New York State
Department of Transportation
Historic Bridge Management Plan

Prepared for:
New York State
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and
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Prepared by:
Mead & Hunt
Engineers
Architects
Scientists
Planners
Madison, Wisconsin
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Executive Summary

In 1999 the New York State Department of Transportation (NYSDOT), in cooperation with the Federal Highway Administration (FHWA), and the State Historic Preservation Office (SHPO), initiated a multi-year effort to identify state and locally owned highway bridges that are eligible for listing in the National Register of Historic Places (National Register) and develop a management plan for them. This effort is rooted in more than two decades of FHWA policy. The Surface Transportation Assistance Act of 1978, for the first time, permitted states to use funds from FHWA’s Bridge Replacement and Rehabilitation Program to conduct inventories of historic bridges. In 1980 FHWA adopted a policy of encouraging states to conduct such inventories. In the early 1980s, many states undertook inventories to identify bridges eligible for listing in the National Register. As these first inventories become outdated or are found to be incomplete, state transportation agencies – including NYSDOT – are reassessing and building upon their early efforts.

The Historic Bridge Inventory and Management Plan project adopts both the approach outlined in NYSDOT’s 1998 Environmental Initiative and the philosophy of Context Sensitive Solutions, which acknowledge the agency’s commitment to the people of New York to protect, conserve, or enhance the natural and man-made environment. Following these principles, planners and designers are encouraged to incorporate, to the extent possible, the preservation of a community’s historic resources, including bridges, in transportation projects. By adopting this approach, NYSDOT has committed itself to a proactive transportation planning process that considers the importance of the state’s environmental and historic resources.

This plan represents the culmination of the Historic Bridge Inventory and Management Plan project. It draws upon the three previous steps and their products. In Step 1, the Contextual Study of New York State’s Pre-1961 Bridges (November 1999) laid a foundation for the development of selection criteria for identifying eligible bridges and provided a background to support the evaluation of New York’s bridges. In Step 2, the Rationale for Evaluation Data Needs (May 2000) explained the process through which bridges were to be selected for inventory and the Bridge Evaluation Criteria (May 2000) described the criteria used for determining eligibility. The product of Step 3 – Evaluation of National Register Eligibility (January 2002) – presented the results of the 2000-2001 inventory. That report’s historical determinations reflect consensus among NYSDOT, FHWA, and the SHPO on the eligibility of pre-1961 bridges that are currently located on public roads and for which NYSDOT has management responsibility.

This Historic Bridge Management Plan recommends practices, which are consistent with the needs of transportation and preservation, that NYSDOT and other bridge owners can apply to their eligible and listed bridges. The plan draws upon lessons learned from other state transportation agencies and incorporates input received from NYSDOT, FHWA, and SHPO staff and other interested parties. Representatives of the
following agencies and organizations contributed to the development of the Historic Bridge Management Plan through attendance at meetings and/or review of drafts:

- NYSDOT, Environmental Analysis Bureau
- NYSDOT, Main Office – Structures
- FHWA, New York Region
- New York SHPO
- NYSDOT Transportation Maintenance Division
- NYSDOT, Regional Offices
- Preservation League of New York State
- Association of County Highway Superintendents
- Association of Counties

The related experiences of other states were summarized in Survey of Selected States with Historic Bridge Management Plans (June 2001). This plan includes the following sections:

1. Introduction – Outlines the plan’s purpose and NYSDOT’s objectives in developing and disseminating it. Also provides background on the Historic Bridge Inventory and Management Plan project to set the plan within a broader context.

2. Management Approach – Presents a step-by-step approach to identifying historic bridges, assessing their ability to meet the transportation need, determining maintenance and rehabilitation needs, and considering options for continued use.

3. Funding – Describes sources of funding for bridge rehabilitation projects.

4. Prioritization – Provides guidelines that owners may use to establish priorities for funding bridge maintenance and rehabilitation projects.

5. Resources – Describes roles and provides contact information for NYSDOT Main Office and Regions; the Office of Parks, Recreation, and Historic Preservation; and the Preservation League of New York State.

6. Education/Outreach – Suggests methods to raise awareness of historic bridges, build support for their preservation, and educate owners and engineers who may become involved in bridge rehabilitation projects.

7. Program Tracking – Proposes methods to track the long-term effect of the Historic Bridge Inventory and Management Plan project and to update information as needed.

8. Supplements – Suggests the development of supplemental management plans to address specific issues encountered in maintaining and rehabilitating historic bridges.
1. Introduction

A. Purpose

Bridges listed in, or eligible for listing in, the National Register of Historic Places (National Register) are afforded a degree of protection under state and federal historic preservation laws that require agencies to take into account the effect of projects on historic properties (see Appendix A for applicable legislation). These laws recognize the value of preserving physical components of the nation’s history. In consideration of the important place that bridges hold in New York’s engineering and cultural heritage, New York State Department of Transportation (NYSDOT), in cooperation with the Federal Highway Administration (FHWA) and the State Historic Preservation Office (SHPO), developed this management plan for the state’s historic bridges. Though use of the plan, NYSDOT intends to provide state-owned historic bridges with the greatest possible chance of survival consistent with transportation needs. Local bridge owners are also encouraged to consider the greatest level of protection feasible for eligible bridges by following the recommendations outlined in this plan.

This plan’s purpose is to encourage maintenance and rehabilitation of bridges that are eligible for, or listed in, the National Register in New York and to outline goals, objectives, and recommendations for the management of this population of bridges. In addition, the plan provides guidance for implementing procedures laid out in the Historic Bridge Programmatic Agreement. That agreement sets forth the process by which NYSDOT, with assistance from FHWA, will meet its responsibilities for historic bridges under state and federal preservation law.

The Historic Bridge Inventory and Management Plan’s overall objective is to identify, categorize, and eventually prioritize historic bridges; it does not involve any engineering analysis of the structural condition of studied bridges.

B. Objectives

In developing and disseminating the Historic Bridge Management Plan, NYSDOT’s objectives are two-fold: to promote maintenance and to encourage rehabilitation. These objectives presume that:

- Bridges shall be maintained in safe operating condition.

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1 The SHPO is an office of the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP).
Introduction

• Every reasonable effort shall be made to continue an historic bridge in a useful transportation service in accordance with the following:
  – Primary consideration should be given to rehabilitation of the bridge at the existing site.
  – Only after this option has been exhausted shall other alternatives be explored.

C. Overview

The NYSDOT, in cooperation with the FHWA and the SHPO, undertook a multi-year effort to identify state and locally owned highway bridges that are eligible for listing in the National Register and develop a management plan for them. This effort is known by the project name, Historic Bridge Inventory and Management Plan. The NYSDOT selected Mead & Hunt, Inc. as its consultant. Allee King Rosen & Fleming, Inc., (AKRF) assisted Mead & Hunt with portions of the project.

In 1984 NYSDOT, in cooperation with the FHWA and the SHPO, identified various types of bridges built prior to 1925. Information was collected on an initial group of approximately 2,100 pre-1925 bridges. As a result, a list of bridge identification numbers (BINs) was issued that identified National Register-listed, eligible, and non-eligible bridges. Bridges that could not be evaluated without additional information were also recognized. The current project updates, reevaluates, and replaces eligibility recommendations resulting from this earlier inventory.

The Historic Bridge Inventory and Management Plan project adopts both the approach outlined in NYSDOT’s 1998 Environmental Initiative and the philosophy of Context Sensitive Solutions, which acknowledge the agency’s commitment to the people of New York to protect, conserve, or enhance the natural and man-made environment. Following these principles, planners and designers are encouraged to incorporate, to the extent possible, the preservation of a community’s historic resources, including bridges, in transportation projects. By adopting this approach, NYSDOT has committed itself to a proactive transportation planning process that considers the importance of the state’s environmental and historic resources.

The current Historic Bridge Inventory and Management Plan project is intended to streamline NYSDOT’s treatment of 10,800 pre-1961 bridges located statewide. The NYSDOT’s 11 Regions and encompassed counties are depicted on the Regional Map (see Figure 1).

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3 Further information may be found at the following NYSDOT websites: http://www.dot.state.ny.us/design/css/css.html and http://www.dot.state.ny.us/eab/envinit.html.
Introduction

Through this project, NYSDOT is condensing the procedures it typically follows for individual bridge projects into a comprehensive approach that covers the pre-1961 bridge population. The *Historic Bridge Inventory and Management Plan* project involves four principle steps:

- Develop a contextual study for historic bridges in New York State (*Contextual Study of New York State’s Pre-1961 Bridges*, November 1999).

- Prepare a methodology for the inventory of pre-1961 bridges and establish criteria for determining which bridges are eligible for listing in the National Register. This information is presented in two reports (*Rationale for Evaluation Data Needs*, May 2000; *Bridge Evaluation Criteria*, May 2000).

- Conduct an inventory, including field survey, to identify potentially eligible bridges and make recommendations concerning their eligibility for inclusion in the National Register (*Evaluation of National Register Eligibility*, January 2002).

- Prepare a Management Plan and draft Programmatic Agreement for eligible and listed bridges.

This plan represents the conclusion of the fourth, and final step – preparing a management plan for eligible and listed bridges. It draws upon the three previous steps and their products. In *Step 1*, the *Contextual Study of New York State’s Pre-1961 Bridges* (November 1999) laid a foundation for the development of selection criteria for identifying eligible bridges and provided a background to support the evaluation of New York’s bridges. *Step 2* – the *Rationale for Evaluation Data Needs* (May 2000) – explained the process through which bridges were to be selected for inventory. A second report – *Bridge Evaluation Criteria* (May 2000) – described the criteria used for determining eligibility. The product of *Step 3* – *Evaluation of National Register Eligibility* (January 2002) – presented the results of the 2000-2001 inventory and evaluation of pre-1961 bridges that are currently located on public roads and for which NYSDOT has management responsibility.

Throughout these steps, the consultants met with NYSDOT, and at key stages with FHWA and SHPO, to discuss the methodology and review products. In December 2001, the agencies reached consensus on the eligibility recommendations presented in the *Evaluation of National Register Eligibility* (January 2002) report. The accompanying *Historic Bridge Database* compiles collected information for individual bridges and presents the resultant historic determinations of "eligible" or "not eligible."

Data from the *Historic Bridge Database* has been incorporated into the "Historic" card of NYSDOT’s WinBolts database. The WinBolts database screens display Bridge Inventory and Inspection System (BIIS) data as described in the Bridge Inventory Manual. Following completion of the Historic Bridge Database, a new "Historic" WinBolts screen was created with data fields corresponding to those described in the *NYSDOT Historic Bridge Database Data Dictionary* (December 2001).
To conclude the project, this Historic Bridge Management Plan recommends practices, which are consistent with the needs of transportation and preservation, that NYSDOT and other bridge owners can apply to their eligible and listed bridges. The plan draws upon lessons learned from other state transportation agencies and incorporates input received from NYSDOT, FHWA, and SHPO staff and other interested parties. The related experiences of other states are summarized in Survey of Selected States with Historic Bridge Management Plans (June 2001).

As the final product of the Historic Bridge Inventory and Management Plan project, a Programmatic Agreement (PA) will be prepared to establish procedures for progressing bridge projects through the Section 106 process. The PA will be fully executed in accordance with FHWA and NYSDOT procedures. These agencies are responsible for complying with Section 106 of the National Historic Preservation Act and Section 14.09 of the New York State Parks, Recreation, and Historic Preservation Law (see Appendix A).

The Historic Bridge Inventory and Management Plan project is expected to streamline the Section 106 review process for projects that affect pre-1961 bridges.

D. Definitions

The following definitions apply to the Historic Bridge Management Plan:

- **NYSDOT-Managed Bridge** – Bridges that are currently located on public roads and for which the NYSDOT has management responsibility. This management responsibility can include providing project funding, conducting inspections, and making recommendations for repairs and/or closings.

- **Historic Bridge** – Pre-1961 NYSDOT-managed bridge that is individually eligible for, or listed in, the National Register of Historic Places.

E. Applicability

The Historic Bridge Management Plan applies directly to New York State-owned historic bridges. It is hoped that other owners of historic bridges will also embrace this plan.
2. Management Approach

A. Identify Historic Bridges

The management approach for historic bridges in New York State encourages NYSDOT Regions and local governments to prioritize their historic bridges for maintenance and rehabilitation. Figure 2 illustrates the Management Approach for Historic Bridges. The first step in this process is to identify historic bridges in each Region.

- Based on the Historic Bridge Database, lists of National Register-eligible and listed bridges were distributed to Regional Cultural Resource Coordinators for each NYSDOT Region.

- The Regions identified the specific owner for each locally owned bridge and provided a list of eligible and listed bridges to the appropriate county, town, village, or city officials and highway departments.

- Regions should assess the maintenance and rehabilitation needs of each historic bridge individually and develop a list of priorities based on their assessments. Regions should also encourage the local governments to do the same. Prioritization is discussed in Section 4.

B. Determination of Transportation Need and Condition of Structure

(1) Transportation Need

The transportation need that the bridge presently serves and is expected to serve in the future should be identified. Typically, a bridge should accommodate the transportation need that is projected for 20 years into the future. Factors that contribute to the function of a bridge are closely interrelated and include:

(a) Traffic

Consider whether the bridge is able to handle the amount and type of traffic.

- Average daily traffic (ADT) – Traffic volume directly affects the desirable geometric criteria (width, horizontal, and vertical alignments) for a bridge.¹

- Type of traffic – Trucks impose greater demands on a bridge than passenger cars do. The percentage of truck traffic is considered for design purposes.²

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² NYSDOT, HDM, 2-9.
Management Approach for Historic Bridges

1. Identify historic bridges (2.A.)

2. Identify transportation need and condition of structure (2.B.)

   Can bridge meet identified transportation need through maintenance and/or rehabilitation? (2.B.(1))

   - Yes → Identify maintenance and/or rehabilitation needs (2.C.) → Complete maintenance or rehabilitation project
   - No → Can design exceptions or alternate standards be applied to deficient bridge? (2.D.(1))

   - Yes → Identify and document design exceptions and/or alternate standards (2.D.) → Complete rehabilitation project
   - No → Is reuse feasible? (2.E.)

   - Yes → Explore immediate use or close and stabilize for future options (2.E.) → Complete reuse project
   - No → Remove or replace following appropriate consultation and the development of mitigation measures

NOTES
Parenthetical references are to sections within the Historic Bridge Management Plan.

Figure 2
(b) **Level of Service**

Based on how they function, roadways are assigned a level of service between A and F. A ranking of C or better is desirable. A bridge should have the same level of service as the adjoining roadway.

(c) **Design Criteria**

- Width – The roadway width should accommodate current and projected traffic.

- Vertical clearance – On a through bridge, large vehicles may be restricted if cross-bracing members are too low. Vertical clearance may also be an issue if another road passes under the historic bridge and the distance between that roadway and the bridge is not adequate. Likewise, clearance between a navigable waterway and a bridge should be adequate.

- Railing – The railing should meet design standards appropriate for the transportation need.

(d) **Safety and Liability**

If a bridge poses a safety concern, as reflected by inspection data, the owner will want to address it to avoid liability responsibilities. Likewise, accident data may point to other safety concerns that should be addressed.

(2) **Condition of Structure**

Using available information, the condition of a bridge should be evaluated to identify factors that may limit a bridge’s future use. A more detailed engineering analysis of the bridge may be needed to supplement existing information.

