

DIN EN 16933-2:2017-12 (E)

Drain and sewer systems outside buildings - Design - Part 2: Hydraulic design

Contents		Page
European foreword		5
Introduction		6
1	Scope	8
2	Normative references	8
3	Terms and definitions	8
4	Symbols and units	10
5	General	11
6	Design criteria	12
7	Hydraulic capacity of pipelines	12
7.1	Introduction	12
7.2	Pipeline headlosses	12
7.2.1	General	12
7.2.2	The Colebrook-White formula	12
7.2.3	The Manning formula	13
7.2.4	Pipeline roughness values	13
7.2.5	Pipeline headloss values	13
7.3	Local headlosses	13
7.4	Total headlosses	13
8	Incoming flows	14
8.1	Foul wastewater flows	14
8.1.1	General	14
8.1.2	Calculation of foul wastewater flow rates based on the appliances connected	14
8.1.3	Calculation of foul wastewater flow rates from population and average flows	14
8.2	Rainfall and runoff from precipitation	15
8.2.1	Rainfall	15
8.2.2	Runoff	15
8.3	Extraneous flows	16
9	Hydraulic calculation of drain and sewer systems	17
9.1	General	17
9.2	Flow in sewer systems	17
9.3	Flow simulation methods	19
9.3.1	Introduction	19
9.3.2	Simple/empirical methods	19
9.3.3	Other simplified methods	19
9.3.4	Dynamic wave methods	19
9.3.5	Selection of calculation method	19
9.4	Surface flood routing	20
9.5	Validation of models	20
10	Hydraulic design	21
10.1	Capacity of drains and sewers	21
10.1.1	General	21

10.1.2	Foul drains and sewers	21
10.1.3	Surface water drains and sewers	21
10.1.4	Combined drains and sewers	22
10.2	Design for self-cleansing	22
10.2.1	Sediment transport	22
10.2.2	Minimization of blockages	22
10.3	Sewers with steep gradients	23
10.4	Surface water inlets	23
10.5	Separators, screens and pretreatment devices	23
10.5.1	General	23
10.5.2	Control of sediments	24
10.5.3	Control of grease and fats	24
10.5.4	Control of light liquids	25
10.5.5	Treatment of surface water to remove dissolved pollutants	25
10.5.6	Screening	26
10.6	Infiltration drainage systems	26
10.7	Evaporation systems	26
10.8	Manholes and inspection chambers	26
10.9	Combined sewer overflows	27
10.10	Tanks and ponds	27
10.10.1	General	27
10.10.2	Detention tanks	27
10.10.3	Ponds	28
10.11	Outfalls	28
11	Sources of additional information	28
Annex A (informative) Sources of additional information		29
A.1	National Standards Bodies	29
A.2	Austria	29
A.2.1	Regulatory Bodies	29
A.2.2	Other organisations	29
A.3	Denmark	29
A.3.1	Regulatory Bodies	29
A.3.2	Other organisations	30
A.4	France	31
A.4.1	Regulatory Bodies	31
A.4.2	Other organisations	31
A.5	Germany	31
A.5.1	Regulatory Bodies	31
A.5.2	Other organisations	32
A.6	Ireland	32
A.6.1	Regulatory Bodies	32
A.7	Italy	33
A.7.1	Regulatory Bodies	33
A.7.2	Other organisations	33
A.8	The Netherlands	33
A.8.1	Regulatory Bodies	33
A.8.2	Other organisations	33
A.9	Norway	34
A.9.1	Regulatory Bodies	34
A.9.2	Other organisations	34
A.10	Portugal	34
A.10.1	Regulatory Bodies	34
A.10.2	Other organisations	35
A.11	Sweden	35
A.11.1	Regulatory Bodies	35
A.11.2	Other organisations	35
A.12	Switzerland	35
A.12.1	Regulatory Bodies	35
A.12.2	Other organisations	36

A.13 United Kingdom36
A.13.1 Regulatory Bodies36
A.13.1.1 General36
A.13.1.2 England36
A.13.1.3 Wales37
A.13.1.4 Scotland37
A.13.1.5 Northern Ireland38
A.13.2 Other organisations38

Bibliography40