

1. Record Nr.	UNINA9911007066403321
Autore	Federation Water Environment
Titolo	Design of Urban Stormwater Controls : MOP 23
Pubbl/distr/stampa	Chicago : , : Water Environment Federation, , 2022 ©2022
ISBN	9781572784321 1572784326 9781523140268 1523140267
Edizione	[1st ed.]
Descrizione fisica	1 online resource (762 pages)
Disciplina	628.21
Soggetti	Storm sewers--Design and construction Urban runoff--Management
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Front Cover -- Title Page -- Half Title -- Copyright -- Contents -- List of Figures -- List of Tables -- Preface -- Chapter 1: Introduction -- 1.0 Urban Stormwater Management Overview -- 2.0 References -- Chapter 2: EEffects of Stormwater on Receiving Waters -- 1.0 Effects of Urbanization on Water Quantity -- 2.0 Effects of Stormwater Control Practices on Water Quantity -- 3.0 Effects of Urbanization on Water Quality -- 4.0 Effects of Stormwater Control Practices on Water Quality -- 5.0 Effects of Urbanization on Channel Form -- 6.0 Effects of Stormwater Control Practices on Channel Form -- 7.0 Effects of Urbanization on Aquatic Biota -- 8.0 Effects of Stormwater Control Practices on Aquatic Biota -- 9.0 Summary -- 10.0 References -- 11.0 Suggested Readings -- Chapter 3: Performance Goals for Stormwater Controls -- 1.0 Introduction -- 1.1 Basic Concepts of Stormwater Control -- 1.2 Relationship between Stormwater Control Objectives and Performance Goals -- 1.2.1 Groundwater Recharge and Evapotranspiration -- 1.2.2 Water Quality -- 1.2.3 Channel Protection -- 1.2.4 Overbank Flood Protection -- 1.2.5 Extreme Flood Protection -- 1.3 Methods for Establishing Performance Criteria -- 2.0 Methods for Establishing Watershed-Based Performance Criteria -- 3.0 Methods

for Establishing Technology-Based Performance Criteria -- 3.1 Step 1: Establish Goals -- 3.2 Step 2: Define the Desired Level of Control -- 3.2.1 Groundwater Recharge and Evapotranspiration Level of Control -- 3.2.2 Water Quality Level of Control -- 3.2.3 Channel Protection Level of Control -- 3.2.4 Level of Control for Large, Infrequent Storms -- 3.3 Step 3: Select Design Precipitation -- 3.3.1 Large, Infrequent Storms -- 3.3.2 Small, Frequent Storms -- 3.3.2.1 Cumulative Probability Distributions -- 3.3.2.2 Mean Annual Runoff-Producing Rainfall. 3.4 Step 4: Define Capture Volumes and Release Rates -- 3.4.1 Large, Infrequent Storms -- 3.4.2 Small, Frequent Storms -- 3.4.2.1 Water Quality Volume Calculation -- 3.4.2.2 Water Quality Treatment Rate -- 4.0 A Note About Water Quality Treatment Effectiveness -- 5.0 Concluding Remarks -- 6.0 References -- Chapter 4: Unit Processes and Operations for Stormwater Control -- 1.0 Introduction -- 2.0 Application of Unit Processes and Operations Concepts -- 2.1 Unit Processes -- 2.2 Unit Operations -- 2.3 Systems -- 2.4 Taxonomy of Stormwater Controls -- 3.0 Unit Processes for Quantity Control -- 3.1 Peak Flow Attenuation -- 3.1.1 Storage Attenuation -- 3.1.2 Hydrodynamic Attenuation -- 3.2 Runoff Volume Reduction -- 3.2.1 Infiltration -- 3.2.2 Dispersion -- 3.2.3 Evapotranspiration -- 3.2.3.1 Evaporation from Interception -- 3.2.3.2 Evaporation from Depression Storage -- 3.2.3.3 Surface Evaporation -- 3.2.3.4 Plant Transpiration -- 3.2.4 Runoff Collection and Usage -- 4.0 Unit Processes for Quality Control -- 4.1 Sedimentation -- 4.1.1 Stokes's Law -- 4.1.2 Hydraulic Loading Rate and Residence Time -- 4.1.3 Hydraulic Efficiency -- 4.2 Flotation -- 4.3 Laminar Separation -- 4.4 Swirl Concentration -- 4.5 Sorption -- 4.5.1 Types of Sorption -- 4.5.2 Sorption Capacity -- 4.6 Precipitation -- 4.6.1 Natural Precipitation -- 4.6.2 Chemical Precipitation -- 4.7 Coagulation -- 4.7.1 Natural Coagulation -- 4.7.2 Chemical Coagulation -- 4.8 Filtration -- 4.9 Biological Processes -- 4.9.1 Biological Forms -- 4.9.1.1 Aquatic Plants -- 4.9.1.2 Terrestrial Plants -- 4.9.1.3 Bacteria -- 4.9.1.4 Algae -- 4.9.2 Plant Metabolism -- 4.9.3 Nitrification and Denitrification -- 4.9.4 Other Biological Unit Processes -- 4.10 Temperature Reduction -- 4.11 Disinfection -- 4.12 Screening -- 5.0 Concluding Remarks -- 6.0 References -- 7.0 Suggested Readings.

