

APPENDIX B

Detailed Preservation and Rehabilitation Guidelines

from State of Hawaii Historic Bridge Inventory and Evaluation

Draft Report, May 1996

DETAILED PRESERVATION AND REHABILITATION GUIDELINES

I. Continued Use for Vehicular Purposes

A. Structural Upgrading

1. Identify the structural system and its individual character-defining features

- a) The structural system should be evaluated using non-destructive testing techniques, where possible.
- b) Passive solutions which adjust the live load by restricting vehicles should be explored, examples include load posting, signaling, and channeling.
- c) The structural system should be respected, and its visual characteristics should be retained if modifications are necessary.
 - (1) The original load-carrying system should be retained, if possible.
 - (2) The dead load should be reduced by providing a lighter deck system, if possible.
 - (3) If the load-carrying system must be altered, the character-defining visual qualities of the original structural system should be retained. Modified systems which can be visually minimized include the introduction of structure continuity and other methods of reinforcement.
 - (4) If visual modifications are necessary, they should be kept as unobtrusive as possible.
 - (a) Modifications may include changing the configuration of isolated members or the addition of helping structures.
 - (b) Supplemental members should be added as needed under the deck of the structure, if possible.

2. Modifications should follow the following guidelines

- a) Visually intrusive structural modifications should be kept as inconspicuous as possible, and should affect only secondary views, if possible. Consideration should be given to whether there is a primary view.
 - (1) Bridges which carry highways are seen by roadway travelers from afar, in elevation, and while traveling on the bridge deck. Modifications should be made with this in mind.
 - (2) Where circumstances are such that the primary view is from below the bridge, such as an overpasses, modifications should be made accordingly.
- b) Modifications should be so designed that there is the least possible loss of historic material, and so that the character-defining features are not obscured, damaged, or destroyed.
- c) Structural modifications, or helping structures, should be clearly differentiated from the historic bridge. The design should be compatible in terms of mass, materials, scale, and detail.

- d) Traffic railings, or safety barriers, should be designed to meet requisite load requirements, and at the same time should be designed and installed so that character-defining features of the bridge are not obscured or damaged.
- e) Deteriorated structural elements should be replaced in kind or with a material which duplicates the visual appearance of the original element.

B. Geometric Modifications

1. Evaluate the geometric constraints of the bridge in the context of the overall highway network. Determine realistic needs for geometric parameters in light of connecting highways, projected traffic volumes, accident history, and the proposed nature of future traffic needs.
2. Explore passive (off-bridge) solutions.
 - a) Adjust alignment of the approaches, restrict the bridge to one-way traffic, or both.
 - (1) Create holding lanes for traffic at the approaches to a one-lane bridge with appropriate provisions for safety.
 - (2) Leave the historic bridge in place for one-lane traffic and move a visually compatible historic bridge to an adjacent site to carry the second lane.
 - (3) Leave the historic bridge in place for one-lane traffic and construct a visually compatible new bridge on an adjacent site to carry the second lane.
 - b) The flow of approaching traffic should be adjusted by restricting vehicles, restricting speed, or installing signs and traffic signals.
 - c) Provide sidewalks external to the bridge for pedestrian safety.
 - d) The bridge should be widened by cantilevering a new deck from either side of the existing structure, where structurally feasible and aesthetically and historically appropriate.
3. Alter the geometric configuration of the bridge to remedy geometric deficiencies.
 - a) To increase the vertical clearance on through bridges, the depth of the portal frames and sway frames should be reduced with minimum possible destruction of historic fabric.
 - b) To increase the vertical clearance on grade-separation structures, the superstructure should be raised or the roadway lowered.
 - c) To increase the roadway width, some types of structures can be modified (e.g., multigirder, some concrete and stone bridges). Modifications should be designed to be compatible with the original structure.

C. Materials Repair and Maintenance

1. Identify features that are important in defining the overall historic character of the bridge.
2. Historic materials should be repaired, if possible. If replacement of a feature is necessary, it should be replaced in kind or with a compatible substitute material.

a) Masonry Superstructure and Substructure

- (1) Drainage and vegetation
 - (a) Provide proper deck drainage systems which do not damage or promote deterioration of the superstructure or substructure
 - (b) Remove vegetation growing on bridge superstructure or substructure.
- (2) Cleaning
 - (a) Clean masonry only when necessary to halt deterioration or to remove heavy soiling.
 - (b) Clean masonry with the gentlest method possible.
 - (c) Use cleaning method on test patches to determine long-range detrimental effect of cleaning.
- (3) Repointing
 - (a) Remove deteriorated mortar by carefully hand-raking the joints to avoid damaging the masonry.
 - (b) Duplicate old mortar in strength, composition, color, and texture.
 - (c) Duplicate old mortar joints in width and joint profile.
- (4) Repair of deteriorated sections
 - (a) Replace extensively deteriorated or missing features in kind or with a compatible substitute material.
 - (b) Replace masonry sections that are not repairable, in kind, using the same materials or compatible substitute materials. Dismantle deteriorated sections by hand, and with care.
 - (c) Do not apply nonhistoric coatings, such as stucco, gunite, and sealants, to masonry surfaces as a substitute for repointing and masonry repairs.