(a) **Condition Rating**

For NYSDOT-managed bridges, the condition rating is a numerical assessment of the condition of major bridge components such as the superstructure, substructure, and deck. The condition rating is used to identify a deficient bridge. The condition rating reflects physical deterioration or lack thereof of bridge components due to environmental effects and traffic. It describes both the degree of bridge component deterioration and the extent to which it is distributed throughout the structure’s components. Features of this rating include:

- Basis for condition rating – Condition ratings are assigned by inspectors based on visual inspection of the primary bridge components (deck, superstructure, and substructure). Bridges are required to be inspected by certified bridge inspectors at least every 2 years.
Management Approach

- Provides for numerical assessment – New York State’s condition rating numerically quantifies the condition of the primary bridge components as assigned during statewide routine bridge inspections. Condition ratings for bridge components range from 1 (totally deteriorated or failed) to 7 (new condition). Generally, any bridge with a component having a condition rating of 1 would be closed to traffic. A bridge component with an overall condition rating greater than or equal to 5 is considered to be in good condition, while a bridge component with a condition rating less than 5 is considered to be deficient. This assessment can be used by a bridge owner to prioritize bridge needs based solely on condition.

(b) Load-Carrying Capacity

This is defined as the usable live-load capacity of a bridge and is usually expressed in tons. The bridge owner can utilize this factor to determine if the bridge has sufficient strength to accommodate the local traffic demands. A bridge that is posted for load restrictions may not be adequate to accommodate present or expected truck traffic. A bridge carrying a high percentage of trucks, or that is planned to carry a high percentage of truck traffic, should be strengthened to eliminate the load-carrying deficiency.

(c) Vulnerability Identification

The vulnerability of historic bridges should be evaluated with regard to hydraulic, overload, seismic, and collision considerations, as well as concrete and steel structural details. A bridge that is retained on-site should also provide adequate geometric features such as an acceptable hydraulic opening.

(3) Sufficiency Rating

The sufficiency rating (SR) is a numerical rating of a bridge based on its structural adequacy and safety for public use, and its serviceability and function. The SR may be used as a basis for establishing eligibility and priority for replacement or rehabilitation of bridges. In general, the lower the rating, the higher the priority. It provides a relative measure of how severely deteriorated, load capacity deficient, or functionally obsolete a bridge is, and ranges from a low of 0 to a high of 100. If the SR is as low as 20, rehabilitation would be a major undertaking. If the SR is above 50, rehabilitation is more likely to be feasible.

\* A functionally obsolete bridge is defined by FHWA as a structure that cannot meet the current or projected traffic need due to meeting one or any combination of the following considerations: inadequate horizontal or vertical clearance, inadequate load-carrying capacity, and/or an insufficient opening to accommodate water flow under the bridge.
(4) Design Criteria Considerations

It may or may not be possible to address design criteria that have been identified as constraints to a bridge's ability to meet the transportation need.

(a) Design Criteria That May Be Addressed if Warranted

• Inadequate vertical clearance under a bridge – It may be possible to raise a superstructure to provide additional clearance for the feature that passes under a bridge. This option would not be available if the superstructure is integral with the substructure, such as is the case with an arch bridge.

• Inadequate railing – Augmenting an historic railing should be considered as a preservation option; however, this option may not always be viable. It may be possible to replace the railing with a new railing that meets applicable design standards. The appearance of the new railing should be similar to the original railing. If that is not possible, the new railing type should be carefully selected so as not to detract from the historic appearance of the bridge.

(b) Design Criteria That are Difficult to Address

• Deficient width – Under certain circumstances, it may be possible to widen a bridge without diminishing its historic integrity. An increase in the width of a bridge where one original fascia remains visible and the other fascia remains intact, although obscured by the new portion of the bridge, may be acceptable. The design and materials of the fascia of the newly constructed portion of the bridge must be compatible with the original structure.

• Inadequate vertical clearance on a bridge – If cross-bracing members on a bridge, such as a through truss, are too low for the type of traffic that should be able to use the bridge, it may be difficult to provide adequate vertical clearance. In some cases, the cross-bracing members can be reconfigured to provide minimal additional clearance. However, this modification would most likely affect character-defining features of a bridge.

• Inadequate live-load capacity – In some cases, the bridge may require complete replacement to provide adequate live-load capacity. In other cases, replacement of certain elements may be sufficient to increase a bridge's load capacity. A structural analysis may be required to determine the controlling elements that cause an insufficient load capacity.

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7 Two stone arch bridges (BINs 1018020 and 2263190) that were widened on one side, leaving one original fascia visible, were determined eligible as part of the Historic Bridge Inventory and Management Plan project.
(5) **Sources of information**

Information needed to assess the transportation need and the condition of the structure for a bridge can be gathered from the following sources:

(a) **Bridge Inspection Files**

These files contain past and current inspection reports and information on load postings and condition ratings. The files are located in the Structures Office of each NYSDOT Region.

(b) **Regional or Municipal Planning Organizations**

These organizations can provide information about the desired level of service for a transportation facility and are a source of current and projected traffic information. The *Directory of Regional and County Planning Agencies and Municipal Planning Organizations in New York State* (July 2001) is included in Appendix B.

(c) **In-Depth Field Inspections**

Field inspections should be conducted to identify and confirm the current condition of a bridge, including its load-carrying capacity, condition rating, ability to meet design criteria, and potential vulnerability to failure.

(d) **Existing Bridge Plans**

Plans may be found within the bridge inspection file or may be held by the owner. They offer information about the original construction of the bridge and its structural capacity.

(e) **NYSDOT’s Highway Design Manual (2002) and Bridge Manual (April 1999; Addendums April 2000 and April 2001)**

These manuals provide information on accepted design criteria.

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8 A current directory can be found at http://www.dos.state.ny.us/lists/regcoplan.html.

9 A new Bridge Manual is expected in late 2002 to replace the 1999 manual and addenda.
C. Assessment of Maintenance and/or Rehabilitation Work Needed

(1) Type of Maintenance Work Needed

Even if a bridge is adequate to meet the demands of traffic and loading that are expected, it will likely need maintenance work. To maintain the historic integrity of the bridge, maintenance work should be conducted using the Secretary of the Interior’s Standards for Rehabilitation in Appendix C.

(a) Factors to Consider When Assessing Maintenance Needs Include:

- Patterns of bridge deterioration as identified through review of previous condition ratings and inspection reports.
- Items that are safety concerns should be addressed immediately. This could include holes in the deck; railings that are damaged or missing; superstructure cracks, spalls, perforations, or significant section loss; and substructure settlement, undermining due to scour, section loss, or cracking. Any items that could contribute to a decreased life expectancy of the bridge, or the loss of the structure itself, should be addressed immediately.
- The type of coating on the steel. Lead-based paint is almost always present; other coatings containing asbestos may also be found on some bridges. The bridge coating needs to be tested for the presence of asbestos before beginning any steel work. Testing may have been done already; check NYSDOT’s Bridge Inventory and Inspection Data.
- If any work is to be done involving the various utilities that may be on a bridge, additional concerns for asbestos exist. Asbestos can be present in utility ducts (transit), utility insulation, caulking, and/or anti-friction sheets.

(b) Routine Maintenance Needs May Include:

- Pressure wash.\(^{10}\)
- Repair damage due to scour.

\(^{10}\) Potential effects to water quality and nesting birds should be considered prior to proceeding with a pressure wash of an historic bridge.
• Improve drainage and water flow. Removing debris from piers and abutments and by keeping gutters and drains open can extend the bridge’s life.  

• Maintain bearings, including lubrication. If a bearing is severely corroded and non-functioning, it should be replaced.

• Repair or replace bridge decking and bridge joints with the same or similar materials.

• Repair or replace railing using materials and designs compatible with historic bridge.

• Repair cracks in superstructure and substructure with the same or similar materials. Care should be taken to determine that the crack is not indicative of structural distress or failure.

• Tighten loose diagonals and lateral bracing on metal truss bridges.

• Spot paint metal components of either superstructure or substructure.

(2) Type of Rehabilitation Work Needed

Once the condition of the structure has been identified, the next step is to determine if any rehabilitation work is needed to make the bridge adequate for the demands of traffic and loading that are expected. Completion of this step requires a thorough assessment of the bridge by the Regional Structures Engineer or the Regional Maintenance Engineer. The need for rehabilitation work will vary depending on the bridge type, condition of the bridge, and identified transportation need. Figure 3 shows relative costs of maintenance, rehabilitation, and repair work that contribute to the preservation of historic bridges. To maintain the historic integrity of

Concrete Arch Rehabilitation
Route 20 Bridge over Eighteen Mile Creek
Towns of Eden and Hamburg, Erie County

The Route 20 Bridge (BIN 1015450) over Eighteen Mile Creek, built in 1929, was rehabilitated as part of a 2-year, $7-million project completed in 2001. Work on the 414-foot-long, four-span, open-spandrel, concrete arch bridge included replacing the concrete deck and floor beams, reconstructing the arch columns, and repairing the arch ribs and substructure. The fascia arches were replaced with precast concrete fascia panels that match the original appearance of the bridge.


\[12\] Dick, “History at the Crossroads.”
Least Costly

- Preventative maintenance
  - washing
  - drainage system cleaning
  - concrete sealing
  - bearing lubrication

- Deck repair & sealing
  - patching
  - crack sealing
  - overlay

- Railing rehabilitation
  - painting
  - member repair
  - complete replacement
    - steel
    - concrete
    - timber
    - masonry

- Substructure rehabilitation
  - concrete
    - crack & small spall repair
    - member strengthening
    - member replacement
  - steel
    - painting
    - member strengthening
    - member replacement
  - timber
  - masonry

- Superstructure rehabilitation
  - concrete
    - crack & small spall repair
    - member strengthening
    - member replacement
  - steel
    - painting
    - member strengthening
    - member replacement
  - timber
  - masonry

- Complete structure painting
- Superstructure widening
- Substructure widening
- Superstructure replacement
- Substructure replacement

Most Costly
the bridge, rehabilitation work should be conducted using the Secretary of the Interior’s Standards for Rehabilitation in Appendix C. Major items of work that may be needed include:

(a)  **Superstructure**

A deficient superstructure may be repaired, but cannot be replaced without detrimental effects on the historic bridge. The superstructure is typically the character-defining element of an historic bridge. If elements of the bridge are deteriorated, they may be repaired or replaced, as needed. The repair or replacement of these elements should be performed in a manner that preserves the original appearance of the element. Appendix D – Superstructure Work By Bridge Type – offers suggestions for work that may be done to rehabilitate or repair a superstructure by bridge type.

(b)  **Substructure**

A deficient substructure can often be strengthened or rebuilt without detrimental effects on the historic bridge if the substructure is not a character-defining feature of the historic bridge. This may be the case for types with a substructure that is not integral with the superstructure, such as a truss or plate girder bridge. If the superstructure is integral with the substructure, such as is the case with an arch bridge, special consideration should be given towards rehabilitation or repair of the substructure to maintain the bridge’s historic integrity.

(c)  **Traffic Railing**

A deficient traffic railing may be repaired, strengthened, or replaced. If the railing is integral with the superstructure, such as a stone-faced parapet on a rigid frame or arch bridge, special consideration should be given toward maintaining the bridge’s historic integrity.

<table>
<thead>
<tr>
<th><strong>Lightweight Decking</strong></th>
</tr>
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<tbody>
<tr>
<td>Use of lightweight decking material, such as carbon fiber composite material, or various grating systems for deck replacement can significantly reduce the dead load on a bridge. NYS DOT offers special provisions for lightweight bridge decking and lists manufacturers that meet NYS DOT requirements. (<em>Use of Advanced Composites at NYS DOT,</em> n.d., <a href="http://www.dot.state.ny.us/tech_serv/trdb/composite.html">http://www.dot.state.ny.us/tech_serv/trdb/composite.html</a> [Accessed 11 June 2002]).</td>
</tr>
</tbody>
</table>

(d)  **Deck**

A deficient deck can often be repaired or replaced without detrimental effects on the historic bridge. To reduce a bridge’s dead load, it may be possible to replace the deck with one of lighter weight.
(3) Other Considerations for Maintenance and Rehabilitation Work

(a) Maintaining Historic Integrity

The focus of maintenance and rehabilitation work should be on maintaining the historic integrity of an historic bridge. To meet this objective, maintenance and rehabilitation work should be conducted using the Secretary of the Interior’s Standards for Rehabilitation in Appendix C. Working through the Local Projects Liaison or NYSDOT Environmental Analysis Bureau (EAB), the SHPO should be consulted early in the project-planning process to determine if a planned maintenance or rehabilitation project will have an effect on an historic bridge. SHPO can provide guidance on minimizing and/or mitigating effects to historic bridges. NYSDOT Structures can offer technical assistance for bridge rehabilitation projects.

(b) Willingness of Owner

Bridge rehabilitation is often more complex than new construction. The preservation of an historic bridge requires an owner to commit to both a rehabilitation project and to regular upkeep to maintain the bridge’s historic integrity. Concerns about future maintenance responsibilities and liability can lead owners to hesitate. However, the liability concerns that the continued use of historic bridges raise often can be addressed through regular structural inspection and maintenance.  

(c) Historic Districts

Bridges that do not meet the National Register criteria for individual eligibility may still be contributing components of an historic district. Therefore, the Historic Bridge Management Plan applies to bridges that contribute to a listed or eligible historic district, as well as to bridges that are individually listed or eligible.

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13 Dick, “History at the Crossroads.”
D. Applicability of Design Exceptions and Alternate Standards

The application of design exceptions and alternate standards may be considered if assessment of the transportation need and condition of the structure identify factors that limit a bridge’s ability to meet proposed project standards. *Alternate Design Standards – Sources and Examples* (Appendix E) provides guidance on applying alternate standards.

(1) Considerations

Variables that should be assessed when seeking design exceptions or applying alternate design standards include:  

- Transportation need for bridge
- Degree to which design standard would be reduced
- Effect of exception on safety and operation of the bridge and compatibility with approach roadway
- Cost of attaining full standards, including environmental or historical consequences
- Whether other design factors would lessen the effect of the exception

Rehabilitation of a Stone Arch Bridge
Route 66 Bridge over the Stony Kill
Village of Chatham, Columbia County, New York

Built in 1886, this earth-filled stone arch bridge (BIN 1029030) was determined eligible for the National Register. In 1998 the village of Chatham, SHPO, and Region 8 decided to fully rehabilitate the bridge to restore its historic character and original integrity. Using postcards of the bridge from 1909, designers from Region 8 were able to distinguish original features. Two of the four original concrete pylons, one inscribed with the name and date of construction, were saved and reused. The remaining two pylons, long since removed, were rebuilt.

From the postcards, designers were also able to determine that a decorative wrought-iron railing originally spanned the space between the pylons. SHPO requested that the ornate railing be restored; however, that would have necessitated an additional railing for safety. After much discussion among the agencies involved, a consensus was reached to install a stone-faced parapet between the pylons and include a replicated wrought-iron railing along the top of the parapet. The stone-faced parapet was representative of bridge design from the late 1800s and its use allowed for the elimination of an unsightly dual rail system. The final result is a bridge with restored historic integrity and character that meets acceptable safety and structural needs.

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Management Approach

(2) Design Exceptions

(a) Applicability

The design exception process allows designers to deviate from normal practice and consider other options in order to safeguard environmental or historical resources.¹⁵

(b) NYSDOT Policy

While it is NYSDOT policy to at least meet normal AASHTO design criteria for a project, NYSDOT recognizes that there may be some situations where less desirable values are appropriate.¹⁶ Where appropriate, design exceptions may be granted for load capacity or geometry.¹⁷ Some examples of these design exceptions include narrower lane and shoulder widths, lower design speeds, and lower design loads.

