FHWA Perspectives: A Comprehensive Approach to Major Highway Reconstruction Projects

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On the 30th anniversary of the Interstate Highway Program, with about 98 percent of the system complete, the highway community's emphasis undoubtedly has turned to the rebuilding of our nation's highways (both Interstate and non-Interstate) rather than to expanding through new construction. The highways are being rebuilt for many reasons: safety improvements, resurfacing, modernization and capacity improvements, and repair of deteriorated pavements and structures. This shift in emphasis can be illustrated by noting that between 1983 and 1985, the number of miles of highways and bridges resurfaced, restored, rehabilitated, or reconstructed (4R) was over 15 times the number of miles newly constructed. The emphasis clearly is on rebuilding.

The need for 4R-type improvements is likely to continue well beyond the year 2000. The 1985 report to Congress on *The Status of the Nation's Highways: Conditions and Performance* showed that in 1983, less than 3 percent of the urban Interstate pavements were deteriorated to the point of needing major reconstruction. The report went on to show that by the year 2000, we will need to reconstruct better than 40 percent of the Interstate highways and about 70 percent of the arterials.

This rebuilding effort coincides with the need to maintain and even expand the capacity of existing highways to meet an increasing demand for travel. This is why this conference is so vital: annual increases in travel demand are occurring on highways that also need to be rebuilt. A recent analysis of urban freeway congestion, using the Highway Performance Monitoring System, estimated that traffic will increase on our freeways by nearly 60 percent between now and the year 2000. Further, the analysis estimated that the largest 37 major metropolitan areas will experience a more than 200-percent increase in congested travel and over a 300-percent increase in delay, solely as a result of increases in travel demand.

This conference represents the beginning of a national focus on the skills and approaches needed to facilitate travel by the public during major reconstruction. This issue has attracted the attention of many interests and disciplines, as shown by the conference attendance list of construction engineers, designers, traffic operations engineers, enforcement officials, planners, transit and ridesharing professionals, and contractors. Being at this conference, with its variety of viewpoints, gives me a special opportunity to share with you my thoughts on six areas that we all must

consider as we approach major rebuilding programs. By addressing these areas comprehensively, rather than piecemeal, we can maintain acceptable levels of service while we rebuild the highways. These six areas are corridor analysis, traffic management, work zone safety, public information, contract administration, and coordination.

First, we must look at the entire corridor to identify opportunities to minimize inconvenience to the traveling public. This approach has two aspects, both equally important. From the transportation side, a corridor analysis can reveal opportunities for shifting traffic from the highway being reconstructed onto alternative routes or other modes of transportation within the corridor. The objective must be to find cost-effective ways to facilitate travel by the public through the corridor. The point to remember here is that actions such as alternative route programs, traffic engineering improvements, park-and-ride lots, and ridesharing programs can be effective when developed through a corridor management approach.

The other aspect of corridor analysis is improving coordination and scheduling by contractors so work can be done effectively with a minimum of inconvenience to the public. This coordination of scheduling is especially critical on major rebuilding jobs that cover several miles and involve work at several locations, possibly by multiple contractors. It may be better to do the work over the entire length of the highway for one or two construction seasons, rather than to spread the work out over many smaller individual projects for a longer period. Economics is a concern, but sometimes it is cheaper and causes less inconvenience to start the project, concentrate on completing it as quickly as possible, and then open the area back up to traffic. This was the philosophy for major reconstruction projects along I-376 in Pittsburgh, the Southeast Expressway in Boston, and the Schuylkill Expressway in Philadelphia. Successful and accelerated completion requires good coordination and scheduling by the contractors.

