

## SECTION 1 INTRODUCTION

### 1.1 Overview

This section outlines the general information contained in the SDDOT Bridge Design Manual and the general processes used by the Office of Bridge Design (OBD).

#### 1.1.1 Use of SDDOT Bridge Design Manual

The *South Dakota Bridge Design Manual* has been developed to provide guidance to Department and consultant personnel performing structural design and plan preparation for highway structures for SDDOT and local agencies. The *Manual* is intended to comply with all State and Federal laws, statutes and regulations, and it presents SDDOT OBD criteria, practices and procedures on the design of highway structures.

This manual is not intended to be a comprehensive guide for highway structure design and must be used in conjunction with the appropriate AASHTO, South Dakota, and other codes and specifications along with sound engineering judgement. It is expected that users of this manual have the appropriate structural engineering background.

Deviations from SDDOT OBD practices and procedures must be approved by the Bridge Design Engineer or Bridge Maintenance Engineer, as applicable. Requests for deviations should be made well in advance of plans preparation deadlines to allow adequate time for consideration of such requests.

It is important to recognize that there will continue to be changes in design specifications, design criteria and SDDOT OBD practices and procedures. Users are expected to refer to the Department's web site for manual updates.

Structure designs for local governments and municipalities shall use this manual as outlined above in conjunction with Department's Local Roads Plan.

##### 1.1.1.1 Requests for Updates

Suggested updates or changes to this manual will be submitted to the OBD through the Bridge Design Engineer. The form for suggesting a revision can be found in Appendix A of this manual. Upon receipt of the form the OBD will evaluate the request and may or may not make the requested changes.



### **1.2.1.1 OBD Sections**

The activities of the OBD fall into five primary sections, Construction, Hydraulics, New Design, Maintenance, and Management.

#### **1.2.1.1.1 Construction Engineering**

##### **1.2.1.1.1.1 Plans Preparation**

The Construction Section assists and advises during the development of plans and specifications to ensure plans are constructible. The Bridge Construction Engineer will also work with the Design Engineer to answer design and construction issues from the contractor Q&A for structure projects that are published for bidding. More information can be found on the SDDOT Bid Letting web page.

##### **1.2.1.1.1.2 Construction Document Review**

The Construction Section is responsible for reviewing various construction documents for accuracy and conformance to plans and specifications. These documents include but are not limited to shop drawings, drilled shaft plans, falsework plans, temporary works plans, and girder erection plans.

##### **1.2.1.1.1.3 Evaluation**

The Construction Section has the responsibility of managing the Department's Approved Products List for products regularly used on structures. For the specific product categories and products contained on the list please follow the link below.

[Approved Products List](#)

The Bridge Construction Engineer is represented on the Department's Contractor Prequalification Committee along with other construction-oriented positions within the Department. The Assistant Bridge Construction Engineer serves as the Bridge Construction Engineer's alternate in any case where the Bridge Construction Engineer is not available to evaluate a contractor.

##### **1.2.1.1.1.4 Construction Engineering Support**

When a field engineer has issues with plans, needs advice, or a construction issue arises the Construction Section assists by advising how to move forward and is the contact between the OBD, consultant engineers, and the field engineers. Scope of this work can

include but is not limited to explaining plan details, revising plans, and redesigning due to contractor error or unknown field conditions.

When changes to the plans are needed for an error in the original plans or a changed field condition the construction Section will provide construction change plans to the project engineer.

#### **1.2.1.1.2 Hydraulics**

The Hydraulics Section duties include but are not limited to, performing drainage studies, sizing hydraulic openings, evaluating scour, specifying countermeasures, and working with structural designers to select structure type, size, and location. Please see the South Dakota Drainage Manual for technical guidance.

#### **1.2.1.1.3 New Design**

The New Design Section is primarily responsible for the design of new bridges, box culverts, light pole footings, retaining walls, roadside barriers, pedestrian handrails, and other miscellaneous structures. At times, this section assists during construction of structures and works with Bridge Construction Engineer.

#### **1.2.1.1.4 Maintenance Design**

The Maintenance Design section is primarily responsible for the repair, maintenance, and modification of existing structures. At times, this section will also assist the Bridge Construction Engineer to resolve construction issues that occur during construction.

#### **1.2.1.1.5 Bridge Management**

##### **1.2.1.1.5.1 Bridge Inventory**

The Bridge Management Section is charged with the evaluation of all NBIS structures on the state highway system. Evaluation consists of using a computer model (AASHTOWare BrR) of the structure and structural components, updating structural condition based on field inspections, and load rating each structure. For more information on load rating contact the Bridge Management Engineer for access to the Department's Load Rating Manual.

##### **1.2.1.1.5.2 Structure Type Code (X... code)**

The South Dakota Structure Type Code is used in the Bridge Inventory and is determined as shown. It is to be placed on plans for all "bridge" length structures (as defined in NBIS). This code is placed immediately above the Index of Sheets as well as in the title block of the first plan sheet.

