

OKLAHOMA DEPARTMENT OF TRANSPORTATION

ROADWAY DESIGN STANDARD DRAWINGS






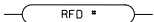
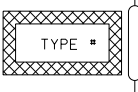





For use with the 2019 ODOT Standard Specifications and effective April 10, 2026


	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	CRCP1-4-	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
DRAINAGE STRUCTURES	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		
	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)	PIB-	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
CULVERT INSTALLATION	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
	R-63	PIPE BEDDING AND BACKFILL	PBB-1-	4
	R-64	STANDARD BOX INSTALLATION	SBI-5-	2
MISCELLANEOUS CONSTRUCTION	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
	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		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		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		221.02E	221.04E	TEMPORARY SEDIMENT BASINS ARE USED TO REDUCE TURBIDITY OF CONSTRUCTION STORMWATER RUNOFF DURING GRADING.
STABILIZED CONSTRUCTION EXIT	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		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		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		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		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		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.

APPROVED BY
ROADWAY ENGINEER:

DATE: 6/29/22

ROADWAY DESIGN DIVISION STANDARD



OKLAHOMA
Transportation

BEST MANAGEMENT PRACTICE
REFERENCE MATRIX

2019 SPECIFICATIONS

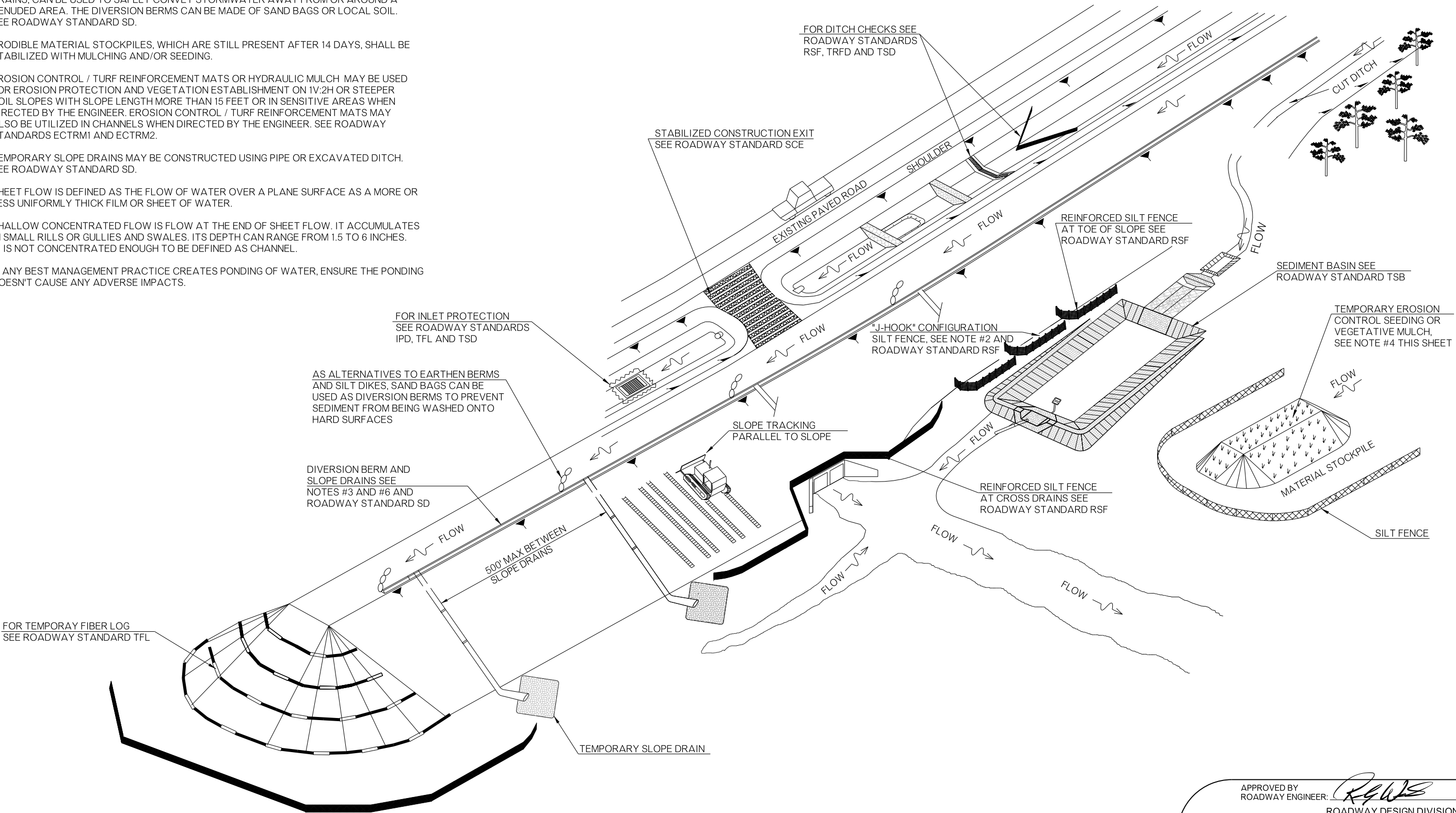
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R-1

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. "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).
3. 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.
4. ERODIBLE MATERIAL STOCKPILES, WHICH ARE STILL PRESENT AFTER 14 DAYS, SHALL BE STABILIZED WITH MULCHING AND/OR SEEDING.
5. 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 ECTRM1 AND ECTRM2.
6. TEMPORARY SLOPE DRAINS MAY BE CONSTRUCTED USING PIPE OR EXCAVATED DITCH. SEE ROADWAY STANDARD SD.
7. 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.
8. 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.
9. IF ANY BEST MANAGEMENT PRACTICE CREATES PONDING OF WATER, ENSURE THE PONDING DOESN'T CAUSE ANY ADVERSE IMPACTS.



APPROVED BY
ROADWAY ENGINEER: *R. G. W.* DATE: 6/29/22

ROADWAY DESIGN DIVISION STANDARD

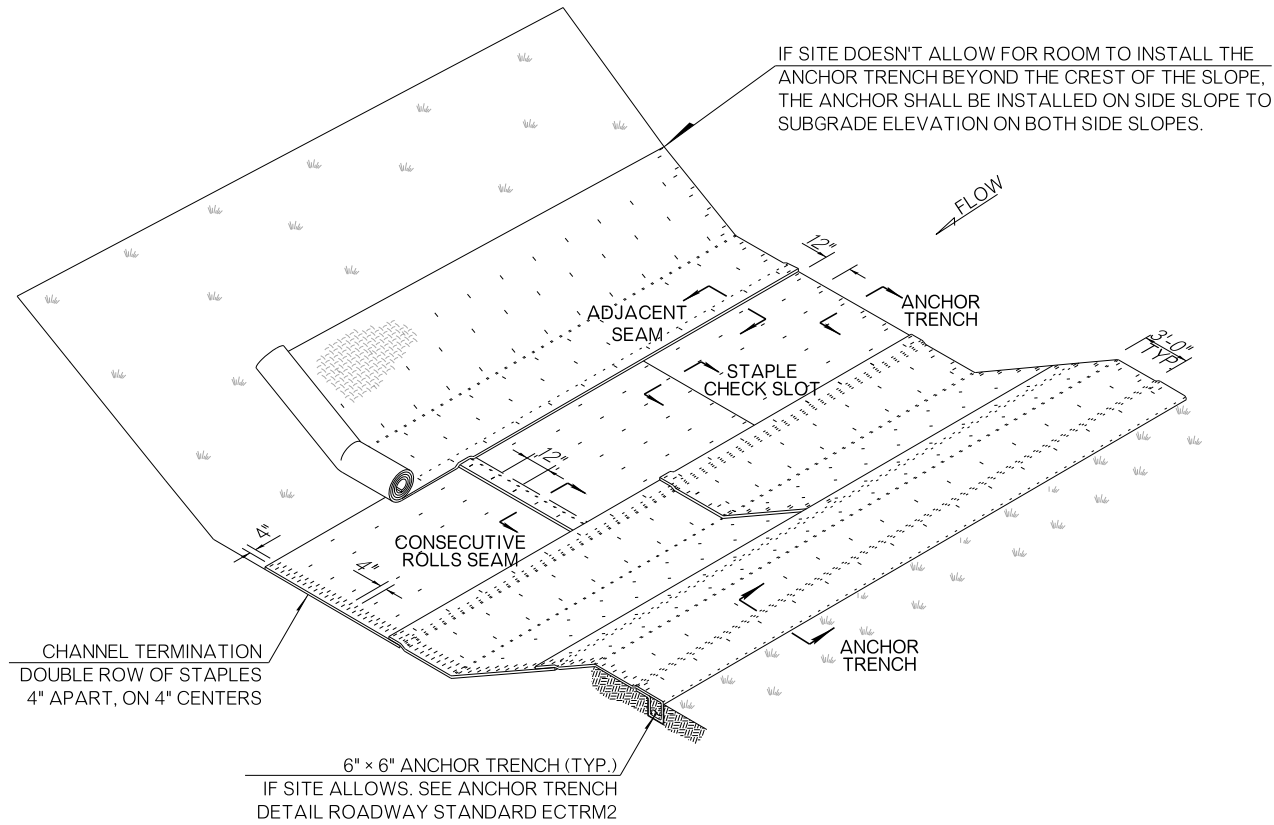
TYPICAL TEMPORARY EROSION/
SEDIMENT CONTROL APPLICATIONS



2019 SPECIFICATIONS

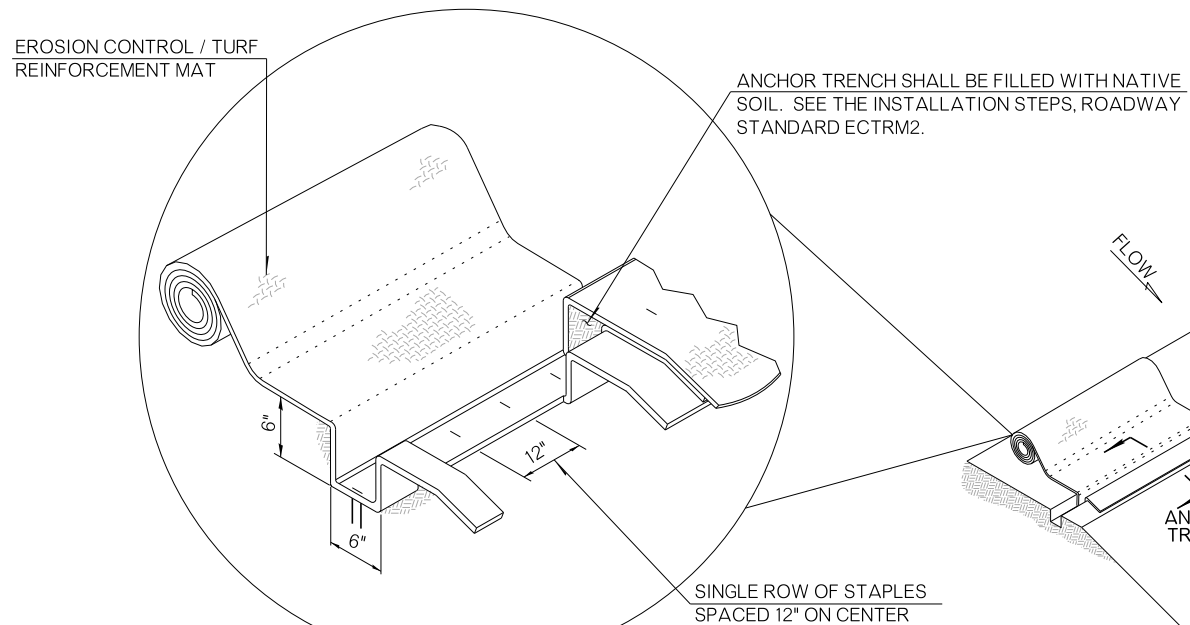
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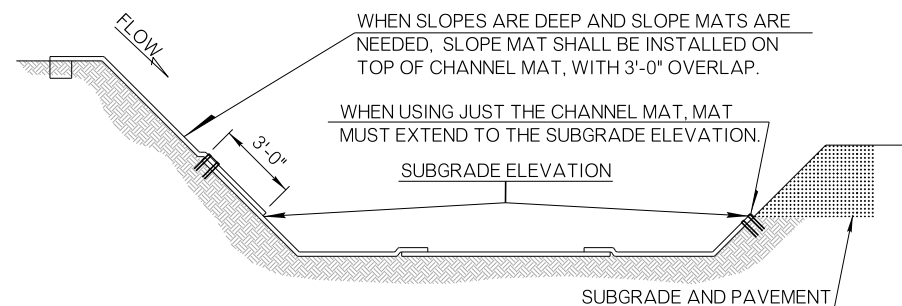
CHANNEL INSTALLATION

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

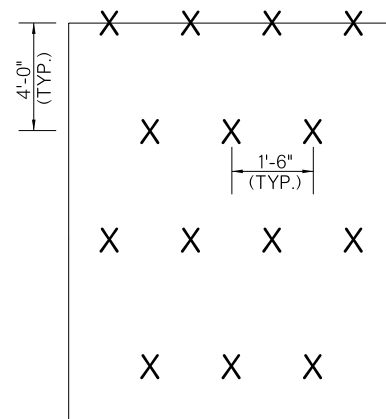


ANCHOR TRENCH DETAIL

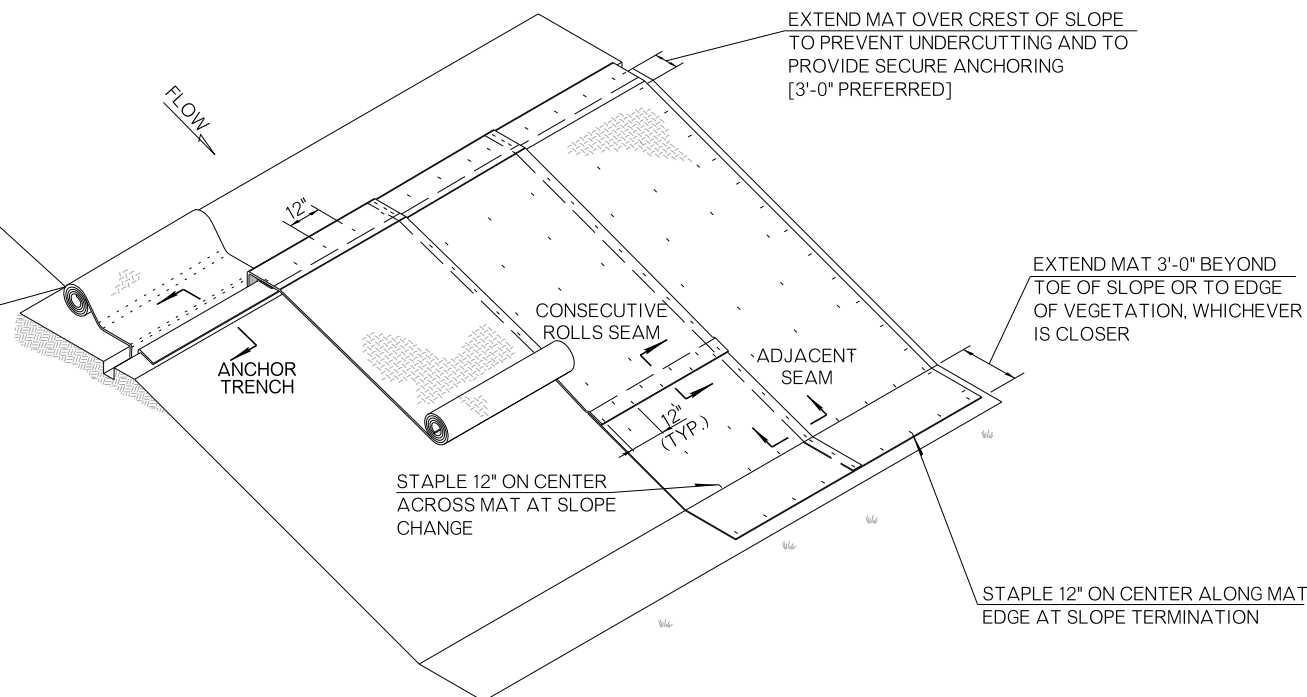
NOTE: IF SHEET FLOW WILL BE ENCOUNTERED AT THE MATTING'S
EDGE, WITHOUT AN ADJACENT OR CONSECUTIVE MAT, AN ANCHOR
TRENCH SHALL BE INSTALLED TO PREVENT UNDERMINING AND
ERODING UNDER MAT.



CHANNEL
ELEVATION DETAIL



STAPLE PATTERN



SLOPE INSTALLATION

INSTALLATION STEPS

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

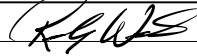
- PREPARE SLOPE BY REMOVING LARGE ROCKS, VEGETATION, FIXING SURFACE RILLS AND COMPACTING SOIL SO THAT SURFACE IS RELATIVELY SMOOTH.
- IF INSTALLING EROSION CONTROL MAT, FERTILIZER AND SEED SHALL BE APPLIED BEFORE INSTALLING MAT ON TOP. IF INSTALLING TURF REINFORCEMENT MAT, SEED AND TOPSOIL MAY BE APPLIED ON TOP OF MAT.
- 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.
- PLACE MAT PARALLEL WITH DIRECTION OF FLOW, AND SECURE MAT IN INITIAL ANCHOR TRENCH, STAPLING MAT AS SHOWN.
- REPLACE NATIVE SOIL PREVIOUSLY REMOVED FROM TRENCH.
- 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.
- 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

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- 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.
- 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.
- 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.
- INSTALLATION IS NOT SUITABLE ON ROCKY SITES.
- 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.
- 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

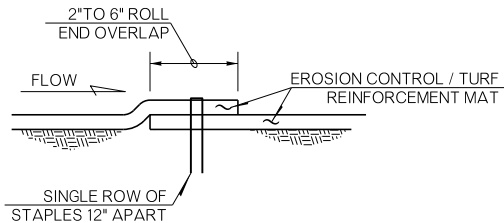
APPROVED BY
ROADWAY ENGINEER:  DATE: 6/24/22

ROADWAY DESIGN DIVISION STANDARD
EROSION CONTROL / TURF REINFORCEMENT MAT
INSTALLATION DETAILS (1 OF 2 SHEETS)

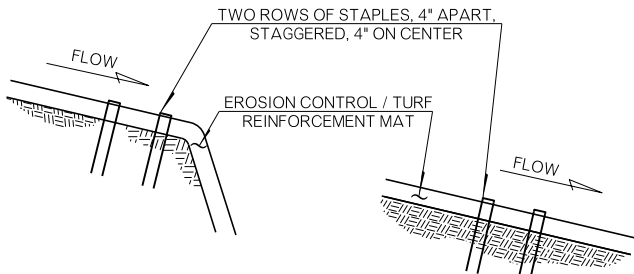


2019 SPECIFICATIONS

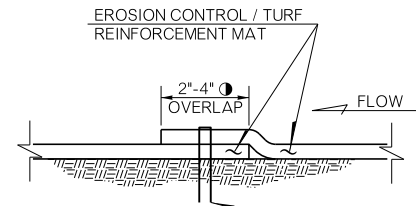
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CONSECUTIVE ROLL SEAM



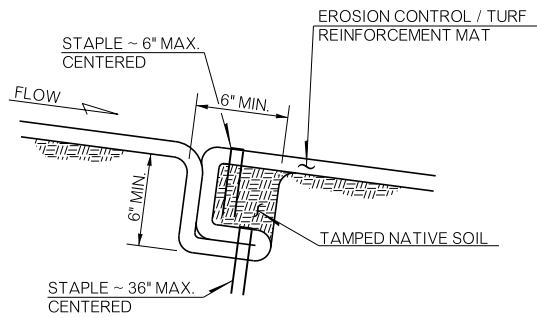
SLOPE
AT TOP OF CREST
CHANNEL
AT 50' INTERVALS
CHECK SEAM / SLOT



STAPLES ARE THROUGH BOTH BLANKETS.
SPACING IS ACCORDING TO THE
MANUFACTURER'S STAPLE GUIDANCE.

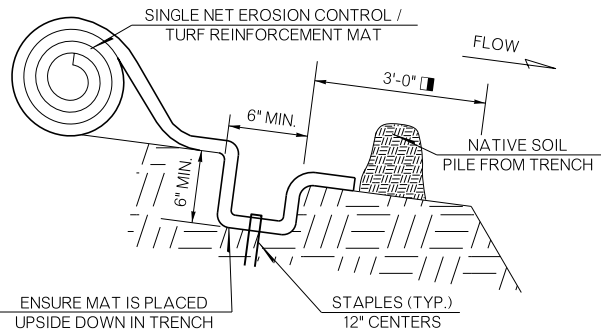
EXCELSIOR / WOOD FIBER MATS SHALL BE ABUTTED TO EACH
OTHER. ALL OTHER TYPES OF MATS SHALL OVERLAP AS SHOWN.

ADJACENT MAT SEAM

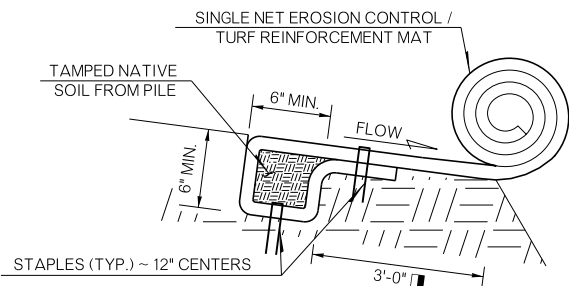


TRENCH CHECK SLOT
PREFERABLY USED IN CHANNELS AND IS
AN OPTION ON SLOPES

SEAMS / SLOTS OPTIONS



STEP ONE

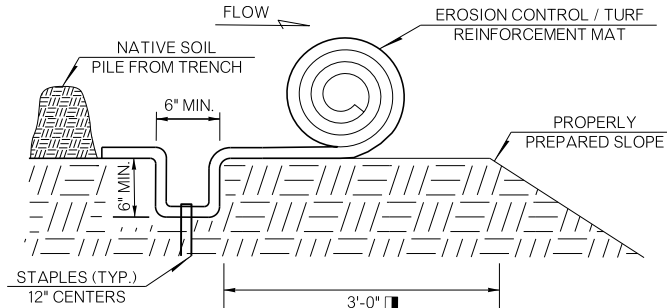


STEP TWO

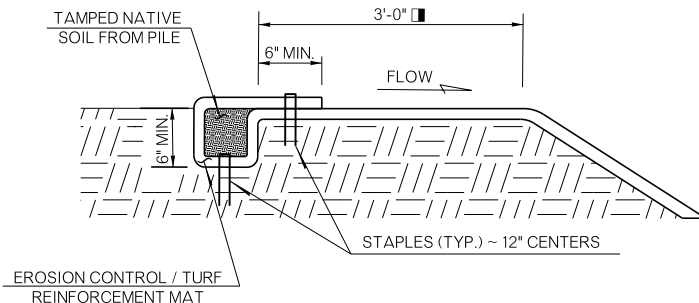
SINGLE NET PRODUCT
SLOPE APPLICATION

ALTERNATIVELY, ANCHOR TRENCHES MAY BE INSTALLED AT THE CREST OF THE SLOPE

ANCHOR TRENCH



STEP ONE



STEP TWO

ALL OTHER TYPES OF MAT
CHANNEL APPLICATION

EROSION CONTROL MATS

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 (ETC).

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

^c REQUIRED 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.

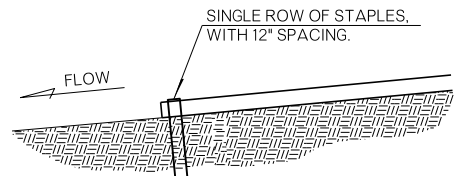
^d C-FACTOR IS THE PERCENT EFFECTIVENESS OF THE MAT IN PREVENTING SOIL LOSS FROM THE RAINFALL
IMPACTING THE SLOPE. ITS VALUE IS INVERSELY PROPORTIONAL TO PERCENT EFFECTIVENESS, IN
WHICH THE SMALLER THE C-FACTOR, THE GREATER THE EFFECTIVENESS.

TURF REINFORCEMENT MATS

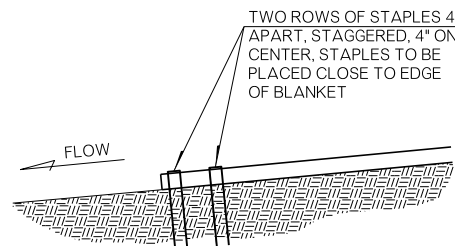
PROPERTY AND TEST METHOD	TYPE 1	TYPE 2	TYPE 3	TYPE 4 (HIGH PERFORMANCE)
MIN. UV STABILITY ASTM D4355	80% AT 500 HRS.	80% AT 1000 HRS.	80% AT 1,000 HRS.	80% AT 3,000 HRS.
MINIMUM TYPICAL TENSILE STRENGTH, MACHINE DIRECTION ASTM D 6818	150 LBS/FT	200 LBS/FT	650 LBS/FT	3000 LBS/FT
MIN. SHEAR STRESS, FOR 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

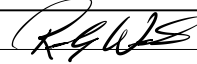
- THE LOCATION OF ALL DETAIL DRAWINGS SHOWN ON THIS SHEET ARE SHOWN ON THE 2019 ROADWAY STANDARD EROSION CONTROL / TURF REINFORCEMENT MAT INSTALLATION DETAILS (1 OF 2 SHEETS).
- EROSION CONTROL MATS ARE TYPICALLY USED WHERE MULCHING IS NOT SUFFICIENT TO CONTROL EROSION AND SOIL STABILITY DURING VEGETATION ESTABLISHMENT. EROSION CONTROL MATS ARE USUALLY TEMPORARY IN NATURE AND ARE MADE UP OF DEGRADABLE FIBERS AND MESH.
- 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.
- 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.
- 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.
- ALL INSTALLATION INFORMATION IS TYPICAL IN NATURE AND DOES NOT REPRESENT ANY SPECIFIC MAT. CONSULT WITH MANUFACTURER FOR SPECIFIC INSTALLATION PROCEDURES.



STAPLES



CHECK SEAM / SLOT
TERMINAL ENDS OPTIONS

APPROVED BY
ROADWAY ENGINEER:  DATE: 6/29/22

ROADWAY DESIGN DIVISION STANDARD

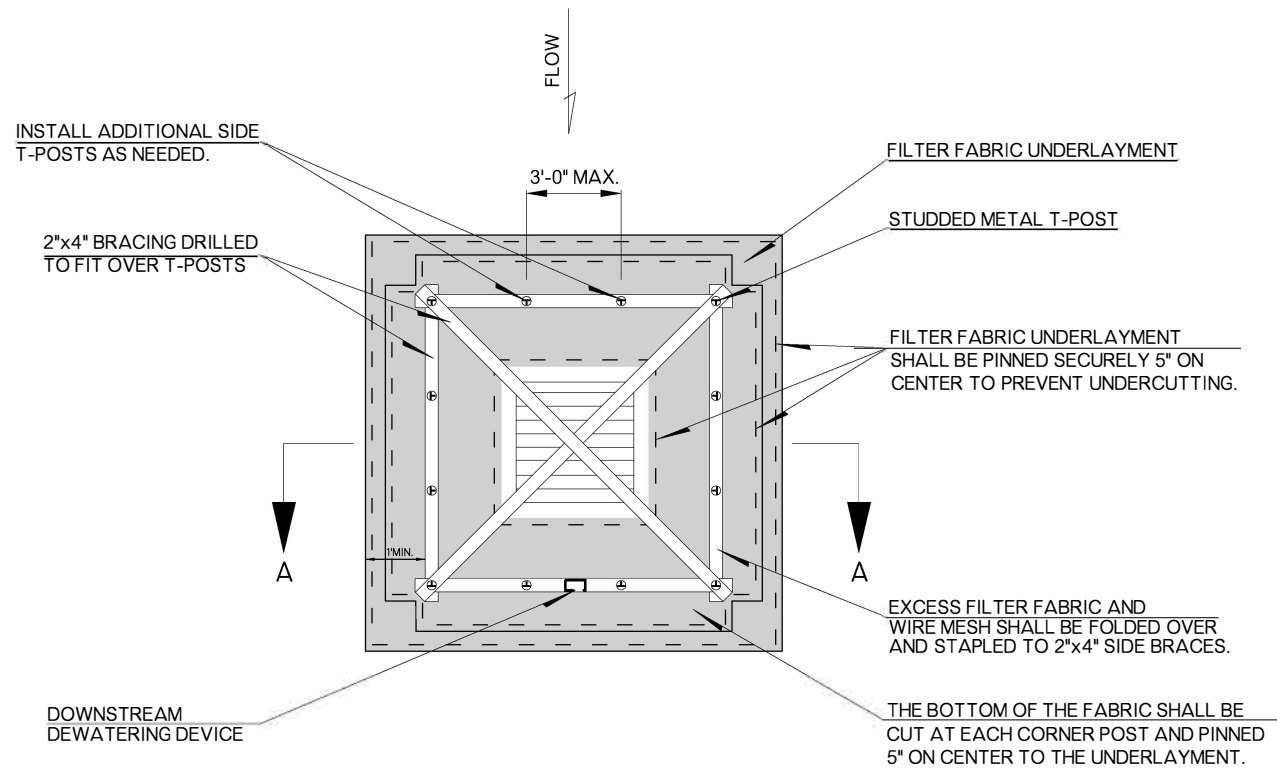
EROSION CONTROL / TURF REINFORCEMENT MAT
INSTALLATION DETAILS (2 OF 2 SHEETS)



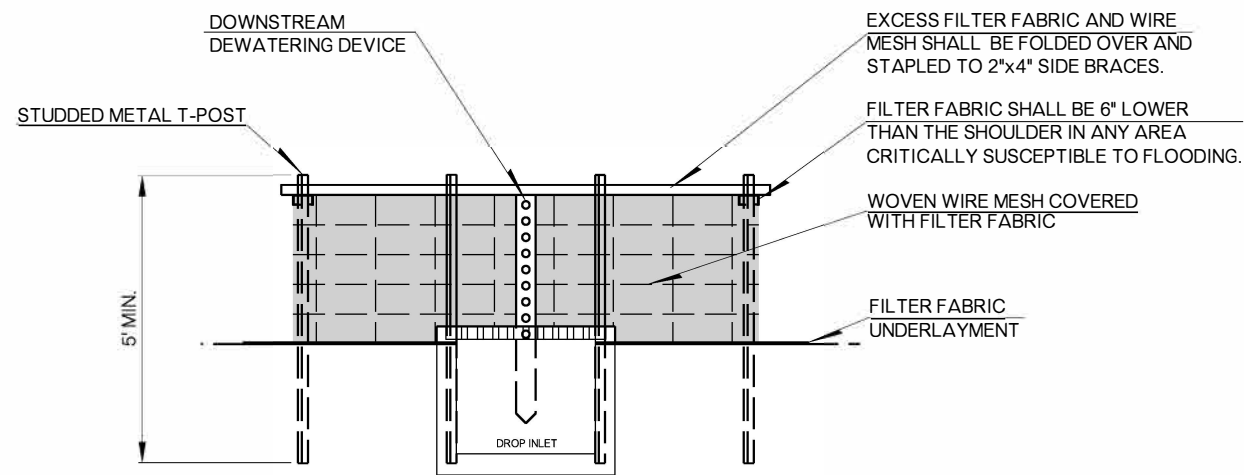
2019 SPECIFICATIONS

ECTRM2 0

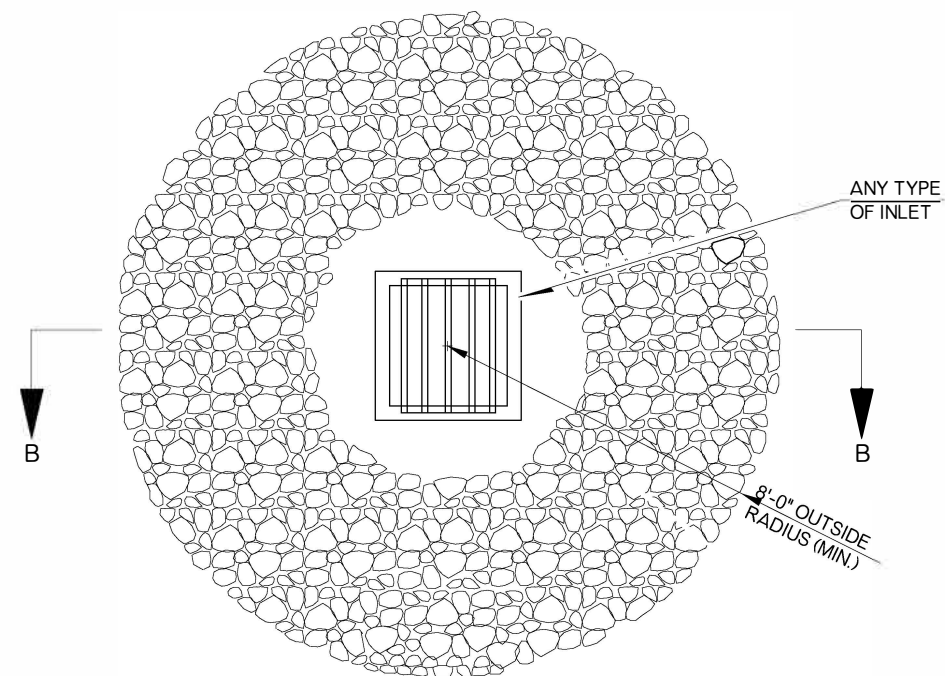
R-4



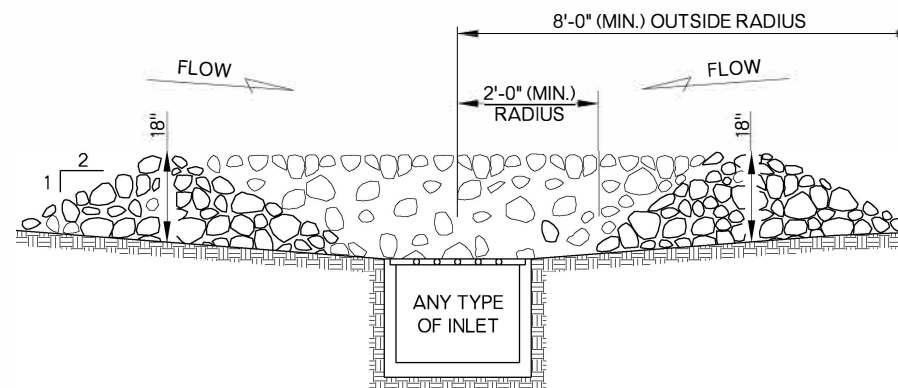
REINFORCED SILT FENCE INLET PROTECTION
 MAX. Q = 5 TO 7 CFS
 MAX. DRAIN AREA = 2 ACRES
PLAN VIEW



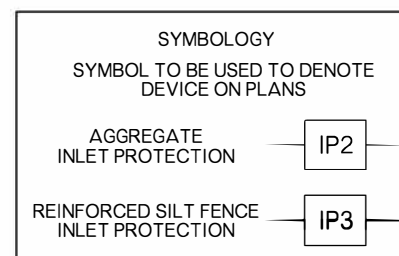
SECTION A-A



AGGREGATE INLET PROTECTION
 MAX. Q = 3 TO 5 CFS
 MAX. DRAIN AREA = 1 ACRE
PLAN VIEW



SECTION B-B



- GENERAL NOTES**
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - 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.
 - IF REINFORCED SILT FENCE IS INSTALLED AROUND THE INLET EXCAVATION IT SHOULD BE PLACED IN A CONFIGURATION THAT WILL ALLOW INLET CONSTRUCTION.
 - 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.
 - FASTEN DEWATERING DEVICE TO THE 2 INCHES BY 4 INCHES SIDE BRACE.
 - 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.
 - 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 |
- 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.
 - 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. W. S.* DATE: 6/24/22

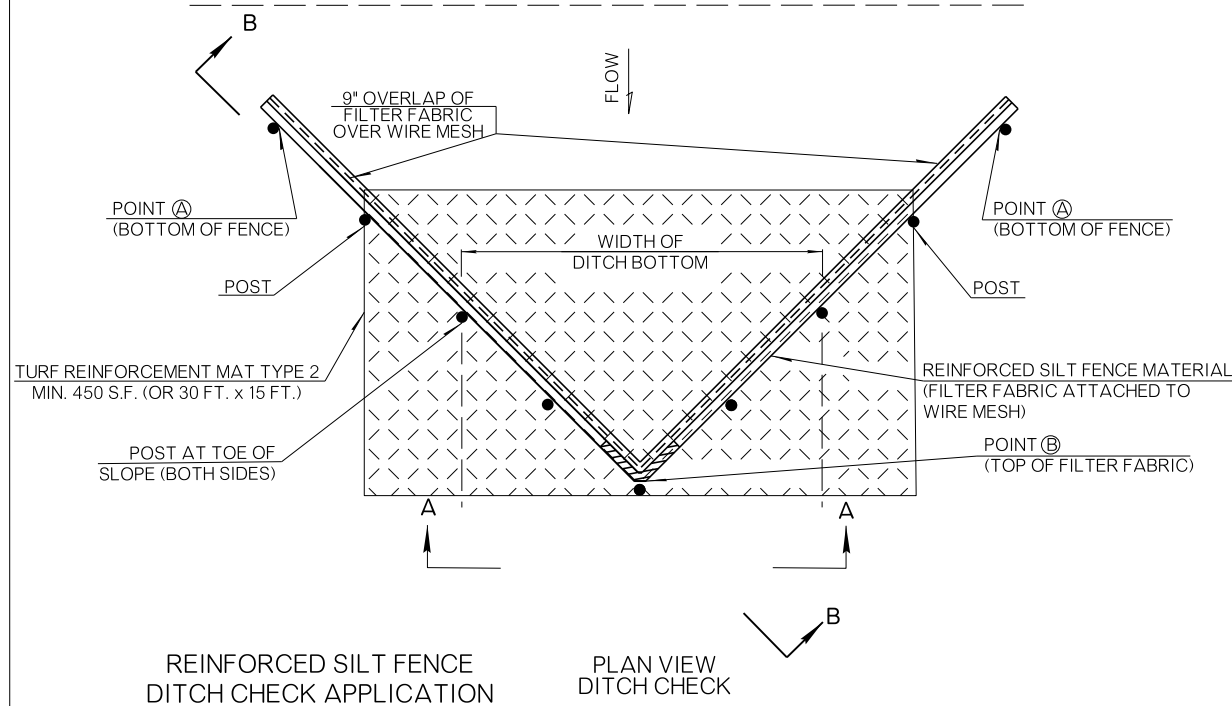
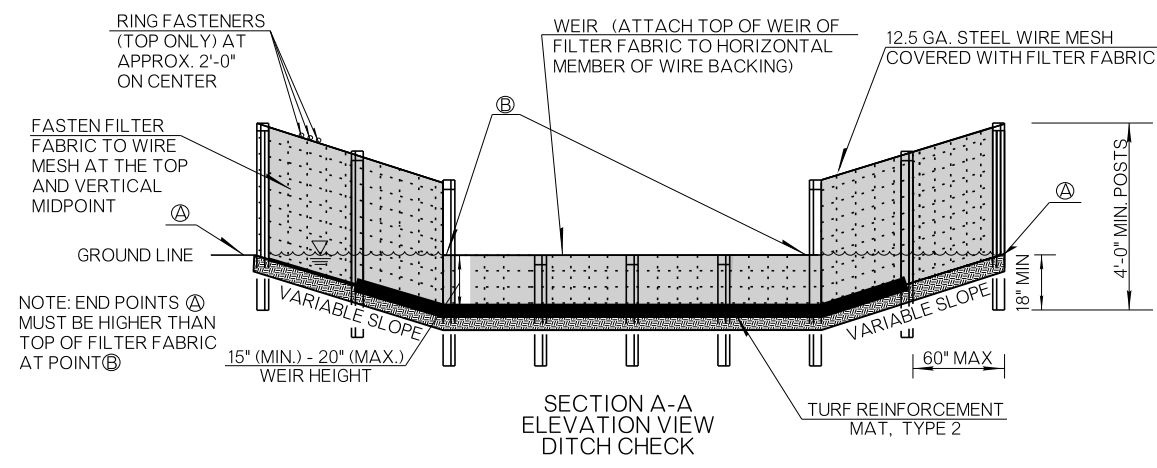
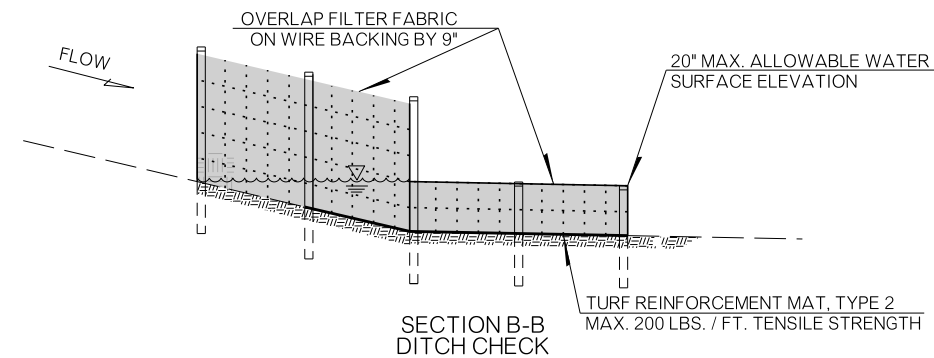
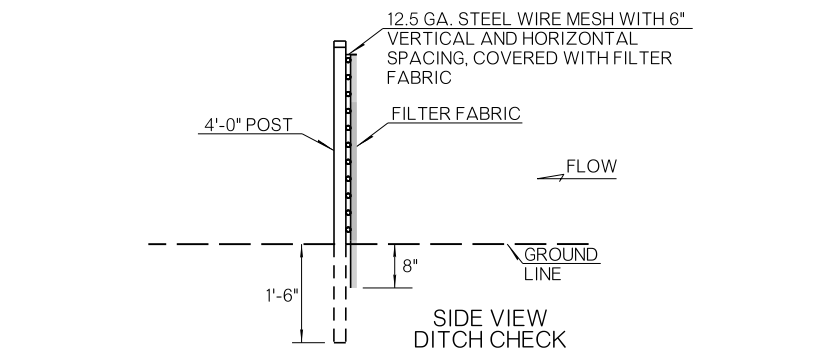
ROADWAY DESIGN DIVISION STANDARD

INLET PROTECTION
 (AGGREGATE AND REINFORCED SILT FENCE APPLICATIONS)



2019 SPECIFICATIONS

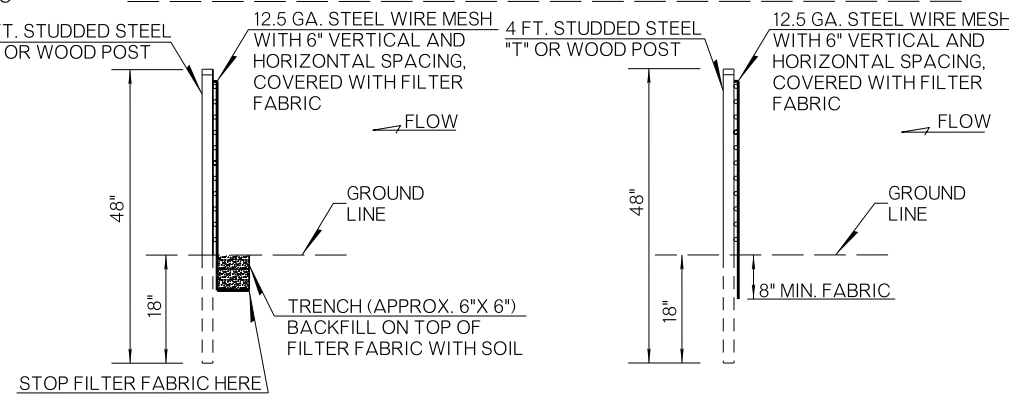
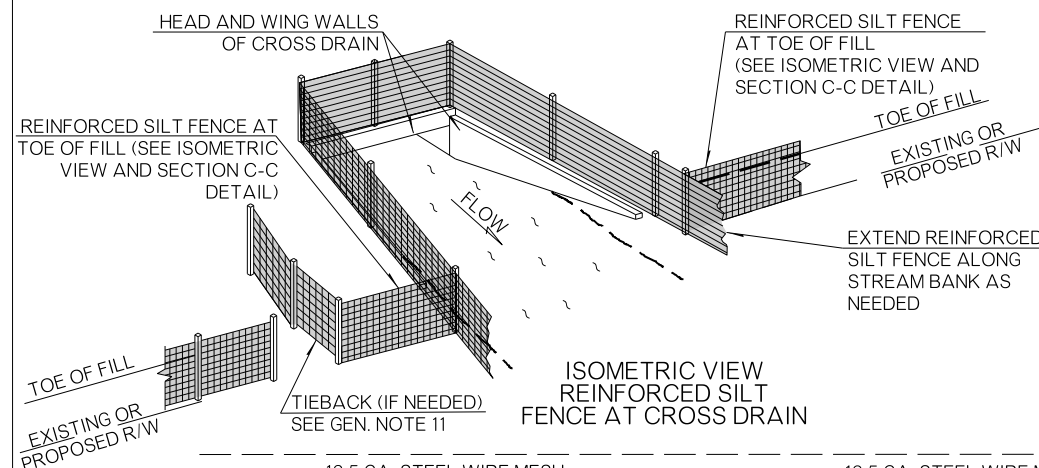
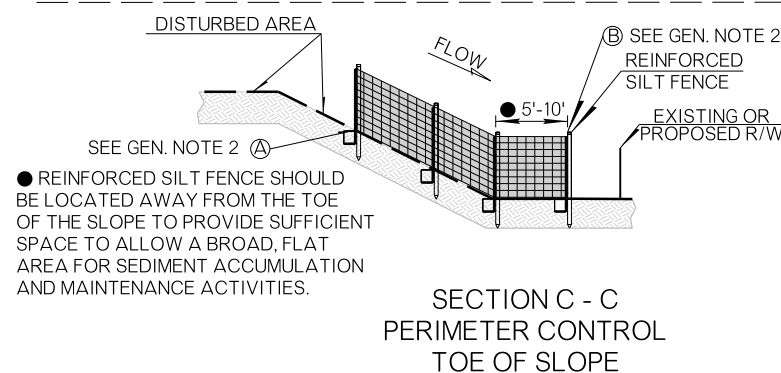
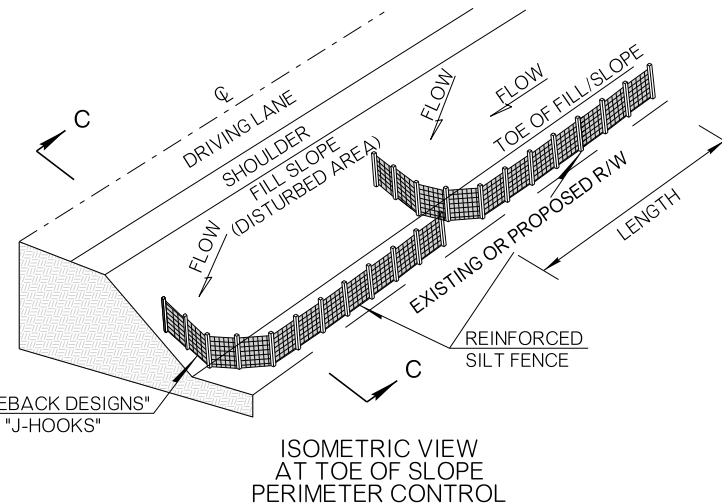
IPD	0
	R-5



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.



REINFORCED SILT FENCE PERIMETER CONTROL APPLICATIONS

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- AFTER THE REINFORCED SILT FENCE IS INSTALLED IN THE DITCH, IF THE TOP OF THE FILTER FABRIC (WEIR) AT POINT B IS HIGHER THAN THE BOTTOM OF THE FENCE AT POINT A (EDGES OF FENCE) THEN NO WEIR IS REQUIRED.
- 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.
- THE CONTRACTOR MAY ELECT TO USE EITHER INSTALLATION: METHOD I OR METHOD II.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- PRICE BID FOR REINFORCED SILT FENCE SHALL INCLUDE COST OF ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE AND REMOVAL, REGARDLESS OF APPLICATION.
- 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. S.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

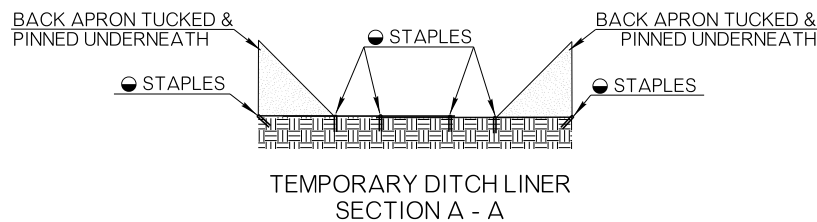
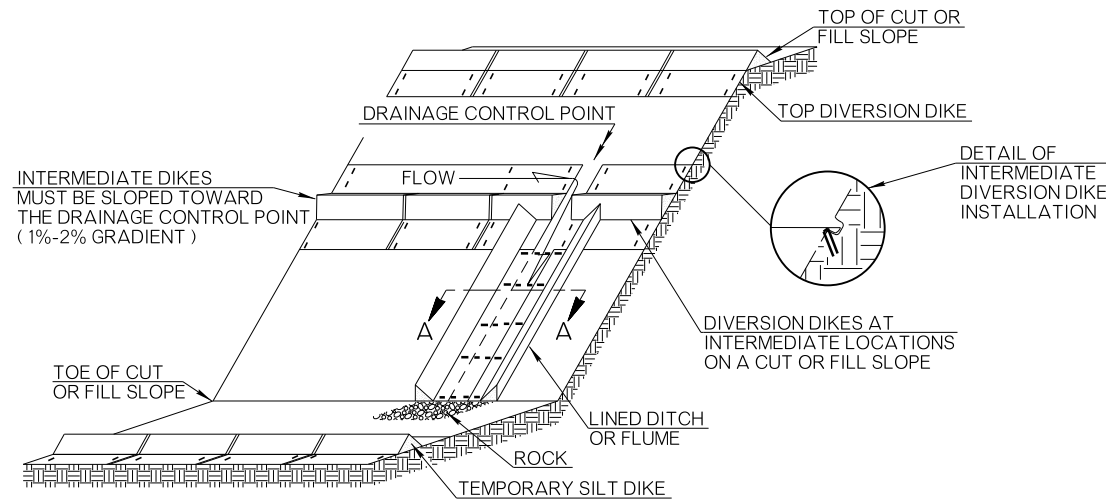


OKLAHOMA
Transportation

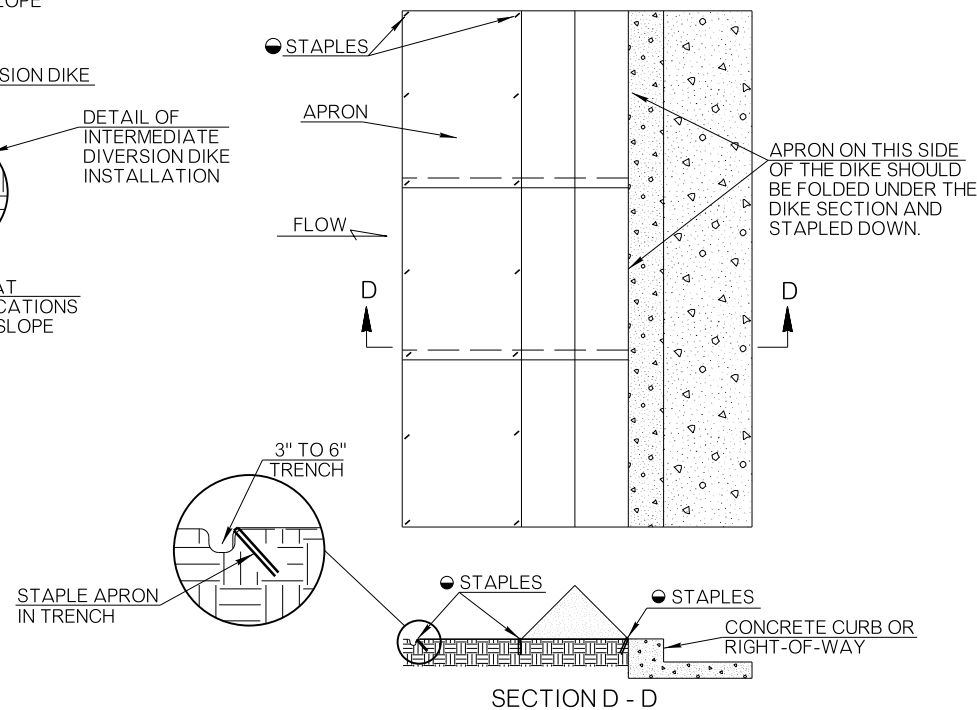
REINFORCED SILT FENCE INSTALLATION AND APPLICATIONS

2019 SPECIFICATIONS

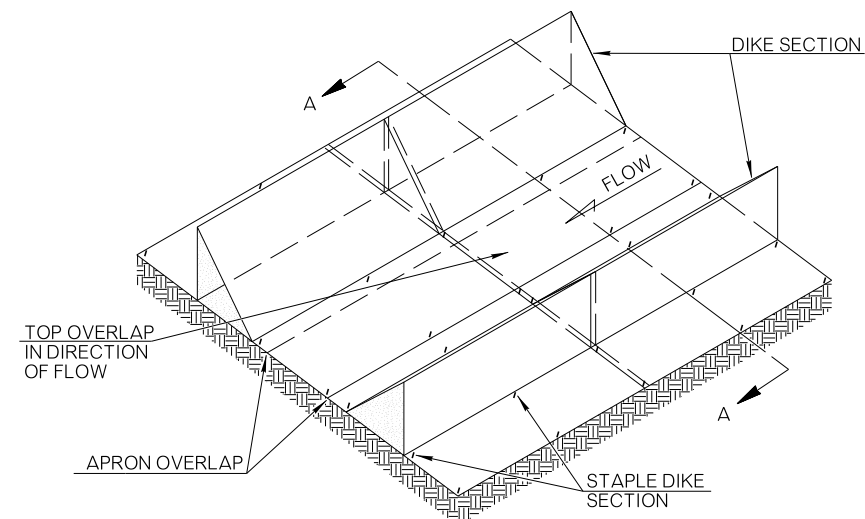
RSF	0
	R-6



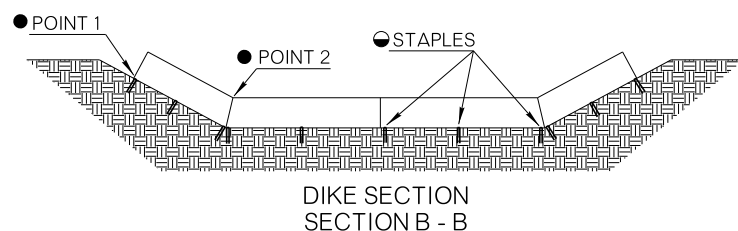
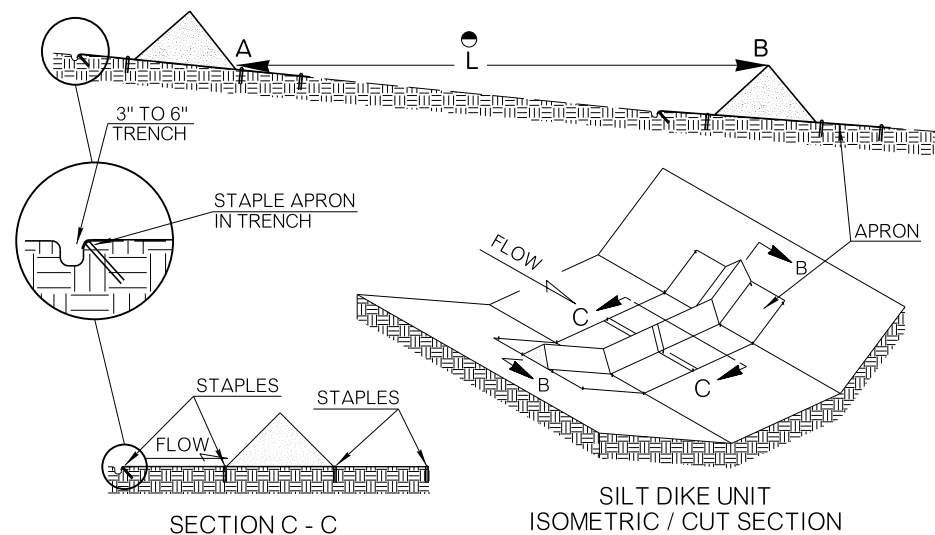
TEMPORARY SILT DIKE INSTALLATION
AS
DIVERSION DIKE AND / OR DITCH CHECK



TEMPORARY SILT DIKE INSTALLATION
AS
PERIMETER CONTROL



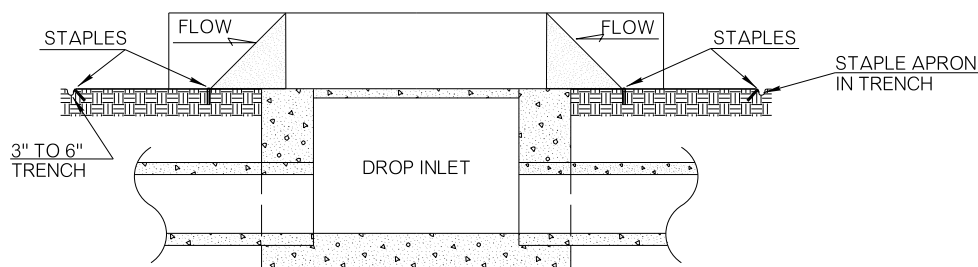
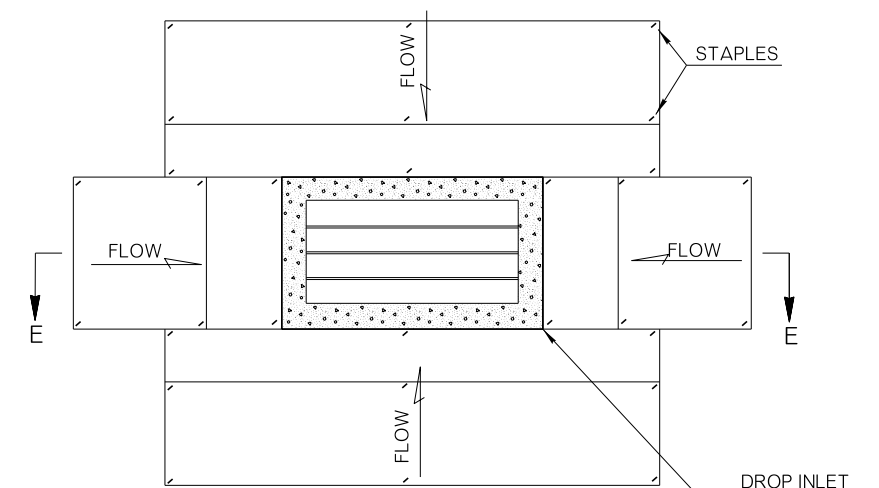
TEMPORARY SILT DIKE INSTALLATION
AS
TEMPORARY DITCH LINER



TEMPORARY SILT DIKE INSTALLATION
AS
ROADWAY DITCH OR DRAINAGE DITCH CHECK

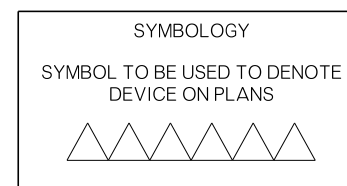
- POINT "1" MUST BE HIGHER THAN POINT "2" TO ENSURE THAT WATER FLOWS OVER THE DIKE AND NOT AROUND THE ENDS.
- STAPLES SHALL BE PLACED WHERE THE UNITS OVERLAP AND IN THE CENTER OF THE UNIT AS SHOWN ON THE DIAGRAM.
- L = THE DISTANCE SUCH THAT POINTS 'A' AND 'B' ARE OF EQUAL ELEVATION

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



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.



- GENERAL NOTES
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - 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.
 - 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.
 - SILT DIKES ARE FURNISHED IN 7 FOOT INCREMENTS. TOP OVERLAPS SHALL BE INSTALLED IN THE DIRECTION OF FLOW.
 - 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.
 - 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

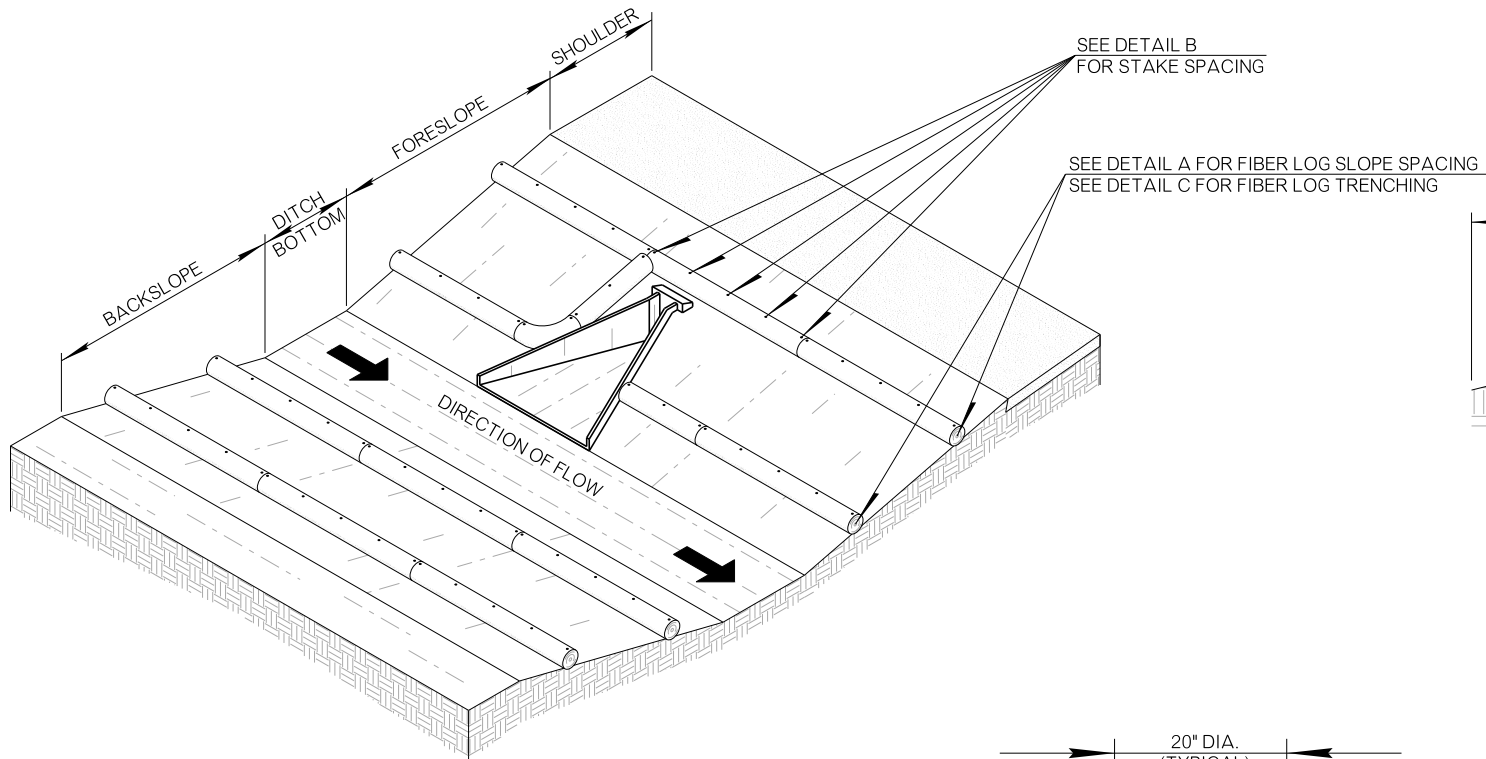
APPROVED BY
ROADWAY ENGINEER: *R. G. W. S.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

TEMPORARY SILT DIKE APPLICATIONS

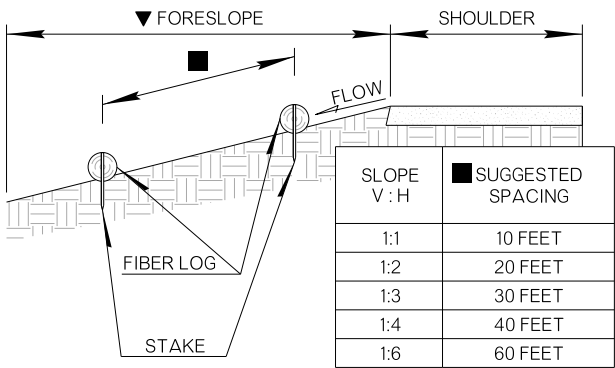


2019 SPECIFICATIONS

TSD	0
	R-7



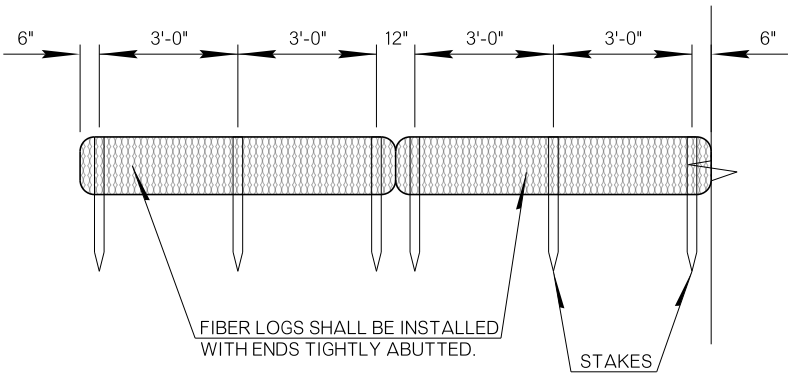
SUGGESTED PLACEMENT AROUND CROSSDRAINS AND ON SLOPES.



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.

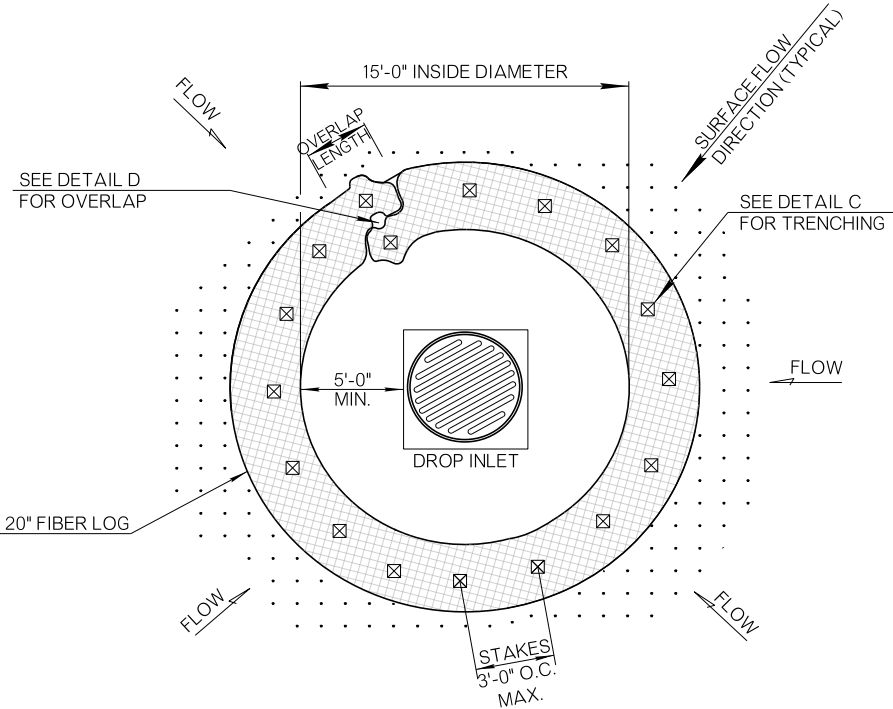
▼ NOTE: SPACING APPLIES FOR BACKSLOPES, AS WELL AS FORESLOPES.



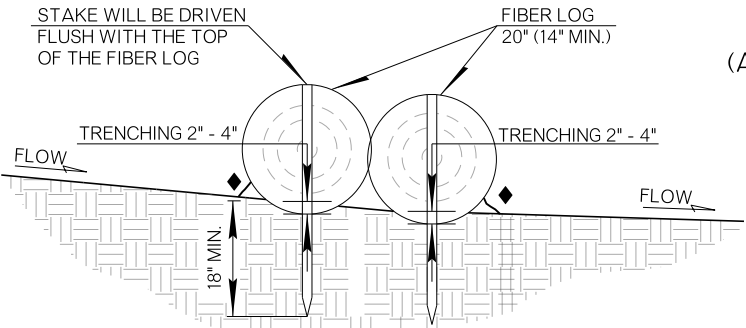
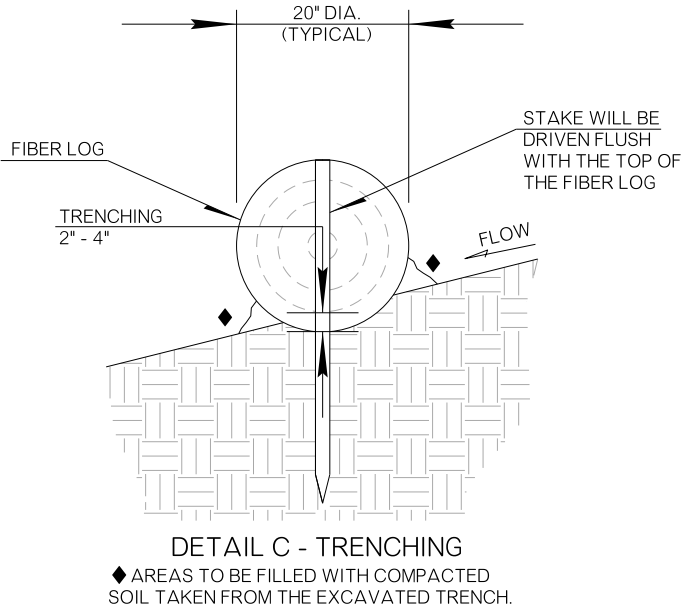
DETAIL B - FIBER LOG FRONT VIEW

GENERAL NOTES

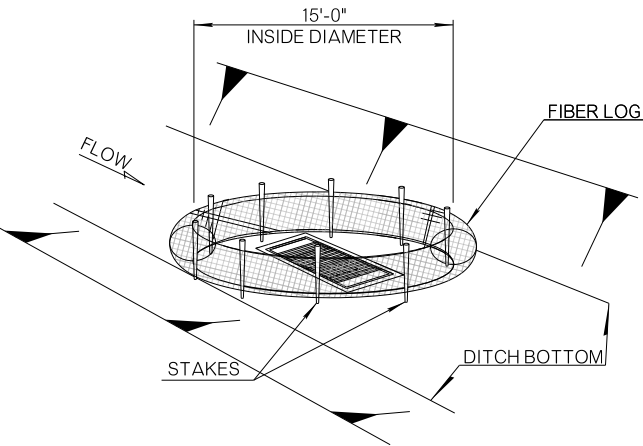
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FIBER LOGS ARE TO BE INSTALLED AND MAINTAINED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.
3. CONFIGURATIONS MAY BE ADJUSTED WITH APPROVAL OF THE ENGINEER FOR TRAVELWAY SAFETY, WATER 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.



FIBER LOG INLET PROTECTION PLAN VIEW



DETAIL D - OVERLAP



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

SYMBOL

SYMBOL TO BE USED TO DENOTE DEVICE ON PLANS

FIBER LOG INLET PROTECTION IP1

TEMPORARY FIBER LOG TO BE USED ON SLOPES

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

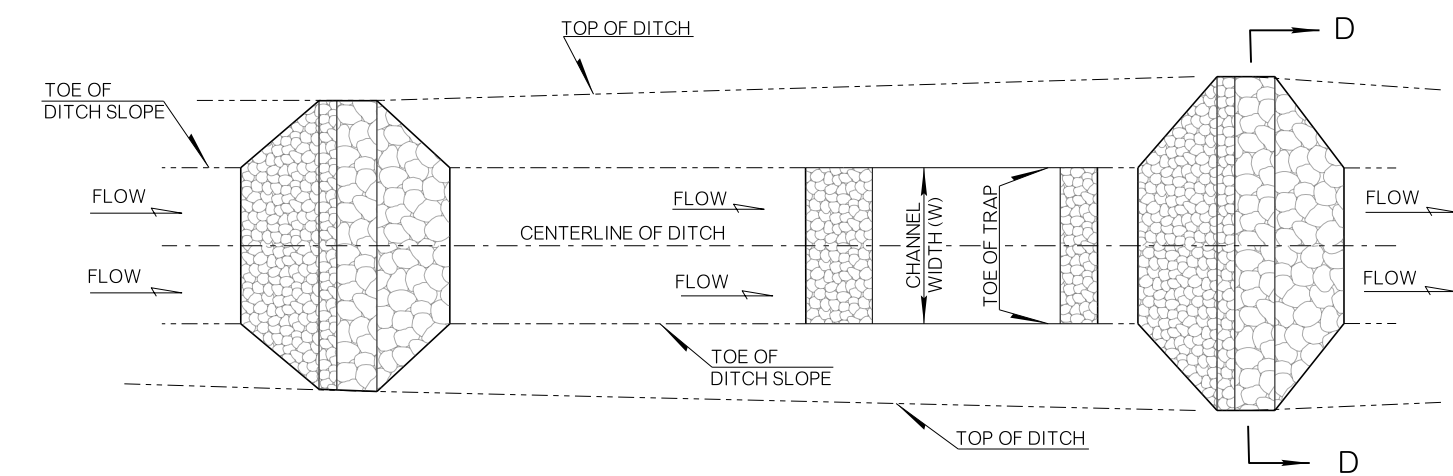
APPROVED BY ROADWAY ENGINEER: *R. G. W.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

TEMPORARY FIBER LOG APPLICATIONS

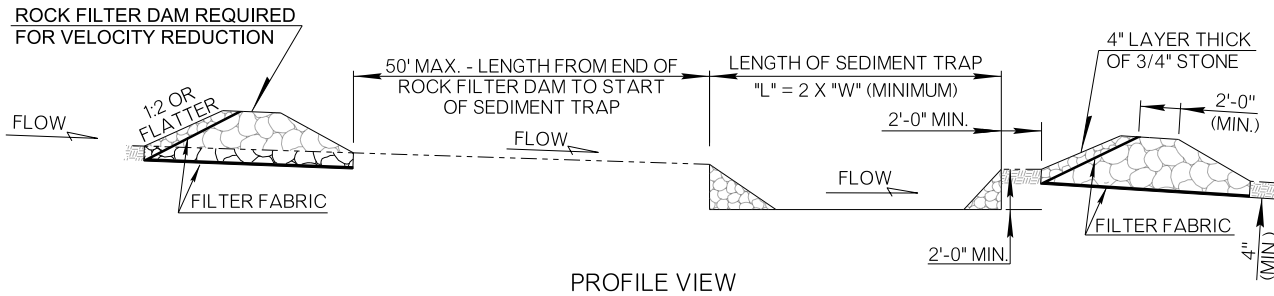


2019 SPECIFICATIONS

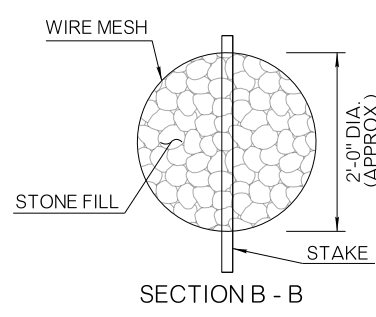
TFL	0
	R-8



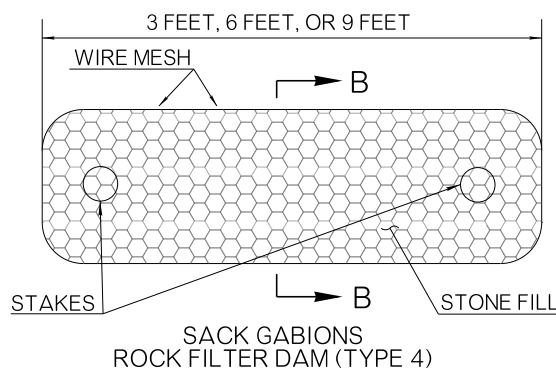
**ROCK FILTER DAM WITH SEDIMENT TRAP
PLAN VIEW**
CAN BE USED IMMEDIATELY UPSTREAM OF A SEDIMENT
BASIN OR ANOTHER BMP, TO SETTLE LARGER SOIL
PARTICLES AND EASE SEDIMENT LOAD IN SEDIMENT BASIN



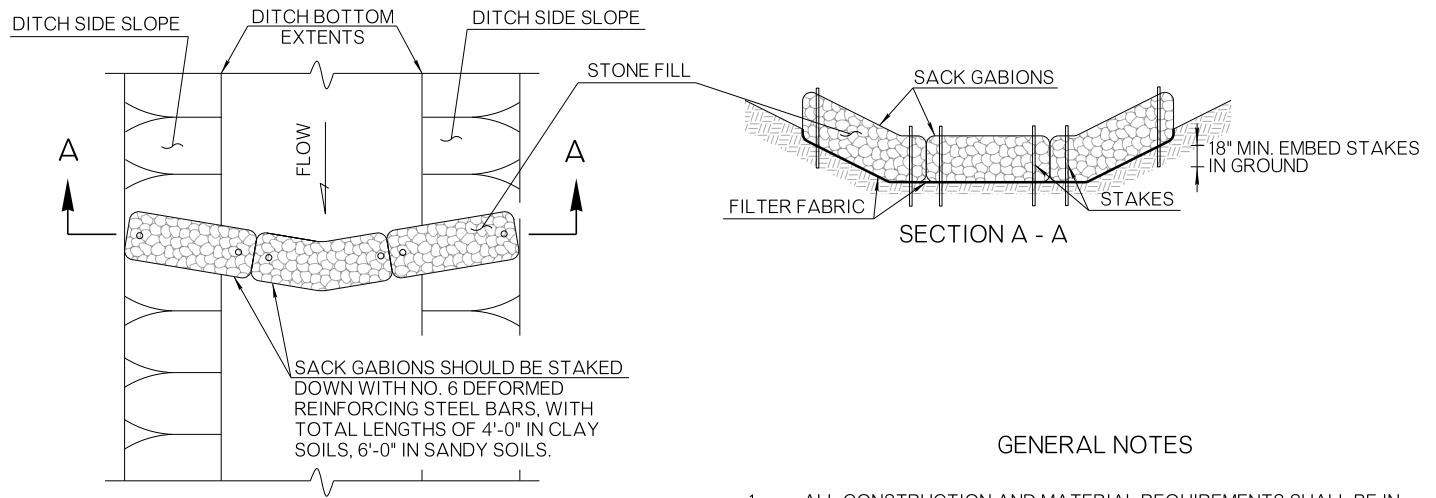
PROFILE VIEW



SECTION B - B



**SACK GABIONS
ROCK FILTER DAM (TYPE 4)**



**DITCH CHANNEL
PLAN VIEW**

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.

ROCK FILTER DAM USAGE GUIDELINES

ROCK FILTER DAMS SHOULD BE USED WHEN SIGNIFICANT AMOUNTS OF SEDIMENT ARE ANTICIPATED, TO DISSIPATE THE ENERGY OF FLOWING WATER AND COLLECT SEDIMENT NEAR THE TOE OF SLOPES, AT UPSTREAM AND DOWNSTREAM DRAINAGE STRUCTURES, IN ROADWAY DITCHES AND IN SMALL CHANNELS, AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.

TYPE 1 (18 IN. HIGH WITH NO WIRE MESH): TYPE 1 SHOULD BE USED AT THE TOE OF SLOPES, AROUND INLETS, IN SMALL DITCHES AND AT DIKE OR SWALE OUTLETS. THIS TYPE OF DAM IS RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA OF 5 ACRES OR LESS. TYPE 1 SHOULD NOT BE USED IN CONCENTRATED HIGH VELOCITY FLOWS (APPROX. 7-9 FT./SEC. OR MORE) IN WHICH ROCK WASH OUT MAY OCCUR. SANDBAGS MAY BE USED AT THE EMBEDDED FOUNDATION (4 IN. DEEP MIN.) FOR BETTER FILTERING EFFICIENCY OF LOW FLOWS.

TYPE 2 (18 IN. HIGH WITH WIRE MESH): TYPE 2 SHOULD BE USED IN DITCHES AND AT DIKES OR SWALE OUTLETS.

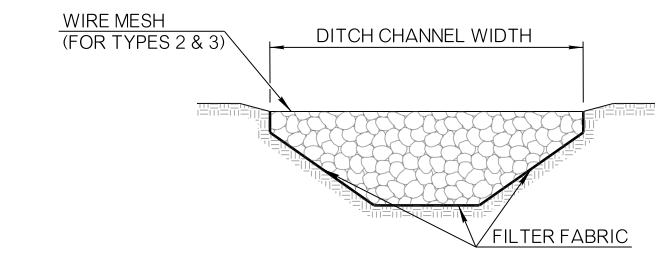
TYPE 3 (3 FT. HIGH WITH WIRE MESH): TYPE 3 SHOULD BE USED IN CHANNEL FLOW AND SHOULD BE SECURED TO THE CHANNEL BED.

TYPE 4 (SACK GABIONS): TYPE 4 SHOULD BE USED IN DITCHES AND SMALLER CHANNELS TO FORM AN EROSION CONTROL DAM.

