ASCE Manuals and Reports of Engineering Practice No. 77
WEF Manual of Practice FD-20

Design and Construction of Urban Stormwater Management Systems

WATER ENVIRONMENT FEDERATION
AMERICAN SOCIETY OF CIVIL ENGINEERS

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Design and Construction of Urban Stormwater Management Systems

Prepared by
The Urban Water Resources Research Council of the American Society of Civil Engineers and the Water Environment Federation (formerly the Water Pollution Control Federation)

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ABSTRACT

Design and Construction of Urban Stormwater Management Systems (Manual of Practice No. 77) updates relevant portions of the ASCE/WPCF Manual of Practice No. 37, *Design and Construction of Sanitary and Storm Sewers*. This update is necessary due to 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. In order to broaden the base of experience reflected in the Manual, each chapter was prepared by one or more authors with experience and expertise in the particular subject area. Thus, the Manual aids the practicing engineer by presenting a brief summary of currently accepted procedures relating to the following areas: 1) Financial services; 2) regulations; 3) surveys and investigations; 4) design concepts and master planning; 5) hydrology and water quality; 6) storm draining hydraulics; and 7) computer modeling.

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The Water Environment Federation is a nonprofit, educational organization composed of member and affiliated associations throughout the world. Since 1928, WEF has represented water quality specialists, including civil, design, and environmental engineers, biologists, bacteriologists, local and national government officials, treatment plant operators, laboratory technicians, chemists, industrial technologists, students, academics, and equipment manufacturers and distributors.

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Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994
(703) 684-2400

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In February 1962 (and revised in April, 1982) the Board of Direction voted to establish:

> A series entitled 'Manuals and Reports on Engineering Practice,' to include the Manuals published and authorized to date, future Manuals of Professional Practice, and Reports on Engineering Practice. All such Manual or Report material of the Society would have been refereed in a manner approved by the Board Committee on Publications and would be bound, with applicable discussion, in books similar to past Manuals. Numbering would be consecutive and would be a continuation of present Manual numbers. In some cases of reports of joint committees, bypassing of Journal publications may be authorized.

Authorized for Publication by the Publications Committee in the name of the Board of Direction Edward O. Pfrang, Executive Director

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HISTORY OF THE MANUAL

The Urban Water Resources Research Council (UWRRC) of the American Society of Civil Engineers (ASCE) has long been a leader in the transfer of urban drainage technology to the engineering community. A major part of its efforts has been the publication of more than a dozen books related to the general subject of urban storm drainage, most of which are the proceedings of a series of Engineering Foundation Conferences. Many of these books are used as standard references in the field.

The last Manual of Practice related to urban storm drainage was Manual of Practice 37, "Design and Construction of Sanitary and Storm Sewers," published jointly in 1969 by ASCE and the Water Environment Federation (formerly the Water Pollution Control Federation). In 1982, it was supplanted, for sanitary sewers, by Manual of Practice Number 60, "Gravity Sanitary Sewer Design and Construction," again jointly published by ASCE and WEF.

In an attempt to fill the void created by the publication of Manual of Practice 60 (which did not address storm drainage), the UWRRC established a Task Committee, chaired by Mr. Richard Lanyon, to begin drafting a manual of practice on urban storm drainage. The chairmanship of the Task Committee was subsequently assumed by Mr. Jonathan E. Jones, who has seen the Manual through to its completion.

To broaden the base of experience to be reflected in the Manual, each chapter was prepared by one or more authors with experience and expertise in the particular subject area. The chapters were also extensively reviewed by the authors and other experts in the field, as well as other interested parties, including members of the regulatory and public works communities, and specialists in such diverse disciplines as law, planning, landscape architecture, meteorology, and ecology.

A draft of the complete Manual was prepared and distributed to an ASCE Senior Review Committee and the Technical Practice Committee of the Water Environment Federation. Many valuable suggestions for improvement were received. After revision based on these reviews, portions of the Manual were distributed to both committees for a second review.

The final draft of the Manual was approved for publication by WEF and ASCE in 1991.