b) Metals

- (1) Cleaning
 - (a) Identify metal prior to cleaning and test for gentlest possible cleaning method.
 - (b) Use the gentlest possible cleaning methods for cast iron, wrought iron, and steel (structural metals found on historic bridges) to remove paint buildup and corrosion. If hand scraping and wire brushing prove ineffective, low pressure dry grit blasting may be used as long as it does not abrade or damage the surface. Test patches should be cleaned to determine damage.
- (2) Repaint with colors that are appropriate for the historic bridge.
- (3) Replace deteriorated or missing decorative elements in kind or with a compatible substitute material.

c) Wood

- (1) Repair historic wood features by patching or reinforcing, using recognized preservation techniques.
- (2) Replace in-kind historic wood features which need to be replaced. If replacement in-kind is not possible, substitute materials that are compatible in texture and form, and that convey the same visual appearance as the original.

D. Removal to a Less Demanding Site

1. If possible, seek a less demanding site on the existing transportation system.
2. If possible, find a new owner for the historic bridge among public agencies such as state parks and recreation departments, or county or municipal parks departments, or state tourism agencies.
3. If a new owner cannot be located in the public sector, an owner in quasi-public or nonprofit groups should be sought.
4. If no recipient can be found in public or quasi-public groups, an owner in the private sector may be sought.
5. Ensure that the recipient of the bridge is prepared to maintain it, and rehabilitate it if necessary. A preservation covenant or restriction may be necessary to ensure this.
6. When possible, undertake the selection and preparation of a relocation site in the proximity of the original site.
7. Prior to removal, make a complete and comprehensive inventory of all bridge parts. The parts should be carefully numbered and referenced to the inventory for identification.
8. If possible, remove the bridge without disassembling.
9. If disassembly is necessary, disassemble the bridge in such a manner as to allow for its reassembly.
10. Reassemble the bridge to duplicate its original configuration.
11. Do any required cleaning or repair of the bridge in conformance with previously stated guidelines as appropriate.

II. Continued Use for Non-vehicular Purposes

- A. Where feasible the bridge should be retained in a transportation or transportation-related function.
 1. While the most feasible transportation use may be to leave the bridge in place as a bicycle or pedestrian crossing, or to move it to a public park or recreation area for the same purpose, other uses and other locations should not be precluded, including ones that involve private ownership.
 2. Adaptive use *in situ* will often be the only alternative for masonry or concrete bridges because of their nature or size. However, others are movable, particularly metal and timber trusses. In instances where the features in the immediate vicinity of the bridge have an associative value, preference should be given to adaptive use *in situ*. This is particularly important where the bridge is located within the boundaries of a historic district, or is clearly associated with contemporary transportation or industrial features.
 3. In choosing among alternatives, greater consideration should be given to those factors that will enhance or protect the historic bridge than to the specific nature of the adaptive use or its location. Such factors include: provision for maintenance; protection from vandalism; accessibility to the public; and opportunities for interpretation.

4. While an adaptive use may reflect a reduced level of loading, structural adequacy for the new use must still be determined, and rehabilitation undertaken when appropriate.
 5. The selection and preparation of an alternative site should be undertaken with sensitivity to the historical use and siting of the bridge.
 - a) A bridge that has distinctive features that link it with a particular use should be used in its historical context.
 - b) Bridges should not be placed where they are clearly too long or too short for the obstruction that they span, and skews generally should be avoided. New abutments should be of compatible design and clearly distinguishable from the historic bridge.
 6. Consistent with safety considerations, the structure itself should be returned to its historic configuration by removing visually obtrusive, non-character-defining elements that may have been added to permit the bridge to serve its present function, but which are not required for the new function. These might include elements added to enhance stiffness or load capacity, or secondary features, such as modern decks and guardrails.
 7. Elements which have been added to the bridge over the course of its history and which are determined to be character-defining should not be removed.
 8. Missing nonstructural elements of the bridge, including decorative features, that are distinctive of the style, type, or period in which the bridge was built should be replaced if they can be replicated from similar elements that survive on the same or a similar bridge.
- B. If it is not feasible to retain the bridge in a transportation-related function, consideration should be given to non-transportation-related uses including public recreational uses, use as interpretive sites or museums, or architectural adaptations that could provide residential, commercial, or educational space.
1. In such instances, the adaptive use should not obscure or alter the essential elements of the structure that impart its identity and significance as a bridge.
 2. If the bridge is to remain or be moved within a historic district, careful consideration should be given to the compatibility of the proposed use with the architectural and historical character of the historic district.
 3. Items A.1., A.2, and A.7 above are equally applicable to architecturally adaptive uses.
- C. If an adaptive use cannot be found, consideration should be given to retaining the bridge either in place or at an alternative location as a historical ruin or monument.

