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Inland Navigation

CHANNEL TRAINING WORKS



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Inland Navigation

Channel Training Works

Prepared by
the Task Committee on Inland Navigation of
the Waterways Committee of
the Coasts, Oceans, Ports, and Rivers Institute of
the American Society of Civil Engineers

Edited by
Thomas J. Pokrefke, P.E.

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Reviewers

Doug Kamien, P.E. Retired deputy district engineer for Programs and Project Management for the Vicksburg District, U.S. Army Corps of Engineers

Mark F. Lindgren, P.E., M.ASCE. Hydraulic engineer, chief of Hydrology and Hydraulics Branch, Walla Walla District, U.S. Army Corps of Engineers

Thomas Wakeman III, Engr.Sc.D., F.PIANC, Dist.D.PE, Dist.D.NE., M.ASCE. Research professor, deputy director of the Center for Maritime Systems of the Stevens Institute of Technology, Hoboken, NJ

BLUE RIBBON REVIEW PANEL

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Pierre Y. Julien, Ph.D., P.E., M.ASCE. Professor of civil and environmental engineering at Colorado State University

Warren J. Mellema, MSCE, P.E. (inactive), LM.ASCE. Retired; previously assistant chief of Engineering Division in the Missouri River Division

Claude N. Strauser, P.E., P.LS., F.ASCE, M.PIANC. Retired supervisory hydraulic engineer (chief of Hydrology and Hydraulics Branch), U.S. Army Corps of Engineers, St. Louis District

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PREFACE

This manual was produced by the Task Committee on Inland Navigation of the Waterways Committee of the Coasts, Oceans, Ports, and Rivers Institute (COPRI), American Society of Civil Engineers. Members of the Task Committee were:

- Bruce L. McCartney, P.E., D.NE, M.ASCE. Retired hydraulic expert for navigation project design, U.S. Army Corps of Engineers Headquarters (Office, Chief of Engineers) and North Pacific Division; Task Committee chair.
- Thomas J. Pokrefke, MSCE, P.E., D.NE, LM.ASCE. Retired research hydraulic engineer for River Studies, U.S. Army Corps of Engineers Engineer Research and Development Center (formerly Waterways Experiment Station); Task Committee editor.
- Michael D. Cox, Dist.D.NE, Aff.M.ASCE. Member and former chair of COPRI Waterways Committee, currently president of COPRI Governing Board. Also experienced in river operations and channel maintenance activities through employment with U.S. Army Corps of Engineers; Task Committee member.
- Stephen W. Ellis, P.E. Retired civil engineer and Mississippi River channel improvement coordinator for the U.S. Army Corps of Engineers Mississippi Valley Division; Task Committee member.
- David C. Gordon, P.E. Chief of hydraulic design, U.S. Army Corps of Engineers, St. Louis District; Task Committee member.
- William H. McAnally, Ph.D., P.E., D.NE, F.ASCE. Research professor of civil and environmental engineering, Mississippi State University, and co-director, Northern Gulf Institute; Task Committee member.
- Freddie Pinkard, P.E., Hydraulic engineer, Chief of the River Engineering Section, and Mississippi River Channel Improvement coordinator, U.S. Army Corps of Engineers, Vicksburg District; Task Committee member.

Eleven of the 13 chapters were assembled by Bruce McCartney and Tom Pokrefke with input and critical reviews from the other committee members, several U.S. Army Corps of Engineers offices, and existing publications. Bruce McCartney is the principal author of Chapter 1; William McAnally is the principal author of Chapter 2; Bruce McCartney, Tom Pokrefke, and Freddie Pinkard are the principal authors of Chapter 4; Freddie Pinkard and Dave Gordon added significantly to Chapter 5; and Freddie Pinkard and Steve Ellis are the principal authors of Chapter 6. Dave Gordon added significantly to Chapter 7, Mike Cox and Freddie Pinkard contributed significantly to Chapter 8, and Tom Pokrefke is the principal author of Chapter 11 with the assistance of Dave Gordon. Tom Pokrefke is the principal author of Appendix I with input from the other committee members. Steve Ellis located the information in Appendix II. The authors extend their appreciation to Carol A. McAnally for her editorial reviews and to Bruce McCartney for his consistent effort to keep us moving forward.

The Waterway Committee reviewers were:

- Doug Kamien, P.E. Retired deputy district engineer for programs and project management for the Vicksburg District, U.S. Army Corps of Engineers.
- Mark F. Lindgren, P.E., M.ASCE. Hydraulic engineer, chief of Hydrology and Hydraulics Branch, Walla Walla District, U.S. Army Corps of Engineers.
- Thomas Wakeman III, Engr.Sc.D., F.PIANC, Dist.D.PE, Dist.D.NE., M.ASCE. Research professor, deputy director of the Center for Maritime Systems at the Stevens Institute of Technology, Hoboken, NJ.

The peer reviewers for the committee of the Coasts, Oceans, Ports, and Rivers Institute were:

- David S. Biedenharn, P.E., Ph.D., M.ASCE. Retired hydraulic engineer, U.S. Army Corps of Engineers; currently principal investigator with Biedenharn Group, LLC. Areas of expertise: river engineering, fluvial geomorphology, sediment management, and channel restoration.
- Pierre Y. Julien, Ph.D., P.E., M.ASCE. Professor of civil and environmental engineering at Colorado State University. Former editor of the ASCE *Journal of Hydraulic Engineering*. Author of textbooks on erosion and sedimentation, and river mechanics.
- Warren J. Mellema, MSCE, P.E. (inactive), LM.ASCE. Final position prior to retirement was assistant chief of engineering division in the Missouri River Division of the U.S. Army Corps of Engineers, with responsibilities for the technical review and approval of all activities

concerned with the Missouri River Navigation Project, Sioux City, Iowa to St. Louis, Missouri. Former member of numerous U.S. Army Corps of Engineers and ASCE technical committees.

