Preventive Maintenance with HBRRP

The New York State DOT would like to receive the flexibility to devote a portion of its HBRRP allocation toward funding Preventive Maintenance actions. The "Preventive Maintenance actions" that we would like to support within the HBRR Program fall into two categories; Corrective actions and Cyclical actions.

The Corrective actions are fundamentally repairs to deteriorated or damaged elements of bridges that are otherwise in good structural condition. This type of work, primary member repair, pedestal repair, joint and bearing repair and replacement, etc., has previously been approved for Federal funding, but not HBRRP, through the State's "Element-Specific" agreement with the FHWA.

The Cyclical actions are basically bridge washing, sealing concrete surfaces, lubricating bearings and painting. This work too, has been approved for Federal funding through our Element-Specific agreement with painting also approved for HBRRP funding.

Our request for funding flexibility with regards to the Corrective actions and the Cyclical program, is meant to facilitate our ability to do the right work on the right bridges at the right time. Our hope is that what follows in this request, clearly outlines our intended actions while illustrating our past successes and detailing the systematic process employed to achieve those successes.

System Overview:

In the late 1980's the NYSDOT adopted and implemented a "Goal Oriented" approach to capital program development. While details of the process, indeed some major details, have changed over the years, the systematic nature of the Department's approach to program development has endured.

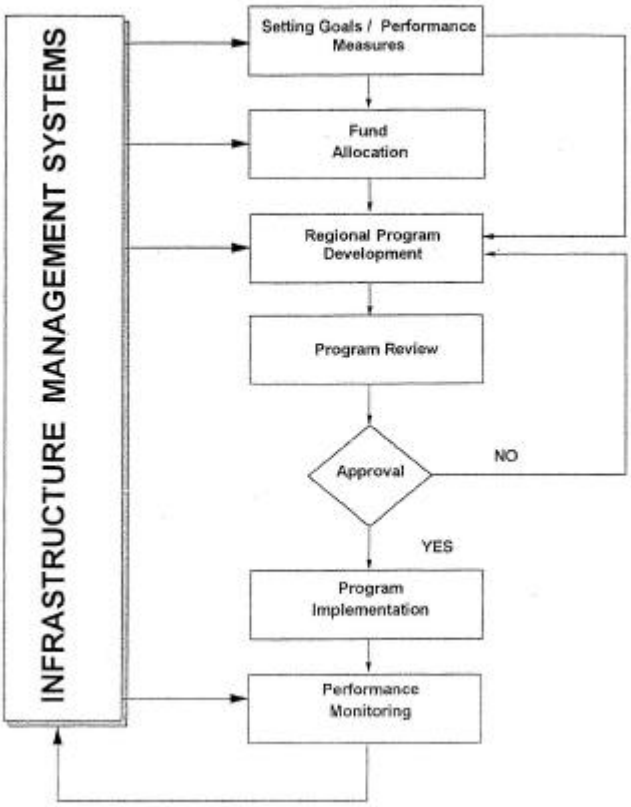
Initially, the primary responsibility for the development of infrastructure goals and associated intermediate targets or measures was assigned to Main Office Functional Units. System needs and allocation formulae intended to equitably distribute funds to address those needs were also generated through Main Office endeavors.

The Bridge Goal development was spearheaded by the Planning Division with significant contributions from the Structures Division. The system forecasting tool used in the development of the goal was the "Bridge Needs Assessment Model" (BNAM), an in-house developed software package. The system characteristic designated to be measured was a bridge's physical condition as expressed by the Department's "Condition Rating". "Condition Rating" is a weighted average of the inspection ratings of 13 bridge elements deemed to be structurally significant. The weights assigned to the various elements represent a "hierarchy" of significance. Element ratings range from "7" - new condition to "1" - totally deteriorated or in failed condition. A bridge with a weighted average condition of less than 5.0 was defined as a "deficient" bridge, and "percent of deficient bridges" was chosen as the specific measure to represent system condition. BNAM, in its "Needs" mode, modeled the bridge infrastructure in terms of its condition profile and identified program candidates and proposed work strategies. The Bridges to be programmed were prioritized by extent of deterioration to key primary features and by overall condition coupled with the level of traffic serviced by the structure. BNAM, in its "Analysis" mode, was able to assess the impact of a proposed work program and predict the state of the system, in terms of bridge condition, after the program period.

Similar exercises occurred in the areas of “Pavement”, “Safety” and “Mobility”. Each of the eleven regions received fiscal allocations, and was directed to develop and submit programs to address the competing needs defined by the various goals. Main Office Functional Units reviewed the regional programs as submitted to assess compliance with their goal of focus and to offer a “reasonableness assessment” of the “balance” of the program relative to all needs. The reviews were interactive, utilizing an open dialogue between the region and reviewer. The reviewers relayed comments to the regions and Executive Management, and the Regions would then present their programs to Executive Management for approval or adjustment and approval. Summary reports and system analyses compiled by Main Office Program Management Units would follow and the projects let to contract would be monitored for compliance with the regions’ submittals.

