

Road Design – A Turn Ahead

by Edward T. McMahon

Has your local government ever been notified that the state highway department is planning to “improve” a rural scenic road, reconfigure a congested suburban intersection, or replace a historic bridge in your community?

Each year American communities are presented with plans to expand or rebuild streets, roads, and bridges. Whether the community is rural or suburban, in Eastern Oregon or Northern Virginia, the explanation is almost always the same. A road that local people are accustomed to is said to be deficient. It does not conform to the latest standards. It is not wide enough or it has too many curves. Unless something is done, motorists will experience delays or unsafe conditions.

Plans are presented that call for a road that is straighter, flatter, and above all, wider than before. The highway department calls the project a road “improvement,” but many local citizens are opposed to the project. Why? Because conventional road widening and bridge reconstruction projects often damage scenery, natural resources, and

community character for little or no real benefit.

The conventional approach to road design aims to move more traffic faster, at the expense of everything else. In her book, *The Living City*, author Roberta Gratz tells the story of a small town that seeks help with repairs to an aging bridge, only to be told that repairing the bridge is “not cost efficient.” Only by widening the two-lane bridge to four lanes would federal funds be available. Adding two lanes, however, will require widening and straightening the road that provides access to the bridge. This will,

in turn, require using adjacent parkland, cutting down a row of 100-year-old trees, and demolishing several historic buildings. When local residents oppose the out-of-scale solution they are accused of opposing progress and are told federal rules “require” the new wider bridge.

Does this sound familiar? Well it should because this scenario, in one form or another, has been repeated through America. Over-scaled, over-priced highway projects are imposed, where smaller, less expensive, equally useful and more environmentally benign solutions would do.



STEVE LOSPEICH



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While environmentally harmful, oversized, highway projects are familiar to us all, the good news is that this all-too-common way of designing roads and bridges is being challenged. A growing number of citizens, planners, and local officials are demanding that local transportation improvements incorporate “context-sensitive” highway design (also known as “place sensitive” or “flexible” highway design) to preserve community character and environmental resources.

What’s more, federal transportation legislation now gives states the flexibility



W. SEAVILLE

▲ In Vermont, as in many states, older bridges which seemed to fit naturally into the landscape have been replaced by bridges with far less character. Above is a view of the 329-foot long metal truss bridge spanning the Lamoille River in West Milton, alongside its recently built replacement. There still is a chance the 98-year old bridge may be preserved for use by pedestrians and bicyclists.

◀ No such possibility exists in Waterbury, Vermont, where the 1928 “Smith’s Store” steel truss bridge carrying U.S. Route 2 over the Winooski River (opposite page lower left) was demolished and replaced by a typical highway-style bridge in the early 1990s (left).

to use their own design standards in sensitive locations. Federal law also makes it clear that highway projects should be developed with respect for social, environmental, and cultural resources.

The origin of most state and local road standards is the publication: *A Policy on Geometric Design of Streets and Highways*, also known as the “Green Book.” This publication by the American Association of State Highway and Transportation Officials (AASHTO) sets out recommended designs standards on all federal aid highway projects. Controversy over design standards often arises when state highway departments take the Green Book standards and apply them in a rigid and unyielding fashion

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Road Capacity & Induced Travel

A recent report by the Surface Transportation Policy Project (STPP) has found that increasing road capacity leads to increased traffic loads. Analyzing data provided by the Texas Transportation Institute, STPP found that every 10 percent increase in the highway network results in a 5.3 percent increase in the amount of driving, *over and above any increases caused by population growth or other factors*. In addition, the analysis concludes that road-building has not been an effective congestion-fighting measure. In fact, STPP found that those metro areas that added the most highway space per person saw congestion levels rise at a slightly higher rate than areas that added few roads per resident.

As the STPP report describes: “We split the 68 metro areas included in Texas Transportation Institute’s study into three groups and compared the congestion rates for the high and low group. The high road-building areas increased road capacity per person by 28 percent, while the low-road building areas actually decreased road capacity per person by 11 percent. Despite this wide discrepancy, the rush-hour congestion profiles as measured by the Travel Rate Index for each group are almost identical. Interestingly, the high road building areas show slightly higher congestion levels than the low road-building areas throughout the period.”