(c) Documentation and Approval

Design exceptions must be justified and adequately documented. Design exceptions can be approved by either FHWA or NYSDOT, depending on project circumstances.

(3) Alternate Design Standards¹⁸

(a) Definition

Alternate design standards take into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. These would be in addition to the typical concerns of safety, durability, and economy of maintenance.

(b) Applicability

Alternate design standards are most often applied to low-volume highways, defined as rural roads and urban streets with a current ADT volume of 400 vehicles per day or less.


¹⁶ NYSDOT, HDM, 2-1.

¹⁷ Texas Department of Transportation (TxDOT), Historic Bridge Manual, (n.p.:TxDOT, 2001), 2-14.

(c) **NYSDOT Policy**

NYSDOT has adapted the American Association of State Highway Transportation Officials (AASHTO) policy to provide for alternate design standards where appropriate.¹⁹ For bridge projects, guidance on alternate design standards is provided in the *Highway Design Manual, Chapter 4 – Design Criteria and Guidance for Bridge Projects on Low Volume Highways* (February 5, 1999). This chapter provides specific requirements and guidance for setting the design criteria for locally owned bridges and approaches on low-volume highways in rural and urban areas.

(d) **Sources**

Other sources of alternate design standards and examples of applications of alternate standards are included in Appendix E.

(4) **Acceptable Alternatives**

(a) A deficient bridge may remain in vehicular use only if it can be rehabilitated and/or improved to meet applicable design standards or if a design exception is approved for the deficiency.²⁰ Based on the alternate design standards provided in NYSDOT's *Highway Design Manual, Chapter 4*, acceptable deficiencies may include:

- Horizontal and vertical alignment – If the existing alignment is satisfactory from a safety and operational perspective (i.e., no accident history at bridge site), retention of these existing features could be justified.

- Design speed – If the existing highway geometry requires lower operating speeds than the design speed that would normally be proposed for a replacement project, and no major highway realignment work is planned, the use of geometric standards for a lower design speed could be justified.

- Geometric elements – Individual geometric elements, including smaller radii and shorter stopping sight distance, may be adopted for lower operating speeds.

- Bridge roadway width – Narrower widths for the lanes, shoulders, total travel way, and clear zones can be considered for low-volume highways.

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¹⁹ National highway legislation allows states to adjust AASHTO standards.

E. Review Options

(1) Motor Vehicle Use

A bridge is a good candidate for rehabilitation if it can fulfill a transportation need. Because many historic bridges were designed with narrower roadway widths and lower load limits, they often have difficulty meeting current design standards. Federal and state policies recognize that existing bridges with less than desirable geometric criteria (width, horizontal and vertical alignments) can be retained.

(a) Fulfilling Transportation Need On-Site

To continue in vehicular use at its current site, a bridge must meet the current and projected transportation need. The bridge’s future transportation role is likely to involve accepting lesser demands on the structure. The NYSDOT Bridge Manual provides guidance regarding bridge design standards, including the criteria for retention of one-lane bridges.

(b) Meeting Reduced Transportation Need On-Site

In select cases, the demands on the bridge can be reduced by making it one of a pair of bridges, each of which would serve traffic in one direction. This option is referred to as twinning. Either a relocated historic bridge or a newly constructed bridge could be erected adjacent to the historic bridge to accomplish the twinning. This option is usually used to accommodate the widening of a roadway. For example, an existing two-lane bridge would carry two lanes of one-direction traffic with the twin structure carrying two lanes of traffic in the other direction. The same strategy can be applied to an historic bridge that can only accommodate one lane of traffic.

(c) Relocating for Less-Demanding Vehicular Use

In rare cases, it may be possible to reuse a bridge for vehicular traffic at a new location, such as on a private road or other less-demanding vehicular route.

21 Dick, “History at the Crossroads.”

22 “Flexibility in Highway Design.”

23 Federal Highway Administration, the Advisory Council on Historic Preservation, the New York State Historic Preservation Officer, the New York State Department of Transportation, Programmatic Agreement Concerning Bridges Over the National Register Eligible New York State Canal System (unpublished document on file at the above cited agency offices, May 2001), Appendix B, 3.

24 TxDOT, Bridge Manual, 2-14.
(2) Other Uses

Other uses of the historic bridge at the existing site or at a new site may be a preservation option if a viable alternate use for the bridge can be found. If an historic bridge cannot meet a vehicular transportation need, other uses for the bridge may be considered.

Reuse of a bridge at the existing location is preferred if a replacement bridge can be constructed to bypass the historic bridge or if there is no longer a transportation need at the site. The existing bridge remains in place, but no longer carries traffic. Reuse of a bridge at a new location may be possible if an appropriate location and willing new owner can be found.

Analysis of the feasibility of reuse options should be done on an individual project basis. However, some considerations for reuse options are provided below. Examples of reuse options include:

- Bicycle/pedestrian traffic – If the bridge is on or near a bicycle/pedestrian route, it may be possible to divert non-vehicular traffic across the historic bridge. It might also be possible to move the bridge to the site of a newly developed or improved bicycle/pedestrian route. Bicycle/pedestrian trails that are being newly developed or improved may have a real need for river crossings.

- Fishing pier – Under certain circumstances, a bridge may be reused for a fishing pier. This reuse option is appropriate if the bridge is located near, or can be moved to, a known fishing area.

- Recreational viewing platform – A bridge may be utilized to provide a view point for adjacent natural or man-made features that are of interest to residents or tourists.

- Snowmobile trail - A bridge may be reused at its existing location for a snowmobile trail if the bridge is located near an existing trail. Alternately, the bridge could be moved to a new location on a newly developed or improved trail.

Conversion to Bicycle/Pedestrian Use

An example of an historic bridge successfully converted to bicycle and pedestrian use is the South Washington Street Bridge in the city of Binghamton, Broome County, New York. The lenticular truss had been closed for several years prior to its being rehabilitated for bicycle and pedestrian use with federal transportation-enhancement funds. The rehabilitated bridge now serves to connect the north and south sides of the city and is part of the city’s waterfront revitalization plan.
Management Approach

• Artifact in bridge park – An historic bridge may be relocated off-site to a bridge park to continue its existence as an engineering artifact. An example of a successful effort to develop an historic bridge park is the Calhoun County, Michigan, Historic Bridge Park. The park was initiated in 1997 and has since become a popular destination. The project was developed on the site of an existing county park and has revitalized the park and preserved numerous historic truss bridges for public benefit. The moving and rehabilitation of the bridges is paid for with state and federal funds and historic preservation grants.²⁵

• Move to private property – Occasionally, potential new owners are interested in moving a bridge to their property. Bridges could be used on a private road or driveway to span a creek. Additional information on this option is included in Section 2.E(1)(c), “Relocating for less-demanding vehicular use.”

• Monument – All or part of a bridge may be relocated to a publicly accessible location to serve as a monument to engineering and/or cultural heritage. Some bridges have been converted into historical exhibits in public parks. For example, the entry portal of the Grand Avenue Bridge in Neillsville, Wisconsin, was relocated to a local park and serves as a decorative landscape feature. The relocation was part of the mitigation for the Grand Avenue Bridge replacement.

• Salvage – In select cases, it may be possible to reuse elements of an historic bridge on a newly constructed bridge. For example, the superstructure of a covered bridge (BIN 2264410) in Hardenburgh, New York, has been salvaged for reuse. Steel I-beams were added to assume the load-carrying function that was formerly filled by the king post truss that exists underneath the wood sheathing. In this example, the beams carry the load and the covered bridge serves an aesthetic role.

• Adapt as building – In some cases, a bridge may be adapted to serve a new role. Covered bridges are good candidates to adapt for use as a building, such as a store, theater or museum. The Shushan Covered Bridge in the hamlet of Shushan New York, has been rehabilitated for reuse as a museum.²⁶ This type of adaptive reuse is eligible for Transportation Enhancement (TE) funds for museum development if the museum is tied to a transportation theme.


• Stabilize and Close – If a bridge does not fulfill a transportation need at the site and it is not feasible to relocate the bridge to a new site due to structural limitations, lack of funding, inability to identify a viable new owner, or lack of public support, it may be possible to close the bridge to traffic, stabilize the bridge, and leave it standing. In this situation, certain measures should be adopted to reduce liability and to monitor the condition of the bridge. Minimal maintenance (washing and spot painting) and periodic inspections should continue. The bridge closure should be clearly posted and a vehicle barrier should be installed to limit pedestrian and vehicle access to the bridge. Removal of the bridge deck may also be appropriate as a means of limiting access to the structure.

(3) Superstructure Selection

Although the Secretary of the Interior’s Standards for Rehabilitation (Appendix C) calls for the continued use of historic bridges, in cases where this is not feasible, selection of a new superstructure of the same basic type may be appropriate. For example, an historic truss could be replaced with a newly constructed truss or an historic concrete arch could be replaced with a newly constructed concrete arch. The new bridge should be similar in scale and type to the one it replaces.

F. Considerations for Relocating Historic Bridges

If an historic bridge needs to be relocated, the following guidelines apply.

(1) Bridge Types That Are Candidates

An important factor to consider in relocating a bridge is ease of transport, which depends on type, length, and condition of the bridge, as well as route and distance to the new location.\textsuperscript{27} The following considerations apply:

• Trusses – Relocation is generally appropriate for pony truss bridges that are less than 90 feet long. While both through and pony truss types have been successfully moved and preserved, pony trusses may be moved more easily due to their smaller size and lack of overhead bracing. Pony trusses with short span lengths can often be moved without disassembly.\textsuperscript{28} Relocation of trusses more than 90 feet long or which have overhead bracing, will be appropriate on a more limited basis, such as for relocation over a short distance. For longer moves, the bridge may need to be disassembled or, if possible, temporarily supported on barges and floated into place.

\textsuperscript{27} TxDOT, Bridge Manual, 2-10.

\textsuperscript{28} TxDOT, Bridge Manual, 2-10.
at a new location. In the latter case, if a bridge must be disassembled for restoration work, it can be transported disassembled over any distance.

- Steel or concrete beam or girder, timber beam – These bridges are candidates for relocation if the superstructure is not integral with the substructure of the bridge. As with truss bridges, relocation is generally appropriate if the bridge is less than 90 feet in length.

- Concrete and masonry arches, and suspension bridges – These bridge types are not normally candidates for relocation due to their construction methods and the high cost associated with disassembling, moving, and re-erecting.

(2) New Owners for Historic Bridges

Individuals, organizations or state or local agencies may be interested in assuming ownership of an historic bridge if they have a need for a bridge or have a strong commitment to preservation. The following steps may be taken to find a new owner for an historic bridge:

- Employ active advertising methods to get the word out that the bridge is available by advertising in newspapers, on the Internet, in journals such as the National Trust’s Preservation magazine, over the radio, and through local television special interest stories.

- Seek help from local preservation groups who might have information on individuals in their community interested in rehabilitating an historic bridge. The Preservation League of New York State (Preservation League) has contact information for local and regional nonprofit preservation organizations. A list of Preservation Colleagues with links to applicable websites can be found at www.preservenys.org/mission.htm.

- Identify contractors and engineers with experience moving bridges.29

- Identify new owners through a list of parties interested in bridge adoption. This list could be maintained by the Preservation League with input from its Preservation Colleagues, in cooperation with NYSDOT EAB. NYSDOT EAB would retain a copy of this list for use in fielding inquiries from Regions or others who are marketing an historic bridge.

(3) Work Considerations

Relocating a bridge and re-erecting it at a new site is a challenging task. Work requirements are project-specific, and identification of individual tasks needs to be done on a case-by-case basis. Examples of some special types of work that may require additional considerations include:

- Strengthening or supplementing existing members that will see a different type of stress when the bridge is supported at temporary points.
- Installing temporary bracing prior to moving to accommodate forces resulting from the removal of an existing feature, such as the deck, to reduce the dead load.
- Categorizing and systematic marking of all pieces to be dismantled. This is particularly important when disassembling a truss.

The first two tasks will require an evaluation by a structural engineer. The remaining task will ensure that each piece is reassembled in the same configuration and location.

(4) Costs

The cost of relocating an historic bridge depends on the ease of relocation and the work that is needed to prepare the bridge for its new use. Factors affecting the cost of relocation include the type and size of the bridge, distance moved, new work site preparation requirements, and transportation costs.

(5) Phased Relocation

When an historic bridge is to be relocated and preserved, the project may involve two construction phases. The initial phase would include moving the historic bridge to the permanent site or to temporary storage. The second phase would involve new site development, restoration, and re-erection of the historic bridge.

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30 TxDOT, Bridge Manual, 3-7 through 3-8.
(6) Storage

If a bridge will not be re-erected immediately, it may be necessary to identify temporary storage facilities. Minimum necessary work to stabilize the bridge and prevent further damage or deterioration during storage should be considered on a case-by-case basis. Considerations for suitable storage facilities include security, space, and cost. If the bridge is already corroded, it is important that the bridge be protected from further exposure to the elements. Bridges should not be stored unless there is a good chance that they will eventually be restored and re-erected.

(7) Transfer Agreement

In accordance with applicable laws, rules, and regulations, it may be possible to transfer an historic bridge from the current owner to a new owner. A transfer agreement should specify the parties involved in the transfer and should transfer responsibility for maintenance and operation to the new owner. Although specific items to include in the agreement should be considered on an individual project basis, it may be appropriate to consider the following:

- Requirements of public owner for dismantling of bridge.
- Special requirements for the reuse of the bridge (e.g., pedestrian railing geometry and capacity restrictions).
- Scope of work to be performed on the bridge, including modifications, restoration, and/or preservation, and the party responsible for such work.
- Description of any new construction needed to accommodate the bridge at its current location or at a new site, and the party responsible for such work.
- Any environmental clearances or permits required.

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• Details of funding provisions, if any.

• Schedule for completing the bridge relocation and rehabilitation.

• Provisions relating to the transfer of any real property associated with the bridge in its current or new location.
3. Funding

A. Funding Options

The majority of funding for the rehabilitation and reuse of historic bridges is available through federal funding programs. These programs include Transportation Enhancement funding (Transportation Equity Act [TEA-21] and successor funding programs), the Highway Bridge Replacement and Rehabilitation Program (HBRRP), Surface Transportation Program, and others. Additional funding is available through grant programs administered by the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) and the Preservation League. Available funding and the applicability of the different funding programs are discussed below.

(1) Highway Bridge Replacement and Rehabilitation Program Funding

The Surface Transportation Assistance Act of 1978 established the HBRRP which sets aside a portion of federal-aid highway funds to help states improve the condition of their bridges on public highways, roads, and streets. Title 23, U.S. Code Section 144 contains the law implementing the HBRRP. Allocations for the HBRRP are made for the states by October 1 of each year. Title 23, U.S. Code Section 144(o) establishes and governs the Historic Bridge Program, which encourages the inventory, retention, rehabilitation, adaptive reuse, and future study of historic bridges.  

(2) Transportation Equity Act for the Twenty-First Century

The TEA-21 was signed into law on June 9, 1998, authorizing highway, highway safety, transit, and other surface transportation programs until 2003. The TE funding program is included in this law. Congressional committee hearings have begun to reauthorize TEA-21 and TE spending for the 6-year-period between 2003 and 2009. Like the HBRRP, TE is one program within the broader Surface Transportation Program.

