

# **B.C. Agricultural Drainage Manual**

## **Appendix B - Manning's n Values**

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The primary purpose of the B.C. Drainage Manual is to provide farmers as well as water management professionals and consultants with technical information on the design, installation and maintenance of agricultural drainage systems.

Individual chapters may rely on information that is presented in other chapters of the manual. There is a risk that downloading individual chapters may not present all of the required information in its entirety. A complete bound manual is available from the Irrigation Industry Association of BC.

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# Appendix B.

## Manning's n Values

*Table B1. Roughness Coefficient n for Manning Formula*

Type and Description of Conduits	n Values		
	Minimum	Design	Maximum
<i>Channels, Lined</i>			
Asphaltic concrete, machine placed		0.014	
Asphalt, exposed prefabricated		0.015	
Concrete	0.012	0.015	0.018
Concrete, rubble	0.017		0.030
Metal, smooth (flumes)	0.011		0.015
Metal, corrugated	0.021	0.024	0.026
Plastic	0.012		0.014
Shotcrete	0.016		0.017
Wood, planed (flumes)	0.010	0.012	0.015
Wood, unplanned (flumes)	0.011	0.013	0.015
<i>Channels, Earth</i>			
Earth bottom, rubble sides	0.028	0.032	0.035
Drainage ditches, large, no vegetation			
(a) hydraulic radius < 0.8 m	0.040		0.045
(b) hydraulic radius 0.8 - 1.2 m	0.035		0.040
(c) hydraulic radius 1.2 - 1.5 m	0.030		0.035
(d) hydraulic radius > 1.5 m	0.025		0.030
Small drainage ditches	0.035	0.040	0.040
Stony bed, weeds on bank	0.025	0.035	0.040
Straight and uniform	0.017	0.0225	0.025
Winding, sluggish	0.0225	0.025	0.030
<i>Channels, Vegetated (grassed waterways)</i>			
Dense, uniform stands of green vegetation more than 250 mm long			
(a) Bermuda grass	0.04		0.20
(b) Kudzu	0.07		0.23
(c) Lespedeza, common	0.047		0.095
Dense, uniform stands of green vegetation cut to a length less than 60 mm			
(a) Bermuda grass, short	0.034		0.11

Table B1. Roughness Coefficient  $n$  for Manning Formula (Cont'd)

Type and Description of Conduits	$n$ Values		
	Minimum	Design	Maximum
(b) Kudza	0.045		0.16
(c) Lespedeza	0.023		0.05
Sorghum, 1 m rows	0.04		0.15
Wheat, mature poor	0.08		0.15
<i>Natural Streams</i>			
(a) Clean, straight bank, full stage, no rifts or deep pools	0.025		0.033
(b) Same as (a), but some weeds and stones	0.030		0.040
(c) Winding, some pools and shoals, clean	0.035		0.050
(d) Same as (c), lower stages, more ineffective slopes and sections	0.040		0.055
(e) Same as (c), some weeds and stones	0.033		0.045
(f) Same as (d), stony sections	0.045		0.060
(g) Sluggish river reaches, rather weedy or with very deep pools	0.050		0.080
(h) Very weedy reaches	0.075		0.150
<i>Pipe</i>			
Asbestos cement		0.009	
Cast iron, coated or uncoated	0.011	0.013	0.015
Clay or concrete drain tile (102-305 mm diameter)	0.011	0.013	0.020
Concrete or clay vitrified sewer pipe	0.01	0.014	0.017
Corrugated high density polyethylene tubing	0.014	0.016	0.022
Metal, corrugated, ring	0.021	0.025	0.026
Metal, corrugated, helical	0.013	0.015	
<i>Steel, riveted and spiral</i>	0.013	0.016	0.017
Wood stave	0.010	0.013	
Wrought iron, black	0.012		
Wrought iron, galvanized	0.013	0.016	0.017