# DIN EN 752 :2008-04 (E)

**Drain and sewer systems outside buildings**

## Contents

Page


**Foreword** ..... 7

**1 Scope** ..... 10

**2 Normative references** ..... 10

**3 Terms and definitions** ..... 11

**4 Objectives** ..... 19
**4.1 General** ..... 19
**4.2 Public Health and Safety** ..... 20
**4.3 Occupational Health and Safety** ..... 20
**4.4 Environmental Protection** ..... 20
**4.5 Sustainable Development** ..... 20

**5 Requirements** ..... 21
**5.1 Functional Requirements** ..... 21
**5.1.1 Introduction** ..... 21
**5.1.2 Protection from flooding** ..... 22
**5.1.3 Maintainability** ..... 22
**5.1.4 Protection of surface receiving waters** ..... 22
**5.1.5 Protection of groundwater** ..... 22
**5.1.6 Prevention of odours and toxic, explosive and corrosive gases** ..... 23
**5.1.7 Prevention of noise and vibration** ..... 23
**5.1.8 Sustainable use of products and materials** ..... 23
**5.1.9 Sustainable use of energy** ..... 23
**5.1.10 Structural integrity and design life** ..... 23
**5.1.11 Maintaining the flow** ..... 23
**5.1.12 Watertightness** ..... 23
**5.1.13 Not endangering adjacent structures and utility services** ..... 23
**5.1.14 Inputs quality** ..... 23
**5.2 Determination of performance requirements for the drain and sewer system** ..... 23

**6 Integrated Sewer System Management** ..... 26
**6.1 Introduction** ..... 26
**6.2 Investigation** ..... 27
**6.2.1 Introduction** ..... 27
**6.2.2 Purpose of investigation** ..... 28
**6.2.3 Review of performance information** ..... 28
**6.2.4 Determine the scope of the investigation** ..... 30
**6.2.5 Review existing information** ..... 30
**6.2.6 Inventory update** ..... 31
**6.2.7 Hydraulic investigation** ..... 31
**6.2.8 Environmental investigation** ..... 31
**6.2.9 Structural investigation** ..... 32
**6.2.10 Operational Investigation** ..... 32
**6.3 Assessment** ..... 33
**6.3.1 Introduction** ..... 33
**6.3.2 Assessment of the hydraulic performance** ..... 33
**6.3.3 Assessment of environmental impact** ..... 33
**6.3.4 Assess structural condition** ..... 34
**6.3.5 Assess operational performance** ..... 34
**6.3.6 Compare with performance requirements** ..... 34
**6.3.7 Identify unacceptable impacts** ..... 34
**6.3.8 Identify causes of performance deficiencies** ..... 34

6.4 Developing the Plan ..... 34
6.4.1 Introduction ..... 34
6.4.2 Develop integrated solutions ..... 35
6.4.3 Assess Solutions ..... 38
6.4.4 Prepare action plan ..... 39
6.5 Implementation ..... 40
6.5.1 Introduction ..... 40
6.5.2 Carry out work ..... 40
6.5.3 Monitoring performance ..... 41
6.5.4 Review performance requirements and update plan ..... 41

7 Health and Safety Principles ..... 41

8 Design Principles ..... 42
8.1 General ..... 42
8.2 Types of systems ..... 42
8.3 Layout and profile ..... 43
8.4 Hydraulic Design ..... 44
8.4.1 General ..... 44
8.4.2 Foul drains and sewers ..... 44
8.4.3 Surface water drains and sewers ..... 45
8.4.4 Combined drains and sewers ..... 47
8.5 Environmental Considerations ..... 47
8.5.1 General ..... 47
8.5.2 Protection of surface receiving waters ..... 49
8.5.3 Protection of Groundwater ..... 49
8.5.4 Prevention of septicity ..... 49
8.5.5 Combined sewer overflows and surface water treatment ..... 50
8.5.6 Emergency overflows ..... 50
8.6 Structural Design ..... 50
8.6.1 Introduction ..... 50
8.6.2 Structural design of pipelines ..... 51
8.6.3 Structural design of other components ..... 51
8.6.4 Materials selection ..... 51
8.7 Operational Considerations ..... 52
8.7.1 General ..... 52
8.7.2 Separators ..... 52
8.7.3 Self-cleansing conditions ..... 52
8.7.4 Access to drains and sewers ..... 53