The TEA-21 builds on the initiatives established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was the last major authorizing legislation for surface transportation. The TEA-21 combines the continuation and improvement of current programs with new initiatives to meet the challenges of improving safety and protecting and enhancing communities and the natural environment.  

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32 “U.S. Code Collection, Title 23, Chapter 1, Subchapter 1, Section 144,” n.d., <http://www4.law.cornell.edu/uscode/23/144.html> (Accessed 22 May 2002); TxDOT, Bridge Manual, 2-6 through 2-7.

(3) **Surface Transportation Program Funds**

The Surface Transportation Program (STP) funds may be used for bridges on public roads of all functional classifications. STP funds can be used for a wide array of transportation projects, such as construction, reconstruction, resurfacing, restoration, rehabilitation, and operational improvements for highways and bridges. Projects that accommodate other transportation modes can also qualify.  

(4) **National Highway System Funds**

These funds are available for work on the National Highway System (NHS). NHS funds may be obligated for any of the following projects:

- Bridges undergoing a rehabilitation that includes improvements for bicycle and pedestrian use.
- Construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the NHS.
- Operational improvements for segments of the NHS.
- Construction of, and operational improvements for, a federal-aid highway not on the NHS.

(5) **National Historic Covered-Bridge Preservation Program**

This program was established by TEA-21. The program provides funding to assist the states in their efforts to preserve, rehabilitate, or restore the nation's historic covered bridges. For the purposes of this program, the term "historic covered bridge" means a covered bridge that is listed or eligible for listing in the National Register.

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(6) Preservation League of New York State Grants

The Preservation League’s Preserve New York program may provide a source of funding for historic bridge maintenance and rehabilitation projects. Currently, grant programs administered by the Preservation League only support planning studies, such as historic structure reports. The grants do not provide any capital funds for maintenance or rehabilitation. The Preservation League has offered to review its grants program to evaluate how it can effectively be used for historic bridge maintenance and rehabilitation projects. Information on private, state, and federal funding sources that may be of help for historic bridges is also available through the Preservation League. The Preservation League’s website, http://www.preservenys.org/, contains information on current grant programs administered by the League.

(7) New York State Office of Parks, Recreation, and Historic Preservation Grants – Environmental Protection Fund

The OPRHP administers several statewide funding programs. Currently, the Environmental Protection Fund (EPF) provides the most likely source of funding for rehabilitation of historic bridges. This fund provides reimbursement grants to municipalities and nonprofit organizations for historic preservation projects. Grants are awarded as a 50/50 match, for up to 50 percent of total project costs. Eligible projects include acquisition and development of park land, preservation and restoration of historic properties, and continuing development of the state’s Heritage Areas System. Information on this grant and additional grant programs managed by the agency is available at OPRHP Regional offices or on the Preservation Resource Guide: Financial Incentives website, located at http://nysparks.state.ny.us/field/presresgde/.

B. Use of Highway Bridge Replacement and Rehabilitation Program Funds

HBRRP funds are available to replace or rehabilitate deficient or functionally obsolete bridges if certain criteria are met. FHWA also allows HBRRP funds to be used for preventive maintenance. Generally speaking, deficient bridges with a sufficiency rating (SR) of less than 50 are eligible for replacement or rehabilitation and deficient bridges with a SR between 50 and 80 are eligible for rehabilitation.37

HBRRP funding typically provides an 80-percent federal contribution to a bridge project, with the additional 20-percent matched by the state and/or local government. If the project is not state sponsored, the additional 20 percent is the local government’s responsibility. HBRRP funds may be used to rehabilitate an historic bridge either for continued vehicular use or for non-vehicular use. If a bridge is not being retained for vehicular use, certain limitations apply.

37 TxDOT, Bridge Manual, 2-7.
(1) **Rehabilitation for Vehicular Use** 38

If an historic bridge can still meet a transportation need, HBRRP funds may be applied when planning a rehabilitation project.

According to FHWA guidance, preventive maintenance on federal-aid highway bridges is eligible for funding under the HBRRP if the state demonstrates to the satisfaction of the Secretary of Transportation that the activity is a cost-effective means of extending the bridge’s useful life. 39

(2) **Rehabilitation for Non-Vehicular Use**

HBRRP funds for non-vehicular use are not to exceed costs of demolition as per Title 23 Section 144(o) of U.S. Code, "Historic Bridge Program." Federal funds are available pursuant to Title 23, Section 144(o) for the rehabilitation of historic bridges for non-vehicular use. If the bridge is no longer carrying motorized traffic, money is available up to the cost of demolition of the bridge. It is important to note that use of these funds precludes future use of TE funds for work on the project bridge. On reuse projects, TEA-21 (and successor funding) funds can and should be used prior to the use of HBRRP funds (See Section 3.A). 40

C. **Use of Transportation Enhancement Funds (and Successor Funding)**

This legislation sets aside 10 percent of a state’s federal transportation dollars for enhancement projects. Funds are available through this program for historic preservation activities, including bridge rehabilitation.

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TE funds can be used to rehabilitate historic bridges for both vehicular and non-vehicular uses. Unlike HBRRP funding, the use of TE funds does not preclude the use of other federal funding. For project planning purposes, use of these funds prior to application for HBRRP funds will maximize the federal assistance for rehabilitation of an historic bridge.

The TEA-21 program, like HBRRP, includes 80 percent federal funding with the remaining 20 percent a mixture of state and local funds. Local governments have the option of contributing their match in local dollars (a "hard" match). A "soft" match option allows local governments to provide their portion of funding through three alternate methods:

1. They can choose to provide their portion of the match by applying other federal funds, such as Housing and Urban Development or Environmental Protection Agency money.

2. They can use a non-FHWA-funded transportation-related expenditure, such as a storm sewer upgrade, as the match.

3. The value of local and state government services, materials, and land utilized for the project and the costs of preliminary engineering prior to project approval may be credited to the state and local match.\(^{41}\)

D. Marcheselli Funds

One way for local governments to reduce their monetary contribution to a project is to apply for Marcheselli funds. Marcheselli is a revenue-sharing program between the state and local governments. This program is the most commonly used means of reducing a local government’s funding responsibilities on non-state-sponsored projects. Marcheselli funding can reduce the local share to 5 percent, with the state providing the additional 15 percent of necessary funding, making the funding breakdown 80-15-5 (federal-state-local). Marcheselli funds are awarded on a competitive basis, with the state legislature distributing Marcheselli funding to localities filing applications for assistance. This option can be pursued for HBRRP projects and projects that utilize TE funds.

4. Prioritization

A. Establish Priorities for Funding Projects

After completing assessments of individual bridges, NYSDOT Regions and local units of government are encouraged to establish priorities for maintenance and rehabilitation work on all historic bridges under their jurisdiction. This prioritization should lay out a time frame during which needed work should be undertaken, including the construction year, for anticipated major projects and annual needs for routine maintenance.

B. Guidelines for Setting Priorities

Priorities should be based on:

(1) Assessment of Transportation Need and Condition of Structure

Consideration of the transportation need, in tandem with an assessment of the condition of the structure, will identify factors limiting a bridge's future use and help clarify future options for a bridge. Section 2.B. provides guidance in completing these assessments.

(2) Assessment of Maintenance and Rehabilitation Needs

The maintenance and rehabilitation needs for each historic bridge, per Section 2.C, will inform future options.

(3) Consideration of Feasibility of Options

Using the results of Step Nos. 1 and 2 above, consider the feasibility of the options presented in Section 2.E. Design exceptions and alternate standards as described in Section 2.D may factor into decision-making. The first priority is to maintain a bridge in vehicular use. Only after this option is ruled out should other alternatives be considered.
(4) Identification of Public Support and/or Local Commitment to Maintaining and/or Rehabilitating Specific Bridges

Public support should be identified through outreach and education programs outlined in Section 6.B. The willingness of the public to support a major expenditure such as a bridge rehabilitation, often depends on a community's perception of the bridge as a valuable resource.

C. Budgeting

NYSDOT Regions and local units of government should estimate the cost of work that needs to be undertaken in the upcoming fiscal year, or next budget cycle, and determine whether or not sufficient funds are available to complete the work. If a local unit of government identifies any budget shortfall that would prohibit them from undertaking needed work on an historic bridge, they should communicate the need for additional funding to the appropriate Region. Regions will communicate budget shortfalls at the local level and the Regional level to the NYSDOT Main Office. NYSDOT will work with local governments and Regions to suggest funding sources.

Information on funding is provided in Section 3.

Public Involvement
Stuyvesant Falls Bridge over the Kinderhook Creek
Town of Stuyvesant Falls, Columbia County

The Stuyvesant Falls Bridge (BIN 3342250), a Camelback through truss bridge built in 1899 by the Berlin Bridge Company, exemplifies public involvement in a bridge rehabilitation project. In 1976 the bridge was placed on the National Register as part of the Stuyvesant Falls Mill District, but deterioration led to its closing in October 1991 and subsequent plans for replacement. Public opposition to replacing the bridge, however, led to a bridge rehabilitation project. The completed project allowed the bridge to carry modern traffic loads and preserved the historic fabric of the Stuyvesant Falls Mill District.
5. Resources

A. NYSDOT Main Office

The Environmental Analysis Bureau (EAB) should be contacted for questions on the Historic Bridge Management Plan and Programmatic Agreement. The Structures Division is available to answer questions on bridge rehabilitation techniques and alternate design standards.

For assistance contact:

EAB
1220 Washington Avenue
Building 5, Room 303
Albany, NY 12232-0473
Telephone: (518) 457-5672
http://www.dot.state.ny.us/eab/eab.html

Structures
1220 Washington Avenue
Building 5, 6th Floor
Albany, NY 12232-0473
Telephone: (518) 457-7339
http://www.dot.state.ny.us/structures/structures_home.html

Bridge Maintenance
1220 Washington Avenue
Building 5, Room 217
Albany, NY 12232-0473
Telephone: (518) 457-8485

B. NYSDOT Regions

Regional Structures Engineers, Bridge Maintenance Engineers, the Regional Planning Unit, and the Cultural Resources Coordinator (CRC) should be consulted for questions on maintenance and rehabilitation of historic bridges. These individuals should consider working as a group in making decisions about historic bridges. These staff members (particularly CRCs and engineers) may also serve as liaisons between local engineers and maintenance departments and EAB and Structures staff at the NYSDOT Main Office. Additional assistance for local governments comes through NYSDOT's Local Projects Liaisons (LPLs). The LPLs assist municipalities in understanding the process for development, design, and construction of federal aid projects. Web links to the Regional offices can be found at http://www.dot.state.ny.us/reg/regmenu.html.

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42 Minutes from NYSDOT Historic Bridge Inventory and Management Plan meeting, April 24, 2002.

C. Local Bridge Owners

Decision-makers at the local level may include the county highway commissioner or superintendent, a county or municipal engineer, and/or maintenance staff. These individuals are encouraged to develop a prioritized list of maintenance and rehabilitation needs for historic bridges that they own. Thereafter, funding needs and requests for other assistance should be conveyed to the NYSDOT Regional Structures Engineer.

D. State Historic Preservation Office

The State Historic Preservation Office (SHPO) is located within the New York State Office of Parks, Recreation and Historic Preservation (OPRHP). The SHPO can provide:

- Guidance on preservation practices and assistance in meeting the Secretary of the Interior’s Standards for Rehabilitation (see Appendix C)
- Referrals to consultants with technical expertise
- Information on possible sources of funding
- Examples of completed rehabilitation projects

Current grant opportunities can be found on the website, http://www.nysparks.state.ny.us/field/presregde.

For assistance contact:

New York State Historic Preservation Office
Office of Parks, Recreation, and Historic Preservation
Peebles Island
Box 189
Waterford, NY 12188-0189
Telephone: (518) 237-8643
Website: http://www.nysparks.state.ny.us/field/

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44 Meeting minutes, April 24, 2002.
E. **Preservation League of New York State**

The Preservation League can provide:

- Technical assistance and strategic advice for achieving bridge preservation goals.
- Advice to community-based groups on developing outreach programs.
- Information on possible sources of funding – both Preservation League grants and other funding sources.

*For assistance contact:*

Preservation League of New York State  
44 Central Avenue  
Albany, NY 12206-3002  
Telephone: (518) 462-5658  
E-mail: info@preservenys.org  
Website: http://www.preservenys.org/mission.htm

F. **Cornell Local Roads Program**

The Cornell Local Roads Program can provide:

- Training  
- Technical assistance

Additional information on the Cornell Local Roads Program is available in Section 6.

*For assistance contact:*

Cornell Local Roads Program  
416 Riley-Robb Hall  
Ithaca, NY 14863-5701  
Telephone: (607) 255-8033  
E-mail: clrp@cornell.edu  
Website: http://www.clrp.cornell.edu/
6. Education/Outreach

A. Education/Outreach to Owners/Engineers

As part of the effort to ensure that New York's historic bridges have the best possible chance of survival, consistent with safety and transportation needs, NYSDOT encourages maintenance, rehabilitation, and reuse of historic bridges. Education and outreach for bridge owners, engineers, and other decision-makers (e.g., local government officials) will help to raise awareness of the initiative to preserve New York's historic bridges and the options available for retaining these bridges. The maintenance, rehabilitation, and reuse of historic bridges should be promoted at different venues in order to reach bridge engineers, decision-makers, and contractors.

(1) Cornell Local Roads Program

The Cornell Local Roads Program is one of 57 centers established under the FHWA's Local Technical Assistance Program. The program provides training, technical assistance, and information to municipal officials and employees responsible for the maintenance, construction, and management of local highways and bridges in New York State.

Services provided by the Cornell Local Roads Program include:

- Training programs – The primary service offered by the Cornell Local Roads Program is training, which is held throughout New York State each year. Programs are announced in the newsletter, Nuggets & Nibbles, on the website (http://www.clrp.cornell.edu/), and by direct mailings to all highway and public works agencies in New York State. A variety of technical and management topics are offered to accommodate the needs of highway personnel and other municipal officials. Currently, the Program does not offer a course focusing on historic bridge issues.

- Annual school for highway superintendents – The Annual School features short sessions of general interest and specialized workshops. Over 750 participants, the majority being local highway and public works officials, attend the Highway School each year.

- Technical assistance – The program’s Technical Assistance Engineer can provide technical assistance relating to pavement maintenance, drainage, road rehabilitation, and administrative topics. Referrals to someone qualified to address specific issues can also be provided.
• Library resources – The information library is composed of publications, videotapes, computer software, and CD-ROMS from a variety of sources on numerous topics. Materials are available to local highway and public works officials and municipal employees, either free of charge or by loan. Information on the Historic Bridge Inventory and Management Plan should be incorporated into the library for distribution.

(2) Conferences

Conferences provide an opportunity for owners, engineers, and other decision-makers (e.g., local government officials) to exchange ideas on successes, failures, and emerging technologies available for bridge maintenance and rehabilitation projects. Conferences where presentations on the Historic Bridge Inventory and Management Plan may be appropriate include:45

• Statewide Local Bridge Conference – The Conference is intended to actively foster partnerships between local agencies with bridge responsibility and the NYSDOT. Conference participants include county, city, town, and village highway officials; representatives of state and federal agencies; and private-sector personnel. The conference is sponsored by NYSDOT, FHWA, Cornell Local Roads Program, NYS County Highway Superintendents’ Association, Association for Bridge Construction & Design (ABCD), Western NY Chapter, Inc., ABCD, Northeast Chapter, Inc., ABCD, Eastern NY Chapter, Inc.46

• Southern Tier Central Local Government Conference – The target audience for this conference is town, village, and city board members, clerks, superintendents of highways and public works departments, planning boards, zoning boards, municipal Attorneys, and other municipal officials. This conference provides local officials the opportunity to meet with state and other local officials to exchange ideas.

