

Guide to Creating An Effective Marketing Plan



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**U.S. Department of Transportation
Federal Highway Administration**

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INTRODUCTION

WHAT DOES MARKETING HAVE TO DO WITH HIGHWAYS?

Our highway system is a national treasure. Not only is it the backbone of our economy, handling 70%¹ of the total value of all shipped goods, the freedom of movement it provides is a mark of our open society. And it's a critical element in national security: After 9/11, it was the highway system that the Nation relied upon to move about, and during the 2004 hurricane season, it provided evacuation routes for tens of thousands of Gulf State residents.

But this treasure is no longer pristine, and it's no longer operating at the level it once did. Highways are built to last 20 to 25 years; bridges about twice that. Much of this valuable infrastructure, begun in the middle of the last century, is crumbling. A headline in the May 9, 2007 issue of The Wall Street Journal summed it up: "U.S. Infrastructure Found to Be in Disrepair." And, even where the structural integrity has remained, the system's designs may not be up to current safety standards.

How do you bring a vast highway system up to modern standards? , It is estimated that, using current practices and technologies, federal, state and local expenditures would have to increase by more than \$11 billion annually from now to 2020 just to maintain the highways and bridges at current levels. The transportation agencies of this country are now attempting to do just that, but the techniques being used often cause as many problems as they alleviate. For example, widening a highway to meet the demands of congestion often means making congestion worse through the very process of construction. And both construction workers and motorists are subjected to increased safety hazards in work zones.

Yet, there now exist dozens of innovations and technologies which, if implemented, would result in noticeably faster construction, and higher levels of safety. And, by using them, we would end up with longer life-cycles for highways, often at lower cost than traditional methods. Unfortunately, the process of getting those new approaches moved from state-of-the-art to state-of-the-practice is painfully slow.

It was with that in mind that Congress authorized a pilot program called Highways for LIFE. The "LIFE" in the name is an acronym designed to call to mind the benefits of those new approaches: Long-lasting, Innovative, Fast construction, Efficient, and Safe. Highways for LIFE is focused on getting everyone in the highway community to be open to applying innovative technologies much quicker. The program uses a variety of means to make that happen, including funding for projects which include innovative approaches, training

¹Bureau of Transportation Statistics, According to the composite estimates, trucking as a single mode was the most frequently used mode, accounting for an estimated 70 percent of the total value, 60 percent of the weight, and 34 percent of the ton-miles. www.bts.gov/publications/freight_in_america/html/nations_freight.html

programs for highway professionals, and publicity aimed at raising awareness among both the highway community and the driving public.

One tool that has proven helpful is an effort focused on how to deploy specific innovations faster. For this effort, three innovations with national significance were selected as pilots and designated “vanguard technologies” because of the innovative groundbreaking approach they were to take. For each of the technologies, a dedicated deployment team was established, using individuals from throughout the Federal Highway Administration as partners. The teams’ first task was to develop a marketing plan, complete with their first year’s strategies and budget. The approach to developing a marketing plan came from that effort.

WHAT DOES MARKETING *REALLY* MEAN?

“Innovation isn’t what innovators do...it’s what customers and clients *adopt*.”

- Micheal Schrage, MIT

Most people think that marketing is only about the advertising and/or personal selling of goods and services. Advertising and personal selling, however, are just two of many activities that fall under marketing.

The new definition of marketing, as released by the American Marketing Association, is: “Marketing is an organizational function and a set of processes for creating, communicating and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders.” In general, marketing is identifying the particular wants and needs of a target audience, and then going about satisfying their needs. More simply: *marketing is finding a need and filling it*. This involves identifying and doing market research on your target audience(s), analyzing their needs, and then determining strategies and allocating resources to mesh your innovation with solving their problem.

In many organizations, it's easy for marketing to be seen as a service function. Non-marketers sometimes think, "We'll do the work; you make it pretty." But marketing is much more than creating a brochure. In reality, marketing focuses on discovering what's important to the customer and then positioning products or services, based on those distinct needs.

That's the major difference between the concepts of “selling” and “marketing.” Take a look at the following chart, and put it in the perspective of, say, an automobile company. Having a “selling” focus, as opposed to a “marketing” focus would reveal the following attributes:

SELLING	MARKETING
Focuses on the needs of the seller	Focuses on the needs of the buyer
Preoccupation with the seller's need to convert products into cash; push for higher sales	Preoccupation with the idea of satisfying the needs of the buyer via product creation, delivery, and consumption
Production says, "We'll make it, you sell it."	Marketing says, "They want it, we'll make it."
Seller takes his cues from himself or the competition	Marketer takes his cues from the buyer (market)
Passive involvement with the environment	Active involvement with the environment
Concerned with the present	Concerned with the future

In the case of marketing an innovation or technology, activities such as market research and one-on-one relationship building are critical.

Why is it so important to spend so much time focusing on the customer? "Well," one might say, "It's just the right thing to do." But if that were the key reason, we wouldn't see Fortune 500 companies spending hundreds of millions of dollars every year on marketing. Someone might say, "We're part of the government. It's our job in this democratic society to provide the people with what they want." That may be true as well, but it doesn't explain why all those organizations in the private sector are doing it also. Actually, the reason for so much market research focused on the customer is simply this: It's the only way you can truly determine that you're providing a service or product that fills a need.

True, such activity can be a lot of work. But when running a marathon, a runner plans and prepares for it rather than just showing up and darting out of the starting gate. In fact, weeks or months of preparation are involved, with emphasis on things as diverse as diet, clothing and mental attitude. Think of your plan as a road map for bringing your innovation into common practice.

THE KEY TO AN *EFFECTIVE PLAN*

The key to developing an effective marketing plan is to center it on one premise: How your technology or innovation will benefit your target audiences--*from their perspective*. The plan will then naturally focus on strategies that not only increase awareness, but also most importantly encourage and persuade your audiences to embrace your innovation. Naturally, you must have a good understanding of the innovation. More important, however, is that you have an understanding of the target audience. To be successful you have to identify who they are and understand what

Keys to Success: Define your target audiences tightly, craft a clear value proposition and identify the right marketing delivery channels. You want your target audience to move from awareness, to interest, desire, and then action—with the ultimate goal of implementation of the innovation, then championing it within their segment of the community.

they require and how the solution is going to fit into their environment. It's not enough to have a great idea; the key is focusing on how that idea (or technology) diffuses throughout the transportation community or at least your targeted segment. Ideally, what are the benefits of your innovation to your customer? Your marketing plan will chart the course.

SECTION ONE: PRELIMINARY TASKS

The following tasks will lead you through the meat of plan development. They will help you think through important aspects of your plan, then provide you with the critical elements that will comprise your living document.

1.1 BUILDING YOUR TEAM

Initially, either you or another highly respected, motivated individual needs to be identified as the team leader. Next, bring people from different highly specialized areas together to address a shared goal, which will build a powerful foundation for successful marketing of your innovation. Key stakeholders and champions should be identified to drive the creation and on-going development of an effective marketing plan. A team should include not only leaders in the organizational area in which the technology falls, but also those individuals who will be asked to deliver the technology. The classic example is the one in which a case of brochures promoting a particular technology mysteriously shows up at a field office with no prior indication of what they are or how they are to be used. More appropriate would be to have included the field specialists in the team, or at least in progress updates on developing the marketing plan as it goes along. Expertise in market research, marketing plan development, and marketing communications tools is also required on the team.

For marketing professionals, it is critical to partner closely with R&D/field colleagues, sit in on staff and concept meetings and spend a lot of time with engineers learning about their work and their challenges. Marketing professionals can listen in order to understand the thinking behind the engineers' decisions and ideas, and help them think through how target audiences will be most likely to apply/adopt the new technology. As marketers, a passion and ability to collaborate with engineers, CEOs and stakeholders is critical. As engineers, researchers or project managers, the recognition of the invaluable skills the marketer brings to your effort will pay huge dividends. Marry the two, and your plan's likelihood of success is much greater. Planning and implementing an effective marketing plan requires collaboration of people with both marketing and technical expertise.

The FHWA Resource Center and the Highways for LIFE program staff can also provide assistance in identifying stakeholders/potential champions, as well as other critical marketing resources/support.

BRINGING THE TEAM TOGETHER

A team gathering in a comfortable, informal setting should be the initial step toward getting the individuals to begin operating as a team. After brief introductions and a statement of commitment from a key leader within the organization, a discussion should be undertaken

on the innovation itself and how it responds to the particular need. Following that should be a discussion of exactly what the overall goal of the effort should be. Goals should not be simply the easily obtainable, but rather have a degree of difficulty in them.

Other discussions should focus on the organization's commitment to the effort, the level of funding available, and the time available to accomplish the work.

DEVELOPING THE PRELIMINARY MARKETING PLAN

Over the next several weeks, it will be the task of the team leader and the marketing specialist to come up with a preliminary marketing plan. Much of this effort will involve market research to determine details about the various attributes of the target audience, needs for training or workshops, potential requirements for the team in terms of delivering the technology, and so forth. This preliminary plan should not be merely an overview, but a full-blown plan, complete with goals, description of the technology, target audience, proposed communications/promotional tools and their costs, and activities which need to be done by team members to assure faster deployment.

PLANNING YOUR TEAM RETREAT

Once a "straw-man" marketing plan has been developed, this is sent to each team member, and then the entire team is brought together for a two-day, off-site, face-to-face meeting. This meeting will serve to validate the assumptions and information compiled during the development of the preliminary marketing plan. The result of the meeting should be a clear set of goals and objectives, identified target audiences and an action plan with responsible parties assigned to each task.

The most crucial part of planning a strategy session is an agenda. Prior to the retreat, all players must have a "game plan" on the purpose, objectives, roles and projected outcomes of the meeting. In addition, it is helpful to have any background information (i.e., previous project reviews, research, etc.) for the team to review **prior to the retreat**. This will allow the team to digest the information and come to the retreat prepared with feedback.

NOTE: For a team retreat blueprint, see section 4.1

1.2 IDENTIFY AND DEFINE TARGET AUDIENCES

Determine target audiences for your innovation and describe them. Identify who are the beneficiaries and users of the innovation and who are the authorized decision-makers whom you have to convince to adopt the innovation. Next, develop a table that illustrates market demographics. Useful table headers may include:

- Audience.
- Characteristics (education level, occupation).
- Obstacles/issues.
- Opportunities/needs.
- Targeted message.

- Messenger (should they be contacted by you or a strategic partner/champion?).
- Strategies (face-to-face meetings? conference presentations? workshops?).

1.3 MARKET RESEARCH

Collect, organize and document information about target audience(s) that will benefit from your innovation, as well as industry conditions. Some areas to consider:

- Transportation market dynamics, patterns and trends.
- Customers - demographics, target markets (primary & secondary), positioning.
- Current practices or processes - What's out there now relative to your innovation?
- Identify previous or planned uses of your innovation.
- Applicable innovation benchmarks in the transportation industry.
- Obstacles to adoption of innovation – talk with potential target audience members in their language about their issues. For example, how the right technology solutions could help them, where the obstacles lie, and what it would take to remove those obstacles. Even if you've worked with them or known them for many years, you may not have had the opportunity to uncover the true issues that stand in their way of adopting new technologies.
- Opportunities in the industry that create a favorable climate for adoption of your innovation/technology
- Strategic Partners/potential champions from which to illicit support (who are the opinion leaders within your target audience?)

NOTE: Typically the opinion leader is held in high esteem by those in their field of expertise. Opinion leadership tends to be subject specific, that is, a person that is an opinion leader in one area may be a follower in another. In order to get others' buy in, you want the opinion leader(s) in your segment/target audience as your champions.

Note: Primary and secondary data are two general categories of market research information.

Primary Data: Information that you personally collect for the purpose of solving a particular problem or investigating a specific issue. This information might be gathered by survey, interview, observation or controlled experiment.

Secondary Data: Information that has been collected or published by other people or organizations.

1.4 INNOVATION DESCRIPTION AND MISSION

Describe the Innovation

- How does the innovation relate to the industry and target audience(s)?
- Where and how has the innovation already been used?

“Innovations that are perceived by individuals as having greater relative advantage, compatibility, triability, observability, and less complexity will be adopted more rapidly than other innovations.”
– Everett M. Rogers

- How does it improve upon current practices or processes?
- What problem does it solve for your target market(s) and the industry?
- What will motivate your target audience to adopt your innovation/technology?
- In addition to the obvious benefits your innovation will provide brainstorm other incentives such as funding, recognition (personal and/or for their organization). In the transportation industry, it is perceived that rewards may consist of a pat on the back, while one could lose their job over making an error.

The key is to communicate in the target audience's language, not yours. Also, you need to know how your innovation is going to impact their operation as a whole even if your innovation is targeted in one area. Your understanding of the interrelationship of all their activities will go a long way in building trust. You may have to help them sell the solution to their superiors. They may need someone to help them justify what they already know from a technical standpoint. They know the technical justification for buying a solution, but they still need to sell it internally.

Be prepared to have tools/resources available to assist your customer in promoting the innovation internally.

Write a concise mission statement (one to three sentences that state):

- Primary audience - who benefits from your innovation, who will use it and who will make the decision to adopt it.
- Contribution – how the innovation solves a problem, addresses a need or improves upon practices
- Distinction – key attributes and benefits of your innovation (i.e., saves time, reduces cost, reduces fatalities, meets new reporting requirements)

Example Mission Statement: Highways for LIFE (HfL) is focused on accelerating the adoption of innovations in the highway community. Its purpose is to advance longer-lasting highway infrastructure using innovations to accomplish the fast construction of efficient and safe highways and bridges.

1.5 BACKGROUND DEVELOPMENT

Target markets, including vendors, media and strategic partners, will want background information that provides details of your industry/segment and the history or path that led to the technology or innovation. This helps tell your story, as well as equipping key audiences and opinion leaders with information that helps them understand the full picture and arms them to persuade others. Also, consider using charts, diagrams, and flow charts, which are appealing to people who learn visually.

1.6 BRAINSTORM MARKETING STRATEGY

Your marketing strategy should focus on 'where we are now', 'where we want to be', and 'how we're going to get there.' Under the umbrella of the marketing strategy, your plan will outline the tactics (or activities) that detail specifically how you will get there. When

putting together the marketing plan, the litmus test for the tactics/activities should be, 'is this in line with our strategy?' Will this help us achieve our objectives?

MARKETING TACTICS / TOOLS (OR MARKETING ACTIVITIES)/VEHICLES

Brainstorm and document marketing tactics and delivery channels that are (1) in line with your marketing strategy; (2) will provide the most efficient means to reach your target audience; and (3) will most effectively help you achieve your objectives. Example tactics include:

- Networking - Go where your audience is
- Direct marketing – Targeted and customized letters, brochures, flyers
- Advertising - print media (ads in trade publications), trade directories
- Presentations - to increase awareness (workshops, conferences)
- Demonstrations – Incorporate the technology into a project and host field visits
- Peer-to-peer exchanges for lead state teams
- Publish - Write articles, give advice, become known as an expert
- Interpersonal – face-to-face meetings with key opinion leaders/potential champions, strategic partners and targeted individuals
- Publicity - press releases, news conferences, media relations
- Displays/booths at trade shows, conferences
- Web site (and promotion of)

Keep in mind that any of these activities that deal with media, publications, and publicity efforts must be cleared with the Agency's Public Affairs Office prior to any dissemination.

Note: A Technology Showcase is a well-advertised gathering of representatives from interested agencies to learn more about one or more technologies and to observe demonstrations. This is also often referred to as a demonstration workshop.

1.7 BRAINSTORM MARKETING GOALS

Brainstorm and draft quantifiable, measurable marketing goals. For instance, your goals might be to gain at least five strategic partners/champions to help diffuse your innovation during the first six months to have successful implementation of your innovation/technology by X number of target organizations. Your goals might include X face-to-face visits with target audience members by a certain date, a certain number of exposures in trade publications, or a certain number of presentations at workshops, showcases or conferences.

1.8 IDENTIFY HOW YOU WILL MONITOR YOUR RESULTS

Determine how you will monitor your results so you can identify the strategies that are working (i.e., surveys, regular meetings with team and champions, track information flow with target audiences, tracking visitors to your web site, percent of responses). Identify important external and internal metrics. Using the experience of your core team, identify

the most important external and internal performance indicators to measure. Be sure to include appropriate metrics for every major element of your marketing mix (such as meetings, publicity, and so forth), so that all members of the team can track their progress and contribution to the team's success. Gain agreement on what and how to measure. Obtain buy-in from key stakeholders once metrics are identified (post your team retreat).

Note: Activities such as measurement and potential adjustment of marketing activities is should be a cost consideration when determining your budget in the next section.

1.9 DETERMINE BUDGET / AVAILABILITY OF FUNDS

Budget your available marketing project dollars.

- What tactics/activities can you afford?
- What can you do in house, what do you need to outsource (i.e, web site support, display materials)?
- Can you obtain/qualify for funding from other organizations/programs?
- Does your innovation qualify for a Highways for LIFE project or Partnership contract?
- Do you have funding for customer training and technical support? (Keep in mind to identify who will conduct the development, delivery and the schedule of training)

If you have limited marketing resources, make sure your target market is not too broad. Find the segments of the broader transportation community that will most benefit from your technology. Who will be most receptive? Prioritize your audiences so that you enter the most fertile segment first without spreading your resources too thin.

SECTION TWO: BUILD YOUR OUTLINE

Now that you've worked through the preliminary items in section 1.0, you're ready to build your plan outline. The following is a suggested Marketing Plan outline, which may be modified, based on your specific technology and needs. Developing your plan outline at this stage allows you to more easily incorporate information you've already developed, task out and/or collaborate with core team members on certain areas, and track your plan development progress.

SAMPLE MARKETING PLAN OUTLINE

- 1.0 Executive Summary
- 2.0 Situation Analysis
 - 2.1 Market Summary
 - 2.2 Market Demographics
 - 2.2.1 Market Needs
 - 2.2.2 Market Trends
- 3.0 Filling the Need: Technology/Innovation Description and Mission

- 4.0 Target Audiences
 - 4.1 Primary
 - 4.2 Secondary
- 5.0 Positioning
- 6.0 Marketing Goals
- 7.0 Opportunities
- 8.0 Obstacles
- 9.0 Marketing Strategy
 - 9.1 Marketing Objectives
 - 9.2 Personnel
 - 9.3 Channels of distribution
 - 9.4 Action Plans with timelines and personnel assignments
- 10.0 Financials/Budget (recommend moving this after contingency planning)
- 11.0 Program reviews and evaluation
- 12.0 Implementation
- 13.0 Contingency Planning
- 14.0 Appendices

SECTION THREE: DEVELOP A DRAFT OR PRELIMINARY PLAN

Below are general descriptions and guidelines for the composition of various sections that you may include in your preliminary plan.

Executive Summary. A summary of your overall plan; although this will be the first section in your final document, it is often best to write this upon completion of your first draft.

Situation Analysis (Market Summary, Market Issues and Needs, Market Trends).

This section is an evaluation of the situation and trends in the transportation industry and your particular segment. It should function as a snapshot of where things stand at the time the plan is presented. You will want to include the market demographics table you developed in section 1.4 and information from section 1.6. Also, describe market issues and needs as well as applicable market trends as subsections.

Filling the Need: Technology/Innovation Description and Mission. This is also commonly called the Product Analysis section. Describe your innovation and include where and how it has already been used with descriptive visuals when possible.

Target Markets. In this section, include a bulleted list of your primary and secondary targeted audiences (beneficiaries, users and decision-makers). This list may be refined based on the discussion from your Team Retreat. You may also want to reference your market demographics table included in the previous section.

Positioning. Write a concise statement that specifies the need(s) you are fulfilling, benefits your innovation/technology offers, and features that deliver those benefits.

Program Goals. What are the overarching goals of your innovation? Include training and implementation goals with specific years for each. Reference any industry or headquarter requirement(s) that your innovation will help fulfill.

Opportunities. Describe the opportunities that create a favorable climate for your target audience to adopt your innovation.

Challenges. Describe the obstacles that may make it difficult for your target audience to adopt your innovation.

Marketing Objectives. The objective of your marketing plan should be to identify various strategies and activities that will result in meeting the goals you identify.

Marketing Tactics and channels. Marketing activities that support your marketing strategy and define the general approach you will take to meet your objective. The channels are the means of delivering your message to your defined target audience. Prioritize activities based on potential impacts and timing (some may need to occur before others can be implemented).

Financials/Budget. Describe funding sources and dollars that are currently secured for the implementation of your plan, and describe other potential resources (if applicable). Include a concise summary of your overall budget. The action plan table/spreadsheet developed at the Team Retreat will also indicate a breakdown of the budget required. Plan to modify as needed and communicate with core team members.

Controls/Measures. Include the information you compiled during the preliminary tasks (section 1.9) delineating how you will measure the success of your plan. Consider how often your team will need to come together for progress reports—both via teleconference/interactive television and face-to-face.

Implementation. This section illustrates timelines and identifies those responsible for performing tasks; information for this section should come from the action plan formulated at your Team Retreat.

Contingency Planning. Detail how you will change your course if your original action plan falls short. How often will you meet with your team to review progress? Will you modify the plan throughout the effort if strategies do not work?

Appendices. Include resources in this section that you will need to refer to during implementation of your plan. Examples include: success stories; publicity; list of current leadership (and contact information) of your primary target audiences; feedback or survey results.

SECTION FOUR: CONDUCT A TEAM RETREAT

BLUEPRINT FOR TWO DAY WORKSHOP / ACTION PLAN DEVELOPMENT

While it may seem exhaustive, the following process will build rapport, foster input and ownership among team members. This off site meeting will also serve to validate the assumptions and information you have already compiled, resulting in a concise plan with responsible parties assigned to each task, a clear set of goals and objectives and identified target audiences. To ensure a successful workshop, it is very important that all of the participants have read and considered the background information and preliminary plan documents in advance of the retreat. Also, ensure they know explicitly what will be expected of them at the retreat.

NOTE: It will be very helpful if you can obtain a facilitator who is familiar with the transportation industry and that has the skills to keep your team on track; having one or more note-takers will also alleviate that burden off of your team. Your note-takers can also take digital photos of all lists for future reference and documentation.

I. Introductions. Introduce the team leader and identify his credentials and experience. Ask team members to introduce themselves and give a brief synopsis of their role and/or interest in the initiative.

II. Setting the stage. Provide introduction of the innovation/technology, history, uses and developments to date. Present any marketing tools (i.e., videos, news clips) that may already exist.

III. Brainstorm opportunities and obstacles. Divide team into two or more groups, with no more than six people in any group (Group A, B, etc.) and ask each group to brainstorm opportunities and obstacles to the adoption of the innovation; make sure to ask them to tie opportunities and obstacles to the various established program goals. Record all items on separate white tablet sheets (it will be easier if you get the tablets that already have “post-it” adhesive on the back of the sheets) to be posted for all to see.

IV. Consolidate and Categorize. Bring two groups back together; facilitator to talk the groups through their lists. As a group, agree on and compile a new list of categories of obstacles and opportunities. Post these sheets in a visible location.

V. Readjust and Prioritize. Facilitator will then review categorized lists with team to clarify and adjust wording as necessary. Next, instruct each of your team members that they have ten ‘votes’ to apply to what they think is most important on both the categorized opportunities and obstacles lists---five for obstacles, and five votes for opportunities. They may also apply multiple votes to one in particular. (Note: It will be helpful if you have the adhesive dots for your team members to use to indicate their votes.) The top five opportunities and top five obstacles will be assigned recommendations. Ask facilitator to record the top five priorities

(of both obstacles and opportunity lists) on separate posted sheets before moving onto the next task.

NOTE: The following are some good questions to consider asking your team in order to stimulate conversation when prioritizing primary and secondary opportunities.

- Will the resources and time be available even if the innovation makes sense?
- Will the risk be perceived as being too high?
- Will the technology make their job easier or will it be perceived as making their job more difficult? (In order for them to consider adopting your innovation, the benefits must outweigh 'changing the course').

VI. Develop Recommendations. Split back into two groups and each generate recommendations as to how to tackle each top five opportunities and obstacles.

VII. Merge recommendations. Bring the groups back together; go over group A's recommendations for both the obstacles and opportunities lists; ask Group B (and C, if there is one) if they have anything to add or modify based on their group's discussion. Post in visible location.

VIII. Ask Team to Invest. Give each team member \$100 or \$1000 in 'monopoly money' that they can place on the opportunities or obstacle recommendations they want to invest in. (Place lists flat on table during voting.) This method 'forces' team members to think hard about what they believe are the most important actions.

NOTE: By using either \$100 or \$1000, you will easily be able to identify percentages.

VIII. Brainstorm and record action plan to include the following for each recommendation: date to be completed, type of activity, location (where activity will take place---origin of the work), target audience, person responsible and approx. cost. (Note: Be sure to assign only one lead for each action item. Remember, if it's everyone's responsibility, then it won't get done. Make sure one person is ultimately responsible for shepherding the task, and assign others to support or participate.) Have facilitator record during session (with note-takers recording discussion and comments), and then later create a table/spreadsheet or flowchart to include in your marketing plan.

X. Go back through original opportunities & obstacles categories lists. If time permits, this final exercise will ensure that an important thought or point is not lost. The facilitator can also discern if all of the original categories of opportunities and obstacles can be connected to the prioritized top five in each area.

XI. Use some mechanism (informal vote) to identify general acceptance of the workshop products.

FOLLOW UP

Compile a report based on the discussions and outcomes of the two-day retreat, and send to team members, along with the action plan table/spreadsheet or flowchart.

SECTION FIVE: MODIFY YOUR PLAN

POST-RETREAT MODIFICATIONS

Upon the completion of your team retreat and your action plan, use the notes and report to validate the assumptions and information you compiled, or modify as necessary. Use the results of the meeting to adjust your goals and objectives, situation analysis, identified target audiences and other sections of your plan.

Distribute the edited documents from your retreat to all of the participants for review comments and finalize the documents by addressing comments. This will build ownership of the products.

ONGOING REVIEWS AND UPDATES

Lastly, remember that your marketing plan is always a work in progress. It may be current, but it is never "done." It should be a living document, constantly being amended and fine-tuned.

SECTION SIX: APPENDICES

Sample Marketing Plans:

- Prefabricated Bridge Elements and Systems
- Road Safety Audits
- Making Work Zones Work Better

Marketing Plan

Prefabricated Bridge Elements and Systems (PBES)

HIGHWAYS FOR LIFE

Accelerating Innovation for the American Driving Experience.



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EXECUTIVE SUMMARY

The current condition of the Nation's highway system, and its bridges in particular, demands a major effort for upgrading. Yet, using traditional approaches would require an enormous cost, create major congestion problems and have significant safety challenges associated with it. A relatively new approach called Prefabricated Bridge Elements and Systems offers a solution to many of the bridge challenges highway agencies are facing. This marketing plan describes the current status of the bridge system, describes PBES, and outlines a comprehensive approach for getting state bridge engineers to consider, learn about, and ultimately try this approach when situations are appropriate for its use.

SITUATION ANALYSIS

When the U.S. Interstate Highway System was first conceived and promoted, it was with the vision that one day Americans would be able to drive from coast to coast without stopping for a traffic signal. In the 50 years since President Eisenhower launched the system with the signing of the Federal Aid Highway Act of 1956, drivers in this country have seen that vision realized. To achieve the goal required the construction of a complex system of highways, bridges, interchanges, drainage systems, traffic controls, landscaping, and lighting systems. Today, the National Highway System (NHS) encompasses some 160,000 miles of roadway.

Although the NHS makes up only 4 percent of America's roads, it carries more than 40 percent of all highway traffic, 75 percent of all heavy truck traffic, and 90 percent of tourist traffic. It has become the very backbone of the American economy, serving as the primary means of moving goods throughout the country. The NHS serves 198 ports, 207 airports, 67 Amtrak train stations, 190 rail/truck terminals, 82 intercity bus terminals, 307 public transit stations, 37 ferry terminals, 58 pipeline terminals, and 20 multipurpose passenger terminals. It is literally the thing that holds the Nation's entire transportation system together.

Unfortunately, the NHS is not without its problems. First, it's overcrowded. By the year 2020, ninety percent of all urban Interstate highways will be at or exceeding capacity. Five years ago, the Texas Transportation Institute put the cost of congestion in the Nation's 75 largest urban areas at \$67.5 billion, and each traveler in those areas sits in traffic for 62 hours a year.

Second, NHS pavements are not lasting as long as they should. Highways built to last 25 years take such a pounding from the amount and the weight of traffic that they rarely stay in optimum condition that long. Today, more than 11,000 miles of pavement on the NHS are in poor condition. Almost a quarter of all bridges in the country—some 146,000—are either structurally deficient or functionally obsolete. Yet, many highway engineers agree that 50-year pavements and 100-year bridges should be attainable using current technology.

Third, we're not building highways safe enough. Every year for the past decade, some 43,000 people die on America's highways. Over half of these fatalities have occurred on two-lane roads that carry only 25 percent of the total NHS traffic. Some 15,000 fatalities are ascribed directly to substandard road conditions, obsolete designs, or roadside hazards.

The list goes on and on. Truly, America's highway system needs help. But how do we bring the system up to the level of quality the traveling public deserves?

That's the challenge the Nation faces at the beginning of a new century. To be sure, many leaders have thought long and hard about solutions. For some, the automatic response to such a challenge is simply to throw money at the problem. Certainly, having the funds to complete necessary road and bridge projects has long been an issue with highway agencies at all governmental levels. But according to organizations such as The Road Information Program (TRIP) and the American Public Transportation Association (APTA), not only is the idea of funding such a massive reconstruction effort unrealistic, the very future of highway funding is in jeopardy.

The average car now gets nearly a third more miles per gallon than it did 20 years ago. Ten years ago, a report from the National Cooperative Highway Research Program (NCHRP) warned that with increasing fuel efficiency (and an expected move toward electric and hybrid vehicles), drivers would be buying less gas in the future, and that would reduce the amount of tax money available for improving roadways. In 2003, a report from the Brookings Institution confirmed those projections and indicated that states are already seeing declines in their tax revenues.

Indeed, as gasoline prices have risen, the public has focused more on conservation, vehicles with higher fuel economy, and vehicles powered with alternative fuels. This has meant less money paid into gasoline taxes. The result is a deep concern that both states and the Federal Government will have to find alternative means for funding highway projects. Toll roads are becoming more and more prevalent, and concepts such as equipping vehicles with on-board computers which calculate mileage and automatically bill the vehicle owner a tax-per-mile fee are getting serious consideration. Several times, Congressional leaders have introduced bills which would provide drivers with a "temporary gas tax holiday," a move which, while appealing to some, would result in severely decreased funds for maintaining the highway system.

Yet, even if the funds were available, a massive effort to rebuild the entire highway system using current practices would be inconceivable today. The public would not stand for the congestion it would bring with it. In 2001, a study analyzing three national surveys of the driving public showed clearly that the public already equates highway construction—*any* highway construction—with congestion. Increasing construction levels, even if it is intended to ultimately cut congestion levels by adding lanes, only exacerbates the public's perception that "the shortest distance between two points is always under construction."

FILLING THE NEED

How does one bring the existing highway system up to the level of quality the public wants, yet do so without the congestion headache that such construction invariably causes?

The solution is to find ways to do as much of the work as possible at times and in locations that minimize interference with the driving public, and for that portion of the work that *does* require such interference, to do it as quickly and safely as possible. These innovative approaches should also result in facilities that are safer, last longer, and are of better quality overall than what was there previously.

Currently, there are numerous innovations that, if implemented nationwide, would have just such a dramatic impact on the driving experience of the motorist. Congestion levels would be reduced, especially in construction work zones. In addition, because construction schedules would be shortened, overall congestion would decrease. Safety levels would be heightened, both in work zones and, because of enhanced designs, on the everyday sections of highway. Highways and bridges would last longer, and as a result, there would be less frequent road closures due to construction. Additionally, roadways would cost less, both in initial cost, and in the entire life cycle of the highway or bridge.

