

**ARTICLE 89-14
STREAM CROSSINGS**

Revisions

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Introduction

- o Article 89-14 of North Dakota Administrative Code, “Stream Crossings” applies to all public centerline roadway stream crossings in the state.
- o An overview of Article 89-14 will be provided, with emphasis given to revisions made to the Code in January, 2015.

ND Stream Crossing Standards

- First created in 2001, North Dakota's stream crossing design standards are contained in Article 89-14 of the ND Administrative Code, and apply to water crossings through public roadways, ranging from township roads to interstate highways.
- The standards apply to any location where water crosses through a public highway, whether the crossing is a pipe culvert, a box culvert or a bridge.
- The two primary design criteria provided by the Stream Crossing Standards are the appropriate design discharge to be used, and the maximum allowable headwater.

Original 2001 Version:

89-14-01-01. Standards. Except as provided in section 89-14-01-06, all highways constructed or reconstructed by the department of transportation, board of county commissioners, board of township supervisors, their contractors, subcontractors, or agents, or by any individual firm, corporation, or limited liability company must be designed to meet the standards contained in this chapter. The department, or any board of county commissioners, board of township supervisors, their contractors, subcontractors, or agents, or any individual, firm, corporation, or limited liability company that fails to comply with these standards is not entitled to the immunity provided in section 24-03-06, 24-03-08, or 24-06-26.1 of the North Dakota Century Code.

History: Effective May 1, 2001; amended effective July 27, 2001.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

89-14-01-02. Definitions.

1. "Construct" means to construct a new highway on a new location or corridor.
2. "Reconstruct" means to regrade or widen an existing roadbed on the existing highway location. For purposes of this chapter, reconstruct also includes replacing, modifying, or installing a stream crossing.

History: Effective May 1, 2001.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

89-14-01-03. Design flood frequency. The following table provides the recurrence interval of the event for which each type of crossing must be designed.

Revised (2015) Version:

89-14-01-01. Standards.

Except as provided in section 89-14-01-06, all highways constructed or reconstructed by the department of transportation, board of county commissioners, board of township supervisors, their contractors, subcontractors, or agents, or by any individual, firm, corporation, or limited liability company must be designed to meet the standards contained in this chapter. The department of transportation, board of county commissioners, board of township supervisors, their contractors, subcontractors, or agents, or any individual, firm, corporation, or limited liability company that fails to comply with these standards is not entitled to the immunity provided in North Dakota Century Code sections 24-03-06, 24-03-08, or 24-06-26.1.

History: Effective May 1, 2001; amended effective July 27, 2001; January 1, 2015.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

89-14-01-02. Definitions.

1. "Constructed" means to construct a new highway on a new location or corridor.
2. "Highway, street, or road" is defined in North Dakota Century Code section 24-01-01.1.
3. "Reconstructed" means to regrade, add a lane adjacent to the existing alignment, or do full depth road surface replacement on an existing highway location. For purposes of this chapter, reconstructed also includes replacing or installing a stream crossing.
4. "Stream crossing" means an opening to permit the flow of water under, adjacent to, or because of a highway.

History: Effective May 1, 2001; January 1, 2015.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

89-14-01-03. Design flood frequency.

The following table provides the minimum design standard recurrence interval of the event for which each type of stream crossing must be designed. Nothing contained in this chapter is intended to restrict an entity from providing greater capacity.

Revised (2015) Version:

No changes made to flood frequencies with 2015 revisions

Type of Crossing	State Highway System						County	
	Urban System		Rural System				Rural System	
	Regional	Urban Roads	Principal Arterial		Minor Arterial	Major Collector	Major Collector	Off ⁴ System
Interstate			Other					
Bridges & Reinforced Concrete Boxes	25 year ²	25 year ²	50 year ²	50 year ²	50 year ²	25 year ²	25 year ^{2,3}	15 year ^{2,3}
Roadway Culverts	25 year ²	25 year ²	50 year ²	25 year ²	25 year ²	25 year ²	25 year ^{2,3}	15 year ^{2,3,5}
Storm Drains	10 year ¹	5 year ¹	10 year ²	10 year ²	10 year ²	10 year ²		
Underpass Storm Drains	25 year ¹	25 year ¹	50 year ²	25 year ²	25 year ²	25 year ²		

¹Discharges must be computed using the rational method or other recognized hydrologic methods.

²Discharges must be computed using [United States geological survey report 92-4020](#) or other recognized hydrologic methods.

³If an overflow section is provided, the pipes and the overflow section, in combination, must pass the appropriate design event within the headwater limitations provided in this chapter.

⁴Off system roads include all township roads.

⁵For township roads, the recurrence interval is 10 years.

