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THE COMMONWEALTH OF MASSACHUSETTS

HIGHWAY DEPARTMENT

ENGINEERING DIRECTIVE

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NON-NHS BRIDGE R&R POLICY

The purpose of this Engineering Directive is to formally notify Department Personnel of the Department's current DESIGN POLICY - BRIDGE R&R PROGRAM FOR NON-NHS ROADWAYS. The policy is in effect immediately.

This replaces existing policy P-91-06, ENGINEERING DIRECTIVE FOR REPLACEMENT & REHABILITATION OF FEDERAL-AID SECONDARY AND OFF-SYSTEM BRIDGES.

The major difference between the current policy and the one it replaces is that the Non-NHS Roadways include those that were formerly Federal Aid Urban Systems Roadways. The previous policy did not include these.

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DESIGN POLICY - BRIDGE R&R PROGRAM

FOR NON-NHS ROADWAYS

There are over 1500 Massachusetts bridges on public roadways that are closed or structurally deficient. The policy of the Massachusetts Highway Department (MHD) is to replace or rehabilitate as many structurally deficient bridges as can be accomplished with available funds. The following guidelines are intended to facilitate the design of replacement structures by eliminating unnecessary right of way and environmental impacts most often associated with approach roadways. Such designs will be undertaken utilizing MHD standards and sound economic practice.

These guidelines apply to roads in the following functional categories:

- o Minor Arterials
- o Urban Extensions of Minor Rural Arterials
- o Collectors
- o Secondary Roadways
- o Local

1. All Massachusetts bridges on public roads are included in the National Bridge Inventory. The purpose of this inventory is to develop and maintain a current sufficiency rating on every public bridge. Bridges with a sufficiency rating of less than 50.0 will be eligible for replacement or rehabilitation while those with a sufficiency rating of 80.0 or less will be eligible for rehabilitation. Bridges that are to be rehabilitated must have the potential

for an extended service life. The life of a rehabilitated structure should be proportional to the funds expended when compared to the cost of a new bridge and the expected service life of a new bridge. Bridges which have the potential to become functionally obsolete (land use changes or development excessively increasing traffic volumes) are poor candidates for rehabilitation regardless of their sufficiency rating. If the potential for an extended service life does not exist, reconstruction should be considered.

2. The MHD will consider the replacement/rehabilitation of a deficient bridge, as a spot improvement on the existing line and grade when no present or planned improvement is contemplated on the connecting roads to the bridge site.

3. The curb-to-curb width of the replacement bridge shall be the same as the curb-to-curb width of the approaches as measured at the immediate vicinity of the existing bridge. For approach roadways with no curbing, the curb-to-curb width of the replacement bridge shall be the same as the approach roadway width, inclusive of usable existing shoulders, in the vicinity of the existing bridge. If the approach roadway is artificially restricted by a taper to meet a narrow bridge, the measurements shall be made at the beginning of each taper. In the case of realignment, the measurements shall be made within the touchdown points to the existing road.

4. Usable shoulder as defined by AASHTO is the unobstructed graded area at the side of the road for lateral clearance. The shoulder material may be a paved surface, gravel, or grass. The cross slope of the shoulder area must be 12:1 or flatter. To determine the usable shoulder for design of these projects, the following procedures shall apply:

- Where curbing exists, the combined traveled way and shoulder width shall be measured from face-to-face of curb.
- Where guardrail exists, the combined traveled way and shoulder width shall be measured from the face of guardrail. New guardrail shall be placed on the same alignment as existing guardrail.
- Where the foreslope continues at 12:1 or flatter in a cleared area, refer to the Department's Massachusetts Highway Design Manual, Chapter 5, Section 5.1.1 for recommended usable shoulder widths.
- Where the roadway foreslope is steeper than 12:1, but flatter than or equal to 4:1, the usable shoulder width shall be measured from the edge of the traveled way to the break point of the foreslope (i.e. the I.T.).
- Where the roadway foreslope is steeper than 4:1 the usable shoulder shall be measured from the edge of the traveled way to the beginning of rounding of the roadway foreslope.

5. If pedestrian use of the existing bridges is permitted, a sidewalk will be provided for at least one side of any replacement bridge. If an existing bridge is being rehabilitated, and it currently carries no sidewalk, a sidewalk need not be added. Sidewalks on the approaches shall be carried across all replacement structures. Reference Section 5.1.6 of the Massachusetts Highway Design Manual.

6. The minimum design load for replacement bridges shall be the HS20-44 loading.

7. If the existing bridge is considered eligible for historic preservation, a study will be made to determine the proper method of preservation. In the case in which a bridge is no longer to be used for motorized vehicular traffic, the bridge may be relocated or otherwise preserved at a cost not to exceed the estimated cost of demolition. In the case in which a bridge is to be rehabilitated with continued use for motorized vehicular traffic and the historical integrity is to be maintained, the load capacity and safety features shall be adequate to serve the intended use for the life of the bridge at a reasonable cost.

8. Vehicular accident records at or near the existing bridge site will indicate whether geometric design improvements on the approach roadway should be examined. If the replacement bridge is in the same location and has the same profile as the existing bridge, a design speed need not be selected, regardless of whether the bridge is the same width, or widened to meet the approach roadway. If geometric improvements are required, the existing approach roadway width, as previously defined, shall be used for design of the improvements. The selected design speed will be related to the observed running speed. Improved warning signs, permanent pavement markings and new highway lighting shall be considered in lieu of costly realignment and profile changes.

