

Storm Sewer Design

Design Manual

Chapter 41

Drainage

Originally Issued: 07-09-11

Revised: 02-09-17

General

This section will assist in understanding the principles, assumptions, and design criteria required for storm sewer design to assist in computer modeling and checking.

This Iowa DOT requires computerized modeling design using [Geopak Outpost](#).

Design in [Geopak Outpost](#) is desired for many reasons including:

- Uniform use of design drainage library components.
- Facilitation of running and evaluating alternate design storms, scenarios, and criteria.
- Evaluation of flow regimes, throat calculations (generally agreed on to not adequately evaluate junction losses at structures and/or velocity changes within pipes). Not all flows are subcritical, supercritical, etc. Models can help document where flow regimes may be critical.
- Evaluation of the [hydraulic grade line \(HGL\)](#) and [inlet water conditions](#) that are related to the previous factors but are not as other constraints.
- Facilitation of plan preparation and reporting.

CADD: See Sections [4A.22](#) and [4A.23](#) for requirements on editing plans and drawing plan profiles.

Exact representations and throat calculations are useful for design checks, however, due to the various scenarios and flows required to be evaluated and the need to evaluate the HGL, representations and throat calculations should not be used as design tools.

Storm sewer systems are designed after intake types, locations, and flows have been identified. The designer should consider such items as routing, classification, design traffic, load, and safety (risk) in the design process. Elements and discharges of storm sewers should be designed to take into consideration potential damage to adjacent and downstream properties.

Before beginning storm sewer design:

- Verify maximum structure depths are not exceeded. Refer to Section [4A.4](#) for requirements.
- Fully understand scenarios and issues related to collecting flow (peak flow) – including the consideration of bypass flow – from one drainage basin to another, or discharge to untreated drainage ways. Document reasons for doing so, along with design considerations.
- Determine downstream controlling conditions including: [Outlet Conditions](#), [Inletwater Conditions](#), [Downstream Inletwater Potential](#), and [Flow Regulation](#).
- Determine the existing and desired maximum high water elevation (HWE) at critical locations within the system. These locations may include intakes, or junctions where there is a change in the system. The design maximum HWE should not interfere with the intended function of any existing or desirable reach or hydraulic cross.

For pipes under railroads, contact Iowa DOT Office of Rail Transportation.

For loading sheds or other urban connections to the storm sewer system, refer to [4A.20](#), design criteria.

Design Manual Storm Sewer Design Chapter 4 Drainage

**Martin P. Wanielista, Robert
Kersten, Ron Eaglin**



Design Manual Storm Sewer Design Chapter 4 Drainage:

Design and Construction of Urban Stormwater Management Systems American Society of Civil Engineers, 1993-01-01
Prepared by the Task Committee of the Urban Water Resources Research Council of ASCE Copublished by ASCE and the Water Environment Federation Design and Construction of Urban Stormwater Management Systems presents a comprehensive examination of the issues involved in engineering urban stormwater systems This Manual which updates relevant portions of Design and Construction of Sanitary and Storm Sewers MOP 37 reflects the many changes taking place in the field such as the use of microcomputers and the need to control the quality of runoff as well as the quantity Chapters are prepared by authors with experience and expertise in the particular subject area The Manual aids the practicing engineer by presenting a brief summary of currently accepted procedures relating to the following areas financial services regulations surveys and investigations design concepts and master planning hydrology and water quality storm drainage hydraulics and computer modeling Design Manual United States. Naval Facilities Engineering Command, 1971 *Design Manual*, 1971

Manual on Drainage in Urbanized Areas: Planning and design of drainage systems Wolfgang F. Geiger, 1987 The main objectives of the manual are to advance the understanding of complex interactions between urban drainage and other facets of urban water resources to increase the awareness of various planning alternatives to aid in the selection of appropriate calculation procedures to demonstrate the importance of input and supporting data to guide the decision makers and designers in implementation of urban drainage projects and to increase awareness of pitfalls of drainage planning

Selected Water Resources Abstracts, 1990 *Water Pollution Control Research Series 11024 EJC 07/70* United States. Water Quality Office, 1970 Design of Wastewater and Stormwater Pumping Stations, 1981 **Green Stormwater**

Infrastructure Fundamentals and Design Allen P. Davis, William F. Hunt, Robert G. Traver, 2022-06-07 Green Stormwater Infrastructure Fundamentals and Design Discover novel stormwater control measures to make for a greener tomorrow The protection of our aquatic resources is growing in importance as the effects of climate change and continued urbanization are felt throughout the world While most rain that falls onto vegetated spaces infiltrates the soil rain that falls onto impervious surfaces will not increasing downstream flooding and erosion and causing impaired water quality Impervious surfaces such as road infrastructure rooftops and parking areas all increase runoff and mobilize many pollutants that have deposited on these surfaces that are then carried into our waterways Proper management of this stormwater through green infrastructure is essential to address these challenges and reduce the environmental and ecological impacts brought about by this runoff This book brings into focus resilient stormwater control measures SCMs for the reduction of stormwater flows and associated pollutants that can detrimentally impact our local environmental and ecological systems These interventions are green infrastructure based utilizing natural hydrologic and environmental features using soil and vegetation to manage stormwater These technologies include water harvesting bioretention and bioinfiltration vegetated swales and filter strips permeable

