

Chapter 1

ADMINISTRATION

ODOT ROADWAY DRAINAGE MANUAL

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Chapter 1

ADMINISTRATION

1.1 INTRODUCTION

For highway applications, hydraulics is the science of collecting, and transporting surface water originating on or near the highway right-of-way or flowing in the streams crossing or bordering that right-of-way. Proper drainage control is one of the essential elements of highway construction, and the cost for the adequate removal of surface water justifies a careful and scientific approach to the design of drainage facilities. A large portion of highway construction costs is devoted to culverts, bridges and other drainage structures.

In hydraulics design, the basic objective is to protect the highway from damage due to storm and subsurface waters and considering the effects of the proposed improvement on traffic and property. Preventing the accumulation and retention of water on and adjacent to the roadway is addressed by the following general objectives:

- anticipating the amount and frequency of storm runoff;
- determining natural points of concentration and discharge and other hydraulics controls;
- providing the most efficient facilities consistent with cost, the importance of the road, maintenance and legal obligations; and
- removing detrimental amounts of subsurface water.

The ODOT *Roadway Drainage Manual* presents the hydraulics guidelines, procedures and practices to meet these objectives. Specifically, Chapter 1 addresses in-house operational procedures related to drainage and the primary highway hydraulics design literature used to produce the *Manual*.

1.2 BASIC APPROACH

The following describes the basic approach for the ODOT *Roadway Drainage Manual*:

1. Audience. The following users are the intended audience for the *Manual*:
 - hydraulics designers,
 - road designers,
 - county and city personnel, and
 - consultant engineers.
2. Application. The *Manual* is an application-oriented document that provides design criteria, practices and procedures for roadway drainage tailored to the prevailing conditions in Oklahoma. It is not intended to be a hydraulics textbook or a step-by-step training manual, but should be viewed as a valuable reference or guide to the user.
3. Coordination with AASHTO Drainage Manual. The AASHTO Technical Committee on Hydrology and Hydraulics produced the 2012 AASHTO *Drainage Manual* (ADM) for use by State Departments of Transportation nationwide. The ADM presents design theories, concepts, guidelines, criteria and procedures for use by the hydraulics designer. The ODOT *Roadway Drainage Manual* has been prepared using the ADM as the starting point. Where practical, the text and graphics in the MDM have been incorporated into the *Manual* with modifications to reflect ODOT policy, criteria and practices. The ADM is the primary source of guidelines, design procedures and example problems.
4. Coordination with Hydraulics Literature. The FHWA hydraulics publications are the primary references for current procedures and for more detailed information. The FHWA has published hydraulics design documents in two general formats — the Hydraulic Design Series (HDS) and the Hydraulic Engineering Circulars (HEC). The HDS publications are considered state of highway hydraulics practice (e.g., HDS-5 *Hydraulic Design of Highway Culverts*). The HEC publications contain procedures that are developing and evolving (e.g., HEC-22 *Urban Drainage Design Manual Third Edition*). All of the FHWA publications are available from its website. Hydraulics software references are provided in Chapter 16 “Hydraulics Software.”
5. Example Problems. This *Manual* provides selected example problems on hydraulics design that are intended to illustrate the specific hydraulics design criteria, practices and guidelines used by ODOT for the selected applications.

1.3 FUNCTIONAL RESPONSIBILITIES

This section briefly discusses the drainage design responsibilities for selected units within the Oklahoma Department of Transportation.

1.3.1 Roadway Design Division

The design teams are responsible for the design of all roadway drainage design, including cross drainage structures that are not classified as bridges (width \leq 20 ft).

1.3.1.1 Roadway Drainage Engineer

The Roadway Drainage Engineer is responsible for establishing ODOT roadway hydraulics guidelines, practices and criteria. The Roadway Drainage Engineer also serves as a technical resource to in-house hydraulics designers, engineers, consultants and local agency staff and will review their work, where applicable.