As stated previously, the details of the Department’s methods may have changed. However, the fundamental principles and activities relative to program development, review, approval and implementation have effectively remained the same. The following flowchart illustrates the Department’s process:

NYSDOT PROGRAM UPDATE PROCESS

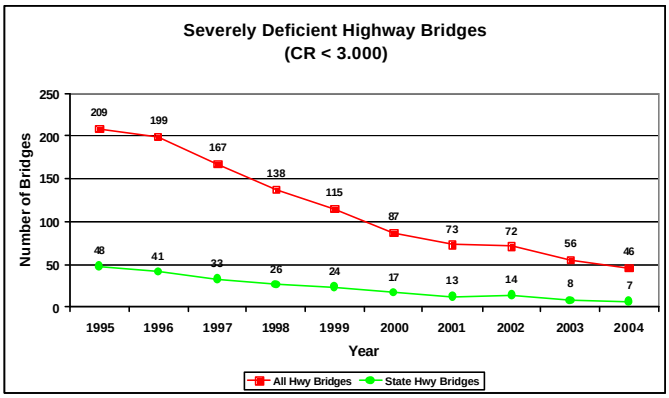


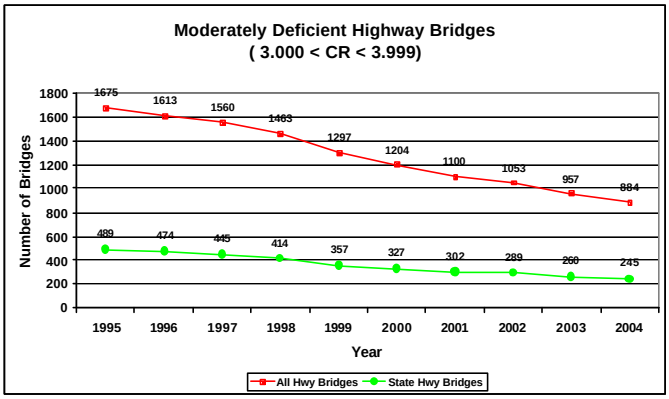
Bridge Program Development:

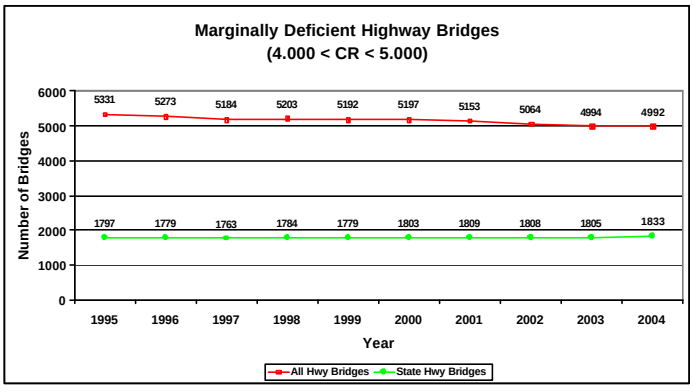
Bridge program development is a regional responsibility. The corporate perspective that guides the program development and specifies intended results is provided by the Main Office Functional Units. This perspective is embodied in the business rules that direct the program process; the detailed goals to be achieved and the prescriptive process specified to identify and develop projects that facilitate goal achievement. The Program Development process is

clearly defined in the Department's guidelines provided to the Regions at the initiation of the Program Update Process. The detailed development of the specific projects for the bridge candidates identified for the program is prescriptively guided by the Department's Project Development Manual and the Bridge Manual.

As our annual Reports of Bridge Management and Inspection Program show, the Department has made steady and measurable progress toward improving the overall condition profile of the bridge infrastructure and certainly in eliminating the system's "bad bridges"; those classified as "Severely Deficient". As we have made progress in eliminating the "bad bridges", the bridge system's Condition Profile has evolved to a point where a large number of our bridges are "Marginally Deficient" and many "Marginally Sufficient".







This profile shift has led us to request the flexibility to devote a portion of our Bridge Funds to preserve, or incrementally improve, the condition of these "good" bridges with cost effective treatments, while continuing our "major" work initiatives on bridges that are needy from a safety or operational perspective.

As referenced earlier, our proposal is to apply a portion of our HBRRP allocations to Preventive Maintenance activities consisting of Corrective and Cyclical actions. We have some history to support the emphasis of these actions.