The question is, then, what innovations exist today for bridge design, construction, and maintenance?

THE AASHTO TECHNOLOGY IMPLEMENTATION GROUP

At the beginning of the new millennium, the American Association of State Highway Transportation Officials (AASHTO) recognized that a few states were having good success with the concept of building bridges offsite, away from the flow of traffic and the hazards and congestion associated with it, and then bringing the structure, either in pieces or fully completed, to the site. The key concept was that, although the actual building of the bridge might take as long or longer as it would have onsite, that wasn't how the highway user viewed it. In the public's perception, the bridge went up almost instantaneously, since they measured the construction period based on the amount of time it impacted traffic circulation, not the actual project schedule. Other benefits were found for such an approach, such as increased safety for construction crews, and better quality of construction, due to contractors' being able to build components in a more controlled environment.

In 2001, the AASHTO Technology Implementation Group (TIG) selected the technology known as "Prefabricated Bridge Elements and Systems," or "PBES," as a focus technology. In May of 2002, the TIG PBES team issued a marketing plan. The plan's primary objectives were focused on building awareness and stimulating nationwide use of the PBES technology. The TIG PBES team produced two brochures and a video, populated a website, gave presentations and wrote papers, and sponsored a number of workshops. Much of the focus of the marketing plan you are now reading owes its impetus to that plan and the individuals who produced it.

Scanning Tour

In April 2004, a team of bridge engineers, sponsored by the Federal Highway Administration (FHWA), AASHTO, and NCHRP visited Japan and Europe to investigate innovations in prefabricated bridge building technology. A number of useful technologies were identified on that trip. Most relevant to the PBES effort was the discovery of self-propelled modular transporters (SPMTs), which are multi-axle devices that can be manipulated in very limited spaces to move complete prefabricated bridge systems into position. Previously, the use of prefabricated systems was limited by the size of loads that could be carried on highways or moved into position with traditional methods (cranes, hoists, etc.). It is now possible to construct very large systems at a staging area near the job site but away from traffic, and then position them with precision into their final location using SPMTs. A prefabricated bridge system can even be lifted and transported by SPMTs from a staging area to barges, floated on the barges to the bridge site, and then lifted into position for connection.

Largely through the efforts of the scanning team, the market for SPMTs was opened up in this hemisphere, and several firms have made the tools available. Most notable, as of this writing, are the Dutch firm Mammoet, a host of the 2004 scan, with its multiple bridge moves in the United States, and the Sarens Group, headquartered in Belgium and also a host of the 2004 scan, with its first bridge move in the United States planned for late 2007. In addition, Barnhart Crane & Rigging has recently purchased SPMTs for bridge moves, and Bigge Crane and Rigging Co. has used SPMTs on a recent West Coast bridge project. Today, there are a sufficient number of firms for construction competition demands.

An excellent example of the difference SPMTs have made is the 5.4-mile I-10 twin span trestle bridge near Slidell, Louisiana. The bridge was originally constructed in 1963 using 260-ton prestressed concrete slabs. The bridge was severely damaged by Hurricane Katrina in 2005. Using barge-mounted SPMTs, one of the twin spans was brought back into service in just weeks. While smaller bridges, such as the single-span Mitchell Gulch Bridge near Denver, Colorado, could be replaced in a weekend using cranes, the technology of SPMTs is required to make this possible on larger structures. A number of other projects in Louisiana used SPMTs to restore damaged bridges after Katrina.

Now, structures carrying multi-lane Interstate highways across busy roadways and waterways, even in the middle of metropolitan areas, can be replaced overnight. The ironic aspect is that, while such amazing work can be done without major interruptions to traffic, the impact of such efforts are largely unappreciated by the public because they don't see the congestion that not using the innovation would have caused. And because highway agencies and their employees are public servants and it has not been their approach in the past to ballyhoo their efforts as a private corporation promoting a product might, these innovative efforts go largely unheralded. This is unfortunate for several reasons: For one, the effort and those who achieved it get little recognition. More important, the public is uneducated on the value of such approaches and does not pressure decision-makers to use them more frequently.

If, for example, a particular urban bridge were successfully replaced using PBES and SPMTs in a few hours, and that project received national attention, citizens of other locales, hearing about the project, might influence locals to use the approach in their communities. Thus, the public would have a stronger hand in technology deployment. As important, the overall education of the general public on highway work would be enhanced, and the level of discussions at future public hearings and public debate would be enhanced.

MARKET ANALYSIS

Bridge projects are one of the most notorious culprits for traffic delay. In many cases, a bridge provides the only passage across a geographic barrier. Taking such facilities out of service for any length of time can mean alternatives that cause great delay and that take drivers many miles out of their way. Also, because of the limited construction work space on bridge projects, safety hazard levels for construction workers and motorists are much higher than those of roadway projects.

THE CURRENT BRIDGE INVENTORY

Today there are more than 595,000 bridge structures on the National Highway System. These include bridges made of steel, concrete, wood, aluminum, and masonry. Current

thinking is that decks should be able to last at least 100 years, and while there still exist functioning bridges that were built more than 100 years ago, the average life of a bridge deck is between 20 and 25 years. For details on the number and types of bridges in each state, see the charts in Appendix A.

PRODUCT LINE ANALYSIS

As previously noted, there are all sorts of design approaches and technologies currently being used in bridge construction. These include the bridges built with steel girders, concrete girders, and even timber. There are cable-stayed bridges, bridges built on piers, and many other approaches. It's important to note that PBES-type construction is not based on the materials used or the structural principles employed to keep the bridge in place. Rather, PBES bridges are merely bridges which can have all or part of their construction done offsite and then erected at the site in a much shortened time period from a bridge built in situ.

WHAT EXACTLY IS A PREFABRICATED BRIDGE SYSTEM?

Prefabricated bridge systems include superstructure systems (composite units, truss spans), substructure systems (abutments, caps/columns, piers), and totally prefabricated bridges. Examples of prefabricated bridge elements include full-depth deck panels and substructure caps. Using prefabricated bridge elements and systems can facilitate meeting several key needs:

- Reduces on-site construction time
- Minimizes traffic impacts of bridge construction projects
- Improves construction work zone safety
- Makes construction less disruptive for the environment
- Improves constructability
- Increases quality and lowers life cycle costs

Traffic and environmental impacts are reduced; constructability and safety are improved because more of the work is moved away from the bridge site, minimizing the need for lane closures, detours, and use of narrowed lanes. Prefabrication of bridge elements and systems can be accomplished in a controlled environment without concern for job-site limitations, and that, in turn, can increase product quality and lower costs. Prefabricated bridge elements and systems especially tend to reduce costs where use of sophisticated techniques would be needed for cast-in-place techniques, such as in long water crossings or high-elevated structures, like multi-level interchanges.

As the December 2004 issue of the FHWA publication *Focus* notes,

For highway agencies, the use of pre-fabricated bridge elements and systems, ranging from substructures to entire bridges, is proving to be not only a best practice but good business. Prefabrication can also lower costs by eliminating the need to perform the

construction in a restrictive sequence of operations. Instead, the work can be done ahead of time, reducing the risks posed by bad weather and other variables.¹

A number of completed PBES projects, including contact names and some contract documents, can be found at www.fhwa.dot.gov/bridge/prefab/projects.htm. In addition, an Accelerated Bridge Construction List, which includes several examples where PBES was used, can be found at www.fhwa.dot.gov/bridge/accelerated/abclist.htm.

HOW DOES PBES COMPARE WITH OTHER METHODS?

Prefabricated bridge elements and systems offer bridge designers and contractors significant advantages in terms of onsite construction time, safety, environmental impact, constructability, and cost.

Minimize Traffic Impacts of Bridge Construction Projects

Using prefabricated bridge elements and systems means that time-consuming formwork, concrete curing, and other tasks associated with fabrication can be done offsite in a controlled environment without affecting traffic.

Improve Construction Zone Safety

Because prefabrication moves so much of the preparation work for bridge construction offsite, the amount of time that workers are required to operate onsite, frequently in or near traffic or at high elevations or over water, is greatly diminished. Job site hazards and constraints such as nearby power lines are minimized when workers can complete most of their construction offsite.

Make Construction Less Disruptive for the Environment

Bringing prefabricated superstructures and substructures to the site ready for installation reduces disturbance to the land surface at the site, and it reduces the amount of time required onsite for heavy equipment. Keeping equipment out of sensitive environments is less disruptive for those environments.

Improve Constructability

Many job sites impose difficult constraints on the constructability of bridge designs—heavy traffic on an Interstate highway that runs under the bridge being constructed, difficult elevations, long stretches over water, or restricted work areas due to adjacent properties, to name a few. Using prefabricated bridge elements and systems relieves such constructability pressures.

Increase Quality and Lower Life Cycle Costs

Prefabricating bridge elements and systems takes them out of the critical path of the project schedule: work can be done ahead of time, using as much time as necessary, in a controlled environment. This reduces dependence on weather and increases quality control of the resulting bridge elements and systems. All projects that

¹ "Prefabricated Bridges Deliver Quality, Safety, and Savings," *Focus*, December 2004, published by the Federal Highway Administration, publication number FHWA-HRT-05-022.

use prefabricated bridge elements and systems increase the quality of their components; most also lower life cycle costs.

ELEMENTS AND SYSTEMS

Rapidly expanding technologies associated with innovative materials and equipment have made it possible to prefabricate the components of bridges—and sometimes even entire bridges. Increasingly, bridge engineers are turning to prefabrication of the following bridge elements and systems to save money, to solve project-specific challenges, and to increase the quality of bridges by conducting fabrication in a controlled environment.

Superstructure: Decks

Prefabrication offers exceptional advantages for deck construction, particularly for removing deck placement from the critical path of bridge construction schedules, for cost to place the deck, and for quality of the deck. Partial-depth prefabricated deck panels act as stay-in-place forms to speed construction and allow more controlled construction for a more durable deck than fully cast-in-place decks. Full-depth prefabricated bridge decks facilitate and speed construction, and bridge designers are finding innovative ways to connect full-depth panels to ensure durable connection details.

Superstructure: Total Superstructure Systems

Increasingly, innovative bridge designers and builders are finding ways to prefabricate entire superstructures. Preconstructed composite units may include steel or concrete girders prefabricated with a composite deck, cast off the project site and then lifted into place in one operation. Truss spans also can be prefabricated. Prefabrication on this scale offers tremendous potential advantages in terms of constructability, onsite construction time, and the need to have equipment on the construction site.

Substructure: Bent Caps

Cast-in-place bent caps require sequential construction processes, including extensive formwork erection and removal, as well as concrete curing time. If they are fabricated offsite, these sequential processes are not a factor. As a result, bridge owners and contractors are turning to prefabricated bent caps:

- For over-water bridges, they reduce the amount of time that workers need to operate over water.
- For bridges over existing roadways, they reduce the disruption to traffic on the lower roadway.
- For bridges with job-site constraints, such as power lines that affect work zone safety, they limit the amount of time that workers are at risk.

Substructure: Pier Columns

Bridge construction times can be greatly reduced by using prefabricated columns. Columns can be steel or concrete (segmental, post-tensioned, either hollow or concrete-filled).

Substructure: Total Substructure Systems

A total substructure system may consist of individual pier(s) or prefabricated bent cap supported by prefabricated column(s) or prefabricated footings.

Totally Prefabricated Bridges

Totally prefabricated bridge systems offer maximum advantages for rapid construction and depend on a range of prefabricated bridge elements and systems that are transported to the work site and assembled in a rapid-construction process.

PRICING ANALYSIS

Prefabricated bridge elements and systems can be the most cost-effective solution in terms of both initial and life cycle costs. This cost competitiveness results from the speed of onsite construction and the improved quality that can be obtained with prefabrication.

Construction Costs

Prefabricated components typically have lower unit costs relative to conventional cast-in-place construction due to economy of scale (e.g., fabricators' fixed costs such as steel forms are spread over a large number of bridges). In addition, shortening the construction time at the bridge site by quickly installing larger prefabricated systems can further reduce construction costs, as listed below:

- Reduced costs for traffic control (including costs for traffic control devices and their maintenance, lighting, and flagging and other traffic control personnel)
- Reduced owner overhead costs to staff projects with construction engineering and inspection support
- Reduced contractor overhead costs to staff projects with construction crews, etc.
- Reduced liability insurance and surety bonding costs to contractors based on the reduced number of days that coverage is required
- Reduced maintenance requirements for detour routes subjected to increased volumes of traffic
- Potential for elimination of temporary roadways
- Innovative contracting strategies and other considerations also can improve the cost-effectiveness of prefabricated bridge construction, as detailed below:
- Use contracting strategies to provide the contractor with a financial reason to complete the project as quickly as possible. These include incentive/disincentive for delivery before/after a time set in the contract; A+B bidding, the cost of contract bid items (A) plus the time bid for construction multiplied by daily user cost (B); lane rentals for lanes taken out of service during temporary lane closures for construction; and no-excuse bonus with no time adjustment for problems such as delays due to weather or utility conflicts.
- Reduce the perception of risk by increasing the options available to contractors for rapid onsite construction, thereby allowing them to optimize construction activities around the strengths of their operations, while ensuring that agency goals are met.

- Consider bundling multiple bridges into one project to allow the contractor to sequentially use specialized equipment such as SPMTs to spread the cost over a larger number of bridges.
- Consider stockpiling standardized prefabricated components to further increase economy of scale, either prior to contract award for a specific project or for future use, independent of a specific project.

Lower Life Cycle Costs

Prefabricated bridge components are built offsite or near-site in controlled environments. Improved quality of materials and construction is achieved due to reduced weather impacts and established materials suppliers and standardized plant operations for consistent quality of materials and production. In addition, the off-the-critical-path construction allows adequate time for curing to obtain more durable concrete. Provided the connections between the prefabricated components are properly designed and constructed, prefabricated systems can be expected to provide extended service life with reduced maintenance requirements.

Delay-related User Costs

The reduced duration of onsite construction time that is possible with prefabricated bridge construction also will result in a reduction in delay-related user costs. Delay-related user costs are real costs to the traveling public in terms of hours of lost productivity and increased gasoline and maintenance costs for their vehicles as they wait in traffic queues and travel additional miles on detours. Increasingly, user costs are being considered in determining contracting strategies, and often they are the basis for the magnitude of incentive/disincentive on a project.

Examples of Cost-effective Prefabricated Accelerated Bridge Construction

A number of examples are available to show the construction cost savings that can be achieved using prefabricated bridge elements and systems on accelerated construction projects. Three such projects are described below. For each project, cost savings are defined as awarded bid price minus engineer's estimate. These three projects saved a total of \$23.2M in construction costs and significant onsite construction time.

Lewis and Clark Bridge Deck Replacement in Washington State

In 2004, a total of 18,000 vehicles per day crossed the mile-long Lewis and Clark Bridge on State Route 433 over the Columbia River between Washington and Oregon. The shortest detour route is 40 miles, necessitating the use of full-depth prefabricated panels and an innovative accelerated installation procedure to replace its deteriorated deck. Using SPMTs and a specially designed frame, 3,900 feet of deck were replaced during 124 night closures plus 3 weekend closures. Conventional cast-in-place deck construction was not a viable option, as it would have required 4 years and significant impact to traffic. The full-width prefabricated deck system combined with innovative construction equipment allowed the bridge deck to be replaced with no impact to rush-hour traffic.

The Washington State Department of Transportation (DOT) used A+B+C bidding, where "A" was the bid items for contractor payment. "B" and "C" were only used to determine the lowest responsible bidder, where "B" was the total number of bridge closures established by the bidder to complete the work multiplied by a closure rental cost

and “C” was the total number of single lane closures established by the bidder to complete the work multiplied by a single-lane rental cost. An incentive was included for early completion. Incentives and disincentives were included for reduced and increased closures, respectively.

The low bid of \$18.0M was 38 percent (\$10.8M) below the engineer’s estimate of \$28.8M. The contractor also received the \$100,000 early-completion incentive and additional incentives for reduced closures, for a total incentive payment of \$185,000. The Washington State DOT obtained the new deck ahead of schedule with no impact to rush-hour traffic.

I-95 Bridge over James River Superstructure Replacement in Virginia

In 1997, a total of 110,000 vehicles per day crossed the twin 4,185-ft-long Interstate 95 bridges over the James River in Richmond, Virginia. With such a large traffic volume, conventional construction was not an option for replacement of the deteriorated superstructures. In 2002, after soliciting the preferences of the public, the existing spans were removed and new prefabricated segments of half the roadway width were installed using high-capacity cranes and conventional flatbed trailers during night operations. The 102 spans were replaced in 137 nights during 17 months, with no impact to rush-hour traffic. Conventional construction would have required 24 to 36 months and significant impact to traffic.

The Virginia DOT used A+B bidding, where “A” was the bid items and “B” was the number of calendar days with nighttime lane closures, with bids greater than 240 days considered to be non-responsive. An incentive and disincentive of \$30,000 per day was included for early completion not to exceed \$2.0M and late completion with no dollar limit, respectively. An additional disincentive that accumulated up to \$250,000 per day was included for not having all lanes of the bridge open to traffic on time.

The low bid of \$43.4M was 11 percent (\$5.1M) less than the engineer’s estimate of \$48.5M. The contractor bid 179 days to replace the spans and completed the work in 137 night closures, receiving \$30,000 for each of 42 nights, for a \$1.3M incentive. The Virginia DOT obtained a new superstructure ahead of schedule with no impact to rush-hour traffic.

State Highway 66 Bridge over Lake Ray Hubbard Precast Bent Caps in Texas

Unlike the above two projects, in which the owner agencies required the use of prefabricated bridge components because of traffic needs, the twin State Highway 66 bridges over Lake Ray Hubbard northeast of Dallas was bid with conventional cast-in-place substructures. After award of the project, the contractor proposed a field change for precast reinforced concrete bent caps on the 4,360-ft-long, 40-ft-wide eastbound bridge to reduce the handling of formwork and materials over water and to minimize the construction workers’ exposure to high-voltage transmission lines that ran adjacent to the bridge. The Texas DOT approved the contractor’s proposal to prefabricate the caps with no change in funding. The contract did not include incentives or disincentives. Precasting the 43 identical caps saved 5 to 7 days per cap, for a total of 215 days. Conventional bent caps would have required 7 days of critical path activity per cap for forming, concrete placement, and curing, totaling an additional 9 months of construction time. Prefabricating the caps off the critical path also allowed the use of normal-strength high performance

concrete with its greater durability but slower strength gain due to the 35 percent replacement of cement with ground-granulated blast-furnace slag.

The low bid of \$40.9M was 15 percent (\$7.3M) less than the engineer's estimate of \$48.2M. The Texas DOT obtained a more durable bridge ahead of schedule.

CUSTOMER-TARGET MARKET ANALYSIS

One can categorize the audience or target market for PBES into the following nine categories:

- State Transportation Agencies (including Chief Executive Officers [CEOs], Chief Engineers, State Bridge Engineers, District Administrators, District Engineers, District Bridge Engineers, Environmental Specialists, and Design and Construction Teams)
- Users (including the Driving Public, Commercial Carriers, Neighbors, Mass Media)
- Local Transportation Agencies (including Counties, Cities, and Townships/Parishes)
- Metropolitan Planning Organizations (MPOs)
- FHWA (including Division Offices, Area Engineers, Division Administrators, Bridge Engineers, Resource Center, and Environmental Specialists)
- Federal Lands Highway Divisions (including Directors of Project Delivery, Bridge Engineers, Project Managers, Design and Construction Team, Environmental Specialists)
- Industry (including Consultants, Fabricators, Suppliers, Contractors, Producers, and Trade/Professional Associations)
- Educators (Academia, National Highway Institute [NHI], Local Technical Assistance Programs [LTAP] and Tribal Technical Assistance Programs [TTAP])
- Researchers (individuals from any of the above categories who are focused on the specific aspect of finding better ways of building bridges through research)

This chapter provides a brief analysis of two of the largest markets—state transportation agencies and highway users.

STATE TRANSPORTATION AGENCIES

In the United States, the decisions regarding what type of bridge gets built where are made primarily within the State DOTs; therefore, this organizational type is the primary focus of the PBES marketing effort. Although there are almost half a dozen types of "customers" considered in the category of State Transportation Agencies, this marketing effort focuses primarily on two key customer types: the state bridge engineer and the CEO.

THE STATE BRIDGE ENGINEER

The state bridge engineer is responsible for planning, designing, and constructing bridges within the state. He or she is the key technical professional having impact on the decision-making process of whether to make the use of prefabricated bridge elements and systems a standard approach. Therefore, it is critical to know how these individuals feel about PBES as a concept, what prevents them from using PBES on a regular basis, and what actions might eliminate those barriers.

In April 2005, in a meeting at Woods Hole, Massachusetts, a focus group of 18 state bridge engineers discussed those very topics. The group found six barriers to using the technology and six needs that, if filled, would eliminate those barriers.

Lack of Education, Training, and Experience

Because of the relative newness of this technology, most of these state bridge engineers felt that extensive training was needed for both the DOT staff and contractor personnel. One engineer noted that contractors are reluctant to bid on technologies, methods, or equipment with which they are unfamiliar. Another pointed out that part of that education and experience would be having access to specialty firms that have done such work before.

How does one remove that barrier? Of course, a formal course and workshops were mentioned, but also, as one bridge engineer noted, on-the-job experience would be very helpful. The State DOT “needs to work through the issues with a small demonstration project.”

Lack of Standards and Specifications

A majority of the group felt that standards and specifications were critical elements as well. The types of standards and specifications the group requested include design considerations, foundation requirements, development of construction specifications to administer the project, project planning guidance early in the schedule to facilitate obtaining adequate right-of-way to build the bridge off the alignment, guidance in speed of installation of foundations, inspection requirements, and an incentive guide specification for PBES. Hauling and transportation of PBES can be an issue as well.

Concerns about Durability or Details

One bridge engineer noted that a barrier for installing PBES routinely in hours or days is the need for testing to ensure the final product meets the state’s seismic potential loss of continuity performance requirements.

Another bridge engineer stated that he had concern for the potential loss of continuity and the smoothness of the riding surface that can be achieved with conventional concrete cast-in-place construction.

Another noted that, “durability of joints and connections in prefab components remains a concern,” and another bridge engineer agreed, saying that connection details (footings to columns and columns to caps) in seismic areas are a concern.

One bridge engineer was concerned about bridge demolition and site preparation time. He said that, “Whereas a prefab bridge itself can be erected quickly, it usually has to go

where an existing bridge is located. Therefore, the road must be shut down for a considerable amount of time to demolish the existing bridge and prep the site for the new bridge. This then forces us to do staged construction or erect temporary bridges. If the incremental time savings is so small versus total project time, there is no incentive to go prefab bridge routinely.”

What did these state bridge engineers want to allay their concerns about durability of details? They felt that more research and testing are needed. One suggested seismic testing of unconventional details and systems. Another wanted more information addressing bridge demolition and site preparation, and others suggested additional research to ensure that adequate ductility can be achieved in connections for PBES.

Higher Cost and Limited Resources

Exactly half of the engineers in the group stated that they perceive PBES to have a higher price tag than conventional approaches. One stated that most of the prefabricated elements used by his state are manufactured out of state, so transportation costs are higher than conventional approaches. Another said that the costs of using SPMTs or other heavy lifting subcontractors can add 15 to 20 percent to the project cost. Although much has been said about PBES saving initial cost funds, it is clear from the responses of this key group of state bridge engineers that PBES projects to date have not consistently achieved lower initial costs, and that it is important to use PBES effectively such that the projects have competitive initial costs.

Lack of Perceived Need for Speed

Several state bridge engineers questioned whether being able to build fast was really necessary, since there were still other items on a project schedule’s critical path that might negate any benefits. Others noted that, in many projects, there was not an alternative route available so that traffic could be even temporarily shunted to another location. As far as what would help most in facilitating this challenge, the responses indicated that adequate evaluation was needed in the planning stage to ensure benefit from the use of PBES. The responses also seemed to imply that PBES should be looked upon as not being simply as way of building fast, but a way of building *better*.

Construction Industry not Geared up for Prefab

Concerns were voiced over contractors’ ability to staff up for projects and then having to lay people off after a project is completed. Also, lack of a large enough number of heavy lifting contractors to compete for projects and lower cost was a concern. One bridge engineer noted a lack of prefab manufacturing facilities in his state or even nearby states.

THE STATE TRANSPORTATION AGENCY CEO

Next in importance is the chief executive officer of the State DOT. Naturally, as the top administrator of the agency, this person can play a major role in the decision-making process for the use of PBES technology.

From the middle to the latter part of the 20th century, the typical State DOT was managed by a leadership staff comprised of civil engineers who answered to a commission appointed by the governor of the state. Commissioners would meet periodically, usually once a month, to provide general direction for the agency and to approve the development of major highways and programs. This approach worked for a few key reasons. First, it allowed the

department and staff to operate based on engineering needs and buffered it from political pressures. Second, it allowed the governor to appoint individuals who had good business sense and who would manage according to the governor's political leanings. It also relieved the commissioners of the day-to-day aspects of design, construction, maintenance, personnel management, and other operational tasks.

It was common to develop agency leaders internally over many years. Agencies would hire college engineering students during the summer months. Later, after they'd received their degrees, these new engineers would have jobs waiting for them at the agency. It was quite normal for a man to work for an agency from his college years, right through to retirement.

While some state DOT heads today are engineers with many years of experience in project work, the picture is changing. With the ever-increasing size of projects, in terms of their construction costs, their complexity, and their impact on the public, newly elected governors have become very much aware of the impact that success or failure of a transportation project or program can have on their administrations. Many of them have appointed their own people to head the state's transportation agency. Typically, the individual selected is a successful business person or political operative who actively supports the governor's agenda. Thus, for the new agency head, concern with the media and the political ramifications of a decision can be as critical as the actual transportation engineering ones.

This practice of appointing non-transportation professionals has gotten so prevalent in recent years that AASHTO has scheduled week-long training camps to bring these new executives up to speed on what running a state's transportation program is all about. By definition, these individuals have an eye on the political implications of transportation decisions and, because their term of office is frequently no longer than that of the governor who appoints them, they look for approaches that have fast results—in months or, at most, a very few years.

Exactly how many state DOTs have such leadership? An Internet search in early 2006 showed some remarkable statistics. Out of 50 states and the District of Columbia, only 19—less than 40—are headed by engineers. This is down dramatically from the numbers of just 5 years ago. Moreover, several of those listed as engineers have their expertise in non-highway related areas, such as mining or forestry. Only 21 DOT heads were agency employees prior to getting the job of CEO. (A chart of the results is found in Appendix B.)

Additional support is found in a mail survey of the heads of state DOTs, undertaken in 2003. Of the 32 respondents, 17 had civil engineering degrees. The other 15 had degrees in topics as diverse as law, psychology, journalism, history, and environmental policy. The group was asked, if they could somehow acquire additional expertise overnight, in order to enhance their role as the leader of their organization, what sort of expertise might it be? In response, 14 said business management, 12 said economics and finance, 9 said marketing and public affairs, 8 said human resources, and only 7 mentioned engineering.

Given the major differences between the engineers and the new type of CEO, it is clear that there need to be at least two marketing approaches in dealing with state transportation agencies, one focused on the engineering, technical aspects, and another focused on areas such as financials, safety and civic responsibility.

HIGHWAY USERS

One might argue that there is no reason to go outside the highway community in order to attain success with PBES. However, those outside the highway community play a critical role in the success of the PBES technology. The foremost reason for involving the public is that the laws, regulations and traditions of our society demand involvement of the public in governmental affairs. Also, of course, it is public funds that support the entire program. And, it is important to note, the impact of PBES extends to areas that influence the public. The cost of congestion, for example, in terms of lost hours and the cost to the national economy are things that impact everyone.

ANALYSIS OF INTERNAL MARKETS AND ENVIRONMENT

CORPORATE PHILOSOPHIES

Both the highway community as a whole and the FHWA in particular have been diligent in seeking out innovative solutions to highway challenges. As noted earlier, each year, teams of engineers, planners, and other professionals scan the globe, looking for potential innovations for highway facilities. The result of those trips is an increase in understanding of what the technology could provide the bridges on the Nation's highway system. A lack of innovation, however, has not been the problem. Rather, the challenge has been in getting those innovations moved from state-of-the-art to state-of-the-practice. Two key factors need to be addressed to improve implementation time.

First, there needs to be a standardized systems approach for deploying technologies. There is a need for a specific system for tracking where in the process an innovation is at any one time, and for getting technologies delivered to state DOTs that might use them. Ensuring that technologies are communicated to and understood by all stakeholders are key objectives.

Prior to 1999, FHWA maintained a central organizational unit responsible for moving technologies into the marketplace—"technology transfer," as it is called. The Office of Technology Applications (OTA) included engineers and communications specialists whose job it was to coordinate the process from "market ready" to state-of-the-practice throughout the highway community. But with the restructuring of the agency that year, OTA was dissolved and the individual program offices were given the funds and the responsibilities for marketing technologies within their own program areas. The result has been inconsistent and uncoordinated.

Second, the culture of the highway community must be changed so that it sees the benefit in trying new innovations. Because of the way many agencies are set-up, very often a project manager prefers to use the "tried-and-true" approach of the past rather than using an innovative approach, even when it has been proven in other locations. This is in part due to the continuing reduction of the state DOT workforce while work volume remains constant or increases, making it difficult to allocate the additional time required to implement new approaches. Also, the lack of a motivating device such as awards and bonuses, or simply an environment that praises innovation, can mean that trying something new is simply not worth the risk.

The consequence of not taking these two necessary steps is a very slow process for delivery of innovations. The effort creeps along, often taking years, or even decades,

before an innovation is accepted on a nationwide basis. What is needed is to “leap, not creep” in this effort.

How is that brought about? One approach is to simply set up a systematic process for technology deployment. But merely setting up a new, untried process will not be sufficient. What is needed is a commitment by management to the process, as well as support to assist with the implementation and examples of innovations that have been successfully delivered using that process, so that others can see the benefits of using such an approach.

Therefore, in the areas of infrastructure, safety, and operations, the FHWA selected three example innovations for deployment using a systems approach that would be common to all:

- Infrastructure: Prefabricated Bridge Elements and Systems (PBES)
- Safety: Road Safety Audits (RSAs)
- Operations: “Making Work Zones Work Better,” which includes a suite of innovations focused on construction work zones

These innovations were chosen for their potential for making a significant impact on the current state of the highway system. They provide the diversity needed to demonstrate that a common approach will work for virtually any innovation. Although this marketing plan focuses on PBES, because it is to serve as a model approach for getting technologies adopted in the future, the plan is intentionally fairly exhaustive in its approach.

The FHWA Innovation Delivery Process Model

The model calls for a marketing team comprised of representatives from the responsible Headquarters Program Office(s), the Resource Center, one or more of the Federal-aid Highway Division Offices, and the Federal Lands Highway Divisions. Among the team’s members are specialists with expertise in the innovation itself, Federal-aid program delivery, Federal Lands Highways program delivery, and marketing. The Highways for LIFE (HfL) program provides coordination and administration services for the team.

The team will be responsible for the development, implementation, and management of a marketing plan for the innovation that includes the following:

- A clear, concise and thoroughly researched statement of the national need
- A detailed description of the innovation itself and its applications
- A comparison of the innovation with the traditional approaches it hopes to replace
- An assessment of the current situation from the perspective of the business environment, the need, and the innovation
- Identification of the target audience/customers within State DOTs, industry, and FHWA
- Identification of the national goal(s) for the innovation and time frame for its acceptance
- Identification of a strategic plan to deliver and deploy the innovation, including
 - Determination of the core messages
 - Promotional items
 - Schedule of activities such as training, special events, one-on-one meetings

- Assignments of specific personnel to handle key activities
- Metrics to evaluate the progress of the strategic plan
- Identification of time sequenced resource needs
- An evaluation process for the success of the overall marketing plan

Resources

For the innovation marketing team to be successful, it will require several specific types of resources, specifically funding, staffing, and commitment from management.