As the report notes: “One explanation for this outcome is that new and wider roads tend to generate new traffic. This phenomenon, known as ‘induced travel,’ occurs when road capacity is expanded and drivers flock to the new facility hoping to save time. The new roadways also tend to draw people who would otherwise avoid congested conditions or take alternative modes to their destinations. ... Half of the new highway capacity has been filled with driving that would not have occurred if the road space had not been added. ... In the long run, this encourages additional development nearby, and that leads to even more traffic.”

The report, “Why Are The Roads So Congested? – A Companion Analysis of the Texas Transportation Institute’s Data On Metropolitan Congestion,” is available from the Surface Transportation Policy Project at: (202) 466-2636, or on their Web site: www.transact.org.

Noted transportation policy expert Anthony Downs has also noted that “authorities improve highways to fight congestion, but then those improvements create incentives to (1) increase automobile vehicle ownership and use, and (2) change the location and form of both residential and nonresidential growth.” From, *Stuck in Traffic: Coping With Peak Hour Traffic Congestion* (Washington, D.C.: The Brookings Institution 1994), p. 31.

Wider & Straighter, But Safer?

When arguments are made for why a local road needs to be widened or straightened, improved safety is almost always at or near the top of the list. Many of us automatically assume that road straightening and widening projects will lead to a dramatic reduction in accidents. After all, with wider lanes there's more room to maneuver; sharp turns are eliminated; and the number of intersections is often reduced.

Evan Manvel, Director of Education and Research for 1000 Friends of Oregon, offers some cautionary notes about this line of reasoning:

"If we are concerned about everyone's safety – driver, passenger, pedestrian, and cyclist – we find evidence that traffic engineering which controls speeds, so called 'traffic calming,' is much more effective than widening roads at reducing road accidents. ... Wider, straighter roads with more open sight-lines inspire faster driving. Driving at unsafe speeds is already a factor in almost a third of accidents. ... According to the U.S. Bureau of Transportation Statistics, 85 percent of the factors contributing to motor vehicle crashes were attributable to driver action, 10 percent involved the highway, and 5 percent involved the vehicle. The road environment was found to be the sole factor in only 3 percent of crashes; road users in 57 percent. In 41 percent of all fatal crashes alcohol is involved.¹

Visibility problems and driver fatigue are also major contributors to accidents. Attention to these serious problems is a better way to address traffic safety than road widening and straightening.

Decades of experience with traffic calming (engineering roads to slow traffic down) and programs aimed at driver behavior have demonstrated ways to improve safety other than creating huge roads. These efforts are usually cheaper and more effective, dollar-per-dollar, than realigning or widening roads. NHTSA studies demonstrate a benefit-cost ratio of 9.6:1 for traffic safety programs, while the highest lifetime benefit ratio even road lobbyists estimate for road widening is 2.7:1.² Studies of roads before and after traffic calming efforts show dramatic decreases in accidents, while actual benefits from road widening and straightening are often less than predicted."

¹ These numbers are from *Transportation Statistics Annual Report 1996*.

² "Moving Americans More Safely," NHTSA, Sept. 1991, p. ii



A familiar scene: a road being widened.

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without regard for community or environmental impacts.

Federal law says these standards "can be applied flexibly" and the Federal Highway Administration (FHWA) has produced an easy-to-read manual that thoroughly discusses the issue of design flexibility in federally funded road projects. This publication, entitled *Flexibility in Highway Design*, can be obtained from the FHWA.  [Resources p.8.](#)

Context sensitive design is a collaborative, interdisciplinary approach involving all stakeholders to ensure that transportation projects are designed in harmony with the community and preserve historic, scenic, aesthetic, and environmental resources – while maintaining safety and mobility. But until recently, most communities had to fight to get anything but the "off the shelf" design.

Consider one example: bridge railings. For over a century bridges have been some of America's greatest engineering and manufacturing achievements. Bridge railings were often works of art: metal trusses, concrete balustrades, decorative stone, and other varied materials. However, in recent years, the standard bridge railing – regardless of the type of bridge or location – has become a "Jersey Barrier." This has happened despite the fact that there are

dozens of approved, crash tested alternatives to Jersey barriers.