9 Detailed Design ..... 53
9.1 Introduction ..... 53
9.2 Layout and profile ..... 53
9.2.1 Introduction ..... 53
9.2.2 Layout ..... 53
9.2.3 Accessibility ..... 54
9.2.4 Depth ..... 54
9.2.5 Need for pumping ..... 55
9.2.6 Pumping Installations ..... 55
9.3 Preliminary Investigations ..... 56
9.3.1 General ..... 56
9.3.2 Topography ..... 56
9.3.3 Geotechnical Survey ..... 56
9.3.4 Groundwater ..... 57
9.3.5 Existing drainage services ..... 57
9.3.6 Other existing utility services ..... 57
9.3.7 Extraneous water ..... 57
9.4 Hydraulic Design ..... 57
9.4.1 Introduction ..... 57
9.4.2 Foul drains and sewers ..... 57
9.4.3 Surface water drains and sewers ..... 58

**9.4.4 Combined drains and sewers** ..... **58**
**9.4.5 Capacity of pipelines** ..... **59**
**9.4.6 Sewers with steep gradients** ..... **59**
**9.4.7 Outfall Design Requirements** ..... **60**
**9.5 Environmental Considerations** ..... **60**
**9.5.1 Introduction** ..... **60**
**9.5.2 Outfall Design Requirements** ..... **60**
**9.5.3 Prevention of septicity** ..... **60**
**9.5.4 Drains and sewers near water abstraction areas** ..... **61**
**9.6 Operational Considerations** ..... **61**
**9.6.1 Introduction** ..... **61**
**9.6.2 Separators** ..... **61**
**9.6.3 Design for self-cleansing** ..... **61**
**9.6.4 Access to drains and sewers** ..... **62**

**10 Construction Principles** ..... **63**
**10.1 General** ..... **63**
**10.2 Pipelines** ..... **63**
**10.3 Ancillaries** ..... **63**

**11 Operations and Maintenance** ..... **64**
**11.1 Introduction** ..... **64**
**11.2 Objectives** ..... **65**
**11.3 Data requirements** ..... **65**
**11.4 Investigation and analysis of operational problems** ..... **66**

**12 Performance testing** ..... **67**

**13 Qualifications and Training** ..... **67**

**14 Sources of Additional Information** ..... **68**

**Annex A** (informative) **Relevant EU Directives** ..... **69**
**A.1 Introduction** ..... **69**
**A.2 Relevant Directives** ..... **69**

**Annex B** (informative) **Sources of Additional Information** ..... **70**
**B.1 National Standards Bodies** ..... **70**
**B.2 Austria** ..... **70**
**B.2.1 Regulatory Bodies** ..... **70**
**B.2.2 Other organisations** ..... **70**
**B.3 Denmark** ..... **71**
**B.3.1 Regulatory Bodies** ..... **71**
**B.3.2 Other organisations** ..... **71**
**B.4 France** ..... **72**
**B.4.1 Regulatory Bodies** ..... **72**
**B.4.2 Other organisations** ..... **72**
**B.5 Germany** ..... **72**
**B.5.1 Regulatory Bodies** ..... **72**
**B.5.2 Other organisations** ..... **73**
**B.6 Ireland** ..... **73**
**B.7 Italy** ..... **73**
**B.7.1 Regulatory Bodies** ..... **73**
**B.7.2 Other organisations** ..... **73**
**B.8 The Netherlands** ..... **74**
**B.8.1 Regulatory Bodies** ..... **74**
**B.8.2 Other organisations** ..... **74**
**B.9 Norway** ..... **75**
**B.9.1 Regulatory Bodies** ..... **75**
**B.9.2 Other organisations** ..... **75**
**B.10 Portugal** ..... **75**
**B.10.1 Regulatory Bodies** ..... **75**
**B.10.2 Other organisations** ..... **76**

