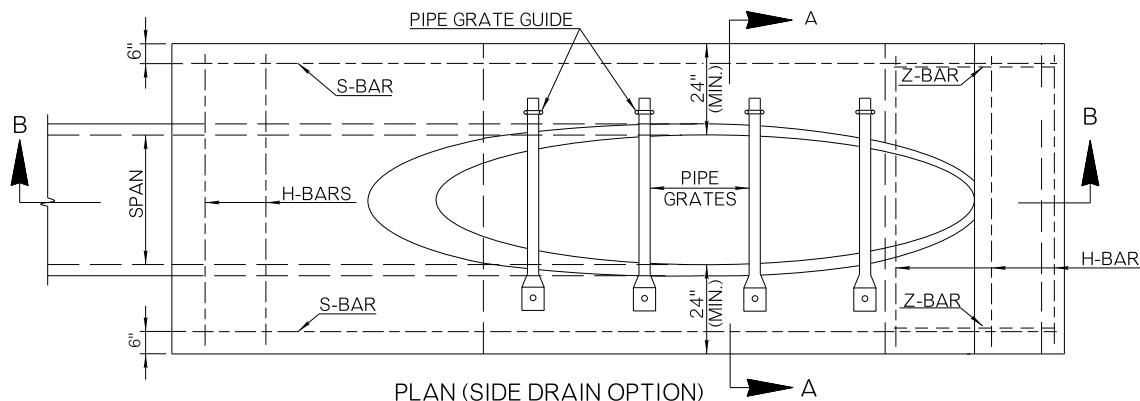
38" R=2" 8"

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

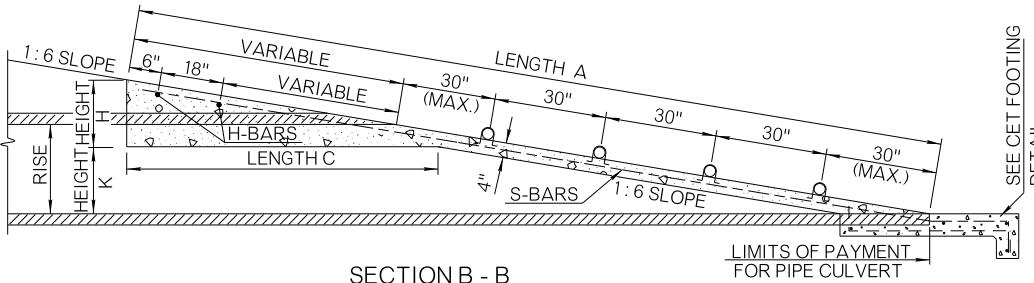
TABLE A - SCHEDULE OF PIPE SAFETY GRATES							
C.E.T. TYPE	CULVERT TYPE				SIDE DRAIN		CROSS DRAIN
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES
A6	18"				3	36"	NONE
		22" x 13"	14" x 23"	21" x 15"	3	42"	NONE
				24" x 18"	3	45"	NONE
B6	24"				4	45"	NONE
		28" x 18"	19" x 30"		3	48"	1 15'-9"
				28" x 20"	4	48"	NONE
	36" x 22"	22" x 34"			4	54"	1 17'-6"
				35" x 24"	4	54"	1 18'-3"
		24" x 38"			4	57"	1 18'-3"
C6	30"				6	50"	NONE
		43" x 26"			5	64"	1 19'-9"
				42" x 29"	5	64"	1 20'-9"
			29" x 45"		5	64"	1 20'-9"
	51" x 31"				6	70"	1 21'-9"
				49" x 33"	6	70"	1 22'-8"
		34" x 53"			6	72"	1 23'-6"
D6	36"				7	54"	1 24'-6"
	42"				8	60"	1 27'-6"
		58" x 36"	38" x 60"	57" x 38"	7	78"	1 25'-6"
	65" x 40"				8	84"	2 26'-6"
				64" x 43"	8	84"	2 28'-0"
E6	48"				9	66"	1 30'-6"
			43" x 68"		8	88"	2 28'-0"
		73" x 45"		71" x 47"	9	92"	2 30'-0"
			48" x 76"		9	96"	2 30'-6"



SECTION A - A



PLAN (SIDE DRAIN OPTION)



SECTION B - B

Diagram illustrating the dimensions and features of a rectangular grating. The width is labeled **WIDTH** with a dimension line from the center to the right edge, labeled **B**. The width is also divided into **B / 2** on each side of the central span. The height is labeled **HEIGHT** with a dimension line from the bottom to the top, labeled **H**. The height is also divided into **K** on the left and **S-BAR** on the right. A **Z-BAR** is shown at the bottom left. The bottom edge is labeled **2"**. The text **END VIEW** and **(PIPE GRATES NOT SHOWN THIS VIEW)** is at the bottom.

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PIPE GRATE GUIDE (U-BOLT)

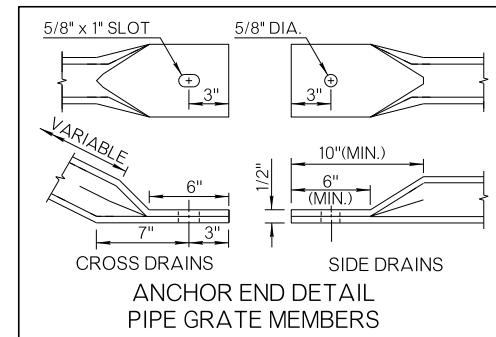
TABLE B - SCHEDULE OF DIMENSIONS

TABLE B - SCHEDULE OF DIMENSIONS												
C.E.T. TYPE	LENGTH A	WIDTH B	WIDTH B	LENGTH C	HEIGHT H	HEIGHT K	WIDTH CONC. CY	WIDTH CONC. CY	STEEL LENGTH			
									H-BARS	H-BARS	S-BARS	Z-BAR
A6	15'- 3"	5'- 6"	6'- 6"	8'- 6"	21"	9"	2.20	2.39	5'- 2"	6'- 2"	17'- 9"	4"- 10"
B6	18'- 3"	6'- 0"	7'- 2"	9'- 0"	22"	14"	2.79	3.33	5'- 8"	6'- 8"	20'- 9"	4"- 10"
C6	23'- 4"	6'- 6"	8'- 5"	11'- 0"	26"	20"	4.24	5.49	6'- 2"	8'- 1"	25'- 10"	4"- 10"
D6	27'- 9"	7'- 6"	9'- 6"	12'- 0"	28"	27"	5.85	7.35	7'- 2"	9'- 2"	30'- 5"	4"- 10"
E6	30'- 6"	8'- 0"	10'- 4"	13'- 0"	30"	30"	7.12	9.19	7'- 8"	10'- 0"	32'- 11"	4"- 10"

ROUND SHAPE CULVERT OPTIONS

Ⓐ ARCH SHAPE CULVERT OPTIONS

(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS



GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS A CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE ODOT SPECIFICATIONS.
3. TYPES A6 THROUGH E6 END TREATMENTS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM AND CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END TREATMENT QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED CULVERT ROUND OR ARCH WITHIN SAME TYPE.
4. COAT THE FIELD OR SHOP CUT EDGES OF THE METAL PIPE CULVERT WITH TWO COATS OF COLD GALVANIZATION. COAT THE FIELD OR SHOP CUT EDGES OF THE CONCRETE PIPE CULVERT WITH CONCRETE OR AN APPROVED CORROSION INHIBITOR. IF THE PIPE CULVERT IS CUT AFTER THE CONSTRUCTION OF THE CULVERT END TREATMENT, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME FOR THE PROPER CURING OF THE CONCRETE. INCLUDE THE COST OF CUTTING AND COATING IN THE PRICE BID FOR THE METAL AND/OR CONCRETE PIPE CULVERT.
5. ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 6 SLOPE.
6. PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
7. ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT.
8. REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
9. CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
 - (A) ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
 - (B) ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.
 - (C) ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME, AND SIZE OF CULVERT.NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
10. ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 13/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
11. FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B (TABLE B) TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER

BASIS OF PAYMENT

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (M)	● CULVERT END TREATMENT	EA

- SPECIFY TYPE OF END TREATMENT
(EXAMPLE: TYPE B6 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES.
(SEE TYPICAL ABBREVIATIONS)

APPROVED BY 
ROADWAY ENGINEER: _____ DATE: _____

ROADWAY DESIGN DIVISION STANDARD
CULVERT END TREATMENT
SINGLE PIPE INSTALLATION
1 TO 6 SAFETY SLOPES

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

TABLE A - SCHEDULE OF PIPE SAFETY GRATES									
C.E.T. TYPE	CULVERT TYPE				SIDE DRAIN		CROSS DRAIN		G DIMENSION
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)	
AA3	18"				2	5'-7"		NONE	12"
	22" x 13"		14" x 23"	21" x 15"	2	6'-5"		NONE	12"
				24" x 18"	2	6'-7"		NONE	12"
BB3	24"				2	6'-7"		NONE	12"
	28" x 18"		19" x 30"		2	7'-7"	2	7'-0"	12"
				28" x 20"	2	7'-3"		NONE	12"
	36" x 22"		22" x 34"		3	8'-7"	2	7'-10"	12"
				35" x 24"	3	8'-5"	2	8'-4"	12"
			24" x 38"		3	9'-2"	2	8'-4"	15"
CC3	30"				3	7'-10"		NONE	15"
	43" x 26"				3	10'-0"	2	8'-10"	15"
				42" x 29"	3	9'-10"	2	9'-8"	15"
			29" x 45"		3	10'-4"	2	9'-8"	15"
	51" x 31"				4	11'-7"	2	10'-2"	18"
				49" x 33"	4	11'-3"	2	10'-8"	18"
			34" x 53"		4	11'-11"	2	11'-0"	18"
DD3	36"				4	9'-1"	2	11'-6"	18"
	42"				4	10'-4"	2	13'-1"	21"
	58" x 36"		38" x 60"	57" x 38"	4	13'-0"	2	12'-0"	21"
	65" x 40"				4	14'-2"	4	12'-6"	21"
				64" x 43"	4	14'-0"	4	13'-4"	21"
EE3	48"				5	11'-7"	2	14'-8"	24"
			43" x 68"		4	14'-11"	4	13'-4"	24"
	73" x 45"			71" x 47"	4	15'-9"	4	14'-5"	24"
			48" x 76"		5	16'-5"	4	14'-8"	26"

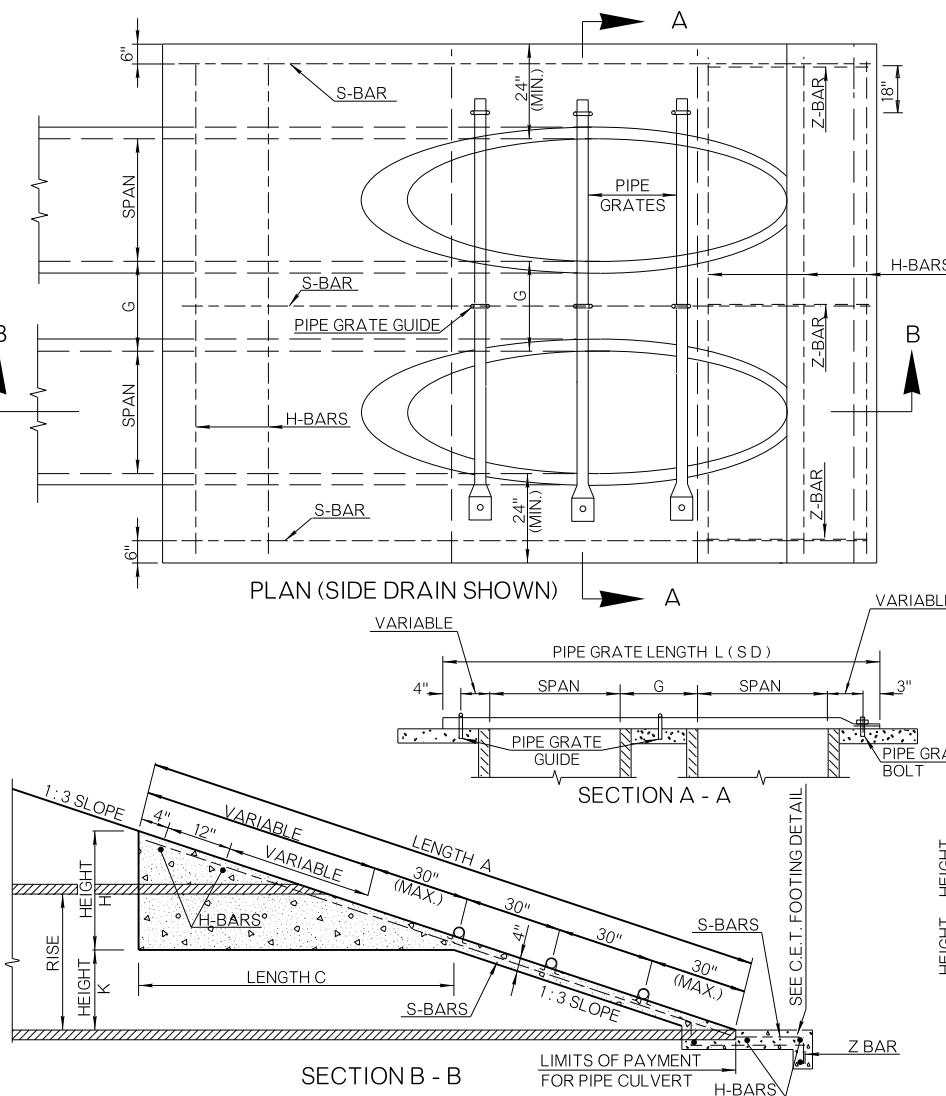


TABLE B - SCHEDULE OF DIMENSIONS

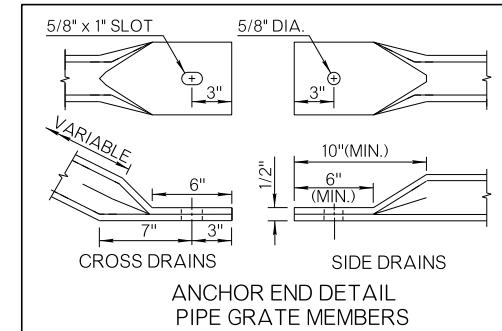
TABLE B - SCHEDULE OF DIMENSIONS												
C.E.T. TYPE	LENGTH A	WIDTH BB	Ⓐ(E) WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	Ⓐ(E) CONC. CY	CONC. CY	STEEL LENGTH			
									Ⓐ(E) H-BARS	Ⓐ(E) H-BARS	S-BARS	Z-BARS
AA3	7'-11"	8'-0"	9'-0"	4'-3"	21"	9"	2.44	2.74	7'-8"	8'- 8"	10'- 3"	4'- 0"
BB3	9'- 6"	9'-0"	11'-7"	4'- 5"	22"	14"	3.07	3.95	8'-8"	11'- 3"	11'-10"	4'- 0"
CC3	12'- 2"	10'-3"	14'-4"	5'- 5"	26"	20"	4.67	6.53	8'-11"	14'- 0"	14'- 5"	4'- 0"
DD3	14'- 6"	12'-9"	16'-7"	6'- 0"	28"	27"	6.78	8.82	12'-5"	16'- 3"	16'-10"	4'- 0"
EE3	15'-10"	14'-0"	18'-10"	6'- 5"	30"	30"	8.39	11.29	13'-8"	18'- 4"	18'- 2"	4'- 0"

⑧ ROUND SHAPE CULVERT OPTIONS

(A) ARCH SHAPE CULVERT OPT

(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A

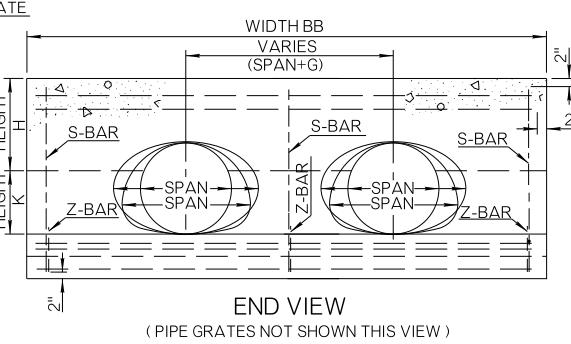


GENERAL NOTES

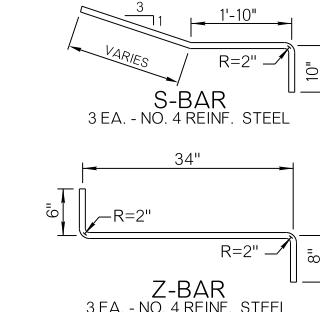
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS A CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE ODOT SPECIFICATIONS.
3. TYPES AA3 THROUGH EE3 END TREATMENTS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM AND CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END TREATMENT QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED CULVERT ROUND OR ARCH WITHIN SAME TYPE.
4. COAT THE FIELD OR SHOP CUT EDGES OF THE METAL PIPE CULVERT WITH TWO COATS OF COLD GALVANIZATION. COAT THE FIELD OR SHOP CUT EDGES OF THE CONCRETE PIPE CULVERT WITH CONCRETE OR AN APPROVED CORROSION INHIBITOR. IF THE PIPE CULVERT IS CUT AFTER THE CONSTRUCTION OF THE CULVERT END TREATMENT, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME FOR THE PROPER CURING OF THE CONCRETE. INCLUDE THE COST OF CUTTING AND COATING IN THE PRICE BID FOR THE METAL AND/OR CONCRETE PIPE CULVERT.
5. ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 3 SLOPE.
6. PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
7. ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT.
8. REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
9. CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
 - (A) ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
 - (B) ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.
 - (C) ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME, AND SIZE OF CULVERT.
10. NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
11. ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 1 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
12. FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B (TABLE B) TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

GET FOOTING DETAIL



PIPE GRATE GUIDE (U-BOLT)



APPROVED BY _____
ROADWAY ENGINEER:  DATE _____
ROADWAY DESIGN DIVISION STANDAR
CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 2 SAFETY CLOPS

BASIS OF PAYMENT

BASIC OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (M)	● CULVERT END TREATMENT	EA

- SPECIFY TYPE OF END TREATMENT
(EXAMPLE: TYPE BB3 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES.
(SEE TYPICAL ABBREVIATIONS.)

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

C.E.T. TYPE	CULVERT TYPE			SIDE DRAIN		CROSS DRAIN		G DIMENSION	
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)	
AA4	18"				2	5'-8"		NONE	12"
		22" x 13"	14" x 23"	21" x 15"	2	6'-6"		NONE	12"
BB4		28" x 18"	19" x 30"	21" x 15"	2	7'-8"	2	10'-9"	12"
				24" x 18"	2	6'-8"		NONE	12"
CC4	24"				2	6'-8"		NONE	12"
		36" x 22"	22" x 34"		2	7'-8"		NONE	12"
DD4		24" x 38"		35" x 24"	3	8'-6"	2	12'-6"	12"
				34" x 53"	3	9'-2"	2	12'-6"	15"
EE4	30"				5	7'-10"		NONE	15"
		43" x 26"			3	10'-0"	2	13'-6"	15"
CC4		29" x 45"		42" x 29"	3	10'-0"	2	14'-3"	15"
		51" x 31"			3	10'-4"	2	14'-3"	15"
DD4		49" x 33"			4	11'-8"	2	15'-3"	18"
		36"			4	9'-8"	2	16'-6"	18"
DD4	42"				5	10'-4"	2	18'-9"	21"
		58" x 36"	38" x 60"	57" x 38"	5	13'-4"	2	17'-3"	21"
EE4		65" x 40"			5	14'-2"	4	18'-0"	21"
				64" x 43"	5	14'-2"	4	19'-0"	21"
EE4	48"				6	11'-8"	2	20'-9"	24"
		43" x 68"			5	15'-0"	4	19'-0"	24"
EE4		73" x 45"		71" x 47"	6	15'-9"	4	20'-6"	24"
				48" x 76"	6	16'-5"	4	20'-9"	26"

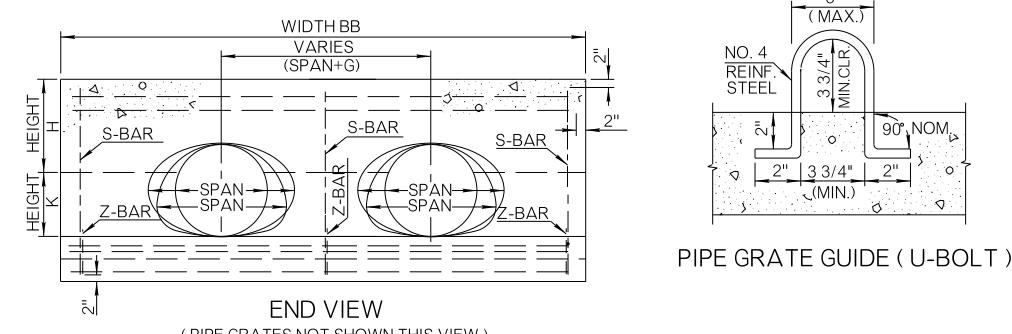
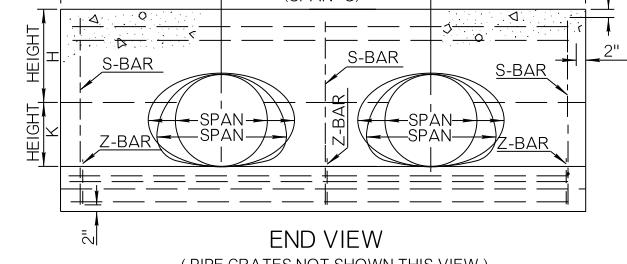
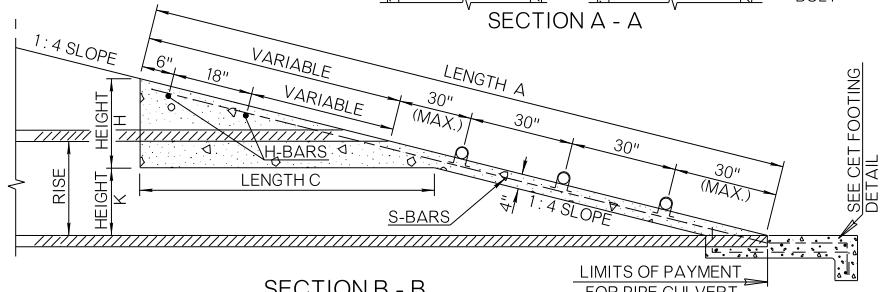
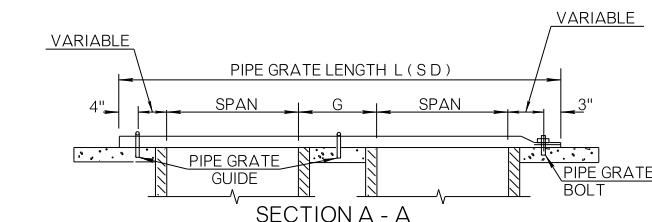
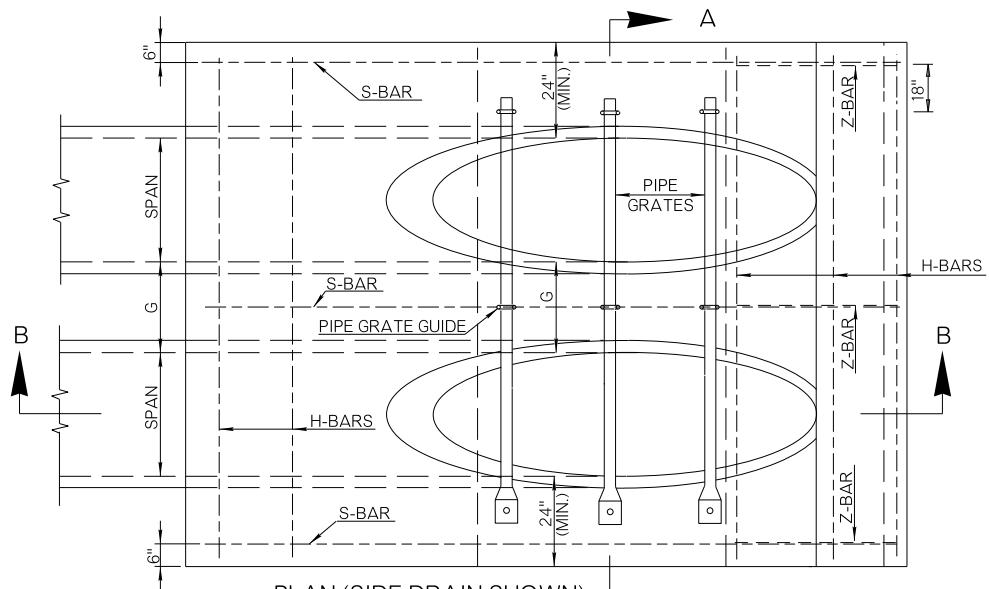


TABLE B - SCHEDULE OF DIMENSIONS

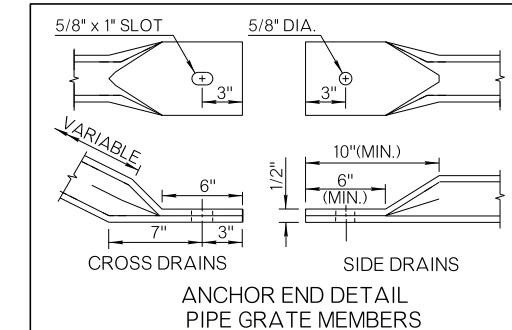
C.E.T. TYPE	LENGTH A	① WIDTH BB	② ③ WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	① CONC. CY	② CONC. CY	STEEL LENGTH			
									③ H-BARS	④ H-BARS	⑤ S-BARS	⑥ Z-BARS
AA4	10'-4"	8'-0"	9'-4"	5'-8"	21"	9"	2.45	2.90	7'-8"	9'-0"	12'-4"	4'-4"
BB4	12'-4"	9'-0"	11'-0"	6'-0"	22"	14"	2.95	3.75	8'-8"	10'-8"	15'-4"	4'-4"
CC4	15'-9"	10'-4"	14'-0"	7'-4"	26"	20"	4.45	5.75	10'-0"	13'-8"	19'-6"	4'-4"
DD4	19'-3"	12'-9"	16'-6"	8'-0"	28"	27"	6.00	8.00	12'-5"	16'-2"	21'-6"	4'-4"
EE4	20'-8"	14'-0"	18'-0"	8'-8"	30"	30"	7.35	9.30	13'-8"	17'-8"	23'-4"	4'-4"

① ROUND SHAPE CULVERT OPTIONS

② ARCH SHAPE CULVERT OPTIONS

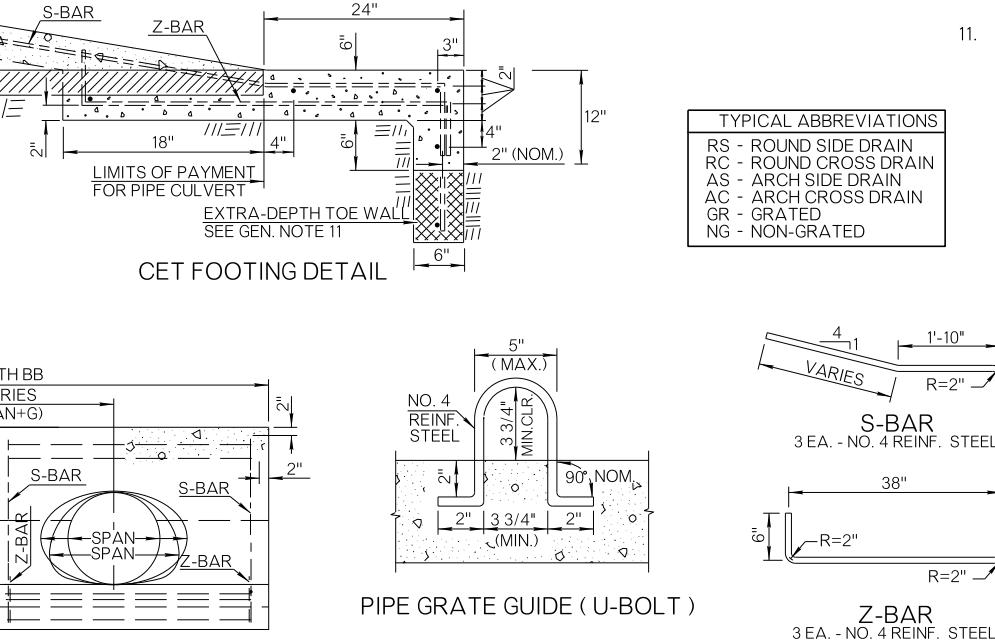
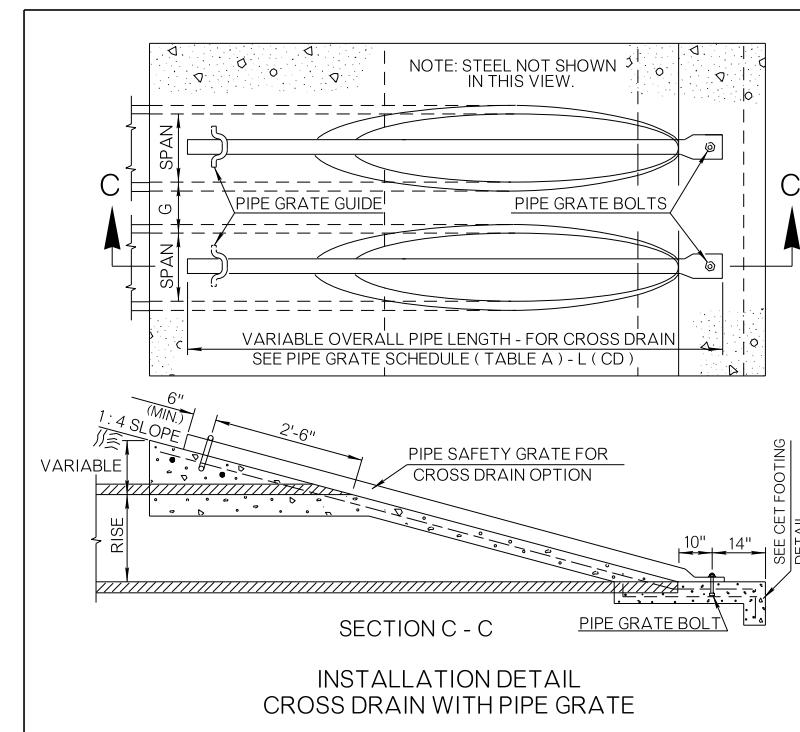
③ HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A



GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS A CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE ODOT SPECIFICATIONS.
- TYPES AA4 THROUGH EE4 END TREATMENTS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM AND CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END TREATMENT QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED CULVERT ROUND OR ARCH WITHIN SAME TYPE.
- COAT THE FIELD OR SHOP CUT EDGES OF THE METAL PIPE CULVERT WITH TWO COATS OF COLD GALVANIZATION. COAT THE FIELD OR SHOP CUT EDGES OF THE CONCRETE PIPE CULVERT WITH CONCRETE OR AN APPROVED CORROSION INHIBITOR. IF THE PIPE CULVERT IS CUT AFTER THE CONSTRUCTION OF THE CULVERT END TREATMENT, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME FOR THE PROPER CURING OF THE CONCRETE. INCLUDE THE COST OF CUTTING AND COATING IN THE PRICE BID FOR THE METAL AND/OR CONCRETE PIPE CULVERT.
- ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 4 SLOPE.
- PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
- ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT.
- REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
- CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
 - ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
 - ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.
 - ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME, AND SIZE OF CULVERT. NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
- ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 1 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
- FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B (TABLE B) TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.



TYPICAL ABBREVIATIONS	
RS	ROUND SIDE DRAIN
RC	ROUND CROSS DRAIN
AS	ARCH SIDE DRAIN
AC	ARCH CROSS DRAIN
GR	GRADED
NG	NON-GRADED

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (M)	● CULVERT END TREATMENT	EA

- SPECIFY TYPE OF END TREATMENT (EXAMPLE: TYPE BB4 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES. (SEE TYPICAL ABBREVIATIONS)

APPROVED BY
ROADWAY ENGINEER: *R.D.W.* DATE 3/31/2025
ROADWAY DESIGN DIVISION STANDARD
CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 4 SAFETY SLOPE

OKLAHOMA
Transportation

2019 SPECIFICATIONS

CET4D-4

3

R-32

TABLE A - SCHEDULE OF PIPE SAFETY GRATES

C.E.T. TYPE	CULVERT TYPE			SIDE DRAIN		CROSS DRAIN		G DIMENSION	
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)	
AA6	18"				3	5'-8"		NONE	12"
		22" x 13"	14" x 23"	21" x 15"	2	6'-6"		NONE	12"
				24" x 18"	3	6'-8"		NONE	12"
	24"				4	6'-8"		NONE	12"
BB6		28" x 18"	19" x 30"		3	7'-8"	2	15'-9"	12"
				28" x 20"	4	7'-8"		NONE	12"
	36" x 22"	22" x 34"			4	8'-6"	2	17'-6"	12"
				35" x 24"	4	8'-6"	2	18'-3"	12"
		24" x 38"			4	9'-2"	2	18'-3"	15"
CC6	30"				6	7'-10"		NONE	15"
		43" x 26"			5	10'-0"	2	19'-9"	15"
			42" x 29"		5	10'-0"	2	20'-9"	15"
			29" x 45"		5	10'-4"	2	20'-9"	15"
	51" x 31"				6	11'-8"	2	21'-9"	18"
			49" x 33"		6	11'-3"	2	22'-8"	18"
DD6	36"				6	12'-0"	2	23'-6"	18"
	42"				7	9'-8"	2	24'-6"	18"
		58" x 36"	38" x 60"	57" x 38"	8	10'-4"	2	27'-6"	21"
		65" x 40"			8	14'-2"	4	26'-6"	21"
EE6	48"				8	14'-2"	4	28'-0"	21"
		43" x 68"			9	11'-8"	2	30'-6"	24"
	73" x 45"		71" x 47"		9	15'-9"	4	30'-0"	24"
		48" x 76"			9	16'-5"	4	30'-6"	26"

TABLE B - SCHEDULE OF DIMENSIONS

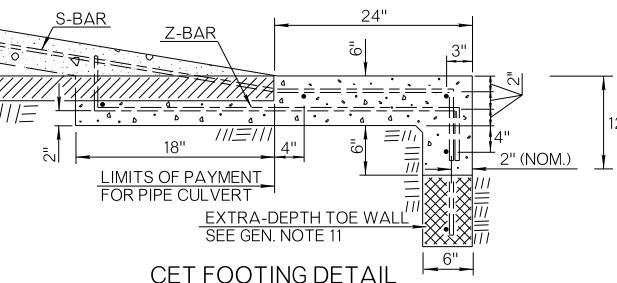
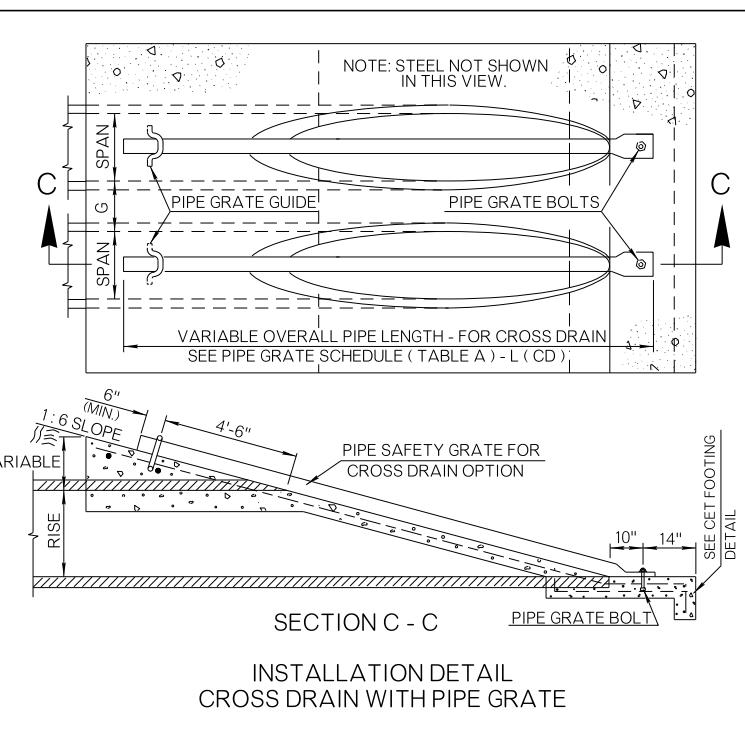
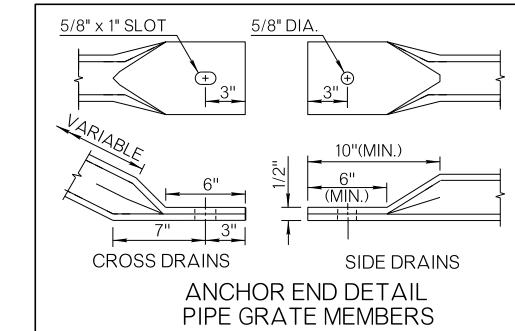
C.E.T. TYPE	LENGTH A	WIDTH BB	A(E) WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	R CONC. CY	A(E) CONC. CY	STEEL LENGTH			
									H-BARS	H-BARS	S-BARS	Z-BARS
AA6	15'-3"	8'-0"	9'-4"	8'-6"	21"	9"	3.55	4.00	7'-8"	9'-0"	17'-9"	4'-10"
BB6	18'-3"	9'-0"	11'-0"	9'-0"	22"	14"	4.40	5.68	8'-8"	10'-8"	20'-9"	4'-10"
CC6	23'-4"	10'-4"	14'-0"	11'-0"	26"	20"	6.16	9.54	10'-0"	13'-8"	25'-10"	4'-10"
DD6	27'-9"	12'-9"	16'-6"	12'-0"	28"	27"	9.64	12.53	12'-5"	16'-2"	30'-5"	4'-10"
EE6	30'-6"	14'-0"	18'-0"	13'-0"	30"	30"	11.85	15.79	13'-8"	17'-8"	32'-11"	4'-10"

(R) ROUND SHAPE CULVERT OPTIONS

(A) ARCH SHAPE CULVERT OPTIONS

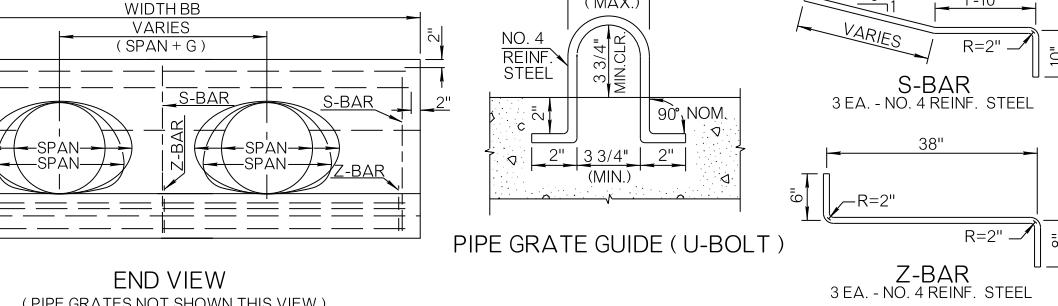
(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A



TYPICAL ABBREVIATIONS	
RS	- ROUND SIDE DRAIN
RC	- ROUND CROSS DRAIN
AS	- ARCH SIDE DRAIN
AC	- ARCH CROSS DRAIN
GR	- GRATED
NG	- NON-GRATED

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.



GENERAL NOTES

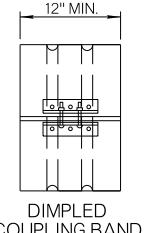
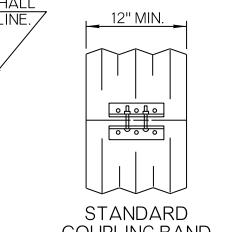
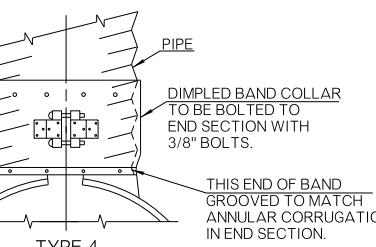
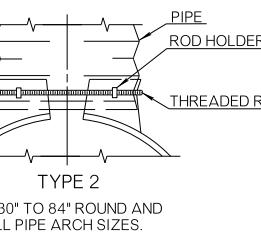
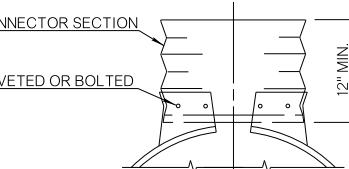
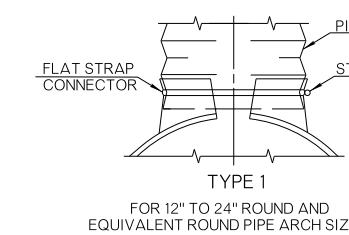
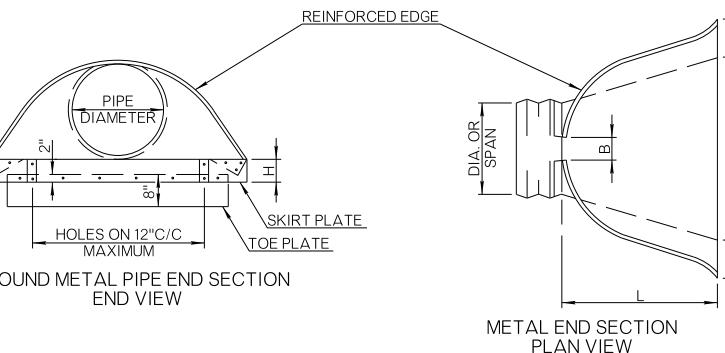
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- COAT THE FIELD OR SHOP CUT EDGES OF THE METAL PIPE CULVERT WITH TWO COATS OF COLD GALVANIZATION. COAT THE FIELD OR SHOP CUT EDGES OF THE CONCRETE PIPE CULVERT WITH CONCRETE OR AN APPROVED CORROSION INHIBITOR. IF THE PIPE CULVERT IS CUT AFTER THE CONSTRUCTION OF THE CULVERT END TREATMENT, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME FOR THE PROPER CURING OF THE CONCRETE. INCLUDE THE COST OF CUTTING AND COATING IN THE PRICE BID FOR THE METAL AND/OR CONCRETE PIPE CULVERT.
- ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 6 SLOPE.
- PIPE FOR SAFETY GRATES SHALL BE 3" x 7.85 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
- ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC-RICH PAINT.
- REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.
- CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
 - ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.
 - ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.
 - ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME, AND SIZE OF CULVERT. NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
- ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5 1/2" GALVANIZED BOLT, NUT AND WASHER. THREADS, 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
- FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH B (TABLE B) TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (M)	CULVERT END TREATMENT	EA

- SPECIFY TYPE OF END TREATMENT (EXAMPLE: TYPE BB6 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES. (SEE TYPICAL ABBREVIATIONS)

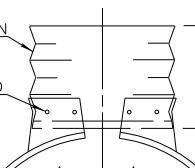
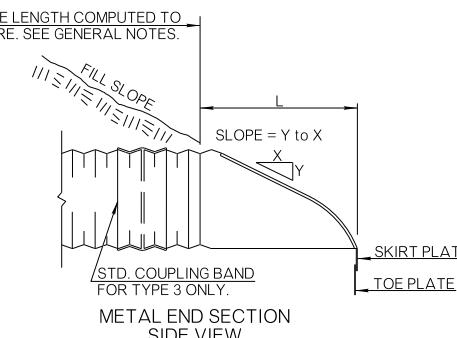
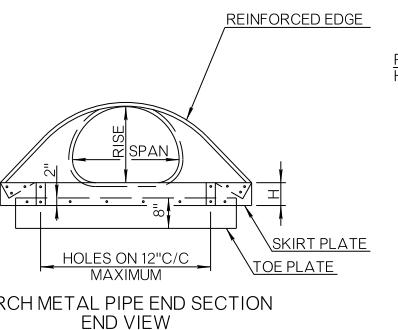
APPROVED BY
ROADWAY ENGINEER: *R. D. W.*
ROADWAY DESIGN DIVISION STANDARD
CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 6 SAFETY SLOPE
OKLAHOMA Transportation
2019 SPECIFICATIONS
CET6D-4 3

DIMENSIONS OF END SECTIONS FOR ROUND METAL PIPE								
PIPE DIA.	GA.	A	B	H	L	W	APPROX. SLOPE	BODY TYPE
12"	16	6"	6"	6"	21"	24"	1:2 1/2	1PC.
15"	16	7"	8"	6"	26"	30"	1:2 1/2	1PC.
18"	16	8"	10"	6"	31"	36"	1:2 1/2	1PC.
21"	16	9"	12"	6"	36"	42"	1:2 1/2	1PC.
24"	16	10"	13"	6"	41"	48"	1:2 1/2	1PC.
30"	14	12"	16"	8"	51"	60"	1:2 1/2	2PC.
36"	14	14"	19"	9"	60"	72"	1:2 1/2	2PC.
42"	12	16"	22"	11"	69"	84"	1:2 1/2	2PC.
48"	12	18"	27"	12"	78"	90"	1:2 1/4	3PC.
54"	12	18"	30"	12"	84"	102"	1:2	3PC.
60"	12	18"	33"	12"	87"	114"	1:1 3/4	3PC.
66"	12	18"	36"	12"	87"	120"	1:1 1/2	3PC.
72"	12	18"	39"	12"	87"	126"	1:1 1/3	4PC.
78"	12	18"	42"	12"	87"	132"	1:1 1/4	4PC.
84"	12	18"	45"	12"	87"	138"	1:1 1/6	4PC.



DIMENSIONS OF END SECTIONS FOR METAL PIPE - ARCH									
SPAN x RISE	EQUIV. ROUND	GA.	A	B	H	L	W	APPROX. SLOPE	BODY TYPE
17" x 13"	15"	16	7"	9"	6"	19"	30"	1:2 1/2	1PC.
21" x 15"	18"	16	7"	11"	6"	23"	36"	1:2 1/2	1PC.
24" x 18"	21"	16	8"	12"	6"	28"	42"	1:2 1/2	1PC.
28" x 20"	24"	16	9"	16"	6"	32"	48"	1:2	1PC.
35" x 24"	30"	14	10"	16"	8"	39"	60"	1:1 7/8	2PC.
42" x 29"	36"	14	12"	18"	9"	46"	75"	1:1 3/4	2PC.
49" x 33"	42"	12	13"	21"	12"	53"	85"	1:1 7/8	2PC.
57" x 38"	48"	12	18"	26"	12"	63"	90"	1:1 7/8	3PC.
64" x 43"	54"	12	18"	30"	12"	70"	102"	1:1 7/8	3PC.
71" x 47"	60"	12	18"	33"	12"	77"	114"	1:1 7/8	3PC.
77" x 52"	66"	12	18"	36"	12"	77"	126"	1:1 5/8	4PC.
83" x 57"	72"	12	18"	39"	12"	77"	138"	1:1 1/2	4PC.

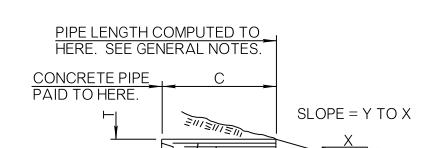
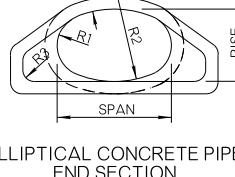
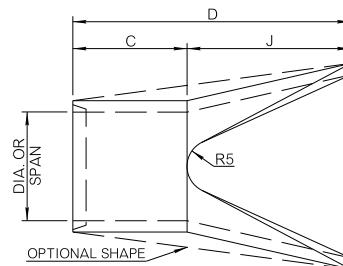
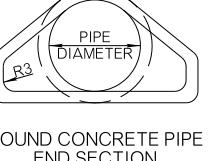
FOR ALUMINUM END SECTIONS THE 28" x 20" SHALL BE 14 GAGE AND THE 42" x 29" SHALL BE 12 GAGE.



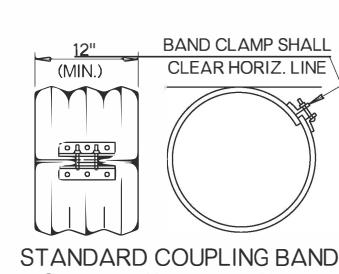
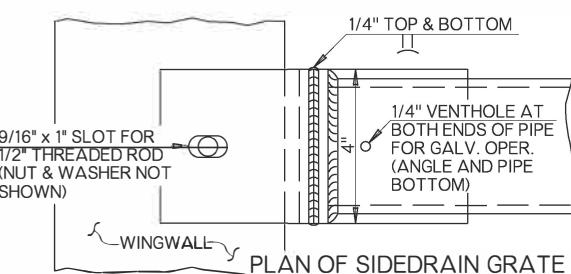
GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. CULVERT END SECTIONS SHALL BE OF THE SAME MATERIAL AND SHAPE (ROUND, ARCH, OR ELLIPTICAL) AS THE PIPE ON WHICH THEY ARE INSTALLED.
3. DIMENSIONS SHOWN FOR END SECTIONS ARE SUBJECT TO MANUFACTURER TOLERANCES.
4. TOE PLATE WILL BE REQUIRED ON ALL METAL END SECTIONS UNLESS SOLID ROCK IS ENCOUNTERED. HOLES IN TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT PLATE, 3/8" BOLTS TO BE FURNISHED. LENGTH OF TOE PLATES FOR ROUND PIPE END SECTIONS SHALL BE W=10" FOR 12" TO 30" DIAMETER PIPE, W=20" FOR 36" TO 84" DIAMETER PIPE. LENGTH OF TOE PLATES FOR ARCH PIPE END SECTIONS SHALL BE W=10" FOR A RISE OF 13" TO 29" AND W=20" FOR A RISE OF 33" TO 57".
5. CONNECTOR SECTION, SKIRT PLATE, AND TOE PLATE ON METAL END SECTIONS SHALL BE THE SAME GAGE AND MATERIAL AS THE SKIRT AND SHALL BE INCLUDED IN PRICE BID FOR END SECTION.
6. IF TYPE 3 METAL END SECTION IS USED AS OPTIONAL PIPE, THE LENGTH OF PIPE TO BE REDUCED BY 12" FOR EACH END SECTION. IF CONCRETE PIPE OPTION IS USED, THE LENGTH OF PIPE TO BE REDUCED BY THE C DIMENSION FOR EACH END SECTION.

DIMENSIONS OF PRECAST END SECTIONS FOR ROUND PIPE										
DIAMETER	R3	R4	R5	T	K	J	C	D	E	SLOPE
18"	3"	3"	6"	2 1/2"	9"	2.25"	3.83"	6.08"	3.00"	1:3
24"	3"	3"	7"	3"	9 1/2"	3.63"	2.50"	6.12"	4.00"	1:3
30"	3"	3"	8"	3 1/2"	12"	4.50"	1.65"	6.16"	5.00"	1:3
36"	3"	3"	10 1/2"	4"	15"	5.25"	2.90"	8.15"	6.00"	1:3
42"	3"	3"	10 1/2"	4 1/2"	21"	5.25"	2.92"	8.17"	6.50"	1:3
48"	6"	6"	14"	5"	24"	6.00"	2.17"	8.17"	7.00"	1:3
54"	6"	6"	-	5 1/2"	27"	5.42"	2.92"	8.33"	7.50"	1:2 1/2
60"	6"	6"	-	6"	30"	5.00"	3.25"	8.25"	8.00"	1:2
66"	6"	6"	-	6 1/2"	24"	6.50"	1.75"	8.25"	8.50"	1:2
72"	6"	6"	-	7"	24"	6.50"	1.75"	8.25"	9.00"	1:2

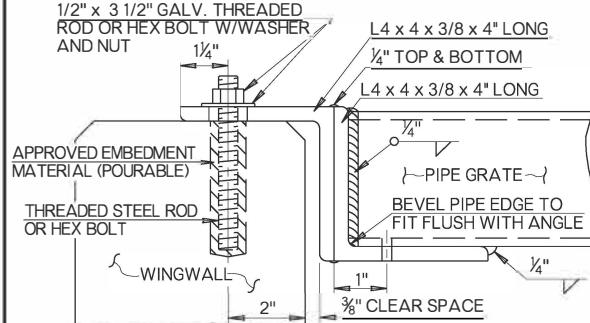


DIMENSIONS OF PRECAST END SECTIONS FOR ELLIPTICAL PIPE										
APPROX. EQUIV. DIAMETER	RISE	SPAN	R1	R2	R3	R4	R5	T	K	SLOPE
18"	14"	23"	6"	20"	3"	3"	6"	2 3/4"	8"	2.25" 3.75" 6.00" 3.00" 1:3
24"	19"	30"	8 1/4"	26 1/4"	3"	3"	7"	3 1/4"	8 1/2"	3.25" 2.75" 6.00" 4.00" 1:3
30"	24"	38"	10 1/4"	32 3/4"	3"	3"	9"	3 3/4"	9 1/2"	4.50" 1.50" 6.00" 5.00" 1:3
36"	29"	45"	12 1/2"	39 1/4"	3"	3"	12"	4 1/2"	11 1/4"	5.00" 3.00" 8.00" 6.50" 1:3
42"	34"	53"	14 1/2"	46"	6"	6"	13"	5"	15 1/4"	5.00" 3.00" 8.00" 6.50" 1:3
48"	38"	60"	16 1/2"	51 1/2"	6"	6"	14"	5 1/2"	21"	5.00" 3.00" 8.00" 7.00" 1:3
54"	43"	68"	18 3/4"	58 1/2"	6"	6"	16"	6"	25 1/2"	5.00" 3.00" 8.00" 7.50" 1:3
60"	48"	76"	20 3/4"	65"	6"	6"	16 1/2"	6"	30"	5.00" 3.25" 8.25" 8.00" 1:2
66"	53"	83"	22 3/4"	71 1/2"	6"	6"	16 1/2"	7 1/2"	24"</	

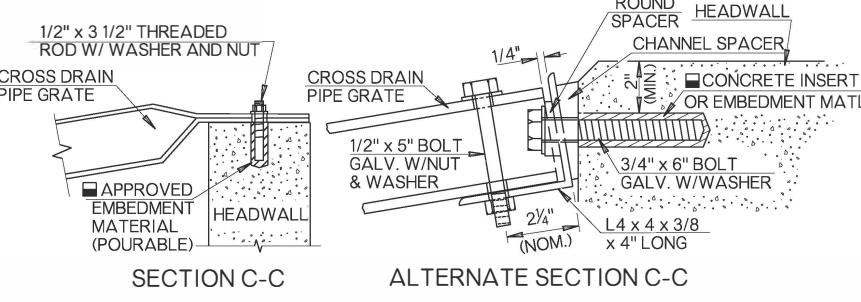
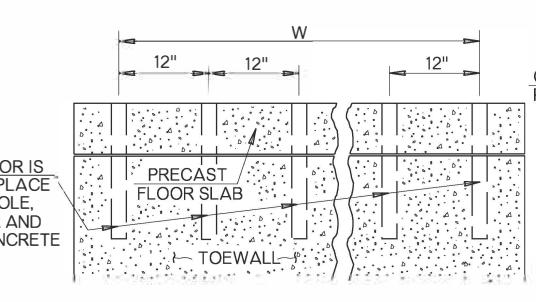
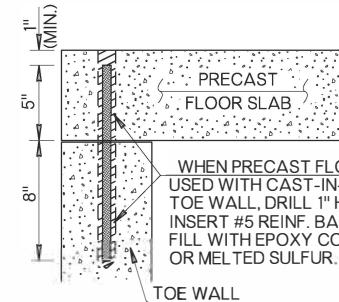


SCES	END SECTION TYPES	ROUND CULV. SIZE	END SECTION DIMENSIONS						SUMMARY-QUANTITIES									
			W	T2	T3	H	LO	NL	1:4 SLOPE	1:6 SLOPE	SCES TYPE	CLASS A CONC. CU. YD.	REINF. STEEL LBS.	SCES TYPE	CLASS A CONC. CU. YD.	REINF. STEEL LBS.		
A4	A6	18"	3'-0"	6"	6"	2'-1"	2'-9 1/4"	1	7'-0"	7'-9"	5	A4	0.92	298	A6	1.26	391	
B4	B6	24"	3'-0"	6"	6"	2'-7"	2'-9 1/4"	1	9'-0"	9'-10"	6	B4	1.18	381	B6	1.65	510	
C4	C6	30"	4'-0"	8"	8"	3'-2"	3'-9 1/4"	1	11'-4"	12'-4"	8	C4	2.26	565	C6	3.15	767	
D4	D6	36"	4'-0"	8"	8"	3'-8"	3'-9 1/4"	1	13'-4"	14'-5"	9	D4	2.66	676	D6	3.76	928	
E4	E6	42"	6'-0"	8"	8"	4'-3"	5'-9 1/4"	2	2	15'-8"	16'-10"	11	E4	4.86	1014	E6	6.88	1500
F4	F6	48"	6'-0"	8"	8"	4'-9"	5'-9 1/4"	2	2	17'-8"	18'-11"	13	F4	5.55	1170	F6	7.91	1612

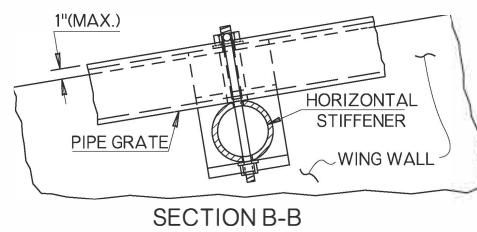
NH=NUMBER OF HORIZONTAL GRATES REQUIRED FOR SIDE DRAIN.
NL=NUMBER OF LONGITUDINAL GS REQUIRED FOR CROSS DRAIN.
NS=NUMBER OF HORIZONTAL STIFFENER(S) EVENLY SPACED FOR CROSS DRAINS (SEE SEC B-B).



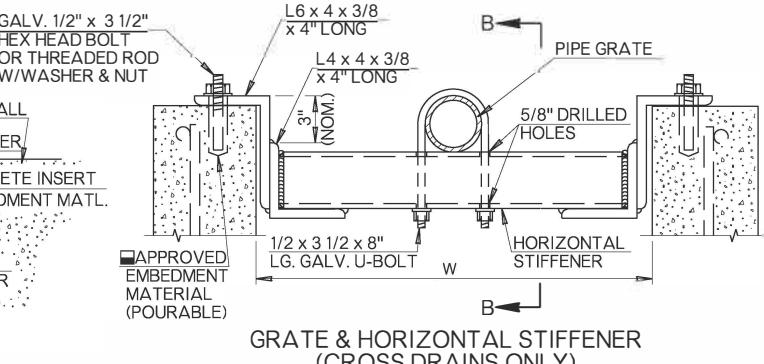
SHALL BE USED TO CONNECT CORRUGATED PIPE CULVERT TO END SECTION



ALTERNATE SECTION C-C



SECTION B-B

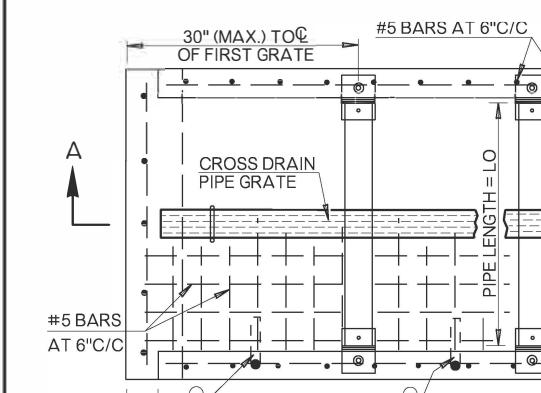


GENERAL NOTES

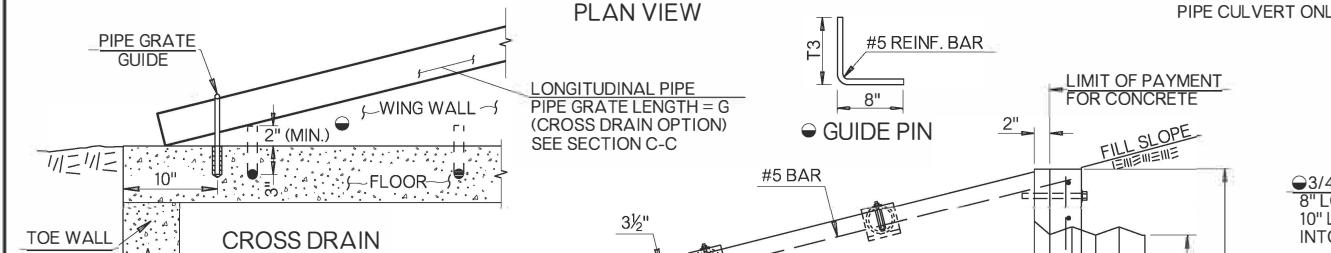
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ALL NOTES DESIGNATED AS **●** APPLY ONLY TO PRECAST OPTION.
3. QUANTITIES SHOWN ARE FOR ONE END ONLY. CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE SPECIFICATIONS. CLASS P CONCRETE, HAVING MINIMUM STRENGTH OF 5000 PSI, SHALL BE USED ON PRECAST UNITS. CLASS A CONCRETE SHALL BE USED ON CAST-IN-PLACE UNITS.
4. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH FABRICATOR AND WITHIN INDUSTRY ACCEPTED TOLERANCES.
5. UNITS SHALL BE ASSEMBLED USING BOLTS, AS SHOWN, AND EPOXY RESIN ADHESIVE CONFORMING TO AASHTO M 235, AT ALL JOINTS.
6. FABRICATOR SHALL SUBMIT TO THE ENGINEER, FOR APPROVAL, PROVISIONS FOR LIFTING COMPONENT PARTS INTO PLACE.
7. WHEN SHOWN ON PLANS, ARCH PIPE (METAL OR CONCRETE) OR ELLIPTICAL PIPE MAY BE USED IN LIEU OF FULL CIRCLE PIPE. WHEN USING ARCH OR ELLIPTICAL PIPE AS A SUBSTITUTE FOR FULL CIRCLE PIPE, THE RESPECTIVE INSIDE SPAN PLUS TWO WALL THICKNESSES MAY NOT EXCEED ANY W DIMENSION SHOWN IN THE TABLE OF END SECTION DIMENSIONS.
8. SHARP EDGES ON PRECAST OR CAST-IN-PLACE UNITS MUST BE CHAMFERED OR ROUNDED TO THE POINT OF SAFE HANDLING. THE CHAMFER SHOULD BE 1/2", OR ROUNDED WITH AN EDGING TOOL.
9. WHEN GRATE MEMBERS ARE REQUIRED, ALL BOLTS, NUTS, WASHERS, BRACKETS, AND STEEL PIPE ARE CONSIDERED PARTS OF THE END SECTION. PAYMENT FOR THESE ITEMS SHALL BE INCLUDED IN BID PRICE FOR THE END SECTION.
10. PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53.
11. ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC RICH PAINT.
12. THREADED ROD, BOLT AND NUTS SHALL CONFORM TO ASTM A307.
13. ALIGNMENT SPACER HARDWARE SHALL CONFORM TO ASTM A36.
14. ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED IN ACCORDANCE WITH SECTION 725.04 OF THE 2009 ODOT STANDARD SPECIFICATIONS.
15. ALL REINFORCING STEEL TO BE #5 BARS AT 6" CENTERS, WITH 12" OVERLAPPING REINFORCING STEEL BETWEEN ADJACENT WALLS, WINGS, TOE WALL AND FLOOR.
16. CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:
 - (A) ALL SIDE DRAIN AND CROSS DRAIN INSTALLATIONS INSIDE THE CLEARZONE.
 - (B) ALL INSTALLATIONS OUTSIDE THE CLEARZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, CLASS, VOLUME AND SIZE OF CULVERT.

NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.

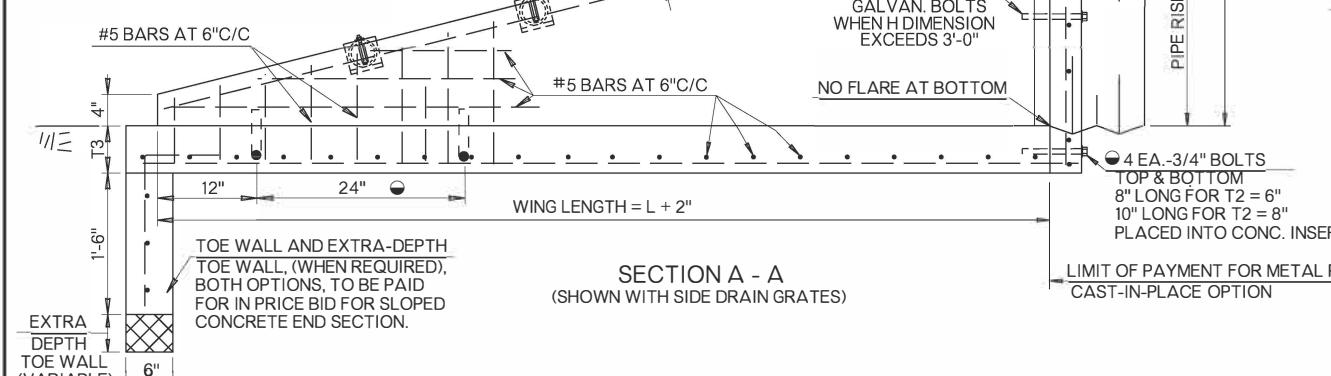
TYPICAL CROSS DRAIN HORIZONTAL STIFFENER(S) AT MID, THIRD AND QUARTER POINTS TO SUPPORT SINGLE OR MULTIPLE LONGITUDINAL PIPE SAFETY GRATES.



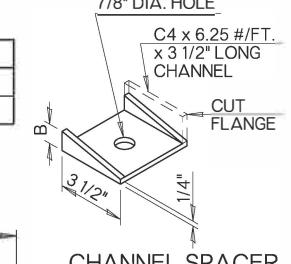
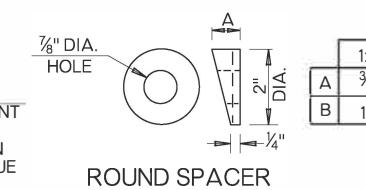
PLAN VIEW



CROSS DRAIN OPTION DETAIL



SECTION A - A
(SHOWN WITH SIDE DRAIN GRATES)



SECTION OF TIE BOLT INSTALLATION
TIE BOLT SHALL BE USED TO CONNECT CONCRETE PIPE CULVERT TO CONCRETE END SECTION.

CAST IN PLACE OPTION
T1 SHALL BE 6".
W
#5 BARS AT 6" C/C

3/4" BOLTS TOP & BOTTOM
8" LONG FOR T2 = 6" AND
10" LONG FOR T2 = 8" PLACED
INTO CONCRETE INSERTS.

1" DIA. HOLES CAST OR
DRILLED INTO BACKWALL
AS SHOWN WHEN CONC.
PIPE CULVERT IS USED.

#4 REINF.
BAR
5" (MAX.)
4 7/8" (MIN.)

PIPE GRATE GUIDE (U-BOLT)

TYPICAL LEGEND
FOR PLAN SUMMARY

SD4 - SIDE DRAIN 1:4
SD6 - SIDE DRAIN 1:6
CD4 - CROSS DRAIN 1:4
CD6 - CROSS DRAIN 1:6
GR - GRATED
NG - NON-GRATED

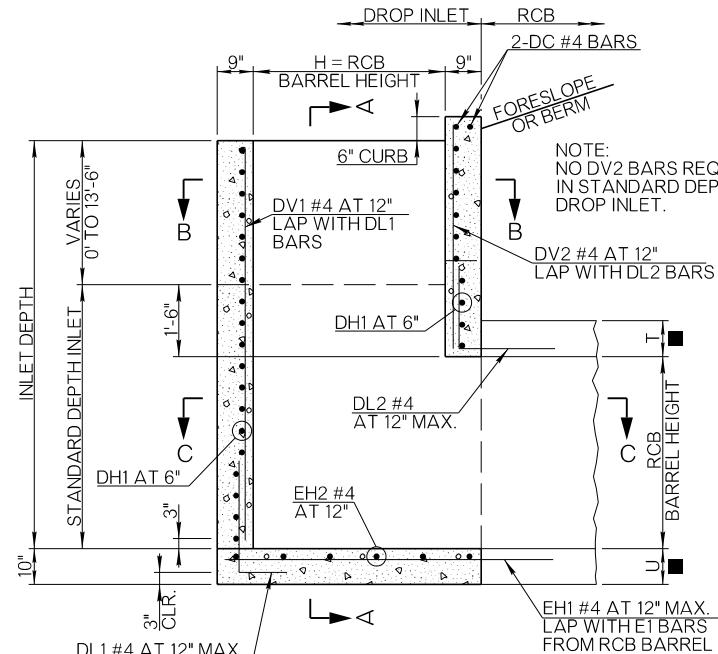
FRONT ELEVATION

ITEM NO.	ITEM	UNIT
613 (N)	SLOPED CONCRETE END SECTION	EA
<input checked="" type="checkbox"/>	SPECIFY TYPE (EXAMPLE: TYPE A4 SLOPED CONC. END SECTION)	
<input checked="" type="checkbox"/>	SCES ORIENTATION, GRATED OR NON-GRATED SHALL BE SHOWN IN PLAN SUMMARIES.	

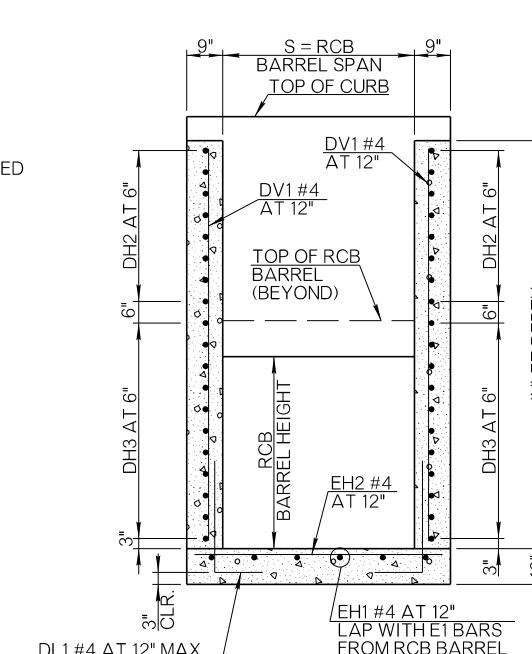
APPROVED BY
ROADWAY ENGINEER: *[Signature]*
ROADWAY DESIGN DIVISION STANDARD
DATE: 6/30/22

SLOPED CONCRETE END SECTIONS
OKLAHOMA
Transportation
2019 SPECIFICATIONS

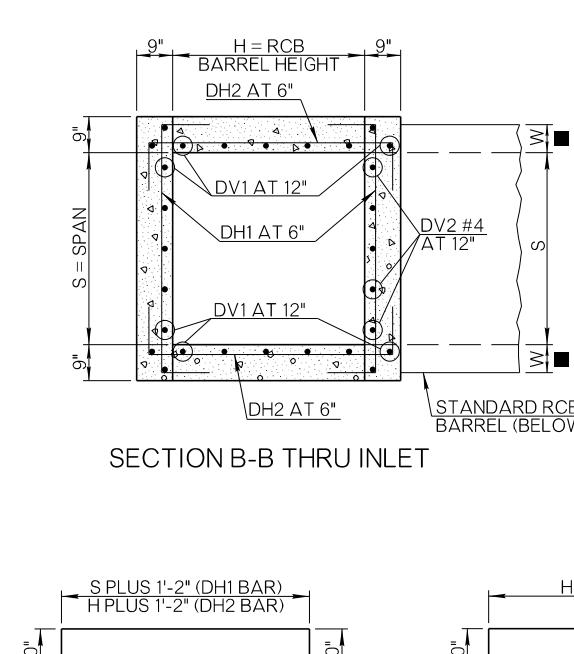
SCES-4 1
R-35



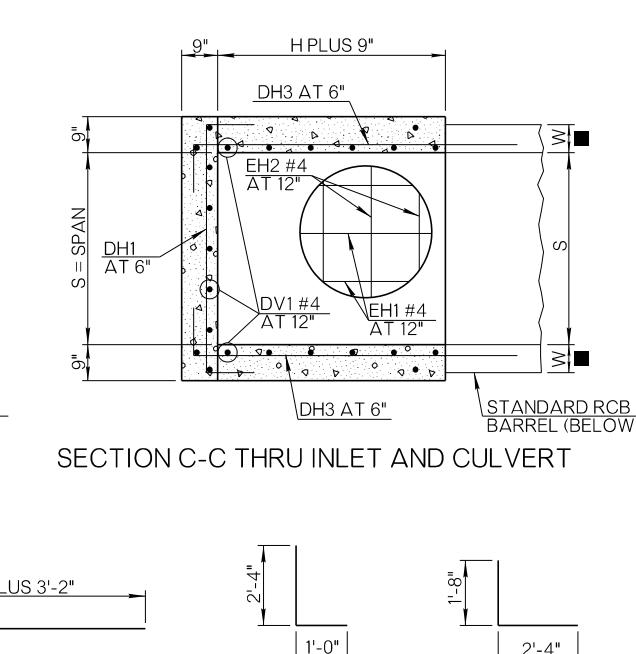
SECTION A-A THRU INLET



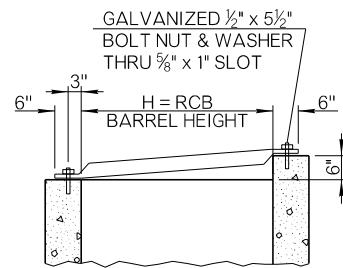
SECTION B-B THRU INLET



SECTION C-C THRU INLET AND CULVERT



SECTION D-D THRU INLET AND CULVERT



TYPICAL GRATE DETAIL

DESIGN NO.	BARREL DIMENSIONS		STANDARD DEPTH	DH1 BARS (BENT)			DH2 BARS (BENT)			DH3 BARS (BENT)			DL1 #4 BARS (BENT)		DL2 #4 BARS (BENT)		DV1 #4 BARS		DV2 #4 BARS		DC #4 BARS		EH1 #4 BARS		EH2 #4 BARS	
	SPAN S	HEIGHT H		SIZE NO.	▲	LENGTH	SIZE NO.	▲	LENGTH	SIZE NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.
1	3'	2'	3'-6"	#4	12	5'-10"	#4	8	4'-10"	#4	16	6'-0"	16	3'-4"	6	4'-0"	16	3'-4"	6	4'-2"	5	5'-1"	4	4'-2"		
2	3'	3'	4'-6"	#4	14	5'-10"	#4	8	5'-10"	#4	20	7'-0"	18	3'-4"	6	4'-0"	18	4'-4"	6	4'-2"	5	6'-1"	5	4'-2"		
3	4'	2'	3'-6"	#4	12	6'-10"	#4	8	4'-10"	#4	16	6'-0"	17	3'-4"	7	4'-0"	17	3'-4"	7	5'-2"	6	5'-1"	4	5'-2"		
4	4'	3'	4'-6"	#5	14	6'-10"	#5	8	5'-10"	#5	20	7'-0"	19	3'-4"	7	4'-0"	19	4'-4"	7	5'-2"	6	6'-1"	5	5'-2"		
5	4'	4'	5'-6"	#5	16	6'-10"	#5	8	6'-10"	#5	24	8'-0"	21	3'-4"	7	4'-0"	21	5'-4"	7	6'-2"	6	7'-1"	6	5'-2"		
6	5'	2'	3'-6"	#5	12	7'-10"	#5	8	4'-10"	#5	16	6'-0"	18	3'-4"	8	4'-0"	18	3'-4"	8	6'-2"	7	5'-1"	4	6'-2"		
7	5'	3'	4'-6"	#5	14	7'-10"	#5	8	5'-10"	#5	20	7'-0"	20	3'-4"	8	4'-0"	20	4'-4"	8	6'-2"	7	6'-1"	5	6'-2"		
8	5'	4'	5'-6"	#5	16	7'-10"	#5	8	6'-10"	#5	24	8'-0"	22	3'-4"	8	4'-0"	22	5'-4"	8	6'-2"	7	7'-1"	6	6'-2"		
9	5'	5'	6'-6"	#5	18	7'-10"	#5	8	7'-10"	#5	28	9'-0"	24	3'-4"	8	4'-0"	24	6'-4"	8	6'-2"	7	8'-1"	7	6'-2"		
10	6'	3'	4'-6"	#5	14	8'-10"	#5	8	5'-10"	#5	20	7'-0"	21	3'-4"	9	4'-0"	21	4'-4"	9	7'-2"	8	6'-1"	5	7'-2"		
11	6'	4'	5'-6"	#5	16	8'-10"	#5	8	6'-10"	#5	24	8'-0"	23	3'-4"	9	4'-0"	23	5'-4"	9	7'-2"	8	7'-1"	6	7'-2"		
12	6'	5'	6'-6"	#5	18	8'-10"	#5	8	7'-10"	#5	28	9'-0"	25	3'-4"	9	4'-0"	25	6'-4"	9	7'-2"	8	8'-1"	7	7'-2"		
13	6'	6'	7'-6"	#5	20	8'-10"	#5	8	8'-10"	#5	32	10'-0"	27	3'-4"	9	4'-0"	27	7'-4"	9	7'-2"	8	9'-1"	8	7'-2"		

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- MAXIMUM DEPTH OF DROP INLETS SHALL BE THE HEIGHT OF THE RCB CULVERT PLUS 15'-0".
- ALL REINFORCING STEEL SHALL HAVE A 2 INCHES MINIMUM CLEAR COVER UNLESS OTHERWISE SHOWN.
- INLET TOP OPENING SHALL HAVE 3" X 7.58 LBS/FT STD. WEIGHT STEEL, GALVANIZED, SCHEDULE 40, PIPE SAFETY GRATES INSTALLED PERPENDICULAR TO THE DIRECTION OF TRAFFIC AT 12 INCHES MAX. CENTERS. COST OF PIPE SAFETY GRATES AND ALL HARDWARE NEEDED FOR INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET.
- PIPE GRATE ENDS SHALL BE HELD DOWN WITH $\frac{1}{2}$ " X $\frac{5}{8}$ " GALVANIZED BOLT, WASHER & NUT MEETING THE REQUIREMENTS OF ASTM F3125. BOLT THREADS, $\frac{1}{4}$ INCHES, SHALL REMAIN EXPOSED FOR INSTALLING GRATE.
- FOR 'T', 'U' AND 'W' DIMENSIONS, SEE BRIDGE STANDARD DRAWINGS.

▲ REINFORCING FOR ADDITIONAL DEPTH

FOR INLET DEPTHS GREATER THAN STANDARD DEPTH:

- 2 ADDITIONAL DH1 BARS WILL BE REQUIRED FOR EVERY 6" OF ADDITIONAL DEPTH.
- 2 ADDITIONAL DH2 BARS WILL BE REQUIRED FOR EVERY 6" OF ADDITIONAL DEPTH.
- DV1 BARS WILL HAVE TO BE EXTENDED BY LENGTH EQUAL TO ADD'L. DEPTH OF INLET.
- DV2 BARS WILL HAVE TO BE ADDED, WITH A LENGTH EQUAL TO ADD'L. DEPTH PLUS 1'-8".

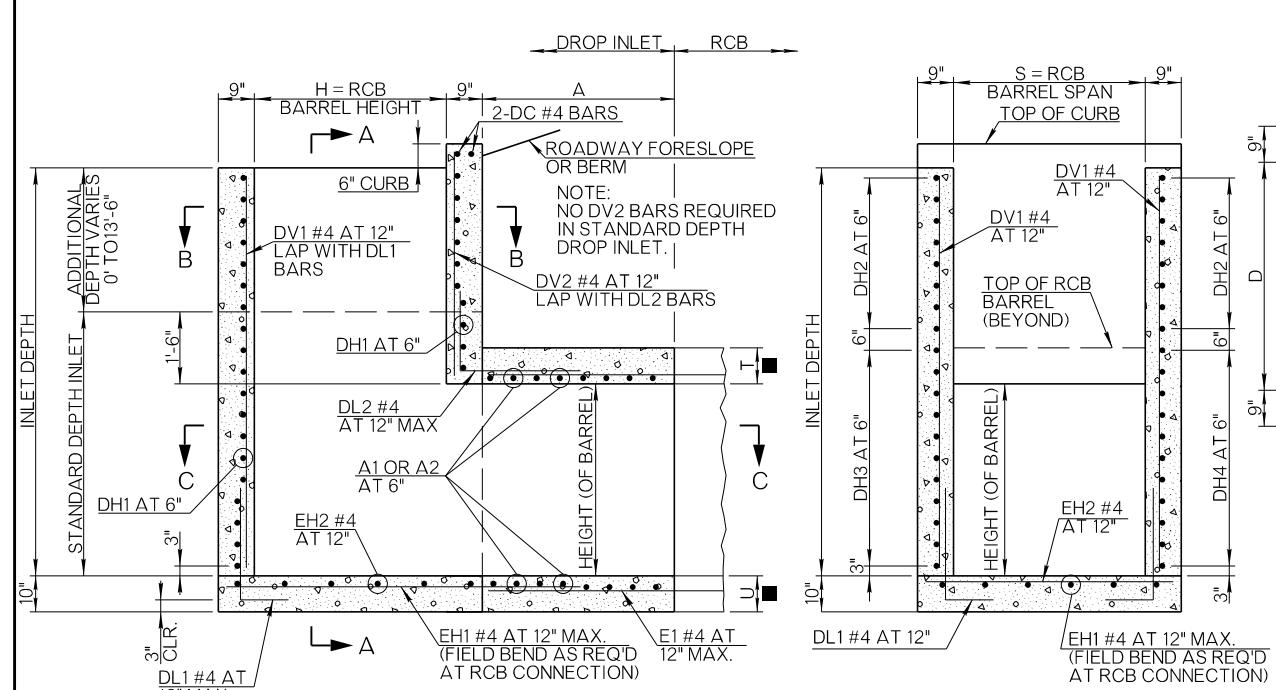
QUANTITIES (FOR INFORMATION PURPOSES ONLY)

DESIGN NO.	CLASS AA CONCRETE		REINFORCING STEEL		PIPE GRATES	
	STANDARD DEPTH INLET	PER ADDITIONAL FT OF DEPTH	STANDARD	ADDITIONAL DEPTH FOR EXTRA DEPTH INLETS	LENGTH OF PIPE	NUMBER OF GRATES
1	1.6 CY	0.37 CY	258 LBS	7 LBS+44 LBS/FT	3'-0 $\frac{3}{4}$ "	2
2	2.2 CY	0.42 CY	328 LBS	7 LBS+48 LBS/FT	4'-0 $\frac{1}{2}$ "	2
3	1.9 CY	0.42 CY	281 LBS	8 LBS+48 LBS/FT	3'-0 $\frac{3}{4}$ "	3
4	2.6 CY	0.48 CY	460 LBS	8 LBS+71 LBS/FT	4'-0 $\frac{1}{2}$ "	3
5	3.4 CY	0.53 CY	568 LBS	8 LBS+76 LBS/FT	5'-0 $\frac{3}{8}$ "	3
6	2.1 CY	0.48 CY	389 LBS	9 LBS+71 LBS/FT	3'-0 $\frac{3}{4}$ "	4
7	2.9 CY	0.53 CY	491 LBS	9 LBS+76 LBS/FT	4'-0 $\frac{1}{2}$ "	4
8	3.7 CY	0.59 CY	603 LBS	9 LBS+82 LBS/FT	5'-0 $\frac{3}{8}$ "	4
9	4.7 CY	0.64 CY	727 LBS	9 LBS+87 LBS/FT	6'-0 $\frac{1}{4}$ "	4
10	3.2 CY	0.59 CY	522 LBS	10 LBS+82 LBS/FT	4'-0 $\frac{1}{2}$ "	5
11	4.1 CY	0.64 CY	639 LBS	10 LBS+87 LBS/FT	5'-0 $\frac{3}{8}$ "	5
12	5.1 CY	0.70 CY	766 LBS	10 LBS+93 LBS/FT	6'-0 $\frac{1}{4}$ "	5
13	6.3 CY	0.75 CY	905 LBS	10 LBS+98 LBS/FT	7'-0 $\frac{1}{4}$ "	5

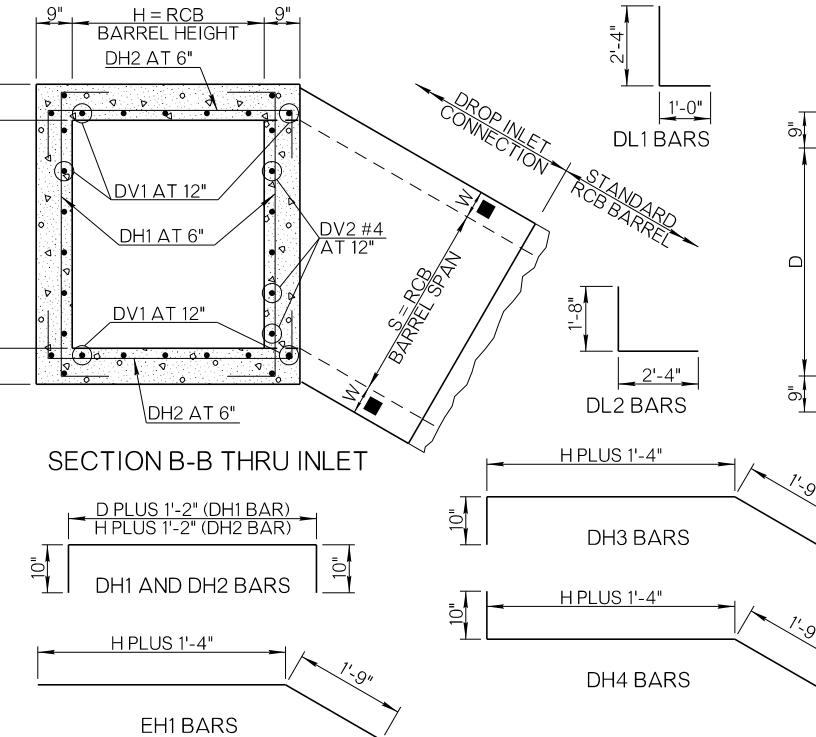
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(G)	INLET CDI RCB DES. ●	EA
611(H)	ADD'L. DEPTH IN INLET CDI RCB DES. ●	VF

● INLET DESIGN NUMBER SHALL BE SPECIFIED.

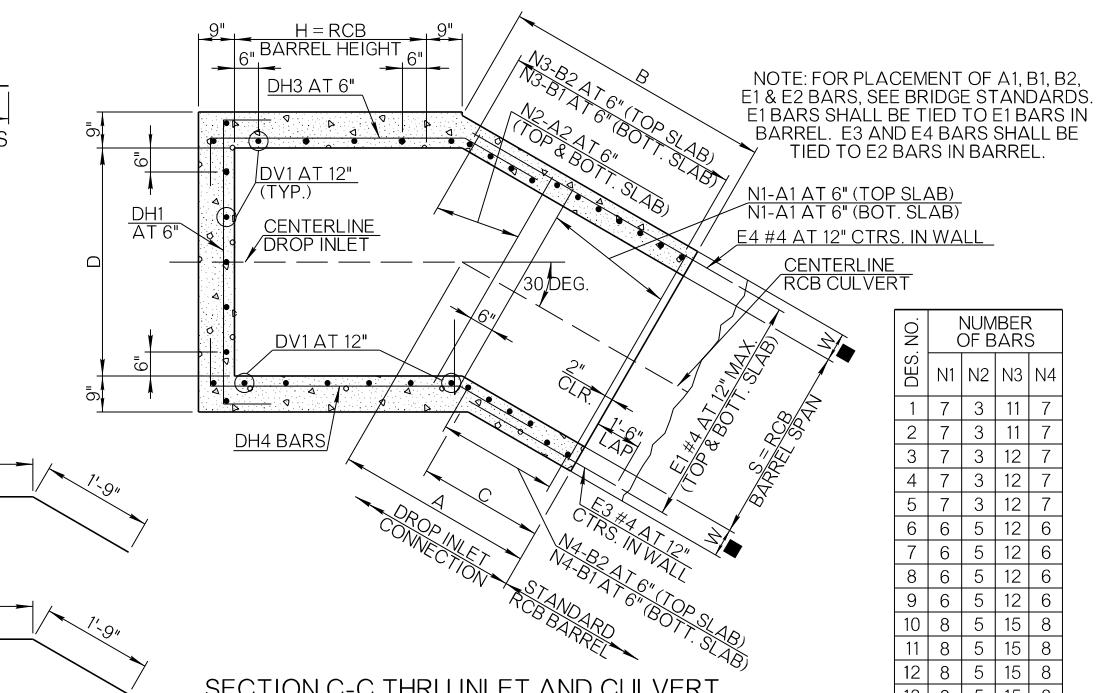
APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD
CAST-IN-PLACE CONCRETE DROP INLETS FOR
R.C. BOXES (3' x 2' TO 6' x 6')



SECTION THRU CENTERLINE RCB CULVERT AND INLET



SECTION A-A THRU INLET

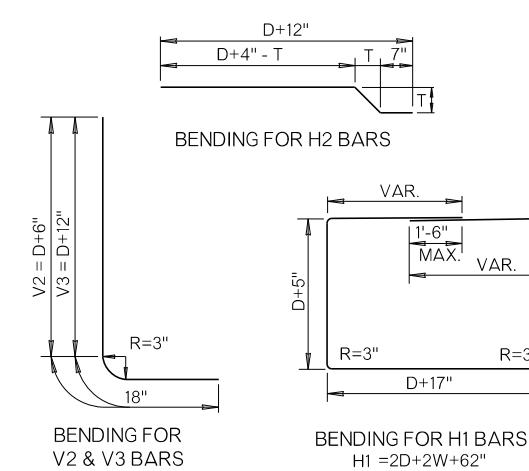
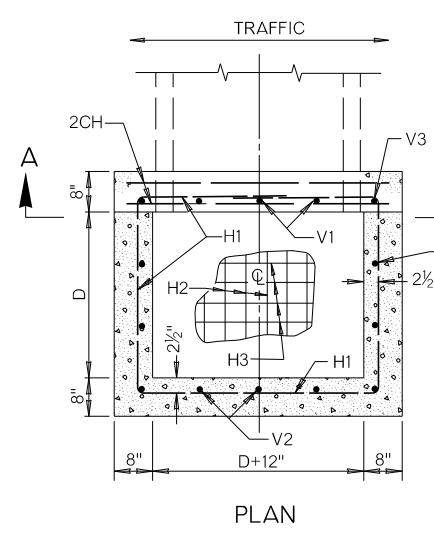


SECTION C-C THRU INLET AND CULVERT

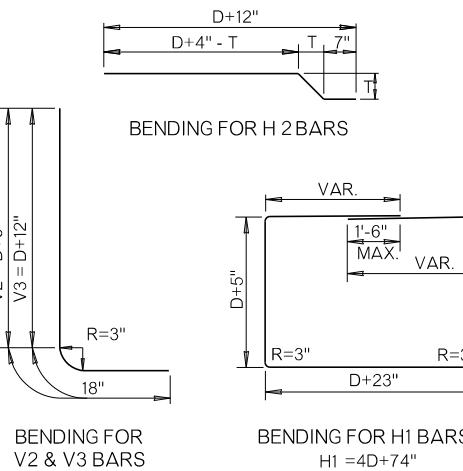
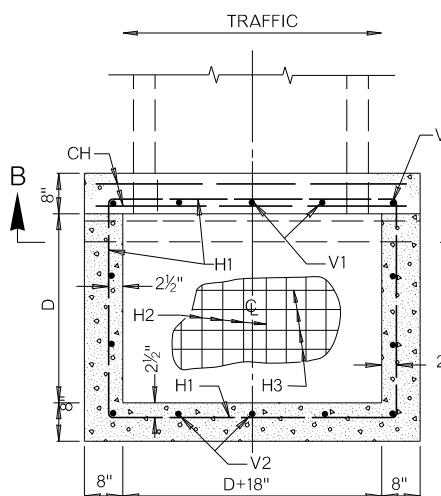
DES. NO.	NUMBER OF BARS			
	N1	N2	N3	N4
1	7	3	11	7
2	7	3	11	7
3	7	3	12	7
4	7	3	12	7
5	7	3	12	7
6	6	5	12	6
7	6	5	12	6
8	6	5	12	6
9	6	5	12	6
10	8	5	15	8
11	8	5	15	8
12	8	5	15	8
13	8	5	15	8

DESIGN NO.	DH1 BARS (BENT)		DH2 BARS (BENT)		DH3 BARS (BENT)		DH4 BARS (BENT)		DL1 #4 BARS (BENT)		DL2 #4 BARS (BENT)		DV1 #4 BARS		DV2 #4 BARS		DC #4 BARS		EH1 #4 BARS (BENT)		EH2 #4 BARS		A1 BARS		A2 BARS		B1 BARS (BENT)		B2 BARS (BENT)		E1 #4 BARS		E3 #4 BARS		E4 #4 BARS	
	SIZE	NO. ▲	LENGTH	SIZE	NO. ▲	LENGTH	SIZE	NO. ▲	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH			
1	#4	12	6'-6"	#4	4	4'-10"	#4	6	5'-11"	#4	6	5'-11"	16	3'-4"	6	4'-0"	16	3'-4"	6	2'-6" AVG. (1'-7" TO 3'-5")	#4	18	2'-5"	#4	18	3'-1"	18	4'-7 1/2" AVG. (3'-8" TO 5'-7")	2	4'-5"	2	6'-10"				
2	#4	14	6'-6"	#4	4	5'-10"	#4	8	6'-11"	#4	8	6'-11"	18	3'-4"	6	4'-0"	18	4'-4"	6	2'-8" AVG. (1'-9" TO 3'-7")	#4	18	2'-5"	#4	18	4'-1"	18	4'-7 1/2" AVG. (3'-8" TO 5'-7")	3	4'-6"	3	6'-10"				
3	#5	12	7'-5"	#5	5	4'-10"	#5	6	5'-11"	#5	6	5'-11"	17	3'-4"	7	4'-0"	17	3'-4"	7	3'-8" AVG. (2'-9" TO 4'-7")	#4	19	2'-7"	#4	19	3'-3"	20	4'-8" AVG. (3'-5" TO 5'-11")	2	4'-2"	2	7'-2"				
4	#5	14	7'-5"	#5	4	5'-10"	#5	8	6'-11"	#5	8	6'-11"	19	3'-4"	7	4'-0"	19	4'-4"	7	3'-8" AVG. (2'-9" TO 4'-7")	#4	19	2'-7"	#4	19	4'-3"	20	4'-8" AVG. (3'-5" TO 5'-11")	3	4'-2"	3	7'-2"				
5	#5	16	7'-5"	#5	4	6'-10"	#5	10	7'-11"	#5	10	7'-11"	21	3'-4"	7	4'-0"	21	5'-4"	7	3'-9" AVG. (2'-11" TO 4'-9")	#5	19	3'-1"	#5	19	5'-5"	20	4'-8" AVG. (3'-5" TO 5'-11")	4	4'-3"	4	7'-2"				
6	#5	12	8'-7"	#5	4	4'-10"	#5	6	5'-11"	#5	6	5'-11"	18	3'-4"	8	4'-0"	18	3'-4"	8	3'-8" AVG. (1'-11" TO 5'-5")	#4	18	2'-7"	#4	18	3'-3"	22	4'-7 1/2" AVG. (3'-1" TO 6'-2")	2	3'-10"	2	7'-5"				
7	#5	14	8'-7"	#5	4	5'-10"	#5	8	6'-11"	#5	8	6'-11"	20	3'-4"	8	4'-0"	20	4'-4"	8	3'-8" AVG. (1'-11" TO 5'-5")	#5	18	3'-1"	#5	18	4'-5"	22	4'-7 1/2" AVG. (3'-1" TO 6'-2")	3	3'-10"	3	7'-5"				
8	#5	16	8'-7"	#5	4	6'-10"	#5	10	7'-11"	#5	10	7'-11"	22	3'-4"	8	4'-0"	22	5'-4"	8	3'-10" AVG. (2'-1" TO 5'-5")	#5	18	3'-1"	#5	18	5'-5"	22	4'-7 1/2" AVG. (3'-1" TO 6'-2")	4	3'-11"	4	7'-5"				
9	#5	18	8'-7"	#5	4	7'-10"	#5	12	8'-11"	#5	12	8'-11"	24	3'-4"	8	4'-0"	24	6'-4"	8	3'-10" AVG. (2'-3" TO 5'-9")	#5	18	3'-1"	#5	18	6'-5"	22	4'-7 1/2" AVG. (3'-1" TO 6'-2")	5	3'-11"	5	7'-5"				
10	#5	14	9'-9"	#5	4	5'-10"	#5	8	6'-11"	#5	8	6'-11"	22	3'-4"	10	4'-0"	22	4'-4"	10	5'-0" AVG. (3'-3" TO 6'-9")	#4	23	2'-7"	#4	23	4'-3"	24	5'-8" AVG. (3'-10" TO 7'-6")	3	4'-8"	3	8'-8"				
11	#5	16	9'-9"	#5	4	6'-10"	#5	10	7'-11"	#5	10	7'-11"	24	3'-4"	10	4'-0"	24	5'-4"	10	5'-0" AVG. (3'-3" TO 6'-9")	#4	23	2'-7"	#4	23	5'-3"	24	5'-8" AVG. (3'-10" TO 7'-6")	4	4'-8"	4	8'-8"				
12	#5	18	9'-9"	#5	4	7'-10"	#5	12	8'-11"	#5	12	8'-11"	26	3'-4"	10	4'-0"	26	6'-4"	10	5'-2" AVG. (3'-5" TO 6'-11")	#4	23	2'-7"	#4	23	6'-3"	24	5'-8" AVG. (3'-10" TO 7'-6")	5	4'-9"	5	8'-8"				
13	#5	20	9'-9"	#5	4	8'-10"	#5	14	9'-11"	#5	14	9'-11"	28	3'-4"	10	4'-0"	28	7'-4"	10	5'-2" AVG. (3'-5" TO 6'-11")	#4	23	2'-8"	#4	23	7'-4"	24	5'-9" AVG. (3'-11" TO 7'-7")	6	4'-9"	6	8'-8"				

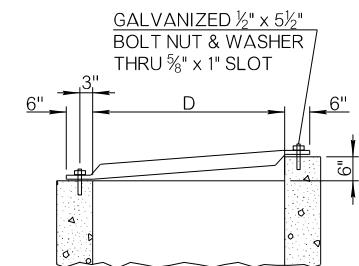
DESIGN NO.	INLET DIMENSIONS				QUANTITIES (FOR INFORMATION PURPOSES ONLY)				
	S = BARREL SPAN	H = STANDARD DEPTH	INLET	REINFORCING STEEL	CLASS AA CONCRETE	PIPE GRATES	STANDARD DEPTH	ADDITIONAL FOR EXTRA DEPTH INLETS	LENGTH OF PIPE
1	2'	3'-6"	A	D	0.39 CY	440 LBS	7 LBS+46 LBS/FT	3'-0 3/4"	3
2	3'	4'-6"	B	C	0.45 CY	530 LBS	7 LBS+50 LBS/FT	4'-0 1/2"	3
3	4'	3'-6"			0.46 CY	570 LBS	8 LBS+68 LBS/FT	3'-0 3/4"	4
4	4'	4'-6"			0.51 CY	680 LBS	8 LBS+73 LBS/FT	4'-0 1/2"	4
5	4'	5'-6"			0.57 CY	880 LBS	8 LBS+79 LBS/FT	5'-0 3/8"	4
6	5'	2'			0.52 CY	670 LBS	9 LBS+74 LBS/FT	3'-0 3/4"	5
7	5'	3'			0.58 CY	840 LBS	9 LBS+79 LBS/FT	4'-0 1/2"	5
8	6'	4'			0.63 CY	980 LBS	9 LBS+85 LBS/FT	5'-0 3/8"	5
9	5'	5'			0.69 CY	1130 L			



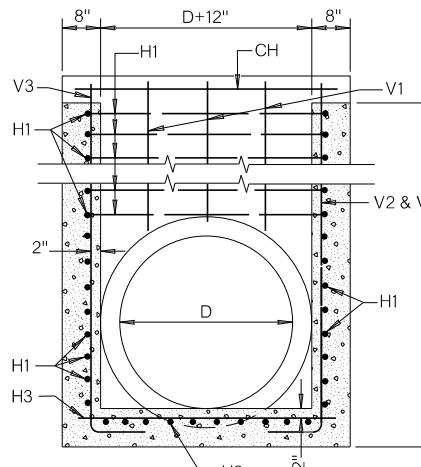
■ BAR BENDING DIAGRAMS



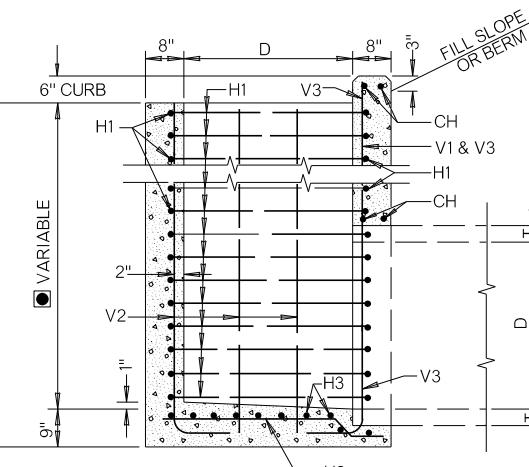
■ BAR BENDING DIAGRAMS



TYPICAL GRATE DETAIL



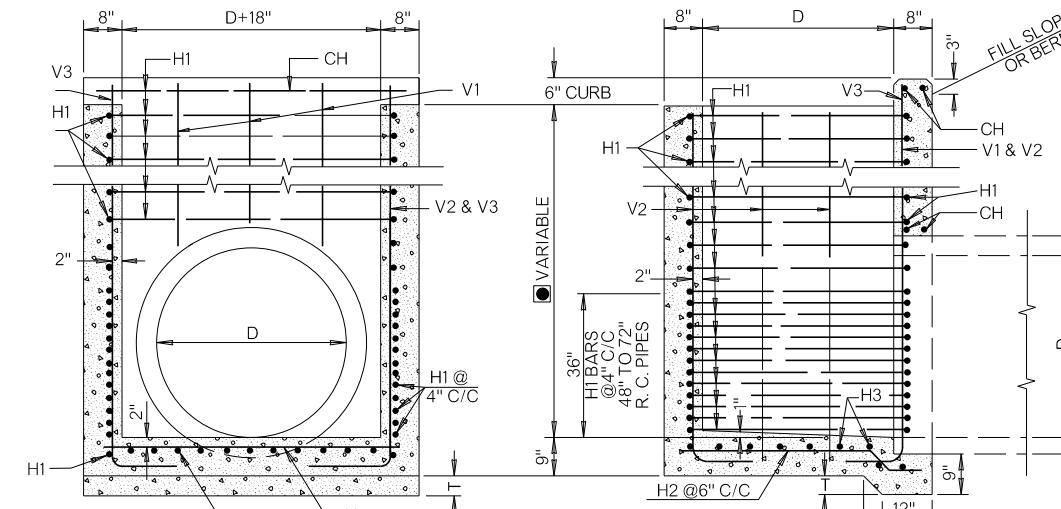
SECTION A-A



SECTION ON C

DROP INLET FOR 18" TO 42" REINF. CONCRETE PIPE

■ DIMENSION FOR STD. DEPTH DROP INLET TO BE (D+T+3")



SECTION B-B

DROP INLET FOR 48" TO 72" REINF. CONCRETE PIPE



SECTION ON C

DIMENSIONS REINFORCING STEEL & QUANTITIES

DESIGN NUMBER	DIMENSIONS					REINFORCING STEEL								CLASS A CONCRETE		REINFORCING STEEL		PIPE GRATES
	DIA. OF PIPE	AREA OF PIPE	THICKNESS OF WALL	STANDARD DEPTH	CH #4 BARS STRAIGHT	H1 #4 BARS BENT	H2 #4 BARS BENT	H3 #4 BARS STRAIGHT	V1 #4 BARS STRAIGHT	V2 #4 BARS BENT	V3 #4 BARS BENT	TOTAL TO TOP OF PIPE INCLUDING CURB	PER FOOT OF ADDITIONAL HEIGHT	TOTAL TO TOP OF PIPE INCLUDING CURB	PER FOOT OF ADDITIONAL HEIGHT	NO. OF PIPE GRATES		
					NO. LGTH.	NO. LGTH.	NO. LGTH.	NO. LGTH.	NO. LGTH.	NO. LGTH.	NO. LGTH.	CY	CY/VF	LBS	LBS/VF	EA		
IN	SQ.FT	IN	FT-IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	EA	EA	EA	EA	EA	
1	18"	1.77	2 1/2"	1'-1 1/2"	4	29"	5	134"	7	30"	7	26"	2	12"	6	42"	2	48"
2	24"	3.14	3"	2'-6"	4	35"	6	158"	8	36"	8	32"	3	13"	6	48"	2	54"
3	30"	4.91	3 1/2"	3'-1/2"	4	41"	7	182"	9	42"	9	38"	4	14"	7	54"	2	60"
4	36"	7.07	4"	3'-7"	4	47"	8	206"	10	48"	10	44"	4	16"	8	60"	2	66"
5	42"	9.62	4 1/2"	4'-1 1/2"	4	53"	9	230"	11	54"	11	50"	5	18"	10	66"	2	72"
6	48"	12.57	5"	4'-8"	4	59"	15	254"	12	60"	12	56"	5	19"	10	72"	2	78"
7	54"	15.90	5 1/2"	5'-2 1/2"	4	65"	16	278"	13	66"	13	62"	6	21"	10	78"	2	84"
8	60"	19.63	6"	5'-9"	4	71"	17	302"	14	72"	14	68"	6	22"	11	84"	2	90"
9	66"	13.76	6 1/2"	6'-3 1/2"	4	77"	18	326"	15	78"	15	74"	7	24"	12	90"	2	96"
10	72"	28.27	7"	6'-10"	4	83"	19	350"	16	84"	16	80"	7	25"	14	96"	2	102"

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- HORIZONTAL REINFORCING BARS SHALL BE PLACED AT 6 INCHES CENTERS EXCEPT AS SHOWN FOR 48 INCHES TO 72 INCHES R.C. PIPE. VERTICAL BARS ARE TIE BARS SPACED AS SHOWN.
- MAXIMUM DEPTHS OF DROP INLET FOR 48 INCHES TO 72 INCHES RCP SHALL BE AS FOLLOWS: 48" RCP - 18'-0" 54" RCP - 16'-0" 66" RCP - 12'-0" 72" RCP - 10'-0".
- TOTAL QUANTITIES AS SHOWN IN TABLE ARE COMPUTED TO TOP OF PIPE AND INCLUDE CURB. FOR DROP INLETS OF GREATER DEPTH, MULTIPLY THE FIGURE IN PER FOOT COLUMN BY THE HEIGHT FROM TOP OF PIPE TO TOP OF DROP INLET AND ADD THE RESULT TO THE QUANTITY IN THE PRECEDING COLUMN.
- INLET TOP OPENING SHALL HAVE 3" x 7.58 LBS/FT STD. WEIGHT STEEL PIPE, GALVANIZED, SCHEDULE 40, PIPE SAFETY GRATES INSTALLED PERPENDICULAR TO THE DIRECTION OF TRAFFIC AT 12 INCHES (MAXIMUM) CENTERS WITH THE COST OF PIPE SAFETY GRATES & ALL HARDWARE NEEDED FOR THE INSTALLATION TO BE INCLUDED IN THE PRICE BID FOR THE INLET.
- PIPE GRATE ENDS SHALL BE HELD DOWN WITH 1/2" x 5 1/2" GALVANIZED BOLT, WASHER & NUT MEETING THE REQUIREMENTS OF ASTM F3125. BOLT THREADS, 1 3/4 INCHES, SHALL REMAIN EXPOSED FOR INSTALLING GRATE.
- 7. BAR BENDING DIAGRAMS AND DIMENSIONS FOR DESIGNS 1 THROUGH 10, AS SHOWN THIS SHEET, ARE FOR STANDARD DEPTH DROP INLETS.
8. ARCH PIPES MAY BE USED INSTEAD OF ROUND PIPES AT THE DISCRETION OF THE ENGINEER.

BASIS OF PAYMENT

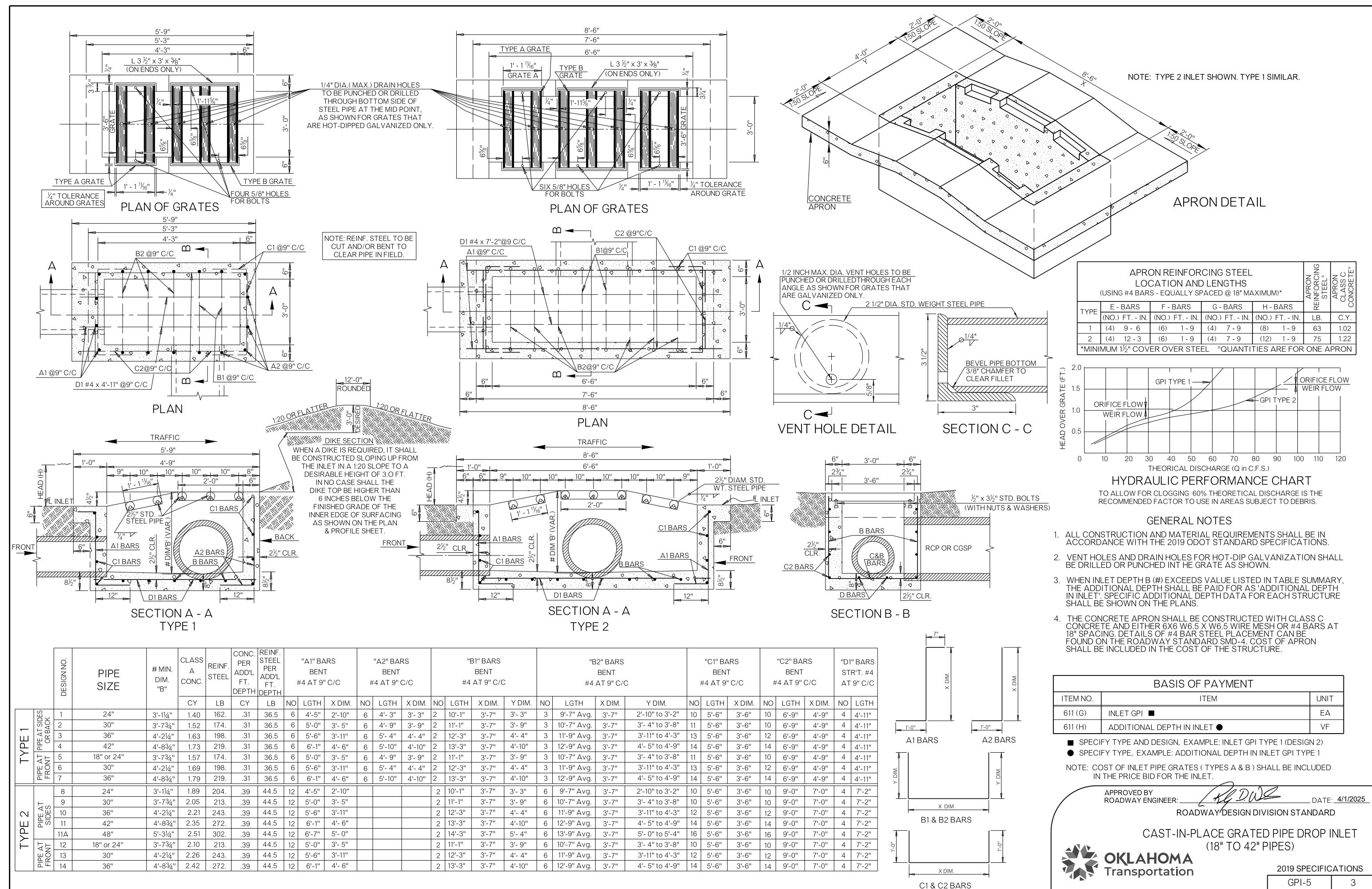
ITEM NO.	ITEM	UNIT
611(G)	INLET CDI RCP DES. ●	EA
611(H)	ADDL. DEPTH IN INLET CDI RCP DES. ●	VF

● DESIGN NUMBER SHALL BE SPECIFIED.

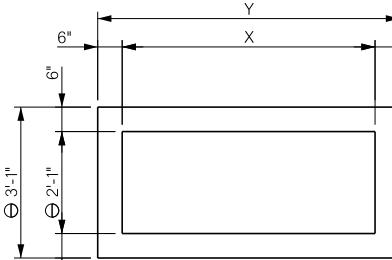
APPROVED BY
ROADWAY ENGINEER: *R.D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE CONCRETE DROP INLETS
FOR 18" TO 72" R.C. PIPES





DESIGN NO.	PIPE SIZE	# MIN. DIM. "B"	CLASS A CONC.	REINF. STEEL PER ADD'L FT. DEPTH	"A1" BARS BENT #4 AT 9" C/C			"A2" BARS BENT #4 AT 9" C/C			"B1" BARS BENT #4 AT 9" C/C			"B2" BARS BENT #4 AT 9" C/C			"C1" BARS BENT #4 AT 9" C/C			"C2" BARS BENT #4 AT 9" C/C			"D1" BARS STRT. #4 AT 9" C/C						
					CY	LB	CY	LB	NO.	LGTH	X DIM.	NO.	LGTH	X DIM.	Y DIM.	NO.	LGTH	X DIM.	NO.	LGTH	X DIM.	NO.	LGTH	X DIM.	NO.	LGTH	X DIM.		
1	24"	3'-11 $\frac{1}{4}$ "	1.40	162.	.31	36.5	6	4'-5"	2'-10"	6	4'-3"	3'-3"	2	10'-1"	3'-7"	3'-3"	3	9'-7" Avg.	3'-7"	2'-10" to 3'-2"	10	5'-6"	3'-6"	10	6'-9"	4'-9"	4	4'-11"	
2	30"	3'-7 $\frac{3}{4}$ "	1.52	174.	.31	36.5	6	5'-0"	3'-5"	6	4'-9"	3'-9"	2	11'-1"	3'-7"	3'-9"	3	10'-7" Avg.	3'-7"	3'-4" to 3'-8"	11	5'-6"	3'-6"	10	6'-9"	4'-9"	4	4'-11"	
3	36"	4'-2 $\frac{1}{4}$ "	1.63	198.	.31	36.5	6	5'-6"	3'-11"	6	5'-4"	4'-4"	2	12'-3"	3'-7"	4'-4"	3	11'-9" Avg.	3'-7"	3'-11" to 4'-3"	13	5'-6"	3'-6"	12	6'-9"	4'-9"	4	4'-11"	
4	42"	4'-8 $\frac{3}{4}$ "	1.73	219.	.31	36.5	6	6'-1"	4'-6"	6	5'-10"	4'-10"	2	13'-3"	3'-7"	4'-10"	3	12'-9" Avg.	3'-7"	4'-5" to 4'-9"	14	5'-6"	3'-6"	14	6'-9"	4'-9"	4	4'-11"	
5	18" or 24"	3'-7 $\frac{3}{4}$ "	1.57	174.	.31	36.5	6	5'-0"	3'-5"	6	4'-9"	3'-9"	2	11'-1"	3'-7"	3'-9"	3	10'-7" Avg.	3'-7"	3'-4" to 3'-8"	11	5'-6"	3'-6"	10	6'-9"	4'-9"	4	4'-11"	
6	30"	4'-2 $\frac{1}{4}$ "	1.69	198.	.31	36.5	6	5'-6"	3'-11"	6	5'-4"	4'-4"	2	12'-3"	3'-7"	4'-4"	3	11'-9" Avg.	3'-7"	3'-11" to 4'-3"	13	5'-6"	3'-6"	12	6'-9"	4'-9"	4	4'-11"	
7	36"	4'-8 $\frac{3}{4}$ "	1.79	219.	.31	36.5	6	6'-1"	4'-6"	6	5'-10"	4'-10"	2	13'-3"	3'-7"	4'-10"	3	12'-9" Avg.	3'-7"	4'-5" to 4'-9"	14	5'-6"	3'-6"	14	6'-9"	4'-9"	4	4'-11"	
8	24"	3'-1 $\frac{1}{4}$ "	1.89	204.	.39	44.5	12	4'-5"	2'-10"				2	10'-1"	3'-7"	3'-3"	6	9'-7" Avg.	3'-7"	2'-10" to 3'-2"	10	5'-6"	3'-6"	10	9'-0"	7'-0"	4	7'-2"	
9	30"	3'-7 $\frac{3}{4}$ "	2.05	213.	.39	44.5	12	5'-0"	3'-5"				2	11'-1"	3'-7"	3'-9"	6	10'-7" Avg.	3'-7"	3'-4" to 3'-8"	10	5'-6"	3'-6"	10	9'-0"	7'-0"	4	7'-2"	
10	36"	4'-2 $\frac{1}{4}$ "	2.21	243.	.39	44.5	12	5'-6"	3'-11"				2	12'-3"	3'-7"	4'-4"	6	11'-9" Avg.	3'-7"	3'-11" to 4'-3"	12	5'-6"	3'-6"	12	9'-0"	7'-0"	4	7'-2"	
11	42"	4'-8 $\frac{3}{4}$ "	2.35	272.	.39	44.5	12	6'-1"	4'-6"				2	13'-3"	3'-7"	4'-10"	6	12'-9" Avg.	3'-7"	4'-5" to 4'-9"	14	5'-6"	3'-6"	14	9'-0"	7'-0"	4	7'-2"	
11A	48"	5'-3 $\frac{1}{4}$ "	2.51	302.	.39	44.5	12	6'-7"	5'-0"				2	14'-3"	3'-7"	5'-4"	6	13'-9" Avg.	3'-7"	5'-0" to 5'-4"	16	5'-6"	3'-6"	16	9'-0"	7'-0"	4	7'-2"	
12	18" or 24"	3'-7 $\frac{3}{4}$ "	2.10	213.	.39	44.5	12	5'-0"	3'-5"				2	11'-1"	3'-7"	3'-9"	6	10'-7" Avg.	3'-7"	3'-4" to 3'-8"	10	5'-6"	3'-6"	10	9'-0"	7'-0"	4	7'-2"	
13	30"	4'-2 $\frac{1}{4}$ "	2.26	243.	.39	44.5	12	5'-6"	3'-11"				2	12'-3"	3'-7"	4'-4"	6	11'-9" Avg.	3'-7"	3'-11" to 4'-3"	12	5'-6"	3'-6"	12	9'-0"	7'-0"	4	7'-2"	
14	36"	4'-8 $\frac{3}{4}$ "	2.42	272.	.39	44.5	12	6'-1"	4'-6"				2	13'-3"	3'-7"	4'-10"	6	12'-9" Avg.	3'-7"	4'-5" to 4'-9"	14	5'-6"	3'-6"	14	9'-0"	7'-0"	4	7'-2"	



PLAN VIEW - STANDARD CURB INLET

CURB INLET SCHEDULE			
DESIGNATION	STRUCTURE LENGTH		
	DESIGN 1	DESIGN 2	DESIGN 3
STD.	3'-7"	6'-2"	11'-6"
A	6'-3"	8'-10"	14'-2"
B	8'-11"	11'-6"	16'-10"
C	11'-7"	14'-2"	19'-6"
D	14'-4"	16'-11"	22'-3"
2A	8'-11"	11'-6"	16'-10"
A-B	11'-7"	14'-2"	19'-6"
A-C	14'-3"	16'-10"	22'-2"
2B	14'-3"	16'-10"	22'-2"
B-C	16'-11"	19'-6"	24'-10"
2C	19'-7"	22'-2"	27'-6"
B-D	19'-8"	22'-3"	27'-7"
2D	25'-1"	27'-8"	33'-0"

CURB INLET ADDITIONAL OPENINGS	
CURB OPENING DESIGNATION	THROAT SECTION LENGTH
A	2'-8"
B	5'-4"
C	8'-0"
D	10'-9"

DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL
 $f'c = 4$ KSI
 $fy = 60$ KSI

LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF FRAMES, GRATES AND HOODS SEE ROADWAY STANDARDS SSIF-5, CIG-4 AND CI-2. COST OF FRAMES, GRATES AND HOODS SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF 1 1/2 INCHES TO REINFORCING STEEL.
- WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 IN² /FT EACH WAY IN THE SECONDARY LAYER.
- BLOCKOUTS IN WALLS MAY BE FORMED FOR GRATE SUPPORT BEAMS. THE SUPPORT BEAM SHALL BE OF SIZE S4x7.7 OR AS DESCRIBED ON ROADWAY STANDARD SSIF-5.
- MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
- DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCHES THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- WALLS AND SLABS WILL HAVE A MINIMUM THICKNESS OF 6 INCHES. A TOLERANCE OF $\pm 3/8$ INCH WILL BE ALLOWED FOR FABRICATION.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES CENTER TO CENTER
- STANDARD DEPTH FOR EACH PIPE SIZE IS SHOWN IN TABLE ①. ALL COSTS FOR THESE STANDARD DEPTH INLETS SHALL BE INCLUDED IN THE PRICE BID OF THE INLET. FOR DEPTHS GREATER THAN STANDARD DEPTH, THE PAY ITEM FOR ADDITIONAL DEPTH IN INLET, PAID AS VERTICAL FEET, SHALL BE USED.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET CI DES. 1 (STD)	EA.
611(G)	PRECAST INLET CI DES. 1 (A)	EA.
611(G)	PRECAST INLET CI DES. 1 (B)	EA.
611(G)	PRECAST INLET CI DES. 1 (C)	EA.
611(G)	PRECAST INLET CI DES. 1 (D)	EA.
611(G)	PRECAST INLET CI DES. 1 (2A)	EA.
611(G)	PRECAST INLET CI DES. 1 (A-B)	EA.
611(G)	PRECAST INLET CI DES. 1 (A-C)	EA.
611(G)	PRECAST INLET CI DES. 1 (2B)	EA.
611(G)	PRECAST INLET CI DES. 1 (B-C)	EA.
611(G)	PRECAST INLET CI DES. 1 (2C)	EA.
611(G)	PRECAST INLET CI DES. 2 (STD)	EA.
611(G)	PRECAST INLET CI DES. 2 (B)	EA.
611(G)	PRECAST INLET CI DES. 2 (C)	EA.
611(G)	PRECAST INLET CI DES. 2 (D)	EA.
611(G)	PRECAST INLET CI DES. 2 (2B)	EA.
611(G)	PRECAST INLET CI DES. 2 (2C)	EA.
611(G)	PRECAST INLET CI DES. 2 (B-D)	EA.
611(G)	PRECAST INLET CI DES. 2 (2D)	EA.
611(G)	PRECAST INLET CI DES. 3 (STD)	EA.
611(G)	PRECAST INLET CI DES. 3 (B)	EA.
611(G)	PRECAST INLET CI DES. 3 (D)	EA.
611(G)	PRECAST INLET CI DES. 3 (2B)	EA.
611(G)	PRECAST INLET CI DES. 3 (B-D)	EA.
611(G)	PRECAST INLET CI DES. 3 (2D)	EA.
611(G)	ADD'L DEPTH IN PRECAST INLET CI DES. 1	VF
611(G)	ADD'L DEPTH IN PRECAST INLET CI DES. 2	VF
611(G)	ADD'L DEPTH IN PRECAST INLET CI DES. 3	VF

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025

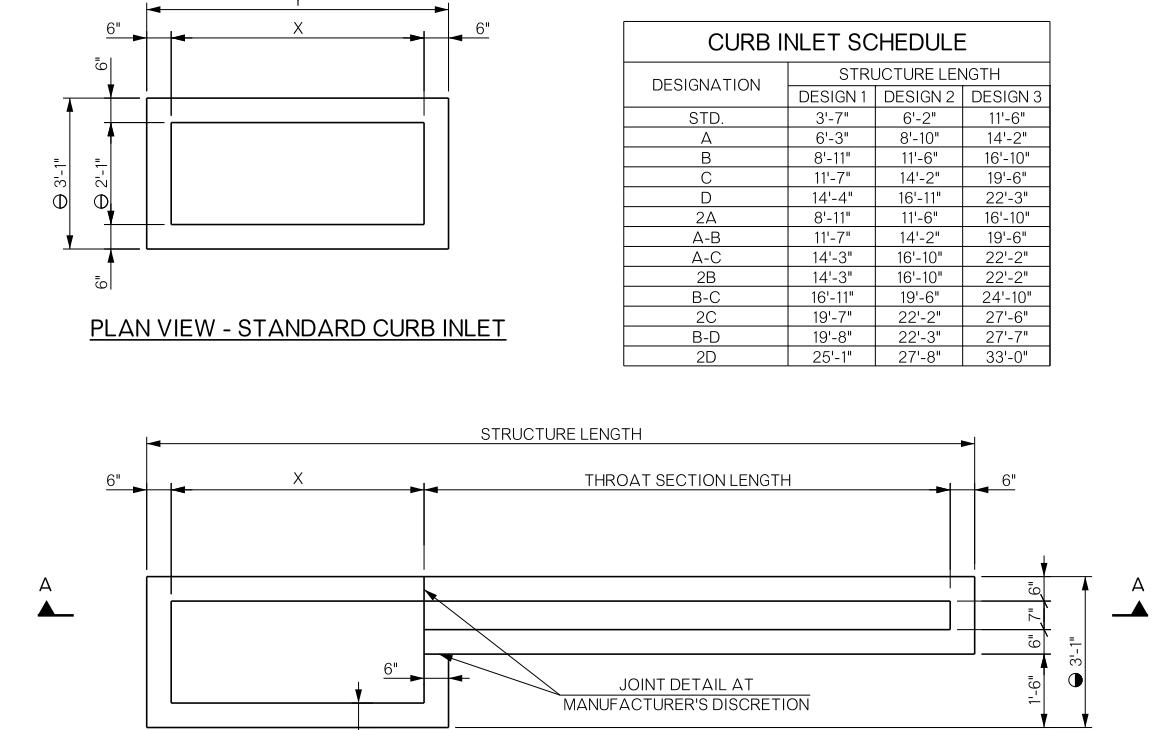
ROADWAY DESIGN DIVISION STANDARD

PRECAST CURB INLET
(DESIGNS 1, 2 AND 3)

2019 SPECIFICATIONS

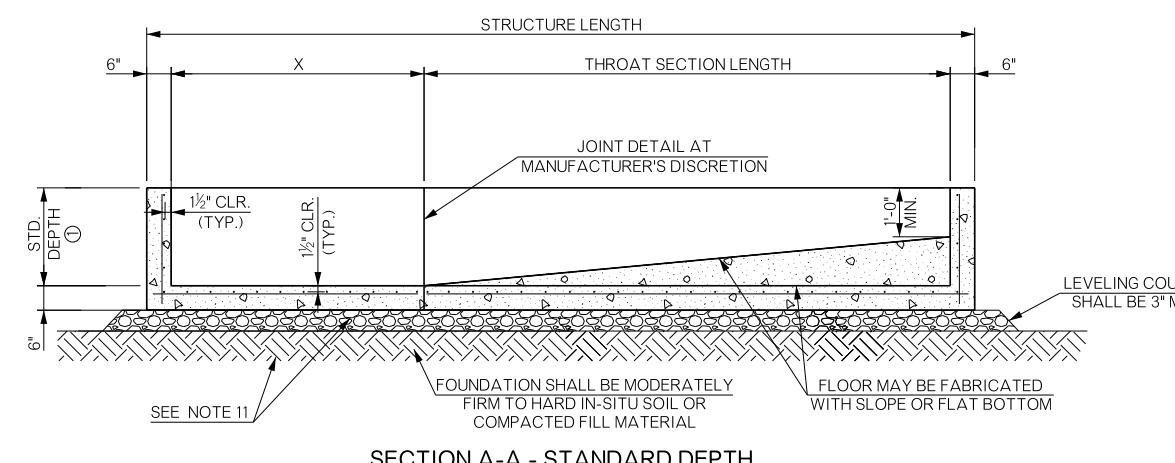
PCI-1

2

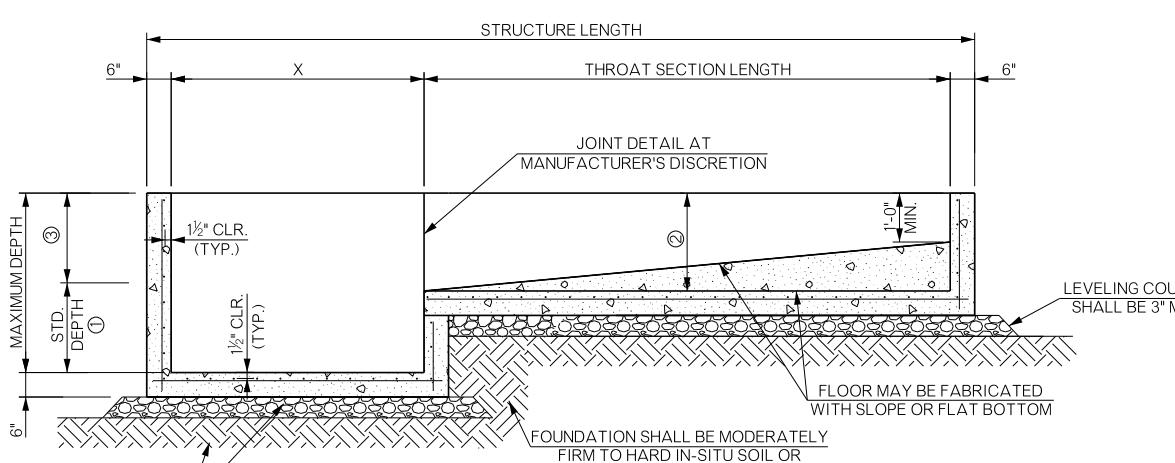


PLAN VIEW - CURB INLET WITH ADDITIONAL OPENINGS

NOTE: THROAT SECTION MAY ENTER EITHER OR BOTH SIDES OF CURB INLET.