CHAIRMAN OF THE TASK COMMITTEE

Jonathan E. Jones

PRINCIPAL AUTHORS AND REVIEWERS OF THE MANUAL OF PRACTICE

(* indicates principal author)

Michael Bealey*
Bent Christensen*
John France*
John M. Hamilton*
Paul A. Hindman*
Mark R. Hunter*
D. Earl Jones, Jr.*
Eric Livingston*
David Lloyd*
Robert Marmon
Herbert G. Poertner*
Jan E. Roshalt
Ronald L. Rossmiller*
William P. Ruzzo
Erez Sela*
Michael B. Sonnen
L. Scott Tucker*
Stuart G. Walesh*
Kevin Weiss
David E. Westfall*
Donald Woodward
John L. Blanchard
Victor F. Coletti*
Mark W. Glidden*
Joseph Hill*
Wayne C. Huber*
Edward Jankiewicz*
David F. Kibler*
Harold Leedom
Jiri Marsalek
Bruce M. McEnroe*
Clifford Randall
Larry A. Roesner*
Richard M. Rudolph*
James E. Scholl*
W. Joseph Shoemaker*
Jon H. Sorenson*
Ben Urbonas*
John J. Warwick
David C. Wells*
William Whipple, Jr.*
Kenneth R. Wright*

James Wulliman

ADDITIONAL AUTHORS AND REVIEWERS

David Anderson
David Balmforth
Carey Brand
Susan K. Bank
Chenchayya T. Bathala
Christopher Burke
Paul A. DeBarry
Robert Deeds
Patricia K. Flood
Gary R. Haynes
Richard J. Heggen
Steve Hickox
Carl Johnson
John R. Lavigne, Jr.
Raymond K. Linsley
Gordon Lutes
John R. Mackie
H. Rooney Malcom
Richard H. McCuen
Gary R. Minton
Herbert Moore
G.R. Olieger
Dennis E. Arbogast
Jay Beaumont
Dan Brock
Patricia Bubar
Nancy C. Bramlett
Lamont W. Curtis
Thomas N. Debo
Jacques W. Delleur
Jonathan French
James P. Heaney
Donald Hey
Robert H. Hoffmaster
Kenneth Kienow
Alan Leak
Byron Lord
William Macaitis
Nathan D. Maier
David Maunder
Theodore Mikalsen
William Mitzelfeld
Kenneth E. Moss
A.S. Paintal

ADDITIONAL AUTHORS AND REVIEWERS (continued)

Chandra S. Pathak
M.R. Phillips
Robert Reynolds
Warren W. Sadler
Kevin G. Stewart
Michael L. Terstriep
Donald Van Sickle
Martin P. Wanielista
Peter D. Waugh
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Richard A. Willet
Shaw L. Yu

MEMBERS OF THE ASCE SENIOR REVIEW COMMITTEE

Michael Bealey
Wayne C. Huber
D. Earl Jones, Jr.
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WEF TASK FORCE ON STORMWATER MANAGEMENT

Howard O. Andrews
William H. Busch
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Randy P. Rivinus
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TECHNICAL EDITOR

Harry C. Torno

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FOREWORD

This Manual of Practice for the Design and Construction of Urban Stormwater Management Systems updates relevant portions of ASCE/WEF Manual of Practice No. 37, "Design and Construction of Sanitary and Storm Sewers," published in 1969. This update was undertaken by the Urban Water Resources Research Council of ASCE for several reasons:

(a) ASCE and WEF published, in 1982, a revised Manual of Practice (No. 60) on "Gravity Sanitary Sewer Design and Construction," which did not address storm drainage.

(b) There have been a number of changes in the field of urban storm drainage, including (1) the virtually universal use of the microcomputer for data organization and analysis, and for the analysis and design of urban storm drainage systems, and (2) the increasing importance of designing urban storm drainage systems for the control of runoff quality as well as quantity.

This Manual is intended to aid the practicing engineer by presenting a brief summary of currently accepted procedures. It is not intended to substitute for engineering experience and judgment, nor is it a replacement for more detailed standard texts and references in the field.

The Manual recognizes that the practice of urban storm drainage is dynamic and rapidly changing, with new techniques, materials, and equipment continuously being introduced, and emphasizes that practitioners in the field must constantly be aware of new developments and modify their practice accordingly. The UWRRC invites comments and recommendations for improvement for possible inclusion in future editions.

The authors recognize that many women professionals are involved in all aspects of the planning, design, and construction of urban stormwater management systems. The use of the masculine gender pronoun throughout the manual has been for the sake of simplicity and brevity, and no other inferences should be drawn.

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The Urban Water Resources Research Council would like first to acknowledge the efforts of Mr. Richard Lanyon of the Metropolitan Sanitary District of Greater Chicago, and Mr. Jonathan E. Jones of Wright Water Engineers, Inc. of Denver, Colorado, without whose leadership, energy and enthusiasm this Manual would never have been completed.

Most of the real work was done by the individual chapter authors, and their work is gratefully acknowledged. Mr. Harry C. Torno worked tirelessly as Technical Editor of the entire book.

Special appreciation is extended to the staff of Wright Water Engineers, Inc. in Denver, Colorado who have worked on virtually every aspect of manuscript preparation.

Finally, the Council would like to thank the following organizations, which generously donated funds to assist with the preparation of the text and figures in the Manual of Practice:

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