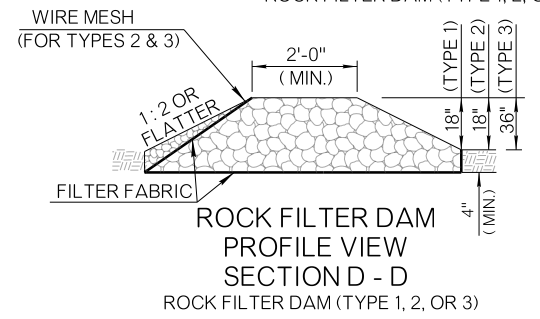
**DITCH CHECK
SPACING FORMULA:**

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

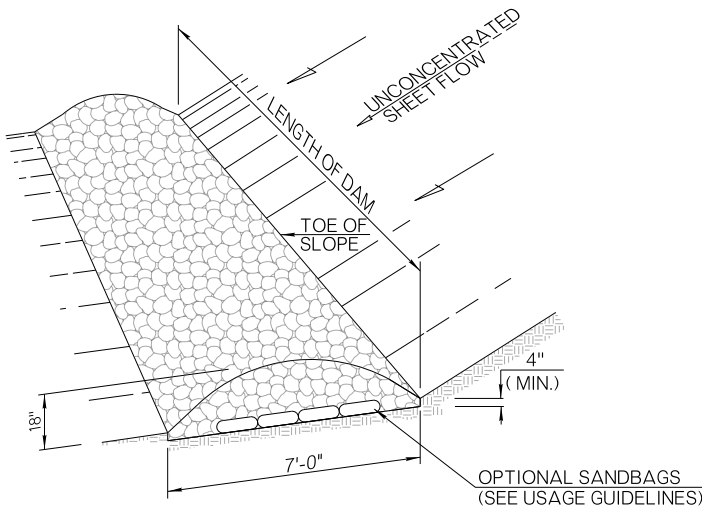
ROCK FILTER DAM DITCH CHECK
L= THE DISTANCE SUCH THAT POINTS
A AND B ARE OF EQUAL ELEVATION



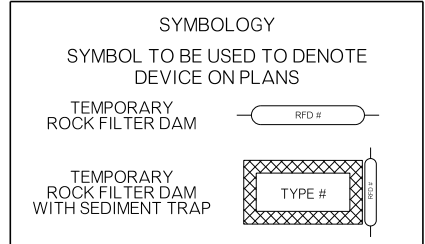
**ROCK FILTER DAM
CROSS SECTION
SECTION D - D**
ROCK FILTER DAM (TYPE 1, 2, OR 3)



**ROCK FILTER DAM
PROFILE VIEW
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.

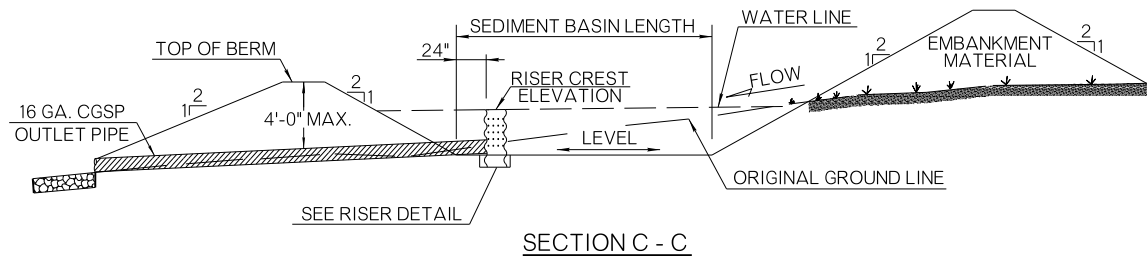
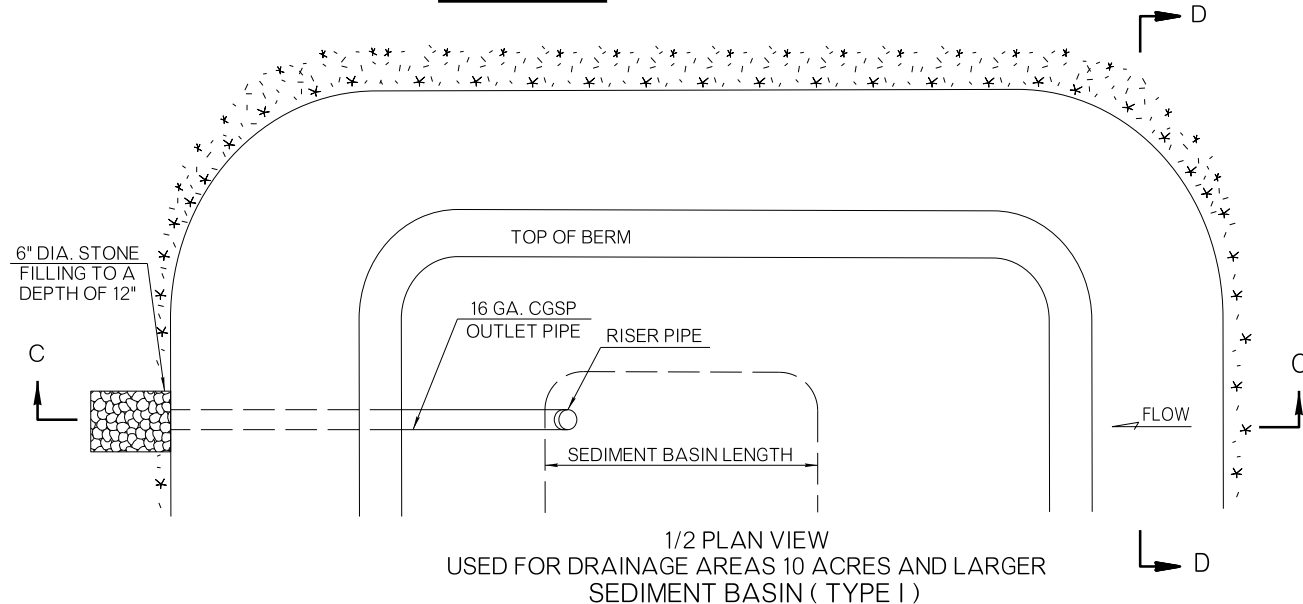
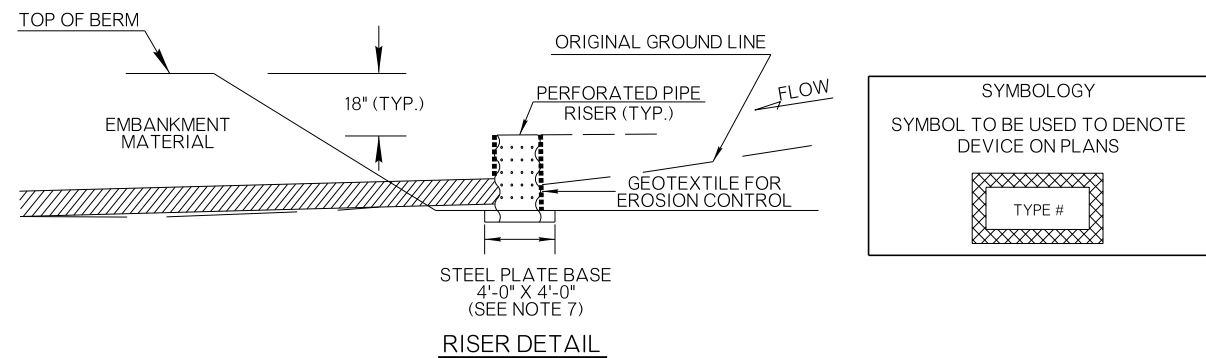


BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 1)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 2)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 3)	CY
221(F)	TEMPORARY ROCK FILTER DAM (TYPE 4)	CY

APPROVED BY
ROADWAY ENGINEER:  DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

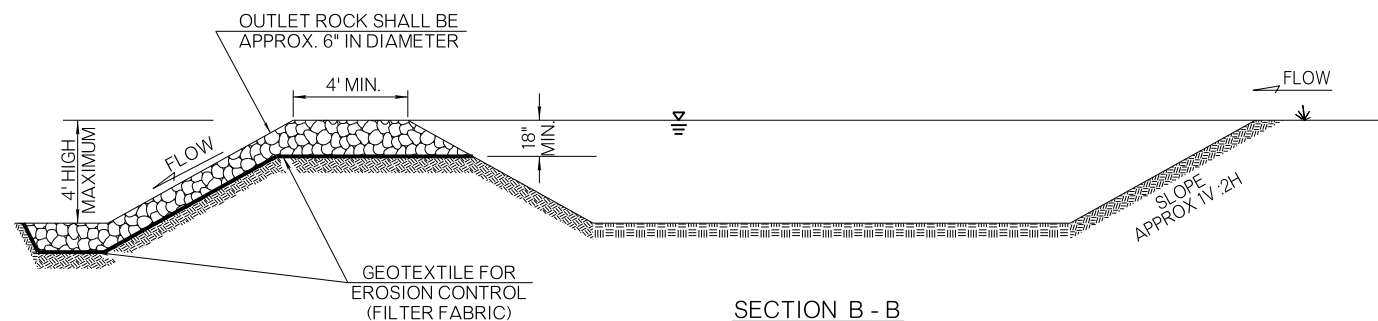
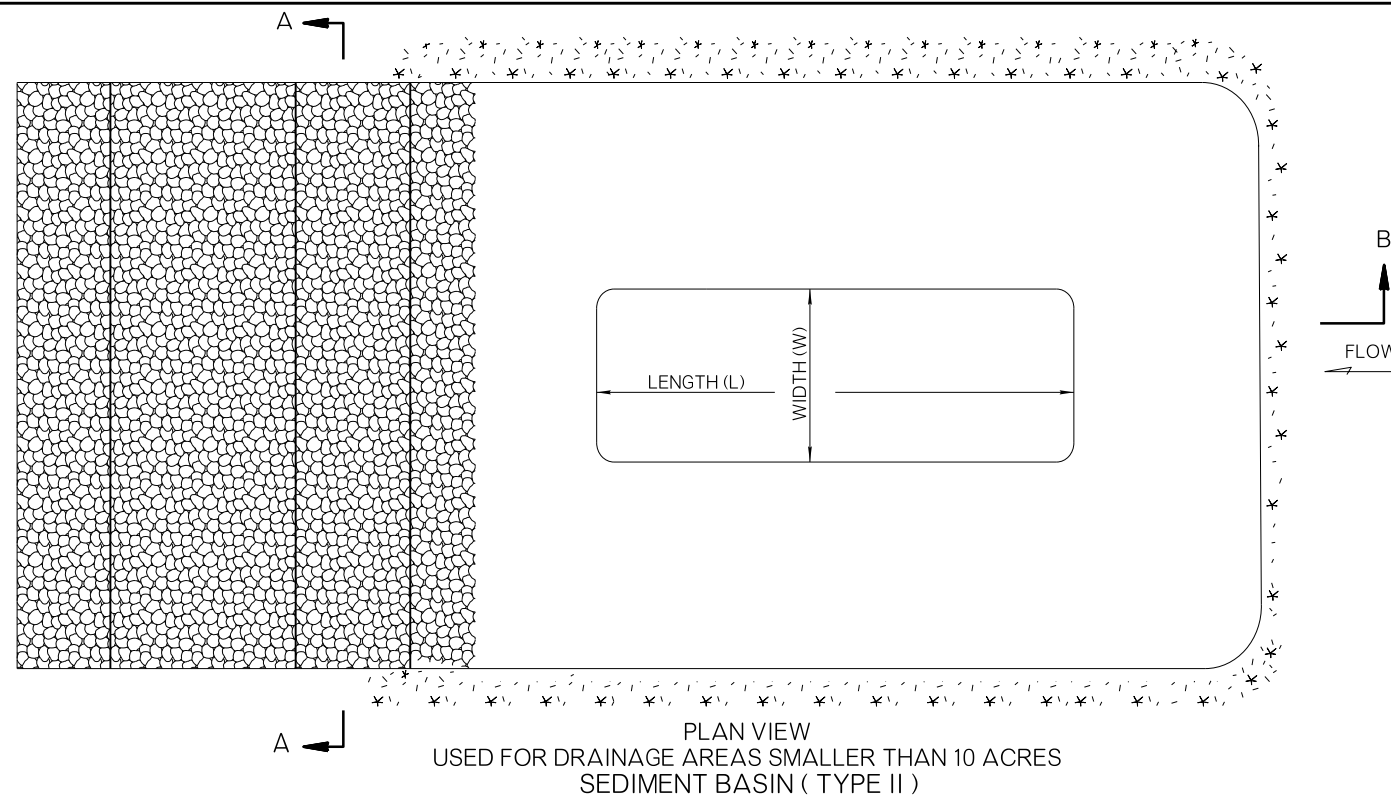
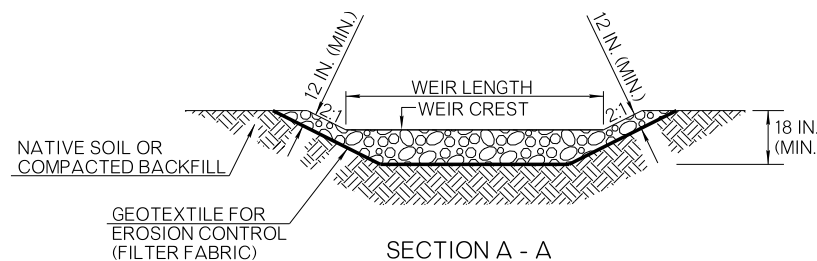
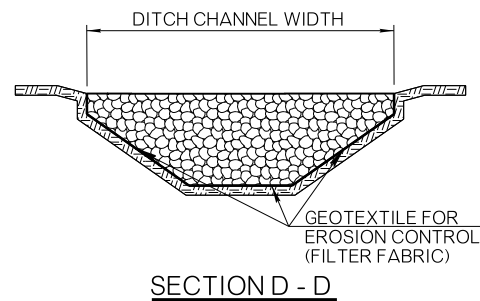
TEMPORARY ROCK FILTER DAM APPLICATIONS





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

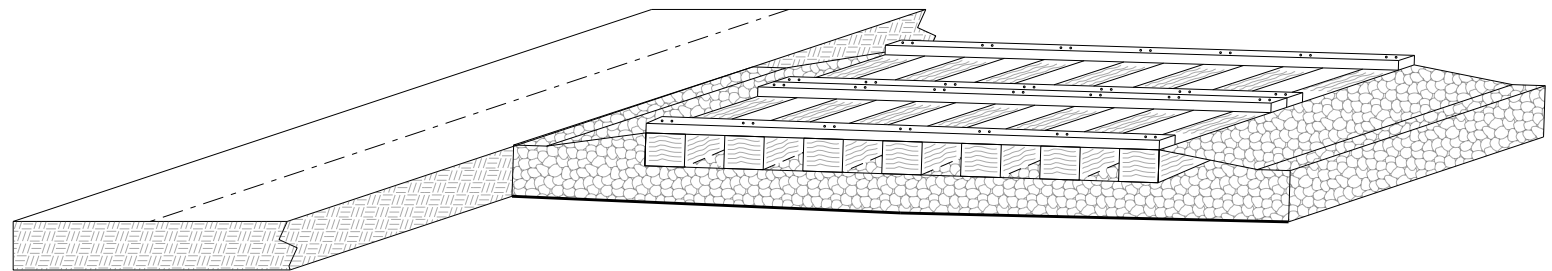
APPROVED BY ROADWAY ENGINEER: DATE: 3/31/2025
ROADWAY DESIGN DIVISION STANDARD

TEMPORARY SEDIMENT BASIN

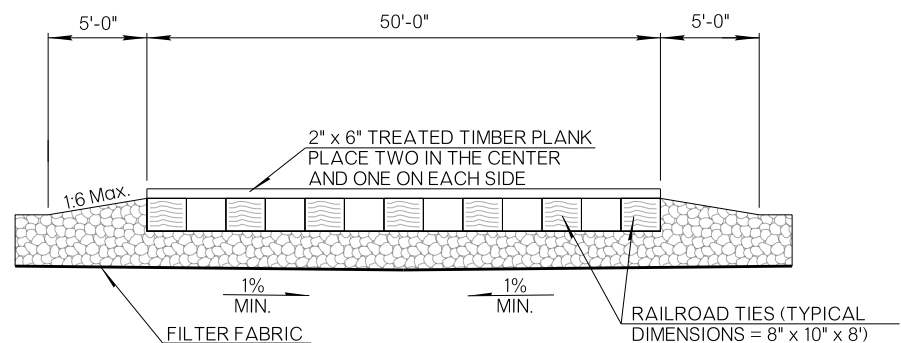
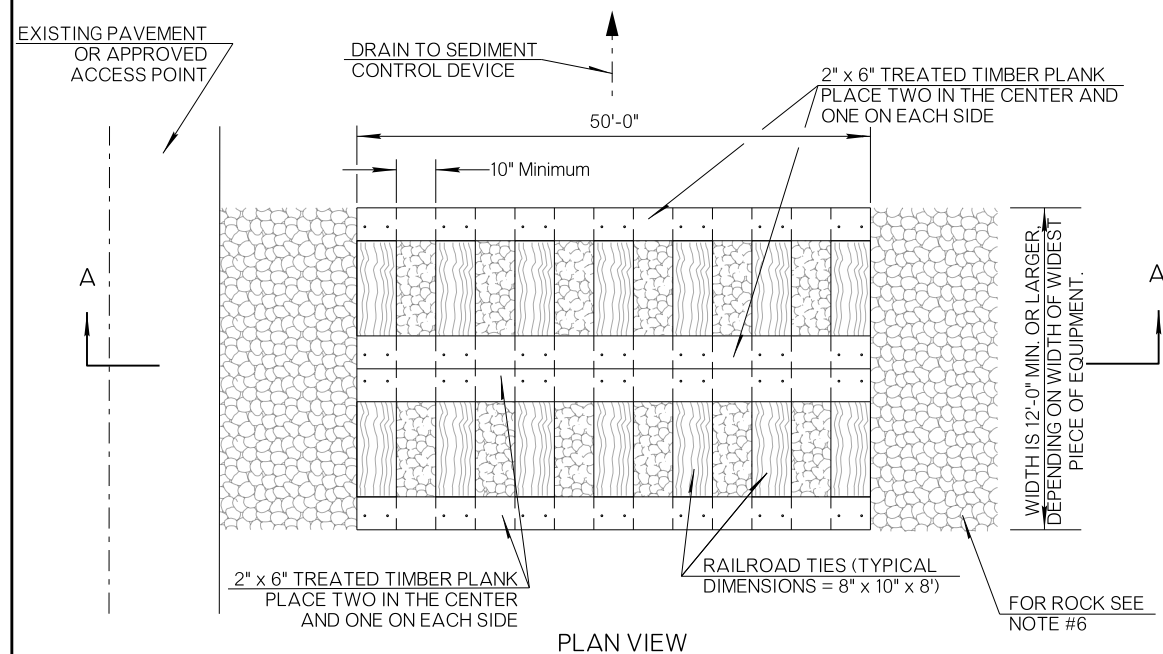


2019 SPECIFICATIONS

TSB	1
	R-10



STABILIZED CONSTRUCTION EXIT

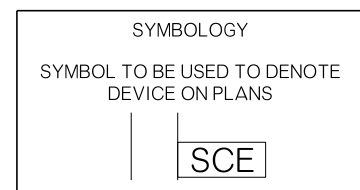


SEC A-A
PROFILE VIEW

GENERAL NOTES

1. LOCATION OF STABILIZED CONSTRUCTION EXIT TO BE AS SHOWN ON THE PLANS OR AS APPROVED BY THE ENGINEER.
2. THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 1:6 OR AS DIRECTED BY THE ENGINEER.
3. RUNOFF FROM THE CONSTRUCTION EXIT SHALL BE DIRECTED TO AN APPROPRIATE SEDIMENT CONTROL DEVICE AS APPROVED BY THE ENGINEER.
4. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MINIMUM, AND SHOULD BE FREE FROM LARGE OR LOOSE KNOTS.
5. 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.
6. MATERIALS FOR THE ROCK BASE SHALL BE IN ACCORDANCE WITH CURRENT STANDARD SPECIFICATIONS, SEC. 713.03 "GABIONS, REVETMENT MATTRESSES, AND ROCK FILTER DAMS."
7. 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.
8. 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.
9. 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



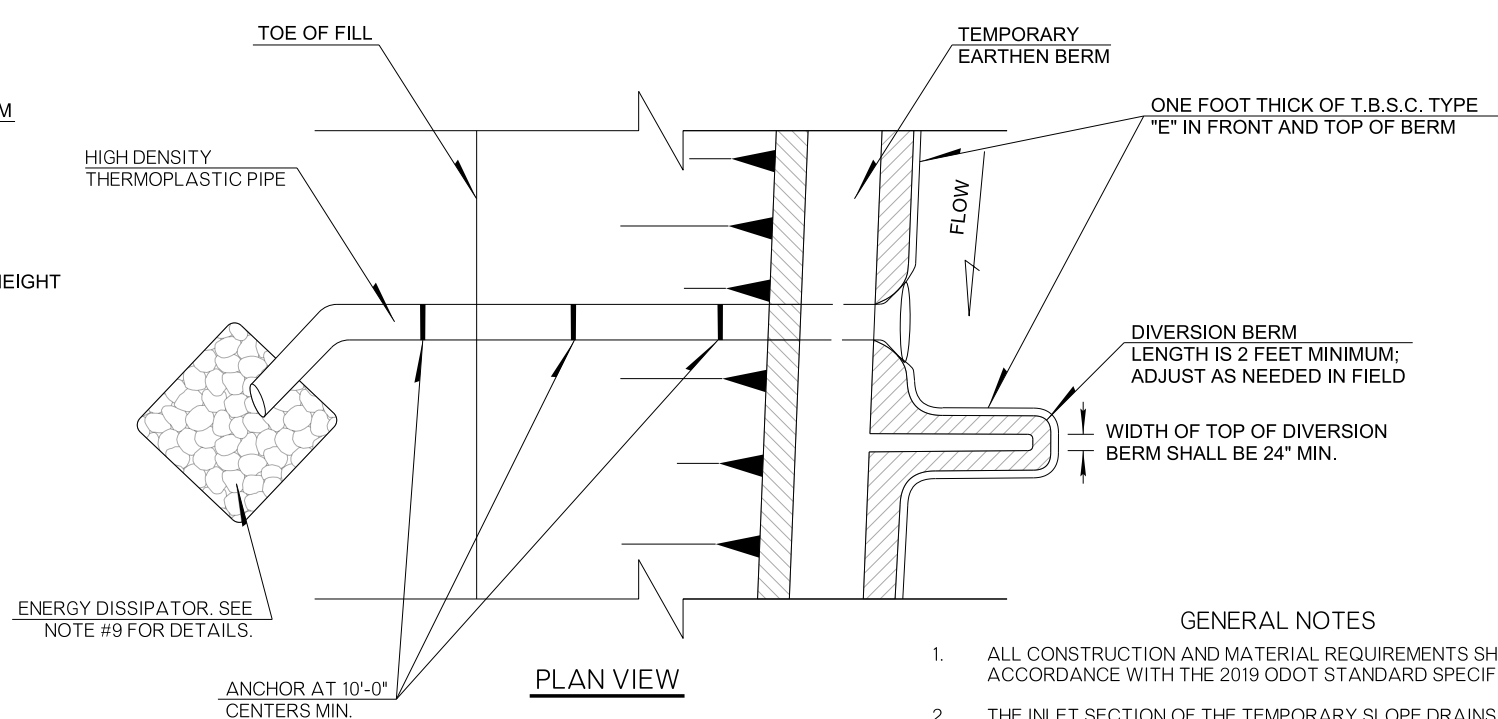
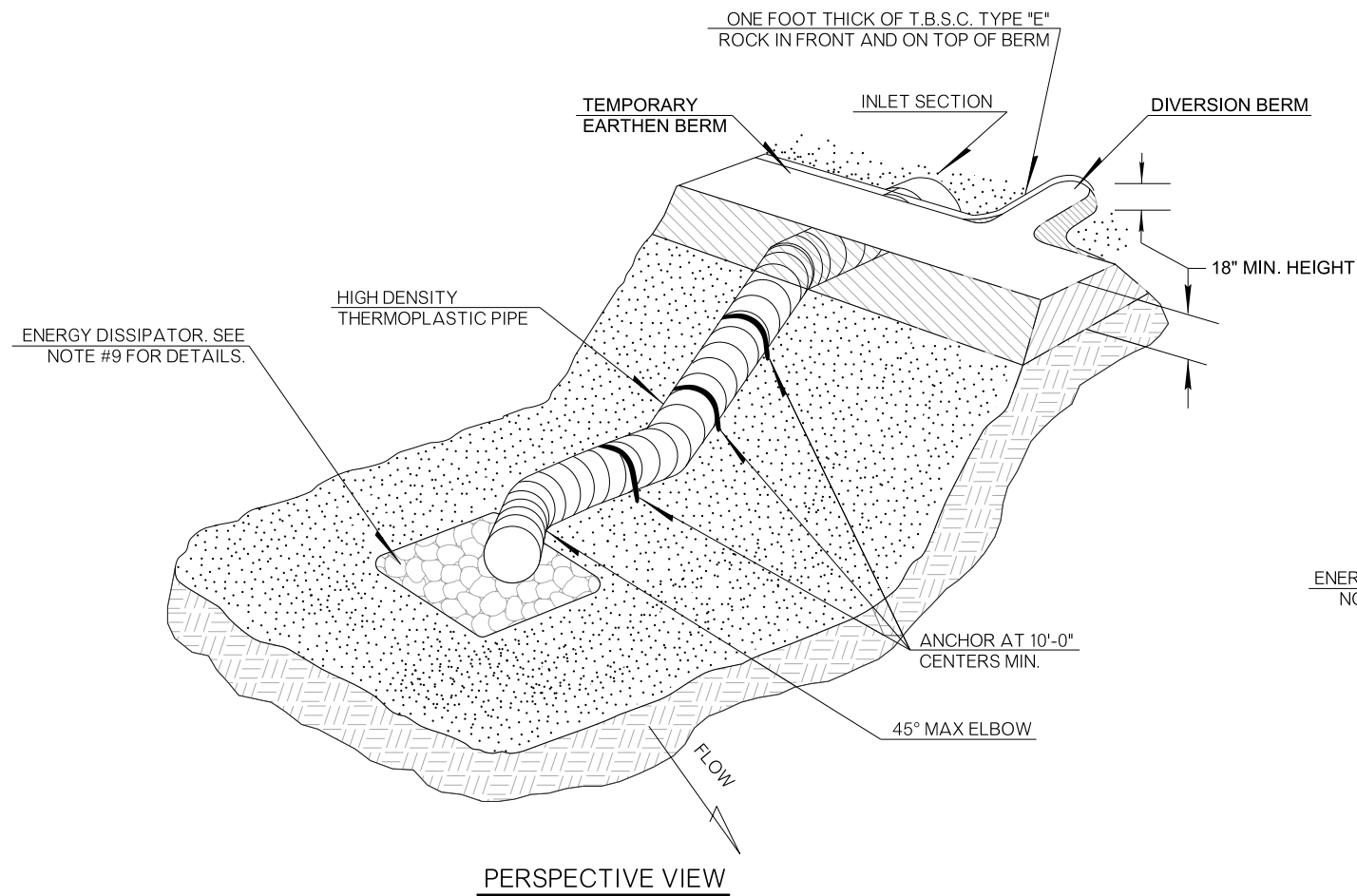
APPROVED BY ROADWAY ENGINEER: *R. G. W.* DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD

STABILIZED CONSTRUCTION EXIT



2019 SPECIFICATIONS

SCE	0
R-11	

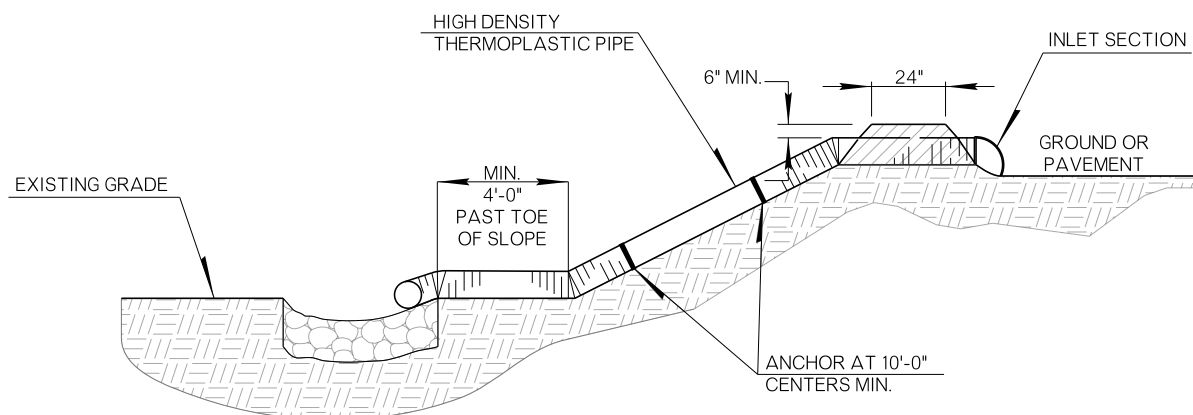


PERSPECTIVE VIEW

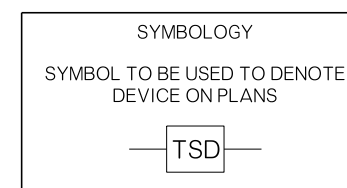
PLAN VIEW

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.



PROFILE VIEW
(DIVERSION BERM NOT SHOWN)



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

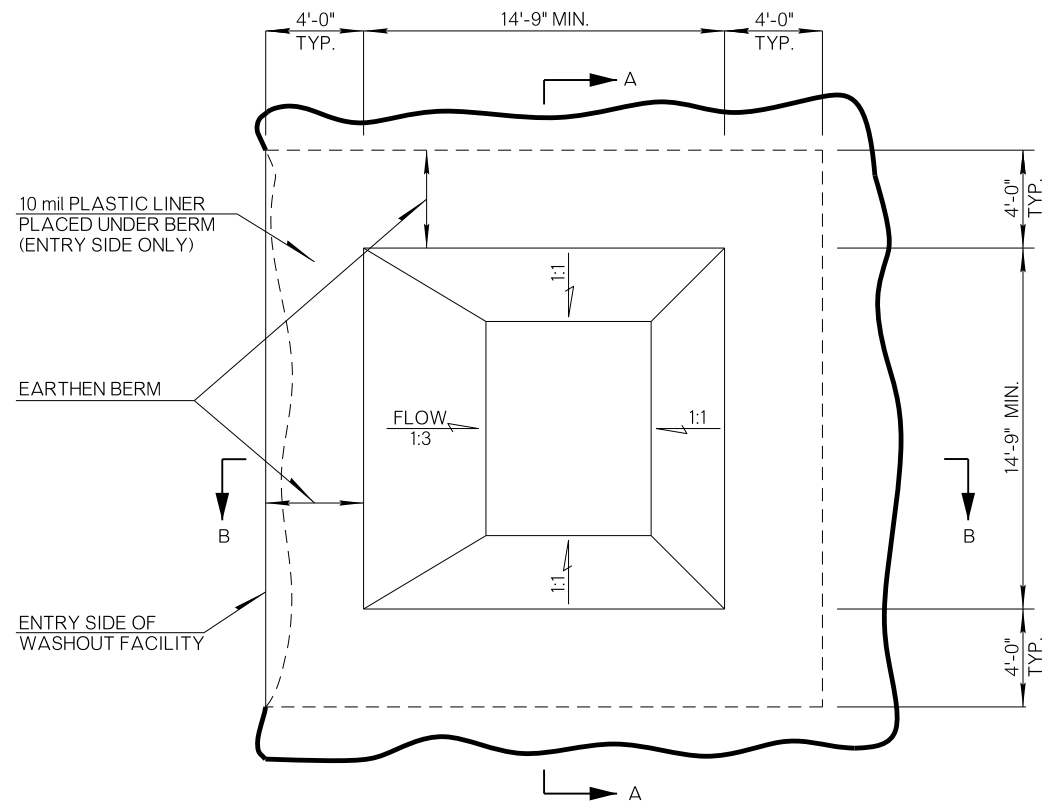
APPROVED BY ROADWAY ENGINEER: *R. G. W.* DATE: *6/24/22*
ROADWAY DESIGN DIVISION STANDARD



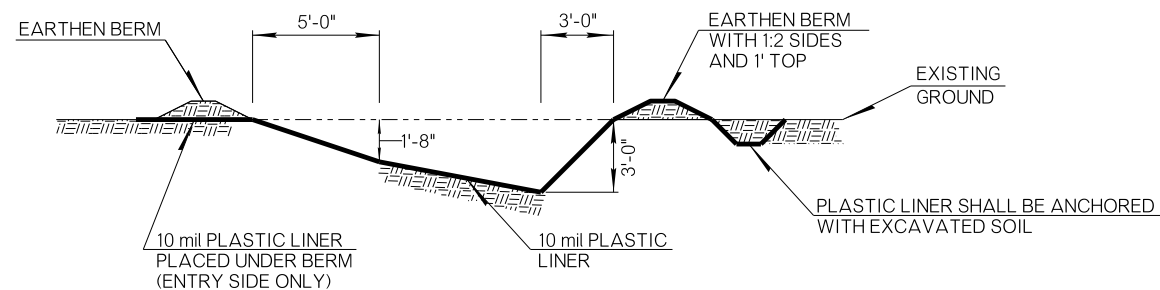
TEMPORARY SLOPE DRAIN

2019 SPECIFICATIONS

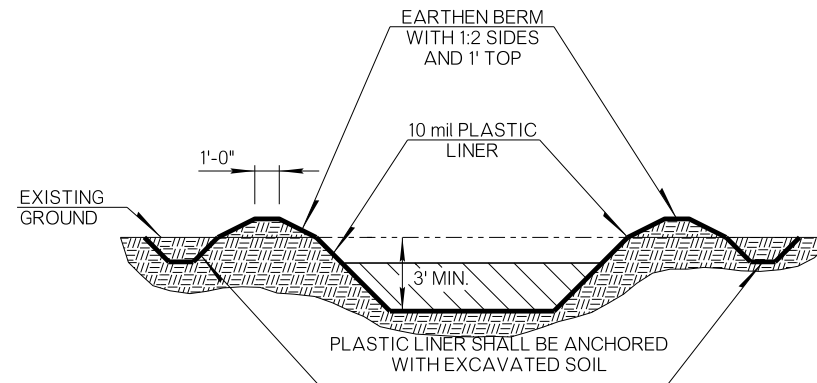
SD	0
	R-12



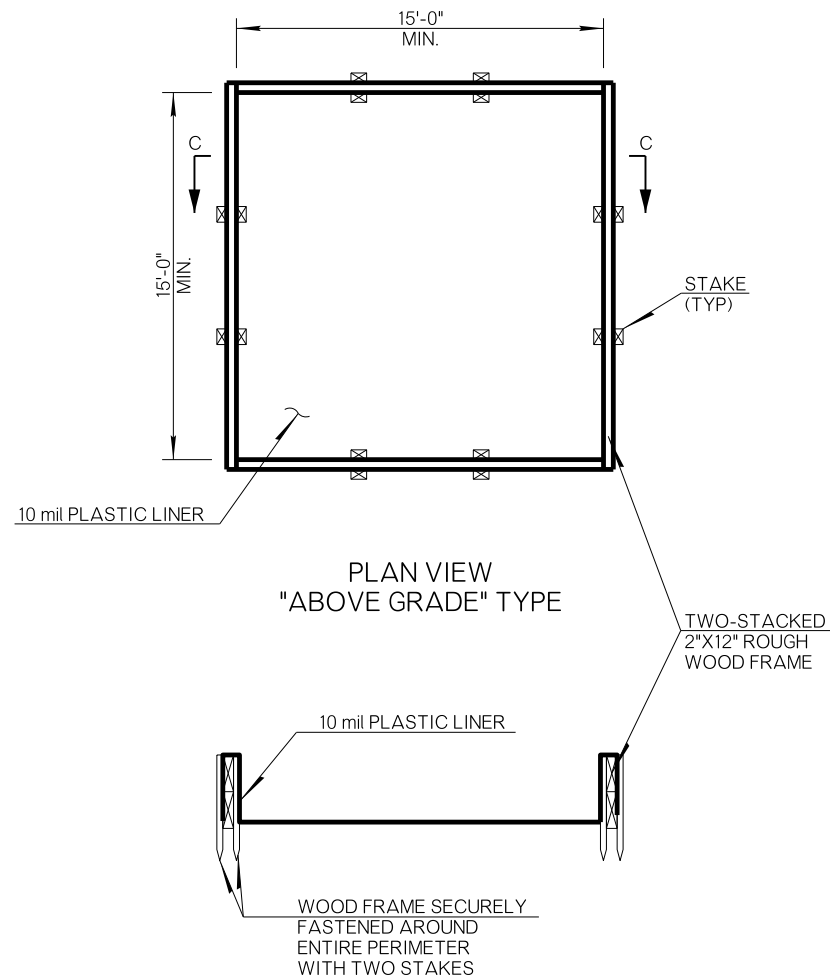
PLAN VIEW
"BELOW GRADE" TYPE



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.

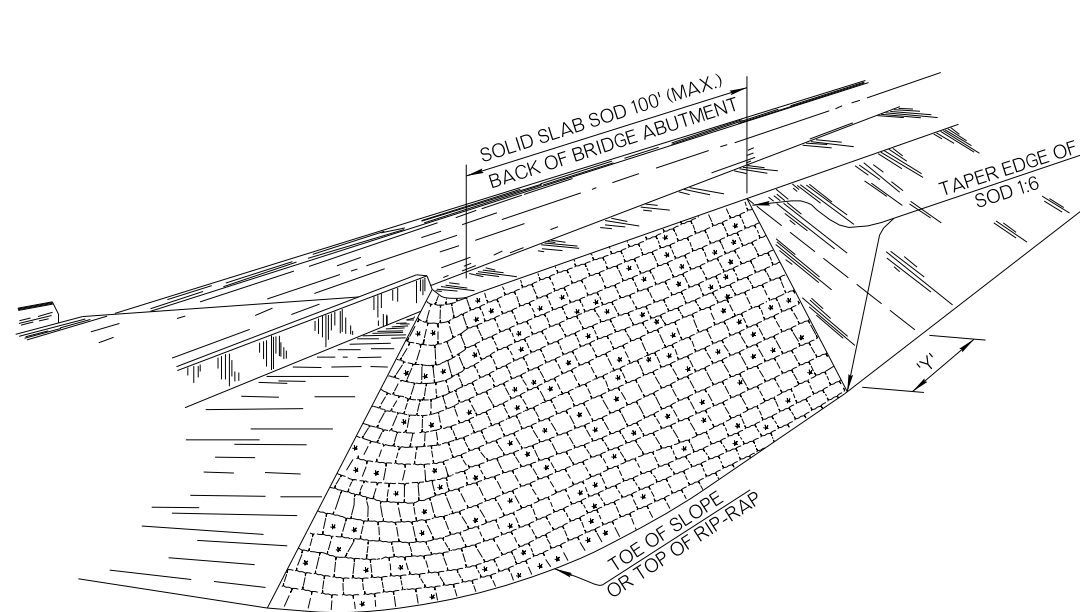
APPROVED BY
ROADWAY ENGINEER: *R. G. W. S.* DATE: *6/24/22*
ROADWAY DESIGN DIVISION STANDARD

CONCRETE WASHOUT APPLICATIONS

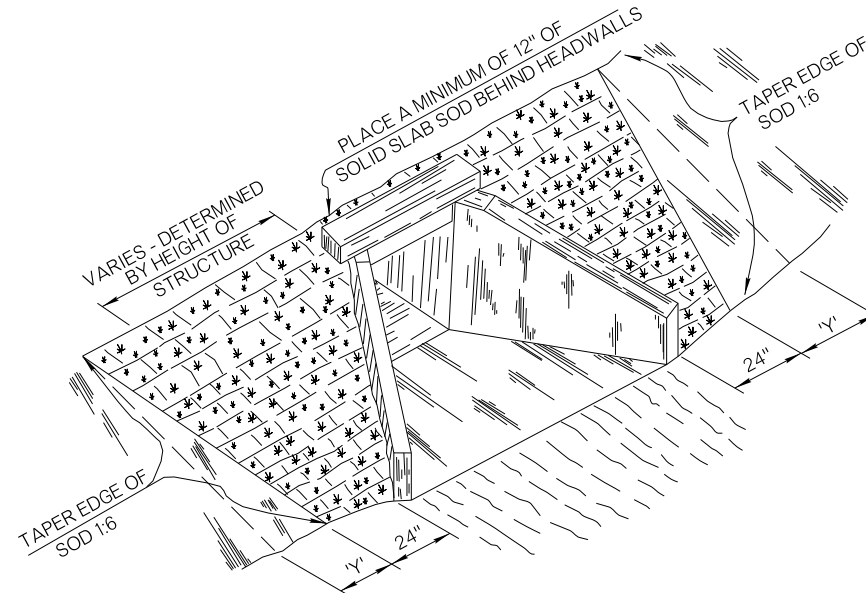


2019 SPECIFICATIONS

CWA	0
R-13	



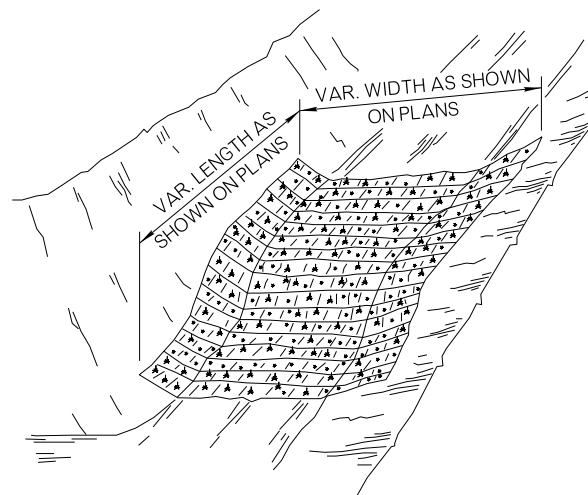
TYPICAL PLACEMENT OF SOLID SLAB SODDING OR APPROVED STABILIZING MAT ON FILL SLOPES, APPROACHES TO OVERPASSES AND BRIDGES



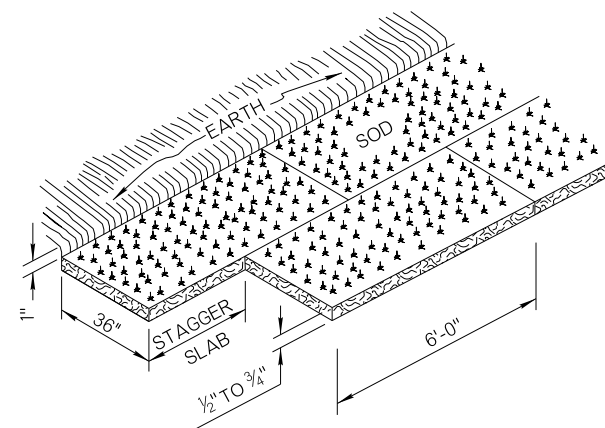
TYPICAL PLACEMENT OF SOLID SLAB SODDING AT STRUCTURE HEADWALLS

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 COMPACTED 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



SOLID SLAB SODDING
(MARCH 1 THRU AUGUST 31)

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

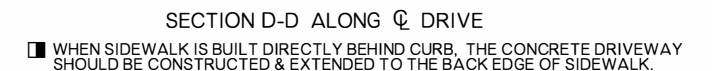
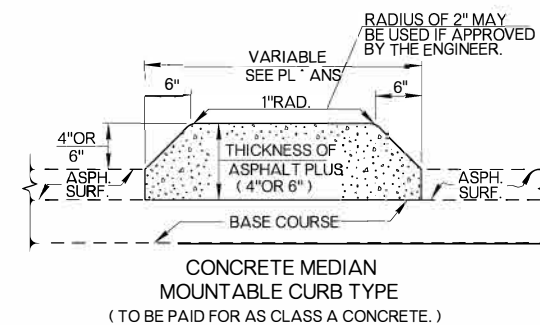
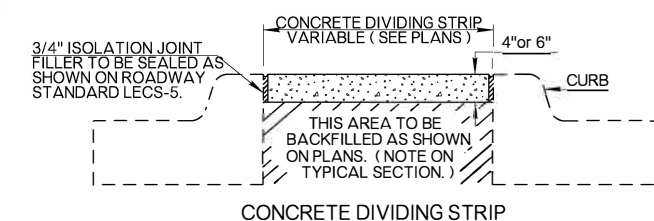
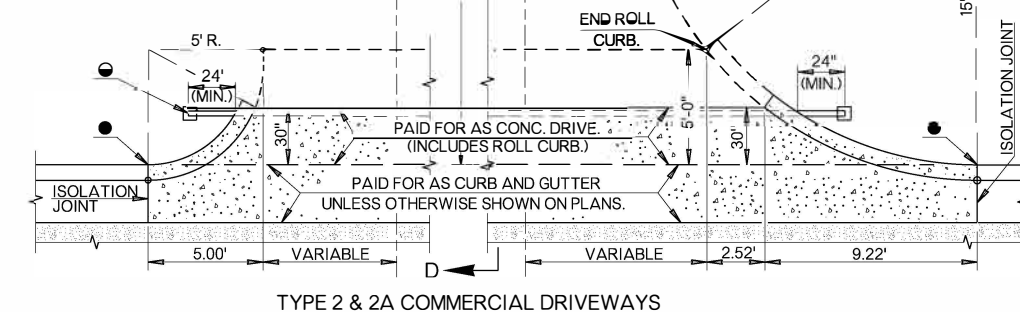
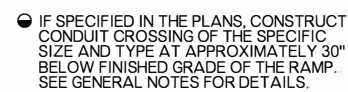
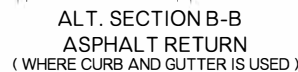
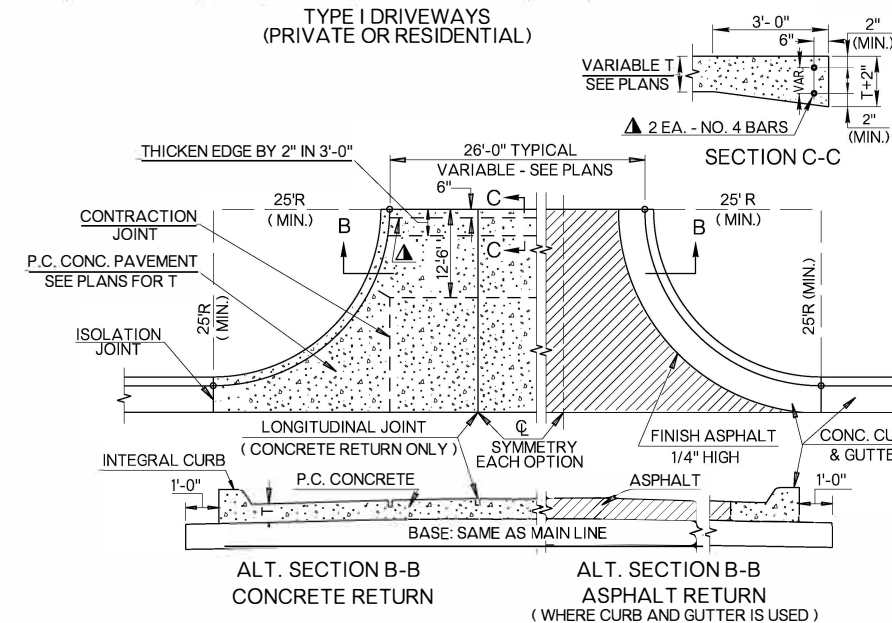
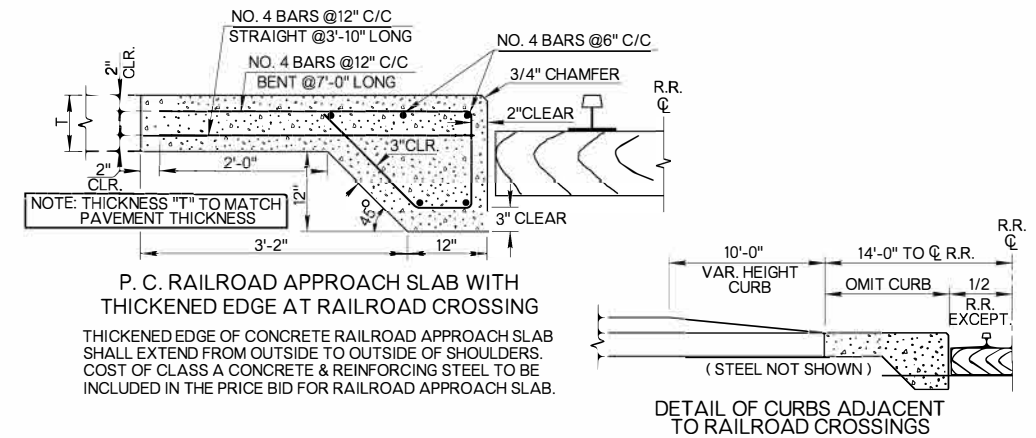
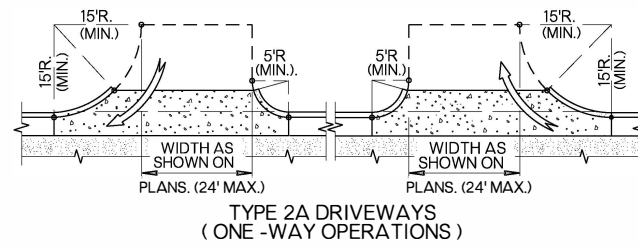
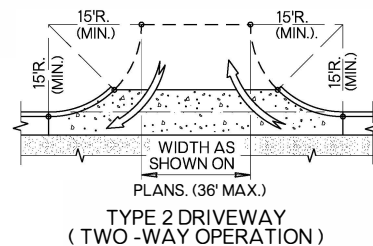
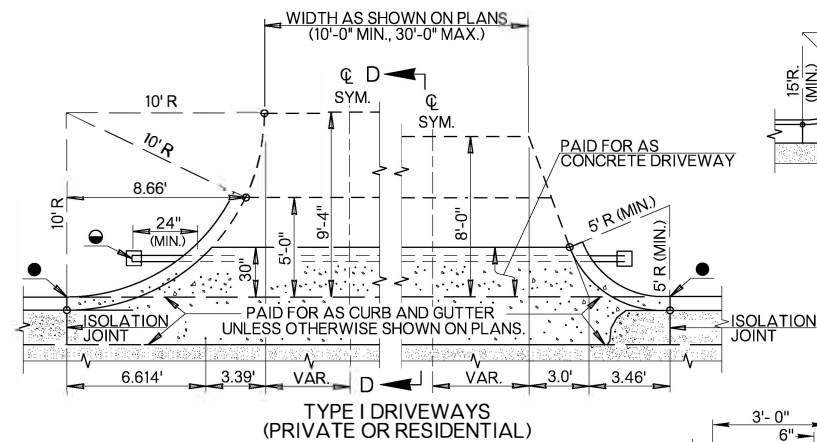
APPROVED BY
ROADWAY ENGINEER:  DATE: 6/24/22
ROADWAY DESIGN DIVISION STANDARD



SOLID SLAB SODDING

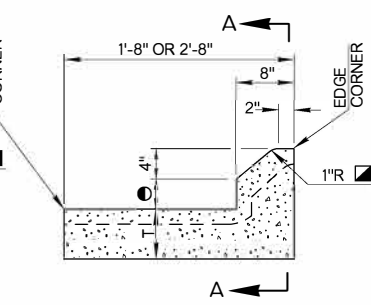
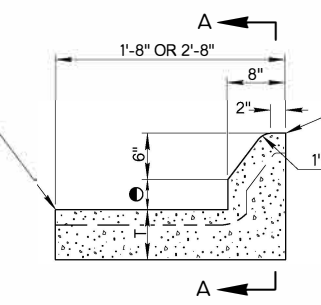
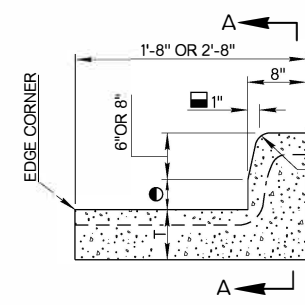
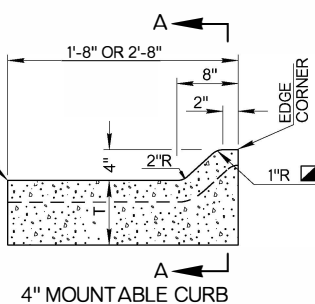
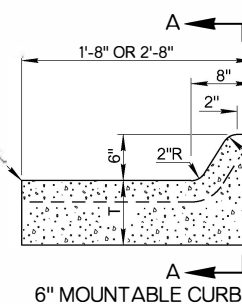
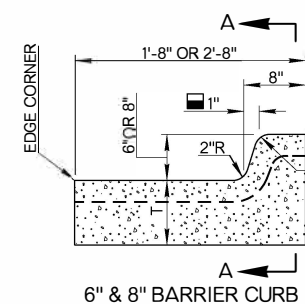
2019 SPECIFICATIONS

SSS-2 1
R-14



GENERAL NOTES

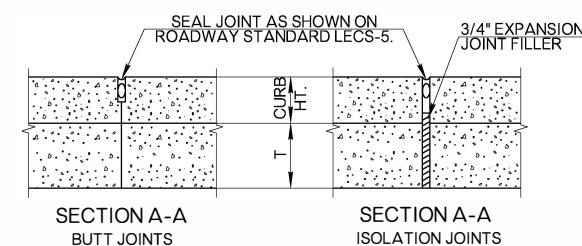
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. COST OF JOINT FILLERS, SEALING AND REINFORCING STEEL SHALL BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.
3. TRANSVERSE ISOLATION JOINTS FOR CONCRETE DIVIDING STRIP AND CONCRETE MEDIAN (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 PREMOLED 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 COMPACTED 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).



COMBINED CURB & GUTTER TYPICAL SECTIONS

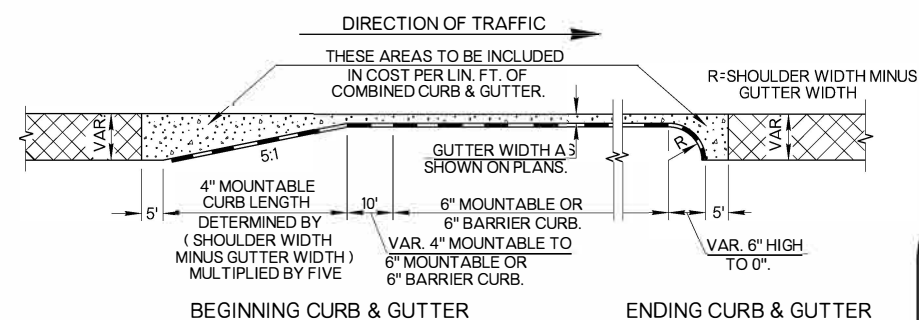
NOTE: T₁ DIMENSION EQUALS THE THICKNESS SHOWN ON TYPICAL SECTION. (MIN.=6")

- ☐ DIMENSION EQUALS THICKNESS SHOWN ON TYPICAL SECTION. (MIN.=0)
☒ 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.



CURB & GUTTER JOINTS

BUTT & ISOLATION JOINTS TO EXTEND THROUGH CURB & GUTTER TO BACK OF CURB



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

DATE: 6/30/22

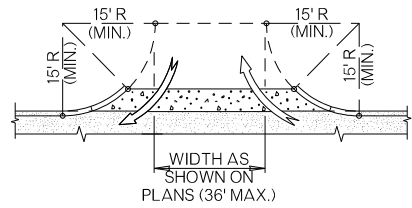
ASPHALT SURFACING CONSTRUCTION DETAILS

2019 SPECIFICATIONS

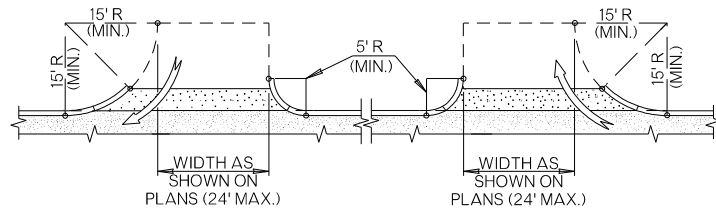
ASCD-6

1
15

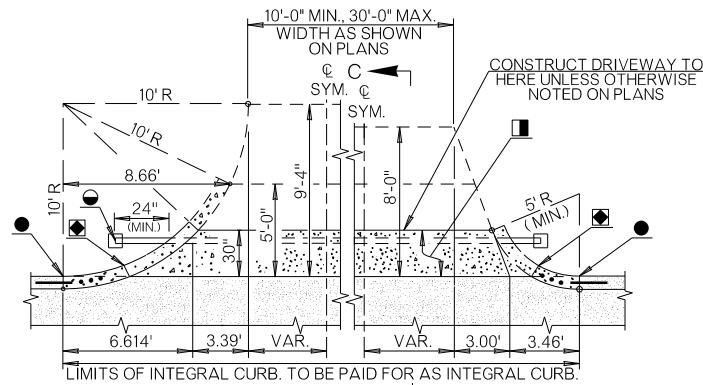
3-15



TYPE 2 DRIVEWAY
(TWO-WAY OPERATION)

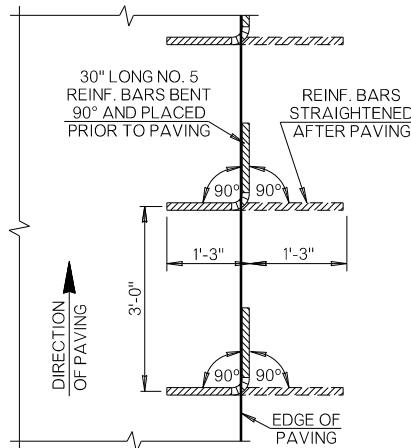


TYPE 2A DRIVEWAYS
(ONE-WAY OPERATION)

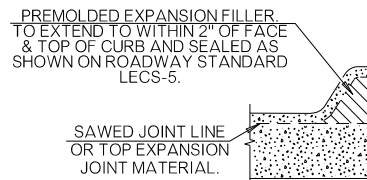


TYPE I DRIVEWAYS
(PRIVATE OR RESIDENTIAL)

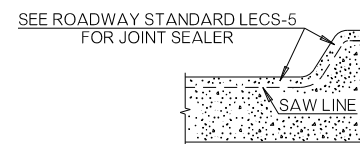
- 3/4" EXPANSION JOINT NO LOAD TRANSFER DEVICES
- PAID FOR AS CONCRETE DRIVEWAY (INCLUDES CURB)
- BEGIN ROLL CURB & TERMINATE INTEGRAL CURB. POUR APRON & CURB INTEGRAL WITH DRIVEWAY
- IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SAME SIZE AND TYPE SPECIFIED AT APPROXIMATELY 30" BELOW FINISHED GRADE OF RAMP. SEE GENERAL NOTES FOR DETAILS.



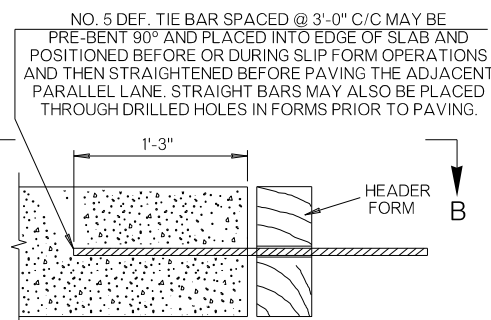
SECTION B-B



CURB JOINT WITH EXPANSION MATERIAL

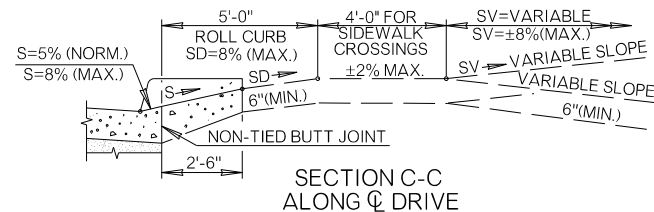


ALTERNATE CURB JOINT



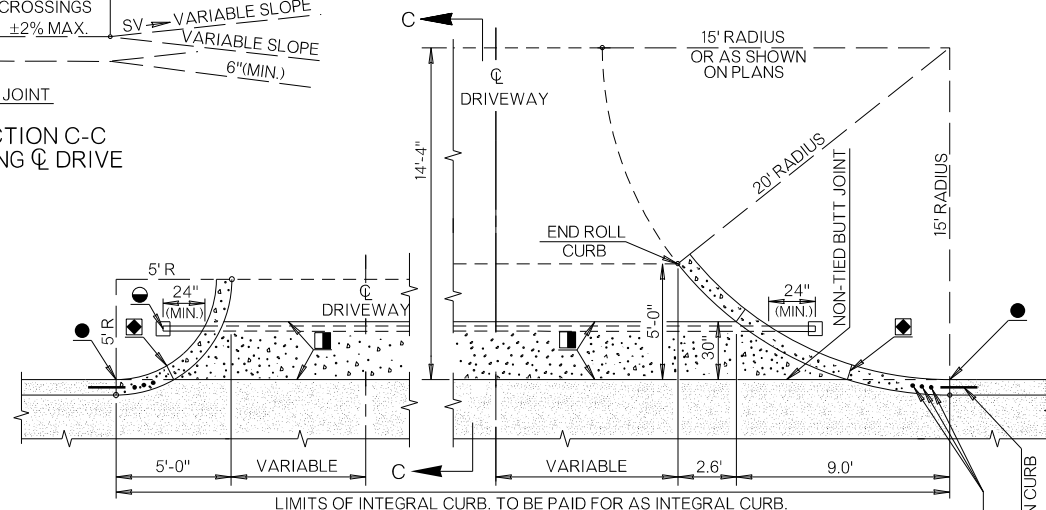
SECTION
TIED LONGITUDINAL BUTT JOINT
(TO BE USED BETWEEN ADJACENT PAVING LANES)

NOTE: LONGITUDINAL BUTT JOINT TIE BAR STEEL AND PLACEMENT METHOD NOT COVERED ON THIS STANDARD SHALL BE APPROVED BY THE ENGINEER.



SECTION C-C
ALONG DRIVE

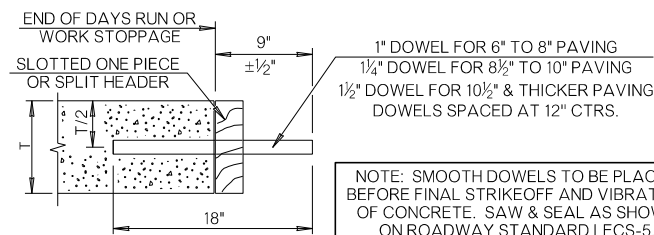
FOR STREET RETURN DETAILS
SEE ROADWAY STD. ASCD-6.



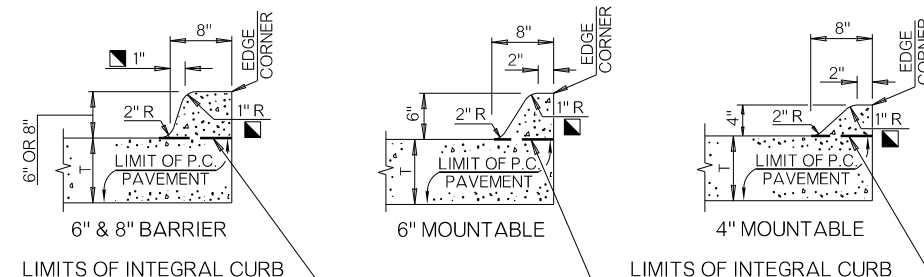
TYPE 2 & 2A COMMERCIAL DRIVEWAYS

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

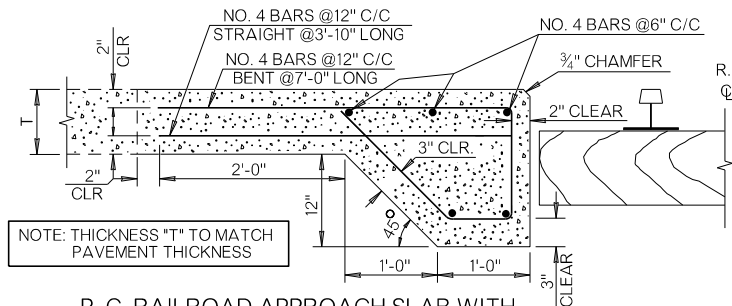
- 3/4" EXPANSION JOINT NO LOAD TRANSFER DEVICES
- PAID FOR AS CONCRETE DRIVEWAY (INCLUDES CURB)
- BEGIN ROLL CURB & TERMINATE INTEGRAL CURB. POUR APRON & CURB INTEGRAL WITH DRIVEWAY
- IF SPECIFIED IN THE PLANS, CONSTRUCT CONDUIT CROSSING OF THE SAME SIZE & TYPE SPECIFIED AT APPROXIMATELY 30" BELOW FINISHED GRADE OF RAMP. SEE GENERAL NOTES FOR DETAILS.



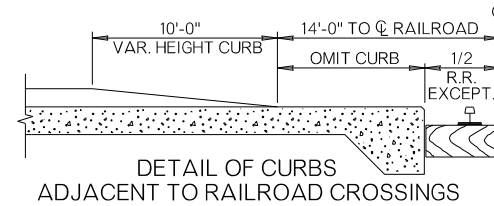
TRANSVERSE CONSTRUCTION JOINT
(TO BE USED AT END OF DAYS RUN OR PLACEMENT OF CONCRETE OR ANY STOPPAGE OF 30 MINUTES OR MORE.)



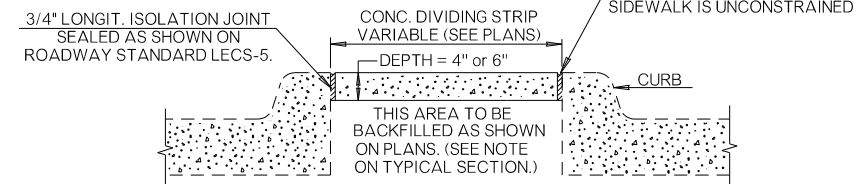
INTEGRAL CURB TYPICAL SECTIONS



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

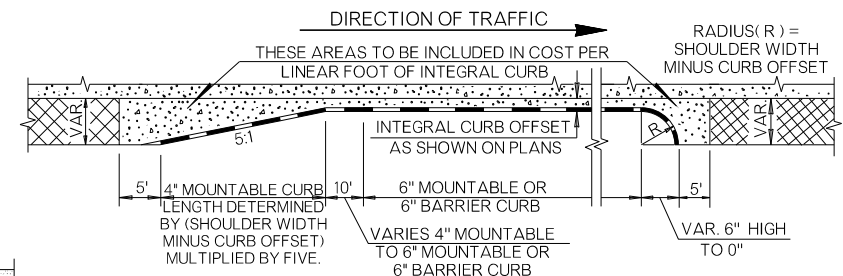


DETAIL OF CURBS
ADJACENT TO RAILROAD CROSSINGS



CONCRETE DIVIDING STRIP

TRANSVERSE EXPANSION JOINTS TO BE 1/2" WIDE. EXPANSION JOINT FILLER AT 50'-0" C/C. AND 1/4" EXPANSION JOINT MATERIAL AT 1/3 POINTS BETWEEN EXPANSION JOINTS. FILLER MATERIAL TO BE PREMOLDED AND JOINTS TO BE SEALED AS SHOWN ON STANDARD DRAWING LECS-5. JOINTS IN DIVIDING STRIP SHOULD ALIGN WITH CURB EXPANSION JOINTS.



CURB BEGINNING

CURB ENDING

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- ALL COST OF CLASS A CONCRETE & REINFORCING STEEL IN THICKENED EDGE AT RAILROAD CROSSINGS SHALL BE INCLUDED IN THE UNIT PRICE BID FOR APPROACH SLAB-RAILROAD.
- COST OF JOINT FILLERS, SEALING AND REINFORCING STEEL SHALL BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.
- CONTRACTION JOINTS IN JOINTED P.C. PAVEMENT SHALL BE AT APPROXIMATELY 15'-0" CENTERS, UNLESS OTHERWISE SHOWN ON THE PLANS.
- CURB & GUTTER SHALL BE PLACED INTEGRAL WITH THE PAVING SLAB UNLESS OTHERWISE SHOWN IN THE PLANS. TRANSVERSE JOINTS SHALL MATCH PAVEMENT JOINTS AND PLACED AT DRAINAGE STRUCTURES. LONGITUDINAL JOINTS SHALL BE TIED WITH #5 DEFORMED TIE BARS 2'-6" LONG AT 3'-0" CENTERS. SEE TIED BUTT AND LONGITUDINAL CONSTRUCTION JOINT DETAIL ON ROADWAY STANDARD LECS-5.
- ALL CONDUIT CROSSINGS ARE TO BE TRENCHED, PLACED, BACKFILLED, AND COMPACTED PRIOR TO SURFACING. BORING OR PUSHING PROCEDURES MAY BE USED WHERE SURFACING IS ALREADY IN PLACE AND IF APPROVED BY THE ENGINEER.
- IF CONDUIT IS NOT CONTINUOUS BETWEEN DRIVEWAYS/RAMPS, CAP BOTH ENDS OF EACH CONDUIT CROSSING AND PLACE MARKER TO PREVENT DAMAGE DURING CONSTRUCTION.
- CONDUIT SHALL NOT TERMINATE BELOW A SURFACED AREA, BUT SHALL EXTEND MINIMUM OF 24" PAST EDGE OF PAVING.
- FOR PULL BOX INSTALLATION DETAILS, SEE TRAFFIC STANDARD PBD1-1.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
414 (G)	P.C. CONCRETE FOR PAVEMENT	CY
414 (H)	P. C. RAILROAD APPROACH SLABS	SY
609 (A)	CONCRETE CURB (INTEGRAL)	LF
610 (A)	CONCRETE SIDEWALK	SY
610 (B)	CONCRETE DRIVEWAY	SY
610 (C)	CONCRETE DIVIDING STRIP	SY

- HEIGHT & TYPE OF CURB SHALL BE SPECIFIED.
- THICKNESS SHALL BE SPECIFIED IN INCHES.

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

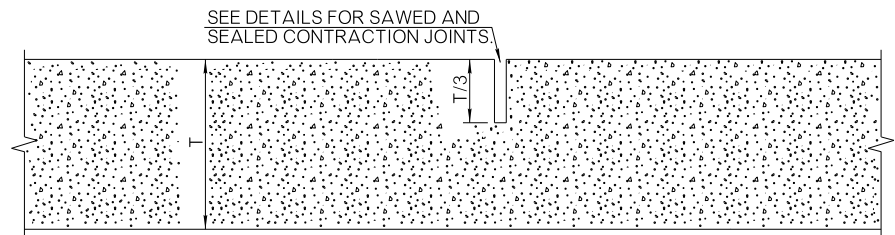


CONCRETE SURFACING
CONSTRUCTION DETAILS

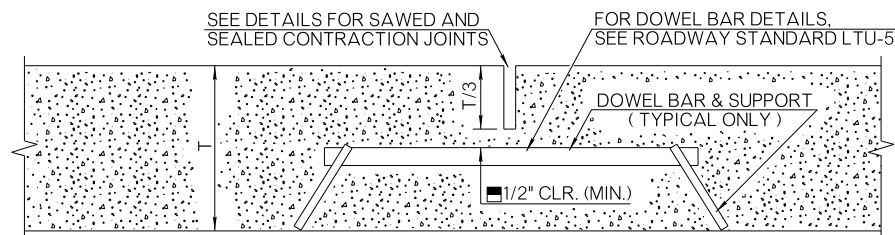
2019 SPECIFICATIONS

CSCD-6 3

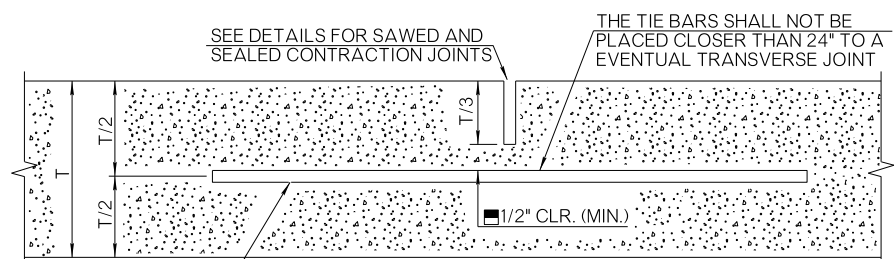
R-16



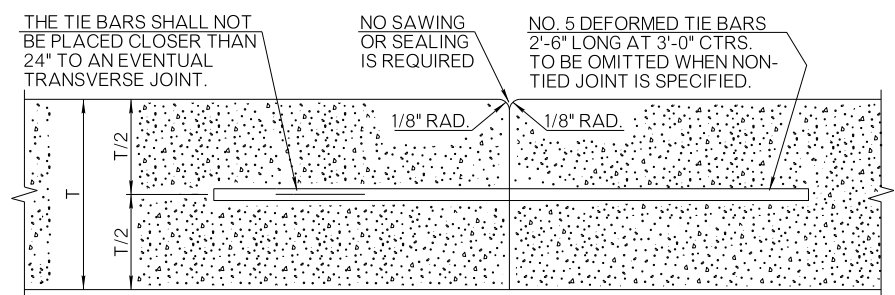
NON-DOWELED CONTRACTION JOINT



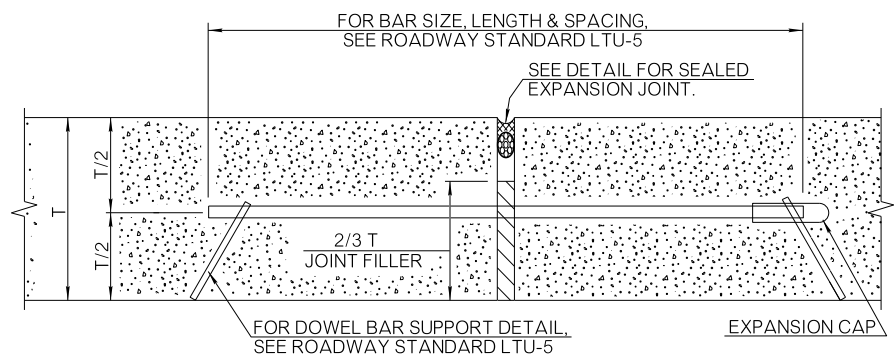
DOWELED CONTRACTION JOINT



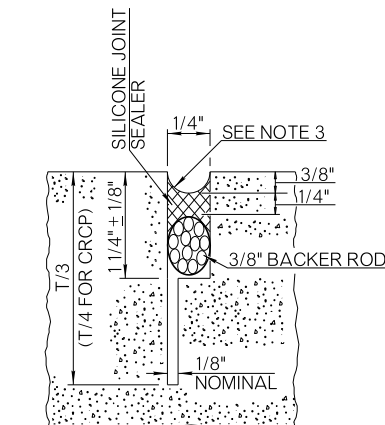
LONGITUDINAL JOINT



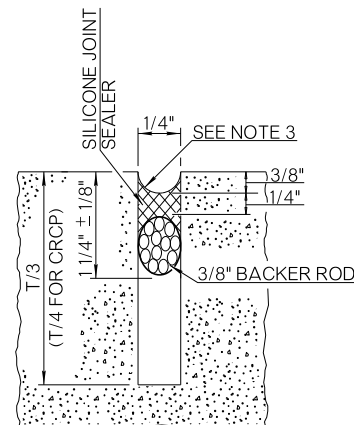
TIED BUTT JOINT AND LONGITUDINAL CONSTRUCTION JOINT



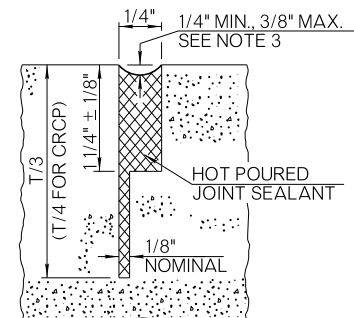
EXPANSION JOINT / ISOLATION JOINT
OMIT DOWEL BARS, CAPS & SUPPORTS FOR ISOLATION JOINTS



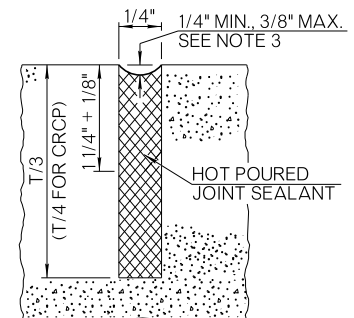
SILICONE SEALANT OPTION



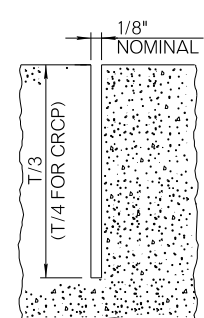
SILICONE SEALANT OPTION



HOT POUR OPTION



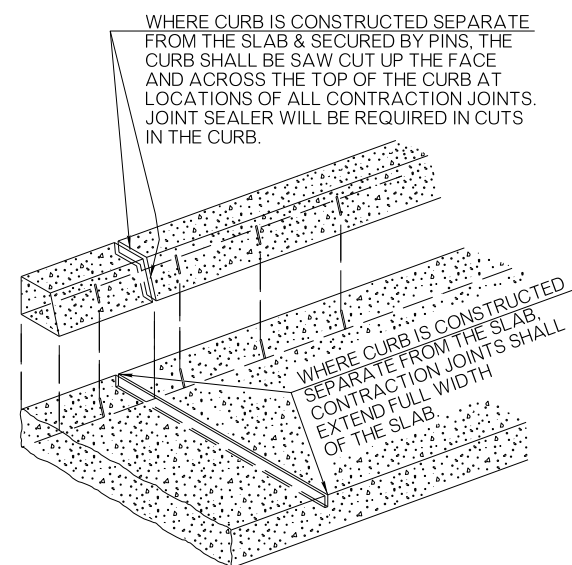
HOT POUR OPTION



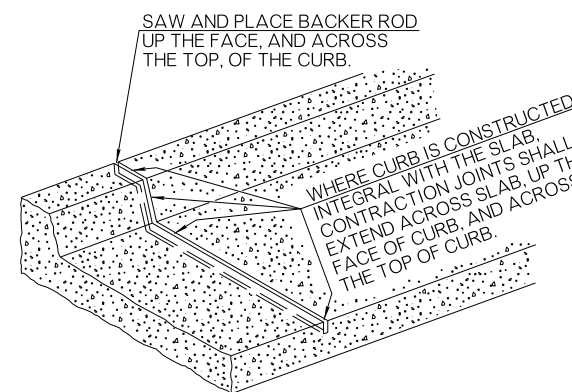
NO SEALANT OPTION

SAWED AND SEALED, CONTRACTION AND LONGITUDINAL JOINTS ALTERNATE DETAILS

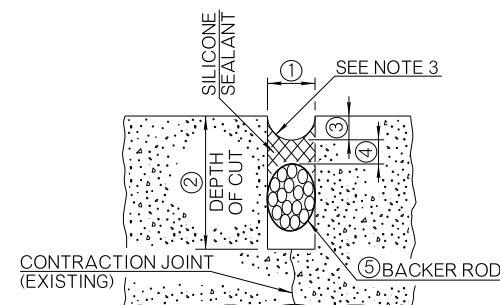
UNLESS OTHERWISE SPECIFIED IN THE PLANS, ONLY THE SILICONE SEALANT OPTIONS WILL BE ALLOWED.



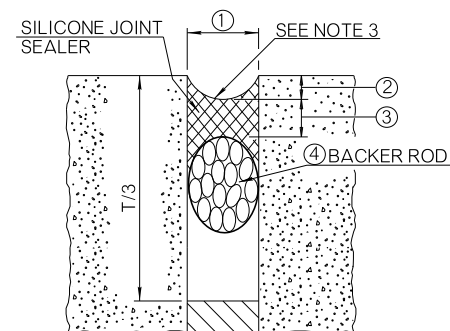
CONTRACTION JOINT WITH SEPARATE CURB



CONTRACTION JOINT WITH INTEGRAL CURB



JOINT REHABILITATION DETAILS



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"	1 1/8"
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, DOWELLED CONTRACTION JOINTS SHALL BE USED ON DRIVING LANES ONLY. CONCRETE SHOULDERS SHALL NOT BE DOWELLED 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 TIME THE PAVEMENT UNLESS OTHERWISE SPECIFIED, OR AS DIRECTED BY THE ENGINEER. CONSTRUCT LONGITUDINAL GROOVING TO THE FOLLOWING DIMENSIONS: 1/8" TO 3/16" WIDE, 1/8" TO 3/16" DEEP, AND EQUALLY SPACED AT 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: 1/8" TO 3/16" WIDE, 1/8" TO 3/16" DEEP, AND EQUALLY SPACED AT 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.

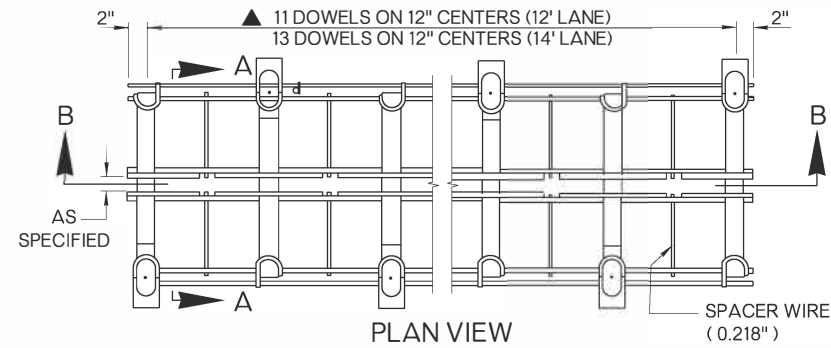
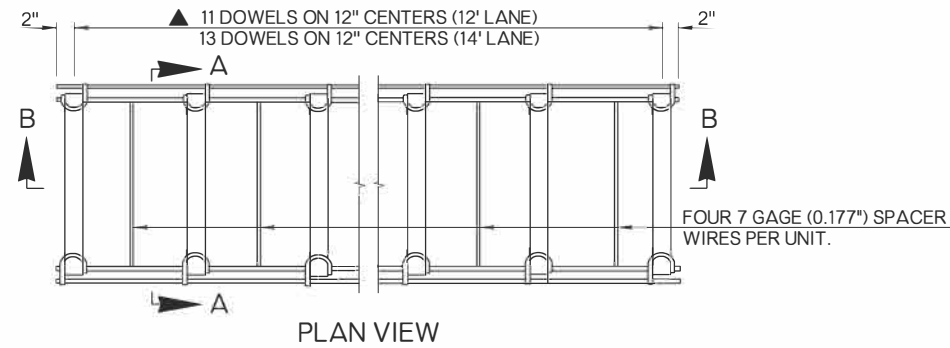
APPROVED BY ROADWAY ENGINEER:  DATE: 3/31/2025

ROADWAY DESIGN DIVISION STANDARD

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

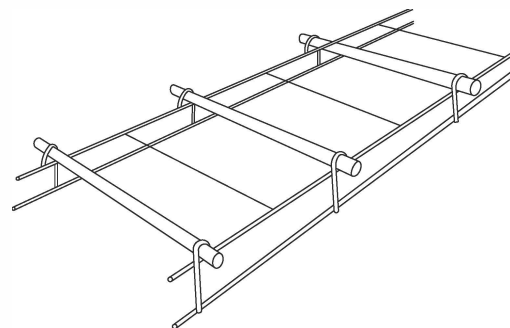
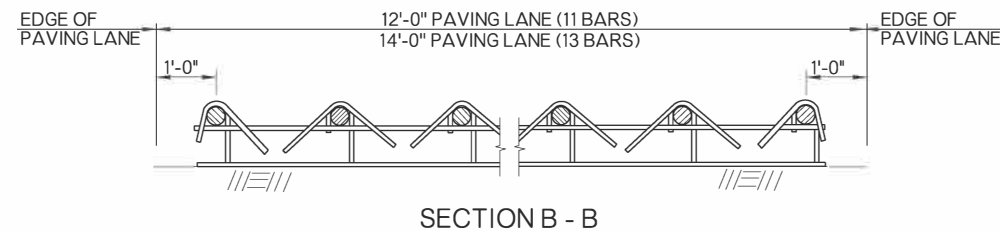
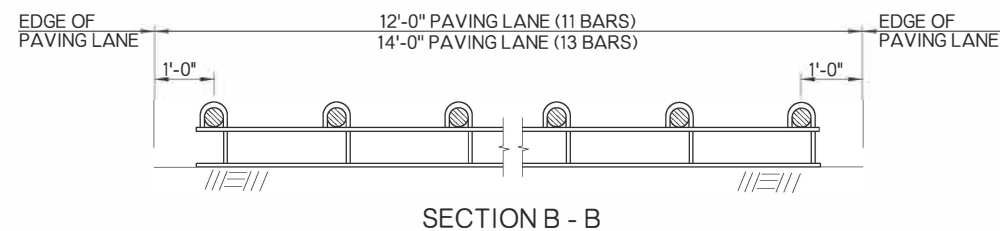
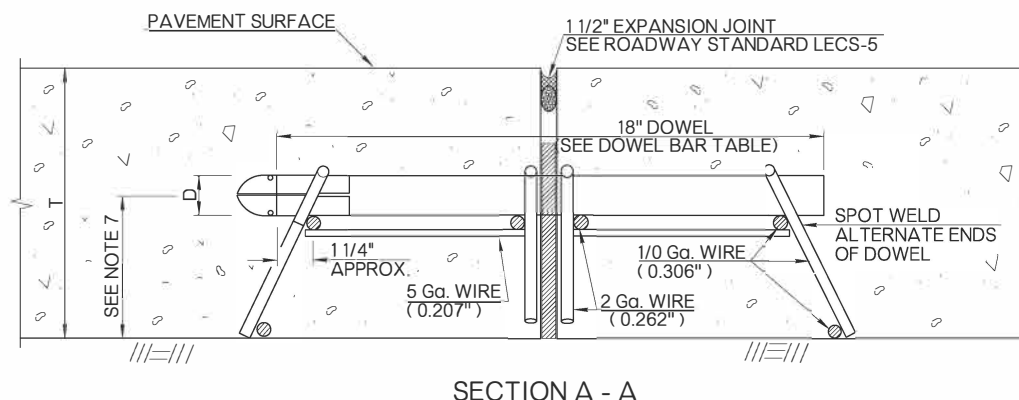
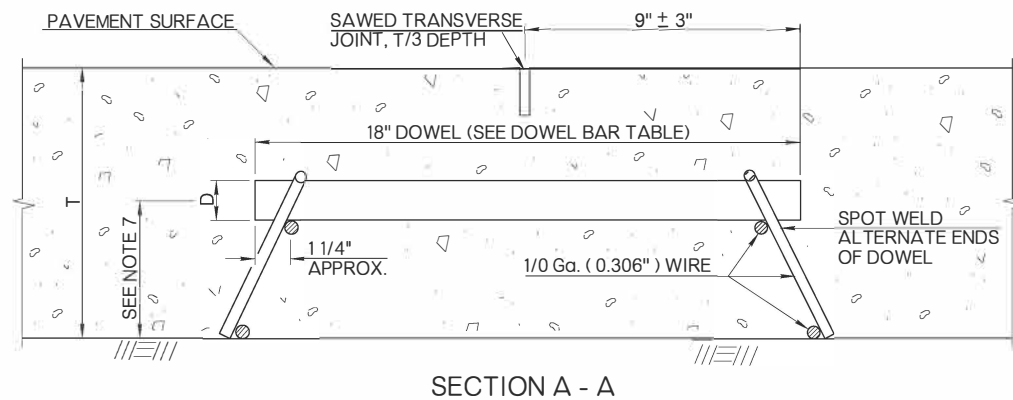


2019 SPECIFICATIONS

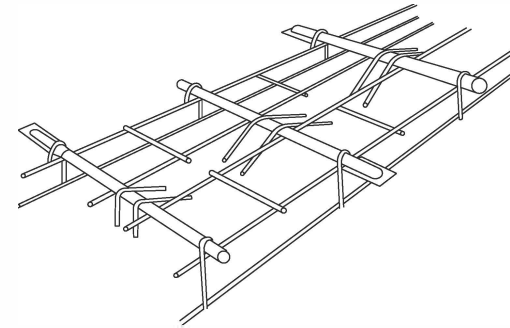


DOWEL BAR TABLE			
▲ SPACING & SIZE DATA			
(T) SLAB DEPTH	DOWEL DIA.	TOTAL DOWEL LENGTH	C/C DOWEL SPACING
6" - 8"	1"	18"	12"
8 1/2" - 10"	1 1/4"	18"	12"
10 1/2" & UP	1 1/2"	18"	12"

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.