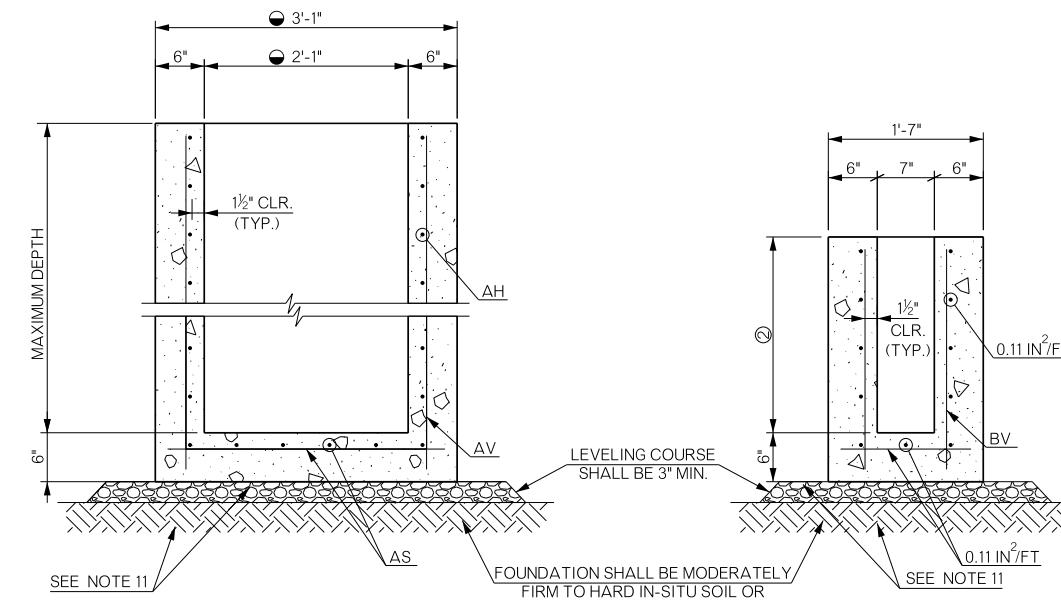
CROSS-SECTIONAL VIEW - CURB INLET



SECTION A-A - NON-STANDARD DEPTH

③ ADDITIONAL CURB INLET DEPTH PER VERTICAL FOOT

① STANDARD DEPTH
2'-9" FOR 18" DIA. PIPE
3'-4" FOR 24" DIA. PIPE
4'-0" FOR 30" DIA. PIPE
4'-6" FOR 36" DIA. PIPE



CROSS-SECTIONAL VIEW - THROAT

② STANDARD DEPTH SHALL BE AS SHOWN IN STANDARD DEPTH TABLE ABOVE. NON-STD. DEPTH SHALL BE A MINIMUM OF 2'-0" AND A MAXIMUM OF 5'-0"

INLET DESIGN	X	Y	CURB INLET							THROAT		
			AH BARS (IN ² /FT)							BV BARS (IN ² /FT)	AS BARS (IN ² /FT)	AV BARS (IN ² /FT)
			DEPTH									
1	2'-7"	3'-7"	0.11	0.11	0.11	0.11	0.11	0.11	0.20	0.11		
2	5'-2"	6'-2"	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.18	0.11	0.11
3	10'-6"	11'-6"	0.20	0.25	0.29	0.33	0.37	0.41	0.46	0.50	0.13	0.17

DIMENSIONS SHOWN ARE THE MAXIMUM DIMENSIONS ALLOWED. INLET DIMENSIONS LESS THAN THOSE SHOWN ARE ACCEPTABLE FOR THE APPLICABLE INLET DESIGN NUMBER PROVIDED THE DIMENSIONS MEET GEOMETRIC REQUIREMENTS OF THE FRAMES, GRATES AND HOODS.

REINFORCING STEEL VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE VALUES LARGER THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

DESIGN DATA

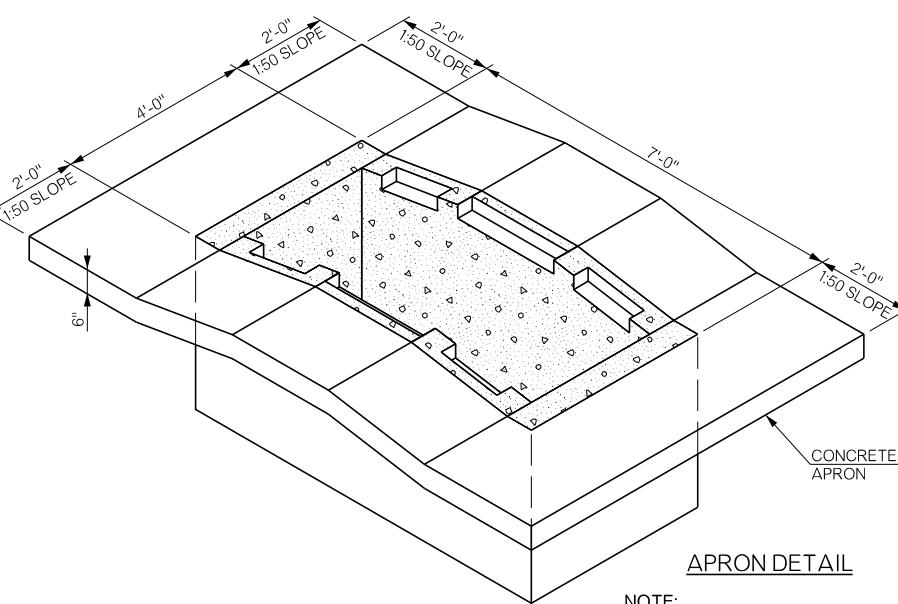
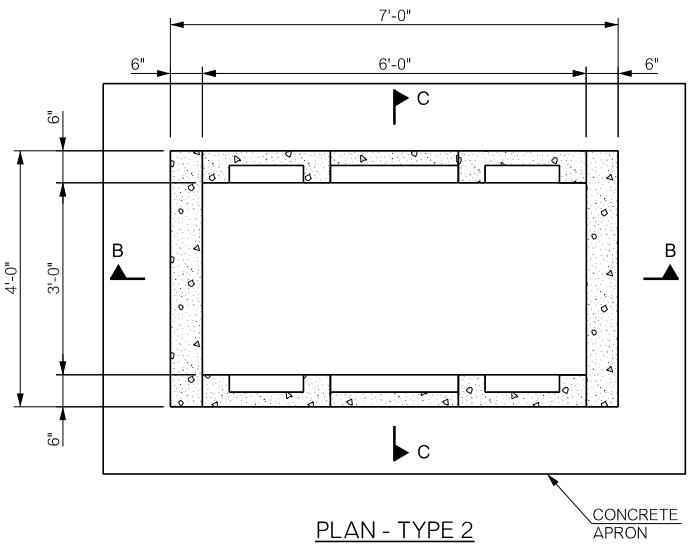
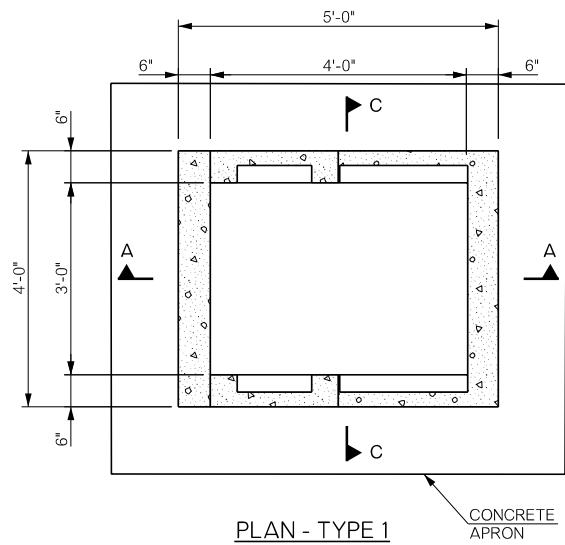
MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

LOADING:
f'c = 4 KSI
fy = 60 KSI
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

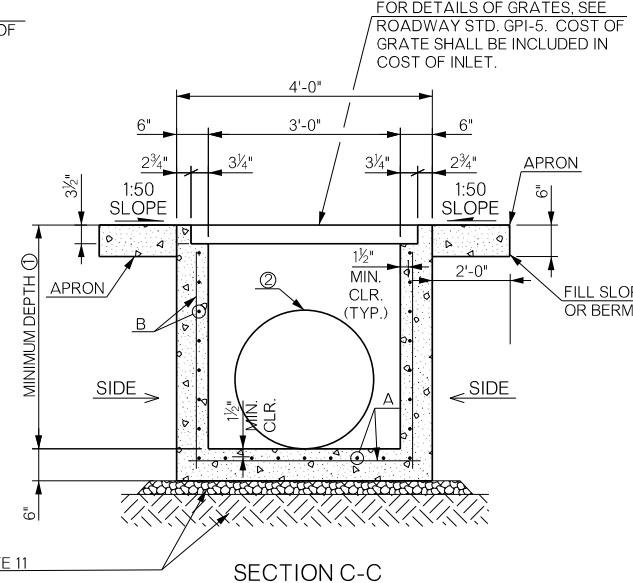
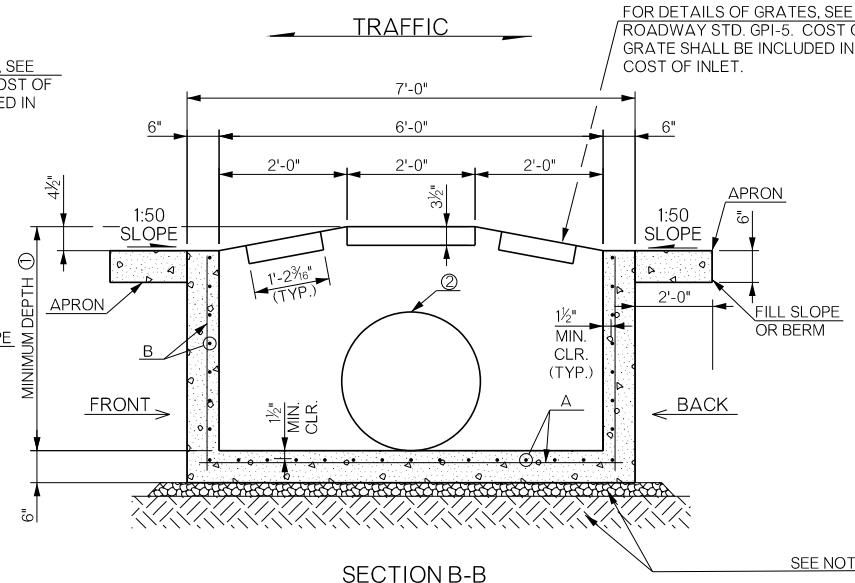
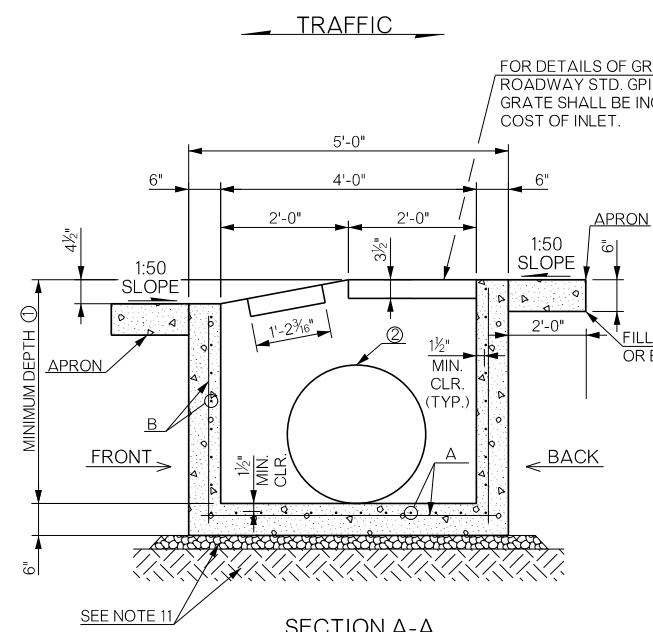
GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF GRATES SEE ROADWAY STANDARDS GPI-5. COST OF GRATES SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF 1½ INCHES TO REINFORCING STEEL.
- IF THE MANUFACTURER ELECTS TO USE WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER, THE WALLS OR SLABS WILL REQUIRE A SECONDARY LAYER OF REINFORCING STEEL EQUAL TO 0.11 IN²/FT EACH WAY IN THE SECONDARY LAYER.
- BLOCKOUTS IN WALLS MAY BE FORMED FOR GRATE SUPPORT.
- MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
- DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCHES THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES CENTER TO CENTER.
- THE CONCRETE APRON SHALL BE CONSTRUCTED WITH CLASS C CONCRETE AND 6X6 W6.5XW6.5 WIRE MESH. COST OF APRON SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.



NOTE:
TYPE 2 INLET SHOWN, TYPE 1 SIMILAR.

REINFORCING STEEL VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE VALUES LARGER THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.



SEE NOTE 11

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL								
PIPE AT FRONT OR BACK	PIPE AT SIDES	DESIGN NO.	PIPE SIZE	MINIMUM DEPTH ①	A BARS (IN ² /FT)		B BARS (IN ² /FT)	
					TYPE 1	TYPE 2	TYPE 1	TYPE 2
TYPE 1	PIPE AT FRONT OR BACK	1	18"	3'-6"	0.20	0.20	0.12	0.12
		2	24"	3'-6"	0.20	0.20	0.12	0.12
		3	30"	4'-0"	0.20	0.20	0.12	0.12
		4	36"	5'-0"	0.20	0.20	0.12	0.12
		5	18"	3'-6"	0.20	0.20	0.12	0.12
		6	24"	3'-6"	0.20	0.20	0.12	0.12
		7	18"	3'-6"	0.20	0.20	0.12	0.12
		8	24"	3'-6"	0.20	0.20	0.12	0.12
		9	30"	4'-0"	0.20	0.20	0.12	0.12
		10	36"	5'-0"	0.20	0.20	0.12	0.12
		11	18"	3'-6"	0.20	0.20	0.12	0.12
		12	24"	3'-6"	0.20	0.20	0.12	0.12

① FOR INLET DEPTH GREATER THAN THE MINIMUM DEPTH LISTED, PAY ITEM FOR ADDITIONAL DEPTH IN PRECAST INLET (GPI TYPE X DES. X) PAID AS VERTICAL FEET SHALL BE USED. AS AN EXAMPLE, A TYPE 2, DES. 8 WILL BE USED WITH A NEEDED DEPTH OF 4'-2". THE DIFFERENCE BETWEEN THIS HEIGHT AND THE MINIMUM DEPTH IS 8 INCHES. THE ADDITIONAL DEPTH IS USED WITH A QUANTITY OF 0.67 VF. SPECIFIC ADDITIONAL DEPTH DATA FOR EACH STRUCTURE SHALL BE SHOWN ON THE PLANS.

② ONLY 18" AND 24" PIPES MAY ENTER AT THE FRONT OR BACK. ALL PIPES MAY ENTER AT THE SIDES. PIPE SHAPES MAY BE ROUND, ARCH OR HORIZONTAL ELLIPTICAL.

③ MAXIMUM DEPTH IS 6 FEET, USING STEEL AREAS SHOWN IN TABLE. IF THE INLET IS GREATER THAN 6 FEET DEEP, IT SHALL BE MADE WITH SPECIAL DESIGN.

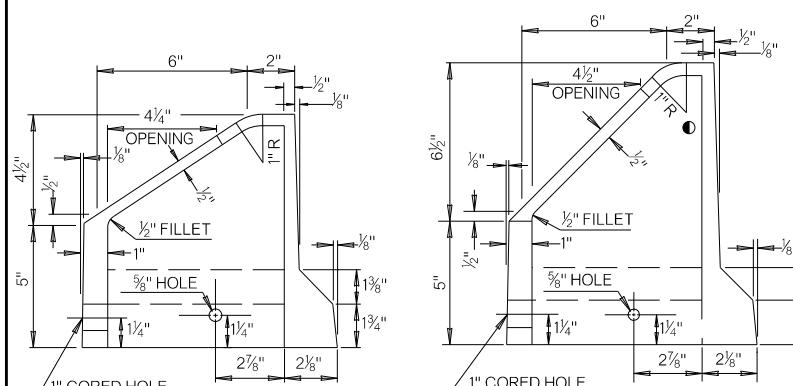
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET (GPI TYPE 1 DES. 1)	EA
611(G)	PRECAST INLET (GPI TYPE 1 DES. 2)	EA
611(G)	PRECAST INLET (GPI TYPE 1 DES. 3)	EA
611(G)	PRECAST INLET (GPI TYPE 1 DES. 4)	EA
611(G)	PRECAST INLET (GPI TYPE 1 DES. 5)	EA
611(G)	PRECAST INLET (GPI TYPE 1 DES. 6)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 7)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 8)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 9)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 10)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 11)	EA
611(G)	PRECAST INLET (GPI TYPE 2 DES. 12)	EA
611(H)	ADD'L DEPTH IN PRECAST INLET (GPI TYPE 1 DES. ▲)	VF
611(H)	ADD'L DEPTH IN PRECAST INLET (GPI TYPE 2 DES. ▲)	VF

▲ SPECIFY TYPE 1 INLET DESIGN NUMBER. SEE CHART ON LEFT

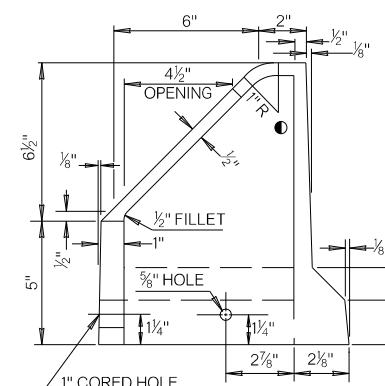
◆ SPECIFY TYPE 2 INLET DESIGN NUMBER. SEE CHART ON LEFT

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

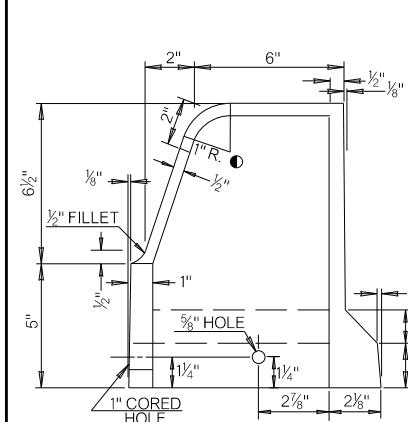
PRECAST GRATED PIPE DROP INLET
OKLAHOMA Transportation
2019 SPECIFICATIONS
PGPI 0
R-44



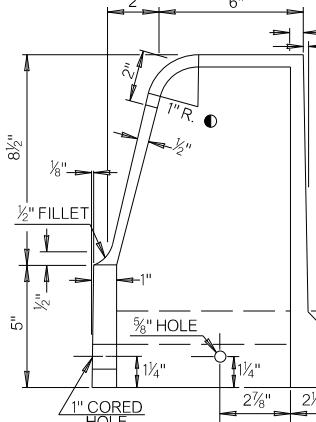
4" MOUNTABLE CURB HOOD



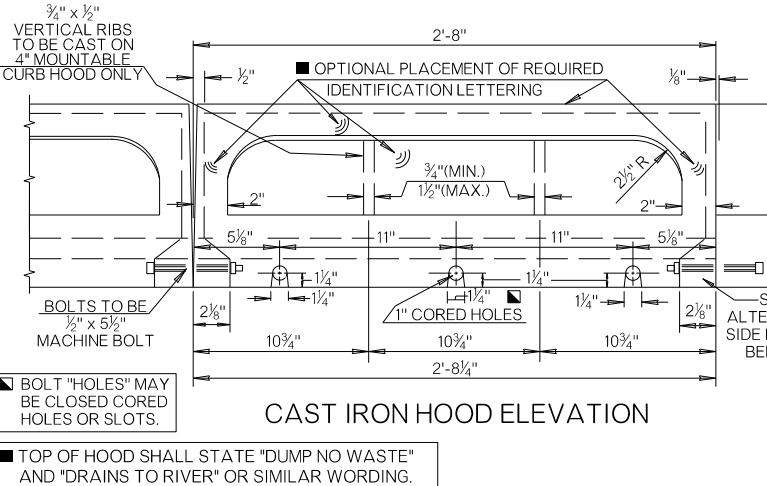
6" MOUNTABLE CURB HOOD



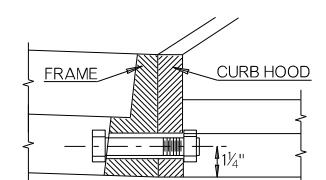
6" BARRIER CURB HOOD



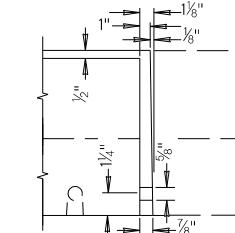
8" BARRIER CURB HOOD



CAST IRON HOOD ELEVATION

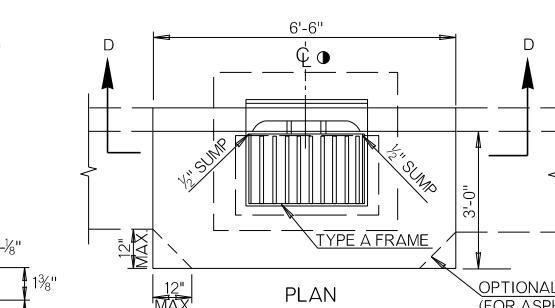


DETAIL OF CONNECTION
FRAME & CAST IRON HOOD

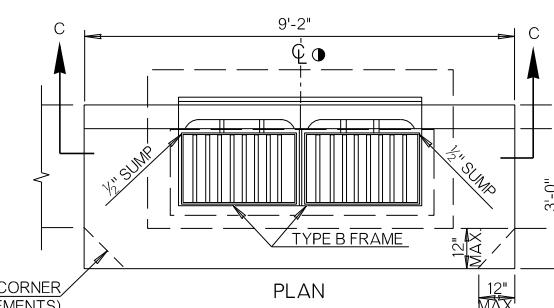


ALTERNATE SIDE DETAIL

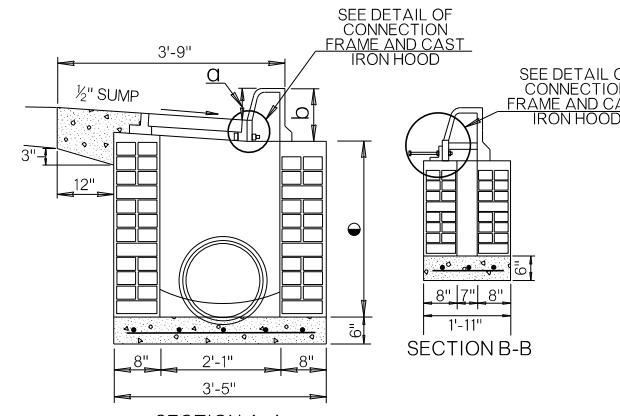
FRAME TO BE BOLTED TO THE HOOD WITH
3 EA. 3/8" x 4 1/2" MACHINE BOLTS. FOR FRAME
DETAILS, SEE ROADWAY STANDARD SSIF-5.



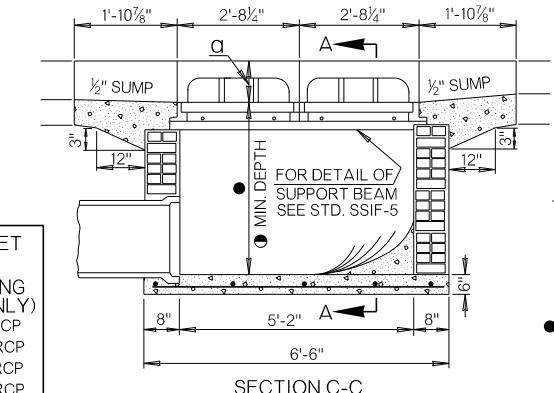
PLAN



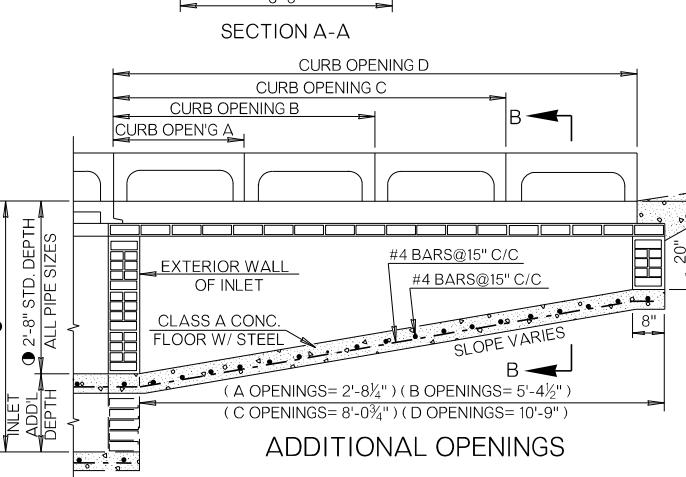
PLAN



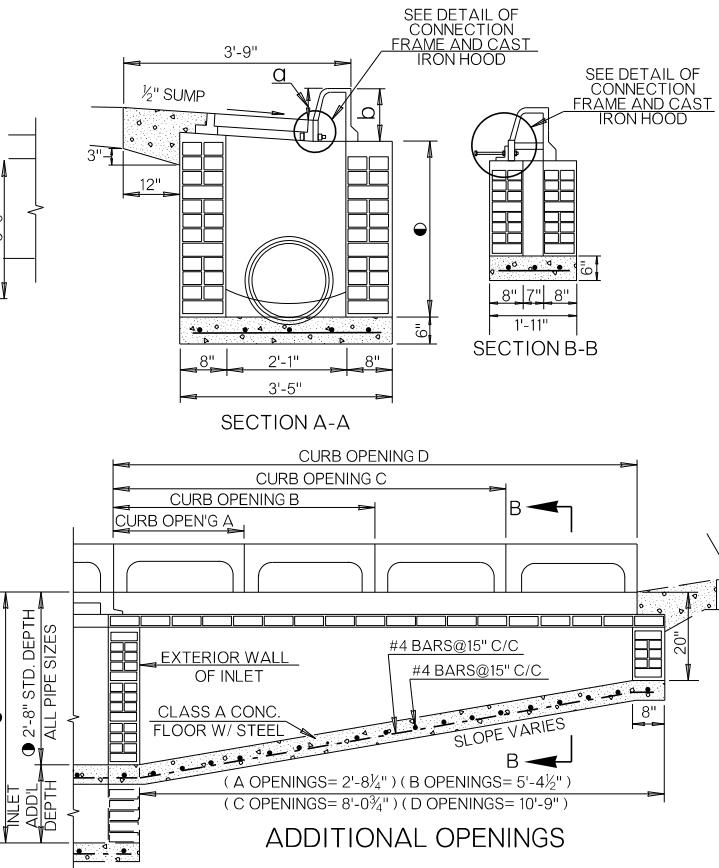
SECTION B-B



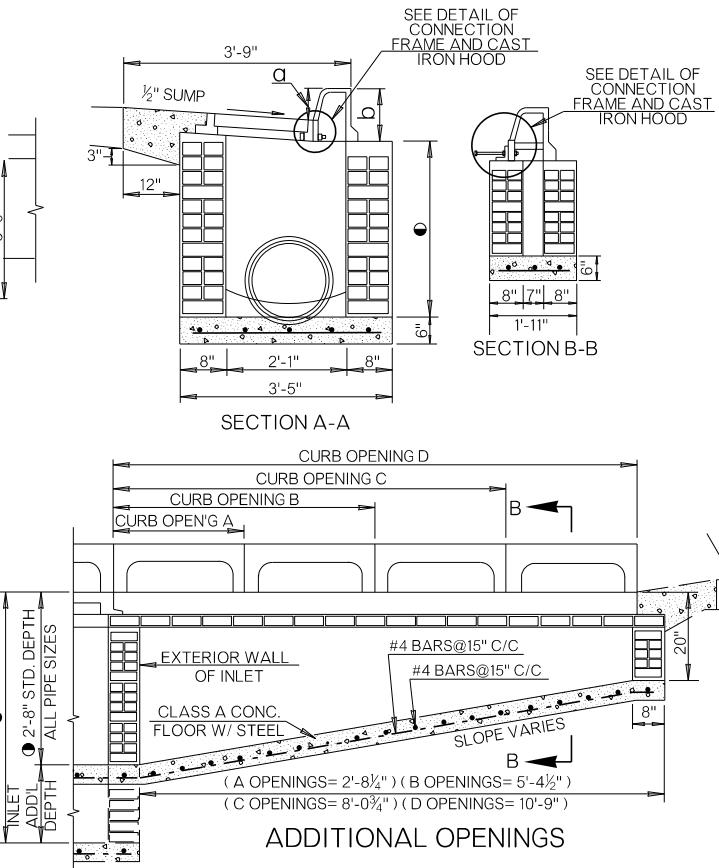
SECTION A-A
DESIGN 2 (DOUBLE GRATING)
DESIGN 3 (MULTIPLE DOUBLE GRATING)



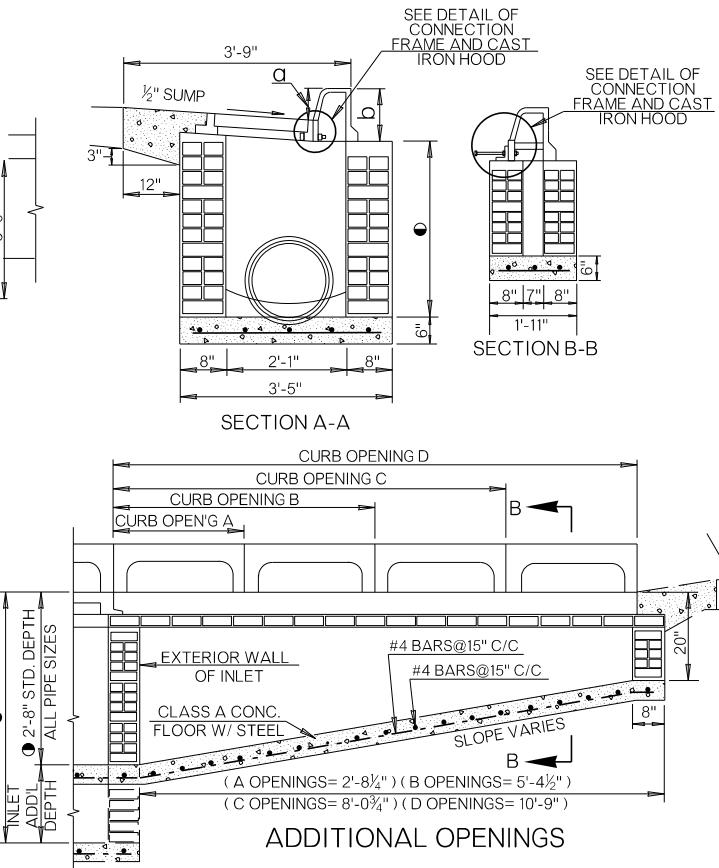
SECTION C-C



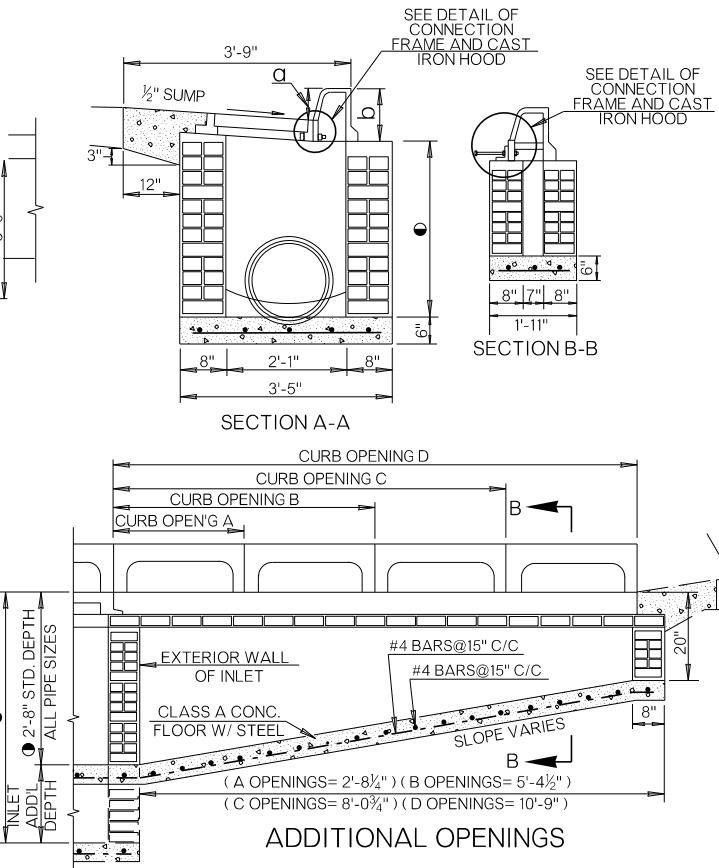
SECTION A-A



SECTION A-A



SECTION A-A



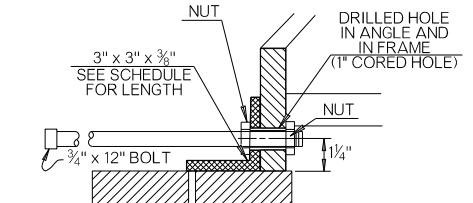
SECTION A-A

MINIMUM DEPTH MASONRY
OR PRECAST WALLS
2'-3" FOR 18" RCP
2'-9" FOR 24" RCP
3'-3" FOR 30" RCP
3'-9" FOR 36" RCP

DESIGN NO.	TYPE OF CURB	DIMENSIONS	
		a	b
1	4" MOUNTABLE	4 1/2"	9 1/2"
	6" MOUNTABLE	6 1/2"	11 1/2"
	6" BARRIER	6 1/2"	11 1/2"
	8" BARRIER	8 1/2"	13 1/2"
2	4" MOUNTABLE	4 1/2"	9 1/2"
	6" MOUNTABLE	6 1/2"	11 1/2"
	6" BARRIER	6 1/2"	11 1/2"
	8" BARRIER	8 1/2"	13 1/2"
3	4" MOUNTABLE	4 1/2"	9 1/2"
	6" MOUNTABLE	6 1/2"	11 1/2"
	6" BARRIER	6 1/2"	11 1/2"
	8" BARRIER	8 1/2"	13 1/2"

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ROADWAY STANDARD SSIF-5 FRAMES AND STANDARD CIG-4 GRATES SHALL BE USED WITH THESE INLETS UNLESS OTHERWISE SPECIFIED. COST OF THE FRAMES, GRATES AND HOODS SHALL BE INCLUDED IN THE COST OF THE CURB INLET.
3. WHEN THE INLET IS BUILT IN NEW CONCRETE PAVEMENT, THE APRON AROUND THE INLET MAY BE BUILT INTEGRAL WITH PAVEMENT OR MAY BE SEPARATE AND OF THE SIZE AS SHOWN. THE THICKNESS SHALL BE THE SAME AS THE CONCRETE PAVEMENT OR CURB AND GUTTER. IF CONSTRUCTED IN ANY OTHER AREA OR IN EXISTING PAVEMENT, THE APRON AROUND THE INLET SHALL BE THE SIZE AS SHOWN AND BUILT OF P.C. CONCRETE TO A MINIMUM 8 INCH THICKNESS.
4. THERE WILL BE NO DEDUCTION OF PAYMENT FOR CONCRETE CURB AND GUTTER OR P.C. CONCRETE THROUGH THE EXTENTS OF THE INLET HOODS. DEDUCTION WILL BE MADE FOR THE PAYMENT OF INTEGRAL CURB THROUGH THE EXTENTS OF THE INLET HOODS.
5. ALL LETTERING TO BE RECESSED 1/8 INCH AND SHALL NOT EXCEED ONE INCH IN HEIGHT. INFORMATION REQUIRED SHALL BE AS STATED IN THE SPECIFICATIONS. LOCATION OF LETTERING TO BE AS SHOWN, WITH ADDITIONAL IDENTIFICATION LETTERING AT OTHER LOCATIONS PERMITTED.
6. CAST-IN-PLACE CONCRETE WALLS MEETING MIX REQUIREMENTS OF CLASS A CONCRETE MAY BE BUILT IN LIEU OF THE BRICK MASONRY TO THE SAME DIMENSIONS AS SHOWN. NO. 4 REINFORCING STEEL BARS SPACED 30 INCHES VERTICALLY AND 12 INCHES HORIZONTALLY WILL BE REQUIRED FOR ALL CAST-IN-PLACE INLET WALLS EXCEEDING 5 FEET IN DEPTH (GUTTER ELEVATION TO THE FLOWLINE ELEVATION). COST OF STEEL REINFORCING TO BE INCLUDED IN THE COST OF THE CURB INLET.
7. ALL CAST-IN-PLACE CLASS A CONCRETE INLET FLOORS SHALL HAVE NO. 4 REINFORCING STEEL PLACED AT 16 INCH MAXIMUM C/C SPACING IN BOTH DIRECTIONS.
8. THE STANDARD DRAWING, DESIGN NUMBER, DESIGNATION NUMBER, AND NUMBER OF ADDITIONAL OPENINGS SHALL BE INDICATED ON THE PLANS: I.E. ROADWAY STANDARD CI-2, DES. 1 (A-B).
9. TYPE B AND C FRAMES TO BE USED FOR MULTIPLE DOUBLE GRATES. SEE ROADWAY STANDARD SSIF-5 FOR DETAILS.
10. BOLT(S) WITH EXPANSION DEVICES OR EPOXY-TYPE PUTTY TO BE USED TO INSTALL CAST IRON HOODS INTO CONCRETE CURB. COST OF INSTALLATION TO BE INCLUDED IN PRICE BID FOR THE CURB INLET.
11. CASTINGS AS SHOWN HERE SHALL BE CAST STEEL, DUCTILE IRON OR GRAY IRON CONFORMING TO SECTION 725 OF THE ODOT SPECIFICATIONS.
12. TWO INCH RADIUS MAY BE USED IF APPROVED BY THE ENGINEER.
13. CONSTRUCTION STATIONING OF THE CURB INLETS IS DETERMINED BY THE CENTERLINE (C) OF THE SURFACE GRATES.



DETAIL OF CONNECTION
ANGLE IRON & CAST IRON HOOD

NOTE: ANGLE IRON TO BE BOLTED TO HOOD
WITH 3 EACH - 3 1/4" x 12" MACHINE BOLTS
IN EACH HOOD SECTION.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (G)	INLET (CI DES. ▲)	EA
611 (H)	ADDITIONAL DEPTH IN INLET (CI DES. ▼)	VF
611 (I)	REPLACEMENT OF INLET FRAME AND GRATE ▲	EA
611 (J)	REPLACEMENT OF INLET FRAME	EA
611 (K)	REPLACEMENT OF INLET GRATE	EA
611 (M)	REPLACEMENT OF CAST IRON HOOD	EA

▲ SPECIFY INLET DESIGN & CURB OPENING DESIGNATION.

▼ SPECIFY INLET DESIGN 1, 2 OR 3.

▲ TYPE OF FRAME AND TYPE OF GRATE SHALL BE SPECIFIED.

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE CURB INLETS



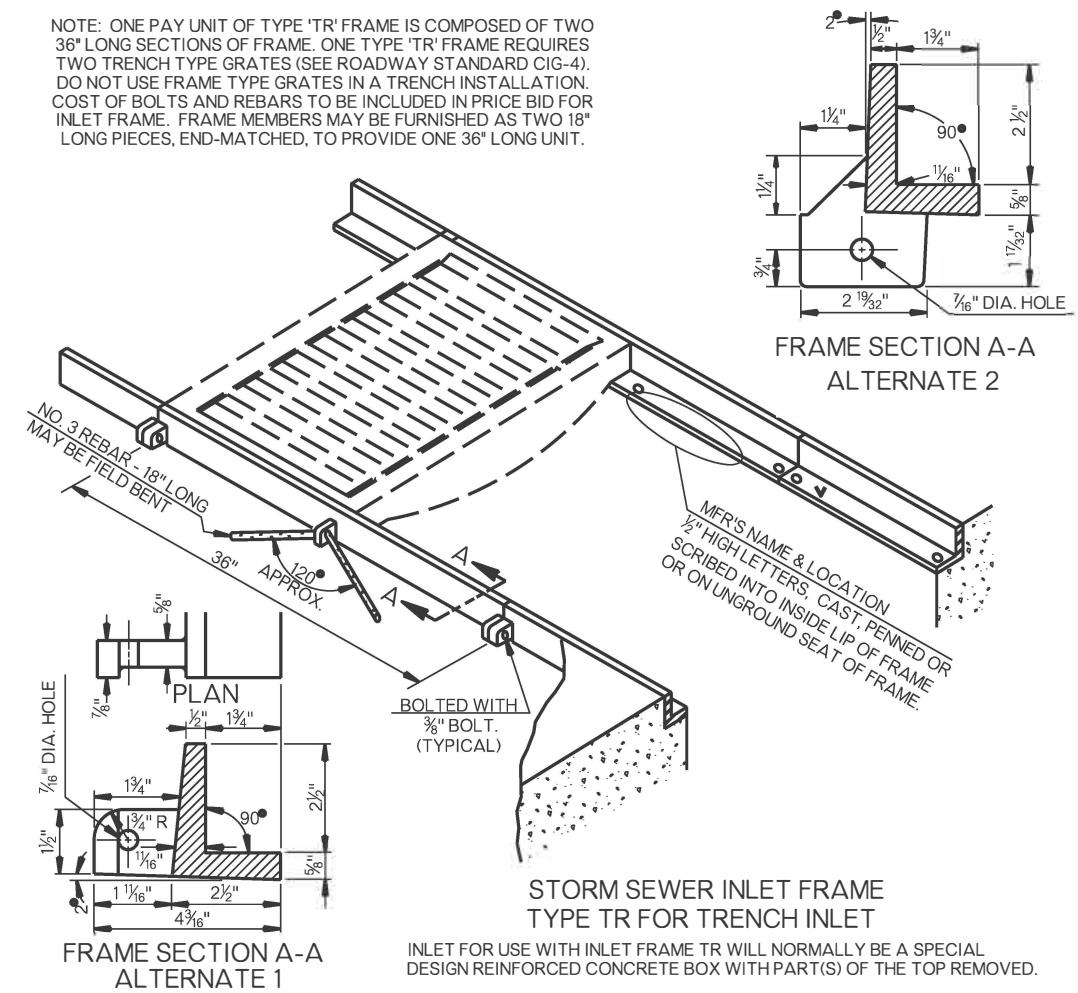
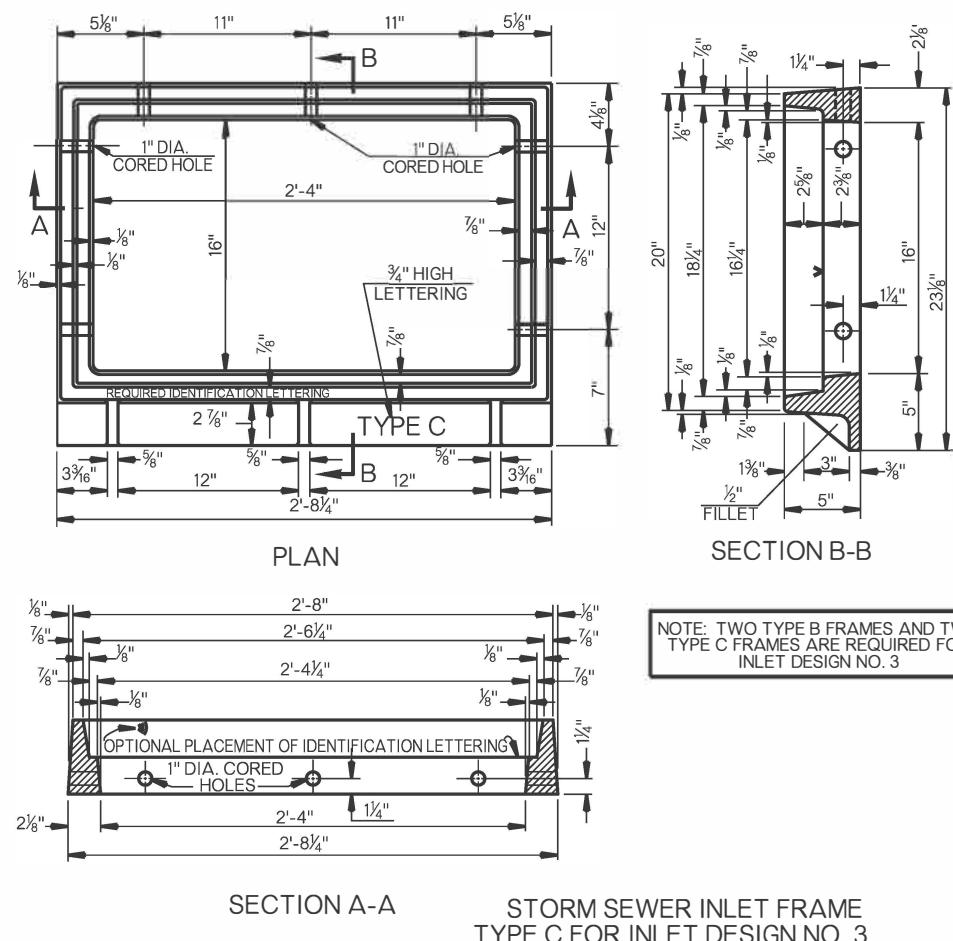
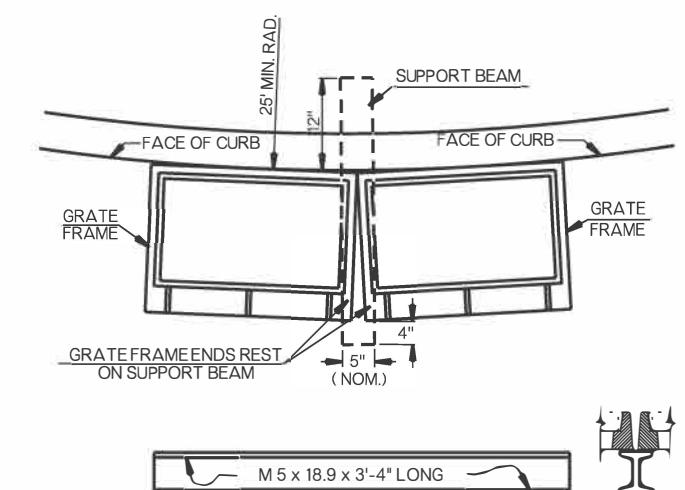
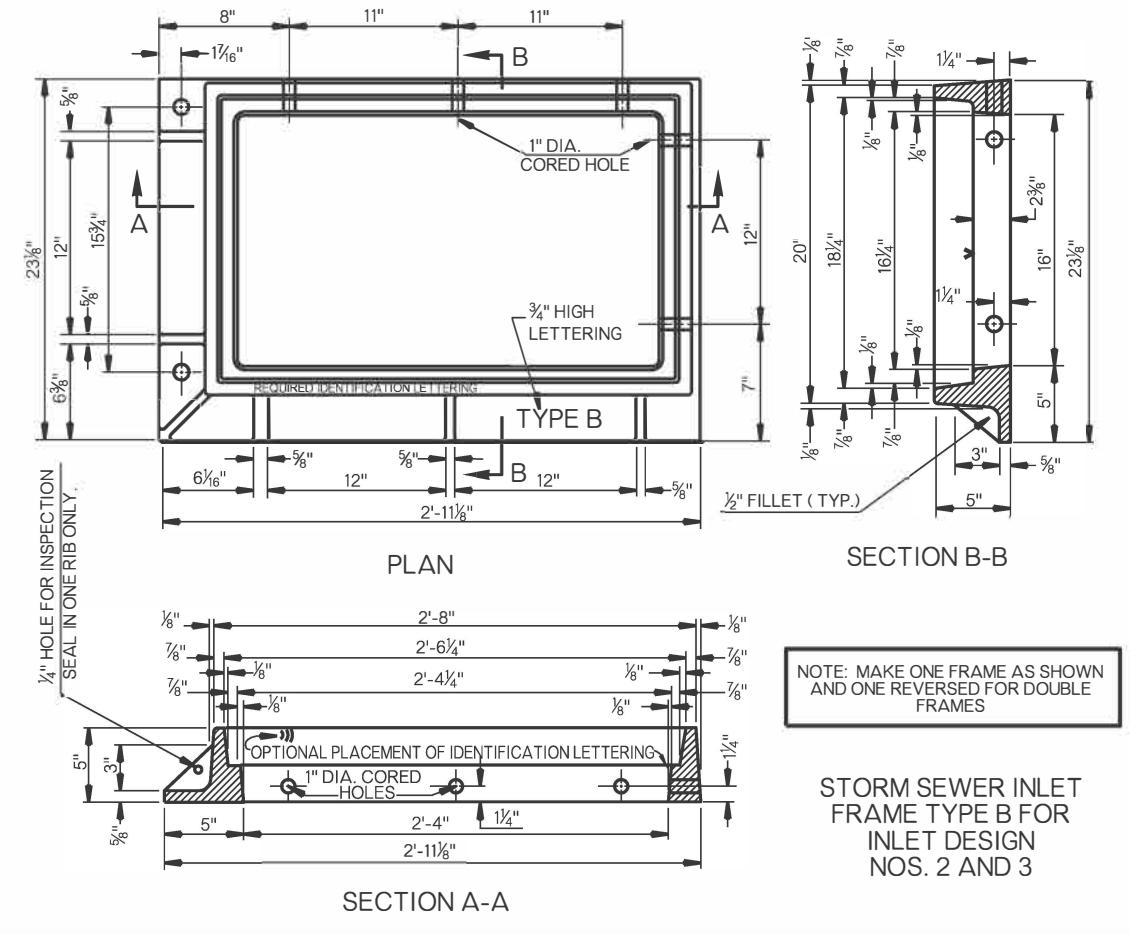
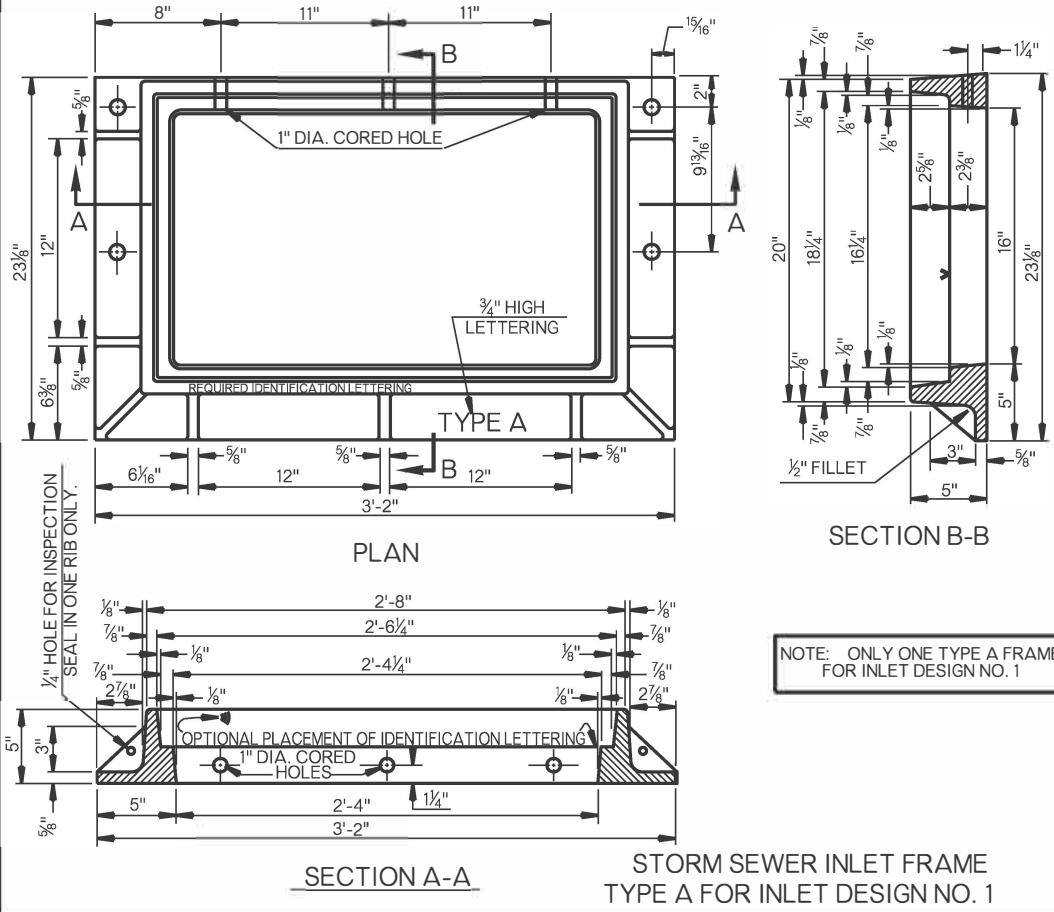
2019 SPECIFICATIONS

CI-2

3

R-45

SPECIAL DESIGN CASTINGS, HOODS, FRAMES OR GRATES MAY BE USED, IN LIEU OF STANDARD DESIGNS SHOWN ON THIS SHEET, IF APPROVED BY THE ENGINEER.



GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. INLET DESIGN NO. 1 REQUIRES ONE TYPE 'A' FRAME.
3. INLET DESIGN NO. 2 REQUIRES TWO TYPE 'B' FRAMES AND 2 EA.-3/4" x 5" BOLTS WITH NUTS AND ONE S 4 x 7.7 x 3'-4" LONG SUPPORT BEAM. IF BUILT ON CURVED CURB, THE INLET REQUIRES 1 EA. 3/4" x 5" BOLT WITH NUT AND 1 EA. 3/4" x 6 1/2" BOLT WITH NUT AND ONE M 5 x 18.9 x 3'-4" LONG SUPPORT BEAM .
4. INLET DESIGN NO. 3 REQUIRES THE SAME APPURTENANCES AS DESIGN NO. 2 WITH TWO OR MORE TYPE 'C' FRAMES LOCATED BETWEEN THE TWO TYPE 'B' FRAMES AND ONE ADDITIONAL SUPPORT BEAM AND A PAIR OF BOLTS WITH NUTS FOR EACH ADDED TYPE 'C' FRAME, PLUS ONE ADDITIONAL PAIR OF BOLTS AND SUPPORT BEAM.
5. ALL LETTERING TO BE RECESSED 1/16" AND SHALL NOT EXCEED 1" IN HEIGHT. INFORMATION REQUIRED SHALL BE STATED IN THE SPECIFICATIONS. LOCATION OF LETTERING TO BE AS SHOWN WITH ADDITIONAL IDENTIFICATION LETTERING AT OTHER LOCATIONS ACCEPTABLE.
6. FRAMES SHALL BE CAST STEEL, DUCTILE IRON, OR GRAY IRON CONFORMING TO SECTION 725 OF THE SPECIFICATIONS.
7. INLET FRAMES AND GRATES INSTALLED DURING ORIGINAL CONSTRUCTION SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE OF THE ORIGINAL INLET.

NOTE: MACHINING (SYMBOL \blacktriangle) MAY BE ACCOMPLISHED BY MILLING OR BY LEVEL GRINDING.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(I)	REPLACEMENT OF INLET FRAME AND GRATE (<input checked="" type="checkbox"/>)	EA
611(J)	REPLACEMENT OF INLET FRAME (<input type="checkbox"/>)	EA

■ TYPE OF FRAME AND TYPE OF GLAZING SHALL BE SPECIFIED.

TYPE A, B, OR C FRAMES AS SHOWN HERE WITH GRATES FROM STANDARD CIG-4 (TYPE VG-F OR RVG-F) COMprise THE PAY ITEM. SEE NOTE THIS IS NOT FOR PAYMENT.

APPROVED BY L. K. DAW DATE: 6/
ROADWAY ENGINEER: ROADWAY DESIGN DIVISION STANDARD

~~ER.~~ _____ DATE. _____
ROADWAY DESIGN DIVISION STANDARD

STORM SEWER INLET FRAMES (QUIPP INLETS)

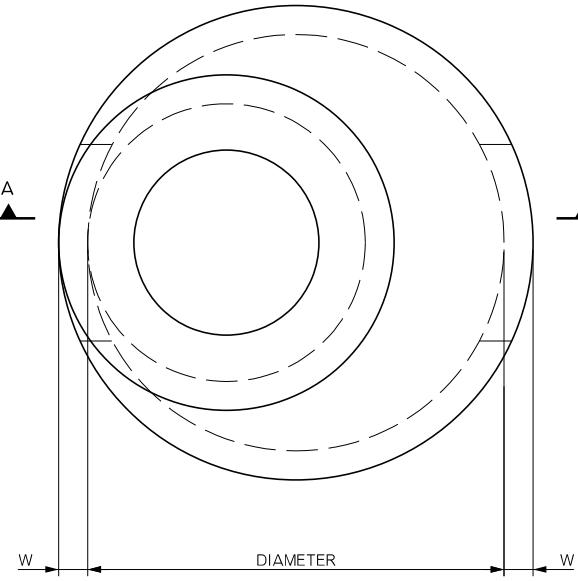
DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

$f'c = 4 \text{ KSI}$
 $fy = 60 \text{ KSI}$

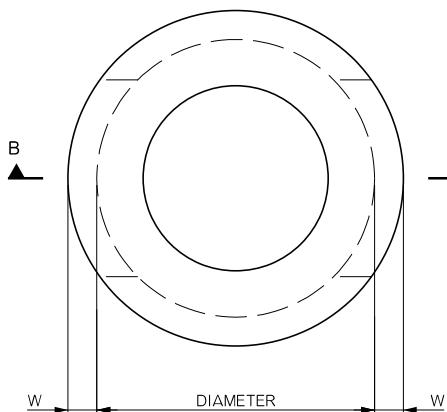
LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, LATEST EDITION
ASTM C478
ASTM C890
ASTM C913



▼ PLAN VIEW - ROUND REDUCED RISER

ROUND MANHOLE, TYPE I

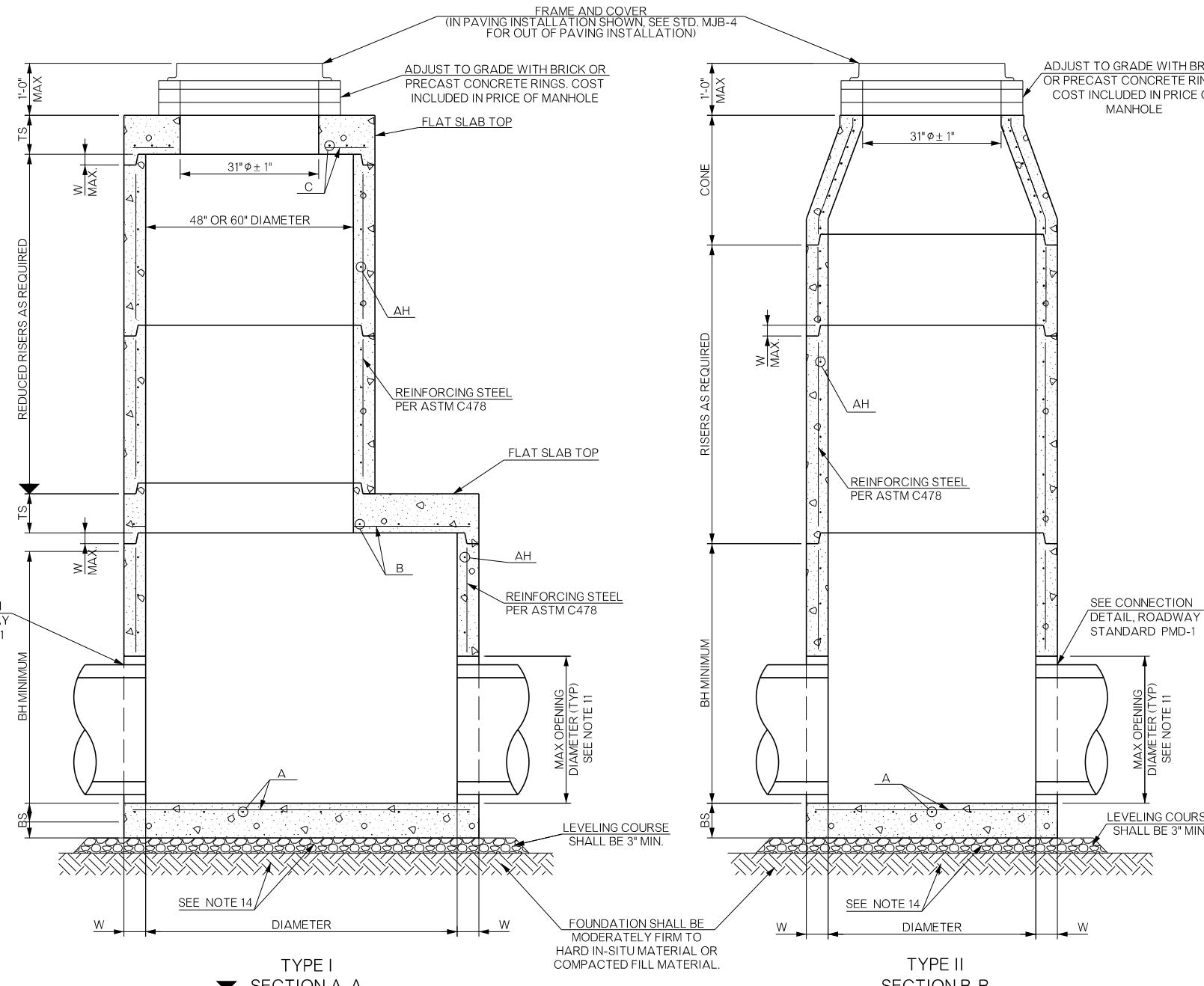


PLAN VIEW - ROUND RISER

ROUND MANHOLE, TYPE II

▼ TO INCLUDE A REDUCED RISER, DEPTH OF MANHOLE
MUST BE A MINIMUM OF 52 INCHES.

DEPTH OF UP TO, AND INCLUDING, 6' SHALL
BE INCLUDED IN PRICE BID PER MANHOLE. ANY DEPTH
ABOVE 6' TO A MAXIMUM DEPTH OF 25',
SHALL BE PAID FOR AS 'ADDITIONAL DEPTH.'



SCHEDULE OF DIMENSIONS AND REINFORCING STEEL

DIAMETER	DEPTH ≤ 25 FT.							
	BH	BS	TS	W	A	B	C	AH
48"	12"	6"	6"	5"	0.27 IN ² /FT	-	0.28 IN ² /FT	0.12 IN ² /FT
60"	36"	8"	8"	6"	0.27 IN ² /FT	0.41 IN ² /FT	0.30 IN ² /FT	0.15 IN ² /FT
72"	36"	8"	8"	7"	0.35 IN ² /FT	0.48 IN ² /FT	0.41 IN ² /FT	0.18 IN ² /FT

VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL"
ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE LARGER VALUES
THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

THE DETAILS SHOWN ON THIS SHEET ARE FOR STORM SEWER APPLICATIONS
ONLY AND ARE NOT INTENDED FOR SANITARY SEWER APPLICATIONS.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FOR DETAILS OF FRAME AND COVER, SEE THE CURRENT VERSION OF ROADWAY STANDARD MFC-5. PRICE BID OF MANHOLE SHALL INCLUDE PAYMENT FOR THESE ITEMS AND ALL OTHER ITEMS AND LABOR NECESSARY TO COMPLETE THE INSTALLATION. PRICE BID OF ADDITIONAL DEPTH SHALL INCLUDE PAYMENT FOR ALL MATERIAL AND LABOR, PERTAINING ONLY TO THE ADDITIONAL DEPTH, NECESSARY TO COMPLETE ITS INSTALLATION.
3. SQUARE MANHOLES MAY BE SUBSTITUTED PER THE MANUFACTURER'S RECOMMENDATION. SEE THE CURRENT VERSION OF ROADWAY STANDARD PSM-1 FOR MATERIAL AND INSTALLATION DETAILS.
4. PIPE OPENINGS SHALL NOT BE LOCATED IN A CONE SECTION.
5. THERE SHALL BE A MINIMUM DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY JOINT.
6. PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064. PROVIDE CIRCUMFERENTIAL REINFORCING STEEL IN VERTICAL WALLS OF BASE, RISER, AND CONE IN ACCORDANCE WITH ASTM C478.
8. PROVIDE A MINIMUM CLEAR COVER OF 1½ INCHES TO REINFORCING STEEL.
9. WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 SQ. IN.²/FT EACH WAY IN THE SECONDARY LAYER.
10. DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON RISER SHOULders, CONICAL TOPs, AND FLAT SLABS. MINIMUM SPIGOT DEPTH IS ¾ INCHES.
11. MAXIMUM OPENING SHALL BE 4 INCHES LARGER THAN OUTSIDE PIPE DIAMETER. REFER TO THE MOST CURRENT VERSION OF ROADWAY DESIGN STANDARD PMD-1 FOR PIPE CONNECTION MATERIAL.
12. SEAL TONGUE AND GROOVE JOINTS WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. TONGUE AND GROOVE JOINTS MAY BE GROUTED NO MORE THAN 1 INCH BETWEEN EACH SECTIONS OR ½ THE JOINT DEPTH, WHICHEVER IS GREATER. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE MANHOLE.
13. DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
14. THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCHES THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE MANHOLE AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSES SHALL BE INCLUDED IN THE PRICE BID OF THE MANHOLE.
15. OPENINGS IN FLAT SLAB TOPS SHALL BE ADDITIONALLY REINFORCED WITH A MINIMUM OF 0.20 SQ. IN. OF REINFORCING STEEL AT 90 DEGREES.
16. REFER TO PROJECT PLAN SHEETS FOR NUMBER, LOCATION, AND SIZE OF PIPE.
17. FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 9 INCHES CENTER TO CENTER.
18. PRECAST CONCRETE GRADE RING WALL THICKNESS SHALL BE ½ OF INTERNAL DIAMETER OR 4 INCHES, WHICHEVER IS GREATER.
19. THE ENGINEER MAY SPECIFY THE USE OF STEPS OR LADDERS AND SHALL CONFORM TO ASTM C478.
20. THE ORIENTATION OF THE SPIGOT IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND IS AT THE DISCRETION OF THE MANUFACTURER.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(A)	PRECAST CONC RND 4' DIA MANHOLE	EACH
611(A)	PRECAST CONC RND 5' DIA MANHOLE	EACH
611(A)	PRECAST CONC RND 6' DIA MANHOLE	EACH
611(B)	ADD'L DEPTH PRECAST RND 4' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST RND 5' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST RND 6' MANHOLE	VF

APPROVED BY
ROADWAY ENGINEER: *RJ DWS* DATE: 1/8/2025
ROADWAY DESIGN DIVISION STANDARD

PRECAST ROUND MANHOLE



2019 SPECIFICATIONS

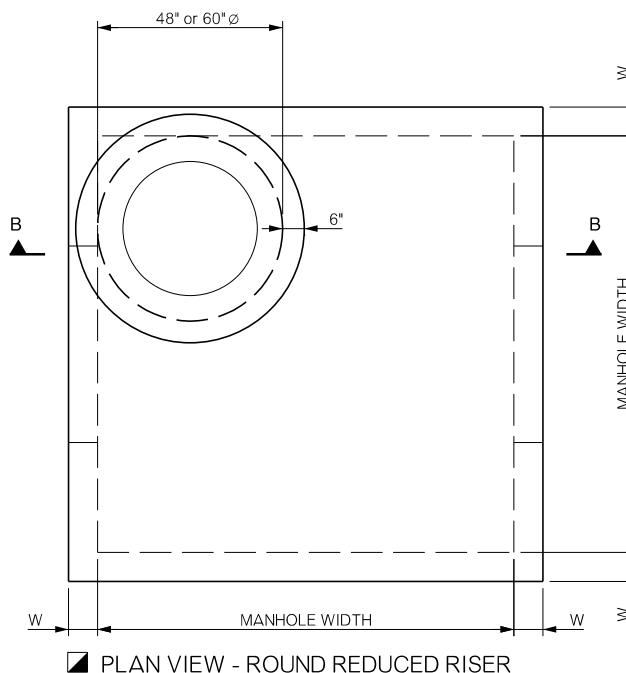
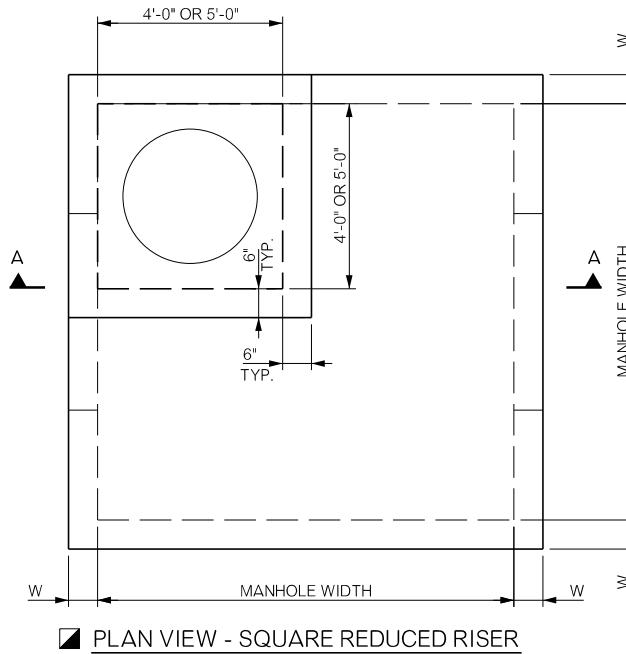
DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

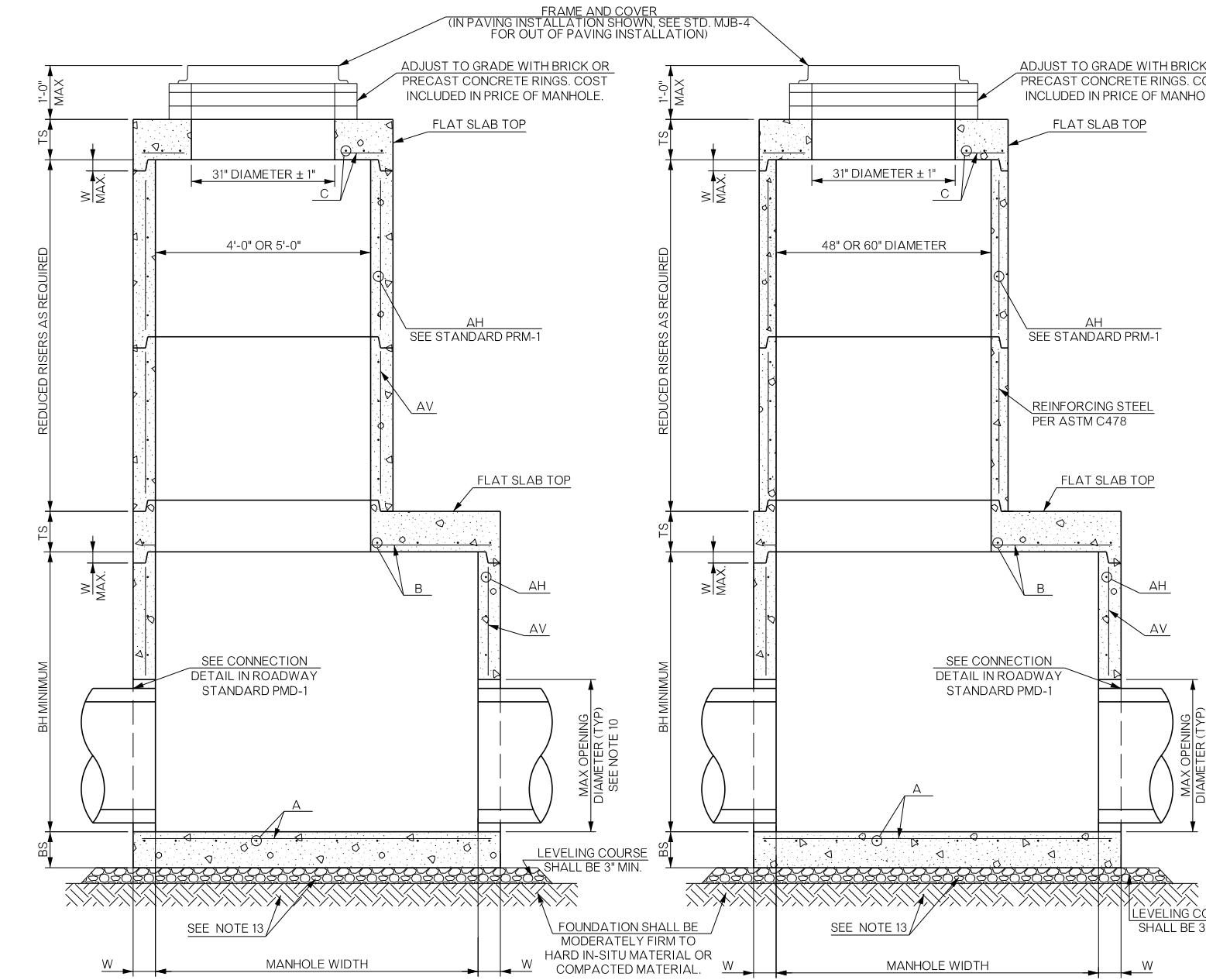
$f'c = 4$ KSI
 $fy = 60$ KSI

LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, LATEST EDITION
ASTM C890
ASTM C913



TO INCLUDE A REDUCED RISER, DEPTH OF MANHOLE
MUST BE A MINIMUM OF 52 INCHES.



MANHOLE WIDTH	DEPTH \leq 25 FT.								
	BH	BS	TS	W	A	B	C	AH	AV
48"	12"	6"	6"	6"	0.49 IN ² /FT	-	0.28 IN ² /FT	0.24 IN ² /FT	0.11 IN ² /FT
60"	36"	6"	8"	6"	0.63 IN ² /FT	0.41 IN ² /FT	0.30 IN ² /FT	0.36 IN ² /FT	0.11 IN ² /FT
72"	36"	6"	8"	8"	0.61 IN ² /FT	0.48 IN ² /FT	0.41 IN ² /FT	0.34 IN ² /FT	0.11 IN ² /FT

VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL"
ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE LARGER VALUES
THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

THE DETAILS SHOWN ON THIS SHEET ARE FOR STORM SEWER APPLICATIONS
ONLY AND ARE NOT INTENDED FOR SANITARY SEWER APPLICATIONS.

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF FRAME AND COVER, SEE CURRENT VERSION OF ROADWAY STANDARD MFC-5. PRICE BID OF MANHOLE SHALL INCLUDE PAYMENT FOR THESE ITEMS AND ALL OTHER ITEMS AND LABOR, NECESSARY TO COMPLETE THE INSTALLATION. PRICE BID OF ADDITIONAL DEPTH SHALL INCLUDE PAYMENT FOR ALL MATERIAL AND LABOR PERTAINING ONLY TO THE ADDITIONAL DEPTH, NECESSARY TO COMPLETE ITS INSTALLATION.
- PRECAST ROUND MANHOLES MAY BE SUBSTITUTED PER THE MANUFACTURER'S RECOMMENDATION. SEE ROADWAY STANDARD PRM-1 FOR DESIGN AND INSTALLATION DETAILS.
- THERE SHALL BE A MINIMUM DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY JOINT.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF 1 1/2 INCHES TO REINFORCING STEEL.
- WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 SQ. IN. / FT EACH WAY IN THE SECONDARY LAYER.
- DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON RISER SHOULDERS, CONICAL TOPS, AND FLAT SLABS. MINIMUM SPIGOT DEPTH IS 3/4 INCHES.
- MAXIMUM OPENING SHALL BE 4 INCHES LARGER THAN OUTSIDE PIPE DIAMETER. REFER TO ROADWAY DESIGN STANDARD PMD-1 FOR PIPE CONNECTION MATERIAL.
- SEAL TONGUE AND GROOVE JOINTS WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. TONGUE AND GROOVE JOINTS MAY BE GROUTED NO MORE THAN 1 INCH BETWEEN EACH SECTIONS OR 1/2 THE JOINT DEPTH, WHICHEVER IS GREATER. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE MANHOLE.
- DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCHES THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE MANHOLE AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSES SHALL BE INCLUDED IN THE PRICE BID OF THE MANHOLE.
- OPENINGS IN FLAT SLAB TOPS SHALL BE ADDITIONALLY REINFORCED WITH A MINIMUM OF 0.20 SQ. IN. OF STEEL AT 90 DEGREES.
- REFER TO PROJECT PLAN SHEETS FOR NUMBER, LOCATION, AND SIZE OF PIPE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 9 INCHES CENTER TO CENTER.
- SEE CURRENT VERSION OF ROADWAY STANDARD PRM-1 FOR DIMENSIONS AND REINFORCING REQUIREMENTS FOR PRECAST CONCRETE ROUND MANHOLES, WITH AND WITHOUT ROUND REDUCED RISER SECTIONS.
- THE ENGINEER MAY SPECIFY THE USE OF STEPS OR LADDERS AND SHALL CONFORM TO ASTM C478.
- THE ORIENTATION OF THE SPIGOT IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND IS AT THE DISCRETION OF THE MANUFACTURER.

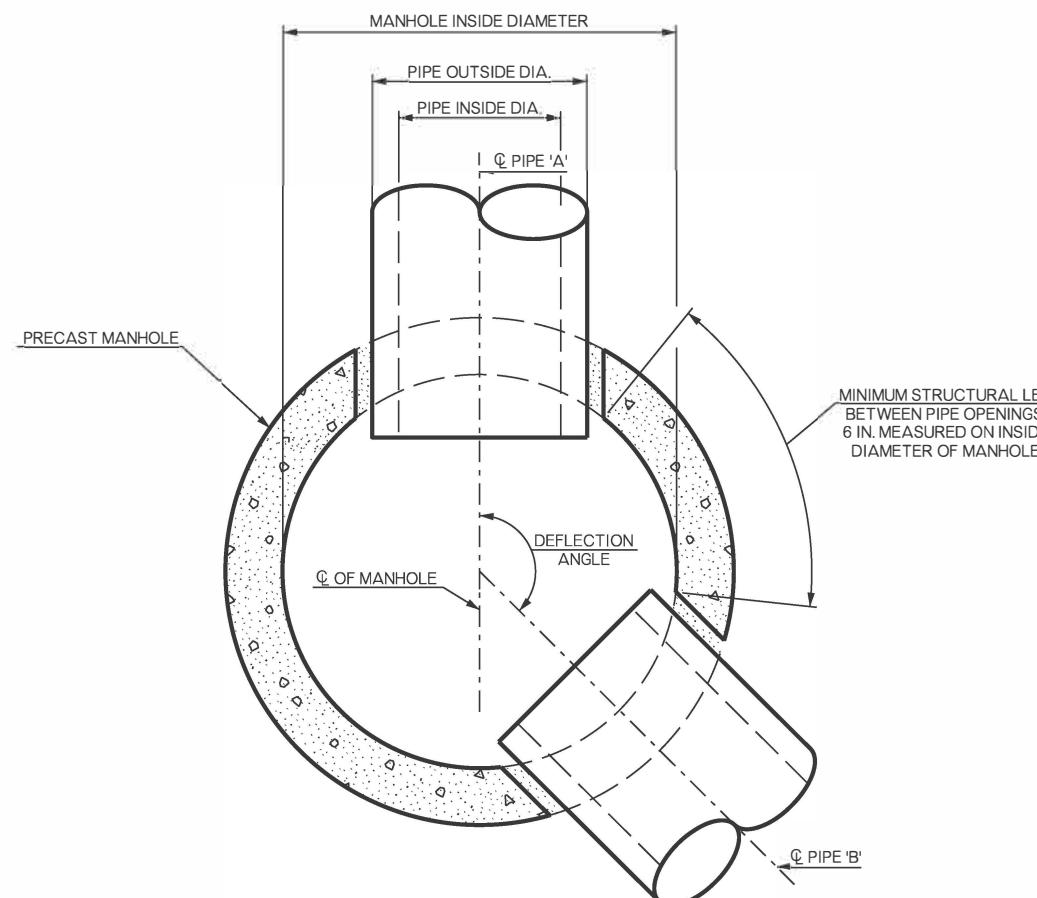
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(A)	PRECAST CONC SQ 4' WIDE MANHOLE	EACH
611(A)	PRECAST CONC SQ 5' WIDE MANHOLE	EACH
611(A)	PRECAST CONC SQ 6' WIDE MANHOLE	EACH
611(B)	ADD'L DEPTH PRECAST SQ 4' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST SQ 5' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST SQ 6' MANHOLE	VF

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 1/8/2025
ROADWAY DESIGN DIVISION STANDARD

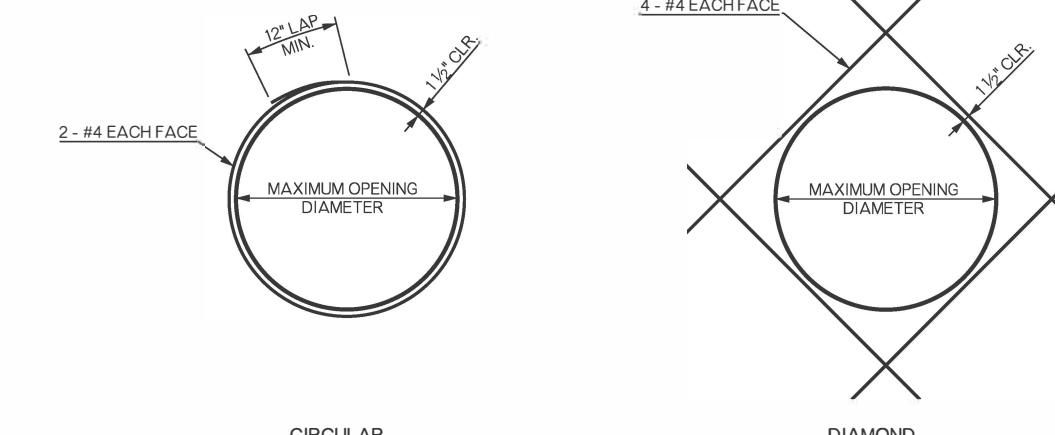
PRECAST SQUARE MANHOLE



2019 SPECIFICATIONS

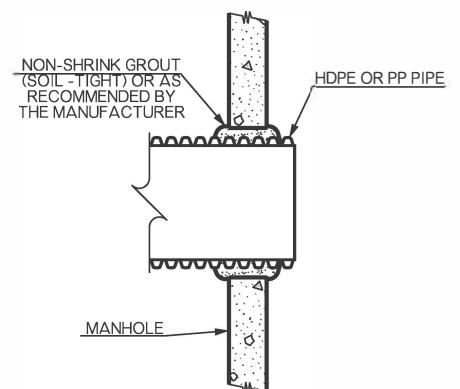


MANHOLE STRUCTURE SIZING DETAIL



TYPICAL PIPE PENETRATION

NOTE: ADDITIONAL REINFORCING SHOWN IS AT THE DISCRETION OF THE MANUFACTURER.



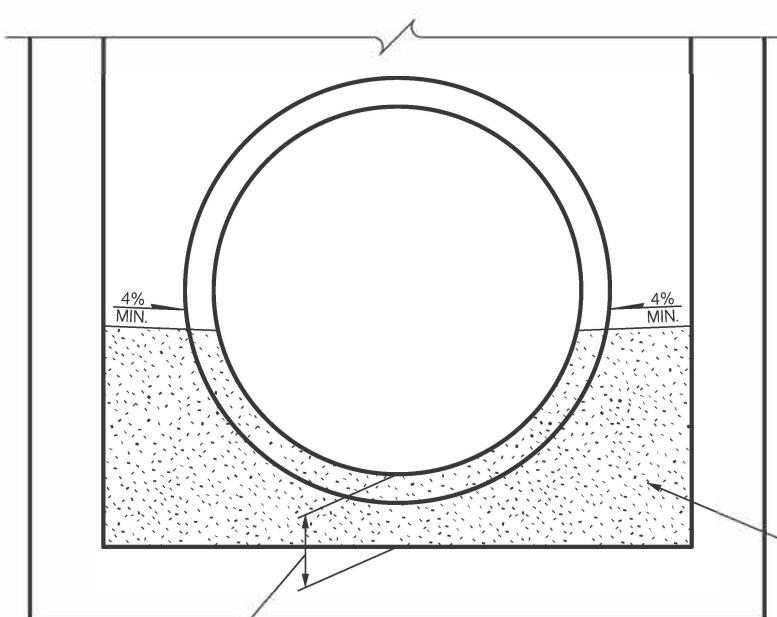
CONNECTION DETAIL

NOTE: HDPE PIPE SHOWN, RCP SIMILAR. ALTERNATIVELY, THE MANUFACTURER MAY PROVIDE BOOTS MEETING ASTM D2321 AND ASTM C923 FOR HDPE OR PP PIPE.

MANHOLE STRUCTURE SIZE SCHEDULE			
MANHOLE INSIDE DIAMETER	90° DEFLECTION	135° DEFLECTION	180° DEFLECTION
48"	18"	27"	30"
60"	27"	36"	42"
72"	33"	48"	48"

NOTE: DIAMETER SHOWN IN MANHOLE STRUCTURE SIZE SCHEDULE IS THE INTERNAL PIPE DIAMETER. TABLE VALUES ARE DETERMINED BY ASSUMING ADJOINING PIPES ARE EQUAL IN DIAMETER AND ARE THE MAXIMUM SIZE ALLOWED FOR ADJOINING PIPES OF EQUAL DIAMETER. PIPES MAY HAVE DIFFERENT DIAMETERS THAN SHOWN IN THE TABLE AS LONG AS THEY PROVIDE A MINIMUM STRUCTURAL LEG OF 6 INCHES.

FOR STRUCTURES WITH DIFFERENT DEFLECTION ANGLES, PIPE DIAMETERS, OR COMBINATIONS REFER TO THE NATIONAL PRECAST CONCRETE ASSOCIATION MANHOLE SIZING RECOMMENDATIONS AT: <https://precast.org/wp-content/uploads/2014/08/Precast-concrete-manhole-sizing-recommendations.pdf>



BENCHING DETAIL

DESIGN DATA

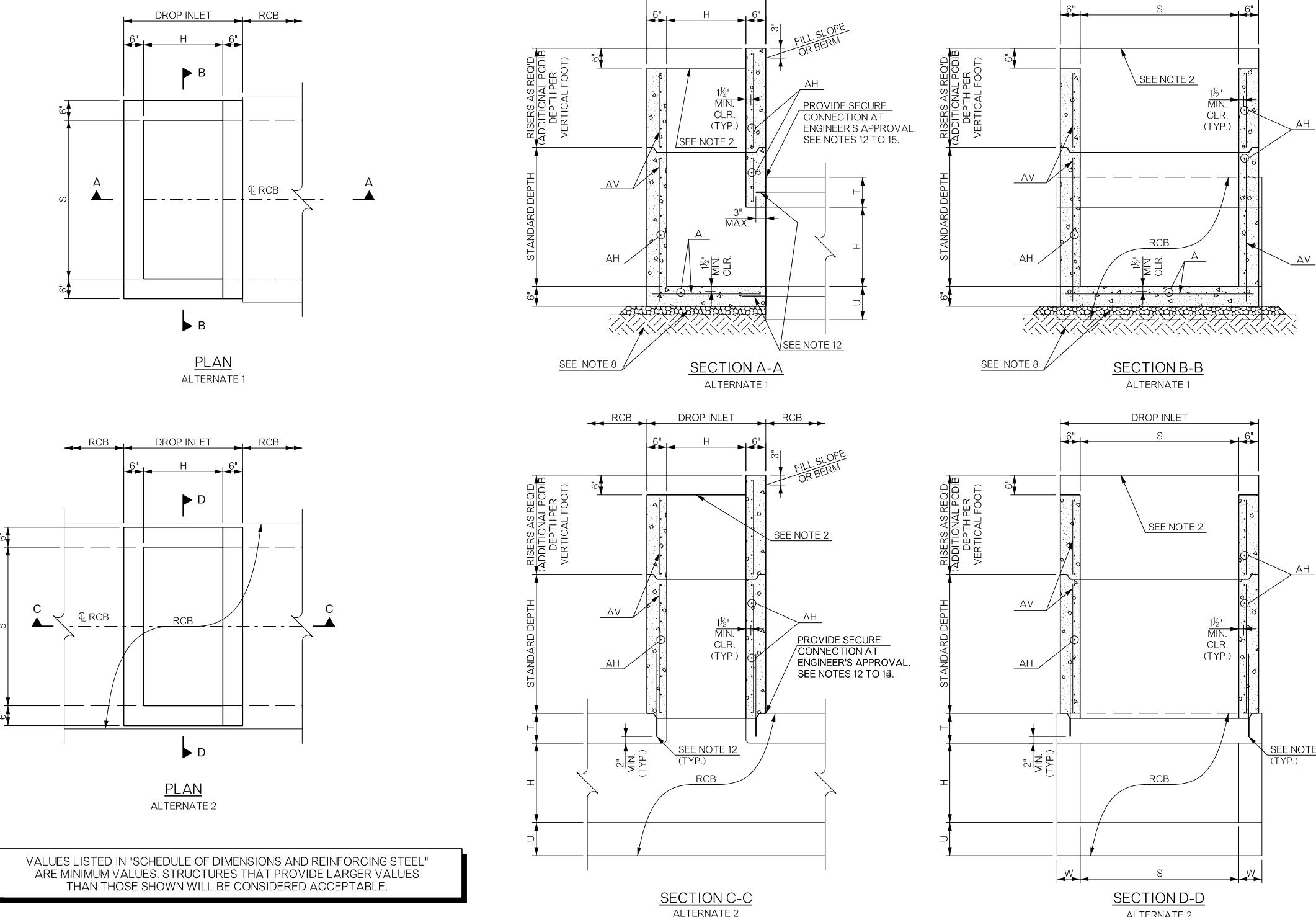
MATERIAL:
CLASS A CONCRETE $f'_c = 4$ KSI
REINFORCING STEEL $f_y = 60$ KSI

LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

GENERAL NOTES

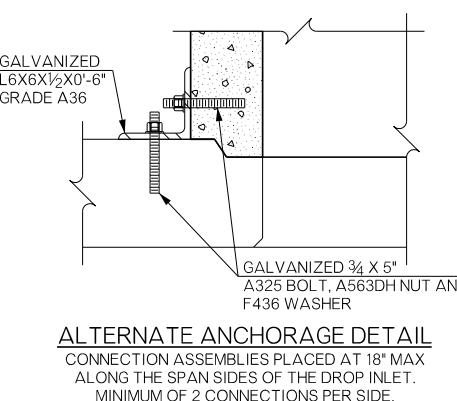
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF GRATES SEE ROADWAY STANDARD CDIB-2. COST OF GRATES SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF 1½ INCHES TO REINFORCING STEEL.
- IF THE MANUFACTURER ELECTS TO USE WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER, THE WALLS OR SLABS WILL REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 IN²/FT EACH WAY IN THE SECONDARY LAYER.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCH THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES CENTER TO CENTER.
- FOR T, U, AND W DIMENSIONS, SEE BRIDGE STANDARDS RCB CULVERT DRAWINGS.
- SEAL JOINTS BETWEEN SUBASSEMBLIES AND AT EACH ENTRANCE OR EXIT CONDUIT WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE A SOIL-TIGHT CONNECTION AND SEAL IN ACCORDANCE WITH SECTION 611 OF THE STANDARD SPECIFICATIONS. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE INLET.
- PROVIDE A SECURE CONNECTION BETWEEN THE DROP INLET AND RCB SUCH AS A CONCRETE COLLAR OR MECHANICAL CONNECTION AS STATED IN NOTES 13 THROUGH 15. THE CONTRACTOR MAY PROVIDE AN ALTERNATIVE ANCHORAGE DETAIL, APPROVED BY THE ENGINEER, TO CONNECT THE DROP INLET TO THE RCB.
- THE CONTRACTOR MAY PLACE A FORMED AND Poured CONCRETE COLLAR BETWEEN THE DROP INLET AND RCB. PIN THE CONCRETE COLLAR TO THE DROP INLET AND RCB AS APPROVED BY THE ENGINEER.
- DRILL AND EMBED #4 BARS AT 18 INCHES IN ACCORDANCE WITH SECTION 509.04.(D.3) OF THE 2019 ODOT STANDARD SPECIFICATIONS. INCLUDE ALL COSTS OF DRILLING, DOWELS, EPOXY ANCHORAGE SYSTEM AND INCIDENTALS IN THE COST OF THE STRUCTURE.
- AN ALTERNATE ANCHORAGE DETAIL MAY BE USED IN LIEU OF DRILLING AND EMBEDDING #4 BARS. SECURE DROP INLETS TO THE RCB WITH ¾ INCH DIAMETER BOLTS, WASHERS, NUTS AND ANGLES OR PLATES. ALL HARDWARE SHALL BE GALVANIZED. INCLUDE ALL COSTS OF DRILLING, BOLTS, NUTS, WASHERS, ANGLES, PLATES, ANCHORAGE SYSTEM AND INCIDENTALS IN THE COST OF THE STRUCTURE. SEE "ALTERNATE ANCHORAGE DETAIL".
- MAXIMUM DEPTH OF DROP INLETS IS 15 FEET. ANY DROP INLET WHICH IS GREATER THAN 15 FEET IN DEPTH SHALL BE A SPECIAL DESIGN AS SHOWN IN THE PLANS AND SHOULD NOT FOLLOW THIS STANDARD.
- ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST INLET.



VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE LARGER VALUES THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

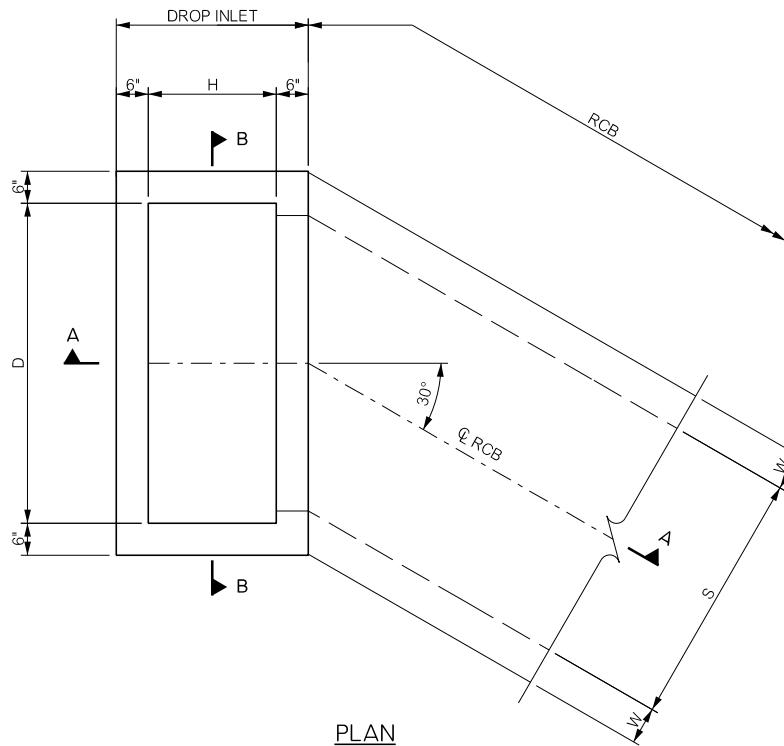
SCHEDULE OF DIMENSIONS AND REINFORCING STEEL

DESIGN NO.	BARREL DIMENSIONS		STANDARD DEPTH	A BARS (IN²/FT)			AH BARS (IN²/FT) - ALTERNATE 1												AH BARS (IN²/FT) - ALTERNATE 2												AV BARS (IN²/FT)		
	SPAN S	HEIGHT H		DEPTH			DEPTH												DEPTH														
				UP TO 5'	6'-10"	11'-15"	UP TO 4'	4'-5"	5'-6"	6'-7"	7'-8"	8'-9"	9'-10"	10'-11"	11'-12"	12'-13"	13'-14"	14'-15"	UP TO 4'	4'-5"	5'-6"	6'-7"	7'-8"	8'-9"	9'-10"	10'-11"	11'-12"	12'-13"	13'-14"	14'-15"			
1	4'	2'	3'-6"	0.16	0.18	0.22	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.17	0.18	0.19	0.21	0.22	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11		
2	4'	3'	4'-6"	0.19	0.23	0.28	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11		
3	4'	4'	5'-6"	0.20	0.24	0.31	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11		
4	5'	2'	3'-6"	0.15	0.17	0.21	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.11			
5	5'	3'	4'-6"	0.19	0.23	0.30	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	-	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.11				
6	5'	4'	5'-6"	0.23	0.28	0.36	0.16	0.17	0.18	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	-	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.11			
7	5'	5'	6'-6"	0.24	0.29	0.38	0.17	0.18	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	-	0.12	0.13	0.15	0.17	0.18	0.19	0.20	0.21	0.23	0.11	0.11	0.11				

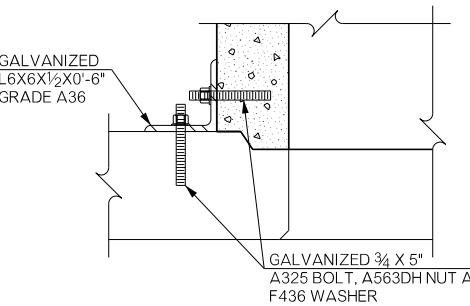


ALTERNATE ANCHORAGE DETAIL
CONNECTION ASSEMBLIES PLACED AT 18" MAX
ALONG THE SPAN SIDES OF THE DROP INLET.
MINIMUM OF 2 CONNECTIONS PER SIDE.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET (CDI RCB DES. ▲)	EA
611(H)	ADD'L DEPTH IN PRECAST INLET (CDI RCB DES. ▲)	VF
▲ SPECIFY INLET DESIGN NUMBER.		
APPROVED BY ROADWAY ENGINEER: <i>R. D. D. S.</i> DATE: 4/1/2025 ROADWAY DESIGN DIVISION STANDARD		
PRECAST CONCRETE DROP INLETS FOR R.C. BOXES (4' x 2' TO 5' x 5')		
OKLAHOMA Transportation		
2019 SPECIFICATIONS		
PCDIB 0		
R-53		



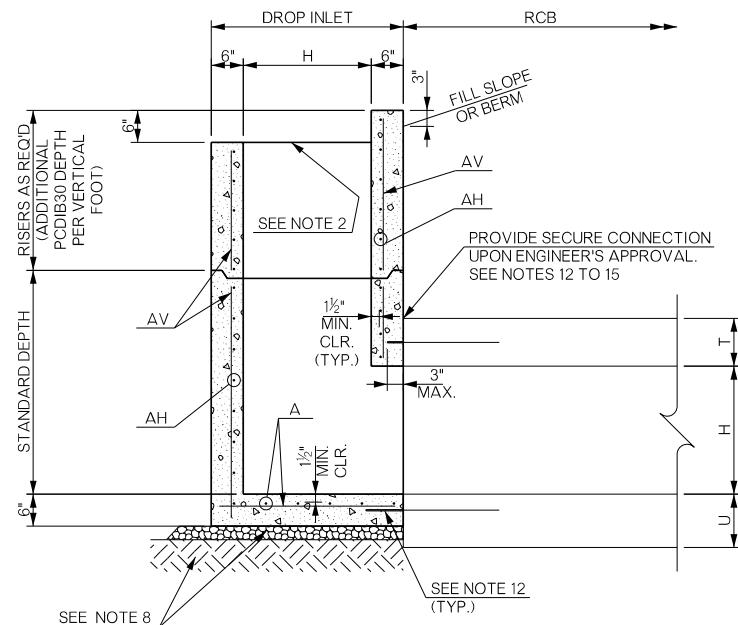
REINFORCING STEEL VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE VALUES LARGER THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.



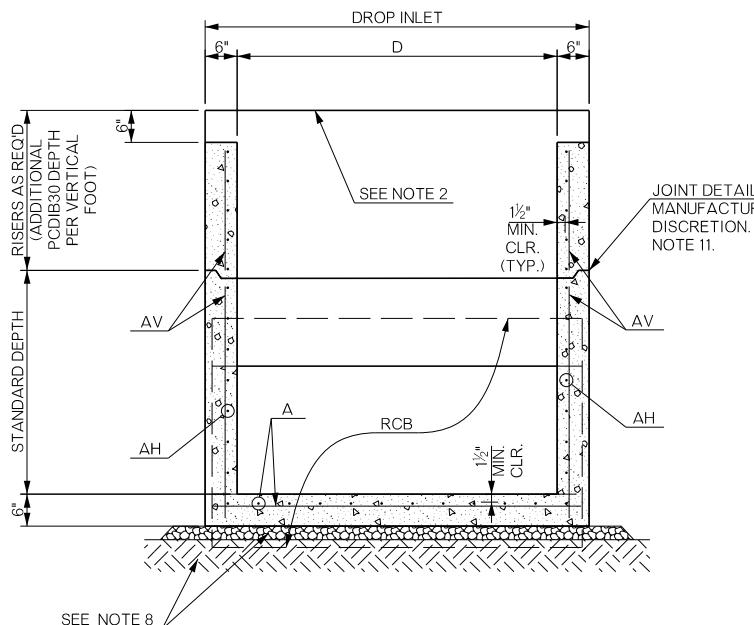
ALTERNATE ANCHORAGE DETAIL

CONNECTION ASSEMBLIES PLACED AT 18" MAX ALONG THE SPAN SIDES OF THE DROP INLET. MINIMUM OF 2 CONNECTIONS PER SIDE.

PLAN



SECTION A-A



SECTION B-B

DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL
 $f'_c = 4$ KSI
 $f_y = 60$ KSI

$f'_c = 4$ KSI
 $f_y = 60$ KSI

LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

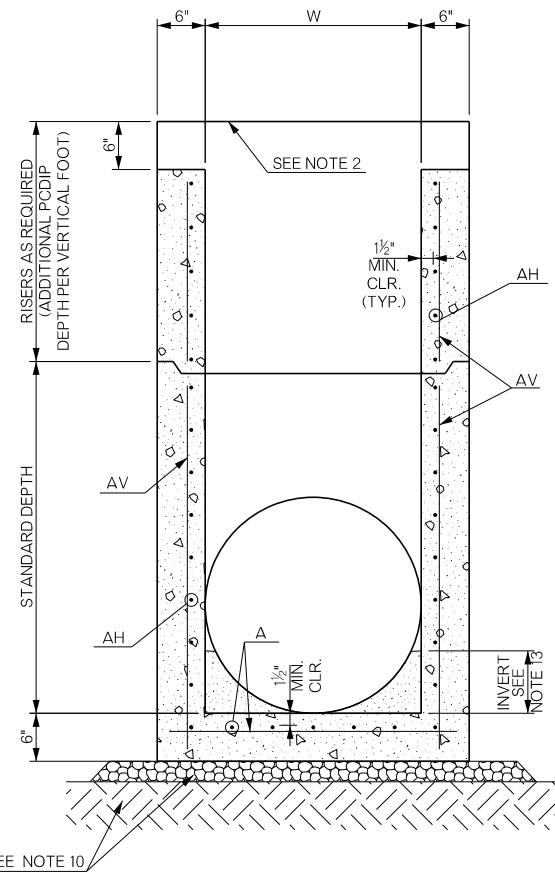
GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FOR DETAILS OF GRATES SEE ROADWAY STANDARD CDIB30-2. COST OF GRATES SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
3. THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
4. PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
5. PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
6. PROVIDE A MINIMUM CLEAR COVER OF 1 1/2 INCHES TO REINFORCING STEEL.
7. IF THE MANUFACTURER ELECTS TO USE WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER, THE WALLS OR SLABS WILL REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 IN²/FT EACH WAY IN THE SECONDARY LAYER.
8. THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCH THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
9. FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES, CENTER TO CENTER.
10. FOR T, U, AND W DIMENSIONS, SEE BRIDGE STANDARDS RCB CULVERT DRAWINGS.
11. SEAL JOINTS BETWEEN SUBASSEMBLIES WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE A SOIL-TIGHT CONNECTION AND SEAL IN ACCORDANCE WITH SECTION 611 OF THE STANDARD SPECIFICATIONS. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE INLET.
12. PROVIDE A SECURE CONNECTION BETWEEN THE DROP INLET AND RCB SUCH AS A CONCRETE COLLAR OR MECHANICAL CONNECTION AS STATED IN NOTES 13 THROUGH 15. THE CONTRACTOR MAY PROVIDE AN ALTERNATIVE ANCHORAGE DETAIL, APPROVED BY THE ENGINEER, TO CONNECT THE DROP INLET TO THE RCB.
13. THE CONTRACTOR MAY PLACE A FORMED AND POURED CONCRETE COLLAR BETWEEN THE DROP INLET AND RCB. PIN THE CONCRETE COLLAR TO THE DROP INLET AND RCB AS APPROVED BY THE ENGINEER.
14. DRILL AND EMBED #4 BARS AT 18 INCHES IN ACCORDANCE WITH SECTION 509.04.(D)3 OF THE STANDARD SPECIFICATIONS. INCLUDE ALL COSTS OF DRILLING, DOWELS, EPOXY ANCHORAGE SYSTEM AND INCIDENTALS IN THE COST OF THE STRUCTURE.
15. AN ALTERNATE ANCHORAGE DETAIL MAY BE USED IN LIEU OF DRILLING AND EMBEDDING #4 BARS. SECURE DROP INLETS TO THE RCB WITH 3/4 INCH DIAMETER BOLTS, WASHERS, NUTS AND ANGLES OR PLATES. ALL HARDWARE SHALL BE GALVANIZED. INCLUDE ALL COSTS OF DRILLING, BOLTS, NUTS, WASHERS, ANGLES, PLATES, ANCHORAGE SYSTEM AND INCIDENTALS IN THE COST OF THE STRUCTURE. SEE "ALTERNATE ANCHORAGE DETAIL".
16. MAXIMUM DEPTH OF DROP INLETS IS 15 FEET. ANY DROP INLET WHICH IS GREATER THAN 15 FEET IN DEPTH SHALL BE A SPECIAL DESIGN AS SHOWN IN THE PLANS AND SHOULD NOT FOLLOW THIS STANDARD.
17. ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST INLET.

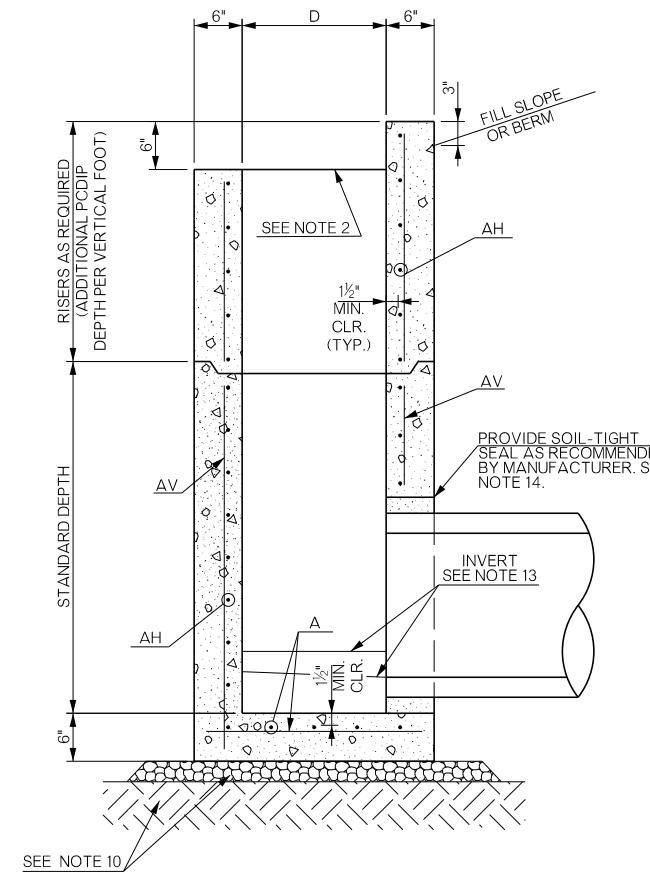
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET (CDI 30SK RCB DES. ▲)	EA.
611(H)	ADD'L DEPTH IN PRECAST INLET (CDI 30SK RCB DES. ▲)	VF

▲ SPECIFY INLET DESIGN NUMBER.

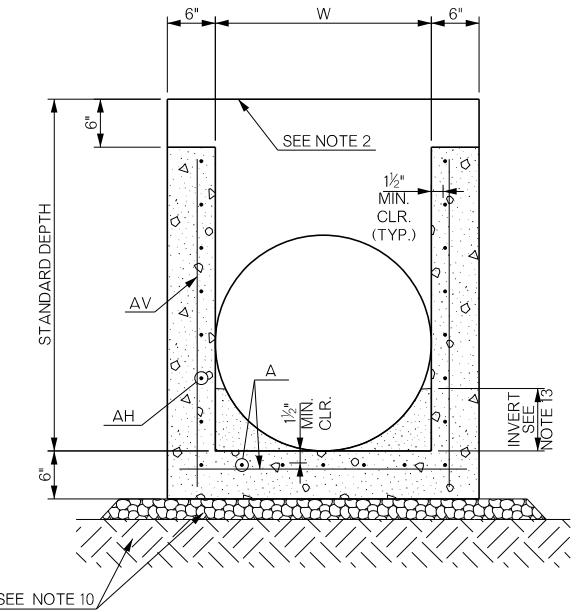
APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD
PRECAST CONCRETE DROP INLETS
FOR 30 DEG. SKEW R.C. BOXES
(4' x 2' TO 5' x 5')
OKLAHOMA
Transportation
2019 SPECIFICATIONS
PCDIB30 0
R-54



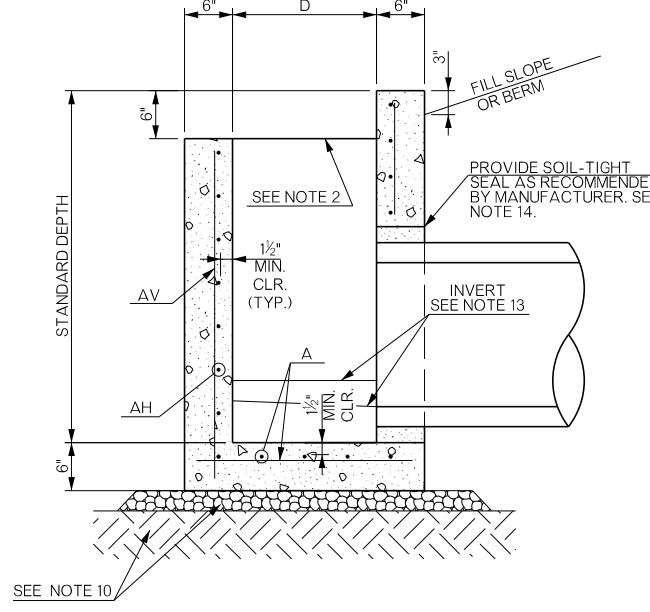
SECTION A-A
RISER OPTION



SECTION B-B
RISER OPTION



SECTION A-A
STANDARD DEPTH INLET



SECTION B-B
STANDARD DEPTH INLET

REINFORCING STEEL VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE VALUES LARGER THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

DESIGN DATA

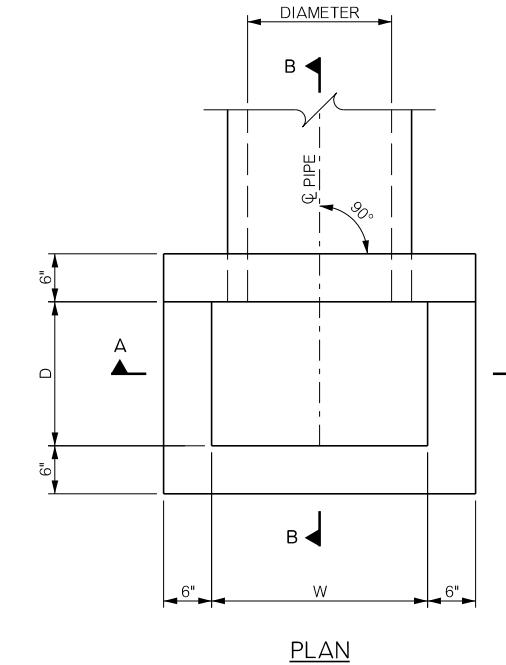
MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL
f'c = 4 KSI
fy = 60 KSI

LOADING:
HL-93

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF GRATES SEE ROADWAY STANDARD CDIP-2. COST OF GRATE SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF 1/2 INCHES TO REINFORCING STEEL.
- IF THE MANUFACTURER ELECTS TO USE WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER, THE WALLS OR SLABS WILL REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO 0.11 IN²/FT EACH WAY IN THE SECONDARY LAYER.
- MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
- DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCH THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES, CENTER TO CENTER.
- ARCH PIPES AND HORIZONTAL ELLIPTICAL PIPES MAY BE USED INSTEAD OF ROUND PIPES AT THE DISCRETION OF THE ENGINEER.
- THE INVERT SHALL BE PLACED AS A SECONDARY POUR TO A HEIGHT OF ONE-QUARTER THE PIPE DIAMETER. PROVIDE A MINIMUM SLOPE OF 4% WITH POSITIVE DRAINAGE TO THE OUTLET. ALL COST OF THE INVERT SHALL BE INCLUDED IN THE COST OF THE STRUCTURE. INVERT IS TYPICALLY CLASS C CONCRETE.
- SEAL JOINTS BETWEEN SUBASSEMBLIES AND AT EACH ENTRANCE OR EXIT CONDUIT WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE A SOIL-TIGHT CONNECTION AND SEAL IN ACCORDANCE WITH SECTION 611 OF THE STANDARD SPECIFICATIONS. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE INLET.
- MAXIMUM DEPTH OF DROP INLETS IS 15 FEET. ANY DROP INLET WHICH IS GREATER THAN 15 FEET IN DEPTH SHALL BE A SPECIAL DESIGN AS SHOWN IN THE PLANS AND SHOULD NOT FOLLOW THIS STANDARD.
- ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST INLET.
- EACH INLET DESIGN NUMBER HAS A STANDARD DEPTH, TO WHICH THEY SHOULD BE MADE. ANY ADDITIONAL DEPTH ABOVE THE STANDARD DEPTH SHALL BE PAID AS "ADD'L DEPTH IN PRECAST INLET (CDI RCP DES. ▲)".