History: Effective May 1, 2001; amended effective July 27, 2001; January 1, 2015.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

New USGS Regression Equations became available later in 2015, so use Equations published in USGS Scientific Investigations Report (SIR) 2015-5096

Revised (2015) Version:

Language relative to upstream impacts says the same thing as 2001 version did, only most people should be able to understand what it says now.

89-14-01-04. Floodplain consideration - Upstream development.

All stream crossings must comply with applicable floodplain regulations and regulatory floodway requirements. If a stream crossing is being replaced and buildings or structures are located upstream from the crossing, the stream crossing must not be reconstructed in a manner that increases the likelihood of impacts to those upstream buildings or structures, even if the capacity of the crossing being replaced was greater than the capacity otherwise required by this chapter. Any stream crossing constructed as part of a newly constructed roadway must be constructed to pass a one hundred-year event without the resulting increase in headwater impacting any existing buildings or structures. Structures, for the purposes of this section, include grain bins, silos, feedlots, and corrals. Structures do not include pasture fencing.

History: Effective May 1, 2001; amended effective January 1, 2015.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

Revised (2015) Version:

Allowable headwater section is the same as before.

89-14-01-05. Allowable headwater.

The allowable maximum headwater when passing the design discharge must be measured from the bottom of the channel. For arch pipes, the maximum allowable headwater must be based on the rise of the pipe, and the pipe size category must be the equivalent round pipe size. For multiple pipe installations, the pipe diameter used to calculate the allowable headwater must be the diameter of the largest pipe. Tailwater resulting from downstream conditions, either natural or manmade, must be accounted for in the determination of the crossing's capacity and the resulting headwater. Additional guidance is provided in the North Dakota department of transportation design manual. If a crossing results in less than one-half foot [15.24 centimeters] of headloss when passing the appropriate design discharge, this section does not apply.

Streambed Slope (feet/mile)	Pipe Size	Allowable Headwater
<5	24" - 54"	pipe diameter + 2 feet
	≥ 60"	1.52 pipe diameters
5 to 10	24" - 36"	pipe diameter + 2 feet
	42" - 54"	1.5 pipe diameters
	≥ 60"	2 pipe diameters
>10	≥ 24"	2 pipe diameters

Headwater and Tailwater:

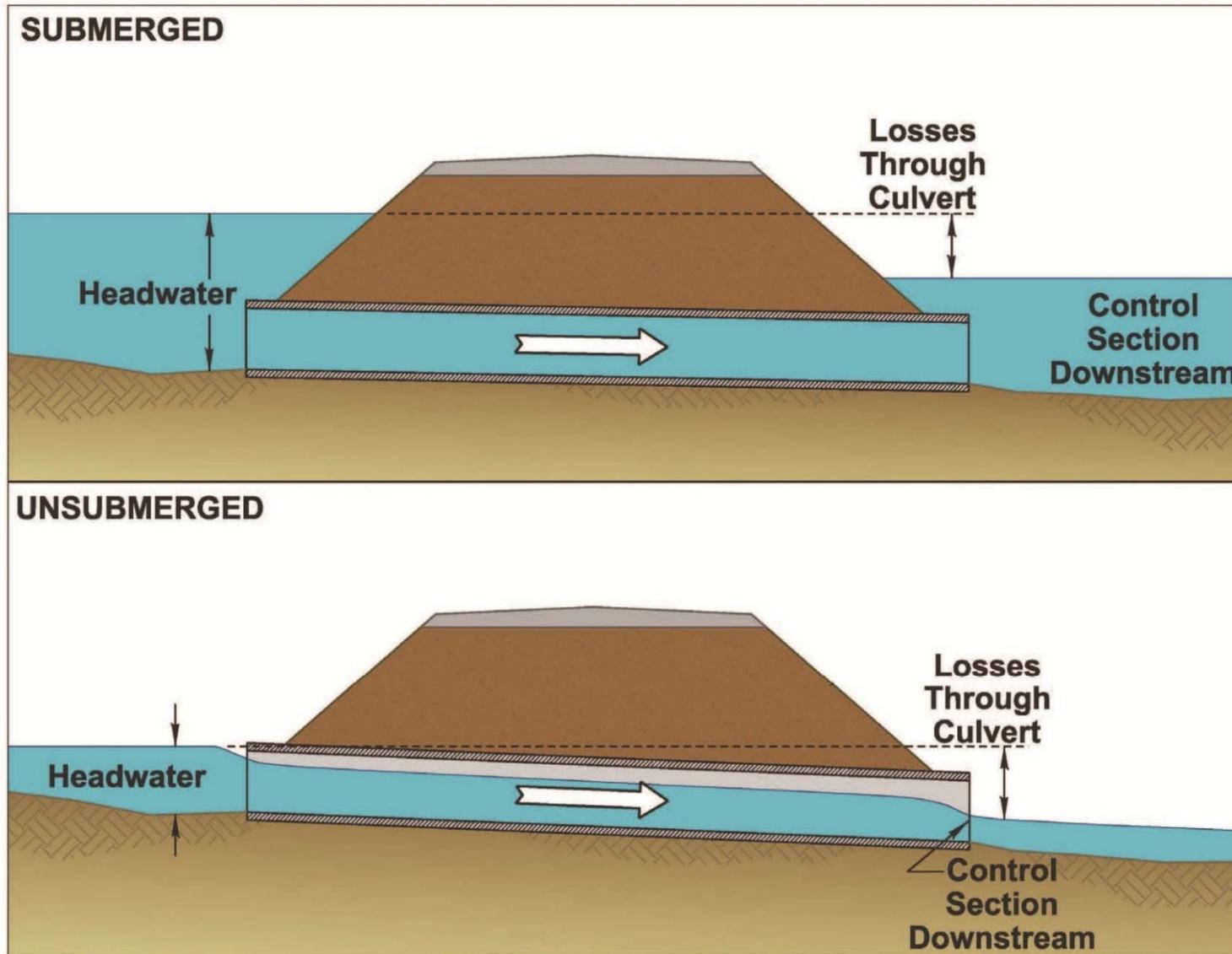


Figure 1.18. Typical outlet control flow conditions.

Revised (2015) Version:

Deviations from the standards – Language is pretty much the same as the 2001 version. And, deviations are still very rare; mostly nonexistent.

89-14-01-06. Deviations.

The board of county commissioners, board of township supervisors, their contractors, subcontractors, or agents, or any individual, firm, corporation, or limited liability company may deviate from the standards contained in this chapter if the deviation is approved in writing by the state engineer and the department of transportation. A request to deviate from the standards must be made in writing and must set forth the reasons for the proposed deviation. The state engineer and department of transportation may grant a deviation for good and sufficient cause after considering public safety, upstream and downstream impacts, and other relevant matters.

The department of transportation may deviate from these standards if the department determines it is appropriate to do so and the crossings are designed under scientific highway construction and engineering standards. The basis for the department's decision must be documented in writing.

Roads constructed as part of a surface coal mining operation for use solely as part of the mining operation are not subject to the requirements of this chapter. Roads constructed because of a surface coal mining operation for use by the public are bound by the requirements of this chapter, but deviations may be requested under this section.

History: Effective May 1, 2001; amended effective January 1, 2015.

General Authority: NDCC 24-02-01.1, 24-02-01.5, 28-32-02, 61-03-13

Law Implemented: NDCC 24-03-06, 24-03-08, 24-06-26.1

Miscellaneous Info

- On the State System, North Dakota has approximately 22,244 centerline culverts, and 999 bridges (which includes structural plate pipes or box culverts having a span of 8 feet or greater) over waterways. All of these are considered stream crossings.
- Every culvert through a township or county road is also considered a stream crossing. No idea how many of those exist.
- Private drives and field approaches, while not specifically addressed by the stream crossing standards, are still crossings which require consideration in their culvert sizing. The NDDOT sizes approach culverts for a 10-year recurrence event, essentially designing them the same as culverts through township roads. In some instances, a higher design flood should be considered.

NDDOT Policy on Failed Culverts on Non-Reconstruction Projects

- Sometimes failing culverts are identified during the development of a roadway rehabilitation project. Section III-04.11 of the Design Manual provides guidance on how to address failing culverts.
- A failed culvert is one that has lost capacity due to deformation, has significant section loss due to corrosion, or has severely separated sections (RCP pipes) with significant loss of material resulting in voids above or around the pipe.
- Where a failed culvert has been identified on a non-reconstruction project, a request to the OPD Director to replace or rehabilitate the culvert must be made at the time of scoping, and the request should be completed no later than at the time of the field review.

NDDOT Policy on Failed Culverts on Non-Reconstruction Projects

- If approval is granted to address a failed culvert, rehabilitation options must be identified and evaluated to determine the most cost effective strategy.
- If lining of a culvert with a thin liner (such as a cured-in place plastic liner) is the appropriate rehabilitation strategy, then these types of liners can be installed without performing a hydraulic analysis provided that the following criteria can be met: For culverts of 48" diameter or smaller, the liner must be one half inch or less in thickness. For culverts larger than 48" diameter, the liner must be no greater than one inch in thickness.
- If rehabilitation is not a feasible strategy, and replacement is required, then hydrology/hydraulic analysis is necessary to size the new culvert, just like any other culvert replacement.

Summary

- o Consistent application of stream crossing design standards is a very good way to keep out of trouble with adjacent landowners, while protecting infrastructure from excessive headwater and high velocity flows, and limiting unsafe overtopping of roadways.
- o ...And, it's the law: All centerline stream crossings which are installed new, or replaced, shall be compliant with Article 89-14 of ND Administrative Code (Stream Crossing Standards)
- o Thank You.

Questions?

