

NCDOT PIPE MATERIAL SELECTION GUIDE

	RCP ¹ (REINFORCED CONCRETE) AASHTO M170								CSP ² (CORRUGATED STEEL) AASHTO M36 2 2/3 X 1/2 CORRUGATION ³								CAAP (CORRUGATED ALUMINUM) AASHTO M196 2 2/3 X 1/2 CORRUGATION ³						HDPE AASHTO M294			PP ⁷ ASTM F2881, ASTM F2764, OR AASHTO M330			PVC-ASTM F949 AASHTO M304			NOTES													
FILL TABLES	CLASS II		CLASS III		CLASS IV		CLASS V		SIZE	MIN. ⁴	MAXIMUM						SIZE	MIN. ⁴	MAXIMUM						SIZE	MIN. ⁴	MAX. ⁴	SIZE	MIN. ⁴	MAX. ⁴	SIZE	MIN. ⁴	MAX. ⁴												
	MIN. ⁴	MAX. ⁴	MIN. ⁴	MAX. ⁴	MIN. ⁴	MAX. ⁴	MIN. ⁴	MAX. ⁴			(Ga)	16	14	12	10	8			(Ga)	16	14	12	10	8										(Ga)	16	14	12	10	8	(Ga)	16	14	12	10	8
	2.0'	10.0'	2.0'	20.0'	1.0'	30.0'	1.0'	40.0'			12"	1.0'	204'	256'	12"	1.0'			123'	155'	218'	281'	344'	12"										2.0'	20'	12"	1.0'	20'	12"	2.0'	30'				
	<p>(FOR FILLS >40' & <80' USE LRFD DIRECT DESIGN METHOD. NOTE: DIRECT DESIGN METHOD RCP PIPES MUST HAVE A MINIMUM DIAMETER OF 36".)</p> <p>WHEN FILL HEIGHTS (NOT INCLUDING THE PAVEMENT STRUCTURE AND CURB) FOR RCP RUNNING PARALLEL TO AND UNDER CURB AND GUTTER, EXPRESSWAY GUTTER, SHOULDER BERM GUTTER AND ADJACENT TO MEDIAN BARRIER ARE 1' OR LESS, SPECIFY CLASS IV RCP.</p> <p>WHEN THE FILL HEIGHTS (FROM TOP OF PIPE TO SUBGRADE) FOR RCP RUNNING UNDER/ACROSS THE PAVEMENT ARE 1' OR LESS, SPECIFY CLASS V RCP.</p> <p>SPECIFY A SINGLE CLASS OF RCP IN A SINGLE RUN OF PIPE.</p>								15"	1.0'	162'	204'	15"	1.0'	98'	123'	174'	224'	275'	15"	2.0'	20'	15"	1.0'	20'	15"	2.0'	30'																	
									18"	1.0'	135'	169'	239'	18"	1.0'	81'	102'	144'	187'	228'	18"	2.0'	20'	18"	1.0'	20'	18"	2.0'	30'																
									24"	1.0'	100'	126'	178'	24"	1.0'	60'	76'	108'	139'	171'	24"	2.0'	20'	24"	1.0'	20'	24"	2.0'	30'																
									30"	1.0'	79'	100'	142'	30"	1.0'	60'	85'	111'	136'	30"	2.0'	17'	30"	1.0'	20'	30"	2.0'	30'																	
									36"	1.0'	65'	83'	117'	36"	1.0'	50'	71'	92'	113'	36"	2.0'	17'	36"	1.0'	20'	36"	2.0'	30'																	
									42"	1.0'	55'	70'	100'	42"	1.0'	60'	78'	96'	42"	2.0'	17'	42"	1.0'	20'																					
									48"	1.0'	48'	61'	87'	48"	1.0'	52'	68'	84'	48"	2.0'	17'	48"	1.0'	20'																					
									54"	1.0'	54'	77'	100'	54"	1.0'	46'	50'	74'	54"	2.0'	17'	54"	NA	NA																					
									60"	1.0'	69'	90'	111'	60"	1.0'	50'	62'	60"	2.0'	17'	60"	1.0'	20'																						
									66"	1.0'	81'	100'	66"	1.0'											51'																				
									72"	1.0'	74'	91'	72"	1.0'											41'																				
									78"	1.0'											81'																								
	84"	1.0'											69'																																
OPEN END CROSS PIPES	INTERSTATE ⁵		CAN BE USED						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						DO NOT USE																								
	PRIMARY ⁵		CAN BE USED						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF TRAFFIC <10000 ADT & <200 DUALS & <100 TTST																								
	SECONDARY		CAN BE USED						CAN BE USED						CAN BE USED						CAN BE USED																								
STORM DRAIN SYSTEMS	INTERSTATE		CAN BE USED						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						DO NOT USE																								
	PRIMARY		CAN BE USED						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF TRAFFIC <10000 ADT & <200 DUALS & <100 TTST																								
	SECONDARY		CAN BE USED						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY AT SYSTEM INLETS & SYSTEM OUTLET IF PIPE SLOPE IS GREATER THAN 10%						CAN BE USED																								
TRANSVERSE MEDIAN PIPES	INTERSTATE		CAN BE USED						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						DO NOT USE																								
	PRIMARY		CAN BE USED						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF PIPE SLOPE IS GREATER THAN 10%						USE ONLY IF TRAFFIC <10000 ADT & <200 DUALS & <100 TTST																								
	SECONDARY		CAN BE USED						CAN BE USED						CAN BE USED						CAN BE USED																								
SLOPE DRAINS ⁶	INTERSTATE		DO NOT USE						CAN BE USED						CAN BE USED						CAN BE USED																								
	PRIMARY		DO NOT USE						CAN BE USED						CAN BE USED						CAN BE USED																								
	SECONDARY		DO NOT USE						CAN BE USED						CAN BE USED						CAN BE USED																								
SIDE DRAINS	INTERSTATE		CAN BE USED						CAN BE USED						CAN BE USED						CAN BE USED																								
	PRIMARY		CAN BE USED						CAN BE USED						CAN BE USED						CAN BE USED																								
	SECONDARY		CAN BE USED						CAN BE USED						CAN BE USED						CAN BE USED																								