PLAN

DESIGN NO.	DIAMETER	STANDARD DEPTH	D	W	A BARS (IN ² /FT)			AH BARS (IN ² /FT)								AV BARS (IN ² /FT) ALL DEPTHS TO 15'	
					UP TO 5'	6'-10'	11'-15'	UP TO 4'	4'-5'	5'-6'	6'-7'	7'-8'	8'-9'	9'-10'	10'-11'	11'-12'	
1A	18"	3'-10"	2'-0"	3'-0"	0.16	0.19	0.22	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
1B			3'-0"	3'-0"	0.17	0.20	0.25	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
2	24"	3'-10"	2'-0"	4'-0"	0.16	0.18	0.22	0.11	0.11	0.11	0.11	0.13	0.14	0.15	0.17	0.18	0.19
3	30"	4'-5"	3'-0"	5'-0"	0.19	0.23	0.30	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
4	36"	5'-0"	3'-0"	5'-0"	0.19	0.23	0.30	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.31

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET (CDI RCP DES. ▲)	EA.
611(H)	ADD'L DEPTH IN PRECAST INLET (CDI RCP DES. ▲)	VF

▲ SPECIFY INLET DESIGN NUMBER.

APPROVED BY
ROADWAY ENGINEER: *R. D. D.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

PRECAST CONCRETE DROP INLETS
FOR 18" TO 36" R.C. PIPES



2019 SPECIFICATIONS

PCDIP 0

DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL
f'c = 4 KSI
fy = 60 KSI

f'c = 4 KSI

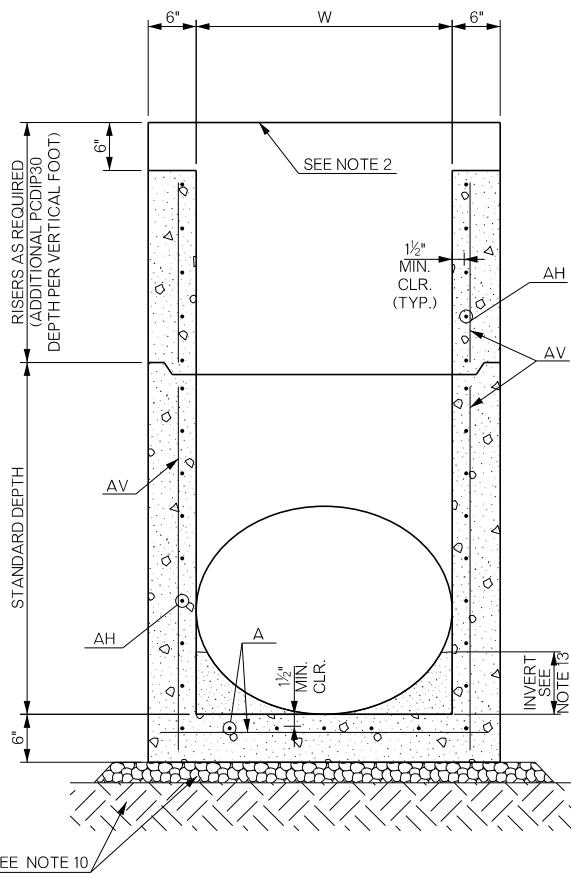
fy = 60 KSI

LOADING:
HL-93

DESIGN:
ASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

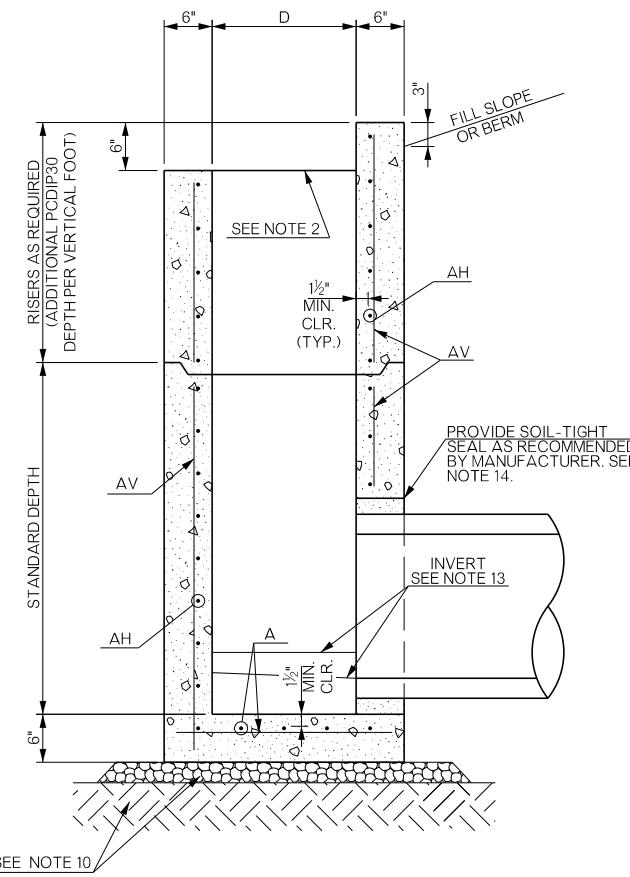
GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF GRATES SEE ROADWAY STANDARD CDIP30-2. COST OF GRATE SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY EDGE.
- PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
- PROVIDE A MINIMUM CLEAR COVER OF $1\frac{1}{2}$ INCHES TO REINFORCING STEEL.
- IF THE MANUFACTURER ELECTS TO USE WALLS OR SLABS WITH A THICKNESS OF 8 INCHES OR GREATER, THE WALLS OR SLABS WILL REQUIRE A SECONDARY LAYER OF REINFORCING STEEL. PROVIDE AN AREA OF REINFORCING STEEL EQUAL TO $0.11 \text{ in}^2/\text{ft}$ EACH WAY IN THE SECONDARY LAYER.
- MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
- DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
- THE FOUNDATION SHALL BE STABILIZED OR REMOVED AND REPLACED WITH FIRM AND STABLE FOUNDATION MATERIAL. A MINIMUM 3 INCH THICK LEVELING COURSE SHALL BE PROVIDED BELOW THE BASE AREA OF THE INLET AND EXTEND 6 INCHES BEYOND THE BASE AREA. THE LEVELING COURSE SHALL BE CONSTRUCTED WITH AGGREGATE BASE TYPE A. COSTS ASSOCIATED WITH THE FOUNDATION AND LEVELING COURSE SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES, CENTER TO CENTER.
- ARCH PIPES AND HORIZONTAL ELLIPTICAL PIPES SHALL NOT BE USED IN LIEU OF ROUND PIPES.
- THE INVERT SHALL BE PLACED AS A SECONDARY POUR TO A HEIGHT OF ONE-QUARTER THE PIPE DIAMETER. PROVIDE A MINIMUM SLOPE OF 4% WITH POSITIVE DRAINAGE TO THE OUTLET. ALL COST OF THE INVERT SHALL BE INCLUDED IN THE COST OF THE STRUCTURE. INVERT IS TYPICALLY CLASS C CONCRETE.
- SEAL JOINTS BETWEEN SUBASSEMBLIES AND AT EACH ENTRANCE OR EXIT CONDUIT WITH PREFORMED OR BULK MASTIC IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE A SOIL-TIGHT CONNECTION AND SEAL IN ACCORDANCE WITH SECTION 611 OF THE STANDARD SPECIFICATIONS. JOINT SEALING SHALL BE INCLUDED IN THE COST OF THE INLET.
- MAXIMUM DEPTH OF DROP INLETS IS 15 FEET. ANY DROP INLET WHICH IS GREATER THAN 15 FEET IN DEPTH SHALL BE A SPECIAL DESIGN AS SHOWN IN THE PLANS AND SHOULD NOT FOLLOW THIS STANDARD.
- ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST INLET.

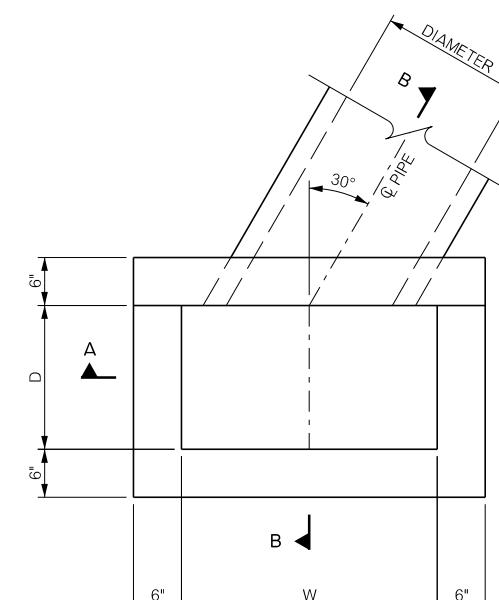


SECTION A-A
RISER OPTION

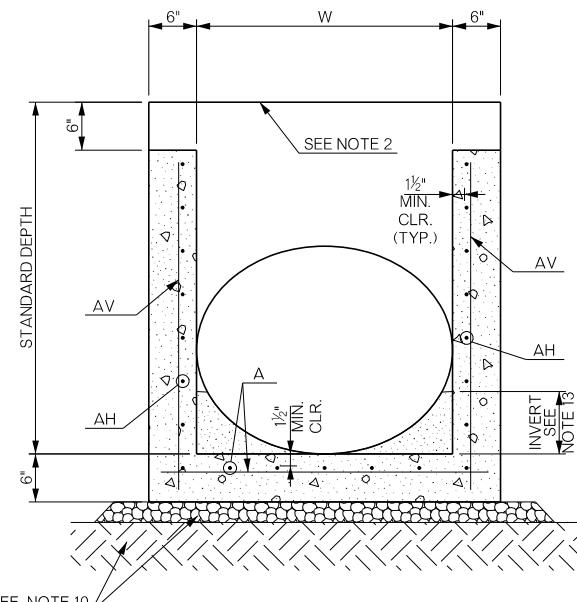
NOTE:
VIEW OF RCP OPENING IS OVAL SHAPED
DUE TO LOCATION OF SECTION CUT.
ARCH PIPES AND HORIZONTAL ELLIPTICAL
PIPES SHALL NOT BE USED.



SECTION B-B
RISER OPTION

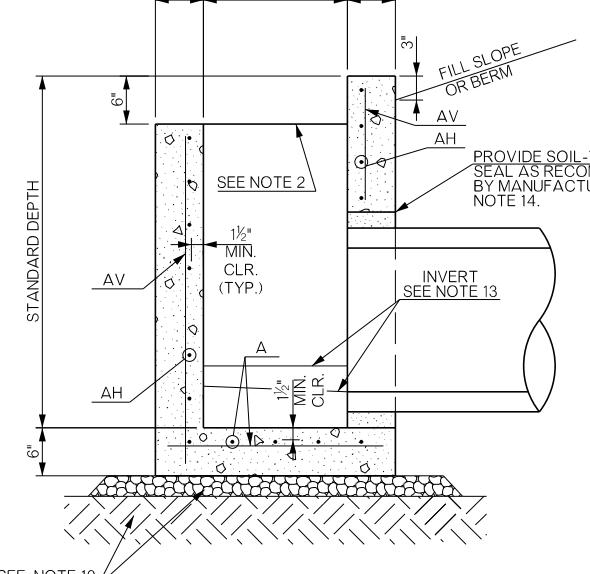


PLAN



SECTION A-A
STANDARD DEPTH INLET

NOTE:
VIEW OF RCP OPENING IS OVAL SHAPED
DUE TO LOCATION OF SECTION CUT.
ARCH PIPES AND HORIZONTAL ELLIPTICAL
PIPES SHALL NOT BE USED.



SECTION B-B
STANDARD DEPTH INLET

REINFORCING STEEL VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE VALUES LARGER THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

DESIGN NO.	DIAMETER	STANDARD DEPTH	D	W	A BARS (in^2/ft)		AH BARS (in^2/ft)						ALL DEPTHS TO 15'							
					UP TO 5'	6'-10"	11'-15'	UP TO 4'	4'-5'	5'-6"	6'-7"	7'-8"	8'-9"	9'-10"	10'-11"	11'-12"	12'-13"	13'-14"	14'-15"	
1A	18"	3'-10"	2'-0"	3'-0"	0.16	0.19	0.22	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.13	0.11	
1B			3'-0"	3'-0"	0.17	0.20	0.25	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.13	0.11
2	24"	3'-10"	2'-0"	4'-0"	0.16	0.18	0.22	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.17	0.18	0.19	0.21	0.22	0.11
3	30"	4'-5"	3'-0"	4'-0"	0.19	0.23	0.28	0.11	0.11	0.12	0.13	0.14	0.15	0.17	0.18	0.19	0.21	0.22	0.11	
4	36"	5'-0"	3'-0"	5'-0"	0.19	0.23	0.30	0.12	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.11

BASIS OF PAYMENT			
ITEM NO.	ITEM	UNIT	
611(G)	PRECAST INLET (CDI 30SK RCP DES. ▲)	EA.	
611(H)	ADD'L DEPTH IN PRECAST INLET (CDI 30SK RCP DES. ▲)	VF	

▲ SPECIFY INLET DESIGN NUMBER.

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD
PRECAST CONCRETE DROP INLETS
FOR 30 DEG. SKEW 18" TO 36" R.C. PIPES

OKLAHOMA
Transportation

2019 SPECIFICATIONS

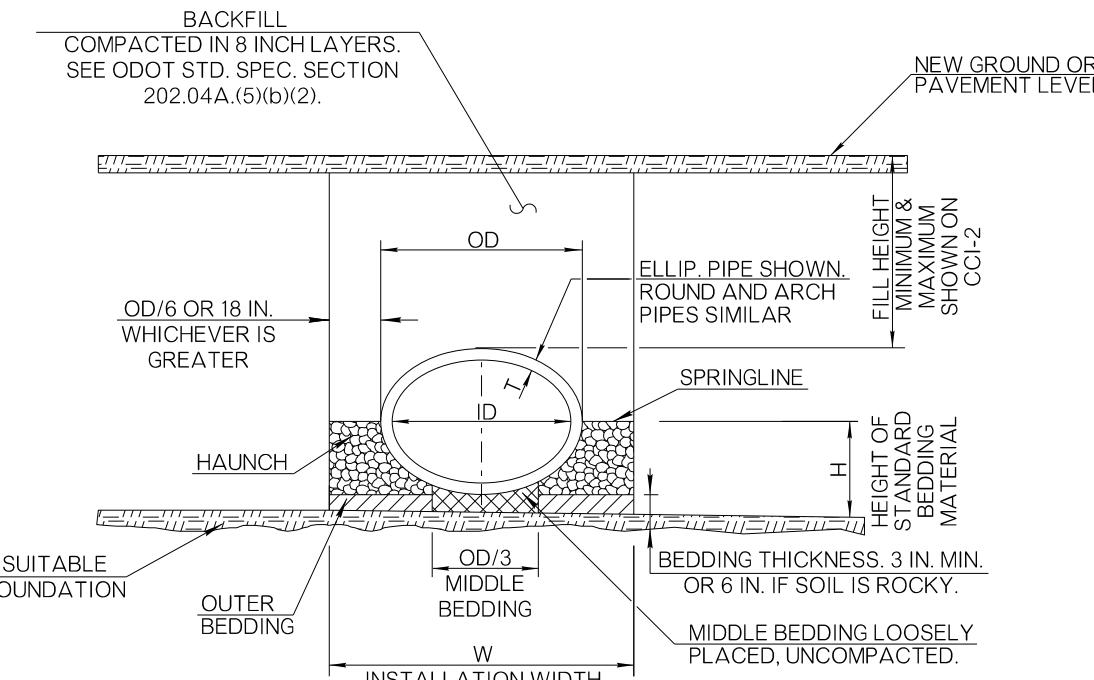
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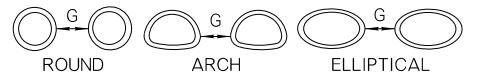
R-56

LEGEND	
ID	= INSIDE DIAMETER
OD	= OUTSIDE DIAMETER
	HAUNCH AREA, COMPACTED TO 95% MAXIMUM DENSITY ●
	SUITABLE FOUNDATION, FREE OF DEBRIS OR LOOSE SOIL
	MIDDLE BEDDING LOOSELY PLACED, UNCOMPACTED
	OUTER BEDDING, COMPACTED TO 95% MAXIMUM DENSITY ●

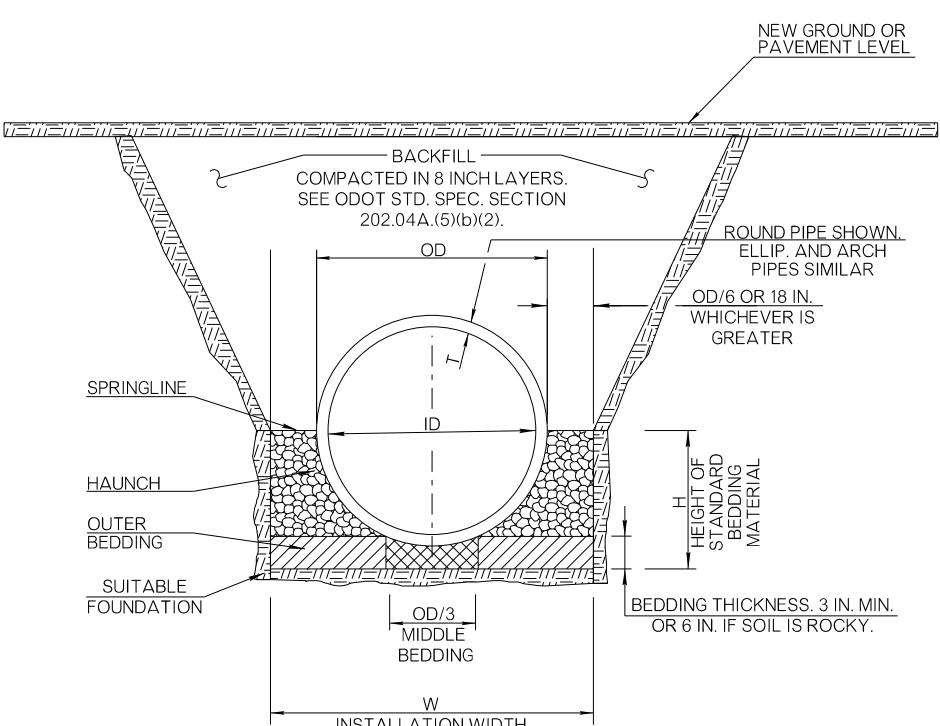
● SEE NOTE 14 ON STANDARD CCI-2



CONDUIT SHAPE			DIST.
ROUND	ARCH	ELLiptical	G
UP TO 24"	UP TO 36"	UP TO 36"	12"
25" TO 72"			D/2"
	37" TO 108"	37" TO 108"	D/3"
FOR DIA. OR SPAN	OVER 108"	OVER 108"	36"



MULTIPLE PIPE INSTALLATION



TRENCH INSTALLATION

(INSTALLATION BELOW EXISTING GROUND)

ALL GENERAL NOTES PERTAINING TO CONCRETE PIPE INSTALLATION ARE FOUND ON ROADWAY STANDARD CCI-2.

ROUND CONCRETE PIPE									
PIPE DIAM. OR DESIGN EQUIV.	H STD BED MAT. ■	PIPE WALL THICKNESS T	CLEAR SPACE BETWEEN PIPES ●	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING		TRIPLE PIPE STANDARD TRENCHING	
				W WIDTH ▲	STANDARD BEDDING MATERIAL ■	W WIDTH ▲	STANDARD BEDDING MATERIAL ■	W WIDTH ▲	STANDARD BEDDING MATERIAL ■
18	1.21	0.208	12.00	4.92	0.17	7.83	0.24	10.75	0.32
24	1.50	0.250	15.00	5.50	0.21	9.25	0.33	13.00	0.45
30	1.79	0.292	18.50	6.08	0.27	10.71	0.43	15.34	0.60
36	2.08	0.333	22.00	6.67	0.32	12.17	0.55	17.66	0.78
42	2.38	0.375	25.50	7.25	0.38	13.63	0.67	20.00	0.97
48	2.67	0.417	29.00	7.83	0.43	15.09	0.81	22.34	1.19
54	2.96	0.458	32.50	8.42	0.50	16.54	0.96	24.66	1.42
60	3.25	0.500	36.00	9.00	0.56	18.00	1.12	27.00	1.68
66	3.57	0.542	36.00	9.58	0.64	19.17	1.27	28.75	1.91
72	3.88	0.583	36.00	10.17	0.71	20.33	1.43	30.50	2.14
78	4.20	0.625	36.00	10.75	0.80	21.50	1.60	32.25	2.39
84	4.51	0.667	36.00	11.33	0.88	22.67	1.77	34.00	2.65
90	4.83	0.708	36.00	11.92	0.98	23.83	1.95	35.75	2.93
96	5.15	0.750	36.00	12.67	1.10	25.17	2.17	37.50	3.21

ARCH CONCRETE PIPE									
ROUND EQUIV.	PIPE SPAN	PIPE HEIGHT	H STD BED MAT. ■	PIPE WALL THICKNESS T	CLEAR SPACE BETWEEN PIPES ●	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING	
						WIDTH ▲	STANDARD BEDDING MATERIAL ■	WIDTH ▲	STANDARD BEDDING MATERIAL ■
18	22	13	0.96	0.208	12.00	5.25	0.19	8.50	0.27
24	28	18	0.99	0.250	12.00	5.83	0.21	9.67	0.31
30	36	22	1.18	0.292	12.00	6.58	0.29	11.17	0.42
36	43	26	1.30	0.333	12.00	7.25	0.35	12.50	0.51
42	51	31	1.46	0.375	17.25	8.00	0.43	14.44	0.65
48	58	36	1.63	0.417	19.61	8.67	0.52	15.97	0.79
54	65	40	1.81	0.458	21.97	9.33	0.62	17.50	0.95
60	73	45	2.02	0.500	24.67	10.08	0.75	19.22	1.16
72	88	54	2.35	0.583	29.72	11.50	1.00	22.48	1.58
84	102	62	2.63	0.667	34.44	13.11	1.28	25.81	2.03
90	115	72	3.15	0.708	36.00	14.67	1.71	28.67	2.64
96	122	77	3.26	0.750	36.00	15.56	1.88	30.22	2.89

HORIZONTAL ELLIPTICAL CONCRETE PIPE									
ROUND EQUIV.	PIPE SPAN	PIPE HEIGHT	H STD BED MAT. ■	PIPE WALL THICKNESS T	CLEAR SPACE BETWEEN PIPES ●	SINGLE PIPE STANDARD		DOUBLE PIPE STANDARD	
						WIDTH ▲	STANDARD BEDDING MATERIAL ■	WIDTH ▲	STANDARD BEDDING MATERIAL ■
18	23	14	1.06	0.229	12.00	5.38	0.18	8.75	0.28
24	30	19	1.31	0.271	12.00	6.04	0.23	10.08	0.37
30	38	24	1.56	0.312	12.00	6.79	0.30	11.58	0.48
36	45	29	1.83	0.375	12.00	7.50	0.37	13.00	0.61
42	53	34	2.08	0.417	17.94	8.25	0.45	15.00	0.78
48	60	38	2.29	0.458	20.31	8.92	0.52	16.52	0.92
54	68	43	2.55	0.500	23.00	9.67	0.60	18.25	1.10
60	76	48	2.83	0.542	25.69	10.42	0.71	19.98	1.33
66	83	53	3.10	0.583	28.06	11.08	0.81	21.50	1.55
72	91	58	3.38	0.625	30.75	11.83	0.94	23.23	1.82
78	98	63	3.66	0.667	33.				

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. TRENCH EXCAVATION AND BEDDING MATERIAL WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS OF SIDE DRAINS UNLESS OTHERWISE NOTED ON THE PLANS.
3. NORMAL BACKFILLING OPERATIONS SHALL FOLLOW BEDDING PIPE INSTALLATION AS CLOSELY AS PRACTICAL. IN NO CASE SHALL A PIPE INSTALLATION SUBJECT TO SUDDEN FLOW DEVELOPMENT BE LEFT WITHOUT SUFFICIENT BACKFILL TO RESTRAIN THE CONDUIT AND PREVENT JOINT SEPARATION AND/OR PIPING SCOUR. PHYSICALLY RESTRAINING THE CONDUIT MAY BE USED TO AUGMENT OR REPLACE THIS IMMEDIATE BACKFILL REQUIREMENT.
4. ANY EXCESS EXCAVATION NOT USED FOR BACKFILL WILL BECOME THE PROPERTY OF, AND DISPOSED OF BY THE CONTRACTOR IN A MANNER APPROVED BY THE ENGINEER.
5. STANDARD BEDDING QUANTITIES FOR ROUND PIPE ARE BASED ON AASHTO SPECIFICATION M-170 DESIGNATED CLASS III (WALL B) REINFORCED CONCRETE PIPE.
6. 3 INCHES OF BEDDING MATERIAL BELOW PIPE CONDUIT IS REQUIRED FOR A PROPER FOUNDATION. IF THE FOUNDATION IS ROCKY, THEN 6 INCHES OF BEDDING MATERIAL IS REQUIRED.
7. MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF $\frac{1}{2}$ D OR 12 INCHES, WHICHEVER IS GREATER, BUT NOT TO EXCEED 36 INCHES.
8. CLASS I AND II REINFORCED CONCRETE PIPE SHALL ONLY BE USED FOR SEWERS IN TRENCHES OUTSIDE ROADBED AND STREET LIMITS.
9. FOR COMPUTING TRENCH EXCAVATION AND STANDARD BEDDING QUANTITIES, THE LENGTH OF THE CULVERT SHALL INCLUDE THE END SECTION AND END TREATMENT LENGTHS. COST OF TRENCH EXCAVATION AND BEDDING SHALL BE PAID FOR SEPARATELY FOR CROSS DRAINS ONLY. FOR SIDE DRAINS, THE COST OF BOTH ITEMS SHALL BE INCLUDED IN COST OF CULVERT.
10. WHEN EITHER GROUND WATER OR SURFACE RUN-OFF IS ENCOUNTERED, THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN, AND OPERATE ALL NECESSARY PUMPS, MATERIALS AND EQUIPMENT TO KEEP EXCAVATION REASONABLY FREE FROM WATER UNTIL THE LAYING AND JOINTING OF THE PIPE, POURING OF CONCRETE AND PLACING OF BEDDING MATERIAL HAS BEEN COMPLETED, INSPECTED AND APPROVED AND ALL DANGER OF FLOTATION AND OTHER DAMAGE IS REMOVED.
11. TYPICAL CLASS OF REINFORCED ARCH PIPE SHALL BE CLASS A-III. AND TYPICAL REINFORCED HORIZONTAL ELLIPTICAL PIPE SHALL BE CLASS HE-III. STANDARD BEDDING MATERIAL QUANTITIES ARE BASED ON THESE PIPE CLASSES.
12. PROPER INSTALLATION PRACTICE MUST BE ADHERED TO AS SHOWN ON ROADWAY STANDARD PBB-1.
13. IN THE EVENT LOADS IN EXCESS OF HL-93 ARE TO BE OPERATED OVER OR ADJACENT TO THE PIPE INSTALLATION DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A MINIMUM OF 3 FEET OF COVER OVER THE PIPE AT WHEEL OR TRUCK PATHS.
14. HAUNCH AREA, AND BEDDING LAYER UNDER PIPE SHALL BE CLASS B OR CLASS C BEDDING. BACKFILL FROM SPRINGLINE TO TOP OF GROUND SHALL BE NATIVE SOIL, SEE ROADWAY STANDARD PBB-1.
15. CLASS V CONCRETE PIPE SHALL BE USED IN PIPE JACKING OPERATIONS, TYPICALLY WITHOUT THE CASING. COST OF ALL MATERIALS AND LABOR ASSOCIATED WITH JACKING OPERATIONS WITHOUT CASING SHALL BE PAID FOR AS 613(W) JACKED CONDUIT, IN UNITS OF LINEAR FEET. TYPICALLY, THE POTABLE WATER AND SANITARY SEWER PIPES ARE CASED. CASING SHALL BE PAID FOR AS 613(U) BORE AND JACK STEEL CASING. WATER AND SANITARY SEWER PIPES ARE PAID FOR SEPARATELY WITH UNITS OF LINEAR FEET.

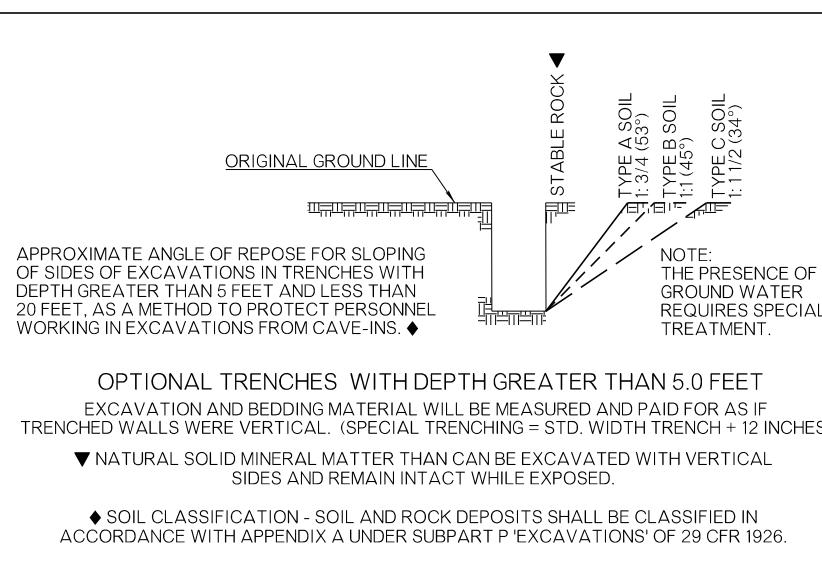
REINFORCED CONCRETE ARCH PIPE				
EQUIV. DIA.	CLASS A-III		MINIMUM COVER	MAXIMUM COVER
	SPAN	RISE		
INCHES	INCHES	INCHES	FEET	
18	22	13	12	10
24	28	18	12	10
30	36	22	12	10
36	43	26	12	10
42	51	31	12	10
48	58	36	12	10
54	65	40	12	10
60	73	45	12	10
66			12	10
72	88	54	12	10
78			12	10
84	102	62	12	10
90	115	72	12	10
96	122	77	12	10

REINF. CONC. HORIZONTAL ELLIPTICAL PIPE				
EQUIV. DIA.	CLASS HE-III		MINIMUM COVER	MAXIMUM COVER
	RISE	SPAN		
INCHES	INCHES	INCHES	FEET	
18	14	23	12	10
24	19	30	12	10
30	24	38	12	10
36	29	45	12	10
42	34	53	12	10
48	38	60	12	10
54	43	68	12	10
60	48	76	12	10
66	53	83	12	10
72	58	91	12	10
78	63	98	12	10
84	68	106	12	10

CONCRETE ROUND PIPE CULVERT								
PIPE DIAMETER	FILL HEIGHT AND PIPE CLASS TABLE				TRENCH			
	MINIMUM COVER INCHES	CLASS II	CLASS III	CLASS IV	CLASS V	CLASS II	CLASS III	CLASS V
MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE IN FEET								
12	12	10	14	20	30	18	50	● ●
18	12	10	14	20	30	20	50	● ●
24	12	10	14	20	30	12	20	40
30	12	10	14	20	30	12	20	50
36	12	10	14	20	30	10	14	30
42	12	10	14	20	30	10	16	30
48	12	10	14	20	30	10	16	30
54	12	10	14	20	30	10	16	30
60	12	12	16	20	30	10	14	25
66	12	12	16	20	30	10	14	25
72	12	12	16	20	35	10	14	25
78	12	12	16	20	35	10	16	25
84	12	12	16	20	35	10	16	25
90	12	12	16	20	35	12	16	25
96	12	12	16	20	35	12	16	25
108	12	12	16	20	35	12	16	25

● SPECIAL DESIGN PIPE. DESIGN METHOD TO CONFORM TO CURRENT AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

CONCRETE PIPE FABRICATION SPECIFICATIONS			PIPE DESCRIPTIONS	
SHAPE OF CONCRETE PIPE	AASHTO	ASTM		
CONCRETE ROUND PIPE	M 170	C 76		
CONCRETE ARCH PIPE	M 206	C 506	SIZE IS DENOTED AS SPAN x RISE, BOTH IN INCHES	
CONCRETE HORIZONTAL ELLIPTICAL PIPE	M 207	C 507	SPAN, THE LONGEST DIMENSION, IS ORIENTED HORIZONTALLY WHILE THE RISE IS ORIENTED VERTICALLY. DENOTED AS RISE x SPAN, BOTH IN INCHES	



BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (A)	<input type="checkbox"/> R.C. PIPE CLASS I	LF
613 (A)	<input checked="" type="checkbox"/> R.C. PIPE ARCH CLASS A-111	LF
613 (A)	<input checked="" type="checkbox"/> R.C. PIPE ELL. CLASS HE-111	LF
613 (R)	STANDARD BEDDING MATERIAL, CLASS A	CY
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY
613 (U)	BORE AND JACK STEEL CASING	LF
613 (V)	TRENCH EXCAVATION	CY
613 (W)	<input checked="" type="checkbox"/> JACKED CONDUIT	LF

APPROVED BY
ROADWAY ENGINEER: _____ DATE: _____

ROADWAY DESIGN DIVISION STANDARD

CONCRETE CULVERT INSTALLATION
(2 OF 2 SHEETS)

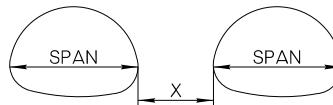
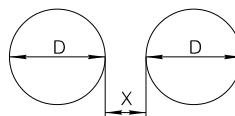


2019 SPECIFICATIONS

CCI-2

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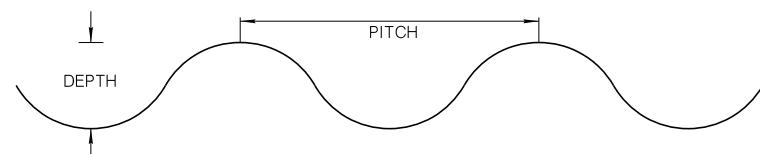
R-58



PIPE DIAMETER	"X" SPACING
UP TO AND INCLUDING 24"	12"
>24" TO 72"	1/2 D
OVER 72"	36"

PIPE SPAN	"X" SPACING
UP TO AND INCLUDING 36"	12"
>36" TO 108"	1/3 ARCH SPAN
OVER 108"	36"

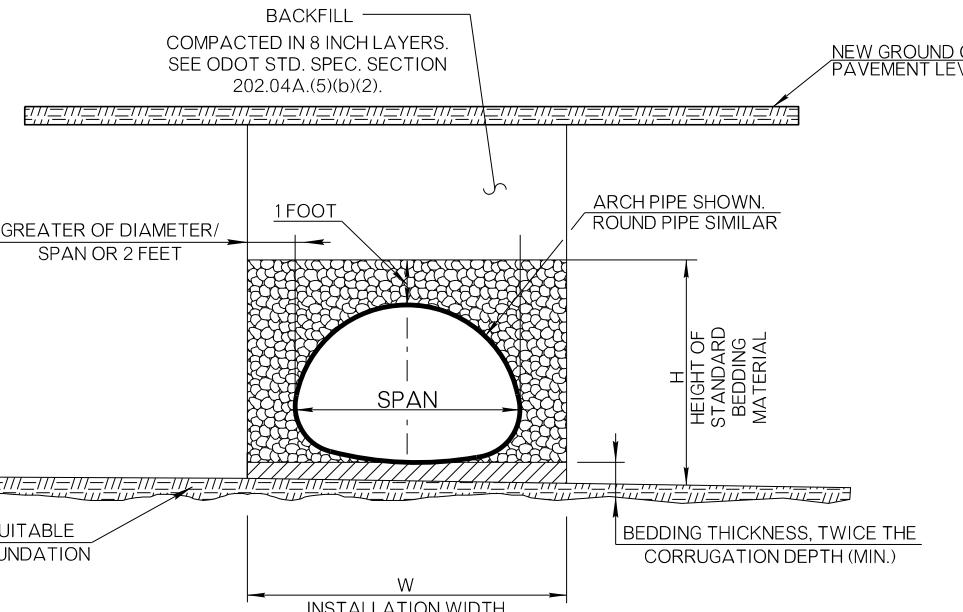
MULTIPLE PIPE INSTALLATION



CORRUGATION PROFILE

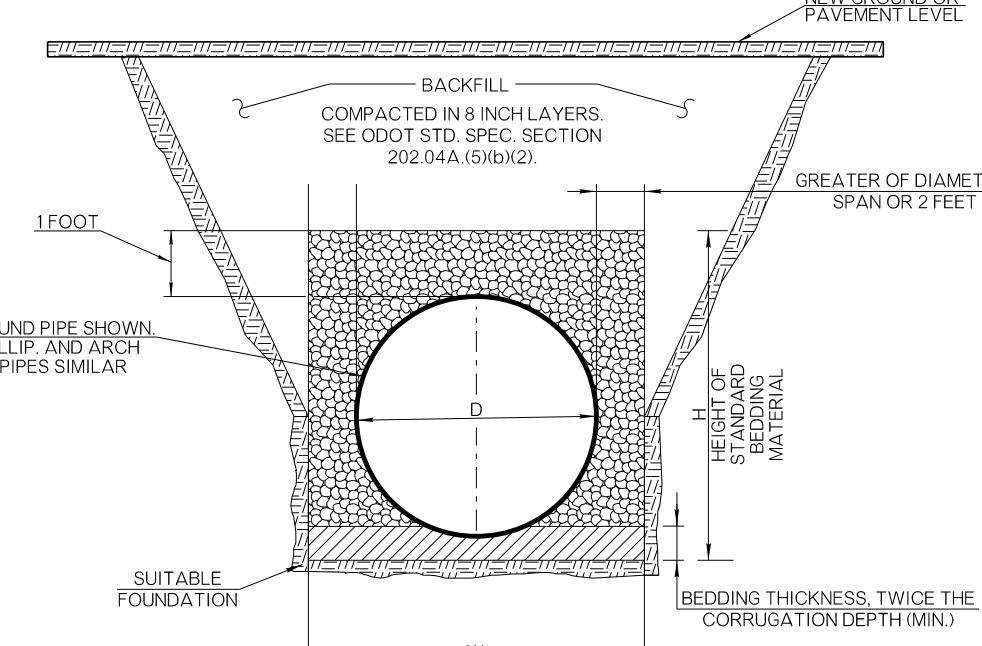
LEGEND	
D	= DIAMETER
	STANDARD BEDDING MATERIAL COMPACTED IN 6" LAYERS 95% MAXIMUM DENSITY
	SUITABLE FOUNDATION, FREE OF DEBRIS OR LOOSE SOIL
	BEDDING LOOSELY PLACED

TYPE OF MATERIAL	PITCH	DEPTH
CORRUGATED ALUMINUM ALLOY	2 2/3"	1/2"
CORRUGATED STEEL	2 2/3"	1/2"
CORRUGATED STEEL	3"	1"
CORRUGATED STEEL	5"	1"
STRUCTURAL PLATE CORR.	6"	2"



GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTIONS 613 AND 726.02 OF THE 2019 ODOT STANDARD SPECIFICATIONS.
- TRENCH EXCAVATION AND STANDARD BEDDING WILL NOT BE REQUIRED FOR PIPE INSTALLATIONS ON SIDE DRAINS, UNLESS OTHERWISE SPECIFIED IN THE PLANS.
- METAL PIPE FILL HEIGHT DESIGNS ARE BASED ON HS-20 LIVE LOADING AND 120 LBS/CF SOIL WEIGHT.
- TRENCHING REQUIREMENTS FOR DEPTHS OVER 5 FEET SHALL BE IN ACCORDANCE WITH AND DEFINED BY, O.S.H.A. REGULATIONS, TITLE 29 CFR, STANDARDS 1926.650, 1926.651 AND 1926.652. SEE DETAIL IN LOWER LEFT.
- IN THE EVENT LOADS IN EXCESS OF HL-93 ARE TO BE OPERATED OVER OR ADJACENT TO THE PIPE INSTALLATION DURING THE CONSTRUCTION PHASE, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A MINIMUM OF 3 FEET OF COVER OVER THE PIPE AT WHEEL OR TRACK PATHS. SEE TABLE ON ROADWAY STANDARD MCI-3.
- PROPER INSTALLATION PRACTICE MUST BE ADHERED TO AS SHOWN ON ROADWAY STANDARD PBB-1 AND THIS STANDARD. IN NO CASE SHALL A PIPE INSTALLATION, SUBJECT TO SUDDEN FLOW DEVELOPMENT, BE LEFT WITHOUT SUFFICIENT BACKFILL TO RESTRAIN THE CONDUIT AND PREVENT JOINT SEPARATION AND/OR PIPING SCOUR. PHYSICALLY RESTRAINING THE CONDUIT MAY BE USED TO AUGMENT OR REPLACE THIS IMMEDIATE BACKFILL REQUIREMENT.
- ANY EXCESS EXCAVATION NOT USED FOR BACKFILL WILL BECOME THE PROPERTY, AND DISPOSED OF BY THE CONTRACTOR IN A MANNER APPROVED BY THE ENGINEER.
- CORRUGATED GALVANIZED STEEL PIPE (CGSP) IS ZINC COATED (GALVANIZED). MILL PRECOATED CGSP HAS A COATING OF POLYMER OVER THE GALVANIZED LAYER. THE ALUMINIZED TYPE 2 CORRUGATED STEEL PIPE (CSP) HAS A PURE ALUMINUM COATING OVER THE CORRUGATED STEEL BASE PIPE AND DOES NOT HAVE A ZINC COATING. ALUMINIZED TYPE 2 CSP IS NOT AN ALUMINUM ALLOY PIPE.
- JOINTS IN METAL PIPES SHALL CONFORM TO SECTION 26.4.2.4 OF AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS. IF A WATERTIGHT JOINT IS SPECIFIED IN THE PLANS, A 12 INCHES WIDE BY 3/4 INCH THICK NEOPRENE SLEEVE GASKET MEETING ASTM D1056 REQUIREMENT SHALL BE USED. ALTERNATIVES MAY BE USED AT THE DISCRETION OF THE ENGINEER.
- BEDDING MATERIAL SHALL BE CLASS 'B' BEDDING MATERIAL, IF PIPE IS INSTALLED UNDER PAVEMENT. OTHERWISE, CLASS C OR D BEDDING IS USED. REFER TO ROADWAY STANDARD PBB-1 FOR MORE DETAILS.
- FOR INSTALLATION AND PAYMENT DETAILS OF TYPICAL END SECTIONS, SEE ROADWAY STANDARDS CET4D-4, CET6D-4, CET4S-4, CET6S-4 AND PCES-5. OTHER END SECTIONS MAY BE USED AT THE DISCRETION OF THE ENGINEER.
- METAL PIPE SHALL HAVE A MINIMUM COVER OF 1 FOOT. SEE ROADWAY STANDARD MCI-2.
- FOUNDATION SHALL BE MADE OF STABLE IN-SITU SOIL. IF THE FOUNDATION AREA IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER.



EMBANKMENT INSTALLATION

(INSTALLATION ON OR ABOVE EXISTING GROUND)

PIPE MATERIAL FABRICATION SPECIFICATIONS			PIPE DESCRIPTIONS
TYPE OF MATERIAL	AASHTO	ASTM	
CORRUGATED ALUMINUM PIPE	M 196	B 745	PIPE IS MADE OF PURE ALUMINUM ALLOY
CORRUGATED STEEL (GALVANIZED)	M 36	A 760	CORRUGATED STEEL PIPE IS GALVANIZED WITH A ZINC COATING
STRUCTURAL PLATE CORR. STEEL	M 167	A 761	STEEL PLATES ARE BOLTED TOGETHER TO FORM THE REQUIRED PIPE SHAPE
MILL PRECOATED CGSP	M 245	A 762	CORR. STEEL PIPE IS GALVANIZED WITH A ZINC COATING, THEN COATED WITH A POLYMER COATING
ALUMINUM COATED, TYPE 2 (ALUMINIZED)	M 36	A 760	CORR. STEEL PIPE IS COATED WITH A TYPE 2 ALUMINUM COATING

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (B)	<input type="checkbox"/> CORR. GALV. STEEL PIPE	LF
613 (B)	<input checked="" type="checkbox"/> CORR. GALV. STEEL PIPE ARCH	LF
613 (C)	<input checked="" type="checkbox"/> MILL PRECOATED CGSP	LF
613 (C)	<input type="checkbox"/> TYPE II ALUMINIZED CORR. STEEL PIPE, ARCH	LF
613 (C)	<input type="checkbox"/> TYPE II ALUMINIZED CORR. STEEL PIPE, ROUND	LF
613 (D)	<input type="checkbox"/> CORR. ALUMINUM PIPE	LF
613 (D)	<input checked="" type="checkbox"/> CORR. ALUMINUM PIPE ARCH	LF
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY
613 (V)	TRENCH EXCAVATION	CY

- SPECIFY SPAN AND RISE OF ARCH PIPE
- SPECIFY DIAMETER OF ROUND PIPE
- SPECIFY SIZE AND SHAPE OF PIPE

APPROVED BY _____
ROADWAY ENGINEER: _____ DATE: _____
ROADWAY DESIGN DIVISION STANDARD

METAL CULVERT INSTALLATION
(1 OF 3 SHEETS)

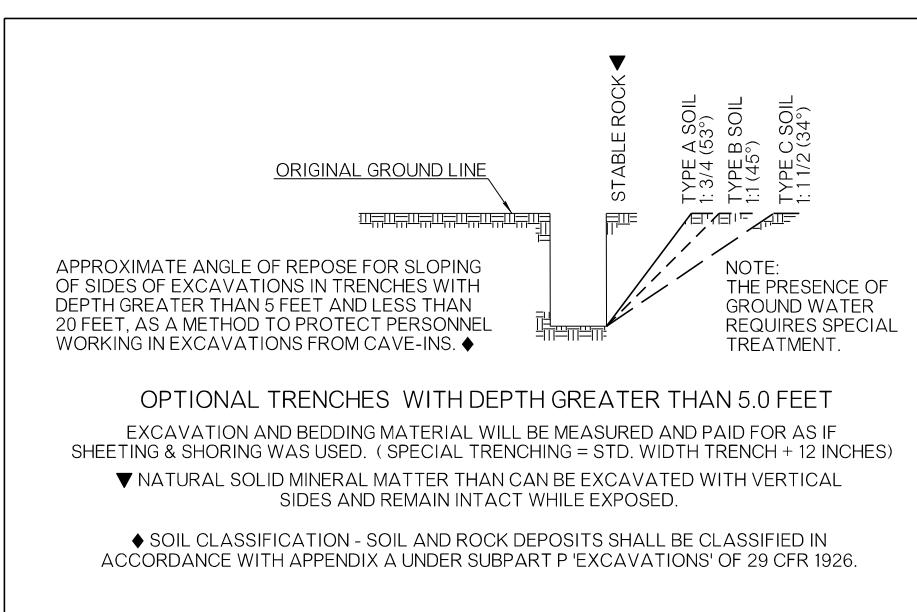


2019 SPECIFICATIONS

MCI-1

0

R-59



FULL CIRCLE STEEL PIPE CULVERT (INCLUDING ALL COATED TYPES)

PIPE DIAM. IN INCHES	PIPE CHARACTERISTICS			MIN. COVER (INCHES) TOP OF PIPE TO TOP OF SUBGRADE	MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)						
	CORRUGATED STEEL				EQUIV. STANDARD GAGE						
	2 2/3" X 1/2"	3" X 1"	5" X 1"	6"x2" STR. PLATE	16	14	12	10	8	7	5
12"	●			12"	218'	272'					
15"	●			12"	174'	218'					
18"	●			12"	145'	181'	254'				
21"	●			12"	124'	155'	218'				
24"	●			12"	108'	136'	190'				
30"	●			12"	87'	108'	152'				
36"	●			12"	72'	90'	127'	163'			
42"	●			12"	83'	104'	146'	188'	231'		
48"	●			12"	62'	77'	108'	140'	171'		
54"	●			12"	71'	89'	125'	161'	198'		
60"	●			12"	54'	67'	95'	122'	150'		
66"	●			12"	62'	78'	109'	141'	173'		
72"	●			12"	55'	69'	97'	125'	153'		
78"	●			12"	60'	84'	109'	133'			
84"	●			12"	55'	69'	97'	125'	153'		
90"	●			12"	49'	61'	86'	111'	136'		
96"	●			12"	49'	61'	86'	111'	136'		
102"	●			12"	45'	56'	79'	102'	125'		
108"	●			12"	40'	50'	70'	91'	111'		
114"	●			12"	44'	55'	78'	100'	123'		
120"	●			12"	46'	55'	89'	109'	138'		
126"	●			12"	40'	50'	70'	91'	111'		
132"	●			12"	42'	62'	78'	98'	120'		
138"	●			12"	36'	46'	64'	83'	102'	122'	90'
144"	●			12"	38'	48'	64'	83'	102'	122'	106'
150"	●			12"	31'	41'	51'	72'	94'	115'	
156"	●			12"	33'	41'	51'	72'	94'	115'	
162"	●			12"	35'	43'	53'	73'	94'	115'	
168"	●			12"	31'	41'	51'	72'	94'	115'	
174"	●			12"	33'	41'	51'	72'	94'	115'	
180"	●			12"	35'	43'	53'	73'	94'	115'	
186"	●			12"	31'	41'	51'	72'	94'	115'	
192"	●			12"	33'	41'	51'	72'	94'	115'	
198"	●			12"	35'	43'	53'	73'	94'	115'	
204"	●			12"	31'	41'	51'	72'	94'	115'	
210"	●			12"	33'	41'	51'	72'	94'	115'	
216"	●			12"	35'	43'	53'	73'	94'	115'	
222"	●			12"	31'	41'	51'	72'	94'	115'	
228"	●			12"	33'	41'	51'	72'	94'	115'	
234"	●			12"	35'	43'	53'	73'	94'	115'	
240"	●			12"	31'	41'	51'	72'	94'	115'	
246"	●			12"	33'	41'	51'	72'	94'	115'	
252"	●			12"	35'	43'	53'	73'	94'	115'	
258"	●			12"	31'	41'	51'	72'	94'	115'	
264"	●			12"	33'	41'	51'	72'	94'	115'	
270"	●			12"	35'	43'	53'	73'	94'	115'	
276"	●			12"	31'	41'	51'	72'	94'	115'	
282"	●			12"	33'	41'	51'	72'	94'	115'	
288"	●			12"	35'	43'	53'	73'	94'	115'	
294"	●			12"	31'	41'	51'	72'	94'	115'	
300"	●			12"	33'	41'	51'	72'	94'	115'	
306"	●			12"	35'	43'	53'	73'	94'	115'	
312"	●			12"	31'	41'	51'	72'	94'	115'	
318"	●			12"	33'	41'	51'	72'	94'	115'	
324"	●			12"	35'	43'	53'	73'	94'	115'	
330"	●			12"	31'	41'	51'	72'	94'	115'	
336"	●			12"	33'	41'	51'	72'	94'	115'	
342"	●			12"	35'	43'	53'	73'	94'	115'	
348"	●			12"	31'	41'	51'	72'	94'	115'	
354"	●			12"	33'	41'	51'	72'	94'	115'	
360"	●			12"	35'	43'	53'	73'	94'	115'	
366"	●			12"	31'	41'	51'	72'	94'	115'	
372"	●			12"	33'	41'	51'	72'	94'	115'	
378"	●			12"	35'	43'	53'	73'	94'	115'	
384"	●			12"	31'	41'	51'	72'	94'	115'	
390"	●			12"	33'	41'	51'	72'	94'	115'	
396"	●			12"	35'	43'	53'	73'	94'	115'	
402"	●			12"	31'	41'	51'	72'	94'	115'	
408"	●			12"	33'	41'	51'	72'	94'	115'	
414"	●			12"	35'	43'	53'	73'	94'	115'	
420"	●			12"	31'	41'	51'	72'	94'	115'	
426"	●			12"	33'	41'	51'	72'	94'	115'	
432"	●			12"	35'	43'	53'	73'	94'	115'	
438"	●			12"	31'	41'	51'	72'	94'	115'	
444"	●			12"	33'	41'	51'	72'	94'	115'	
450"	●			12"	35'	43'	53'	73'	94'	115'	
456"	●			12"	31'	41'	51'	72'	94'	115'	
462"	●			12"	33'	41'	51'	72'	94'	115'	
468"	●			12"	35'	43'	53'	73'	94'	115'	
474"	●			12"	31'	41'	51'	72'	94'	115'	
480"	●			12"	33'	41'	51'	72'	94'	115'	
486"	●			12"	35'	43'	53'	73'	94'	115'	
492"	●			12"	31'	41'	51'	72'	94'	115'	
498"	●			12"	33'	41'	51'	72'	94'	115'	
504"	●			12"	35'	43'	53'	73'	94'	115'	
510"	●			12"	31'	41'	51'	72'	94'	115'	
516"	●			12"	33'	41'</					

STANDARD BEDDING MATERIAL QUANTITIES (ROUND PIPE)

PIPE DIAMETER	H STD. BEDDING MAT'L ■	BEDDING THICKNESS UNDER PIPE	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING		TRIPLE PIPE STANDARD TRENCHING		SPACING BETWEEN PIPES ▲	SPACING OUTSIDE OF PIPE, EACH SIDE
			W WIDTH	STANDARD BEDDING MATERIAL ■	W WIDTH	STANDARD BEDDING MATERIAL ■	W WIDTH	STANDARD BEDDING MATERIAL ■		
INCHES	FT.	INCHES	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF	INCHES	FT.
12	2.17	2.00	5.00	0.37	7.00	0.53	9.00	0.69	12	2.00
15	2.42	2.00	5.25	0.42	7.50	0.63	9.75	0.83	12	2.00
18	2.67	2.00	5.50	0.48	8.00	0.72	10.50	0.97	12	2.00
21	2.92	2.00	5.75	0.53	8.50	0.83	11.25	1.13	12	2.00
24	3.17	2.00	6.00	0.59	9.00	0.94	12.00	1.29	12	2.00
30	3.67	2.00	6.50	0.70	10.25	1.21	14.00	1.72	15	2.00
36	4.17	2.00	7.00	0.82	11.50	1.51	16.00	2.21	18	2.00
42	4.67	2.00	7.50	0.94	12.75	1.85	18.00	2.75	21	2.00
48	5.17	2.00	8.00	1.07	14.00	2.21	20.00	3.36	24	2.00
54	5.67	2.00	8.50	1.19	15.25	2.61	22.00	4.03	27	2.00
60	6.17	2.00	9.00	1.33	16.50	3.04	24.00	4.75	30	2.00
66	6.67	2.00	9.50	1.47	17.75	3.50	26.00	5.54	33	2.00
72	7.17	2.00	10.00	1.61	19.00	4.00	28.00	6.38	36	2.00
78	7.67	2.00	10.50	1.75	20.00	4.45	29.50	7.15	36	2.00
84	8.17	2.00	11.00	1.90	21.00	4.93	31.00	7.95	36	2.00
90	8.67	2.00	11.50	2.06	22.00	5.43	32.50	8.80	36	2.00
96	9.17	2.00	12.00	2.21	23.00	5.95	34.00	9.68	36	2.00
102	9.73	2.00	12.50	2.40	24.00	6.55	35.50	10.69	36	2.00
108	10.29	2.00	13.00	2.60	25.00	7.17	37.00	11.75	36	2.00
114	10.85	2.00	13.50	2.80	26.00	7.83	38.50	12.85	36	2.00
120	11.42	2.00	14.00	3.01	27.00	8.51	40.00	14.00	36	2.00

MINIMUM COVER FOR CONSTRUCTION LOADS (INCHES)

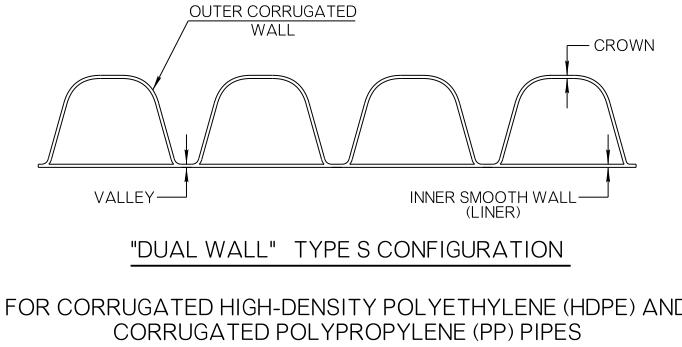
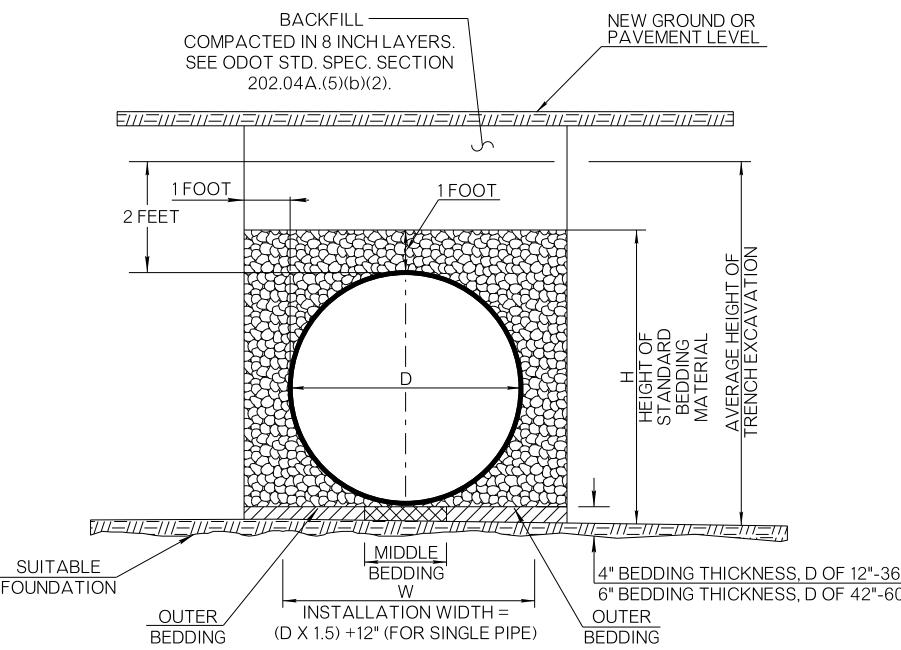
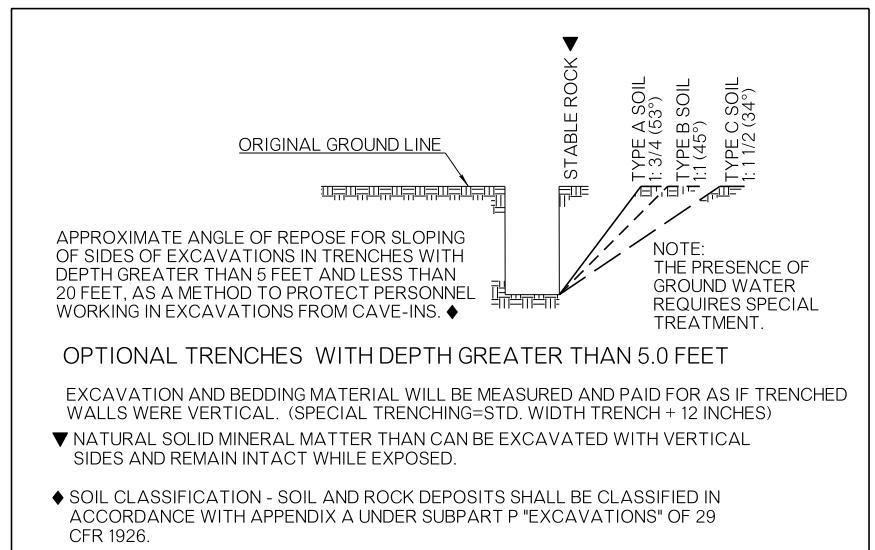
DIAMETER OR PIPE SPAN INCHES	AXLE FORCE			
	18-50 KIPS	50-75 KIPS	75-110 KIPS	110-150 KIPS
12" - 42"	24"	30"	36"	36"
48" - 72"	36"	42"	48"	48"
78" - 120"	36"	42"	48"	48"
126" - 144"	42"	48"	54"	54"

THE CONTRACTOR SHALL PROVIDE MINIMUM COVER PLUS ANY ADDITIONAL COVER (AS SPECIFIED BY THE ENGINEER) REQUIRED TO AVOID DAMAGE TO THE PIPE. IN UNPAVED SITUATIONS, THE SURFACE MUST BE MAINTAINED TO A LEVEL AND NON-RUTTED CONDITION.