III. Replacement With Mitigation

- A. Documentation: The primary criterion in documenting historic bridges is whether the bridge can reveal information critical to understanding and interpreting bridge design, fabrication, engineering, and technology. Documenting bridges can contribute to understanding the development of transportation systems in the United States. Moreover, documentation provides information on the lives and works of individuals and engineers

who contributed to advancing bridge technology. The following guidelines are recommended for documentation of historic bridges:

1. When a bridge has been determined to be eligible for the National Register of Historic Places and all alternatives for preservation are exhausted, the federal and state agencies involved should consult with the appropriate Regional Office of the National Park Service (Western Regional Office in San Francisco) to determine the documentation level required. Generally, the levels of documentation correspond to the level of significance of the bridge as follows:
 - a) Documentation Level I for bridges of national significance requires
 - (1) measured drawings,
 - (2) large-format contemporary photographs,
 - (3) photocopies of selected existing drawings (when available),
 - (4) historic photographs and illustrations, and
 - (5) written data.
 - b) Documentation Level II for bridges of state significance requires
 - (1) photocopies of selected existing drawings (when available),
 - (2) historic photographs and illustrations,
 - (3) large-format contemporary photographs, and
 - (4) written data.
 - c) Documentation Level III for bridges of local significance requires
 - (1) dimensioned sketch plans and elevations showing bridge configuration,
 - (2) large-format contemporary photographs, and
 - (3) written data.
4. Individuals compiling documentation should be professionally qualified with demonstrable experience in bridge history and in documenting historic bridges.
5. Documentation should focus on the existing bridge and should be an accurate record of existing conditions supplemented by information obtained from reliable secondary sources with documentary limitations clearly stated.
6. Documentation should be prepared in such a manner as to permit the independent verification of information.
7. Documentation should be prepared on materials that are readily reproducible, durable, and of standard sizes that meet accession and archival requirements of the Library of Congress.
8. Documentation should be clearly and concisely presented.
- B. Storage and/or Salvage: If storage and/or salvage are part of the mitigation required for the bridge, additional consideration is necessary after Documentation, above, has been completed.
 1. The goal of salvaging parts or all of the historic bridge should be identified in order to determine appropriate treatment.
 2. If future use of the bridge is anticipated, a comprehensive inventory of all bridge parts should be completed. The bridge parts should be carefully numbered and referenced to the inventory for identification.

3. If future use of the entire bridge is anticipated, the bridge should be dismantled with care in such a way as to allow reassembly. The bridge parts should be stored in a place where they will be protected from deterioration.
4. If only portions of the bridge will be salvaged, those portions should be removed with care and stored or delivered to the new owner.
5. Guidelines included in Section I-D: Removal to a Less Demanding Site, may be applicable.

IV. Special considerations for Bridges Located in Historic Districts

- A. In consultation with the State Historic Preservation Officer (SHPO), designated historic districts and their important characteristics should be identified.
 1. Identify features which are important in defining the overall historic character of the district.
 2. Identify character-defining features of the historic bridge and its relationship to the buildings, streetscapes, and landscapes in the historic district.
- B. The treatment to be given historic bridges should be established with reference to the Priority Levels presented in the section on Standards and Guidelines for the Treatment of Historic Bridges.
 1. If the bridge is a historic bridge and/or contributing structure within the designated historic district, rehabilitation options may include:

Priority I: Continued Use for Vehicular Purposes, or
Priority II: Continued Use for Non-vehicular Purposes
 2. When the bridge cannot be upgraded adequately for continued vehicular use and the site precludes other uses, the historic bridge may need to be replaced. This alternative may require replacement with mitigation, including documentation.
 3. In addition to the evaluation of appropriate treatments for the historic bridge, the design of the replacement bridge should include consideration of the new bridge's compatibility within the historic district.
- C. New bridges built in existing historic districts, whether replacement bridges or not, should be designed to be compatible with the character of the historic district in which they are located.
 1. The design and construction of the new or replacement bridge should be compatible with the bridge site and the historic character of the district in terms of size, scale, design, materials, color, and texture.
 2. The design of the new or replacement bridge should preserve the historic relationship between the bridge, its site, and the buildings adjacent to it.
 3. The design of the new replacement bridge should retain the historic relationship between the overall bridge siting and streetscape and landscape features in the district.

4. If the historic substructure is sound, the replacement bridge should incorporate it as part of the new bridge.