Management commitment includes both the senior management of the agency and the immediate supervisors of the staffers who will be called on to work on the innovation team. This approach provides a means for getting innovations to state DOTs faster and with a higher potential of being implemented. A training module will be developed as one means of addressing this matter, which will specifically show highway engineers and other employees how to access a variety of resources where such innovations are described. The training also will provide guidance on how individuals can develop innovative approaches to the challenges they face in developing new highway or bridge projects.

A critical element of the process will be the assignment of specific tasks to individuals, along with timeframes in which those tasks are to be completed. Without such personal accountability, schedules are not likely to be met.

Finally, it is critical to have sufficient financial resources to fund communications materials, travel, and training curriculum development. Two sources for funding have been identified: the HfL program has agreed to provide significant initial funding, and bridge program funds can supplement that.

INTERNAL ORGANIZATION

Attached is an organization chart of FHWA. It is noteworthy that bridge engineers populate every aspect of the agency: Headquarters (including both those in the Nassif Building and at the Turner-Fairbank Highway Research Center), the Resource Center, the division offices, and the Federal Lands Highway offices. Thus, unlike many areas of the agency, it is possible to have a “champion” of PBES in virtually every office of FHWA. As one of the FHWA bridge engineering websites notes,

FHWA's partners and senior managers expect FHWA bridge engineers to aid them in the deployment of emerging technologies and practices that reduce the number of deficient bridges, construction time, and construction and maintenance costs, while improving work zone and traffic safety. FHWA bridge engineers must possess superior technical skills and have a comprehensive understanding of “best-practices” in bridge engineering to be able to accommodate our agency's strategic goals and support the “Vital Few.”²

FHWA's Bridge Leadership Council has committed to serving as a champion as well. As that website notes, through the efforts of the council, “FHWA bridge engineers will be

² For details on this, see the agency's intranet discussion at staffnet.fhwa.dot.gov/bridge/blc/enhance.htm.

able to lead the mainstreaming of new technologies and strategies to assess and preserve bridges, which reduce the construction time and impacts on congestion.” This organization should be enlisted to provide resources, whether it’s assistance in communicating with others within the agency, or financial assistance.

The various roles of FHWA units in implementing PBES are as follows:

- **R&T Leadership Team:** Establish PBES as an FHWA priority, set the national goal for PBES, agree to full agency support and participation to achieve the goal, agency accountability for achieving the goal
- **Program Office:** Champion PBES, provide technical and goal direction, funding
- **Resource Center:** PBES technology delivery and technical assistance
- **Division Offices:** Mobilize staff to deploy PBES with their state DOTs and industry
- **Federal Lands:** Adopt PBES as a standard, build demonstration projects, support demonstrations and documentation
- **National Highway Institute:** Training development and delivery
- **PBES Implementation Team:** Lead deployment effort, develop and implement marketing plan, monitor and report on progress toward goal.

OTHER TARGET MARKETS

CONSTRUCTION CONTRACTORS

As the focus group interviews with state bridge engineers noted, the relative comfort that contractors feel in using PBES will play a critical role in the technology’s acceptance. Therefore, activities are needed to reduce the contractors’ perception of higher risk with the use of PBES. Such activities may include evaluation in the project planning stage to ensure effective use of PBES, the development of standard design plans and specifications, the continued use of demonstration projects and workshops, training for both owners and contractors, and the use of contracting strategies that provide the contractor with a financial incentive to meet the owner’s reduced onsite construction timelines.

TRADE ASSOCIATIONS

Trade associations have long played a key role in getting highway innovations adopted. Often, an association’s research group can aid in the development or refinement of a technology. Likewise, their communications groups can be key informants to their thousands of members throughout the world. *Civil Engineering* magazine is an excellent example. The publication has long been recognized as a resource for obtaining details on new technologies and how they have been applied to specific projects. The publication has an international readership of professional engineers throughout a wide range of areas, including government agencies, research programs, consulting firms, and academia. Partnering with such trade associations provides an important ally to the team charged with

getting a new technology implemented. To the association itself, it provides an entrée to details of the technology, a valuable aid in serving its membership.

OTHER GROUPS

While other markets and audiences are important (e.g., local transportation agencies, MPOs, educators, researchers), most of them can be reached, either through secondary communication with the above noted markets, or through including them with the communications efforts to state DOTs.

MARKETING STRATEGY

MARKETING OBJECTIVES

The objective of the PBES initiative is that, by the year 2010, all State DOTs and the three Federal Lands Highway Divisions will consider the use of PBES to be a standard practice for bridge design and construction. The long-term vision is to have stockpiled PBES superstructure and substructure components which are standardized, inexpensive, durable, and rapidly erected. To achieve this goal, the PBES implementation team determined where it should be going between now and 2009:

- Look at the “opportunity” states
 - Raj’s spreadsheet
 - Bridge program volume
 - Future needs based on the National Bridge Inventory [NBI]
- Look at states with no accelerated bridge construction (ABC) projects
- Progressive states that choose non-risk projects
- Convince states that they will save money on first costs
- Action plans to achieve consideration of PBES as standard practice by 2010
- Focus on replacement versus new construction
- Tools to define cost-effectiveness (first cost/user cost/life cycle cost)
- Mobilize FHWA Division Offices
- Continue developing needed tools, both technical and marketing
- Example contracting specifications to states to get short timelines

MEASURE

The measure for success in a particular area is framed in the following question: Does the state DOT or Federal Lands Highway Division have a PBES policy and specification?

CURRENT STATUS

Three states (New York, Texas, and Washington) each have built more than 20 PBES bridges. Alabama, Connecticut, Florida, Illinois, Indiana, New Jersey, Pennsylvania, and Virginia are actively pursuing PBES as a standard practice.

MARKETING PERSONNEL

The core PBES marketing team includes the following members (listed alphabetically):

- Kathleen Bergeron, Marketing Specialist, HfL
- Hala Elgaaly, Bridge Engineer, Federal Lands Highways
- Shoukry Elnahal, Structures Technical Service Team Leader, FHWA Resource Center
- Vasant Mistry, Senior Bridge Engineer, Office of Bridge Technology
- Benjamin Tang, Bridge Team Leader, Office of Bridge Technology

CHANNELS OF DISTRIBUTION

EXISTING CHANNELS OF DISTRIBUTION

The PBES implementation team developed the following list of approaches to customers and technology transfer:

- One-on-one assistance – most important!
- Training (formal classroom), including on manuals and decision-making framework
- Activities based on customer feedback
- Funding
- Marketing tools (e.g., toolkit CDs)
- Open houses/showcases/demonstration workshops, including contractor participation
- Technical tools (e.g., manuals)
 - Connection details, user-cost models, contracting methods
- Mini-scan tours between states
- Trade shows
- CDs/DVDs, including videos of construction
- Website
- Presentations
- Articles, papers, brochures
- Emphasize lessons learned and important aspects
- Interaction with the ones doing the work
- Marketing to CEOs

The team will identify federal and state champions and bring a diverse group of experts together, including experts in hydraulics, maintenance, right of way, and utilities, for a systems-based approach to design and construction. See Appendix C for contact information for key state and federal transportation officials.

There are several key methods for getting information to the state DOTs:

- ***One-on-one meetings.*** This is the most critical of any of the tools under consideration. This allows the other person to actually get involved in a dialog, rather than simply reading a brochure or listening to a speaker at a conference or workshop. It also allows the FHWA representative to probe into reasons why a DOT employee would resist using a new technology. Is it because of the technology itself? Is there something inherent in the agency's culture? Whatever the case, one-on-one meetings are marvelous tools for ferreting out answers while creating personal relationships. Further, any hesitation to using a new technology can be overcome better because the other person is there to

reassure and the provide encouragement. Goals of the one-on-one meetings include building a relationship and partnership with the state DOT and obtaining buy-in to the technology; care will be taken to ensure that the technology is not perceived as an FHWA mandate.

- ***Training programs.*** Formal classes and workshops reinforce the one-on-one meetings because they can graphically demonstrate that the individual new to a technology may become quite conversant in it in a very short time. Also, because such programs use success stories to illustrate how the technology is applied, potential users who might otherwise feel that they are not able to apply the technology in their states are put at ease. Not to be minimized is the importance of providing a certificate to individuals who attend classes and workshops. It is vitally important that those individuals are told—not just orally, but also in print—that they are now recognized as being capable of applying the new technology. Their attendance in the classroom is not merely a review of information but rather an actual instructional effort with the desired outcome that graduates will be able to leave the classroom fully capable of putting the technology to work in their jobs.
- ***Presentations.*** Meetings of bridge engineers, as well as the leaders of highway agencies, are excellent vehicles for delivering a message on PBES technology. While less effective than either of the previous channels of communication, presentations at meetings are excellent ways of making an initial impression. Graduates of the training programs mentioned above should be armed with basic tools for providing presentations to their staffs, once they return to their workplaces in their home state DOTs.
- ***Open Houses>Showcases.*** These special events are focused around projects that are being constructed using the particular technology under consideration. For example, if one state is building a bridge using PBES, it becomes an excellent opportunity to bring bridge engineers from other states to see the process as it develops. They get a chance to discuss aspects of the project with the project engineer as the work is being done.
- ***Marketing Communication Tools.*** Such tools as videos, brochures, PowerPoint presentations, and websites can be used as vehicles for delivering the message on a technology. However, care must be taken not to rely on them to carry the message alone. Using a short video as part of a presentation, for example, is much more effective than simply sending it to everyone via the mail. Even such often derided items as give-a-ways can be used effectively in gaining support for the technology. Items such as lapel pins or stickers for hard hats, promoting the innovation, can send the message that the wearer is a supporter of the technology and can encourage others to “join the team.”

NEW CHANNELS OF DISTRIBUTION

Weblogs (“blogs”) (use example of GM’s CEO and how he participates in web blogs, talking with customers across the country, the world, in discussing his firm’s products. Not

only does it clarify the organization's vision to the customer, it keeps that CEO up to date on what some of his customers are thinking and needing.

MARKETING STRATEGY: YEAR ONE

TARGETS FOR FY2007

During the 2006 fiscal year, the PBES implementation team's goal was to have 15 additional states try PBES on one or more projects, with 8 of them determining that PBES will be their standard approach to bridge design, with "stick-built" being used only when PBES is not appropriate.

Also, participation in the PBES implementation effort needs to include others within the highway community, so at least four industry groups and associations were targeted during the first year of the program. A key device for measuring an organization's commitment to PBES was having their primary member publication publish a positive article on PBES, with a commitment to encourage the use of the technology by their members.

MARKETING STRATEGIES

The PBES implementation team will meet and discuss which states are most liable to go to PBES as a standard approach and target them first. The idea is that, as more and more states adopt PBES, eventually a "tipping point" will be reached, after which other states which might not be inclined toward PBES now, would be more so inclined.

Once these "opportunity states" have been identified, appointments will be made for bridge specialists on the team to travel to the appropriate division offices, there to meet with the division administrator [DA], give an all-hands presentation on the technology, and then to accompany the DA to the state DOT offices. At the DOT offices, the bridge specialist from the marketing team and the DA would meet with the CEO, with the state bridge engineer from the DOT in attendance. At that meeting, the bridge specialist from the marketing team would show a short (1 to 3 minutes) video on the technology, focusing on the bottom line benefits. Once that meeting was over, the bridge specialist from the implementation team would give more details to the state bridge engineer, perhaps showing a longer, more technical version of the video to the entire bridge design staff in the state DOT. The bridge specialist from the implementation team would leave behind a copy of the video, a brochure for each bridge person on the staff, and an advertising specialty item that was selected to tie in somehow with PBES. There would also be invitations provided to upcoming open houses/showcases or formal training sessions. Opportunities would be made for holding a training session there in that city.

National and regional workshops, conferences, and open houses/showcases also will be held throughout the year, and individuals from the targeted "opportunity states" will be invited to attend. Special travel scholarships will be made available for those same individuals, so that they can be sure to attend. Ultimately, the goal would be that, once an opportunity state has implemented PBES (and then later institutes PBES as the standard), DOT staff members will serve as champions for the technology to their peers. They will be asked to represent their state on panels at the annual meeting of the Transportation Research Board (TRB) and other prestigious conferences, as well as to accompany PBES implementation team members on

calls to other states, where possible. Should some sort of peer-to-peer program be established, these champions would be among the first to be recruited to serve.

Through a variety of special events, media interviews with trade journal reporters, and the above-mentioned association publications, the PBES message will be sent out nationally. Reprints will be obtained of all articles published on PBES, and these will be distributed to members of the target market. The message from this wide-ranging communications push will be that PBES is an established, ready-to-be-used technology that is being used throughout the country.

IDENTIFICATION OF PBES OPPORTUNITIES AND OBSTACLES

The PBES implementation team identified opportunities to implement PBES and obstacles to the use of PBES and then consolidated, categorized, and prioritized the list. The top categories of opportunities in priority order are:

- Standardizing and stockpiling “bread & butter” bridges (200 ft or less total bridge length)
- Saving money
- Technology advancements (high performance materials [HPM], design, construction, etc.)
- Congestion reduction
- Success stories and lessons learned

The top categories of obstacles in priority order are:

- Lack of training and tools
- Need to develop “bread & butter” (200 ft or less total bridge length) structure plans and implementation packages
- Lack of standardization
- Resistance to change/lack of buy-in
- Industry not geared up to deliver
- Need for knowledge transfer on all levels
- Lack of champions from states

PRIORITIZED RECOMMENDATIONS TO IMPLEMENT OPPORTUNITIES AND TO ADDRESS OBSTACLES

The team developed recommendations to implement the top prioritized categories of opportunities and to address the top prioritized categories of obstacles. The recommendations to implement opportunities (OP_) and to address obstacles (OB_) were then prioritized as shown in the tables below in ranked order. The recommendations without an “OP_” or “OB_” designation were ranked as low priority. Ties are shown with an “a,” “b,” etc., after the number.

Priority	Prioritized Recommendations to Implement Opportunities
OP1	Develop and promote standard design plans and specifications for PBES and substructure.
OP2	Continue to develop new technologies to implement PBES, e.g., durable connections.
OP3	Determine how cost analysis is being done in different states and develop standard formula for calculating cost savings. Incorporate it into framework.
OP4	Promote construction during off-peak times.
OP5a	Expand and continue to share knowledge of innovative construction techniques and equipment.
OP5b	Find states with large capital improvement programs and encourage partnership with fabricators.
OP7	Promote use of innovative contracting strategies for ABC bidding (e.g., incentive/disincentive).
OP8a	Work with industry to see what it would take for them to make it work, e.g., Alabama DOT program.
OP8b	Get 360° feedback and knowledge from industry on what works and what doesn't work.
OP8c	Promote regional and national technology exchange.
OP8d	Enhance media relations programs (e.g., publish articles on projects and case studies).
OP12a	Develop cost analysis software for initial, user, and life cycle costs.
OP12b	Maximize use of accelerated construction techniques (e.g., offsite construction).
OP12c	Continue to use internet to advance technology.
OP15a	Look at cost information for past projects and success stories.
OP15b	Mine and share information on past projects.
	Test prototype(s).
	Show that life cycle costs are lower with high performance materials.
	Incorporate and promote high performance materials for long-term durability and efficiency.
Keep "Get In, Get Out, Stay Out"	

Priority	Prioritized Recommendations to Address Obstacles
OB1	Collect and compile information (standard sections and plans) from all states, including connection details catalog. Hold at central clearinghouse.
OB2	Continue to develop and conduct demonstration projects and workshops.
OB3	Make NHI training a top priority.
OB4	Develop promotional and implementation packages for various levels of end users.
OB5a	Get the technical tools to states (availability of manuals and tools expedited).
OB5b	Promote use to all levels of owners.
OB7	Encourage owners to spec it.
OB8	Encourage owner to develop specifications that take some of risk away from contractors (DB)
OB9	Identify and recruit State DOT champions.

OB10	Find out what other technical tools are needed.
OB11	Use LTAP & TTAP centers.
OB12	Market the technical tools and training. Develop executive summaries on training for CEOs. Increase personalized effort by FHWA headquarters to collect information. Develop and deliver tools and training.

PBES ACTION PLAN FOR 2007, 2008, AND 2009, INCLUDING BUDGETS

The PBES developed a listing of the activities to be conducted in 2007, 2008, and 2009 to accomplish the prioritized recommendations. Who, what, when, where, and how much cost were identified for each activity, as shown in the following table.

MARKETING ACTIVITIES TIMETABLE

Priority	Date	Activities	Location	Target Audience	Lead Team Members	Approx .Cost
OP5a OP8c OB2	Dec. 2007	Conference	Baltimore, MD	Bridge Professionals	V. Mistry R. Ailaney	\$98,000
OP5a OB2	2008 2009	ABC Workshop	Pittsburg h, PA	Bridge Professionals	V. Mistry	\$5,000/ yr.
OP5a OB2	2007 2008 2009	ABC Workshops for States	TBD	Bridge Professionals	V. Mistry R. Ailaney G. Jakovich	\$40,000 /yr.
OP5a OP8c OB2	June 2007	PBES Bridge Replacement Showcase	Salt Lake City, UT	Bridge Professionals; Government Leaders; General Public	V. Mistry	\$20,000
OP5a OP8c OB2	2008	PBES Bridge Replacement Showcase	Oregon	Bridge Professionals; Government Leaders; General Public	V. Mistry T. Rogers	\$20,000
OB3	2007 2008 2009	Best Practices Manual for ABC & NHI Training		Bridge Professionals; Designers	V. Mistry R. Ailaney G. Jakovich	\$750,00 0/1 st yr. (SBIR)
OB1	2007	Catalog of Connection Details	HQ	Bridge Professionals; Designers	G. Jakovich V. Mistry R. Ailaney	\$240,00 0
OB4	2007 2008 2009	Presenting successful projects and case studies (marketing video)		Bridge Professionals; Decision Makers	V. Mistry K. Bergeron R. Ailaney G. Jakovich	\$25,000 /yr.
OB1 OB8	2007	Meet with 8 States to compile existing	CA FL	Team members &	G. Jakovich R. Ailaney	\$15,000

		plans & specifications for all ABC (1-on-1 mtgs)	LA NY PA TX VA WA	Div. Bridge Engr. with State Bridge Engr.	T. Rogers	
OB1	2007	With initial compiled plans & specifications, coordinate with HfL to populate the exchange website	HQ	FHWA, States, industry, local agencies	M. Cribbs G. Jakovich R. Ailaney	\$10,000
OP5a OP12c	2007	Re-format PBES website to topic-based format	HQ	Web users	M. Cribbs R. Ailaney	\$0
OP1 OP8b OB10	2007 2008	Collect existing industry standards & populate website	HQ	NCBC, NSBA, PCI, PTI, PCA, SCEF/PCEF, PCINE, ASBI, ...	G. Jakovich R. Ailaney T. Rogers H. Bowman C. Napier M. Cribbs	\$10,000 /yr.
OP2	2007 2008 2009	PBES testing of connections & other details as needed	TFHRC	Users	M. Adams G. Jakovich	TBD
OP3 OP12a	2007 2008 2009	Develop standard methodology, software, & template for calculating all costs, and include in Framework, Best Practice Manual, NHI training, & HfL evaluation of projects	HQ	Users	R. Ailaney C. Napier K. Bergeron E. Gabler	\$250,000 in 2 nd yr.
OP4 OP5a	2007 2008 2009	Ongoing – manual, training, workshops, framework	HQ	Users	Team	-
OP4 OP7	Aug. 2007	Educate Divisions on innovative contracting strategies	TN FHWA mtg.	Division Bridge Engineers	R. Ailaney H. Bowman	\$5,000
OB1 OB7 OB8 OB9	2008 2009	Do 1-on-1 meetings in all States	52 minus initial 8 in 2007	State Bridge Engineers, Construction Engineers, & Project Mgrs.	V. Mistry	\$50,000 /yr.
OP8d OB4 OB5a OB5b OB10 OB11	2007 2008 2009	Develop 2-level set of tools: - Marketing - Technical & then take to users	HQ	Users	K. Bergeron G. Jakovich	\$75,000 /yr.
OP5a	2007	Publish & distribute	HQ	Users	B. Tang	\$10,000

	OP12b	SPMT Manual; post on website		M. Cribbs		
OP5b OP8a OP8b	2007 2008 2009	Contact Alabama DOT, Gene Calvert, NCBC & NSBA to learn what they are doing with fabrication of stockpiled products. Then go to states with large capital improvement projects to promote partnerships with fabricators	HQ	FL, OH, OR, UT	B. Tang G. Jakovich V. Mistry S. Elnahal	\$10,000 /yr.
	June '07 June '08 June '09	6-month follow-up meeting	TN DC DC	Team	V. Mistry	\$5,000/yr.
	Dec. '07 Dec. '08 Dec. '09	Annual meeting	TBD	Team	V. Mistry	\$10,000 /yr.

REVIEWS AND EVALUATION

Twice annually (at least through 2009), the PBES implementation team will meet to review and evaluate progress on the activities to achieve the prioritized recommendations that will implement opportunities and address obstacles. Mid-course corrections will be implemented as needed to ensure that the activities are consistent with where the team has determined it should be going to reach its goals by 2010.

APPENDIX A – BRIDGES BY MATERIAL TYPES, 12/2004

BRIDGES BY YEAR BUILT, AS OF DECEMBER 2004

State	Pre 1900	1900-1905	1906-1910	1911-1915	1916-1920	1921-1925	1926-1930	1931-1935	1936-1940	1941-1945	1946-1950	1951-1955	1956-1960	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2004
ALABAMA	2	95	19	37	71	186	609	436	972	326	902	1171	1623	1647	1406	965	774	998	1109	1050	780	470
ALASKA	0	15	2	0	1	0	0	5	16	9	15	44	55	64	105	147	128	174	131	105	103	53
ARIZONA	0	49	4	9	42	30	161	341	342	75	220	333	488	782	904	495	522	485	744	431	449	217
ARKANSAS	1	1	10	10	43	60	712	398	549	174	565	562	766	1041	1160	947	1072	775	948	939	1021	702
CALIFORNIA	8	41	68	188	280	383	751	532	875	330	1158	1277	2336	3173	3906	2429	1353	885	1176	1021	919	249
COLORADO	3	2	15	15	25	42	135	269	394	67	296	241	668	713	712	538	491	700	972	910	747	224
CONNECTICUT	40	70	34	34	43	53	147	151	256	66	146	139	698	621	406	219	165	198	357	211	87	26
DELAWARE	0	18	2	6	15	14	20	27	22	4	15	33	50	86	97	75	74	45	66	88	75	18
DIST. OF COL.	0	4	7	3	1	3	15	16	21	18	15	38	72	23	10	1	1	0	0	2	0	0
FLORIDA	0	18	1	4	12	45	128	61	193	106	402	562	1129	1528	1281	1346	763	806	968	908	832	377
GEORGIA	4	6	8	21	45	98	296	354	606	228	841	912	1614	1493	1319	999	1287	970	1212	1106	733	309
HAWAII	2	14	6	35	25	37	82	68	82	23	41	69	69	94	168	113	48	54	23	18	11	7
IDAHO	0	0	10	14	28	23	93	107	117	22	138	234	393	544	520	467	397	231	219	216	162	104
ILLINOIS	71	1063	470	137	266	431	643	699	684	204	485	855	2082	2066	1779	1761	2186	2665	2405	2156	1679	833
INDIANA	175	199	198	158	444	357	721	527	619	170	454	370	1395	1610	1739	1532	1294	1350	1582	1534	1283	460
IOWA	70	1235	122	290	578	452	569	417	1073	422	1359	1795	2262	1672	1971	1866	2049	1561	1510	1335	1468	826
KANSAS	20	562	415	195	633	439	1868	1446	1653	605	1102	1339	2263	1910	1790	1379	1543	1678	1502	1313	1320	554
KENTUCKY	10	14	11	12	72	134	604	776	578	205	656	957	855	1046	1341	1044	872	912	1008	1266	806	329
LOUISIANA	0	0	3	2	7	27	90	259	203	89	300	736	1412	1469	1711	1302	1317	1241	1078	942	771	320
MAINE	7	11	4	15	25	81	142	160	210	57	170	299	191	189	148	136	110	84	95	68	124	45
MARYLAND	51	91	47	43	110	79	183	193	130	66	211	259	403	557	461	461	282	334	428	339	219	109
MASSACHUSETTS	308	142	107	64	74	104	146	158	477	50	214	308	942	600	351	146	219	127	99	112	130	75
MICHIGAN	34	160	88	63	172	260	505	366	395	121	324	367	904	1370	978	1087	762	739	632	615	476	398
MINNESOTA	16	52	60	171	230	263	298	261	492	170	287	487	698	983	1083	870	1677	1057	1040	1030	1090	705
MISSISSIPPI	0	22	4	11	24	25	134	202	561	83	516	612	1371	1444	1490	1518	1384	1428	1382	1726	1919	984
MISSOURI	3	1054	422	164	657	662	1646	1291	1162	213	1116	995	1691	1614	1362	953	865	961	1496	2013	2208	1241
MONTANA	13	6	30	62	40	39	111	275	329	107	269	229	400	502	564	458	469	370	277	209	164	118
NEBRASKA	7	40	86	94	115	69	178	4028	473	103	461	381	673	1003	813	870	933	1202	1209	1210	936	569
NEVADA	0	4	1	0	2	4	8	26	23	13	34	29	76	236	143	94	134	74	159	195	273	83
NEW HAMPSHIRE	40	44	18	13	54	38	182	117	213	47	124	86	236	182	225	137	144	131	105	80	109	32
NEW JERSEY	100	273	94	103	146	200	386	240	292	139	405	573	387	503	644	599	255	206	327	285	262	63
NEW MEXICO	0	0	2	5	3	11	42	155	321	119	184	187	332	371	529	385	356	228	200	169	122	106
NEW YORK	213	190	237	221	196	222	885	1104	1124	296	681	1198	1357	1602	1471	1120	736	745	1062	1122	1041	478
NORTH CAROLINA	1	3	7	5	64	307	209	137	373	116	709	1590	2209	1830	1678	1173	1364	1072	1207	1310	1367	595
NORTH DAKOTA	3	12	30	44	95	51	116	158	307	98	303	267	381	371	428	321	404	308	270	231	183	124
OHIO	44	2253	230	264	276	315	832	742	991	364	747	1637	2285	2621	2794	1966	1385	1420	1733	2225	2053	731
OKLAHOMA	0	32	116	133	437	325	1250	1144	4004	668	1680	943	1451	1323	1225	1098	727	1300	1583	1624	1610	639
OREGON	2	2	17	41	56	110	167	153	154	60	230	563	1003	1025	747	668	551	500	359	292	376	182
PENNSYLVANIA	590	448	422	477	667	725	1437	1176	1758	550	1027	1315	1656	1936	1818	1368	722	737	1131	846	916	449
RHODE ISLAND	29	17	11	14	17	20	35	30	18	4	22	33	87	144	112	41	19	18	22	33	18	5
SOUTH CAROLINA	0	40	2	7	16	90	221	206	424	148	403	451	1149	1066	1121	892	854	513	422	545	711	220
SOUTH DAKOTA	0	27	67	63	89	131	446	367	416	149	254	286	490	597	464	426	303	260	326	292	301	207
TENNESSEE	3	18	12	32	95	244	684	481	799	309	932	744	1721	1746	1754	1435	960	2498	1829	1536	1351	505
TEXAS	0	58	38	54	195	665	1581	2107	2757	911	2542	2871	4668	4869	4494	3556	2687	2775	4549	3090	2962	1523
UTAH	0	1	2	6	10	19	33	76	59	53	101	102	213	253	338	275	191	292	242	149	290	93
VERMONT	66	35	10	21	136	47	285	118	305	30	112	97	145	228	194	231	149	135	105	99	94	43
VIRGINIA	16	18	19	39	58	115	301	1426	366	220	372	431	836	1448	1429	1260	1075	706	991	841	833	359
WASHINGTON	0	62	22	65	118	125	177	208	217	107	362	548	781	829	881	743	497	420	382	427	400	190
WEST VIRGINIA	54	40	37	157	228	260	267	169	323	94	261	197	317	328	389	451	612	355	784	609	709	246
WISCONSIN	13	32	52	64	240	245	528	340	505	159	474	460	877	1100	1276	952	940	978	1272	1283	1123	698
WYOMING	0	1	2	11	20	19	34	52	56	13	119	161	411	428	469	227	254	226	201	145	120	60
PUERTO RICO	26	17	4	12	27	59	57	21	94	57	103	88	112	136	173	264	212	84	113	191	235	50
TOTALS	2045	8611	3705	3708	7323	8741	21138	24575	29378	8840	24862	30438	50649	55065	54384	43815	38268	38012	43042	40490	37973	18003