Chapter 5: Selection Criteria and Design Considerations -- 1.0 Introduction -- 2.0 Understanding Goals and Design Criteria -- 2.1 Planning Considerations -- 2.2 Goals for Stormwater Management -- 2.2.1 Federal Regulations -- 2.2.2 Municipal Regulations -- 2.3 Enforcement -- 3.0 Understanding and Protecting Site Resources -- 3.1 Headwater Streams -- 3.2 Wetlands -- 3.3 Floodplains -- 3.4 Riparian Buffers -- 3.5 Existing Forests and Vegetation -- 3.6 Native Soil Structure -- 3.7 Steep Slopes -- 4.0 Identification of Source Controls -- 4.1 Runoff Source Controls -- 4.1.1 Elimination or Disconnection of Impervious Surfaces -- 4.1.2 Pervious Area Management -- 4.1.3 Vegetation Management -- 4.1.4 Rainwater Harvesting -- 4.2 Pollutant Source Control -- 4.2.1 Segregation -- 4.2.2 Material and Waste Management -- 4.2.3 Cleanup -- 4.2.4 Street Sweeping -- 4.3 Runoff Conveyance and Diversions -- 5.0 Selection of Structural Controls -- 5.1 System Configuration Principles -- 5.1.1 Pretreatment -- 5.1.2 Storage and Flow Control -- 5.1.3 Pollutant Removal -- 5.2 Constraints -- 5.2.1 Physical Constraints -- 5.2.1.1 Drainage Area -- 5.2.1.2 Land Area Requirements -- 5.2.1.3 Topography -- 5.2.1.4 Site Slope -- 5.2.1.5 Geology (Karst) -- 5.2.1.6 Depth to Bedrock -- 5.2.1.7 Water Table -- 5.2.1.8 Soils -- 5.2.1.9 Climate -- 5.2.2 Construction and Maintenance Constraints -- 5.2.2.1 Complexity -- 5.2.2.2 Maintenance Requirements -- 5.2.2.3 Construction Access -- 5.2.2.4 Utility and