1.3.1.2 Hydraulics Engineer/Designer

The project hydraulics engineer/designer is responsible for the hydraulics design for each individual project. Within this *Manual*, the term “hydraulics designer” is used when noting a hydraulics activity that is performed by qualified roadway design personnel. The responsibilities of the roadway hydraulics designer with respect to roadway drainage include the following:

- determining hydrology (see Chapter 7 “Hydrology”),
- designing roadside ditches (see Chapter 8 “Channels”),
- designing culverts (see Chapter 9 “Culverts”),
- locating and sizing roadway inlets (see Chapter 10 “Storm Drainage”),
- designing storm drains (see Chapter 10 “Storm Drainage”),
- designing energy dissipators (see Chapter 11 “Energy Dissipators”),
- locating and sizing storage facilities (see Chapter 12 “Storage Facilities”),
- determining erosion and sediment control (see Chapter 13 “Erosion and Sediment Control”),
- designing bank protection (see Chapter 14 “Bank Protection”), and
- complying with FEMA/NFIP and water-related permits (see Chapter 15 “Permits”).

1.3.2 Bridge Division

The Bridge Division provides a variety of engineering services for the design of drainage and structures on the State highway system. Specifically for preconstruction, the Bridge Division is responsible for the hydraulic and structural design of all new bridges required on the State highway system. The Bridge Division is also responsible for the design of all projects to rehabilitate or reconstruct existing bridges on the State highway system.

1.3.3 Environmental Programs Division

The drainage design responsibilities of the Environmental Program Division include:

1. Environmental Documents. The Environmental Programs Division prepares environmental documents for ODOT projects (e.g., Environmental Impact Statements, Environmental Assessments, Categorical Exclusions, 4(f) Assessments, wetland findings, storm water permits). These documents assess the drainage impacts of ODOT projects on adjacent properties (e.g., water, wildlife, fisheries).
2. External Agency Coordination. The Environmental Programs Division facilitates the timely letting of construction projects by obtaining a consensus among ODOT and other State and Federal resource agencies concerning the development of highway construction projects with respect to environmental impacts.

Some of the environmental issues for which the hydraulics designer may need to coordinate with the Environmental Program Division are:

- wetlands;
- the design for fish passage (e.g., coordinating with US Fish and Wildlife and Oklahoma Department of Wildlife Conservation);
- defining the habitats of endangered species;
- encroachments (e.g., floodplains);
- water quality (e.g., wetlands, ground water, erosion control, post-construction run-off controls); and
- Section 404 permits.

If the Environmental Programs Division identifies the need to accommodate fish passage through a selected culvert; the hydraulics designer would determine how to provide the accommodation.

1.3.4 Consultant-Designed Projects

For those projects designed by consultants, the following summarizes the division of responsibilities for drainage design:

1. Consultant. In general, the consultant is responsible for all hydrologic and hydraulic computations on their projects. Consultants are responsible for performing their analyses consistent with the drainage guidelines and criteria adopted by ODOT.
2. ODOT. ODOT will review the consultant's proposed drainage design for consistency with the drainage guidelines and criteria adopted by ODOT and practicality with the project site conditions.

1.3.5 Local Government Division

The ODOT Local Government Division provides financial and technical assistance to county and city governments for the construction and reconstruction of roads, streets and bridges. This office is responsible for:

- administering State and Federal contracts,
- conducting field review inspections on local projects, and
- facilitating plan review.

The design for local agency highway projects is typically accomplished through contracts with consulting engineering firms (e.g., survey, roadway, hydraulics, structural design). Local Government Division administers these projects in coordination with the local government.

County Highway System Design Guidelines Manual was developed in coordination between ODOT and the counties of Oklahoma. This manual is a guideline for use in planning, designing and constructing roads and bridges on local government road systems. City streets may be designed in accordance with ODOT design criteria for city streets, unless the city has their own overriding design criteria.