9. When the bridge is reconstructed on the same location, the most economical and efficient construction procedure is to close the bridge and detour traffic. The detour should be signed and the bridge site should be protected from traffic. Bridge reconstruction should typically last no more than one construction season.

10. If the existing bridge can be partially removed without destroying the integrity of the remaining portion of the structure, stage construction may be warranted. Stage construction is more expensive and may need two (2) construction seasons. A warrant for this increased cost would be a detour of significant length which could adversely affect public safety such as adequate police, fire or ambulance protection. Another warrant would be if the detour route could not safely accommodate the increased traffic. The stage construction would allow one-way traffic to use the bridge in the direction from the fire station or other source of public safety. Twenty-four (24) hour traffic control by an actuated signal for two-way bridge traffic may be used for low volume roads. A temporary vehicular and/or pedestrian by-pass bridge may be considered.

11. Design process for Federal-Aid Non-NHS Bridges.

a. From Paragraph 1: The type of bridge improvement (i.e. replacement or rehabilitation) is determined from the sufficiency number. Rehabilitation is considered to be strengthening the existing bridge. Replacement is considered to be construction of a new bridge.

b. From Paragraphs 3 and 4: Measurements are taken in the field at the existing bridge to determine the design width of the replacement.

c. From Paragraph 8: The MHD statewide accident record system data furnished by the Registry of Motor Vehicles and local police department can be used to provide a recent history of accidents at the existing bridge site. The bridge site itself should be examined for evidence of vehicular accidents. A review of this accident history and a comparison to statewide averages will indicate if a geometric improvement should

be considered.

d. A key element of any approach roadway geometric improvement is proposed design speed. The design speed selection as expressed by AASHTO is related to the observed running speed on the length of roadway including the existing bridge site. Once it has been determined that a geometric improvement is required, a study of the running speeds will be performed by the Department to determine the design speed for the geometric improvement. The selected design speed will give horizontal and vertical design criteria for the geometric improvement.

e. Another element of the bridge improvement will be the cross sectional area of the bridge opening. In the case of a railroad bridge transferred to the Department under Chapter 634 of the Massachusetts General Laws, the Law states that the MHD only has to provide the same opening. Furthermore, Transportation Bond Issues enacted by the Massachusetts Legislature state "that in case of any state highway or other bridge crossing over railroad right-of-way or railroad tracks, the Department shall seek the opinion of any railroad company, or its assigns operating on said track of a desirable clearance between said track and the state highway bridge, but said clearance shall be at the discretion of the Department". Accordingly, the MHD will attempt to cooperate with the railroads to improve lateral and vertical clearance whenever practical and economically feasible. However, lateral and vertical clearance changes greater than existing openings, are at the discretion of the MHD. In the case of a bridge over water, when the

hydraulic opening is being altered, a hydraulic study will be done to determine the proper opening. When the hydraulic opening is not being altered, a study will only be done if there are any indications from the District, Maintenance, or from inspection or rating reports that a problem exists. This study will consider the upstream and downstream impacts of changing the opening. In the case of a bridge over a roadway an investigation shall be made to determine if there are any planned improvements to this roadway. If widening or alignment improvements are being considered for the roadway under, these proposed improvements shall be reflected in the design of the new bridge.

f. When required, approach roadway geometric improvement design will be developed and a preliminary cost estimate prepared. The impacts to the environment will be assessed. The design will be evaluated by costs, traffic service during and after construction, and impacts to the environment to arrive at a selected improvement.

g. Local officials and citizen input will be obtained through the public hearing process and informational meetings. Before the bridge project is advertised for bids for construction, the municipality shall execute any required traffic control agreement ~~with the~~ Department.

h. Environmental procedures will be documented. A list of Environmental Actions/Permits which may be required for bridge projects is presented in Appendix A. The type of actions or permits required depends upon the scope and geographic location of the project.

12. This constitutes the Design Policy for all Federal-Aid Bridge R&R projects except NHS Roadways. All projects designed under this criteria will be approved by the Chief Engineer. Waivers from any of the above criteria will be requested by the Highway Design Engineer for in-house projects and by the Manager of Engineering Expediting for consultant designed projects. The request will be made through the Deputy Chief Engineer for Highway Engineering, who will forward the request, along with his recommendation, to the Chief Engineer for final approval.

APPENDIX A

Section 404 Permit	U.S. Army Corps of Engineers
Section 9 Bridge Permit	U.S. Coast Guard
Section 106 Historic\ Archaeological Review	FHWA\MA Historical Commission
Water Quality Certification	MA. Dept. Environmental Protection
Coastal Zone Management Consistency Certification	MA. Coastal Zone Management
Section 4 (f) Clearance	FHWA
National Environmental Policy Act (NEPA)	FHWA
* MA. Environmental Policy (MEPA)	Executive Office Environmental Affairs
* MA. Wetlands Protection Act	MA. Dept. of Environmental Protection
* MA. Chapter 91 Waterways Regulations	MA. Dept. of Environmental Protection

* If the replacement bridge is not substantially the functional equivalent of and similar alignment to the existing bridge.