WELDED CONTRACTION JOINT ASSEMBLY



WELDED EXPANSION JOINT ASSEMBLY

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- 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.
- PRODUCER AND CONTRACTOR SHALL AVOID PATENT INFRINGEMENT OF THE BASKET AND SHALL SAVE THE STATE HARMLESS IN THE USE OF ANY BASKET.
- 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.
- COLD-DRAWN STEEL WIRE, USED FOR DOWEL BASKETS, SHALL BE ACCEPTED BY VISUAL FIELD INSPECTION, AS PROVIDING SUFFICIENT DOWEL BAR SUPPORT DURING PAVING PROCESS.
- ▲ 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.
- 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.
- 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.
- 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).
- 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.
- 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.

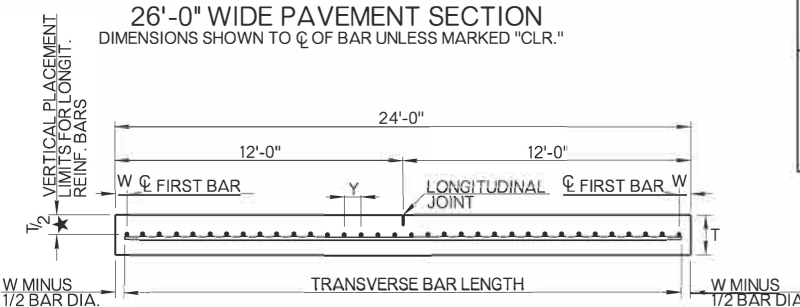
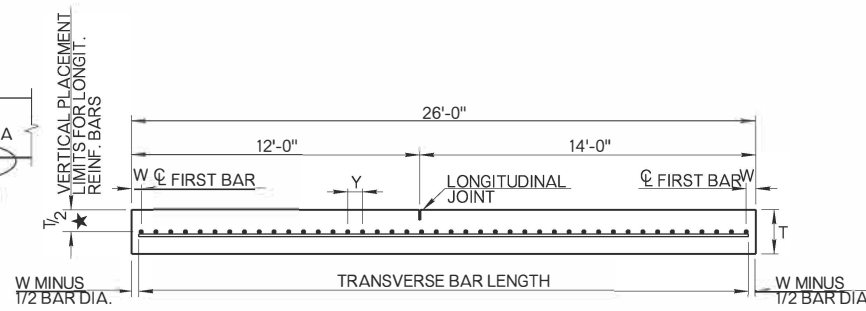
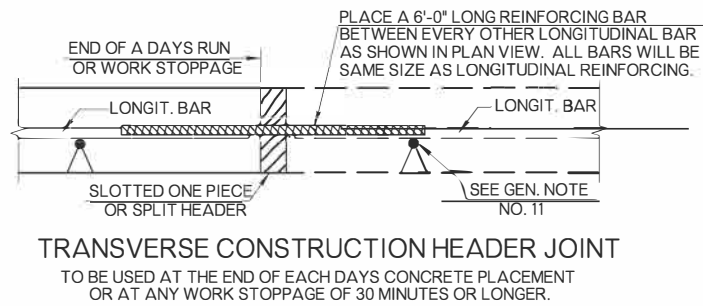
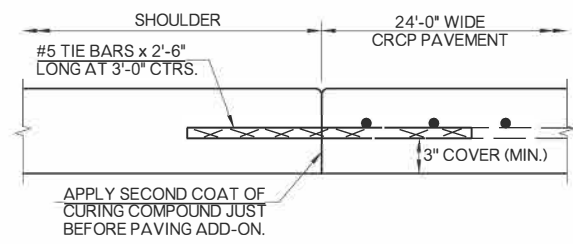
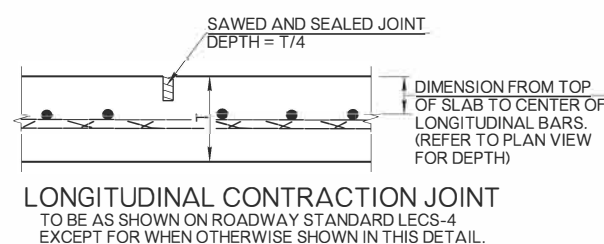
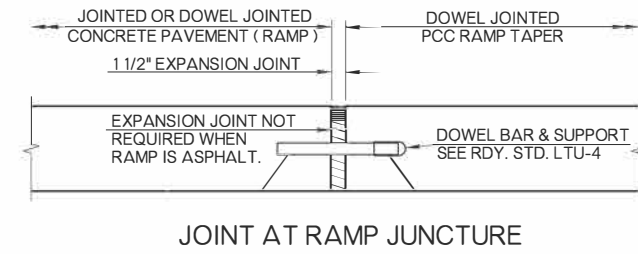
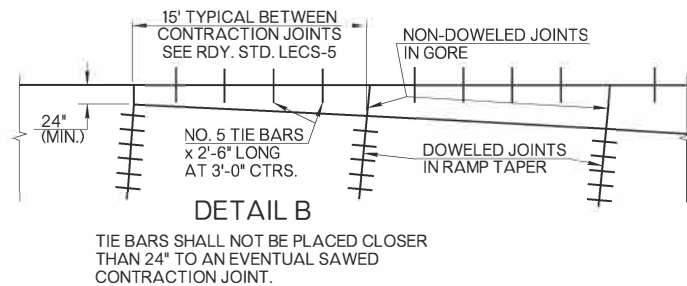
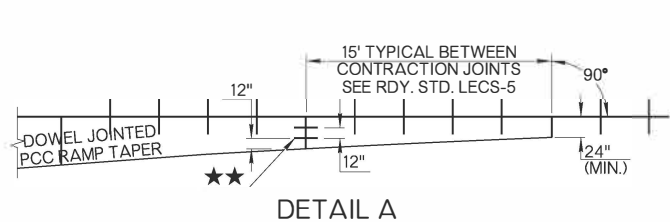
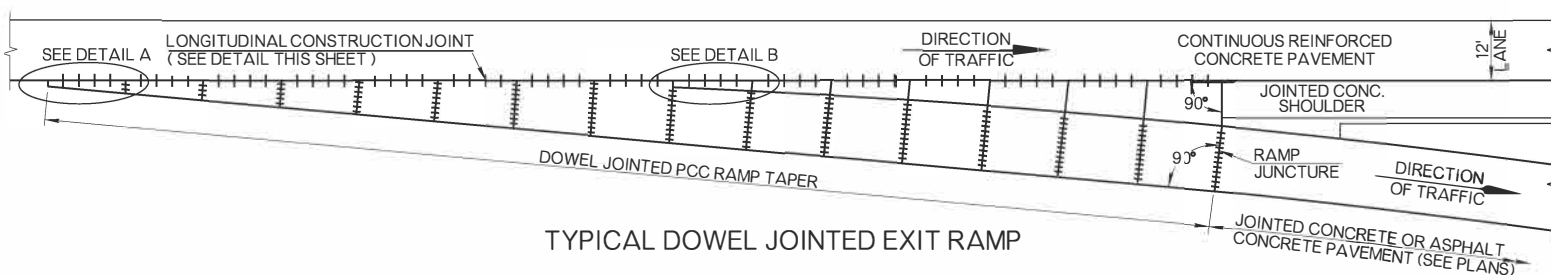
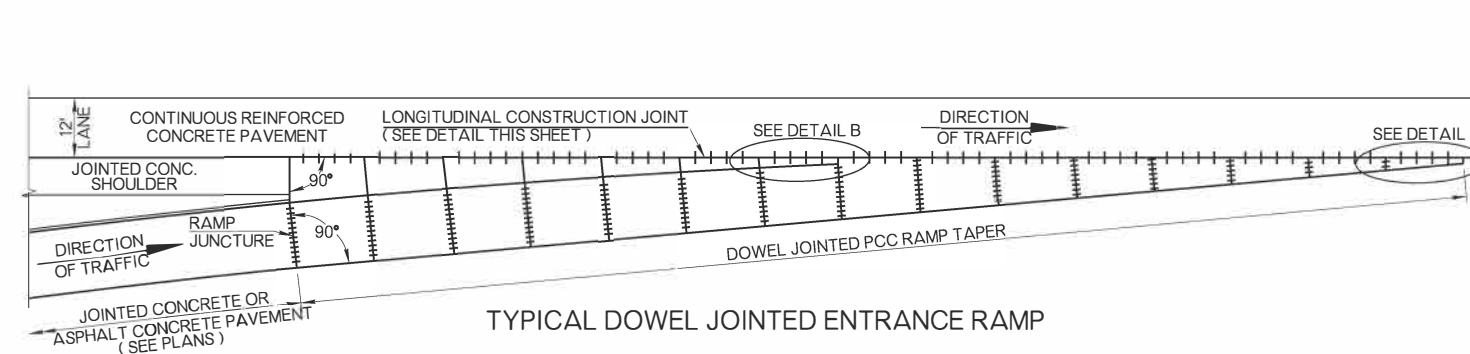
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ROADWAY ENGINEER:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



LOAD TRANSFER UNITS FOR
CONCRETE PAVEMENT JOINTS

2019 SPECIFICATIONS

LTU-5	1
	R-18



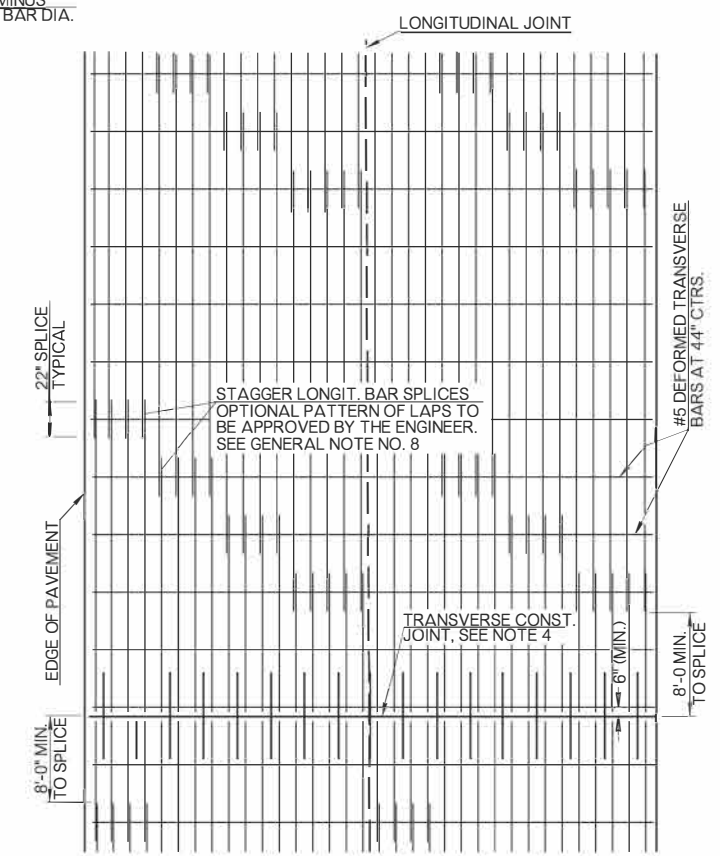
★ TOLERANCE FOR PLACEMENT OF LONGITUDINAL STEEL:
UPPER LIMIT = $T/2 + 1"$ (UP FROM $T/2$)
LOWER LIMIT = $T/2 - 1/2"$ (DOWN FROM $T/2$)
PLACEMENT IS MEASURED AT CENTERLINE OF BARS.
TRANSVERSE PLACEMENT LIMITS EQUALS PLANS LOCATION OF EACH BAR PLUS OR MINUS 2 INCHES.

★★ 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

- ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- 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.
- EXPANSION JOINTS WILL NOT BE USED, EXCEPT AT TERMINAL POINTS AS SHOWN IN THE PLANS, FOR MAINLINE AND/OR SHOULDER PAVEMENT.
- TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY HEADERS OTHER THAN SHOWN, BUT ONLY WITH PRIOR APPROVAL OF THE ENGINEER.
- 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).
- 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.
- 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.
- NOT OVER 30 PERCENT OF THE REGULAR LONGITUDINAL STEEL SHALL BE SPICES WITHIN ANY GIVEN AREA MEASURED 12'-0" TRANSVERSELY BY 2'-6" LONGITUDINALLY.
- 'LEAVE OUT' SECTIONS (OMISSIONS) WILL NOT BE PERMITTED. TEMPORARY BRIDGES WILL BE USED WHERE REQUIRED. COST TO BE INCLUDED IN OTHER ITEMS OF WORK.
- 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.
- 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.
- 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.
- 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 THICK-NESS	TRANS. #5 BAR LENGTH	BAR SIZE	SPACING		NO. OF BARS	LBS. PER SY	DES. (%)	
				W	Y				
26'-0" PAVEMENT	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
24'-0" PAVEMENT	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

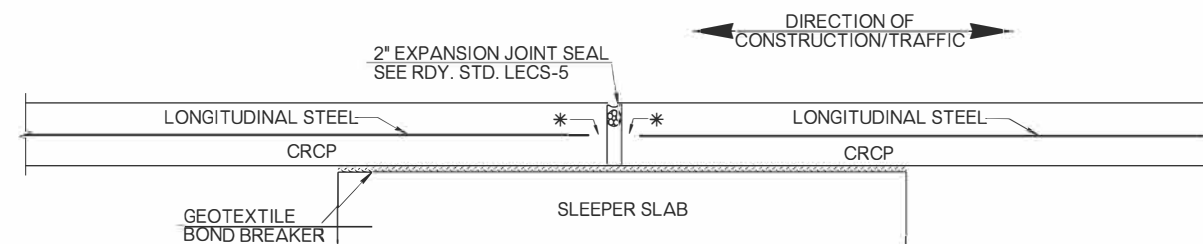


BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
414 (C)	CONT. REINF. P. C. C. PAVT. (PLACEMENT)	SY
414 (G)	P. C. CONCRETE FOR PAVEMENT	CY

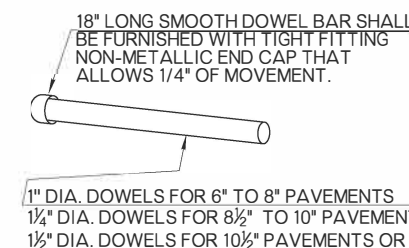
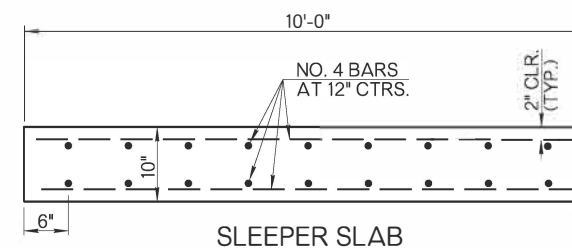
APPROVED BY ROADWAY ENGINEER: DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



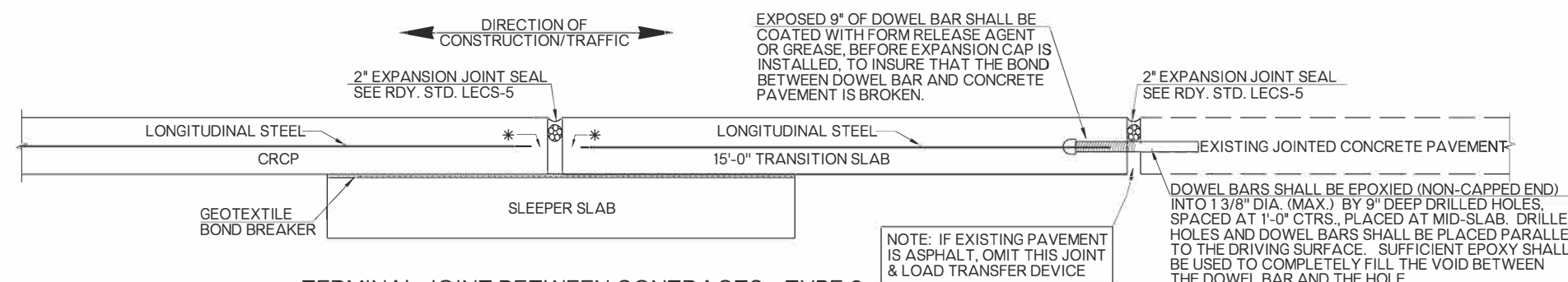
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DETAILS



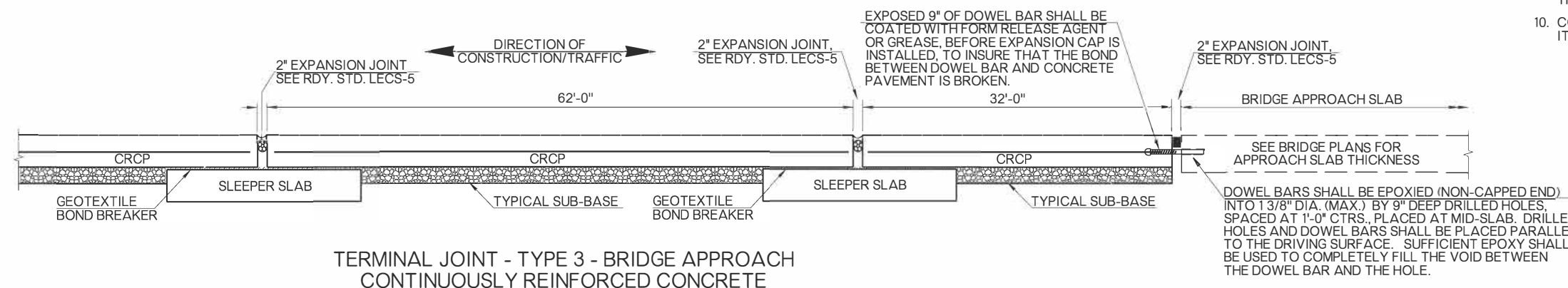
TERMINAL JOINT BETWEEN CONTRACTS - TYPE 1



DETAIL OF DOWEL BAR WITH CAP



TERMINAL JOINT BETWEEN CONTRACTS - TYPE 2



TERMINAL JOINT - TYPE 3 - BRIDGE APPROACH
CONTINUOUSLY REINFORCED CONCRETE

- GENERAL NOTES**
- ALL CONSTRUCTION AND MATERIALS REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - 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.
 - 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.
 - 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.
 - TYPE 2 TERMINAL JOINT TO BE USED WHEN CRCP PAVEMENT TERMINATES AT LOCATIONS OTHER THAN AT BRIDGES. TRANSITION SLAB MAY BE TEMPORARY OR PERMANENT.
 - THE 15 FOOT TRANSITION SECTION OF REINFORCED PAVEMENT ADJACENT TO THE TYPE 2 TERMINAL JOINT SHALL BE PAID FOR AS CONTINUOUSLY REINFORCED CONCRETE PAVEMENT.
 - 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".
 - * THE LONGITUDINAL REINFORCING STEEL SHALL HAVE 3" TO 4" OF CONCRETE COVER BETWEEN THE END OF THE REINFORCING STEEL AND THE JOINT OPENING FACE.
 - SLEEPER SLAB SHALL EXTEND 2'-0" BEYOND THE OUTSIDE LATERAL EDGES OF THE CRCP PAVED LANES.
 - COST OF LOAD TRANSFER DEVICE RETROFIT TO BE INCLUDED IN OTHER ITEMS OF WORK.

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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ROADWAY ENGINEER:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

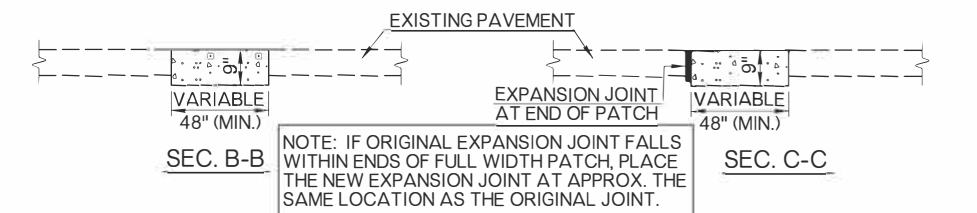
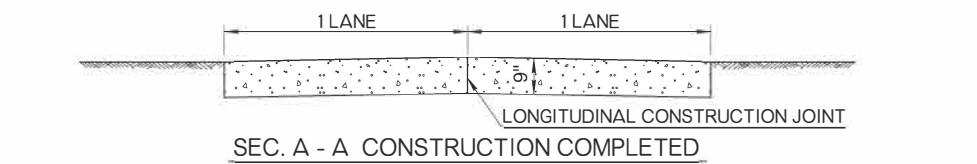
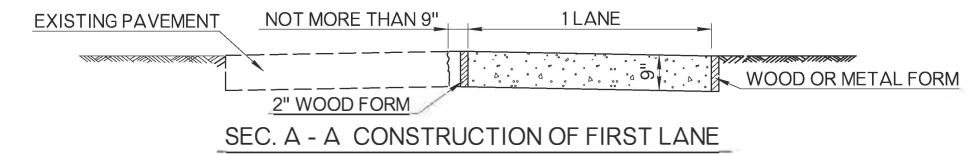
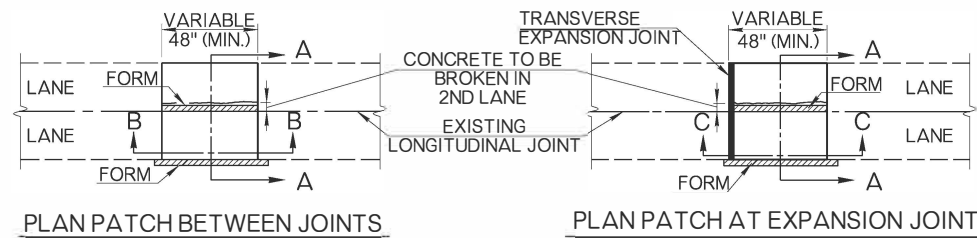


CONTINUOUSLY REINFORCED CONCRETE
PAVEMENT TERMINAL JOINTS

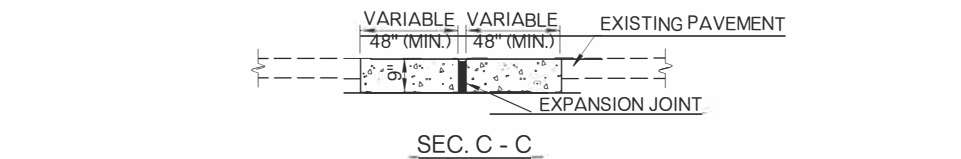
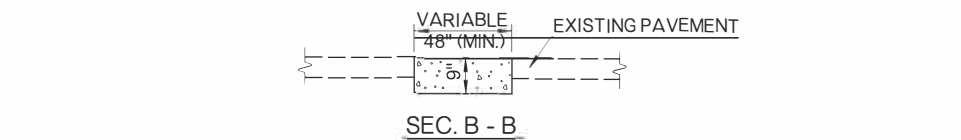
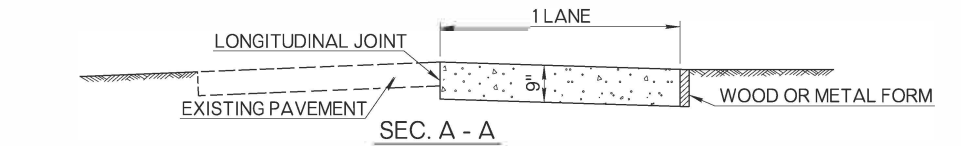
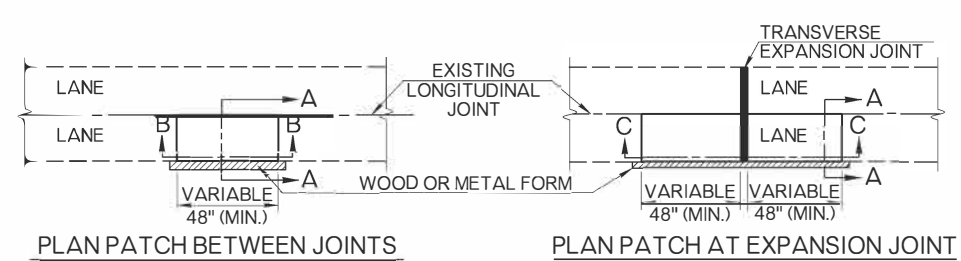
2019 SPECIFICATIONS

CRCP2-4 1

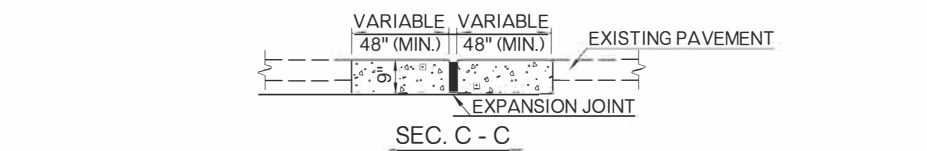
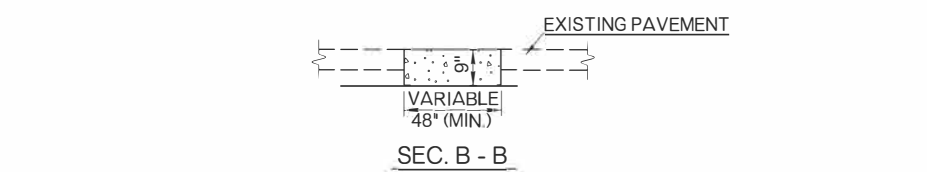
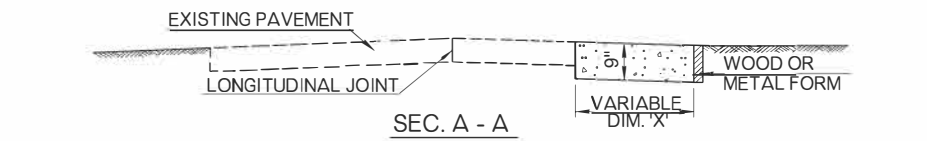
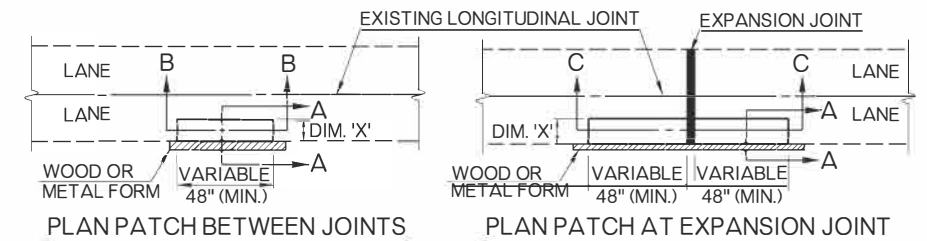
R-20



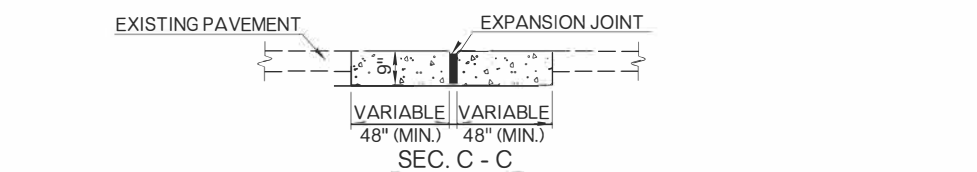
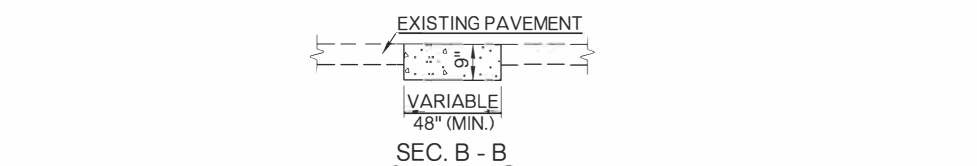
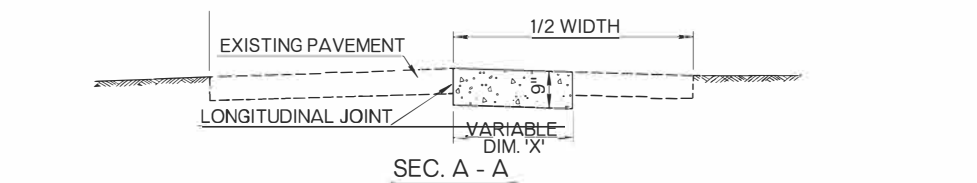
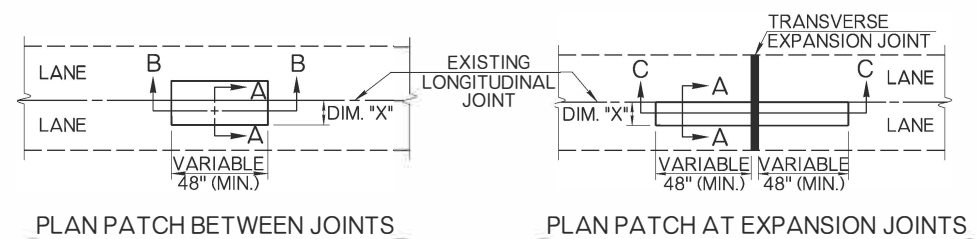
MULTI LANE PATCH (CONSTRUCTED ONE LANE AT A TIME)



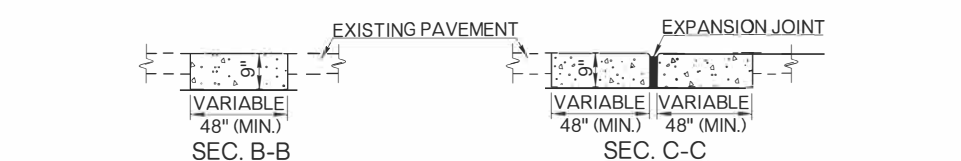
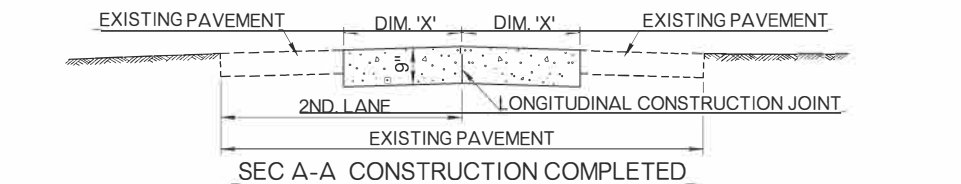
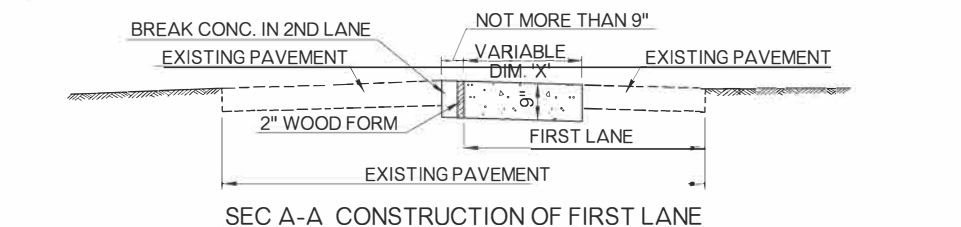
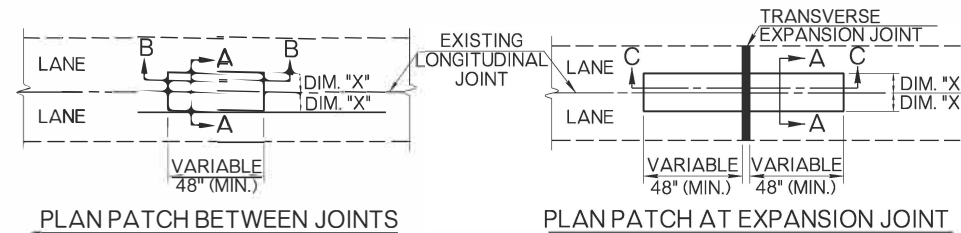
SINGLE LANE PATCH



EXTERIOR EDGE PATCH



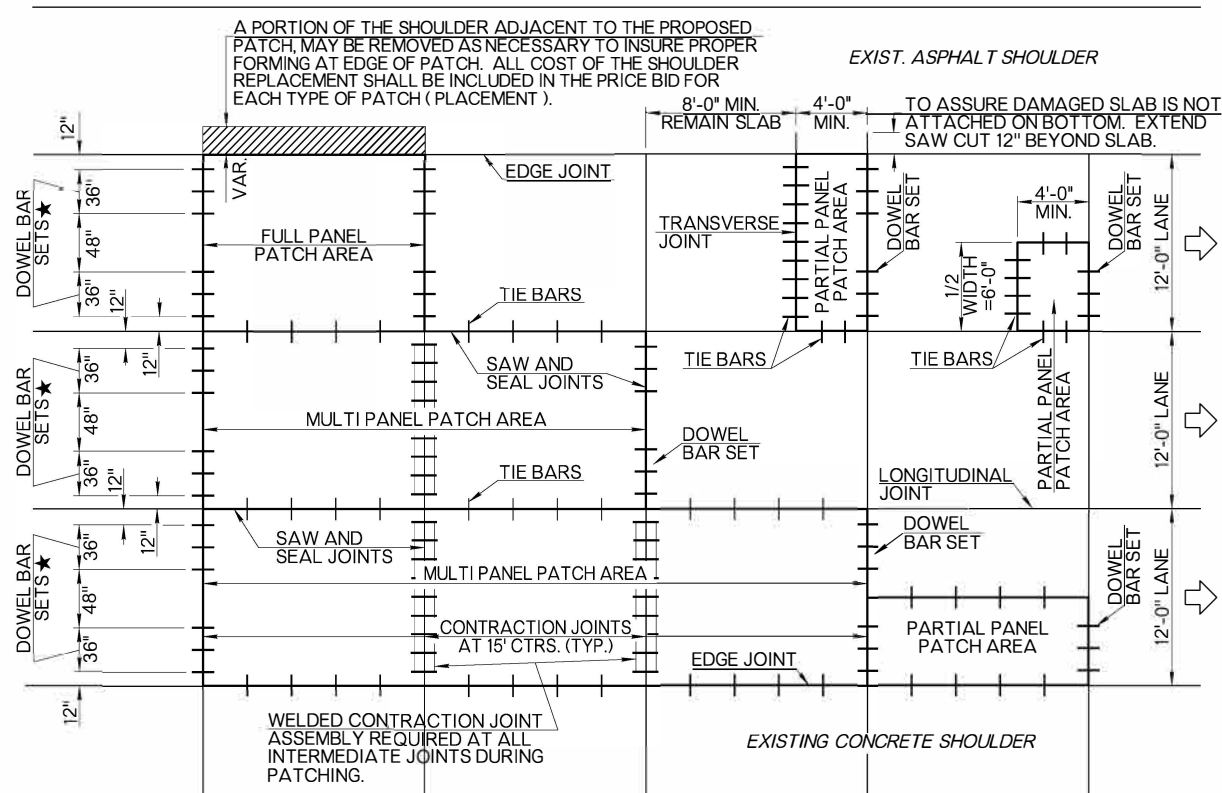
INTERIOR EDGE PATCH



RECTANGULAR PLUG PATCH

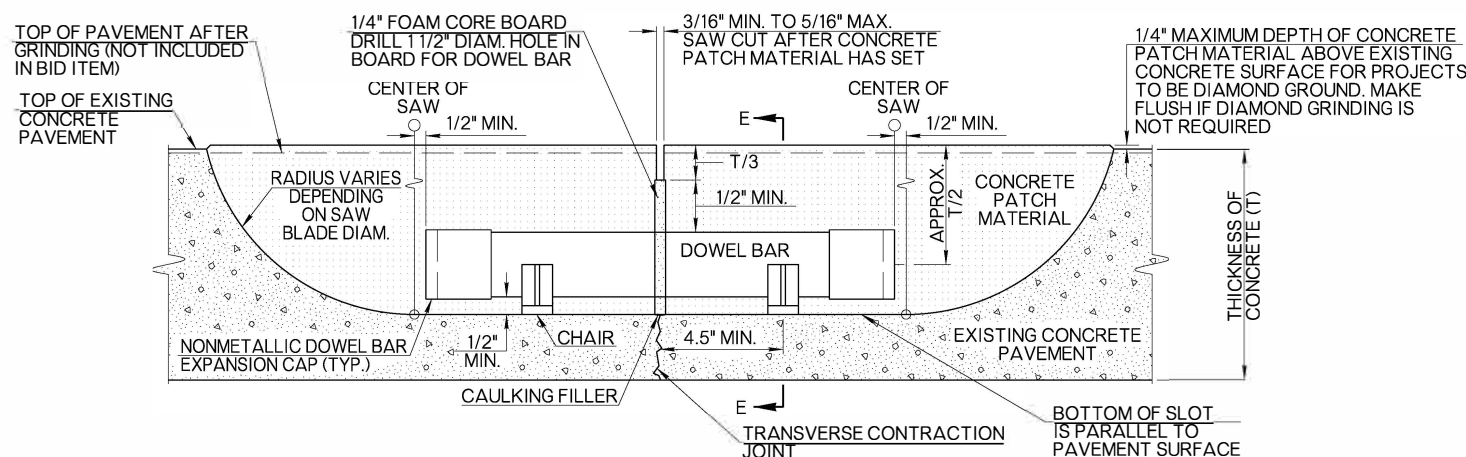
- GENERAL NOTES
1. CROWN OF PATCH TO MATCH CROWN OF EXISTING PAVEMENT.
 2. EDGES OF PAVEMENT SLAB, OPEN JOINTS AND CONSTRUCTION JOINTS SHALL BE EDGED WITH AN EDGER HAVING A 1/2" RADIUS. JOINT ALONG A BROKEN EDGE OF THE EXISTING PAVEMENT SHALL NOT BE EDGED.
 3. CONCRETE FOR PATCHES SHALL BE HIGH-EARLY-STRENGTH 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.

APPROVED BY
ROADWAY ENGINEER:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

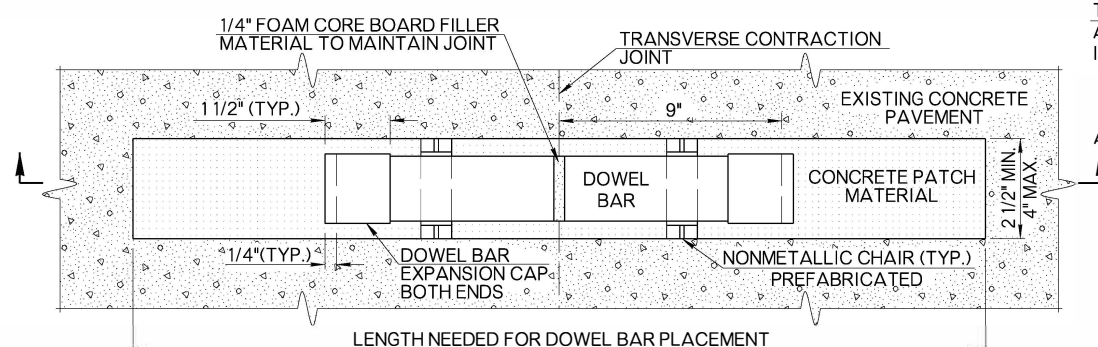


★ DOWEL BAR SETS (FOUR BARS AT 12"CTRS.) SHALL BE USED AS SHOWN FOR ALL CONTRACTION JOINTS. IF PATCH EXTENDS IN BOTH DIRECTIONS, FROM A CONTRACTION JOINT, THEN APPROVED LOAD TRANSFER DEVICES MEETING THE REQUIREMENTS OF SECTION 414.04, AND AS SHOWN ON ROADWAY STANDARD LTU-5 SHALL BE USED IN LIEU OF DOWEL 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.

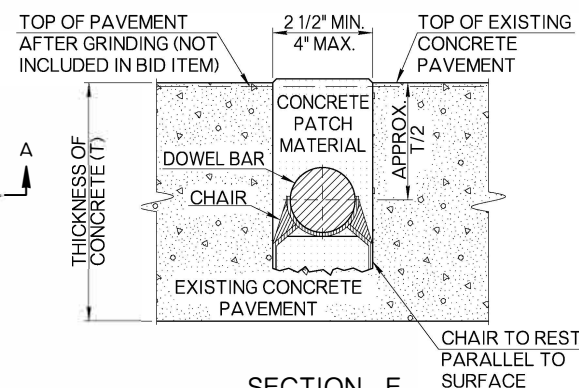
FULL DEPTH PATCHING DETAIL



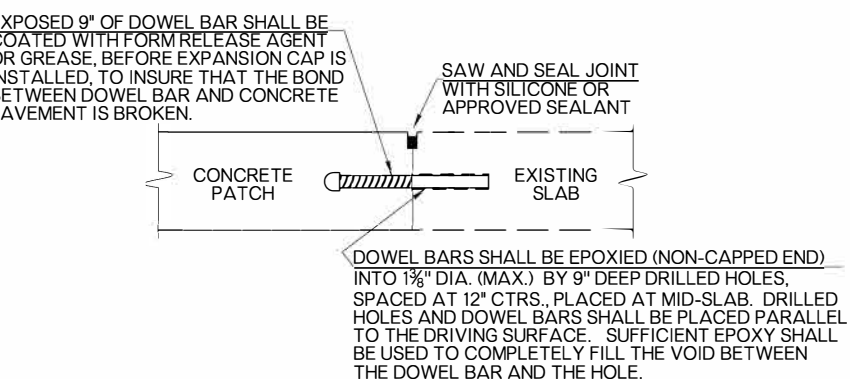
SECTION - A
DOWEL BAR RETROFIT PLACEMENT DETAIL



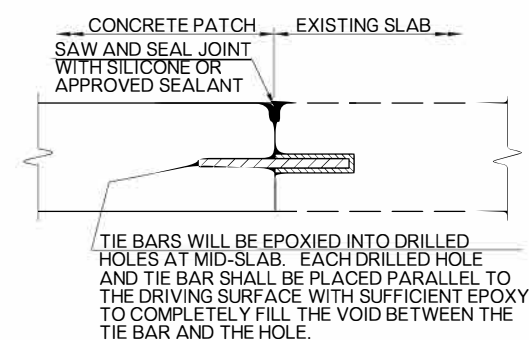
PLAN VIEW
DOWEL BAR RETROFIT INSTALLATION



SECTION - E

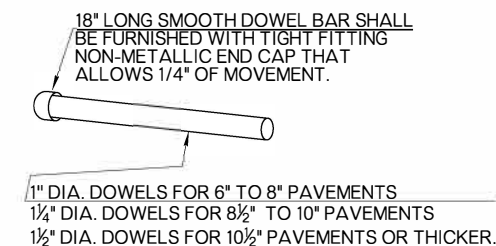


DETAIL OF DOWEL BAR AT CONSTRUCTION JOINT



DETAIL OF TIE BAR JOINT

NOTE
LONGITUDINAL JOINT - TIE BARS - NO. 5 DEFORMED REINFORCING STEEL BARS, 2'-6" LONG, SHALL BE EPOXIED INTO 3/4" DIA. (MAX.) DRILLED HOLES AT 3'-0" CTRS. TIED LONGITUDINALLY. JOINT SHALL BE SAWED AND SEALED.
TRANSVERSE JOINT - TIE BARS - NO. 10 DEFORMED REINFORCING STEEL BARS, 1'-6" LONG, SHALL BE EPOXIED INTO 1 3/8" DIA. (MAX.) DRILLED HOLES AT 18" CTRS. FULL WIDTH, TRANSVERSE, TIED JOINTS SHALL NOT BE SAWED OR SEALED.



DETAIL OF DOWEL BAR WITH CAP

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.

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

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.

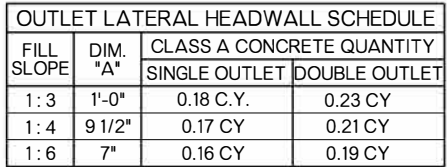
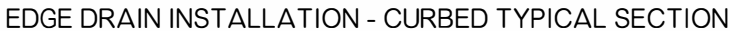
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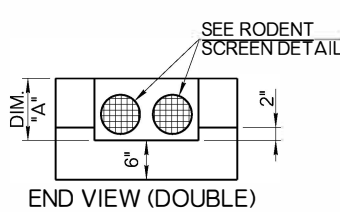
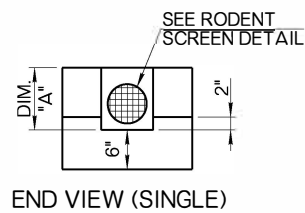
PORTLAND CEMENT CONCRETE PAVEMENT REPAIR

2019 SPECIFICATIONS

PCPR-4	2
	R-22



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

APPROVED BY
ROADWAY ENGINEER

ROADWAY DESIGN DIVISION STANDARD

DATE: 6/30/22

PAVEMENT EDGE DRAIN



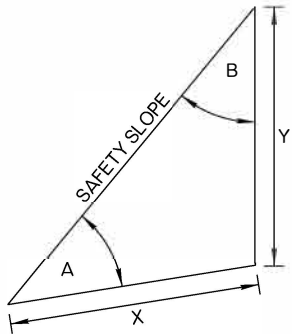
2019 SPECIFICATIONS

PED-4

1

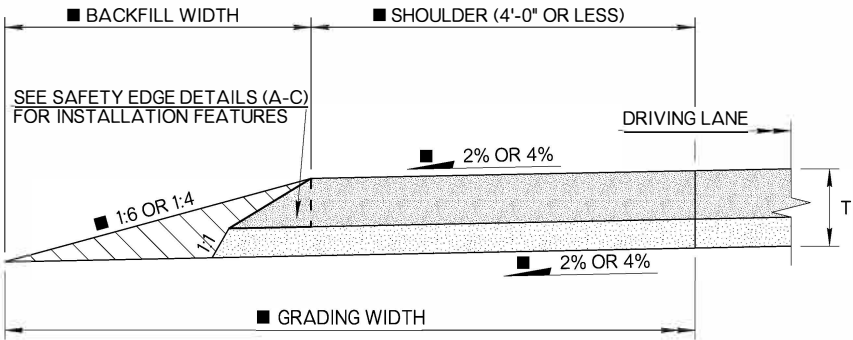
R-23

X - ASPHALT PAVEMENT SAFETY EDGE WIDTH			
Y	X (2% SLOPE)		X (-4% SLOPE)
	2%	-2%	
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



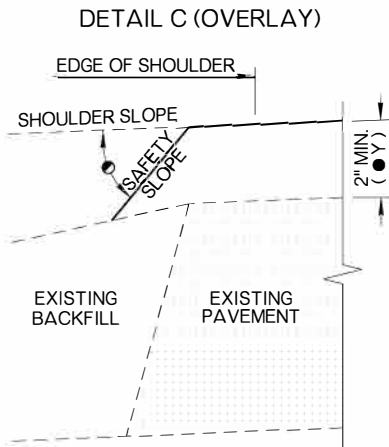
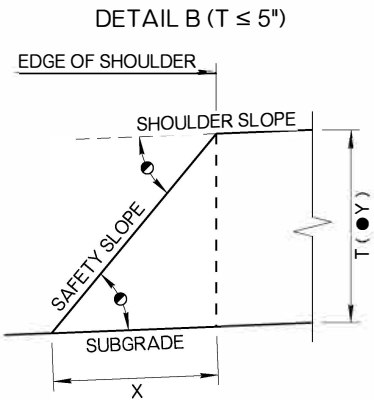
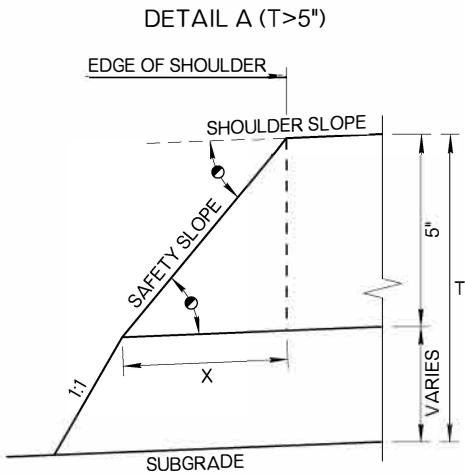
$$X = \frac{Y \times \sin(B)}{\sin(A)}$$

CALCULATE X USING
30° FOR ANGLE A.



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

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- SAFETY EDGE SHALL BE CONSTRUCTED IN UNION WITH THE ASPHALT CONCRETE PAVEMENT.
- THE SAFETY EDGE, AS SHOWN, CAN BE APPLIED TO NEW CONSTRUCTION AND TO OVERLAYS OF AT LEAST 2".
- INSTALLATION OF SAFETY EDGE IS NOT REQUIRED IN CURB AND GUTTER AREAS.
- 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.
- 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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ROADWAY DESIGN DIVISION STANDARD



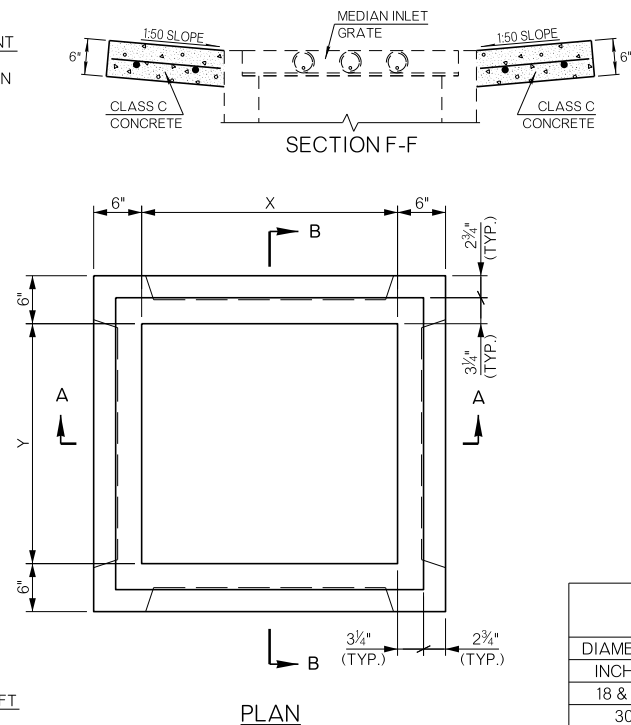
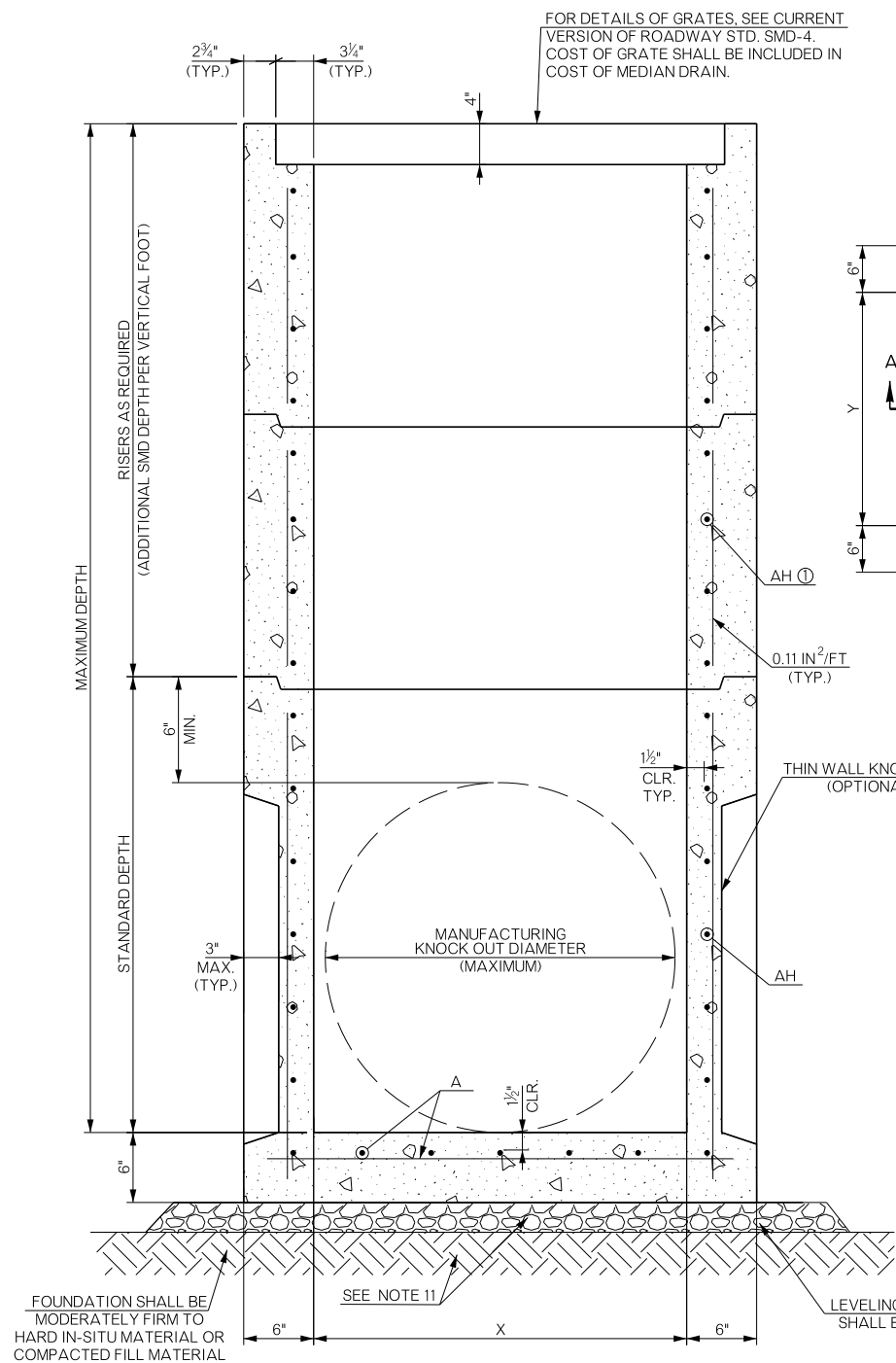
PAVEMENT SAFETY EDGE

2019 SPECIFICATIONS

PSE-2

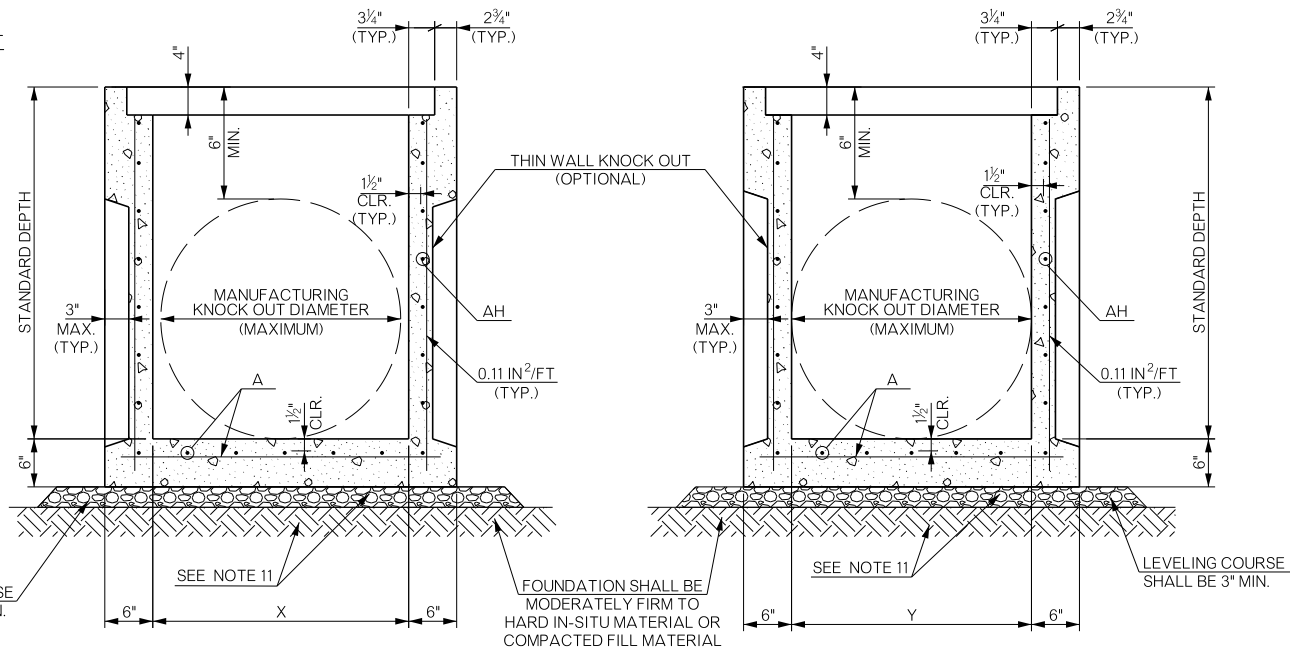
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R-24



APRON REINFORCING STEEL LOCATION & LENGTHS (#4 BARS - EQUALLY SPACED @ 18" MAXIMUM) ①								APRON REINF. STEEL °	APRON CLASS C CONCRETE °
DIAMETER INCHES	E - BARS (NO.) FT. - IN.	F - BARS (NO.) FT. - IN.	G - BARS (NO.) FT. - IN.	H - BARS (NO.) FT. - IN.	X FT. - IN.	Y FT. - IN.			
18 & 24	(4) 6 - 5	(4) 1 - 9	(4) 6 - 3	(4) 1 - 9	2 - 8	2 - 6	44	0.68	
30	(4) 7 - 5	(8) 1 - 9	(4) 7 - 5	(8) 1 - 9	3 - 8	3 - 8	59	0.84	

① MINIMUM 1½" COVER OVER STEEL ° QUANTITIES ARE FOR ONE APRON



SCHEDULE OF DIMENSIONS AND REINFORCING STEEL																			
PIPE DIAMETER	STANDARD DEPTH	TYPE OF INLET	TYPE OF GRATE	MANUFACTURING KNOCK OUT DIAMETER	X	Y	A BARS (IN²/FT)			AH BARS (IN²/FT) ①									
							DEPTH			DEPTH									
							≤5'	≤10'	≤15'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'
18" & 24"	3'-2"	TYPE 1 OR 2	TYPE 1 OR 2	2'-6"	2'-8"	2'-6"	0.17	0.21	0.26	0.12	0.12	0.12	0.13	0.14	0.15	0.17	0.18	0.20	0.21
30"	4'-3"	TYPE 2B	TYPE 1B OR 2B	3'-8"	3'-8"	3'-8"	0.20	0.27	0.34	0.19	0.22	0.25	0.28	0.31	0.35	0.38	0.41	0.45	0.48

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.

① SECTIONS WITHOUT A THIN WALL KNOCK OUT AND A MINIMUM THICKNESS OF 6 INCHES MAY USE AN AREA OF REINFORCING STEEL EQUAL TO 0.13 IN²/FT

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.
- STANDARD DEPTH IS AS SHOWN. COST OF ALL MATERIALS FOR ADDITIONAL DEPTH SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET. INLET ADDITIONAL DEPTH DATA SHALL BE NOTED ON THE PLANS.
- THERE SHALL BE A MINIMUM VERTICAL DISTANCE OF 6 INCHES BETWEEN OPENINGS AND THE TOP 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 ½ 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 STEEL EQUAL TO 0.11 IN²/FT EACH WAY.
- DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON BOTH SHOULDERS. MINIMUM SPIGOT DEPTH IS ¾ INCHES.
- 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 SECTION OR ½ THE JOINT DEPTH, WHICHEVER IS GREATER. JOINT SEALING SHALL BE INCLUDED IN COST OF STRUCTURE.
- 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 COURSES SHALL BE INCLUDED IN THE PRICE BID OF THE STRUCTURE.
- THIN WALL KNOCKOUTS MAY BE CAST AT THE MANUFACTURER'S DISCRETION.
- REFER TO PROJECT PLAN SHEETS FOR NUMBER, LOCATION, AND SIZE OF PIPE.
- FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCH CENTER TO CENTER.
- COST OF APRON MATERIALS (INCLUDING REINFORCING STEEL), LABOR, AND INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR PRECAST SMD INLET. FOR DETAILS OF APRON SEE ROADWAY STANDARD SMD-4.
- FOR GRATE DIMENSIONS AND OTHER DETAILS, REFER TO ROADWAY STANDARD SMD-4.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET (SMD - TYPE 1)	EA.
611(G)	PRECAST INLET (SMD - TYPE 2)	EA.
611(G)	PRECAST INLET (SMD - TYPE 2B)	EA.

NOTE: COST OF INLET GRATE SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET. COST OF ALL CLASS A CONCRETE AND REINFORCING STEEL NEEDED FOR ADDITIONAL DEPTH SHALL BE INCLUDED IN THE PRICE BID FOR THE PRECAST SMD INLET. SMD INLET ADDITIONAL DEPTH DATA SHALL BE NOTED IN THE PLANS.

APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 4/3/2025

ROADWAY DESIGN DIVISION STANDARD

PRECAST STANDARD MEDIAN DRAIN

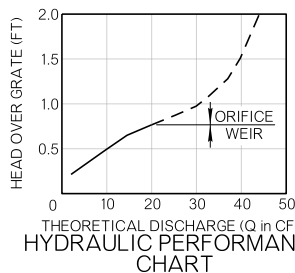


2019 SPECIFICATIONS

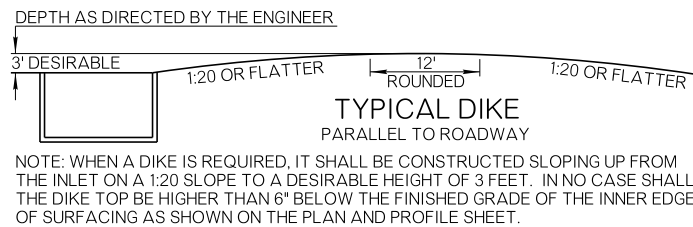
PSMD-2

3

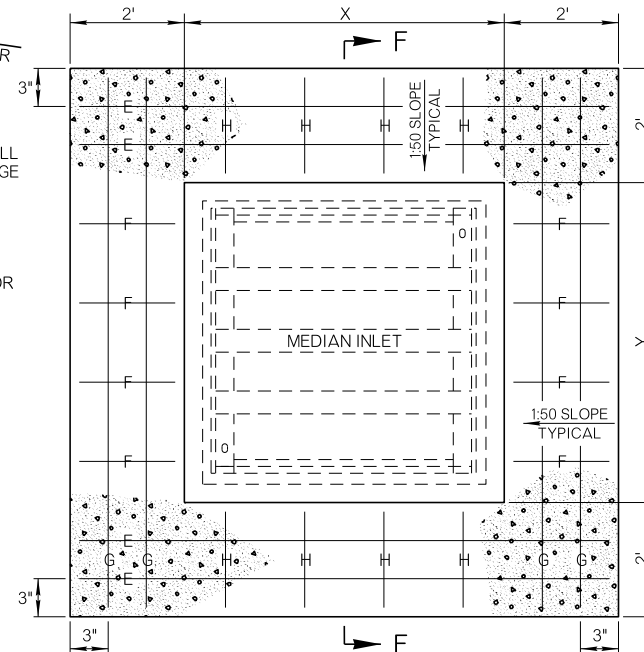
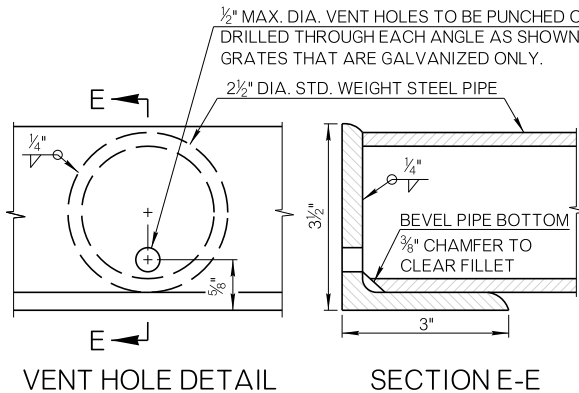
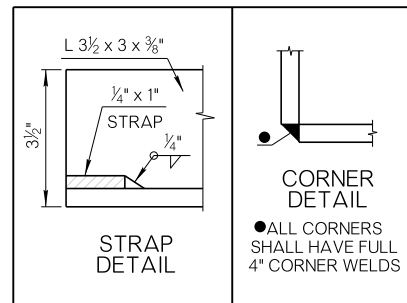
R-25



NOTE: TO ALLOW FOR CLOGGING 60% THEORETICAL DISCHARGE IS THE RECOMMENDED FACTOR TO USE IN AREAS SUBJECT TO FLOODING.



NOTE: WHEN A DIKE IS REQUIRED, IT SHALL BE CONSTRUCTED SLOPING UP FROM THE INLET ON A 1:20 SLOPE TO A DESIRABLE HEIGHT OF 3 FEET. IN NO CASE SHALL THE DIKE TOP BE HIGHER THAN 6" BELOW THE FINISHED GRADE OF THE INNER EDGE OF SURFACING AS SHOWN ON THE PLAN AND PROFILE SHEET.

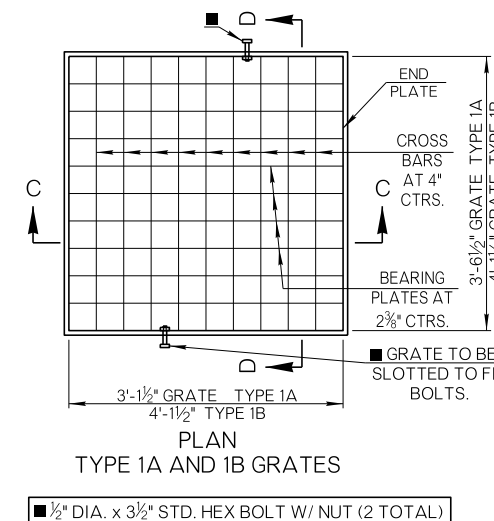
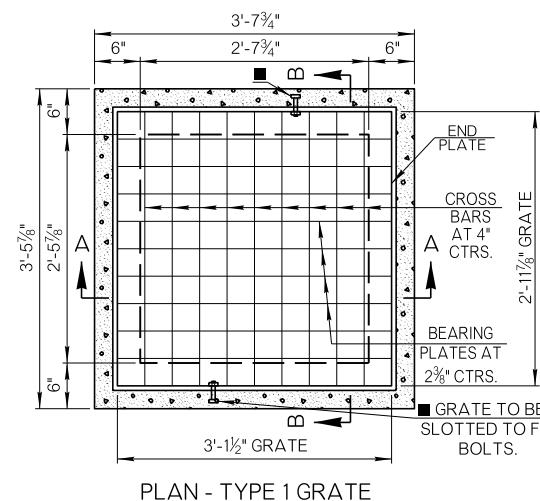
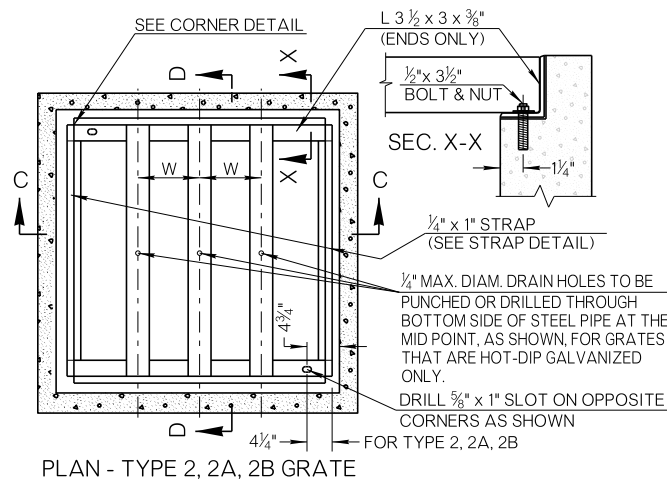
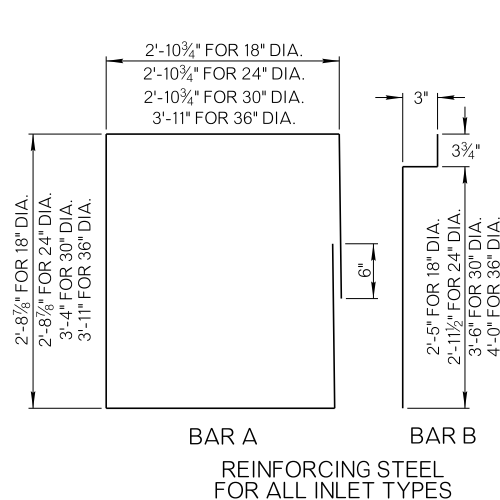


APRON REINFORCING STEEL LOCATION & LENGTHS (#4 BARS - EQUALLY SPACED @ 18" MAXIMUM)*							APRON REINF. STEEL °	APRON CLASS C CONCRETE °
DIAMETER	E - BARS	F - BARS	G - BARS	H - BARS	X	Y		
IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	(NO.) FT. - IN.	FT. - IN.	FT. - IN.	LB.	C.Y.
18 & 24	(4) 7 - 2 1/2	(8) 1 - 9	(4) 7 - 4 3/4	(8) 1 - 9	3 - 7 3/4	3 - 5 1/2	57	0.83
30	(4) 7 - 10	(8) 1 - 9	(4) 7 - 4 3/4	(8) 1 - 9	3 - 7 3/4	4 - 1	59	0.87
36	(4) 8 - 5	(9) 1 - 9	(4) 8 - 5	(9) 1 - 9	4 - 8	4 - 8	66	0.99

*MINIMUM 1 1/2" COVER OVER STEEL °QUANTITIES ARE FOR ONE APRON

COMPONENT	TYPE 1 GRATE		TYPE 1A GRATE		TYPE 1B GRATE	
	DIMENSIONS	NO.	DIMENSIONS	NO.	DIMENSIONS	NO.
CROSS BARS	3/8" DIA. x 2'-11 1/8"	10	3/8" DIA. x 3'-6 1/2"	10	3/8" DIA. x 4'-1 1/2"	14
END PLATES	3 1/2" x 1/2" x 2'-11 1/8"	2	3 1/2" x 1/2" x 3'-6 1/2"	2	3 1/2" x 1/2" x 4'-1 1/2"	2
BEARING PLATES	4" x 1/4" x 3'-1"	16	4" x 1/4" x 3'-1"	19	4" x 1/4" x 4'-1"	22

SMD INLET BAR LIST					
BAR	SIZE	NO.	SHAPE	LENGTH	SPACE
TYPE 1 - 18" OR 24" RCP OR CGSP					
A	#4	5	BENT	11'-10"	6" C/C
B	#4	15	BENT	2'-11 3/4"	9" C/C
C	#5	7	STR.	3'-1 1/2"	6" C/C
D	#5	6	STR.	3'-3 3/4"	6" C/C
TYPE 2 - 18" OR 24" RCP OR CGSP					
A	#4	6	BENT	11'-10"	6" C/C
B	#4	16	BENT	3'-6 1/2"	9" C/C
C	#5	7	STR.	3'-1 1/2"	6" C/C
D	#5	6	STR.	3'-3 3/4"	6" C/C
TYPE 2A - 18", 24" OR 30" RCP OR CGSP					
A	#4	7	BENT	12'-11 1/2"	6" C/C
B	#4	18	BENT	4'-1"	9" C/C
C	#5	7	STR.	3'-3 3/4"	6" C/C
D	#5	7	STR.	3'-7"	6" C/C
TYPE 2B - 18", 24", 30" OR 36" RCP OR CGSP					
A	#4	8	BENT	16'-2"	6" C/C
B	#4	20	BENT	4'-7"	9" C/C
C	#5	7	STR.	4'-4"	6" C/C
D	#5	8	STR.	4'-4"	6" C/C
GRATES - OVERALL DIMENSIONS					
TYPE 1 GRATE: 3'-1 1/2" x 2'-11 1/8"					
TYPE 2 GRATE: 3'-1 1/2" x 2'-11 1/8"					
TYPE 1A, 2A GRATE: 3'-1 1/2" x 3'-6 1/2"					
TYPE 1B, 2B GRATE: 4'-1 1/2" x 4'-1 1/2"					
W = 8 1/4" FOR TYPE 2					
W = 9" FOR TYPE 2A & 2B					
PIPE GRATE MATERIAL					
2 1/2" I.D. STD. WEIGHT STEEL PIPE					



ESTIMATED SMD QUANTITIES						ADD'L SMD DEPTH PER VERT. FT.
DESIGNATED PIPE SIZE IN INLET	TYPE OF GRATE	1 PIPE CLASS A CONC.	2 PIPES CLASS A CONC.	REINF. STEEL	CLASS A CONC.	
18" RCP	1 OR 2	0.75	0.67	115	0.23	27
24" RCP	1 OR 2	0.85	0.76	129	0.23	27
30" RCP	1A OR 2A	1.06	0.96	160	0.25	29
36" RCP	1B OR 2B	1.52	1.38	211	0.31	35

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- VENT HOLES AND DRAIN HOLES FOR HOT DIP GALVANIZATION SHALL BE DRILLED OR PUNCHED IN GRATE AS SHOWN.
- BICYCLE AND PEDESTRIAN SAFE GRATES, SIMILAR TO TYPE 1 GRATES, MAY BE USED, PROVIDED THEY MEET THE MINIMUM EQUIVALENT HYDRAULIC STRUCTURAL REQUIREMENTS AND PROPOSED DESIGNS ARE APPROVED BY THE ENGINEER. SUBSTITUTED GRATES SHALL BE INCLUDED IN THE PRICE BID FOR THE RESPECTIVE INLET.
- EXPOSED ROUNDED EDGING, ALL EXPOSED SURFACES SHALL BE FINISHED IN ACCORDANCE WITH SECTION 509.
- COST OF APRON MATERIALS (INCLUDING REINFORCING STEEL), LABOR, AND INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR SMD INLET.
- AS SHOWN ON THIS STANDARD, INLET CONCRETE DRAWINGS AND INLET REINFORCING STEEL DESIGN ARE BASED ON CAST-IN-PLACE MANUFACTURING. PRECAST CONCRETE MANUFACTURING DESIGN AND DRAWINGS ARE ON ROADWAY STANDARD PSMD-2.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (G)	INLET (SMD-TYPE 1)	EA
611 (G)	INLET (SMD-TYPE 2)	EA
611 (G)	INLET (SMD-TYPE 2A)	EA
611 (G)	INLET (SMD-TYPE 2B)	EA

NOTE: COST OF INLET GRATE SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET. COST OF ALL CLASS A CONCRETE AND REINFORCING STEEL NECESSARY FOR ADDITIONAL DEPTH SHALL BE INCLUDED IN THE PRICE BID FOR THE SMD INLET. SMD INLET ADDITIONAL DEPTH DATA SHALL BE NOTED ON THE PLANS.

APPROVED BY ROADWAY ENGINEER: DATE: 4/3/2025
ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE STANDARD MEDIAN DRAINS
(18" TO 36" PIPES)



2019 SPECIFICATIONS

SMD-4

3

R-26

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"		2	48"	1	8'-0"
				28" x 20"	2	48"	NONE	
		36" x 22"	22" x 34"		3	54"	1	8'-9"
				35" x 24"	3	54"	1	9'-4"
			24" x 38"		3	57"	1	9'-4"
C3	30"				3	50"	NONE	
		43" x 26"			3	64"	1	9'-10"
				42" x 29"	3	64"	1	10'-8"
			29" x 45"		3	64"	1	10'-8"
		51" x 31"			4	70"	1	11'-2"
				49" x 33"	4	70"	1	11'-8"
D3			34" x 53"		4	72"	1	12'-0"
	36"				4	54"	1	12'-6"
	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"

C.E.T. TYPE	LENGTH A	WIDTH B (R)	WIDTH B (A/E)	LENGTH C	HEIGHT H	HEIGHT K	CONC CY (R)	CONC. CY (A/E)	STEEL LENGTH			
									H-BARS (R)	H-BARS (A/E)	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"

5/8" x 1" SLOT

5/8" DIA.

3"

3"

VARIABLE

6"

7"

3"

10" (MIN.)

6" (MIN.)

1 1/2"

CROSS DRAINS

SIDE DRAINS

ANCHOR END DETAIL
PIPE GRATE MEMBERS

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 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.
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 SHALL BE INCLUDED IN THE PRICE BID FOR 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 MEMBER:
 - (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 1/2" 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.
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.

The diagram illustrates a rectangular manhole frame and cover assembly. Key components and dimensions are labeled as follows:

- Dimensions:**
 - Overall width: 24" (MIN.)
 - Overall height: 24" (MIN.)
 - Span: Indicated by a horizontal arrow on the left.
 - Vertical spacing: 2 1/2" is shown at the top and bottom edges.
- Components:**
 - PIPE GRATE GUIDES:** Vertical guides supporting the pipe grates.
 - PIPE GRATES:** The central oval-shaped grates.
 - S-BAR:** Horizontal bars located near the top and bottom edges.
 - H-BARS:** Horizontal bars located on the left and right sides.
 - Z-BAR:** Vertical bars located near the corners.
- Orientation:**
 - A:** Arrow pointing to the right, indicating the horizontal axis.
 - B:** Arrow pointing upwards, indicating the vertical axis.

A schematic diagram of a variable span pipe grate assembly. It shows a horizontal pipe grate labeled "PIPE GRATE L (SD)" supported by two vertical "PIPE GRATE GUIDE"s. The distance between the guides is labeled "SPAN". The distance from the left guide to the left end of the grate is labeled "4\"", and the distance from the right guide to the right end is labeled "3\"". Both end distances are also labeled "VARIABLE". The grate is shown with a cross-hatched pattern, and the guides are shown with a diagonal hatched pattern.

NOTE: STEEL NOT SHOWN IN THIS VIEW.

PIPE GRATE GUIDE

PIPE GRATE BOLT

VARIABLE OVERALL PIPE LENGTH - FOR CROSS DRAIN
SEE PIPE GRATE SCHEDULE (TABLE A) - L (CD)

SECTION C - C

INSTALLATION DETAIL
CROSS DRAIN WITH PIPE GRATE

1'-6"

6" (MIN) SLOPE

1:3 SLOPE

PIPE SAFETY GRATE FOR CROSS DRAIN OPTION

H BARS

LENGTH

C

RISE

HEIGHT

HEIGHT

K

S BARS

1:3 SLOPE

10"

14"

PIPE GRATE BOLT

Z BAR

SEE CFT FOOTING DETAIL

S-BAR

H-BAR (TYP.)

Z-BAR

24"

12"

2"

3"

4"

2" (NOM.)

6"

4"

14"

2"

LIMITS OF PAYMENT FOR PIPE CULVERT

EXTRA-DEPTH TOE WALL
SEE GEN. NOTE 11

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

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

SECTION B - B

Diagram illustrating the cross-section of a sloped footing (Section B - B) showing reinforcement details and dimensions.

- The footing is shown on a **1:3 SLOPE**.
- Reinforcement includes **H-BARS[®]**, **S-BARS**, and **Z BAR**.
- Dimensions and labels include:
 - RISE** and **HEIGHT** (overall vertical dimension).
 - HEIGHT K** (vertical distance from footing base to top of reinforcement).
 - LENGTH A** (horizontal distance along the slope).
 - LENGTH C** (horizontal distance from footing face to centerline).
 - LIMITS OF PAYMENT FOR PIPE CULVERT** (indicated by dashed lines).
 - H-BARS (TYP.)** (typical horizontal bars).
 - SEE C.E.I. FOOTING DETAIL** (reference to another drawing).
- Other annotations include "VARIABLE LENGTH A", "30\" (MAX.)", "4\"", "12\"", "30\"", "1:3 SLOPE", and "Z BAR".

Diagram illustrating the END VIEW of a manhole structure. The structure is shown in cross-section, revealing the internal components and dimensions.

Dimensions:

- WIDTH B:** The total width of the structure.
- B / 2:** The width from the centerline to the side wall.
- HEIGHT H:** The total height of the structure.
- HEIGHT K:** The height from the base to the top of the structure.
- 2" (TYP.):** The thickness of the top and bottom plates.

Structural Components:

- H-BARS:** Horizontal reinforcement bars.
- S-BAR:** Side reinforcement bars.
- Z-BAR:** Vertical reinforcement bars.
- SPAN:** The horizontal distance between the side walls.
- RISE:** The vertical distance from the base to the top of the structure.

END VIEW
(PIPE GRATES NOT SHOWN THIS VIEW)

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

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



ROADWAY DESIGN DIVISION STANDARD

CULVERT END TREATMENT

SINGLE PIPE INSTALLATION

1 TO 3 SAFETY SLOPE

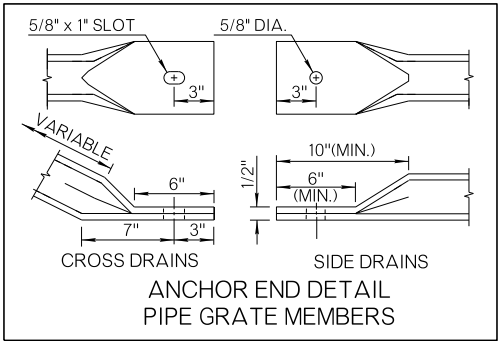
2019 SPECIFICATIONS

CET 3S-1	0
	R-2

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"	22" x 13"	14" x 23"	21" x 15"	2	36"		NONE
				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			24" x 38"		3	57"	1	12'-6"
	30"				5	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"
D4		51" x 31"			4	70"	1	15'-3"
				49" x 33"	4	70"	1	15'-9"
			34" x 53"		4	73"	1	15'-9"
	36"				4	54"	1	16'-6"
	42"				5	61"	1	18'-9"
E4		58" x 36"	38" x 60"	57" x 38"	5	78"	1	17'-3"
		65" x 40"			5	86"	2	18'-0"
				64" x 43"	5	84"	2	19'-0"
E4	48"		43" x 68"		6	68"	1	20'-9"
					5	90"	2	19'-0"
		73" x 45"		71" x 47"	6	92"	2	20'-6"
			48" x 76"		6	99"	2	20'-9"

TABLE B - SCHEDULE OF DIMENSIONS													
C.E.T. TYPE	LENGTH A	WIDTH B	WIDTH B	LENGTH C	HEIGHT H	HEIGHT K	CONC CY	CONC. CY	STEEL LENGTH				
		Ⓡ	Ⓐⓔ						Ⓡ	Ⓐⓔ	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"	

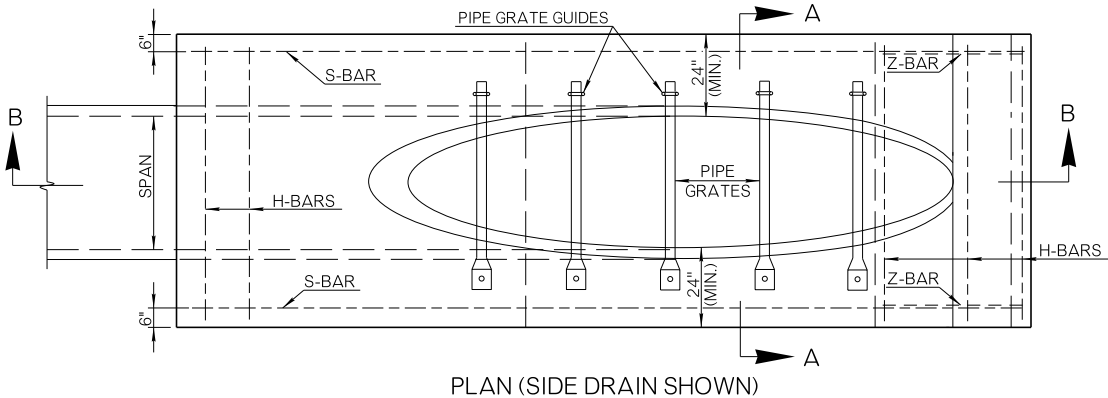
- Ⓡ ROUND SHAPE CULVERT OPTIONS
Ⓐ ARCH SHAPE CULVERT OPTIONS
ⓔ HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS



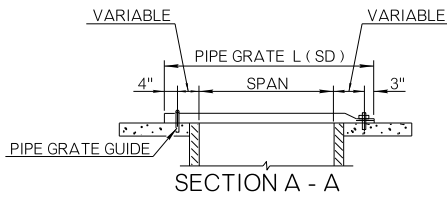
GENERAL NOTES

- 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 A4 THROUGH E4 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:
 - (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.
- 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.

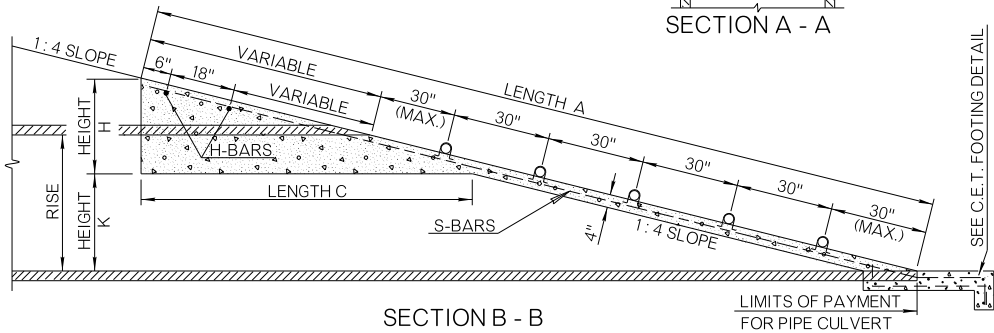
PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.