Bridge Maintenance Program

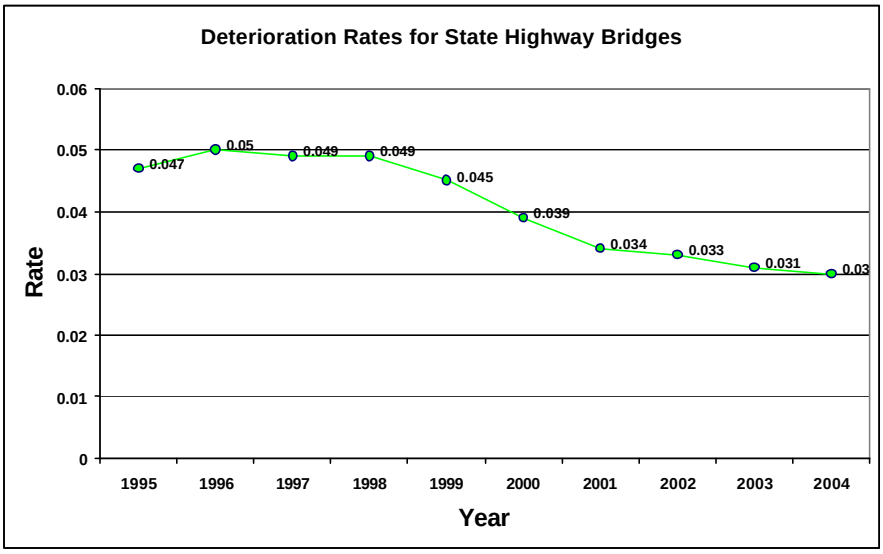
The Department implemented an organized and aggressive maintenance program in the mid 1980's in recognition of the evolving condition profile of the state's bridge infrastructure. As the "Interstate Construction Era" wound down, and the bridges built early in the era began to exhibit signs of wear, we initiated efforts to determine appropriate actions to preserve the investments that we had made. These efforts included instituting "formal" definitions of various maintenance categories, and recommendations as to the identification procedures for suitable bridge candidates for each category and the appropriate type of work to address the structural characteristics that rendered the candidate suitable. Two of the "programs" that evolved were the "preventive" effort and the "5 to 7" effort.

The preventive effort is aimed at nearly all bridges, and focused to retard deterioration and maintain functionality. The core activities of the effort are bridge washing, joint repair/replacement and concrete sealing activities. The nature of the actions is generally cyclical, and candidate identification is based on that principle. Joint repair/replacement is the exception, with candidates identified based on the condition of the joint, the overall condition of the bridge and functional characteristics of the facility the bridge carries. Our Main Office Operations personnel have developed and distributed guidelines to systematically identify these candidates.

The "5 to 7" effort is aimed at a more select portion of our bridge population. The original purpose of the program was to "save" bridges from becoming deficient as defined by NYS criteria, i.e. a Condition Rating (a.k.a., Weighted Average Condition) of less than 5.0. The 5 to 7 program generally directs repairs to the 13 elements included in the Condition Rating formula and concentrates on those elements weighted most heavily, such as the primary members, structural deck, pier columns and cap beams, bridge seats and bearings. While accomplishing the main program objective of "saving" marginally deficient bridges and preventing marginally non-deficient bridges from becoming deficient, the effort arrests deterioration of specific bridge elements and prolongs a structure's functional life in a cost effective manner. Selection criteria and appropriate work strategies have been documented and distributed to the appropriate bridge managers.

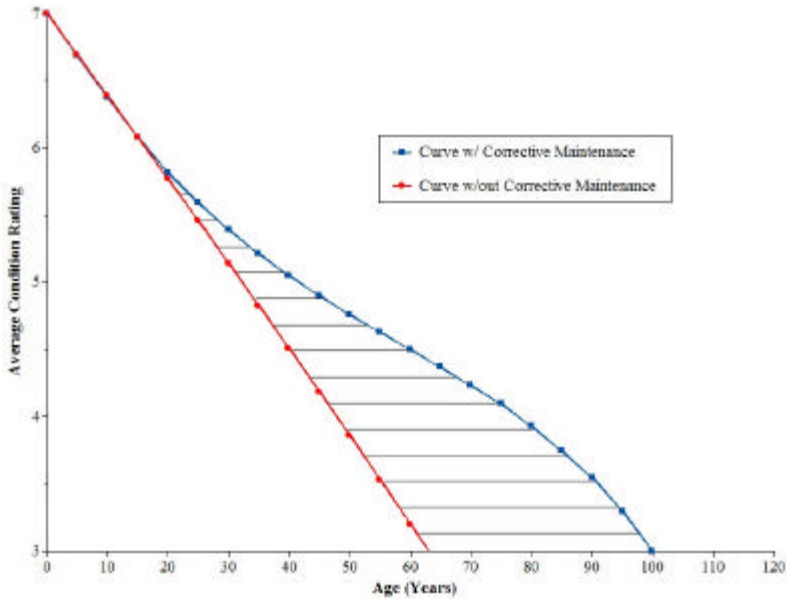
Since we integrated these actions into our Bridge Program development activities we have been able to isolate and measure two system characteristics that support the effectiveness of the actions taken as a compliment to the implementation of our major (capital) work strategies.