STRUCTURALLY DEFICIENT BRIDGES BY YEAR BUILT, AS OF DECEMBER 2004

State	Pre 1900	1900-1905	1906-1910	1911-1915	1916-1920	1921-1925	1926-1930	1931-1935	1936-1940	1941-1945	1946-1950	1951-1955	1956-1960	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2004			
ALABAMA	2	27	10	19	33	59	137	144	329	81	255	246	300	226	157	113	96	73	46	40	0	0	0		
ALASKA	0	0	1	0	1	0	0	2	4	2	10	13	11	16	21	19	21	16	13	1	0	0	0	0	
ARIZONA	0	7	0	1	4	4	21	12	8	2	7	7	16	25	19	9	13	7	1	0	0	0	0	0	
ARKANSAS	1	1	6	9	17	20	66	48	114	28	83	61	114	123	149	124	75	65	71	62	0	0	0	0	
CALIFORNIA	1	15	19	55	55	66	142	78	141	58	161	142	364	483	446	291	96	88	74	38	0	0	0	0	
COLORADO	1	0	6	4	11	7	37	55	89	20	48	29	70	74	65	30	26	20	10	2	0	0	0	0	
CONNECTICUT	6	15	11	5	8	15	31	21	42	7	12	19	71	29	25	6	10	5	7	0	0	0	0	0	
DELAWARE	0	4	1	2	1	1	2	4	2	0	3	1	4	2	1	5	4	0	0	0	0	0	0	0	
DIST. OF COL.	0	2	1	0	0	0	0	3	1	4	2	1	5	4	0	0	0	0	0	0	0	0	0	0	0
FLORIDA	0	0	0	1	0	5	12	2	19	12	25	31	67	37	32	23	15	19	12	5	0	0	0	0	
GEORGIA	3	2	3	11	13	21	38	33	97	35	190	139	208	99	85	59	75	35	28	13	0	0	0	0	
HAWAII	0	7	3	22	9	12	33	9	14	8	8	4	0	4	11	7	1	1	1	0	0	0	0	0	
IDAHO	0	0	4	6	12	11	21	35	39	1	20	19	43	36	29	17	13	3	5	1	0	0	0	0	
ILLINOIS	41	426	240	76	100	120	155	130	122	42	71	101	303	204	111	106	49	16	13	3	0	0	0	0	
INDIANA	79	100	97	83	161	137	262	140	143	38	81	48	104	134	143	89	69	41	27	17	0	0	0	0	
IOWA	54	633	94	160	299	170	246	151	499	184	580	672	639	283	240	146	150	37	16	6	0	0	0	0	
KANSAS	16	205	303	99	297	137	449	252	379	147	215	172	228	173	129	61	33	20	12	3	0	0	0	0	
KENTUCKY	6	8	8	5	42	38	143	119	129	24	88	84	101	104	115	73	60	74	47	13	0	0	0	0	
LOUISIANA	0	0	2	2	3	4	23	73	89	35	101	193	342	310	348	181	177	101	56	24	0	0	0	0	
MAINE	3	6	2	4	10	17	37	47	49	13	35	58	26	14	7	6	7	2	9	3	0	0	0	0	
MARYLAND	10	20	13	6	26	16	35	33	20	8	37	37	49	52	21	20	11	4	5	2	0	0	0	0	
MASSACHUSETTS	72	23	29	16	23	25	48	39	113	10	29	40	74	46	12	5	4	2	1	2	0	0	0	0	
MICHIGAN	26	90	56	41	100	112	197	93	122	25	74	61	165	261	149	134	36	10	9	3	0	0	0	0	
MINNESOTA	12	20	38	95	118	99	77	52	106	32	57	113	104	91	75	38	23	7	2	2	0	0	0	0	
MISSISSIPPI	0	15	3	7	11	12	77	87	243	39	183	230	444	414	402	384	250	185	176	217	0	0	0	0	
MISSOURI	2	432	265	90	374	222	672	523	501	78	407	290	438	259	145	120	95	53	31	31	0	0	0	0	
MONTANA	6	4	21	40	19	12	33	56	64	13	46	32	48	34	41	31	32	27	11	6	0	0	0	0	
NEBRASKA	6	32	60	50	73	26	53	1710	80	17	101	53	91	60	55	45	13	16	9	0	0	0	0	0	
NEVADA	0	3	1	0	1	2	1	5	8	2	5	0	4	6	5	3	3	2	2	1	0	0	0	0	
NEW HAMPSHIRE	19	15	7	9	21	7	54	17	60	10	30	8	24	32	17	7	9	6	3	0	0	0	0	0	
NEW JERSEY	44	111	38	48	62	77	123	71	71	37	32	49	44	31	25	12	6	6	2	0	0	0	0	0	
NEW MEXICO	0	0	0	1	0	5	15	21	44	9	5	38	52	44	64	56	31	9	3	0	0	0	0	0	
NEW YORK	73	62	60	73	48	68	273	282	273	73	104	184	149	155	97	95	48	26	23	6	0	0	0	0	
NORTH CAROLINA	1	0	4	3	19	74	38	31	83	24	192	468	442	423	250	150	74	25	12	9	0	0	0	0	
NORTH DAKOTA	3	10	25	33	57	27	66	69	140	43	103	61	55	40	32	26	10	0	2	1	0	0	0	0	
OHIO	19	719	88	93	87	101	241	170	212	59	132	190	326	193	193	128	55	28	12	7	0	0	0	0	
OKLAHOMA	0	25	110	114	279	192	684	416	1818	297	839	281	433	270	351	221	162	228	354	233	0	0	0	0	
OREGON	0	0	4	6	4	23	20	42	29	17	33	102	162	111	42	34	16	7	7	0	0	0	0	0	
PENNSYLVANIA	289	211	235	249	341	368	709	460	675	185	259	292	340	274	288	182	44	18	7	6	0	0	0	0	
RHODE ISLAND	7	6	5	9	5	7	10	10	9	1	11	12	40	31	21	6	1	1	0	1	0	0	0	0	
SOUTH CAROLINA	0	4	1	2	3	15	37	39	95	48	71	183	271	212	117	92	40	19	18	19	0	0	0	0	
SOUTH DAKOTA	0	14	47	45	53	54	176	141	128	46	60	54	63	66	48	27	24	15	7	4	0	0	0	0	
TENNESSEE	3	9	4	7	29	42	92	73	104	48	126	73	206	183	198	167	47	40	27	21	0	0	0	0	
TEXAS	0	50	24	27	79	65	198	153	323	87	288	175	266	179	143	81	103	144	150	45	0	0	0	0	
UTAH	0	1	2	3	5	7	7	21	16	23	20	15	19	30	45	20	8	6	4	3	0	0	0	0	
VERMONT	22	14	5	12	47	22	102	38	79	12	20	16	19	29	30	10	1	1	2	3	0	0	0	0	
VIRGINIA	10	8	15	21	22	51	88	306	69	46	52	59	76	142	81	66	37	20	10	7	0	0	0	0	
WASHINGTON	0	10	4	11	21	20	26	33	31	14	39	47	54	42	31	16	12	8	1	1	0	0	0	0	
WEST VIRGINIA	37	26	21	62	101	82	78	52	83	35	79	61	92	77	58	35	54	26	14	5	0	0	0	0	
WISCONSIN	5	16	32	37	111	95	178	107	167	48	140	82	131	122	144	51	18	7	1	3	0	0	0	0	
WYOMING	0	0	2	4	14	9	24	22	20	4	34	20	40	48	53	34	30	11	6	0	0	0	0	0	
PUERTO RICO	13	2	2	8	8	16	23	6	18	10	17	15	16	17	24	28	17	8	6	7	0	0	0	0	
TOTALS	892	3410	2032	1786	3237	2797	6310	6536	8113	2141	5620	5384	7751	6358	5390	3686	2306	1611	1371	882	0	0	0	0	

FUNCTIONALLY OBSOLETE BRIDGES BY YEAR BUILT, AS OF DECEMBER 2004

State	Pre 1900	1900-1905	1906-1910	1911-1915	1916-1920	1921-1925	1926-1930	1931-1935	1936-1940	1941-1945	1946-1950	1951-1955	1956-1960	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2004
ALABAMA	0	12	2	6	8	51	122	84	246	101	209	233	347	303	198	96	65	82	79	42	0	0
ALASKA	0	10	0	0	0	0	0	2	6	3	2	11	8	2	5	8	26	43	36	28	0	0
ARIZONA	0	5	2	2	11	9	19	30	31	5	9	20	44	105	74	39	28	30	55	36	0	0
ARKANSAS	0	0	3	0	9	17	171	127	195	45	171	141	171	192	158	79	115	95	124	82	0	0
CALIFORNIA	5	15	26	44	80	111	211	137	249	83	269	281	497	516	452	237	144	86	127	99	0	0
COLORADO	0	0	3	3	7	13	29	39	34	5	30	44	119	126	76	37	39	54	80	44	0	0
CONNECTICUT	22	27	12	17	14	17	46	64	89	23	49	29	189	152	66	41	19	28	73	41	0	0
DELAWARE	0	5	0	0	4	4	4	10	4	2	2	3	5	12	8	4	5	3	4	1	0	0
DIST. OF COL.	0	2	5	1	1	1	1	7	9	9	9	10	19	38	13	8	1	0	0	0	0	0
FLORIDA	0	0	1	2	6	16	51	11	52	25	97	117	286	416	228	188	67	97	67	75	0	0
GEORGIA	0	2	3	8	17	31	75	48	142	52	247	235	276	240	159	50	49	31	63	33	0	0
HAWAII	0	5	2	9	11	19	37	45	41	6	18	20	34	33	42	12	10	7	2	0	0	0
IDAHO	0	0	2	1	8	3	15	20	11	3	14	16	58	92	69	32	29	16	11	12	0	0
ILLINOIS	9	184	78	23	73	74	82	71	58	17	75	132	296	281	133	76	55	50	62	74	0	0
INDIANA	54	48	50	34	97	69	127	101	107	26	80	41	260	247	231	128	70	64	108	81	0	0
IOWA	6	158	10	41	83	85	79	59	120	57	152	165	185	142	120	55	80	47	22	33	0	0
KANSAS	1	47	38	37	121	109	298	168	215	94	132	146	428	188	189	95	108	59	49	48	0	0
KENTUCKY	4	5	1	3	17	62	257	310	192	67	173	210	151	205	280	224	173	160	166	158	0	0
LOUISIANA	0	0	0	0	1	9	22	76	54	14	88	260	387	371	400	138	125	110	111	82	0	0
MAINE	3	1	1	2	8	21	30	53	74	14	48	96	47	29	15	12	10	11	8	5	0	0
MARYLAND	25	27	15	26	38	38	78	71	41	20	37	50	105	141	72	68	46	57	57	39	0	0
MASSACHUSETTS	132	64	46	26	29	41	54	50	122	16	83	123	400	284	185	51	106	62	37	21	0	0
MICHIGAN	5	15	9	8	38	59	81	58	40	16	50	79	174	243	141	129	63	58	49	42	0	0
MINNESOTA	0	7	9	48	35	29	16	14	39	11	9	9	45	65	66	15	17	11	21	4	0	0
MISSISSIPPI	0	6	1	2	3	6	32	63	93	12	96	108	287	272	130	48	40	40	32	47	0	0
MISSOURI	0	143	39	18	85	159	297	246	184	35	180	178	320	330	204	113	121	141	205	217	0	0
MONTANA	2	1	5	9	4	6	16	27	20	10	16	22	39	96	75	48	40	40	22	2	0	0
NEBRASKA	0	6	18	26	20	23	34	757	43	9	58	52	61	59	84	56	34	50	19	16	0	0
NEVADA	0	1	0	0	0	0	2	4	2	2	0	1	14	59	23	9	7	5	7	8	0	0
NEW HAMPSHIRE	9	16	7	1	16	9	46	32	55	15	37	21	42	27	29	19	20	13	11	8	0	0
NEW JERSEY	28	71	21	23	31	58	73	55	86	25	122	171	79	147	179	184	40	34	31	21	0	0
NEW MEXICO	0	0	1	1	1	4	16	15	22	7	13	31	47	53	41	32	12	17	6	0	0	
NEW YORK	85	58	112	89	86	67	237	329	319	82	193	434	488	622	478	209	88	100	179	125	0	0
NORTH CAROLINA	0	0	2	1	25	138	64	40	122	30	182	509	686	533	215	103	48	58	61	55	0	0
NORTH DAKOTA	0	0	3	6	17	13	15	13	32	8	29	16	18	20	22	14	16	10	2	3	0	0
OHIO	5	526	45	58	66	70	197	153	212	75	124	385	341	449	497	277	170	103	154	143	0	0
OKLAHOMA	0	0	2	6	37	44	119	73	233	24	108	72	148	171	104	119	44	33	50	64	0	0
OREGON	0	1	8	25	29	45	64	41	55	15	70	127	199	200	87	63	56	50	36	18	0	0
PENNSYLVANIA	164	104	82	123	158	182	314	232	310	84	228	305	314	328	323	199	93	108	177	87	0	0
RHODE ISLAND	8	7	3	4	4	7	8	5	3	2	4	10	21	51	34	13	9	7	6	6	0	0
SOUTH CAROLINA	0	6	1	4	4	22	41	30	69	17	56	49	169	125	109	43	31	33	21	14	0	0
SOUTH DAKOTA	0	5	13	10	8	11	65	38	44	15	24	15	55	47	27	12	4	13	8	4	0	0
TENNESSEE	0	2	4	12	30	82	182	161	305	113	256	199	337	368	247	163	108	206	126	99	0	0
TEXAS	0	4	7	14	44	101	242	218	408	124	505	614	929	852	660	502	400	555	925	511	0	0
UTAH	0	0	0	0	0	2	4	16	7	5	10	11	22	40	56	17	12	23	18	6	0	0
VERMONT	32	9	2	2	26	13	63	28	75	6	18	14	24	48	32	30	17	18	6	7	0	0
VIRGINIA	3	3	2	12	22	38	89	479	118	83	131	143	189	268	181	109	97	67	65	63	0	0
WASHINGTON	0	14	7	20	41	62	79	91	80	34	98	175	214	240	157	93	48	64	75	47	0	0
WEST VIRGINIA	7	8	6	54	79	107	97	45	105	18	67	48	59	75	65	69	175	78	218	98	0	0
WISCONSIN	2	3	5	6	35	35	85	43	34	20	39	42	72	152	90	48	34	30	35	0	0	
WYOMING	0	0	0	3	3	2	5	6	6	1	11	5	51	40	39	27	5	7	4	5	0	0
PUERTO RICO	10	13	1	4	14	38	29	13	62	34	66	51	51	70	65	75	35	43	39	0	0	
TOTALS	621	1646	715	874	1604	2229	4408	4909	5268	1634	4788	6261	9791	10159	7645	4525	3314	3198	3959	2834	0	0

DEFICIENT BRIDGES BY YEAR BUILT, AS OF DECEMBER 2004

State	Pre 1900	1900-1905	1906-1910	1911-1915	1916-1920	1921-1925	1926-1930	1931-1935	1936-1940	1941-1945	1946-1950	1951-1955	1956-1960	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2004
ALABAMA	2	39	12	25	41	110	259	228	575	182	464	479	647	529	355	209	161	155	125	82	0	0
ALASKA	0	10	1	0	1	0	0	4	10	5	12	24	19	18	26	27	47	59	49	29	0	0
ARIZONA	0	12	2	3	15	13	40	42	39	7	16	27	60	130	93	48	41	37	56	36	0	0
ARKANSAS	1	1	9	9	26	37	237	175	309	73	254	202	285	315	307	203	190	160	195	144	0	0
CALIFORNIA	6	30	45	99	135	177	353	215	390	141	430	423	861	999	898	528	240	174	201	137	0	0
COLORADO	1	0	9	7	18	20	66	94	123	25	78	73	189	200	141	67	65	74	90	46	0	0
CONNECTICUT	28	42	23	22	32	77	85	131	30	61	48	260	181	91	47	29	33	80	41	0	0	
DELAWARE	0	9	1	2	5	5	6	14	6	2	5	7	7	18	9	6	7	7	5	1	0	0
DIST. OF COL.	0	4	6	1	1	1	10	10	13	11	11	24	42	13	8	1	0	0	0	0	0	0
FLORIDA	0	0	1	3	6	21	63	13	71	37	122	148	353	453	260	211	82	116	79	80	0	0
GEORGIA	3	4	6	19	30	52	113	81	239	87	437	374	484	339	244	109	124	66	91	46	0	0
HAWAII	0	12	5	31	20	31	70	54	55	14	26	24	34	37	53	19	11	8	3	0	0	0
IDAHO	0	0	6	7	20	14	36	55	50	4	34	35	101	128	98	49	42	19	16	13	0	0
ILLINOIS	50	610	318	99	173	194	237	201	180	59	146	233	599	485	244	182	104	66	75	77	0	0
INDIANA	133	148	147	117	258	206	389	241	250	64	161	89	364	381	374	217	139	105	135	98	0	0
IOWA	60	791	104	201	382	255	325	210	619	241	732	837	824	425	360	201	230	84	38	39	0	0
KANSAS	17	252	341	136	418	246	747	420	594	241	347	318	656	361	318	156	141	79	61	51	0	0
KENTUCKY	10	13	9	8	59	100	400	429	321	91	261	294	252	309	395	297	233	234	213	171	0	0
LOUISIANA	0	0	2	2	4	13	45	149	143	49	189	453	729	681	748	319	302	211	167	106	0	0
MAINE	6	7	3	6	18	38	67	100	123	27	83	154	73	43	22	18	17	13	17	8	0	0
MARYLAND	35	47	28	32	64	54	113	104	61	28	74	87	154	193	93	88	57	61	62	41	0	0
MASSACHUSETTS	204	87	75	42	52	66	102	89	235	26	112	163	474	330	197	56	110	64	38	23	0	0
MICHIGAN	31	105	65	49	138	171	278	151	162	41	124	140	339	504	290	263	99	68	58	45	0	0
MINNESOTA	12	27	47	143	153	128	93	66	145	43	66	122	149	156	141	53	40	18	23	6	0	0
MISSISSIPPI	0	21	4	9	14	18	109	150	336	51	279	338	731	686	532	432	290	225	208	264	0	0
MISSOURI	2	575	304	108	459	381	969	769	685	113	587	468	758	589	349	233	216	194	236	248	0	0
MONTANA	8	5	26	49	23	18	49	83	84	23	62	54	87	130	116	79	72	67	33	8	0	0
NEBRASKA	6	38	78	76	93	49	87	2467	123	26	159	105	152	119	139	101	47	66	28	16	0	0
NEVADA	0	4	1	0	1	2	3	9	10	4	5	1	18	65	28	12	10	7	9	9	0	0
NEW HAMPSHIRE	28	31	14	10	37	16	100	49	115	25	67	29	66	59	46	26	29	19	14	8	0	0
NEW JERSEY	72	182	59	71	93	135	196	126	157	62	154	220	123	178	204	196	46	40	33	21	0	0
NEW MEXICO	0	0	1	2	1	6	19	37	59	31	12	51	83	91	117	97	63	21	20	6	0	0
NEW YORK	158	120	172	162	134	135	510	611	592	155	297	618	637	777	575	304	136	126	202	131	0	0
NORTH CAROLINA	1	0	6	4	44	212	102	71	205	54	374	977	1128	956	465	253	122	83	73	64	0	0
NORTH DAKOTA	3	10	28	39	74	40	81	82	172	51	132	77	73	60	54	40	26	10	4	4	0	0
OHIO	24	1245	133	151	153	171	438	323	424	134	256	575	667	642	690	405	225	131	166	150	0	0
OKLAHOMA	0	25	112	120	316	236	803	489	2051	321	947	353	581	441	455	340	206	261	404	297	0	0
OREGON	0	1	12	31	33	68	84	83	84	32	103	229	361	311	129	97	72	57	43	18	0	0
PENNSYLVANIA	453	315	317	372	499	550	1023	692	985	269	487	597	654	602	611	381	137	126	184	93	0	0
RHODE ISLAND	15	13	8	13	9	14	18	15	12	3	15	22	61	82	55	19	10	8	6	7	0	0
SOUTH CAROLINA	0	10	2	6	7	37	78	69	164	65	127	232	440	337	226	135	71	52	39	33	0	0
SOUTH DAKOTA	0	19	60	55	61	65	241	179	172	61	84	69	118	113	75	39	28	28	15	8	0	0
TENNESSEE	3	11	8	19	59	124	274	234	409	161	382	272	543	551	445	330	155	246	153	120	0	0
TEXAS	0	54	31	41	123	166	440	371	731	211	793	789	1195	1031	803	583	503	699	1075	556	0	0
UTAH	0	1	2	3	5	9	11	37	23	28	30	26	41	70	101	37	20	29	22	9	0	0
VERMONT	54	23	7	14	73	35	165	66	154	18	38	30	43	77	62	40	18	19	8	10	0	0
VIRGINIA	13	11	17	33	44	89	177	785	187	129	183	202	265	410	262	175	134	87	75	70	0	0
WASHINGTON	0	24	11	31	62	82	105	124	111	48	137	222	268	282	188	109	60	72	76	48	0	0
WEST VIRGINIA	44	34	27	116	180	189	175	97	188	53	146	109	151	152	123	104	229	104	232	103	0	0
WISCONSIN	7	19	37	43	146	130	263	150	201	68	179	124	203	274	234	99	52	41	31	38	0	0
WYOMING	0	0	2	7	17	11	29	28	26	5	45	25	91	88	92	61	39	37	15	11	0	0
PUERTO RICO	23	15	3	12	22	54	52	19	80	44	83	66	67	87	89	103	92	43	49	46	0	0
TOTALS	1513	5056	2747	2660	4841	5026	10718	11445	13381	3775	10408	11645	17542	16517	13035	8211	5620	4809	5330	3716	0	0

COUNT OF BRIDGES BY FUNCTIONAL CLASSIFICATION, AS OF DECEMBER 2004

State	26=01	26=02	26=06	26=07	26=08	26=09	26=11	26=12	26=14	26=16	26=17	26=19
ALABAMA	607	1,156	1,427	3,110	2,525	4,275	555	87	556	304	230	815
ALASKA	148	117	79	209	51	395	27	16	31	54	22	38
ARIZONA	1,278	597	951	905	291	821	279	267	264	492	354	610
ARKANSAS	459	1,035	1,225	3,926	1,090	3,046	341	136	356	328	138	379
CALIFORNIA	1,243	1,464	1,528	2,038	1,215	4,080	2,530	2,790	2,067	2,178	863	1,811
COLORADO	985	791	1,099	745	1,055	2,322	29	71	192	255	216	417
CONNECTICUT	132	173	146	298	114	617	697	482	333	360	459	356
DELAWARE	0	99	29	77	23	212	92	32	102	58	78	48
DIST. OF COL.	0	0	0	0	6	0	64	32	66	22	13	46
FLORIDA	754	1,233	636	812	597	1,549	1,010	1,049	1,001	882	811	1,134
GEORGIA	486	951	1,447	2,804	1,210	3,717	502	206	669	950	456	1,062
HAWAII	4	67	172	117	31	114	194	84	102	42	72	101
IDAHO	304	284	210	660	279	1,821	86	0	124	121	71	87
ILLINOIS	1,057	944	1,508	3,822	794	12,512	1,182	139	1,143	1,101	718	807
INDIANA	761	562	798	2,771	2,291	7,514	716	208	673	635	507	735
IOWA	396	1,190	1,090	3,436	4,046	12,804	251	0	510	451	233	495
KANSAS	577	1,345	1,324	6,400	2,029	11,807	433	223	309	441	230	413
KENTUCKY	351	963	567	2,199	2,504	5,561	400	156	266	292	147	95
LOUISIANA	732	616	1,432	1,901	1,208	4,865	815	162	473	286	71	797
MAINE	177	134	186	464	271	743	96	20	70	80	79	51
MARYLAND	246	257	230	399	472	1,019	620	291	288	274	250	719
MASSACHUSETTS	244	128	171	323	163	539	847	284	647	766	418	425
MICHIGAN	383	610	584	2,071	521	3,107	799	323	648	779	459	534
MINNESOTA	299	684	990	1,942	1,297	5,685	428	200	302	597	271	330
MISSISSIPPI	530	1,262	1,411	3,807	760	7,733	235	108	133	311	207	343
MISSOURI	415	1,372	1,152	4,193	966	11,672	615	946	93	544	504	1,319
MONTANA	734	431	588	510	495	2,103	83	0	55	29	11	6
NEBRASKA	219	844	1,283	2,363	1,247	8,767	124	44	220	132	88	124
NEVADA	307	101	34	111	57	155	165	86	87	134	182	192
NEW HAMPSHIRE	260	187	134	252	198	878	101	42	82	97	51	73
NEW JERSEY	169	291	128	353	212	835	897	597	800	964	512	726
NEW MEXICO	595	569	447	456	329	505	279	0	285	133	110	131
NEW YORK	800	722	1,278	1,543	1,857	5,017	1,284	807	1,119	1,169	672	1,018
NORTH CAROLINA	444	1,023	702	2,048	1,703	7,716	507	398	598	679	342	1,180
NORTH DAKOTA	146	346	245	874	15	2,646	59	0	79	51	19	27
OHIO	931	1,326	923	3,904	3,269	11,185	1,353	781	863	1,080	988	1,305
OKLAHOMA	646	1,113	1,423	7,281	154	9,837	462	392	541	450	488	529
OREGON	383	677	488	1,489	612	2,252	228	95	310	319	230	177
PENNSYLVANIA	1,106	1,374	1,809	2,188	2,383	7,040	902	726	1,458	1,206	776	1,266
RHODE ISLAND	14	18	20	24	26	39	123	106	124	130	65	60
SOUTH CAROLINA	449	503	912	1,755	835	3,283	262	65	249	293	298	297
SOUTH DAKOTA	382	410	569	1,172	164	2,972	67	0	64	72	38	51
TENNESSEE	654	1,179	1,518	2,013	3,421	6,800	711	282	937	842	398	932
TEXAS	3,086	3,752	3,879	7,948	3,354	10,169	3,166	3,098	3,031	2,275	1,213	3,979
UTAH	444	172	171	314	154	559	381	20	112	153	86	239
VERMONT	256	113	250	519	173	1,160	58	24	28	37	41	31
VIRGINIA	714	736	914	2,162	594	4,456	932	358	587	713	402	593
WASHINGTON	361	599	376	1,212	756	2,117	573	309	487	320	187	258
WEST VIRGINIA	453	366	376	1,615	491	2,886	204	24	107	136	72	157
WISCONSIN	602	984	1,062	1,975	728	5,467	521	446	613	583	191	404
WYOMING	763	326	173	312	208	888	159	5	74	43	45	38
PUERTO RICO	162	63	103	257	147	379	223	95	201	159	166	180
TOTALS	27,648	36,259	40,197	94,079	49,391	208,641	27,667	17,112	24,529	24,802	15,548	27,940

COUNT OF STRUCTURALLY DEFICIENT BRIDGES BY FUNCTIONAL CLASSIFICATION, AS OF DECEMBER 2004

State	26=01	26=02	26=06	26=07	26=08	26=09	26=11	26=12	26=14	26=16	26=17	26=19
ALABAMA	6	59	90	373	577	1,051	7	4	38	43	23	121
ALASKA	30	8	4	11	20	52	1	0	2	8	4	11
ARIZONA	9	4	25	24	31	45	2	0	3	6	4	10
ARKANSAS	5	26	63	272	172	608	8	12	23	15	2	32
CALIFORNIA	119	171	140	264	152	559	384	349	316	224	84	131
COLORADO	61	46	90	63	68	225	0	1	6	17	9	18
CONNECTICUT	6	3	9	17	16	70	25	17	26	38	61	57
DELAWARE	0	1	1	2	2	16	3	0	4	1	6	6
DIST. OF COL.	0	0	0	0	1	0	1	3	7	4	1	6
FLORIDA	4	12	10	36	27	115	5	8	8	22	18	52
GEORGIA	6	23	45	197	125	619	4	1	14	45	28	80
HAWAII	1	5	17	37	15	33	11	3	10	6	8	10
IDAHO	8	14	22	47	27	161	5	0	12	6	5	9
ILLINOIS	30	89	130	242	65	1,328	95	13	99	131	87	127
INDIANA	4	7	16	199	323	1,186	7	6	27	45	51	122
IOWA	21	64	57	505	763	3,616	27	0	28	52	33	93
KANSAS	28	51	71	384	245	2,416	14	4	13	31	25	48
KENTUCKY	6	12	41	159	166	825	17	2	13	18	12	12
LOUISIANA	9	33	60	237	182	1,298	21	1	45	35	10	139
MAINE	16	10	19	52	33	170	8	2	6	11	12	16
MARYLAND	9	8	17	44	60	128	21	6	24	19	22	70
MASSACHUSETTS	3	9	27	57	24	84	47	38	115	96	54	60
MICHIGAN	47	64	76	256	78	572	161	53	119	146	79	113
MINNESOTA	5	16	44	166	111	671	22	6	12	49	25	36
MISSISSIPPI	0	45	112	670	88	2,340	1	0	4	34	37	48
MISSOURI	5	94	151	1,041	217	3,068	25	70	11	60	60	226
MONTANA	5	12	28	31	72	414	2	0	10	1	0	1
NEBRASKA	3	39	51	140	198	2,073	6	2	10	12	4	11
NEVADA	7	2	1	9	2	22	0	1	3	4	2	1
NEW HAMPSHIRE	21	10	16	21	22	197	15	4	5	22	9	13
NEW JERSEY	0	34	31	67	33	181	25	22	130	176	89	102
NEW MEXICO	42	27	46	61	53	89	33	0	30	14	7	2
NEW YORK	42	40	130	177	252	964	76	49	107	115	83	136
NORTH CAROLINA	29	59	82	252	314	1,209	16	43	66	62	49	141
NORTH DAKOTA	3	5	6	49	0	730	0	0	2	5	1	2
OHIO	22	49	36	305	421	1,674	40	36	66	120	102	182
OKLAHOMA	112	88	251	1,740	21	4,657	83	30	75	70	89	91
OREGON	50	81	64	149	48	154	18	4	22	35	21	13
PENNSYLVANIA	126	228	514	663	661	1,876	111	95	321	328	208	330
RHODE ISLAND	5	3	6	9	5	12	28	21	35	31	19	19
SOUTH CAROLINA	12	69	130	232	116	567	5	5	23	41	37	49
SOUTH DAKOTA	22	26	32	137	28	798	2	0	8	5	6	8
TENNESSEE	14	20	124	136	275	704	31	13	40	52	26	64
TEXAS	14	52	79	246	107	1,766	48	27	47	39	39	116
UTAH	16	11	10	29	24	82	28	2	14	16	6	18
VERMONT	30	19	51	118	21	218	6	1	2	5	11	2
VIRGINIA	27	35	104	211	39	578	27	6	46	41	29	43
WASHINGTON	5	26	25	85	40	139	4	11	38	18	16	13
WEST VIRGINIA	22	55	78	285	63	443	30	1	16	30	15	40
WISCONSIN	16	36	54	250	110	718	80	10	60	72	20	69
WYOMING	58	34	13	28	25	200	12	0	10	10	12	7
PUERTO RICO	22	0	18	40	22	57	19	3	23	21	25	11
TOTALS	1,163	1,934	3,317	10,825	6,560	41,778	1,667	985	2,194	2,507	1,685	3,137

COUNT OF FUNCTIONALLY OBSOLETE BRIDGES BY FUNCTIONAL CLASSIFICATION, AS OF DECEMBER 2004

State	26=01	26=02	26=06	26=07	26=08	26=09	26=11	26=12	26=14	26=16	26=17	26=19
ALABAMA	137	248	239	374	269	498	78	20	159	80	55	129
ALASKA	8	11	2	18	7	117	11	4	5	6	7	6
ARIZONA	87	27	32	47	17	96	23	14	36	76	28	69
ARKANSAS	48	186	189	433	174	535	49	14	97	102	28	40
CALIFORNIA	54	166	228	256	130	722	383	471	410	448	160	348
COLORADO	174	60	107	54	56	192	1	1	43	55	16	24
CONNECTICUT	14	14	43	63	33	119	145	126	96	114	158	93
DELAWARE	0	9	2	7	1	10	16	0	13	8	9	5
DIST. OF COL.	0	0	0	0	1	0	33	17	34	9	7	32
FLORIDA	19	147	66	104	56	269	152	141	155	172	245	276
GEORGIA	21	116	273	342	110	316	37	35	109	188	103	111
HAWAII	0	34	53	41	4	31	54	46	39	17	20	18
IDAHO	95	18	12	51	22	155	14	0	15	21	8	3
ILLINOIS	38	24	40	136	39	694	233	36	169	230	181	105
INDIANA	74	22	53	229	222	776	166	33	107	148	98	95
IOWA	58	61	59	146	187	925	46	0	68	75	22	52
KANSAS	103	75	66	386	190	1,343	133	57	72	97	20	28
KENTUCKY	46	105	136	672	464	1,089	70	44	47	79	51	17
LOUISIANA	106	89	211	359	159	591	217	67	149	88	28	190
MAINE	25	19	40	129	63	113	24	10	16	24	19	6
MARYLAND	33	17	56	86	88	196	162	71	48	58	59	178
MASSACHUSETTS	144	33	38	98	34	112	414	106	269	336	181	168
MICHIGAN	18	19	38	219	41	240	124	30	160	219	125	124
MINNESOTA	7	16	21	17	10	154	36	25	19	73	44	48
MISSISSIPPI	225	120	176	204	78	257	55	25	27	87	33	31
MISSOURI	35	140	187	496	72	1,393	165	212	16	132	124	244
MONTANA	164	19	39	36	25	160	33	0	13	8	3	0
NEBRASKA	11	16	24	134	110	1,050	9	4	19	21	14	13
NEVADA	67	3	3	4	4	12	15	5	6	8	7	10
NEW HAMPSHIRE	30	22	24	45	34	205	8	7	16	20	9	13
NEW JERSEY	17	32	25	88	35	162	158	186	203	286	133	155
NEW MEXICO	52	12	10	29	28	108	13	0	30	17	10	11
NEW YORK	151	91	174	205	259	841	513	400	442	580	292	432
NORTH CAROLINA	55	108	100	355	287	1,257	92	63	123	161	82	191
NORTH DAKOTA	2	4	1	15	0	217	2	0	11	5	1	1
OHIO	72	75	57	295	467	1,546	293	171	210	288	298	278
OKLAHOMA	52	52	66	466	19	405	70	63	74	84	80	20
OREGON	56	131	97	181	53	286	63	32	102	91	58	39
PENNSYLVANIA	166	133	225	297	297	1,281	229	134	367	278	218	314
RHODE ISLAND	4	2	4	4	7	13	26	35	29	48	19	21
SOUTH CAROLINA	31	54	144	177	25	131	32	12	55	61	87	35
SOUTH DAKOTA	57	5	15	24	13	276	18	0	5	3	2	0
TENNESSEE	39	130	231	282	517	998	119	42	200	194	104	144
TEXAS	274	213	233	918	295	1,816	587	475	665	821	401	917
UTAH	63	7	11	25	9	38	46	0	10	18	7	16
VERMONT	72	21	24	79	38	182	20	2	6	9	12	5
VIRGINIA	32	93	205	382	86	729	134	37	122	162	68	112
WASHINGTON	39	164	100	241	78	370	166	80	175	117	47	61
WEST VIRGINIA	43	39	72	379	155	642	30	4	18	38	20	38
WISCONSIN	12	27	53	67	14	249	87	56	105	116	28	30
WYOMING	81	1	1	3	17	75	29	0	4	5	2	2
PUERTO RICO	13	6	49	128	71	167	31	21	72	74	73	83
TOTALS	3,224	3,236	4,354	9,826	5,470	24,159	5,664	3,434	5,460	6,455	3,904	5,381