STANDARD BEDDING MATERIAL QUANTITIES (ARCH PIPE)

SPAN	HEIGHT	EQUIV. ROUND	H STD. BEDDING MAT'L ■	BEDDING THICKNESS UNDER PIPE	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING		TRIPLE PIPE STANDARD TRENCHING		SPACING BETWEEN PIPES	SPACING OUTSIDE OF PIPE, TRENCH WALL	
					W WIDTH, USING SPAN	STANDARD BEDDING MATERIAL ■	W WIDTH, USING SPAN	STANDARD BEDDING MATERIAL ■	W WIDTH, USING SPAN	STANDARD BEDDING MATERIAL ■			
INCHES	INCHES	INCHES	FT.	INCHES	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF	INCHES	FT.	
17	13	15	2 2/3" x 1 1/2" CORRUGATION	2.25	2.00	5.42	0.41	7.83	0.61	10.25	0.81	12.00	2.00
21	15	18		2.42	2.00	5.75	0.45	8.50	0.70	11.25	0.94	12.00	2.00
24	18	21		2.67	2.00	6.00	0.50	9.00	0.80	12.00	1.10	12.00	2.00
28	20	24		2.83	2.00	6.33	0.55	9.67	0.90	13.00	1.25	12.00	2.00
35	24	30		3.17	2.00	6.92	0.63	10.83	1.09	14.75	1.55	12.00	2.00
42	29	36		3.58	2.00	7.50	0.73	12.00	1.33	16.50	1.93	12.00	2.00
49	33	42		3.92	2.00	8.08	0.82	13.53	1.61	18.97	2.40	16.33	2.00
57	38	48		4.33	2.00	8.75	0.94	15.08	1.96	21.42	2.97	19.00	2.00
64	43	54		4.75	2.00	9.33	1.05	16.44	2.30	23.56	3.55	21.33	2.00
71	47	60		5.08	2.00	9.92	1.14	17.81	2.63	25.69	4.11	23.67	2.00
77	52	66		5.50	2.00	10.42	1.24	18.97	2.98	27.53	4.73	25.67	2.00
83	57	72		5.92	2.00	10.92	1.35	20.14	3.37	29.36	5.39	27.67	2.00
40	31	36	3" x 1" & 5" x 1" CORRUGATION	3.75	2.00	7.33	0.76	11.67	1.36	16.00	1.96	12.00	2.00
46	36	42		4.17	2.00	7.83	0.85	12.94	1.64	18.06	2.43	15.33	2.00
53	41	48		4.58	2.00	8.42	0.96	14.31	1.96	20.19	2.96	17.67	2.00
60	46	54		5.00	2.00	9.00	1.08	15.67	2.31	22.33	3.55	20.00	2.00
66	51	60		5.42	2.00	9.50	1.18	16.83	2.65	24.17	4.12	22.00	2.00
73	55	66		5.75	2.00	10.08	1.27	18.19	2.99	26.31	4.72	24.33	2.00
81	59	72		6.08	2.00	10.75	1.37	19.75	3.40	28.75	5.43	27.00	2.00
87	63	78		6.42	2								

LEGEND	
D	= DIAMETER
	STANDARD BEDDING MATERIAL COMPACTED IN 6" LAYERS 95% MAXIMUM DENSITY
	SUITABLE FOUNDATION, FREE OF DEBRIS OR LOOSE SOIL
	MIDDLE BEDDING, LOOSELY PLACED, UNCOMPACTED
	OUTER BEDDING COMPACTED TO 95% MAXIMUM DENSITY



CORRUGATED POLYPROPYLENE AND HIGH DENSITY POLYETHYLENE PIPES									
STANDARD BEDDING MATERIAL QUANTITIES									
PIPE DIAM. (D) IN.	H STD BED. MAT. FT.	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE		CLEAR SPACE BETWEEN PIPES FEET	SPACE BETWEEN PIPE AND TRENCH WALL FEET
		W WIDTH	STANDARD BEDDING MATERIAL CY/LF	W WIDTH	STANDARD BEDDING MATERIAL CY/LF	W WIDTH	STANDARD BEDDING MATERIAL CY/LF		
12	2.33	2.50	0.19	5.00	0.37	7.00	0.52	1.00	1.00
15	2.58	2.88	0.23	5.50	0.44	7.75	0.61	1.00	1.00
18	2.83	3.25	0.28	6.00	0.50	8.50	0.70	1.00	1.00
24	3.33	4.00	0.38	7.00	0.63	10.00	0.89	1.00	1.00
30	3.83	4.75	0.49	8.25	0.81	12.00	1.16	1.25	1.00
36	4.33	5.50	0.62	9.50	1.00	14.00	1.46	1.50	1.00
42	4.83	6.25	0.76	10.75	1.21	16.00	1.80	1.75	1.00
48	5.33	7.00	0.92	12.00	1.44	18.00	2.16	2.00	1.00
60	6.33	8.50	1.27	15.00	2.06	22.50	3.10	2.50	1.25

■ HEIGHT OF STD BEDDING MATERIAL INCLUDES THE BEDDING UNDER PIPE, THE NOMINAL DIAMETER OF THE PIPE, AND 12 INCHES ABOVE TOP OF PIPE.

■ FOR PIPES UNDER PAVEMENT, THE H DIMENSION AND THE STANDARD BEDDING MATERIAL QUANTITY SHALL BE INCREASED TO GO TO THE PAVEMENT. SEE ROADWAY STANDARD PBB-1.

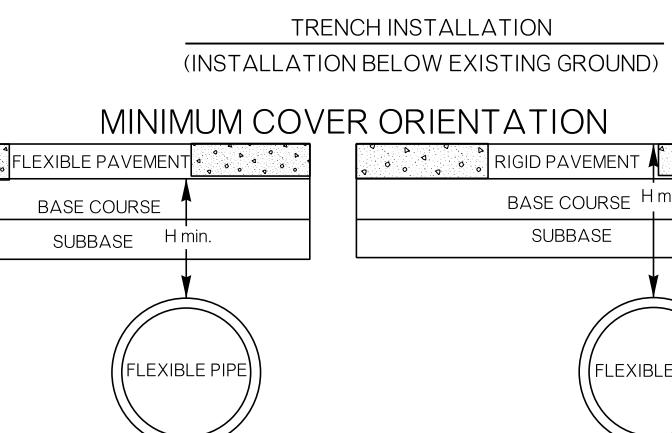
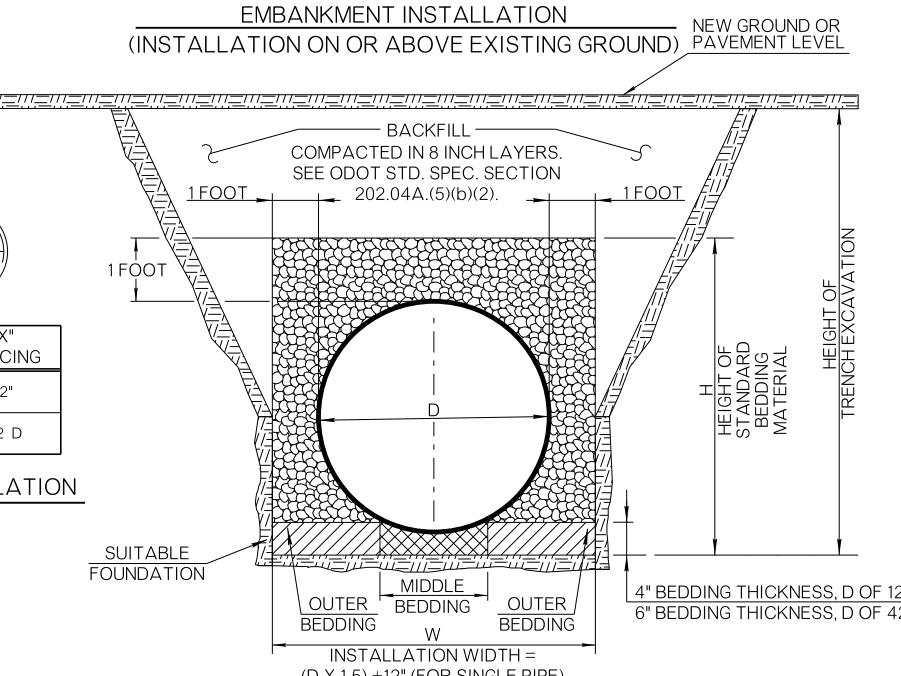
▲ SEE MULTIPLE INSTALLATIONS TABLE.

ALLOWABLE PIPE SIZES	
CORRUGATED HIGH DENSITY POLYETHYLENE PIPE, TYPE S (HDPE) ■	CORRUGATED POLYPROPYLENE PIPE, TYPE S (PP) ●
AASHTO M 294	AASHTO M 330
ASTM F2306	ASTM F2881
DIAMETER (INCHES)	DIAMETER (INCHES)
12	12
15	15
18	18
24	24
30	30
36	36
42	42
48	48
60	60

■ SEE "DUAL WALL" TYPE S CONFIGURATION DETAIL

MINIMUM AND MAXIMUM HEIGHT OF COVER FOR CORR. HIGH DENSITY POLYETHYLENE (HDPE) AND CORR. POLYPROPYLENE (PP) PIPES ●				
PIPE DIAMETER	MIN. HT. OF COVER		MAX. HT. OF COVER	
	HDPE	PP	HDPE	PP
INCHES	FEET	FEET	FEET	FEET
12	1	1	29	32
15	1	1	26	30
18	1	1	26	25
24	1	1	24	25
30	1	1	24	25
36	1	1	24	24
42	1	1	23	23
48	1	2	23	21
60	1	2	23	21

● MINIMUM COVER DEPTH IS TAKEN FROM AASHTO LRFD BRIDGE DESIGN SPEC. 12.6.6.3, AND THE MAXIMUM COVER DEPTH IS TAKEN FROM PLASTIC PIPE INSTITUTE'S HANDBOOK, CHAPTER 7.



H min. = MINIMUM ALLOWABLE COVER DIMENSION

NOTE: THE MINIMUM COVER DIMENSION IS NOT TO BE CONFUSED WITH THE FILL HEIGHT USED FOR CALCULATION PURPOSES, WHICH SHALL BE FROM THE TOP OF THE PIPE TO THE TOP OF THE SURFACE, REGARDLESS OF THE PIPE TYPE OR PAVEMENT TYPE.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (E)	CORRUGATED POLYETHYLENE PIPE	LF
613 (EE)	CORRUGATED POLYPROPYLENE PIPE	LF
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY
613 (V)	TRENCH EXCAVATION	CY

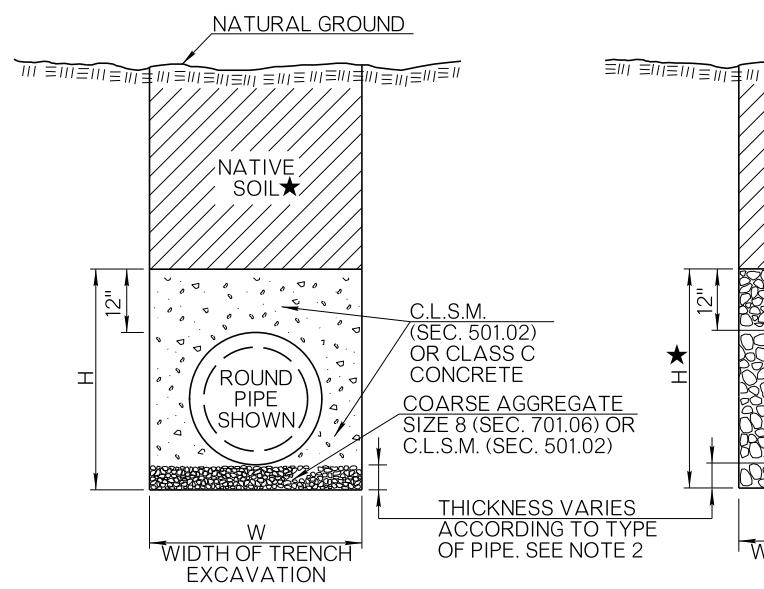
ROADWAY DESIGN DIVISION STANDARD
THERMOPLASTIC
CULVERT INSTALLATION



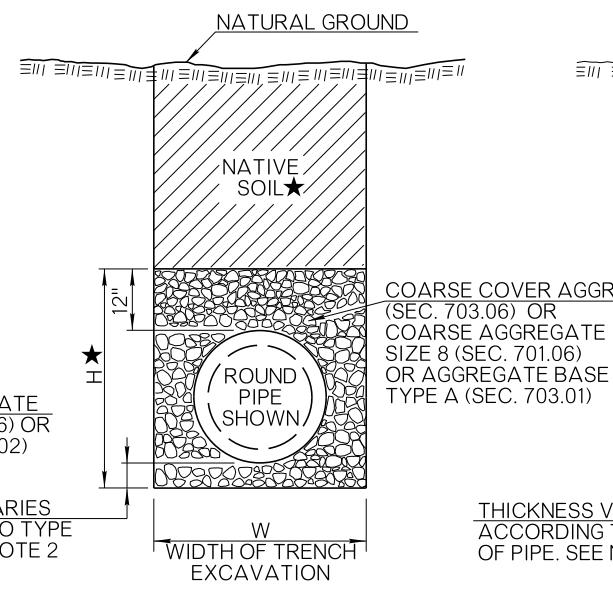
APPROVED BY ROADWAY DESIGN DIVISION
ON 01/07/2026

2019 SPECIFICATIONS
TCI-1
1

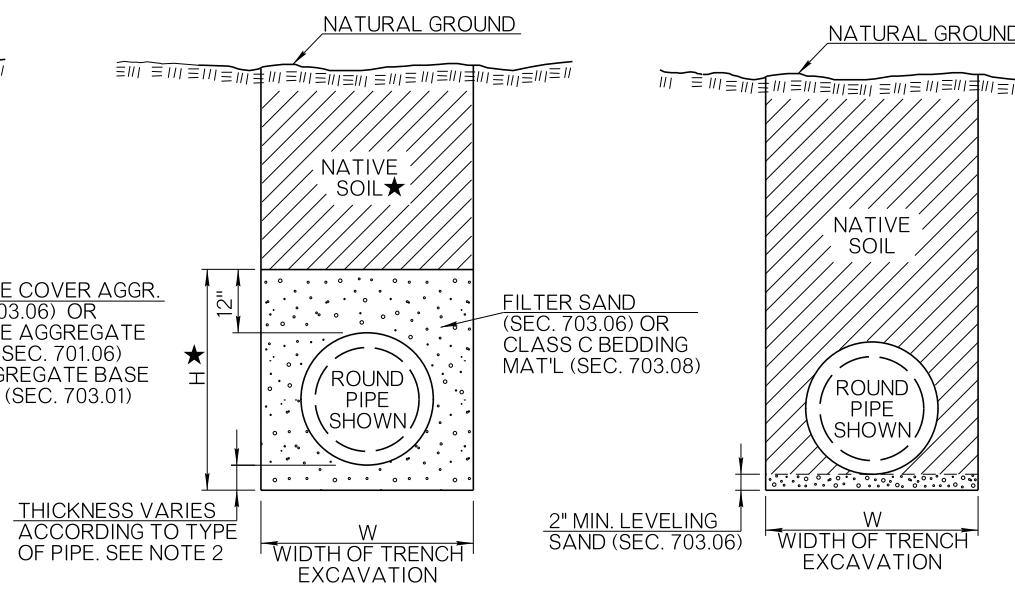
R-62



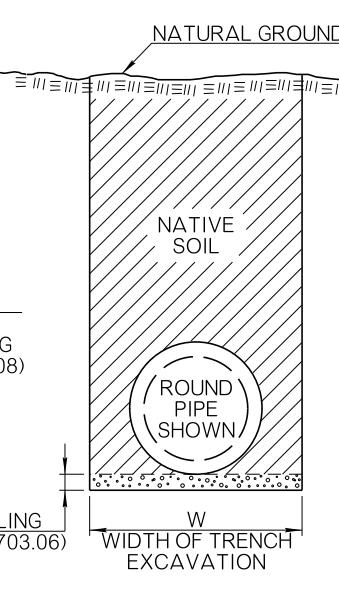
CLASS A BEDDING



CLASS B BEDDING



CLASS C BEDDING



CLASS D BEDDING
ALTERNATE 1

GENERAL NOTES

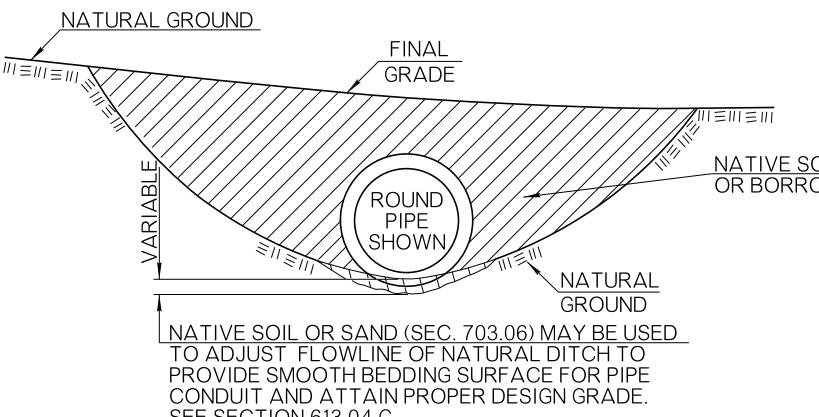
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- THE THICKNESS OF BEDDING MATERIAL BELOW PIPE CONDUIT VARIES ACCORDING TO THE TYPE OF PIPE BEING INSTALLED. SEE ROADWAY STANDARDS CCI-1, TCI-1 AND MCI-1.
- NATIVE SOIL FOR BACKFILL, TO BE COMPAKTED IN ACCORDANCE WITH SECTION 202.04 OF THE STANDARD SPECIFICATIONS.
- A BETTER CLASS OF BEDDING MAY BY SUBSTITUTED FOR THE NEXT LOWER CLASS. EXAMPLE: CLASS A STANDARD BEDDING CAN BE USED IN LIEU OF CLASS B STANDARD BEDDING.
- FOR TRENCH WIDTH (W), BEDDING HEIGHT (H), PIPE DATA, MULTIPLE PIPE SPACING & BEDDING DATA, SEE ROADWAY STANDARDS CCI-1, TCI-1, MCI-1, AND MCI-3.
- DESIGN TABLE WILL DISPLAY 'NA' WHEN THE TYPE OF PIPE IS NOT ALLOWED.
- STANDARD BEDDING CLASS D MATERIAL(S) (ALTERNATE 1) WILL BE CONSIDERED AS INCIDENTAL AND NOT BE PAID FOR SEPARATELY. COST FOR BORROW OR FILL MATERIAL, NEEDED FOR ALTERNATE 2, WILL BE INCLUDED IN THE PRICE OF THE PIPE.
- PIPE MATERIAL(S) / PRODUCT(S) NOT SHOWN IN THE DESIGN TABLE WILL BE EVALUATED AND APPROVED ON A CASE BY CASE BASIS.
- ALL TEMPORARY PIPES SHALL HAVE CLASS D BEDDING UNLESS OTHERWISE SHOWN IN THE PLANS.
- BEDDING MATERIAL CLASSES B, C, AND D, SHALL BE PLACED IN 6" LAYERS. CLASSES C AND D BEDDING SHALL BE COMPAKTED TO 95% MAXIMUM DENSITY AND CLASS B SHALL BE COMPAKTED TO 98% STANDARD DENSITY. ALL COMPAKTION OF BEDDING MATERIAL SHALL BE DONE USING HAND-OPERATED EQUIPMENT ONLY.

- WHEN PIPE INSTALLATION IS UNDER PAVING, IN LIEU OF BACKFILLING WITH NATIVE SOIL, PLACE BEDDING MATERIAL ALL THE WAY TO THE PAVEMENT FOR ALL PIPES EXCEPT REINFORCED CONCRETE PIPE. THE STANDARD BEDDING HEIGHT FOR REINFORCED CONCRETE PIPE SHALL GO TO THE SPRINGLINE OF PIPE, NO MATTER IF PIPE IS UNDER PAVEMENT OR NOT. SEE ROADWAY STANDARD CCI-1 FOR DETAILS.
- THE USE OF AN ALTERNATE PIPE AND ITS CORRESPONDING BEDDING MATERIAL WILL BE ACCEPTABLE PROVIDED THE CRITERIA IN THE DESIGN TABLE IS MET.
- CORRUGATED POLYPROPYLENE PIPE SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321.

TYPE OF PIPE	■ UNDER PAVING			OUTSIDE PAVING			
	CROSS DRAIN (NHS OR ADT > 6000 VPD)	CROSS DRAIN (OTHER)	STORM SEWER (NHS OR ADT > 6000 VPD)	STORM SEWER (OTHER)	CROSS DRAIN	SIDE DRAIN	STORM SEWER
REINFORCED CONCRETE PIPE	B	C	B	C	C	D	C
CORRUGATED GALV. STEEL PIPE (CGSP)	NA	B	NA	B	C	D	C
MILL (POLYMER) PRECOATED CGSP	NA	B	NA	B	C	D	C
CORRUGATED GALV. STRUCT. PLATE	NA	B	NA	B	C	D	C
ALUMINIZED (ALUMINUM COATED) TYPE II CSP	NA	B	NA	B	C	D	C
CORRUGATED HIGH DENSITY POLYETHYLENE / PVC	NA	A	NA	A	B	B	B
POLYVINYL CHLORIDE (SC 40/80 PVC)	NA	NA	NA	NA	NA	NA	NA
CORRUGATED POLYPROPYLENE PIPE (PP) ▲	B	B	B	B	C	D	C

■ WHEN THERE IS ANY POSSIBILITY OF THE PAVEMENT BEING WIDENED DURING THE LIFE OF THE DRAINAGE STRUCTURE, THE BEDDING SHALL MEET THE 'UNDER PAVING SECTION' CRITERIA FOR THE FULL EXTENT OF ANY ANTICIPATED EXPANSION TO THE FACILITY.

▲ BACKFILL WITH A MINIMUM OF TWO (2) FEET OF APPROVED BACKFILL MATERIAL FOR DIAMETERS GREATER THAN 42 INCHES. SEE ROADWAY STANDARD "THERMOPLASTIC CULVERT INSTALLATION"



CLASS D BEDDING
ALTERNATE 2

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (R)	STANDARD BEDDING MATERIAL, CLASS A	CY
613 (S)	STANDARD BEDDING MATERIAL, CLASS B	CY
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY

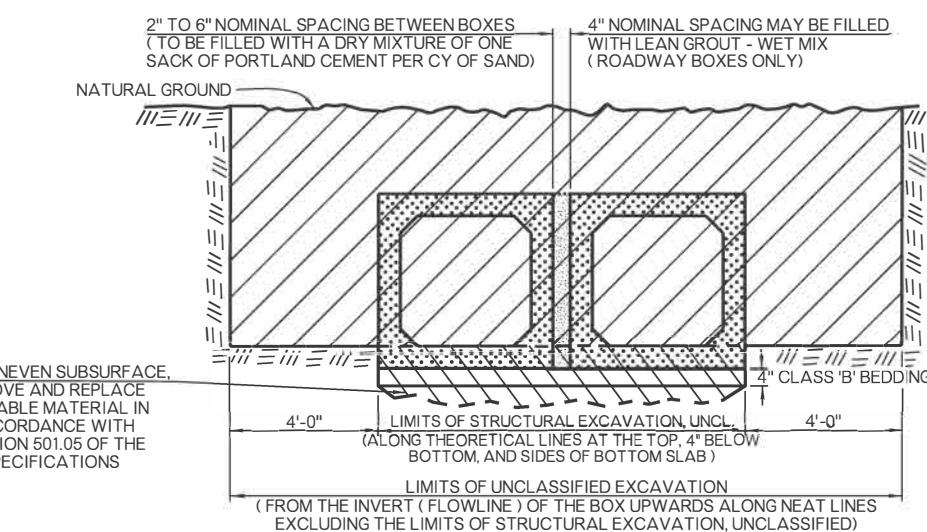
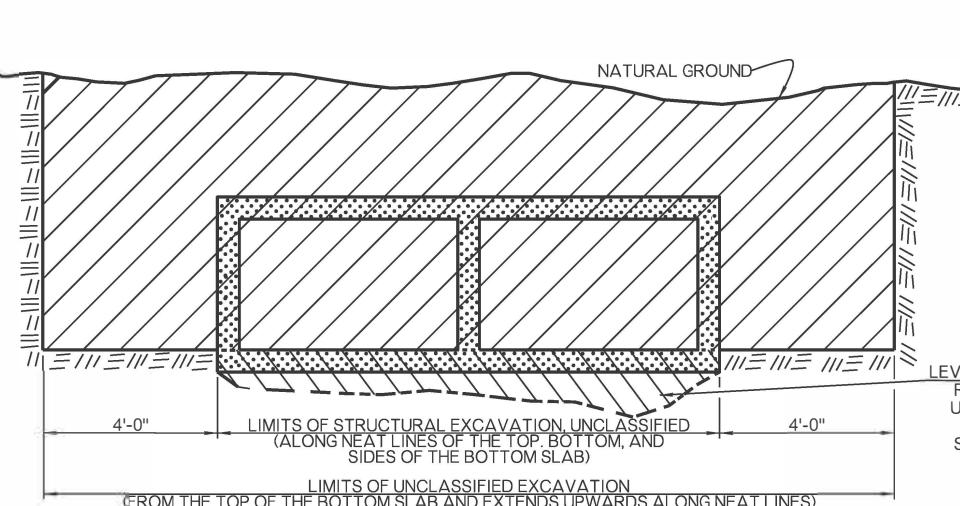
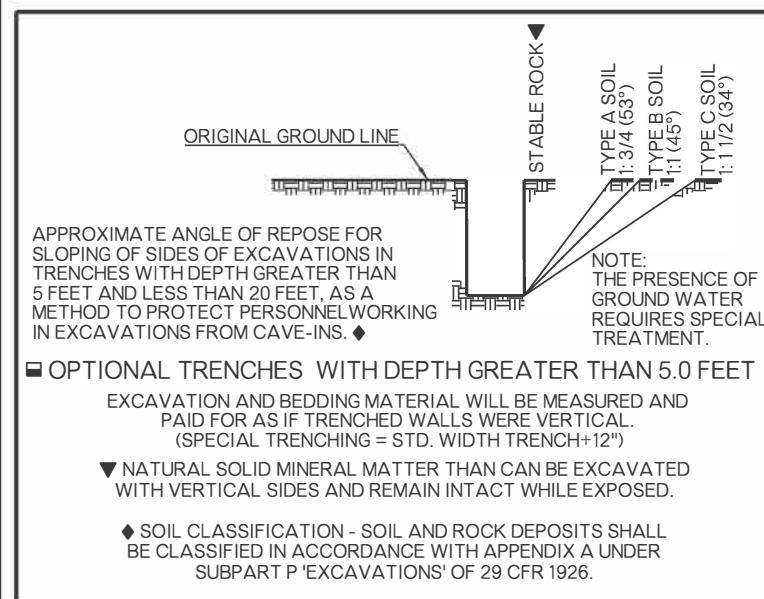
ROADWAY DESIGN DIVISION STANDARD

PIPE BEDDING AND BACKFILL



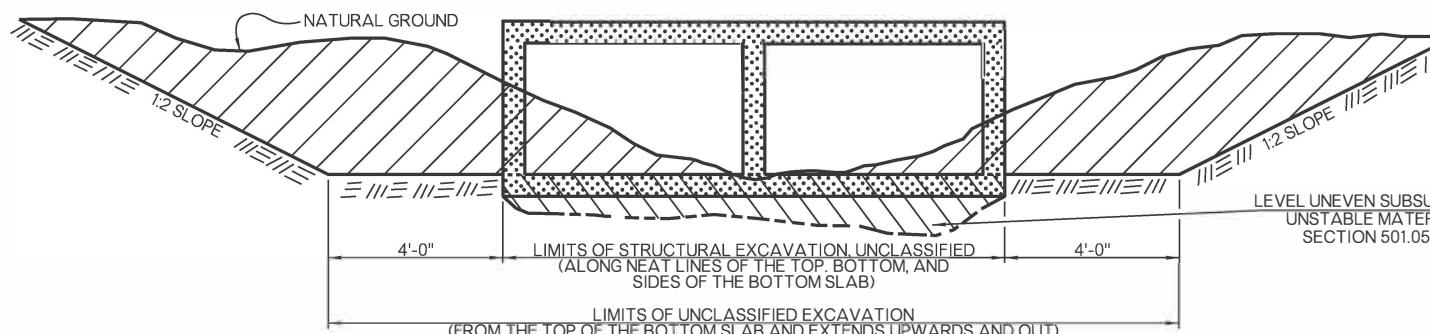
APPROVED BY ROADWAY DESIGN DIVISION
ON 01/07/2026

2019 SPECIFICATIONS
PBB-1 4

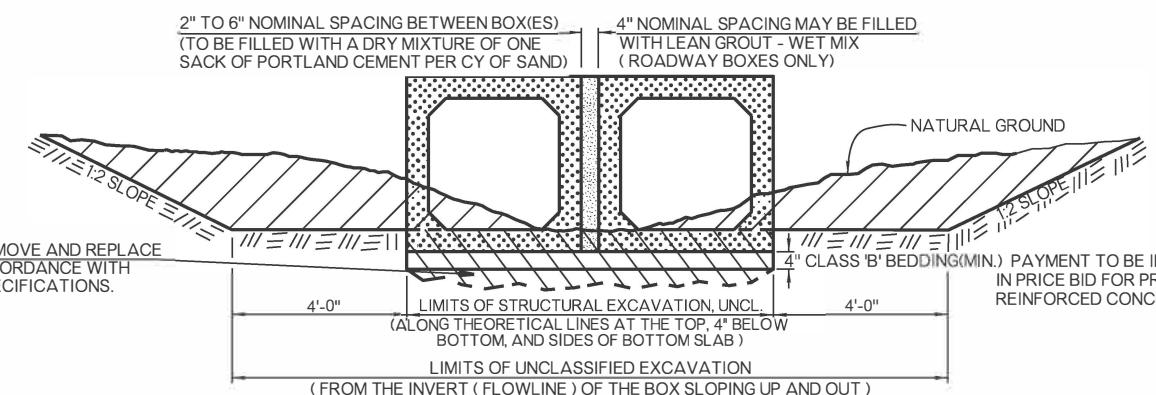


REQUIREMENTS FOR UNCLASSIFIED AND STRUCTURAL EXCAVATION OF RCB STORM SEWERS

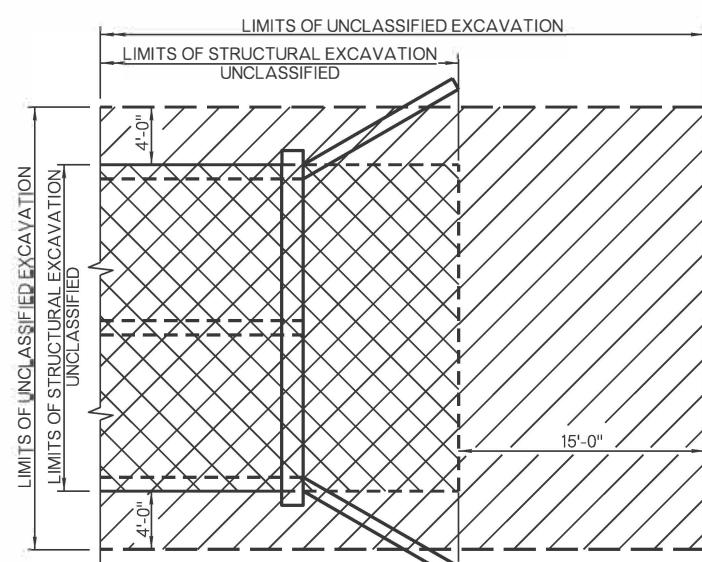
REQUIREMENTS FOR EXCAVATION OF PRECAST RCB STORM SEWERS



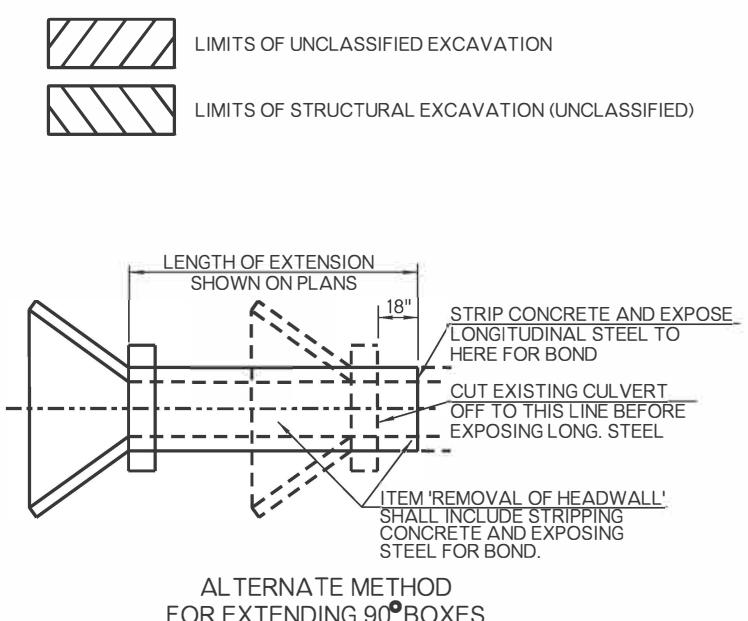
REQUIREMENTS FOR UNCLASSIFIED AND STRUCTURAL EXCAVATION OF RCB CULVERTS OF ROADWAY AND BRIDGE CLASSIFICATION



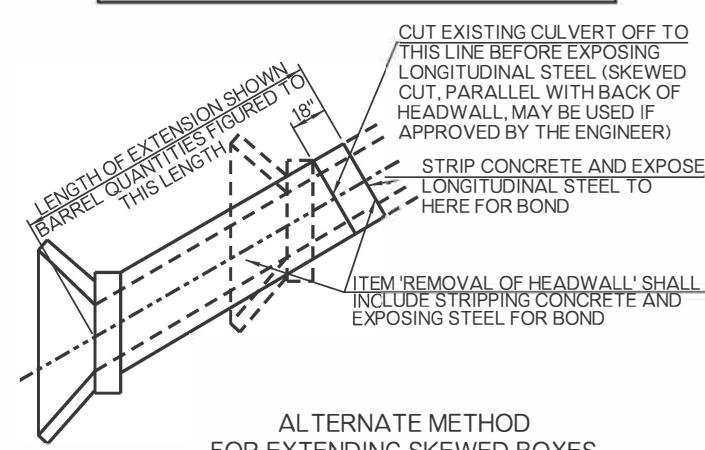
REQUIREMENTS FOR EXCAVATION OF PRECAST RCB CULVERTS OF ROADWAY AND BRIDGE CLASSIFICATION.



PLAN VIEW



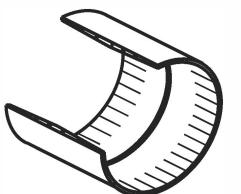
ALTERNATE METHOD FOR EXTENDING 90° BOXES



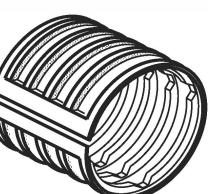
ALTERNATE METHOD FOR EXTENDING SKEWED BOXES

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
202 (A)	UNCLASSIFIED EXCAVATION	CY
501 (A)	STRUCTURAL EXCAVATION UNCLASSIFIED	CY
619 (B)	REMOVAL OF HEADWALL	EA

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



TYPICAL COUPLING FOR
PVC PIPE UNDERDRAIN
1/4 SECTION REMOVED



TYPICAL CORRUGATED COUPLING
OR AN APPROVED EQUAL

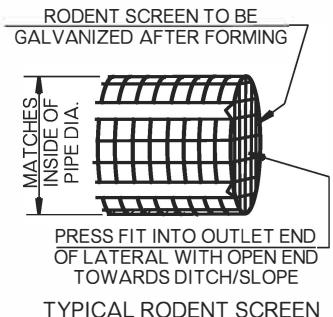
INSTALLATION TECHNIQUE: (12" DIAMETER OR SMALLER)

PERFORATED PIPE UNDERDRAIN, WHEN INSTALLED IN A TRENCH, SHALL BE BEDDED ON 4" OF COARSE COVER AGGREGATE. THE INSTALLED PIPE SHALL THEN BE CAREFULLY BACKILLED WITH THE REMAINING COARSE COVER AGGREGATE TO 6" ABOVE THE TOP OF THE PIPE. FILTER SAND SHALL BE INSTALLED TO APPROXIMATELY 6" BELOW THE ORIGINAL NATURAL GROUND AS APPROVED BY THE ENGINEER. THE COARSE COVER AGGREGATE AND FILTER SAND SHALL BE PAID FOR AS PIPE UNDERDRAIN COVER MATERIAL AND SHALL CONFORM TO SEC. 703.06 OF THE SPECIFICATIONS.

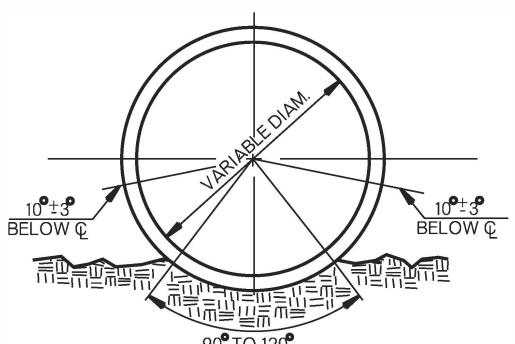
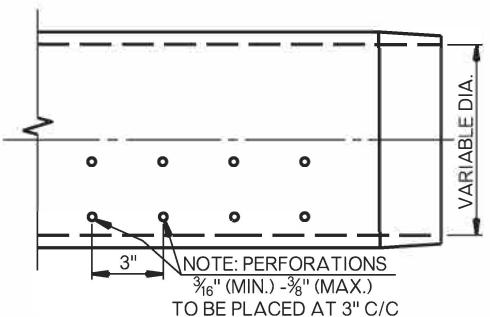
NON-PERFORATED PIPE UNDERDRAIN, WHEN INSTALLED IN A TRENCH, SHALL BE BEDDED IN A 4" LAYER CONSISTING OF COARSE AGGREGATE COVER MATERIAL OR A 50-50 MIX OF COARSE AGGREGATE COVER MATERIAL AND FILTER SAND. THIS LAYER OF COVER MATERIAL SHALL CONFORM TO SEC. 703.06, AND SHALL BE PAID FOR AS PIPE UNDERDRAIN COVER MATERIAL. THE REMAINING BACKFILL MAY BE NATIVE SOIL REMOVED IN THE TRENCHING OPERATION, FILTER SAND OR BACKFILLED ACCORDING TO THE ENGINEER. COST TO BE INCLUDED IN OTHER ITEMS OF WORK. SEE GENERAL NOTE NUMBERS 5 & 6.

GENERAL NOTES

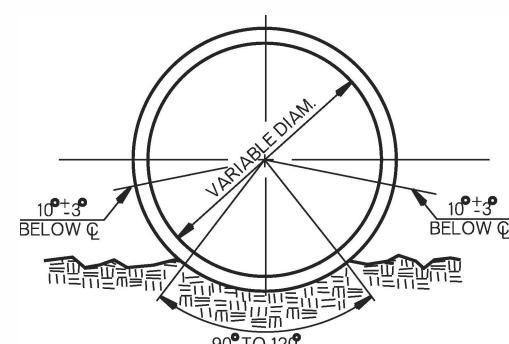
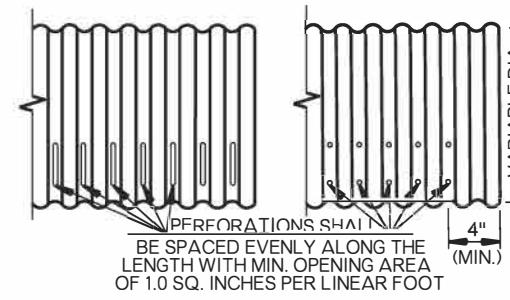
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. THE EXTENT, LOCATION AND DEPTH OF DRAINS MAY BE ADJUSTED BY THE ENGINEER TO SUIT CONDITIONS FOUND DURING CONSTRUCTION.
3. COST OF ALL FITTINGS TO BE INCLUDED IN THE PRICE BID PER LINEAR FOOT OF PIPE UNDERDRAIN.
4. FOR PIPE UNDERDRAIN OF UP TO 12" IN DIAMETER, W = 24" WITHOUT SHEETING AND SHORING. W = 36" WHEN SHEETING AND SHORING IS USED. SEE ROADWAY STANDARD SPI-5 FOR SHEETING & SHORING NOTES.
5. FOR PIPE UNDERDRAIN LARGER THAN 12" IN DIAMETER, SEE ROADWAY STANDARD SPI-5 FOR ADDITIONAL TRENCH EXCAVATION DETAILS.
6. NON-PERFORATED UNDERDRAIN PIPES, LARGER THAN 12", SHALL BE TREATED AS PIPE CONDUITS: I.E., PAY ITEMS SHALL CONSIST OF TRENCH EXCAVATION AND BEDDING MATERIAL. SEE STANDARD SPB-2.
7. MATERIALS SHOWN HERE ARE TYPICAL ONLY AND ARE NOT THE ONLY CHOICE FOR SUBSURFACE DRAINAGE PURPOSES.
8. OUTLET OPENING SHALL HAVE INSTALLED A REMOVABLE RODENT SCREEN HAVING A WIRE MESH DESIGN & 0.23" to 0.50" (NOM.) SQUARE OPENINGS. SCREEN MATERIAL MAY BE STAINLESS STEEL OR GALVANIZED WITH WIRE THICKNESS OF BETWEEN 0.023" & 0.038", AFTER SHAPING AND FABRICATION. RODENT SCREEN DESIGN SHALL BE APPROVED BY THE ENGINEER.
9. THE FINAL SECTION OF THE OUTLET LATERAL CONDUIT SHALL BE NON-PERFORATED, SCHEDULE 40 OR TYPE S HIGH DENSITY POLYETHYLENE AND A MINIMUM 20'-0" IN LENGTH, INCLUDING COUPLINGS.
10. FOR DETAILS OF OUTLET LATERAL HEADWALL, SEE ROADWAY STANDARD PED-4.



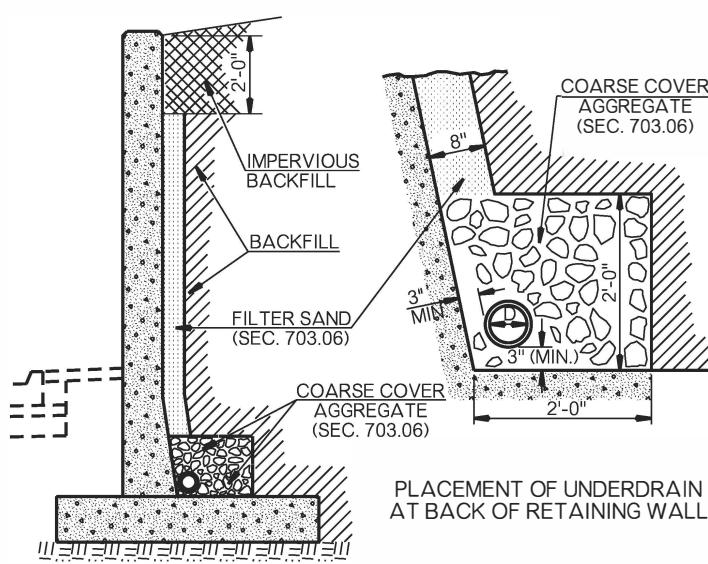
TYPICAL RODENT SCREEN



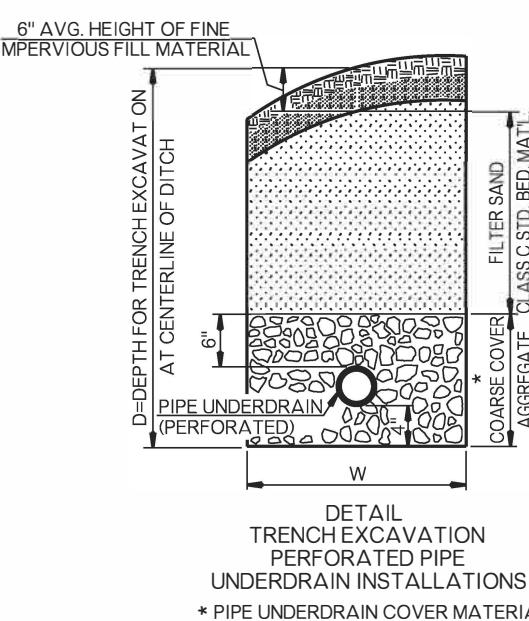
POLYVINYL (PVC) PIPE UNDERDRAIN



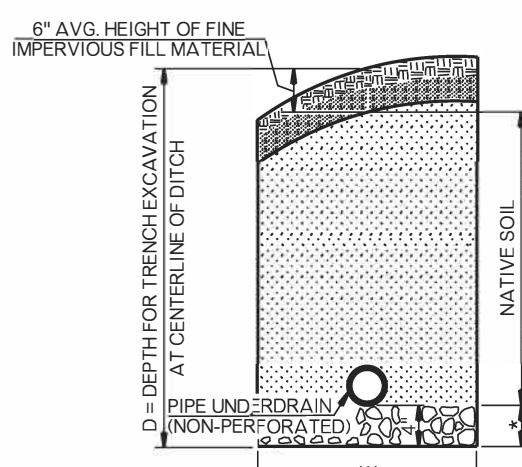
CORRUGATED POLYETHYLENE PIPE UNDERDRAIN



PLACEMENT OF UNDERDRAIN
AT BACK OF RETAINING WALL



DETAIL
TRENCH EXCAVATION
PERFORATED PIPE
UNDERDRAIN INSTALLATIONS
* PIPE UNDERDRAIN COVER MATERIAL



DETAIL
TRENCH EXCAVATION
NON-PERFORATED PIPE
UNDERDRAIN INSTALLATIONS
* PIPE UNDERDRAIN COVER MATERIAL

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (H)	PERFORATED PIPE UNDERDRAIN ROUND	LF
613 (I)	NON-PERFORATED PIPE UNDERDRAIN RND.	LF
613 (Q)	OUTLET LATERAL HEADWALL	EA
613 (T)	STANDARD BEDDING MATERIAL, CLASS C	CY
613 (U)	PIPE UNDERDRAIN COVER MATERIAL	CY
613 (V)	TRENCH EXCAVATION	CY

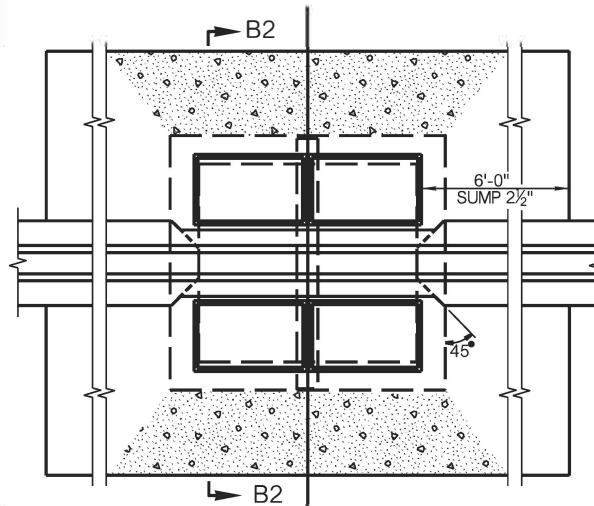
■ DIMENSION TO BE SPECIFIED IN INCHES

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

PIPE UNDERDRAIN INSTALLATION



2019 SPECIFICATIONS
PUD-4 1



PLAN OF DOUBLE SIDED INLET, OR TYPE II,
IN LONGITUDINAL BARRIER
(SHOWN ABOVE IS TYPE II, DESIGN 2)

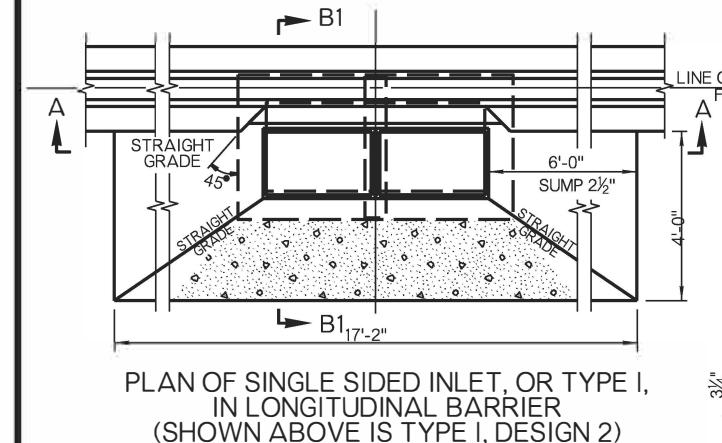
• RCP SIZE	MIN. DEPTH
18" RCP	2' - 8"
24" RCP	3' - 2"
30" RCP	3' - 8"

NOTE: SEE ROADWAY STDS. SSIF-5 & CIG-4
FOR AVAILABLE INLET FRAME & GRATES TO
BE USED ON SINGLE (TYPE I) OR DOUBLE
(TYPE II) SIDED INLETS.

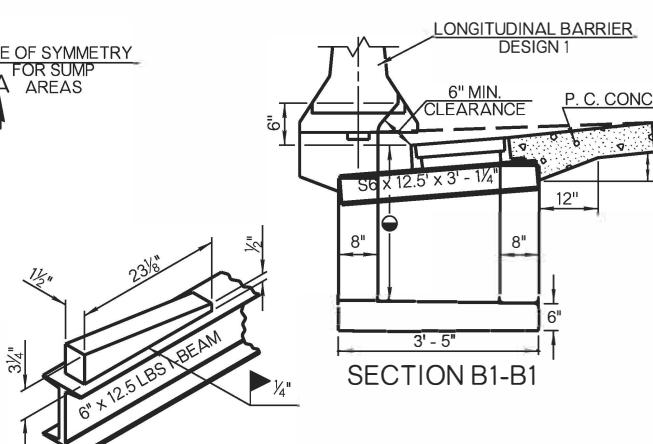
BENDING DIAGRAM
BAR C (J-HOOK) @10" C/C

L(MIN.)	GRADE DIFF.	OVERALL
41"	12" THRU 18"	54"
47"	19" THRU 24"	60"
53"	25" THRU 30"	67"
59"	31" THRU 36"	73"

NOTE: FOR GRADE DIFFERENCE OF
0" TO 11" BETWEEN OPPOSITE
SIDES OF BARRIER, NO ADDITIONAL
REINFORCEMENT IS REQUIRED.

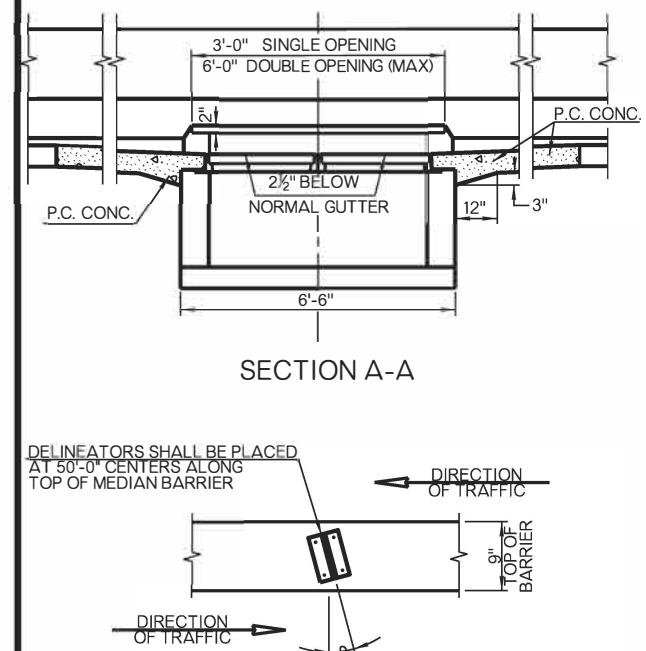
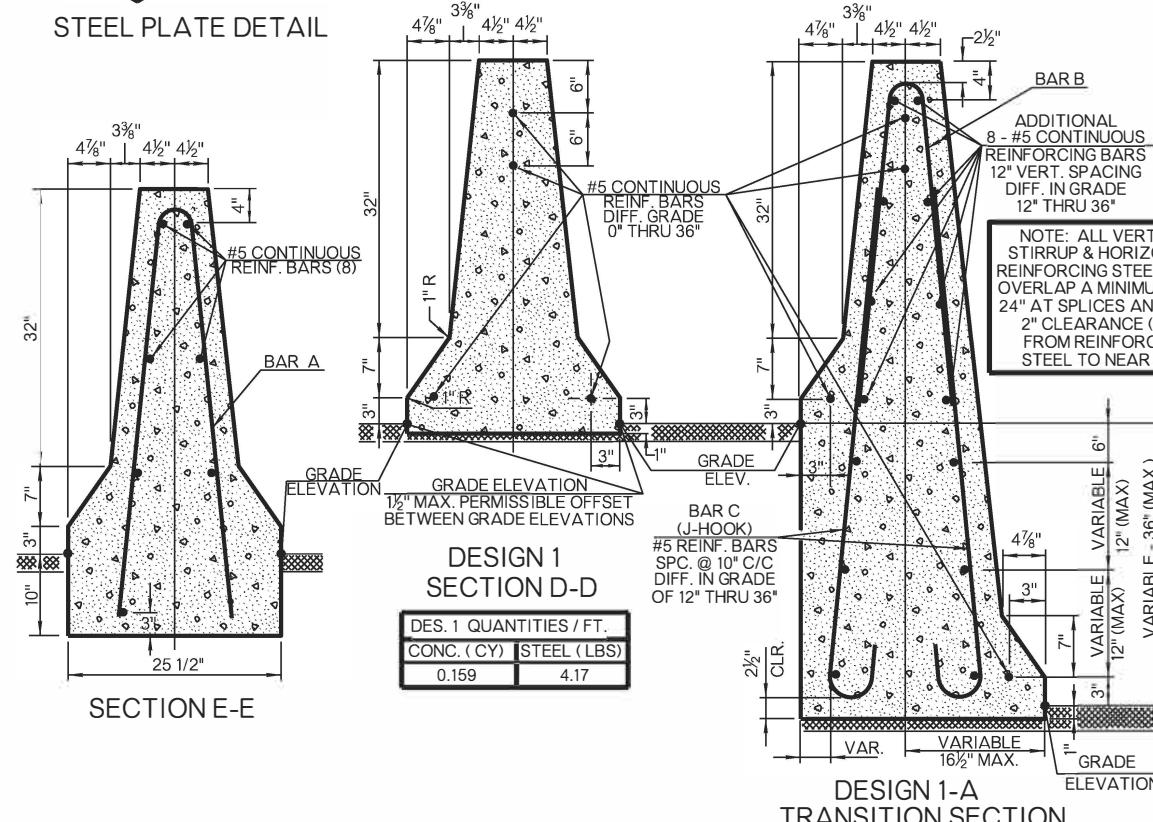


PLAN OF SINGLE SIDED INLET, OR TYPE I,
IN LONGITUDINAL BARRIER
(SHOWN ABOVE IS TYPE I, DESIGN 2)

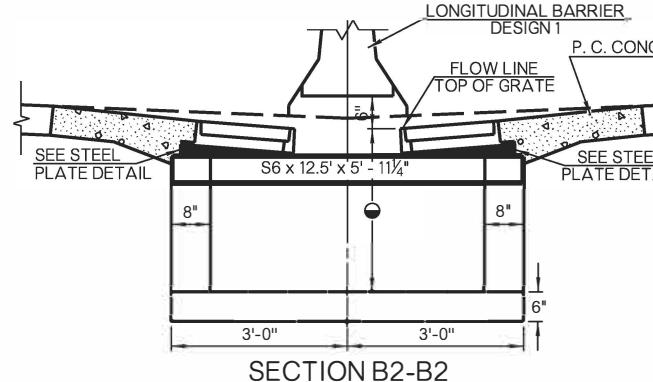


BENDING DIAGRAM
BARS A & B

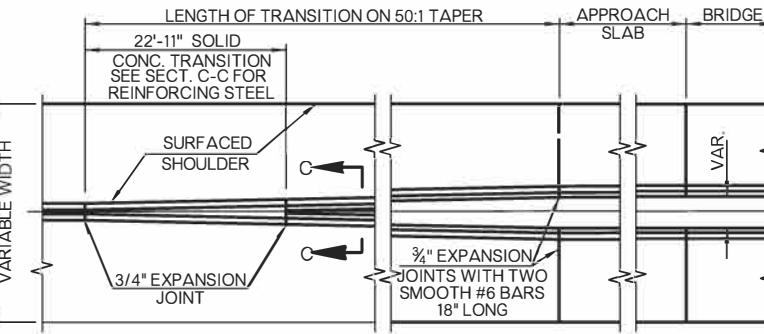
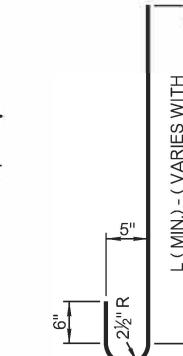
STEEL PLATE DETAIL



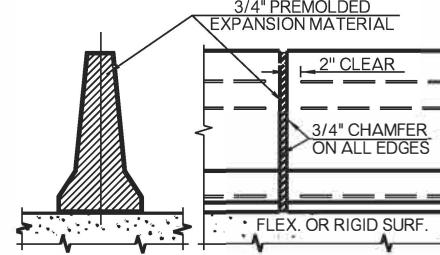
PLAN OF DELINEATOR PLACEMENT



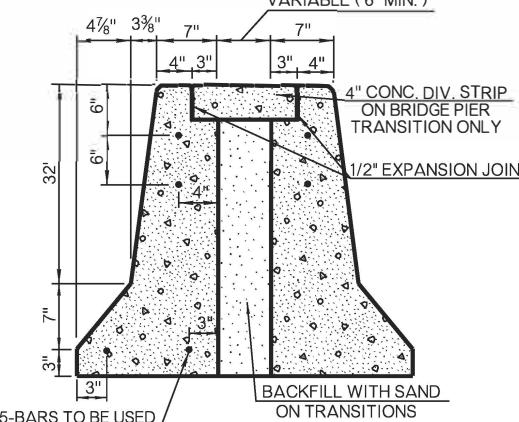
SECTION B2-B2



DETAIL OF TRANSITION SECTION AT BRIDGE ENDS



DETAIL EXPANSION JOINT



SECTION C-C

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. PRICE BID SHALL INCLUDE PAYMENT FOR MATERIALS, LABOR, PIPE SLEEVES, EXPANSION JOINTS AND ALL INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION.
3. FOR DETAILS OF LONGITUDINAL BARRIER MOUNTED LIGHT POLE BASES AND INSTALLATIONS, SEE TRAFFIC STANDARD BMF1-2.
4. LONGITUDINAL BARRIER SHALL BE MEASURED FOR PAYMENT AS CONTINUOUS BARRIER. PAYMENT FOR LIGHT POLE FOOTINGS TO BE INCLUDED IN OTHER ITEMS OF WORK.
5. WHEN LONGITUDINAL BARRIER IS PLACED ON FLEXIBLE BASE OR SURFACING, CONTRACTION JOINTS OR CHAMFERS ARE REQUIRED AT MAX. 20 FT. C/C SPACING AND EXPANSION JOINTS ARE REQUIRED AT MAX. 200 FT. C/C SPACING. WHEN THE LONGITUDINAL BARRIER IS PLACED ON P.C. CONCRETE SURFACING THE JOINTS SHALL MATCH THE JOINTS ON THE RIGID SURFACING. SAW-CUT JOINTS WITHIN 10 HOURS OF BARRIER PLACEMENT.
6. WHEN LONGITUDINAL BARRIER IS CONSTRUCTED OR EXISTS PRIOR TO CONSTRUCTION OF ADJACENT SHOULders OR OVERlays, THE SHOULder LAYERING SHALL NOT ALTER THE ORIGINAL TRAFFIC SIDE GEOMETRY OF THE LONGITUDINAL BARRIER.
7. DELINEATOR UNITS SHALL BE PLACED ON MEDIAN BARRIER ACCORDING TO TRAFFIC STANDARD DU1-1. ALL COST OF INSTALLATION SHALL BE INCLUDED IN UNIT PRICE BID OF TRAFFIC PAY ITEM BARRIER DELINEATORS.
8. AN ALTERNATE DESIGN (INCLUDING PRECAST) CONCRETE LONGITUDINAL BARRIER, MEETING NCHRP 350 REQUIREMENTS, MAY BE USED WHEN APPROVED BY THE ENGINEER.
9. WALLS OF INLETS MAY BE MADE OF BRICK MASONRY OR OF CLASS A CONCRETE. TO THE SAME DIMENSIONS. PRICE OF I-BEAM, FRAMES & GRATES SHALL BE INCLUDED IN PRICE BID OF INLET. WELDING SHALL BE PER CURRENT AWS D1.1 STRUCTURAL WELDING CODE.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
627 (A)	CONCRETE LONGITUDINAL BARRIER DESIGN 1	LF
627 (B)	CONCRETE LONGITUDINAL BARRIER END SECTION	EA
509 (B)	CLASS A CONCRETE (LONG.BAR.DES.1-A)	CY
511 (A)	REINFORCING STEEL	LBS
611 (G)	INLET - LONGITUDINAL BARRIER - TYPE I, DES. <input checked="" type="checkbox"/>	EA
611 (G)	INLET - LONGITUDINAL BARRIER - TYPE II, DES. <input checked="" type="checkbox"/>	EA

SPECIFY DESIGN 1 (SINGLE FRAME & GRATE) OR 2 (DOUBLE FRAME & GRATE)

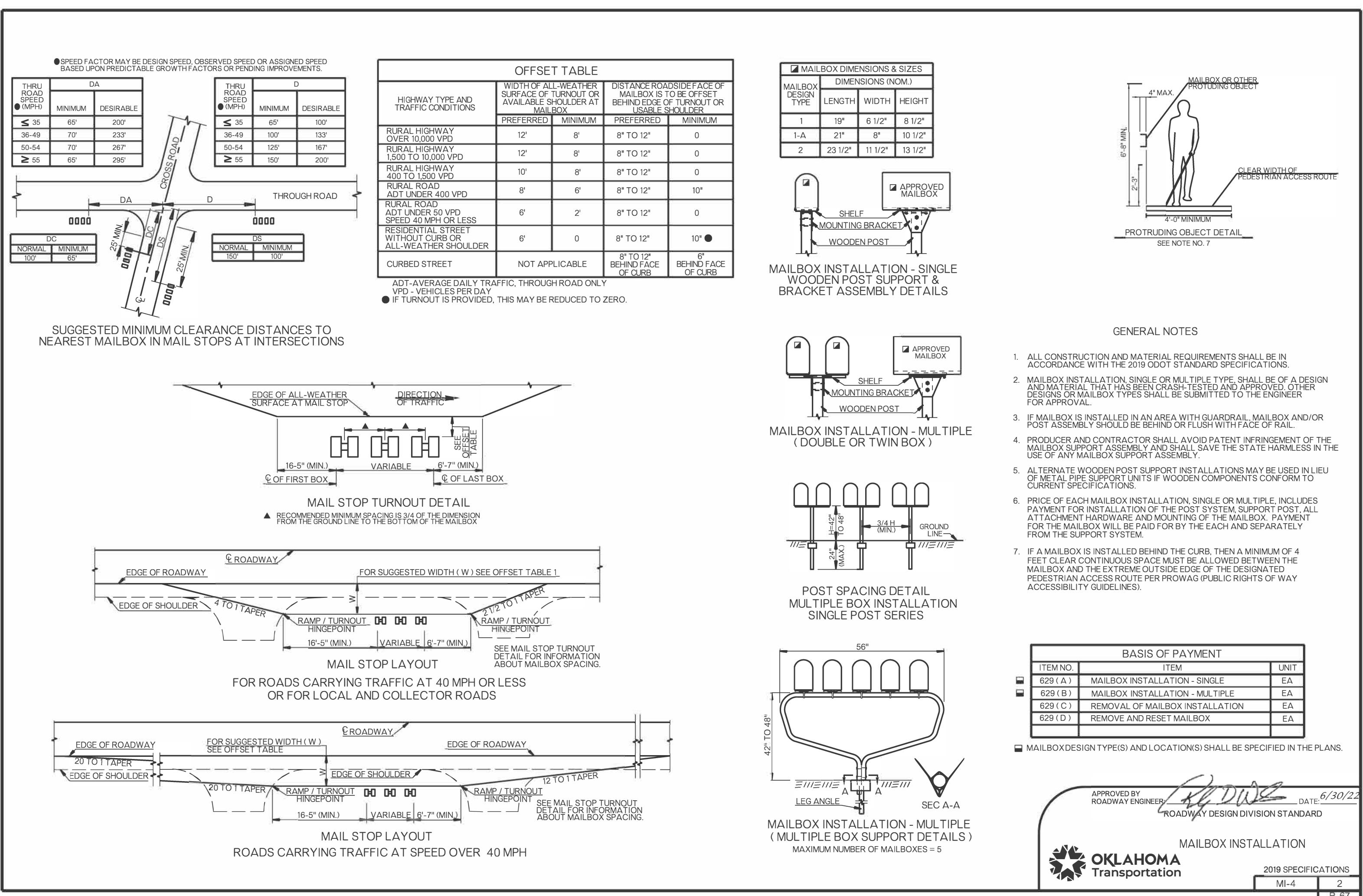
APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22

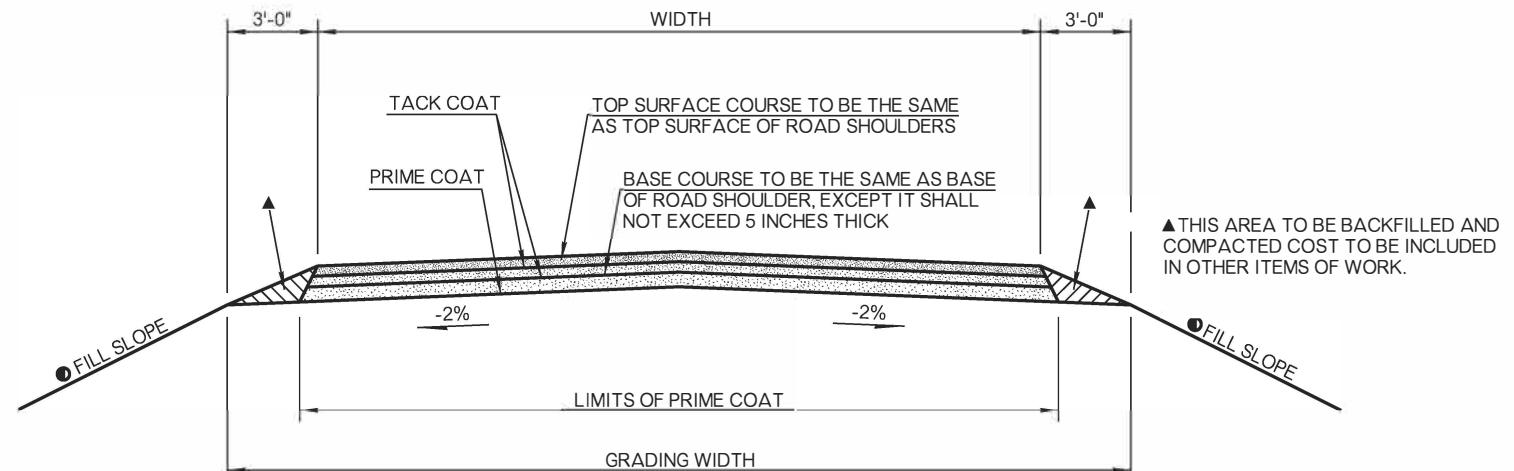
ROADWAY DESIGN DIVISION STANDARD

CONCRETE LONGITUDINAL BARRIER (MASH F-SHAPE)

OKLAHOMA
Transportation

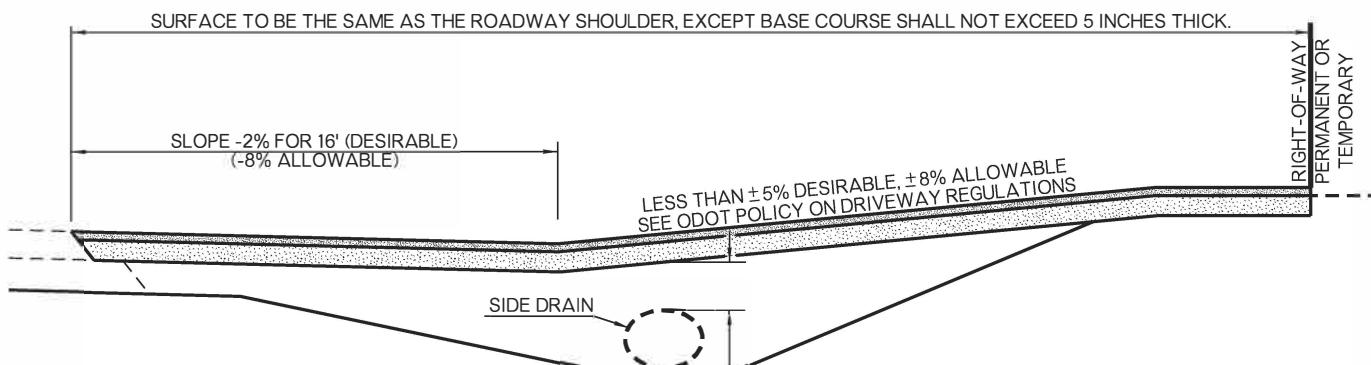
2019 SPECIFICATIONS



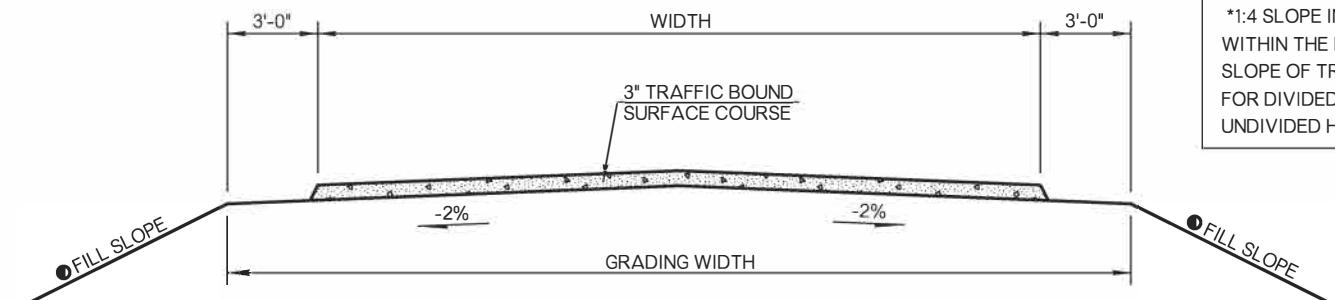


TYPICAL SECTION OF ASPHALT RETURN/DRIVE

▲ THIS AREA TO BE BACKFILLED AND
COMPACTED COST TO BE INCLUDED
IN OTHER ITEMS OF WORK.