The SD Structure Type Code is an alphanumeric character consisting of an “X” followed by three numbers describing the SD Structure Type. The second digit indicates the type of service the structure provides; if the structure does not carry a highway, leave blank. The third digit indicates the material used in the principal member of the spans. The fourth digit indicates the main span type. Codes are as follows:

#### SD Structure Type Service

Code	Description
0	Highway over waterway
1	Highway over railroad
2	Highway over highway
3	Highway over waterway and railroad
4	Highway over waterway and highway
5	Highway over railroad and highway
6	Highway under railroad
7	Highway under highway
8	Highway under railroad and highway
9	Other combinations, including highway over waterway, railroad and highway; also 3- and 4-level grade separations and miscellaneous

#### SD Structure Material

Code	Description
0	Timber
1	Masonry
2	Concrete, not prestressed
3	Steel
4	Steel and concrete
5	Timber and Steel
6	Timber and Concrete
7	Composite steel and concrete
8	Concrete, prestressed
9	Aluminum

#### SD Span Type

Code	Description
0	Slab
1	Girder
2	Truss (except cantilever)
3	Rigid frame

4	Arch
5	Cantilever truss
6	Movable
7	Suspension
8	Box culvert (bridge length)

#### **1.2.1.1.5.3 Scoping and Planning**

Along with evaluation and load rating the Bridge Management Engineer and the Bridge Maintenance Engineer plan and program projects into the STIP for maintenance, rehabilitation, and replacement.

#### **1.2.1.1.6 Overload Evaluation**

The SDDOT along with Highway Patrol evaluate vehicles in excess of legal South Dakota loads and will issue a permit for the vehicle configuration and route. The Highway Patrol performs the analysis of structures through a program called SDAPS which will perform a simplified analysis of the permit vehicle. If SDAPS runs through its analysis and no failures occur the Highway Patrol will issue a permit for the vehicle and route. If SDAPS shows a failure of the permit vehicle the Highway Patrol will supply the OBD a list of the failing structures and the configuration of the permit vehicle for a more refined analysis using AASHTOWare BrR. If the structures pass the refined analysis the OBD will direct the Highway Patrol to issue the permit. If the refined analysis still fails, the OBD will notify the Highway Patrol and a new route for the permit vehicle will be required.

#### **1.2.1.1.7 Structure Numbering**

Each structure is assigned a unique eight-digit number which describes the structure's location within a county. The first two numbers XX-xxx-xxx indicate what county the structure is in from the list provided. The next three xx-XXX-xxx are the miles and tenths of a mile from the west most edge of the county (XX.X miles) to the structure. The last three xx-xxx-XXX are the miles and tenths of a mile from the north most edge of the county (XX.X miles) to the structure. The location on the structure is the highest MRM point along the centerline of roadway on the structure.

Proposed structure numbers are to be submitted to the Bridge Management Engineer for review and approval.

For counties which are more than 100 miles in width the first two digits (the one and first zero) are replaced with an A. For example, if a structure is 103.2 miles from the west edge of the county the structure number would be xx-A32-xxx.

For structures that cross county lines, the county will be assigned based on in which county the highest MRM along centerline of roadway is located. This results in the northern or eastern county on north/south and east/west routes respectively. For a structure located on a county boundary, the structure will be assigned to the county to the north or east.

For structures on divided highways where there are twin structures the following applies: For north/south routes, the structure number is assigned to the southbound structure as outlined above. The northbound structure is assigned by increasing the middle three numbers one digit higher for the east coordinate. Similarly, for east west routes the number is assigned to the westbound and the eastbound northing is increased by one digit.

#### 1.2.1.1.8 County Numbers

02 Aurora	24 Fall River	46 Marshall
03 Beadle	25 Faulk	47 Meade
04 Bennett	26 Grant	48 Mellette
05 Bon Homme	27 Gregory	49 Miner
06 Brookings	28 Haakon	50 Minnehaha
07 Brown	29 Hamlin	51 Moody
08 Brule	30 Hand	52 Pennington
09 Buffalo	31 Hanson	53 Perkins
10 Butte	32 Harding	54 Potter
11 Campbell	33 Hughes	55 Roberts
12 Charles Mix	34 Hutchinson	56 Sanborn
13 Clark	35 Hyde	57 Oglala Lakota
14 Clay	36 Jackson	58 Spink
15 Codington	37 Jerauld	59 Stanley
16 Corson	38 Jones	60 Sully
17 Custer	39 Kingsbury	61 Todd
18 Davison	40 Lake	62 Tripp
19 Day	41 Lawrence	63 Turner
20 Deuel	42 Lincoln	64 Union
21 Dewey	43 Lyman	65 Walworth
22 Douglas	44 McCook	68 Yankton
23 Edmunds	45 McPherson	69 Zieback