COUNT OF DEFICIENT BRIDGES BY FUNCTIONAL CLASSIFICATION, AS OF DECEMBER 2004

State	26=01	26=02	26=06	26=07	26=08	26=09	26=11	26=12	26=14	26=16	26=17	26=19
ALABAMA	143	307	329	747	846	1,549	85	24	197	123	78	250
ALASKA	38	19	6	29	27	169	12	4	7	14	11	17
ARIZONA	96	31	57	71	48	141	25	14	39	82	32	79
ARKANSAS	53	212	252	705	346	1,143	57	26	120	117	30	72
CALIFORNIA	173	337	368	520	282	1,281	767	820	726	672	244	479
COLORADO	235	106	197	117	124	417	1	2	49	72	25	42
CONNECTICUT	20	17	52	80	49	189	170	143	122	152	219	150
DELAWARE	0	10	3	9	3	26	19	0	17	9	15	11
DIST. OF COL.	0	0	0	0	2	0	34	20	41	13	8	38
FLORIDA	23	159	76	140	83	384	157	149	163	194	263	328
GEORGIA	27	139	318	539	235	935	41	36	123	233	131	191
HAWAII	1	39	70	78	19	64	65	49	49	23	28	28
IDAHO	103	32	34	98	49	316	19	0	27	27	13	12
ILLINOIS	68	113	170	378	104	2,022	328	49	268	361	268	232
INDIANA	78	29	69	428	545	1,962	173	39	134	193	149	217
IOWA	79	125	116	651	950	4,541	73	0	96	127	55	145
KANSAS	131	126	137	770	435	3,759	147	61	85	128	45	76
KENTUCKY	52	117	177	831	630	1,914	87	46	60	97	63	29
LOUISIANA	115	122	271	596	341	1,889	238	68	194	123	38	329
MAINE	41	29	59	181	96	283	32	12	22	35	31	22
MARYLAND	42	25	73	130	148	324	183	77	72	77	81	248
MASSACHUSETTS	147	42	65	155	58	196	461	144	384	432	235	228
MICHIGAN	65	83	114	475	119	812	285	83	279	365	204	237
MINNESOTA	12	32	65	183	121	825	58	31	31	122	69	84
MISSISSIPPI	225	165	288	874	166	2,597	56	25	31	121	70	79
MISSOURI	40	234	338	1,537	289	4,461	190	282	27	192	184	470
MONTANA	169	31	67	67	97	574	35	0	23	9	3	1
NEBRASKA	14	55	75	274	308	3,123	15	6	29	33	18	24
NEVADA	74	5	4	13	6	34	15	6	9	12	9	11
NEW HAMPSHIRE	51	32	40	66	56	402	23	11	21	42	18	26
NEW JERSEY	17	66	56	155	68	343	183	208	333	462	222	257
NEW MEXICO	94	39	56	90	81	197	46	0	60	31	17	13
NEW YORK	193	131	304	382	511	1,805	589	449	549	695	375	568
NORTH CAROLINA	84	167	182	607	601	2,466	108	106	189	223	131	332
NORTH DAKOTA	5	9	7	64	0	947	2	0	13	10	2	3
OHIO	94	124	93	600	888	3,220	333	207	276	408	400	460
OKLAHOMA	164	140	317	2,206	40	5,062	153	93	149	154	169	111
OREGON	106	212	161	330	101	440	81	36	124	126	79	52
PENNSYLVANIA	292	361	739	960	958	3,157	340	229	688	606	426	644
RHODE ISLAND	9	5	10	13	12	25	54	56	64	79	38	40
SOUTH CAROLINA	43	123	274	409	141	698	37	17	78	102	124	84
SOUTH DAKOTA	79	31	47	161	41	1,074	20	0	13	8	8	8
TENNESSEE	53	150	355	418	792	1,702	150	55	240	246	130	208
TEXAS	288	265	312	1,164	402	3,582	635	502	712	860	440	1,033
UTAH	79	18	21	54	33	120	74	2	24	34	13	34
VERMONT	102	40	75	197	59	400	26	3	8	14	23	7
VIRGINIA	59	128	309	593	125	1,307	161	43	168	203	97	155
WASHINGTON	44	190	125	326	118	509	170	91	213	135	63	74
WEST VIRGINIA	65	94	150	664	218	1,085	60	5	34	68	35	78
WISCONSIN	28	63	107	317	124	967	167	66	165	188	48	99
WYOMING	139	35	14	31	42	275	41	0	14	15	14	9
PUERTO RICO	35	6	67	168	93	224	50	24	95	95	98	94
TOTALS	4,387	5,170	7,671	20,651	12,030	65,937	7,331	4,419	7,654	8,962	5,589	8,518

COUNT OF FUNCTIONALLY OBSOLETE BRIDGES BY STRUCTURE TYPE AS OF 12/ 2004

State	Slab	Stringer /Multi-Beam or Girder	Girder & Floorbeam System	Tee Beam	Box Beam or Girders (Multiple)	Box Beam or Girders (Single or Spread)	Frame (Except Culverts)	Orthotropic	Truss-Deck	Truss-Thru	Arch-Deck	Arch-Thru	Suspension	Stayed Girder	Movable-Lift	Movable-Bascule	Movable-Swing	Tunnel	Culvert	Mixed Types	Segmental Box Girder	Channel Beam	Other	
ALABAMA	813	5646	304	1938	130	7	216	0	20	119	27	7	0	2	1	1	0	1	5691	0	1	692	32	
ALASKA	22	683	11	269	48	7	0	9	7	49	5	0	0	2	0	0	0	0	52	0	0	0	20	
ARIZONA	876	1203	32	173	329	507	93	0	7	24	34	1	0	0	0	0	0	0	3833	0	1	11	1	
ARKANSAS	1908	4459	73	603	59	0	10	390	11	108	76	7	2	0	1	0	0	0	2722	0	0	2027	3	
CALIFORNIA	5485	3952	67	3157	7150	151	18	6	63	250	330	11	11	0	6	17	16	38	3159	8	2	24	31	
COLORADO	321	3772	88	1487	288	282	131	0	7	102	41	12	1	1	0	0	0	0	1624	0	16	1	9	
CONNECTICUT	495	2225	56	139	238	68	117	1	7	32	163	1	0	0	2	8	5	0	594	0	2	9	5	
DELAWARE	74	368	12	4	109	9	28	0	2	6	23	1	1	1	0	9	2	0	200	0	0	0	1	
DIST. OF COL.	4	130	30	5	18	4	24	1	0	0	21	0	0	0	0	0	0	1	13	0	0	0	0	
FLORIDA	3172	5034	36	315	14	87	15	0	1	48	35	2	1	2	3	141	11	0	2150	1	42	336	5	
GEORGIA	1175	5277	43	2166	193	106	9	0	3	33	43	0	0	2	0	3	2	1	5387	6	0	12	0	
HAWAII	198	267	38	253	111	0	20	0	5	6	29	6	0	0	0	0	0	8	157	0	0	0	2	
IDAHO	236	1981	55	924	91	14	491	0	5	106	15	2	2	0	1	0	0	0	109	0	4	9	2	
ILLINOIS	2420	7763	218	668	7972	55	96	5	7	398	77	14	3	7	6	53	3	5	4094	0	4	1488	371	
INDIANA	3336	6252	158	162	4402	478	44	0	9	505	860	6	0	1	0	3	0	0	1375	0	16	444	120	
IOWA	4437	13492	270	1154	76	2	17	1	16	1548	103	21	3	1	0	0	1	1	3503	0	1	206	49	
KANSAS	4713	9585	515	1364	382	9	50	0	16	773	332	51	0	0	0	0	0	0	7559	0	0	2	179	
KENTUCKY	751	3563	178	2596	2958	174	14	0	12	188	38	10	2	0	0	1	0	1	2795	0	3	216	18	
LOUISIANA	5204	4583	155	400	73	0	0	0	3	50	17	0	0	1	43	12	97	3	2325	0	0	269	7	
MAINE	339	1178	61	261	9	2	59	0	6	67	38	4	3	0	1	1	8	0	334	0	0	0	0	
MARYLAND	421	2598	89	169	139	21	95	0	11	81	196	8	2	0	0	21	3	0	1133	0	1	2	75	
MASSACHUSETTS	552	2885	164	249	167	57	112	0	19	99	304	9	2	0	0	23	7	10	292	0	1	0	2	
MICHIGAN	562	5312	149	860	2109	103	37	3	14	137	110	17	1	0	1	21	4	0	1293	0	2	1	56	
MINNESOTA	1780	5534	303	9	80	0	30	0	7	203	159	6	2	0	2	1	2	3	4880	0	0	1	1	
MISSISSIPPI	688	7244	150	163	45	296	67	0	7	79	24	0	0	0	3	7	2	1	3198	0	6	4812	48	
MISSOURI	2452	12688	324	1660	189	256	23	0	7	1273	107	8	7	3	0	0	0	0	4617	0	2	165		
MONTANA	288	3526	95	620	14	2	13	0	11	190	11	0	1	0	0	0	0	0	196	3	0	26	47	
NEBRASKA	1726	8477	550	603	53	1	13	0	4	1043	51	1	0	0	0	0	0	0	2884	0	1	45	3	
NEVADA	197	218	13	43	376	30	41	0	2	2	16	0	0	0	0	0	0	0	667	0	0	4	2	
NEW HAMPSHIRE	194	1381	44	80	24	1	241	0	5	62	59	3	0	0	2	2	0	0	241	0	0	2	16	
NEW JERSEY	586	3797	289	80	596	35	140	0	9	194	283	2	2	0	9	32	12	1	401	0	0	2	14	
NEW MEXICO	359	1477	11	75	85	15	23	0	7	38	7	1	0	0	0	0	0	0	1675	0	0	65	0	
NEW YORK	980	10078	579	191	1355	28	801	3	33	607	762	23	19	2	24	33	12	2	1658	1	3	11	96	
NORTH CAROLINA	1728	9247	282	746	18	17	31	0	2	50	46	2	0	0	1	6	11	0	4679	0	3	440	3	
NORTH DAKOTA	109	1806	17	384	226	573	0	0	0	242	2	1	0	0	0	0	0	0	825	0	0	317	5	
OHIO	4492	11746	577	854	5969	0	454	0	157	1257	392	25	3	0	5	5	1	0	1695	0	0	0	276	
OKLAHOMA	2381	12178	234	670	71	11	46	1	14	939	128	8	0	2	0	0	0	0	6604	1	1	0	27	
OREGON	2222	2963	118	339	607	38	248	1	41	168	51	15	3	0	8	8	2	0	291	0	0	133	4	
PENNSYLVANIA	1183	8088	739	2367	3233	2157	221	1	54	745	881	23	10	0	1	2	0	1	1631	773	0	34	109	
RHODE ISLAND	75	441	12	22	46	0	23	0	0	14	80	1	2	0	0	0	1	0	28	0	1	1	2	
SOUTH CAROLINA	4202	2814	19	929	15	1	5	0	1	46	53	0	0	0	0	3	7	3	1077	0	2	12	12	
SOUTH DAKOTA	1304	2258	26	707	35	5	19	0	8	215	19	2	0	0	0	0	0	0	1108	0	0	253	2	
TENNESSEE	245	5333	24	2217	850	1437	53	0	8	85	187	7	0	0	0	1	0	0	8278	0	0	962	1	
TEXAS	4651	21436	101	1407	2117	37	39	8	26	403	72	6	6	0	2	1	7	0	17697	0	0	0	936	
UTAH	121	1497	13	329	37	0	250	0	2	19	14	3	0	0	0	0	0	0	507	0	0	0	7	
VERMONT	403	1535	60	300	14	1	13	0	8	141	28	11	0	0	0	2	0	0	167	0	0	5	1	
VIRGINIA	1545	6758	116	983	274	14	150	0	15	162	153	11	0	1	3	6	11	0	2940	0	7	1	11	
WASHINGTON	1291	3024	130	1201	409	339	142	1	31	178	190	28	4	5	34	13	7	0	219	0	5	296	14	
WEST VIRGINIA	561	2779	338	139	1569	29	23	2	34	263	475	7	4	2	0	0	0	0	500	0	11	130	21	
WISCONSIN	4187	6616	156	5	122	0	79	0	16	135	109	7	0	0	7	34	0	1	1880	0	0	244	13	
WYOMING	475	1490	48	440	42	4	22	0	3	64	6	1	0	0	0	0	0	0	428	0	0	8	4	
PUERTO RICO	407	1042	34	205	55	6	28	1	4	7	19	1	0	0	0	1	0	0	0	323	0	1	0	1
TOTALS	78346	249679	8204	37084	45591	7476	4934	434	767	13553	7301	393	97	35	167	470	235	93	1E+05	793	143	13714	2674	

COUNT OF STRUCTURALLY DEFICIENT BRIDGES BY STRUCTURE TYPE AS OF 12/ 2004

State	Slab	Stringer /Multi-Beam or Girder	Girder & Floorbeam System	Tee Beam	Box Beam or Girders (Multiple)	Box Beam or Girders (Single or Spread)	Frame (Except Culverts)	Orthotropic	Truss-Deck	Truss-Thru	Arch-Deck	Arch-Thru	Suspension	Stayed Girder	Movable-Lift	Movable-Bascule	Movable-Swing	Tunnel	Culvert	Mixed Types	Segmental Box Girder	Channel Beam	Other	
ALABAMA	174	1377	48	189	19	0	104	0	12	87	5	1	0	0	0	0	0	0	347	0	0	23	7	
ALASKA	3	104	4	8	5	1	0	0	1	14	2	0	0	1	0	0	0	0	1	0	0	0	7	
ARIZONA	38	75	4	11	5	1	2	0	2	10	5	0	0	0	0	0	0	0	9	0	0	0	1	
ARKANSAS	74	810	9	21	6	0	0	87	3	68	11	3	2	0	1	0	0	0	28	0	0	115	0	
CALIFORNIA	455	880	7	570	757	4	0	0	26	103	40	6	5	0	5	11	3	0	30	0	0	0	1	4
COLORADO	7	384	18	100	3	10	2	0	0	34	6	0	1	0	0	0	0	0	36	0	0	0	0	3
CONNECTICUT	31	186	20	22	9	0	9	0	2	9	26	0	0	0	1	3	1	0	26	0	0	0	0	0
DELAWARE	6	17	7	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	7	0	0	0	0	0
DIST. OF COL.	1	9	4	0	2	1	2	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0
FLORIDA	79	158	4	33	1	0	1	0	0	1	2	0	0	0	0	8	6	0	20	0	0	0	0	3
GEORGIA	221	738	10	96	0	1	0	0	0	20	9	0	0	0	0	0	1	0	85	2	0	0	4	0
HAWAII	19	48	13	39	5	0	1	0	3	4	9	3	0	0	0	0	0	0	11	0	0	0	1	1
IDAHO	10	159	10	60	3	0	7	0	1	57	2	0	1	0	1	0	0	0	4	0	0	0	1	0
ILLINOIS	263	1046	67	114	283	1	12	0	2	279	30	1	0	0	3	14	0	3	100	0	0	0	117	101
INDIANA	204	783	72	17	269	8	4	0	6	281	170	0	0	0	0	0	0	0	79	0	1	92	7	
IOWA	309	3479	102	122	12	0	1	1	12	1019	25	7	0	0	0	0	0	0	100	0	0	0	58	12
KANSAS	333	1812	132	114	5	3	3	0	7	590	81	11	0	0	0	0	0	0	193	0	0	0	45	0
KENTUCKY	100	613	25	209	91	0	0	0	4	108	6	5	0	0	0	0	0	0	92	0	0	0	29	1
LOUISIANA	295	1510	21	69	0	0	0	0	1	27	2	0	0	0	9	6	42	0	32	0	0	0	46	1
MAINE	23	179	30	40	0	0	1	0	1	21	3	2	3	0	1	0	5	0	46	0	0	0	0	0
MARYLAND	35	239	17	30	8	1	3	0	2	11	34	0	0	0	1	0	0	0	30	0	0	0	1	15
MASSACHUSETTS	43	311	60	56	7	1	5	0	8	36	49	3	0	0	0	14	5	2	13	0	0	0	0	1
MICHIGAN	48	1240	56	129	89	1	7	0	4	94	35	2	0	0	1	2	3	0	35	0	2	0	14	0
MINNESOTA	135	605	114	0	10	0	1	0	4	139	25	1	0	0	1	0	1	0	126	0	0	0	1	0
MISSISSIPPI	93	2061	124	44	3	5	2	0	7	58	1	0	0	0	1	1	1	0	10	0	0	0	947	21
MISSOURI	406	2876	158	290	5	33	7	0	3	977	34	0	4	0	0	0	0	0	164	0	0	0	70	1
MONTANA	9	376	12	25	0	0	1	0	3	109	1	0	0	0	0	0	0	0	6	1	0	0	3	30
NEBRASKA	66	1529	251	12	3	0	3	0	0	627	30	0	0	0	0	0	0	0	29	0	0	0	0	0
NEVADA	6	28	2	3	4	0	0	0	0	1	3	0	0	0	0	0	0	0	7	0	0	0	0	0
NEW HAMPSHIRE	11	232	13	13	0	0	9	0	3	30	5	1	0	0	1	2	0	0	25	0	0	0	1	9
NEW JERSEY	69	408	144	18	22	0	12	0	5	108	56	0	0	0	5	21	9	0	9	0	0	0	1	3
NEW MEXICO	33	296	7	4	6	2	3	0	3	20	0	0	0	0	0	0	0	0	16	0	0	0	14	0
NEW YORK	115	1293	198	38	58	4	57	1	6	196	104	4	5	0	6	7	4	1	57	1	0	0	1	16
NORTH CAROLINA	31	1566	152	168	2	0	0	0	1	31	9	0	0	0	2	8	0	110	0	0	0	241	0	
NORTH DAKOTA	13	551	1	22	7	2	0	0	0	175	1	0	0	0	0	0	0	0	14	0	0	0	17	0
OHIO	435	1340	174	145	87	0	16	0	57	468	113	10	2	0	2	3	0	0	107	0	0	0	94	0
OKLAHOMA	866	5260	80	71	9	4	7	0	8	782	79	4	0	0	0	0	0	115	1	0	0	21	0	
OREGON	65	391	32	33	40	0	2	0	14	44	10	5	1	0	1	3	0	0	4	0	0	0	13	1
PENNSYLVANIA	177	2312	365	912	304	179	18	0	23	480	338	7	1	0	0	1	0	0	76	195	0	5	71	0
RHODE ISLAND	22	117	3	10	4	0	4	0	0	10	19	1	1	0	0	0	0	0	1	0	0	0	0	0
SOUTH CAROLINA	590	411	12	206	1	0	0	0	1	32	9	0	0	0	0	1	6	0	10	0	0	0	7	0
SOUTH DAKOTA	107	634	6	45	7	1	0	0	5	152	10	0	0	0	0	0	0	0	63	0	0	0	42	0
TENNESSEE	30	698	6	215	37	15	1	0	3	44	34	1	0	0	0	1	0	0	118	0	0	0	296	0
TEXAS	263	1621	25	67	16	0	1	1	8	324	5	0	3	0	0	1	1	0	138	0	0	0	106	0
UTAH	15	155	1	42	3	0	12	0	1	10	1	0	0	0	0	0	0	0	15	0	0	0	0	0
VERMONT	18	258	27	81	1	1	0	0	4	75	8	5	0	0	0	1	0	0	5	0	0	0	0	0
VIRGINIA	86	663	51	137	4	0	5	0	7	98	28	2	0	0	1	1	9	0	94	0	0	0	0	0
WASHINGTON	45	196	12	41	12	4	3	0	5	39	25	0	1	0	6	3	2	0	4	0	0	0	21	2
WEST VIRGINIA	120	396	125	49	35	0	0	0	11	123	148	2	3	0	0	0	0	0	22	0	2	0	34	8
WISCONSIN	245	902	51	0	30	0	20	0	7	76	28	0	0	0	2	11	0	0	84	0	0	0	39	0
WYOMING	44	221	16	58	8	0	0	0	1	48	1	0	0	0	0	0	0	0	8	0	0	0	1	3
PUERTO RICO	59	118	10	38	0	1	0	0	3	6	2	0	0	0	0	0	0	0	24	0	0	0	0	0
TOTALS	6945	43671	2912	4838	2299	284	348	90	290	8156	1682	87	33	1	48	118	108	6	2785	200	6	2237	613	

COUNT OF FUNCTIONALLY OBSOLETE BRIDGES BY STRUCTURE TYPE AS OF 12/ 2004

State	Slab	Stringer /Multi-Beam or Girder	Girder & Floorbeam System	Tee Beam	Box Beam or Girders (Multiple)	Box Beam or Girders (Single or Spread)	Frame (Except Culverts)	Orthotropic	Truss-Deck	Truss-Thru	Arch-Deck	Arch-Thru	Suspension	Stayed Girder	Movable-Lift	Movable-Bascule	Movable-Swing	Tunnel	Culvert	Mixed Types	Segmental Box Girder	Channel Beam	Other
ALABAMA	131	941	34	679	17	1	63	0	4	16	11	2	0	0	0	0	0	1	339	0	0	45	2
ALASKA	4	135	0	21	16	1	0	7	0	10	0	0	0	0	0	0	0	0	4	0	0	0	4
ARIZONA	137	185	6	29	33	54	33	0	1	8	7	0	0	0	0	0	0	0	60	0	0	0	1
ARKANSAS	412	789	23	209	15	0	2	123	4	24	28	0	0	0	0	0	0	0	56	0	0	210	0
CALIFORNIA	614	843	18	561	1166	8	5	1	14	82	148	2	1	0	0	4	9	16	276	2	1	0	8
COLORADO	40	307	17	265	34	26	10	0	2	18	13	3	0	0	0	0	0	0	45	0	1	1	1
CONNECTICUT	150	569	24	41	59	10	61	1	1	9	55	1	0	0	0	0	1	0	33	0	0	1	2
DELAWARE	5	52	3	0	2	0	1	0	1	1	9	1	0	0	0	4	0	0	1	0	0	0	0
DIST. OF COL.	2	70	13	4	8	2	12	1	0	0	12	0	0	0	0	0	0	0	10	0	0	0	0
FLORIDA	616	795	15	106	2	6	4	0	0	4	17	2	1	0	1	56	3	0	69	0	0	0	103
GEORGIA	161	1080	14	408	17	1	3	0	2	9	20	0	0	0	0	2	0	0	43	0	0	0	1
HAWAII	81	59	11	129	29	0	6	0	1	1	12	1	0	0	0	0	0	8	19	0	0	0	0
IDAHO	13	256	5	69	4	1	38	0	1	21	3	0	0	0	0	0	0	0	2	0	0	0	1
ILLINOIS	195	1064	65	68	151	3	8	2	1	52	16	0	2	1	1	24	2	0	96	0	0	48	126
INDIANA	186	855	35	15	414	14	11	0	1	135	194	1	0	0	0	0	0	0	39	0	2	66	55
IOWA	170	1121	29	43	12	0	3	0	3	228	19	3	3	0	0	0	1	1	53	0	0	0	7
KANSAS	296	1394	134	134	70	2	6	0	5	99	44	17	0	0	0	0	0	0	316	0	0	0	53
KENTUCKY	239	625	22	955	560	13	4	0	4	57	14	2	2	0	0	1	0	0	298	0	1	24	0
LOUISIANA	707	926	45	183	33	0	0	0	1	10	3	0	0	0	15	2	21	3	277	0	0	6	1
MAINE	57	256	21	73	1	0	22	0	1	39	12	1	0	0	0	0	3	0	2	0	0	0	0
MARYLAND	91	579	23	71	33	11	24	0	4	29	72	5	2	0	0	10	2	0	58	0	1	1	36
MASSACHUSETTS	145	1311	64	80	43	7	72	0	4	31	117	3	0	0	0	4	0	8	43	0	1	0	0
MICHIGAN	74	786	27	130	171	5	14	1	1	13	26	4	1	0	0	7	1	0	86	0	0	0	7
MINNESOTA	37	293	64	0	6	0	6	0	0	20	25	0	0	0	1	0	1	0	17	0	0	0	0
MISSISSIPPI	112	690	7	70	7	120	38	0	0	11	10	0	0	0	0	0	1	1	19	0	1	228	3
MISSOURI	436	1781	53	314	35	120	8	0	2	129	40	4	2	0	0	0	0	0	274	0	2	15	1
MONTANA	77	314	29	37	0	0	0	0	0	28	3	0	0	0	0	0	0	0	3	0	0	4	5
NEBRASKA	61	950	135	13	5	0	2	0	2	231	6	0	0	0	0	0	0	0	20	0	0	0	0
NEVADA	36	22	2	7	43	1	24	0	1	1	0	0	0	0	0	0	0	0	7	0	0	0	0
NEW HAMPSHIRE	34	238	10	30	3	0	53	0	1	18	21	1	0	0	0	0	0	0	23	0	0	0	1
NEW JERSEY	100	1022	68	21	87	8	41	0	2	35	65	0	1	0	2	4	1	0	20	0	0	0	3
NEW MEXICO	32	174	0	21	12	2	2	0	0	14	2	1	0	0	0	0	0	0	49	0	0	11	0
NEW YORK	155	2713	210	64	159	4	352	1	13	225	321	10	11	0	14	17	6	0	84	0	0	1	20
NORTH CAROLINA	137	2175	80	343	3	0	13	0	1	12	17	0	0	0	0	2	3	0	56	0	0	0	26
NORTH DAKOTA	2	174	0	16	7	6	0	0	0	40	1	1	0	0	0	0	0	0	5	0	0	5	2
OHIO	499	2496	154	144	286	0	54	0	28	197	103	6	1	0	2	2	1	0	18	0	0	0	59
OKLAHOMA	169	833	14	22	6	2	19	0	1	57	15	0	0	0	0	0	0	0	313	0	0	0	0
OREGON	177	573	36	61	101	6	45	1	13	90	23	5	2	0	5	3	1	0	23	0	0	24	0
PENNSYLVANIA	165	1783	178	404	429	232	107	1	13	149	272	7	6	0	1	1	0	0	72	99	0	3	18
RHODE ISLAND	19	136	2	1	15	0	14	0	0	0	19	0	1	0	0	0	0	0	5	0	0	0	0
SOUTH CAROLINA	175	327	6	232	1	0	2	0	0	11	13	0	0	0	0	2	1	3	70	0	0	1	0
SOUTH DAKOTA	79	255	2	10	5	0	0	0	1	48	1	0	0	0	0	0	0	0	13	0	0	4	0
TENNESSEE	56	987	11	740	106	12	0	2	25	95	3	0	0	0	0	0	0	0	733	0	0	124	0
TEXAS	1240	3893	23	342	642	4	24	5	5	42	26	1	0	0	2	0	4	0	1100	0	0	0	262
UTAH	14	151	3	30	7	0	20	0	0	1	1	0	0	0	0	0	0	0	22	0	0	0	0
VERMONT	42	255	14	64	1	0	0	0	2	41	2	5	0	0	0	0	0	0	43	0	0	0	1
VIRGINIA	244	1353	36	321	46	4	23	0	4	40	45	4	0	0	1	1	1	0	36	0	0	0	3
WASHINGTON	278	492	39	276	120	91	16	0	12	92	69	10	3	1	21	4	3	0	18	0	0	90	4
WEST VIRGINIA	197	529	69	42	276	6	6	0	9	62	192	0	0	0	0	0	0	0	36	0	2	46	6
WISCONSIN	135	567	21	0	23	0	14	0	2	24	19	1	0	0	4	10	0	1	18	0	0	4	1
WYOMING	70	78	3	57	1	0	3	0	1	3	1	0	0	0	0	0	0	0	0	2	0	0	1
PUERTO RICO	253	297	12	95	17	1	15	0	0	0	15	0	0	0	1	0	0	0	81	0	0	0	1
TOTALS	9557	40549	1929	8050	5339	878	1315	144	171	2542	2274	108	39	2	71	160	66	52	5395	101	12	1098	694