Doing a corridor analysis can also lead to alternative management and project design choices. For example, such an analysis may show that a highway can be closed completely, rebuilt in one season (instead of two) at a lower cost, and result in only a slight increase in delay along alternative routes. The corridor analysis can highlight the trade-offs in design and management that can be made to balance inconvenience to the traveling public and the cost of the construction project. The corridor analysis must be done early in the project development phase if it is to result in cost-effective management and design decisions. Similarly, good traffic management, the second important area in a comprehensive approach, must be incorporated into project design at the earliest stage. How the project is designed affects what actions can be used to manage traffic during the reconstruction. The success of the reversible lane configuration during Boston's Southeast Expressway reconstruction is a good example of how traffic management can be incorporated effectively into project design. Compared with the original roadway, this configuration resulted in higher vehicle speeds and fewer accidents while handling nearly the same traffic volumes. Another example of incorporating traffic management into project design effectively occurred on the Shirley Highway (I-395) in the vicinity of Washington, D.C. When the Shirley Highway was rebuilt in the early 1970s, Virginia highway officials designed the project to allow for a temporary bus lane through the construction zone. This feature not only permitted the efficient movement of people during the reconstruction, but was a major factor in the development of the present high-occupancy-vehicle (HOV) lane on the Shirley Highway.

The relationship between good traffic management and design is an important element in the reconstruction of U.S. 12/I-394 in Minneapolis, to cite another example.

The interim HOV lane established to handle traffic during the reconstruction will become a permanent feature of the final design of I-394.

Good traffic management also includes cost-effective actions to move people and vehicles through the entire corridor, not just on the highway that is being rebuilt. In reviewing some of the reconstruction projects around the country, we find that traffic engineering improvements along alternative routes in the corridor can be the most cost-effective action for managing traffic. When alternative routes are improved with coordinated signal controllers, parking restrictions, and traffic control officers at critical intersections, they can handle up to 25 percent more vehicles. As for expense, the alternative route improvements in Pittsburgh cost about $320,000; in Boston, about $200,000; and on the Ventura Freeway reconstruction in Los Angeles, the cost is expected to be about $500,000.

Other actions should also be thoroughly analyzed for their effectiveness in moving people through the corridor during the reconstruction. Preferential-treatment for high-occupancy vehicles, corridor vanpool programs, park-and-ride lots, express bus services, and the like can reduce demand through the construction area. They may also create long-term changes in commuter travel habits. This change was noticed in Pittsburgh after completion of the I-376 project. About 1,000 commuters switched permanently to vanpools after the reconstruction. The cost of this vanpool program was about $60,000.

Commuter rail improvements are another matter. They may have potential in corridors where commuter rail service existed before the reconstruction. This potential was shown by the projects in Boston and Philadelphia. But from the viewpoint of economics, it is important to analyze the cost-effectiveness of commuter rail improvements thoroughly. Some limited experiences suggest that new commuter rail lines may not be effective at diverting trips from the reconstructed highway. For example, the use of a new commuter rail line established for the reconstruction of I-376 in Pittsburgh cost about $1.6 million and moved only about 500 people daily. Meanwhile, approximately $1 million in traffic engineering actions along alternative routes resulted in an extra 4,700 vehicles using the routes each day. Clearly, the commuter rail line was not cost-effective. In fact, this commuter rail line was discontinued after the first construction season.

Good transportation management should also include provisions for incident management during the reconstruction. Tow trucks, road service, and variable message signs can do a great deal to lessen congestion, as was shown by projects in Pittsburgh, Boston, Chicago, and Philadelphia. Anticipating the need for these services helps promote good public relations for the state.

Traffic management to minimize delays to the public may also include the use of innovated designs, construction materials, and methods that will reduce construction time and exposure. For example, the use of pre-cast concrete bridge deck panels can speed up bridge repair and reduce delay to the traveling public. This was shown by successful bridge projects in California, Connecticut, Delaware, Illinois, Maryland, New York, and Pennsylvania.

A final point about traffic management involves economics. Some reconstruction projects have traffic management programs that account for 10 to 15 percent and even up to 20 percent of total project cost. These programs do drive up the cost and, therefore, require thorough analysis to determine which actions are cost-effective and what trade-offs can be made.

