OFFICE STANDARD 61

ROUGHNESS FACTOR (MANNING'S n) FOR PIPES AND CHANNELS

Pipe

Asbestos Cement Pipe	.010 — Not Allowed - See 4-15-86 Memo by ESD
Reinforced Concrete Pipe	.013
Reinforced Concrete Pipe - Private Construction	.015
Cast in Place Concrete Pipe	.015

Corrugated Metal Pipe:

ALL EXCEPT 12" - 24" DIAMETER PIPE WITH HELICAL CORRUGATIONS

Corrugations:	2-2/3 X 1/2 In.	3 X 1 In.	Structural Plate 6 X 2 In.
100% Paved	.012	.012	.012
25% Paved	.021	.023	.026
Unlined (1)	.024	.027	.031

HELICALLY CORRUGATED PIPE 12" THROUGH 24" DIAMETER ONLY

Diameter (inches)	Helix (Angle) (2)	100% Paved	Unlined (3)
12	59-1/2°	.012	.013
18	70°	.012	.015
24	75°	.012	.017

Channels

Concrete	.014
Concrete-Private Construction	.015
Gunite	.016
Earth and Vegetative Channels (4)	.030
Grouted Rock Riprap	.030
Loose Rock Riprap	.035

(1) SEE ALSO C. OF E. PUBLICATION "RESISTANCE COEFFICIENTS FOR STRUCTURAL PLATE CORRUGATED PIPE" TECH LIBRARY NO. 1.2.6.1.

(2) HELIX ANGLE: ANGLE BETWEEN A LINE PARALLEL TO THE LONGITUDINAL AXIS OF THE PIPE AND A TANGENT TO A CORRUGATION DRAWN ALONG THE CORRUGATION.

(3) THESE VALUES APPLY FOR FLOW VELOCITIES GREATER THAN 4 FEET PER SECOND WITH THE HELIX ANGLE AS NOTED. OTHERWISE USE MANNING'S n VALUE OF .024 FOR UNLINED PIPE.

(4) VELOCITIES IN NEW EARTH CHANNELS SHOULD BE CHECKED USING n = .025 AND 5-YEAR FREQUENCY STORM. THE VELOCITIES DETERMINED BY THESE CONDITIONS SHOULD NOT EXCEED THE ALLOWABLE VELOCITY. REFERENCE S.C.S. MANUAL 25 FOR ALLOWABLE VELOCITIES. TECHNICAL LIBRARY NO. 1.1.1.2.

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