COUNT OF DEFICIENT BRIDGES BY STRUCTURE TYPE AS OF 12/ 2004

State	Slab	Stringer /Multi-Beam or Girder	Girder & Floorbeam System	Tee Beam	Box Beam or Girders (Multiple)	Box Beam or Girders (Single or Spread)	Frame (Except Culverts)	Orthotropic	Truss-Deck	Truss-Thru	Arch-Deck	Arch-Thru	Suspension	Stayed Girder	Movable-Lift	Movable-Bascule	Movable-Swing	Tunnel	Culvert	Mixed Types	Segmental Box Girder	Channel Beam	Other
ALABAMA	305	2318	82	868	36	1	167	0	16	103	16	3	0	0	0	0	0	1	686	0	0	68	9
ALASKA	7	239	4	29	21	2	0	7	1	24	2	0	0	1	0	0	0	0	5	0	0	0	11
ARIZONA	175	260	10	40	38	55	35	0	3	18	12	0	0	0	0	0	0	0	69	0	0	1	1
ARKANSAS	486	1599	32	230	21	0	2	210	7	92	39	3	2	0	1	0	0	0	84	0	0	325	0
CALIFORNIA	1069	1723	25	1131	1923	12	5	1	40	185	188	8	6	0	5	15	12	16	306	2	1	1	12
COLORADO	47	691	35	365	37	36	12	0	2	52	19	3	1	0	0	0	0	0	81	0	1	1	4
CONNECTICUT	181	755	44	63	68	10	70	1	3	18	81	1	0	0	1	3	2	0	59	0	0	1	2
DELAWARE	11	69	10	2	4	0	1	0	1	2	9	1	0	0	0	4	0	0	8	0	0	0	0
DIST. OF COL.	3	79	17	4	10	3	14	1	0	0	15	0	0	0	0	0	1	10	0	0	0	0	0
FLORIDA	695	953	19	139	3	6	5	0	0	5	19	2	1	0	1	64	9	0	89	0	0	106	1
GEORGIA	382	1818	24	504	17	2	3	0	2	29	29	0	0	0	0	2	1	0	128	2	0	5	0
HAWAII	100	107	24	168	34	0	7	0	4	5	21	4	0	0	0	0	0	8	30	0	0	0	1
IDAHO	23	415	15	129	7	1	45	0	2	78	5	0	1	0	1	0	0	0	6	0	0	2	0
ILLINOIS	458	2110	132	182	434	4	20	2	3	331	46	1	2	1	4	38	2	3	196	0	0	165	227
INDIANA	390	1638	107	32	683	22	15	0	7	416	364	1	0	0	0	0	0	0	118	0	3	158	62
IOWA	479	4600	131	165	24	0	4	1	15	1247	44	10	3	0	0	0	1	1	153	0	0	61	19
KANSAS	629	3206	266	248	75	5	9	0	12	689	125	28	0	0	0	0	0	0	509	0	0	0	98
KENTUCKY	339	1238	47	1164	651	13	4	0	8	165	20	7	2	0	0	1	0	0	390	0	1	53	1
LOUISIANA	1002	2436	66	252	33	0	0	0	2	37	5	0	0	0	24	8	63	3	309	0	0	52	2
MAINE	80	435	51	113	1	0	23	0	2	60	15	3	3	0	1	0	8	0	48	0	0	0	0
MARYLAND	126	818	40	101	41	12	27	0	6	40	106	5	2	0	0	11	2	0	88	0	1	2	51
MASSACHUSETTS	188	1622	124	136	50	8	77	0	12	67	166	6	0	0	0	18	5	10	56	0	1	0	1
MICHIGAN	122	2026	83	259	260	6	21	1	5	107	61	6	1	0	1	9	4	0	121	0	2	0	21
MINNESOTA	172	898	178	0	16	0	7	0	4	159	50	1	0	0	2	0	2	0	143	0	0	1	0
MISSISSIPPI	205	2751	131	114	10	125	40	0	7	69	11	0	0	0	1	1	2	1	29	0	1	1175	24
MISSOURI	842	4657	211	604	40	153	15	0	5	1106	74	4	6	0	0	0	0	0	438	0	2	85	2
MONTANA	86	690	41	62	0	0	1	0	3	137	4	0	0	0	0	0	0	0	9	1	0	7	35
NEBRASKA	127	2479	386	25	8	0	5	0	2	858	36	0	0	0	0	0	0	0	49	0	0	0	0
NEVADA	42	50	4	10	47	1	24	0	1	2	3	0	0	0	0	0	0	0	14	0	0	0	0
NEW HAMPSHIRE	45	470	23	43	3	0	62	0	4	48	26	2	0	0	1	2	0	0	48	0	0	1	10
NEW JERSEY	169	1430	212	39	109	8	53	0	7	143	121	0	1	0	7	25	10	0	29	0	0	1	6
NEW MEXICO	65	470	7	25	18	4	5	0	3	34	2	1	0	0	0	0	0	65	0	0	25	0	
NEW YORK	270	4006	408	102	217	8	409	2	19	421	425	14	16	0	20	24	10	1	141	1	0	2	36
NORTH CAROLINA	168	3741	232	511	5	0	13	0	2	43	26	0	0	0	4	11	0	0	166	0	0	267	1
NORTH DAKOTA	15	725	1	38	14	8	0	0	0	215	2	1	0	0	0	0	0	0	19	0	0	22	2
OHIO	934	3836	328	289	373	0	70	0	85	665	216	16	3	0	4	5	1	0	125	0	0	0	153
OKLAHOMA	1035	6093	94	93	15	6	26	0	9	839	94	4	0	0	0	0	0	0	428	1	0	0	21
OREGON	242	964	68	94	141	6	47	1	27	134	33	10	3	0	6	6	1	0	27	0	0	37	1
PENNSYLVANIA	342	4095	543	1316	733	411	125	1	36	629	610	14	7	0	1	2	0	0	148	294	0	8	89
RHODE ISLAND	41	253	5	11	19	0	18	0	0	10	38	1	2	0	0	0	0	0	6	0	1	0	0
SOUTH CAROLINA	765	738	18	438	2	0	2	0	1	43	22	0	0	0	0	3	7	3	80	0	0	1	7
SOUTH DAKOTA	186	889	8	55	12	1	0	0	6	200	11	0	0	0	0	0	0	0	76	0	0	46	0
TENNESSEE	86	1685	17	955	143	121	13	0	5	69	129	4	0	0	0	1	0	0	851	0	0	420	0
TEXAS	1503	5514	48	409	658	4	25	6	13	366	31	1	3	0	2	1	5	0	1238	0	0	0	368
UTAH	29	306	4	72	10	0	32	0	1	11	2	1	0	0	0	0	0	37	0	0	0	0	
VERMONT	60	513	41	145	2	1	0	0	6	116	10	10	0	0	1	0	0	0	48	0	0	0	1
VIRGINIA	330	2016	87	458	50	4	28	0	11	138	73	6	0	0	2	2	10	0	130	0	0	0	3
WASHINGTON	323	688	51	317	132	95	19	0	17	131	94	10	4	1	27	7	5	0	22	0	0	111	6
WEST VIRGINIA	317	925	194	91	311	6	6	0	20	185	340	2	3	0	0	0	0	0	58	0	4	80	14
WISCONSIN	380	1469	72	0	53	0	34	0	9	100	47	1	0	0	6	21	0	1	102	0	0	43	1
WYOMING	114	299	19	115	9	0	3	0	2	51	2	0	0	0	0	0	0	0	10	0	0	2	3
PUERTO RICO	312	415	22	133	17	2	15	0	3	6	17	0	0	0	1	0	0	0	105	0	0	0	1
TOTALS	16502	84220	4841	12888	7638	1162	1663	234	461	10698	3956	195	72	3	119	278	174	58	8180	301	18	3335	1307

APPENDIX B – CURRENT STATE DOT CHIEF EXECUTIVE OFFICERS AS OF OCTOBER, 2005

SOURCE: WORLD WIDE WEB

STATE	ENGINEER?	JOB PRIOR TO THIS	WORKED FOR DOT?
Alabama	No	Executive VP – Consult. Engineer	No
Alaska	No	Forestry	No
Arizona	Yes	Transportation Engineer	Yes
Arkansas	Yes	With State DOT since 1969	Yes
California	No	Assistant City Manager	Yes
Colorado	Yes	State Legislator	No
Connecticut	No	Airport Administrator	No
Delaware	No	Corporate Finance	No
District of Col.	No	Acting Director of DOT	Yes
Florida	Yes	Governor's Chief of Staff	No
Georgia	Yes	Exec Assistant to DOT Commissioner	Yes
Hawaii	Yes	Project Manager, Consulting Engineer	No
Idaho	Yes	Minnesota DOT	No
Illinois	Yes	CEO of Chicago Public Schools	No
Indiana	Yes	Retired Businessman	No
Iowa	No	Acting Director of DOT	Yes
Kansas	No	Planning Consultant	Yes
Kentucky	No	Mayor	No
Louisiana	Yes	Executive with Conoco Oil Company	No
Maine	No	Economic Development	No
Maryland	No	Politics (House of Delegates)	No
Massachusetts	No	Commissioner of Mass Hwy Dept.	Yes
Michigan	Yes	Deputy Administrator, FHWA	No
Minnesota	No	Legislator	No
Mississippi	No	Marketing, Real Estate	No
Missouri	No	Consulting, Construction	No
Montana	?	Contracting Consultant	No
Nebraska	No	U.S. Army Corps of Engineers	No
Nevada	Yes	Deputy Director Nevada DOT	Yes
New Hampshire	?	Worked for State DOT	Yes
New Jersey	Yes	Deputy Commissioner	Yes
New Mexico	Yes	Worked for State DOT	Yes
New York	No	Politics	No
North Carolina	No	Accounting	No
North Dakota	Yes	State Engineer	Yes
Ohio	No	ODOT Chief of Staff	Yes

Oklahoma	No	Retired – Real Estate	No
Oregon	No	Head of Department of Motor Vehicles	Yes
Pennsylvania	Yes	Consulting Engineer	No
Puerto Rico	?	(Bernardo Fagundo)	?
Rhode Island	Yes	Chief Engineer	Yes
South Carolina	No	Various positions in DOT	Yes
South Dakota	No	Risk Manager	No
Tennessee	No	State Housing Agency	No
Texas	Yes	District Engineer	Yes
Utah	Yes	Chief Engineer	Yes
Vermont	No	Deputy Secretary of Commerce	No
Virginia	No	Deputy Secretary of Transportation	Yes
Washington	No	Executive Director: Water Resources	No
West Virginia	No	Chief Financial Officer of DOT	Yes
Wisconsin	No	Teamsters Official	No
Wyoming	No	Administrator: Highway Patrol	No
TOTALS	Yes: 19 No: 30		Yes: 21 No: 30

APPENDIX C –CONTACT INFORMATION FOR KEY FEDERAL AND STATE TRANSPORTATION OFFICIALS, MAY 2007

BRIDGE, HYDRAULICS & GEOTECHNICAL ENGINEERS, CONTACT INFORMATION

FHWA OFFICE OF BRIDGE TECHNOLOGY

Name	Phone	Specialty
Myint Lwin	202-366-4589	Director
Cathy Holly	202-366-4589	Program Support Assistant
Vacant	202-366-6712	Strategic Planning and Coordination
Steve Ernst	202-366-4619	Safety and Security
Chien-Tan Chang	202-366-6746	Contracts

Bridge and Tunnel Team

Ben Tang	202-366-4592	Team Leader
Jesus Rohena	202-366-4593	Tunnels
Firas Ibrahim	202-366-4598	Codes and Specifications
Vasant Mistry	202-366-4599	Steel
Gary Jakovich	202-366-4596	Concrete
Glenn Smith	202-366-8795	Seismic
Krishna Verma	202-366-4601	Structural Fabrication

Bridge Programs Team

Tom Everett	202-366-4675	Team Leader
Minnie Long	202-366-8791	Reports and Database
Fernando Luna	202-366-4621	National Bridge Inventory Support
Gary Moss	202-366-4654	National Bridge Inspection Standards
Ann Shemaka	202-366-1575	National Bridge Inventory Specialist
Edgar Small	202-366-4622	National Bridge Inventory
Wade Casey (Asset Management)	202-366-4606	Bridge Management Engineer
Rajkumar Ailaney (Asset Management)	202-366-1567	Bridge Management Engineer

Hydraulics and Geotechnical

Jorge Pagán-Ortiz	202-366-4604	Team Leader
Jerry DiMaggio	202-366-1569	Geotechnical
Joe Krolak	202-366-4611	Hydraulics
Michelle Cribbs	202-366-8792	Computer Applications Engineer
Annie Hamer	202-366-4623	Computer Service

FHWA DIVISION BRIDGE ENGINEERS

State	Name	Phone	Title
Alabama	Robert King	334-223-7376	Division Bridge Engineer
Alaska	Steve Boch	907-586-7427	Structural Engineer
Arizona	Aryan Lirange	602-379-3645 x116	Technical Services Engineer
Arkansas	Terry Daniel	501-324-5356	Division Bridge Engineer
California	Martha Nevai	916-498-5889	Structural Engineer
	Sarah Skeen	916-498-5023	Structures/Research Engineer
Colorado	Matthew Greer	720-963-3008	Division Bridge/Materials Engineer
Connecticut	Joseph E. Chilstrom	860-659-6703 x3031	Division Bridge Engineer
Delaware	Matthew Hake	302-734-1657	Division Bridge Engineer
District of Columbia	Bob Mihalek	202-523-0170	Division Bridge Engineer
Florida	Jeffrey Ger	850-942-9650 x3039	Division Bridge Engineer
	Burt Buchanan		Assistant Bridge Engineer
Georgia	Edward T. Parker	404-562-3643	Division Bridge Engineer
	Olu Adeyemi	404-562-3636	Division Bridge Engineer
Hawaii	Domingo Galicinao	808-541-2700 x302	Division Bridge Engineer
Idaho	Richard Scarr	208-334-9180 x124	Division Bridge Engineer
Illinois	Daniel Brydl	217-492-4632	Division Bridge Engineer
	Doug Blade	217-492-4629	Assistant Bridge Engineer
Indiana	Keith Hoernschemeyer	317-226-7490	Division Bridge Engineer
Iowa	Curtis Monk	515-233-7320	Division Bridge Engineer
Kansas	Steven E. Toillion	785-267-7299 x311	Division Bridge Engineer
Kentucky	Vacant	502-223-6763	Bridge Engineer
Louisiana	Arturo Aguirre	225-757-7623	Division Bridge Engineer
Maine	Maria Drozd	207-622-8350 x108	Division Bridge Engineer
Maryland	Derek Constable	410-779-7157	Structural Engineer
Massachusetts	Everett Matias	617-494-2462	Division Bridge Engineer
	Michael Arpino	617-494-2316	Assistant Bridge Engineer
Michigan	Jon Nekritz	517-702-1837	Division Bridge Engineer
	Sonny Jadun	517-702-1846	Assistant Bridge Engineer
Minnesota	Romeo R. Garcia	651-291-6125	Division Bridge Engineer
Mississippi	Richard Ward	601-965-4227	Division Bridge Engineer
Missouri	Peter Clogston	573-638-2613	Division Bridge Engineer
	Bill Stroessner	573-638-2618	Assistant Bridge Engineer
Montana	Ted Burch	406-449-5302	Operations Engineer
Nebraska	Greg Kolle	402-437-5977	Division Bridge Engineer
Nevada	Terry Philbin	775-687-5322	Construction and Bridge Engineer

New Hampshire	David R. Hall	603-228-3057 x115	Division Bridge Engineer
New Jersey	Helene Bowman	609-637-4230	Division Bridge Engineer
	Luc Saroufim	609-637-4239	Assistant Bridge Engineer
New Mexico	William Dooley	505-820-2025	Division Bridge Engineer
	Dan Byer	518-431-4125 x253	Division Bridge Engineer
New York	John Burns	518-431-4125 x252	Assistant Bridge Engineer
	Earl Dubin	518-431-4125 x229	Assistant Bridge Engineer
North Carolina	Thomas Drda	919-856-4760	Division Bridge Engineer
	Ernesto Villalba	919-856-4760	Assistant Bridge Engineer
North Dakota	Carl Highsmith	701-250-4343 x103	Structures and Engineering Team Leader
Ohio	Matt Shamis	614-280-6847	Division Bridge Engineer
	Thomas Lefchik	614-280-6845	Assistant Bridge and Technology Transfer Engineer
Oklahoma	Calvin Karper	405-605-6166 x325	Division Bridge Engineer
Oregon	Tim Rogers	503-399-5749	Division Bridge Engineer
Pennsylvania	William Williams	717-221-4542	Division Bridge Engineer
	Tod Kimball	717-221-4541	Assistant Structural Engineer
Puerto Rico	Luis Sandoval	787-766-5600 x229	Division Bridge Engineer
Rhode Island	Anthony Rotondo	401-528-4577	Division Structural Engineer
South Carolina	J. Ken Johnson	803-253-3880	Bridge Engineer
South Dakota	Mark Clausen	605-224-7326 x3034	Division Bridge Engineer
Tennessee	Paul Sharp	615-781-5762	Division Bridge Engineer
	Rebecca Jaramilla	615-781-5758	Assistant Bridge Engineer
Texas	Peter Chang	512-536-5920	Division Bridge Engineer
	Peter Forsling	402-437-6624	Assistant Division Bridge Engineer
Utah	Russell Robertson	801-963-0078	Division Bridge Engineer
Vermont	Michael Canavan	802-828-4574	Division Bridge Engineer
Virginia	Claude Napier	804-775-3363	Division Bridge Engineer
	Rodolfo Maruri	804-775-3361	Assistant Division Bridge Engineer
Washington	Barry Brecko	360-753-9482	Division Bridge Engineer
West Virginia	Jack L. Justice	304-347-5932	Division Bridge Engineer
	John Bargo	304-347-5930	Assistant Bridge Engineer
Wisconsin	Tom Strock	608-829-7507	Division Bridge Engineer
Wyoming	Lee Potter	307-772-2012 x46	Division Bridge/Pavement Engineer

FHWA RESOURCE CENTER TECHNICAL SERVICE TEAMS

Hydraulics and Geotechnical

Name	Phone	Title	Office Location
Peter Osborn	410-962-0702	Hydraulics and Geotechnical Technical Service Team Leader	Resource Center (Baltimore)
Larry Arneson	720-963-3200	Senior Hydraulics Engineer	Resource Center (San Francisco)
Eric Brown	410-962-3743	Hydraulics Engineer	Resource Center (Baltimore)
Dan Ghere	708-283-3557	Hydraulics Engineer	Resource Center (Olympia Fields)
Cynthia Nurmi	404-562-3908	Hydraulics Engineer	Resource Center (Atlanta)
Veronica Ghelardi	720-963-3238	Hydraulics Engineer	Professional Development Program
Rich Barrows	360-619-7704	Geotechnical Engineer	Western Federal Lands
Chris Dumas	410-962-0096	Geotechnical Engineer	Resource Center (Baltimore)
Sam Mansukhani	708-283-3550	Geotechnical Engineer	Resource Center (Olympia Fields)
Silas Nichols	410-962-2460	Geotechnical Engineer	Resource Center (Baltimore)
Benjamin Rivers	404-562-3926	Geotechnical Engineer	Resource Center (Atlanta)
Barry Siel	720-963-3208	Geotechnical Engineer	Resource Center (San Francisco)

Structures

Name	Phone	Title	Office Location
Skoukry Elnahal	703-404-6232	Structures Technical Service Team Leader	Resource Center (Baltimore)
Shay Burrows	410-962-3743	BMS/NBIS Engineer	Resource Center (Baltimore)

Doug Edwards	404-895-6228	Senior Structural Engineer	Resource Center (Atlanta)
Derrell Manceaux	303-716-2096	Structural Design Engineer	Resource Center (San Francisco)
Roland Nimis	415-744-2653	Structures Technology Engineer	Resource Center (San Francisco)
Larry O'Donnell	708-283-3502	BMS/NBIS Engineer	Resource Center (Olympia Fields)
Vacant	410-962-2542	Complex Structures Engineer	Resource Center (Baltimore)
Tom Saad	708-283-3521	Structural Design Engineer	Resource Center (Olympia Fields)
Jeffrey Smith	404-562-3905	Structural Design Engineer	Resource Center (Atlanta)
Louis Triandafilou	410-962-3648	High Performance Struct. Mat'l's Engr.	Resource Center (Baltimore)
Waider Wong	410-962-9252	Structural Design Engineer	Resource Center (Baltimore)

Federal Lands Highway Office

Office	Name	Phone	Title
Headquarters	Vacant	202-366-9487	Program Engineer (Bridge)
Eastern Federal Lands	Hala Elgaaly	703-404-6232	FLH Bridge Engineer
	George Choubah	703-404-6244	Bridge Design Team Leader
	Mark Clabaugh	703-404-6235	Bridge Design Team Leader
	Vacant	703-404-6236	Bridge Design Team Leader
	Hratch Pakhchanian	703-404-6246	Bridge Design Team Leader
	Hong Chen	703-404-6249	Bridge Design Team Leader
	Shyan-Yung Pan	703-404-6239	Bridge Design Team Leader
	John Thiel	703-404-6251	BIP Coordinator
	Joseph Wu	703-404-6237	QAQC Structural Engineer
	Brian Beucler	703-404-6353	Hydraulics Engineer

	Abbi Ginsberg	703-404-6354	Asst. Hydraulics Engineer
	David Dajc	703-404-6363	Asst. Hydraulics Engineer
	Vacant	703-404-6347	Division Geotechnical Engineer
	Karl Eikermann	720-963-3390	Bridge Design Team Leader
	Bonnie Klamerus		Design Team Leader
	Norman Schneider	720-963-3398	Bridge Design Team Leader
Central Federal Lands	Matt DeMarco	720-963-3520	Geotechnical Engineer
	Bart Bergendahl	720-963-3754	Federal Lands Hydraulics Team Leader
	Thiet Nguyen	720-963-3756	Hydraulics Engineer
	Peter Sletten	720-963-3757	Hydraulics Engineer
Western Federal Lands	Marc A. Veneroso	360-619-7708	Bridge Design Engineer
	Fahmi Ismail	360-619-7705	Structural Engineer
	Jeff M. Berg	360-619-7719	Structural Engineer
	Alan P. Kilian	360-619-7748	Geotechnical Engineer
	Mark C. Browning	360-619-7964	Hydraulics Engineer
	Sven Leon	360-619-7767	Hydraulics Engineer

STATE DEPARTMENTS OF TRANSPORTATION (OR EQUIVALENT)

ALABAMA	Hours: 8:00 am - 5:00 pm CST	
Alabama DOT 1409 Coliseum Boulevard Montgomery, AL 36130-0001	Web site: www.dot.state.al.us	Phone: 334-242-6311 Fax: 334-262-8041
Transportation Director	Joe McInnes	334-242-6311
Assistant Director	Daniel Morris	334-242-6775
Chief Engineer	Donald W. Vaughn	334-242-6310
ALASKA	Hours: 8:00 am - 4:30 pm AST	
Alaska DOT & Public Facilities 3132 Channel Drive Juneau, AK 99801-7898	Web site: www.dot.state.ak.us	Phone: 907-465-3900 Fax: 907-586-8365
Commissioner	Mike Barton (Acting)	907-465-3900
Deputy Commissioner	Vacant	907-465-3900
Chief Engineer	Michael Downing	907-465-6948
Special Assistant to the Commissioner	Dennis Poshard	907-465-3904
AMERICAN SAMOA		
Department of Public Works American Samoa Government Pago Pago, American Samoa 96799		Fax: 011-684-633-5958
Director	Punaofo Tilei	011-684-633-4141
ARIZONA	Hours: 8:00 am- 5:00 pm MST	
Arizona DOT Mail Drop 100A Phoenix, AZ 85007	Web site: www.dot.state.az.us	Phone: 602-712-7011 Fax: 602-712-6941
Director	Victor M. Mendez	602-712-7227
Deputy Director	Vacant	602-712-7550
State Engineer	Dick Wright	602-712-7391
ARKANSAS	Hours: 8:00 am - 4:30 pm CST	
Arkansas State Highway and Transportation Department	Mailing Address: P.O. Box 2261	Phone: 501-569-2000

State Highway Department Building 10324 Interstate 30 Little Rock, AR 72209	Little Rock, AR 72203-2261 Web site: www.ahtd.state.ar.us E-mail address: info@ahtd.state.ar.us	Fax: 501-569-2400
Director of Highways and Transportation	Dan Flowers	501-569-2211
Chief Engineer	Bob Walters	501-569-2214
CALIFORNIA	Hours: 8:00 am - 5:00 pm PST	
California DOT 1120 N Street MS-49 Sacramento, CA 95814	Web site: www.dot.ca.gov Mailing Address: P.O. Box 942873 Sacramento, CA 94273	Phone: 916-654-5267 Fax: 916-654-6608
Director of Transportation	Jeff Morales	916-654-5267
Chief, Deputy Director	Tony Harris	916-654-5267
Chief Engineer	Brent Felker	916-654-5782
AASHTO Representative	Edda Rossa	916-653-4976
COLORADO	Hours: 8:00 am -4:30 pm MST	
Colorado DOT 4201 East Arkansas Avenue Denver, CO 80222-3406	Web site: www.dot.state.co.us	Phone: 303-757-9011 Fax: 303-757-9656
Executive Director	Tom Norton	303-757-9201
Deputy Director	Peggy Catlin	303-757-9205
Division of Highways Chief Engineer	John Umbewust	303-757-9206
Director, Office of Policy	Mike Fitzsimmons	303-757-9755
CONNECTICUT	Hours: 8:30 am -4:30 pm EST	
Connecticut DOT 2800 Berlin Turnpike P.O. Box 317546 Newington, CT 06111	Web site: www.ct.gov/dot Mailing Address: P.O. Box 317546 Newington, CT 06131	Phone: 860-594-3000 Fax: 860-594-3008
Commissioner of Transportation, Acting	James F. Byrnes, Jr.	860-594-3000
Deputy Commissioner	James A. Adams	860-594-3000

Bureau of Engr. and Highway Operations, Acting	Art Gruhn	860-594-2701
Bureau of Policy and Planning	Richard Martinez	860-594-2001
DELAWARE	Web site: www.deldot.net	Hours: 8:00 am -4:30 pm EST
Delaware DOT Highway Administration Center 800 Bay Road, Route 113 Dover, DE 19903	Mailing Address: P.O. Box 778 Dover, DE 19903	Phone: 302-760-2000 Fax: 302-739-5736
Secretary of Transportation	Nathan Hayward III	302-760-2303
Chief Engineer and Director of Transportation Solutions	Carolann Wicks	302-760-2305
Director of Maintenance and Operations	James McNinch	302-760-2201
DISTRICT OF COLUMBIA	Hours: 8:15 am - 4:45 pm EST	
Department of Transportation Reeves Center 2000-14 th Street, NW., 6 th Floor Washington, D.C. 20009-4473	Web site: www.ddot.dc.gov/	Phone: 202-673-6812 Fax: 202-671-0642
Director of Public Works	Leslie Hotaling	202-673-6812
Acting Director, District Division of Transportation	Dan Tangherlini	202-673-6813
Deputy Director, District Division of Transportation	Michele Pourciau	202-673-6813
FLORIDA	Web site: www.dot.state.fl.us	Hours: 8:15 am - 5:15 pm EST
Florida Department of Transportation Haydon Burns Building 605 Suwannee Street Tallahassee, FL 32399-0450		Phone: 850-414-5200 Fax: 850-414-5201
Secretary of Transportation	Jose Abreu	850-414-5205
Asst. Secretary for Transp. Policy	Ken Morefield	850-414-5200
Federal Programs Coordinator	Stephaine Kopelousos	850-414-5205
GEORGIA	Hours: 8:15 am - 5:00 pm EST	
Georgia DOT 2 Capitol Square Atlanta, GA 30334-9003	Web site: www.dot.state.ga.us	Phone: 404-656-5200 Fax: 404-656-3507
Commissioner	Harold Linnenkohl	404-656-5121
Deputy Commissioner	Vacant	
Chief Engineer	Frank Danchetz	404-656-5277

Director of Planning and Programming	Paul Millins	404-656-0610
GUAM		
Department of Public Works Government of Guam 542 North Marine Drive Tamuning, Guam 96911		Phone: 1-671-646-3259 or 3131 Fax: 1-671-649-6178
Director	Jose P. Morcilla, Jr.	1-671-646-3259 or 3131
HAWAII	Hours: 7:45 am-4:30 pm	
Hawaii DOT 869 Punchbowl Street Honolulu, HI 96813-5097	Web site: www.hawaii.gov/dot	Phone: 808-587-2150 Fax: 808-587-2167
Director of Transportation	Rodney K. Haraga	808-587-2150
Highway Administrator, Highway Div.	Glenn M. Yasui	808-587-2220
IDAHO	Hours: 8:00 am- 5:00 pm MST	
Idaho Transportation Department 3311 West State Street P. O. Box 7129 Boise, ID 83707	Web site: itd.idaho.gov/	Phone: 208-334-8000 Fax: 208-334-3858
Director	David S. Ekern	208-334-8807
Deputy Director	Keith Bumsted	208-334-8818
Division of Highways 3311 West State Street Boise, ID 83707	Mailing Address: P. O. Box 7129 Boise, ID 83707	
State Highway Administrator	Jimmy D. Ross	208-334-8803
ILLINOIS	Hours: 8:00 am- 4:30 pm CST	
Illinois DOT 2300 South Dirksen Parkway Springfield, IL 62764-0001	Web site: dot.state.il.us	Phone: 217-782-2632 Fax: 217-782-6828
Secretary	Timothy W. Martin	217-782-5597
Deputy Secretary (Chicago)	Joseph Banks	312-793-2250
Acting Director, Division of Highways	Jack Hook	217-782-2151
Deputy Director, Division of Highways	Robert W. Jones	217-782-2101
Deputy Director, Division of Highways	Jay W. Miller	217-785-0888
Deputy Director, Division of Highways	Jack M. Hook	217-782-3568
Chief of Policy & Federal Affairs	Dan Gentry	217-782-5123
INDIANA	Hours: 8:15 am- 4:45 pm EST	
Indiana DOT 100 North Senate Avenue,	Web site:	Phone: 317-232-5526

Room N758 Indianapolis, IN 46204-2249	www.in.gov/dot	Fax: 317-232-0238
Commissioner	Bryan Nicol	317-232-5525
Deputy Commissioner	Vacant	317-232-1472
IOWA	Hours: 7:45 am- 4:30 pm CST	
Iowa DOT 800 Lincoln Way Ames, IA 50010-6915	Web: www.dot.state.ia.us/	Phone: 515-239-1101 Fax: 515-239-1639
Director	Mark Wandro	515-239-1111
Director, Highway Division and Chief Engineer	E. Thomas Wandro	515-239-1124
Director, Planning and Programming Division	Dennis L. Tice	515-239-1661
KANSAS	Hours: 8:00 am- 5:00 pm CST	
Kansas DOT Docking State Office Bldg, 7 th floor 915 Harrison Topeka, KS 66612-1568	Web site: www.ink.org/public/kdot	Phone: 785-296-3461 Fax: 785-296-1095
Secretary of Transportation	Deb Miller	785-296-3461
Asst. Secretary and State Transportation Engineer	Warren Sick	785-296-3285
Director of Planning and Development	Terry Heidner	785-296-2252
KENTUCKY	Hours: 8:00 am- 4:30 pm EST	
Kentucky Transportation Cabinet State Office Building 501 High Street Frankfort, KY 40622	Web site: www.kytc.state.ky.us/	Phone: 502-564-4890 Fax: 502-379-1851
Secretary	Maxwell Clay Bailey	502-564-4890
Deputy Secretary	Kevin Flanery	502-564-4890
State Highway Engineer	J. M. "Mac" Yowell	502-564-3730
LOUISIANA	Hours: 7:45 am- 4:15 pm CST	
Louisiana DOT and Development P.O. Box 94245 1201 Capitol Access Road Baton Rouge, LA 70804- 9245	Web site: www.dotd.state.la.us	Phone: 225-379-1200 Fax: 225-379-1851
Secretary	Dr. Kam K. Movassaghi	225-379-1200
Director and Chief Engineer	Roderick E. Dillon, Jr.	225-379-1233
Deputy Secretary	Blaise Carriere	225-379-1210

MAINE	Hours: 8:00 am- 5:00 pm EST	
Maine DOT Transportation Building State House Station 16 Augusta, ME 04333-0016	Web site: www.state.me.us/mdot	Phone: 207-624-3000 Fax: 207-624-3001
Commissioner of Transportation	David Cole	207-624-3000
Deputy Commissioner	Bruce Van Note (Acting)	207-624-3000
Chief Engineer	John Dority	207-624-3000
MARYLAND	Hours: 8:30 am- 4:30 pm EST	
Maryland DOT 10 Elm Road Baltimore-Washington International Airport, MD 21240	Web site: www.mdot.state.md.us Mailing Address: P.O. Box 8755 Baltimore-Washington International Airport, MD 21240-0755	Phone: 410-865-1000 Fax: 410-865-1334
Secretary	Robert Flanagan	410-865-1000
Deputy Secretary	Beverly Swaim-Staley	410-865-1002
Exec. Sec., MD Trans Authority	Thomas L. Osborne	410-288-8410
Maryland State Highway Administration 707 North Calvert Street Baltimore, MD 21202	Mailing Address: P.O. Box 717 Baltimore, MD 21203	410-545-0302
Administrator.	Neil J. Pedersen	410-545-0400
Deputy Administrator	Elizabeth L. Homer	410-545-0402
Chief Engineer	Doug Rose	410-545-0360
Dir., Ofc of Policy & Tech. Utilization	Vacant	410-545-0340
MASSACHUSETTS	Hours: 8:45 am- 4:30 pm EST	
Executive Office of Transportation (EOT) Transportation Building 10 Park Plaza, Room 3170 Boston, MA 02116-3973		Phone: 617-973-7000 Fax: 617-523-6454
Secretary	Daniel A. Grabauskas	617-973-7000
Massachusetts Highway Department Transportation Building 10 Park Plaza, Suite 3510 Boston, MA 02116-3973	Web site: www.magnet.state.ma.us/mhd/home.htm	Fax: 617-973-8040
Commissioner	John Cogliano	617-973-7811
Deputy Commissioner	Luisa Paiewonksy	617-973-7818
Chief Engineer	Thomas F. Broderick	617-973-7830
MICHIGAN	Hours: 7:30 am- 4:30 pm EST	
Michigan Department of Transportation	Web site:	Phone: 517-373-2090