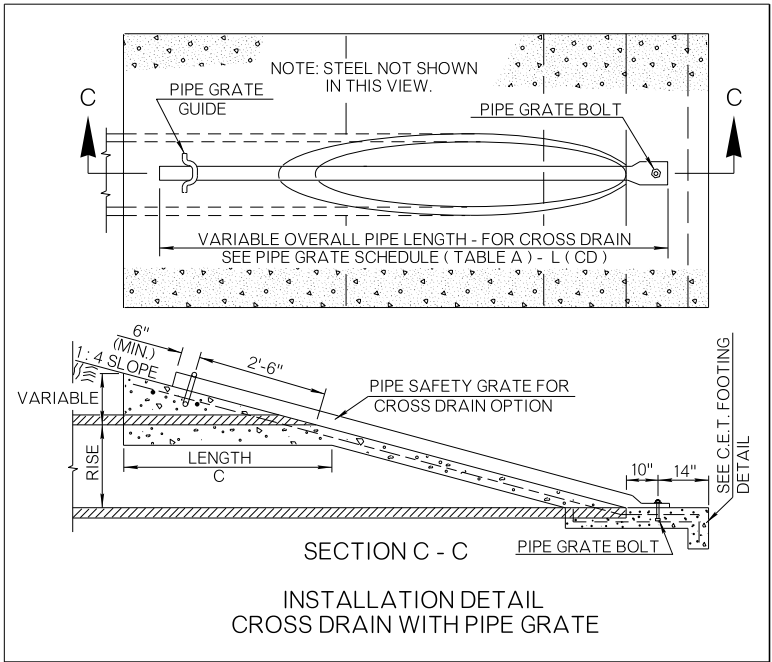
PLAN (SIDE DRAIN SHOWN)



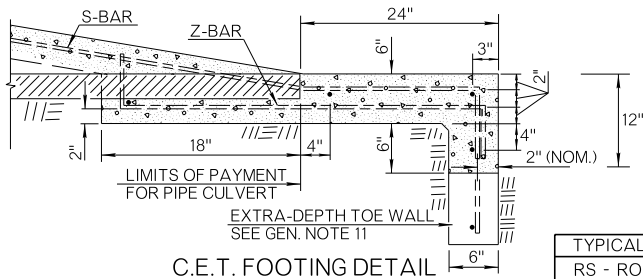
SECTION A - A



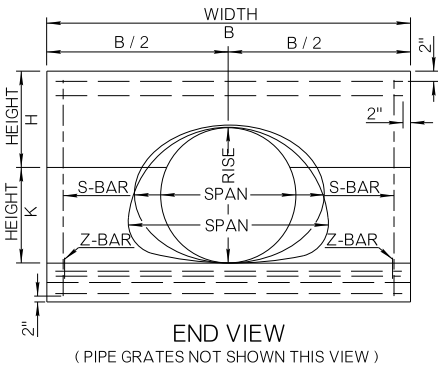
SECTION B - B



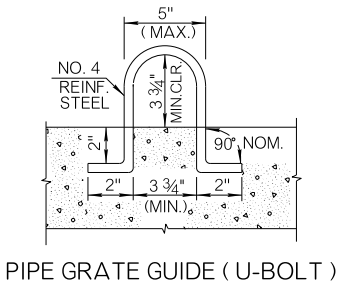
INSTALLATION DETAIL
CROSS DRAIN WITH PIPE GRATE



C.E.T. FOOTING DETAIL

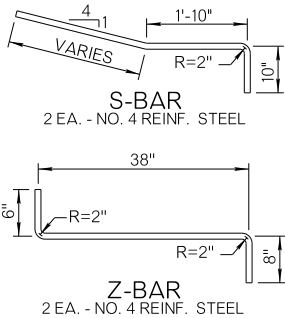


END VIEW
(PIPE GRATES NOT SHOWN THIS VIEW)



PIPE GRATE GUIDE (U-BOLT)

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



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

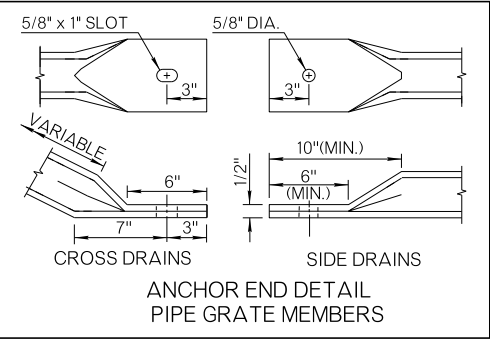
- SPECIFY TYPE OF END TREATMENT (EXAMPLE: TYPE B4 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES. (SEE TYPICAL ABBREVIATIONS)

TABLE A - SCHEDULE OF PIPE SAFETY GRATES								
C.E.T. TYPE	CULVERT TYPE				SIDE DRAIN		CROSS DRAIN	
	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"			21" x 15"	2	5'-7"	NONE	12"
		22" x 13"	14" x 23"	24" x 18"	2	6'-5"	NONE	12"
					2	6'-7"	NONE	12"
BB3	24"				2	6'-7"	NONE	12"
		28" x 18"	19" x 30"	28" x 20"	2	7'-7"	2	7'-0"
				35" x 24"	3	7'-3"	NONE	12"
		36" x 22"	22" x 34"		3	8'-7"	2	7'-10"
					3	8'-5"	2	8'-4"
CC3			24" x 38"		3	9'-2"	2	8'-4"
	30"				3	7'-10"	NONE	15"
		43" x 26"			3	10'-0"	2	8'-10"
				42" x 29"	3	9'-10"	2	9'-8"
			29" x 45"		3	10'-4"	2	9'-8"
		51" x 31"			4	11'-7"	2	10'-2"
DD3				49" x 33"	4	11'-3"	2	10'-8"
			34" x 53"		4	11'-11"	2	11'-0"
	36"				4	9'-1"	2	11'-6"
	42"				4	10'-4"	2	13'-1"
		58" x 36"	38" x 60"	57" x 38"	4	13'-0"	2	12'-0"
EE3				65" x 40"	4	14'-2"	4	12'-6"
				64" x 43"	4	14'-0"	4	13'-4"
	48"				5	11'-7"	2	14'-8"
			43" x 68"		4	14'-11"	4	13'-4"
		73" x 45"		71" x 47"	4	15'-9"	4	14'-5"
			48" x 76"		5	16'-5"	4	14'-8"

TABLE B - SCHEDULE OF DIMENSIONS													
C.E.T. TYPE	LENGTH A	WIDTH BB	WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	CONC. CY	CONC. CY	STEEL LENGTH				G DIMENSION
									CONC. CY	CONC. CY	H-BARS	H-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"	

(R) ROUND SHAPE CULVERT OPTIONS
(A) ARCH SHAPE CULVERT OPTIONS
(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A



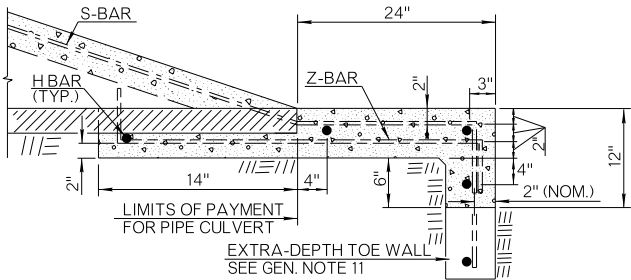
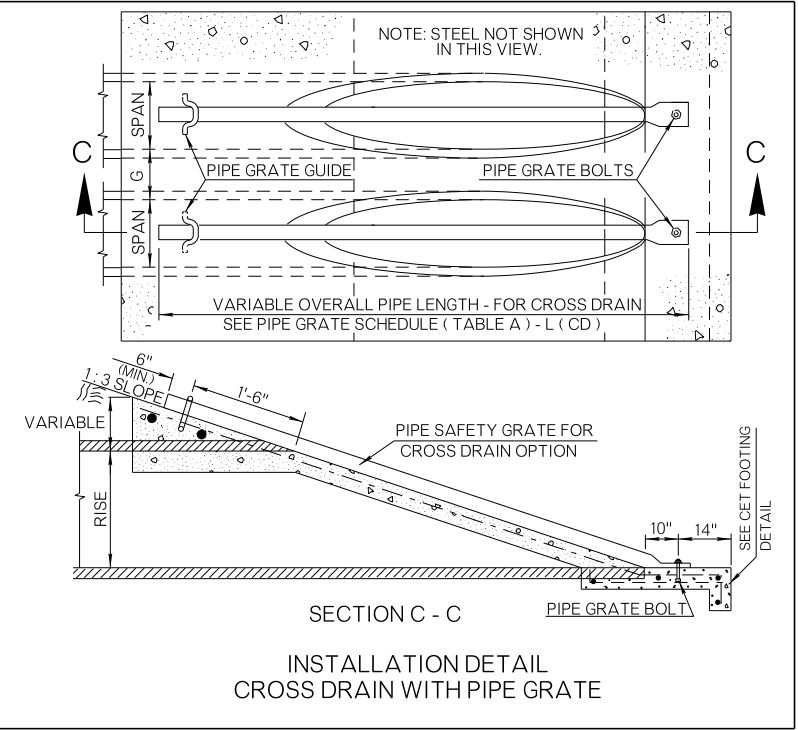
GENERAL NOTES

- 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 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.
- 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 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:
 - (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.
- 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.

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

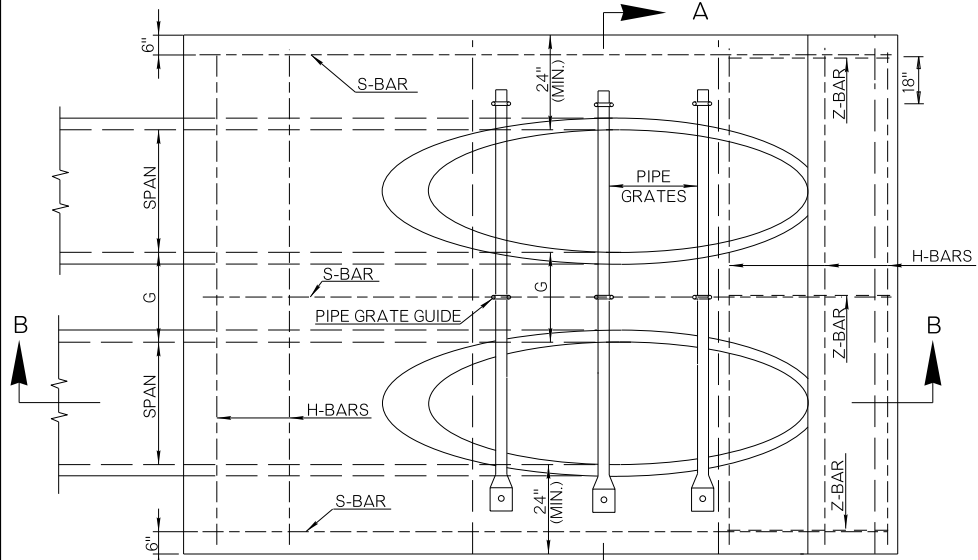
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (M)	CULVERT END TREATMENT	EA

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

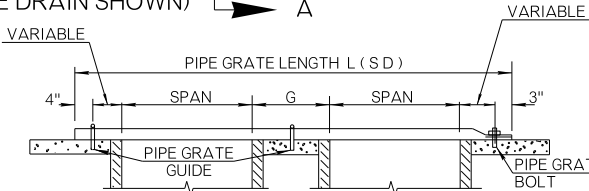


C.E.T. FOOTING DETAIL

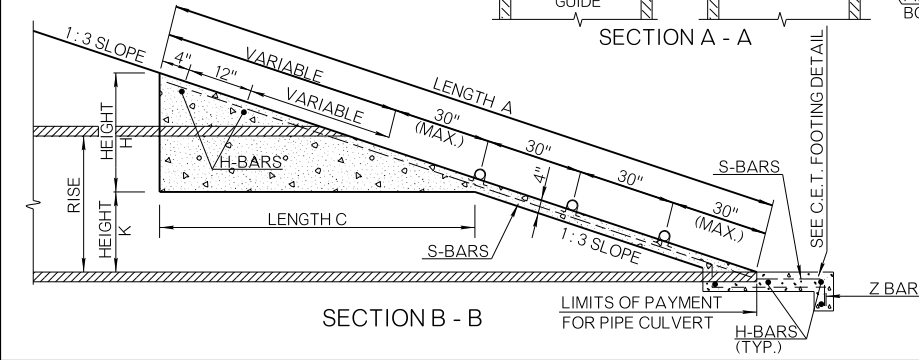
TYPICAL ABBREVIATIONS	
RS	ROUND SIDE DRAIN
RC	ROUND CROSS DRAIN
AS	ARCH SIDE DRAIN
AC	ARCH CROSS DRAIN
GR	GRADED
NG	NON-GRATED



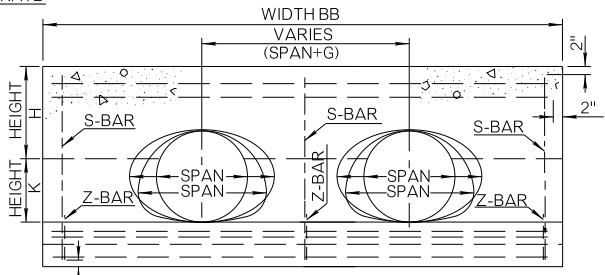
PLAN (SIDE DRAIN SHOWN)



SECTION A - A

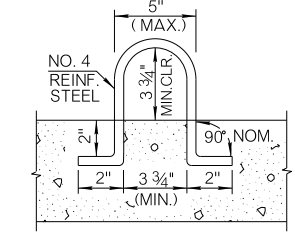


SECTION B - B

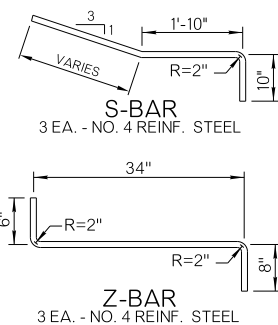



END VIEW

(PIPE GRATES NOT SHOWN THIS VIEW)



PIPE GRATE GUIDE (U-BOLT)



APPROVED BY
ROADWAY ENGINEER:  DATE: 4/3/2025

ROADWAY DESIGN DIVISION STANDARD

CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 3 SAFETY SLOPE

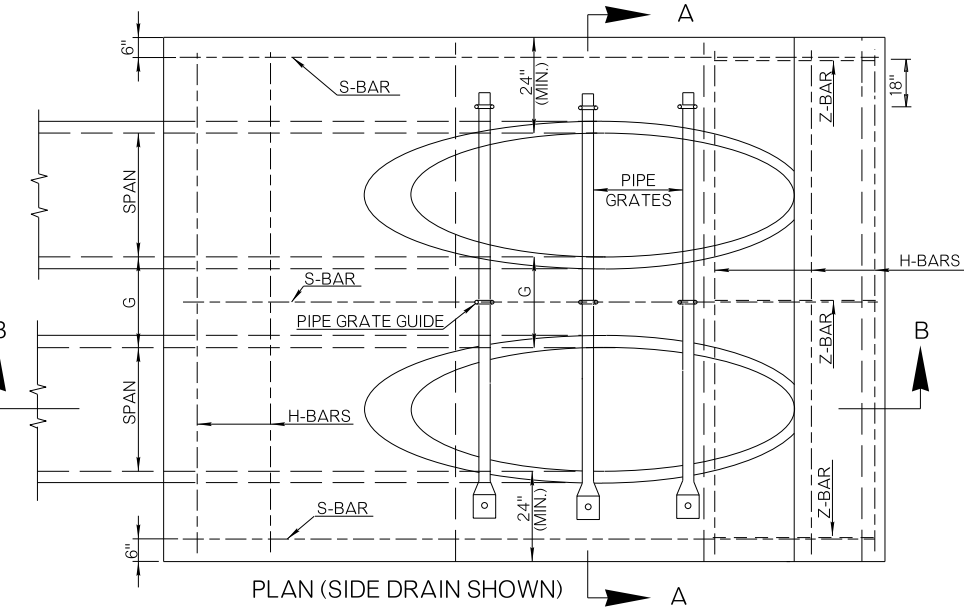
2019 SPECIFICATIONS

CET3D-1

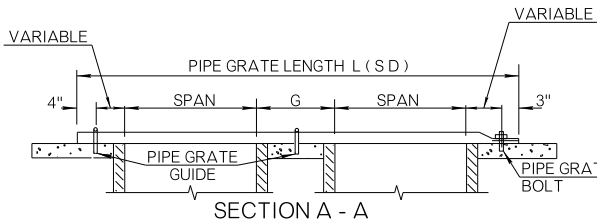
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R-31

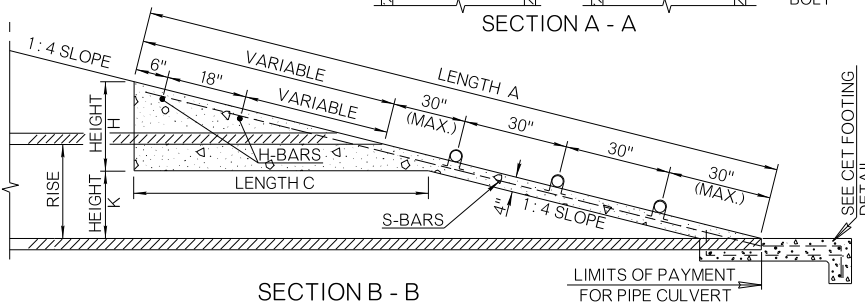
TABLE A - SCHEDULE OF PIPE SAFETY GRATES								
C.E.T. TYPE	CULVERT TYPE				SIDE DRAIN		CROSS DRAIN	G DIMENSION
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE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



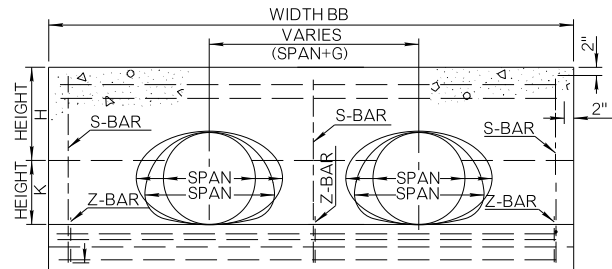
PLAN (SIDE DRAIN SHOWN)



SECTION A - A



SECTION B - B



END VIEW

(PIPE GRATES NOT SHOWN THIS VIEW)

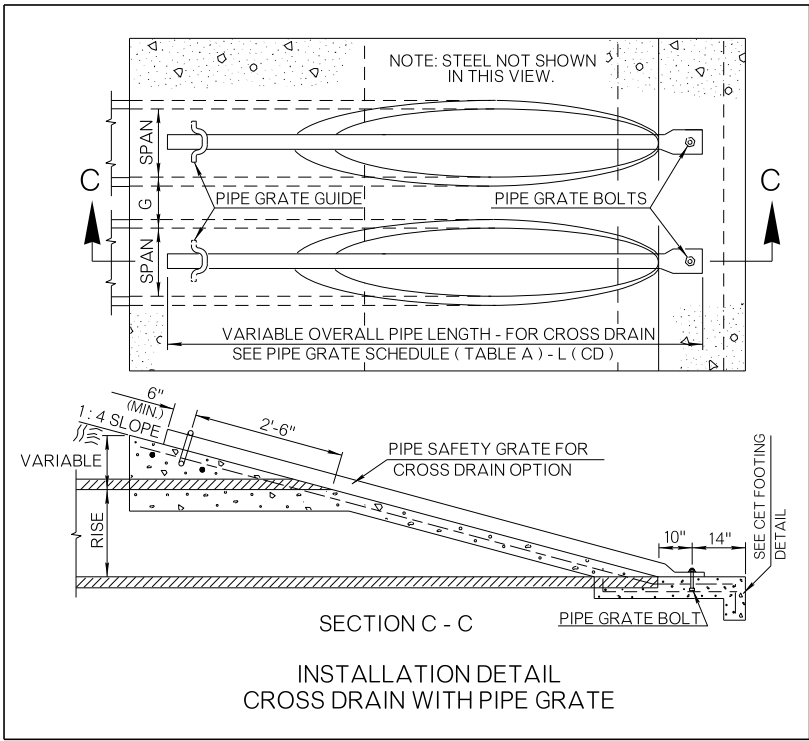
TABLE B - SCHEDULE OF DIMENSIONS												
C.E.T. TYPE	LENGTH A	WIDTH BB	WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	CONC. CY	CONC. CY	STEEL LENGTH			
									Ⓡ H-BARS	Ⓐⓔ H-BARS	S-BARS	Z-BARS
AA4	10'- 4"	8'-0"	9'-4"	5'- 8"	21"	9"	2.45	2.90	7'-8"	9'- 0"	12'- 4"	4'- 4"
BB4	12'- 4"	9'-0"	11'-0"	6'- 0"	22"	14"	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"

Ⓡ ROUND SHAPE CULVERT OPTIONS

Ⓐ ARCH SHAPE CULVERT OPTIONS

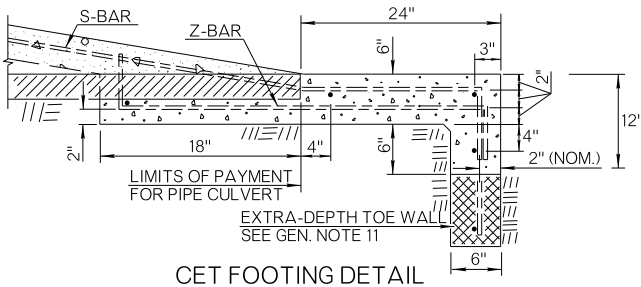
ⓔ HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A



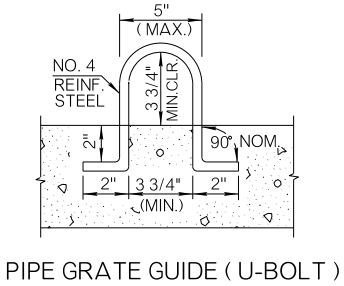
SECTION C - C

INSTALLATION DETAIL
CROSS DRAIN WITH PIPE GRATE

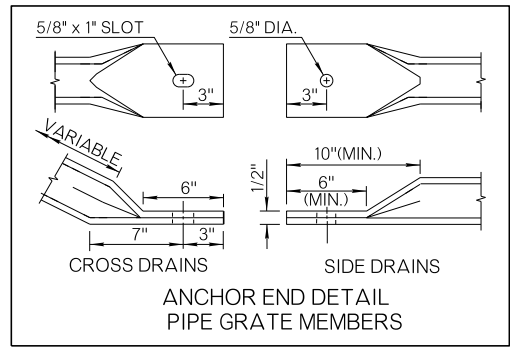
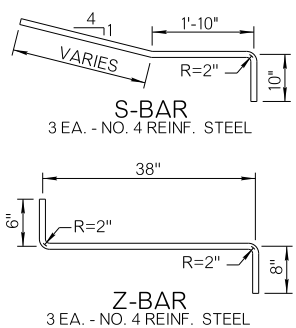


CET FOOTING DETAIL

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



PIPE GRATE GUIDE (U-BOLT)




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.


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:  DATE: 3/31/2025

ROADWAY DESIGN DIVISION STANDARD
CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 4 SAFETY SLOPE

 OKLAHOMA
Transportation

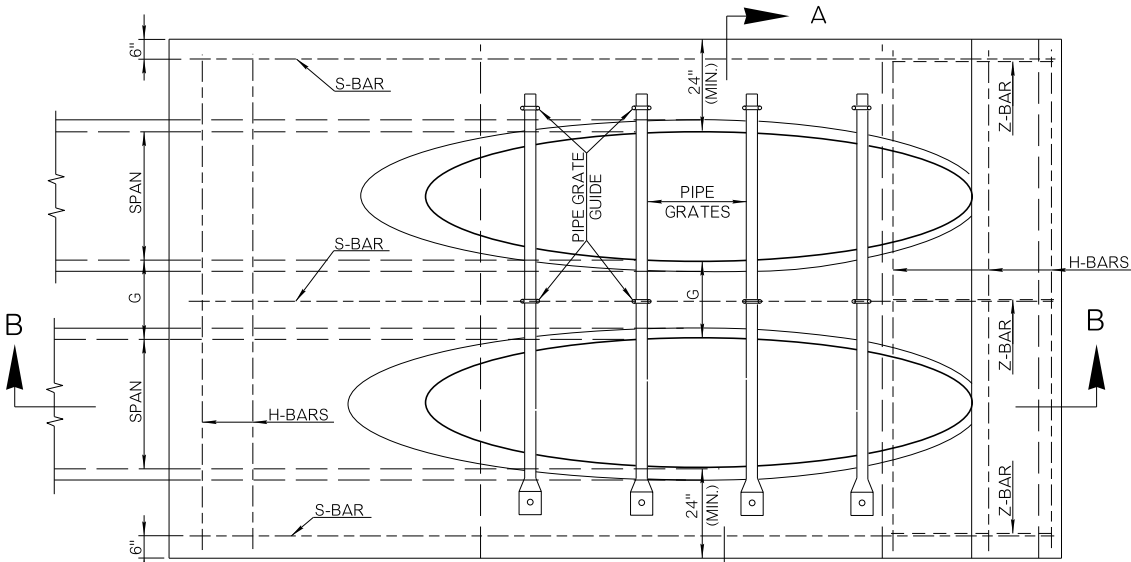
2019 SPECIFICATIONS

CET4D-4

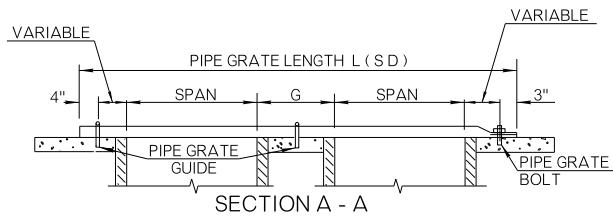
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R-32

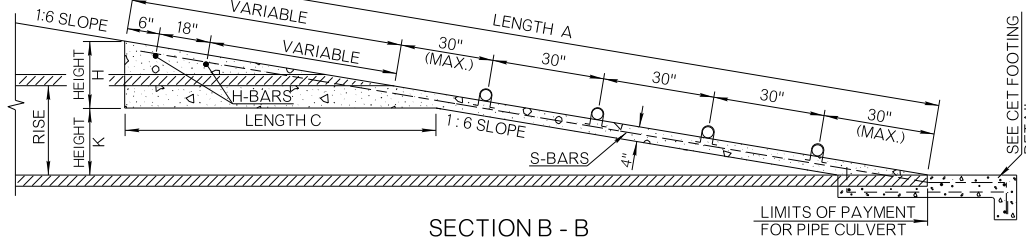
TABLE A - SCHEDULE OF PIPE SAFETY GRATES									
CET TYPE	CULVERT TYPE				SIDE DRAIN		CROSS DRAIN		G DIMENSION
	REINF. CONC., STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE	NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE 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"
BB6	24"				4	6'-8"		NONE	12"
		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"
CC6	30"		24" x 38"		4	9'-2"	2	18'-3"	15"
					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"
DD6	36"				6	11'-8"	2	21'-9"	18"
				49" x 33"	6	11'-3"	2	22'-8"	18"
			34" x 53"		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"
EE6					7	13'-4"	2	25'-6"	21"
					8	14'-2"	4	26'-6"	21"
				64" x 43"	8	14'-2"	4	28'-0"	21"
	48"		43" x 68"		9	11'-8"	2	30'-6"	24"
					8	15'-0"	4	28'-0"	24"
EE6		73" x 45"		71" x 47"	9	15'-9"	4	30'-0"	24"
			48" x 76"		9	16'-5"	4	30'-6"	26"



PLAN (SIDE DRAIN SHOWN)



SECTION A - A



SECTION B - B

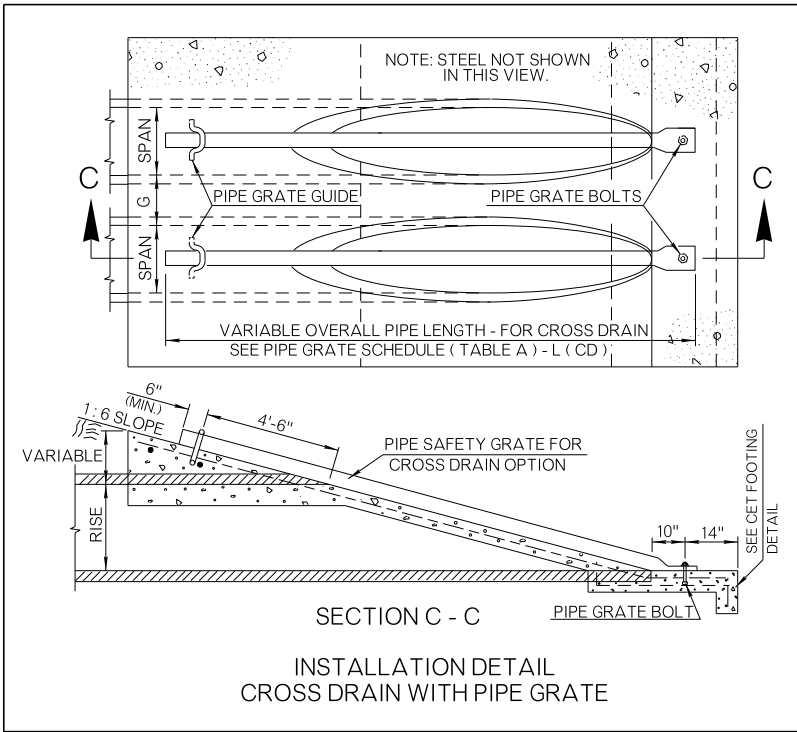
TABLE B - SCHEDULE OF DIMENSIONS													
C.E.T. TYPE	LENGTH A	WIDTH BB	WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	CONC. CY	CONC. CY	STEEL LENGTH				G
									CONC. CY	CONC. CY	H-BARS	H-BARS	
AA6	15'- 3"	8'-0"	9'-4"	8'- 6"	21"	9"	3.55	4.00	7'-8"	9'-0"	17'- 9"	4'- 10"	
BB6	18'- 3"	9'-0"	11'-0"	9'- 0"	22"	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

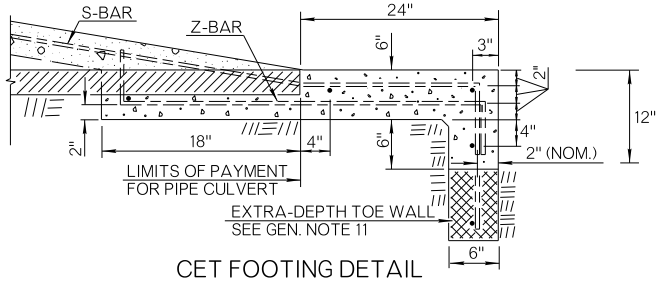
(A) ARCH SHAPE CULVERT OPTIONS

(E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS

NOTE: FOR G DIMENSION, SEE TABLE A



SECTION C - C
INSTALLATION DETAIL
CROSS DRAIN WITH PIPE GRATE



CET 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.

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: DATE: 3/31/2025

ROADWAY DESIGN DIVISION STANDARD

CULVERT END TREATMENT
DOUBLE PIPE INSTALLATION
1 TO 6 SAFETY SLOPE



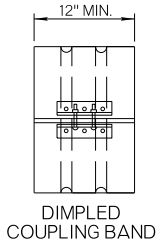
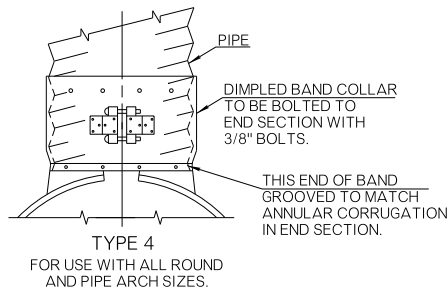
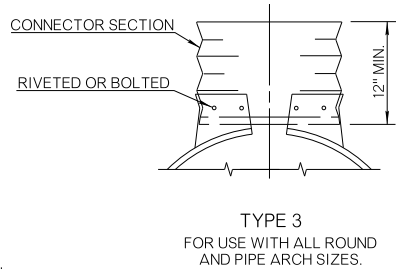
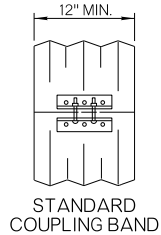
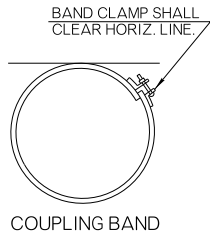
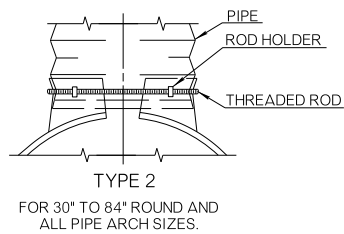
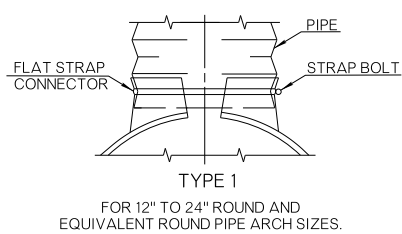
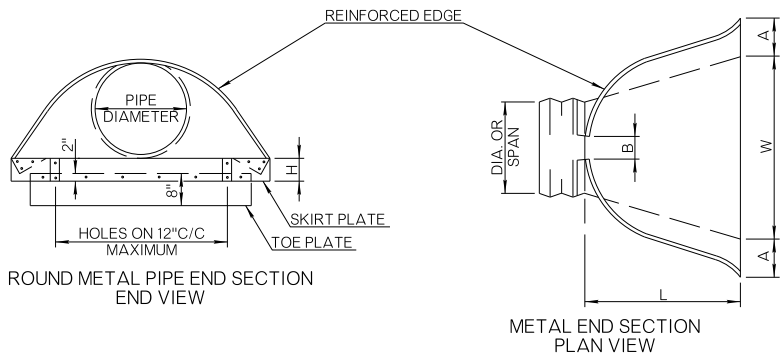
2019 SPECIFICATIONS

CET6D-4

3

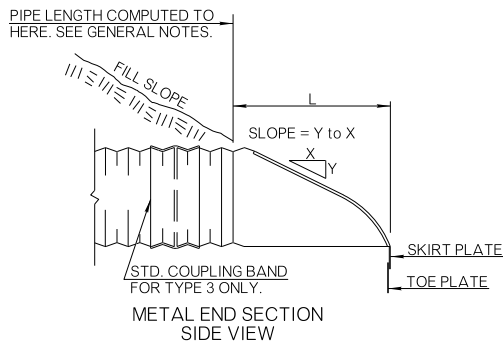
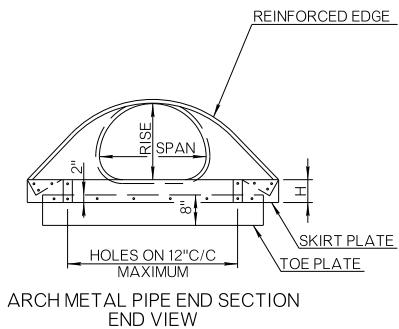
R-33

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	1 PC.		
15"	16	7"	8"	6"	26"	30"	1:2 1/2	1 PC.		
18"	16	8"	10"	6"	31"	36"	1:2 1/2	1 PC.		
21"	16	9"	12"	6"	36"	42"	1:2 1/2	1 PC.		
24"	16	10"	13"	6"	41"	48"	1:2 1/2	1 PC.		
30"	14	12"	16"	8"	51"	60"	1:2 1/2	2 PC.		
36"	14	14"	19"	9"	60"	72"	1:2 1/2	2 PC.		
42"	12	16"	22"	11"	69"	84"	1:2 1/2	2 PC.		
48"	12	18"	27"	12"	78"	90"	1:2 1/4	3 PC.		
54"	12	18"	30"	12"	84"	102"	1:2	3 PC.		
60"	12	18"	33"	12"	87"	114"	1:1 3/4	3 PC.		
66"	12	18"	36"	12"	87"	120"	1:1 1/2	3 PC.		
72"	12	18"	39"	12"	87"	126"	1:1 1/3	4 PC.		
78"	12	18"	42"	12"	87"	132"	1:1 1/4	4 PC.		
84"	12	18"	45"	12"	87"	138"	1:1 1/6	4 PC.		



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	1 PC.	
21" x 15"	18"	16	7"	11"	6"	23"	36"	1:2 1/2	1 PC.	
24" x 18"	21"	16	8"	12"	6"	28"	42"	1:2 1/2	1 PC.	
28" x 20"	24"	16	9"	16"	6"	32"	48"	1:2	1 PC.	
35" x 24"	30"	14	10"	16"	8"	39"	60"	1:1 7/8	2 PC.	
42" x 29"	36"	14	12"	18"	9"	46"	75"	1:1 3/4	2 PC.	
49" x 33"	42"	12	13"	21"	12"	53"	85"	1:1 7/8	2 PC.	
57" x 38"	48"	12	18"	26"	12"	63"	90"	1:1 7/8	3 PC.	
64" x 43"	54"	12	18"	30"	12"	70"	102"	1:1 7/8	3 PC.	
71" x 47"	60"	12	18"	33"	12"	77"	114"	1:1 7/8	3 PC.	
77" x 52"	66"	12	18"	36"	12"	77"	126"	1:1 5/8	4 PC.	
83" x 57"	72"	12	18"	39"	12"	77"	138"	1:1 1/2	4 PC.	

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

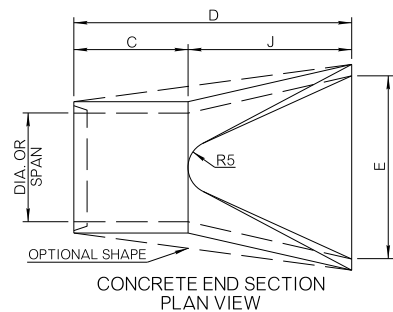
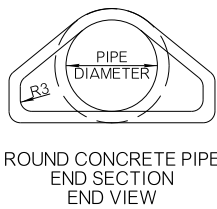


TYPICAL METAL END SECTION CONNECTIONS

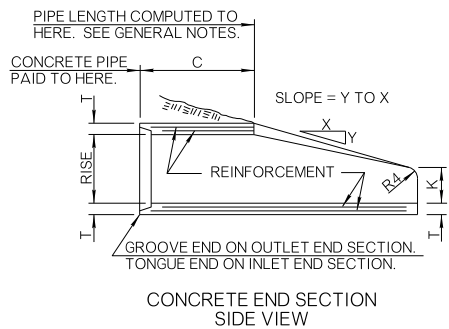
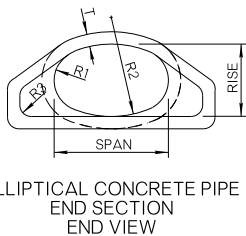
GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- CULVERT END SECTIONS SHALL BE OF THE SAME MATERIAL AND SHAPE (ROUND, ARCH, OR ELLIPTICAL) AS THE PIPE ON WHICH THEY ARE INSTALLED.
- DIMENSIONS SHOWN FOR END SECTIONS ARE SUBJECT TO MANUFACTURER TOLERANCES.
- 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".
- 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.
- 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	



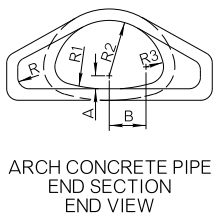
APPROX. EQUIV. DIAMETER	DIMENSIONS OF PRECAST END SECTIONS FOR ELLIPTICAL PIPE															SLOPE
	RISE	SPAN	R1	R2	R3	R4	R5	T	K	J	C	D	E			
18"	14"	23"	6"	20"	3"	3"	6"	2 3/4"	8"	2.25'	3.75'	6.00'	3.00'	1:3		
24"	19"	30"	8 1/4"	26 1/4"	3"	3"	7"	3 1/4"	8 1/2"	3.25'	2.75'	6.00'	4.00'	1:3		
30"	24"	38"	10 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 1/4"	39 1/4"	3"	3"	12"	4 1/2"	11 1/4"	5.00'	3.00'	8.00'	6.00'	1:3		
42"	34"	53"	14 1/2"	46"	6"	6"	13"	5"	15 3/4"	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"	36 11/16"	6 1/2"	30"	5.00'	3.25'	8.25'	8.00'	1:2		
66"	53"	83"	22 3/4"	71 1/2"	6"	6"	36 1/8"	7 1/2"	24"	6.50'	1.75'	8.25'	8.50'	1:2		
72"	58"	91"	24 3/4"	78"	6"	6"	38"	7 1/2"	24"	6.50'	1.75'	8.25'	9.00'	1:2		

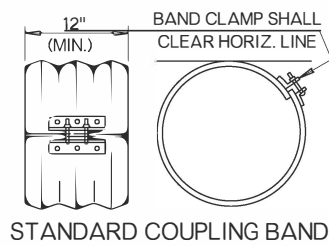
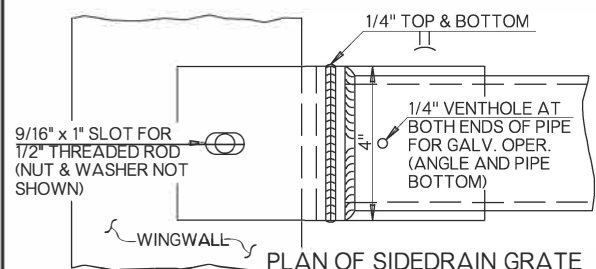


BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (L)	▼ PREFAB. CULVERT END SECTION, ROUND	EA
613 (L)	▼ PREFAB. CULVERT END SECTION, ARCH	EA
613 (L)	▼ PREFAB. CULVERT END SECTION, ELLIPTICAL	EA

▼ END SECTION DIMENSION(S) SHALL BE SPECIFIED.

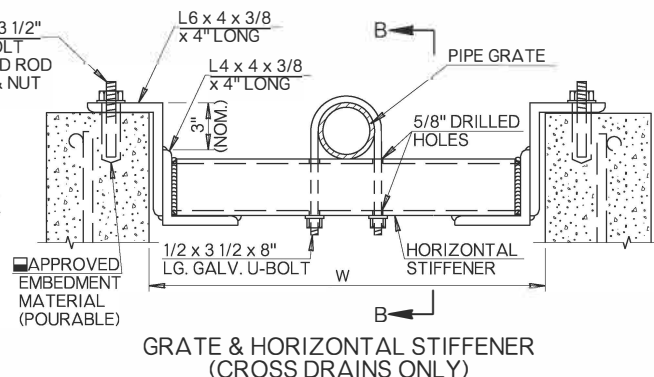
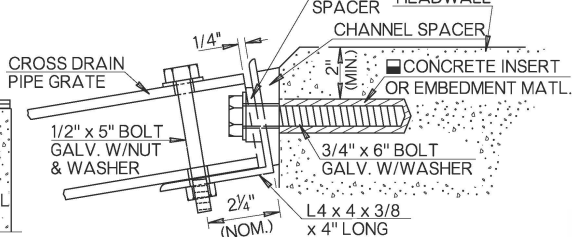
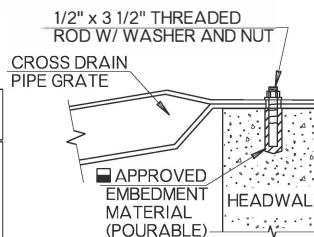
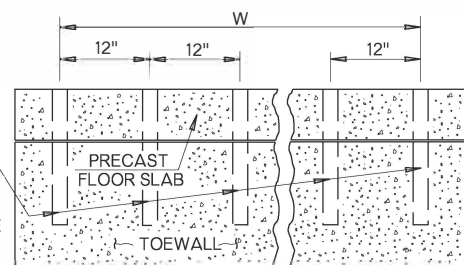
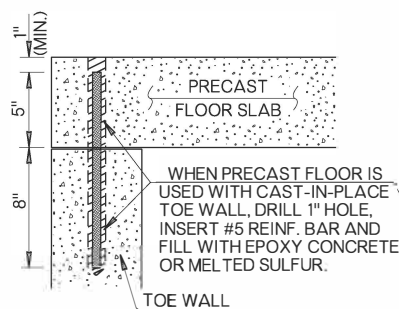
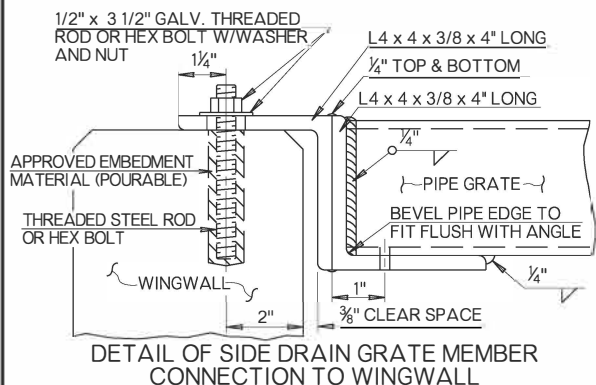
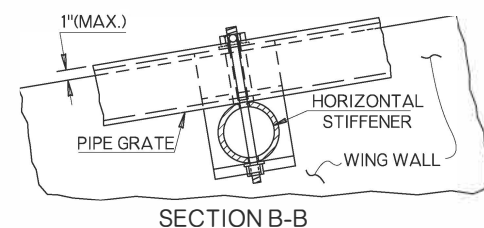
APPROX. EQUIV. DIAMETER	DIMENSIONS OF PRECAST END SECTIONS FOR ARCH PIPE																SLOPE
	SPAN	RISE	A	B	R	R1	R2	R3	R4	R5	T	K	J	C	D	E	
18"	22"	13"	- 1/4"	5 3/4"	2"	27 1/2"	13 3/4"	5 1/4"	3"	13"	2 1/2"	7"	2.25'	3.75'	6.08'	3.00'	1:3
24"	28"	18"	3 7/16"	9 21/32"	3"	40 11/16"	14 9/16"	4 19/32"	3"	16 13/16"	3"	9 1/2"	3.58'	2.50'	6.08'	4.00'	1:3
30"	36"	22"	3 3/4"	12 3/32"	3"	51"	18 3/4"	6 1/32"	3"	18 1/2"	3 1/2"	12"	4.50'	1.58'	6.08'	5.00'	1:3
36"	43"	26"	4 1/8"	15 1/2"	6"	62"	22 1/2"	6 3/8"	3"	24 5/16"	4"	15"	5.25'	2.90'	8.15'	6.00'	1:3
42"	51"	31"	5 1/16"	18"	6"	73"	26 1/4"	7 9/16"	3"	27 1/2"	4 1/2"	21"	5.25'	2.92'	8.17'	6.50'	1:3
48"	58"	36"	6"	20 1/2"	6"	84"	30"	8 3/4"	3"	28 1/2"	5"	24"	6.00'	2.17'	8.17'	7.00'	1:3
54"	65"	40"	6 5/8"	22 11/16"	6"	92 1/2"	33 3/8"	9 13/16"	6"	33 1/8"	5 1/2"	27"	5.42'	2.92'	8.34'	7.50'	1:2.4
60"	73"	45"	7 1/2"	25 9/32"	6"	105"	37 1/2"	11 7/32"	6"	33 11/16"	6"	30"	5.00'	3.25'	8.25'	8.00'	1:2
72"	88"	54"	9"	31 7/16"	6"	126"	45"	12 9/16"	6"	38 15/16"	7"	24"	6.50'	1.75'	8.25'	9.00'	1:2



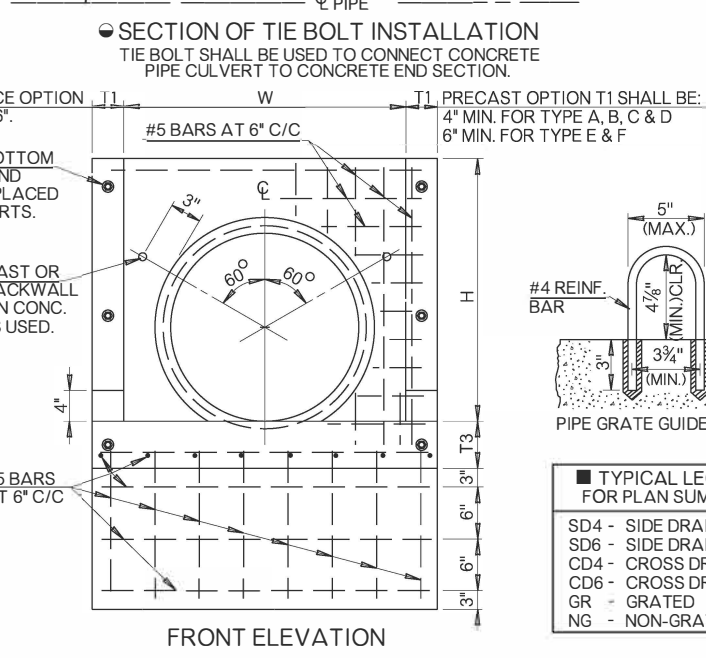
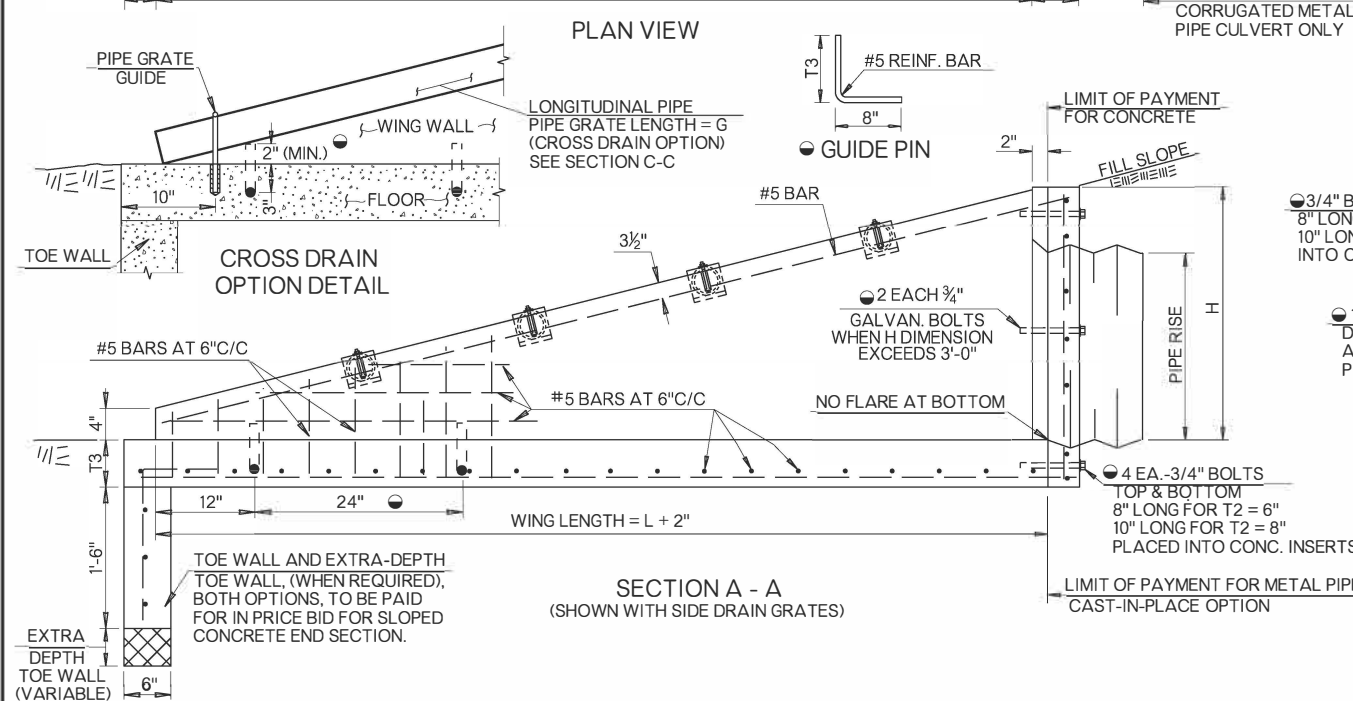
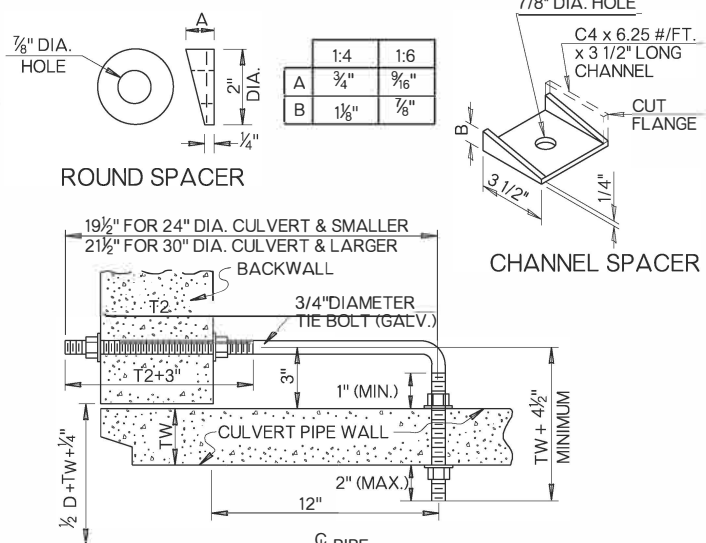
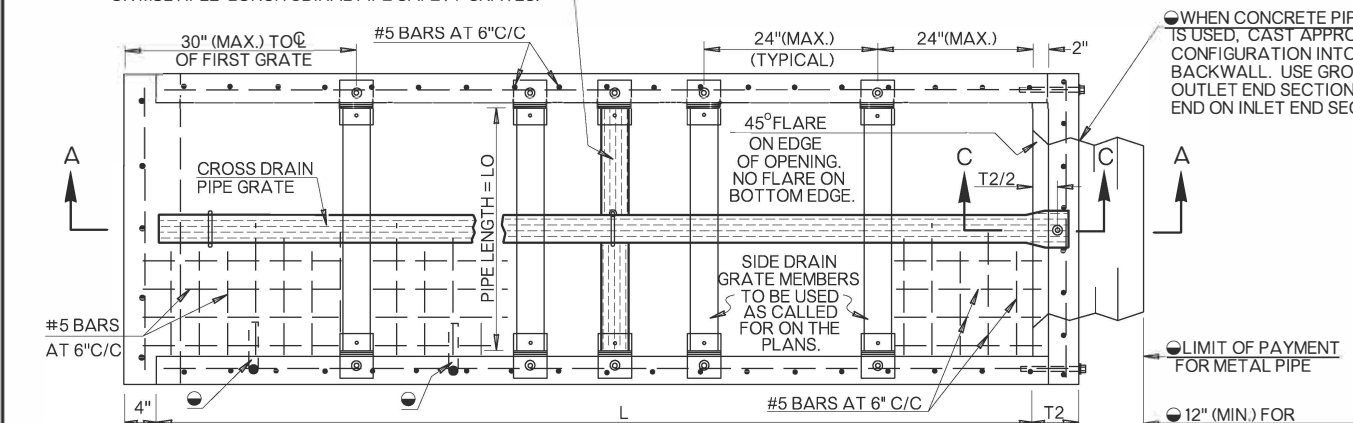


S C E S END SECTION TYPES		ROUND CULV. SIZE	END SECTION DIMENSIONS												SUMMARY-QUANTITIES							
			W	T2	T3	H	LO	NL	1:4 SLOPE				1:6 SLOPE				1:4 SLOPE			1:6 SLOPE		
									NS	L	G	NH	NS	L	G	NH	SCES TYPE	CLASS A CONC. CU. YD.	REINF. STEEL LBS.	SCES TYPE	CLASS A CONC. CU. YD.	REINF. STEEL LBS.
A4	A6	18"	3'-0"	6"	6"	2'-1"	2'-9 3/4"	1	-	7'-0"	7'-9"	3	-	10'-6"	11'-1"	5	A4	0.92	298	A6	1.26	391
B4	B6	24"	3'-0"	6"	6"	2'-7"	2'-9 3/4"	1	1	9'-0"	9'-10"	4	1	13'-6"	14'-2"	6	B4	1.18	381	B6	1.65	510
C4	C6	30"	4'-0"	8"	8"	3'-2"	3'-9 3/4"	1	1	11'-4"	12'-4"	5	2	17'-0"	17'-11"	8	C4	2.26	565	C6	3.15	767
D4	D6	36"	4'-0"	8"	8"	3'-8"	3'-9 3/4"	1	1	13'-4"	14'-5"	6	2	20'-0"	20'-11"	9	D4	2.66	676	D6	3.76	928
E4	E6	42"	6'-0"	8"	8"	4'-3"	5'-9 3/4"	2	2	15'-8"	16'-10"	7	3	23'-6"	24'-6"	11	E4	4.86	1014	E6	6.88	1500
F4	F6	48"	6'-0"	8"	8"	4'-9"	5'-9 3/4"	2	2	17'-8"	18'-11"	8	3	26'-6"	27'-6"	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).



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



- ### GENERAL NOTES
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - ALL NOTES DESIGNATED AS APPLY ONLY TO PRECAST OPTION.
 - 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.
 - DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH FABRICATOR AND WITHIN INDUSTRY ACCEPTED TOLERANCES.
 - UNITS SHALL BE ASSEMBLED USING BOLTS, AS SHOWN, AND EPOXY RESIN ADHESIVE CONFORMING TO AASHTO M 235, AT ALL JOINTS.
 - FABRICATOR SHALL SUBMIT TO THE ENGINEER, FOR APPROVAL, PROVISIONS FOR LIFTING COMPONENT PARTS INTO PLACE.
 - 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.
 - 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.
 - 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.
 - 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.
 - 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.
 - THREADED ROD, BOLT AND NUTS SHALL CONFORM TO ASTM A307.
 - ALIGNMENT SPACER HARDWARE SHALL CONFORM TO ASTM A36.
 - ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED IN ACCORDANCE WITH SECTION 725.04 OF THE 2009 ODOT STANDARD SPECIFICATIONS.
 - ALL REINFORCING STEEL TO BE #5 BARS AT 6" CENTERS, WITH 12" OVERLAPPING REINFORCING STEEL BETWEEN ADJACENT WALLS, WINGS, TOE WALL AND FLOOR.
 - 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.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (N)	SLOPED CONCRETE END SECTION	EA

SPECIFY TYPE (EXAMPLE: TYPE A4 SLOPED CONC. END SECTION)
 SCES ORIENTATION, GRATED OR NON-GRATED SHALL BE SHOWN IN PLAN SUMMARIES.

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	

APPROVED BY ROADWAY ENGINEER: DATE: 6/30/22

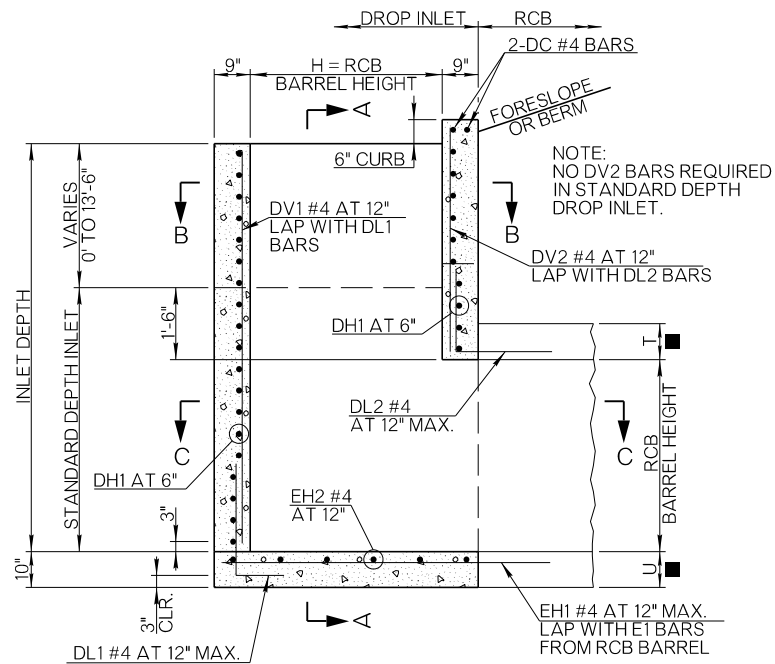
ROADWAY DESIGN DIVISION STANDARD

SLOPED CONCRETE END SECTIONS

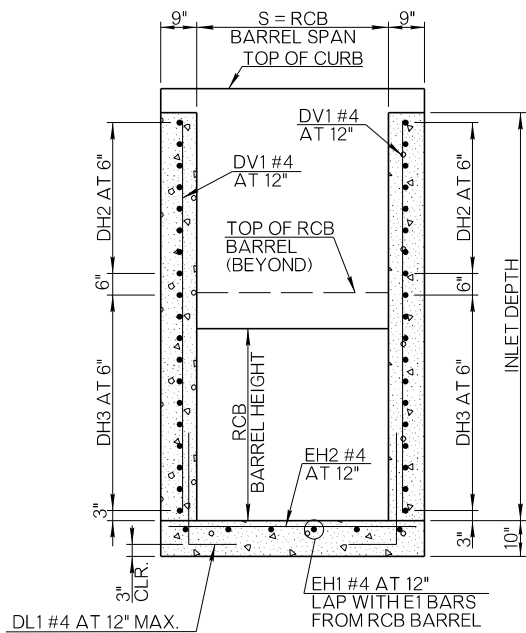
OKLAHOMA Transportation

2019 SPECIFICATIONS

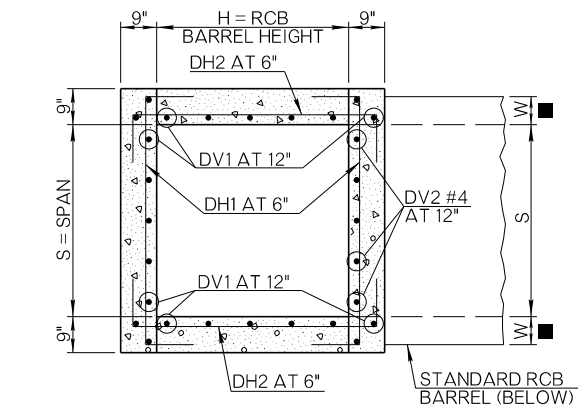
SCES-4	1
	R-35



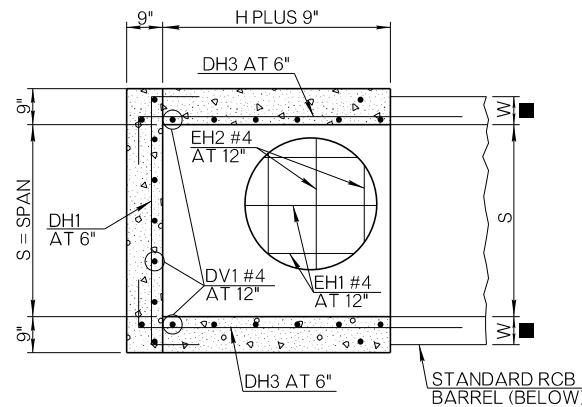
SECTION THRU CENTERLINE RCB CULVERT AND INLET



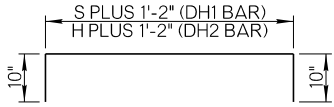
SECTION A - A THRU INLET



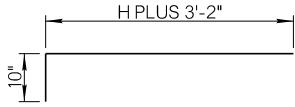
SECTION B-B THRU INLET



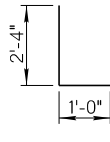
SECTION C-C THRU INLET AND CULVERT



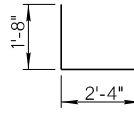
DH1 AND DH2 BARS



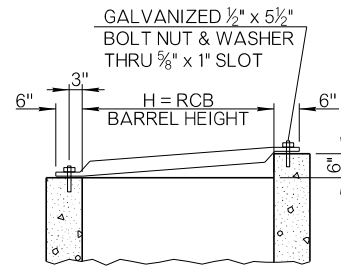
DH3 BARS



DL1 BARS



DL2 BARS



TYPICAL GRATE DETAIL

DIMENSIONS AND BAR LIST																										
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
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	FOR INLETS WITH ADDITIONAL DEPTH ONLY - SEE REINFORCING FOR ADDITIONAL DEPTH NOTE.	2	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		2	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		2	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		2	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		2	5'-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		2	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		2	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		2	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		2	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		2	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		2	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		2	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		2	7'-2"	8	9'-1"	8	7'-2"

▲ 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 ADDITIONAL 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 DEPTH INLET	ADDITIONAL 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 3/4"	2
2	2.2 CY	0.42 CY	328 LBS	7 LBS+48 LBS/FT	4'-0 1/2"	2
3	1.9 CY	0.42 CY	281 LBS	8 LBS+48 LBS/FT	3'-0 3/4"	3
4	2.6 CY	0.48 CY	460 LBS	8 LBS+71 LBS/FT	4'-0 1/2"	3
5	3.4 CY	0.53 CY	568 LBS	8 LBS+76 LBS/FT	5'-0 3/8"	3
6	2.1 CY	0.48 CY	389 LBS	9 LBS+71 LBS/FT	3'-0 3/4"	4
7	2.9 CY	0.53 CY	491 LBS	9 LBS+76 LBS/FT	4'-0 1/2"	4
8	3.7 CY	0.59 CY	603 LBS	9 LBS+82 LBS/FT	5'-0 3/8"	4
9	4.7 CY	0.64 CY	727 LBS	9 LBS+87 LBS/FT	6'-0 1/4"	4
10	3.2 CY	0.59 CY	522 LBS	10 LBS+82 LBS/FT	4'-0 1/2"	5
11	4.1 CY	0.64 CY	639 LBS	10 LBS+87 LBS/FT	5'-0 3/8"	5
12	5.1 CY	0.70 CY	766 LBS	10 LBS+93 LBS/FT	6'-0 1/4"	5
13	6.3 CY	0.75 CY	905 LBS	10 LBS+98 LBS/FT	7'-0 1/4"	5

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 1/2" x 5 1/2" GALVANIZED BOLT, WASHER & NUT MEETING THE REQUIREMENTS OF ASTM F3125. BOLT THREADS, 1 1/4 INCHES, SHALL REMAIN EXPOSED FOR INSTALLING GRATE.
- FOR 'T', 'U' AND 'W' DIMENSIONS, SEE BRIDGE STANDARD DRAWINGS.

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: *[Signature]* 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')

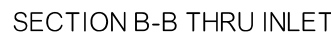
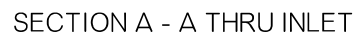


2019 SPECIFICATIONS

CDIB-2

3

R-36



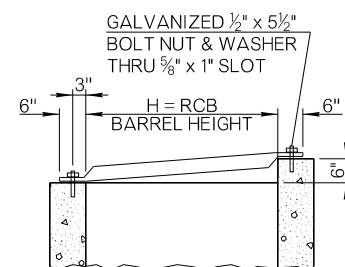
DES. NO.	NUMBER OF BARS			
	N1	N2	N3	N4
1	7	3	11	7
2	7	3	11	7
3	7	3	12	7
4	7	3	12	7
5	7	3	12	7
6	6	5	12	6
7	6	5	12	6
8	6	5	12	6
9	6	5	12	6
10	8	5	15	8
11	8	5	15	8
12	8	5	15	8
13	8	5	15	8

BAR LIST																																																	
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	SIZE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH ▲	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	NO.	LENGTH	SIZE	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	4'-2"	5	5'-1"	4	4'-2"	#5	14	3'-8"	#5	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	4'-2"	5	6'-1"	4	4'-2"	#5	14	3'-10"	#5	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	4	4'-10"	#5	6	5'-11"	#5	6	5'-11"	17	3'-4"	7	4'-0"	17	3'-4"	7		2	5'-2"	6	5'-1"	4	5'-2"	#5	14	4'-10"	#5	6	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		2	5'-2"	6	6'-1"	5	5'-2"	#5	14	4'-10"	#5	6	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		2	5'-2"	6	7'-1"	6	5'-2"	#5	14	5'-0"	#5	6	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		2	6'-2"	7	5'-1"	4	6'-2"	#6	12	5'-8"	#6	10	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		2	6'-2"	7	6'-1"	5	6'-2"	#6	12	5'-8"	#6	10	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		2	6'-2"	7	7'-1"	6	6'-2"	#6	12	5'-10"	#6	10	3'-10" AVG. (2'-1" TO 5'-7")	#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		2	6'-2"	7	8'-1"	7	6'-2"	#6	12	6'-0"	#6	10	4'-0" 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		2	7'-2"	8	6'-1"	5	7'-2"	#6	16	7'-0"	#6	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		2	7'-2"	8	7'-1"	6	7'-2"	#6	16	7'-0"	#6	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		2	7'-2"	8	8'-1"	7	7'-2"	#6	16	7'-2"	#6	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		2	7'-2"	8	9'-1"	8	7'-2"	#6	16	7'-2"	#6	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"					

DIMENSION TABLE							
DESIGN NO.	S = BARREL SPAN	H = BARREL HEIGHT	STANDARD DEPTH	INLET DIMENSIONS			
				A	B	C	D
1	3'	2'	3'-6"	4'-0"	5'-39 $\frac{1}{16}$ "	2'-87 $\frac{1}{16}$ "	3'-59 $\frac{1}{16}$ "
2	3'	3'	4'-6"	4'-0"	5'-39 $\frac{1}{16}$ "	2'-87 $\frac{1}{16}$ "	3'-59 $\frac{1}{16}$ "
3	4'	2'	3'-6"	4'-0"	5'-71 $\frac{1}{16}$ "	2'-415 $\frac{1}{16}$ "	4'-77 $\frac{1}{16}$ "
4	4'	3'	4'-6"	4'-0"	5'-71 $\frac{1}{16}$ "	2'-415 $\frac{1}{16}$ "	4'-77 $\frac{1}{16}$ "
5	4'	4'	5'-6"	4'-0"	5'-71 $\frac{1}{16}$ "	2'-415 $\frac{1}{16}$ "	4'-77 $\frac{1}{16}$ "
6	5'	2'	3'-6"	4'-0"	5'-101 $\frac{1}{2}$ "	2'-11 $\frac{1}{2}$ "	5'-95 $\frac{1}{16}$ "
7	5'	3'	4'-6"	4'-0"	5'-101 $\frac{1}{2}$ "	2'-11 $\frac{1}{2}$ "	5'-95 $\frac{1}{16}$ "
8	5'	4'	5'-6"	4'-0"	5'-101 $\frac{1}{2}$ "	2'-11 $\frac{1}{2}$ "	5'-95 $\frac{1}{16}$ "
9	5'	5'	6'-6"	4'-0"	5'-101 $\frac{1}{2}$ "	2'-11 $\frac{1}{2}$ "	5'-95 $\frac{1}{16}$ "
10	6'	3'	4'-6"	5'-0"	7'-2"	2'-10"	6'-111 $\frac{1}{8}$ "
11	6'	4'	5'-6"	5'-0"	7'-2"	2'-10"	6'-111 $\frac{1}{8}$ "
12	6'	5'	6'-6"	5'-0"	7'-2"	2'-10"	6'-111 $\frac{1}{8}$ "
13	6'	6'	7'-6"	5'-0"	7'-2"	2'-10"	6'-111 $\frac{1}{8}$ "

QUANTITIES (FOR INFORMATION PURPOSES ONLY)						
DESIGN NO.	CLASS AA CONCRETE		REINFORCING STEEL		PIPE GRATES	
	STANDARD DEPTH INLET	PER ADDITIONAL FT OF DEPTH	STANDARD DEPTH INLET	ADDITIONAL FOR EXTRA DEPTH INLETS	LENGTH OF PIPE	NUMBER OF GRATES
1	2.8 CY	0.39 CY	440 LBS	7 LBS+46 LBS/FT	3'-0 $\frac{3}{4}$ "	3
2	3.7 CY	0.45 CY	530 LBS	7 LBS+50 LBS/FT	4'-0 $\frac{1}{2}$ "	3
3	3.5 CY	0.46 CY	570 LBS	8 LBS+68 LBS/FT	3'-0 $\frac{3}{4}$ "	4
4	4.4 CY	0.51 CY	680 LBS	8 LBS+73 LBS/FT	4'-0 $\frac{1}{2}$ "	4
5	5.6 CY	0.57 CY	880 LBS	8 LBS+79 LBS/FT	5'-0 $\frac{3}{8}$ "	4
6	4.0 CY	0.52 CY	670 LBS	9 LBS+74 LBS/FT	3'-0 $\frac{3}{4}$ "	5
7	4.9 CY	0.58 CY	840 LBS	9 LBS+79 LBS/FT	4'-0 $\frac{1}{2}$ "	5
8	6.1 CY	0.63 CY	980 LBS	9 LBS+85 LBS/FT	5'-0 $\frac{3}{8}$ "	5
9	7.4 CY	0.69 CY	1130 LBS	9 LBS+90 LBS/FT	6'-0 $\frac{1}{2}$ "	5
10	6.5 CY	0.64 CY	960 LBS	12 LBS+87 LBS/FT	4'-0 $\frac{1}{2}$ "	6
11	7.7 CY	0.7 CY	1090 LBS	12 LBS+92 LBS/FT	5'-0 $\frac{3}{8}$ "	6
12	9.2 CY	0.75 CY	1250 LBS	12 LBS+98 LBS/FT	6'-0 $\frac{1}{2}$ "	6
13	10.7 CY	0.81 CY	1410 LBS	12 LBS+103 LBS/FT	7'-0 $\frac{1}{4}$ "	6

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. MAXIMUM DEPTH OF DROP INLETS SHALL BE THE HEIGHT OF THE RCB CULVERT PLUS 15'-0".
3. ALL REINFORCING STEEL SHALL HAVE A 2 INCHES MINIMUM CLEAR COVER UNLESS OTHERWISE SHOWN.
4. INLET TOP OPENING SHALL HAVE 3" x 7.5 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.
5. PIPE GRATE ENDS SHALL BE HELD DOWN WITH ½" x 5½" GALVANIZED BOLT, WASHER & NUT MEETING THE REQUIREMENTS OF ASTM F3125. BOLT THREADS, 1¼ INCHES, SHALL REMAIN EXPOSED FOR INSTALLING GRATE.
6. FOR 'I', 'U' AND 'W' DIMENSIONS, SEE BRIDGE STANDARD DRAWINGS.



TYPICAL GRATE DETAIL

FOR INLET DEPTHS GREATER THAN STANDARD DEPTH:

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

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

● DESIGN NUMBER SHALL BE SPECIFIED.

APPROVED BY
ROADWAY ENGINEER:  DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

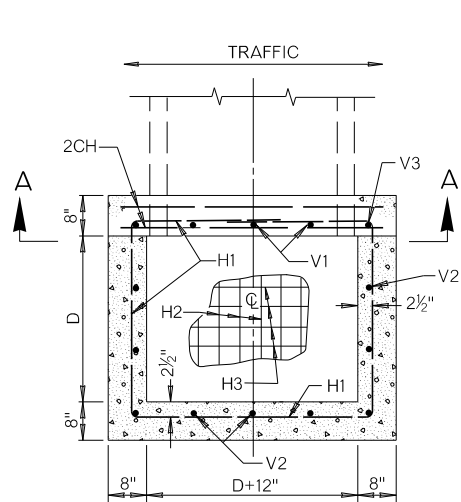
CAST-IN-PLACE CONCRETE DROP INLETS FOR 30 DEG. SKEW R.C. BOXES (3' x 2' TO 6' x 6')



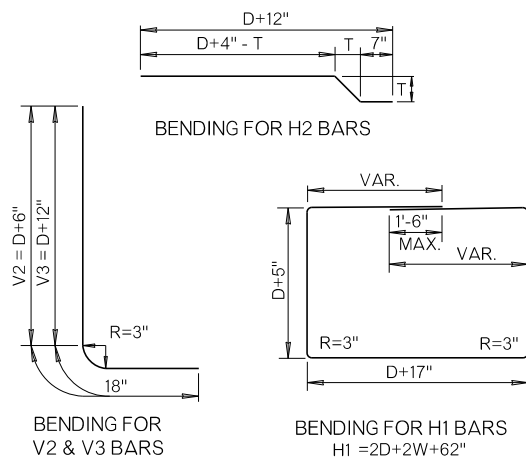
OKLAHOMA
Transportation

2019 SPECIFICATIONS

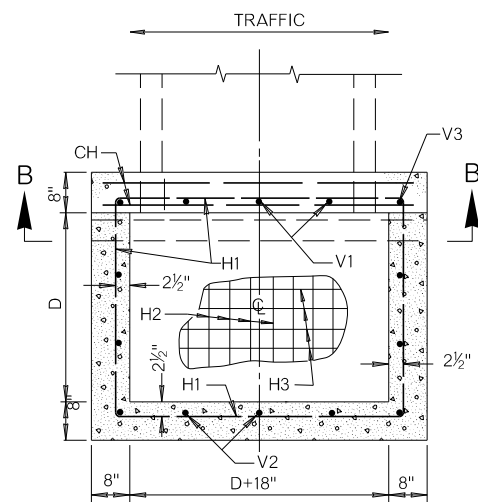
CDIB30-2	3
	R-37



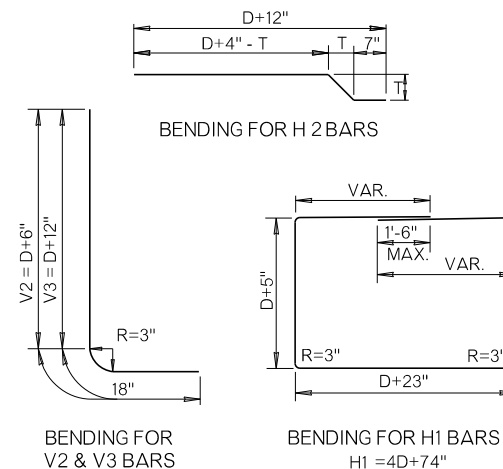
PLAN



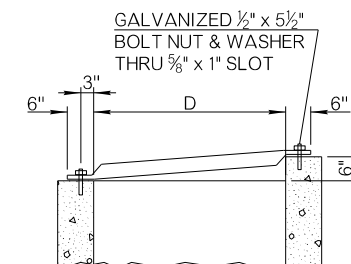
BAR BENDING DIAGRAMS



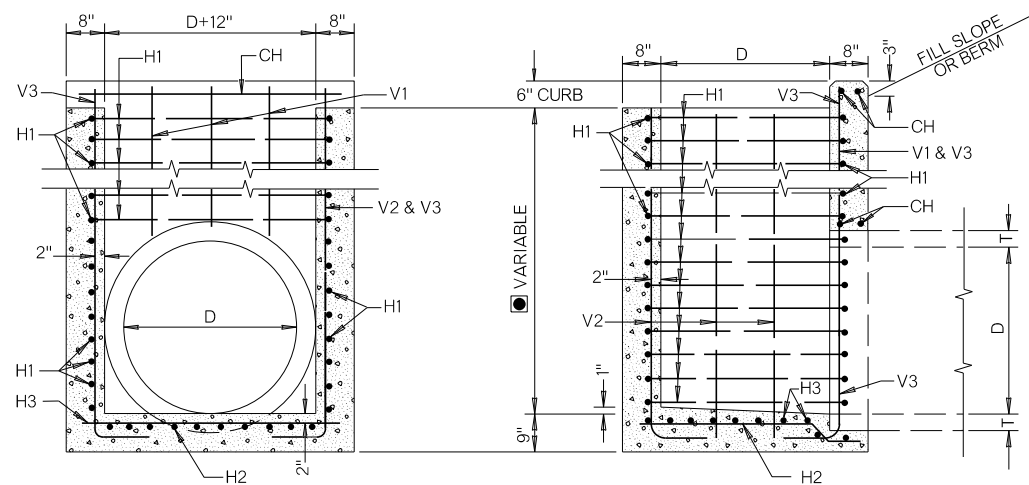
PLAN



BAR BENDING DIAGRAMS



TYPICAL GRATE DETAIL

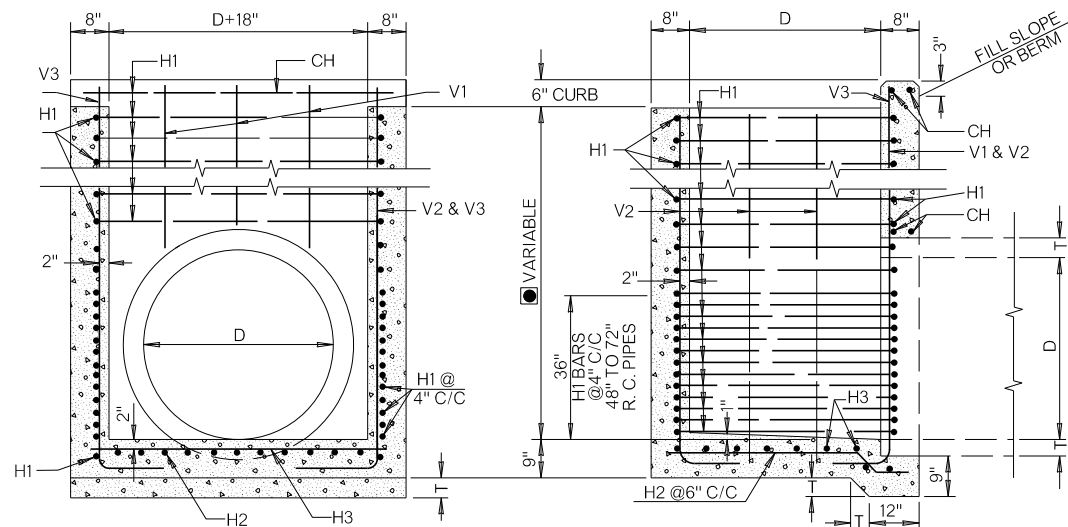


SECTION A-A

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

SECTION ON C

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

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.
- BAR BENDING DIAGRAMS AND DIMENSIONS FOR DESIGNS 1 THROUGH 10, AS SHOWN THIS SHEET, ARE FOR STANDARD DEPTH DROP INLETS.
- ARCH PIPES MAY BE USED INSTEAD OF ROUND PIPES AT THE DISCRETION OF THE ENGINEER.

DIMENSIONS REINFORCING STEEL & QUANTITIES

DIMENSIONS REINFORCING STEEL & QUANTITIES																							PIPE GRATES
DESIGN NUMBER	DIMENSIONS				REINFORCING STEEL												CLASS A CONCRETE		REINFORCING STEEL		NO. OF PIPE GRATES		
	D DIAM. OF PIPE	AREA OF PIPE	T= THICKNESS OF WALL	STANDARD DEPTH	#4 BARS STRAIGHT		H1 BARS BENT		H2 BARS BENT		H3 BARS STRAIGHT		V1 BARS STRAIGHT		V2 BARS BENT		V3 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.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.					
					EA	IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	IN					
IN	SQ.FT	IN	FT-IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	IN	EA	IN	CY	CY/VF	LBS	LBS/VF	EA	
1	18"	1.77	2½"	1'-11½"	4	29"	5	134"	7	30"	7	26"	2	12"	6	42"	2	48"	0.58	0.21	77	24	2
2	24"	3.14	3"	2'-6"	4	35"	6	158"	8	36"	8	32"	3	13"	6	48"	2	54"	0.86	0.26	104	29	2
3	30"	4.91	3½"	3'-½"	4	41"	7	182"	9	42"	9	38"	4	14"	7	54"	2	60"	1.20	0.30	138	35	3
4	36"	7.07	4"	3'-7"	4	47"	8	206"	10	48"	10	44"	4	16"	8	60"	2	66"	1.58	0.35	176	42	3
5	42"	9.62	4½"	4'-1½"	4	53"	9	230"	11	54"	11	50"	5	18"	10	66"	2	72"	2.11	0.40	223	49	4
6	48"	12.57	5"	4'-8"	4	59"	15	254"	12	60"	12	56"	5	19"	10	72"	2	78"	2.60	0.45	333	52	4
7	54"	15.90	5½"	5'-2½"	4	65"	16	278"	13	66"	13	62"	6	21"	10	78"	2	84"	3.18	0.49	385	60	5
8	60"	19.63	6"	5'-9"	4	71"	17	302"	14	72"	14	68"	6	22"	11	84"	2	90"	3.79	0.54	448	66	5
9	66"	24.30	6½"	6'-3½"	4	77"	18	326"	15	78"	15	74"	7	24"	12	90"	2	96"	4.47	0.59	517	74	6
10	72"	28.27	7"	6'-10"	4	83"	19	350"	16	84"	16	80"	7	25"	14	96"	2	102"	5.21	0.64	594	83	6

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

● DESIGN NUMBER SHALL BE SPECIFIED.

APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 4/1/2025

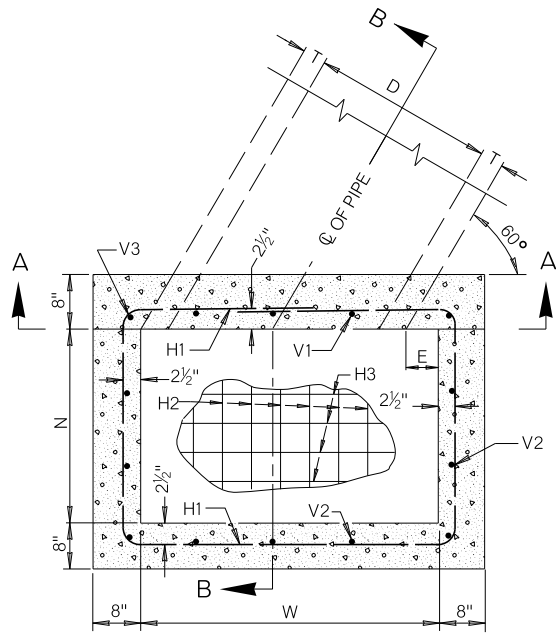
ROADWAY DESIGN DIVISION STANDARD

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

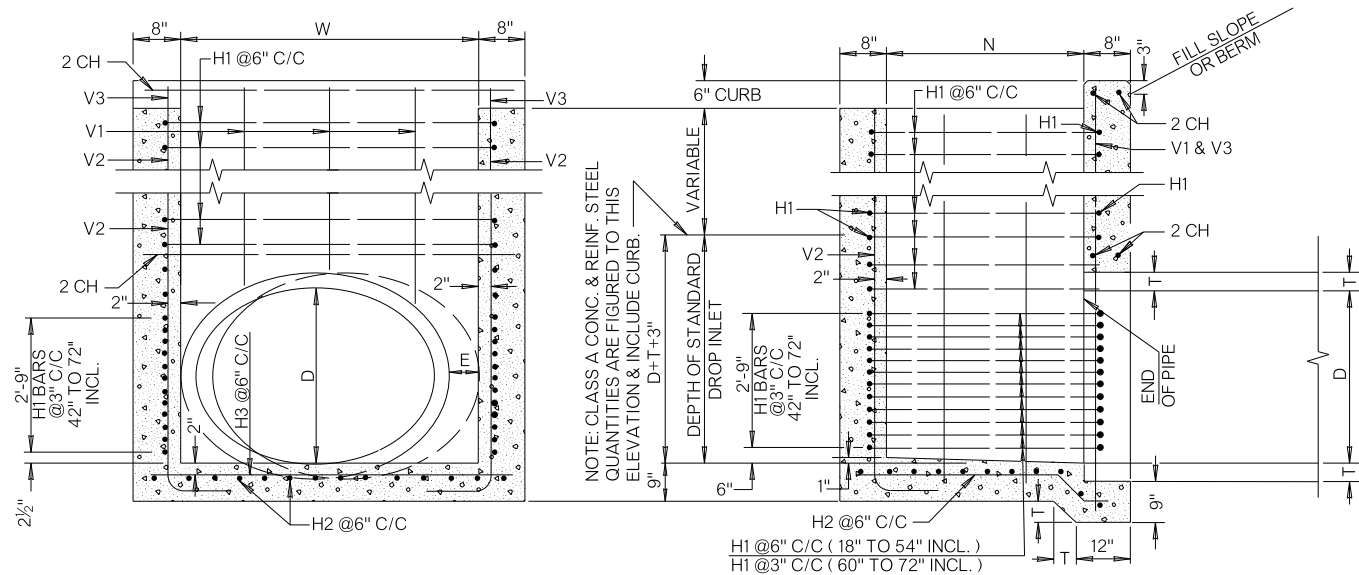


2019 SPECIFICATIONS

CDIP-2	3
	R-38



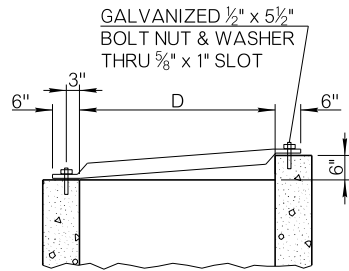
PLAN



SECTION A-A

SECTION B-B

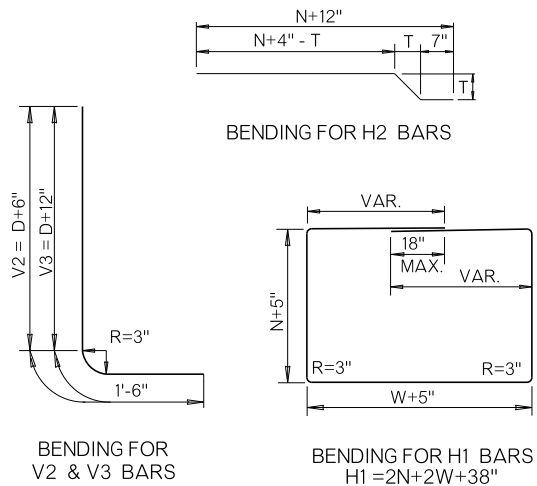
DIMENSIONS																				
DESIGN NO.	1	2	3	4	5	6	7	8	9	10										
DIAM.(D) & N	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"										
AREA (SQ. FEET)	1.77	3.14	4.91	7.07	9.62	12.57	15.90	19.63	23.76	28.27										
STANDARD DEPTH	1'-11½"	2'-6"	3'-½"	3'-7"	4'-1½"	4'-8"	5'-2½"	5'-9"	6'-¾"	6'-10"										
T	2½"	3"	3½"	4"	4½"	5"	5½"	6"	6½"	7"										
E	4½"	4½"	4½"	4½"	4½"	4½"	4½"	4½"	4½"	4½"										
W	2'-7"	3'-3"	3'-11"	4'-7"	5'-3"	5'-11"	6'-7"	7'-4"	8'-0"	8'-8"										
REINFORCING STEEL																				
DESCRIPTION	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.
CH-STR. #4 BAR	4	42"	4	50"	4	58"	4	65"	4	74"	4	81"	4	90"	4	98"	4	105"	4	113"
H1-BENT #4 BAR	5	136"	6	164"	7	192"	8	220"	14	248"	15	276"	16	304"	17	334"	18	362"	19	390"
H2-BENT #4 BAR @6" C/C	7	30"	8	36"	9	42"	10	48"	11	54"	12	60"	13	66"	14	72"	15	78"	16	84"
H3-STR. #4 BAR @6" C/C	7	39"	8	47"	9	55"	10	62"	11	71"	12	78"	13	86"	14	95"	15	102"	16	110"
V1-STR. #4 BAR	2	11½"	3	13"	4	14½"	4	16"	5	16½"	5	19"	6	20"	6	21½"	7	23"	7	24½"
V2-BENT #4 BAR	5	42"	5	48"	5	54"	6	60"	8	66"	9	72"	10	78"	12	84"	12	90"	13	96"
V3-BENT #4 BAR	2	48"	2	54"	2	59"	2	66"	2	72"	2	77"	2	84"	2	90"	2	96"	2	102"
QUANTITIES																				
CLASS A CONCRETE , CUBIC YARDS																				
STANDARD DROP INLETS	0.80	1.15	1.57	2.07	2.62	3.23	3.92	4.68	5.51	6.38										
PER FOOT OF ADD'L DEPTH	0.26	0.31	0.37	0.43	0.49	0.54	0.60	0.65	0.71	0.77										
REINFORCING STEEL , POUNDS (LBS)																				
STANDARD DROP INLETS	92.4	124.4	161.2	204.6	328.3	390.6	460.3	541.4	616.2	700.8										
PER FOOT OF ADD'L DEPTH	18.9	24.9	28.6	32.9	40.0	42.3	50.6	57.3	63.6	69.5										
NUMBER OF PIPE GRATES	2	2	3	3	4	4	5	5	6	6										



TYPICAL GRATE DETAIL

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- TOTAL QUANTITIES AS SHOWN IN TABLE ARE COMPUTED TO TOP OF THE PIPE PLUS 3 INCHES AND INCLUDES CURB. FOR DROP INLETS OF GREATER DEPTH, MULTIPLY THE FIGURE IN THE PER FOOT ROW BY THE DIFFERENCE IN HEIGHT FROM TOP OF PIPE PLUS 3 INCHES TO TOP OF DROP INLET AND ADD THE RESULT TO THE STANDARD DROP INLET QUANTITY.
- MAXIMUM DEPTH OF DROP INLETS FOR 42 INCHES TO 72 INCHES RCP SHALL BE AS FOLLOWS: 42" RCP - 22'-0" 48" RCP - 18'-0" 54" RCP - 16'-0" 60" RCP - 14'-0" 66" RCP - 12'-0" 72" RCP - 11'-0"
- 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 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 F 3125. BOLT THREADS, 1 3/4 INCHES, SHALL REMAIN EXPOSED FOR INSTALLING GRATE.
- BAR BENDING DIAGRAMS AND DIMENSIONS, AS SHOWN THIS SHEET, ARE FOR STANDARD DEPTH DROP INLETS.



BAR BENDING DIAGRAMS

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

● DESIGN NUMBER SHALL BE SPECIFIED.

APPROVED BY ROADWAY ENGINEER:  DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE CONCRETE DROP INLETS FOR 30 DEG. SKEW 18" TO 72" R.C. PIPES

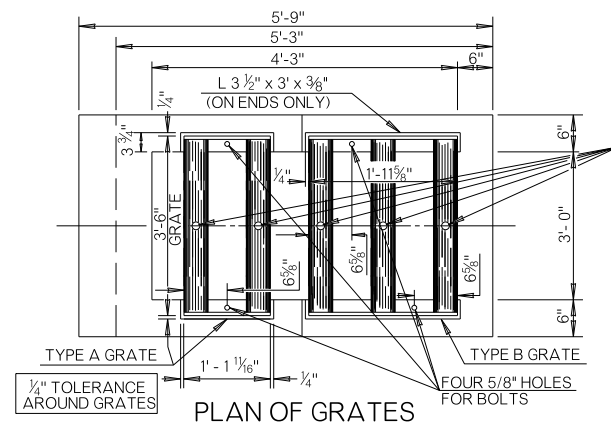


2019 SPECIFICATIONS

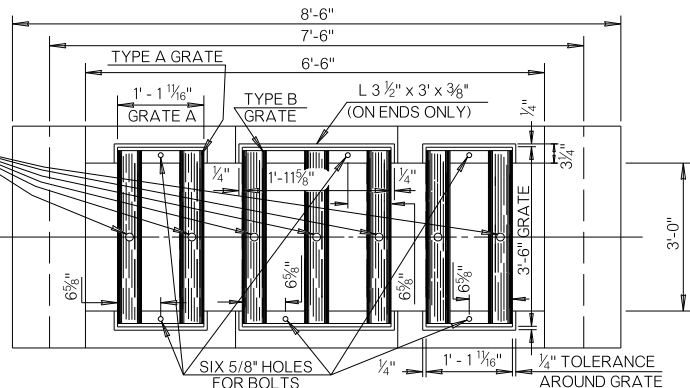
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3

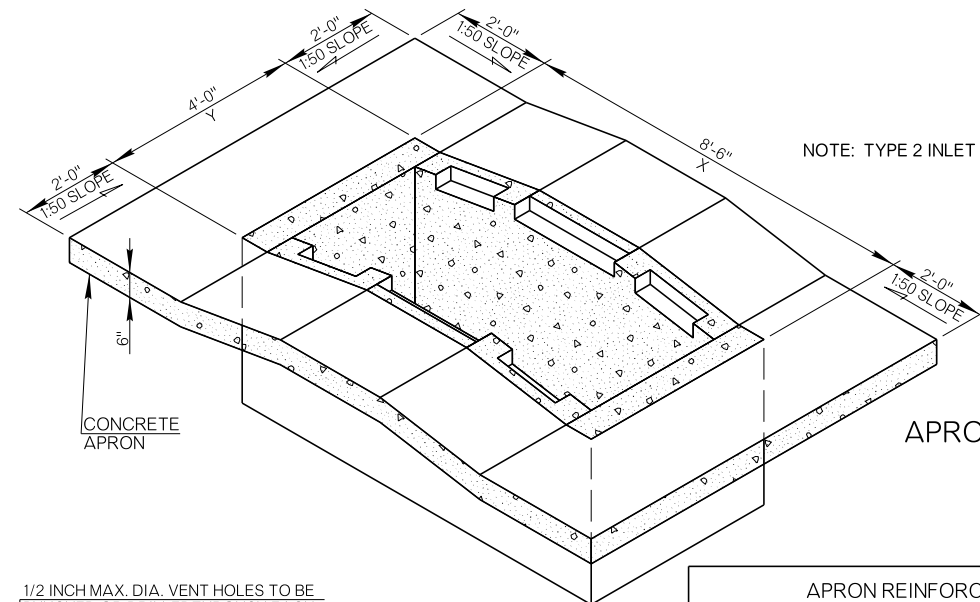
R-39



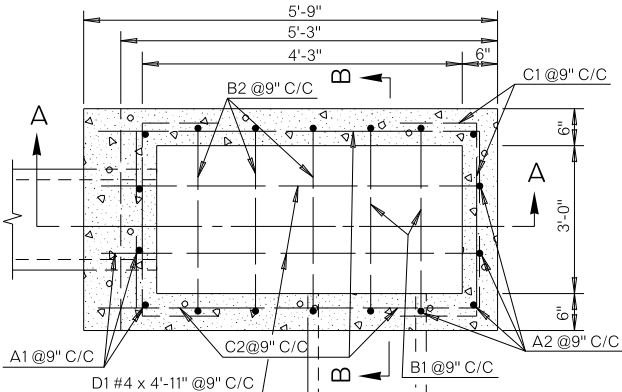
PLAN OF GRATES



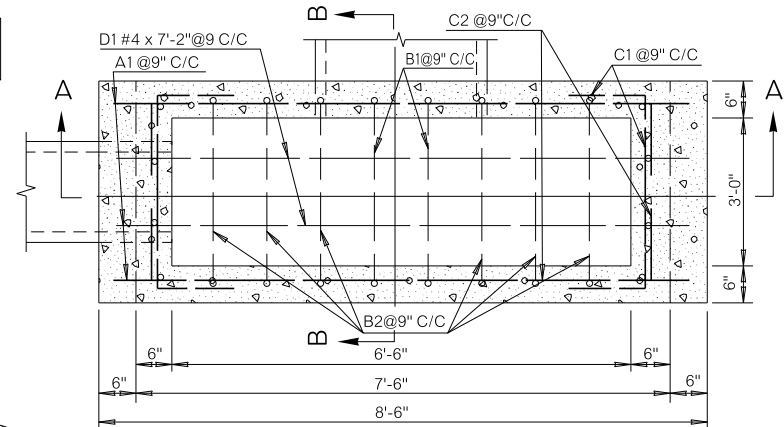
PLAN OF GRATES



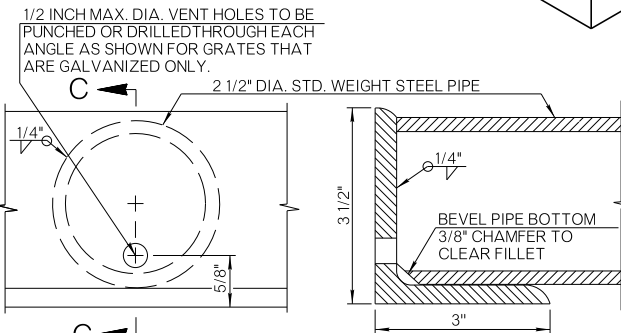
APRON DETAIL



PLAN



PLAN

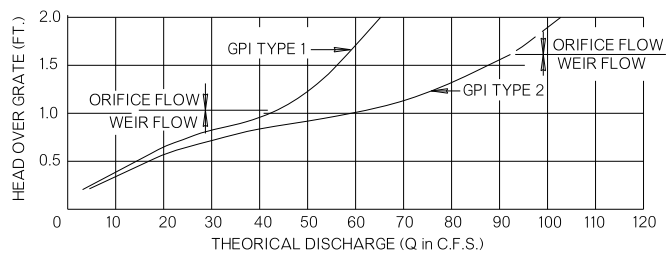


VENT HOLE DETAIL

SECTION C - C

APRON REINFORCING STEEL LOCATION AND LENGTHS (USING #4 BARS - EQUALLY SPACED @ 18" MAXIMUM)*					APRON REINFORCING STEEL ° LB.	APRON CLASS C CONCRETE ° C.Y.
TYPE	E - BARS (NO.) FT. - IN.	F - BARS (NO.) FT. - IN.	G - BARS (NO.) FT. - IN.	H - BARS (NO.) FT. - IN.		
1	(4) 9 - 6	(6) 1 - 9	(4) 7 - 9	(8) 1 - 9	63	1.02
2	(4) 12 - 3	(6) 1 - 9	(4) 7 - 9	(12) 1 - 9	75	1.22
*MINIMUM 1½" COVER OVER STEEL °QUANTITIES ARE FOR ONE APRON						

*MINIMUM 1 1/2" COVER OVER STEEL °QUANTITIES ARE FOR ONE APRON

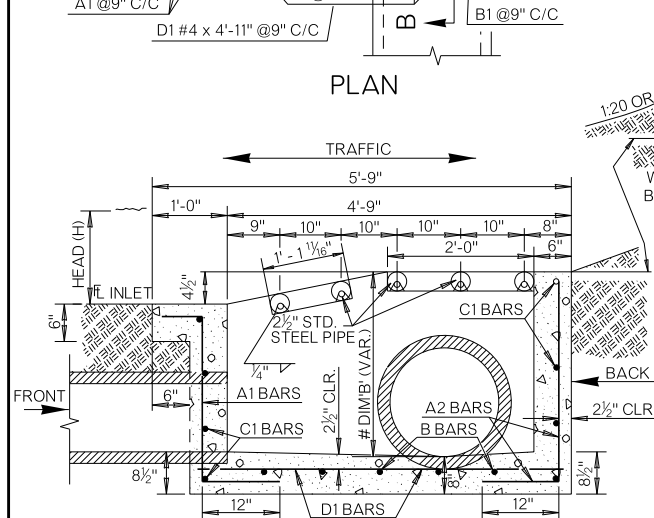


HYDRAULIC PERFORMANCE CHART

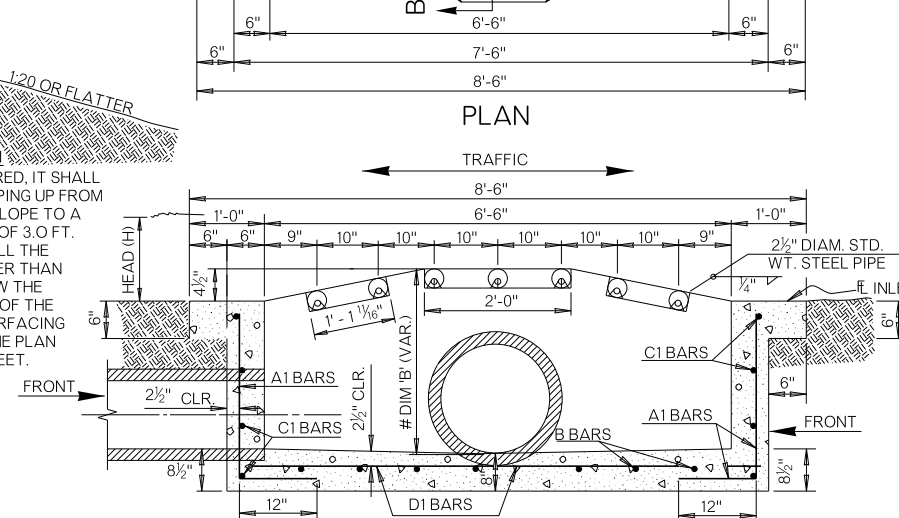
TO ALLOW FOR CLOGGING 60% THEORETICAL DISCHARGE IS THE RECOMMENDED FACTOR TO USE IN AREAS SUBJECT TO DEBRIS.

GENERAL NOTES

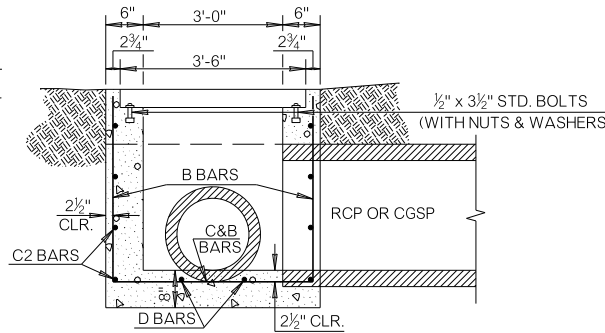
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- VENT HOLES AND DRAIN HOLES FOR HOT-DIP GALVANIZATION SHALL BE DRILLED OR PUNCHED IN THE GRATE AS SHOWN.
- WHEN INLET DEPTH B (#) EXCEEDS VALUE LISTED IN TABLE SUMMARY, THE ADDITIONAL DEPTH SHALL BE PAID FOR AS 'ADDITIONAL DEPTH IN INLET'. SPECIFIC ADDITIONAL DEPTH DATA FOR EACH STRUCTURE SHALL BE SHOWN ON THE PLANS.
- THE CONCRETE APRON SHALL BE CONSTRUCTED WITH CLASS C CONCRETE AND EITHER 6X6 W6.5 X W6.5 WIRE MESH OR #4 BARS AT 18" SPACING. DETAILS OF #4 BAR STEEL PLACEMENT CAN BE FOUND ON THE ROADWAY STANDARD SMD-4. COST OF APRON SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.



SECTION A - A
TYPE 1

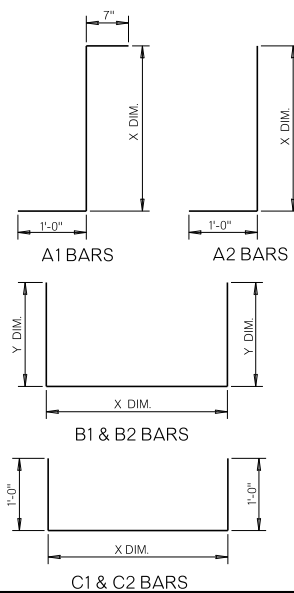


SECTION A - A
TYPE 2



SECTION B - B

		DESIGN NO.	PIPE SIZE	# MIN. DIM. "B"	CLASS A CONC.	REINF. STEEL	CONC. PER ADD'L FT. DEPTH	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 STR'T. #4 AT 9" C/C			
					CY	LB	CY	LB	NO	LGTH	X DIM.	NO	LGTH	X DIM.	NO	LGTH	X DIM.	Y DIM.	NO	LGTH	X DIM.	Y DIM.	NO	LGTH	X DIM.	NO	LGTH	X DIM.	NO	LGTH
TYPE 1	PIPE AT SIDES OR BACK	1	24"	3'-1¼"	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'-7¾"	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'-2¼"	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'-8¾"	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'-7¾"	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'-2¼"	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'-8¾"	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"
TYPE 2	PIPE AT FRONT	PIPE AT SIDES	8	24"	3'-1¼"	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'-7¾"	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'-2¼"	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'-8¾"	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'-3¼"	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'-7¾"	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'-2¼"	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'-8¾"	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"		



BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (G)	INLET GPI ■	EA
611 (H)	ADDITIONAL DEPTH IN INLET ●	VF

- SPECIFY TYPE AND DESIGN, EXAMPLE: INLET GPI TYPE 1 (DESIGN 2)
- SPECIFY TYPE, EXAMPLE: ADDITIONAL DEPTH IN INLET GPI TYPE 1

NOTE: COST OF INLET PIPE GRATES (TYPES A & B) SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET.

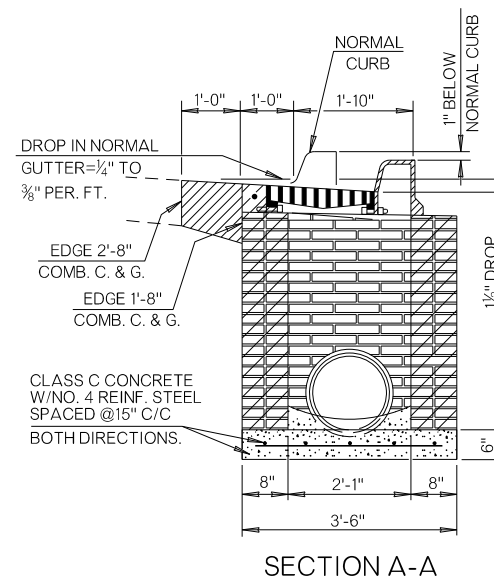
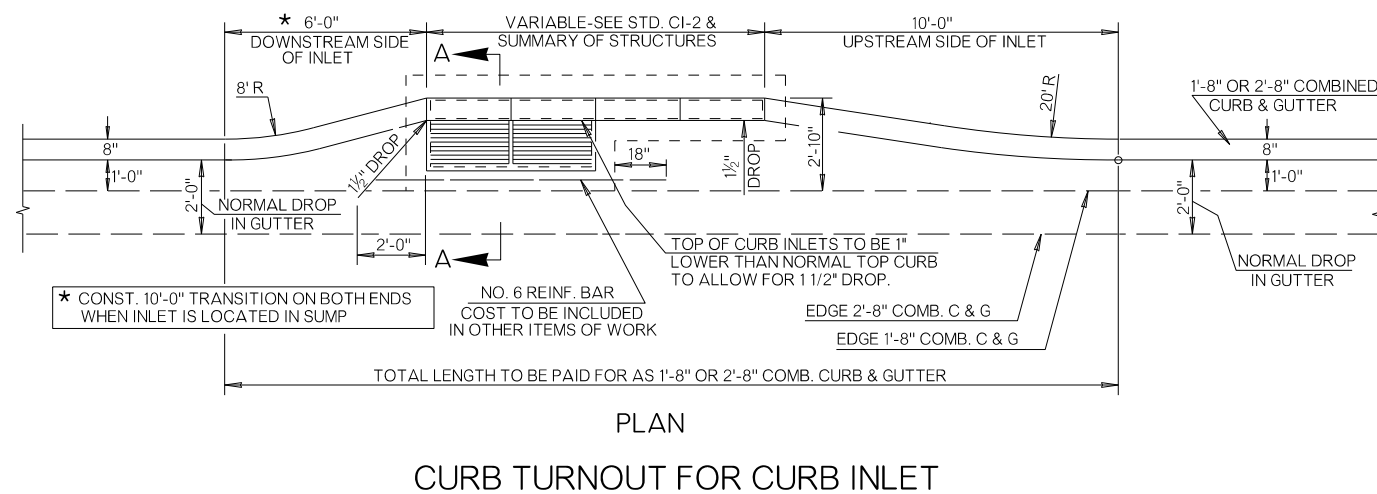
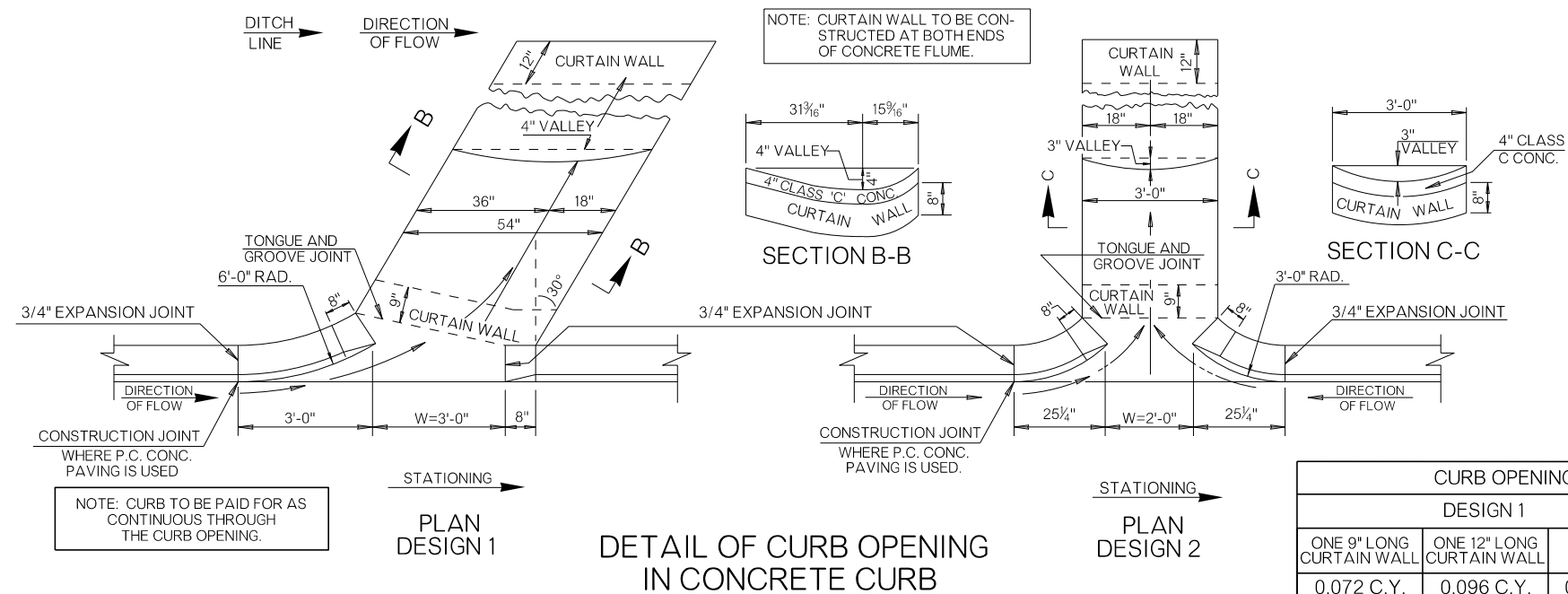
APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE GRATED PIPE DROP INLET (18" TO 42" PIPES)



2019 SPECIFICATIONS

GPI-5	3
	R-40



- GENERAL NOTES
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - INLET STRUCTURES MAY BE SUPPLIED AS PRECAST UNITS IF PROPOSED PRECAST DESIGN IS SUBMITTED TO THE ENGINEER AND APPROVED FOR USE. SEE ROADWAY STANDARD CI-2.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
509 (D)	CLASS C CONCRETE	CY

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



STORM SEWER CONSTRUCTION DETAILS

2019 SPECIFICATIONS

SSCD-4 2

R-41



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"
B-C	14'-3"	16'-10"	22'-2"
2B	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 OPENING DESIGNATION	THROAT SECTION LENGTH
A	2'-8"
B	5'-4"
C	8'-0"
D	10'-9"

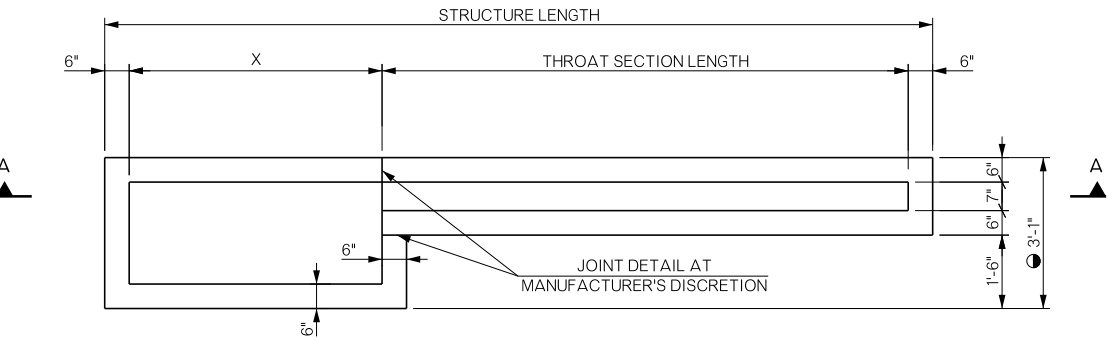
① STANDARD DEPTH
2'-9" FOR 18" DIA. PIPE
3'-4" FOR 24" DIA. PIPE
4'-0" FOR 30" DIA. PIPE
4'-6" FOR 36" DIA. PIPE

DESIGN DATA

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

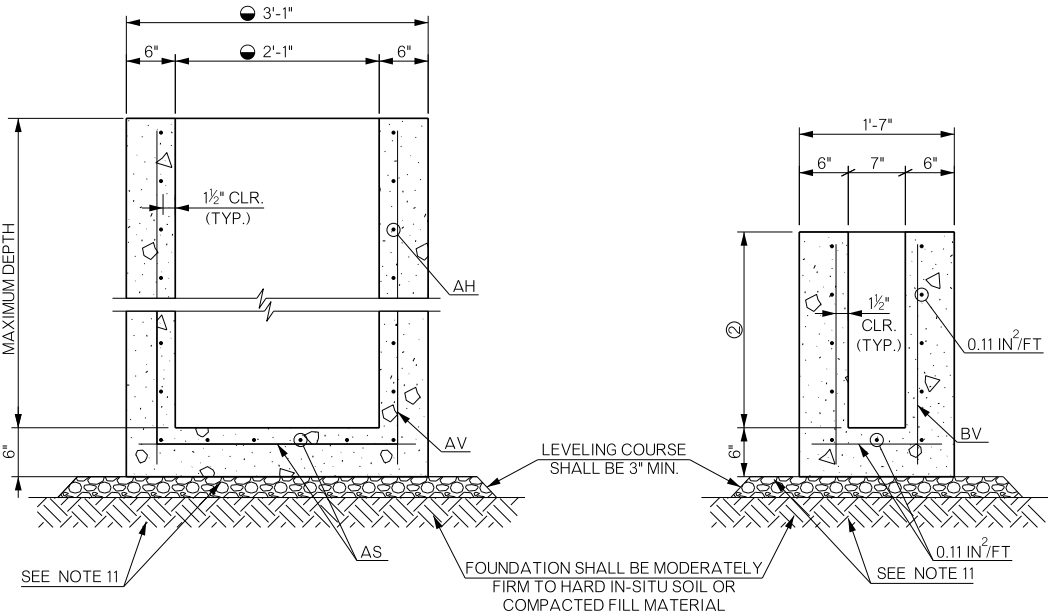
LOADING:
HL-93

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



PLAN VIEW - CURB INLET WITH ADDITIONAL OPENINGS

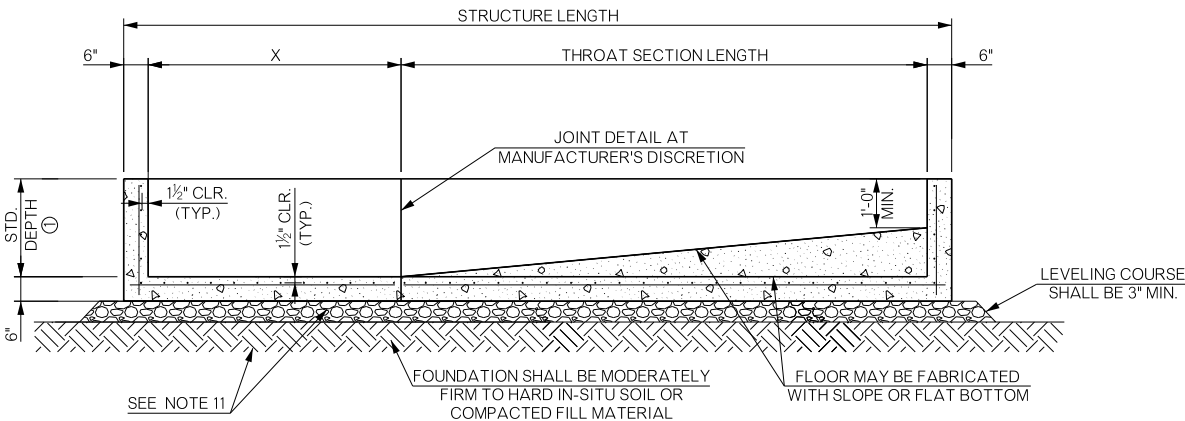
NOTE: THROAT SECTION MAY ENTER EITHER OR BOTH SIDES OF CURB INLET.



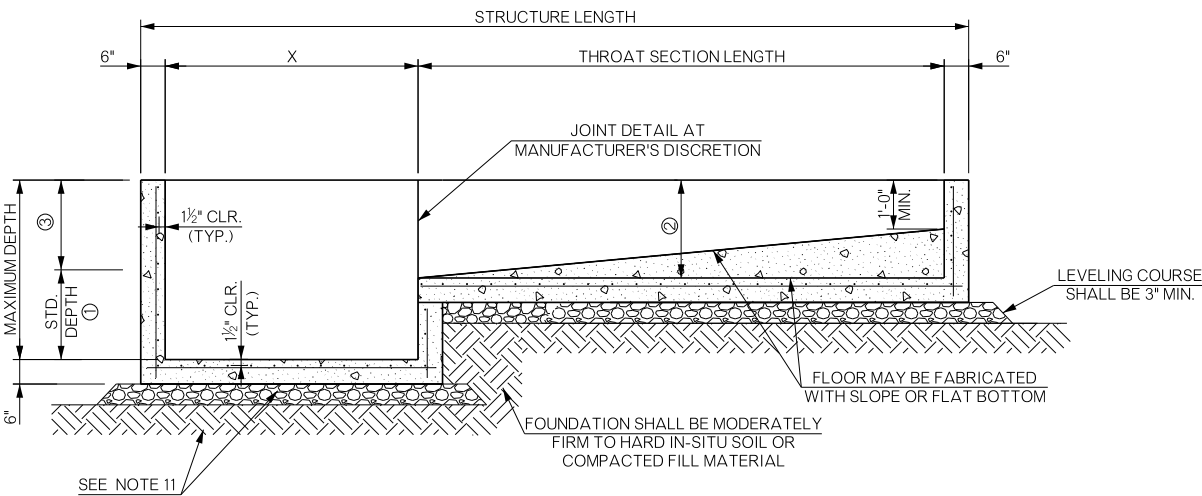
CROSS-SECTIONAL VIEW - CURB INLET

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"





SECTION A-A - STANDARD DEPTH



SECTION A-A - NON-STANDARD DEPTH

③ ADDITIONAL CURB INLET DEPTH PER VERTICAL FOOT

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL															
INLET DESIGN	 X	 Y	CURB INLET										THROAT		
			AH BARS (IN²/FT)								AS BARS (IN²/FT)	AV BARS (IN²/FT)	BV BARS (IN²/FT)		
			DEPTH										DEPTH		
			3'	4'	5'	6'	7'	8'	9'	10'			3'	4'	5'
1	2'-7"	3'-7"	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.20	0.11	0.11	0.16	0.26
2	5'-2"	6'-2"	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.18	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.

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. 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.
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 1½ INCHES TO REINFORCING STEEL.
7. 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.
8. 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.
9. MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
10. DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
11. 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.
12. WALLS AND SLABS WILL HAVE A MINIMUM THICKNESS OF 6 INCHES. A TOLERANCE OF ±3⁄8 INCH WILL BE ALLOWED FOR FABRICATION.
13. FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 6 INCHES CENTER TO CENTER
14. STANDARD DEPTH FOR EACH PIPE SIZE IS SHOWN IN TABLE ④. 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:  DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

PRECAST CURB INLET (DESIGNS 1, 2 AND 3)

2019 SPECIFICATIONS



PCI-1	2
	R-42

DESIGN DATA

MATERIAL:

CLASS A CONCRETE

REINFORCING STEEL

LOADING:

HL-93

DESIGN:

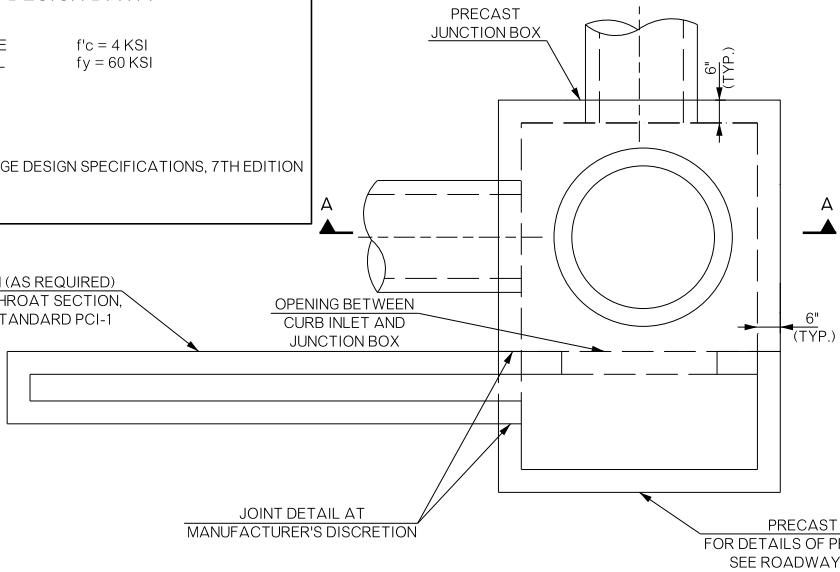
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION

ASTM C890

ASTM C913

$f'_c = 4 \text{ KSI}$

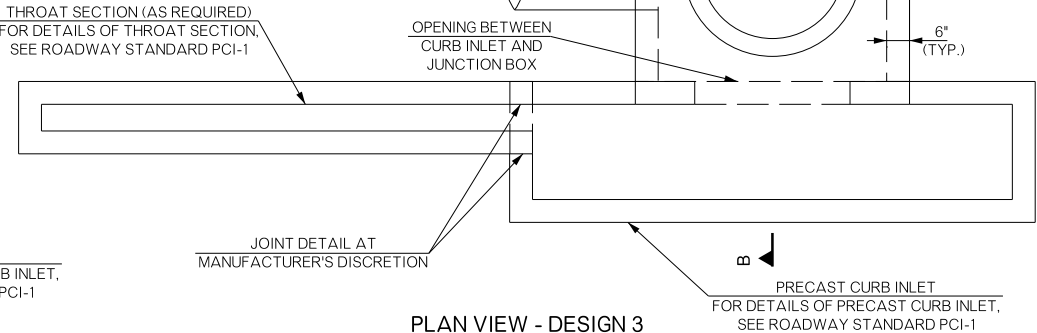
$f_y = 60 \text{ KSI}$



PLAN VIEW - DESIGN 2

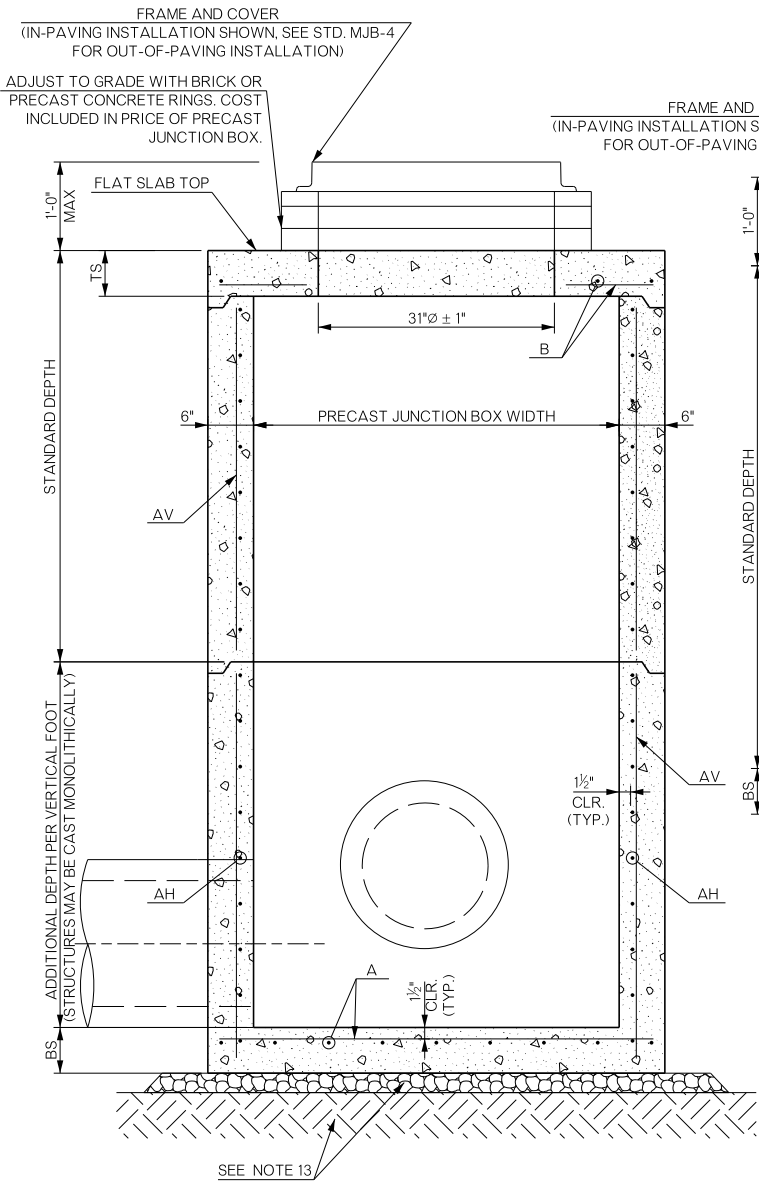
NOTE: THROAT SECTION MAY ENTER EITHER
OR BOTH SIDES OF PRECAST CURB INLET.

DETAILS ARE SHOWN FOR DESIGN 2 AND DESIGN 3 ONLY.
DESIGN 1 DETAILS ARE SIMILAR.

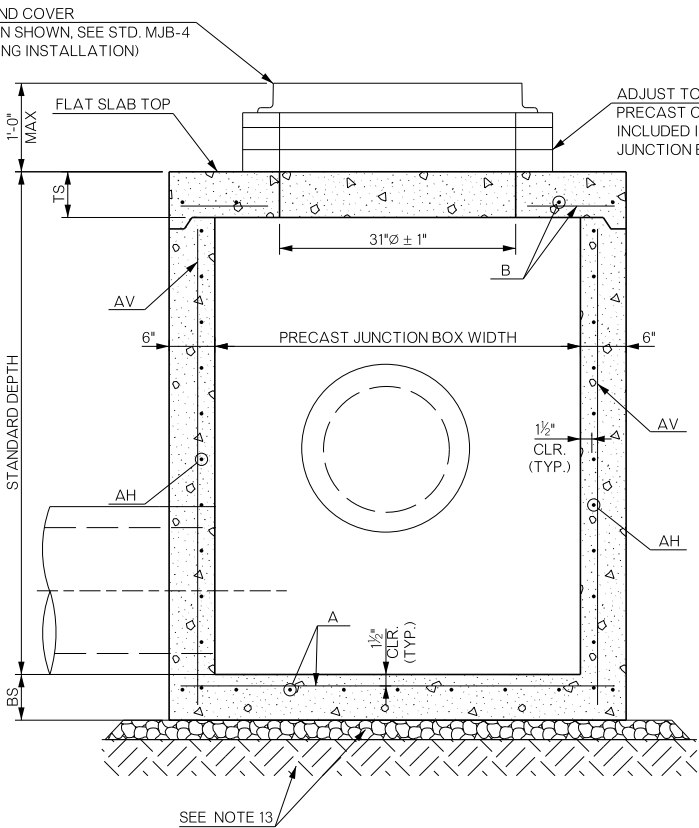


PLAN VIEW - DESIGN 3

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



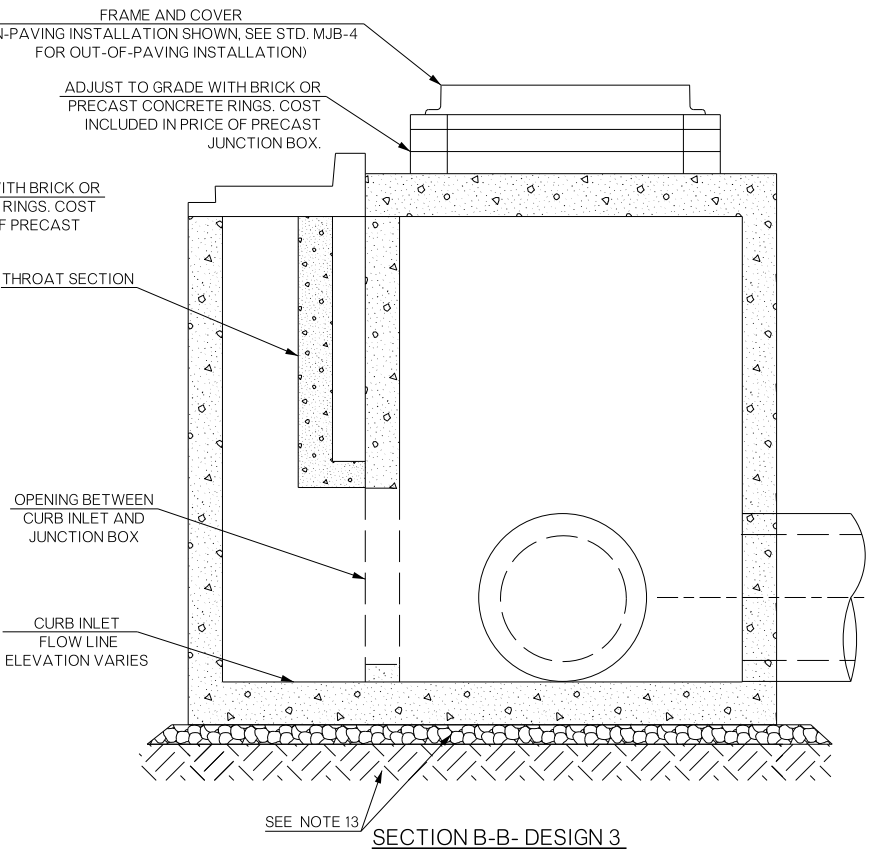
SECTION A-A - NON-STANDARD DEPTH



SECTION A-A - STANDARD DEPTH

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL											
JUNCTION BOX WIDTH ■	STANDARD DEPTH	A BARS (IN ² /FT)	AH BARS (IN ² /FT)					B BARS (IN ² /FT)	BS	TS	AV BARS (IN ² /FT)
		ALL DEPTHS TO 10 FT	DEPTH					ALL DEPTHS TO 10 FT			ALL DEPTHS TO 10 FT
			5'-6'	6'-7'	7'-8'	8'-9'	9'-10'				
48"	6'-0"	0.29	0.11	0.12	0.13	0.14	0.15	0.29	6"	6"	0.11
60"	6'-0"	0.36	0.15	0.17	0.19	0.21	0.23	0.30	6"	8"	0.11
72"	6'-0"	0.44	0.21	0.24	0.27	0.30	0.32	0.41	6"	8"	0.11

■ JUNCTION BOXES ARE SQUARE, WITH ALL SIDES BEING THE LENGTH SHOWN.



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.

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 MFC-5, SSIF-5, CIG-4 AND CI-2. COST OF FRAMES, GRATES AND HOODS SHALL BE INCLUDED IN THE COST OF THE STRUCTURE.
- THE THREE PRECAST JUNCTION BOX DESIGNS SHOWN ARE TO BE MADE TO A DEPTH OF 6 FEET, ANY DEPTH ABOVE 6 FEET TO 10 FEET, SHALL BE PAID FOR AS "ADDITIONAL DEPTH", IN VF.
- 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.
- 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.
- MAXIMUM OPENING DIAMETER SHALL BE 4 INCHES LARGER THAN OUTSIDE DIAMETER OF PIPE.
- DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON BOTH SHOULDERS. MINIMUM SPIGOT DEPTH IS ¾ INCHES.
- 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 SECTION OR HALF THE JOINT DEPTH, WHICHEVER IS GREATER. JOINT SEALING SHALL BE INCLUDED IN COST OF STRUCTURE.
- 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.
- OPENINGS IN FLAT SLAB TOPS SHALL BE ADDITIONALLY REINFORCED WITH A MINIMUM OF 0.20 SQUARE INCHES OF STEEL AT 90 DEGREES.
- THE ENGINEER MAY SPECIFY THE USE OF STEPS OR LADDERS, WHICH SHALL CONFORM TO ASTM C478.
- THE ORIENTATION OF THE SPIGOT IS FOR INFORMATIONAL PURPOSES ONLY AND IS AT THE DISCRETION OF THE MANUFACTURER.
- PRECAST JUNCTION BOXES CAN BE MADE UP TO A DEPTH OF 10 FEET USING DESIGN SHOWN ON THIS SHEET. DEPTHS GREATER THAN 10 FEET WILL REQUIRE SPECIAL DESIGN.
- ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST JUNCTION BOX.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
611(G)	PRECAST INLET PJB 4' WIDE (DES. ▲)	EA.
611(G)	PRECAST INLET PJB 5' WIDE (DES. ▲)	EA.
611(G)	PRECAST INLET PJB 6' WIDE (DES. ▲)	EA.
611(H)	ADD'L DEPTH IN PRECAST INLET PJB 4' WIDE	VF
611(H)	ADD'L DEPTH IN PRECAST INLET PJB 5' WIDE	VF
611(H)	ADD'L DEPTH IN PRECAST INLET PJB 6' WIDE	VF

▲ SPECIFY INLET DESIGN & CURB OPENING DESIGNATION. REFER TO STD. PCI-1.

ROADWAY DESIGN DIVISION STANDARD

PRECAST JUNCTION BOX
(KEYED WITH PRECAST CURB INLETS)



OKLAHOMA
Transportation

APPROVED BY ROADWAY DESIGN DIVISION
ON 01/07/2026

2019 SPECIFICATIONS

PJB

1

R-43

DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

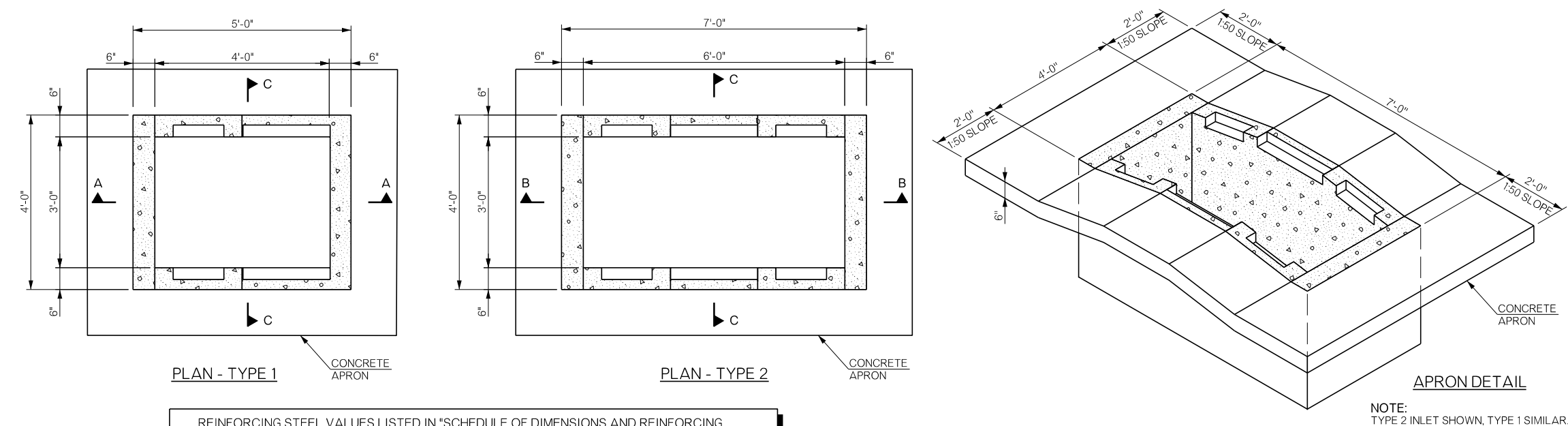
$f'_c = 4 \text{ KSI}$
 $f_y = 60 \text{ KSI}$

LOADING:
HL-93

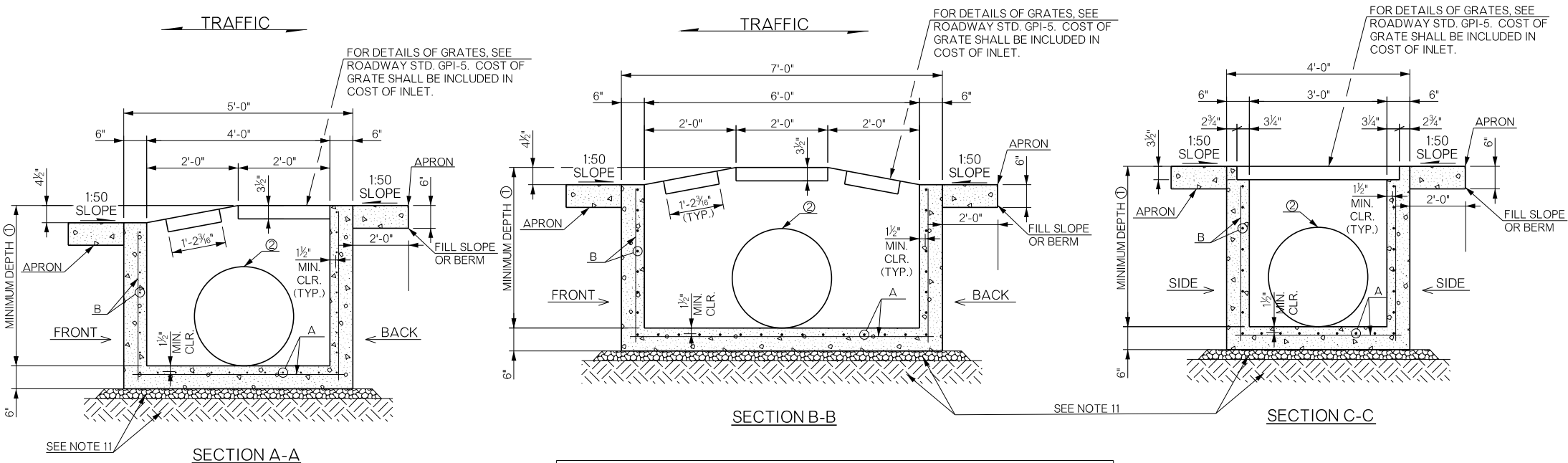
DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION
ASTM C890
ASTM C913

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- FOR DETAILS OF GRATES SEE ROADWAY 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.



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.



SCHEDULE OF DIMENSIONS AND REINFORCING STEEL							
DEPTH ≤ 6 FT. ③							
	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 SIDES	1	18"	3'-6"	0.20	0.20	0.12
		2	24"	3'-6"	0.20	0.20	0.12
		3	30"	4'-0"	0.20	0.20	0.12
		4	36"	5'-0"	0.20	0.20	0.12
TYPE 2	PIPE AT FRONT OR BACK	5	18"	3'-6"	0.20	0.20	0.12
		6	24"	3'-6"	0.20	0.20	0.12
		7	18"	3'-6"	0.20	0.20	0.12
		8	24"	3'-6"	0.20	0.20	0.12
	PIPE AT SIDES	9	30"	4'-0"	0.20	0.20	0.12
		10	36"	5'-0"	0.20	0.20	0.12
	PIPE AT FRONT OR BACK	11	18"	3'-6"	0.20	0.20	0.12
		12	24"	3'-6"	0.20	0.20	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: *[Signature]* DATE: 4/1/2025

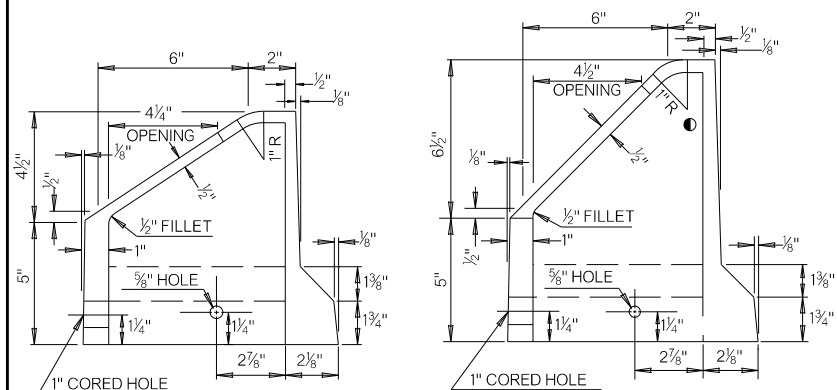
ROADWAY DESIGN DIVISION STANDARD



PRECAST GRATED PIPE DROP INLET

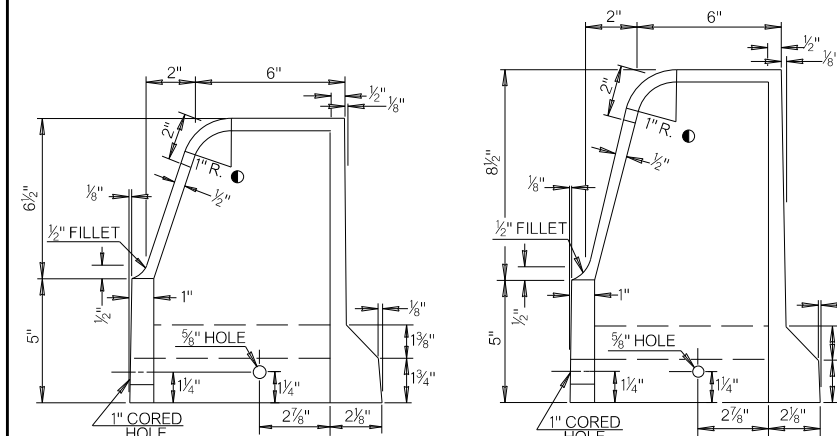
2019 SPECIFICATIONS

PGPI	0
R-44	



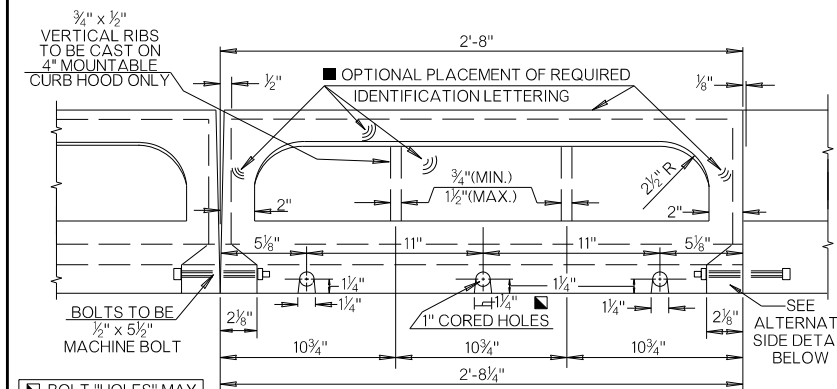
4" MOUNTABLE CURB HOOD

6" MOUNTABLE CURB HOOD



6" BARRIER CURB HOOD

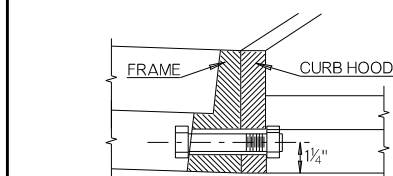
8" BARRIER CURB HOOD



CAST IRON HOOD ELEVATION

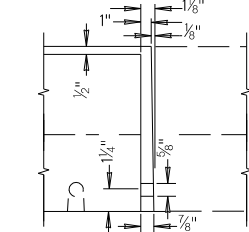
■ BOLT "HOLES" MAY BE CLOSED CORED HOLES OR SLOTS.

■ TOP OF HOOD SHALL STATE "DUMP NO WASTE" AND "DRAINS TO RIVER" OR SIMILAR WORDING.

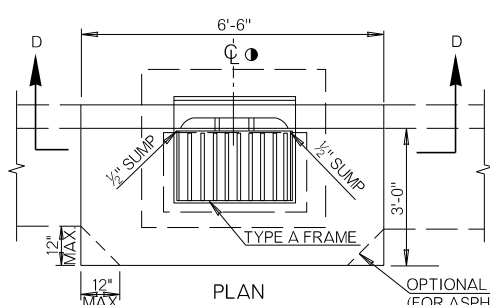


DETAIL OF CONNECTION
FRAME & CAST IRON HOOD

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

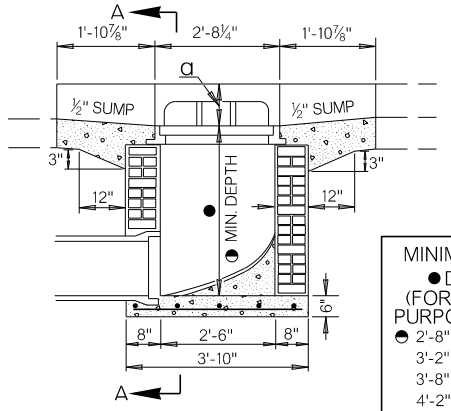


ALTERNATE SIDE DETAIL



PLAN

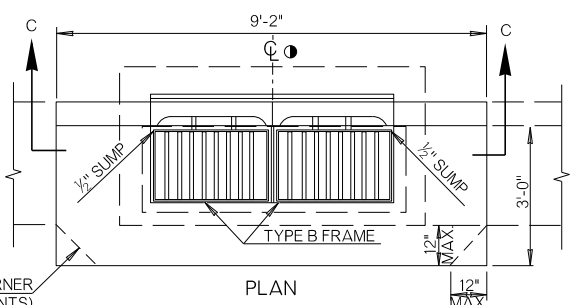
OPTIONAL CLIPPED CORNER
(FOR ASPHALT PAVEMENTS)



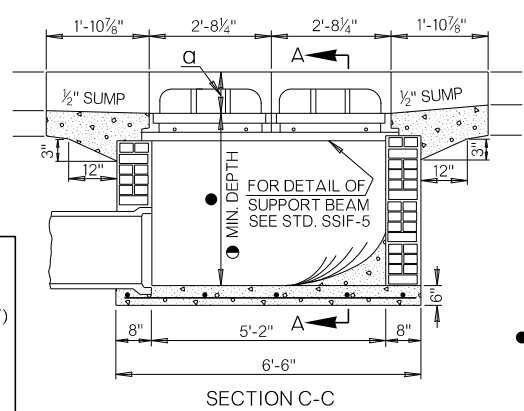
SECTION D-D

DESIGN 1
(SINGLE GRATE)

MINIMUM INLET
● DEPTH
(FOR DRAWING
PURPOSES ONLY)
● 2'-8" FOR 18" RCP
● 3'-2" FOR 24" RCP
● 3'-8" FOR 30" RCP
● 4'-2" FOR 36" RCP

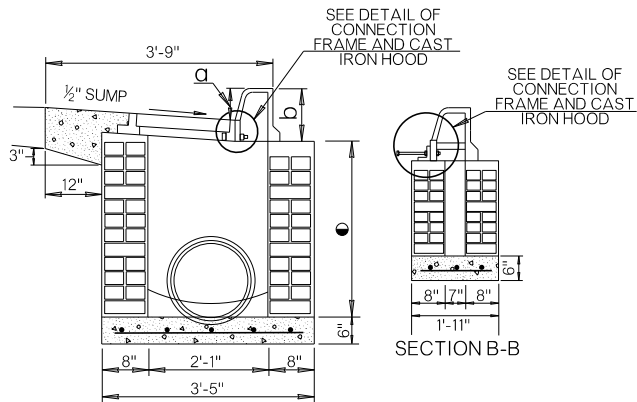


PLAN

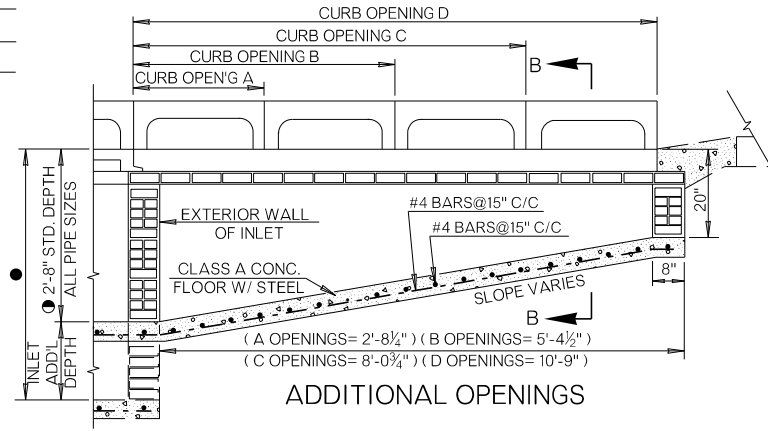


SECTION C-C

DESIGN 2 (DOUBLE GRATING)
DESIGN 3 (MULTIPLE DOUBLE GRATING)



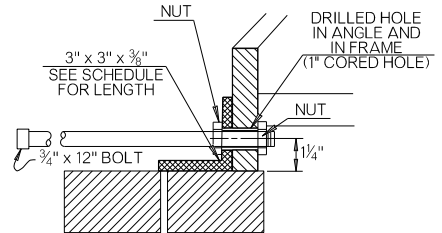
SECTION A-A



ADDITIONAL OPENINGS

● 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"



DETAIL OF CONNECTION
ANGLE IRON & CAST IRON HOOD

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

QUANTITIES (FOR 18" R.C. PIPE AND MIN. DEPTH) ■								
INLET	CURB OPENING	CLASS A CONCRETE	INLET	INLET FRAME & GRATE	CAST IRON HOOD	ANGLE IRON		
DESIGN	DESIGNATION	CU. YD.	BASE (CF) ▼	ADD'L CF PER VERT FT.	EACH	EACH	NO.	LENGTH
1	STD.	0.24	17.76	7.89	1	1	-	-
	A	0.34	23.84	7.89	1	2	1	2'-5 3/8"
	B	0.43	30.11	7.89	1	3	1	5'-1 1/8"
	C	0.53	36.38	7.89	1	4	1	7'-9 7/8"
	D	0.63	42.66	7.89	1	5	1	10'-6 1/8"
	2A	0.43	29.91	7.89	1	3	2	2'-5 3/8"
	A-B	0.53	36.19	7.89	1	4	2	2'-5 3/8"
	A-C	0.62	42.46	7.89	1	5	2	2'-5 3/8"
	2B	0.62	42.46	7.89	1	5	2	5'-1 1/8"
	B-C	0.72	48.74	7.89	1	6	2	5'-1 1/8"
2	2C	0.82	55.01	7.89	1	7	2	7'-9 7/8"
	STD.	0.41	25.76	11.45	2	2	-	-
	B	0.60	38.11	11.45	2	4	1	5'-1 1/8"
	C	0.73	44.39	11.45	2	5	1	7'-9 7/8"
	D	0.79	50.66	11.45	2	6	1	10'-6 1/8"
	2B	0.79	50.46	11.45	2	6	2	5'-1 1/8"
	2C	0.98	63.01	11.45	2	8	2	7'-9 7/8"
	B-D	0.98	63.01	11.45	2	8	2	5'-1 1/8"
	2D	1.17	75.56	11.45	2	10	2	10'-6 1/8"
	2D	1.17	75.56	11.45	2	10	2	10'-6 1/8"
3	STD.	0.74	41.27	18.34	4	4	-	-
	B	0.93	53.62	18.34	4	6	1	5'-1 1/8"
	D	1.12	66.17	18.34	4	8	1	10'-6 1/8"
	2B	1.12	65.98	18.34	4	8	1	5'-1 1/8"
	B-D	1.31	78.52	18.34	4	10	2	5'-1 1/8"
	2D	1.50	91.07	18.34	4	12	2	10'-6 1/8"
	2D	1.50	91.07	18.34	4	12	2	10'-6 1/8"
	2D	1.50	91.07	18.34	4	12	2	10'-6 1/8"

■ DEPTH OF 2'-8" SHALL BE USED AS STANDARD DEPTH FOR ALL PIPE SIZES AND/OR PIPE TYPES.
FOR INLET DEPTHS GREATER THAN STANDARD DEPTH, A PAY ITEM FOR ADDITIONAL DEPTH IN INLET,
PAID AS VERTICAL FEET, SHALL BE USED. TO DETERMINE TOTAL INLET QUANTITY FOR INLET DEPTHS
GREATER THAN 2'-8", MULTIPLY ADDITIONAL DEPTH BY ADDITIONAL CUBIC FEET PER VERTICAL FOOT
AND ADD TO THE INLET BASE, IN CUBIC FEET.

▼ BASE AMOUNT IS THE CUBIC FEET OF THE INLET, WITHOUT ADDITIONAL DEPTH. AS AN EXAMPLE, THE
DESIGN 1B INLET IS HAVING WALLS 8" THICK, WITH OUTSIDE DIMENSIONS OF 3'-10" AND 3'-6" FOR THE
'MAIN' BOX, AND WALLS 8" THICK AND OUTSIDE DIMENSIONS OF 1'-11" AND 5'-4 1/2" FOR THE 'B' CURB
OPENING.

■ QUANTITIES SHOWN ARE FOR 2 DOUBLE-GRATED INLETS.

PAYMENT FOR ALL CLASS A CONCRETE AND ANY REINFORCING STEEL USED TO CONSTRUCT
CAST-IN-PLACE INLET WALLS OR FLOORS SHALL BE INCLUDED IN THE PRICE BID FOR THE INLET.
PRECAST INLET ALTERNATIVES ARE ACCEPTED, BUT ONLY IF THEIR DESIGNS FOLLOW ROADWAY
STANDARD PCI-1.

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

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- 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.
- 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.
- 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.
- ALL LETTERING TO BE RECESSED 1/16 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.
- 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.
- 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.
- 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).
- TYPE B AND C FRAMES TO BE USED FOR MULTIPLE DOUBLE GRATES. SEE ROADWAY STANDARD SSIF-5 FOR DETAILS.
- 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.
- CASTINGS AS SHOWN HERE SHALL BE CAST STEEL, DUCTILE IRON OR GRAY IRON CONFORMING TO SECTION 725 OF THE ODOT SPECIFICATIONS.
- TWO INCH RADIUS MAY BE USED IF APPROVED BY THE ENGINEER.
- CONSTRUCTION STATIONING OF THE CURB INLETS IS DETERMINED BY THE CENTERLINE (C) OF THE SURFACE GRATES.

APPROVED BY
ROADWAY ENGINEER: DATE: 4/1/2025

ROADWAY DESIGN DIVISION STANDARD

CAST-IN-PLACE CURB INLETS

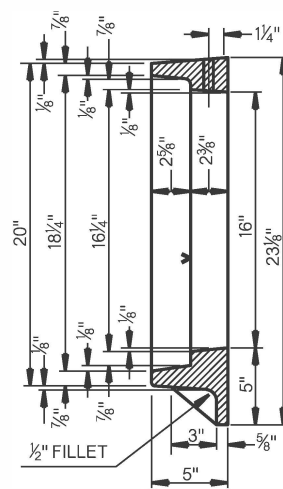


2019 SPECIFICATIONS

CI-2

3

R-45



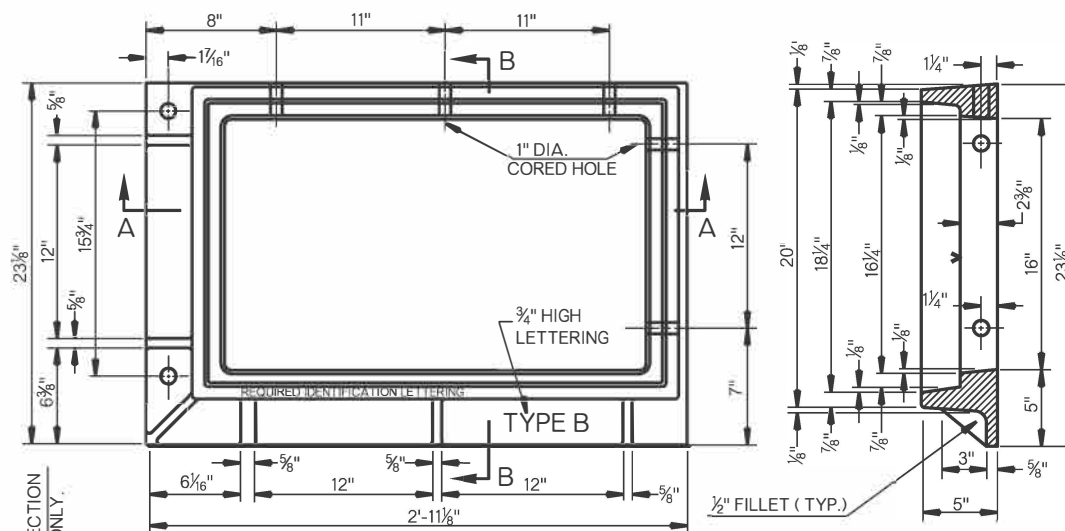
PLAN

SECTION B-B



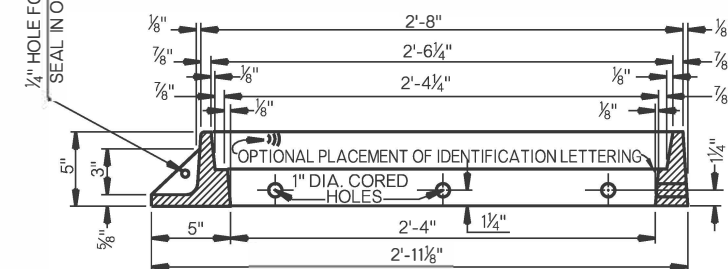
SECTION A-A

STORM SEWER INLET FRAME
TYPE A FOR INLET DESIGN NO. 1



PLAN

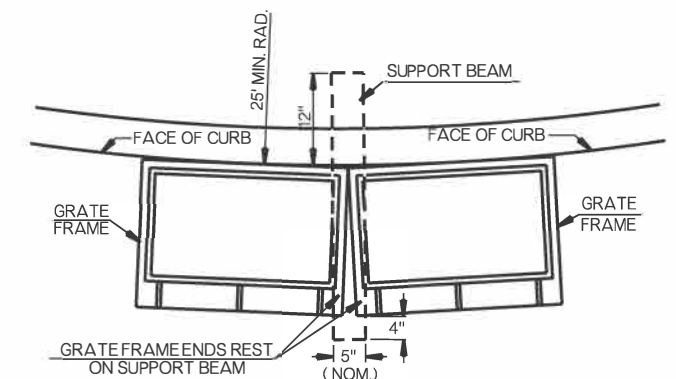
SECTION B-B



SECTION A-A

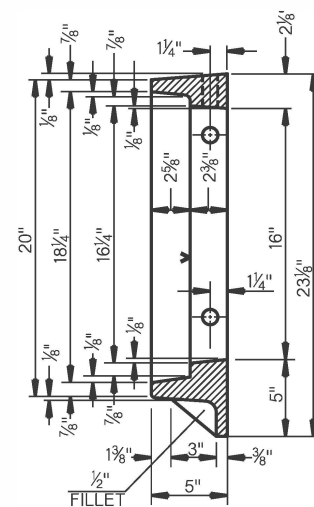
NOTE: MAKE ONE FRAME AS SHOWN
AND ONE REVERSED FOR DOUBLE
FRAMES

STORM SEWER INLET
FRAME TYPE B FOR
INLET DESIGN
NOS. 2 AND 3



M 5 x 18.9 x 3'-4" LONG

ALTERNATE SUPPORT BEAM
TO BE USED IN LIEU OF S 4 x 7.7, WHEN
STRUCTURE IS BUILT ALONG CURVED CURB



PLAN

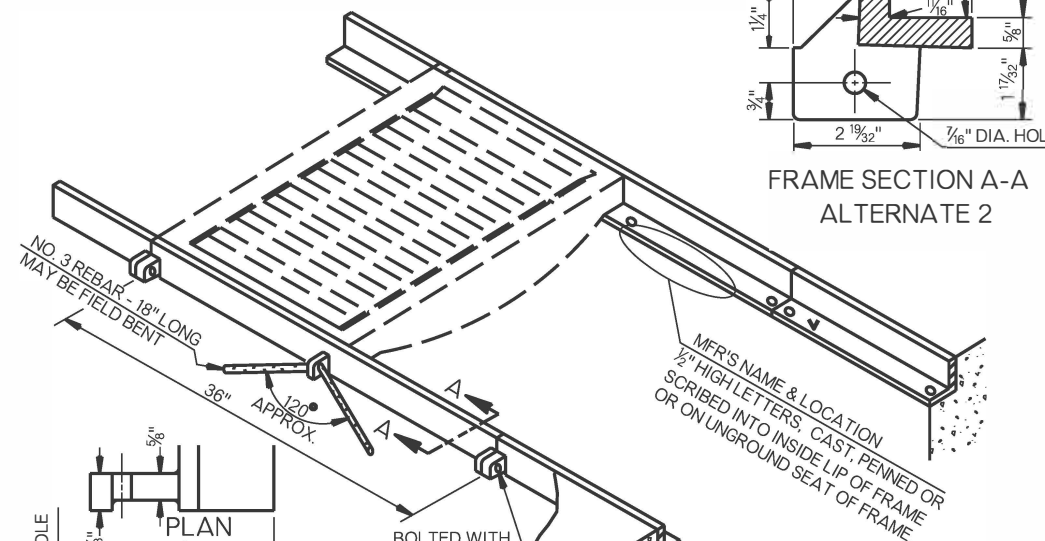
SECTION B-B



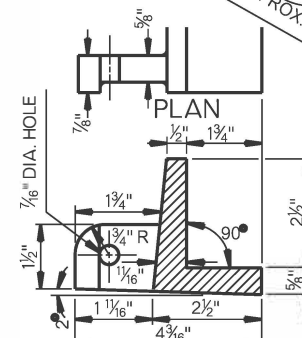
SECTION A-A

STORM SEWER INLET FRAME
TYPE C FOR INLET DESIGN NO. 3

NOTE: ONE PAY UNIT OF TYPE '1R' FRAME IS COMPOSED OF TWO 36" LONG SECTIONS OF FRAME. ONE TYPE '1R' FRAME REQUIRES TWO TRENCH TYPE GRATES (SEE ROADWAY STANDARD CIG-4). DO NOT USE FRAME TYPE GRATES IN A TRENCH INSTALLATION. COST OF BOLTS AND REBARS TO BE INCLUDED IN PRICE BID FOR INLET FRAME. FRAME MEMBERS MAY BE FURNISHED AS TWO 18" LONG PIECES, END-MATCHED, TO PROVIDE ONE 36" LONG UNIT.



FRAME SECTION A-A
ALTERNATE 2



FRAME SECTION A-A
ALTERNATE 1

STORM SEWER INLET FRAME
TYPE TR FOR TRENCH INLET

INLET FOR USE WITH INLET FRAME TR WILL NORMALLY BE A SPECIAL
DESIGN REINFORCED CONCRETE BOX WITH PART(S) OF THE TOP REMOVED.

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 ▲) MAY BE ACCOMPLISHED BY MILLING OR BY LEVEL GRINDING.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (I)	REPLACEMENT OF INLET FRAME AND GRATE (■)	EA
611 (J)	REPLACEMENT OF INLET FRAME (■)	EA

■ TYPE OF FRAME AND TYPE OF GRATE 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 SHEET FOR PAY UNIT.