• Southern Tier West Regional Local Government Conference – This conference provides local officials, including municipal boards, clerks, highway superintendents, justices, court clerks, water/wastewater operators, and zoning/planning board members the opportunity to meet with state and other local officials to exchange ideas. Sessions on SEQRA law and responsibilities and liabilities could provide appropriate venues for discussions of historic bridge maintenance and rehabilitation.


46 “Cornell Local Roads Program.”
• New York State County Highway Superintendents' Conference – This association holds meetings twice a year. County highway superintendents have the opportunity to discuss current legislation, emerging technologies, and transportation issues specific to New York State. Opportunities to present information on maintaining and rehabilitating historic bridges include the general sessions, sessions discussing TEA-21, and lunch time speaking opportunities.

• New York State Association of Town Superintendents of Highways Conference – This annual conference provides local highway superintendents with opportunities for information exchange and education. New technologies that might benefit the superintendents are also presented.  

• New York Conference of Mayors – The New York State Conference of Mayors and Municipal Officials (NYCOM) is an association of cities and villages in New York. NYCOM holds an annual meeting to discuss local government issues and hosts an annual Main Street conference. NYCOM’s membership includes more than 573 member municipalities.

Presentations should highlight NYSDOT’s commitment to maintaining and rehabilitating historic bridges in the state and should offer guidance to local governments as they pursue options to retain their historic bridges. The content and materials for the presentations could be assembled by NYSDOT, with assistance from the Preservation League and the SHPO. Presentations could be made either by NYSDOT staff, who could focus on the technical aspects of historic bridge maintenance and rehabilitation, or by representatives of SHPO or the Preservation League, who should focus on the benefits of preserving the population of historic bridges identified by the Historic Bridge Inventory.

(3) Engineering/Professional Training Programs

Training programs also provide an opportunity to disseminate available information on historic bridge preservation issues and emerging technologies. Engineers and NYSDOT contractors should be encouraged to attend training programs on historic bridge maintenance and rehabilitation.

47 Phone interview with Joan Brown, New York State Association of Town Highway Superintendents, 28 May 2002.

(a) **Available Training Programs**

Existing training programs are offered by the Cornell Local Roads Program (see Section 6.A[1]). An additional course, "Analysis and Preservation of Historic Bridges," is offered through the American Society of Civil Engineers. This course focuses on opening a dialogue between preservationists and engineers and finding common ground. Although existing programs could provide useful information to engineers and planners, development of a program to specifically address the maintenance and rehabilitation of historic bridges could be of greater benefit.

(b) **Potential New Programs**

Additional training programs could be developed through available federal grants. Grants of up to $40,000 are awarded annually by the National Center for Preservation Technology and Training (for additional information see http://www.ncptt.nps.gov). This money could be used to develop a training program to promote the maintenance and rehabilitation of New York's historic bridges. The training could be given in several locations across the state to encourage attendance by local bridge owners and engineers. The training program should include a brief overview of historic bridges and an explanation of why it is important to preserve them. The focus of the training should be on the "nuts and bolts" of bridge preservation, providing specifications for how to maintain and rehabilitate bridges while retaining their historic integrity.

(4) **Publications**

Another possible use of grant money is for the production of a publication on historic bridge maintenance and rehabilitation. This type of manual would provide additional specific guidance on maintaining and rehabilitating different types of historic bridges. The publication could be used as a reference guide for engineers and local governments who own historic bridges. This type of publication may be in the process by another state transportation agency. The Maryland State Highway Administration is developing a booklet that will offer guidance to highway commissioners and other engineers who are undertaking bridge maintenance and rehabilitation efforts. Maryland's goal is to adapt the *Secretary of the Interior's Standards for Rehabilitation* into a document that targets historic bridge issues. The Maryland State Highway Administration plans to distribute the booklet to District offices and owners of historic bridges.


50 Anne Bruder, <abruder@sha.state.md.us> “Re: MD historic bridges,” 19 July 2002, personal e-mail (Accessed 23 July 2002).
(5) Awards

Additional incentives to maintain and rehabilitate historic bridges could be provided to NYSDOT engineers through the establishment of an awards program. Awards for engineering excellence in historic bridge rehabilitation should be considered as a method to encourage creative problem-solving.

For example, the Ohio DOT gives up to three awards annually to county engineers who have demonstrated a commitment to preservation of historic bridges through successful rehabilitation projects or unique and innovative approaches. The awards are handed out at the annual Ohio Transportation Engineering Conference. There are no monetary awards, but an award recipient has a greater chance of receiving TE funds in the future, due to the perception that they can be relied on to continue good preservation practices. Names of award winners are published in professional publications such as the Transportation Research Board newsletter or in local newsletters. The success of the program comes from the enjoyment that the county engineers derive from competing for the awards and their pride in receiving an award.51

The Preservation League’s existing awards program highlights preservation accomplishments in New York State. These annual awards give recognition to individuals and organizations who have shown an outstanding commitment to retaining, promoting, and reusing historic properties. Projects involving historic bridges are eligible for these awards. The awards are given at the Preservation League’s annual meeting and are published on the Preservation League’s website.

The New York SHPO also has an awards program. The annual New York State Historic Preservation Awards honor excellence in the preservation of the state’s scenic and historic resources. Awards recognize exceptional rehabilitation projects. Projects involving historic bridges are eligible for this award. The awards are presented at the SHPO’s spring meeting and published in the SHPO’s newsletter, The Preservationist.

B. Creating Public Support and Raising Awareness

Support for saving bridges should be cultivated in the public realm, as well as among engineers and government officials. Too often the public does not become involved in the maintenance and preservation decisions for their bridges until a bridge is slated for replacement. Raising awareness of the importance of historic bridges in communities may increase local support for bridge maintenance and rehabilitation, and increase the chances of these bridges’ survival.

(1) Methods

To help create additional public support for saving historic bridges, NYSDOT should consider the following ideas. Agencies and organizations, such as the SHPO or the Preservation League, that could work to develop and/or sponsor public programs should be identified. Potential public programs are listed below. Outreach efforts conducted by the SHPO and Preservation League could provide the public with a greater understanding of the importance of maintaining and rehabilitating their population of historic bridges and the available grants to accomplish preservation goals.

(a) Develop School Programs

Discussions of historic bridges could be incorporated into school programs. School children could learn about the history of bridge engineering through Engineers Week, an event designed to introduce students to the importance of engineering. Engineers’ Week is sponsored primarily by the American Society of Civil Engineers, which chairs the National Engineers' Week Committee of sponsors. Other supporting sponsors include FHWA.52

(b) Create Popular Publication

A popular publication on New York State's historic bridges could be prepared and distributed to historical societies, libraries, and interested individuals to stimulate interest in preservation.

(c) Produce Bridge Poster or Calendar

An historic bridge poster or calendar could be created and distributed to raise awareness of, and create interest in, New York's historic bridges.

(d) Produce Informational Pamphlets

Informational pamphlets could be created for distribution at public meetings, museums, libraries, and highway rest stops. The pamphlets could include information about the results of the Historic Bridge Inventory. The benefits of preservation to communities, with examples, could also be discussed.

(e) **Develop a Website**

A website could be developed to stimulate interest in New York's historic bridges. The site could be a part of NYSDOT's existing site or could be hosted by another appropriate organization, such as the SHPO or Preservation League. The Preservation League has offered to put information on New York's historic bridges, as well as links to key technical, funding, and state and federal resources that support bridge preservation, on its website as part of a public outreach program.

(f) **Publicize Bridge Rehabilitation Success Stories**

Success stories about successful rehabilitation projects could be publicized through the Preservation League, SHPO, Local Historical Societies, and NYSDOT websites; newsletters such as *The Preservationist* or *Preservation News*; and in local newspapers. NYSDOT's public relations office should be consulted in this effort.

(g) **Compile a List of Experienced Contractors and Engineers**

A list of contractors and engineers with experience moving and/or rehabilitating historic bridges could be compiled. This list could serve as an important tool for members of the public who are considering adopting a bridge.53

(h) **Maintain a List of Potential Historic Bridge Owners**

This list would include individuals and organizations that have expressed interest in relocating an historic bridge. The list would be most useful if it included details about the intended use, desired length, intended location, and expected cost held by the prospective owner.

(i) **Create Public Programs for Local Historical Societies and Preservation Groups**

Public programs, developed by NYSDOT, with help from the Preservation League and SHPO, could be used by local historical societies to mount bridge exhibits, highlighting a community's or county's bridges. Additional programs, including public talks, could also be coordinated through these groups. The Preservation League has proposed to create a stand-alone presentation for general audiences focusing on historic bridge preservation.

(j) **Nominate Selected Bridges to the National Register**

Bridges for which strong local support exists could be nominated to the National Register to increase the recognition of their significance and build a commitment to maintain them on a long-term basis.

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53 “North Carolina Department of Transportation, Historic Truss – Bridge Relocation and Reuse Program.”
(2) Role of Preservation League of New York State

The Preservation League supports the maintenance and rehabilitation of bridges identified as historic through the Historic Bridge Inventory project and presented in the *Evaluation of National Register Eligibility* report (January 2002). The Preservation League proposes to:

- Coordinate with local preservation organizations to increase public awareness of the importance of historic bridges.
- Disseminate information on funding available for historic bridge preservation.
- Provide information on the Historic Bridge Management Plan to local government officials.
- Publicize accomplishments of NYSDOT and others in preserving historic bridges.
- Sponsor discussions on identified historic bridges at its annual conference and at public speaking engagements across the state.
7. Program Tracking

A. Tracking Historic Bridges

To monitor maintenance and rehabilitation efforts over time (e.g., how many bridges are maintained and/or rehabilitated versus replaced) and to facilitate rapid retrieval of up-to-date information on historic bridges, the NYSDOT Main Office will conduct an ongoing tracking program for historic bridges. This tracking program will use existing software systems and current updating procedures associated with NYSDOT’s bridge inventory and inspection program to record changes to historic bridges. Information gathered for the Historic Bridge Inventory is recorded on the “Historic” card in the WinBolts database (see Figure 4) and in the Historic Bridge Database constructed as part of the Historic Bridge Inventory. Changes to historic bridges will be recorded on the “Historic” card in WinBolts and the Historic Bridge Database. If an historic bridge is replaced and the BIN is deleted from WinBolts, information on the historic bridge will be retained in the Historic Bridge Database.

B. Periodic Review of Management Plan

NYSDOT EAB will track activities affecting historic bridges and periodically assess the effectiveness of this management plan.

C. Historic Bridge Inventory Update

NYSDOT EAB will assess the need for an update of the Historic Bridge Inventory in 2012.
**Figure 4: Sample WinBolts Historic Card**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Historic Determination</strong></td>
<td>Eligible</td>
</tr>
<tr>
<td><strong>Reason 1</strong></td>
<td>04 - Criterion C: possesses high artistic value</td>
</tr>
<tr>
<td><strong>Reason 2</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Reason 3</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>GTMS: Material Code</strong></td>
<td>Concrete</td>
</tr>
<tr>
<td><strong>GTMS: Structural Code</strong></td>
<td>04 - Tee Beam</td>
</tr>
<tr>
<td><strong>Main Span Design Type</strong></td>
<td>05 - Tee Beam</td>
</tr>
<tr>
<td><strong>Bridge Type Details</strong></td>
<td>15 - Bridge Plate</td>
</tr>
<tr>
<td><strong>Truss Type Details</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Construction Date Update</strong></td>
<td>1926</td>
</tr>
<tr>
<td><strong>Integrity Problems 1</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Integrity Problems 2</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Integrity Problems 3</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Engineer or Designer</strong></td>
<td>2 - County</td>
</tr>
<tr>
<td><strong>Name of Engineer</strong></td>
<td>Charles MacDonald, County Engineer</td>
</tr>
<tr>
<td><strong>Name of Builder</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Special Recognition 1</strong></td>
<td>Aesthetic Treatment (x)</td>
</tr>
<tr>
<td><strong>Special Recognition 2</strong></td>
<td>N - Not Applicable</td>
</tr>
<tr>
<td><strong>Special Recognition 3</strong></td>
<td>N - Not Applicable</td>
</tr>
<tr>
<td><strong>Aesthetic Treatment 1</strong></td>
<td>02 - Decorative Rail or Pail</td>
</tr>
<tr>
<td><strong>Aesthetic Treatment 2</strong></td>
<td>04 - Masonry Veneer</td>
</tr>
<tr>
<td><strong>Aesthetic Treatment 3</strong></td>
<td>05 - Decorative Arch</td>
</tr>
<tr>
<td><strong>Aesthetic Treatment 4</strong></td>
<td>NA - Not Applicable</td>
</tr>
<tr>
<td><strong>Historic Assoc Detail</strong></td>
<td>N - Not Applicable</td>
</tr>
<tr>
<td><strong>Plans Available Update</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Possible Historic Dist</strong></td>
<td>NOT In Or Adjacent to a Possible Historic District</td>
</tr>
<tr>
<td><strong>Historical Marker</strong></td>
<td>N - NO Historical Marker Present</td>
</tr>
<tr>
<td><strong>Land Use</strong></td>
<td>N - Not Applicable</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>N - Not Applicable</td>
</tr>
</tbody>
</table>
8. Supplements

NYSDOT Regions or local governments may wish to develop supplemental management plans to address specific issues encountered in maintaining and rehabilitating historic bridges for which they are responsible. These individual management plans would be based on detailed information from the NYSDOT Regions and may be developed to address specific bridge types or to set maintenance and rehabilitation priorities for a Region’s or local government’s population of historic bridges based on available funds.

Examples of possible supplemental management plans include:

- Regions could cooperate to develop a plan to rehabilitate examples of an uncommon bridge type. For example, the *Historic Bridge Inventory and Management Plan* project identified eight eligible lenticular trusses, an uncommon type, in four Regions (3, 6, 7, and 9). Uncommon bridges often possess a high profile in the communities in which they are located, resulting in significant public support for their preservation. Bridges for which rehabilitation enjoys strong public support could be given extra consideration for rehabilitation in a supplemental management plan.

- A Region could develop a supplemental plan to set priorities for addressing its population of historic bridges. This type of plan might prioritize maintenance and rehabilitation of a Region’s historic bridges by giving priority to bridges with the most urgent need for maintenance or rehabilitation, or to projects that provide the best use of limited funding, or to projects that provide the greatest benefit to the public.

- Local governments could conduct a feasibility study to identify opportunities to maintain and rehabilitate their population of historic bridges. Recognizing the limited availability of funds, the local governments could use the results of the feasibility study to select candidates for maintenance and rehabilitation.

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**An Uncommon Bridge With a High Level of Public Support**

The Bow Bridge, a lenticular truss in Hadley, New York, enjoys a high level of public support for its preservation. Closed to traffic since 1983, the National Register-listed bridge was slated for demolition in early 2000. Public support for the bridge’s preservation resulted in a postponement of demolition. Currently, preservation groups are developing a plan to rehabilitate the Bow Bridge. To assist the effort, a locally published book of artwork and writings inspired by the bridge is being sold to help fund its rehabilitation.
Bibliography


Alkhradaji, Tarek, "FRP: New Life for Bridges and Budgets." *Structure* (March 2002).