State Transportation Building 425 West Ottawa, P.O. Box 30050 Lansing, MI 48913	www.mdot.state.mi.us	Fax: 517-373-0167
Director	Gloria Jeff	517-373-2114
Chief Administrative Officer	Barbara Hayes	517-373-0718
Chief Operations Officer	C. Thomas Maki	517-373-4656
MINNESOTA	Hours: 8:00 am- 4:30 pm CST	
Minnesota DOT Transportation Building, MS-100 395 John Ireland Boulevard St. Paul, MN 55155-1899	Web site: www.dot.state.mn.us/	Phone: 651-296-3000 Fax: 651-296-3587
Commissioner	Carol Molnau	651-297-2930
Deputy Commissioner, Chief Engineer	Douglas Differt	651-296-8532
MISSISSIPPI	Web site: www.gomdot.com/	Hours:8:00 am- 5:00 pm CST
Mississippi DOT 401 N. West Street, Room 157 Jackson, MS 39205	Mailing Address: P.O. Box 1850 Jackson, MS 39215-1850	Phone: 601-359-7001 Fax: 601-359-7050
Executive Director	Larry L. Brown	601-359-7002
Chief Engineer	Harry Lee James	601-359-7004
MISSOURI	Hours:8:00 am- 5:00 pm CST	
Missouri DOT Highway and Transportation Building P.O. Box 270 105 West Capitol Avenue Jefferson City, MO 65102-0270	Web site: www.modot.state.mo.us	Phone: 573-751-2551 Fax: 573-526-5419
Director	David Snider (Acting)	573-751-4622
Chief Engineer	Kevin Keith	573-751-2803
MONTANA	Hours: 8:00 am- 5:00 pm MST	
Montana DOT 2701 Prospect Avenue Helena, MT 59620-9726	Web site: www.mdt.state.mt.us Mailing Address: P. O. Box 201001 Helena, MT 59620-1001	Phone: 406-444-6201 Fax: 406-444-7643

Director of Transportation	David A. Galt	406-444-6201
Chief Engineer	Gary Gilmore	406-444-6206
NEBRASKA	Hours: 8:00 am- 5:00 pm CST	
Department of Roads 1500 Nebraska Highway 2 Lincoln, NE 68509	Web site: www.dor.state.ne.us Mailing Address: P.O. Box 94759 Lincoln, NE 68509-4759	Phone: 402-471-4567 Fax: 402-479-3758
Director	John Craig	402-479-4615
Deputy Director - Chief Engineer	Monty W. Fredickerson	402-479-4671
Deputy Director - Lead Business Manager	Jack Pittman	402-479-4615
NEVADA	Hours: 8:00 am- 5:00 pm PST	
Nevada DOT Administration Building, Room 201 1263 South Stewart Street Carson City, NV 89712-0001	Web site: www.nevadadot.com/	Phone: 775-888-7440 Fax: 775-888-7201
Director	Jeffrey Fontaine	775-888-7440
Deputy Director	Susan Martinovich	775-888-7440
NEW HAMPSHIRE	Hours: 8:00 am- 4:00 pm EST	
New Hampshire DOT John O. Morton Building 7 Hazen Drive P. O. Box 483 Concord, NH 03301-0483	Web site: www.state.nh.us/dot/	Phone: 603-271-3734 Fax: 603-271-3914
Commissioner	Carol A. Murray	603-271-3734
Director of Project Development	Bob Greer	603-271-1484
Assistant Commissioner	Gil Rogers	603-271-1486
NEW JERSEY	Hours: 9:00 am- 4:30 pm EST	
New Jersey DOT 1035 Parkway Avenue P. O. Box 600 Trenton, NJ 08625-0601	Web site: www.state.nj.us/transportation	Phone: 609-530-2001 Fax: 609-530-3894
Commissioner	John F. (Jack) Lettiere	609-530-3536
Deputy Commissioner	James Snyder	609-530-2002
Asst. Commissioner, Capital Program Management	Arthur Silber	609-530-5776
NEW MEXICO	Hours: 7:45 am- 4:45 pm MST	
State Highway and Transportation Department State Highway Department Building	Web site: www.nmshtd.state.nm.us	Phone: 505-827-5110 Fax: 505-827-5469

PO Box 1149 1120 Cerrillos Road Santa Fe, NM 87504		
Secretary	Rhonda G. Faught, P.E.	505-827-5110
Deputy Secretary, Transportation Planning & Design	Rick Chavez	505-827-5258
Deputy Secretary for Highway Operations	Steve Harris	505-827-5106
Adjutant Secretary	Rebecca Montoya	505-827-9863
NEW YORK	Hours: 8:00 am- 5:00 pm EST	
New York State DOT 220 Washington Avenue, State Campus Bldg. 5 Albany, NY 12232-0002	Web site: www.dot.state.ny.us	Phone: 518-457-4422 Fax: 518-457-4190
Commissioner	Joseph H. Boardman	518-457-4422
First Deputy Commissioner	Michael R. Fleischer	518-457-4422
Deputy Commissioner and Chief Engineer	Paul T. Wells	518-457-4430
Director of Governmental Relations	Steven Hewitt	518-457-2345
NORTH CAROLINA	Hours: 8:00 am-5:30 pm EST	
North Carolina DOT One South Wilmington Street Raleigh, NC 27611	Web site: www.dot.state.nc.us Mailing Address: 1501 Mail Service Center Raleigh, NC 27699-1501	Phone: 919-733-2520 Fax: 919-733-9150
Secretary	Lyndo Tippett	919-733-2520
Chief Deputy Secretary	Eugene A. Conti, Jr.	919-733-2520
Division of Highways, State Highway Administrator	Len Sanderson	919-733-7384
NORTH DAKOTA	Hours: 8:00 am- 5:00 pm CST	
North Dakota DOT 608 East Boulevard Bismarck, ND 58505-0700	Web site: www.state.nd.us/dot/	Phone: 701-328-2500 Fax: 701-328-1420
Director	David Sprynczynatyk	701-328-2581
Deputy Director for Engineering	Grant Levi	701-328-2584
NORTHERN MARIANA ISLANDS		

Office of the Secretary of Public Works Commonwealth of the Northern Mariana Islands 2 nd Floor, Joeten Commercial Building, Gualo Rai Saipan, MP 96950		670-235-5827 Fax: 670-235-6346
Secretary	Juan S. Reyes	670-235-5827
OHIO	Hours: 7:30 am- 4:30 pm EST	
Ohio Department of Transportation 1980 W. Broad Street Columbus, OH 43223	Web site: www.dot.state.oh.us	Phone: 614-466-2335 Fax: 614-466-0587
Director	Gordon Proctor	614-466-2335
Chief of Staff	David L. Celona	614-644-8241
Asst. Director Planning and Production	O. Cash Misel	614-466-2448
Asst. Director Highway Management	Mary Ellen Kimberlin	614-466-8990
Asst. Director Business Management	Thomas M. McPherson	614-466-2687
OKLAHOMA	Hours: 8:00 am- 5:00 pm CST	
Oklahoma DOT 200 N.E. 21 st Street Oklahoma City, OK 73105-3204	Web site: www.okladot.state.ok.us/	Phone: 405-521-2631 Fax: 405-521-2093
Secretary of Transportation	Phil Tomlinson	405-521-2631
Director	Gary M. Ridley	405-521-1800
Deputy Director	Paul Adams	405-521-2701
Chief Engineer	Bruce Taylor	405-521-2688
Oklahoma Transportation Authority 3500 Martin Luther King Blvd. Oklahoma City, OK 73111	Mailing Address: P.O. Box 11357 Oklahoma City, OK 73136-0357	
Director	Holly Lowe	405-425-3650
OREGON	Hours: 8:00 am- 5:00 pm PST	
Oregon DOT 355 Capitol Street, NE. Salem, OR 97310-3871	Web site: www.odot.state.or.us/	Phone: 503-986-3200 Fax: 503-986-3446
Director	Bruce Warner	503-986-3200
Deputy Director	Tom Lulay	503-986-3200
PENNSYLVANIA	Hours: 8:00 am- 4:30 pm EST	
Department of Transportation Commonwealth Keystone Building	Web site: www.dot.state.pa.us/	Phone: 717-787-5574 Fax: 717-787-5491

400 North Street, 8 th Floor Harrisburg, PA 17120		
Secretary of Transportation	Allen D. Biehler	717-787-5574
Deputy Secretary for Highway Administration	Gary L. Hoffman	717-787-6875
Deputy Secretary for Planning	Larry King	717-787-3154
PUERTO RICO	Hours: 8:00 am- 4:30 pm AST	
Puerto Rico DOT and Public Works P. O. Box 41269 San Juan, PR 00940-1269	Web site: www.dtop.gov.pr	Phone: 787-723-1390 Fax: 787-728-8963
Secretary	Bernardo Fagundo	787-725-7112
Executive Director, Highway and Transportation Authority	Vacant	787-729-1531
RHODE ISLAND	Hours: 8:30 am- 4:00 pm EST	
Rhode Island DOT 2 Capitol Hill, Room 210 State Office Building Providence, RI 02903	Web site: www.dot.state.ri.us/	Phone: 401-222-2481 Fax: 401-222-6038
Director	James Capaldi	401-222-2481
Executive Officer	Vacant	401-222-2481
Chief Engineer	Vacant	401-222-2481
Chief Engineer	Wendall Flanders	401-222-2481
SOUTH CAROLINA	Hours: 8:30 am- 5:00 pm EST	
South Carolina Department of Transportation Silas N. Pearman Building 955 Park Street Columbia, SC 29202	Web site: www.dot.state.sc.us Mailing Address: P.O. Box 191 Columbia, SC 29202-0191	Phone: 803-737-1324 Fax: 803-737-2038
Executive Director	Elizabeth S. Mabry	803-737-1302
Chief of Staff	Robert J. Probst	803-737-1302
State Highway Engineer	Don Freeman	803-737-1314
SOUTH DAKOTA	Hours: 8:00 am- 5:00 pm CST	
South Dakota DOT Becker-Hansen Building 700 East Broadway Avenue Pierre, SD 57501-2586	Web site: www.sddot.com/	Phone: 605-773-3265 Fax: 605-773-3921
Secretary of Transportation	Dennis Landguth	605-773-3265
Deputy Secretary	Vacant	605-773-3265

TENNESSEE	Hours: 8:00 am- 5:00 pm CST	
Tennessee DOT 700 James K. Polk Building Fifth & Deaderick Street Nashville, TN 37243-0349	Web site: www.tdot.state.tn.us/	Phone: 615-741-2848 Fax: 615-741-2508
Commissioner	Gerald Nicely	615-741-2848
Deputy Commissioner	Tommy Hart	615-741-2848
Chief Engineer	William L. Moore	615-741-0791
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Texas DOT 125 E. 11 th Street Austin, TX 78701-2483	Web site: www.dot.state.tx.us	Phone: 512-305-9501 Fax: 512-463-0283
Executive Director	Michael W. Behrens	512-305-9501
Deputy Executive Director	Steven E. Simmons	512-305-9502
Asst Exec Dir, Engineering Operations	Amadeo Saenz, Jr.	512-305-9504
Asst Exec Dir, Support Operations	Cathy J. Williams	512-305-9506
UTAH	Hours: 8:00 am- 5:00 pm MST	
Utah DOT 4501 South 2700 West Salt Lake City, UT 84114-1245	Web site: www.sr.ex.state.ut.us	Phone: 801-965-4113 Fax: 801-965-4338
Executive Director	John Njord	801-965-4027
Deputy Director	Carlos Braceras	801-965-4082
VERMONT	Hours: 7:45 am- 4:30 pm EST	
Agency of Transportation National Life Building Drawer 33 Montpelier, VT 05633-5001	Web site: www.aot.state.vt.us	Phone: 802-828-2657 Fax: 802-828-3522
Secretary of Transportation	Patricia S. McDonald	802-828-2657
Deputy Secretary	Micque Glitman	802-828-2657
VIRGINIA	Hours: 8:15 am- 5:00 pm EST	
Virginia DOT 202 Ninth Street, Suite 523 Richmond, VA 23219	Web site: www.vdot.state.va.us/	Phone: 804-786-6675 Fax: 804-786-6683
Secretary of Transportation	Whittington W. Clement	804-786-6675
Deputy Secretary	Vacant	804-786-6675
Commissioner	Philip A. Shucet	804-786-2700
Chief Engineer	C. Frank Gee	804-786-2707
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Government of the Virgin Islands of the United States Public Works Department 8244 Sub Base		Phone: 340-776-4844 Fax: 340-774-5869

St. Thomas, VI 00802-5805		
Commissioner	Wayne D. Callwood	340-776-4844 Ext. 207/208
Dep. Commissioner of Engineering	Eduardo O'Neal	340-776-4844 Ext. 234
WASHINGTON	Hours: 8:00 am- 5:00 pm PST	
Washington DOT P.O. Box 47316, Maple Park Drive Olympia, WA 98504-7316	Web site: www.wsdot.wa.gov	Phone: 360-705-7000 Fax: 360-705-6800
Secretary of Transportation	Doug MacDonald	360-705-7054
Assistant Secretary	John Conrad	360-705-7032
Chief of Staff	Paula Hammond	360-705-7027
WEST VIRGINIA	Hours: 7:30 am- 4:00 pm EST	
West Virginia DOT 1900 Kanawha Boulevard, East Capitol Complex, Building 5, Room 109 Charleston, WV 25305	Web site: www.state.wv.us/wvdot	Phone: 304-558-0444 Fax: 304-558-4076
Secretary of Transportation	Fred Van Kirk	304-558-0444
Commissioner	Paul Mattox	304-558-3505
State Highway Engineer	Vacant	304-558-0191
Deputy State Highway Engineer, Development	Randy Epperly	304-558-6266
Deputy State Highway Engineer, Operations	Carl Thompson	304-558-6264
WISCONSIN	Web site: www.dot.state.wi.us	Hours: 7:45 am- 4:30 pm CST
Wisconsin DOT State Transportation Building 4802 Sheboygan Avenue Madison, WI 53702	Mailing Address: P.O. Box 7910 Madison, WI 53707	Phone: 608-266-1113 Fax: 608-266-9912
Secretary	Frank Busalacchi	608-266-1114
Deputy Secretary	Pat Goss	608-266-1114
Chief, Operating Office	Vacant	608-266-1114
Administrator, Transportation Infrastructure Development Division	Michael Cass	608-267-7774

WYOMING	Hours: 8:00 am- 5:00 pm MST	
Wyoming DOT 5300 Bishop Boulevard Cheyenne, WY 82009	E-mail address: wydot@state.wy.us Web site: dot.state.wy.us/	Phone: 307-777-4375 Fax: 307-777-4163
Director	Sleeter C. Dover	307-777-4484
Chief Engineer	Delbert McOmie	307-777-4484



HIGHWAYS FOR LIFE

Accelerating Innovation for the American Driving Experience.



U.S. Department of Transportation
Federal Highway Administration

Marketing Plan

Road Safety Audit

HIGHWAYS FOR LIFE

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August 2007



U.S. Department of Transportation
Federal Highway Administration

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EXECUTIVE SUMMARY

The Federal Highway Administration (FHWA), including Federal-Aid and Federal Lands, is promoting Road Safety Audits (RSAs) as a proactive process to reduce deaths and injuries on our nation's roadways. RSAs involve a formal safety performance examination of a road or intersection by an independent, multidisciplinary team, and they can be used in the planning or design stage, or for identifying and mitigating safety concerns on existing roads and intersections.

The FHWA Office of Safety, in partnership with the FHWA Office of Infrastructure, Highways for LIFE (HfL) team, FHWA Resource Center, and the American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group (TIG), is working diligently to champion the need for RSAs. Toward that end, this marketing plan has been developed to implement a more effective approach to promoting RSAs to FHWA's customers.

The FHWA is working toward the following RSA goals to help the nation meet the United States Department of Transportation (USDOT) goal to reduce the fatality rate to 1.0 fatalities per 100 million vehicle miles traveled by 2008.

Goals of this marketing plan:

- From fiscal year (FY) 2007 to FY2012, at least one RSA will be conducted per year by each of the three Division Offices of the FHWA's Federal Lands Highway Program.
- By 2008, training courses on RSAs will have occurred in all of the Opportunity and Focus states.¹
- By 2010, RSAs will be documented in all strategic highway safety plans.
- By 2012, RSAs will be considered on all projects that qualify for safety funding as determined by the agency's prioritization process. Generally, a national average of 10 RSAs will be performed in each state every year.

This marketing plan describes the "corporate" FHWA philosophy, the "product" analysis (giving detail about what RSAs are), costs and benefits, the market (who the customers are and what they need), current market trends, challenges, the strategy for implementation, and identifies the team members. In

¹ Sixteen states, each with a fatality rate above the national average of 1.5, or with a fatality improvement trend over the past 5 years below that of the national average, were identified in 2003 as opportunities for comprehensive safety improvements and are called "Opportunity states." FHWA also identified several "Focus" states and cities, defined as those with the greatest challenges in the FHWA focus areas of roadway departure, intersection, and pedestrian fatalities. Focus states and cities have a fatality rate above the national average and/or are above a fatality number threshold for that category of crash.

addition, this plan discusses how RSAs can be effective in helping FHWA customers address locations identified as part of new reporting requirements in SAFETEA-LU, the availability of funding sources for conducting and implementing improvements identified in RSAs, and how RSAs fit into FHWA's Risk Management Initiative.

FHWA will reach RSA program goals by:

1. Developing and implementing this marketing plan
2. Forming an RSA implementation team
3. Supporting the team's effort by continued funding of the RSA program to support training, technical assistance, and outreach/technology transfer

Appendices to this marketing plan show the difference between RSAs and traditional safety reviews, list the Opportunity and Focus states and cities, summarize RSA implementation experiences, discuss legal issues related to RSAs, and summarize available RSA technical resources.

INTRODUCTION

In spite of the fact that a variety of efforts have been made to improve safety nationwide, the annual number of fatalities has remained essentially constant since the year 2000. As a result, the transportation safety profession is being challenged to try something different. The use of RSAs is a new way of doing business.

In 1996, the FHWA conducted an international scan on RSAs. The conclusion was that RSAs help to maximize the safety of roadway designs and operations and should be tested in the U.S. A workshop to promote RSAs was held in 1998, and several states participated in a pilot program to assess the benefits of RSAs. Since then, the FHWA has developed a 2-day National Highway Institute (NHI) course on RSAs and a day-and-a-half "Road Safety Audit for Locals" course.

The RSA process is a way to improve safety and communicate to the public how an agency is working towards reducing crashes.

The RSA process:

- Helps produce designs that reduce the number and severity of crashes
- Promotes awareness of safe planning, design, operational, and maintenance practices
- May reduce costs by identifying safety issues and correcting them before projects are built

- Considers human factors and all road users (pedestrian, bicycle, motorcycle, automobile, and truck)

RSAs provide the opportunity for agencies to identify and document safety issues at intersections or along a highway and to make suggestions on how to mitigate those issues. The highway authority, using the RSA process, formally responds to the suggestions of the RSA team and either implements those suggestions or documents the reasons why the suggestions cannot be implemented. This structured approach may reduce an agency's liability for tort actions for the locations where RSAs have been conducted and any follow-up actions documented.

The FHWA Office of Safety has partnered with several other FHWA offices/groups and the AASHTO TIG to champion the need for RSAs. For example, the HfL team is providing marketing expertise and funding to speed the implementation of RSAs across the country.

A key tool in getting innovations into use is a marketing plan. A marketing plan is a roadmap for delivering products or services, or in this case, a process. Having a marketing plan can aid in moving a product or service faster, more cost-effectively, and to the right people.

By definition, marketing calls for an exchange of values, such as money for products or services. In the case of innovations, the exchange of values is the highway professionals' investment of time to understand these new technologies or processes and to commit to putting them into practice. New technologies flourish when resources are invested to enhance effective program delivery.

Several State DOTs and local agencies have begun to incorporate RSAs into their existing efforts to enhance safety. In New York, the DOT has integrated RSAs within its pavement overlay program. In Iowa, RSAs are conducted on 3R (pavement rehabilitation, restoration and resurfacing) projects. In Kansas and South Dakota, RSAs are conducted on existing roads. In South Carolina, RSAs are conducted on all types of projects at various stages in the project development process and on existing roads. Collier County, Florida, has awarded contracts to consultants for their services to lead RSA teams of independent county staff. The Utah Local Technical Assistance Program (LTAP) center is helping local agencies form teams from nearby jurisdictions to conduct RSAs on local roads and intersections without needing to hire a consultant.

The FHWA believes that RSAs can have a great impact on the safety of the nation's roads and intersections. This marketing plan has been developed for a more effective approach to promoting RSAs to FHWA's customers, to help train RSA teams, and to assist FHWA in reaching its RSA program goals.

Throughout this plan, whenever FHWA is mentioned, it includes the Federal-Aid and Federal Lands functions.

CORPORATE PHILOSOPHY

The highway community as a whole, and the FHWA in particular, has been seeking out and evaluating innovative solutions to highway safety challenges. Each year, teams of engineers, planners, and other professionals scan the globe, looking for potential innovations to improve highway facilities. In 1996, a team visited Australia and New Zealand to learn about the RSA process and interview officials undertaking and overseeing RSA programs in their countries. The result of those trips was an increase in understanding of how the process could benefit the safety of the nation's highway system. A lack of innovation has not been the problem; rather, the challenge has been in getting those innovations moved from state-of-the-art to state-of-the-practice.

In 2002, the national highway fatality rate was 1.5 deaths per 100 million vehicle miles traveled. Former Secretary of Transportation Norman Mineta established a goal to reduce that number to 1.0 deaths per 100 million vehicle miles traveled by 2008. Approximately 9,000 lives would be saved each year.

In announcing his goal to reduce fatalities, Secretary Mineta made it clear that "there's not one silver bullet that will drive the fatality rate down." Major improvements in highway safety require a comprehensive and coordinated approach that addresses drivers response, vehicle design, and the roadway itself. RSAs are a comprehensive tool that can address driver behavior as well as the roadway. The Strategic Highway Safety Plans (SHSPs) or Comprehensive Highway Safety Plans (CHSPs) that are now required by law to be developed by each state are an avenue to adopt RSAs statewide and address safety in a strategic fashion.

The FHWA has the overall lead in engaging highway agencies to improve the safety of the nation's roadways, and it has identified safety as a priority among the "vital few" focus areas targeted for greater attention and resources. To achieve the Department's safety goal, the FHWA is committed to and reliant upon working with other federal, state, territory, local, and tribal governments to improve the safety of America's roadways and roadsides through a collaborative and comprehensive approach to safety.

Pennsylvania DOT has found that RSAs are a valuable, low-cost tool that enhances the safety of a project by providing unbiased early recommendations for the project based on safety and multimodal needs. We intend to make RSAs an easily and frequently used tool in the design process.

*-Girish (Gary) N. Modi, P.E.
Chief, Safety Management Division
Bureau of Highway Safety and
Transportation Engineering
Pennsylvania DOT*

RSA MISSION AND PROGRAM GOALS

As mentioned previously, the mission of the FHWA RSA program is to contribute to the overall FHWA and national goals to proactively reduce deaths and injuries on our nation's roadways while providing a long-term value-added

tool to the highway community. The FHWA is working toward the goals listed below to help reduce the U.S. fatality rate to 1.0 fatalities per 100 million vehicle miles traveled.

GOALS:

- From fiscal year (FY) 2007 to FY2012, at least one RSA will be conducted per year by each of the three Division Offices of the FHWA's Federal Lands Highway Program.
- By 2008, training courses on RSAs will have occurred in all of the Opportunity and Focus states.²
- By 2010, RSAs will be documented in all strategic highway safety plans.

By 2012, RSAs will be considered on all projects that qualify for safety funding as determined by the agency's prioritization process. Generally, a national average of 10 RSAs will be performed in each state every year.

PRODUCT ANALYSIS

We view the RSAs as a proactive low-cost approach to improve safety. The RSAs helped our engineering team develop a number of solutions incorporating measures that were not originally included in the projects. The very first audit conducted saved SCDOT thousands of dollars by correcting a design problem.

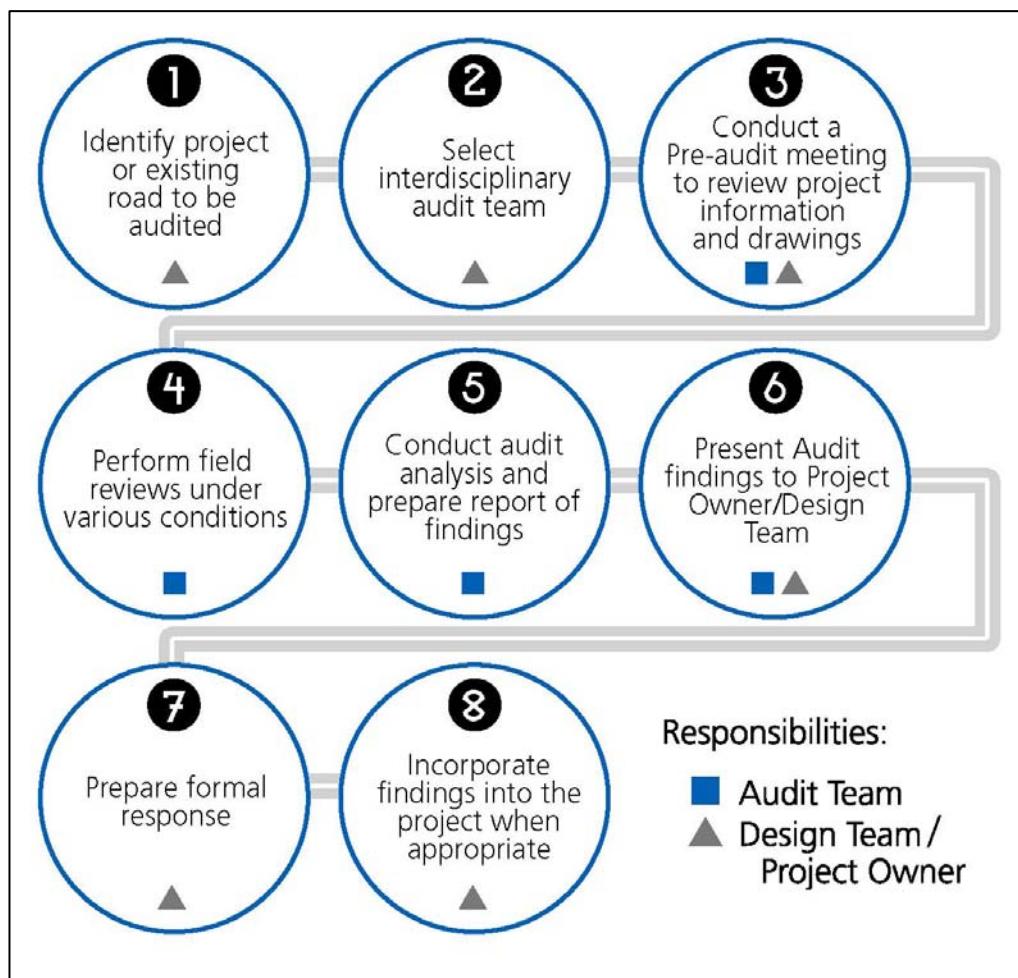
*-Terecia Wilson
Director of Safety
South Carolina Department of Transportation*

RSAs are not a technology, but rather a *process* to follow to help identify potential safety issues that can then be solved by new technology or traditional traffic safety tools, hardware, and traffic control devices. Many times, low-cost safety improvements can be used to alleviate the safety issues identified.

RSAs can be used in any phase of project development, including planning, preliminary design, detailed design, traffic control planning, construction, pre-opening, and on existing roads. RSAs also can be used on any sized project, from minor intersection and roadway retrofits to mega-projects.

Below is a diagram illustrating the steps in an RSA process. The project owner is the representative of management of the agency that initiates the RSA.

² Sixteen states, each with a fatality rate above the national average of 1.5, or with a fatality improvement trend over the past 5 years below that of the national average, were identified in 2003 as opportunities for comprehensive safety improvements and are called "Opportunity states." FHWA also identified several "Focus" states and cities, defined as those with the greatest challenges in the FHWA focus areas of roadway departure, intersection, and pedestrian fatalities. Focus states and cities have a fatality rate above the national average and/or are above a fatality number threshold for that category of crash.



An RSA team is proactive by trying to anticipate traffic conflicts and potential for crashes. RSA teams are multidisciplinary, and the people on the team vary depending on the review stage and scope of the RSA. A human factors expert sometimes is included on RSA teams, along with experts for all road users (including bicyclists, pedestrians, older road users, truckers, law enforcement, and emergency personnel). The teams are independent of the design of a new facility or the reconstruction of the existing facility. RSA teams perform several field reviews during different times of the day and a night field review to see the changes that could affect safety during periods of increased vehicular or pedestrian traffic or darkness. If available, RSA teams use existing crash data as another input to their safety examination. RSA teams sometimes use a checklist or prompt list to ensure they cover all the main areas of potential concern. A sample prompt list is included in the FHWA RSA Guidelines document.

Although concerns have been raised that the use of RSAs would increase an agency's liability, just the opposite may be true. Proactively implementing a plan

to reduce crash potential and improve the safety performance of a roadway should be used in defense against lawsuits. This is particularly true of RSAs performed in the early stages of a project. Identifying and documenting safety issues on an existing roadway is not an admission of guilt; rather, it is the first step in a process designed to improve safety. Proper documentation, communication, and logical prioritization of an agency's plan to address safety issues identified in the RSA would be difficult to fault. For more information on legal issues, see the RSA Legal Issues appendix at the end of this document and consult with an attorney.

The keys to success in implementing an RSA program are:

- Agency support and willingness to incorporate audit findings
- Small, multidisciplinary audit team consisting of three to five people (may include highway/traffic safety, traffic engineering, planning, operations, geometric design, construction, maintenance, human factors, and enforcement)
- Audit conducted at the earliest possible stage of project development
- Willingness to investigate new ideas outside the traditional scope of work

COSTS AND BENEFITS OF RSAS

Approximate direct and indirect costs and benefits of adopting RSAs are detailed below:

1. Costs for implementing the RSA, if a consultant is used:
 - \$6-10K for consultant
 - 50-60 agency staff hours
2. Costs for implementing improvements will vary depending on the nature and scope of the suggested improvements.
3. Benefits – Safety benefits of various countermeasures are known (crash reduction factors, accident modification factors) and can be converted to dollars.
4. Benefits – RSAs are a way for an agency to improve safety and communicate to the public how an agency is working towards reducing crashes.

Evaluation of RSAs in the U.S. has been very limited. Below are details from RSAs conducted in South Carolina and Michigan. Additionally, AUSTROADS (the federal road authority in

I believe that road safety audits are an excellent tool for evaluating and improving the safety of our highway system. In the projects we've done, we've seen the most benefit in doing an audit during conceptual and preliminary design, when any improvements can be incorporated into our project estimates and final design.

*-Beth Wright
District Engineer
Missouri DOT*

Australia) has found very positive benefit cost ratios on their RSAs.

The South Carolina DOT has conducted six RSAs since 2003. In one case, a Spartanburg County road audited in 2003, SC-296, saw a 23.4 percent reduction in crashes in 2004. Twenty-five of the 37 safety recommendations were adopted. All nine suggested safety improvements resulting from an RSA of SC-14 in Greenville County were implemented. This site saw a reduction of 60 percent in fatalities from 2003 to 2004, which equates to an estimated savings of \$3,660,000. The DOT acknowledges these results are preliminary, but the numbers appear very promising.

