# AASHTO Drainage Manual

# Volume 1—Policy

# 2014

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# AASHTO DRAINAGE MANUAL
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## PREFACE

The American Association of State Highway and Transportation Officials (AASHTO) Technical Committee on Hydrology and Hydraulics (TCHH) has produced a series of drainage manuals and guides. The TCHH produced this manual as part of their continuing work to assist the Standing Committee on Highways, Subcommittee on Design, in developing guidelines and in formulating policy. This publication supersedes the 2005 AASHTO publication, *Model Drainage Manual*. The *AASHTO Drainage Manual* provides transportation agencies with guidelines for establishing state-specific policy and procedures for the design of highway drainage facilities.

### SCOPE

The TCHH has incorporated its numerous years of experience into this drainage manual to provide guidance on most aspects of highway drainage. Design, concepts, practices, manuals, policies, and procedures are condensed and written for use by the hydraulics engineer. Where appropriate, relevant existing AASHTO guidelines, including parts of the *Highway Drainage Guidelines*, are referenced.

Due to significant topographical, climatological, and political differences throughout the nation, it is impossible to develop a design manual that is a consensus document. Policies, criteria, and information that the agency may wish to use in the development of policy documents are included within each chapter and will require the state's review for alteration or acceptance. Changes in the criteria or other portions of the manual are encouraged, and the recommended policies and criteria are not meant to be recommended minimum standards.

This manual has been developed to provide hydraulics engineers with a basic working knowledge of hydrology and hydraulics. All basic design elements are included such that the hydraulics engineer can design highway drainage with minimal assistance. However, this manual cannot provide guidance on complex hydrologic or hydraulic problems, and it is no substitute for experience or engineering judgment.

### MANUAL FORMAT

The manual is divided into two volumes. Volume One provides states with guidelines or examples for drainage design policies, criteria, and standards. Volume Two provides

hydrologic and hydraulic design procedures that are frequently used by highway hydraulics engineers.

Volume One chapters can generally be grouped into the five parts listed below:

- Part 1, General (Chapters 1–4). The introduction and chapters on legal aspects, data collection, and documentation provide recommended policies that apply to all drainage topics.
- Part 2, Planning and Environment (Chapters 6–8). Chapters on planning and location, surface water environment, and wetlands provide guidelines for policies and practices that are normally accomplished with the interaction of a hydraulics engineer before design.
- Part 3, Highway Hydraulic Design (Chapters 9–15). Chapters pertaining to hydrology, channels, culverts, energy dissipators, storm drainage systems, storage facilities, and pump stations provide design policies for facilities typically designed by highway hydraulics engineers.
- Part 4, Bridge Hydraulic Design and Floodplains (Chapters 16–19). Chapters on stream stability, bridges, channel and stream bank stabilization, and coastal zone provide design policies for facilities typically designed by bridge hydraulics engineers.
- Part 5, Construction and Maintenance (Chapters 20–22). Chapters about erosion and sediment control, construction, and maintenance provide guidelines for hydraulics engineers to provide assistance in these areas.

Volume One chapters provide the following:

- guideline policy, criteria, and standard practices;
- reference to procedures in Volume Two; and
- overview of the subject.

Volume Two chapters can generally be grouped in the five parts listed below:

- Part 1, General (Chapters 1–5). Introduction, permits and certifications, data collection, documentation, and software chapters provide recommended guidelines and procedures that apply to all topics discussed in this Manual.
- Part 2, Planning and Environment (Chapters 6–8). Planning and location, surface water environment and wetlands provide guidelines for procedures that are normally accomplished before design with the interaction of a hydraulics engineer.
- Part 3, Highway Hydraulic Design (Chapters 9–15). Hydrology, channels, culverts, energy dissipators, storm drainage systems, storage facilities, and pump stations

chapters provide design procedures for facilities typically designed by highway hydraulic engineers.

- Part 4, Bridge Hydraulic Design and Floodplains (Chapters 16–19). Stream stability, bridges, channel and stream bank stabilization, and coastal zone chapters provide design procedures for facilities typically designed by bridge hydraulic engineers.
- Part 5, Construction and Maintenance (Chapters 20–22). The erosion and sediment control chapter provides guidelines for hydraulic engineers to provide assistance in these areas.

Volume Two chapters provide the following:

- Reference to policy, criteria, and standards in Volume One.
- Design Procedures that the TCHH determined were frequently used have either:
    - step-by-step procedures and design examples that can be worked by hand;
    - step-by-step procedures and design examples that can be solved with the FHWA Hydraulic Toolbox, FHWA HY-8, and other public domain software; or
    - reference to worked examples for procedures (e.g., storm drain design, bridge design, and coastal engineering) that are commonly solved with software that requires substantial expertise.
- References to recommended guidelines for less common procedures.

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