



# INDIANA DEPARTMENT OF TRANSPORTATION

*Driving Indiana's Economic Growth*

## Design Memorandum No. 07-05 Policy Change

March 22, 2007

**TO:** All Design, Operations, and District Personnel, and Consultants

**FROM:** /s/ Anthony L. Uremovich  
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Production Management Division

**SUBJECT:** Treatment of Historic Bridge on Low-Volume Local Road

**ADDs:** *Indiana Design Manual Section 72-7.0*

**EFFECTIVE:** April 2, 2007, Start Plan Development Date

### I. INTRODUCTION

A historic bridge is one which was built prior to 1966, and is in, or is eligible for inclusion in, the National Register of Historic Places. The Department has developed a listing of all publicly-owned historic bridges that are National Register-eligible or -listed.

The purpose of this policy is to define standards to be used to determine if a historic bridge on a low-volume local road can be rehabilitated for continued vehicular use. A low-volume road is defined as having a design year ADT of less than or equal to 400.

A historic-bridge owner must first consider rehabilitating the bridge in accordance with this policy. The rehabilitation alternatives must include the option of a one-way pair that involves rehabilitating the existing bridge and constructing a new parallel bridge. If the bridge cannot be rehabilitated in accordance with one or more of the design criteria described in Section III below, the owner may request a Level One design exception(s).

## **II. TYPES OF HISTORIC BRIDGES**

A historic bridge will be classified as either Select or Non-Select. The Department is in the process of determining each bridge's classification in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the Indiana Department of Transportation, the Indiana State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Management and Preservation of Indiana's Historic Bridges (PA)*. A listing of Select and Non-Select bridges will be issued by the Production Management Division's Services and Cultural Resources Team. Until that time, each historic bridge should be regarded as Select.

### **A. Select Bridge**

A Select bridge has been identified as a historic bridge that is an excellent example of its structure type to be a suitable candidate for preservation. The intent of the *PA* is to preserve Select bridges in place for continued vehicular use. If rehabilitation alternatives are not in accordance with Section III below, and the owner is not granted a design exception or does not request one, the Select bridge must be bypassed or relocated for another use. See the *PA* for further guidance on bypassing and/or relocating the bridge.

### **B. Non-Select Bridge**

A Non-Select bridge has been identified as a historic bridge that is not an excellent example of its structure type, nor is a suitable candidate for preservation. If the rehabilitation alternatives are not in accordance with Section III below, and the owner is not granted a design exception or does not request one, the Non-Select bridge must be marketed for re-use. In accordance with the *PA*, if no party steps forward to assume ownership of the bridge, the bridge may be demolished. See the *PA* for further guidance on marketing and/or demolishing the bridge.

## **III. DESIGN CRITERIA**

### **A. Structural Capacity**

The structural capacity should be in accordance with Figure 07-05A, Historic-Bridge Structural Capacity. The required capacity designations are those described in AASHTO *Standard Specifications for Highway Bridges*.

	Detour Length		5 mi ≤ Detour Length < 10 mi		Detour Length	
	< 5 mi		Length < 10 mi		≥ 10 mi	
Design Year ADT	< 100	100 ≤ ADT ≤ 400	< 100	100 ≤ ADT ≤ 400	< 100	100 ≤ ADT ≤ 400
AASHTO Loading	H-15	HS-15	HS-15	HS-15	HS-15	HS-20
Required Capacity	15 tons	27 tons	27 tons	27 tons	27 tons	36 tons

Notes:

1. *Detour length is defined as the total additional travel a through-bound vehicle would experience from closing the bridge. This is determined by the shortest route on which a vehicle with a loading of HS-20 (36 tons) is legally capable of traveling.*
2. *Vehicles that may use a bridge with AASHTO loading of H-15 (15 tons) or HS-15 (27 tons) include typical farm vehicle (15 tons), school bus carrying up to 84 passengers (15 tons), loaded garbage truck (27 tons), and single-unit fire engine (27 tons).*
3. *Vehicles that may use a bridge with AASHTO loading of HS-20 (36 tons) include all of the H-15 and HS-15 vehicles, plus payloaded ready-mix-concrete truck (30 tons), and tractor-apparatus fire engine (36 tons).*
4. *A bridge on a dead-end road will be considered as having a detour length greater than 10 miles.*
5. *The annual traffic growth factor used in determining Design Year ADT must be justified.*

## HISTORIC-BRIDGE STRUCTURAL CAPACITY

**Figure 07-05A (English Units)**

	Detour Length < 8 km		8 km ≤ Detour Length < 16 km		Detour Length ≥ 16 km	
Design Year ADT	< 100	100 ≤ ADT ≤ 400	< 100	100 ≤ ADT ≤ 400	< 100	100 ≤ ADT ≤ 400
AASHTO Loading	H-15	HS-15	HS-15	HS-15	HS-15	HS-20
Required Capacity	13.6 Mg	24.5 Mg	24.5 Mg	24.5 Mg	24.5 Mg	32.7 Mg

Notes:

1. *Detour length is defined as the total additional travel a through-bound vehicle would experience from closing the bridge. This is determined by the shortest route on which a vehicle with a loading of HS-20 (32.7 Mg) is legally capable of traveling.*
2. *Vehicles that may use a bridge with AASHTO loading of H-15 (13.6 Mg) or HS-15 (24.5 Mg) include typical farm vehicle (13.6 Mg), school bus carrying up to 84 passengers (13.6 Mg), loaded garbage truck (24.5 Mg), and single-unit fire engine (24.5 Mg).*
3. *Vehicles that may use a bridge with AASHTO loading of HS-20 (32.7 Mg) include all of the H-15 and HS-15 vehicles, plus payloaded ready-mix-concrete truck (27.3 Mg), and tractor-apparatus fire engine (32.7 Mg).*
4. *A bridge on a dead-end road will be considered as having a detour length greater than 16 km.*
5. *The annual traffic growth factor used in determining Design Year ADT must be justified.*

#### HISTORIC-BRIDGE STRUCTURAL CAPACITY

**Figure 07-05A** (Metric Units)

### B. Hydraulic Capacity

Improvements may consist of removal of sand bars or debris, channel clearing, or adding a supplemental structure. If a bridge is to remain in place and its approaches are realigned, the removal of existing roadway fill is an option toward improving the hydraulic capacity.

### C. Bridge Width

The minimum bridge width should be in accordance with Figure 07-05B, Historic-Bridge Minimum Clear-Roadway Width.

Lanes on Bridge	Design Year ADT $< 100$	$100 \leq \text{Design Year ADT} \leq 400$
One <sup>1</sup>	15 ft (4.5 m)	16 ft (4.8 m)
Two	18 ft (5.4 m)	20 ft (6.1 m)

*Notes:*

1. Use the given values for rehabilitation of a Select bridge in a one-way-pair or two-way configuration. Use the given values for rehabilitation of a Non-Select bridge in a one-way-pair configuration. For rehabilitation of a Non-Select bridge in a two-way configuration, the owner must obtain a design exception.
2. The minimum bridge width is defined as the most restrictive minimum distance between curbs, rails, or other obstructions on the bridge roadway.
3. The annual traffic growth factor used in determining Design Year ADT must be justified.

### HISTORIC-BRIDGE MINIMUM CLEAR-ROADWAY WIDTH

Figure 07-05B

### D. Bridge Railing

Bridge railing may be left in place if there is no documented crash history or other evidence of crash history within the past 5 years such as damaged railing or concerns by local police agencies. If only slightly damaged, railing should be replaced in kind. If there is evidence of crash history within the past 5 years, the possible causes should be corrected, or new bridge railing provided as described in *Indiana Design Manual* Section 61-6.0.

### E. Approach Guardrail

Approach guardrail, if in place, should remain. If not in place, it may be omitted if there is no documented crash history or other evidence of crash history within the last 5 years, such as vehicles hitting the ends of the bridge railing or vehicles leaving the roadway. Crash history, such as that regarding damaged ends of bridge railings, may be an indicator of the need for approach guardrail.

In addition to those guardrails which the Department has standardized, there are others which have passed NCHRP 350 crash tests for specified Test Levels. If one of these devices is desired to be used for a specific project, the documentation to be provided is as follows:

1. an acceptance letter from the FHWA that approves the device for use; and
2. complete details for the device as successfully crash tested.

## **F. Design Speed**

The existing posted speed should be used as the design speed. If the road is not posted, an engineering speed study should be performed and the road should be posted between logical termini.

## **G. Approach Roadways (Horizontal and Vertical Alignment)**

These should be analyzed within 300 ft (90 m) of either side of the bridge in accordance with *Indiana Design Manual* Sections 55-4.02, 55-4.03, and 55-4.04.

## **IV. ECONOMIC AND OTHER CRITERIA**

### **A. Select Bridge**

To determine the appropriateness of rehabilitating a Select bridge, the cost effectiveness should be assessed as follows:

1. if the initial rehabilitation cost is less than 80% of the replacement cost, rehabilitation is warranted; or
2. if the initial rehabilitation cost is equal to or greater than 80% of the replacement cost, the owner may request further consultation with FHWA to determine rehabilitation eligibility.

A rehabilitation project should result in a 20-year design life for the rehabilitated bridge.

A Select bridge may be rehabilitated and left in place, and a new bridge and new approaches may be built adjacent to it. This effectively creates one bridge and approaches for each direction of travel. For this situation, the new bridge must meet all design standards for a new bridge.

Where appropriate, the new 1-way bridge must be able to accommodate future widening to provide for 2-way travel.

## **B. Non-Select Bridge**

To determine the appropriateness of rehabilitating a Non-Select bridge, the cost effectiveness and other criteria should be assessed as follows:

If the initial rehabilitation cost is greater than or equal to 40% of the replacement cost, or the bridge meets any two of the following criteria that cannot be economically corrected as part of a rehabilitation project, then replacement is warranted.

1. The bridge's waterway opening is inadequate (i.e., National Bridge Inventory Item 71 is rated 2 or 3).
2. The bridge has a documented history of catching debris due to inadequate freeboard or due to piers in the stream.
3. The bridge requires special inspection procedures (i.e., the first character of National Bridge Inventory Item 92A or 92C is Y).
4. The bridge is classified as scour-critical (i.e., National Bridge Inventory Item 113 is rated 0, 1, 2, or 3).
5. The bridge has fatigue-prone welded components that are expected to reach the end of their service lives within the next 20 years. See *Indiana Design Manual* Section 72-2.03(04) for information on conducting a fatigue analysis.
6. The bridge has a Sufficiency Rating of lower than 35.

A rehabilitation project should result in a 20-year design life for the rehabilitated bridge.

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