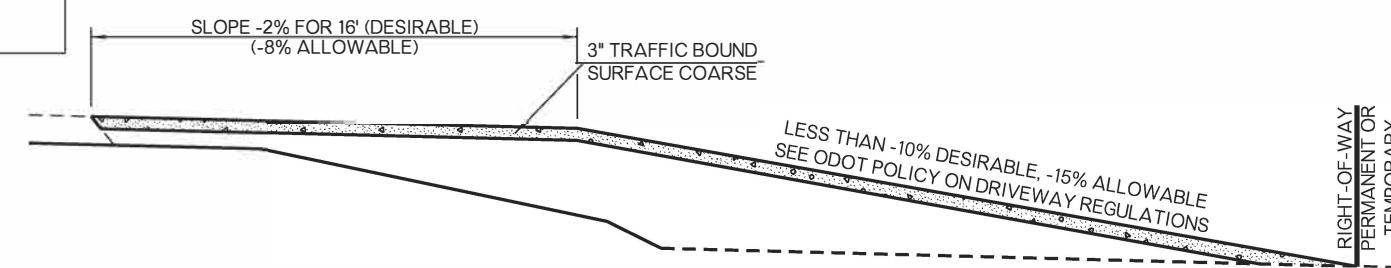


PROFILE OF TYPICAL ASPHALT RETURN/DRIVE ON ROADWAY CUT SECTION

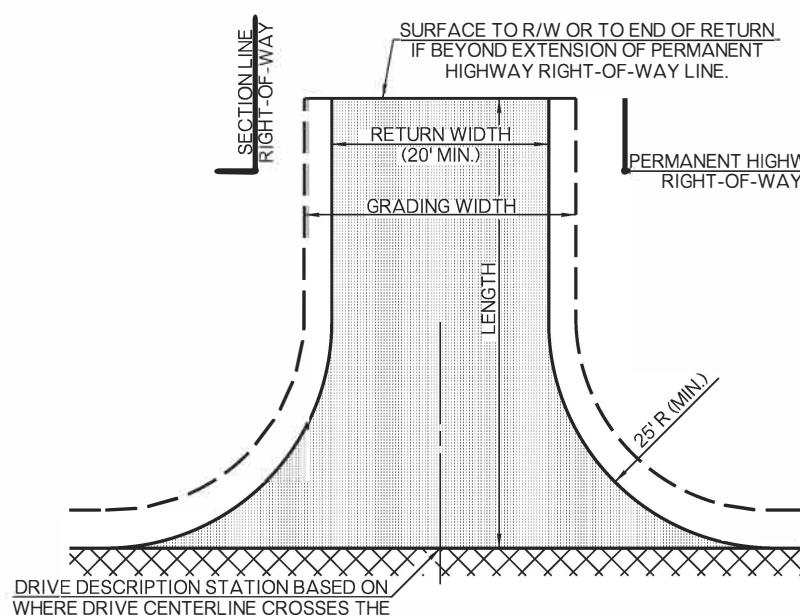


TYPICAL SECTION OF T.B.S.C. RETURN/DRIVE

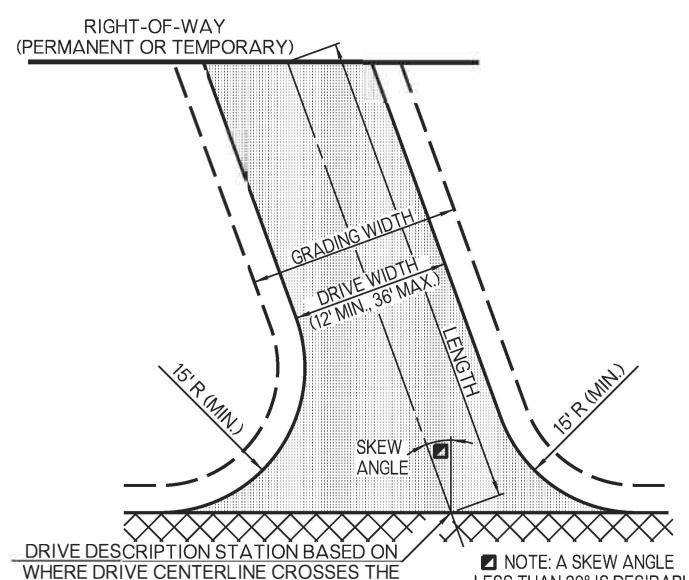
● FILL SLOPE NOTES:
FILL SLOPE AS SHOWN IN TYPICAL SECTIONS
SHALL NOT EXCEED:
*1:3 SLOPE OUTSIDE HIGHWAY CLEARZONE
*1:4 SLOPE INSIDE HIGHWAY CLEARZONE
WITHIN THE HIGHWAY CLEARZONE, ADJUST
SLOPE OF TRAFFIC APPROACH END TO 1:10
FOR DIVIDED HIGHWAYS AND 1:6 FOR
UNDIVIDED HIGHWAYS.



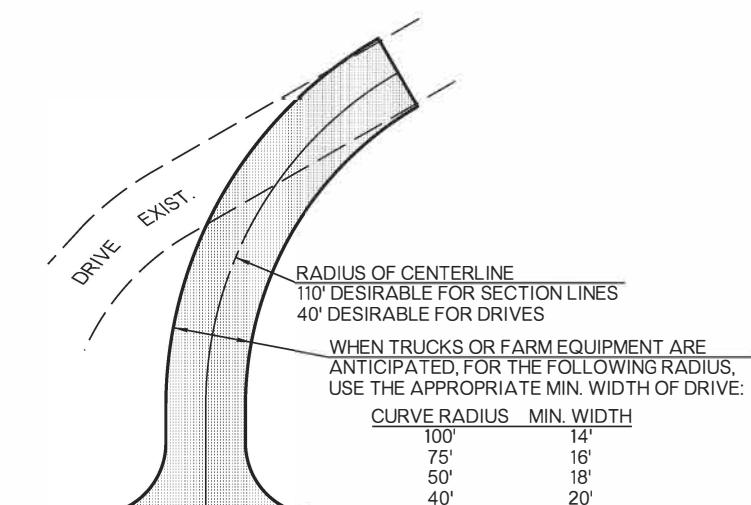
PROFILE OF TYPICAL T.B.S.C. RETURN/DRIVE ON ROADWAY FILL SECTION



PLAN TYPICAL SECTION LINE RETURN



PLAN TYPICAL DRIVE ON SKEW



SECTION LINE OR DRIVE
WITH CURVED ALIGNMENT

PROPOSED DRIVES AND RETURNS SHALL
MATCH EXISTING EXCEPT WHEN SKEW
ANGLE EXCEEDS 20 DEGREES. IT IS THEN
DESIRED TO SHIFT THE LOCATION AND
CONSTRUCT USING CURVED ALIGNMENT

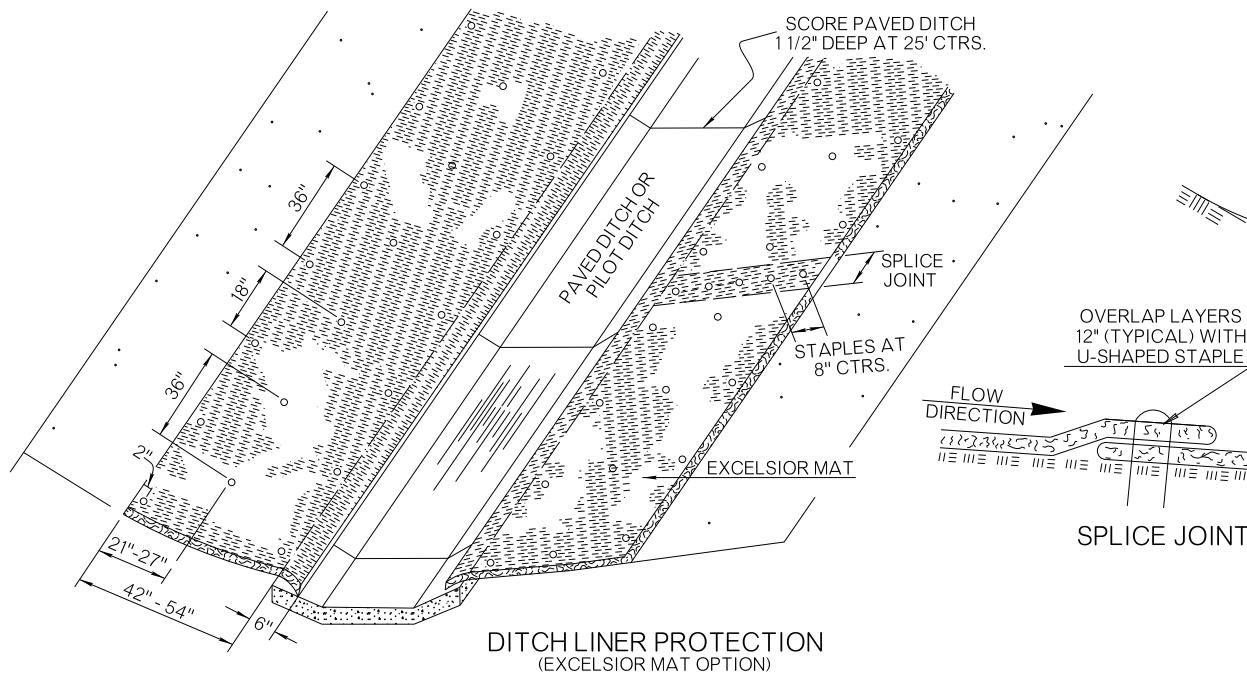
USEFUL ABBREVIATIONS FOR PLAN SHEETS:	
ASPH.	ASPHALT
T.B.S.C.	TRAFFIC BOUND SURFACE COARSE
CONC.	CONCRETE
SEC. RET.	SECTION LINE RETURN
FIELD ENT.	FIELD ENTRANCE
PVT. DRIVE	PRIVATE DRIVE
COMM. DRIVE	COMMERCIAL DRIVE
W/S.D.	WITH SIDE DRAIN
AS DIKE	AS DIKE ACROSS DITCH

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

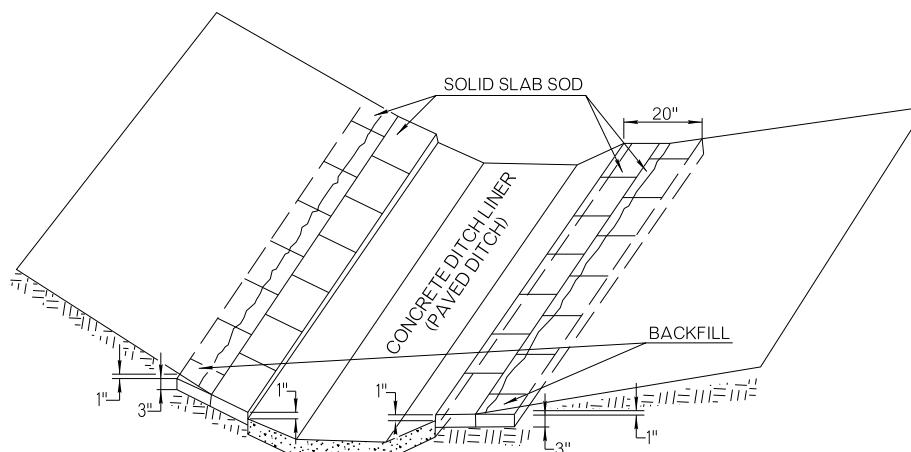
RURAL DRIVEWAY INSTALLATION



2019 SPECIFICATIONS
RDI-4 1
R-68



DITCH LINER PROTECTION
(EXCELSIOR MAT OPTION)



DITCH LINER PROTECTION
(SOLID SLAB SOD OPTION)

DESIGN NO. 1 - A PAVED PILOT DITCH TO BE PLACED 6" BELOW THE NORMAL FLOWLINE AND IN THE CENTER OF A STANDARD DITCH

DESIGN NO. 2 - A DITCH THAT IS PAVED AND HAVING THE SAME FLOWLINE AS A STANDARD UNPAVED DITCH

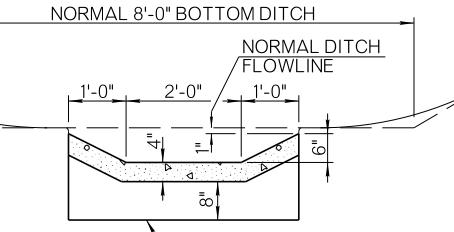
DESIGN NO. 1					
BOTTOM WIDTH					
	2'-0"	3'-0"	4'-0"	5'-0"	6'-0"
K 1	.0522	.0645	.0769	.0892	.1016
K 2	.0586	.0709	.0832	.0955	.1078

DESIGN 2A = 1:1 SLOPES
DESIGN 2B = 1:2 SLOPES
DESIGN 2C = 1:3 SLOPES
DESIGN 2D = 1:4 SLOPES
DESIGN 2E = 1:6 SLOPES

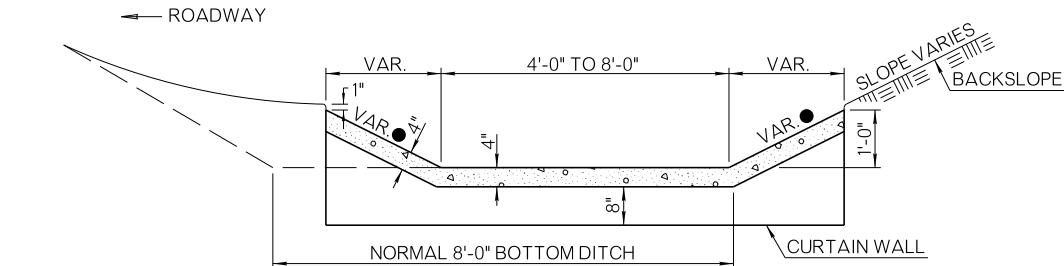
K1 = CU. YDS. OF CONCRETE PER LINEAR FOOT
K2 = CU. YDS. OF CONCRETE PER CURTAIN WALL

TOTAL CLASS C CONCRETE = (LENGTH OF PAVED DITCH) (K1) + (NO. OF CURTAIN WALLS) (K2)

QUANTITIES OF C.Y. OF CLASS C CONCRETE PER L.F. OF PAVED DITCH

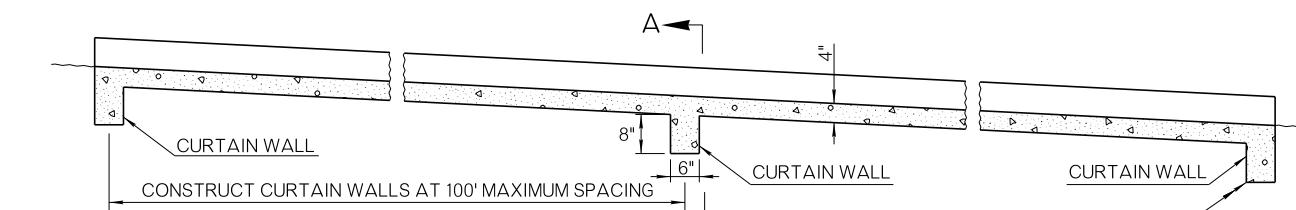


SECTION A - A
DESIGN NO. 1

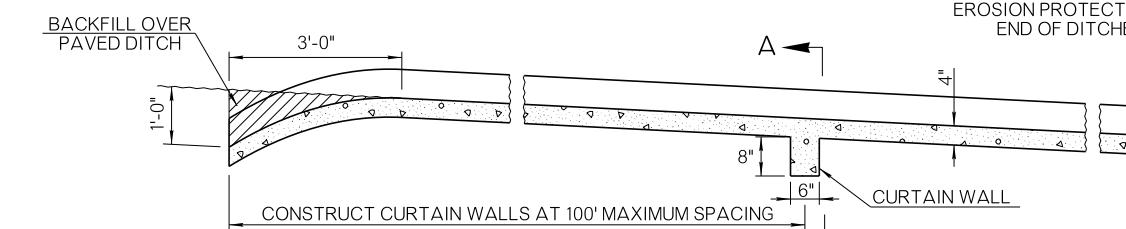


SECTION A - A
DESIGN NO. 2

● VARIABLE SLOPE, AS SHOWN IN PLANS



LONGITUDINAL SECTION WITH CURTAIN WALLS



OPTIONAL LONGITUDINAL SECTION WITH BURIED ENDS
(BURIED ENDS SHALL NOT BE USED ADJACENT TO DRAINAGE STRUCTURES)

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ALL COST OF ADDITIONAL BORROW OR EXCAVATION, REQUIRED FOR INSTALLING PAVED DITCH, SHALL BE INCLUDED IN PRICE BID FOR CLASS C CONCRETE.
3. THE DITCH SHALL BE WATERED, AND COMPACTED, BEFORE PLACING CLASS C CONCRETE.
4. DITCH LINER PROTECTION MAY BE EITHER EXCELSIOR MAT OR SOLID SLAB SOD, AND SHALL BE MEASURED BY THE LINEAR FOOT OF DITCH (PAVED DITCH), IN PLACE.

DESIGN NO. 2					
BOTTOM WIDTH					
	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"
K1	.0923	.1048	.1172	.1295	.1479
K2	.1105	.1228	.1352	.1476	.1600
K1	.1045	.1168	.1292	.1415	.1539
K2	.1357	.1480	.1603	.1726	.1850
K1	.1274	.1397	.1521	.1644	.1768
K2	.1790	.1913	.2036	.2159	.2282
K1	.1512	.1635	.1759	.1832	.2006
K2	.2222	.2346	.2469	.2593	.2716
K1	.1996	.2119	.2243	.2366	.2490
K2	.3086	.3210	.3333	.3457	.3580

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
509 (D)	CLASS C CONCRETE	C.Y.
229	DITCH LINER PROTECTION	L.F.

APPROVED BY
ROADWAY ENGINEER: *R. D. D.* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

PAVED DITCHES AND FLUMES



2019 SPECIFICATIONS

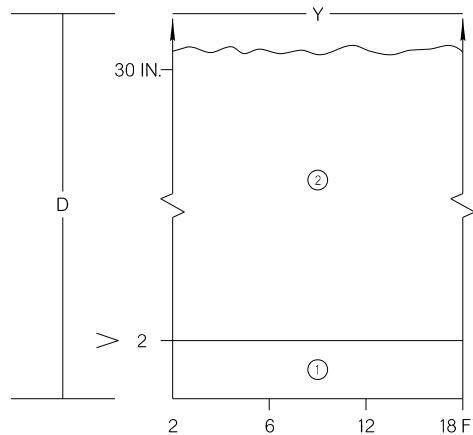
DC-4

2

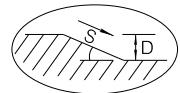
R-69

DEFINITION OF TREATMENT ZONES FOR EDGE DROP-OFF CONDITIONS

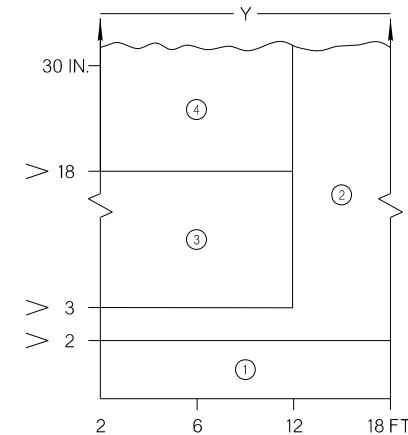
EDGE HEIGHT (D) IN INCHES VERSUS LATERAL CLEARANCE (Y) IN FEET



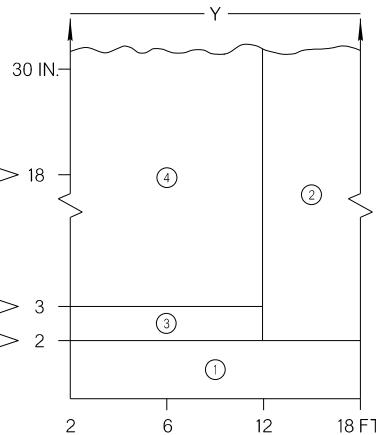
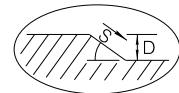
EDGE CONDITION A
S = 1:3 OR FLATTER



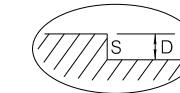
EDGE CONDITIONS A AND B: THE SLOPE (V:H) MUST BE CONSTRUCTED WITH A COMPACTED MATERIAL CAPABLE OF SUPPORTING VEHICLES. LABOR AND MATERIAL SHALL BE INCLUDED IN OTHER ITEMS OF WORK.



EDGE CONDITION B
S = 1:2.99 TO 1:1



EDGE CONDITION C
S = STEEPER THAN 1:1



EDGE CONDITION C: MILLING OR OVERLAY OPERATIONS THAT RESULT IN EDGE CONDITION C SHOULD NOT BE IN PLACE WITHOUT APPROPRIATE WARNING TREATMENTS, AND THESE CONDITIONS SHOULD NOT BE LEFT IN PLACE FOR EXTENDED PERIODS OF TIME.

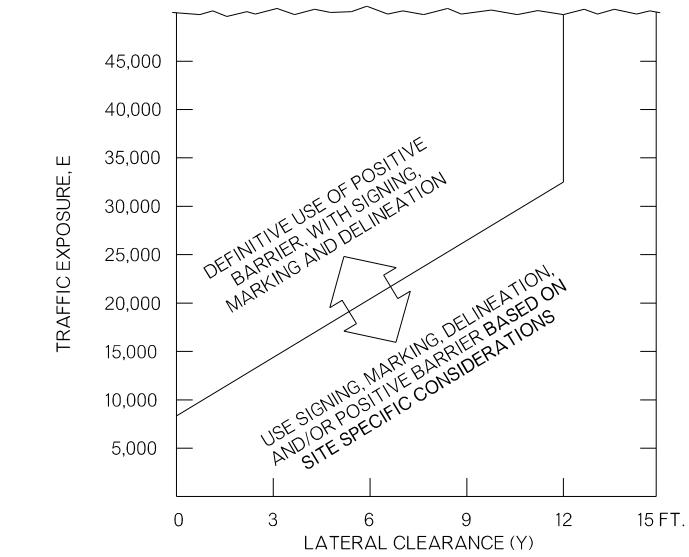


FIGURE-1: CONDITIONS INDICATING THE NEED FOR POSITIVE BARRIER

E = CURRENT ADT x T

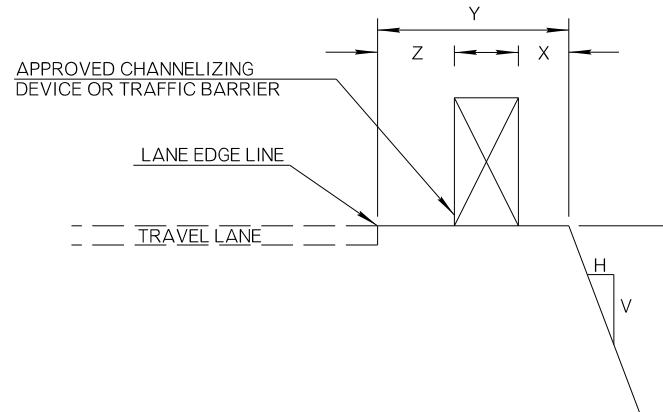
WHERE CURRENT ADT IS THAT PORTION OF THE AVERAGE DAILY TRAFFIC VOLUME TRAVELING WITHIN 12 FEET (GENERALLY ONE ADJACENT LANE) OF THE EDGE DROP-OFF CONDITION; AND, T IS THE DURATION TIME IN YEARS OF THE DROP-OFF CONDITION.

OTHER FACTORS, SUCH AS THE PRESENCE OF HEAVY MACHINERY, CONSTRUCTION WORKERS, OR THE MIX AND VOLUME OF TRAFFIC MAY MAKE THE NEED OF POSITIVE BARRIERS APPROPRIATE BY THE DESIGN ENGINEER, EVEN WHEN THE EDGE CONDITION ALONE MAY NOT JUSTIFY THE USE OF A BARRIER.

AN APPROVED END TREATMENT SHALL BE PROVIDED FOR ANY POSITIVE BARRIER END LOCATED WITHIN APPLICABLE CONSTRUCTION CLEAR ZONE (REFER TO TRAFFIC STANDARD TCS2-1).

GENERAL NOTES

1. THESE GUIDELINES APPLY TO CONSTRUCTION ZONE WORK AREAS WHERE CONTINUOUS PAVEMENT EDGES OR DROP-OFFS EXIST PARALLEL AND ADJACENT TO A LANE USED FOR TRAFFIC.
2. THE FOLLOWING TYPES OF TREATMENT MAY BE USED:
 - WARNING DEVICES (SUCH AS SIGNS OR CHANNELIZING DEVICES), AND
 - POSITIVE BARRIERS (SUCH AS PORTABLE LONGITUDINAL BARRIERS).
3. DISTANCE "X" IS TO BE THE MAXIMUM PRACTICAL UNDER JOB CONDITIONS. TWO FEET MINIMUM FOR CONDITIONS WITH TRAVELING SPEEDS GREATER THAN AND EQUAL TO 45 MPH. DISTANCE "Y" IS THE LATERAL CLEARANCE FROM EDGE OF TRAVEL LANE TO EDGE OF DROP-OFF. DISTANCE "Z" DOES NOT HAVE A MINIMUM VALUE.
4. EACH CONSTRUCTION ZONE DROP-OFF CONDITION SHOULD BE ANALYZED INDIVIDUALLY, TAKING INTO ACCOUNT OTHER VARIABLES, SUCH AS: TRAFFIC MIX, POSTED SPEED IN THE CONSTRUCTION ZONE, HORIZONTAL CURVATURE, AND THE PRACTICALITY OF THE TREATMENT TYPES.
5. THE CONDITIONS FOR INDICATING THE USE OF POSITIVE OR PROTECTIVE BARRIERS ARE GIVEN BY FIGURE-1.
6. POSITIVE OR PROTECTIVE BARRIERS AS DEFINED BY FHWA ARE DEVICES THAT CONTAIN AND/OR REDIRECT VEHICLES AND MEET THE CRASH-WORTHINESS EVALUATION CRITERIA CONTAINED IN NCHRP REPORT 350. SEE TITLE 23 OF CFR (CODE OF FEDERAL REGULATIONS), SUBPART K, PART 630 "TEMPORARY TRAFFIC CONTROL DEVICES."
7. SEVERAL TYPES OF POSITIVE BARRIERS ARE AVAILABLE TO ENHANCE WORKER AND MOTORIST SAFETY. THEY INCLUDE, BUT NOT LIMITED TO, PORTABLE CONCRETE LONGITUDINAL BARRIERS, BALLAST-FILLED BARRIERS, AND MOVEABLE BARRIERS AS WELL AS SHADOW VEHICLES WITH TRUCK-MOUNTED ATTENUATORS.



ZONE	TREATMENT TYPES GUIDELINES:
①	W8-11 "UNEVEN LANES" SIGNS.
②	W8-17 AND W8-17P "SHOULDER DROP-OFF" SIGNS PLUS APPROVED CHANNELIZING DEVICES.
③	W8-11 "UNEVEN LANES" AND W8-17 "SHOULDER DROP-OFF" SIGNS PLUS DRUMS. WHERE RESTRICTED SPACE PRECLUDES THE USE OF DRUMS, USE AN APPROVED CHANNELIZING DEVICE. AN EDGE FILL MAY BE PROVIDED TO CHANGE THE EDGE SLOPE TO THAT OF THE PREFERABLE EDGE CONDITION A.
④	SEE (FIGURE-1). WHERE POSITIVE BARRIER MAY OR MAY NOT BE USED, THE TREATMENT SHOWN ABOVE FOR ZONE ③ MAY BE USED AFTER CONSIDERATION OF OTHER APPLICABLE FACTORS.

APPROVED BY _____
ROADWAY ENGINEER: _____ DATE: _____
ROADWAY DESIGN DIVISION STANDARD

PAVEMENT DROP-OFF TREATMENTS

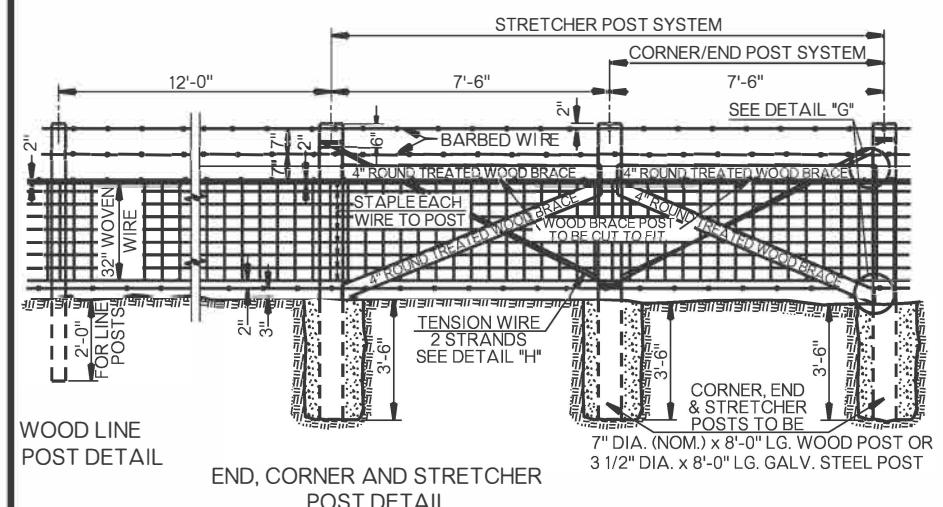


2019 SPECIFICATIONS

PDT-2

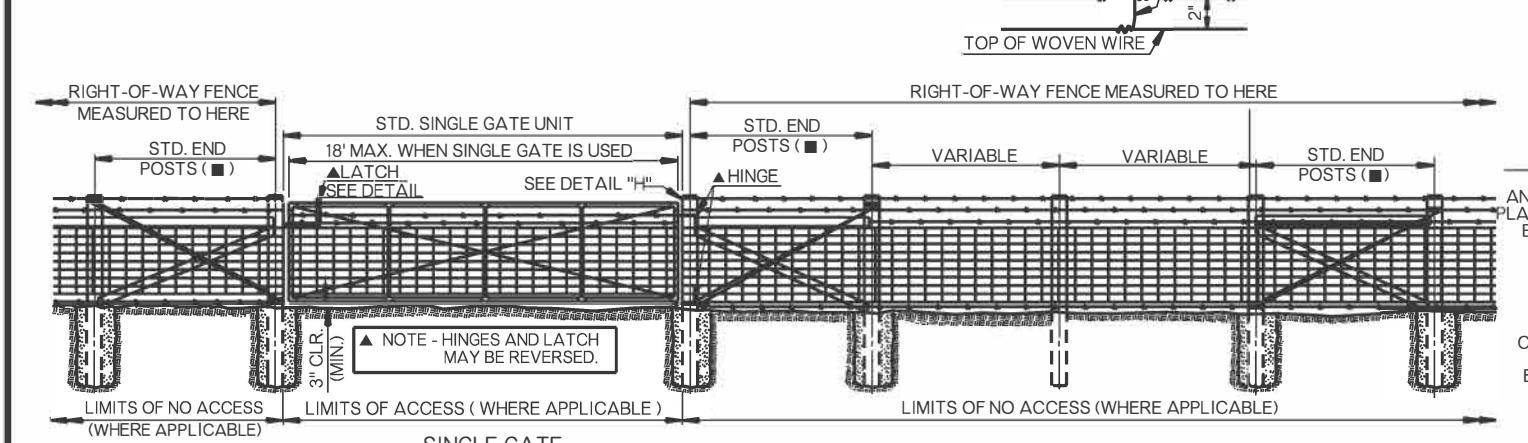
3

R-70

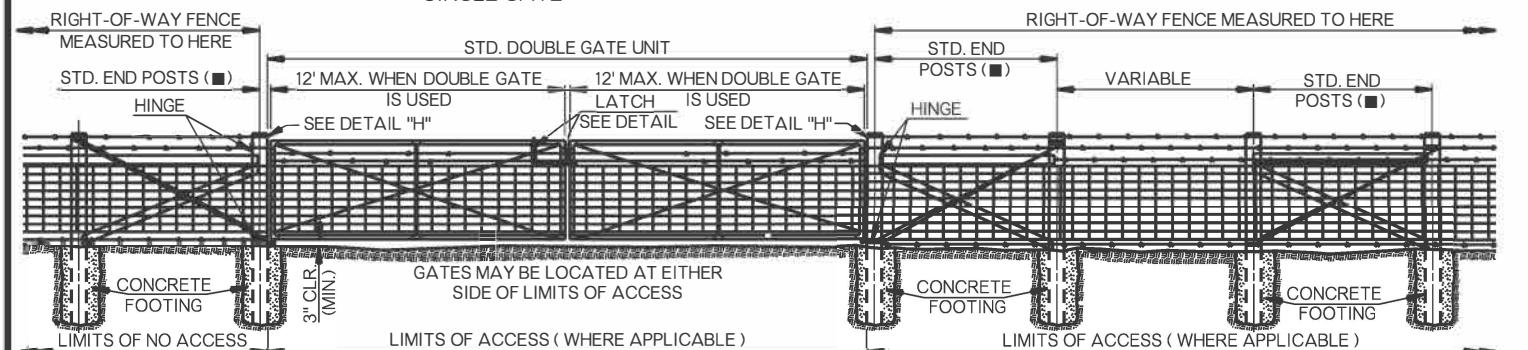


WOOD LINE
POST DETAIL
END, CORNER AND STRETCHER
POST DETAIL

USE STRETCHER DETAILS AT ALL CORNERS, BENDS
IN R/W, HILL TOPS, IN VALLEYS OR DEEP DEPRESSIONS
AND AT 500'-0" MAXIMUM SPACING USE END POSTS
FOR CROSS FENCE CONNECTIONS.

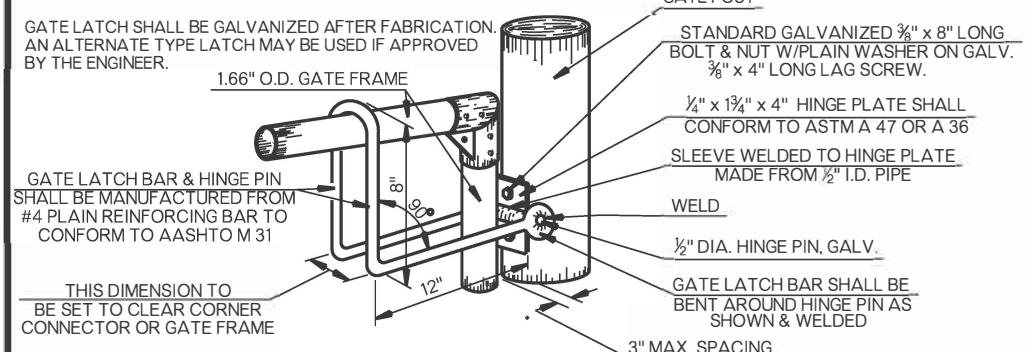


SINGLE GATE

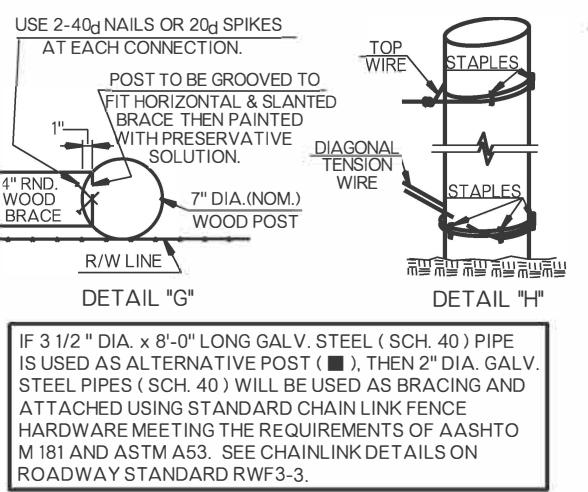


DOUBLE GATE

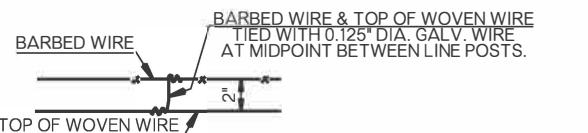
GATE DETAILS



TYPICAL GATE LATCH DETAIL



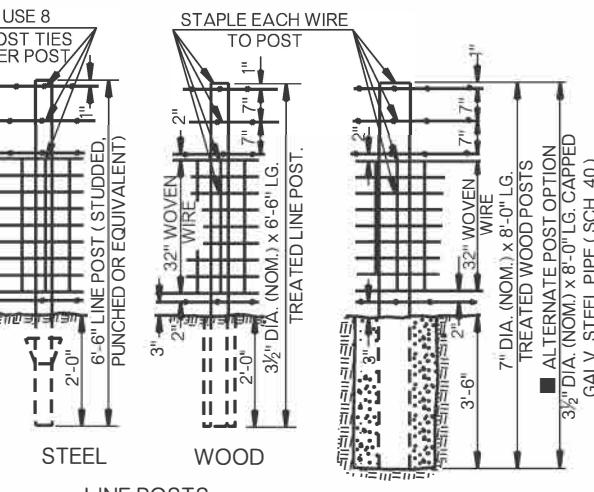
IF 3 1/2" DIA. x 8'-0" LONG GALV. STEEL (SCH. 40) PIPE IS USED AS ALTERNATIVE POST (■), THEN 2" DIA. GALV. STEEL PIPES (SCH. 40) WILL BE USED AS BRACING AND ATTACHED USING STANDARD CHAIN LINK FENCE HARDWARE MEETING THE REQUIREMENTS OF AASHTO M 181 AND ASTM A53. SEE CHAINLINK DETAILS ON ROADWAY STANDARD RWF3-3.



TOP OF WOVEN WIRE

BARBED WIRE

TIED WITH 0.125" DIA. GALV. WIRE AT MIDPOINT BETWEEN LINE POSTS.



LINE POSTS

HOLES FOR WOOD LINE POSTS SHALL BE DRILLED 8" DIAMETER OR POST MAY BE DRIVEN.

HOLE SHALL BE 18" DIAM. (MIN.) REQUIRES CONCRETE FOOTING

CORNER, STRETCHER, GATE, OR END POST

ALTERNATE WOOD POSTS

■ ALTERNATE POST OPTION

GALV. STEEL PIPE (SCH. 40)

3 1/2" DIA. (NOM.) x 8'-0" LG. TREATED LINE POST.

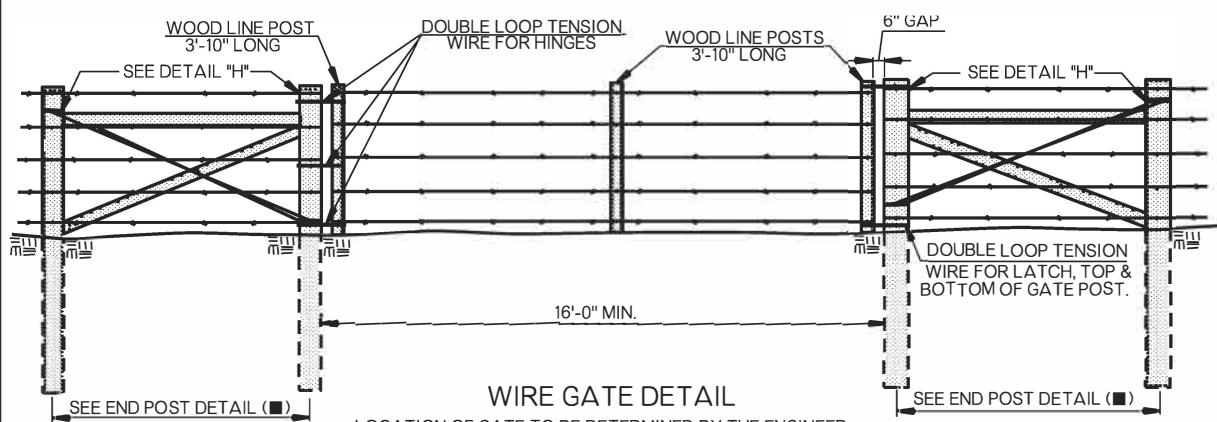
3 1/2" DIA. (NOM.) x 6'-6" LG. PUNCHED OR EQUIVALENT

6'-6" LINE POST (STUDDED OR EQUIVALENT)

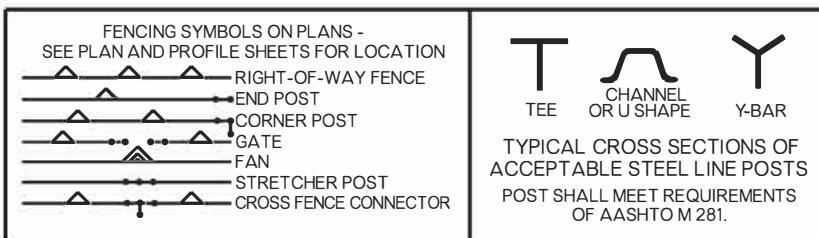
3 1/2" DIA. (NOM.) x 6'-6" LG. TREATED LINE POST.

3 1/2" DIA. (NOM.) x 8'-0" LG. CAPPED

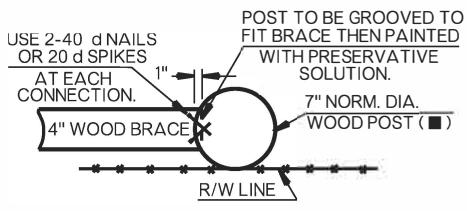
3



LOCATION OF GATE TO BE DETERMINED BY THE ENGINEER.
OTHER TYPES OF GATES MAY BE SUBSTITUTED FOR THE WIRE GATE,
SUCH AS PREFABRICATED PIPE TUBING TYPE OR RANCH STYLE
METAL PANEL TYPE, IF APPROVED BY THE ENGINEER. COST OF
WIRE GATE SHALL BE INCLUDED IN THE PRICE BID FOR FENCE.



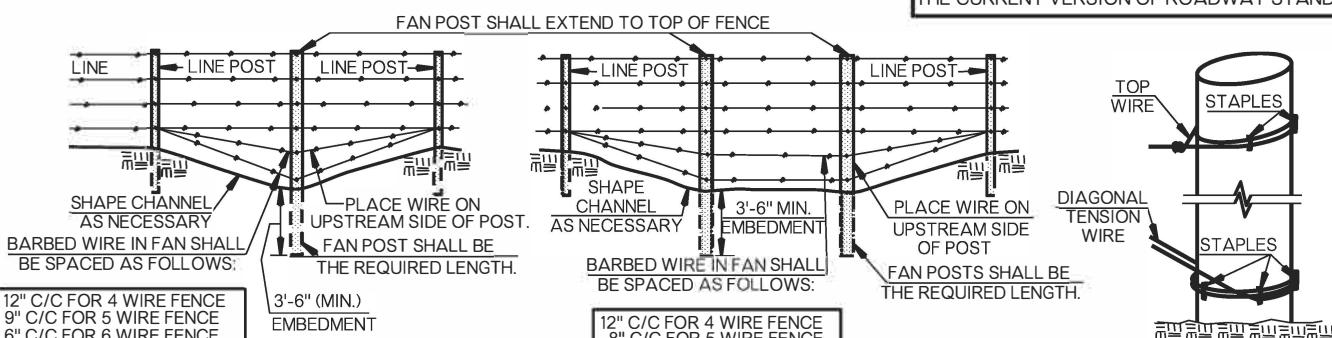
TYPICAL CROSS SECTIONS OF
ACCEPTABLE STEEL LINE POSTS
POST SHALL MEET REQUIREMENTS
OF AASHTO M 281.



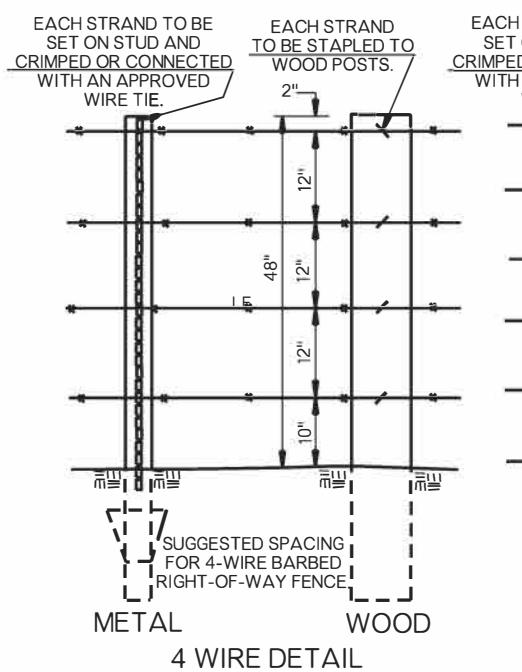
R/W LINE

DETAIL "G"

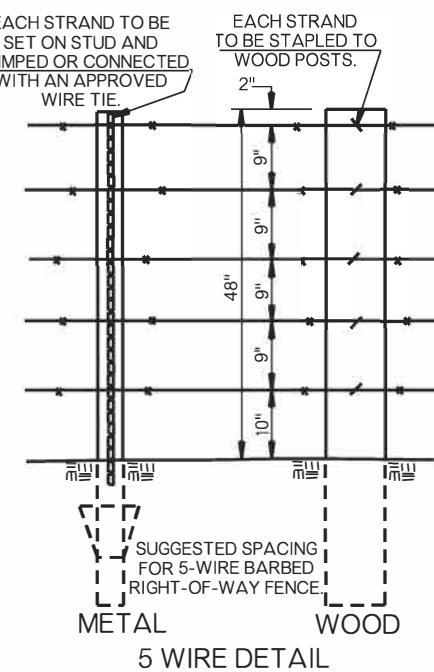
IF 3 1/2 " DIA. x 8'-0" LONG GALV. STEEL (SCH. 40) PIPE
IS USED AS ALTERNATIVE POST (■), THEN 2" DIA. GALV.
STEEL PIPES (SCH. 40) WILL BE USED AS BRACING AND
ATTACHED USING STANDARD CHAIN LINK FENCE
HARDWARE MEETING THE REQUIREMENTS OF AASHTO
M 181 & ASTM A53. SEE CHAINLINK DETAILS ON
THE CURRENT VERSION OF ROADWAY STANDARD RWF3-3.



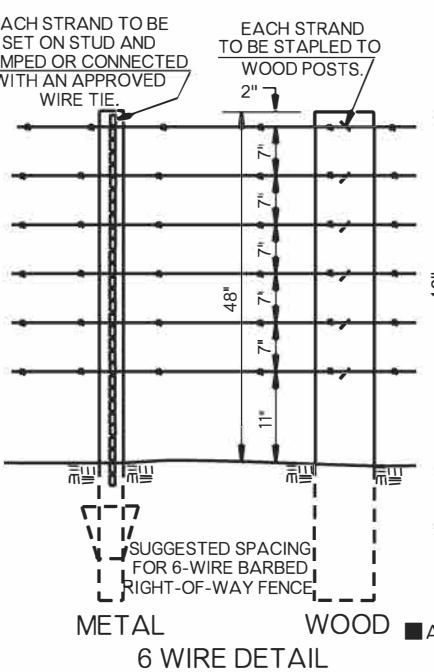
TYPICAL FAN DETAILS
(FOR SMALL DRAINS AND IRREGULAR TERRAIN)



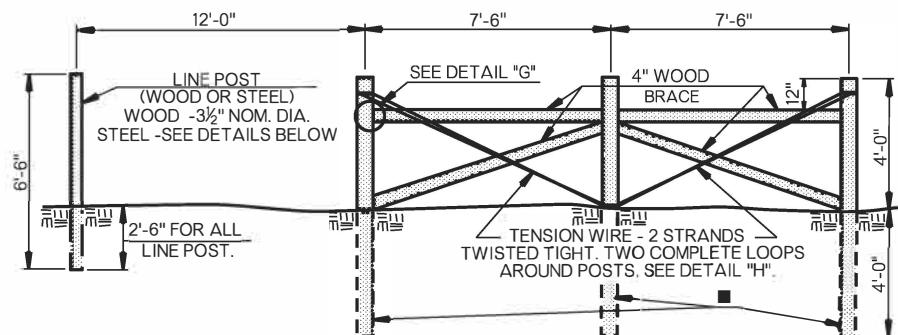
4 WIRE DETAIL



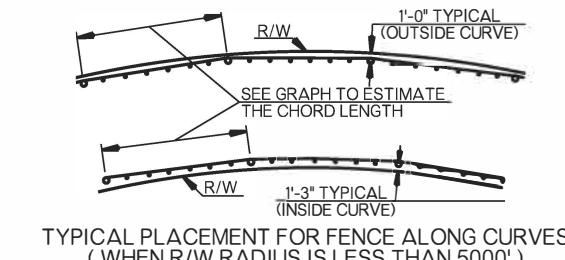
5 WIRE DETAIL



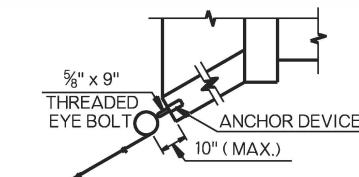
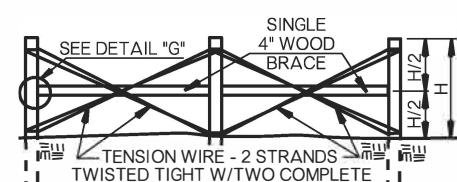
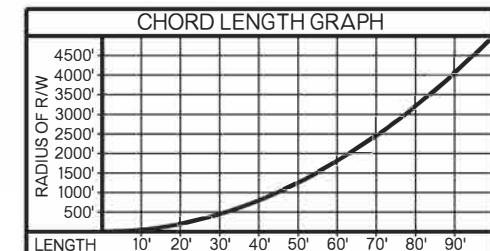
6 WIRE DETAIL



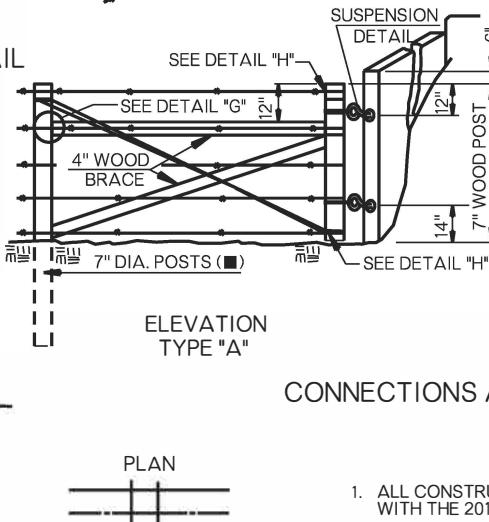
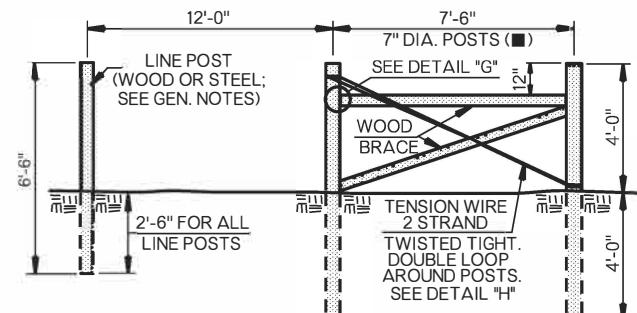
CORNER & STRETCHER POSTS DETAIL
USE STRETCHER DETAILS AT ALL CORNERS, BENDS IN R/W, ON HILL TOPS,
IN VALLEYS OR DEEP DEPRESSIONS, AND AT 500' MAXIMUM SPACING.



TYPICAL PLACEMENT FOR FENCE ALONG CURVES
(WHEN R/W RADIUS IS LESS THAN 5000')



CORNER & STRETCHER POSTS DETAIL
ALTERNATIVE



CONNECTIONS AT CULVERTS

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FENCE, IN GENERAL, SHALL BE ON OUTSIDE OF POSTS AWAY FROM CENTERLINE OF HIGHWAY AND CONSTRUCTED ON THE PERMANENT RIGHT-OF-WAY (EXCEPTIONS ARE CORNERS AND CURVES).
3. HINGES AND LOOP LATCH ON WIRE GATES SHALL BE FABRICATED FROM TENSION WIRE. THE HINGES (3 PER POST) SHALL BE FORMED OF DOUBLE LOOPS ON THE GATE POST. THE LOOP HINGES AROUND THE WIRE GATE POST SHALL BE FORMED LOOSE FOR EASE OF MOVEMENT. THE TOP 2 (TOP AND BOTTOM) LOOP STRETCHER POSTS TO BE USED IN GENERAL AT HILL TOPS AND AT BOTTOM OF VALLEYS AND AT A MAXIMUM OF 500 FEET APART.
4. ALL MISCELLANEOUS HARDWARE SHALL BE FURNISHED GALVANIZED OR ALUMINUM COATED. ALL ALTERNATIVE METAL PIPE POSTS SHALL BE CAPPED.