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

STORM SEWER INLET FRAMES
(CURB INLETS)

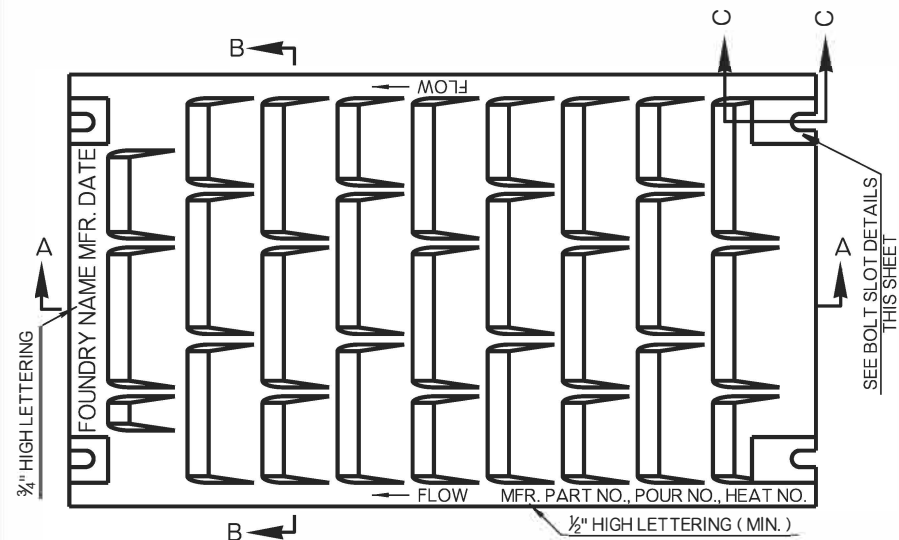


OKLAHOMA
Transportation

2019 SPECIFICATIONS

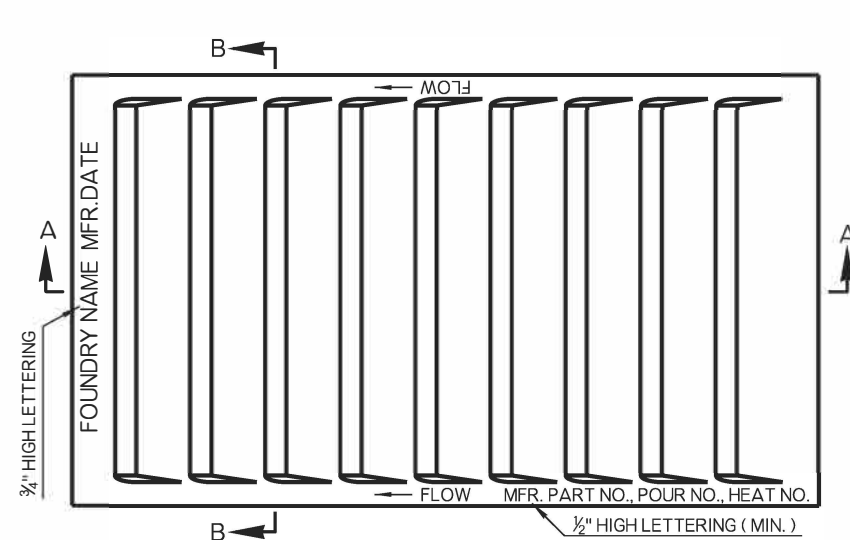
SSIF-5

R-46



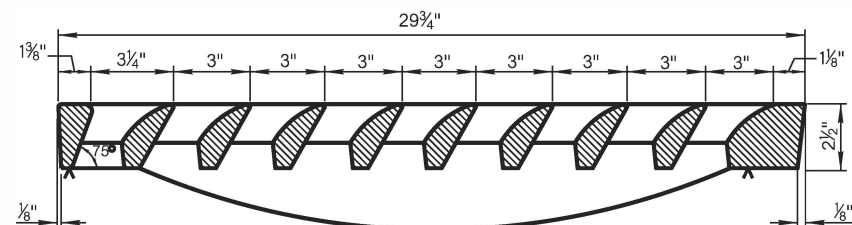
PLAN - RIBBED VANE GRATE
(SHOWN FOR TRENCH INSTALLATION)

TYPE RVG-F (FRAME INSTALLATION)
TYPE RVG-T (TRENCH INSTALLATION)

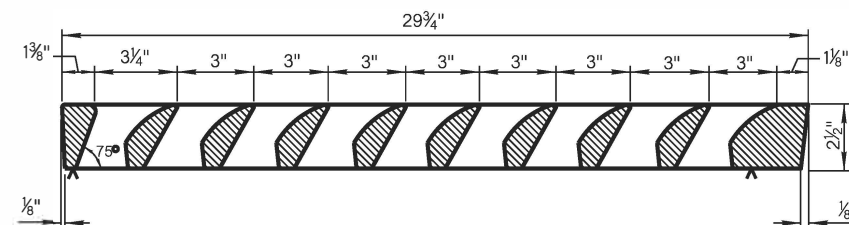


PLAN - VANE GRATE
(SHOWN FOR FRAME INSTALLATION)

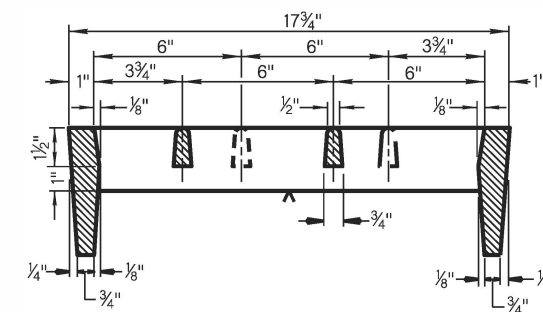
TYPE VG-F (FRAME INSTALLATION)
TYPE VG-T (TRENCH INSTALLATION)



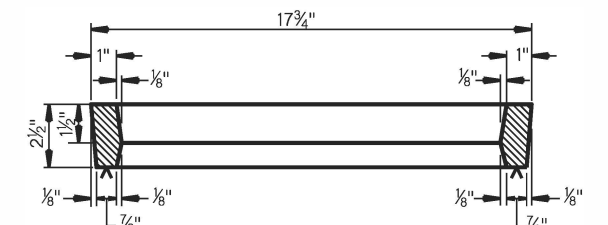
SECTION A - A (TRENCH INSTALLATION)



SECTION A - A (FRAME INSTALLATION)




SECTION B - B (TRENCH INSTALLATION)




SECTION B - B (FRAME INSTALLATION)

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FRAME TYPE GRATES SHALL NOT TO BE USED IN TRENCH INSTALLATIONS.
3. GRATES SHALL BE INSTALLED IN THE FRAME WITH FLOW ARROW POINTING DOWNSTREAM OR TOWARD THE LOW POINT IN A SUMP.
4. ALL LETTERING IS TO BE RECESSED 1/16". ALL INFORMATION REQUIRED SHALL BE SUFFICIENT FOR IDENTIFICATION, AS SHOWN.
5. GRATES SHALL BE CAST STEEL, DUCTILE IRON, OR GRAY IRON CONFORMING TO SECTION 725 OF THE SPECIFICATIONS.
6. ALL GRATES INSTALLED IN A TRENCH FRAME (STD. SSIF-5) SHALL HAVE A BOLTED HOLD-DOWN FEATURE. IF INSTALLED IN AN ANGLE IRON FRAME OR RESTING ON A CONCRETE SHOULDER, A POSITIVE HOLD-DOWN FEATURE, APPROVED BY THE ENGINEER, SHALL BE USED.
7. INLET FRAMES, GRATES AND COVER GRATES INSTALLED DURING ORIGINAL CONSTRUCTION SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE OF THE ORIGINAL INLET OR MANHOLE.

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

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (I)	REPLACEMENT OF INLET FRAME AND GRATE	EA
611 (K)	REPLACEMENT OF INLET GRATE (TYPE )	EA

▼ ANY FRAME TYPE GRATE ON THIS DRAWING INSTALLED IN A PROPER FRAME, AS SHOWN ON ROADWAY STANDARD SSIF-5 (TYPES A, B AND C) WILL COMPRISE THE PAY ITEM.

CAST INLET GRATE NOMENCLATURE	
TYPE VG-F	VANE GRATE - FRAME TYPE
TYPE VG-T	VANE GRATE - TRENCH TYPE
TYPE RVG-F	RIBBED VANE GRATE - FRAME TYPE
TYPE RVG-T	RIBBED VANE GRATE - TRENCH TYPE

APPROVED BY
ROADWAY ENGINEER:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

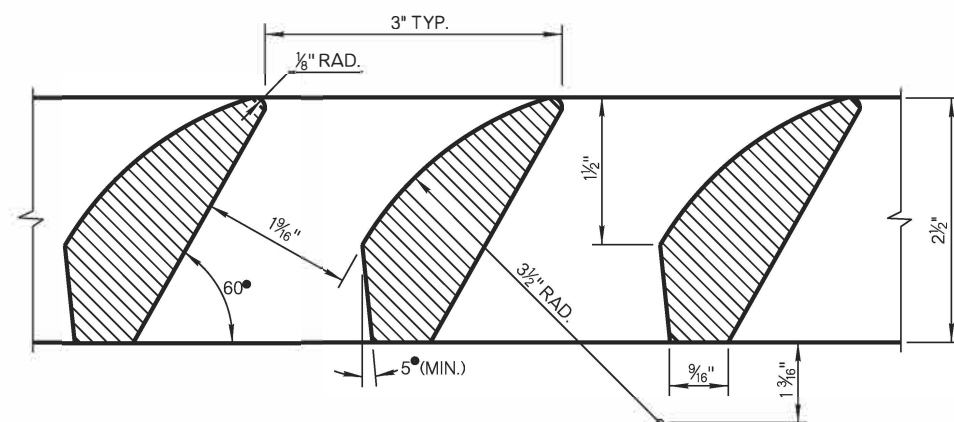


CAST IRON GRATES
(CURB INLETS)

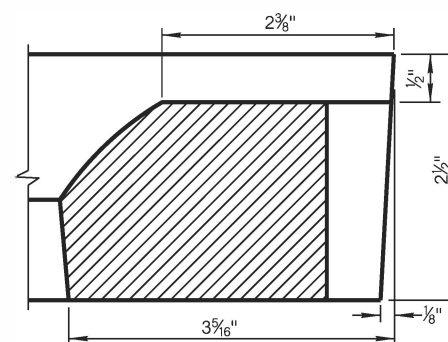
2019 SPECIFICATIONS

CIG-4 1

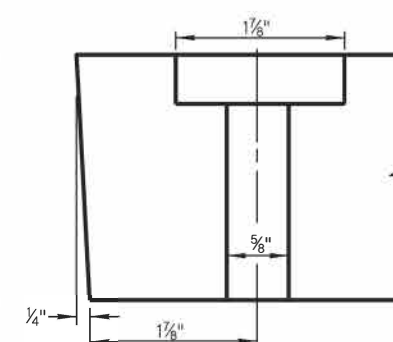
R-47



TYPICAL SECTION THRU VANES

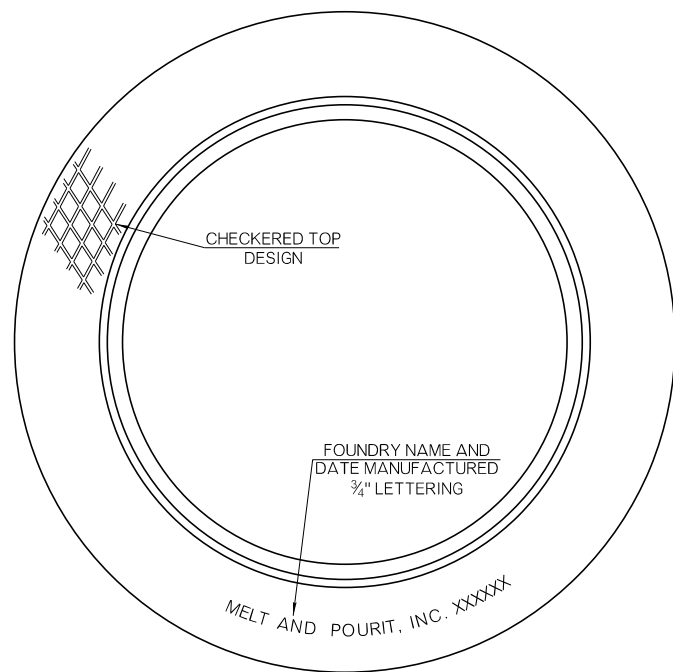


SECTION C - C

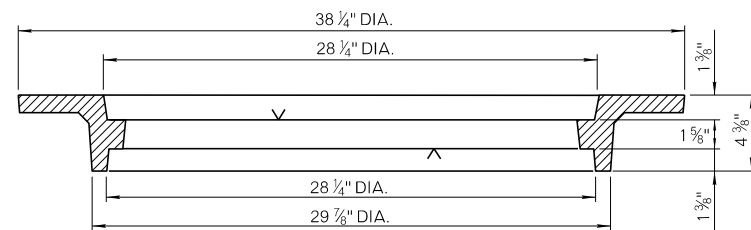


END VIEW

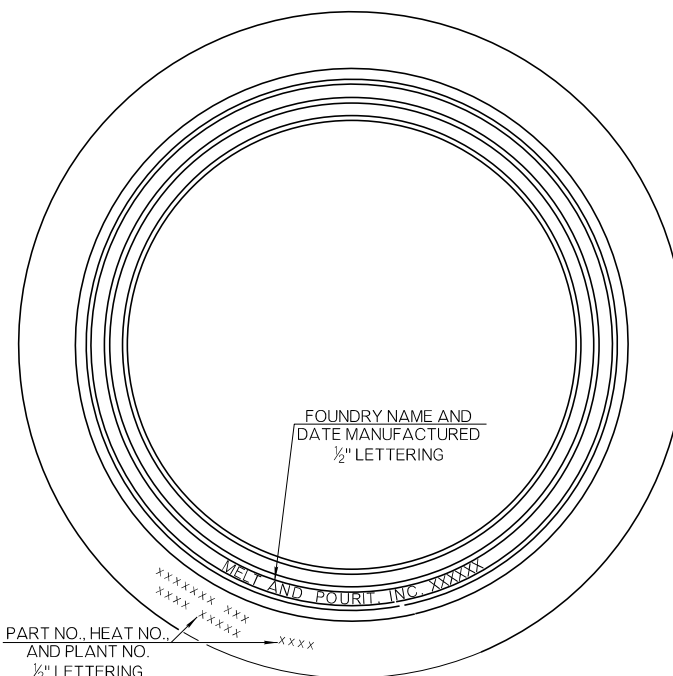
BOLT SLOT DETAILS



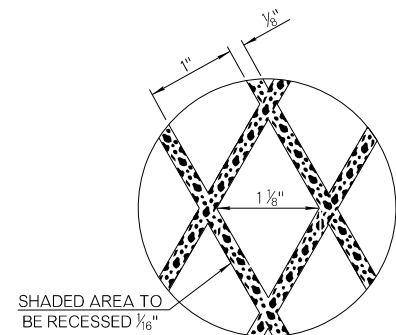
TOP SIDE OF FRAME FOR
OUT OF PAVING INSTALLATION



SECTION THRU FRAME, WHEN INSTALLED OUT OF PAVING

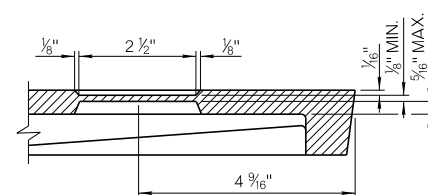


TOP SIDE OF FRAME FOR
IN PAVING INSTALLATION

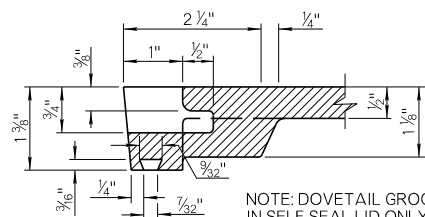


CHECKERED DESIGN DETAIL

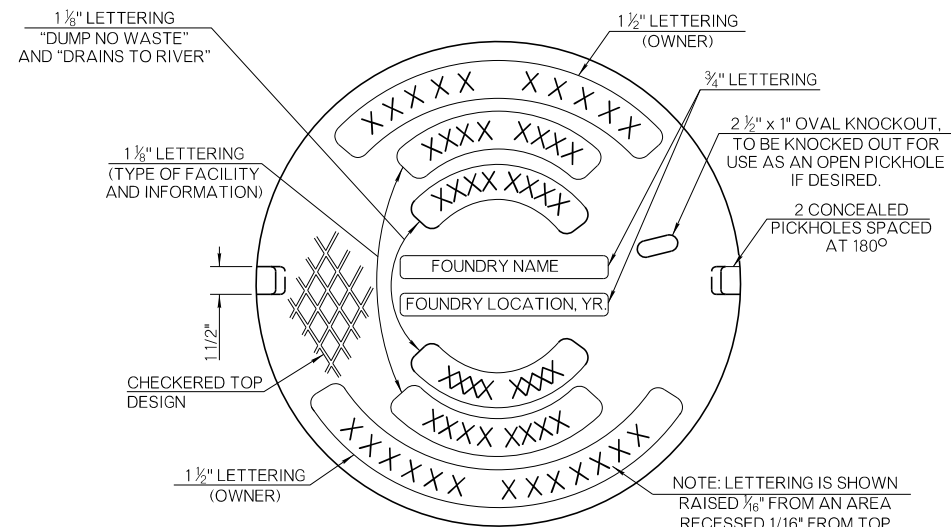
*NOTE: FRAME TO BE TURNED OVER
WHEN INSTALLED INSIDE OF PAVING.



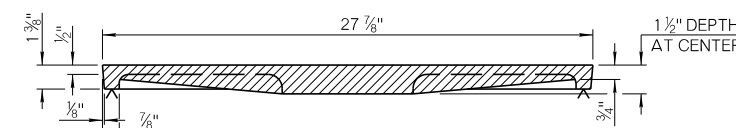
SECTION THRU
OVAL KNOCKOUT



SECTION THRU PICKHOLE

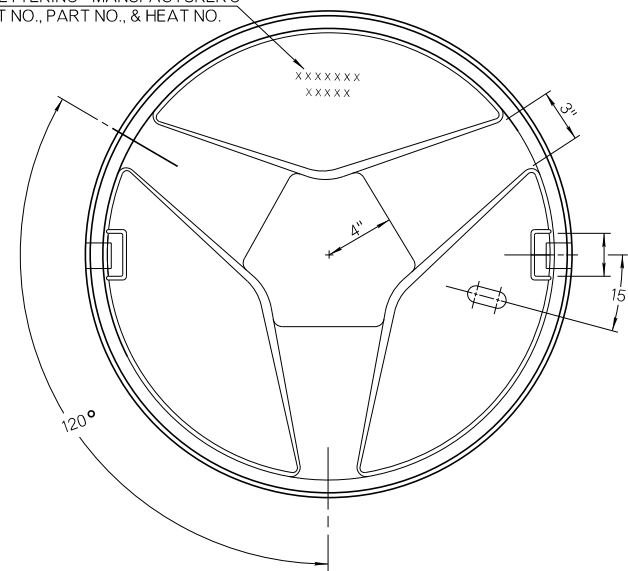


TOP SIDE OF COVER

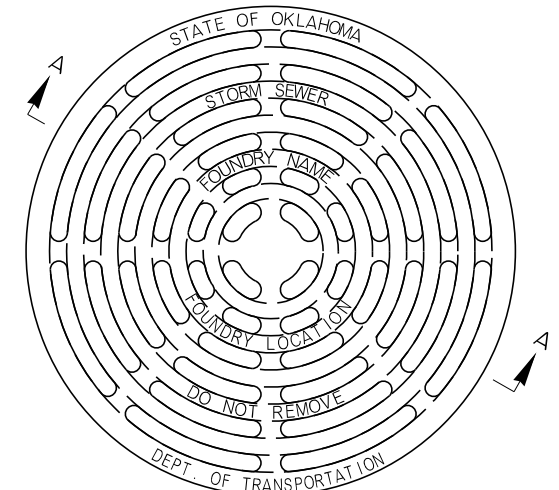


SECTION THRU COVER

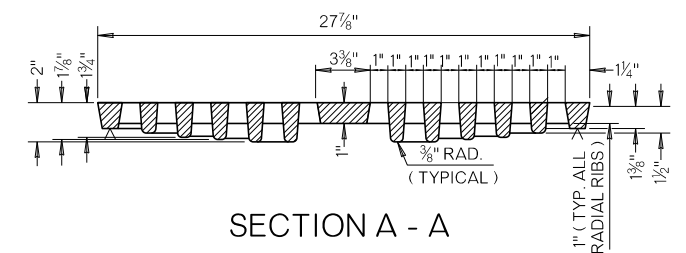
3/4\"/>



BOTTOM SIDE OF COVER



TOP SIDE OF COVER GRATE



SECTION A - A

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. COVERS WILL BE FURNISHED WITH A PLAIN SEAT, UNLESS A SELF-SEAL SEAT OR A LOCKING DEVICE IS SPECIFIED IN THE PLANS.
3. LETTERING TO DENOTE OWNERSHIP AND TYPE OF USAGE WILL BE AT THE DISCRETION OF THE OWNER.
4. FRAMES AND COVERS SHALL BE CAST STEEL, DUCTILE IRON, OR GRAY IRON CONFORMING TO SECTION 725 OF THE SPECIFICATIONS.
5. MANHOLE FRAMES, COVERS AND COVER GRATES INSTALLED DURING ORIGINAL CONSTRUCTION SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE OF THE ORIGINAL MANHOLE.

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

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611 (C)	REPLACEMENT OF MANHOLE FRAME AND COVER	EA
611 (D)	REPLACEMENT MANHOLE FRAME	EA
611 (E)	REPLACEMENT OF MANHOLE COVER	EA
611 (F)	REPLACEMENT OF MANHOLE COVER GRATE	EA

APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD



MANHOLE FRAME AND COVER

2019 SPECIFICATIONS

MFC-5 2

R-48

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- 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.
- SQUARE MANHOLES MAY BE SUBSTITUTED PER THE MANUFACTURER'S RECOMMENDATION. SEE THE CURRENT VERSION OF ROADWAY STANDARD PSM-1 FOR MATERIAL AND INSTALLATION DETAILS.
- PIPE OPENINGS SHALL NOT BE LOCATED IN A CONE SECTION.
- 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 CIRCUMFERENTIAL REINFORCING STEEL IN VERTICAL WALLS OF BASE, RISER, AND CONE IN ACCORDANCE WITH ASTM C478.
- PROVIDE A MINIMUM CLEAR COVER OF 1½ 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.²/ 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 ¾ INCHES.
- 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.
- 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.
- 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 REINFORCING 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.
- PRECAST CONCRETE GRADE RING WALL THICKNESS SHALL BE ½ OF INTERNAL DIAMETER OR 4 INCHES, WHICHEVER IS GREATER.
- 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 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:  DATE: 1/8/2025
ROADWAY DESIGN DIVISION STANDARD

PRECAST ROUND MANHOLE



2019 SPECIFICATIONS

PRM-1	3
	R-50

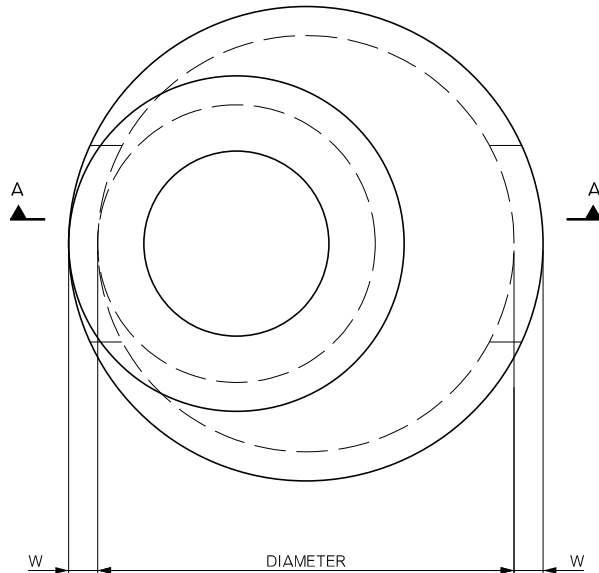
DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

$f'_c = 4 \text{ KSI}$
 $f_y = 60 \text{ KSI}$

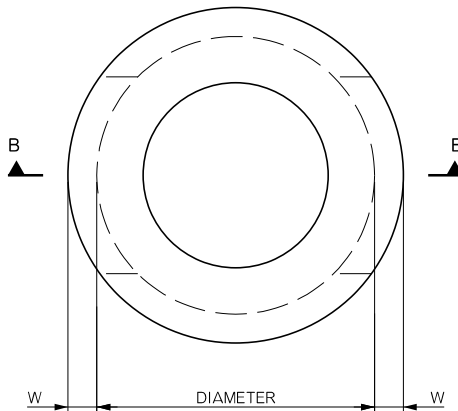
LOADING:
HL-93

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



PLAN VIEW - ROUND REDUCED RISER

ROUND MANHOLE, TYPE I

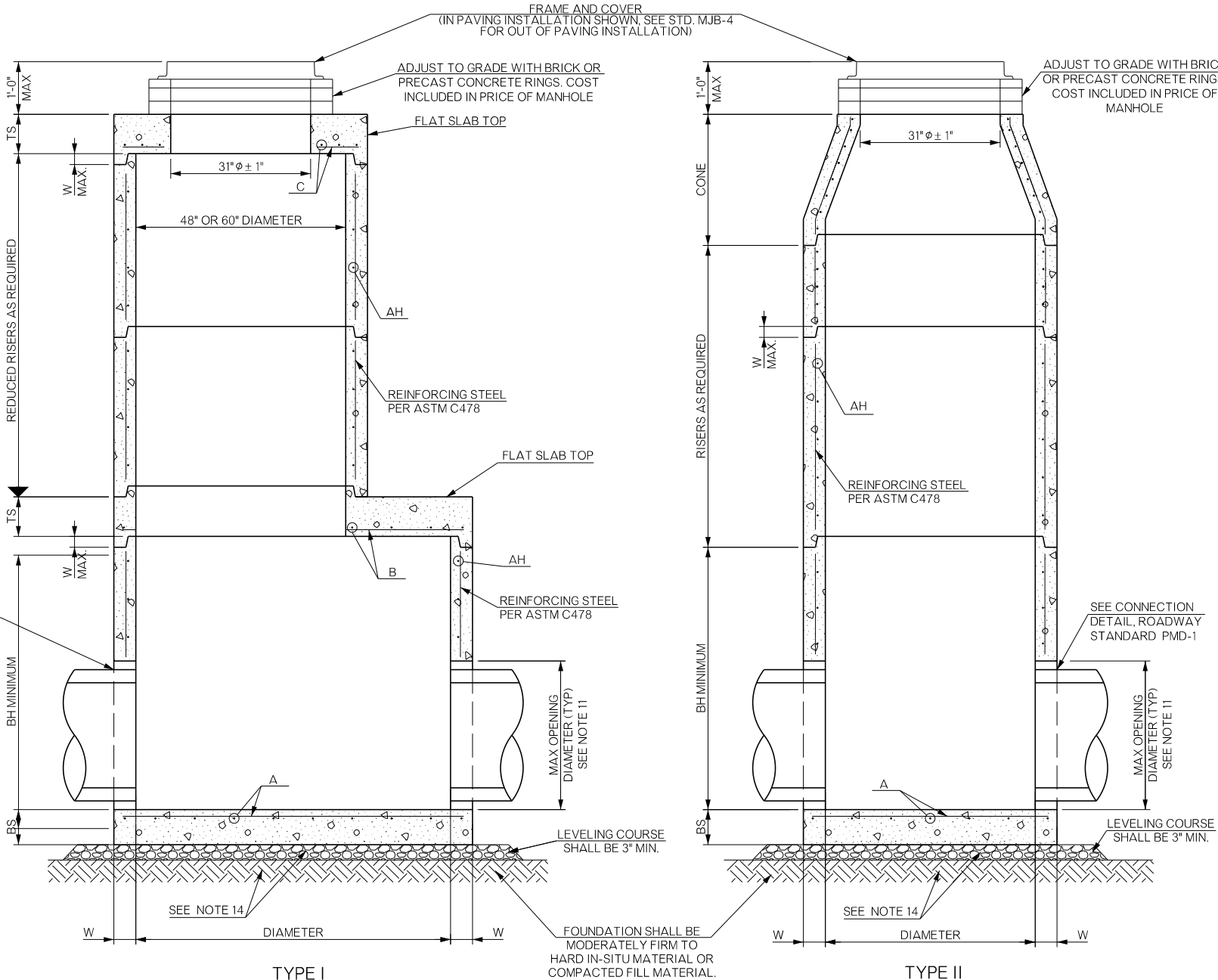


PLAN VIEW - ROUND RISER

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.'



TYPE I
SECTION A-A
ROUND REDUCED RISER OPTION
SHOWING FLAT SLAB TOP.
CONE MAY BE USED.

TYPE II
SECTION B-B
ROUND RISER OPTION
SHOWING CONE.
FLAT SLAB TOP MAY BE USED.

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 IN²/FT	-	0.28 IN²/FT	0.12 IN²/FT
60"	36"	8"	8"	6"	0.27 IN²/FT	0.41 IN²/FT	0.30 IN²/FT	0.15 IN²/FT
72"	36"	8"	8"	7"	0.35 IN²/FT	0.48 IN²/FT	0.41 IN²/FT	0.18 IN²/FT

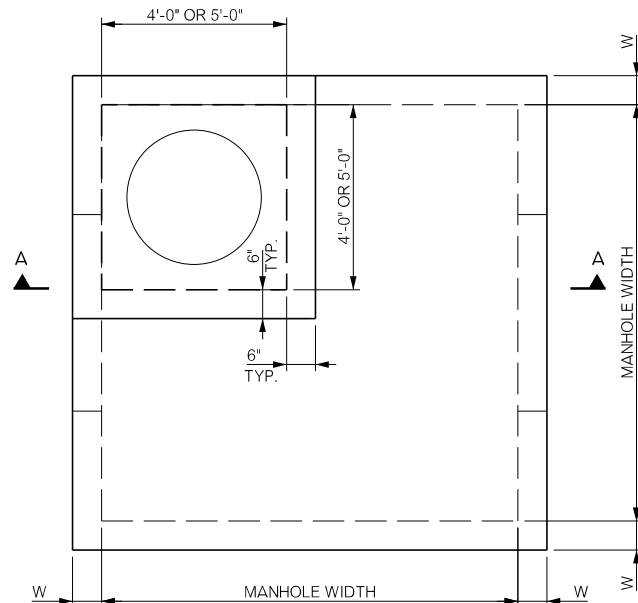
VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE LARGER VALUES THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.

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

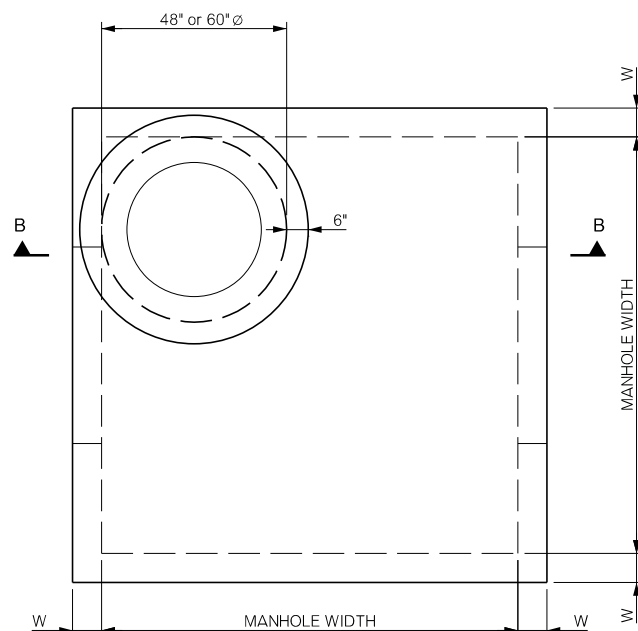
MATERIAL:
CLASS A CONCRETE $f'_c = 4$ KSI
REINFORCING STEEL $f_y = 60$ KSI

LOADING:
HL-93

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



■ PLAN VIEW - SQUARE REDUCED RISER
SQUARE MANHOLE, TYPE I

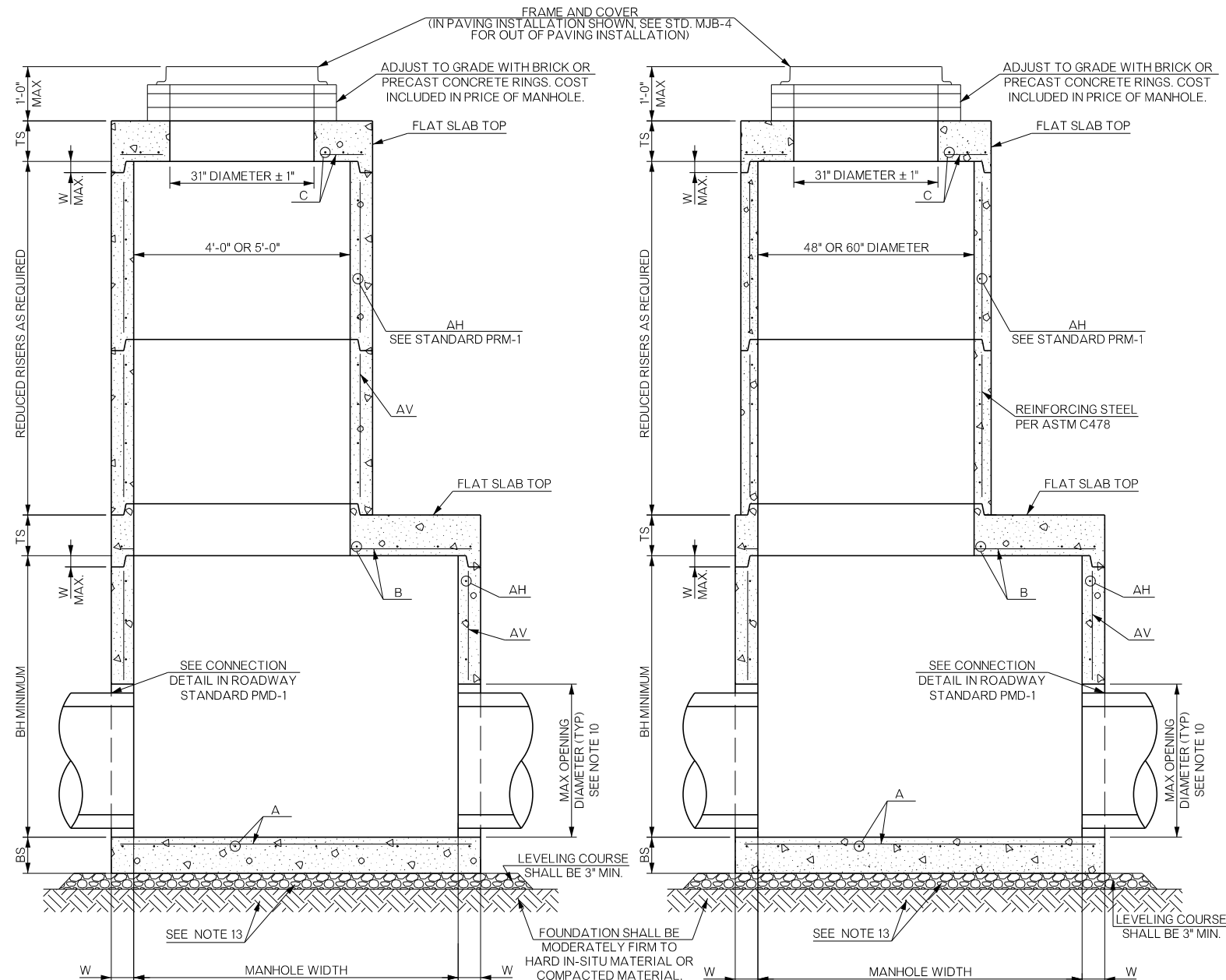


PLAN VIEW - ROUND REDUCED RISER

SQUARE 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'



TYPE I
SECTION A-A
SQUARE REDUCED RISER OPTION
SHOWING FLAT SLAB TOP.

TYPE II
SECTION B-B
ROUND REDUCED RISER OPTION
SHOWING FLAT SLAB TOP.
CONE MAY BE USED.

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL									
MANHOLE WIDTH	DEPTH ≤ 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.

1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. 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.
3. PRECAST ROUND MANHOLES MAY BE SUBSTITUTED PER THE MANUFACTURER'S RECOMMENDATION. SEE ROADWAY STANDARD PRM-1 FOR DESIGN AND INSTALLATION DETAILS.
4. THERE SHALL BE A MINIMUM DISTANCE OF 6 INCHES BETWEEN AN OPENING AND ANY JOINT.
5. PROVIDE LIFTING DEVICES IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. PROVIDE GRADE 60 REINFORCING STEEL CONFORMING TO ASTM A615 OR EQUIVALENT AREA OF WELDED WIRE REINFORCING CONFORMING TO ASTM A1064.
7. PROVIDE A MINIMUM CLEAR COVER OF 1½ INCHES TO REINFORCING STEEL.
8. 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.
9. DESIGN TONGUE AND GROOVE JOINTS FOR FULL CLOSURE ON RISER SHOULDERS, CONICAL TOPS, AND FLAT SLABS. MINIMUM SPIGOT DEPTH IS ¾ INCHES.
10. MAXIMUM OPENING SHALL BE 4 INCHES LARGER THAN OUTSIDE PIPE DIAMETER. REFER TO ROADWAY DESIGN STANDARD PMD-1 FOR PIPE CONNECTION MATERIAL.
11. 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.
12. DO NOT GROUT RUBBER GASKET JOINTS WITHOUT THE MANUFACTURER'S RECOMMENDATIONS.
13. 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.
14. OPENINGS IN FLAT SLAB TOPS SHALL BE ADDITIONALLY REINFORCED WITH A MINIMUM OF 0.20 SQ. IN. OF STEEL AT 90 DEGREES.
15. REFER TO PROJECT PLAN SHEETS FOR NUMBER, LOCATION, AND SIZE OF PIPE.
16. FLEXURAL REINFORCING STEEL SHALL NOT EXCEED SPACING OF 9 INCHES CENTER TO CENTER.
17. 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.
18. THE ENGINEER MAY SPECIFY THE USE OF STEPS OR LADDERS AND SHALL CONFORM TO ASTM C478.
19. THE ORIENTATION OF THE SPIGOT IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND IS AT THE DISCRETION OF THE MANUFACTURER.

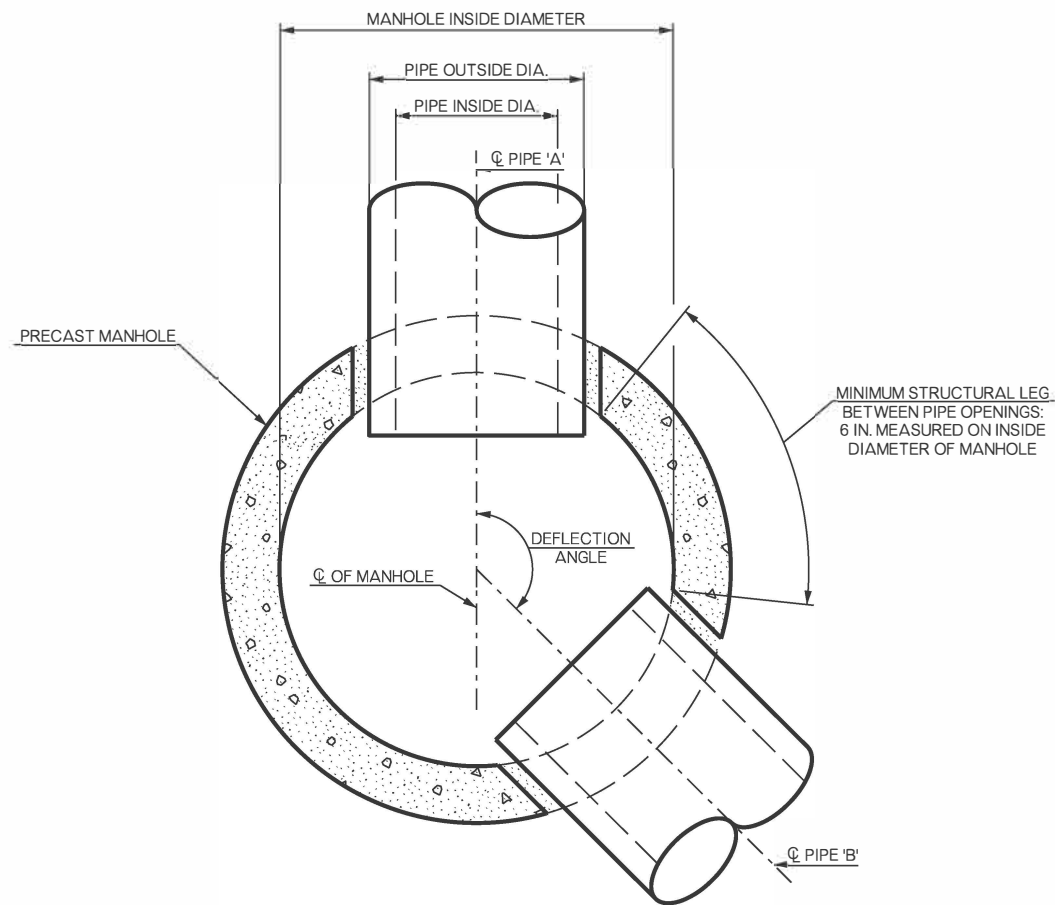
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611(A)	PRECAST CONC SQ 4' WIDE MANHOLE	EACH
611(A)	PRECAST CONC SQ 5' WIDE MANHOLE	EACH
611(A)	PRECAST CONC SQ 6' WIDE MANHOLE	EACH
611(B)	ADD'L DEPTH PRECAST SQ 4' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST SQ 5' MANHOLE	VF
611(B)	ADD'L DEPTH PRECAST SQ 6' MANHOLE	VF

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

PRECAST SQUARE MANHOLE



2019 SPECIFICATIONS

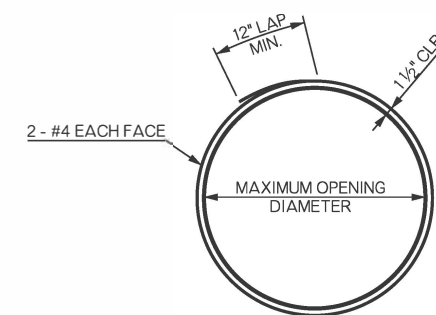


MANHOLE STRUCTURE SIZING DETAIL

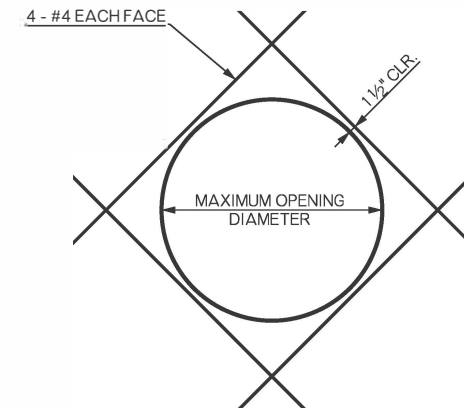
MANHOLE STRUCTURE SIZE SCHEDULE			
MANHOLE INSIDE DIAMETER	90° DEFLECTION	135° DEFLECTION	180° DEFLECTION
48"	18"	27"	30"
60"	27"	36"	42"
72"	33"	48"	48"

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>



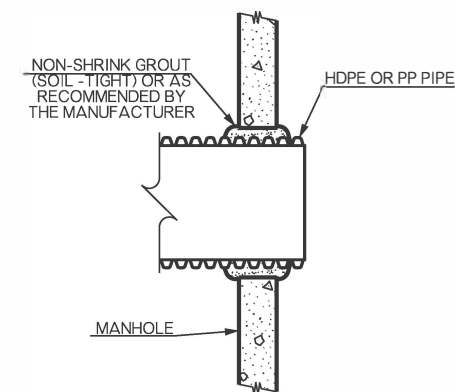
CIRCULAR



DIAMOND

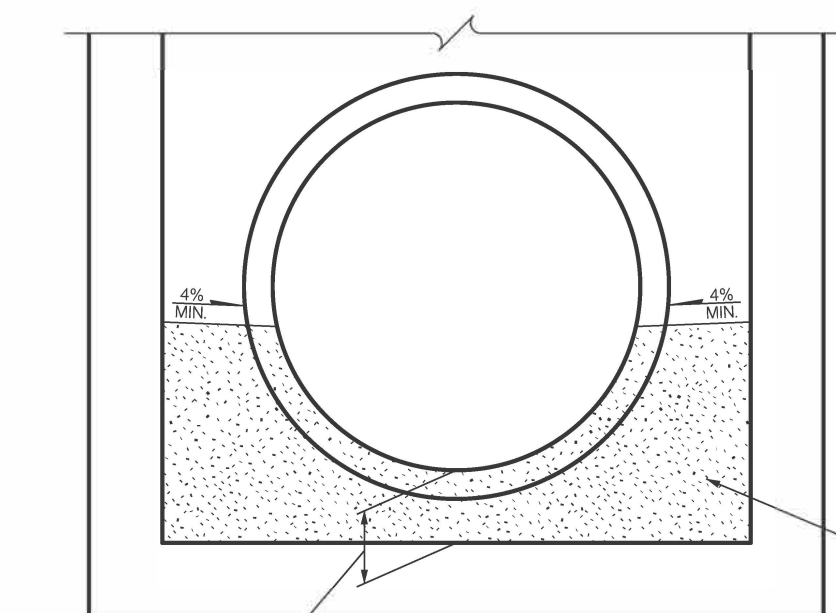
TYPICAL PIPE PENETRATION

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.



SEE ASTM C478 FOR INVERT DIMENSION REQUIREMENTS

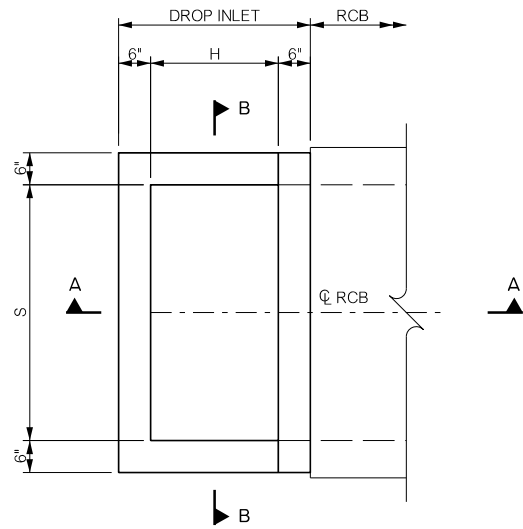
BENCHING DETAIL

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

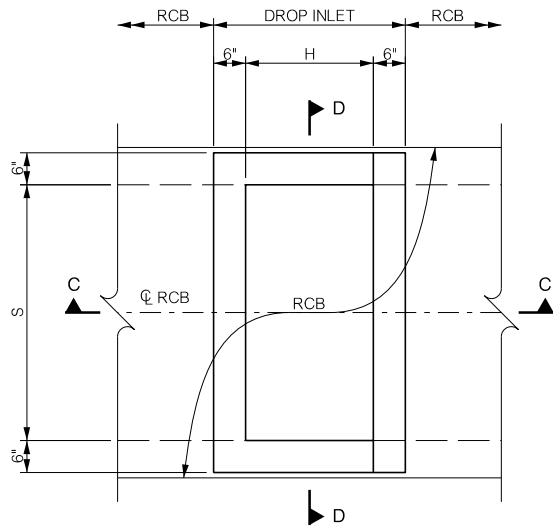


PRECAST MANHOLE DETAILS

2019 SPECIFICATIONS

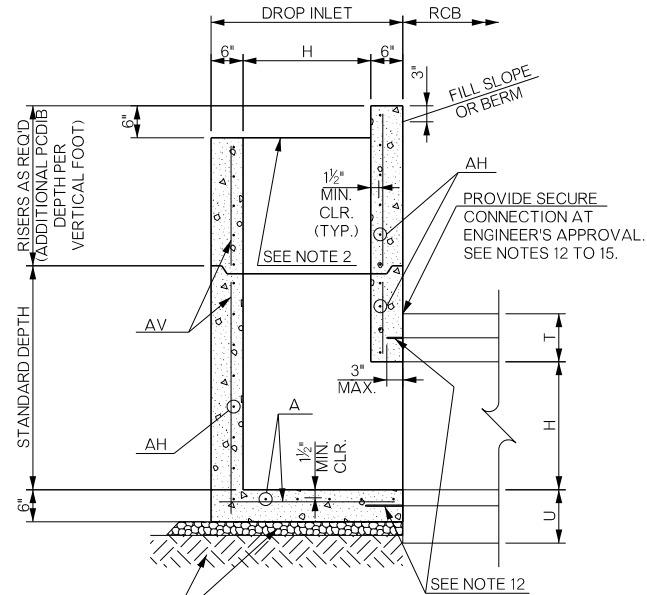


PLAN
ALTERNATE 1

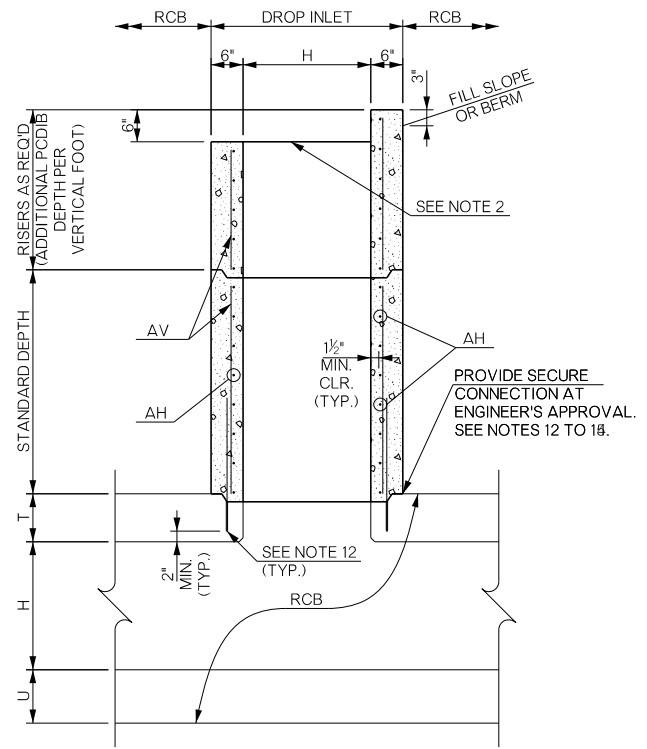


PLAN
ALTERNATE 2

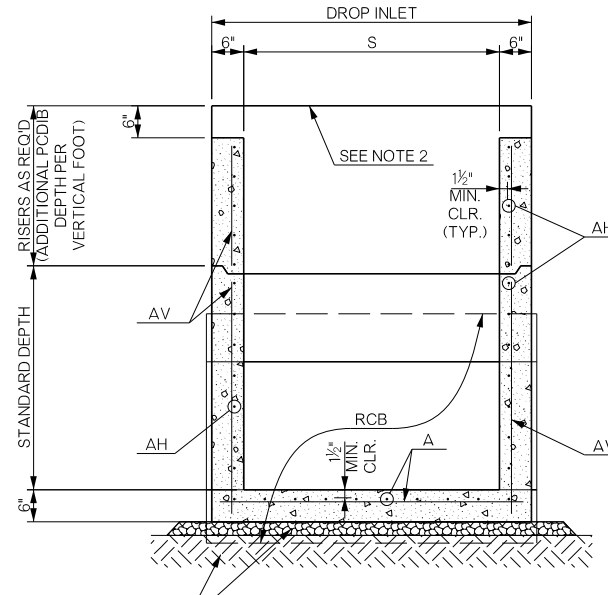
VALUES LISTED IN "SCHEDULE OF DIMENSIONS AND REINFORCING STEEL" ARE MINIMUM VALUES. STRUCTURES THAT PROVIDE LARGER VALUES THAN THOSE SHOWN WILL BE CONSIDERED ACCEPTABLE.



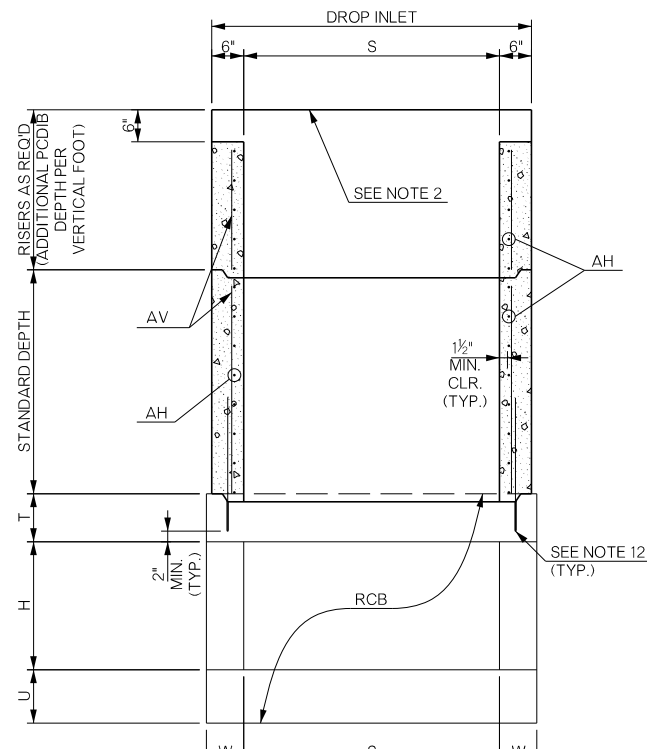
SECTION A-A
ALTERNATE 1



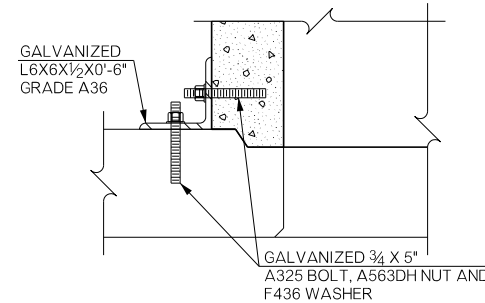
SECTION C-C
ALTERNATE 2



SECTION B-B
ALTERNATE 1



SECTION D-D
ALTERNATE 2



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

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 1 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 IN ²/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.(D3) 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 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".
- 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.

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:

[Signature]
ROADWAY DESIGN DIVISION STANDARD

DATE: 4/1/2025

PRECAST CONCRETE DROP INLETS FOR R.C. BOXES (4' x 2' TO 5' x 5')



2019 SPECIFICATIONS

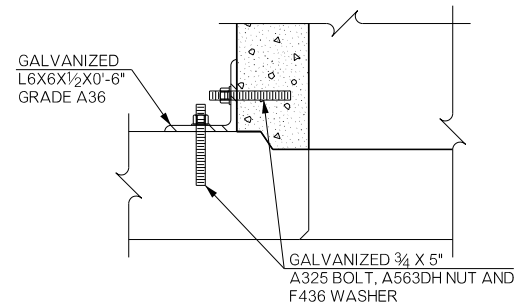
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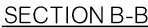
R-53

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL

DESIGN NO.	BARREL DIMENSIONS		STANDARD DEPTH	A BARS (IN ² /FT)			AH BARS (IN ² /FT) - ALTERNATE 1														AH BARS (IN ² /FT) - ALTERNATE 2														AV BARS (IN ² /FT) ALL DEPTHS TO 15'							
	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	0.12	0.11										
2	4'	3'	4'-6"	0.19	0.23	0.28													-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.13	0.11
3	4'	4'	5'-6"	0.20	0.24	0.31													-	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.13	0.14	0.15	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	0.11	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													-	0.11	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													-	-	0.11	0.11	0.11	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.11											
7	5'	5'	6'-6"	0.24	0.29	0.38													-	-	-	0.12	0.13	0.15	0.17	0.18	0.19	0.20	0.21	0.23	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.



DESIGN DATA

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

LOADING:
HL-93

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

GENERAL NOTES

1. ALL COMPONENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. FOR DETAILS OF GRATES SEE ROADWAY STANDARD CDB30-2. 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 1½ 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.(D3) 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 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".
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 SHALL NOT FOLLOW THIS STANDARD.
17. ALL MATERIALS AND LABOR INCLUDED IN COST OF PRECAST INLET.

▲ SPECIFY INLET DESIGN NUMBER

APPROVED BY
ROADWAY ENGINEER:  DATE: 4/1/2025

ROADWAY DESIGN DIVISION STANDARD

PRECAST CONCRETE DROP INLETS FOR 30 DEG. SKEW R.C. BOXES

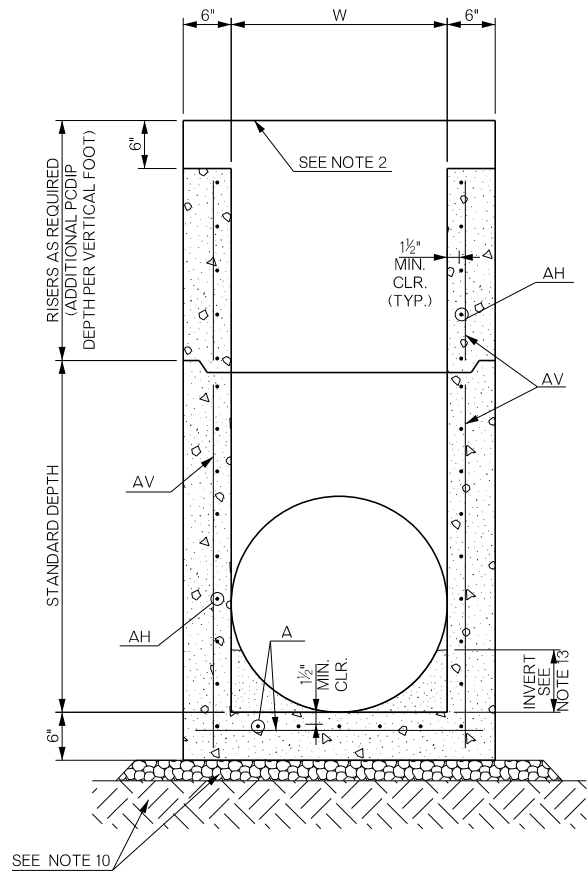
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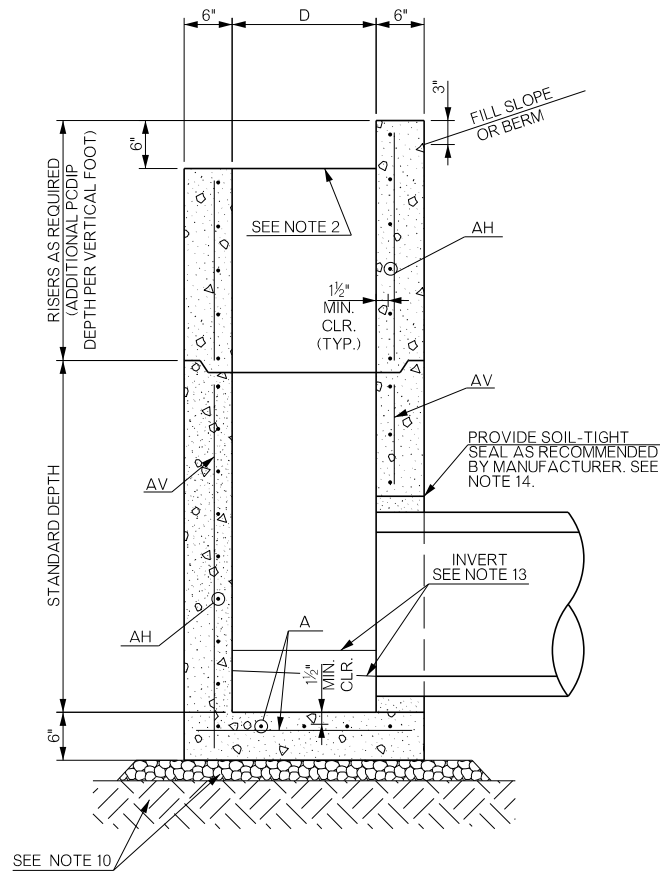
OKLAHOMA
Transportation

2019 SPECIFICATIONS

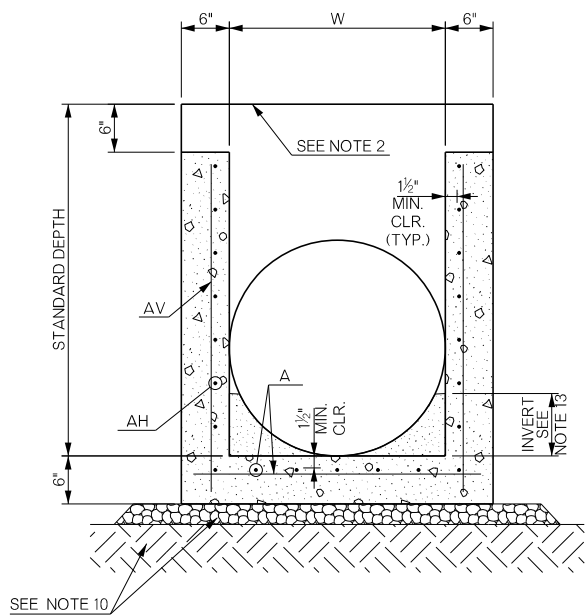
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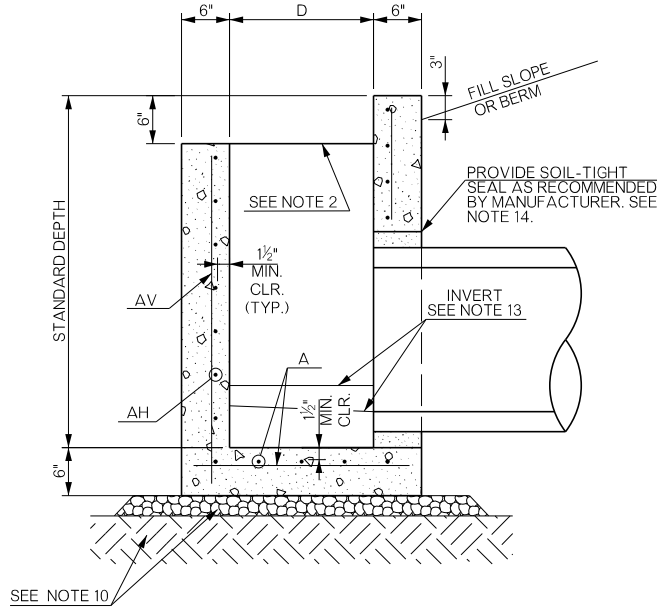
SECTION A-A
RISER OPTION



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.

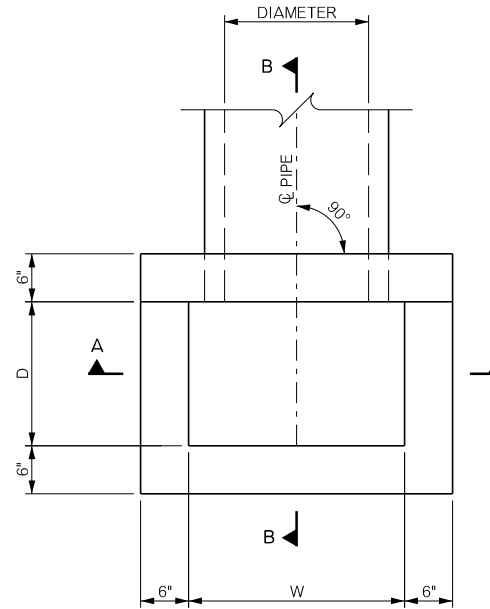
DESIGN DATA

MATERIAL:
CLASS A CONCRETE
REINFORCING STEEL

$f'_c = 4 \text{ KSI}$
 $f_y = 60 \text{ KSI}$

LOADING:
HL-93

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



PLAN

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 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.
- 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. ▲)".

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL

DESIGN NO.	DIAMETER	STANDARD DEPTH	D	W	A BARS (IN ² /FT)			AH BARS (IN ² /FT)														AV BARS (IN ² /FT)
					DEPTH			DEPTH														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	0.11	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"	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		
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 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. W.* DATE: 4/1/2025

ROADWAY DESIGN DIVISION STANDARD

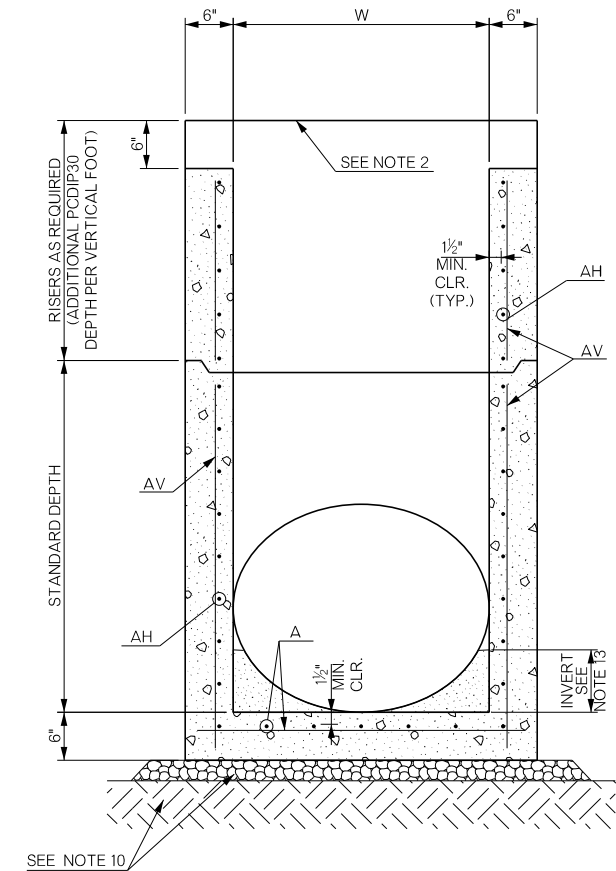
PRECAST CONCRETE DROP INLETS
FOR 18" TO 36" R.C. PIPES



2019 SPECIFICATIONS

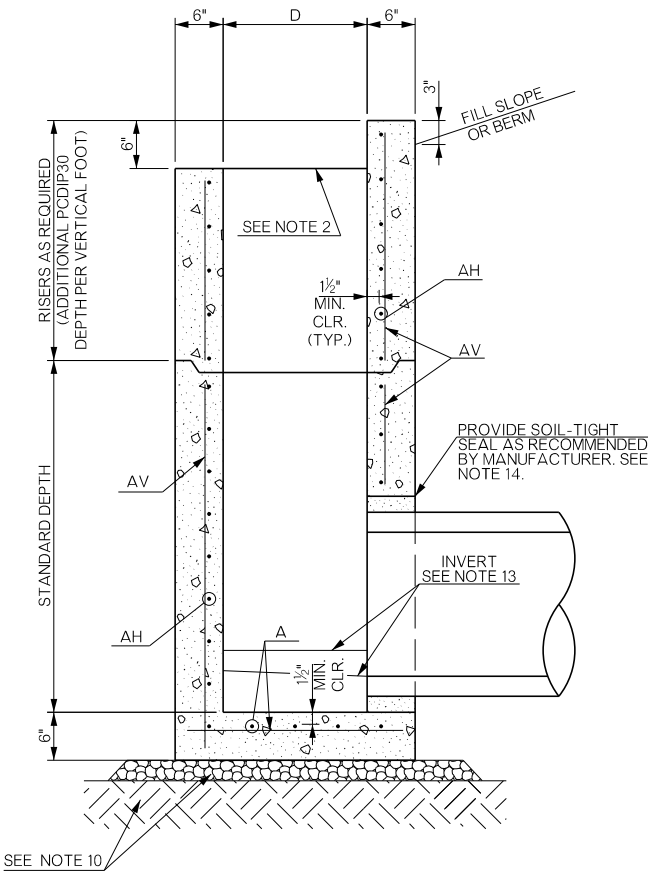
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R-55

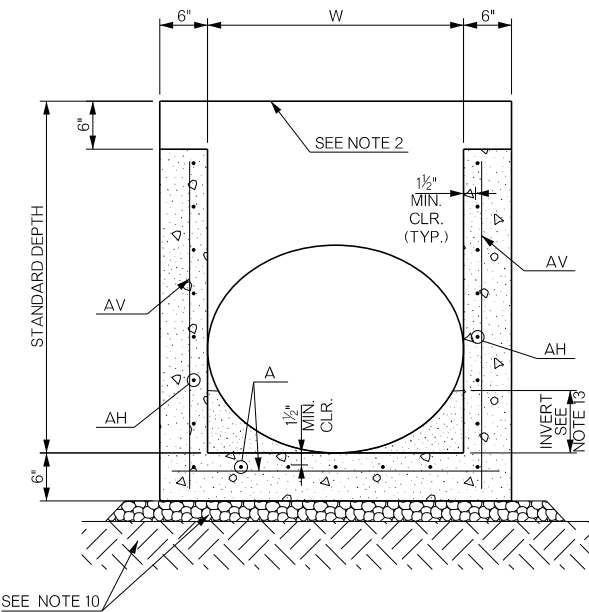


SECTION A-A
RISER OPTION

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

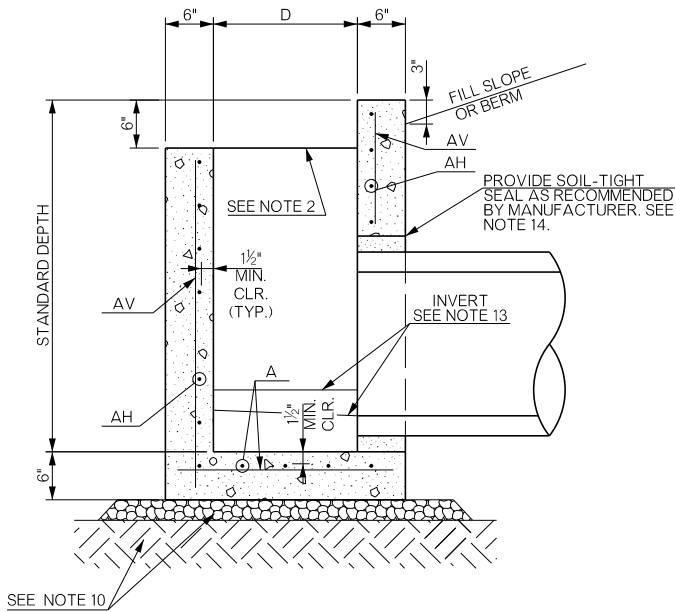


SECTION B-B
RISER OPTION



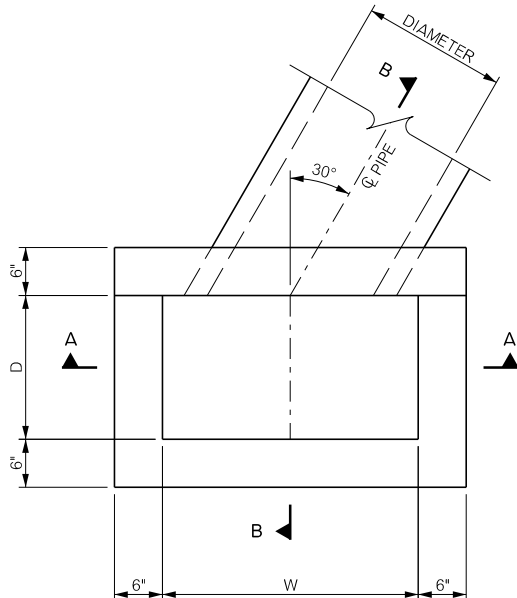
SECTION A-A
STANDARD DEPTH INLET

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.



PLAN

DESIGN DATA

MATERIAL:
CLASS A CONCRETE $f'_c = 4 \text{ KSI}$
REINFORCING STEEL $f_y = 60 \text{ KSI}$
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 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 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 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.

SCHEDULE OF DIMENSIONS AND REINFORCING STEEL																			
DESIGN NO.	DIAMETER	STANDARD DEPTH	D	W	A BARS (IN ² /FT)			AH BARS (IN ² /FT)											
					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'
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	0.12	0.12	0.13
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
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
3	30"	4'-5"	3'-0"	4'-0"	0.19	0.23	0.28	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.17	0.18	0.19	0.21	0.22
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

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:  DATE: 4/1/2025

ROADWAY DESIGN DIVISION STANDARD

PRECAST CONCRETE DROP INLETS
FOR 30 DEG. SKEW 18" TO 36" R.C. PIPES



2019 SPECIFICATIONS

PCDIP30	0
	R-56

LEGEND

ID = INSIDE DIAMETER

OD = OUTSIDE DIAMETER

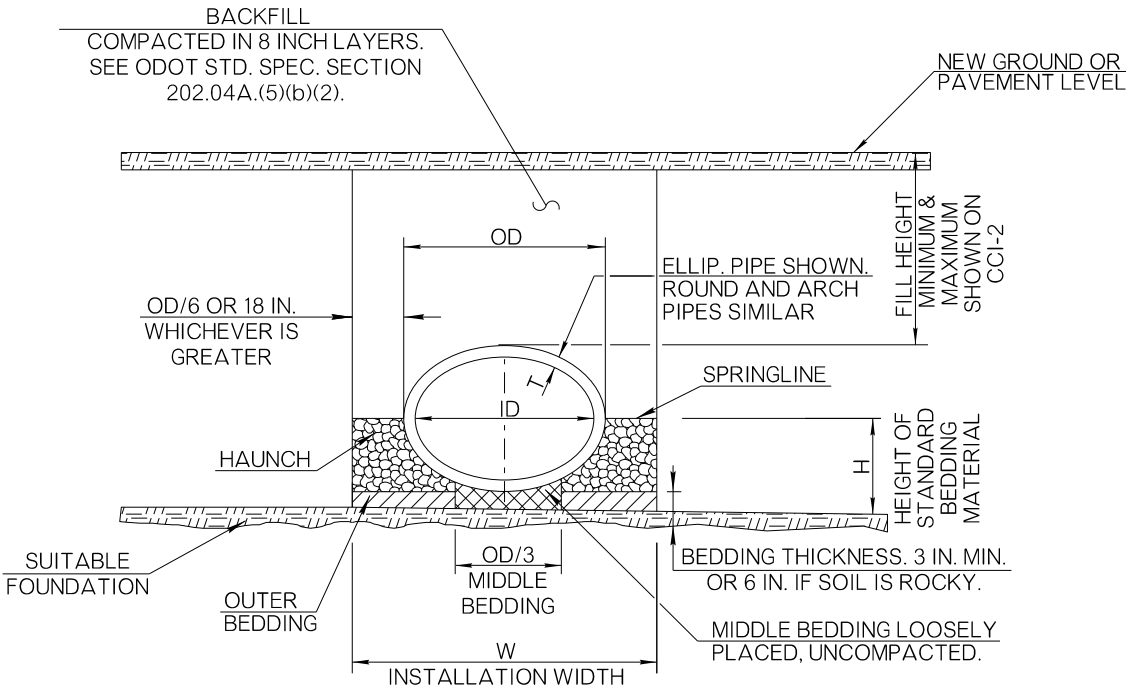
HAUNCH AREA, COMPACTED TO 95% MAXIMUM DENSITY

SUITABLE FOUNDATION, FREE OF DEBRIS OR LOOSE SOIL

MIDDLE BEDDING LOOSELY PLACED, UNCOMPACTED

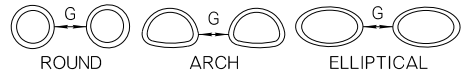
OUTER BEDDING, COMPACTED TO 95% MAXIMUM DENSITY

SEE NOTE 14 ON STANDARD CCI-2

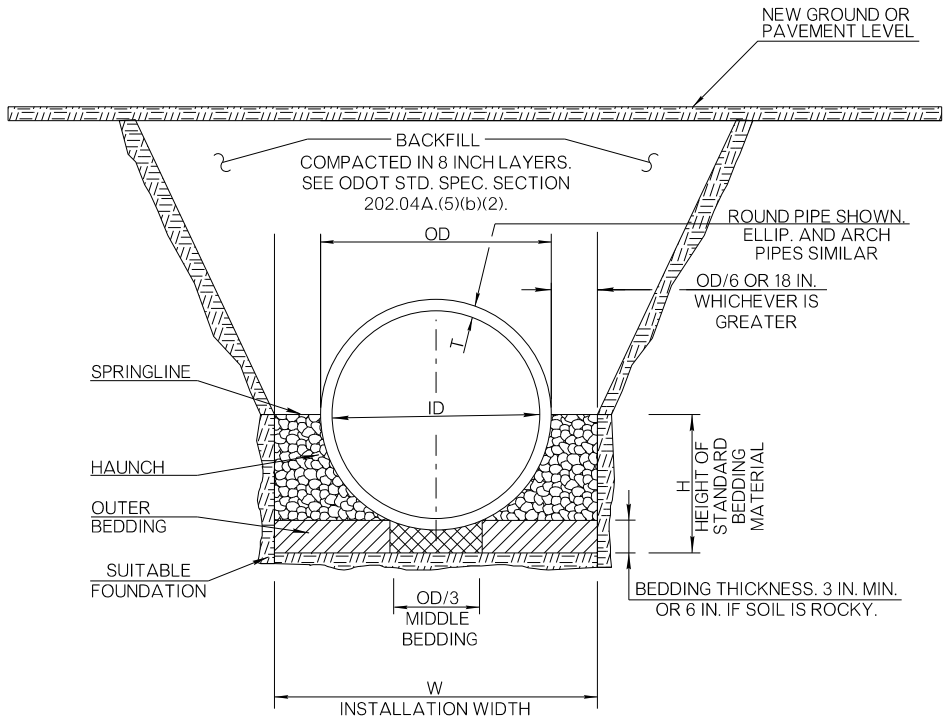


EMBANKMENT INSTALLATION
(INSTALLATION ON OR ABOVE EXISTING GROUND)

FOR DIA. OR SPAN	CONDUIT SHAPE			DIST. G
	ROUND	ARCH	ELLIPTICAL	
	UP TO 24"	UP TO 36"	UP TO 36"	
	25" TO 72"	37" TO 108"	37" TO 108"	
OVER 73"	OVER 108"	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 DIA. OR DESIGN EQUIV.	H STD BED MAT.	PIPE WALL THICKNESS	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
IN.	FT.	FT.	IN.	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF
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	CLEAR SPACE BETWEEN PIPES	SINGLE PIPE STANDARD TRENCHING		DOUBLE PIPE STANDARD TRENCHING		TRIPLE PIPE STANDARD TRENCHING	
						WIDTH	STANDARD BEDDING MATERIAL	WIDTH	STANDARD BEDDING MATERIAL	WIDTH	STANDARD BEDDING MATERIAL
IN.	IN.	IN.	FT.	FT.	IN.	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF
18	22	13	0.96	0.208	12.00	5.25	0.19	8.50	0.27	11.75	0.37
24	28	18	0.99	0.250	12.00	5.83	0.21	9.67	0.31	13.50	0.43
30	36	22	1.18	0.292	12.00	6.58	0.29	11.17	0.42	15.75	0.58
36	43	26	1.30	0.333	12.00	7.25	0.35	12.50	0.51	17.75	0.71
42	51	31	1.46	0.375	17.25	8.00	0.43	14.44	0.65	20.88	0.93
48	58	36	1.63	0.417	19.61	8.67	0.52	15.97	0.79	23.27	1.15
54	65	40	1.81	0.458	21.97	9.33	0.62	17.50	0.95	25.66	1.39
60	73	45	2.02	0.500	24.67	10.08	0.75	19.22	1.16	28.36	1.71
72	88	54	2.35	0.583	29.72	11.50	1.00	22.48	1.58	33.45	2.34
84	102	62	2.63	0.667	34.44	13.11	1.28	25.81	2.03	38.52	3.02
90	115	72	3.15	0.708	36.00	14.67	1.71	28.67	2.64	42.67	3.92
96	122	77	3.26	0.750	36.00	15.56	1.88	30.22	2.89	44.89	4.28

HORIZONTAL ELLIPTICAL CONCRETE PIPE											
ROUND EQUIV.	PIPE SPAN	PIPE HEIGHT	H STD BED MAT.	PIPE WALL THICKNESS	CLEAR SPACE BETWEEN PIPES	SINGLE PIPE STANDARD		DOUBLE PIPE STANDARD		TRIPLE PIPE STANDARD	
						WIDTH	STANDARD BEDDING MATERIAL	WIDTH	STANDARD BEDDING MATERIAL	WIDTH	STANDARD BEDDING MATERIAL
IN.	IN.	IN.	FT.	FT.	IN.	FT.	CY/LF	FT.	CY/LF	FT.	CY/LF
18	23	14	1.06	0.229	12.00	5.38	0.18	8.75	0.28	12.13	0.38
24	30	19	1.31	0.271	12.00	6.04	0.23	10.08	0.37	14.13	0.50
30	38	24	1.56	0.312	12.00	6.79	0.30	11.58	0.48	16.37	0.66
36	45	29	1.83	0.375	12.00	7.50	0.37	13.00	0.61	18.50	0.85
42	53	34	2.08	0.417	17.94	8.25	0.45	15.00	0.78	21.74	1.11
48	60	38	2.29	0.458	20.31	8.92	0.52	16.52	0.92	24.13	1.33
54	68	43	2.55	0.500	23.00	9.67	0.60	18.25	1.10	26.83	1.61
60	76	48	2.83	0.542	25.69	10.42	0.71	19.98	1.33	29.53	1.96
66	83	53	3.10	0.583	28.06	11.08	0.81	21.50	1.55	31.92	2.29
72	91	58	3.38	0.625	30.75	11.83	0.94	23.23	1.82	34.63	2.71
78	98	63	3.66	0.667	33.11	12.67	1.08	24.93	2.10	37.19	3.12
84	106	68	3.94	0.708	35.81	13.67	1.25	26.90	2.44	40.13	3.63
90	113	72	4.17	0.750	36.00	14.56	1.40	28.47	2.69	42.39	3.99
96	121	77	4.45	0.792	36.00	15.56	1.60	30.22	3.04	44.89	4.49

- ▲ W, OR WIDTH OF TRENCHING IS BASED ON TRENCH INSTALLATION, WITH SPRINGLINE WIDTH OF THE GREATER OF OD/6 OR 18 INCHES.
- SEE MULTIPLE PIPE INSTALLATION TABLE.
- VALUES SHOWN IN TABLES ARE BASED ON HEIGHT TO SPRINGLINE.

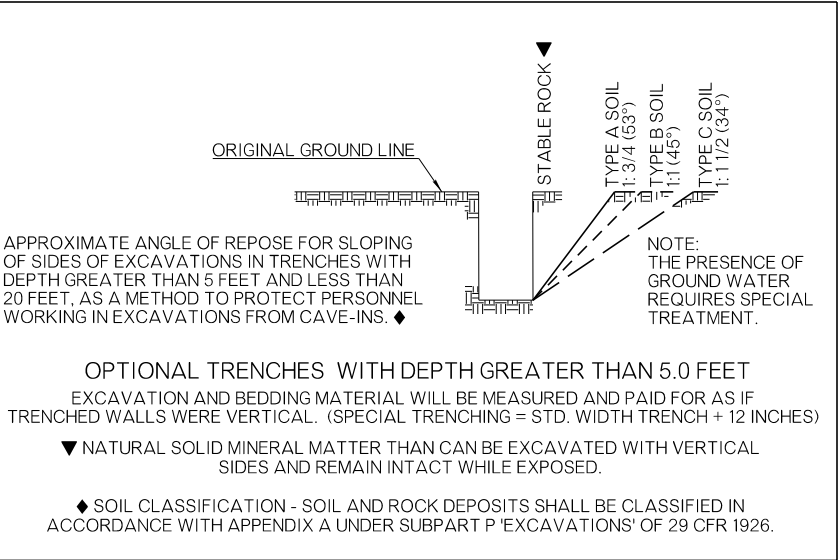
REINFORCED CONCRETE ARCH PIPE				
EQUIV. DIA.	CLASS A-III		MINIMUM COVER	MAXIMUM COVER
	SPAN	RISE		
INCHES	INCHES		INCHES	FEET
18	22	13	12	10
24	28	18	12	10
30	36	22	12	10
36	43	26	12	10
42	51	31	12	10
48	58	36	12	10
54	65	40	12	10
60	73	45	12	10
66			12	10
72	88	54	12	10
78			12	10
84	102	62	12	10
90	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								
	MINIMUM COVER INCHES	EMBANKMENT				TRENCH			
		CLASS II	CLASS III	CLASS IV	CLASS V	CLASS II	CLASS III	CLASS IV	CLASS V
INCHES		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	50
42	12	10	14	20	30	10	16	30	50
48	12	10	14	20	30	10	16	30	50
54	12	10	14	20	30	10	16	30	50
60	12	12	16	20	30	10	14	25	50
66	12	12	16	20	30	10	14	25	50
72	12	12	16	20	35	10	14	25	50
78	12	12	16	20	35	10	16	25	50
84	12	12	16	20	35	10	16	25	50
90	12	12	16	20	35	12	16	25	50
96	12	12	16	20	35	12	16	25	50
108	12	12	16	20	35	12	16	25	50

● 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	
CONCRETE HORIZONTAL ELLIPTICAL PIPE	M 207	C 507	
			SIZE IS DENOTED AS SPAN x RISE, BOTH IN INCHES
			SPAN, THE LONGEST DIMENSION, IS ORIENTED HORIZONTALLY WHILE THE RISE IS ORIENTED VERTICALLY. DENOTED AS RISE x SPAN, BOTH IN INCHES




- ▣ SPECIFY DIAMETER OF PIPE.
- ▣ SPECIFY CLASS OF PIPE.
- ▣ SPECIFY SPAN AND RISE OF ARCH PIPE.
- ▣ SPECIFY RISE AND SPAN OF ELLIPTICAL PIPE.
- ▲ SPECIFY DIAMETER OF STEEL CASING.
- SPECIFY DIAMETER OF CLASS V CONC. PIPE.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
613 (A)	▣ R.C. PIPE CLASS▣	LF
613 (A)	▣ R.C. PIPE ARCH CLASS A-111	LF
613 (A)	▣ 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)	● JACKED CONDUIT	LF

APPROVED BY
ROADWAY ENGINEER: _____ DATE: _____

ROADWAY DESIGN DIVISION STANDARD

CONCRETE CULVERT INSTALLATION
(2 OF 2 SHEETS)

OKLAHOMA
Transportation

2019 SPECIFICATIONS

CCI-20

R-58

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.