pavements sand filters green roofs and stormwater wetlands among others The basic science and engineering of these technologies is discussed including performance information and best maintenance practices Green Stormwater Infrastructure readers will also find Research informed resilient SCM design fundamentals Diagrams developed by the authors to enhance understanding Case studies to illustrate the points elucidated in the book End of chapter problems with a separate solutions manual Green Stormwater Infrastructure is an ideal resource for environmental civil and biological engineers and environmental scientists in the consulting field Landscape architects managers and engineers of watershed districts and members of federal state and local governmental agencies especially those in the departments of environmental protection and transportation will find many uses for this guidebook It will also be of interest to professors upper level undergraduates and graduate students in environmental civil and biological engineering programs Engineering Manual for Military Construction United States Engineers Corps (Army).,1951 *Selected Water Resources Abstracts* ,1971

Using Graywater and Stormwater to Enhance Local Water Supplies National Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, Water Science and Technology Board, Committee on the Beneficial Use of Graywater and Stormwater: An Assessment of Risks, Costs, and Benefits, 2016-06-30 Chronic and episodic water shortages are becoming common in many regions of the United States and population growth in water scarce regions further compounds the challenges Increasingly alternative water sources such as graywater untreated wastewater that does not include water from the toilet but generally includes water from bathroom sinks showers bathtubs clothes washers and laundry sinks and stormwater water from rainfall or snow that can be measured downstream in a pipe culvert or stream shortly after the precipitation event are being viewed as resources to supplement scarce water supplies rather than as waste to be discharged as rapidly as possible Graywater and stormwater can serve a range of non potable uses including irrigation toilet flushing washing and cooling although treatment may be needed Stormwater may also be used to recharge groundwater which may ultimately be tapped for potable use In addition to providing additional sources of local water supply harvesting stormwater has many potential benefits including energy savings pollution prevention and reducing the impacts of urban development on urban streams Similarly the reuse of graywater can enhance water supply reliability and extend the capacity of existing wastewater systems in growing cities Despite the benefits of using local alternative water sources to address water demands many questions remain that have limited the broader application of graywater and stormwater capture and use In particular limited information is available on the costs benefits and risks of these projects and beyond the simplest applications many state and local public health agencies have not developed regulatory frameworks for full use of these local water resources To address these issues Using Graywater and Stormwater to Enhance Local Water Supplies analyzes the risks costs and benefits on various uses of graywater and stormwater This report examines technical economic regulatory and social issues associated with graywater and stormwater capture for a range of uses including non potable

urban uses irrigation and groundwater recharge Using Graywater and Stormwater to Enhance Local Water Supplies considers the quality and suitability of water for reuse treatment and storage technologies and human health and environmental risks of water reuse The findings and recommendations of this report will be valuable for water managers citizens of states under a current drought and local and state health and environmental agencies **Reclamation Manual: Design and construction, pt. 2. Engineering design: Design supplement no. 2: Treatise on dams; Design supplement no. 3: Canals and related structures; Design supplement no. 4: Power systems; Design supplement no. 5: Field installation procedures; Design supplement no. 7: Valves, gates, and steel conduits; Design supplement no. 8: Miscellaneous mechanical equipment and facilities; Design supplement no. 9: Buildings; Design supplement no. 10: Transmission structures; Design supplement no. 11: Railroads, highways, and camp facilities** United States. Bureau of Reclamation, *Urban Drainage* David Butler, Christopher Digman, Christos Makropoulos, John W. Davies, 2018-04-09 This new edition of a well established textbook covers the environmental and engineering aspects of the management of rainwater and wastewater in areas of human development Urban Drainage deals comprehensively not only with the design of new systems but also the analysis and upgrading of existing infrastructure Keeping its balance of principles practice and research this new edition has significant new material on modelling resilience smart systems and the global and local context The two new authors bring further research and practice based experience This is an essential text for undergraduate and graduate students lecturers and researchers in water engineering environmental engineering public health engineering engineering hydrology and related non engineering disciplines It also serves as a dependable reference for drainage engineers in water service providers local authorities and for consulting engineers Extensive examples are used to support and demonstrate the key issues throughout the text *Planning & Design Manual for the Control of Erosion, Sediment and Stormwater* ,1994 *Facilities Development Manual* Wisconsin. Department of Transportation, 1979 **Selected Urban Storm Water Runoff Abstracts** ,1968 **Hydrology** Martin P. Wanielista, Robert Kersten, Ron Eaglin, 1996-09-28 Complete up to date coverage of the critical issues of water quality emphasizing the illustration and application of both hydrologic and economic water management techniques Using a fundamentals through applications approach the book includes worked examples case studies and problems Current methodologies such as the use of a spreadsheet in hydrology and the use of the Internet in data collection are covered in this text **Interstate 90 (I-90) South Sammamish Plateau Access Road and Sunset Interchange Modifications** ,1999 *Manual* ,1993 *Urban Storm Water Design* James C. Y. Guo, 2003

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