First, our annually calculated bridge deterioration rate has improved dramatically. The rate is calculated discounting major work and "measurable" corrective actions. While the improvement was not necessarily consistent in the early years of program implementation, it has been significant over the last nine years as the following graph illustrates:



While the benefits truly "Preventive" activities such as washing, sealing and lubricating are difficult to measure, the methodology employed in developing the values in this graph attempts to isolate such activities by eliminating bridges that have received major work or that reflect a measurable increase in Condition Rating within the period being examined. This exercise reflects an improvement in the deterioration rate for State Highway bridges in the order of 40% over the last nine years. The improvement since the mid 80's (from .161 in 1985 to the current .030) is more than 6 times the improvement over the last nine years.

We employed similar logic to attempt to isolate the "Corrective" ("5 to 7") activities and measure their impact on the State highway system. In this study, an incremental improvement in the Condition Rating, which was assumed to represent the effect of a corrective action, was left in the population of bridges composing a curve that plots average Condition Rating to age and that curve was compared to one that did not include those incremental improvements:



A comparison of the curves indicates that the implementation of Corrective actions extends the non-deficient life of a structure by 30%.

Evaluations of our bridge infrastructure, fueled by these noted and similar studies, highlighted the need for a re-evaluation of the Infrastructure goals that guided our program development process. This re-evaluation led to the formulation of the Department's 21'st Century Bridge Goal:

21st CENTURY GOAL: BRIDGES

GOAL:

Assure a safe and serviceable bridge infrastructure for all public highway facilities in New York State at the lowest practical life-cycle cost.

OBJECTIVES:

1. Safety: Provide mitigation measures to assure that all bridges are safe for their intended use.

2. Preservation: Assure an acceptable bridge infrastructure condition through all appropriate life-cycle actions.

3. Serviceability: Address bridge structural and geometric features that compromise the efficient movement of goods and people, appropriate to the function of the highway facility.

MEASURES:

1. SAFETY

   Identify and address all critical bridge safety needs, related to:
   a. Vulnerability
   b. Structural Condition
   c. Flags

2. PRESERVATION

   a. Accomplish 100% of qualifying cyclical preservation tasks.
   b. Improve average Bridge Condition Index, consistent with Hierarchy-Based Concept (attached).
   c. Improve average Maintenance Condition Index.

3. SERVICEABILITY

a. Load and clearance postings do not compromise the function of the facility.
b. No load or clearance postings on NHS and other specifically identified corridors or routes.
c. Bridge traffic level of service is appropriate to planned function of facility.

The Preservation Objective clearly promotes the corrective and cyclical activities discussed in this document.

"New Direction":

As stated previously, NYSDOT has made significant progress in addressing our severely deficient bridges and has improved the system's condition profile to a point that warrants a conscious "shift" of our program focus to a "Maintenance and Operations First" approach. In this spirit, the Department has recently issued program development guidance (Attachment1) to direct the formulation of the work strategies to be funded in the 2005 – 2010 Program Period.

The "Guidance" promotes Cyclical and Corrective activities that the Department views as comprising a "Preventive Maintenance Program" fundable within the revised parameters of the Highway Bridge Program. The candidates for the activities promoted can be identified utilizing bridge data management tools that are provided to each Region.

The "Systematic" approach to the "overall" program process that is documented in the flowchart on page two of this document, is the process that will guide each initiative implemented in our Maintenance and Operations First Initiative. Our information and management systems will assist us in defining goals, objectives, measures and candidate selection criteria for each initiative. Funds will be allocated, programs developed, reviewed, approved and implemented. Finally performance will be monitored and fed back into the system to refine subsequent iterations of the process. This basic approach has been proven effective over time and will endure any organizational modifications that the Department implements.

Conclusion:

NYSDOT views its program development approach as being systematic and in conformance with the "advance" initiative to fund Preventive Maintenance activities with HBRRP monies. It is an approach that will endure changes in organization and one that can be applied to individual initiatives as they are rolled up into a comprehensive program. The process serves our Maintenance and Operations First approach well and promotes conformance to the Department's 21'st Century Bridge Goal. We believe that our past successes illustrate the strength of the approach, and we request the flexibility to fund our Preventive activities (Element-Specific Cyclical Bridge Work and Element-Specific Bridge Work (Attachment 2)) within the HBRR program.