BRIDGE DESIGN MANUAL

MICHIGAN DESIGN MANUAL
BRIDGE DESIGN

CHAPTER 1 • INTRODUCTION

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1.00 INTRODUCTION

The Bridge Design Manual addresses the procedures involved in preparing plans of bridges and other major structures on the interstate/freeway, arterial, collector and local road system governed by the Michigan Department of Transportation (MDOT). Incorporation of or connectivity to other modes of transportation (pedestrian, bicycle, multi-use paths, etc.) must be considered.

In this manual a bridge is defined by the National Bridge Inspection Standards Federal Code of Regulations (23 CFR 650) as a structure that spans over a waterway, highway, or railway with an opening measured along the center of roadway of more than 20'. Structures that span distances under 20' are considered culverts.

In compiling these procedures, an effort was made to include all information related to plan preparation. The major portion of the manual is devoted to design criteria and the presentation of plan information. But other chapters deal with the routines of processing the work, the source material supporting design considerations, and the involvement of other agencies affected by the project. In general, the Bridge Design Manual is intended to be a single source reference for the MDOT Design Engineers and consultants assigned the responsibility of producing bridge plans. It is assumed that this manual is to be used in conjunction with the MDOT Road Design Manual. The Road Design Manual contains relative/pertinent information and procedures for both road designers and bridge designers. In general, the Bridge Design Manual is intended to be a reference for the MDOT Design Engineers and consultants assigned the responsibility of producing bridge plans of the requirements specific to structure design beyond those detailed in the Road Design Manual.

Much of the information presented originates from the Bridge Squad Leaders' Notes, for many years the reference manual for the MDOT Bridge Engineer. These notes were updated and rearranged to comprise several chapters of the volume. This was expanded with input from other MDOT divisions and outside agencies, the policies of which influence the design and geometry of bridges. Some contributions resulted from experience in fabricating, constructing, and maintaining bridges.

The design of highway bridges in Michigan is based on the ***Standard Specifications for Highway Bridges*** and ***LRFD Bridge Design Specifications*** published by the American Association of State Highway and Transportation Officials (AASHTO). Repetition of any of these specifications would be unnecessary and was avoided in preparing this manual. In some cases, however, the AASHTO specifications are vague or leave a decision to the judgment of the Engineer.

LRFD Guide Specifications for the Design of Pedestrian Bridges and ***Guide for the Development of Bicycle Facilities*** will aid in the design of other modes of transportation.

Guidelines in the Bridge Design Manual are provided as clarification and thus supplement the provisions of AASHTO. Some minimum requirements in the AASHTO specifications have been found through experience to be insufficient. In these instances, the Design Manual supersedes AASHTO with more rigorous controls.

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Procedures and guidelines continually change. The material in the Bridge Design Manual is continually updated and every attempt is made to keep the Manual as current as possible. When the need for an addition or change arises, the Manual is updated on a monthly basis. These updates will describe the revision, explain the reason, serve as a commentary, and assign the date of its implementation. (12-16-2019)

It is expected that many of the changes will be additions prompted by comments from those using the Manual. While considerable effort was made to compile all information that should be required to prepare plans, some points no doubt have been overlooked. For this reason, any questions or suggestions regarding the text of the Bridge Design Manual should be sent to the MDOT Standards Unit at MDOT-Bridge-Design-Standards@michigan.gov.

Many different resources are available for designing and detailing of bridges, structures, and all modes of transportation. Those include plan sheet examples, drafting details and practices and various types of specifications. A summary and link location to these is described in the subsequent sections.

1.01 MDOT DEVELOPMENT GUIDE

The MDOT Development Guide is currently available only on the State of Michigan (SOM) SharePoint Site which is open to all SOM Employees. However, external access for design engineers that are not SOM Employees but are responsible for producing road or bridge plans in Michigan is available. Consultants should contact MDOT Engineering Support at MDOT-EngineeringSupportTraining@michigan.gov for instructions on how to create and maintain a SOM M365 guest account to receive access.

1.02 PLAN SHEET EXAMPLES

Plan sheet examples can be found at Guidelines for Bridge Plan Preparation (MDOT Sample Plans Bridge). The document presents samples of detail sheets that can be used as guides in preparing plans of highway bridges. The samples were selected and tailored to provide as much reference data as possible on a limited number of sheets. Each of the detail sheets of a typical set of plans is represented. At the same time, detailing procedures for a variety of bridge types are illustrated. Commentary is provided for more clarity and background on guidelines and detailing procedures. Also included are abbreviations, symbols and naming conventions for files.

In general, adherence to these guides is recommended. Many of them result from past construction experience, and while other methods of presenting structural details may be equally effective, it is possible that they would create problems. The format shown is preferred if for no other reason than the familiarity that the state contractors have developed following it on previous jobs. On rare occasions, the guides may not be appropriate, but before electing to deviate, drafting personnel should be sure there is ample justification.

Additional information and Archived Bridge Sample Plans are available online from the MDOT Development Guide.

1.03 DRAFTING DETAILS AND PRACTICES

Drafting details and practices, cell libraries and other miscellaneous files can be found on the MDOT Development Guide and MDOT Design Services Website.

Various details have been standardized and appear on specific sheets. See Guidelines For Bridge Plan Preparation (MDOT Sample Plans Bridge) and the Bridge Support Resources section of the MDOT Development Guide for various details, practices and sample plan sheets. It also contains drafting degrees of accuracy, abbreviations and symbols used on plans.

For naming convention of files see Base File Name Conventions of the MDOT Development Guide (CAD Standards).

Structure designations and additional bridge/structure information is available in the Michigan Structure Inventory and Appraisal Coding Guide.

Checking all detail drawings must be done to ensure the accuracy of the plans. The drawings shall comply with the design calculations, existing design guides, and the practices listed in Guidelines For Bridge Plan Preparation.

1.04 SPECIFICATIONS

Specifications are to accompany the plans as part of the contract documents. They establish how the work is to be done, the materials and equipment that are to be used, and the method of measurement and payment for the work. It is the Design Engineer's responsibility to see that all relevant specifications are included in the contract.

Three types of specifications exist, all accomplishing the purposes stated above. These are Standard Specifications for Construction, Supplemental Specifications, and special provisions (including The Frequently Used Special Provisions).

For more detailed information on specifications including Special Provisions, supplemental specifications and proprietary items see Chapter 11 of the Road Design Manual.