Program Management Issues

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State departments of transportation generally have a mission statement or other document that sets the direction to be followed in establishing and accomplishing their objectives. This mission statement may include planning, developing, operating, and maintaining a safe, cost-effective, and efficient statewide system of transportation facilities, or simply the goal of protecting the public's investment in transportation.

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Bridges are an important part of the transportation system and investment because of their cost and potential impact on facility use. The management decisions necessary for the bridge portion of the system are unique and require some special considerations. These considerations generally relate to managing the bridge inventory so that its condition remains the same or improves with time while the minimum needs of the public are met or exceeded. To this end, it is necessary to allocate dedicated budget and personnel resources and establish minimum performance criteria to ensure uninterrupted use of these critical transportation facilities for the mobility of people and goods. The established performance criteria will have effects in several areas, including budget activities, design, construction, and maintenance.

Transportation program needs at all levels of government generally exceed the available funding by a large margin. Management must therefore review critically all actions necessary to achieve its minimum objectives and allocate the available funds cost-efficiently. The bridge program must compete with all other funding needs. The shortfall of funds reinforces the requirement for management to base its funding allocation decisions on accurate and current information. This requirement is compounded by the increasing trend to incorporate participation of local citizens in project development, which can result in additional costs.

To help management in its decision making and allocation of resources, a good database with continuous updating is necessary. The compilation of such a database and the identification of needed bridge work begin with bridge inspection. Today's bridge inspection programs are large in scope, well organized, and professionally managed. The data collected can consist of more than 400 data items per bridge. These data provide critical information for decisions that result in a mix of preventive maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridge. Bridges can be identified as functionally obsolete or structurally deficient so that appropriate actions can be planned to reduce the deficiencies and their impact on the usefulness of the transportation system, especially for critical facilities. Some states have established policies that limit the time allowed to mitigate a structurally deficient bridge once it has been classified.

Most states have in place or are developing a bridge management program to provide means of evaluating bridge data and reporting critical trends. Because the databases are so large, it has been necessary to develop automation tools to help in sorting, compiling, reporting, and analyzing the data. The more widely used tools are the Pontis and BRIDGIT software programs. Various specific state programs have been developed as well. With such automation tools, numerous combinations of parameters can be used for comparison and evaluation of the bridge data.

One type of information that can and should be obtained from the data is performance information relative to bridge types, component types, materials, and construction practices. This information can be used to make better choices in design, materials, and construction methods that will give structures longer service lives and the lowest life-cycle costs. The strategy of management should be to

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leverage advances in materials science, design practices, and construction methods, along with an aggressive maintenance program, to extend the useful bridge service life, thus minimizing the need to replace many bridges within a short time. There is also a trend today toward developing major bridge projects for a longer service life by using advanced design and construction practices and high-performance materials.

Other issues that are becoming critical in bridge type selection are construction time and impact on the public during construction. Although these are short-term issues with respect to the bridge service life, they can have a significant impact on costs. The public is demanding reduced construction times and fewer impacts on businesses, adjacent landowners, and motorists. Meeting these demands requires evaluating bridge concepts that involve quick construction with minimum impact on the motoring public, such as off-site prefabrication and quick field erection. As a result, the desire to use other structural concepts based on long-term performance may be overridden.

Maintenance of bridges is a major concern for management because of the long-term impact on the budget and operation of the facilities. The overall objective of bridge maintenance is the safety and preservation of existing bridges. Maintenance and timely repair activities keep bridges in good condition, avoid more expensive repair or replacement costs in the future, and ensure that the bridges are safe for use by the public. However, the conduct of maintenance activity according to past practices will not keep pace with growing needs. The average age and number of bridges are increasing, resulting in more maintenance demand and cost. Accordingly, management must identify new means of making better use of the available resources.

In summary, the issues raised above reflect the complexity of the bridge program and its continuing challenges for management. The bridge program involves several disciplines within a transportation department that must work as a team so that decisions will be made with the objective of ensuring that all bridges will serve the needs of the public at the lowest possible cost.

Bridge Management Software Programs

EDGAR P. SMALL AND JAMES COOPER

BRIDGE MANAGEMENT DECISIONS are currently made using priority ranking procedures or rating formulas. For example, federal funding eligibility for bridges is determined on the basis of the sufficiency rating, which is calculated using information from the National Bridge Inventory (NBI). This rating combines information reflecting the structural adequacy of the bridge and the associated effect on public safety; the serviceability of the bridge, and whether the structure adequately services user demands or is functionally obsolete; and how essential or important the bridge is to the traveling public.

The ratings are determined by means of a point deduction system. A new bridge would receive a sufficiency rating of 100, given that the structure met or exceeded all level-of-service criteria. A failed structure would receive a rating of 0. Bridges with sufficiency ratings of 50 or lower are eligible for federal replacement funds, while bridges with ratings between 50 and 80 are eligible for rehabilitation funds. Sufficiency ratings often provide a basis for state bridge management activities.

This form of bridge management is responsive to specific conditions and is intended to address the worst structures first. Future conditions and future traffic demand are not considered in calculating the sufficiency rating. Given static and potentially shrinking funds, it has been widely recognized that a new form of bridge management is required. In

Beautiful Railway Bridge
of the Silv'ry Tay!
Alas! I am sorry to say
That ninety lives have been
taken away
On the last Sabbath day of 1879,
Which will be remembered for a
very long time.

Poem of William McGonagall,
1880, commemorating the collapse
of the Firth of Tay bridge,
quoted by Joseph Gies in *Bridges and Men*