Brown, Joan (New York State Association of Town Highway Superintendents). Phone interview with Mary Ebeling, 28 May 2002.


Minutes from NYSDOT Historic Bridge Inventory and Management Plan meeting. February 6, 2002.

Minutes from NYSDOT Historic Bridge Inventory and Management Plan meeting. April 24, 2002.


Rees, R. Lloyd (Cintec International). Phone interview with Mary Ebeling, 12 April 2002.


Appendix A. Relevant Guidelines, Standards, and Regulations
Appendix A
Relevant Guidelines, Standards, and Regulations

1. **Section 106 of the National Historic Preservation Act of 1966 (as amended)** – This law requires federal agencies to take into account the effects of their undertakings on historic properties, including historic bridges, and afford the Advisory Council on Historic Preservation (Council) a reasonable opportunity to comment on such undertakings. The historic preservation review process mandated by Section 106, which also provides a review role for SHPO, is outlined in regulations issued by the Council. Revised regulations became effective January 11, 2001.\(^{54}\)

2. **Section 4(f)** – This law was enacted as part of the U.S. Department of Transportation Act of 1966 (Title 49, United States Code, Section 1653(f)). Section 4(f) applies to undertakings that require the "use" of an historic bridge. The "use" of an historic bridge is defined as an action that will impair the historic integrity of a bridge either by rehabilitation or demolition. Documentation that there is no feasible and prudent alternative to the use of the historic bridge and that all possible planning to minimize harm has been incorporated into the project must be presented for review. FHWA will ensure that the provisions of Section 4(f) are met before approving a project for letting. Section 4(f) approval is necessary for federally funded transportation projects. Rehabilitation that does not impair the historic integrity of a bridge is not subject to Section 4(f).\(^{55}\)

3. **National Environmental Policy Act, as amended (NEPA)** – NEPA applies to actions that are federally funded or subject to federal approval and governs public involvement for federally funded undertakings (Title 42, U.S. Code, Sections 4321-4347). NEPA (as amended, effective September 1982) establishes national policies and goals for the protection of the environment. The Council on Environmental Quality (CEQ) regulations on implementing NEPA require that agencies make a diligent effort to involve the public in preparing and implementing their NEPA procedures. NEPA also requires that agencies provide public notice of NEPA-related hearings, public meetings, and the availability of environmental documents so as to inform those persons and agencies who may be interested or affected.\(^{56}\)


4. Title 23 of U.S. Code, Section 144 – Title 23 contains the law setting aside a portion of federal-aid highway funding for the replacement or rehabilitation of structurally deficient and/or functionally obsolete bridges located on public highways, roads, and streets (the HBRRP). Title 23, U.S. Code Section 144 contains the law implementing the HBRRP. Allocations for the HBRRP are made for the states by October 1 of each year. Title 23, U.S. Code Section 144(o) governs the Historic Bridge Program, which encourages the inventory, retention, rehabilitation, adaptive reuse, and future study of historic bridges.  

5. Transportation Equity Act for the twenty-first century (TEA-21) – This act authorizes funding for highway, highway safety, transit, and other surface transportation programs until 2003. The act provides funding for the TE program. TE projects that qualify for funding under this program include historic preservation and rehabilitation of historic transportation structures and facilities. Funding for the TE program is generated through a 10-percent set-aside of each state’s transportation funding. 

6. Article 14 of New York State Consolidated Laws governs New York’s historic preservation policy and procedures – Section 14.01 states that it is the policy of the state to “engage in a comprehensive program of historic preservation . . .” Section 14.09 establishes procedures for implementing this policy, which includes consultation with the SHPO. The law applies to state agency activities affecting historic or cultural properties, including historic bridges. 

7. State Environmental Quality Review Act (SEQRA) – This act requires NYSDOT to consider environmental factors in project planning, review, and decision-making for state-funded projects. Under this act, local, county, and state agencies must determine if actions they undertake, fund or approve, have a significant effect on the environment and must work to minimize any effect to the greatest extent possible. This act delineates the steps involved in determining environmental impacts, completing an Environmental Impact Statement, and coordinating public involvement. SEQRA is designed to be integrated into compliance procedures outlined in NEPA. If federal funding is involved, a project must comply with NEPA. NEPA documents can generally be used for SEQRA compliance. 

8. NYSDOT Environmental Initiative – Through the Environmental Initiative, begun in 1998, NYSDOT has affirmed its obligation and responsibility to protect, improve, and enhance the environment as opportunities arise. By implementing the Environmental Initiative, NYSDOT has become an important part of New York State’s environmental solution and has changed its working relationships with environmental agencies and groups. By progressing the philosophy of environmental stewardship, NYSDOT has moved beyond the conventional reactive response to regulatory requirements to that of protecting and enhancing the 

57 *“U.S. Code Collection, Title 23, Chapter 1, Subchapter 1, Section 144;” TxDOT, Bridge Manual, 2-6 through 2-7.*


environment. The Environmental Initiative includes preservation, restoration, and enhancement of historic and/or cultural features.  

9. **NYSDOT Highway Design Manual** – The primary functions of the Highway Design Manual (HDM) are to: (1) provide design criteria, requirements, and guidance on highway design methods and policies that are as current as practicable and, (2) ensure uniformity in the application of design practices throughout the New York State DOT consistent with the collective experience of the DOT, the American Association of Highway and Transportation Officials, and the FHWA.  

   - Chapter 2 – Design Criteria and Chapter 4 – Design Criteria & Guidance for Bridge Projects on Low Volume Highways were used in the preparation of the Management Plan.

10. **NYSDOT Bridge Manual** – The Bridge Manual has been prepared to provide policies, guidance, and procedures for bridge project development and design for the NYSDOT. The manual is intended to provide guidance for decisions in the bridge project process, to document or reference policies and standards that need to be considered, and to provide a discussion of good bridge engineering practice. The chapter describing NYSDOT’s one-lane bridge policy presents information on alternate standards for bridges on low-volume roads.  

   - Section 2 Appendix 2B, One Lane Bridge Policy was used in the preparation of the Management Plan.


   61 NYSDOT, HDM.

Appendix B. Directory of Regional and County Planning Agencies and Municipal Planning Organizations in New York State
New York State Department of State
Directory of Regional and County Planning Agencies and Metropolitan Planning Organizations in New York State

Revised July 2002

Regional Planning Agencies

CAPITAL DISTRICT REGIONAL PLANNING COMMISSION
(Counties of Albany, Rensselaer, Saratoga, and Schenectady)

Chungchin Chen, Executive Director
Capital District Regional Planning Commission
5 Computer Drive West No. 2
Albany, NY 12205-1659

Phone: (518) 453-0850
Fax: (518) 453-0856
E-mail: cdrpc@cdrpc.org

CENTRAL NEW YORK REGIONAL PLANNING AND DEVELOPMENT BOARD
(Counties of Cayuga, Madison, Onondaga, and Oswego)

Gary G. Hayes, Executive Director
Central New York Regional Planning and Development Board
126 North Salina Street, Suite 200
Syracuse, NY 13202

Phone: (315) 422-8276
Fax: (315) 422-9051
E-mail: mail@cnyrpdb.org

ERIE AND NIAGARA COUNTIES REGIONAL PLANNING BOARD
(Counties of Erie and Niagara)

Spencer P. Schofield, Senior Planner
Erie and Niagara Counties Regional Planning Board
95 Franklin Street, Room 1010
Buffalo, NY 14202

Phone: (716) 858-6926
Fax: (716) 858-7248
E-mail: schofies@bflo.co.erie.ny.us

HERKIMER-ONEIDA COUNTIES COMPREHENSIVE PLANNING PROGRAM
(Counties of Herkimer and Oneida)

Michael Gapin, Program Director
Herkimer-Oneida Counties Comprehensive Planning Program
Union Station, 3rd Floor
321 Main Street
Utica, NY 13501

Phone: (315) 798-5710
Fax: (315) 798-5852
E-mail: planning@co.oneida.ny.us

LAKE CHAMPLAIN-LAKE GEORGE REGIONAL PLANNING BOARD
(Counties of Clinton, Essex, Hamilton, Warren, and Washington)

William F. Davidson, Director
Lake Champlain-Lake George Regional Planning Board
Lower Amherst Street
P.O. Box 765
Lake George, NY 12845

Phone: (518) 668-5773
Fax: (518) 668-5774
E-mail: rpb@mail.albany.net

LONG ISLAND REGIONAL PLANNING BOARD
(Counties of Nassau and Suffolk)

Harold Withers, Deputy Director
Long Island Regional Planning Board
P.O. Box 6100
Hauppauge, NY 11788

Phone: (631) 853-5191
Fax: (631) 853-4044
E-mail: kim.kennedy@co.suffolk.ny.us
SOUTHERN TIER CENTRAL REGIONAL PLANNING AND DEVELOPMENT BOARD
(Counties of Chemung, Schuyler, and Steuben)

William D. Hess, Executive Director
Southern Tier Central Regional Planning and Development Board
145 Village Square
Painted Post, NY 14870

Phone: (607) 962-5092
Fax: (607) 962-3400
E-mail: stcrpdb@stny.rr.com

SOUTHERN TIER EAST REGIONAL PLANNING DEVELOPMENT BOARD
(Counties of Broome, Chenango, Cortland, Delaware, Otsego, Schoharie, Tioga, and Tompkins)

Robert Augenstern, Director
Southern Tier East Regional Planning Development Board
375 State Street
Binghamton, NY 13901

Phone: (607) 724-1327
Fax: (607) 724-1194
E-mail: sterpdb@stny.rr.com

SOUTHERN TIER WEST REGIONAL PLANNING AND DEVELOPMENT BOARD
(Counties of Allegany, Cattaraugus, and Chautauqua)

Donald Rychnowski, Executive Director
Southern Tier West Regional Planning and Development Board
4039 Route 219
Salamanca, NY 14779

Phone: (716) 945-5301
Fax: (716) 945-5550
E-mail: stwrpdb@netsync.net

GENESEE-FINGER LAKES REGIONAL PLANNING COUNCIL
(Counties of Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates)

Paul Howard, Director
Genesee-Finger Lakes Regional Planning Council
50 West Main Street, Suite 8107
Rochester, NY 14618

Phone: (716) 454-0190
Fax: (716) 454-0191
E-mail: dzorn@frontiernet.net
Web: http://www.gflrpc.org

HUDSON VALLEY REGIONAL COUNCIL

John Crews, Executive Director
Hudson Valley Regional Council
2007 D Street
New Windsor, NY 12553

Phone: (845) 567-9466
Fax: (845) 567-9480
E-mail: hvrc@hvi.net

TUG HILL COMMISSION

Robert Quinn, Executive Director
Tug Hill Commission
317 Washington Street
Watertown, NY 13601-3782

Phone: (315) 785-2380
Fax: (315) 785-2574
E-mail: tughill@tughill.org

ADIRONDACK PARK AGENCY

Richard Lefebvre, Chairman
Adirondack Park Agency
P.O. Box 99
Ray Brook, NY 12977

Phone: (518) 891-4050
Fax: (518) 891-3938
E-mail: No general e-mail address
County Planning Agencies

ALBANY COUNTY

Steven Harausz, Director
Albany County Department of Economic Development, Conservation, and Planning
112 State Street, Room 1006
Albany, NY 12207

Phone: (518) 447-5660
Fax: (518) 447-5662
E-mail: No general e-mail address
Web: http://www.albanycounty.com

ALLEGANY COUNTY

H. Kier Dirlam, Contract Planner
Allegany County Office of Economic Development and Planning
County Office Building
7 Court Street, Room 208
Belmont, NY 14813

Phone: (585) 268-9229
Fax: (585) 268-9720
E-mail: dirlamhk@alleganyco.com
Web: http://www.alleganyco.com/

BROOME COUNTY

Julie M. Sweet, Commissioner
Broome County Department of Planning and Economic Development
County Office Building
P.O. Box 1766
Binghamton, NY 13902

Phone: (607) 778-2114
Fax: (607) 778-6051
E-mail: jsweet@co.broome.ny.us

CATTARAUGUS COUNTY

Terry Martin, Ph.D., Chief Planner
Cattaraugus County Department of Economic Development, Planning, and Tourism
303 Court Street
Little Valley, NY 14755

Phone: (716) 938-9111, ext. 2313
Fax: (716) 938-9431
E-mail: terrma@lv.co.cattaraugus.ny.us
Web: http://www.co.cattaraugus.ny.us/

CAYUGA COUNTY

David C. Miller, Director of Planning
Cayuga County Planning Department
160 Genesee Street, 5th Floor
Auburn, NY 13021

Phone: (315) 253-1276
Fax: (315) 253-1499
E-mail: planning@co.cayuga.ny.us

CHAUTAUQUA COUNTY

R. Gilbert Randell, Director
Chautauqua County Planning Department
3 North Erie Street
Mayville, NY 14757

Phone: (716) 753-4296
Fax: (716) 753-4475
E-mail: chplan@netsync.net

CHEMUNG COUNTY

Randy J. Olthof, Planning Commissioner
Chemung County Planning Department
Chemung County Commerce Center
400 East Church Street
P.O. Box 588
Elmira, NY 14902-0588

Phone: (607) 737-5510
Fax: (607) 737-5512
CHENANGO COUNTY

R. C. Woodford, Planning Director
Chenango County Department of Planning and Development
County Office Building
5 Court Street
Norwich, NY 13815-1695

Phone: (607) 337-1640
Fax: (607) 336-6551
E-mail: rolthof@co.chemung.ny.us

CLINTON COUNTY

Rodney L. Brown, Planning Director
Clinton County Planning Department
137 Margaret Street
Plattsburgh, NY 12901

Phone: (518) 565-4711 or 565-4709
Fax: (518) 565-4885
E-mail: brownr@co.clinton.ny.us

COLUMBIA COUNTY

Roland Vosburgh, Director
Columbia County Planning Department
401 State Street
Hudson, NY 12534

Phone: (518) 828-3375
Fax: (518) 828-1717
E-mail: vosburgh@govt.co.columbia.ny.us

CORTLAND COUNTY

Daniel S. Dineen, Director of Planning
Cortland County Planning Department
4 Lincoln Avenue
Cortland, NY 13045

Phone: (607) 753-5043
Fax: (607) 758-7540
E-mail: ddineen@cornell-co.org

DELAWARE COUNTY

Nicole Franzese, Planning Director
Delaware County Planning Department
P.O. Box 367
Delhi, NY 13753

Phone: (607) 746-2944
Fax: (607) 746-8479
E-mail: Delplan@catskill.net

DUTCHESS COUNTY

Roger P. Akeley, Commissioner
Dutchess County Department of Planning and Development
27 High Street
Poughkeepsie, NY 12601

Phone: (845) 486-3600
Fax: (845) 486-3610
E-mail: dc2@idsi.net

ERIE COUNTY

Lawrence K. Rubin, Commissioner for Planning
Erie County Department of Environment and Planning
95 Franklin Street, Room 1053
Buffalo, NY 14202

Phone: (716) 858-8390
Fax: (716) 858-7248
E-mail: rubinl@bflo.co.erie.ny.us

ESSEX COUNTY

William B. Johnston, County Planner
Essex County Department of Community Development and Planning
P.O. Box 217
Elizabethtown, NY 12932

Phone: (518) 873-3685, ext. 375
Fax: (518) 873-3751
E-mail: bjohnston@co.essex.ny.us