- Claude N. Strauser, P.E., P.LS., F.ASCE, M.PIANC. Retired supervisory hydraulic engineer (chief of the Hydrology and Hydraulics Branch), U.S. Army Corps of Engineers, St. Louis District. Areas of expertise: river engineering, potamology, sedimentation, morphology, project management, hydrology and hydraulics, and environmental river engineering.

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CHAPTER 1
INTRODUCTION

1.1 PURPOSE

This manual presents design guidance on various types of waterway training structures. These structures confine and stabilize a channel by reshaping it to create reliable depths and widths for safe and dependable vessel transit. The goal of river training systems is to provide the desired channel dimensions and alignment with little or no maintenance dredging. The proper use of dikes and revetments can achieve this goal, as shown by Fig. 1-1. Navigation channels can be in rivers (one flow direction) or in coastal areas (reversing tidal flow). This manual is confined to river systems. These river channels are subdivided into "open river" and lock and dam systems built in existing rivers. Information on tidal channel training structures can be found in ASCE Manuals and Reports on Engineering Practice No. 107, *Ship Channel Design and Operation* (McCartney et al. 2005). Appendix I provides a list of numerous terms related to channel training works presented in this manual.

1.2 NAVIGATION ENGINEERING

This manual joins a larger body of literature in the field of "navigation engineering" (NE). This newly evolving civil engineering discipline is defined as:

> The practice of life-cycle planning, design, construction, operation, and maintenance of safe, secure, reliable, efficient, and environmentally sustainable navigable waterways (channels, structures, and



Fig. 1-1. Dikes and revetments on the Mississippi River
Source: USACE St. Louis District

support systems) used to move people and goods by waterborne vessels.

This manual joins four other ASCE manuals on NE subjects:

No. 50, *Planning and Design Guidelines for Small Craft Harbors* (ASCE 2012)
No. 94, *Inland Navigation: Locks, Dams and Channels* (McCartney et al. 1998)
No. 107, *Ship Channel Design and Operation* (McCartney et al. 2005)
No. 116, *Navigation Engineering Practice and Ethical Standards* (McAnally 2009).

The U.S. Army Corps of Engineers (USACE) *Engineer Manual* series (USACE 2012) and PIANC publications (PIANC 2012) also provide information on NE subjects.

1.3 SCOPE

This manual will focus on the "training structures" component of navigation channel design in mainly open-river channels; however, many of the types of structures presented can and have been used in lock and dam systems. The information in this manual is applicable to "open-river"

projects (no locks and dams) and "run-of-the-river" projects (low-head locks and dams with no reservoir storage capacity). High-head locks and dam projects have deep upstream pools and do not need channel training structures except for the reach immediately downstream from the lock structure. Channel width, depth, alignment, and maintenance dredging are covered in *ASCE Manual of Practice No. 94*. Subjects included in this manual are planning, design, construction, cost, repair, environmental impact, model studies, and case histories.

1.4 TRAINING WORKS ON MAJOR RIVER SYSTEMS

To gain an understanding of the vast application of river training structures, it is enlightening to see the magnitude of riverine systems within the United States that have such structures (Fig. 1-2). The ASCE *2009 Report Card for American Infrastructure, Inland Waterways* (ASCE 2009) provides a good description of the federally operated and maintained Inland Waterway System as follows:

Mississippi River and Tributaries System	9,000 mi (14,480 km)
Ohio River and Tributaries System	2,800 mi (4,500 km)
Gulf Coast Intercoastal Waterways System	1,109 mi (1,785 km)
Columbia River and Tributaries System	596 mi (959 km)

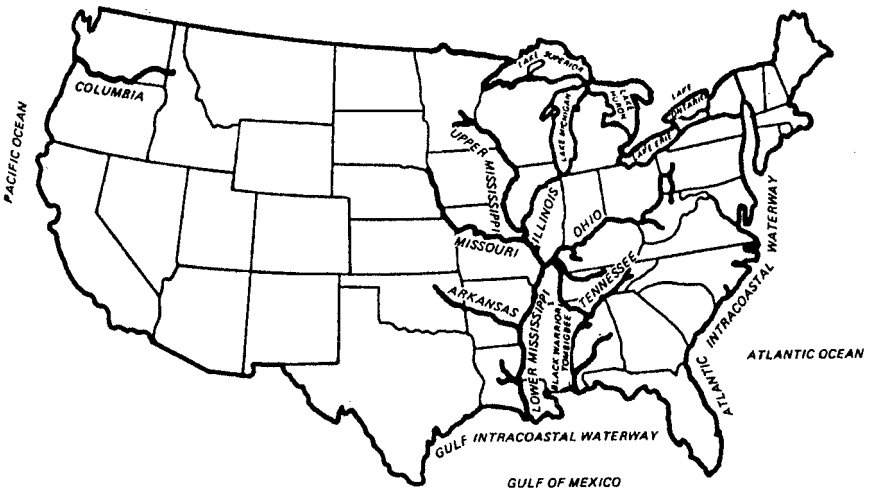


Fig. 1-2. U.S. inland waterway system
Source: McCartney et al. (1998); ©ASCE