- 1- RCP IS NOT ALLOWED FOR GRADES >10%
 - 2- FOR COUNTIES LISTED IN ARTICLE 310-0 OF THE STANDARD SPECIFICATIONS CSP IS NOT ALLOWED. IN OTHER COUNTIES CSP REQUIRES AN ACCEPTABLE COATING IN ACCORDANCE WITH 1032-4.
 - 3- FOR DIFFERENT CORRUGATIONS AND ARCH PIPES REFER TO ROADWAY DESIGN MANUAL AND MANUFACTURERS SPECIFICATION.
 - 4- MINIMUM FILL HEIGHT IS MEASURED FROM TOP OF PIPE TO SUBGRADE.
 - 5- WHERE SITE CONDITIONS ALLOW:
INCREASE PIPE DIAMETER OF OPEN END CROSS PIPES AND SECTIONS OF STORM SEWER SYSTEMS ACTING AS OPEN END CROSS PIPES, A MINIMUM OF ONE SIZE FOR FUTURE REHABILITATION. THIS IS IN ADDITION TO UPSIZING TO COMPENSATE FOR BURYING INVERTS FOR WILDLIFE PASSAGE.
 - 6- FOR PIPE RUNS WITH GREATER THAN 12' VERTICAL DROP TO DOWNSTREAM STRUCTURE, PROVIDE A MEANS TO REDUCE RISK OF UNINTENDED ENTRY INTO UPSTREAM END OF PIPE.
 - 7- FILL HEIGHTS SHOWN WERE CALCULATED USING AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS. JUSTIFY FILL HEIGHT OR DESIGN DEVIATIONS WITH STRUCTURAL DESIGN BASED ON AASHTO LRFD BRIDGE DESIGN OR ASTM STANDARDS. SUBMIT DESIGN SEALED BY AN NC PE FOR REVIEW & APPROVAL BY NCDOT.
- INSTALLATION OF ALL PIPE TYPES IS SUBJECT TO THE INSTALLATION METHODS FOUND IN THE STANDARD DRAWINGS, STANDARD SPECIFICATIONS, HYDRAULICS GUIDELINES, AND CONTRACT DOCUMENTS; ACCOUNTING FOR SITE CONDITIONS SUCH AS SOIL PROPERTIES.
- ALL PIPES TYPES ARE SUBJECT TO THE MAXIMUM AND MINIMUM FILL HEIGHT REQUIREMENTS AS FOUND IN CHAPTER 5 OF THE ROADWAY DESIGN MANUAL. THE APPROPRIATE CLASS OF PIPE FOR RCP AND GAUGE THICKNESS FOR CSP/CAAP SHOULD BE SELECTED BASED ON FILL HEIGHT.
- SITE SPECIFIC CONDITIONS MAY LIMIT A PARTICULAR MATERIAL BEYOND WHAT IS IDENTIFIED IN THE TABLE. THESE CONDITIONS INCLUDE, BUT ARE NOT LIMITED TO, ABRASION, ENVIRONMENTAL, SOIL RESISTIVITY AND PH, HIGH GROUND WATER AND SPECIAL LOADING CONDITIONS. THE HYDRAULIC DESIGN ENGINEER WILL DETERMINE IF ADDITIONAL RESTRICTIONS ARE NECESSARY.

DEFINITIONS

SIDE DRAINS- STORM DRAIN PIPES RUNNING PARALLEL TO THE ROADWAY TO INCLUDE PIPES IN THE MEDIANS, OUTSIDE DITCHES, DRIVEWAYS AND UNDER SHOULDER BERM GUTTER ALONG OUTSIDE SHOULDERS GREATER THAN 4' WIDE. MAY OR MAY NOT BE OPEN ENDED. 1' MINIMUM COVER FOR ALL SIDE DRAIN PIPE IN ACCORDANCE WITH STANDARD SPECIFICATIONS.

STORM DRAIN SYSTEMS- LATERAL DRAIN PIPE UNDER CURB AND GUTTER, EXPRESSWAY GUTTER AND SHOULDER BERM GUTTER (WITH SHOULDERS 4' WIDE OR LESS) THAT CONNECT DRAINAGE STRUCTURES AND IS NOT OPEN ENDED. ALSO INCLUDES CROSS DRAIN CONNECTING TWO OR MORE SYSTEMS OR SYSTEM OUTLETS. ONLY PIPE WITH SMOOTH WALL INSIDE WALLS WILL BE ALLOWED FOR STORM DRAIN SYSTEMS.

TRANSVERSE MEDIAN PIPES- SHALLOW CROSS DRAIN PIPE THAT COLLECTS DRAINAGE IN A MEDIAN DITCH OR CURB SECTION AND DEPOSITS IT OUTSIDE DITCHES OR NATURAL DRAINAGE CHANNELS. MAY OR MAY NOT BE OPEN ENDED.

ALTERNATE PIPE- PIPE IN WHICH MATERIAL IS UNSPECIFIED ON THE DRAINAGE SUMMARY SHEET AND DRAINAGE PLANS.

HDPE- HIGH DENSITY POLYETHYLENE

PP- POLYPROPYLENE