FRANKLIN COUNTY

No Planning Department
FULTON COUNTY

James Mraz, Planning Director
Fulton County Planning Department
One East Montgomery Street
Johnstown, NY 12095

Phone: (518) 736-5660
Fax: (518) 762-4597
E-mail: fcpd@superior.net

GENESEE COUNTY

James Duval, Director
Genesee County Planning Department
3837 West Main Street Road
Batavia, NY 14020-9404

Phone: (716) 344-2580, ext. 5466
Fax: (716) 344-8560
E-mail: jduval@co.genesee.ny.us

GREENE COUNTY

Warren Hart, Director
Greene County Planning Department
909 Greene County Office Building
Cairo, NY 12413-9509

Phone: (518) 622-3251
Fax: (518) 622-9437
E-mail: gcplan@mhcable.com

HAMILTON COUNTY

Katryna Wells, Interim Director
Hamilton County Planning Department
P.O. Box 771
White Birch Lane
Indian Lake, NY 12842-0771

Phone: (518) 648-5239
Fax: (518) 648-022
E-mail: info@hamiltoncounty.com

HERKIMER COUNTY

Michael Gapin, Program Director
Herkimer-Oneida Counties Comprehensive Planning Program
321 Main Street
Utica, NY 13501

Phone: (315) 798-5710
Fax: (315) 798-5852
E-mail: planning@co.oneida.ny.us

JEFFERSON COUNTY

Bruce Armstrong, Director
Jefferson County Planning Department
175 Arsenal Street
Watertown, NY 13601

Phone: (315) 785-3144
Fax: (315) 785-5092
E-mail: plan1@co.jefferson.ny.us

LEWIS COUNTY

John F. McHugh, Planning Director
Lewis County Planning Department
7660 State Street
Lowville, NY 13367

Phone: (315) 376-5422
Fax: (315) 376-5445
E-mail: lcplan-john@northnet.org

LIVINGSTON COUNTY

David O. Woods, Director
Livingston County Planning Department
6 Court Street, Room 305
Geneseo, NY 14454-1043

Phone: (716) 243-7550
Fax: (716) 243-7126
E-mail: dwoods@co.livingston.ny.us
MADISON COUNTY
Russell Lura, Director
Madison County Planning Department
County Building
P.O. Box 606
Wampsville, NY 13163
Phone: (315) 366-2376
Fax: (315) 366-2742
E-mail: ingmire@co.madison.ny.us

MONROE COUNTY
Rocco DiGiovanni, Director
Monroe County Department of Planning and Development
City Place
50 West Main Street, Suite 8100
Rochester, NY 14614-1225
Phone: (716) 428-2970
Fax: (716) 428-5336
E-mail: mcplan@growmonroe.com
Web: http://www.co.monroe.ny.us/

MONTGOMERY COUNTY
Michael Kayes, Director
Montgomery County Department of Planning and Development
County Annex Building
P.O. Box 1500
Fonda, NY 12068-1500
Phone: (518) 853-8155
Fax: (518) 853-8358
E-mail: dir_kayes@plan.co.montgomery.ny.us
Web: http://www.montgomeryny.com/

NASSAU COUNTY
No Director at This Time
Nassau County Planning Commission
400 County Seat Drive
Mineola, NY 11501
Phone: (516) 571-5844
Fax: (516) 571-3839
E-mail: No general e-mail address

NIAGARA COUNTY
Samuel M. Ferraro, Commissioner
Niagara County Planning, Development, and Tourism
59 Park Avenue, Suite 205
Lockport, NY 14094-2740
Phone: (716) 439-7235
Fax: (716) 439-7267
E-mail: sam.ferraro@niagaracounty.com

ONEIDA COUNTY
Michael Gapin, Program Director
Herkimer-Oneida Counties Comprehensive Planning Program
Union Station, 3rd Floor
321 Main Street
Utica, NY 13501
Phone: (315) 798-5710
Fax: (315) 798-5852
E-mail: planning@co.oneida.ny.us

ONONDAGA COUNTY
Karen B. Kitney, Director
Syracuse-Onondaga County Planning Agency
1100 Civic Center
421 Montgomery Street
Syracuse, NY 13202
Phone: (315) 435-2611
Fax: (315) 435-2439
E-mail: onsocpa@nysnet.net

ONTARIO COUNTY
Kristen Hughes, Director
Ontario County Department of Planning and Research
20 Ontario Street, Suite 323
Canandaigua, NY 14424
Phone: (585) 396-4455
Fax: (585) 393-2960
E-mail: ocplanni@nysnet.net
Web: www.co.ontario.ny.us/planning
ORANGE COUNTY

David Church, AICP, Commissioner
Orange County Department of Planning
124 Main Street
Goshen, NY 10924-2124

Phone: (845) 291-2318
Fax: (845) 291-2533
E-mail: dchurch@co.orange.ny.us

ORLEANS COUNTY

Wayne Hale, Jr., Director
Orleans County Department of Planning and Development
County Administration Building
14016 Route 31 West
Albion, NY 14411-9382

Phone: (716) 589-3199
Fax: (716) 589-8105
E-mail: No general e-mail address
Web: http://www.orleansny.com/

OSWEGO COUNTY

Donna Scanlon, Interim Director
Oswego County Planning Board
46 East Bridge Street
Oswego, NY 13126

Phone: (315) 349-8292
Fax: (315) 349-8279
E-mail: dwise@co.oswego.ny.us

OTSEGO COUNTY

Diane V. Carlton, AICP, Director
Otsego County Planning Department
197 Main Street
Cooperstown, NY 13326-1129

Phone: (607) 547-4225
Fax: (607) 547-6492
E-mail: carltond@co.otsego.ny.us

PUTNAM COUNTY

John J. Lynch, Director
Putnam County Division of Planning and Development
841 Fair Street
Carmel, NY 10512

Phone: (845) 878-3480
Fax: (845) 878-6721
E-mail: cdemarch@bestweb.net

RENSSELAER COUNTY

Robert Pasinella, Jr., Director
Rensselaer County Department of Economic Development and Planning
1600 Seventh Avenue
Troy, NY 12180

Phone: (518) 270-2914
Fax: (518) 270-2981
E-mail: Rpasinella@rensco.com

ROCKLAND COUNTY

Dr. James J. Yarmus, P.E., Commissioner
Rockland County Department of Planning
Robert Yeager Health Center
50 Sanitorium Road, Building T
Pomona, NY 10970

Phone: (845) 364-3434
Fax: (845) 364-3435
E-mail: yarmusj@co.rockland.ny.us

ST. LAWRENCE COUNTY

Keith Zimmerman, Director
St. Lawrence County Planning Office
Courthouse Room 255
48 Court Street
Canton, NY 13617-1194

Phone: (315) 379-2292
Fax: (315) 379-2252
E-mail: kzimmerman@co.st-lawrence.ny.us
TIoga County

Elaine Jardine, Director
Tioga County Department of Economic Development and Planning
County Office Building
56 Main Street
Oswego, NY 13827

Phone: (607) 687-8257
Fax: (607) 687-1435
E-mail: jardinee@co.tioga.ny.us

Tompkins County

Edward C. Marx, AICP, Commissioner
Tompkins County Department of Planning
121 East Court Street
Ithaca, NY 14850

Phone: (607) 274-5560
Fax: (607) 274-5578
E-mail: emarx@tompkins-co.org

Ulster County

Herbert Hekler, Director
Ulster County Planning Department
County Office Building
244 Fair Street
P.O. Box 1800
Kingston, NY 12402-1800

Phone: (845) 340-3340
Fax: (845) 340-3429
E-mail: Planning@co.ulster.ny.us

Warren County

Patricia Tatich, Planning Director
Warren County Planning Department
Warren County Municipal Center
1340 State Route 9
Lake George, NY 12845

Phone: (518) 761-6410
Fax: (518) 761-6411
E-mail: wcped@capital.net

Washington County

Brian Gilchrist, Director
Washington County Planning Department
383 Broadway
Fort Edward, NY 12828

Phone: (518) 746-2290
Fax: (518) 746-2293
E-mail: tourisminfo@washingtoncounty.org

Wayne County

Sharon T. Lilla, Director
Wayne County Planning Department
9 Pearl Street
Lyons, NY 14489

Phone: (315) 946-5919
Fax: (315) 946-7657
E-mail: slilla@redsuspenders.com

Westchester County

Joyce M. Lannert, Commissioner
Westchester County Department of Planning
416 Michaelian Office Building
148 Martine Avenue
White Plains, NY 10601

Phone: (914) 285-4402 or 285-4404
Fax: (914) 285-9093
E-mail: eeb6@westchestergov.com

Wyoming County

Thomas E. Skoglund, AICP, County Planner
Wyoming County Planning and Development
6470 Route 20A, Suite 4
Perry, NY 14530-9796

Phone: (716) 237-4110
Fax: (716) 237-4113
E-mail: planner@wycol.com
Metropolitan Planning Organizations

ADIRONDACK-GLENS FALLS TRANSPORTATION COUNCIL (A/GFTC)
Scott Sopczyk, Staff Director
Washington County Metropolitan Center
Room A-204
Fort Edward, NY 12828
Phone: (518) 746-2199
Fax: (518) 746-2441
E-mail: Agftc@aol.com
Web: http://www.agftc.org/

BINGHAMTON METROPOLITAN TRANSPORTATION STUDY (BMTS)
Steven Gayle, Executive Director
P.O. Box 1766
Government Plaza
Binghamton, NY 13902
Phone: (607) 778-2443
Fax: (607) 778-6051
E-mail: mts@co.broome.ny.us
Web: Coming soon

CAPITAL DISTRICT TRANSPORTATION COMMITTEE (CDTC)
John P. Poorman, Staff Director
5 Computer Drive West
Albany, NY 12205
Phone: (518) 458-2161
Fax: (518) 459-2155
E-mail: dtc@crisny.org
Web: http://www.cdtcmpo.org/

EXECUTIVE TRANSPORTATION COMMITTEE FOR CHEMUNG COUNTY (ETCCC)
Jay Schissell, Director
P.O. Box 588
400 East Church Street
Elmira, NY 14902-0588
Phone: (607) 737-5510
Fax: (607) 737-5512
E-mail: tccc@stny.rr.com
Web: None
GENESEE TRANSPORTATION COUNCIL (GTC)
Stephen Gleason, Director
65 West Broad Street, Suite 101
Rochester, NY 14614-2288
Phone: (716) 232-6240
Fax: (716) 262-3106
E-mail: contactgtc@gtcmpo.org
Web: http://www.gtcmpo.org/

GREATER BUFFALO-NIAGARA FRONTIER TRANSPORTATION COMMITTEE (GBNRTC)
Hal Morse, Executive Director
438 Main Street, 5th Floor
Buffalo, NY 14202
Phone: (716) 856-2026
Fax: (716) 856-3203
E-mail: staff@gbnrtc.org
Web: http://www.gbnrtc.org/

HERKIMER-ONEIDA COUNTIES TRANSPORTATION STUDY (HOCTS)
De Forest Winfield, Program Manager
Union Station
321 Main Street
Utica, NY 13501
Phone: (315) 798-5701
Fax: (315) 798-5852
E-mail: planning@co.oneida.ny.us
Web: http://www.oneidacounty.org/

ITHACA-TOMPKINS COUNTY TRANSPORTATION COUNCIL (ITCTC)
Fernando de Aragon, Staff Director
121 East Court Street
Ithaca, NY 14850
Phone: (607) 274-5570
Fax: (607) 274-5578
E-mail: itctc@tompkins-co.org
Web: www.tompkins-co.org/itctc

NEWBURGH-ORANGE COUNTY TRANSPORTATION COUNCIL (NOCTC)
Carl D. Daiker, Acting Staff Director
124 Main Street
Goshen, NY 10924
Phone: (845) 291-2318
Fax: (845) 291-2533
E-mail: NOCTC@warwick.net
Web: None

NEW YORK METROPOLITAN TRANSPORTATION COUNCIL (NYMTC) and Transportation Coordinating Committees (TCCs)
Main office contact information
47-40 21st Street
Long Island City, NY 11101
Phone: (718) 472-3046
Fax: (718) 482-7431
E-mail: None
Web: http://www.nymtc.org/

POUGHKEEPSIE-DUTCHESS COUNTY TRANSPORTATION COUNCIL (PDCTC)
Kealy Salomon, Transportation Program Administrator
27 High Street, 2nd Floor
Poughkeepsie, NY 12601
Phone: (845) 486-3600
Fax: (845) 486-3610
E-mail: pdctc@co.dutchess.ny.us
Web: www.dutchessny.gov/pdctc.htm
SYRACUSE METROPOLITAN TRANSPORTATION COUNCIL (SMTC)

Mary M. Rowlands, Director
100 Clinton Square
126 North Salina Street, Suite 100
Syracuse, NY 13202

Phone: (315) 422-5716
Fax: (315) 422-7753
E-mail: None
Web: http://www.smtcmpo.org/

NYS MPO STAFF

Sarah Siwek, Project Manager
Sarah J. Siwek & Associates
8433 Holy Cross Place
Los Angeles, CA 90045-2634

Phone: (310) 417-6660, ext. 224
Fax: (310) 417-6670

Don Camph, Deputy Project Manager
Aldaron, Inc.
8433 Holy Cross Place
Los Angeles, CA 90045-2634

Phone: (310) 417-6660, ext. 225
Fax: (310) 417-6670

Carolyn Bourdeaux, Project Associate

Phone: (315) 471-8550
Fax: None
Web: http://www.nysmpos.org/
Appendix C. Secretary of the Interior’s Standards for Rehabilitation

The Secretary of the Interior’s Standards for Rehabilitation are basic principles created to help preserve the distinctive character of an historic building and its site, while allowing reasonable change to meet new needs. Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior’s Standards is included in Appendix C1. These guidelines illustrate how the Secretary’s Standards have been adapted to the needs of maintaining and rehabilitating historic bridges and may provide additional information for owners pursuing such projects.
Appendix C

Secretary of the Interior’s Standards for Rehabilitation

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Appendix C1. Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards

The Virginia Transportation Research Council, in its recently completed Management Plan for Historic Bridges in Virginia, has adapted the Secretary of the Interior’s Standards to address the special requirements of historic bridges and to identify specific applications of the standards to historic bridges. These guidelines may provide useful guidance to anyone involved in a bridge maintenance and/or rehabilitation project.
Appendix C1
Guidelines for Bridge Maintenance and Rehabilitation
Based on the Secretary of the Interior's Standards

1. The original character-defining qualities or elements of a bridge, its site, and its environment should be respected. The removal, concealment, or alteration of any historic material or distinctive engineering or architectural features should be avoided.

2. All bridges shall be recognized as products of their own time. Alterations that have no historical basis and that seek to create a false historical appearance shall not be undertaken.

3. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

4. Distinctive engineering and stylistic features, finishes, and construction techniques or examples of craftsmanship that characterize an historic property shall be preserved.

5. Deteriorated structural members and architectural features shall be retained and repaired, rather than replaced. Where the severity of deterioration requires replacement of a distinctive element, the new element should match the old in design, texture, and other visual qualities and where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

6. Chemical and physical treatments that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the most environmentally sensitive means possible.

