

TABLE D - REQUIRED METAL GAUGE THICKNESS (AFTER ABRASION CONSIDERATIONS)

TABLE D FOR GALVANIZED STEEL 50-YEAR DESIGN LIFE								
	MINIMUM IN -SITU SOIL RESISTIVITY							
pH *	2000	3000	4000	5000	6000	7000	8000	>9000
6	10	12	12	12	12	12	14	14
6.5	12	12	12	14	14	14	14	16
6.8	12	14	14	14	16	16	16	16
7	14	14	16	16	16	16	16	16
7.1	14	16	16	16	16	16	16	16
≥ 7.2	16	16	16	16	16	16	16	16

TABLE D FOR GALVANIZED STEEL 75-YEAR DESIGN LIFE					
	MINIMUM IN -SITU SOIL RESISTIVITY				
pH *	2000	3000	4000-5000	6000-8000	>9000
6	8	8	10	10	12
6.5	8	10	10	12	12
6.8	10	10	12	12	12
7	10	12	12	12	12
7.1	12	12	12	12	12
≥7.2	12	12	12	12	12

TABLE D FOR ALUMINUM COATED TYPE 2, ALUMINUM ALLOY, AND POLYMER -COATED STEEL 50-YEAR DESIGN LIFE											
	MINIMUM IN -SITU SOIL RESISTIVITY										
pH *	1500	2000	3000	4000	5000	6000	7000	8000	9000	10000	>20000
4	10	10	12	12	12	12	14	14	14	14	16
5	12	12	12	14	14	14	14	16	16	16	16
5.5	12	12	14	14	14	16	16	16	16	16	16
6	12	12	14	14	14	16	16	16	16	16	16
6.5	14	14	14	16	16	16	16	16	16	16	16
6.8	14	14	16	16	16	16	16	16	16	16	16
≥7	16	16	16	16	16	16	16	16	16	16	16

TABLE D FOR ALUMINUM COATED TYPE 2, ALUMINUM ALLOY, AND POLYMER -COATED STEEL 75-YEAR DESIGN LIFE															
	MINIMUM IN -SITU SOIL RESISTIVITY														
pH *	1500	2000	3000	4000	5000	6000	7000	8000	9000	10000	20000	30000	40000	50000	>50000
4	N/A	N/A	8	10	10	10	10	12	12	12	12	12	14	14	14
5	8	8	10	10	12	12	12	12	12	12	12	14	14	14	14
5.5	8	10	12	12	12	12	12	12	12	12	14	14	14	16	16
6	10	10	12	12	12	12	12	12	12	12	14	14	16	16	16
6.5	12	12	12	12	12	12	12	14	14	14	16	16	16	16	16
6.8	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16
7	12	12	14	14	14	14	14	16	16	16	16	16	16	16	16
7.1	12	12	14	14	16	16	16	16	16	16	16	16	16	16	16
7.2	14	14	14	16	16	16	16	16	16	16	16	16	16	16	16
7.3	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
> 7.3	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

NOTES:

1. LEVEL 3 ABRASION IS MAXIMUM FOR POLYMER COATED STEEL PIPE AND GALVANIZED STEEL PLATE WITH THICKENED INVERT.
2. LEVEL 2 ABRASION IS MAXIMUM FOR REST OF METAL PIPES.
3. PIPES THAT MEET THE CRITERIA OF TABLES A, B, AND C MAY NOT MEET THE CONSIDERATION OF PARTICLE SIZE OF THE BEDLOAD AS DESCRIBED IN THE FHWA ABRASION REQUIREMENTS.
4. BASED ON pH AND RESISTIVITY REQUIREMENTS THE GAUGE OF PIPE MAY NEED TO BE INCREASED AS NOTED IN THESE TABLES TO ATTAIN THE REQUIRED DESIGN LIFE.

* MINIMUM AND MAXIMUM pH FOR EACH PIPE TYPE IS LISTED IN TABLE C

ABRASION LEVEL DEFINITIONS (FHWA)
LEVEL 1 - NONABRASIVE CONDITIONS, AREAS OF NO BEDLOAD AND VERY LOW VELOCITIES. THIS IS THE CONDITION ASSUMED FROM THE SOIL SIDE OF DRAINAGE PIPES
LEVEL 2 - LOW ABRASIVE CONDITIONS, AREAS OF MINOR BEDLOADS AND VELOCITIES OF 5 ft/s OR LESS.
LEVEL 3 - MODERATE ABRASIVE CONDITIONS, AREAS OF MODERATE BEDLOADS OF SAND AND GRAVEL AND VELOCITIES BETWEEN 5 ft/s AND 15 ft/s.
LEVEL 4 - SEVERE ABRASIVE CONDITIONS, AREAS OF HEAVY BEDLOADS OF SAND, GRAVEL, AND ROCK AND VELOCITIES EXCEEDING 15 ft/s.

SPECIFICATION REFERENCE

232
302

A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

**ALLOWABLE PIPE CRITERIA FOR
CULVERT AND STORM SEWERS**

VIRGINIA DEPARTMENT OF TRANSPORTATION



ROAD AND BRIDGE STANDARDS

REVISION DATE

11/15

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