**B.11 Sweden** ..... **76**
**B.11.1 Regulatory Bodies** ..... **76**
**B.11.2 Other organisations** ..... **76**
**B.12 Switzerland** ..... **76**
**B.12.1 Regulatory Bodies** ..... **76**
**B.12.2 Other organisations** ..... **77**
**B.13 United Kingdom** ..... **77**
**B.13.1 Regulatory Bodies** ..... **77**
**B.13.2 Other organisations** ..... **79**

**Annex C** (normative) **Operations and maintenance** ..... **80**
**C.1 Introduction** ..... **80**
**C.2 Operations planning** ..... **80**
**C.2.1 Inspection routines** ..... **80**
**C.2.2 Operations procedures** ..... **80**
**C.2.3 Contingency Planning** ..... **80**
**C.3 Pipelines** ..... **81**
**C.3.1 General** ..... **81**
**C.3.2 Functional problems** ..... **81**
**C.3.3 Structural problems** ..... **82**
**C.4 Manholes and Inspection Chambers** ..... **83**
**C.5 Combined sewer overflows** ..... **83**
**C.6 Detention tanks** ..... **84**
**C.7 Separators, settling chambers and gullies** ..... **84**
**C.8 Pumping installations** ..... **85**
**C.9 Inverted siphons** ..... **85**
**C.10 Pest control** ..... **86**
**C.11 Making connections to existing drains and sewers** ..... **86**
**C.12 Control of disused drains and sewers** ..... **87**
**C.13 Control of building over or adjacent to sewers** ..... **87**

**Annex D** (normative) **Health and Safety** ..... **88**
**D.1 Safe systems of work** ..... **88**
**D.2 Training and supervision** ..... **88**
**D.3 Hazardous atmospheres** ..... **88**
**D.3.1 Oxygen deficient and toxic atmospheres** ..... **88**
**D.3.2 Potentially explosive atmospheres** ..... **88**
**D.4 Traffic control** ..... **89**
**D.5 Protective equipment and welfare facilities** ..... **89**
**D.6 Emergency procedures** ..... **89**
**D.7 Temporary works** ..... **89**
**D.8 Excavation work** ..... **89**
**D.9 Hazardous materials** ..... **90**
**D.10 Vaccinations** ..... **90**

**Annex E** (normative) **Hydraulic Design** ..... **91**
**E.1 General** ..... **91**
**E.1.1 Introduction** ..... **91**
**E.1.2 Selection of Flow Simulation Method** ..... **91**
**E.2 Hydraulic calculations** ..... **92**
**E.2.1 Velocity equations** ..... **92**
**E.2.2 The Saint Venant equations** ..... **94**
**E.3 Methods of calculating runoff from small development schemes** ..... **96**
**E.4 Calculation of foul wastewater flows for drain systems** ..... **97**
**E.5 Calculation of foul wastewater flows for sewer system** ..... **97**
**E.6 Combined sewer overflows** ..... **98**

**Annex F** (normative) **Pumping Installations** ..... **99**
**F.1 General** ..... **99**
**F.2 Planning of pumping installations** ..... **99**
**F.2.1 Preliminary Considerations** ..... **99**

F.2.2 Planning ..... 100
F.3 Design of pumping stations ..... 101
F.3.1 Layout ..... 101
F.3.2 Wet well design ..... 102
F.3.3 External layout and access ..... 103
F.3.4 Environmental impact ..... 103
F.3.5 Structural design ..... 103
F.3.6 Maintenance considerations ..... 103
F.4 Design of rising mains ..... 104
F.4.1 Principal considerations ..... 104
F.4.2 Choice of route ..... 104
F.4.3 Choice of diameter ..... 104
F.4.4 Pressures and external loads ..... 104
F.4.5 Choice of materials ..... 105
F.4.6 Thrust ..... 105
F.4.7 Discharge points ..... 105
F.4.8 Control of Septicity ..... 105
F.4.9 Valve chambers ..... 105
F.5 Components and appliances ..... 106
F.5.1 Pumps ..... 106
F.5.2 Prime Movers and Drives ..... 106
F.5.3 Valves ..... 107
F.5.4 Controls and electrical equipment ..... 107
F.5.5 Instrumentation ..... 108
F.5.6 Alarms ..... 108
F.6 Health and Safety ..... 108

Bibliography ..... 110