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613 (B)	■ CORR. GALV. STEEL PIPE	LF
613 (B)	▣ CORR. GALV. STEEL PIPE ARCH	LF
613 (C)	▲ MILL PRECOATED CGSP	LF
613 (C)	▣ TYPE II ALUMINIZED CORR. STEEL PIPE, ARCH	LF
613 (C)	■ TYPE II ALUMINIZED CORR. STEEL PIPE, ROUND	LF
613 (D)	■ CORR. ALUMINUM PIPE	LF
613 (D)	▣ 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

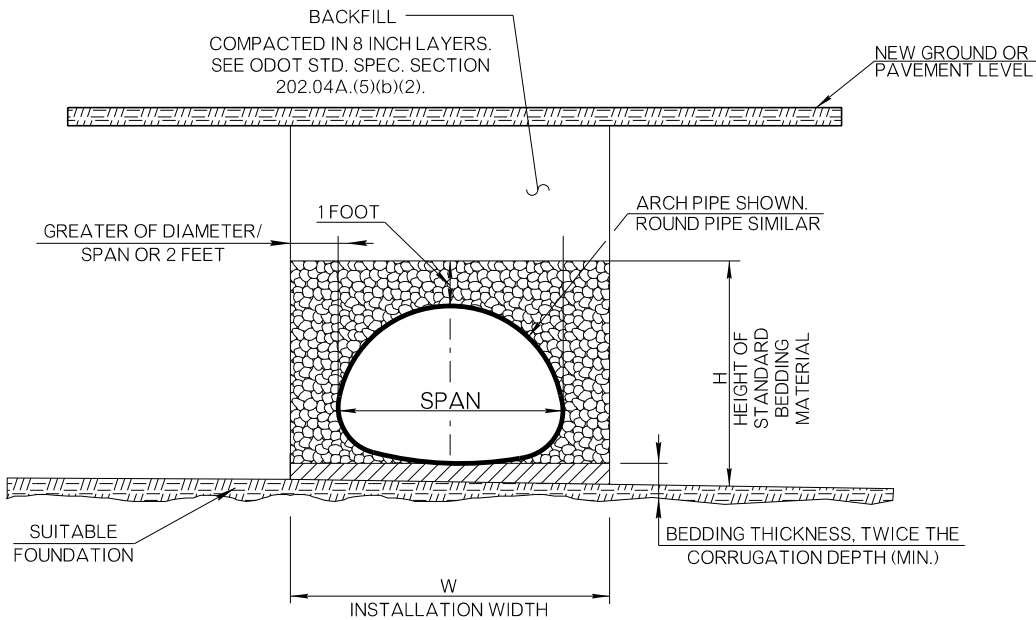


METAL CULVERT INSTALLATION
(1 OF 3 SHEETS)

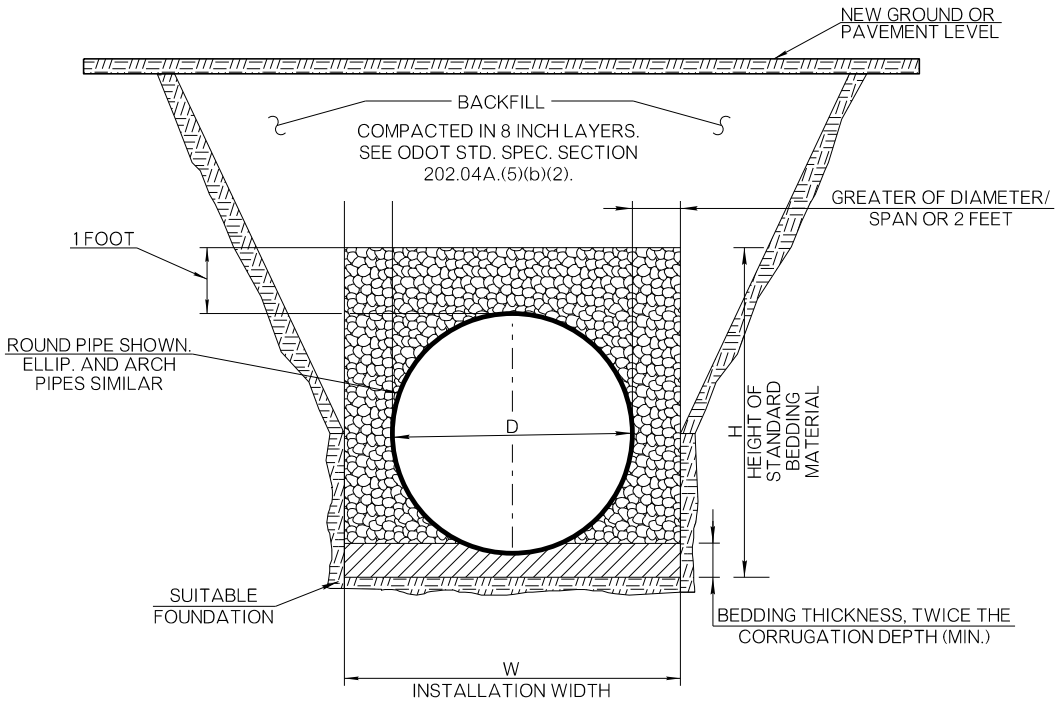
2019 SPECIFICATIONS

MCI-1 0

R-59

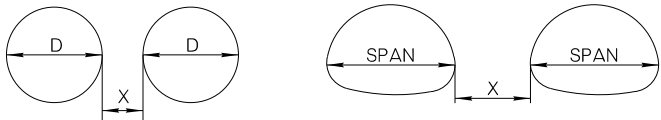


EMBANKMENT INSTALLATION
(INSTALLATION ON OR ABOVE EXISTING GROUND)



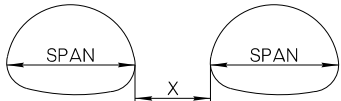
TRENCH INSTALLATION
(INSTALLATION BELOW EXISTING GROUND)

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

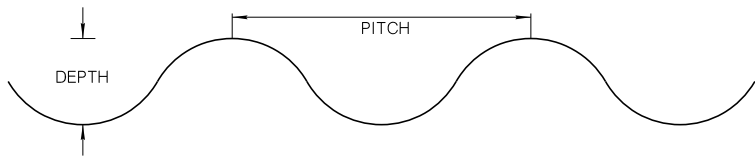


PIPE DIAMETER	"X" SPACING
UP TO AND INCLUDING 24"	12"
>24" TO 72"	1/2 D
OVER 72"	36"

MULTIPLE PIPE INSTALLATION



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



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"

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS IN TRENCHES WITH DEPTH GREATER THAN 5 FEET AND LESS THAN 20 FEET, AS A METHOD TO PROTECT PERSONNEL WORKING IN EXCAVATIONS FROM CAVE-INS. ♦

STABLE ROCK
TYPE A SOIL
1:3/4 (53°)
TYPE B SOIL
1:1 (45°)
TYPE C SOIL
1:1 1/2 (34°)

NOTE: THE PRESENCE OF GROUND WATER REQUIRES SPECIAL TREATMENT.

OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET

EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF SHEETING & SHORING WAS USED. (SPECIAL TRENCHING = STD. WIDTH TRENCH + 12 INCHES)

▼ NATURAL SOLID MINERAL MATTER THAN CAN BE EXCAVATED WITH VERTICAL SIDES AND REMAIN INTACT WHILE EXPOSED.

♦ SOIL CLASSIFICATION - SOIL AND ROCK DEPOSITS SHALL BE CLASSIFIED IN ACCORDANCE WITH APPENDIX A UNDER SUBPART P 'EXCAVATIONS' OF 29 CFR 1926.

FULL CIRCLE STEEL PIPE CULVERT (INCLUDING ALL COATED TYPES)												
PIPE DIAM. IN INCHES	PIPE CHARACTERISTICS				MIN. COVER (INCHES)	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	TOP OF PIPE TO TOP OF SUBGRADE	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'			
		●			12"	83'	104'	146'	188'	231'		
42"	●				12"	62'	77'	108'	140'	171'		
		●			12"	71'	89'	125'	161'	198'		
48"	●				12"	54'	67'	95'	122'	150'		
		●			12"	62'	78'	109'	141'	173'		
			●		12"	55'	69'	97'	125'	153'		
54"	●				12"		60'	84'	109'	133'		
		●			12"	55'	69'	97'	125'	153'		
			●		12"	49'	61'	86'	111'	136'		
60"	●				12"			76'	98'	120'		
		●			12"	49'	62'	87'	112'	138'		
			●		12"	44'	55'	78'	100'	123'		
				●	12"			46'	68'	90'	96'	106'
66"	●				12"				89'	109'		
		●			12"	45'	56'	79'	102'	125'		
			●		12"	40'	50'	70'	91'	111'		
				●	12"			42'	62'	78'	82'	90'
72"	●				12"				81'	99'		
		●			12"	41'	51'	72'	94'	115'		
			●		12"	36'	46'	64'	83'	102'	73'	78'
				●	12"			38'	57'	69'		
78"	●				12"					88'		
		●			12"	38'	47'	67'	86'	106'		
			●		12"	33'	42'	59'	77'	94'		
				●	12"			35'	53'	63'	66'	70'
84"	●				12"					76'		
		●			12"	35'	44'	62'	80'	98'		
			●		12"	31'	39'	55'	71'	87'		
				●	12"			33'	49'	59'	61'	64'
90"					12"							
		●			12"	32'	41'	58'	75'	92'		
			●		12"	29'	36'	51'	66'	81'		
				●	12"			31'	45'	55'	57'	60'
96"					12"							
		●			12"		38'	54'	70'	86'		
			●		12"		34'	48'	62'	76'		
				●	12"			29'	43'	53'	54'	57'
102"					12"							
		●			24"		36'	51'	66'	81'		
			●		24"		32'	45'	58'	72'		
108"					24"							
		●			24"			48'	62'	76'		
			●		24"			43'	55'	68'		
				●	24"			25'	38'	49'	50'	52'
114"					24"							
		●			24"			45'	59'	72'		
			●		24"			40'	52'	64'		
120"		●			24"			43'	56'	68'		
			●		24"			38'	50'	61'		
				●	24"			23'	34'	45'	48'	49'

FULL CIRCLE ALUMINUM ALLOY PIPE CULVERT									
PIPE DIAM. IN INCHES	PIPE CHARACTERISTICS			MIN. COVER (INCHES)	MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE (FEET)				
	CORR. ALUMINUM ALLOY				EQUIV. STANDARD GAGE				
	2 2/3" X 1/2"	3" X 1"	6" X 1"		16	14	12	10	8
12"	●			12"	141'	176'	247'	318'	
15"	●			12"	112'	141'	197'	254'	
18"	●			12"	93'	117'	164'	212'	
21"				12"	80'	100'	140'	181'	
24"	●			12"	69'	87'	123'	158'	
30"	●			12"		77'	109'	140'	
		●		12"			98'	126'	
36"	●			12"		69'	88'	114'	
		●		12"			81'	105'	
			●	12"			69'	89'	
42"	●			12"		63'	60'	78'	
		●		12"			53'	69'	
48"	●			12"		57'		61'	51'
		●		12"					82'
54"	●			12"					45'
		●		12"					73'
			●	12"					66'
60"	●			12"					41'
		●		12"					66'
			●	12"					58'
66"	●			12"					37'
		●		12"					51'
			●	12"					52'
72"		●		12"					54'
			●	15"					43'
78"		●		15"					50'
			●	15"					40'
84"		●		18"					47'
			●	18"					37'
90"		●		18"					43'
			●	18"					34'
96"		●		18"					40'
			●	18"					32'
102"		●		21"					37'
			●	21"					29'
108"		●		21"					35'
			●	21"					28'
114"		●		24"					34'
			●	24"					26'
120"		●		24"					32'
			●	24"					25'

ALL NOTES, PAY ITEMS, AND DRAWINGS RELEVANT TO METAL CULVERTS, AND THEIR INSTALLATIONS ARE SHOWN ON ROADWAY STANDARD MCI-1.

TABLE OF STANDARD BEDDING MATERIAL QUANTITIES SHOWN ON ROADWAY STANDARD MCI-3.

STEEL & ALUMINUM ALLOY PIPE ARCH - FILLS TO 10 FT. MAX.					
2 2/3" x 1/2" CORRUGATION PATTERN					
APPROX. EQUIV. ROUND PIPE	SIZE SPAN x RISE	CORRUGATED STEEL		ALUMINUM ALLOY	
		MIN. GAGE	MIN. COVER (INCHES)	MIN. GAGE	MIN. COVER (INCHES)
15"	17" x 13"	16	12"	16	12"
18"	21" x 15"	16	12"	16	12"
21"	24" x 18"	16	12"	16	12"
24"	28" x 20"	16	12"	14	12"
30"	35" x 24"	14	12"	14	12"
36"	42" x 29"	14	12"	12	15"
42"	49" x 33"	14	12"	12	15"
48"	57" x 38"	12	12"	10	15"
54"	64" x 43"	12	12"	10	18"
60"	71" x 47"	10	12"	8	18"
66"	77" x 52"	8	12"	8	18"
72"	83" x 57"	8	12"	8	18"
3" x 1" & 5" x 1" CORRUGATION PATTERN					
36"	40" x 31"	14	12"		
42"	46" x 36"	14	12"		
48"	53" x 41"	14	12"		
54"	60" x 46"	14	12"	14	15"
60"	66" x 51"	14	12"	14	18"
66"	73" x 55"	14	12"	14	18"
72"	81" x 59"	14	12"	12	21"
78"	87" x 63"	14	12"	12	21"
84"	95" x 67"	12	12"	12	24"
90"	103" x 71"	12	18"	10	24"
96"	112" x 75"	12	18"	10	27"
102"	117" x 79"	12	18"		
108"	128" x 83"	10	24"		
114"	137" x 87"	10	24"		
120"	142" x 91"	10	24"		

● WHEN INSTALLED UNDER PAVEMENT INCLUDING ALL P.C. OR A.C. SURFACING UNDER MAINLINE TRAFFIC AND MAJOR STREET RETURNS. A MINIMUM PIPE GAGE OF 16 MAY BE USED FOR INSTALLATIONS REQUIRING 30 INCH EQUIVALENT ROUND CONDUITS (MAX.) AND LIMITED TO LOW VOLUME COUNTY OR OFF-SYSTEM ROADS, MINOR STREET RETURNS, DRIVEWAYS OR TEMPORARY DETOURS, AS APPROVED BY THE ENGINEER.

EQUIVALENT METAL THICKNESS AND GAGE		
GAGE NUMBER	METAL THICKNESS (INCHES)	
	■ STEEL	◆ ALUMINUM ALLOY
16	0.064	0.060
14	0.079	0.075
12	0.109	0.105
10	0.138	0.135
8	0.168	0.164
7	0.188	----
5	0.218	----

- THE THICKNESS OF THE SHEET INCLUDES BOTH THE BASE STEEL AND THE ZINC COATING (GALVANIZE).
- ◆ THE THICKNESS SHOWN REFERS TO THE BASE ALUMINUM CLAD SHEET.

APPROVED BY ROADWAY ENGINEER: _____ DATE: _____

ROADWAY DESIGN DIVISION STANDARD

METAL CULVERT INSTALLATION
(2 OF 3 SHEETS)



2019 SPECIFICATIONS

MCI-2

0

R-60

		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 ■		
CORRUGATED STEEL, ALUMINIZED TYPE 2, CORRUGATED ALUMINUM, AND MILL PRECOATED PIPE	ROUND PIPE	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		

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 BETWEEN PIPE AND 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 1/2" 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	2.00	11.25	1.44	20.92	3.74	30.58	6.04	29.00	2.00
95	67	84		6.75	2.00	11.92	1.55	22.47	4.19	33.03	6.83	31.67	2.00
103	71	90		7.08	2.00	12.58	1.66	24.03	4.67	35.47	7.67	34.33	2.00
112	75	96		7.42	2.00	13.33	1.80	25.67	5.19	38.00	8.58	36.00	2.00
117	79	102		7.75	2.00	13.75	1.85	26.50	5.50	39.25	9.16	36.00	2.00
128	83	108		8.08	2.00	14.67	2.03	28.33	6.13	42.00	10.22	36.00	2.00
137	87	114		8.42	2.00	15.42	2.18	29.83	6.67	44.25	11.17	36.00	2.00
142	91	120		8.75	2.00	15.83	2.22	30.67	7.03	45.50	11.84	36.00	2.00

- 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 PIPE INSTALLATION, ROADWAY STANDARD MCI-1.

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"	36"	42"	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.

ALL NOTES, PAY ITEMS AND DRAWINGS RELEVANT TO METAL CULVERTS AND THEIR INSTALLATIONS ARE SHOWN ON ROADWAY STANDARD MCI-1.

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

ORIGINAL GROUND LINE

STABLE ROCK

TYPE A SOIL
t: 3/4 (63°)

TYPE B SOIL
t: 1 (45°)

TYPE C SOIL
t: 1 1/2 (34°)

NOTE:
THE PRESENCE OF
GROUND WATER
REQUIRES SPECIAL
TREATMENT.

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS IN TRENCHES WITH DEPTH GREATER THAN 5 FEET AND LESS THAN 20 FEET, AS A METHOD TO PROTECT PERSONNEL WORKING IN EXCAVATIONS FROM CAVE-INS. ◆

OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET

EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF TRENCHED WALLS WERE VERTICAL. (SPECIAL TRENCHING=STD. WIDTH TRENCH + 12 INCHES)

▼ NATURAL SOLID MINERAL MATTER THAN CAN BE EXCAVATED WITH VERTICAL SIDES AND REMAIN INTACT WHILE EXPOSED.

◆ SOIL CLASSIFICATION - SOIL AND ROCK DEPOSITS SHALL BE CLASSIFIED IN ACCORDANCE WITH APPENDIX A UNDER SUBPART P "EXCAVATIONS" OF 29 CFR 1926.

FOR CORRUGATED HIGH-DENSITY POLYETHYLENE (HDPE) AND CORRUGATED POLYPROPYLENE (PP) PIPES

GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- BOTH THE CORRUGATED POLYPROPYLENE (PP) AND CORRUGATED POLYETHYLENE (HDPE) PIPES' COVER HEIGHT VALUES ARE BASED ON A HL-93 LIVE LOADING, NO HYDROSTATIC PRESSURE, 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, PART 1926, SUBPART P - 'EXCAVATIONS', STANDARDS 1926. 650, 1926.651 AND 1926.652.
- 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 4 FEET OF COVER OVER THE PIPE AT WHEEL OR TRACK PATHS.
- PROPER INSTALLATION PRACTICE MUST BE ADHERED TO AS SHOWN ON ROADWAY STANDARD PBB-1 AND AS DESIGNATED IN ASTM D2321. THE PAY ITEMS OF TRENCH EXCAVATION AND STANDARD BEDDING WILL BE REQUIRED FOR THESE PIPES WHEN THEY ARE INSTALLED AS CROSS DRAINS.
- 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 OF THE CONTRACTOR AND DISPOSED OF BY THE CONTRACTOR IN A MANNER APPROVED BY THE ENGINEER.
- JOINTS IN THERMOPLASTIC PIPES SHALL CONFORM TO THE REQUIREMENTS OF ASTM D3212. SPIGOTS SHALL HAVE WATER TIGHT GASKETS MEETING THE REQUIREMENTS OF ASTM F477.
- 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.
- CORRUGATED HIGH DENSITY POLYETHYLENE PIPE (HDPE) SHALL HAVE A MINIMUM COVER OVER PIPE OF 1 FOOT. THE MINIMUM COVER OVER POLYPROPYLENE PIPE (PP) IS 1 FOOT. SEE ROADWAY STANDARD PBB-1 FOR MORE DETAILS OF BOTH PIPES.
- SEGMENTS OF NON-FLAMMABLE PIPE ARE NO LONGER REQUIRED. HOWEVER, METAL OR CONCRETE END TREATMENTS SHALL BE PROVIDED AND PAID FOR AS A SEPARATE PAY ITEM.

CORRUGATED POLYPROPYLENE AND HIGH DENSITY POLYETHYLENE PIPES									
STANDARD BEDDING MATERIAL QUANTITIES									
PIPE DIAM. (D)	H STD BED. MAT. ■	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE		CLEAR SPACE BETWEEN PIPES ▲	SPACE BETWEEN PIPE AND TRENCH WALL
		W WIDTH	STANDARD BEDDING MATERIAL	W WIDTH	STANDARD BEDDING MATERIAL	W WIDTH	STANDARD BEDDING MATERIAL		
		FT.	CY/LF	FT.	CY/LF	FT.	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.

MULTIPLE PIPE INSTALLATION

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

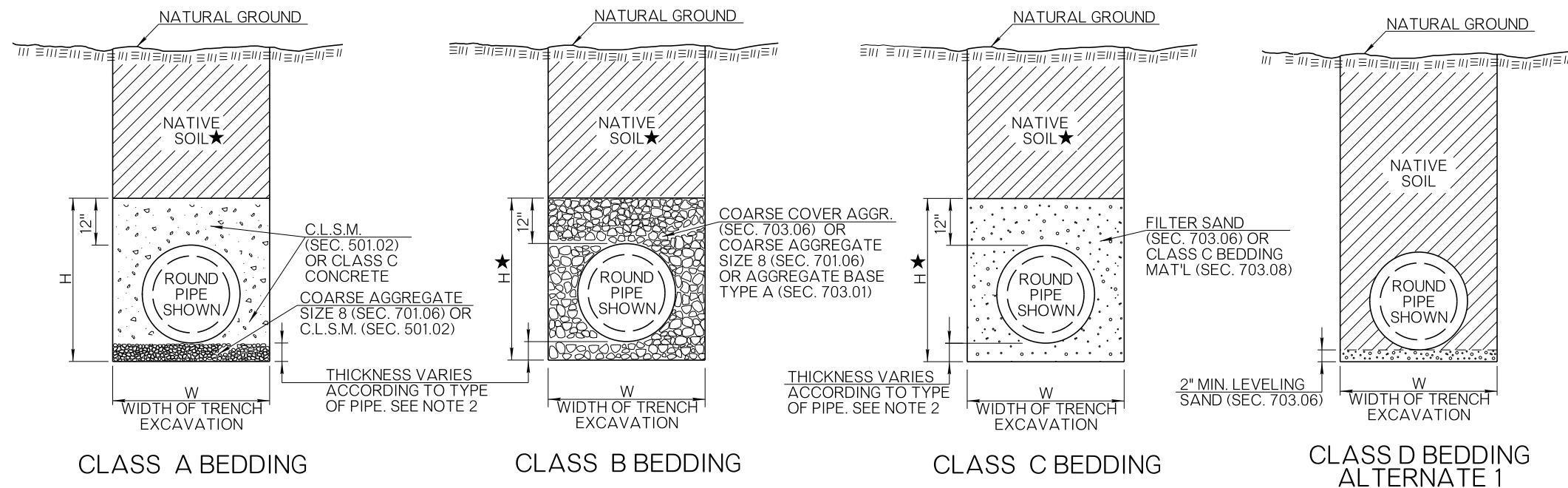
APPROVED BY ROADWAY DESIGN DIVISION
ON 01/07/2026

2019 SPECIFICATIONS

TCI-1

1

R-62



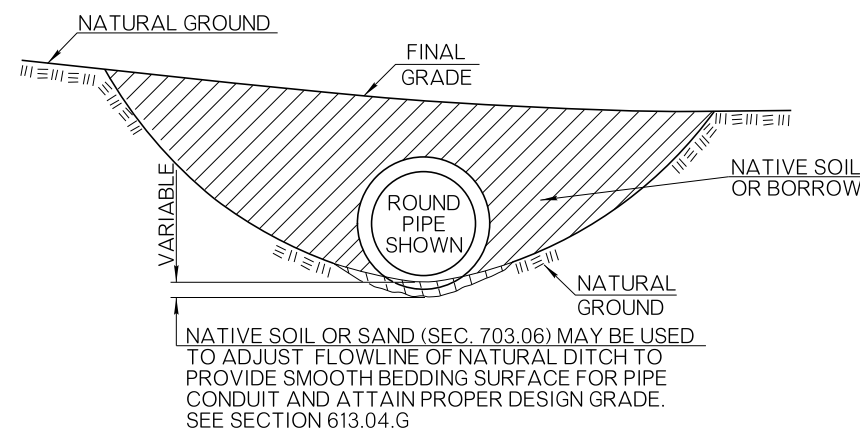
GENERAL NOTES

- 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 COMPACTED 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 COMPACTED TO 95% MAXIMUM DENSITY AND CLASS B SHALL BE COMPACTED TO 98% STANDARD DENSITY. ALL COMPACTION OF BEDDING MATERIAL SHALL BE DONE USING HAND-OPERATED EQUIPMENT ONLY.
- ★ 11. 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.

PIPE BEDDING CLASS/DESIGN TABLE							
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
R-63	

ORIGINAL GROUND LINE

STABLE ROCK

TYPE A SOIL
1:3/4 (53°)

TYPE B SOIL
1:1 (45°)

TYPE C SOIL
1:1 1/2 (34°)

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS IN TRENCHES WITH DEPTH GREATER THAN 5 FEET AND LESS THAN 20 FEET, AS A METHOD TO PROTECT PERSONNEL WORKING IN EXCAVATIONS FROM CAVE-INS. ♦

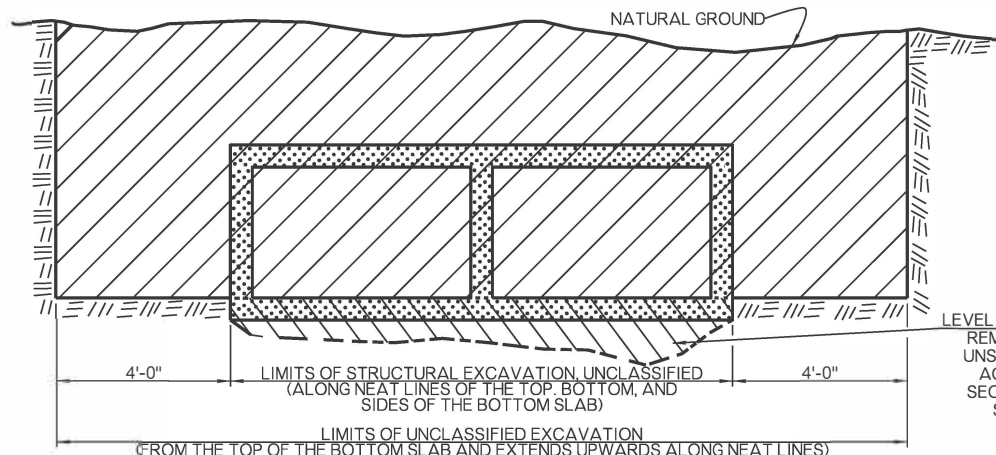
NOTE: THE PRESENCE OF GROUND WATER REQUIRES SPECIAL TREATMENT.

OPTIONAL TRENCHES WITH DEPTH GREATER THAN 5.0 FEET

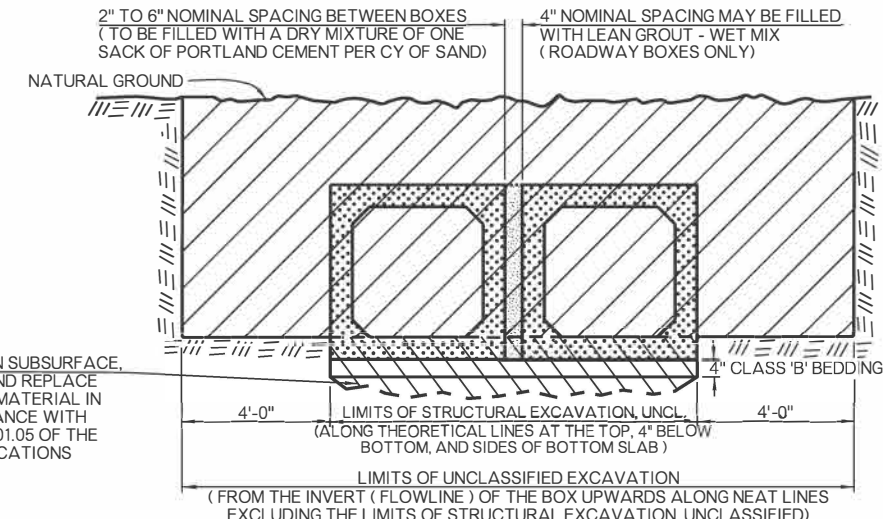
EXCAVATION AND BEDDING MATERIAL WILL BE MEASURED AND PAID FOR AS IF TRENCHED WALLS WERE VERTICAL. (SPECIAL TRENCHING = STD. WIDTH TRENCH+12")

NATURAL SOLID MINERAL MATTER THAN CAN BE EXCAVATED WITH VERTICAL SIDES AND REMAIN INTACT WHILE EXPOSED.

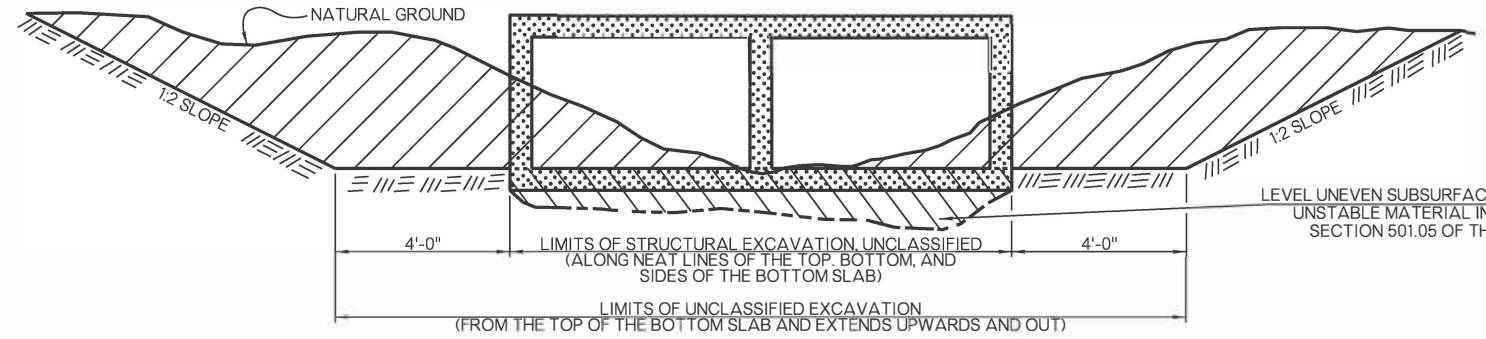
SOIL CLASSIFICATION - SOIL AND ROCK DEPOSITS SHALL BE CLASSIFIED IN ACCORDANCE WITH APPENDIX A UNDER SUBPART P 'EXCAVATIONS' OF 29 CFR 1926.



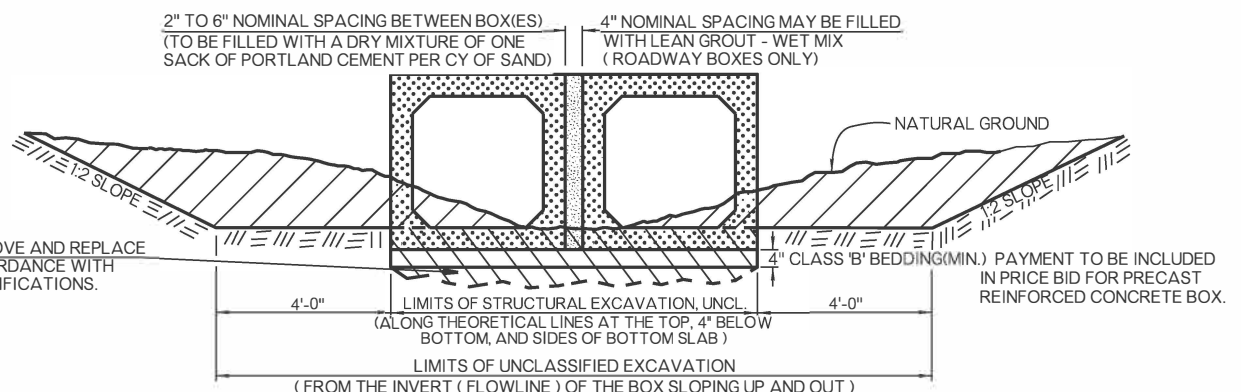
REQUIREMENTS FOR UNCLASSIFIED AND STRUCTURAL EXCAVATION OF RCB STORM SEWERS



REQUIREMENTS FOR EXCAVATION OF PRECAST RCB STORM SEWERS



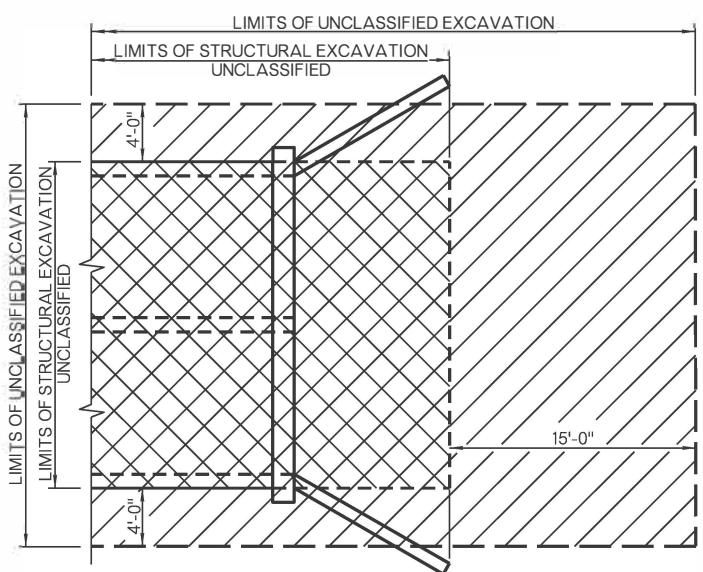
REQUIREMENTS FOR UNCLASSIFIED AND STRUCTURAL EXCAVATION OF RCB CULVERTS OF ROADWAY AND BRIDGE CLASSIFICATION



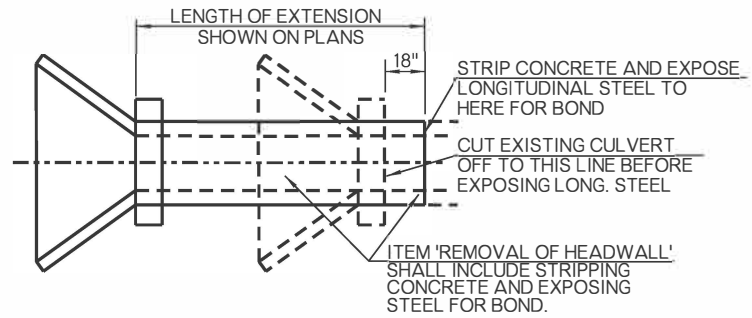
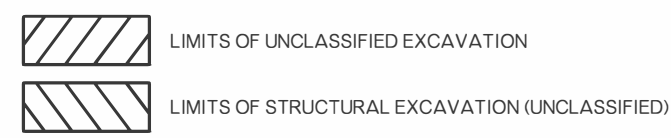
REQUIREMENTS FOR EXCAVATION OF PRECAST RCB CULVERTS OF ROADWAY AND BRIDGE CLASSIFICATION

GENERAL NOTES

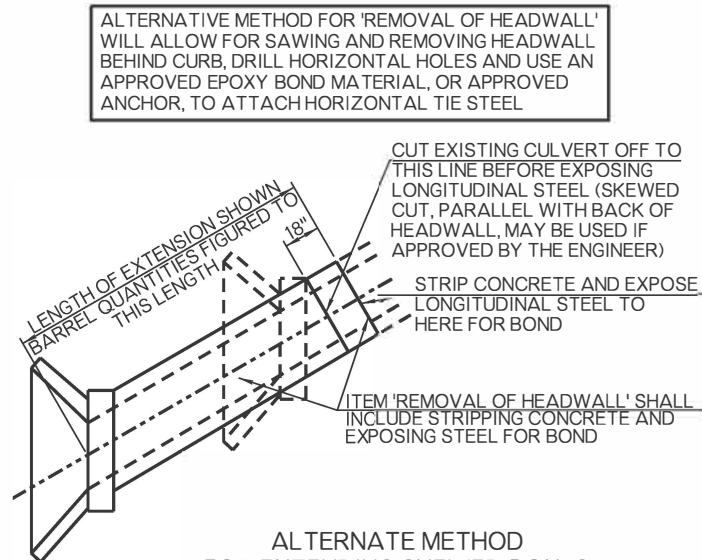
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. PAYMENT FOR CAST-IN-PLACE REINFORCED CONCRETE BOXES WILL BE IN CUBIC YARDS OF CLASS A OR CLASS AA CONCRETE AND POUNDS OF REINFORCING STEEL, IN ACCORDANCE WITH SECTION 509 AND 511 OF THE SPECIFICATIONS.
3. PAYMENT FOR PRECAST CONCRETE BOX CULVERTS WILL BE MADE BASED ON THE UNIT PRICE BID FOR ITEMS AND QUANTITIES OF A CAST-IN-PLACE BOX OF THE LENGTH REQUIRED AS DETERMINED BY FIELD MEASUREMENTS, AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH SECTION 508 OF THE SPECIFICATIONS.
4. PRECAST CONCRETE BOX SECTIONS, USED IN LIEU OF CAST-IN-PLACE CONCRETE BOXES, SHALL MEET MINIMUM DESIGN REQUIREMENTS OF AASHTO M 259 OR M 273, AND ASTM C1433 OR C1577, AND JOINT FILLER SHALL MEET THE REQUIREMENTS OF SUBSECTION 726.01.B OF THE SPECIFICATIONS.



PLAN VIEW



ALTERNATE METHOD FOR EXTENDING 90° BOXES

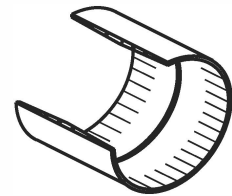


ALTERNATE METHOD FOR EXTENDING SKEWED BOXES

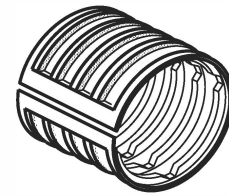
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
202 (A)	UNCLASSIFIED EXCAVATION	CY
501 (A)	STRUCTURAL EXCAVATION UNCLASSIFIED	CY
619 (B)	REMOVAL OF HEADWALL	EA

APPROVED BY ROADWAY ENGINEER:  DATE: 6/30/22

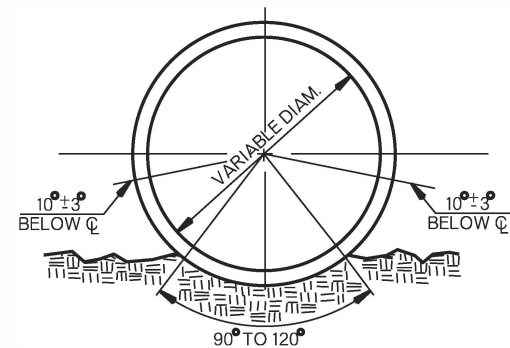
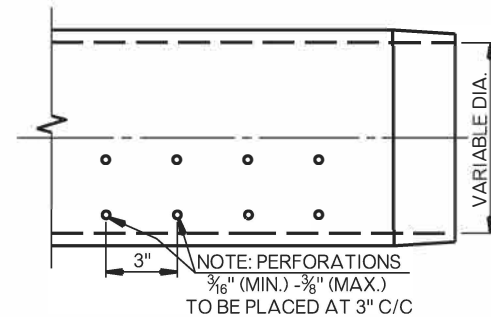
ROADWAY DESIGN DIVISION STANDARD



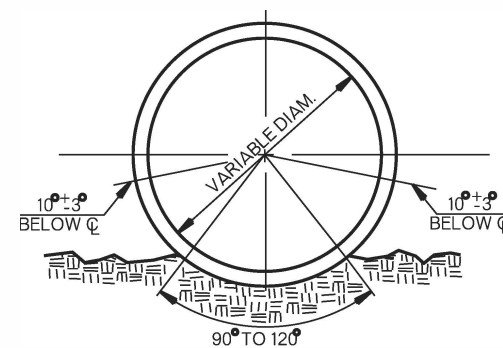
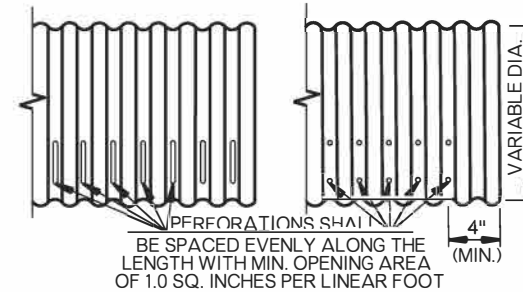
TYPICAL COUPLING FOR
PVC PIPE UNDERDRAIN
1/4 SECTION REMOVED



TYPICAL CORRUGATED COUPLING
OR AN APPROVED EQUAL



POLYVINYL (PVC) PIPE UNDERDRAIN



CORRUGATED POLYETHYLENE PIPE UNDERDRAIN

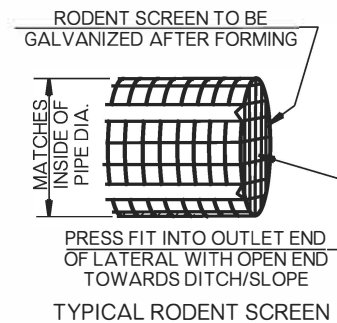
INSTALLATION TECHNIQUE: (12" DIAMETER OR SMALLER)

PERFORATED PIPE UNDERDRAIN, WHEN INSTALLED IN A TRENCH, SHALL BE BEDDED ON 4" OF COARSE COVER AGGREGATE. THE INSTALLED PIPE SHALL THEN BE CAREFULLY BACKFILLED 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.

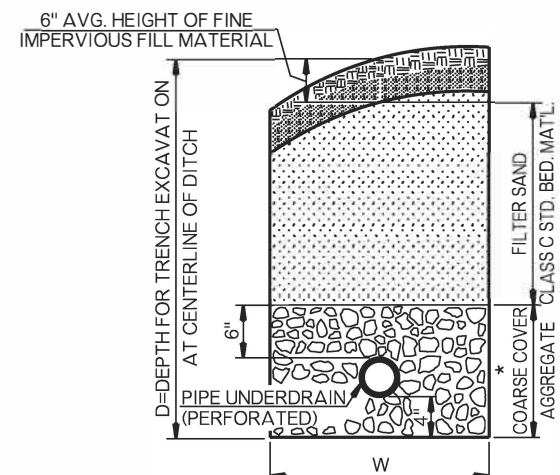
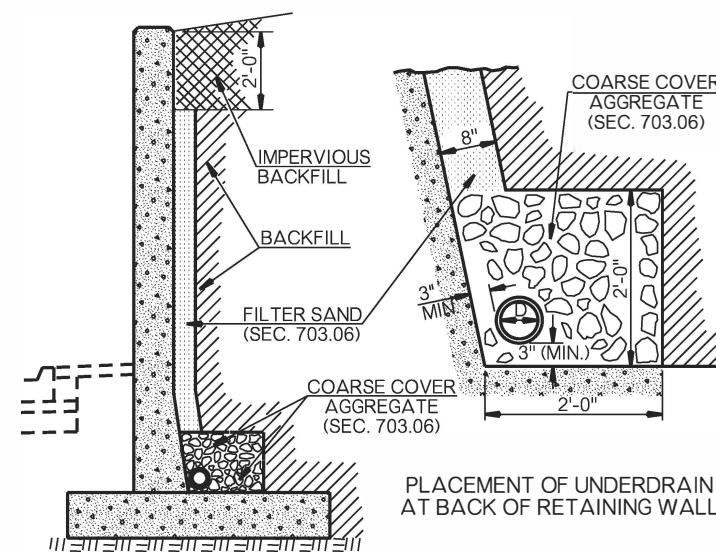
NON-PERFORATED PIPE UNDERDRAIN, WHEN INSTALLED IN A TRENCH, SHALL BE BEDDED IN A 4" LAYER CONSISTING OF COARSE AGGREGATE COVER MATERIAL OR A 50-50 MIX OF COARSE AGGREGATE COVER MATERIAL AND FILTER SAND. THIS LAYER OF COVER MATERIAL SHALL CONFORM TO SEC. 703.06, AND SHALL BE PAID FOR AS PIPE UNDERDRAIN 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

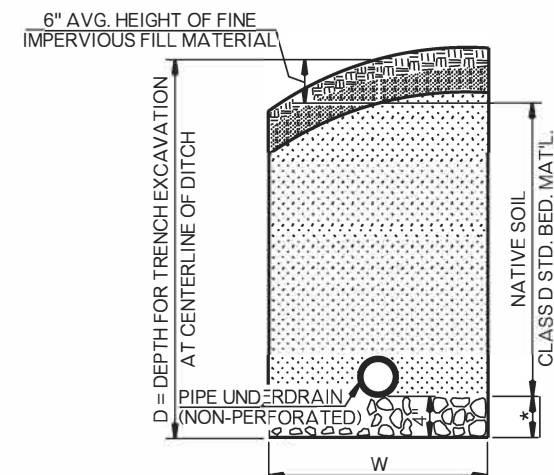
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. THE EXTENT, LOCATION AND DEPTH OF DRAINS MAY BE ADJUSTED BY THE ENGINEER TO SUIT CONDITIONS FOUND DURING CONSTRUCTION.
3. COST OF ALL FITTINGS TO BE INCLUDED IN THE PRICE BID PER LINEAR 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



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:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

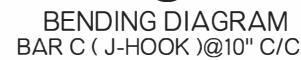
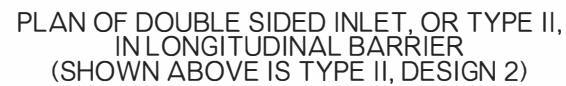


PIPE UNDERDRAIN INSTALLATION

2019 SPECIFICATIONS

PUD-4 1

R-65

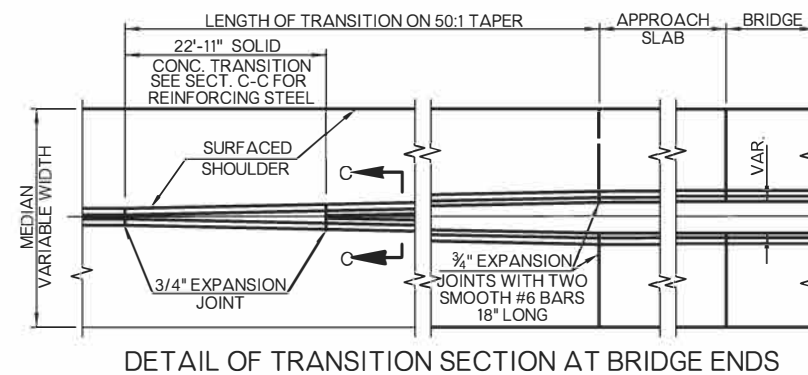


RCP SIZE	MIN. DEPTH
18" RCP	2' - 8"
24" RCP	3' - 2"
30" RCP	3' - 8"

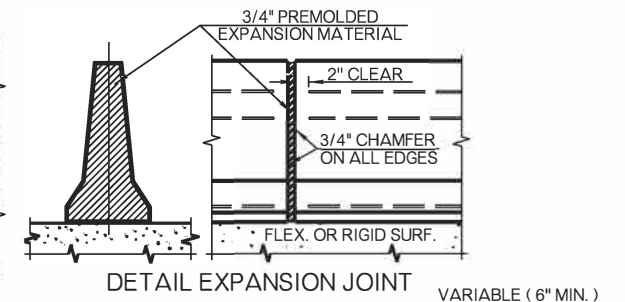
NOTE: SEE ROADWAY STDS. SSIF-5 & CIG-4
FOR AVAILABLE INLET FRAME & GRATES TO
BE USED ON SINGLE (TYPE I) OR DOUBLE
(TYPE II) SIDED INLETS.

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"

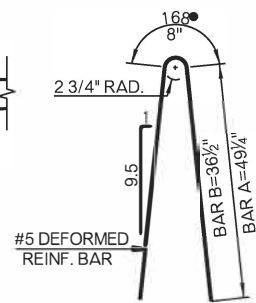
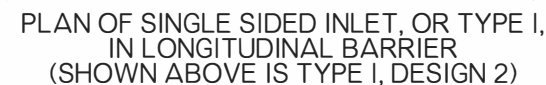
NOTE: FOR GRADE DIFFERENCE OF
0" TO 11" BETWEEN OPPOSITE
SIDES OF BARRIER, NO ADDITIONAL
REINFORCEMENT IS REQUIRED.



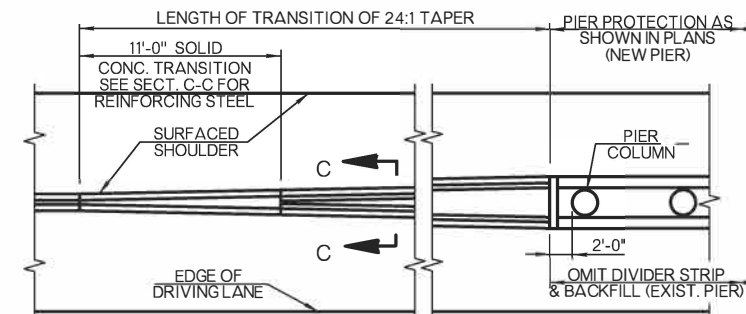
DETAIL OF TRANSITION SECTION AT BRIDGE ENDS



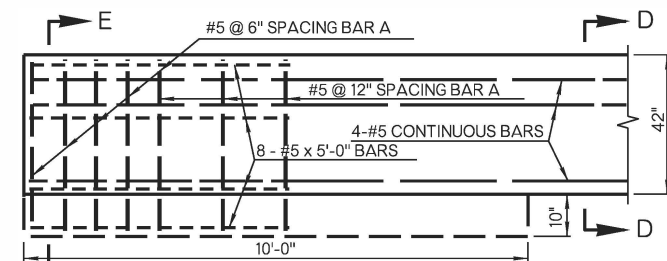
DETAIL EXPANSION JOINT VARIABLE (6" MIN)



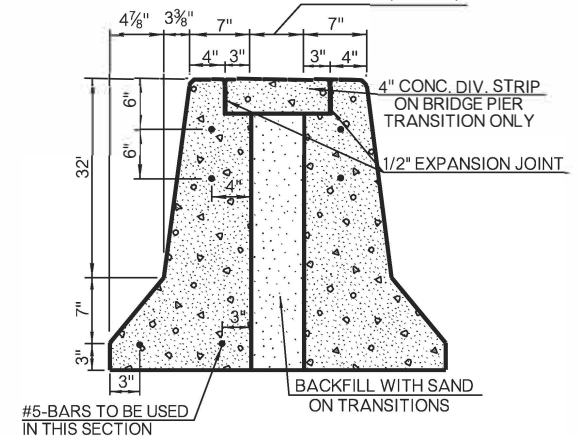
BENDING DIAGRAM
BARS A & B



DETAIL OF TRANSITION SECTION AT BRIDGE PIERS





PROFILE LONGITUDINAL BARRIER END SECTION
(ONE PLACED AT EACH END OF CONCRETE LONGITUDINAL BARRIER RUNS)



SECTION C-C

GENERAL NOTES

1. ALL CONSTRUCTION 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 DUT-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. 	EA
611 (G)	INLET - LONGITUDINAL BARRIER - TYPE II, DES. 	EA

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

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ROADWAY ENGINEER: [Signature] DATE: 6/30/22
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CONCRETE LONGITUDINAL BARRIER (MASH F-SHAPE)

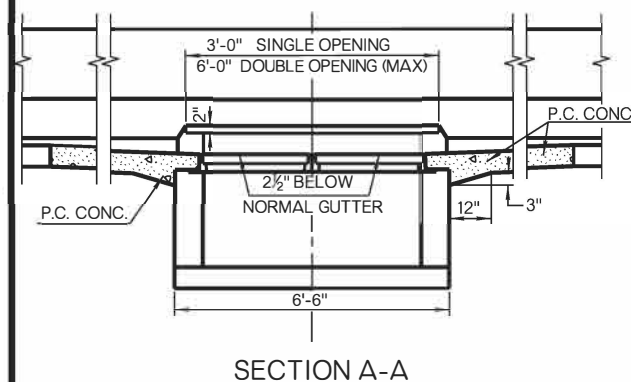


OKLAHOMA
Transportation

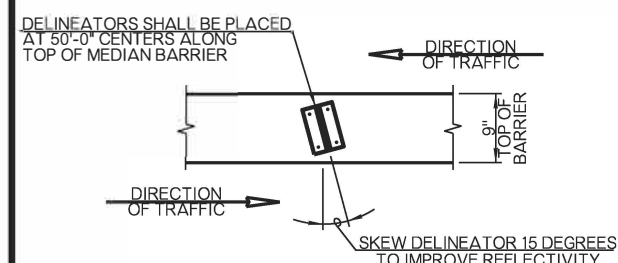
2019 SPECIFICATIONS

CLB-2	2
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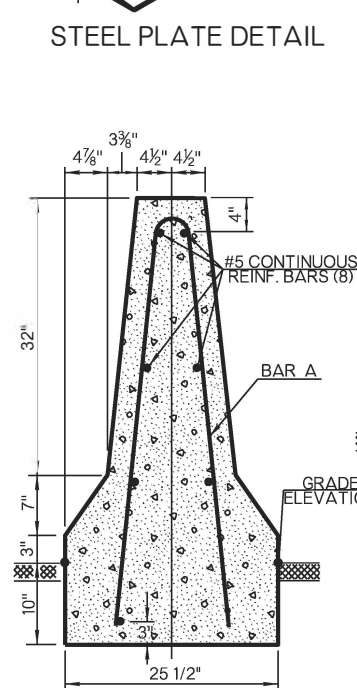
R-66



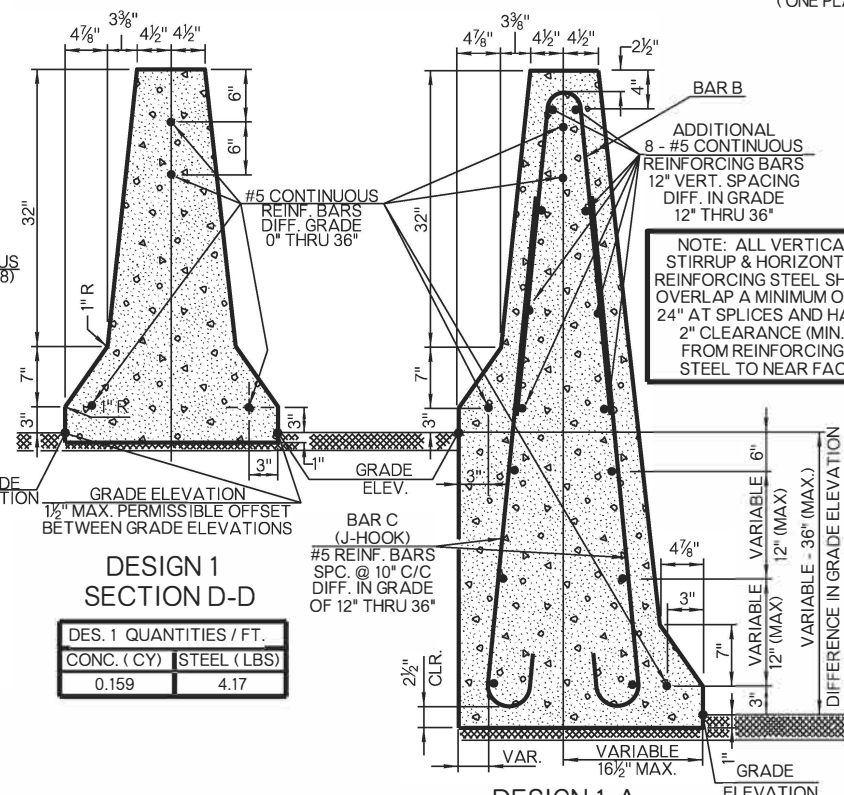
SECTION A-A



PLAN OF DELINEATOR PLACEMENT



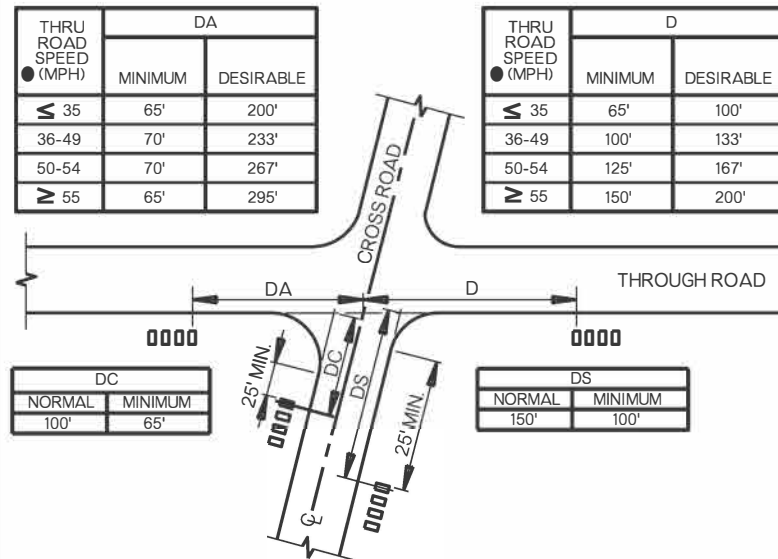
SECTION E-E



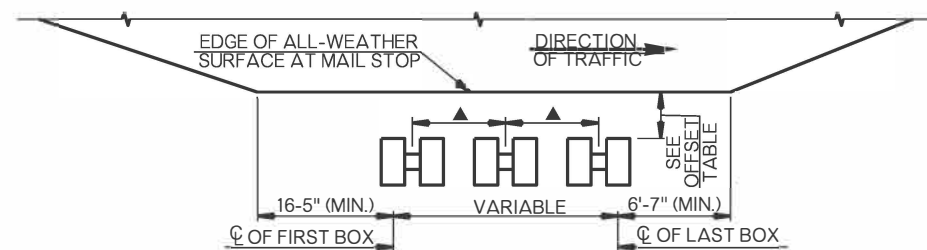
DESIGN 1-A
TRANSITION SECTION

LONGITUDINAL BARRIER DESIGN 1-A QUANTITIES					
DIFFERENTIAL GRADE SECTION					
DIFFERENCE IN GRADE ELEVATION	TOTAL CONCRETE CU. YDS. PER LF	HORIZ. REINF. #5 BARS EACH	BAR B #5 BAR 10" C/C INCHES	BAR C #5 BAR 10" C/C INCHES	TOTAL REINF. QUANTITY LBS./LF
1"	0.164	4	-	-	4.17
2"	0.170	4	-	-	4.17
3"	0.176	4	-	-	4.17
4"	0.181	4	-	-	4.17
5"	0.187	4	-	-	4.17
6"	0.193	4	-	-	4.17
7"	0.198	4	-	-	4.17
8"	0.204	4	-	-	4.17
9"	0.210	4	-	-	4.17
10"	0.216	4	-	-	4.17
11"	0.222	4	-	-	4.17
12"	0.228	14	1@81	2@54	34.48
13"	0.233	14	1@81	2@54	34.48
14"	0.239	14	1@81	2@54	34.48
15"	0.245	14	1@81	2@54	34.48
16"	0.251	16	1@81	2@54	34.48
17"	0.257	16	1@81	2@54	34.48
18"	0.263	16	1@81	2@54	34.56
19"	0.269	16	1@81	2@60	34.83
20"	0.276	16	1@81	2@60	34.83
21"	0.282	16	1@81	2@60	34.83
22"	0.288	16	1@81	2@60	34.83
23"	0.294	16	1@81	2@60	34.83
24"	0.300	18	1@81	2@60	34.83
25"	0.306	18	1@81	2@67	39.30
26"	0.313	18	1@81	2@67	39.30
27"	0.319	18	1@81	2@67	39.30
28"	0.325	18	1@81	2@67	39.30
29"	0.332	18	1@81	2@67	39.30
30"	0.338	18	1@81	2@67	41.39
31"	0.344	18	1@81	2@74	42.86
32"	0.351	18	1@81	2@74	42.86
33"	0.357	18	1@81	2@74	42.86
34"	0.364	18	1@81	2@74	42.86
35"	0.370	18	1@81	2@74	42.86
36"	0.377	18	1@81	2@74	42.86

● SPEED FACTOR MAY BE DESIGN SPEED, OBSERVED SPEED OR ASSIGNED SPEED BASED UPON PREDICTABLE GROWTH FACTORS OR PENDING IMPROVEMENTS.

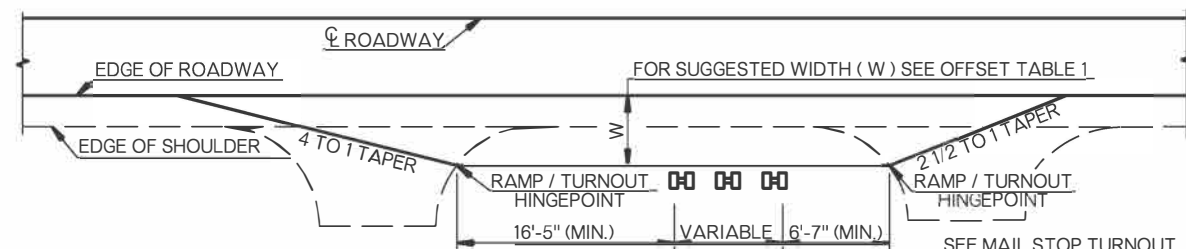


SUGGESTED MINIMUM CLEARANCE DISTANCES TO NEAREST MAILBOX IN MAIL STOPS AT INTERSECTIONS



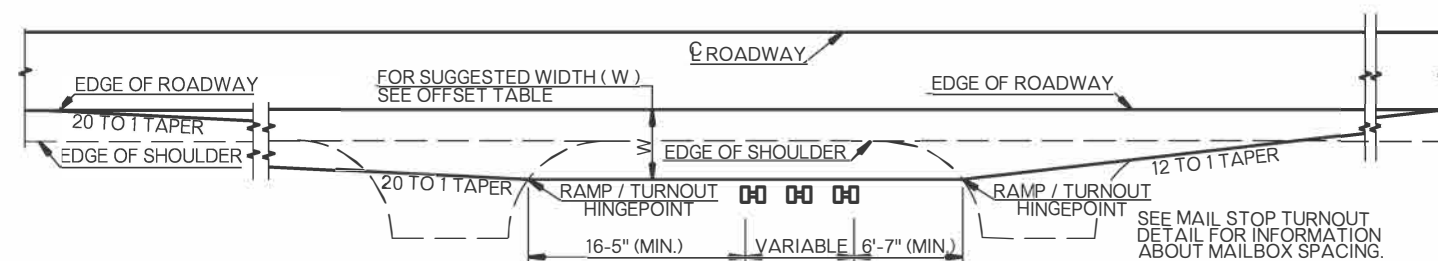
MAIL STOP TURNOUT DETAIL

▲ RECOMMENDED MINIMUM SPACING IS 3/4 OF THE DIMENSION FROM THE GROUND LINE TO THE BOTTOM OF THE MAILBOX



MAIL STOP LAYOUT

FOR ROADS CARRYING TRAFFIC AT 40 MPH OR LESS OR FOR LOCAL AND COLLECTOR ROADS



MAIL STOP LAYOUT

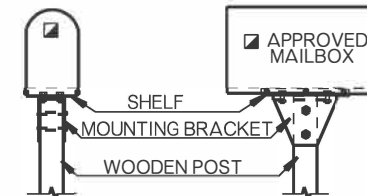
ROADS CARRYING TRAFFIC AT SPEED OVER 40 MPH

OFFSET TABLE

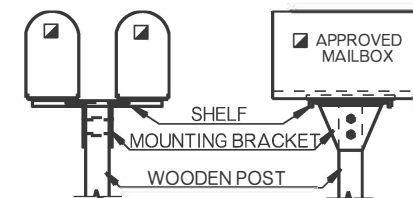
HIGHWAY TYPE AND TRAFFIC CONDITIONS	WIDTH OF ALL-WEATHER SURFACE OF TURNOUT OR AVAILABLE SHOULDER AT MAILBOX		DISTANCE ROADSIDE FACE OF MAILBOX IS TO BE OFFSET BEHIND EDGE OF TURNOUT OR USABLE SHOULDER	
	PREFERRED	MINIMUM	PREFERRED	MINIMUM
RURAL HIGHWAY OVER 10,000 VPD	12'	8'	8" TO 12"	0
RURAL HIGHWAY 1,500 TO 10,000 VPD	12'	8'	8" TO 12"	0
RURAL HIGHWAY 400 TO 1,500 VPD	10'	8'	8" TO 12"	0
RURAL ROAD ADT UNDER 400 VPD	8'	6'	8" TO 12"	10"
RURAL ROAD ADT UNDER 50 VPD SPEED 40 MPH OR LESS	6'	2'	8" TO 12"	0
RESIDENTIAL STREET WITHOUT CURB OR ALL-WEATHER SHOULDER	6'	0	8" TO 12"	10" ●
CURBED STREET	NOT APPLICABLE		8" TO 12" BEHIND FACE OF CURB	6" BEHIND FACE OF CURB

ADT-AVERAGE DAILY TRAFFIC, THROUGH ROAD ONLY
VPD - VEHICLES PER DAY
● IF TURNOUT IS PROVIDED, THIS MAY BE REDUCED TO ZERO.

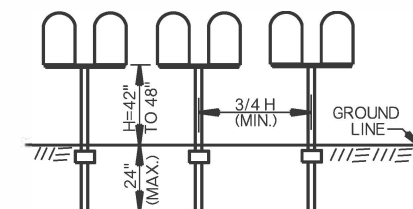
MAILBOX DESIGN TYPE	DIMENSIONS (NOM.)		
	LENGTH	WIDTH	HEIGHT
1	19"	6 1/2"	8 1/2"
1-A	21"	8"	10 1/2"
2	23 1/2"	11 1/2"	13 1/2"



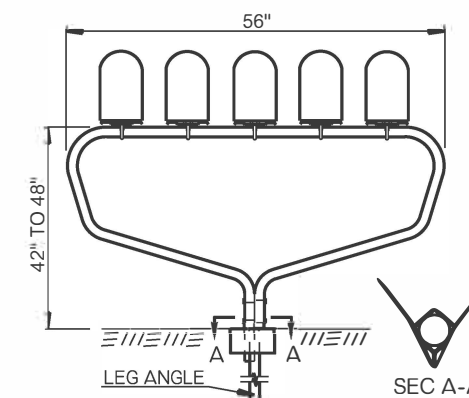
MAILBOX INSTALLATION - SINGLE WOODEN POST SUPPORT & BRACKET ASSEMBLY DETAILS



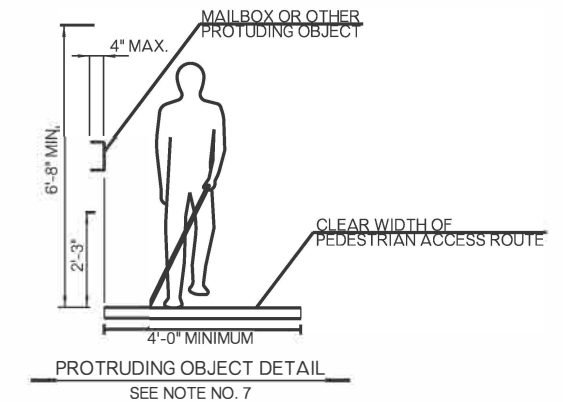
MAILBOX INSTALLATION - MULTIPLE (DOUBLE OR TWIN BOX)



POST SPACING DETAIL MULTIPLE BOX INSTALLATION SINGLE POST SERIES



MAILBOX INSTALLATION - MULTIPLE (MULTIPLE BOX SUPPORT DETAILS)
MAXIMUM NUMBER OF MAILBOXES = 5



GENERAL NOTES

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- MAILBOX INSTALLATION, SINGLE OR MULTIPLE TYPE, SHALL BE OF A DESIGN AND MATERIAL THAT HAS BEEN CRASH-TESTED AND APPROVED. OTHER DESIGNS OR MAILBOX TYPES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- IF MAILBOX IS INSTALLED IN AN AREA WITH GUARDRAIL, MAILBOX AND/OR POST ASSEMBLY SHOULD BE BEHIND OR FLUSH WITH FACE OF RAIL.
- PRODUCER AND CONTRACTOR SHALL AVOID PATENT INFRINGEMENT OF THE MAILBOX SUPPORT ASSEMBLY AND SHALL SAVE THE STATE HARMLESS IN THE USE OF ANY MAILBOX SUPPORT ASSEMBLY.
- ALTERNATE WOODEN POST SUPPORT INSTALLATIONS MAY BE USED IN LIEU OF METAL PIPE SUPPORT UNITS IF WOODEN COMPONENTS CONFORM TO CURRENT SPECIFICATIONS.
- PRICE OF EACH MAILBOX INSTALLATION, SINGLE OR MULTIPLE, INCLUDES PAYMENT FOR INSTALLATION OF THE POST SYSTEM, SUPPORT POST, ALL ATTACHMENT HARDWARE AND MOUNTING OF THE MAILBOX. PAYMENT FOR THE MAILBOX WILL BE PAID FOR BY THE EACH AND SEPARATELY FROM THE SUPPORT SYSTEM.
- IF A MAILBOX IS INSTALLED BEHIND THE CURB, THEN A MINIMUM OF 4 FEET CLEAR CONTINUOUS SPACE MUST BE ALLOWED BETWEEN THE MAILBOX AND THE EXTREME OUTSIDE EDGE OF THE DESIGNATED PEDESTRIAN ACCESS ROUTE PER PROWAG (PUBLIC RIGHTS OF WAY ACCESSIBILITY GUIDELINES).

BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
629 (A)	MAILBOX INSTALLATION - SINGLE	EA
629 (B)	MAILBOX INSTALLATION - MULTIPLE	EA
629 (C)	REMOVAL OF MAILBOX INSTALLATION	EA
629 (D)	REMOVE AND RESET MAILBOX	EA

MAILBOX DESIGN TYPE(S) AND LOCATION(S) SHALL BE SPECIFIED IN THE PLANS.

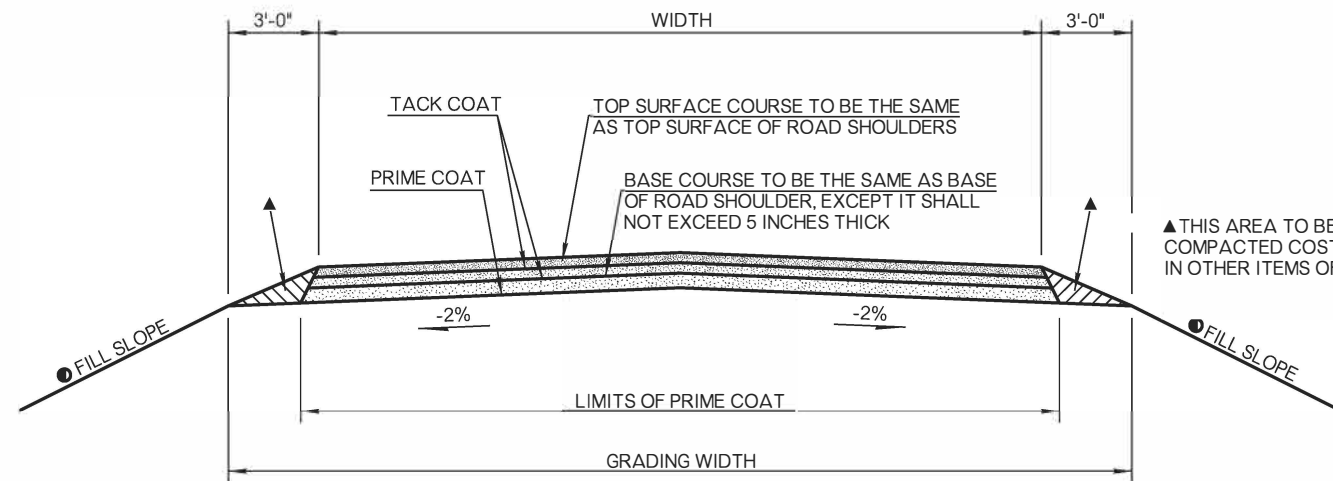
APPROVED BY ROADWAY ENGINEER:  DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



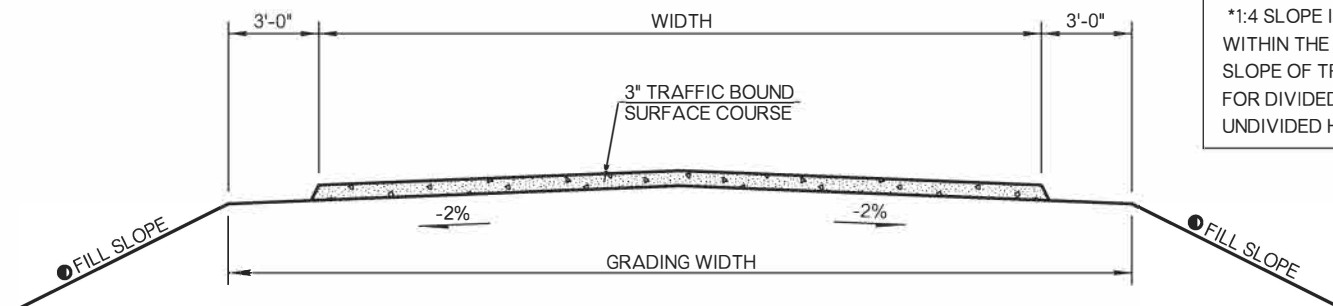
MAILBOX INSTALLATION

2019 SPECIFICATIONS

MI-4 2 R-67

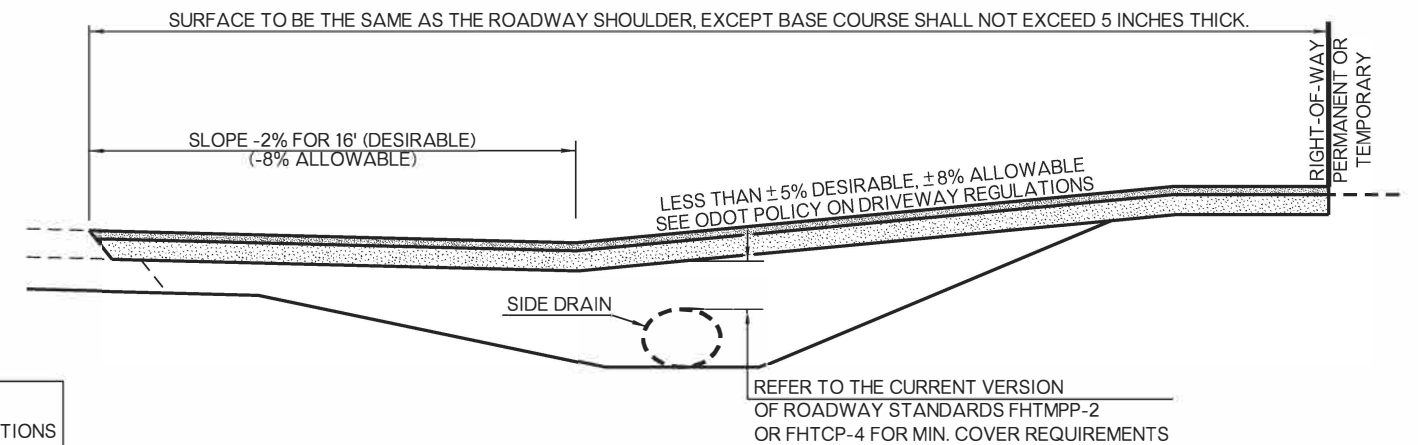


TYPICAL SECTION OF ASPHALT RETURN/DRIVE

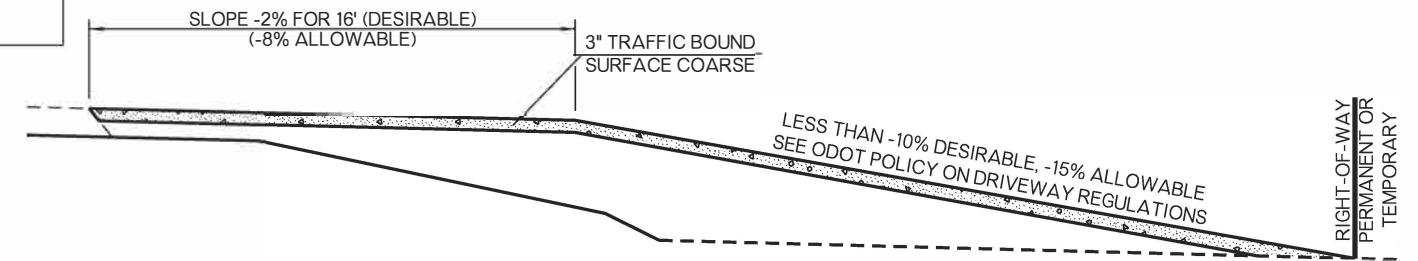


TYPICAL SECTION OF T.B.S.C. RETURN/DRIVE

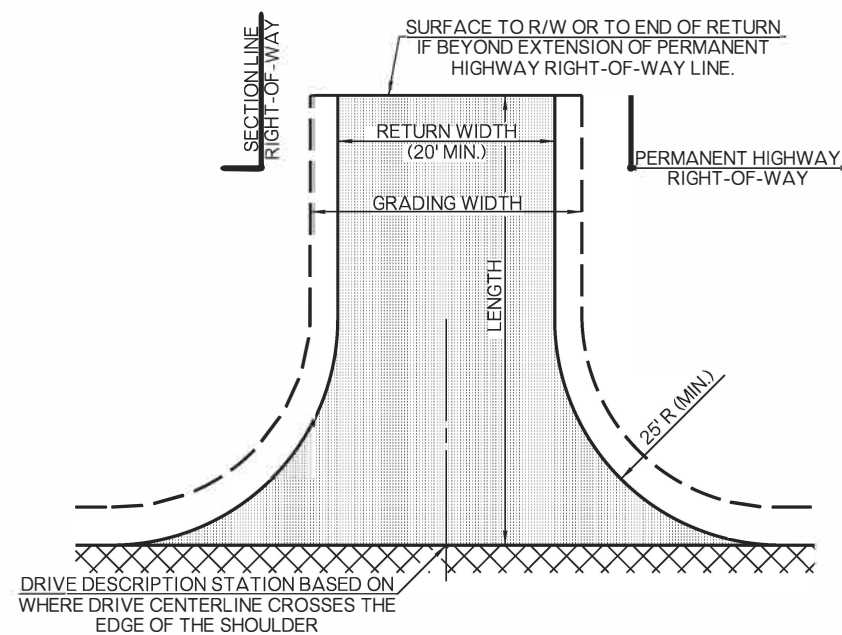
FILL SLOPE NOTES:
FILL SLOPE AS SHOWN IN TYPICAL SECTIONS SHALL NOT EXCEED:
*1:3 SLOPE OUTSIDE HIGHWAY CLEARZONE
*1:4 SLOPE INSIDE HIGHWAY CLEARZONE
WITHIN THE HIGHWAY CLEARZONE, ADJUST SLOPE OF TRAFFIC APPROACH END TO 1:10 FOR DIVIDED HIGHWAYS AND 1:6 FOR UNDIVIDED HIGHWAYS.



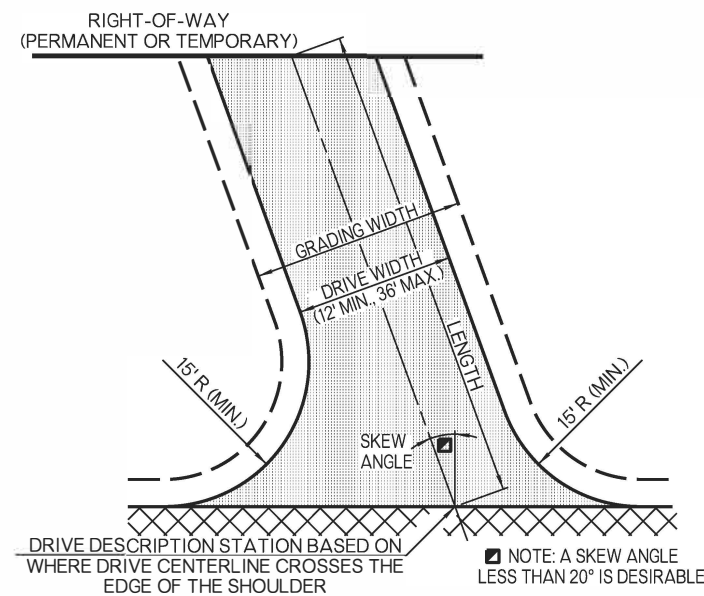
PROFILE OF TYPICAL ASPHALT RETURN/DRIVE ON ROADWAY CUT SECTION



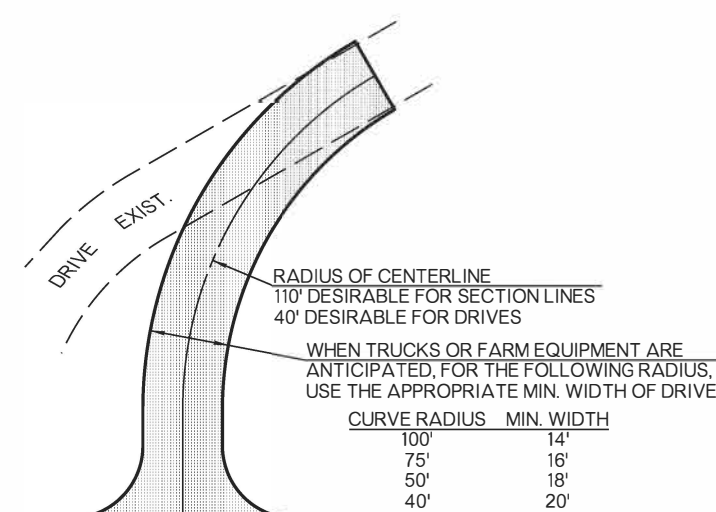
PROFILE OF TYPICAL T.B.S.C. RETURN/DRIVE ON ROADWAY FILL SECTION



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

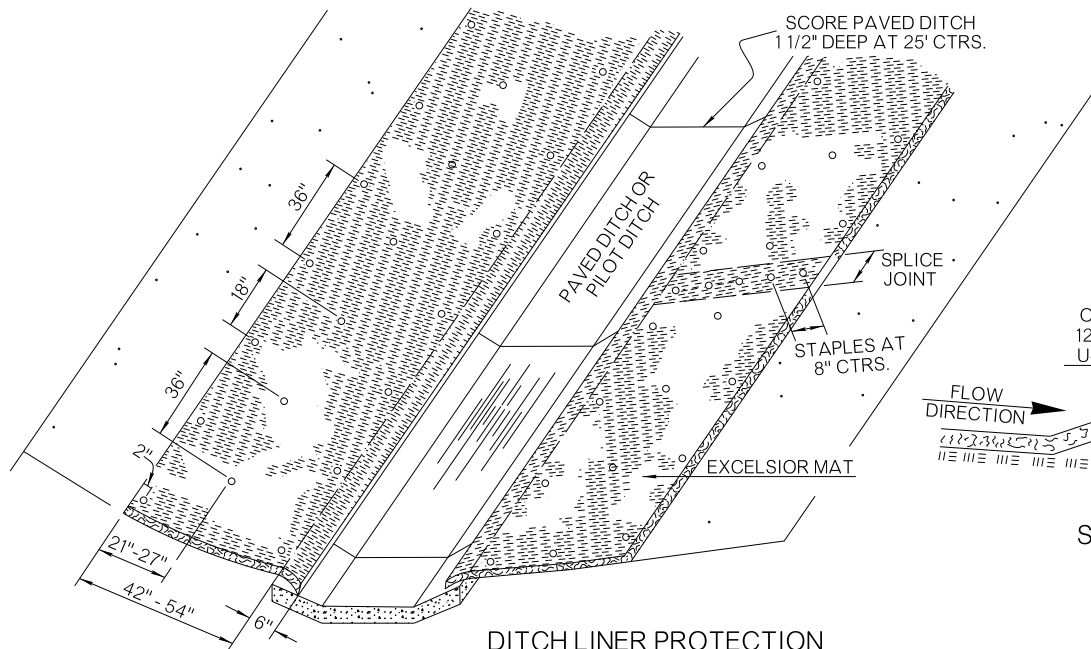
APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



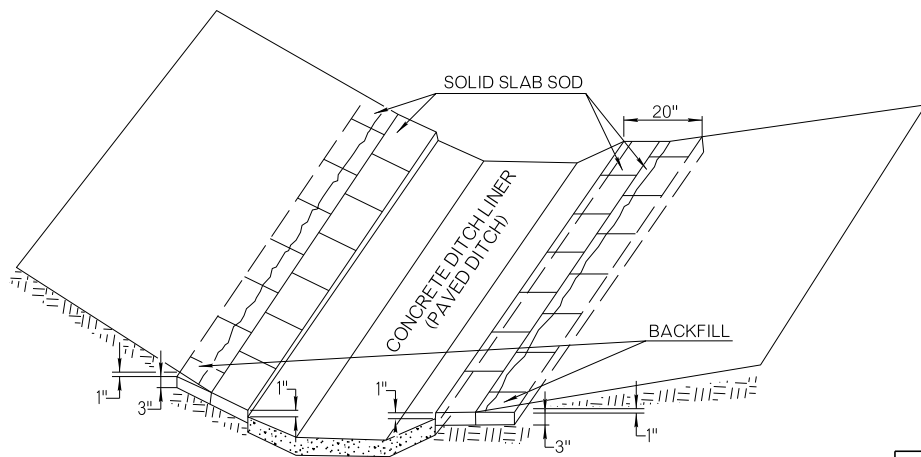
RURAL DRIVEWAY INSTALLATION

2019 SPECIFICATIONS

RDI-4 1 R-68



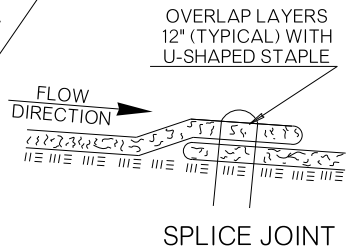
DITCH LINER PROTECTION
(EXCELSIOR MAT OPTION)



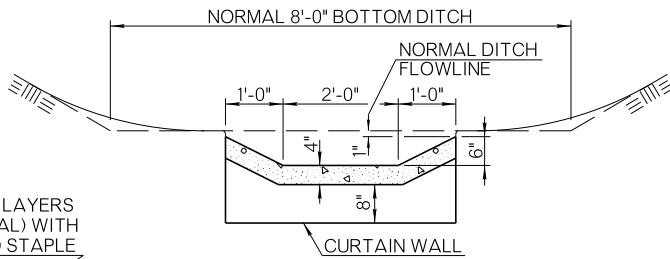
DITCH LINER PROTECTION
(SOLID SLAB SOD OPTION)

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

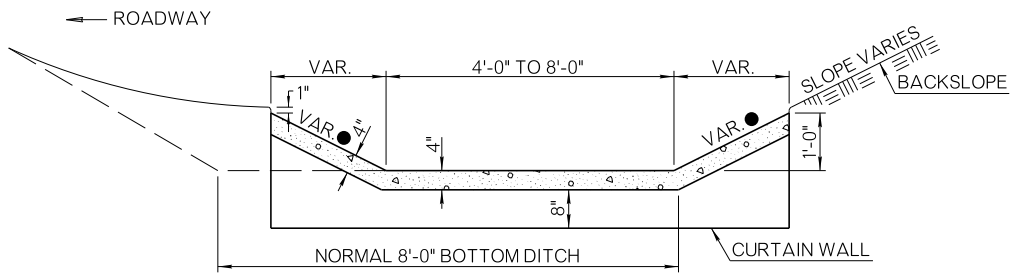
DESIGN NO. 2 - A DITCH THAT IS PAVED AND HAVING THE SAME FLOWLINE AS A STANDARD UNPAVED DITCH



SPLICE JOINT

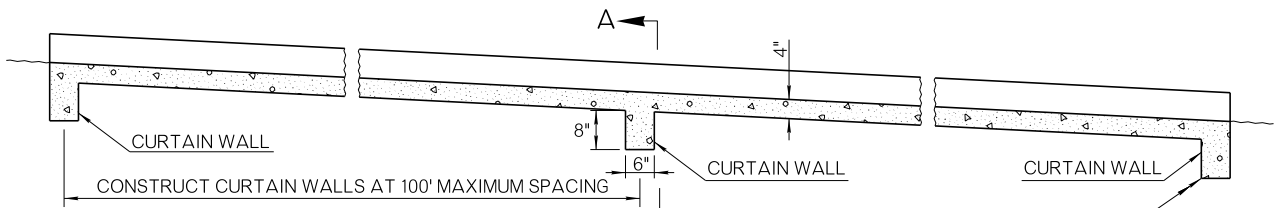


SECTION A - A
DESIGN NO. 1

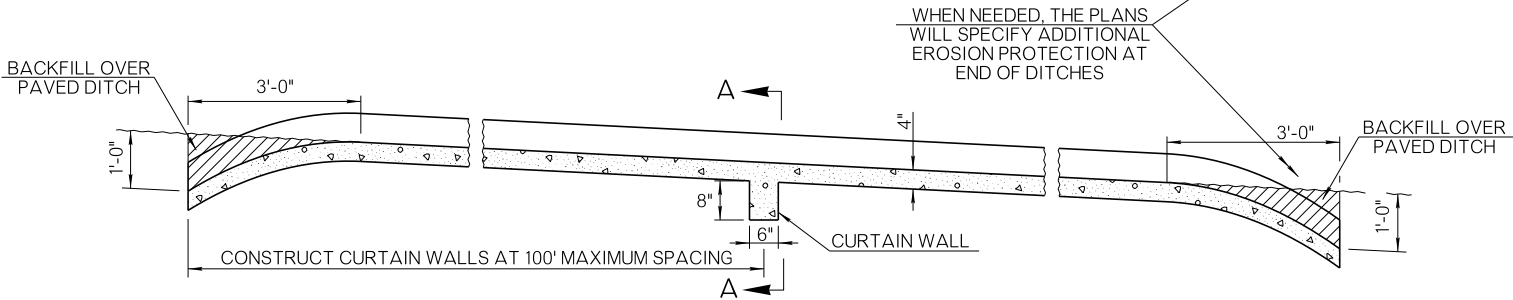


SECTION A - A
DESIGN NO. 2

● 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

- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- ALL COST OF ADDITIONAL BORROW OR EXCAVATION, REQUIRED FOR INSTALLING PAVED DITCH, SHALL BE INCLUDED IN PRICE BID FOR CLASS C CONCRETE.
- THE DITCH SHALL BE WATERED, AND COMPACTED, BEFORE PLACING CLASS C CONCRETE.
- 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.