While maintaining a safe driving environment is fundamentally important to highway design, there are a range of legally acceptable solutions to almost any road design problem. Just consider two recent projects in Brooklyn, Connecticut and Okemos, Michigan.

In Okemos, Michigan, a busy intersection at the corner of Marsh and Hamilton near the local mall was proposed for improvement to eliminate congestion that sometimes resulted in thirty vehicles backed up at the red light. The conventional approach would have added new lanes to facilitate and separate left turns from right turns and through traffic.

Instead, the County Road Commission constructed a new two lane "roundabout" – a modern, smaller-scale variant of the old-style traffic circle. Despite a great deal of initial skepticism, the roundabout has proven to be both popular and efficient. In place of the traffic light the roundabout now safely moves more than 2,000 vehicles per hour with less delay than the old design. Local residents say they like the roundabout and the most vocal critic has even changed his mind. A second larger roundabout designed for more than 3,500 vehicles per hour opened to traffic in August 2000 on the Michigan State University

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Attractively designed bridges, like Wilmington, Delaware's, Washington Street Bridge (left), used to be the norm in our cities and towns. But well-designed bridges can still be built today, as seen in Hanover, New Hampshire (below).

A Maine Perspective

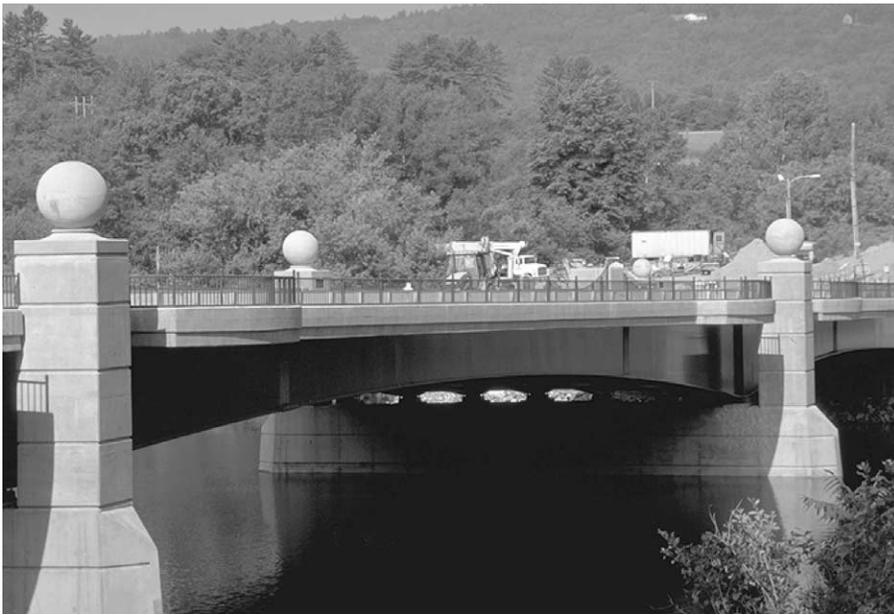
by Kathy Fuller

In the early 1990's, Maine citizens enacted the Sensible Transportation Policy Act. The law requires examination of a range of transportation choices, and applies to transportation planning, capital investment, and project development decisions. It also seeks to integrate transportation planning with social, environmental, and economic objectives.

Since then, the way the Maine Department of Transportation (MDOT) delivers highway projects has changed. Design does not begin until after MDOT project managers hold a pre-design "blank slate" public meeting at which attendees are invited to relate their desires for the final product. From neighborhood friendly improvements like sidewalks, street lights, and landscaping, to business needs for access and free flow of goods and services, this process results in projects that improve both community and transportation. Planning for parkways or bypasses incorporate policies of a community's Comprehensive Plan during evaluation of appropriate alternatives.

Addressing local preferences, however, can create interesting challenges for the transportation professional. For example, communities that designate growth areas along an arterial – a logical, market based approach – are supporting development patterns that can severely undermine the function of that roadway as a long distance, through-travel economic corridor. A solution that works best for a particular community may not work as well from a statewide perspective. Which should take precedence? At Maine DOT, the project development goal is to integrate these often opposing objectives. However, meeting these challenges requires more design time, and often, more money.

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Okemos, Michigan's first "roundabout" replaced a congested, signalized intersection. Since the photo was taken, the chevrons on the central island have been lowered and several of the sign posts consolidated.