7. Significant archaeological and cultural resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

8. New additions, exterior alterations, structural reinforcements, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

9. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

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64 Virginia Management Plan, 13-16.
Appendix D. Superstructure Work By Bridge Type
Appendix D
Superstructure Work By Bridge Type

Arch Bridges

The arch bridge, whose basic technology dates back to ancient Rome, is a semi-circular form which can be composed of masonry, brick, steel, timber, or concrete. The arch rib or ring spans an opening, providing support for the roadway. The space between the arch ring and the roadway, or deck, is the spandrel. The spandrel may be walled and filled, known as a filled or closed spandrel, or open. Deck arches have either open or closed spandrels with the spandrel located above the arch and below the roadway. A through arch, or less commonly a half-through arch, has the roadway at the bottom, or mid-point, of the arch.  

Brick and Stone Arch Bridges
Grouted anchors can be used to increase the load capacity for masonry arch bridges. This system, often referred to as "Cintec" or "ARCHTEC," utilizes a hollow steel bar enclosed in a mesh fabric sock. Cementitious grout is pumped through the steel bar to inflate the sock, expanding to fill adjacent voids and bond with the existing masonry. This technology has been used effectively to reduce or eliminate load postings on masonry arch bridges and secure bridge abutments to embankments. The successful rehabilitation of the Aldie Bridge in Aldie, Virginia, using the Cintec system allowed the 180-year-old structure to meet AASHTO standards while maintaining the historic integrity of the structure.

Filled Concrete Arch Bridges
Grouted anchors can also be used on concrete arch bridges in conjunction with other rehabilitation techniques to provide a similar result. Additional rehabilitation work that may be required for this bridge type includes measures to remedy salt and water damage. If salt and water penetrate the road surface and enter the spandrel fill, the structural integrity of the bridge may be compromised. In these cases, rehabilitation efforts in addition to the grouted anchors should be undertaken to ensure the long-term effectiveness of the rehabilitation project. Additional work may include the replacement of the spandrel fill and the installation of an impermeable membrane underneath the wearing surface.

Steel Arch Bridges
These bridges can be rehabilitated in a similar manner to truss bridges (see below) in that the deck, floor beams, and stringers can be replaced. Individual members may also be replaced in kind.

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Beams/Girders

Beam or girder bridges have become a prevalent bridge type in the United States in the twentieth century. The terms beam and girder are interchangeable as girder simply refers to a large beam of metal or concrete. Based on the post and lintel structural system, the earliest simple beam bridges were constructed of timber and often consisted of a plank stretched over a waterway supported by a basic pier or block system. Using the same structural form as the simple beam structures, multi-girders are structures consisting of a series of steel or concrete beams placed parallel to traffic, supporting the roadway directly on their top flanges. Beam and girder bridges are supported by abutments at the ends of the bridge. The placement of intermediate piers allowed for an almost unlimited total overall bridge length. Limits on shipping, splicing, and girder depths dictated the maximum unsupported distance for this type of construction. As material technology advanced, the favored materials for beam and girder bridges became steel and concrete.68

Steel or Pre-Stressed Concrete Beams/Girders

Steel or pre-stressed concrete structures may be strengthened by adding intermediate girders. The deck would need to be replaced for this option. Steel girder structures may also be strengthened by augmentation, such as through adding cover plates. Pre-stressed concrete girders could be strengthened by post-tensioning.

Reinforced-Concrete Girders

Reinforced-concrete girder bridges are generally designed to act compositely with the deck; therefore, adding intermediate girders is often not practical. A new method to strengthen this type of structure is to utilize externally bonded Fiber Reinforced Polymer (FRP) sheets to the sides of the girder. The use of externally bonded FRP achieves added strength using carbon FRP (CFRP). CFRP uses a wet lay-up procedure that is similar to cast-in-place concrete. CFRP materials are lightweight, easily installed, corrosion-resistant, and have high tensile strength. Application of the CFRP process can reduce or eliminate the load posting on a bridge. The American Concrete Institute is currently finalizing a "Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures." This guide should be used when planning a bridge rehabilitation project utilizing the CFRP system.69

Movable Bridges

Movable bridges are usually found over waterways. By lifting, swinging, or sliding, these types of bridges allow for improved or unlimited vertical clearances for navigation vessels. The four primary types of movable bridges are retractile, swing, lift, and bascule. The pontoon is a less common movable structure.70

Movable bridges may incorporate truss or girder construction in their superstructures. For guidance on superstructure work, see these sections. The concerns for rehabilitation of the lift mechanism will be specific to each individual bridge.

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70 Mead & Hunt, Inc. and Allee, King, Rosen & Fleming, Inc., Contextual Study, 23.
Trusses

A truss uses diagonal, vertical and horizontal members to support the deck loads. The members are joined with plates and fasteners (rivets or bolts) to create several rigid triangular shapes. This configuration allows relatively light units to be created for large spans. Most covered bridges use truss forms. The roofing and siding attached to these trusses shielded the load-carrying truss elements from the environment.

There are three basic arrangements of trusses – pony, through, and deck – and a wide variety of types. The arrangement is called a pony truss (or, less commonly, a low truss) when the structural system lies alongside the deck. A through truss may also be referred to as an overhead truss. In the case of a deck truss, the entire truss is below the roadway. The roadway itself is usually supported by a system of longitudinal and transverse beams supported by the truss.

Various truss configurations are found in New York, with different types selected based on the span length that was needed. The continuous and cantilevered design approach also produced changes in the range of spans for trusses.71

Truss bridges generally need to be temporarily supported to replace any deficient, or deteriorated members. In cases where the members are left in place and are being augmented or strengthened by post-tensioning the truss could be rehabilitated without having to provide temporary supports. The following presents discussion on strengthening or replacing the primary elements of truss bridges. The discussion applies to both steel and timber truss bridges.

**Lower Chord**
This normally tension member is fracture critical. If it fails, it tends to fail catastrophically. The failure of this member could cause the entire bridge to collapse. These members can be replaced with a new member or they can be strengthened by augmentation, including post-tensioning. Post-tensioning uses steel or non-metallic cables or rods to provide additional load-carrying capabilities. It may or may not be fastened to a chord member. Strengthening the lower chord is generally expensive and must be done carefully to avoid causing the collapse of the structure.

**Upper Chord**
This normally compressive member tends to buckle. Upper chords are usually conservatively designed. Strengthening the upper chord can be accomplished by augmentation. Complete replacement is expensive and would require that the structure be temporarily supported.

**Stringers**
These are longitudinal members, connected to transverse floor beams. They carry the deck and live loads to the floor beams. These members can be replaced with new members or they can be strengthened with augmentation. It is relatively inexpensive to replace the stringers compared to the major truss elements.

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71 Mead & Hunt, Inc. and Allee, King, Rosen & Fleming, Inc., *Contextual Study*, 16-17.
**Floor Beams**
These are usually larger transverse members connecting to the main trusses at the panel points. At these panel points, the deck and live loading are transferred to the truss. These members can be replaced or they can be strengthened by adding cover plates.

**Web Members (Diagonals, Verticals and Bracing)**
The diagonals are generally tension members and the verticals can be tension or compression members. The rehabilitation of these members would be similar to the bottom chord and top chord, respectively.

**Slabs**
The concrete slab type is generally favored for shorter spans, and is the simplest and most economical of concrete bridge designs. The concrete slab structure includes a rigid horizontal piece that serves as the deck and a structural member carrying stresses to the abutments and/or piers. The introduction of prestressed concrete allowed the concrete slab form to be used for spanning longer distances.\(^{72}\)

Slab structures are difficult to strengthen. Complete replacement with a new slab having the same outward appearance but with additional internal strength is an option for this structure type.

**Suspension Bridges**
Suspension bridges use a main support system of wire cables, or sometimes even iron chains, supported by towers. Attached to the main cables are a series of vertical hangers, used to support the bridge deck system. The deck system often utilizes a deck truss to produce sufficient stiffness. The cable or chain runs the entire length of the bridge. At the bridge ends, the cables are connected to an anchorage system.\(^{73}\)

Suspension bridges are expensive to rehabilitate. These bridges can be rehabilitated in a similar manner to truss bridges in that the deck, floor beams, and stringers can be replaced. However, the overall bridge needs to be analyzed if modifications are made to reduce the dead load of the bridge. Reducing the bridge dead load may have drastic consequences due to wind-induced vibration or deflection.

**Timber Bridges**
Simple wood beams could span about 20 feet; used in an arched truss, truss, or trestle form, wood was used for longer spans. The pile-and-beam trestle was common for long spans where piers could be placed frequently. An exposed wood bridge may be expected to last 20 to 30 years if it is not damaged by fire or a flood. Timber beams, because of their ephemeral construction material, require regular maintenance and replacement of deteriorating members. The replacement of original fabric on these bridges, if it is done using historically

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\(^{72}\) Mead & Hunt, Inc. and Allee, King, Rosen & Fleming, Inc., *Contextual Study*, 24-25.

compatible materials, does not affect a timber beam's National Register eligibility. The impermanence of timber bridges was an accepted fact of bridge-building practice in early America.\(^{74}\)

Timber bridges may be strengthened by adding intermediate beams or replacing existing beams with deeper members. Glue laminated (glulam) wood beams can also be used to rehabilitate wood bridges. Structural glulam timbers provide greater strength, durability, appearance, and economy. Glulam timbers have the potential for use throughout a timber bridge structure, including a covered bridge. Glulam was recently used successfully to replace the bottom chords of the Downsville, New York, covered bridge (Bin 3352070).\(^{75}\)

\(^{74}\) Mead & Hunt, Inc. and Allee, King, Rosen & Fleming, Inc., Contextual Study, 27.

Appendix E
Alternate Design Standards – Sources and Examples

Sources

1. *Guidelines for Geometric Design Policy of Very Low-Volume Local Roads (ADT # 400)*

   Adopted by AASHTO in 2001, these guidelines apply to the many two-lane highways in the U.S. that have very low traffic volume. Of two-lane highways in the U.S., approximately 80 percent have an average daily traffic (ADT) volume of less than 400 vehicles per day. This study demonstrates that minimum roadway widths for such highways can be used to economically and safely address operational needs. The recommended standards for low-volume highways are expected to produce meaningful savings in construction costs.


   The Cornell Local Roads Program offers guidance on design standards for low-volume roads in its *Manual: Guidelines for Rural Town and County Roads, New York State Guidelines* (Local Roads Research and Coordination Council, December 1992). The *New York State Guidelines* are an alternative set of standards for classification and management of low-volume roads (< 400 ADT). Developed specifically for New York State, the guidelines establish appropriate standards for speed, construction, and maintenance, which are consistent with the needs and uses of these roads. The guidelines also provide an easy mechanism for judging existing conditions, determining needs, and establishing priorities.

3. *Policy on the Geometric Design of Highways and Streets (Green Book)*

   A *Policy on the Geometric Design of Highways and Streets* (known as the Green Book), published by the American Association of State Highway and Transportation Officials (AASHTO), contains the basic geometric design criteria that establish the physical features of a roadway. State standards for roadway and bridge design are typically based on the Green Book. As noted in *Flexibility in Highway Design*, discussed below, a project that is sensitive to an historic bridge may be achieved within the parameters established by the Green Book.

4. *Flexibility in Highway Design*

   FHWA’s *Flexibility in Highway Design* (on-line at www.fhwa.dot.gov/environment/flex/) offers highway engineers and project managers guidance about the flexibility available to them when designing roads and illustrates successful approaches used in other highway projects. Starting with the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, Congress made a commitment to preserving and protecting...
the environmental and cultural values affected by transportation facilities. This guide is intended to provoke innovative thinking for fully considering the scenic, historic, aesthetic, and other cultural values, along with the safety and mobility needs, in developing highway projects. It does not establish any new or different geometric design standards or criteria for highways and streets in scenic, historic, or otherwise environmentally or culturally sensitive areas, nor does it imply that safety and mobility are less important design considerations.

Flexibility in Highway Design is correlated to a large extent to the Green Book because that is the primary geometric design tool used by the highway design community. Projects highlighted in this guide were achieved working within the parameters of the Green Book to obtain safety and mobility and to preserve environmental and cultural resources. These projects used the alternatives that are available within the criteria of the Green Book. Flexibility in Highway Design encourages highway designers to expand their consideration in applying the Green Book criteria by showing possible approaches that fully consider aesthetic, historic, and scenic values, along with safety and mobility.

Options available to state and local highway agency officials to aid in achieving a balanced road design and to resolve design issues include:

- Use the flexibility within the standards adopted for each state.
- Recognize that design exceptions may be appropriate where environmental consequences are great.
- Be prepared to reevaluate decisions made in the planning phase.
- Consider developing alternative standards for different types of local roadways.
- Recognize the safety and operational impact of various design features and modifications.

Examples

1. Bridge Width

The key considerations for bridge width are width of the adjacent roadway and safety performance of the existing bridge. For existing bridges on very low-volume highways, AASHTO guidelines specify that these structures can remain in place without widening, unless evidence exists for a site-specific safety problem related to the width of the bridge.78

The Green Book presents a range of options for traveled way widths for bridges with a span of less than 100 feet, depending on functional classification and ADT. For existing bridges that do not meet the criteria for traveled way width, the Green Book recognizes that those that tolerably meet the criteria may be retained. It identifies some of the factors in considering the retention of existing bridges, including "the

aesthetic value and the historical significance attached to famous structures, covered bridges, and stone arches. Because of this, AASHTO has criteria for minimum roadway widths and minimum structural capacities for bridges that are to remain in place.

Normally, historic bridges cannot be widened without significantly altering aspects of these structures that make them historically significant. The selection of lane and shoulder widths on NYSDOT-managed bridges must be consistent with the New York State "Geometric Design Policy for Bridges" (July 1993), which serves as a standard for designers in determining minimum requirements. NYSDOT’s Highway Design Manual, Chapter 4 – Design Criteria & Guidance for Bridge Projects on Low Volume Highways provides minimum roadway widths for low-volume roads.

2. Bridge Railings

When designing a bridge, designers can either choose to use a bridge railing that has already been designed and crash-tested, or they can design a new one and have it crash-tested. FHWA requires that the railings of bridges on the National Highway System be crash-tested. Currently, there are approximately 60 crash-tested railing designs. These include steel bridge railings, solid concrete barriers, aesthetic steel pipe bridge railings, aesthetic stone masonry-faced concrete, and wood railings. The New Jersey and F-shape concrete safety shape bridge barriers are the most commonly used for new construction projects. Because of the desire for aesthetic barriers, however, other types have been developed. Bridges with lower traffic volumes, little truck traffic, and lower design speeds have the most options in terms of the types of bridge railings that have been crash-tested. Information on approved crash-tested rails is located at http://safety.fhwa.dot.gov/fourthlevel/hardware/longbarriers.htm.

It may be impossible or impractical to provide a crash-tested rail on certain historic bridges, such as trusses. For bridges located on low-volume or low-speed highways, alternate railings may be allowed. At a minimum, obstructions and bridge members at the roadway level should be delineated.

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80 “Flexibility in Highway Design.”

81 TxDOT, Bridge Manual, 2-15.

82 NYSDOT, HDM, 2-1.

83 NYSDOT, HDM, 4-13.

84 “Flexibility in Highway Design.”

85 TxDOT, Bridge Manual, 2-15.
3. **Load-Carrying Capacity**

In certain cases, a minimum load-carrying capacity may be permitted for a bridge if an alternate route is available for large vehicles such as school buses and emergency vehicles. Required load limit signs should be posted on the bridge. New York State “Geometric Design Policy for Bridges” (July 1993) serves as a standard for designers in determining minimum requirements for live loading.  

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87 NYSDOT, HDM, 2-4.