BASIS OF PAYMENT

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

	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

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

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



PAVED DITCHES AND FLUMES

2019 SPECIFICATIONS

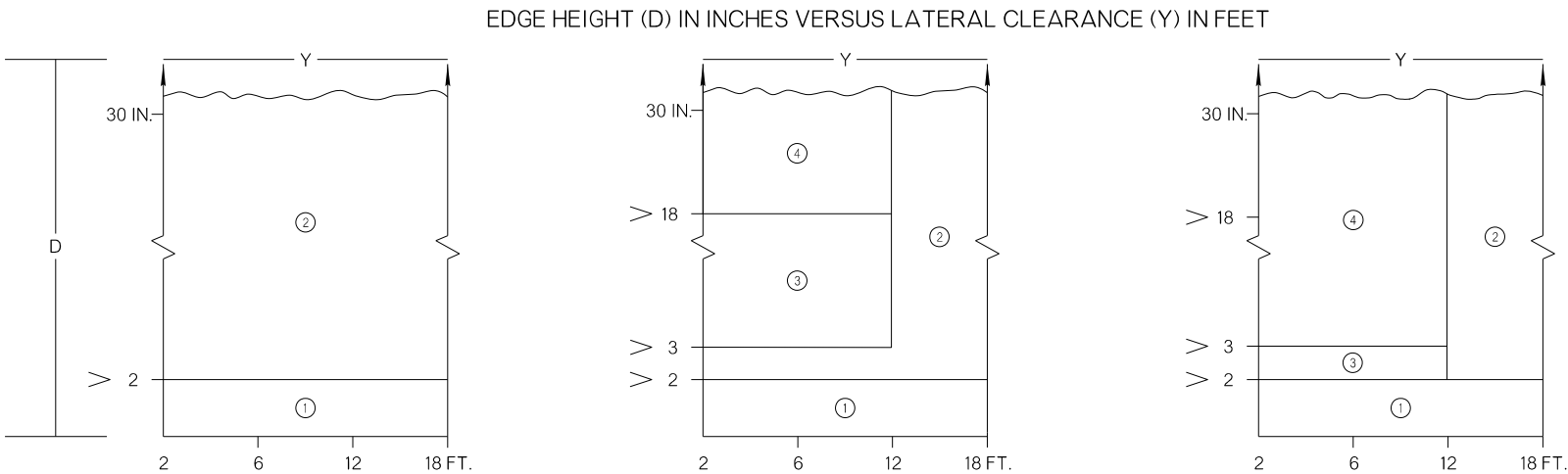
DC-4

2

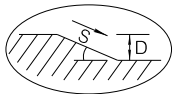
R-69

APPROVED BY
ROADWAY ENGINEER: DATE: 4/1/2025
ROADWAY DESIGN DIVISION STANDARD

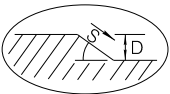
DEFINITION OF TREATMENT ZONES FOR EDGE DROP-OFF CONDITIONS



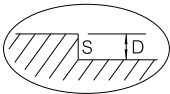
EDGE CONDITION A
S = 1:3 OR FLATTER



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



EDGE CONDITION C
S = STEEPER THAN 1:1



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 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.

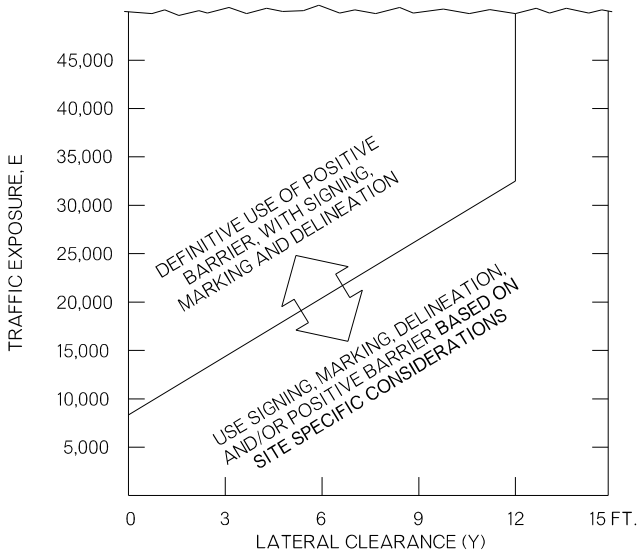


FIGURE-1: CONDITIONS INDICATING THE NEED FOR POSITIVE BARRIER

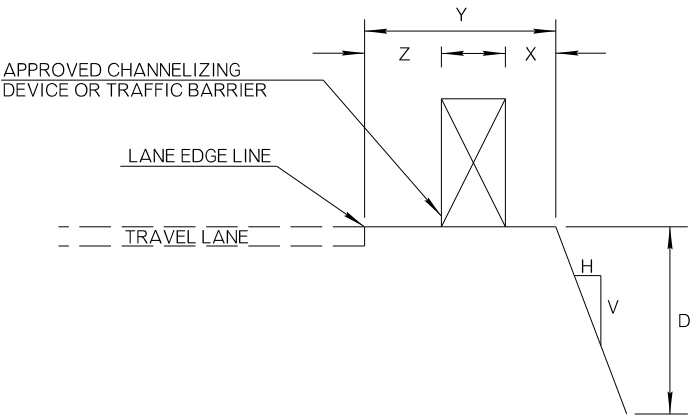
$E = \text{CURRENT ADT} \times T$
WHERE CURRENT ADT IS THAT PORTION OF THE AVERAGE DAILY TRAFFIC VOLUME TRAVELING WITHIN 12 FEET (GENERALLY ONE ADJACENT LANE) OF THE EDGE DROP-OFF CONDITION; AND, T IS THE DURATION TIME IN YEARS OF THE DROP-OFF CONDITION.

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

- 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.
- THE FOLLOWING TYPES OF TREATMENT MAY BE USED:
 - WARNING DEVICES (SUCH AS SIGNS OR CHANNELIZING DEVICES), AND
 - POSITIVE BARRIERS (SUCH AS PORTABLE LONGITUDINAL BARRIERS).
- 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.
- 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.
- THE CONDITIONS FOR INDICATING THE USE OF POSITIVE OR PROTECTIVE BARRIERS ARE GIVEN BY FIGURE-1.
- 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."
- 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

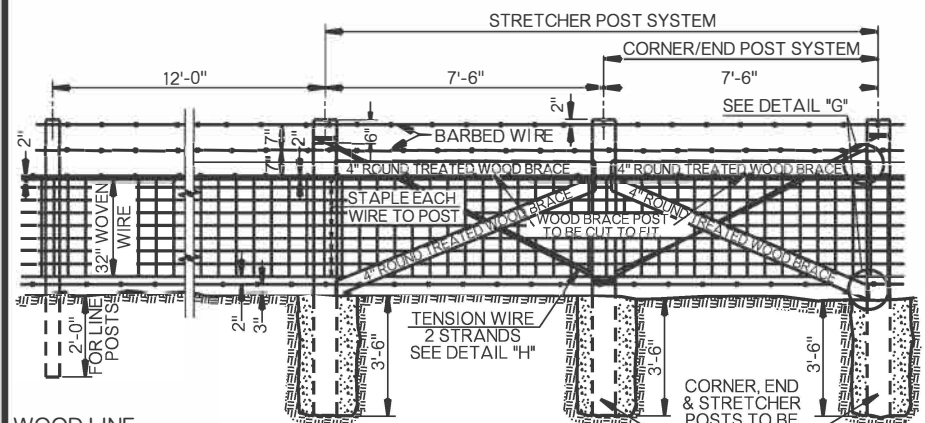


2019 SPECIFICATIONS

PDT-2

3

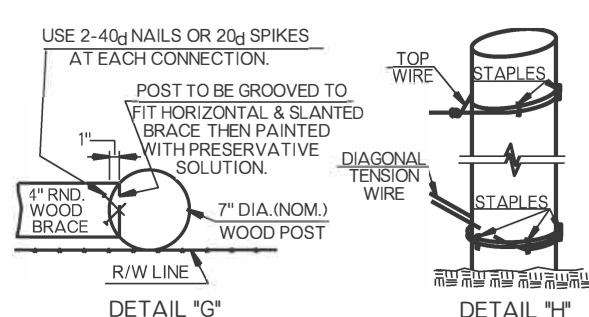
R-70



WOOD LINE POST DETAIL

END, CORNER AND STRETCHER POST DETAIL

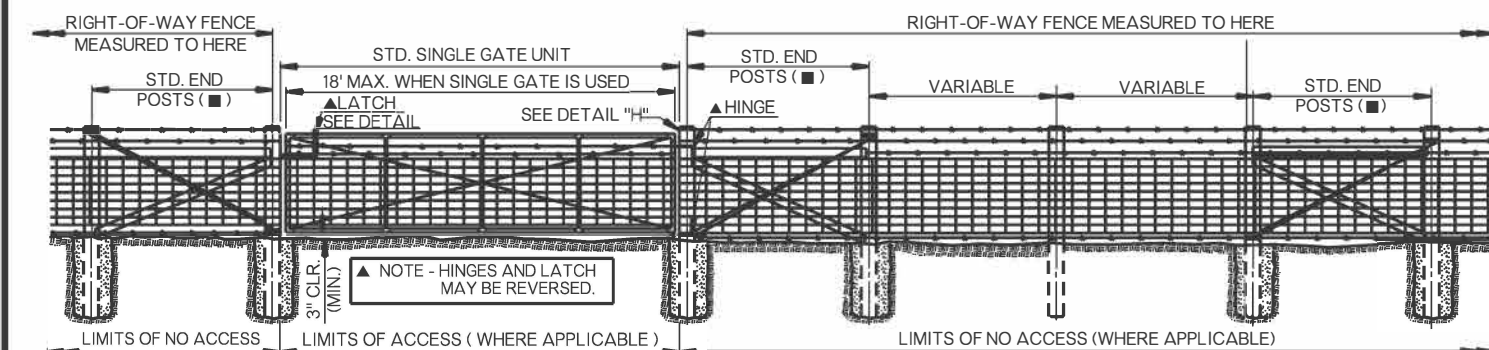
USE STRETCHER DETAILS AT ALL CORNERS, BENDS IN R/W, HILL TOPS, IN VALLEYS OR DEEP DEPRESSIONS AND AT 500'-0" MAXIMUM SPACING USE END POSTS FOR CROSS FENCE CONNECTIONS.



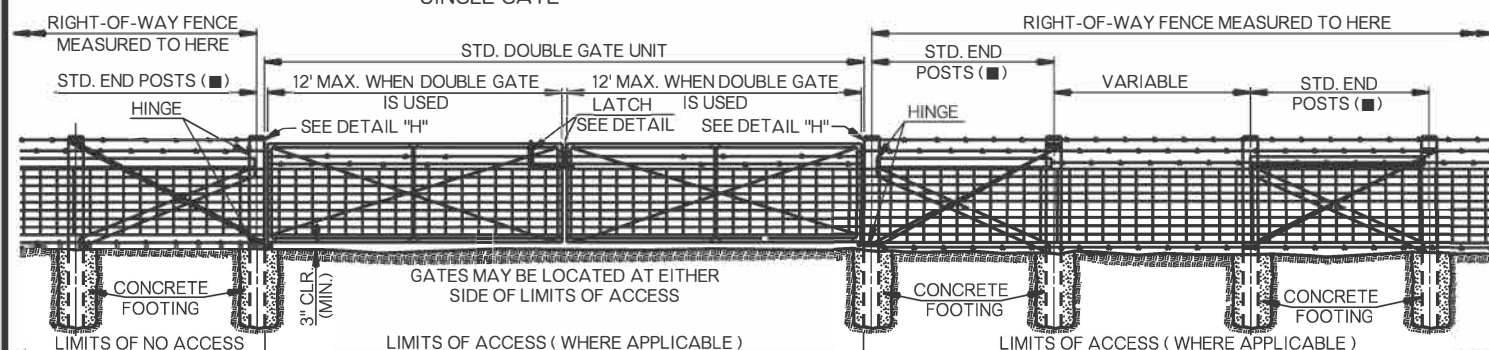
DETAIL "G"

DETAIL "H"

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 RW3-3.

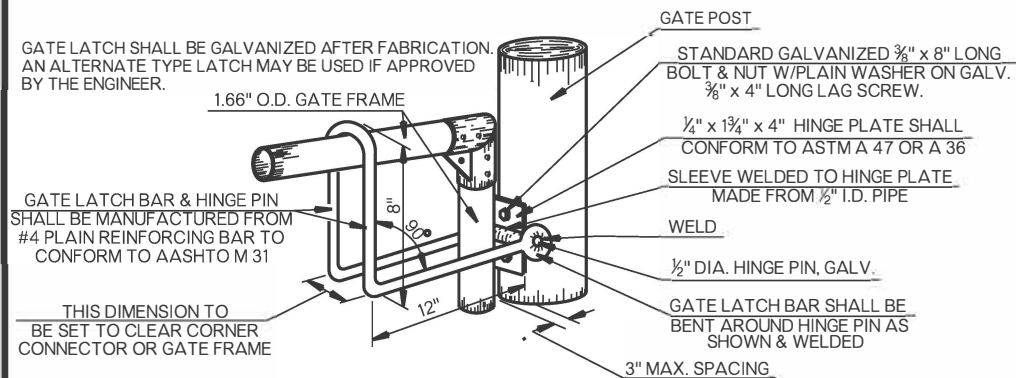


SINGLE GATE

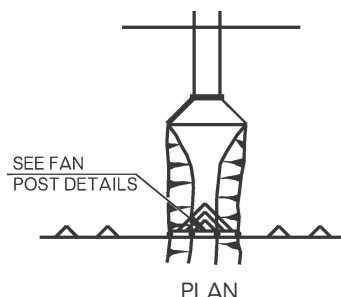


DOUBLE GATE

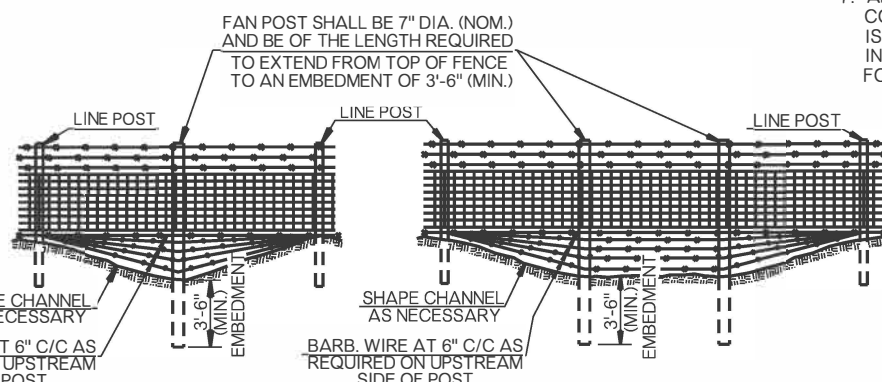
GATE DETAILS



TYPICAL GATE LATCH DETAIL

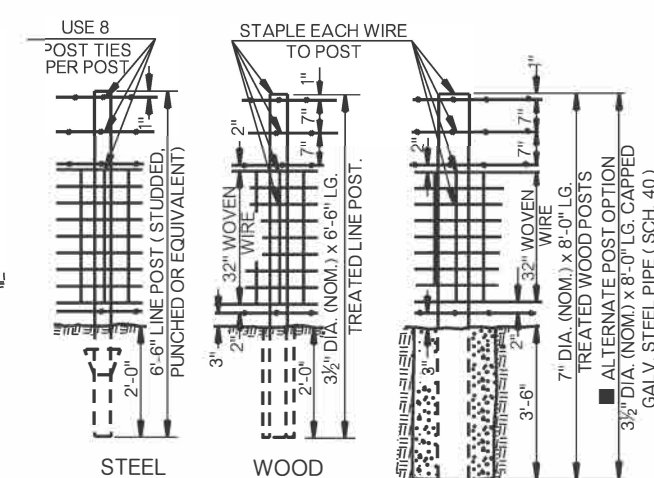


PLAN



TYPICAL FAN DETAILS

FOR SMALL DRAINS AND IRREGULAR TERRAIN

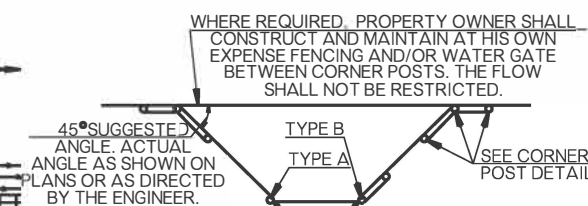


STEEL

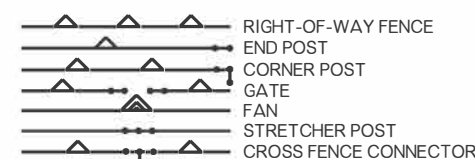
WOOD

CORNER, STRETCHER, GATE, OR END POST

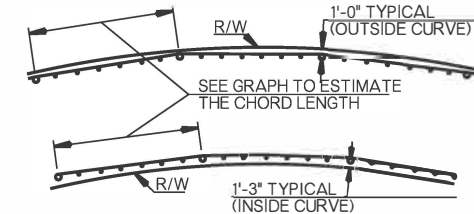
HOLE SHALL BE 18" DIA. (MIN.) REQUIRES CONCRETE FOOTING



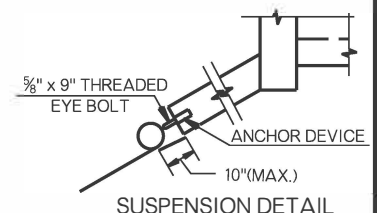
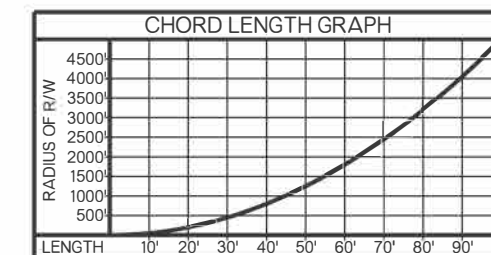
PLAN



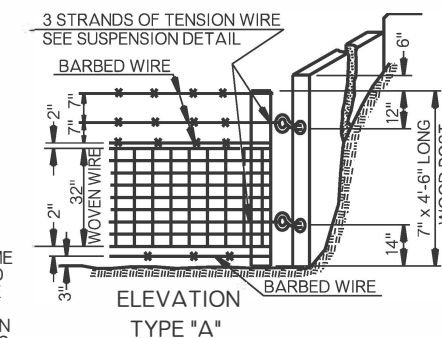
FENCING SYMBOLS ON PLANS
SEE PLAN AND PROFILE SHEETS FOR LOCATION



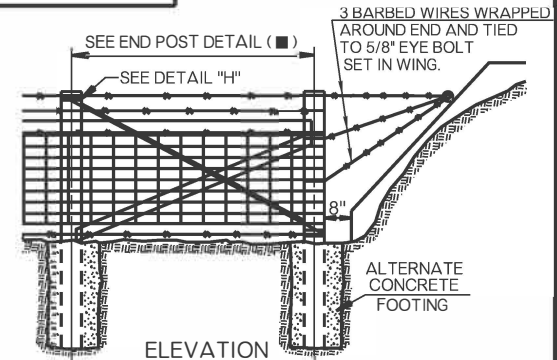
TYPICAL PLACEMENT FOR FENCE ALONG CURVES
(WHEN R/W RADIUS IS LESS THAN 5000')



SUSPENSION DETAIL



ELEVATION
TYPE "A"



ELEVATION
TYPE "B"

CONNECTIONS AT CULVERTS

GENERAL NOTES

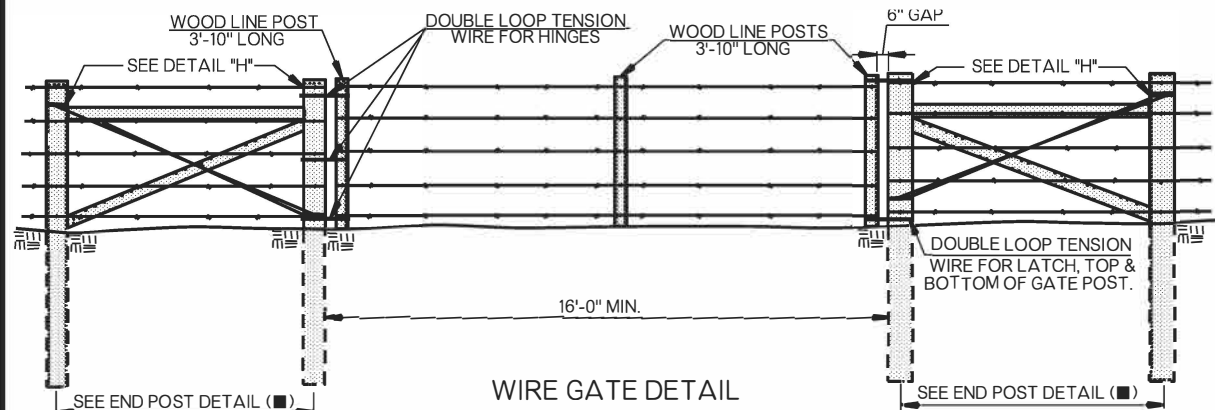
1. ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
2. SEE PLANS FOR SIZE AND LOCATION OF GATES. USE DOUBLE GATES WHERE WIDTH IS GREATER THAN 18 FEET. ALL DOUBLE GATES SHALL BE PAID FOR AS TWO SINGLE GATES AND SHALL INCLUDE ALL HINGES, LATCHES, AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION.
3. FENCE, IN GENERAL, SHALL BE ON OUTSIDE OF POSTS. AWAY FROM CENTERLINE OF HIGHWAYS AND CONSTRUCTED ON THE PERMANENT RIGHT-OF-WAY LINE (EXCEPTIONS ARE ON CURVES AND CORNERS).
4. ALL WIRES SHALL MAKE TWO COMPLETE WRAPS AROUND EACH END POST, THEN AROUND THEMSELVES TWO TWISTS/TURNS. USE EXTRA STAPLES ON END POST. SEE DETAIL "H" FOR WIRE WRAPPING EXAMPLES.
5. STRETCHER POST TO BE USED IN GENERAL AT HILL TOPS AND AT BOTTOM OF VALLEYS AND AT A MAXIMUM 500 FEET APART.
6. ALL MISCELLANEOUS HARDWARE SHALL BE FURNISHED GALVANIZED OR ALUMINUM COATED. ALL ALTERNATIVE METAL PIPE POSTS SHALL BE CAPPED.
7. 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.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
624 (A)	FENCE, STYLE WWF	LF
624 (B)	GATE, STYLE WWF	EA

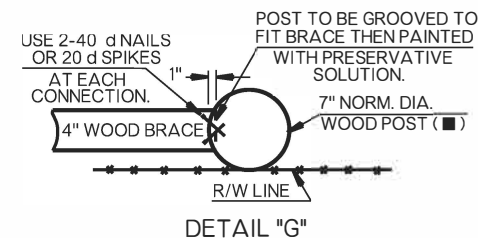
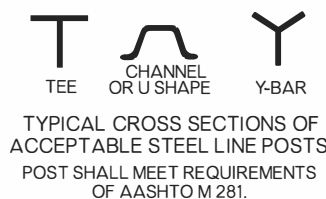
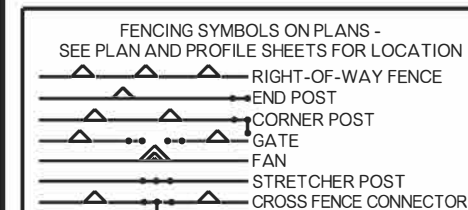
APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

RIGHT-OF-WAY FENCE STYLE WWF
(WOVEN WIRE FENCE)

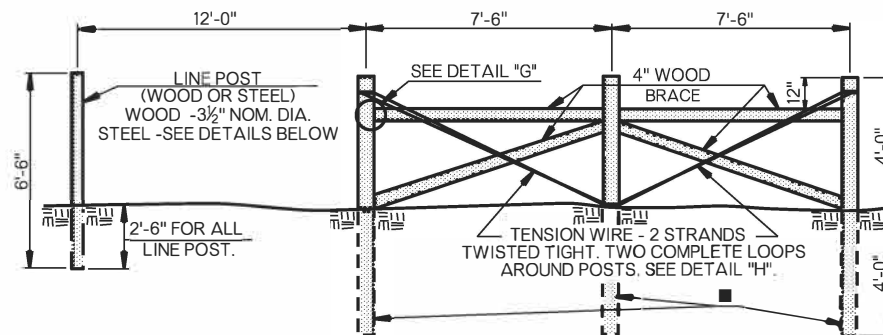




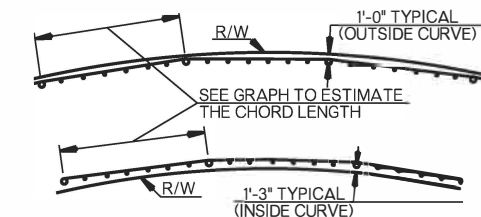
WIRE GATE DETAIL
LOCATION OF GATE TO BE DETERMINED BY THE ENGINEER. OTHER TYPES OF GATES MAY BE SUBSTITUTED FOR THE WIRE GATE, SUCH AS PREFABRICATED PIPE TUBING TYPE OR RANCH STYLE METAL PANEL TYPE, IF APPROVED BY THE ENGINEER. COST OF WIRE GATE SHALL BE INCLUDED IN THE PRICE BID FOR FENCE.



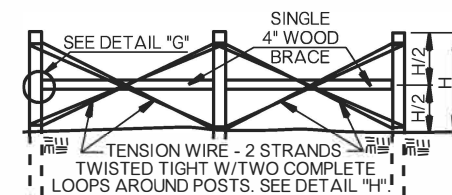
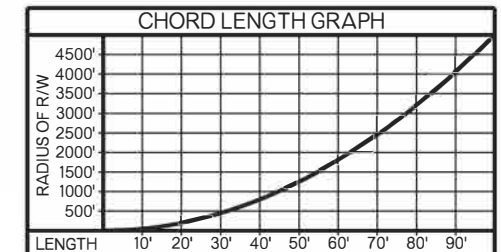
IF 3 1/2" DIA. x 8'-0" LONG GALV. STEEL (SCH. 40) PIPE IS USED AS ALTERNATIVE POST (■), THEN 2" DIA. GALV. STEEL PIPES (SCH. 40) WILL BE USED AS BRACING AND ATTACHED USING STANDARD CHAIN LINK FENCE HARDWARE MEETING THE REQUIREMENTS OF AASHTO M 181 & ASTM A53. SEE CHAINLINK DETAILS ON THE CURRENT VERSION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



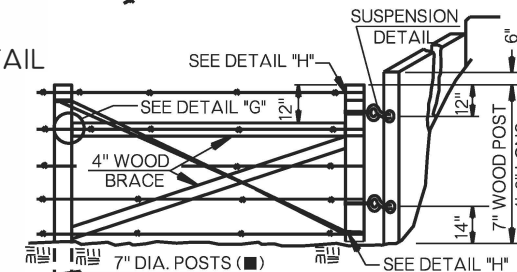
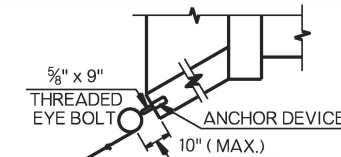
CORNER & STRETCHER POSTS DETAIL
USE STRETCHER DETAILS AT ALL CORNERS, BENDS IN R/W, ON HILL TOPS, IN VALLEYS OR DEEP DEPRESSIONS, AND AT 500' MAXIMUM SPACING.



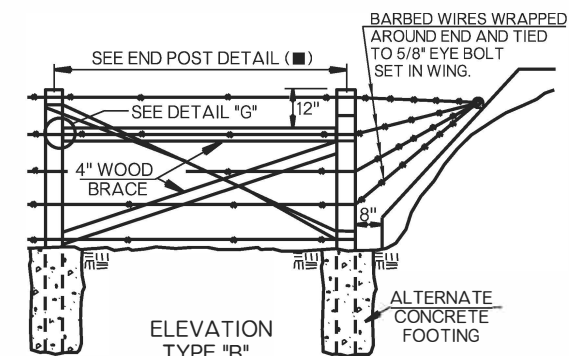
TYPICAL PLACEMENT FOR FENCE ALONG CURVES
(WHEN R/W RADIUS IS LESS THAN 5000')



CORNER & STRETCHER POSTS DETAIL ALTERNATIVE

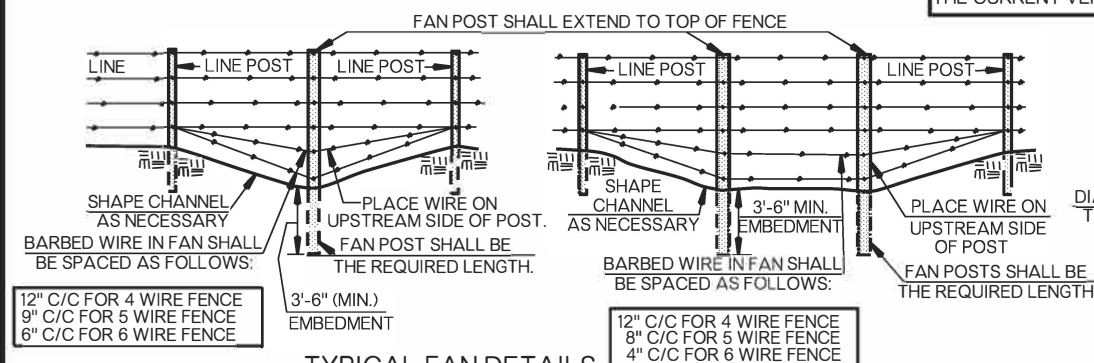


ELEVATION TYPE "A"

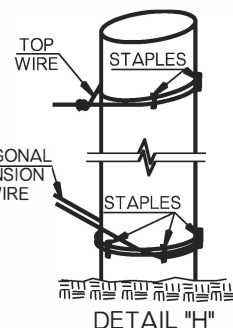


ELEVATION TYPE "B"

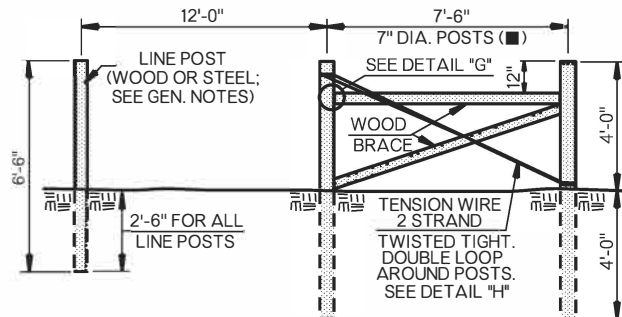
CONNECTIONS AT CULVERTS



TYPICAL FAN DETAILS
(FOR SMALL DRAINS AND IRREGULAR TERRAIN)

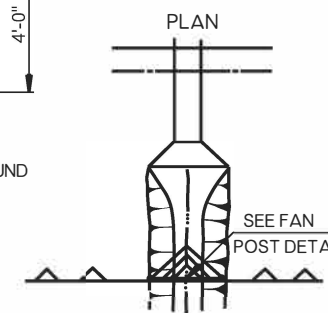


DETAIL "H"



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".

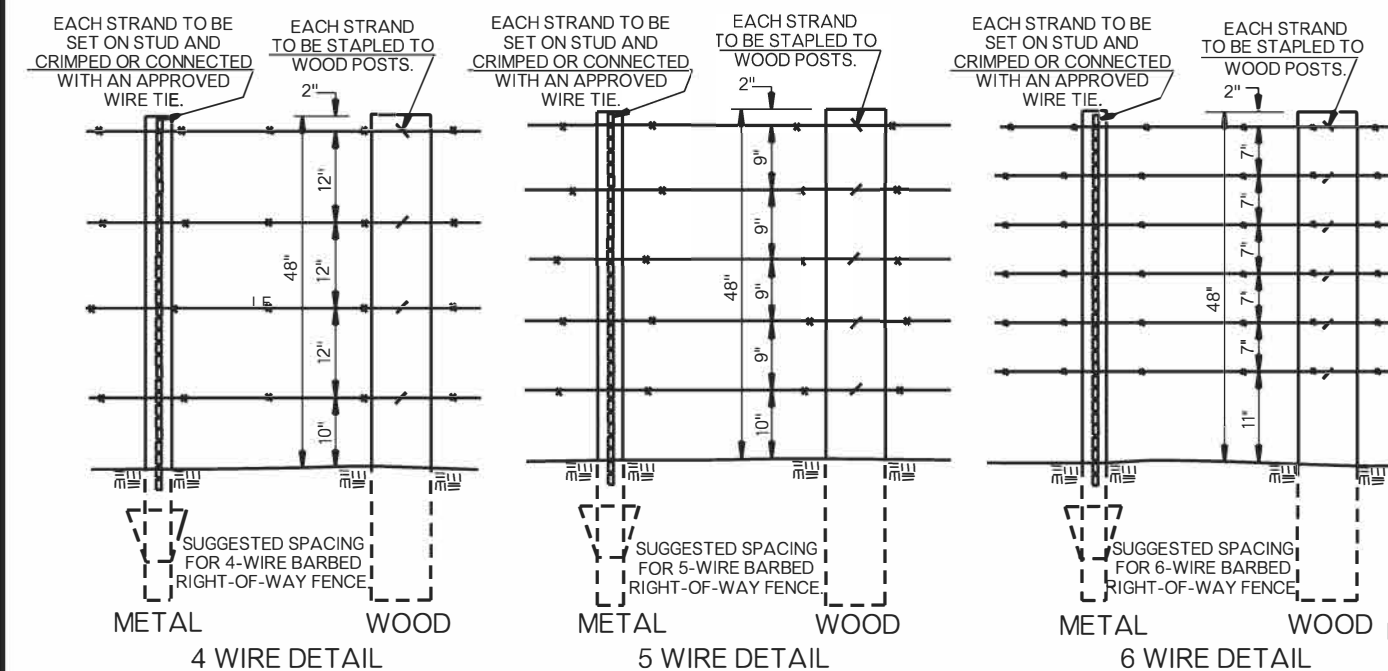


PLAN

- GENERAL NOTES**
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
 - 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).
 - 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.
 - 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

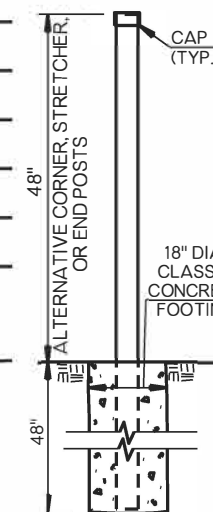
● NUMBER OF STRANDS



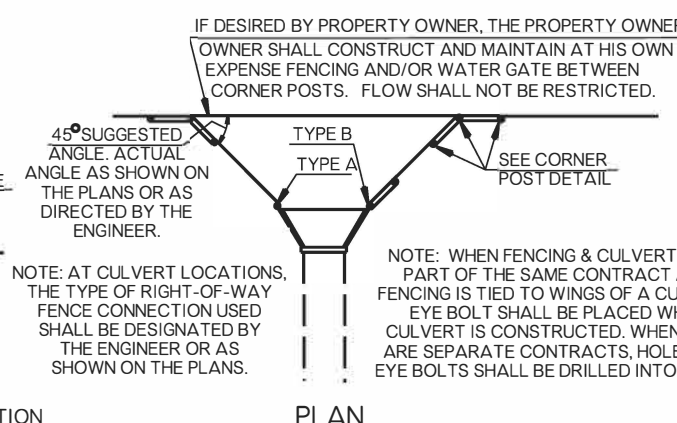
4 WIRE DETAIL
METAL WOOD

5 WIRE DETAIL
METAL WOOD

6 WIRE DETAIL
METAL WOOD



ALTERNATE POST OPTION
3 1/2" DIA. X 8'-0" LG. CAPPED
GALV. SCH. 40 STEEL PIPE



PLAN



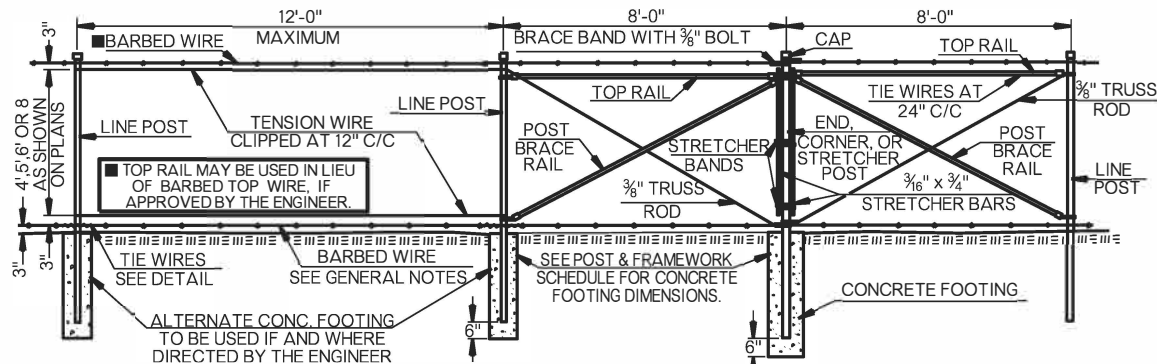
APPROVED BY
ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD

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

2019 SPECIFICATIONS

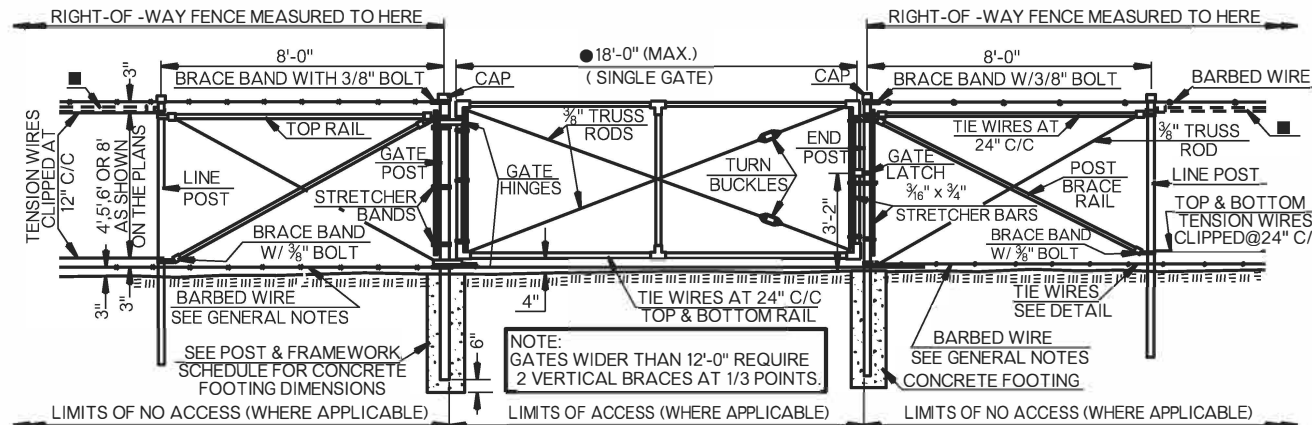
RWF2-3 1

R-72



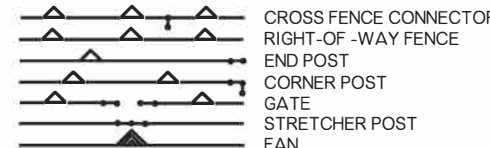
TYPICAL LINE POST DETAIL

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)



GATE DETAIL

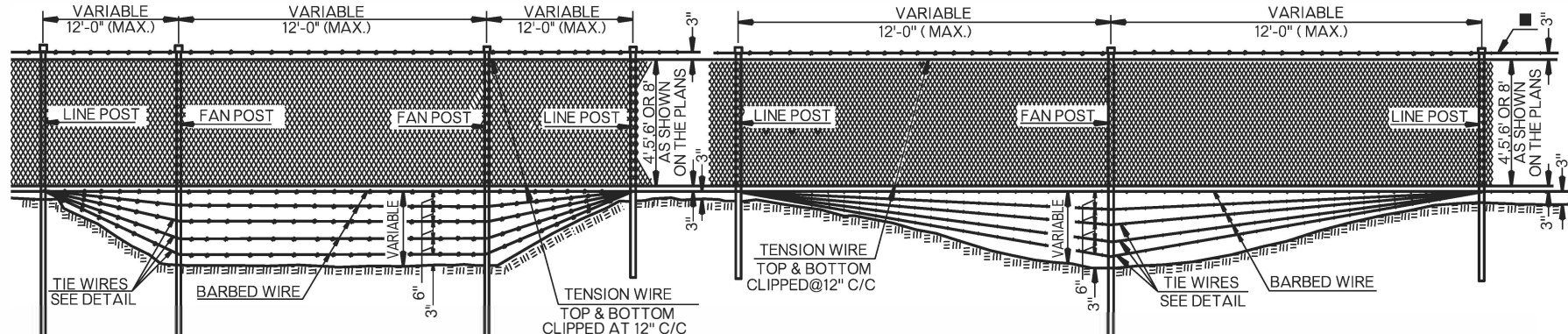
SEE PLANS FOR SIZE AND LOCATION OF GATES. FOR WIDTH GREATER THAN 18'-0", USE DOUBLE SWING GATES WITH MIDDLE LATCH. OPENING MAY BE UP TO 36'-0" WIDE.



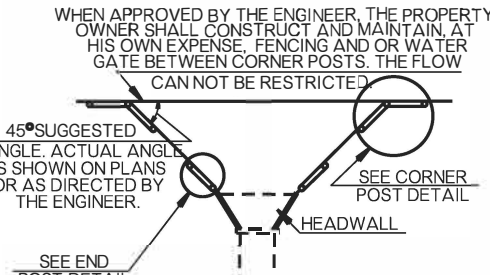
FENCING SYMBOLS ON PLANS
SEE PLAN AND PROFILE SHEETS FOR LOCATION.



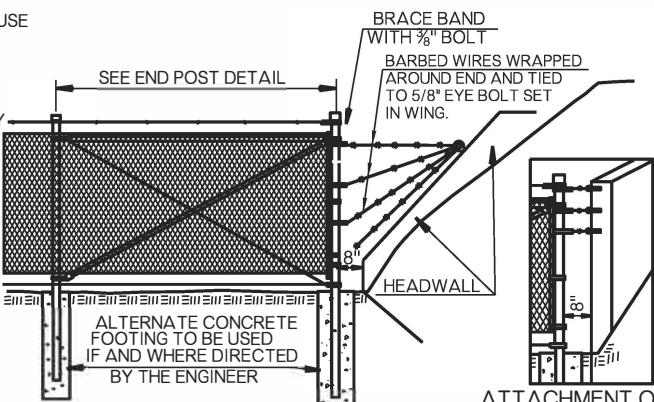
CONCRETE FOOTING FOR POSTS



FAN DETAILS



HEADWALL CONNECTION

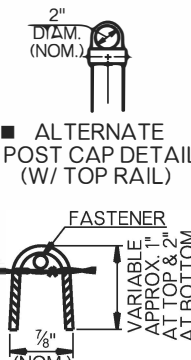


ELEVATION HEADWALL CONNECTION

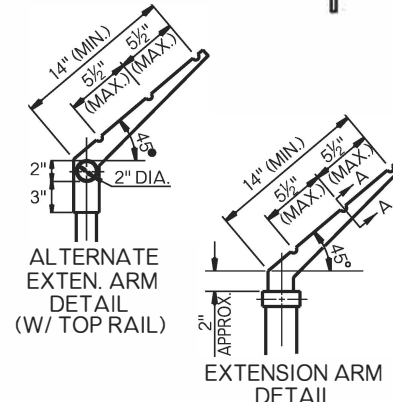
ATTACHMENT OPTION FULL HEIGHT WING/WALL
WHEN WING OR WALL HEIGHT EQUALS FENCE HEIGHT

GENERAL NOTES

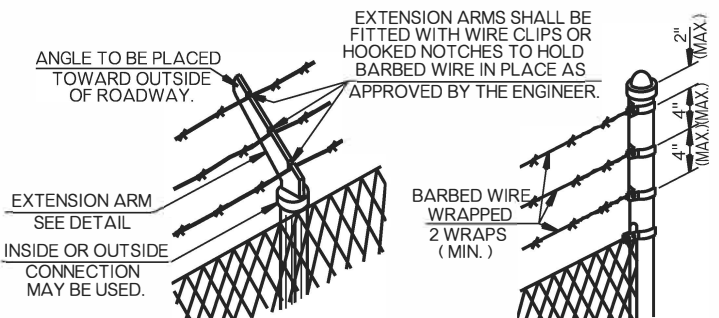
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2019 ODOT STANDARD SPECIFICATIONS.
- COST OF BARBED WIRE AND EXTRA LENGTH POSTS FOR FAN TO BE INCLUDED IN PRICE BID FOR CHAIN LINK FENCE.
- THE BOTTOM BARBED WIRE MAY BE OMITTED AND FABRIC INSTALLED 1" CLEAR FROM GROUND LINE IN LOCATIONS APPROVED BY THE ENGINEER.
- ALL MISCELLANEOUS HARDWARE SHALL BE FURNISHED GALVANIZED OR ALUMINUM ALLOY.
- 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 PRESSED STEEL OR MALLEABLE IRON AND SHALL BE GALVANIZED AFTER FABRICATION.
- CHAIN LINK FABRIC MAY BE ACCEPTED KNUCKLED BOTH SELVAGES IN ALL WIDTHS. NO FABRIC WITH TWISTS AND BARBS ON BOTH SELVAGES WILL BE ACCEPTED.
- STRETCHER POSTS TO BE USED IN GENERAL AT HILL TOPS AND AT BOTTOM OF VALLEYS AND AT A MAXIMUM OF 500 FEET APART.
- 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.
- 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.



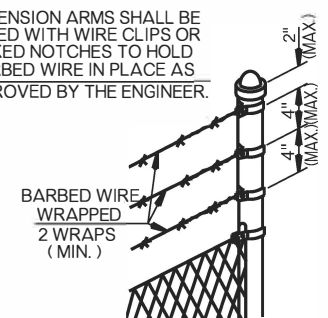
SECTION A-A



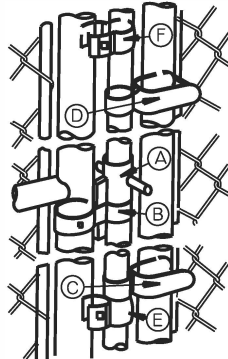
EXTENSION ARM DETAIL



ANGULAR CLIMB BARRIER FOR LINE POSTS



VERTICAL CLIMB BARRIER FOR END & GATE POSTS

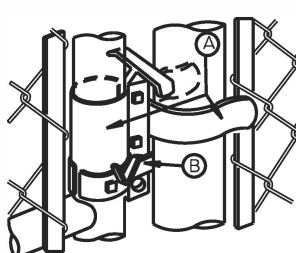


DOUBLE GATE LATCH



TYPICAL GATE LATCH DETAIL

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



SINGLE GATE LATCH

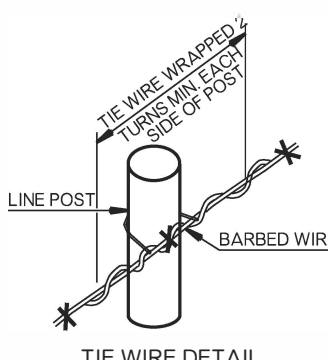
POST & FRAMEWORK SCHEDULE											
SHAPE	LINE POST				END, CORNER, OR STRETCHER POSTS	GATE POSTS				TOP RAIL OR POST BRACE RAIL	
	1 7/8" O.D. PIPE	ROLL FORMED HEAVY "C"	ROLL FORMED STAND. "C"	"H" RAIL		6" WIDE & LESS	OVER 6" TO 12" WIDE	OVER 12" TO 18" WIDE		15/8" O.D. PIPE	ROLL FORMED
NOMENCLATURE	1 7/8" O.D. PIPE	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
DIMENSIONS	1.9" O.D. T = 0.145"	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"
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
WEIGHT	2.72 LBS./LIN. FT.	2.78 LBS./LIN. FT.	3.26 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.	1.84 LBS./LIN. FT.
LENGTH FOR GIVEN FENCE FAB. HT.	4' 6"-10" W/CONC. FOOTING; 7'-4" WHEN DRIVEN.	5' 8"-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	10'-4" W/CONC. FOOTING		10'-4" W/CONC. FOOTING	12'-4" W/CONC. FOOTING
EMBEDMENT FOR GIVEN FENCE FAB. HT.	24" IN CONC. FOOTING; 30" WHEN DRIVEN.	27" IN CONC. FOOTING; 33" WHEN DRIVEN.	30" IN CONC. FOOTING; 36" WHEN DRIVEN.	33" 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	42" IN CONC. FOOTING
FOOTING DIM. IN EARTH	9" DIA.	9" DIA.	9" DIA.	9" DIA.	9" DIA.	12" DIA.	16" DIA.	18" DIA.		9" DIA.	12" DIA.
FOOTING DIM. IN ROCK	36" DEEP	4" DIA.	4" DIA.	4" DIA.	4" DIA.	5" DIA.	6" DIA.	8" DIA.		4" DIA.	5" DIA.

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.

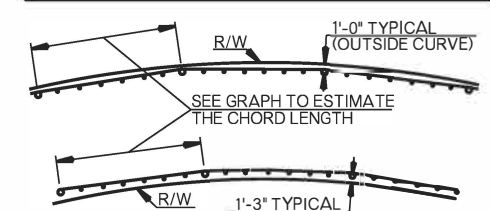
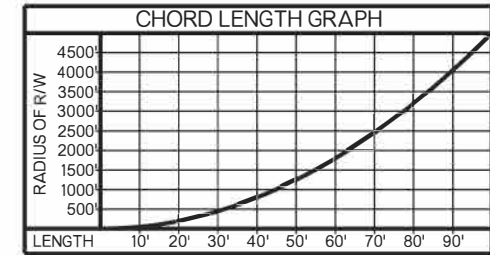
▲ T = WALL THICKNESS

▼ SECTION MODULUS AS SHOWN IS BASED UPON ASTM A53 AND AASHTO M 181. SEE SPECIFICATIONS FOR SUBSTITUTION FORMULA ON CLASS 2 COLD FORMED STEEL PIPE.

● SECTION MODULUS AS SHOWN IS BASED UPON ASTM A501 AND AASHTO M 181. SEE SPECIFICATIONS FOR SUBSTITUTION FORMULA ON CLASS 2 COLD FORMED STEEL PIPE.



TIE WIRE DETAIL



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

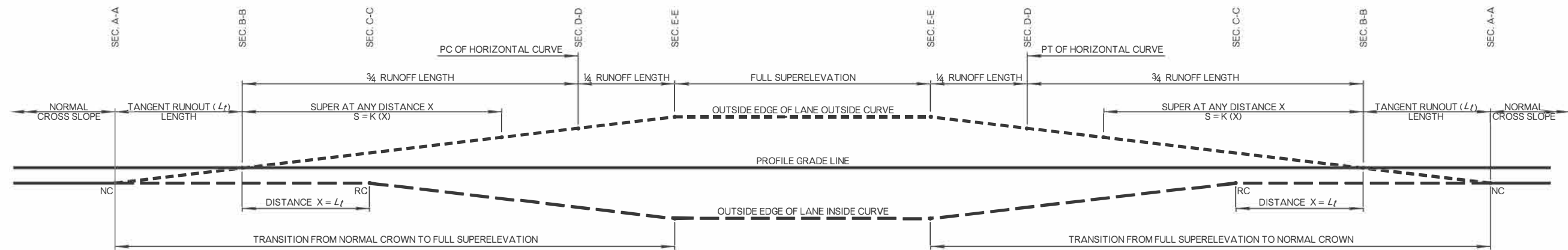
BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
624 (E)	FENCE, STYLE CLF (1 FT. HIGH, CLASS B)	LF
624 (F)	GATE, STYLE CLF (1 FT. HIGH X 1 FT. LONG)	EA

- 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.

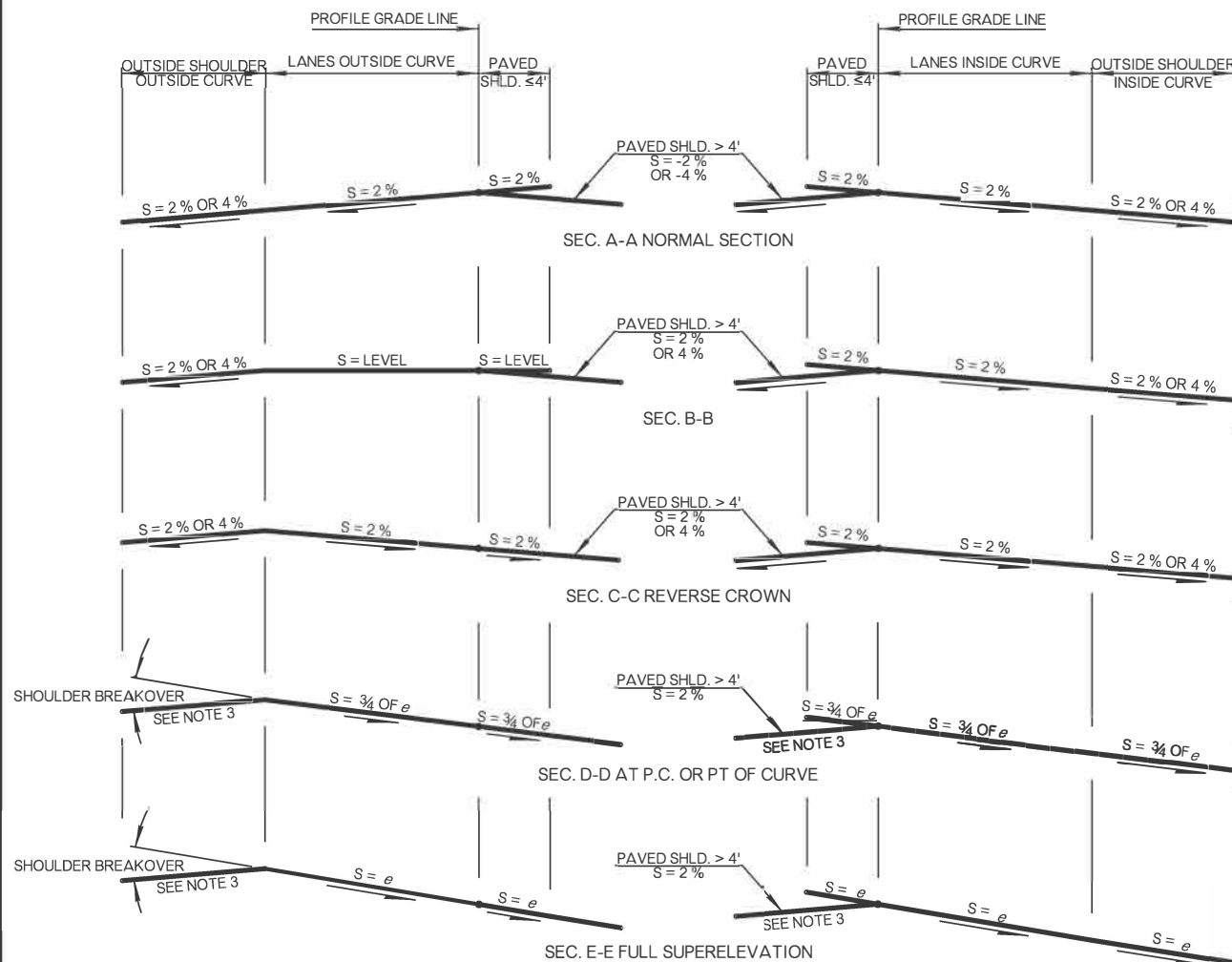
APPROVED BY ROADWAY ENGINEER: *[Signature]* DATE: 6/30/22
ROADWAY DESIGN DIVISION STANDARD



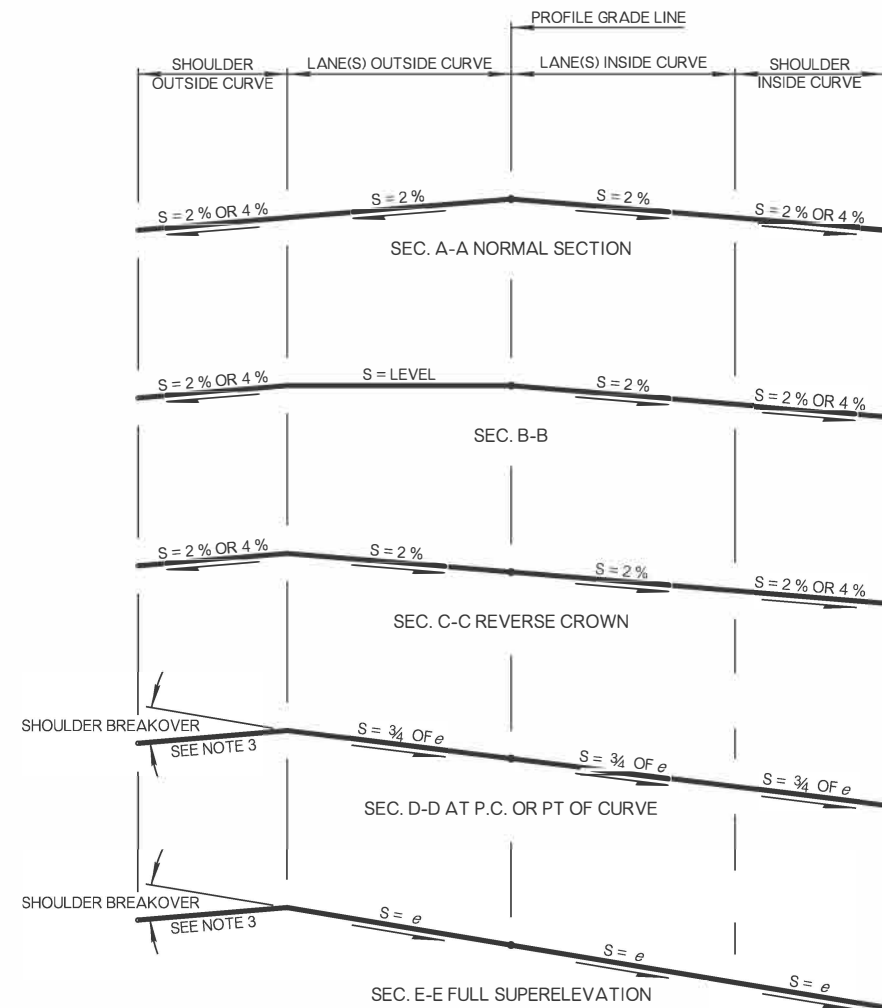
RIGHT-OF-WAY FENCE STYLE CLF
(CHAIN LINK FENCE)



PROFILE FOR UNDIVIDED (CROWN SECTION) AND DIVIDED HIGHWAYS
 PROFILE GRADE IS FINISH GRADE LINE



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



TYPICAL SECTIONS FOR UNDIVIDED HIGHWAYS
 PROFILE GRADE IS FINISH GRADE LINE

RUNOFF LENGTH ADJUSTMENTS		
NUMBER OF LANES ROTATED η_l	ADJUSTMENT FACTOR b_w	LENGTH INCREASE RELATIVE TO 1 LANE $= \eta_l b_w$
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.
 η_l = NUMBER OF LANES ROTATED.
 NC = NORMAL CROWN.
 RC = REVERSE CROWN
 S = CROSS SLOPE (%).
 V_d = DESIGN SPEED (MILES PER HOUR)
 $K = \frac{e_d(0.1)}{L_r}$ (FT/FT)

GENERAL NOTES

- 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".
- 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.
- 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.
- CROSS SLOPE (S) IS NORMALLY SET AT 3/4 (75%) SUPER AT THE P.C. AND P.T. OF A CURVE, HOWEVER THE DESIGNER MAY ADJUST THIS PERCENTAGE TO BE FROM 60% TO 90%, TO ACCOMMODATE SITE CONDITIONS.
- THE SUPERELEVATION TABLE FOR LOW SPEED URBAN STREETS MAY BE USED WHERE THE DESIGN SPEED IS NOT GREATER THAN 45 MPH.

SUPERELEVATION RATE GUIDELINES

- e_{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
- e_{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

APPROVED BY
 ROADWAY ENGINEER: DATE: 6/30/22
 ROADWAY DESIGN DIVISION STANDARD



SUPERELEVATION

SUPERELEVATION e_d	SUPERELEVATION TABLE (LOW SPEED URBAN STREETS)																				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			$V_d = 45$ 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 RUNOUT LENGTH (L_t), USE THE FORMULA: $\frac{2.0\%(OI)}{K}$, WHERE K IS $\frac{e_d(OI)}{L_r(FT)}$.
5. VALUES OF RADIUS AND SUPERELEVATION RUNOFF LENGTHS SHALL NOT BE INTERPOLATED OR ROUNDED UP.

APPROVED BY
ROADWAY ENGINEER: 

ROADWAY DESIGN DIVISION STANDARD

DATE: 6/30/22



SUPERELEVATION TABLE
LOW SPEED URBAN STREETS

2019 SPECIFICATIONS

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			$V_d=45$ 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)	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			$V_d=80$ 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)	7,870	48	72	9,410	51	77	11,100	53	80	12,600	56	84	14,100	60	90	15,700	63	95	17,400	69	103	-2.0 % (NC)
2.0 % (RC)	5,700	48	72	6,820	51	77	8,060	53	80	9,130	56	84	10,300	60	90	11,500	63	95	12,900	69	103	2.0 % (RC)
2.2 %	5,100	53	79	6,110	56	84	7,230	59	88	8,200	61	92	9,240	66	99	10,400	69	104	11,600	75	113	2.2 %
2.4 %	4,600	58	86	5,520	61	92	6,540	64	96	7,430	67	100	8,380	72	108	9,420	76	114	10,600	82	123	2.4 %
2.6 %	4,170	62	94	5,020	66	100	5,950	69	104	6,770	73	109	7,660	78	117	8,620	82	123	9,670	89	134	2.6 %
2.8 %	3,800	67	101	4,580	71	107	5,440	75	112	6,200	78	117	7,030	84	126	7,930	88	133	8,910	96	144	2.8 %
3.0 %	3,480	72	108	4,200	77	115	4,990	80	120	5,710	84	126	6,490	90	135	7,330	95	142	8,260	103	154	3.0 %
3.2 %	3,200	77	115	3,860	82	123	4,600	85	128	5,280	89	134	6,010	96	144	6,810	101	152	7,680	110	165	3.2 %
3.4 %	2,940	82	122	3,560	87	130	4,250	91	136	4,890	95	142	5,580	102	153	6,340	107	161	7,180	117	175	3.4 %
3.6 %	2,710	86	130	3,290	92	138	3,940	96	144	4,540	100	151	5,210	108	162	5,930	114	171	6,720	123	185	3.6 %
3.8 %	2,490	91	137	3,040	97	146	3,650	101	152	4,230	106	159	4,860	114	171	5,560	120	180	6,320	130	195	3.8 %
4.0 %	2,300	96	144	2,810	102	153	3,390	107	160	3,950	112	167	4,550	120	180	5,220	126	189	5,950	137	206	4.0 %
4.2 %	2,110	101	151	2,590	107	161	3,140	112	168	3,680	117	176	4,270	126	189	4,910	133	199	5,620	144	216	4.2 %
4.4 %	1,940	106	158	2,400	112	169	2,920	117	176	3,440	123	184	4,010	132	198	4,630	139	208	5,320	151	226	4.4 %
4.6 %	1,780	110	166	2,210	117	176	2,710	123	184	3,220	128	193	3,770	138	207	4,380	145	218	5,040	158	237	4.6 %
4.8 %	1,640	115	173	2,050	123	184	2,510	128	192	3,000	134	201	3,550	144	216	4,140	152	227	4,790	165	247	4.8 %
5.0 %	1,510	120	180	1,890	128	191	2,330	133	200	2,800	140	209	3,330	150	225	3,910	158	237	4,550	171	257	5.0 %
5.2 %	1,390	125	187	1,750	133	199	2,160	139	208	2,610	145	218	3,120	156	234	3,690	164	246	4,320	178	267	5.2 %
5.4 %	1,280	130	194	1,610	138	207	1,990	144	216	2,420	151	226	2,910	162	243	3,460	171	256	4,090	185	278	5.4 %
5.6 %	1,160	134	202	1,470	143	214	1,830	149	224	2,230	156	234	2,700	168	252	3,230	177	265	3,840	192	288	5.6 %
5.8 %	1,040	139	209	1,320	148	222	1,650	155	232	2,020	162	243	2,460	174	261	2,970	183	275	3,560	199	298	5.8 %
6.0 %	833	144	216	1,060	153	230	1,330	160	240	1,660	167	251	2,040	180	270	2,500	189	284	3,050	206	309	6.0 %

NOTES:

1. THE VALUES LISTED IN THE SUPERELEVATION TABLES WERE CALCULATED USING DISTRIBUTION METHOD 5.
2. 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.
3. FOR THE TANGENT RUNOUT LENGTH (L_t), USE THE FORMULA: $\frac{2.0\%(.01)}{K}$, WHERE K IS $\frac{e_d(.01)}{L_r(FT)}$.
4. VALUES OF RADIUS AND SUPERELEVATION RUNOFF LENGTHS SHALL NOT BE INTERPOLATED OR ROUNDED UP.

APPROVED BY
ROADWAY ENGINEER:  DATE: 6/30/22

ROADWAY DESIGN DIVISION STANDARD



SUPERELEVATION TABLES
($e_{max.}=6\%$)

2019 SPECIFICATIONS

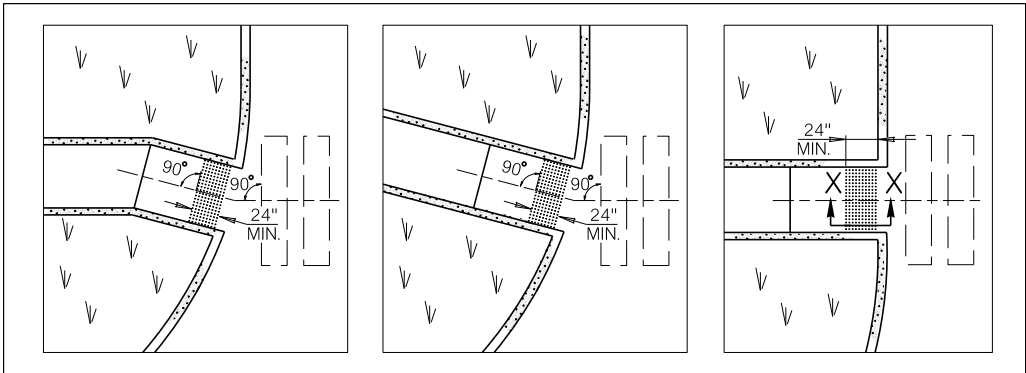
SUEL3-4

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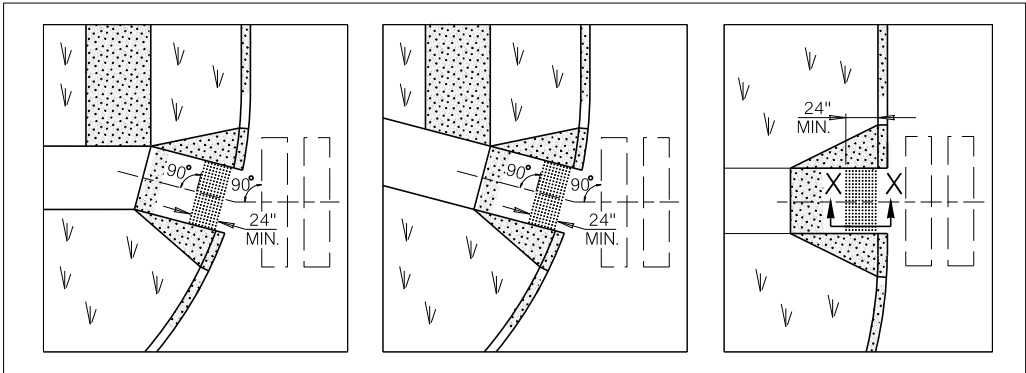
R-76

SUPERELEVATION e_d	SUPERELEVATION TABLE ($e_{max}=8\%$)																					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			$V_d = 45$ 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)	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 %

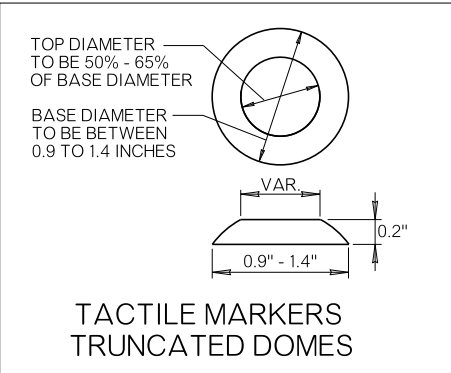
SUPERELEVATION e_d	SUPERELEVATION TABLE ($e_{max}=8\%$)																				SUPERELEVATION e_d								
	$V_d = 50$ mph				$V_d = 55$ mph				$V_d = 60$ mph				$V_d = 65$ mph				$V_d = 70$ mph					$V_d = 75$ mph				$V_d = 80$ mph			
	RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)		RADIUS (FT.)	L_r (FT.)									
		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$	$n_f=2$		$n_f=1$		$n_f=2$	$n_f=1$	$n_f=2$					
-2.0 % (NC)	8,150	48	72	9,720	51	77	11,500	53	80	12,900	56	84	14,500	60	90	16,100	63	95	17,800	69	103	-2.0 % (NC)							
2.0 % (RC)	5,990	48	72	7,150	51	77	8,440	53	80	9,510	56	84	10,700	60	90	12,000	63	95	13,300	69	103	2.0 % (RC)							
2.2 %	5,400	53	79	6,450	56	84	7,620	59	86	8,600	61	92	9,660	66	99	10,800	69	104	12,000	75	113	2.2 %							
2.4 %	4,910	58	86	5,870	61	92	6,930	64	96	7,830	67	100	8,810	72	108	9,850	76	114	11,000	82	123	2.4 %							
2.6 %	4,490	62	94	5,370	66	100	6,350	69	104	7,180	73	109	8,090	78	117	9,050	82	123	10,100	89	134	2.6 %							
2.8 %	4,130	67	101	4,950	71	107	5,850	75	112	6,630	78	117	7,470	84	126	8,370	88	133	9,340	96	144	2.8 %							
3.0 %	3,820	72	108	4,580	77	115	5,420	80	120	6,140	84	126	6,930	90	135	7,780	95	142	8,700	103	154	3.0 %							
3.2 %	3,550	77	115	4,250	82	123	5,040	85	128	5,720	89	134	6,460	96	144	7,260	101	152	8,130	110	165	3.2 %							
3.4 %	3,300	82	122	3,970	87	130	4,700	91	136	5,350	95	142	6,050	102	153	6,800	107	161	7,620	117	175	3.4 %							
3.6 %	3,090	86	130	3,710	92	138	4,400	96	144	5,010	100	151	5,680	108	162	6,400	114	171	7,180	123	185	3.6 %							
3.8 %	2,890	91	137	3,480	97	146	4,140	101	152	4,710	106	159	5,350	114	171	6,030	120	180	6,780	130	195	3.8 %							
4.0 %	2,720	96	144	3,270	102	153	3,890	107	160	4,450	112	167	5,050	120	180	5,710	126	189	6,420	137	206	4.0 %							
4.2 %	2,560	101	151	3,080	107	161	3,670	112	168	4,200	117	176	4,780	126	189	5,410	133	199	6,090	144	216	4.2 %							
4.4 %	2,410	106	158	2,910	112	169	3,470	117	176	3,980	123	184	4,540	132	198	5,140	139	208	5,800	151	226	4.4 %							
4.6 %	2,280	110	166	2,750	117	176	3,290	123	184	3,770	128	193	4,310	138	207	4,890	145	218	5,530	158	237	4.6 %							
4.8 %	2,160	115	173	2,610	123	184	3,120	128	192	3,590	134	201	4,100	144	216	4,670	152	227	5,280	165	247	4.8 %							
5.0 %	2,040	120	180	2,470	128	191	2,960	133	200	3,410	140	209	3,910	150	225	4,460	158	237	5,050	171	257	5.0 %							
5.2 %	1,930	125	187	2,350	133	199	2,820	139	208	3,250	145	218	3,740	156	234	4,260	164	246	4,840	178	267	5.2 %							
5.4 %	1,830	130	194	2,230	138	207	2,680	144	216	3,110	151	226	3,570	162	243	4,090	171	256	4,640	185	278	5.4 %							
5.6 %	1,740	134	202	2,120	143	214	2,550	149	224	2,970	156	234	3,420	168	252	3,920	177	265	4,460	192	288	5.6 %							
5.8 %	1,650	139	209	2,010	148	222	2,430	155	232	2,840	162	243	3,280	174	261	3,760	183	275	4,290	199	298	5.8 %							
6.0 %	1,560	144	216	1,920	153	230	2,320	160	240	2,710	167	251	3,150	180	270	3,620	189	284	4,140	206	309	6.0 %							
6.2 %	1,480	149	223	1,820	158	237	2,210	165	248	2,600	173	260	3,020	186	279	3,480	196	294	3,990	213	319	6.2 %							
6.4 %	1,400	154	230	1,730	163	245	2,110	171	256	2,490	179	268	2,910	192	288	3,360	202	303	3,850	219	329	6.4 %							
6.6 %	1,330	158	238	1,650	169	253	2,010	176	264	2,380	184	276	2,790	198	297	3,240	208	313	3,720	226	339	6.6 %							
6.8 %	1,260	163	245	1,560	174	260	1,910	181	272	2,280	190	285	2,690	204	306	3,120	215	322	3,600	233	350	6.8 %							
7.0 %	1,190	168	252	1,480	179	268	1,820	187	280	2,180	195	293	2,580	210	315	3,010	221	332	3,480	240	360	7.0 %							
7.2 %	1,120	173	259	1,400	184	276	1,720	192	288	2,070	201	301	2,470	216	324	2,900	227	341	3,370	247	370	7.2 %							
7.4 %	1,060	178	266	1,320	189	283	1,630	197	296	1,970	207	310	2,350	222	333	2,780	234	351	3,250	254	381	7.4 %							
7.6 %	980	182	274	1,230	194	291	1,530	203	304	1,850	212	318	2,230	228	342	2,650	240	360	3,120	261	391	7.6 %							
7.8 %	901	187	281	1,140	199	299	1,410	208	312	1,720	218	327	2,090	234	351	2,500	246	369	2,970	267	401	7.8 %							
8.0 %	758	192	288	960	204	306	1,200	213	320	1,480	223	335	1,810	240	360	2,210	253	379	2,670	274	411	8.0 %							



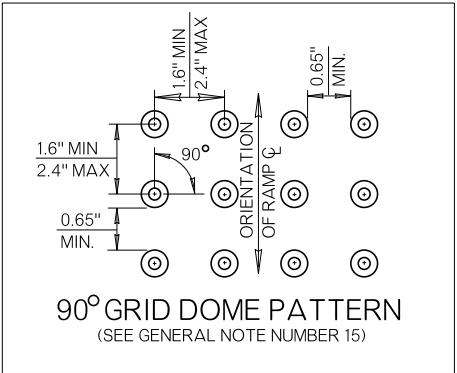
TACTILE SYSTEM ORIENTATION - TYPICAL CURBED RAMPS



TACTILE SYSTEM ORIENTATION - TYPICAL FLARED RAMPS



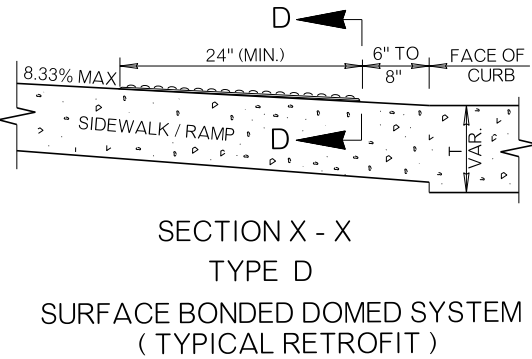
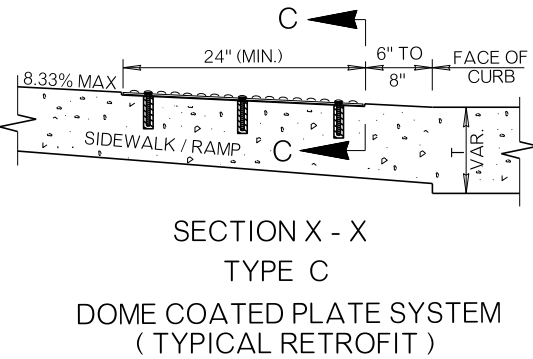
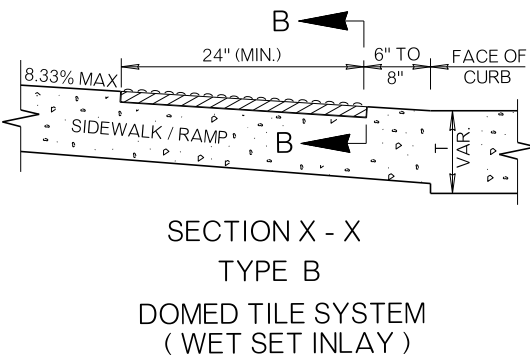
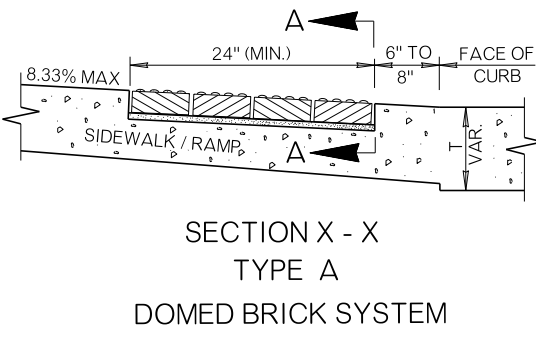
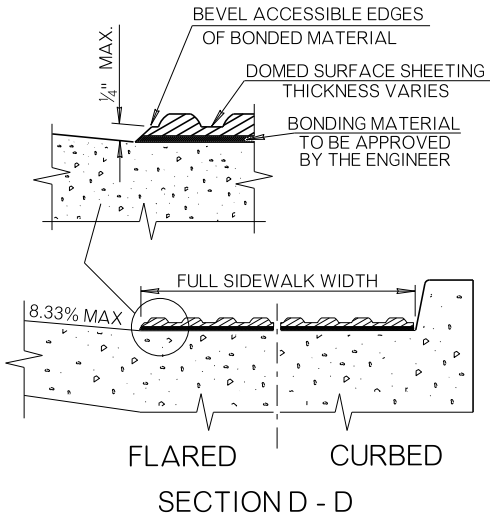
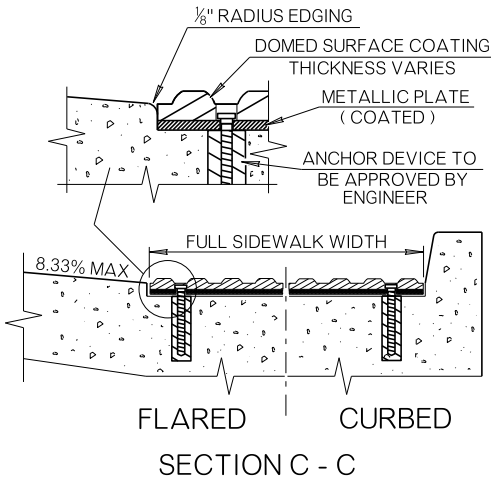
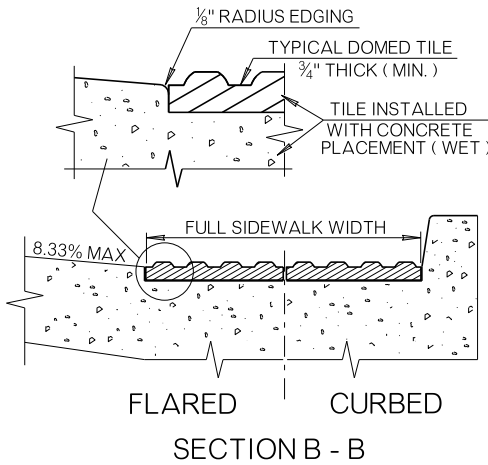
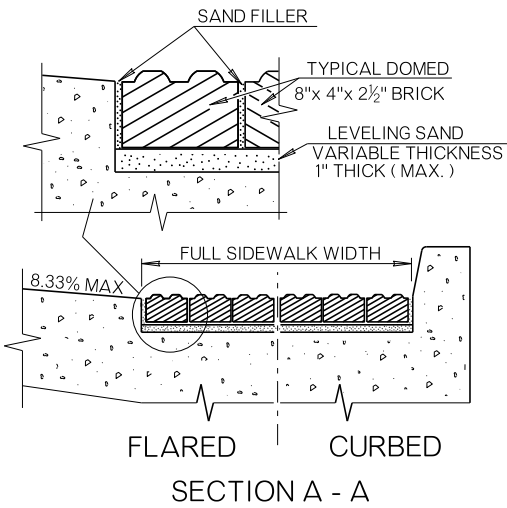
TACTILE MARKERS
TRUNCATED DOMES



90° GRID DOME PATTERN
(SEE GENERAL NOTE NUMBER 15)

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:  DATE: 4/3/2025
ROADWAY DESIGN DIVISION STANDARD



TACTILE WARNING DEVICES

2019 SPECIFICATIONS

TWD-2 3
R-79