Road Conflicts -- 5.2.3 Environmental Factors and Permitting --
5.2.3.1 Forests -- 5.2.3.2 Wetlands -- 5.2.3.3 Instream Flows --
5.2.3.4 Discharge Temperature -- 5.2.3.5 Beaches and Shellfish Beds
-- 5.2.3.6 Reservoirs -- 5.2.3.7 Floodplains -- 5.2.3.8 Aquifers --
5.2.3.9 Urban Habitat Modification -- 5.2.4 Social -- 5.2.4.1 Land
Ownership -- 5.2.4.2 Health and Safety.
5.2.4.3 Aesthetics and Amenity Usage -- 5.2.4.4 Effects on Adjacent
Land Use -- 5.2.4.5 Education and Stewardship Opportunities -- 6.0
Implementation and Performance Monitoring -- 6.1 Construction
Sequencing and Inspection -- 6.2 Monitoring -- 6.2.1 Pollutant
Removal -- 6.2.2 Quantity Control -- 7.0 References -- 8.0 Suggested
Readings -- Chapter 6: Basins -- 1.0 Description -- 2.0 Design
Principles -- 2.1 Sediment Storage Considerations -- 2.2 Basin
Geometry -- 2.3 Physical Site Suitability -- 3.0 Cisterns and Rain
Barrels -- 3.1 Typical Applications -- 3.1.1 Physical Site Suitability --
3.1.2 Water Quantity Control -- 3.1.3 Water Quality Control -- 3.2
Limitations -- 3.3 Design Procedure and Criteria -- 3.3.1 Typical
Configurations -- 3.3.2 Pretreatment Unit -- 3.3.3 Main Treatment Unit
-- 3.3.4 Outlet Structure -- 3.4 Aesthetic and Safety Considerations --
3.5 Access and Maintenance Features -- 4.0 Forebays -- 4.1 Typical
Applications -- 4.1.1 Physical Site Suitability -- 4.1.2 Water Quantity
Control -- 4.1.3 Water Quality Control -- 4.2 Limitations -- 4.3 Design
Procedure and Criteria -- 4.3.1 Typical Configurations -- 4.3.2
Pretreatment Unit -- 4.3.3 Main Treatment Unit -- 4.3.4 Outlet
Structure -- 4.4 Aesthetic and Safety Considerations -- 4.5 Access and
Maintenance Features -- 5.0 Vaults and Swirl Concentrators -- 5.1
Typical Applications -- 5.1.1 Physical Site Suitability -- 5.1.2 Water
Quantity Control -- 5.1.3 Water Quality Control -- 5.2 Limitations --
5.3 Design Procedure and Criteria -- 5.3.1 Typical Configurations --
5.3.2 Pretreatment Unit -- 5.3.3 Main Treatment Unit -- 5.4 Aesthetic
and Safety Considerations -- 5.5 Access and Maintenance Features --
6.0 Oil and Water Separators -- 6.1 Typical Applications -- 6.1.1
Physical Site Suitability -- 6.1.2 Water Quantity Control -- 6.1.3 Water
Quality Control -- 6.2 Limitations.
6.3 Design Procedure and Criteria -- 6.3.1 Typical Configurations --
6.3.2 Pretreatment Unit -- 6.3.3 Main Treatment Unit -- 6.3.3.1 Sizing
-- 6.3.3.2 Sizing American Petroleum Institute Separators -- 6.3.3.3
Sizing Coalescing Plate Separators -- 6.4 Aesthetic and Safety
Considerations -- 6.5 Access and Maintenance Features -- 7.0 Dry
Basins -- 7.1 Typical Applications -- 7.1.1 Physical Site Suitability --
7.1.2 Water Quantity Control -- 7.1.3 Water Quality Control -- 7.2
Limitations -- 7.3 Design Procedure and Criteria -- 7.3.1 Typical
Configurations -- 7.3.2 Pretreatment Unit -- 7.3.3 Main Treatment Unit
-- 7.3.3.1 Determining Water Quality Volume -- 7.3.3.2 Hydrograph
Routing -- 7.3.3.3 Two-Stage Design -- 7.3.3.4 Basin Side Slopes --
7.3.3.5 Low-Flow Channel -- 7.3.3.6 Basin Embankment -- 7.3.3.7
Vegetation -- 7.3.4 Outlet Structure -- 7.3.4.1 Single Orifice -- 7.3.4.2
Outlets for Hybrid Dry-Wet Basins -- 7.3.4.3 T-Weir Outlet -- 7.3.4.4
Perforated Riser -- 7.3.4.5 Skimmers -- 7.3.4.6 Sand and Bioretention
Filters -- 7.3.4.7 Mechanical Outlets -- 7.3.4.8 Gross Solids Control --
7.4 Aesthetic and Safety Considerations -- 7.5 Access and Maintenance
Features -- 7.6 Dry Basin Design Example -- 7.6.1 Basic Site Data --
7.6.2 Define Hydrologic Characteristics of the Site for Flood Protection
-- 7.6.2.1 Composite Curve Number Calculation -- 7.6.2.2 Time of
Concentration Calculation -- 7.6.2.3 Determine Feasibility of a Dry
Basin -- 7.6.3 Design Steps -- 7.6.3.1 Step 1: Find Rainfall Depth and
Distribution Data for the Site -- 7.6.3.2 Step 2: Compute
Predevelopment and Postdevelopment Peak Rates of Runoff -- 7.6.3.3

Step 3: Compute Water Quality Volume -- 7.6.3.4 Step 4: Determine Preliminary Geometry and Sizing of the Dry Basin -- 7.6.3.5 Step 5: Size the Outlet for Water Quality Volume -- 7.6.3.6 Step 6: Size the Flood Protection Outlets.
7.6.3.7 Step 7: Size the Forebay.

Sommario/riassunto

This manual, a revision of the Water Environment Federation's (WEF's) and the American Society of Civil Engineer's (ASCE's) manual of practice (MOP) titled Urban Runoff Quality Management (1998), takes a holistic view and espouses the concept that systems of stormwater controls can be designed to meet the various objectives of stormwater management, including flood control; stream channel protection; groundwater recharge; water quality improvement; protection of public safety, health, and welfare; and multipurpose public benefits such as the provision of open space, parks, playgrounds, trails, wildlife habitat, and enhancement of property values. This MOP focuses on consolidating technologies under a comprehensive view of stormwater management in an attempt to foster convergence between traditional stormwater controls and green infrastructure. Developed by WEF and ASCE.