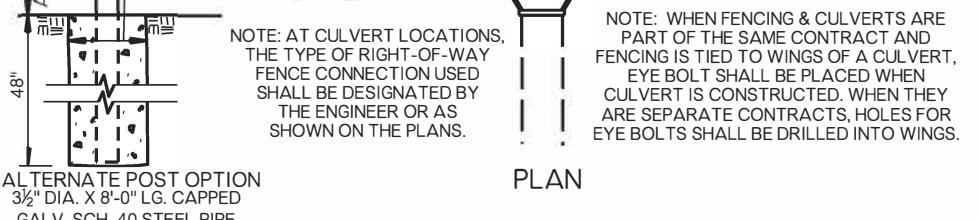
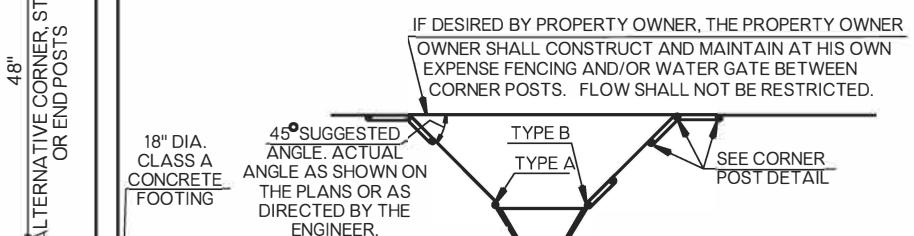
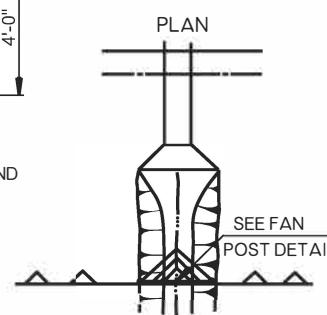
BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
624 (C)	FENCE, STYLE SWF (● BARBED WIRE)	LF
624 (C)	FENCE, STYLE SWF (● SMOOTH WIRE)	LF
624 (C)	FENCE, STYLE SWF (● BARBLESS WIRE)	LF

● NUMBER OF STRANDS

END POST DETAIL
USE FOR CROSS FENCE CONNECTIONS.

NOTE: ALL WIRES SHALL MAKE TWO COMPLETE WRAPS AROUND
END POST, THEN AROUND THEMSELVES TWO TURNS.
USE EXTRA STAPLES ON END POSTS. SEE DETAIL "H".



IF DESIRED BY PROPERTY OWNER, THE PROPERTY OWNER
OWNER SHALL CONSTRUCT AND MAINTAIN AT HIS OWN
EXPENSE FENCING AND/OR WATER GATE BETWEEN
CORNER POSTS. FLOW SHALL NOT BE RESTRICTED.

45° SUGGESTED
ANGLE, ACTUAL
ANGLE AS SHOWN ON
THE PLANS OR AS
DIRECTED BY THE
ENGINEER.

NOTE: AT CULVERT LOCATIONS,
THE TYPE OF RIGHT-OF-WAY
FENCE CONNECTION USED
SHALL BE DESIGNATED BY
THE ENGINEER OR AS
SHOWN ON THE PLANS.

NOTE: WHEN FENCING & CULVERTS ARE
PART OF THE SAME CONTRACT AND
FENCING IS TIED TO WINGS OF A CULVERT,
EYE BOLT SHALL BE PLACED WHEN
CULVERT IS CONSTRUCTED. WHEN THEY
ARE SEPARATE CONTRACTS, HOLES FOR
EYE BOLTS SHALL BE DRILLED INTO WINGS.

PLAN

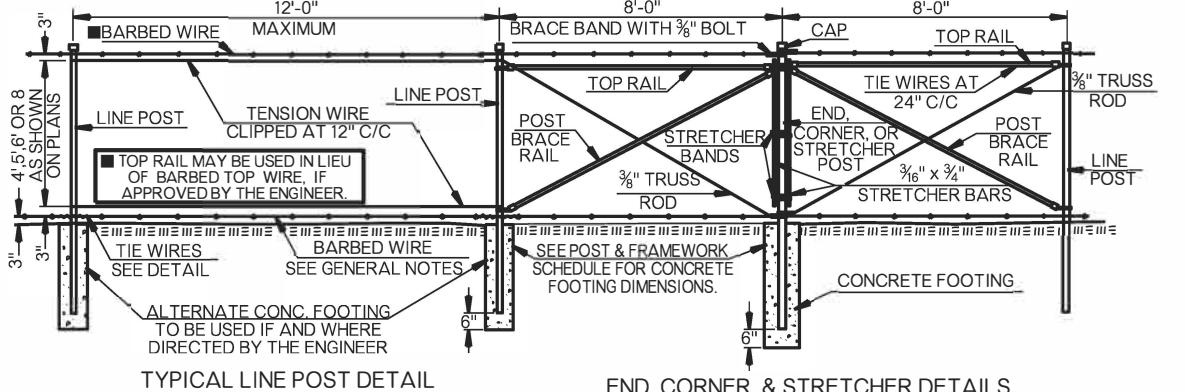
APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

RIGHT-OF-WAY FENCE STYLE SWF
(STRAND WIRE FENCE)

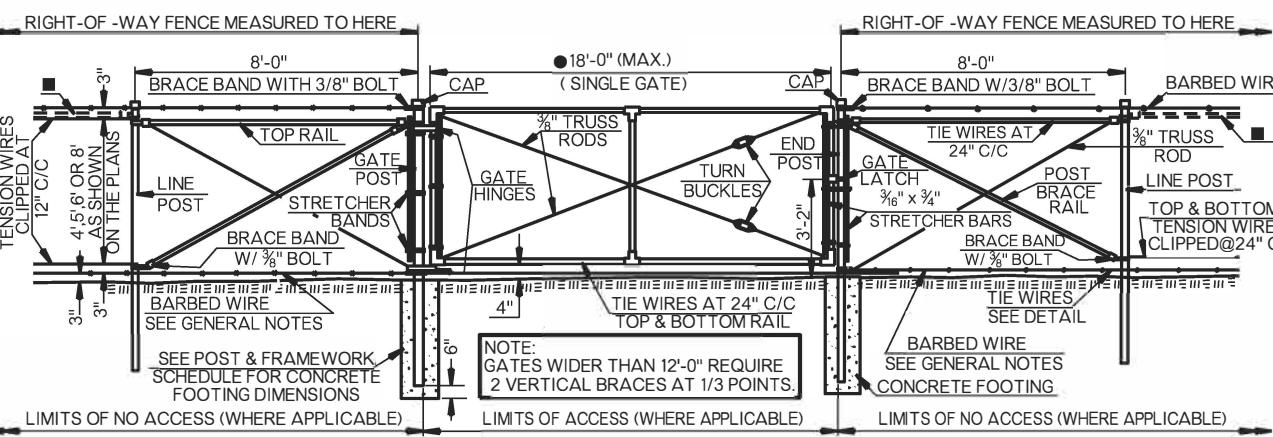
OKLAHOMA
Transportation

2019 SPECIFICATIONS

RWF2-3

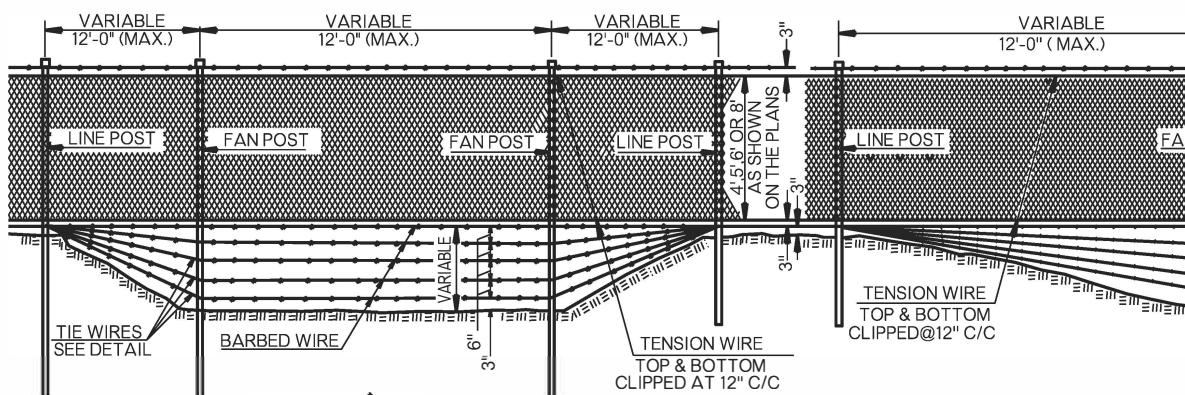


TYPICAL LINE POST DETAIL

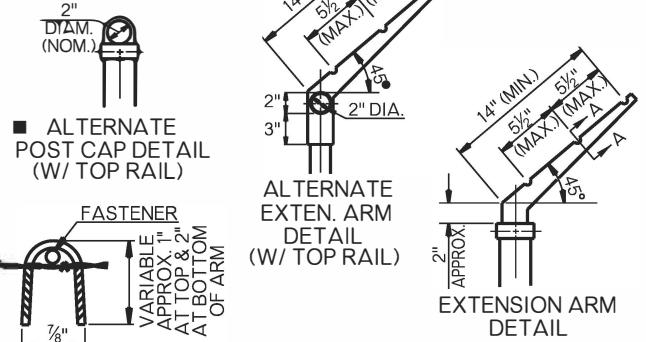


END, CORNER, & STRETCHER DETAILS

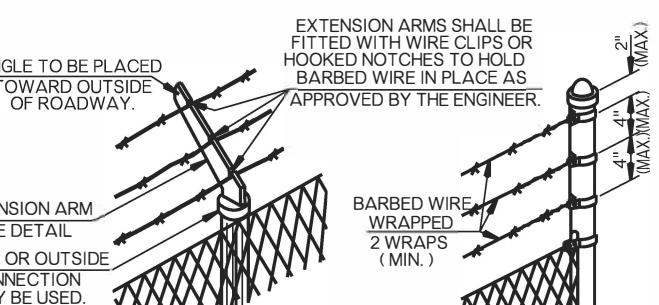
USE STRETCHER DETAILS AT ALL CORNERS, BENDS IN R/W, ON HILL TOPS IN VALLEYS OR DEEP DEPRESSIONS AND AT 500 FEET MAXIMUM SPACING - (REQUIRES CONCRETE FOOTING)



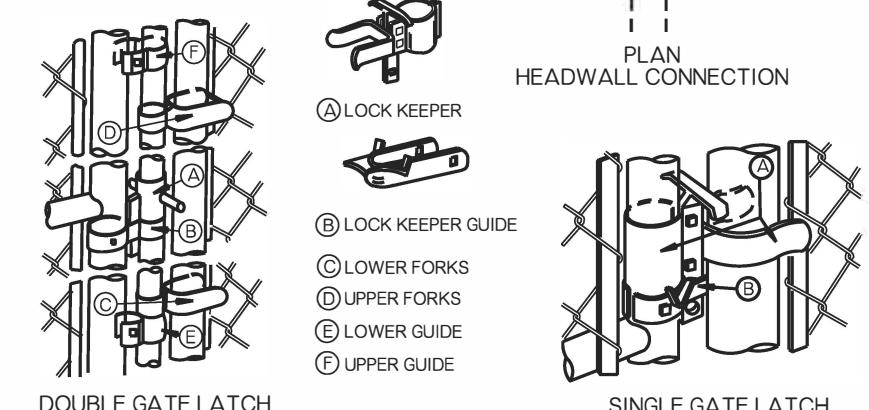
FAN DETAILS



SECTION A-A



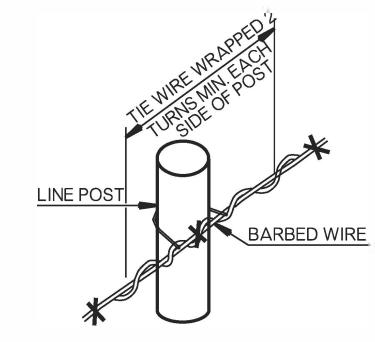
ANGULAR CLIMB BARRIER FOR LINE POSTS



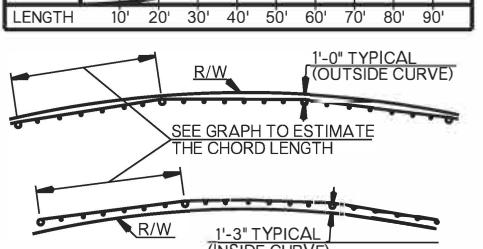
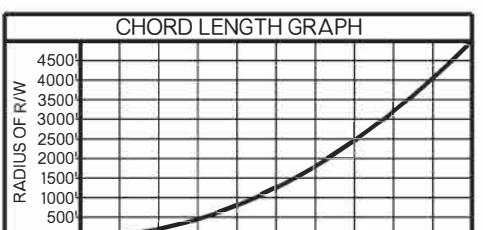
DOUBLE GATE LATCH

TYPICAL GATE LATCH DETAIL
ALTERNATE TYPE LATCH MAY BE USED IF APPROVED BY THE ENGINEER.

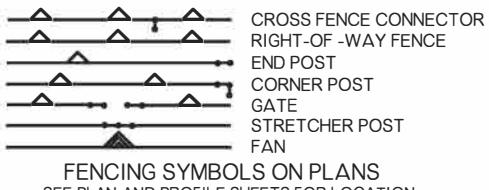
SHAPE	LINE POST			END, CORNER, OR STRETCHER POSTS			GATE POSTS			TOP RAIL OR POST BRACE RAIL			GATE FRAMES		
	O	C	C	I	O	O	O	O	O	O	O	O	O	O	O
NOMENCLATURE	17/8" O.D. T=0.145"	ROLL FORMED HEAVY "C"	ROLL FORMED STAND. "C"	"H" RAIL	2 3/8" O.D. PIPE	2 7/8" O.D. PIPE	4" O.D. PIPE	5 9/16" O.D. PIPE	15/8" O.D. PIPE	ROLL FORMED	15/8" O.D. PIPE	17/8" O.D. PIPE	17/8" O.D. PIPE	17/8" O.D. PIPE	
DIMENSIONS	1.9" O.D. T=0.121"	2.25" x 1.7" T=0.121"	1.875" x 1.625" T=0.121"	2.25" x 1.7" T=0.125"	2.375" O.D. T=0.154"	2.875" O.D. T=0.203"	4.0" O.D. T=0.226"	5.563" O.D. T=0.258"	1.66" O.D. T=0.111"	1.625" x 1.25" T=0.08"	1.66" O.D. T=0.111"	1.9" O.D. T=0.120"	1.9" O.D. T=0.145"		
Critical Axis Sec. Modulus	.326 in. ³	.506 in. ³	.368 in. ³	.661 in. ³	.561 in. ³	1.06 in. ³	2.39 in. ³	5.45 in. ³	0.195 in. ³	0.165 in. ³	0.195 in. ³	0.270 in. ³	0.326 in. ³		
WEIGHT	2.72 LBS./LIN. FT	2.78 LBS./LIN. FT	2.40 LBS./LIN. FT	3.26 LBS./LIN. FT	3.65 LBS./LIN. FT	5.79 LBS./LIN. FT	9.11 LBS./LIN. FT	14.63 LBS./LIN. FT	1.84 LBS./LIN. FT	1.35 LBS./LIN. FT	1.84 LBS./LIN. FT	2.28 LBS./LIN. FT	2.72 LBS./LIN. FT		
LENGTH FOR GIVEN FENCE FAB. HT.	4' 6"-10" W/ CONC. FOOTING; 7'-4" WHEN DRIVEN. 5' 0"-1" W/ CONC. FOOTING; 8'-7" WHEN DRIVEN. 6' 9"-4" W/ CONC. FOOTING; 9'-10" WHEN DRIVEN. 8' 11"-4" W/ CONC. FOOTING; 11'-10" WHEN DRIVEN.	7'-4" W/ CONC. FOOTING 8'-7" W/ CONC. FOOTING 9'-10" W/ CONC. FOOTING 11'-10" W/ CONC. FOOTING	7'-10" W/ CONC. FOOTING 8'-7" W/ CONC. FOOTING 9'-10" W/ CONC. FOOTING 11'-10" W/ CONC. FOOTING	7'-10" W/ CONC. FOOTING 8'-7" W/ CONC. FOOTING 9'-10" W/ CONC. FOOTING 11'-10" W/ CONC. FOOTING	9"-1" W/ CONC. FOOTING 10"-4" W/ CONC. FOOTING 12"-4" W/ CONC. FOOTING 14"-4" W/ CONC. FOOTING										
EMBEDMENT FOR GIVEN FENCE FAB. HT.	4' 24" IN CONC. FOOTING; 30" WHEN DRIVEN. 5' 27" IN CONC. FOOTING; 33" WHEN DRIVEN. 6' 30" IN CONC. FOOTING; 36" WHEN DRIVEN. 8' 30" IN CONC. FOOTING; 36" WHEN DRIVEN.	30" IN CONC. FOOTING 33" IN CONC. FOOTING 36" IN CONC. FOOTING 36" IN CONC. FOOTING	36" IN CONC. FOOTING 39" IN CONC. FOOTING 42" IN CONC. FOOTING 42" IN CONC. FOOTING	36" IN CONC. FOOTING 39" IN CONC. FOOTING 42" IN CONC. FOOTING 42" IN CONC. FOOTING											
FOOTING DIM. IN EARTH	9" DIA. 36" DEEP	9" DIA. 9" DEEP	12" DIA. 12" DEEP	16" DIA. 16" DEEP	18" DIA. 24" DEEP										
FOOTING DIM. IN ROCK	4" DIA. 9" DEEP	4" DIA. 9" DEEP	5" DIA. 12" DEEP	6" DIA. 16" DEEP	8" DIA. 24" DEEP										



DIAMETERS AS SHOWN ARE MINIMUM VALUES.
DEPTHS FOR ROCK ARE MINIMUMS. DEPTHS SHOWN FOR CONCRETE
FOOTINGS IN EARTH ARE MINIMUM FOR 6'-0" HIGH FENCE AND MAY
BE REDUCED 3" FOR EACH FOOT OF FENCE HEIGHT LESS THAN 6'-0" HIGH.
▲ T = WALL THICKNESS
▼ SECTION MODULUS AS SHOWN IS BASED UPON ASTM A53
AND AASHTO M181. SEE SPECIFICATIONS FOR SUBSTITUTION
FORMULA ON CLASS 2 COLD FORMED STEEL PIPE.
● SECTION MODULUS AS SHOWN IS BASED UPON ASTM A501
AND AASHTO M181. SEE SPECIFICATIONS FOR SUBSTITUTION
FORMULA ON CLASS 2 COLD FORMED STEEL PIPE.



TYPICAL PLACEMENT FOR FENCE ALONG CURVES
(WHEN R/W RADIUS IS LESS THAN 5000')



FENCING SYMBOLS ON PLANS
SEE PLAN AND PROFILE SHEETS FOR LOCATION.



FENCING SYMBOL THIS SHEET



BRACE BAND WITH 3/8" BOLT



BARBED WIRES WRAPPED AROUND END TIED TO 5/8" EYE BOLT SET IN WING.



HEADWALL



ATTACHMENT OPTION FULL HEIGHT WING/WALL

WHEN WING OR WALL HEIGHT EQUALS FENCE HEIGHT

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. COST OF BARBED WIRE AND EXTRA LENGTH POSTS FOR FAN TO BE INCLUDED IN PRICE BID FOR CHAIN LINK FENCE.
3. THE BOTTOM BARBED WIRE MAY BE OMITTED AND FABRIC INSTALLED 1" CLEAR FROM GROUND LINE IN LOCATIONS APPROVED BY THE ENGINEER.
4. ALL MISCELLANEOUS HARDWARE SHALL BE FURNISHED GALVANIZED OR ALUMINUM ALLOY.
5. CLIMB BARRIER SHOWN INTENDED ONLY TO SHOW AN ACCEPTABLE TYPE. ALTERNATE CLIMB BARRIERS APPROVED BY THE ENGINEER PRIOR TO INSTALLATION MAY BE USED. FENCE POST EXTENSION ARM SHALL BE MADE OF PRERESSED STEEL OR MALLEABLE IRON AND SHALL BE GALVANIZED AFTER FABRICATION.
6. CHAIN LINK FABRIC MAY BE ACCEPTED KNUCKLED BOTH SELVAGES IN ALL WIDTHS. NO FABRIC WITH TWISTS AND BARBS ON BOTH SELVAGES WILL BE ACCEPTED.
7. STRETCHER POSTS TO BE USED IN GENERAL AT HILL TOPS AND AT BOTTOM OF VALLEYS AND AT A MAXIMUM OF 500 FEET APART.
8. ALL POSTS WITH THE EXCEPTION OF LINE POSTS, FAN POSTS AND HEADWALL CONNECTION STRETCHER POSTS SHALL BE EMBEDDED IN CONCRETE WHEN FENCE IS BEING ERECTED ON EARTHEN FOUNDATIONS. OTHER POSTS MAY BE EMBEDDED IN CONCRETE IF AND AS DIRECTED BY THE ENGINEER TO SATISFY SPECIFIC FOOTING REQUIREMENTS.
9. WHEN TOP RAIL IS USED IN LIEU OF BARBED TOP WIRE THE COST OF TOP RAIL SHALL BE INCLUDED IN THE PRICE BID FOR FENCE.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
624 (E)	FENCE, STYLE CLF (1 FT. HIGH, CLASS □)	LF
624 (F)	GATE, STYLE CLF (1 FT. HIGH X □ FT. LONG)	EA

■ HEIGHT OF FENCE OR GATE SHALL BE SPECIFIED.
□ CLASS A DESIGNATES FENCE OR GATE WITHOUT CLIMB BARRIER
CLASS B DESIGNATES FENCE OR GATE WITH CLIMB BARRIER
■ LENGTH OF GATE SHALL BE SPECIFIED.

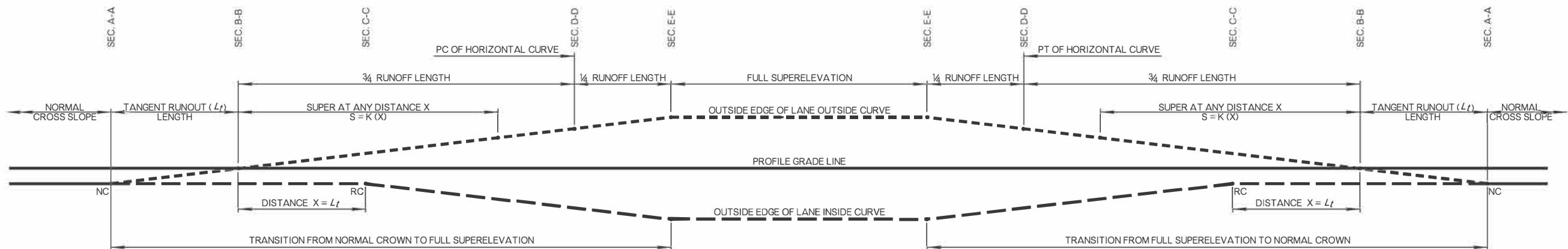
APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

RIGHT-OF-WAY FENCE STYLE CLF
(CHAIN LINK FENCE)

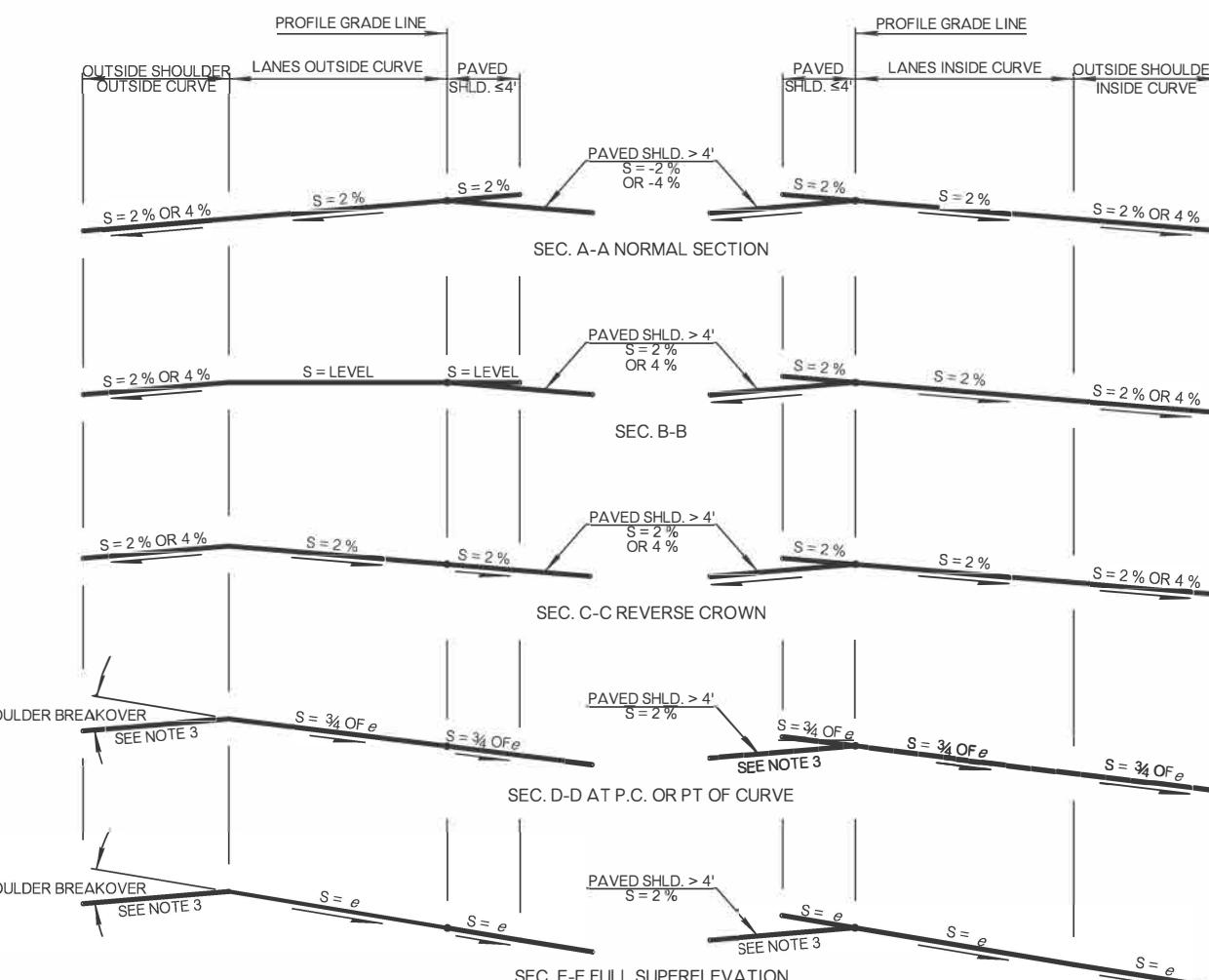


2019 SPECIFICATIONS

RWF3-3 2



PROFILE FOR UNDIVIDED (CROWN SECTION) AND DIVIDED HIGHWAYS



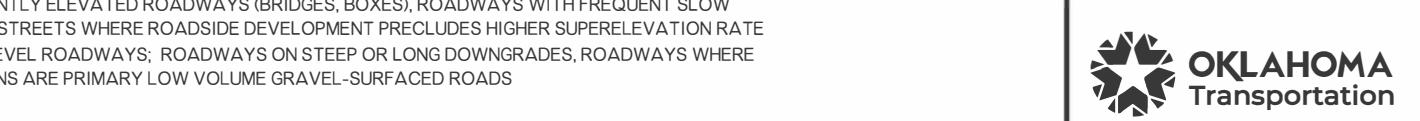
TYPICAL SECTIONS FOR DIVIDED HIGHWAYS

NOTE: FOR DIVIDED HIGHWAYS WITH MEDIAN WIDTH GREATER THAN 46 FEET, TREAT EACH DIRECTION AS A SEPARATE ROADWAY.

PROFILE GRADE IS FINISH GRADE LINE

SLIPPERY ELEVATION RATE GUIDELINES

SUPERELEVATION RATE GUIDELINES	
$\theta_{max.}$	= 6.0 % ELEVATED OR INTERMITTENTLY ELEVATED ROADWAYS (BRIDGES, BOXES), ROADWAYS WITH FREQUENT SLOW MOVING VEHICLES, URBAN STREETS WHERE ROADSIDE DEVELOPMENT PRECLUDES HIGHER SUPERELEVATION RATE
$\theta_{max.}$	= 8.0 % DEPRESSED OR GROUND-LEVEL ROADWAYS; ROADWAYS ON STEEP OR LONG DOWNGRADES, ROADWAYS WHERE DRAINAGE CONSIDERATIONS ARE PRIMARY; LOW VOLUME GRAVEL-SURFACED ROADS



SUPERFILATION

2019 SPECIFICATIONS

SUB

B-74

RUNOFF LENGTH ADJUSTMENTS		
NUMBER OF LANES ROTATED	ADJUSTMENT FACTOR b_w	LENGTH INCREASE RELATIVE TO 1 LANE $= n b_w$
1.0	1.00	1.00
1.5	0.83	1.25
2.0	0.75	1.50
2.5	0.70	1.75
3.0	0.67	2.00
3.5	0.64	2.25

SUPERELEVATION NOMENCLATURE

b_w = ADJUSTMENT FACTOR FOR ROTATED LANES.
 e_d = DESIGN SUPERELEVATION RATE (%)
 L_r = MINIMUM LENGTH OF SUPERELEVATION RUNOFF
 L_t = MINIMUM LENGTH OF TANGENT RUNOUT.
 n_f = NUMBER OF LANES ROTATED.
 NC = NORMAL CROWN.
 RC = REVERSE CROWN
 S = CROSS SLOPE (%).
 V_d = DESIGN SPEED (MILES PER HOUR)
 $K = \frac{e_d(1.01)}{L_r}$ (FT/FT)

GENERAL NOTES

1. THIS STANDARD DRAWING PROVIDES BASIC GUIDELINES FOR SUPERELEVATION DEVELOPMENT FOR TWO OR FOUR LANE, OPEN ROADWAY CONDITIONS ONLY; FOR OTHER SUPERELEVATION DESIGN CRITERIA, SEE THE 2018 AASHTO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS".
2. FOR CURVES WITH SPIRALS, RUNOFF LENGTH IS EQUAL TO SPIRAL LENGTH, WITH FULL SUPERELEVATION REACHED AT S.C. OR C.S. OF CURVE. CHECK RAMP GRADES AND SUPERELEVATION TRANSITIONS AT RAMP TERMINALS DURING STAKING AND MAKE ADJUSTMENTS AS REQUIRED TO OBTAIN SMOOTH PROFILES FOR BOTH EDGES OF THE RAMP PAVEMENT. CROSSOVER CROWN LINE BREAKOVER SHALL NOT EXCEED 5.0% (CALCULATED AS THE ALGEBRAIC DIFFERENCE IN CROSS SLOPES OF ADJACENT PAVEMENTS), WITHOUT THE APPROVAL OF ODOT ENGINEER.
3. IF PRACTICAL THE SHOULDER BREAKOVER SHOULD NOT EXCEED 0.07 FEET PER FOOT, CALCULATED AS THE ALGEBRAIC DIFFERENCE IN CROSS SLOPE OF PAVEMENT AND SHOULDER SURFACES. IT IS ACCEPTABLE FOR THE BREAKOVER TO BE 8%. ROTATE SHOULDER TO MAINTAIN DESIRABLE BREAKOVER. CONTINUOUS SHOULDER CROSS SLOPE SHOULD BE AT LEAST 1% TO INSURE PROPER DRAINAGE.
4. CROSS SLOPE (S) IS NORMALLY SET AT 3/4 (75%) SUPER AT THE P.C. AND PT OF A CURVE, HOWEVER THE DESIGNER MAY ADJUST THIS PERCENTAGE TO BE FROM 60% TO 90%, TO ACCOMMODATE SITE CONDITIONS.
5. THE SUPERELEVATION TABLE FOR LOW SPEED URBAN STREETS MAY BE USED WHERE THE DESIGN SPEED IS NOT GREATER THAN 45 MPH.

SUPERELEVATION e_d	SUPERELEVATION TABLE (LOW SPEED URBAN STREETS)																		SUPERELEVATION e_d			
	$V_d = 15 \text{ mph}$				$V_d = 20 \text{ mph}$				$V_d = 25 \text{ mph}$				$V_d = 30 \text{ mph}$				$V_d = 35 \text{ mph}$					
	RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		
		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$	
-2.0 % (NC)	50	31	46	107	32	49	198	34	51	333	36	55	510	39	58	762	41	62	1,039	44	67	-2.0 % (NC)
2.0 % (RC)	44	31	46	92	32	49	167	34	51	273	36	55	408	39	58	593	41	62	794	44	67	2.0 % (RC)
2.2 %	44	34	51	91	36	54	165	38	57	270	40	60	404	43	64	586	46	68	785	49	73	2.2 %
2.4 %	44	37	55	91	39	58	164	41	62	268	44	65	400	46	70	580	50	74	776	53	80	2.4 %
2.6 %	43	40	60	90	42	63	163	45	67	265	47	71	396	50	75	573	54	81	767	58	87	2.6 %
2.8 %	43	43	65	89	45	68	161	48	72	263	51	76	393	54	81	567	58	87	758	62	93	2.8 %
3.0 %	43	46	69	89	49	73	160	51	77	261	55	82	389	58	87	561	62	93	750	67	100	3.0 %
3.2 %	43	49	74	88	52	78	159	55	82	259	58	87	385	62	93	556	66	99	742	71	107	3.2 %
3.4 %	42	52	78	88	55	83	158	58	87	256	62	93	382	66	99	550	70	106	734	76	113	3.4 %
3.6 %	42	55	83	87	58	88	157	62	93	254	65	98	378	70	105	544	74	112	726	80	120	3.6 %
3.8 %	42	58	88	87	62	92	155	65	98	252	69	104	375	74	110	539	79	118	718	84	127	3.8 %
4.0 %	42	62	92	86	65	97	154	69	103	250	73	109	371	77	116	533	83	124	711	89	133	4.0 %
4.2 %	41	65	97	85	68	102	153	72	108	248	76	115	368	81	122	528	87	130	703	93	140	4.2 %
4.4 %	41	68	102	85	71	107	152	75	113	246	80	120	365	85	128	523	91	137	696	98	147	4.4 %
4.6 %	41	71	106	84	75	112	151	79	118	244	84	125	361	89	134	518	95	143	689	102	153	4.6 %
4.8 %	41	74	111	84	78	117	150	82	123	242	87	131	358	93	139	513	99	149	682	107	160	4.8 %
5.0 %	41	77	115	83	81	122	149	86	129	240	91	136	355	97	145	508	103	155	675	111	167	5.0 %
5.2 %	40	80	120	83	84	126	148	89	134	238	95	142	352	101	151	503	108	161	668	116	173	5.2 %
5.4 %	40	83	125	82	88	131	147	93	139	236	98	147	349	105	157	498	112	168	662	120	180	5.4 %
5.6 %	40	86	129	82	91	136	146	96	144	234	102	153	346	108	163	494	116	174	655	124	187	5.6 %
5.8 %	40	89	134	81	94	141	145	99	149	233	105	158	343	112	168	489	120	180	649	129	193	5.8 %
6.0 %	39	92	138	81	97	146	144	103	154	231	109	164	340	116	174	485	124	186	643	133	200	6.0 %

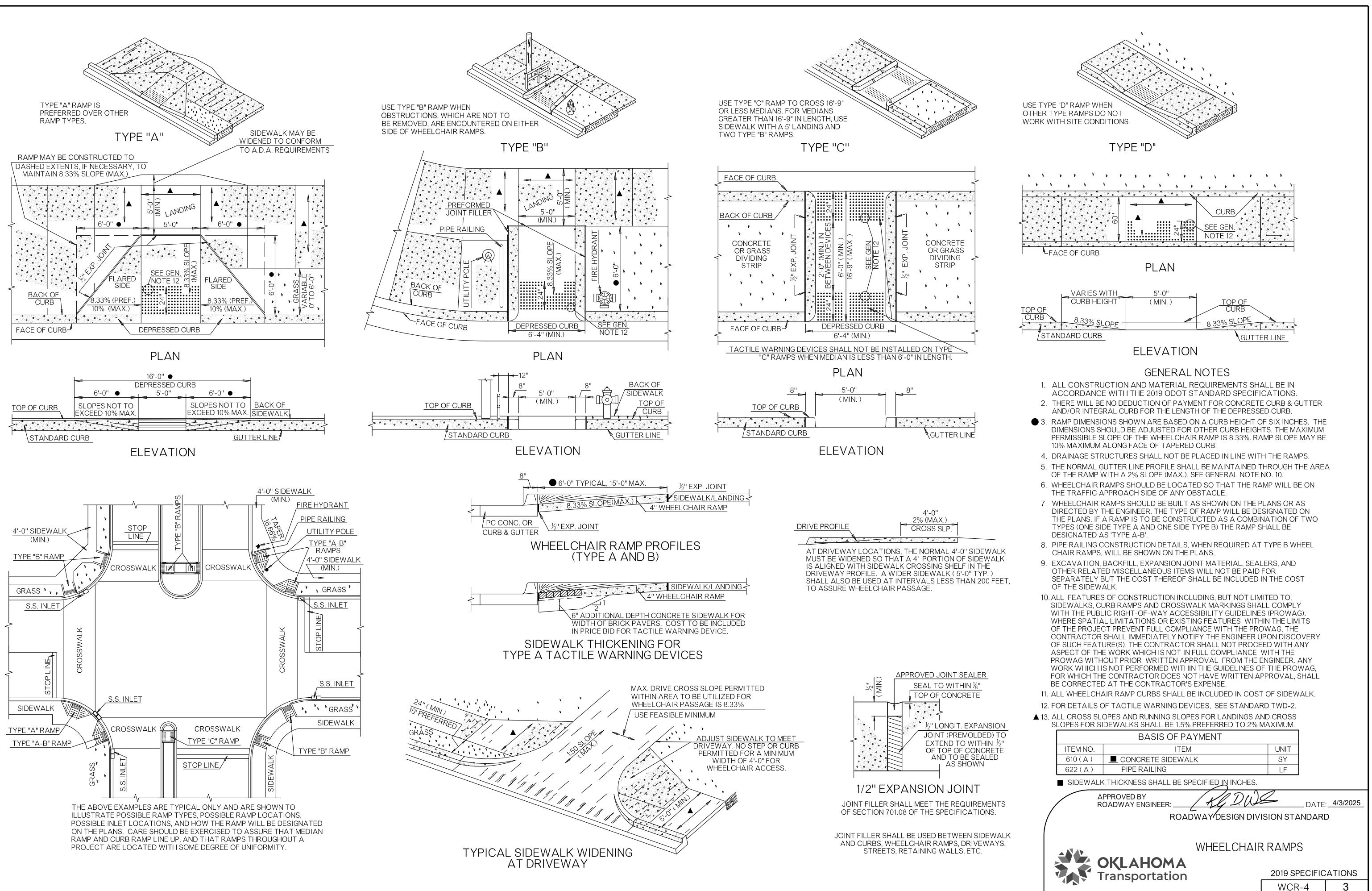
NOTES - LOW-SPEED URBAN STREETS TABLE

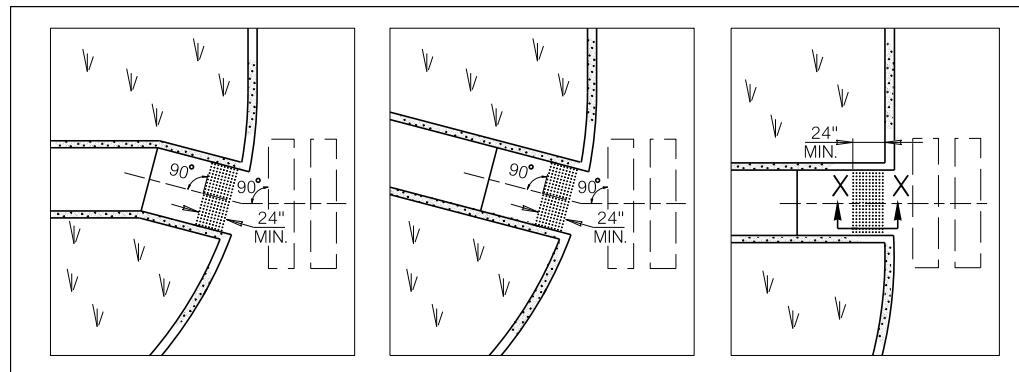
1. THE VALUES LISTED ON THIS TABLE WERE CALCULATED USING DISTRIBUTION METHOD 2.
2. SUPERELEVATION MAY BE OPTIONAL ON LOW-SPEED URBAN STREETS.
3. THE SUPERELEVATION RUNOFF LENGTH (L_r) WAS BASED ON THE NUMBER OF LANES ROTATED. SINGLE LANE ROTATED IS TYPICAL OF 2 LANE HIGHWAYS, AND TWO LANES ROTATED IS TYPICAL OF 4 LANE HIGHWAYS.
4. FOR THE TANGENT RUNOFF LENGTH (L_r), USE THE FORMULA: $\frac{2.0\% \cdot 0.01}{K}$, WHERE K IS $\frac{e_d \cdot 0.01}{L_r \text{ (FT)}}$.
5. VALUES OF RADIUS AND SUPERELEVATION RUNOFF LENGTHS SHALL NOT BE INTERPOLATED OR ROUNDED UP.

SUPERELEVATION e_d	SUPERELEVATION TABLE ($e_{max.} = 6\%$)																								SUPERELEVATION e_d	
	$V_d = 15$ mph				$V_d = 20$ mph				$V_d = 25$ mph				$V_d = 30$ mph				$V_d = 35$ mph				$V_d = 40$ mph					
	RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)			
		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		
-2.0 % (NC)	868	31	46	1,580	32	49	2,290	34	51	3,130	36	55	4,100	39	58	5,230	41	62	6,480	44	67	-2.0 % (NC)				
2.0 % (RC)	614	31	46	1,120	32	49	1,630	34	51	2,240	36	55	2,950	39	58	3,770	41	62	4,680	44	67	2.0 % (RC)				
2.2 %	543	34	51	991	36	54	1,450	38	57	2,000	40	60	2,630	43	64	3,370	46	68	4,190	49	73	2.2 %				
2.4 %	482	37	55	884	39	58	1,300	41	62	1,790	44	65	2,360	46	70	3,030	50	74	3,770	53	80	2.4 %				
2.6 %	430	40	60	791	42	63	1,170	45	67	1,610	47	71	2,130	50	75	2,740	54	81	3,420	58	87	2.6 %				
2.8 %	384	43	65	709	45	68	1,050	48	72	1,460	51	76	1,930	54	81	2,490	58	87	3,110	62	93	2.8 %				
3.0 %	341	46	69	635	49	73	944	51	77	1,320	55	82	1,760	58	87	2,270	62	93	2,840	67	100	3.0 %				
3.2 %	300	49	74	566	52	78	850	55	82	1,200	58	87	1,600	62	93	2,080	66	99	2,600	71	107	3.2 %				
3.4 %	256	52	78	498	55	83	761	58	87	1,080	62	93	1,460	66	99	1,900	70	106	2,390	76	113	3.4 %				
3.6 %	209	55	83	422	58	88	673	62	93	972	65	98	1,320	70	105	1,740	74	112	2,190	80	120	3.6 %				
3.8 %	176	58	88	358	62	92	583	65	98	864	69	104	1,190	74	110	1,590	79	118	2,010	84	127	3.8 %				
4.0 %	151	62	92	309	65	97	511	69	103	766	73	109	1,070	77	116	1,440	83	124	1,840	89	133	4.0 %				
4.2 %	131	65	97	270	68	102	452	72	108	684	76	115	960	81	122	1,310	87	130	1,680	93	140	4.2 %				
4.4 %	116	68	102	238	71	107	402	75	113	615	80	120	868	85	128	1,190	91	137	1,540	98	147	4.4 %				
4.6 %	102	71	106	212	75	112	360	79	118	555	84	125	788	89	134	1,090	95	143	1,410	102	153	4.6 %				
4.8 %	91	74	111	189	78	117	324	82	123	502	87	131	718	93	139	995	99	149	1,300	107	160	4.8 %				
5.0 %	82	77	115	169	81	122	292	86	129	456	91	136	654	97	145	911	103	155	1,190	111	167	5.0 %				
5.2 %	73	80	120	152	84	126	264	89	134	413	95	142	595	101	151	833	108	161	1,090	116	173	5.2 %				
5.4 %	65	83	125	136	88	131	237	93	139	373	98	147	540	105	157	759	112	168	995	120	180	5.4 %				
5.6 %	58	86	129	121	91	136	212	96	144	335	102	153	487	108	163	687	116	174	903	124	187	5.6 %				
5.8 %	51	89	134	106	94	141	186	99	149	296	105	158	431	112	168	611	120	180	806	129	193	5.8 %				
6.0 %	39	92	138	81	97	146	144	103	154	231	109	164	340	116	174	485	124	186	643	133	200	6.0 %				

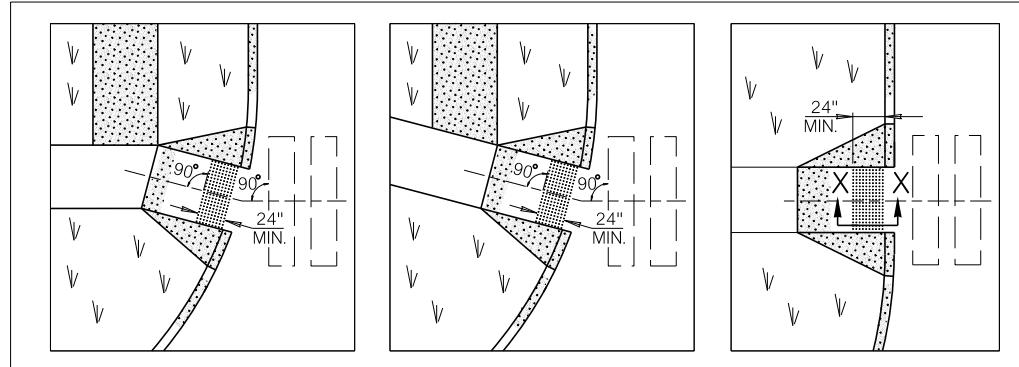
SUPERELEVATION e_d	SUPERELEVATION TABLE ($e_{max.} = 6\%$)																									SUPERELEVATION e_d
	$V_d = 50$ mph				$V_d = 55$ mph				$V_d = 60$ mph				$V_d = 65$ mph				$V_d = 70$ mph				$V_d = 75$ mph					
	RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT																					

SUPERELEVATION θ_d	SUPERELEVATION TABLE ($e_{max.} = 8\%$)																		SUPERELEVATION θ_d			
	$V_d = 15 \text{ mph}$			$V_d = 20 \text{ mph}$			$V_d = 25 \text{ mph}$			$V_d = 30 \text{ mph}$			$V_d = 35 \text{ mph}$			$V_d = 40 \text{ mph}$						
	RADIUS (FT.)		L_r (FT.)	RADIUS (FT.)		L_r (FT.)	RADIUS (FT.)		L_r (FT.)	RADIUS (FT.)		L_r (FT.)	RADIUS (FT.)		L_r (FT.)	RADIUS (FT.)		L_r (FT.)				
	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$	$\eta_{l=1}$	$\eta_{l=2}$				
-2.0 % (NC)	932	31	46	1,640	32	49	2,370	34	51	3,240	36	55	4,260	39	58	5,410	41	62	6,710	44	67	-2.0 % (NC)
2.0 % (RC)	676	31	46	1,190	32	49	1,720	34	51	2,370	36	55	3,120	39	58	3,970	41	62	4,930	44	67	2.0 % (RC)
2.2 %	605	34	51	1,070	36	54	1,550	38	57	2,130	40	60	2,800	43	64	3,570	46	68	4,440	49	73	2.2 %
2.4 %	546	37	55	959	39	58	1,400	41	62	1,930	44	65	2,540	46	70	3,240	50	74	4,030	53	80	2.4 %
2.6 %	496	40	60	872	42	63	1,280	45	67	1,760	47	71	2,320	50	75	2,960	54	81	3,690	58	87	2.6 %
2.8 %	453	43	65	796	45	68	1,170	48	72	1,610	51	76	2,130	54	81	2,720	58	87	3,390	62	93	2.8 %
3.0 %	415	46	69	730	49	73	1,070	51	77	1,480	55	82	1,960	58	87	2,510	62	93	3,130	67	100	3.0 %
3.2 %	382	49	74	672	52	78	985	55	82	1,370	58	87	1,820	62	93	2,330	66	99	2,900	71	107	3.2 %
3.4 %	352	52	78	620	55	83	911	58	87	1,270	62	93	1,690	66	99	2,170	70	106	2,700	76	113	3.4 %
3.6 %	324	55	83	572	58	88	845	62	93	1,180	65	98	1,570	70	105	2,020	74	112	2,520	80	120	3.6 %
3.8 %	300	58	88	530	62	92	784	65	98	1,100	69	104	1,470	74	110	1,890	79	118	2,360	84	127	3.8 %
4.0 %	277	62	92	490	65	97	729	69	103	1,030	73	109	1,370	77	116	1,770	83	124	2,220	89	133	4.0 %
4.2 %	255	65	97	453	68	102	678	72	108	955	76	115	1,280	81	122	1,660	87	130	2,080	93	140	4.2 %
4.4 %	235	68	102	418	71	107	630	75	113	893	80	120	1,200	85	128	1,560	91	137	1,960	98	147	4.4 %
4.6 %	215	71	106	384	75	112	585	79	118	834	84	125	1,130	89	134	1,470	95	143	1,850	102	153	4.6 %
4.8 %	193	74	111	349	78	117	542	82	123	779	87	131	1,060	93	139	1,390	99	149	1,750	107	160	4.8 %
5.0 %	172	77	115	314	81	122	499	86	129	727	91	136	991	97	145	1,310	103	155	1,650	111	167	5.0 %
5.2 %	154	80	120	284	84	126	457	89	134	676	95	142	929	101	151	1,230	108	161	1,560	116	173	5.2 %
5.4 %	139	83	125	258	88	131	420	93	139	627	98	147	870	105	157	1,160	112	168	1,480	120	180	5.4 %
5.6 %	126	86	129	236	91	136	387	96	144	582	102	153	813	108	163	1,090	116	174	1,390	124	187	5.6 %
5.8 %	115	89	134	216	94	141	358	99	149	542	105	158	761	112	168	1,030	120	180	1,320	129	193	5.8 %
6.0 %	105	92	138	199	97	146	332	103	154	506	109	164	713	116	174	965	124	186	1,250	133	200	6.0 %
6.2 %	97	95	143	184	101	151	308	106	159	472	113	169	669	120	180	909	128	192	1,180	138	207	6.2 %
6.4 %	89	98	148	170	104	156	287	110	165	442	116	175	628	124	186	857	132	199	1,110	142	213	6.4 %
6.6 %	82	102	152	157	107	161	267	113	170	413	120	180	590	128	192	808	137	205	1,050	147	220	6.6 %
6.8 %	76	105	157	146	110	165	248	117	175	386	124	185	553	132	197	761	141	211	990	151	227	6.8 %
7.0 %	70	108	162	135	114	170	231	120	180	360	127	191	518	135	203	716	145	217	933	156	233	7.0 %
7.2 %	64	111	166	125	117	175	214	123	185	336	131	196	485	139	209	672	149	223	878	160	240	7.2 %
7.4 %	59	114	171	115	120	180	198	127	190	312	135	202	451	143	215	628	153	230	822	164	247	7.4 %
7.6 %	54	117	175	105	123	185	182	130	195	287	138	207	417	147	221	583	157	236	765	169	253	7.6 %
7.8 %	48	120	180	94	126	190	164	134	201	261	142	213	380	151	226	533	161	242	701	173	260	7.8 %
8.0 %	38	123	185	76	130	195	134	137	206	214	145	218	314	155	232	444	166	248	587	178	267	8.0 %

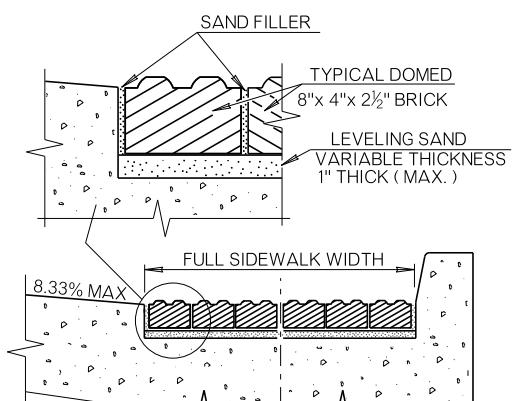




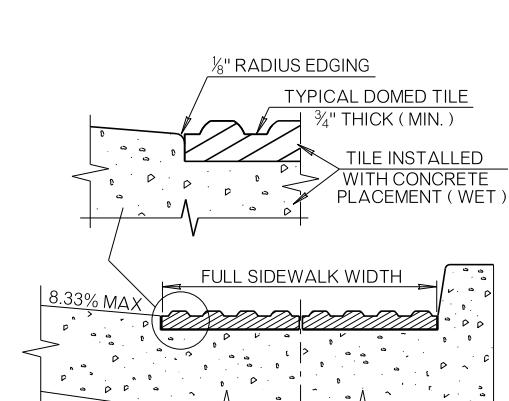
TACTILE SYSTEM ORIENTATION - TYPICAL CURBED RAMPS



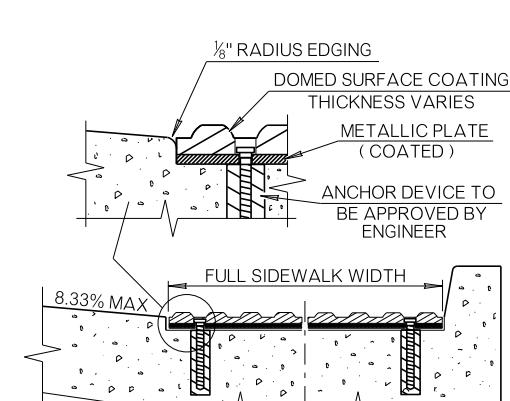
TACTILE SYSTEM ORIENTATION - TYPICAL FLARED RAMPS



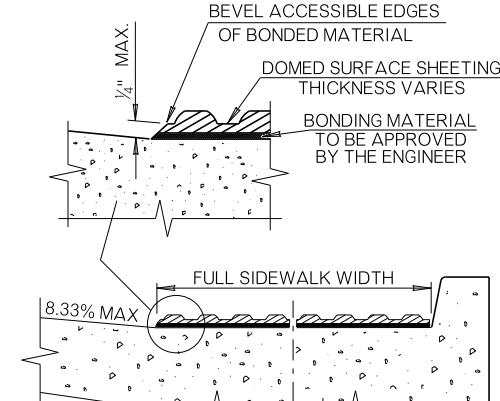
FLARED CURBED
SECTION A - A



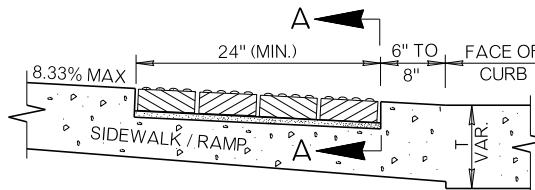
FLARED CURBED
SECTION B - B



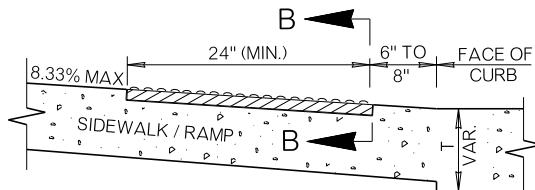
FLARED CURBED
SECTION C - C



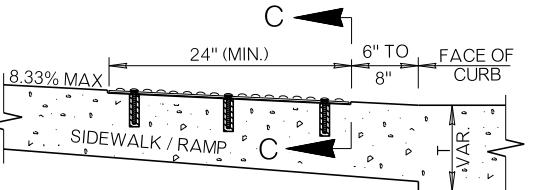
FLARED CURBED
SECTION D - D



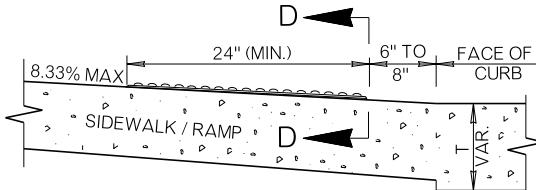
SECTION X - X
TYPE A
DOMED BRICK SYSTEM



SECTION X - X
TYPE B
DOMED TILE SYSTEM
(WET SET INLAY)



SECTION X - X
TYPE C
DOME COATED PLATE SYSTEM
(TYPICAL RETROFIT)



SECTION X - X
TYPE D
SURFACE BONDED DOMED SYSTEM
(TYPICAL RETROFIT)

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. ALL FEATURES OF TACTILE WARNING DEVICE DESIGN AND FINAL INSTALLATION SHALL COMPLY WITH THE PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG). WHERE SPATIAL LIMITATIONS OR EXISTING FEATURES WITHIN THE LIMITS OF THE PROJECT PREVENT FULL COMPLIANCE WITH THE PROWAG, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERY OF SUCH FEATURE(S). THE CONTRACTOR SHALL NOT PROCEED WITH ANY ASPECT OF THE WORK WHICH IS NOT IN FULL COMPLIANCE WITH THE PROWAG WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER. ANY WORK WHICH IS NOT PERFORMED WITHIN THE GUIDELINES OF THE PROWAG, FOR WHICH THE CONTRACTOR DOES NOT HAVE WRITTEN APPROVAL, SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.
3. TACTILE WARNING SURFACE SHALL EXTEND FROM EDGE TO EDGE OF WALKWAY ENTERING THE CROSSWALK, AT STREET LEVEL.
4. CURB IS NOT SHOWN IN THE SECTION X-X DETAIL ON THIS SHEET.
5. THICKNESS 'T' OF PAVEMENT ABUTTING SIDEWALK/RAMP VARIES.
6. SIDEWALK, RAMP AND FLARE THICKNESS SHALL BE 4" MINIMUM THICKNESS AFTER INSTALLATION OF TACTILE WARNING TREATMENT.
7. TRUNCATED DOME SURFACE SHALL CONTRAST VISUALLY WITH THE ADJOINING WALKING SURFACES EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT. THE MATERIAL USED TO PROVIDE CONTRAST SHALL BE AN INTEGRAL PART OF THE TRUNCATED SURFACE.
8. LEVELING SAND FOR DOMED BRICK SYSTEMS SHALL MEET THE REQUIREMENTS OF SECTION 703.06B(2) OF THE SPECIFICATIONS.
9. SURFACE BONDED TACTILE SYSTEMS MAY ONLY BE PLACED ON NEWLY POURED CONCRETE AFTER AN APPROPRIATE PERIOD OF CURING, IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND AS DIRECTED BY THE ENGINEER.
10. ROWS OF TACTILE DOME TREATMENT SHOULD BE ORIENTED PARALLEL WITH CENTERLINE OF SIDEWALK/RAMP OR TOWARD THE CENTERLINE OF MARKED CROSSWALK.
11. EXPANSION JOINTS DEEMED NECESSARY, BUT NOT SHOWN ON THE PLANS, MAY BE ADDED AND PLACED DURING CONSTRUCTION, AS DIRECTED BY THE ENGINEER.
12. TACTILE SYSTEMS, DOME PATTERNS OR FEATURES DIFFERING FROM THOSE SHOWN ON THIS DETAIL, BUT MEETING CURRENT PROWAG SPECIFICATIONS, SHALL BE SUBMITTED TO AND APPROVED BY THE ENGINEER BEFORE INSTALLATION.
13. THE SAME TACTILE DOME PATTERN AND COLOR SHALL BE USED THROUGHOUT ANY NEW OR RETROFIT PROJECT. DOME PATTERN AND LOCATION OF EXISTING RAMPS TO BE RETROFIT WITH TACTILE DEVICES SHALL BE DESIGNATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
14. RETROFIT INSTALLATIONS WILL NOT REQUIRE REPLACING EXISTING DEPRESSED CURBING. A NOMINAL 6 TO 8 INCH SETBACK FROM FACE OF CURB SHALL BE ENFORCED FOR NEAR EDGE OF TACTILE DOMES.
15. TYPES A & B TACTILE SYSTEMS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 10,000 PSI. TYPES C & D SYSTEMS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI. COMPRESSIVE TESTS MEET ASTM D695.
16. TACTILE WARNING SURFACES MAY NOT BE STAMPED IN WET CONCRETE.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
610 (1)	TACTILE WARNING DEVICE - NEW	SF
610 (1)	TACTILE WARNING DEVICE - RETROFIT	SF

NOTE: TYPE A OR B TACTILE WARNING DEVICE SHALL BE SPECIFIED ON THE PLANS FOR NEW CONSTRUCTION & TYPE C OR D SHALL BE SPECIFIED ON THE PLANS FOR RETROFIT CONSTRUCTION.

APPROVED BY
ROADWAY ENGINEER: *R. D. W.* DATE: 4/3/2025
ROADWAY DESIGN DIVISION STANDARD

TACTILE WARNING DEVICES



2019 SPECIFICATIONS

TWD-2

3

R-79