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campus in East Lansing. Many others are now being proposed. *Editor's Note: For more on the modern roundabout, see "Roundabouts: What They Are & How They Work" in PCJ #26.*

Another example of context sensitive design is the reconstruction of a twenty-three mile segment of U.S. Route 6 in the Brooklyn, Connecticut, area. The state Department of Transportation first proposed the construction of a by-pass around the Brooklyn town center. When this idea was rejected, the state DOT next proposed widening and realigning the road through the town center. This proposal, in turn, generated considerable opposition on the part of town residents and officials, in part because it would destroy portions of the town green, an historic stone wall, and several large trees.

Connecticut DOT officials agreed to take a fresh look at the entire project. Meetings were held with town leaders, local residents, and state historic preservation office staff to listen to their con-

cerns. The end result: the state DOT agreed to reduce the width of the paved shoulder in the town, eliminate a proposed passing lane, and change the proposed alignment to save the town green, historic wall, and large trees. The revised design achieved the DOT project goals of reconstructing the road, improving roadside drainage, and upgrading the guard rails, while also satisfying local concerns.

Unfortunately, the flexibility shown by Connecticut's transportation department is still the exception rather than the rule. Many state highway departments continue to resist community requests for waivers or flexible application of AASHTO standards. One big reason is a fear of legal liability if an accident occurs on a road not meeting AASHTO design guidelines.

According to the Boston-based Conservation Law Foundation, this fear is unwarranted for two basic reasons: First, "flaws in highway design" are usually considered within the scope of governmental immunity for planning and discretionary functions. While the law of governmental immunity varies from state to state, as a general rule a lawsuit against a highway department or public works office would succeed only if the design received no review, was obviously inherently dangerous, or was clearly made without adequate care.

Second, the plaintiff who manages to overcome the presumption of governmental immunity must still prove the highway department was negligent. Failing to follow AASHTO guidelines does not itself constitute negligence – just as following the guidelines does not necessarily mean the highway department is not negligent. The guidelines simply represent general advice to be considered in the context of all the circumstances of a particular situation.

In fact, Vermont's transportation agency has developed its own road design standards that are more flexible than AASHTO's. The state's standards apply to all roads except those on the federal interstate highway system or part of the "National Highway System." Likewise, the Oregon DOT has taken full



Resources:

Take Back Your Streets: How to Protect Communities from Asphalt and Traffic, Conservation Law Foundation, 1998.

Limited supply available for \$12.15. Call: 617-350-0990.

Getting it Right in the Right-of-Way: Citizen Participation in Context Sensitive Highway Design, Scenic America, 2000. Available for \$5.00. Call: 202-543-6200.

Flexibility in Highway Design, Federal Highway Administration, U.S. Department of Transportation. Available free. Call: 301-577-0818.

A State Highway Project in Your Town? Your Role and Rights: A Primer for Citizens and Public Officials, Preservation Trust of Vermont, 1995. Call: 802-658-6647.

advantage of flexibility within the Green Book when addressing design issues on the historic Columbia River Highway. In addition, five other states – Connecticut, Kentucky, Maryland, Minnesota, and Utah – are working on a FHWA sponsored pilot project to develop context sensitive highway design standards.

The ultimate goal of context-sensitive design is to provide transportation facilities that meet the needs of motorists while also addressing the concerns of the community that the road passes through. At one time in our history we designed transportation facilities that were beautiful as well as functional, that met the needs of people as well as motor vehicles, and that respected local communities. That time may have come again. ♦

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Online Comment

"While incorporated cities and towns have their share of intense traffic problems, county governments have them too, and solutions seem to be very cookie cutter in the typical, 'Let's widen, create more lanes, and put a traffic light ...' approach toward road improvements. How do we get beyond these typical approaches? The states may have more involvement toward design, but my attention is always grabbed when I read solution-based information, along with methods for creating increased working dialogue between local governments and the state agencies (Regional and DOTs) that are charged with many of our highway improvements, since communication is often the most difficult part of the process.

... Certainly, here in Citrus County, we could start working more closely with everyone involved to create more suitable road improvements."

– Larry Frey, Community Development Manager, Citrus County, Florida