The third essential area to address is work zone safety. While traffic flow, construction schedules, and economics are critical to a reconstruction project, the safety of the workers and people passing through the project must be given significant

consideration. From 1982 to 1985, work zone fatalities on the Interstate System alone increased from about 90 to 200, a reflection in part of the increased work that resulted from additional funding approved in early 1983 for Interstate 4R projects. About 15 percent of all work zone fatalities involve pedestrians, many of whom may be employees of the state or the contractor. Of course, reducing vehicle demand by instituting good traffic management programs will help address this work zone safety problem, and we will continue to emphasize safety in work zones. However, the states and contractors can have the most impact on safety by using effective traffic control plans for reconstruction projects.

Public information and relations is a fourth area of major importance to a comprehensive approach for reconstruction projects. It is one thing to develop transportation management actions, but making the actions effective requires a good public information program. The successful rebuilding projects have all had strong programs to inform the public and the media of the reconstruction project and of the alternative routes, modes, and services available. States such as Massachusetts, Minnesota, New Jersey, New York, Pennsylvania, and Washington, for example, have prepared commuter guides for informing the public. A good public information program is an essential part of a reconstruction project. We have noticed that it can lead to good public and political support for state projects.

In this type of project, contract administration demands more attention than usual. Construction oversight for a reconstruction project is different than it is for a traditional new construction project. When feasible, incentive/disincentive clauses can do a lot to accelerate construction progress or to keep a project on schedule. These provisions are most effective for 4R, bridge reconstruction, or other projects where traffic inconvenience and delays can become significant. Evaluation of these provisions showed they were not abused and were valuable construction tools. They should be used when experience or analysis shows they will be effective in reducing inconvenience, saving money, benefiting the public, and increasing safety. Incentive/disincentive clauses are key elements of the contract provisions for major projects under way in Houston, Philadelphia, and Seattle.

We have recommended the use of unit bid prices to pay for traffic control items on major or complex projects, but some agencies have been hesitant to use this approach in their contracts. The separate bid item approach gives contractors a financial incentive to install and maintain traffic control devices properly. It also gives a state better oversight of the traffic control devices. Using separate bid items may mean additional administrative effort and expense; however, states using this concept have found that it is more effective than the lump-sum bid item approach.

The contract should require that materials be provided on site. When we are talking about an accelerated project, material availability and management are critical. To minimize delays, contracts should require that contractors have the materials on site and available. The Pennsylvania Department of Transportation, for example, is doing a good job of this on the Schuylkill project. Another important element of good contract administration is fast decision making. Because reconstruction projects are often on accelerated schedules, decisions for the contractor, the state, and the public must be made as quickly as possible. States and contractors need to streamline and expedite decision making in whatever way they can. This effort may involve the delegation of authority to the lowest level possible. Project engineers should have as much authority as possible to make on-the-spot decisions about the project work plans. Such streamlined decision making will benefit the public by enabling the project to proceed with minimal delay.

The sixth and final area is the need to coordinate all aspects of the reconstruction

plan—public relations, design, traffic management, and contract administration. Coordination should take place not only within the state, but with local leaders, business and civic groups, the media, the transit agency, and the ridesharing agency. An effective way to coordinate this effort is to establish a corridor management team that meets frequently from the earliest design phases through reconstruction. This team can be the focus of planning and decision making on all aspects of the project. Experience in Boston, Chicago, Minneapolis, and Pittsburgh has shown that the management team approach is an effective device for getting things done.

In summary, the theme of this discussion is ways of maintaining mobility and safety while undertaking major reconstruction projects. The six areas highlighted—corridor analysis, traffic management, safety, public information, contract administration, and coordination—all affect how well we can do this. We must understand the trade-offs that exist in trying to balance the need to facilitate travel by the public with economic, engineering, and design concerns. This conference is enabling us to take a significant step toward establishing a comprehensive view of major highway reconstruction projects.

Before closing, I want to call your attention to the FHWA case studies report, *Corridor Traffic Management for Major Highway Reconstruction,* that was prepared for this conference. This report includes summaries of a variety of reconstruction projects, a reprint from the *Federal Register* on the use of incentive/disincentive provisions, a summary of ways to expedite expressway and bridge rehabilitation, and a statement on applying traffic management actions. In addition, the report contains abstracts and summaries of current literature. It is available from FHWA, U.S. Department of Transportation.