AAA Michigan conducted RSAs on 35 intersections in Detroit. Collectively, these intersections experienced a 56 percent decrease in injury collisions. The economic evaluation (in terms of societal costs) for the Detroit intersections is summarized below:

- Overall, the net present value of the Detroit improvements is \$4,792,000 (2-year life cycle) or \$33,720,000 (15-year life cycle).
- A total of 22 intersections (or 65 percent) exceeded a benefit/cost ratio (B/C) of 2:1 in 2 years.
- A total of 33 intersections (or 97 percent) exceeded a B/C of 2:1 in 15 years.
- A total of 32 intersections (or 94 percent) reported a positive net present value (benefits) over 2 years.

FUNDING FOR RSAS

Federal-Aid funds can be used to conduct RSAs as part of preliminary engineering during project development. Federal-Aid funds can also be used to implement improvements from RSAs. Highway Safety Improvement Program (HSIP) funds can be used to conduct RSAs on existing roads and intersections.

Engineering services, such as RSAs, have always been eligible as part of a Federal-aid project under the broad Title 23 definitions of construction and projects. Section 112 of Title 23 allows the state to contract for these design/engineering services. Additionally, engineering services were an eligible expense under the previous Hazardous Elimination Safety program, and they remain an eligible expense under the new core HSIP program. Considering the respective provisions outlined in the law, HSIP funds, including the set-aside programs (High Risk Rural Roads and Railway-Highway Crossings), may be used to implement eligible countermeasures suggested in RSA reports.

The FHWA South Dakota Division Office is working with the South Dakota DOT to develop a policy where some of their safety money is earmarked to fund improvements identified by an RSA. The DOT tentatively has budgeted \$250,000 for the year 2006 and \$500,000 for 2007. There is great potential for conducting more RSAs once the availability of funding for these proactive safety improvements is known.

Metropolitan Planning Organizations in New Jersey and Pennsylvania have used and are using planning funds to conduct RSAs. See the appendices for more details.

SITUATION ANALYSIS

This section describes the environment in which targeted RSA users are operating. Several different situations are summarized, including legislation, policy initiatives, and crash reporting limitations.

SAFETEA-LU was passed on August 10, 2005. There is a requirement in this law for states to report annually, as part of their HSIP, at least 5 percent of the locations on their public roads that are exhibiting the most severe safety needs. The law also requires that this report include remedies, costs, and impediments to implementing improvements at each of these locations. This requirement provides an excellent opportunity to incorporate RSAs into a state's overall safety process, since RSAs can identify comprehensive solutions to these severe safety problems beyond the traditional design approach.

RSAs also fit into FHWA's Risk Management Initiative. Risk is defined as a future phenomenon that may occur with a direct impact to a project or program's benefit or detriment. FHWA's Risk Management Initiative is about communicating transparently about resources and our risks. Through the Risk Management Initiative, the FHWA is encouraging Division Offices and state and locals partners to identify risks and mitigation strategies for their core work elements (responsibilities). An example risk event/threat statement related to safety is: If fatalities and injuries continue to occur at the current level/rate, then we will not be accomplishing our objectives, which will result in additional negative press and political pressure. RSAs are a mitigation risk response strategy.

Traffic safety is a result of the interaction of three factors: the vehicle, the driver, and the road. Crashes are very often attributed to more than just one of the causes. For example, a nighttime run-off-road collision may be attributed to both drowsy driving (human factors) and an unsigned, unmarked curve (road environment). Human factors play a part in about 95 percent of crashes, while the road environment affects about 28 percent of crashes. Clearly, the driver is the weakest link in the system, so the transportation safety profession must consider human needs in the design process. At the same time, even with collisions attributed purely to driver error or vehicle faults, a well-designed road can help to reduce the collision severity.

RSAs have been used successfully worldwide for a number of years to help agencies make systematic safety improvements to address the human and roadway factors that contribute to collisions. Globally, it is estimated that one million fatalities result from motor vehicle crashes each year. One simply cannot measure the impact an RSA program can have on communities and families. The potential for RSAs is unlimited. They can be conducted at any stage of the

project development process, or on existing roads. Suggestions that come from RSAs can be applied to the project being examined, as well as future projects to improve safety. RSAs are a mechanism to “move the numbers” to reduce roadway deaths and injuries.

For years, many public agencies have been conducting what they call “road safety reviews.” However, these road safety reviews are different from RSAs. A table showing the differences between these two processes is included in the appendices.

MARKET SUMMARY

The market for RSAs is quite broad, since virtually all roadway owners can benefit from them. Specifically, federal agencies and state, territory, county, city, and tribal governments should be interested in RSAs. Within these agencies, the segments most likely to influence the adoption of RSAs are listed below. Because of limited resources, outreach should focus on selected agencies that can leverage their resources with those of the FHWA. These “focus agencies” also are identified below. As more resources become available, the list of focus agencies may expand.

The road safety audit process is valuable from the perspective of identifying deficiencies, developing mitigative strategies, improving public relations, and enhancing Mn/DOT's credibility.

*-Bernie Arseneau
Director, Office of Traffic, Security and Operations*

Segments most likely to influence adoption of RSAs:

FHWA

FHWA Leadership Team, HQ Office of Safety, Division Administrators, Division Safety and Area Engineers, Resource Center, Federal Lands Highway Division safety Engineers, Technical Specialists, and Design Teams

Federal Land Management Agencies (FLMA)

Engineers, planners, landscape architects, cultural resource specialists, maintenance, and enforcement; USDA Forest Service, Bureau of Indian Affairs, National Park Service, U.S. Fish & Wildlife Service, Tribal councils, Tribal planning, Tribal public works, and Tribal public safety

Local Agencies & Organizations

Engineers, planners, MPO engineers/planners, public works directors, elected/appointed officials, lawyers/risk managers, Local Technical Assistance Programs/Tribal Technical Assistance Programs (LTAP/TTAP) Centers, Intertribal Association (ITA), Tribal Councils and agencies, the National Association of County Engineers (NACE), the public safety community (law enforcement, fire, emergency medical service (EMS)), the American Public

Works Association (APWA), the Association of Metropolitan Planning Organizations (AMPO) , the National Association of Regional Councils (NARC), the National League of Cities, National Association of Towns and Townships, and the Institute of Transportation Engineers (ITE).

State DOTs, Territories & Organization

Secretaries of Transportation/Chief Executive Officers, Management/chief engineers, designers, safety engineers, lawyers/risk managers, construction and maintenance personnel, Governors' highway safety offices, Public safety community (law enforcement, fire, EMS), American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE).

Focus Agencies

FHWA, AASHTO, NACE, ITE, LTAP/TTAP, IACP, APWA

MARKET ANALYSIS

On the pages that follow is a table that summarizes primary RSA customers, their needs, and products to fill those needs. As progress is made regarding the listed audiences/customers, the RSA team can address the needs of secondary customers. Every audience/customer has a desire or need to reduce fatalities and injuries; specific needs to achieve those goals are listed in the chart.

HOW TO LEVERAGE ADDITIONAL RESOURCES/ PARTNERS

The RSA message can be conveyed in a variety of contexts, including:

- Federal Land Management Agencies' Safety Management Systems
- FHWA Performance Plans
- FHWA Safety Circuit Riders Program (Local Outreach)
- Academia/Curriculum
- FHWA New Employee Orientation/FHWA's Professional Development Program
- FHWA's Intranet
- AASHTO Technology Implementation Group for RSAs
- Highway Safety Manual
- Interactive Highway Safety Design Module software

- Safety Analyst software
- Value Engineering Projects
- Context Sensitive Solutions Projects
- Environmental Impact Studies
- Transportation Safety Planning Initiative
- FHWA's peer exchange program
- Statewide SHSPs or CHSPs
- Partnerships with agencies such as AAA

Addressing Primary RSA Customers

Audience/ Customer	Needs	RSA Products/Strategies
Engineering Organization s and Associations	Train employees on RSAs, develop agreements with neighboring jurisdictions to serve on RSA teams for each other's projects, receive technical assistance, and help with their first RSA. Educate the elected officials and general public on why RSAs are important.	RSA for Locals Training Course, RSA Guidelines and Prompt list, RSA Case Studies, Technical Assistance, RSA Peer-2-Peer, RSA Benefits, RSA Success Stories, products that show how RSAs move the numbers (research study), which consultants that are trained in RSAs
Risk Managers/Attorneys	To protect their agency from lawsuits.	RSA Guidelines, RSA Case Studies, RSA Legal Information and Experience of other State/Local/Tribal Governments
Planning Organization s and Associations	Train employees on RSAs, develop agreements with neighboring jurisdictions to serve on RSA teams for each other's projects, receive technical assistance, and help with their first RSA. Educate the elected officials and general public on why RSAs are important. Commitments from implementing agencies on follow through with improvements	RSA for Locals Training Course, RSA Guidelines and Prompt list, RSA Case Studies, Technical Assistance, RSA Peer-2-Peer, local examples of RSAs, RSA Benefits, RSA Success Stories

Audience/ Customer	Needs	RSA Products/Strategies
Federal Land Management Agencies (FLMAs)	Crash data improvement, systematic safety improvements (through SMS) in parks, forest, refuges, and Indian lands, training on RSAs, agreements with neighboring jurisdictions to serve on RSA teams for each other's projects, technical assistance	To leadership: Short briefing on RSAs and their potential, success stories, demonstrating benefits. To technical staff: Promotional materials, guidelines and prompt list, training, peer-to-peer program, RSA consultant technical assistance
Tribal Governments , Intertribal Association (ITA), Tribal Councils	Tribal specific case studies, training on RSAs, assistance with their first RSA	Tribal RSA Case Studies Peer-to-peer RSA program, technical assistance, RSA training
Public Safety	Primarily focused on public safety as opposed to highway safety. They view their input limited to enforcement, emergency response and crash investigation.	Short briefing on RSAs and their potential, success stories, demonstrating benefits, RSA Training

MARKET TRENDS

There are a couple trends that may affect the implementation of RSAs. The first trend relates to emphasis on partners. The second relates to agency leadership.

In the past, the FHWA has concentrated its efforts on state DOTs and has produced products for, and in conjunction with, these DOTs. Now the FHWA is moving forward on efforts to improve facilities where a majority of fatalities are occurring: two-lane rural roads. To further these efforts, FHWA is partnering with additional groups to reach the local road agencies and tribal governments with jurisdiction over these rural roads. The FHWA also is hiring more non-engineers and providing training in diverse areas, and some of FHWA's customers are non-engineers.

The road safety audit process looks at the roadway from a purely technical safety viewpoint without outside influences. It is a valuable process that gives an unbiased view of safety issues with support from safety experts. These recommendations are helpful when working with others, such as political leaders.

*-Ricky May
District Engineer*

In addition, in many of the targeted agencies, the person responsible for transportation safety is a road superintendent, the director of street maintenance, or a transportation safety official. These individuals can have diverse backgrounds, not necessarily engineering.

With these trends in mind, RSA marketing efforts need to serve those with traditional engineering backgrounds and non-traditional backgrounds. Non-technical marketing communication tools (e.g., brochures, videos, PowerPoint presentations) should be created to communicate effectively with non-engineers. In addition, local agencies lacking transportation and/or safety professionals may need technical assistance.

CHALLENGES

Below is a summary of challenges to RSA implementation:

- Obtaining support from chief executives and upper management of federal, state, and local agencies and tribal governments
- Competing demands and resources
- Limited manpower, high turnover, staff with limited experience and no training, limited travel
- Resistance to the word “audit” because of negative feelings associated with financial audits
- Liability concerns

Even with these challenges, the FHWA remains hopeful that implementation will occur with the support of federal, state, local, and tribal leadership, as well as major associations and committees. With the increasing emphasis on saving lives, the FHWA believes that the RSA message will not only be heard, but will be heeded. Primary strategies to overcome these challenges include RSA training, technical assistance, and technology transfer. Specific products envisioned to accomplish these strategies are outlined in chapter 9.

MARKETING STRATEGY

The RSA marketing strategy is to leverage all resources that will help deliver the RSA message throughout the country. By utilizing the success of the states with active RSA programs, other states and partners will learn of the benefits that RSAs will offer their transportation programs. FHWA will seek the support of executive leadership to champion RSAs and develop and deliver materials that will help fulfill the RSA objectives. Expertise and resources from the FHWA HfL

team also will be used. Some actions that will be taken to help execute FHWA's strategy include:

- Developing marketing materials (talking points, presentations, articles, success stories, case studies)
- Involving representatives from various FHWA units (RSA Implementation Team; see chapter 9)
- Face-to-face interaction with those who are directly involved with the RSA decision-making process
- Offering executive briefings to senior management at federal, state, and local agencies and tribal governments
- Encouraging champions
- Training technical staff, including FHWA Safety and Area Engineers
- Securing participation of attorneys for RSA training courses
- Liaising with the Transportation Research Board (TRB) committee on tort management
- Producing documents to address liability concerns
- Hosting training on RSAs at partner organizations' meetings and conferences
- Offering technical assistance through the FHWA Resource Center and RSA Peer-to-Peer program
- Hosting a peer exchange workshop for mid-level managers
- Partnering with enforcement, behavioral experts, private companies, and academia
- Continuing FHWA's participation in RSA-related international community meetings and activities

The RSA Implementation Team will deliver the RSA message through several channels of communications:

- In-person briefings, including use of RSA video
- Training/executive summary for FHWA Field Management (Division Administrators/Engineers and the Directors of Field Services)
- Workshops/trainings courses (NHI RSA course and "RSA for Locals" training)
- Technical assistance with pilot RSAs (FHWA, Peer-to-Peer, consultant)
- Technical material (RSA guidelines and prompt list, software, case studies, model RSA policy)
- Online/Websites (FHWA Resource Center, NHI, Division Offices, LTAP Centers, and private partners)
- Conferences/exhibits/presentations/articles
- Promotional literature (brochures, email and direct mail, CD-ROMs)
- Networking
- Team meetings

Several key "focus agencies" have been identified within the transportation safety committee as likely partners in RSA implementation efforts. These agencies include AASHTO, as mentioned earlier, as well as the following:

- National Association of County Engineers (NACE)
- Institute of Transportation Engineers (ITE)
- Local Technical Assistance Program (LTAP) and Tribal Technical Assistance Program (TTAP) centers

- International Association of Chiefs of Police (IACP)
- American Public Works Association (APWA)

With these agencies in mind, potential conferences to target for presentations and exhibits include those of the focus agencies, as well as:

- National Association of Towns and Townships
- National League of Cities
- Regional County Engineers Association Meetings
- National Association of Counties
- Transportation Research Board
- U.S. Conference of Mayors
- Association of Metropolitan Planning Organizations
- National Association of Regional Councils
- Lifesavers
- Governors' Highway Safety Association
- Federal Land Management Agencies' annual conferences/meetings
- National Sheriffs Association
- CARE (Combined Accident Reduction Effort) state law enforcement
- American Traffic Safety Services Association

FHWA personnel need to be champions of RSAs. Champions should come from top management in FHWA and the FHWA Office of Safety. The RSA Implementation Team will work with the FHWA Leadership Team and Division Administrators to consult with the State DOT executives on RSAs.

FHWA champions should endeavor to stress, especially to road designers, that **RSAs make safe roads safer**. RSAs are not conducted to criticize designs; they are intended to identify opportunities to improve safety. For example, newspapers put out more accurate stories when they have copy editors who check facts and make sure the grammar and spelling are correct. Automobile manufacturers build better cars when they have people who inspect the finished vehicles for anything that might have been overlooked in assembly. Just like any organization focused on putting out a high-quality product, RSAs have people review what's already been done and give some positive, creative suggestions for making what's good even better.

Iowa DOT has implemented road safety audits on proposed resurfacing projects. Previously, very few safety improvements were incorporated into our resurfacing projects. We now see that our staff consistently look for and implement numerous low-cost safety improvements on Iowa's roads.

*-Thomas M. Welch, P.E.
State Transportation Safety Engineer
Iowa DOT*

As the RSA program goals are currently tied to Opportunity and Focus states, those states will be approached first. Additionally, FHWA's Office of Safety established Safety Circuit Rider Programs. Training and technical assistance will be offered to these programs to advance RSAs. As resources permit, cities and counties will be approached for interest in RSAs. (At the same time, the FHWA will respond to states or localities expressing interest in RSAs).

RSA IMPLEMENTATION PROCESS

The steps below show the process the RSA Implementation Team will follow in offering training and technical assistance to Opportunity and Focus states/cities and to other agencies/governments interested in developing an RSA program. The “RSA Program Manager” refers to the FHWA Office of Safety RSA Program Manager; the “FHWA Training Coordinator” refers to the FHWA Resource Center Lead RSA Instructor; and the “RSA Coordinator” is one of the Implementation Team members.

1. An FHWA RSA Implementation Team member is identified and approved as the RSA Coordinator for the interested state/agency.
2. The RSA Coordinator contacts the FHWA Division Safety Engineer (who coordinates with the Division Administrator) to determine who will make initial contact with the state/agency (either a Division representative or the RSA Coordinator). A meeting is scheduled to make a presentation on RSAs to the agency.
3. The RSA Coordinator and/or other Implementation Team member makes the presentation to the agency and offers additional training
4. The RSA Coordinator works through the FHWA Division Safety Engineer and/or agency to determine reactions, answer questions, or discuss barriers to RSA implementation. The RSA Coordinator then schedules training.
5. The RSA Coordinator communicates with the RSA Program Manager and FHWA Training Coordinator on the status of the RSA implementation and to get assistance answering questions or overcoming obstacles. If the state/agency requests a formal NHI course as part of their training efforts, the Agency attorney is contacted and asked to make a presentation during the training.
6. Training is conducted.
7. The RSA Coordinator contacts the FHWA Division and/or the state/agency to schedule a pilot RSAs and, if needed, schedule a Peer-to-Peer to assist with a pilot RSA or an FHWA Technical Assistance Request to help with RSA.
8. The pilot RSA is conducted.
9. The RSA Coordinator contacts the FHWA Division and/or the state/agency to find out how the pilot program went and discusses the agency’s plans for conducting more RSAs. The RSA Coordinator also discusses RSA software and offers training and demonstration of software on a future RSA.
10. If desired by the state/agency, RSA software training and demonstration is scheduled.

11. The RSA Coordinator contacts the FHWA Division and/or the state/agency to find out how the software pilot went, to discuss the potential for a formal RSA program in that agency, and to provide a sample RSA policy to show how other agencies are implementing RSAs.
12. The RSA Coordinator communicates with the RSA Program Manager and FHWA Training Coordinator on implementation status/needed assistance (this step can and should occur at any step of the process.)

FINANCIALS

The responsibility for the RSA program resides in the FHWA Office of Safety. The Office of Safety has been providing funding for the RSA program since the scanning mission to Australia and New Zealand in 1996. In FY05, the RSA program began receiving marketing support and, with the enactment of SAFETEA-LU, began receiving financial resources from the FHWA Office of Infrastructure, Highways for LIFE team.³ These financial resources support the activities listed in chapter 9.

CONTROLS

The FHWA Office of Safety's RSA Program Manager maintains a status spreadsheet on RSA implementation. This is updated from Implementation Team members' inputs and occasional contact with the FHWA Safety Engineers in the Division Offices. Training evaluations are collected and compiled by the FHWA Resource Center and the National Highway Institute. An annual evaluation of the marketing strategy and achievement towards RSA program goals will be conducted.

IMPLEMENTATION

The implementation of this marketing plan will be two-pronged. The RSA Implementation Team (and FHWA Resource Center) will be working directly with the aforementioned primary customers to help them pilot and eventually institutionalize RSAs into their safety programs through presentations, training, technical assistance, and conducting RSAs. Concurrently, the FHWA Office of Safety is developing tools to assist the team and customers in facilitating the adoption of RSAs.

³ The FHWA HfL team is assisting the FHWA Office of Safety with marketing expertise and funding to speed the implementation of RSAs across the country. The purpose of HfL is to advance longer-lasting highway infrastructure using innovations to accomplish the fast construction of efficient and safe highways and bridges. "Innovations" is used by HfL to encompass technologies, materials, tools, equipment, procedures, specifications, methodologies, processes ,or practices used in the financing, design, or construction of highways.

FIRST YEAR RSA TEAM ACTIVITIES:

	Start Date	Completion Date
RSA Team Coordinator (will also evaluate marketing strategies)		
Implementation Team Meeting and Software Training		
Promotion of RSAs and Delivery of RSA for Locals Training and Travel for Locals to Training		
Printing New NHI Course Materials		
Branding for RSAs (A Look and a Hook)		
Printing of RSA Guidelines and Checklist		
Local Marketing/Repackaging Assistance (Arizona Specific RSA Brochure)		
Sponsorship of Local Conferences on RSAs or RSA Topics on Local Conference Programs		
Continue Funding RSA Peer-to-Peer Program		
RSA Consultant Technical Assistance (For Agencies new to RSAs)		
RSA Software Modifications and Training		

FY07 (DEPENDENT ON APPROVAL OF SPENDING PLAN REQUEST ITEMS):

Project	Funding
Implementation Team Meeting	
RSA Program Support	
RSA Promotion and Training Delivery	

RSA Train-the-Trainer for Division Safety and Area Engineers and Fed Lands	
RSA Training for FHWA Field Management (DAs and DFSs)	
Co-Sponsor AASHTO TIG RSA Peer Exchange	
RSA Case Studies Evaluation	
RSA Communications Support	
Duplication of RSA Video	
New RSA Video	
Printing RSA Guidelines and Case Studies Documents	
RSA Peer-to-Peer Program	
RSA Software Develop Users Manual, Testing, Demonstration, and Modifications	
RSA LTAP/TTAP Programs	
Updating NHI RSA Course	
Offering 1 free RSA per State	
Demonstrating Pedestrian RSA Guidelines and Prompt Lists	

Below is a list of the types of tools that the FHWA Office of Safety has or is developing:

- RSA Peer-to-Peer Program (established in 2005)
- RSA Video (published August 2006)
- RSA Guidelines (published December 2006)
- RSA Prompt Lists (published January 2006)
- RSA Software
- RSA Technical Assistance
- RSA Outreach
- Internal FHWA Weekly Report Items (Once a month)
- Articles in FHWA publications, industry magazines and newsletters

- Obtaining reprints of articles for distribution
- Developing/Tailoring/Delivering RSA presentations
- Developing talking points on RSAs
- Developing and Staffing RSA Exhibits
- Brochures for overall program, Peer-to-Peer program (published 2006), risk managers/attorneys, local outreach
- Business cards
- RSA Website
- Maintaining RSA contacts database
- RSA Video focusing on RSA results
- RSA NHI Training (Developed 2002)
- RSA Training for Locals (Developed 2005)
- RSA Training Scheduling and Coordination
- RSA Peer Exchanges (First one scheduled for May 22-23, 2007)
- RSA Case Studies
- RSA Benefits Information and Evaluation
- RSA LTAP/TTAP Programs
- Pedestrian RSA Guidelines and Prompt Lists
- Intersection RSA Guidelines and Prompt Lists
- Road Departure RSA Guidelines and Prompt Lists
- Work Zone RSA Guidelines and Prompt Lists
- Low Cost Safety Improvement RSA Implementations
- RSA Marketing Plan Implementation Evaluation

The RSA Implementation Team meets yearly to discuss the RSA program. The team will assist in communicating the availability of these tools to RSA customers and in determining whether these customers have additional RSA needs. These needs may result in the development of additional tools or activities.

MARKETING ORGANIZATION

FHWA'S RSA Implementation Team

- RSA Program Manager, Office of Safety
- Craig Allred, Resource Center
- Mike Castellano, Pennsylvania Division
- Chimai Ngo, Federal Lands Highway
- Monica Gourdine, Federal Lands Highway
- Byron Lord, Highways for LIFE
- Kathleen Bergeron, Highways for LIFE
- Timothy Barkley, Office of Safety

- Keith Sinclair, Resource Center
- Jeff Shaw, Resource Center
- Keith Harrison, Resource Center
- Karen Yunk, New Jersey Division
- Jessica Rich, Tennessee Division
- Marcee Allen, Colorado Division
- Karla Petty, HQ Office of Safety/Arizona Division
- Don Neuman, HQ Office of Safety/Missouri Division
- Rudy Umbs, HQ Office of Safety
- Jacinda Russell, Eastern Federal Lands
- John Balser, HQ Office of Safety
- Additionally, Human factors expertise has been made available from the FHWA Safety R&D Human Centered Systems Team.

APPENDICES

- I. Traditional Road Safety Reviews vs. RSAs
- II. Opportunity and Focus States
- III. RSA Experience
- IV. RSA Legal Issues
- V. RSA Technical Resources

APPENDIX I

TRADITIONAL ROAD SAFETY REVIEWS VS. RSAS

What is the difference between RSA and Traditional Safety Review?

Road Safety Audit	Traditional Safety Review
Performed by a team independent of the project	The safety review team is usually not completely independent of the design team
Performed by a multi-disciplinary team	Typically performed by a team with only design and/or safety expertise
Considers all potential road users	Often concentrates on motorized traffic
Accounting for road user capabilities and limitations is an essential element of an RSA	Safety reviews do not normally consider human factor issues
Always generates a formal RSA report	Often does not generate a formal report
A formal response report is an essential element of an RSA	Often does not generate a formal response report

APPENDIX II

OPPORTUNITY AND FOCUS STATES

The 16 Opportunity states are:

Arizona

California

Florida

Pennsylvania

Ohio

Tennessee

Kentucky

Illinois

Missouri

Alabama

Texas

North Carolina

South Carolina

Louisiana

Mississippi

Wisconsin

THE FOCUS STATES AND CITIES ARE:

State/City	Roadway Departure Focus State	Intersection Focus State	Pedestrian Focus City and/or State
Alabama	X	X	
Arizona and Phoenix, AZ	X	X	X
Arkansas	X		
California and Los Angeles	X		X
Colorado	X		
Florida	X	X	X
Georgia		X	X
Hawaii			X
Indiana		X	
Illinois and Chicago, IL			X
Kentucky	X		
Louisiana	X	X	
Michigan and Detroit, MI		X	X
Minnesota		X	
Mississippi	X		
Missouri	X	X	
Montana	X		
Nebraska	X		
Nevada	X		
New Jersey			X
New Mexico	X		
New York and New York City			X

State/City	Roadway Departure Focus State	Intersection Focus State	Pedestrian Focus City and/or State
North Carolina	X	X	X
Ohio	X		
Oklahoma	X		
Pennsylvania	X		X
South Carolina	X	X	
Tennessee	X	X	
Texas	X	X	X
Utah	X		
Washington	X		
West Virginia	X		
Wisconsin		X	
Wyoming	X		

APPENDIX III

RSA EXPERIENCE

ILLINOIS DOT



The Illinois DOT has completed two RSAs after receiving training from the FHWA. At the close of each RSA, a PowerPoint presentation with corresponding images for each finding was given to the local planning/design staff. Also invited were the area maintenance engineer and local roads engineer. Though not a direct focus of the RSA process, the RSA team believed it worthwhile to share what were described as immediate, low-cost needs that had been observed. This included pointing out the location of a missing stop sign, a high mast to light a ramp that had three of four bulbs burnt

believed it worthwhile to share what were described as immediate, low-cost needs that had been observed. This included pointing out the location of a missing stop sign, a high mast to light a ramp that had three of four bulbs burnt

out, tree limbs obscuring signs, damaged guardrail, and signs placed illegally on state right-of-way that hindered sight lines. Overall, the RSA process promises to open the eyes of all involved in transportation to the realities of their choices regarding risk.

HOWARD COUNTY, MARYLAND

Howard County has utilized RSAs on six different occasions; all entailed existing roadways with persistent collision histories that did not seem to respond to traditional solutions. The fundamental issue discovered in the six RSAs was the lack of institutional memory. Highways built over a long period of time (15 years or more) were found to have differing design speeds between the older and newer sections. In the most recent study, residential streets built over 45 years were found to have been built to different standards when compared to current criteria. The RSA process clarified the steps needed to improve safety in these locations.

MINNESOTA DOT

A Minnesota District office has used RSAs primarily to review existing locations with severe and challenging safety issues. The RSA process has benefited the District in various ways:

- Bringing in the RSA team builds department credibility by demonstrating that the District is still trying to find a solution to a challenging problem and is willing to go the distance to bring in an outside expert team.
- The RSA team brings in a new perspective and may introduce new ideas that had not been previously considered.
- The RSA report and recommendations can provide the impetus (or tie-breaking vote) for the District to take action it was not previously considering, or to take action that the District has already considered, but for various reasons (engineering and political) may have been hesitant or unwilling to implement.
- The RSA report and suggestions can also substantiate and support an unpopular position the District may have already taken on an issue and possible solutions.

SOUTH JERSEY TRANSPORTATION PLANNING ORGANIZATION

RSAs have been very well received by local jurisdictions in the South Jersey Transportation Planning Organization (SJTPO) area and have identified numerous safety concerns and improvement proposals that otherwise would not have come to light. Several projects identified in these RSAs will shortly move to construction. SJTPO is now in the third year of their program.

Because SJTPO did not have the resources to develop and operate a region-wide, comprehensive safety management system, they began

conducting RSAs for locations of concern. The selection of roads to be audited is done in a rigorous fashion that combines crash data analysis with local experience. Since the recommended improvements emerge from a systematic process that selects the roads to be audited, the FHWA New Jersey Division Office accepts the recommendations as eligible for federal funding.

Both qualitative and quantitative criteria are used in selecting the sites for road safety audits. The SJTPO requests local experts, including engineers, planners, and enforcement officers, to nominate roadway segments that could be improved with quick and inexpensive measures. The nominated road segments initially are selected based on the following qualitative factors:

- Geographic compactness of corridor (road segments should be compact – 2 or 3 continuous miles)
- Degree of local control (there should be local control over the site with few state highway intersections within the selected segment)
- Degree of agency cooperation (cooperation among agencies and governments is important to the success of the project)
- Potential for safety improvement

Road segments that best meet the qualitative criteria are then screened quantitatively using crash, fatality, and injury data from the New Jersey DOT for the years 2001, 2002, 2003, and the first half of 2004. Database tools are used to identify the crashes for each candidate road segment, including cross streets. The number of crashes is converted to a rate per miles of travel to allow a data-driven ranking of candidate segments. The highest ranked segments are then compared to the averages for each of the four counties to identify RSA candidates with high promise for safety improvement.

The SJTPO retains consultants to audit the selected roadways. Audits consist of three phases: data collection and evaluation, field review, and preparation of the report and findings. The audit process is thorough, and each phase must address predefined requirements. The final report summarizes the findings of the inspection and describes recommended improvements.

Generally, an RSA is conducted each year for a roadway segment within each of SJTPO's four counties. Project development work also is commissioned for high-priority improvements identified from previous audits. Depending on the types and costs of recommended improvements, projects can be either programmed for federal authorization in the following fiscal year or handled by the sponsoring agency with their own funds. Many improvements, such as sign replacement, striping, and clear zone maintenance, can be prioritized within existing maintenance budgets, whereas large-scale, complex improvements, such as intersection reconstruction or the addition of turn lanes, must be assigned to a regional project pool for prioritization and eventual implementation.

In 2004, FHWA's New Jersey Division and the New Jersey DOT agreed to reserve \$1 million annually for each of New Jersey's three MPOs for transportation system capital improvements. The SJTPO reserves up to \$100,000 of planning funds each year to conduct RSAs of local roadway segments or intersections following the selection process outlined above. They also program up to \$50,000 per year for consultant assistance in developing construction plans and permitting information, obtaining survey data, and developing other materials necessary to obtain Federal authorization. This assistance enables county and municipal project sponsors to accelerate project delivery, which is in keeping with the goal of quickly implementing low-cost safety improvements. Also, as a Transportation Management Area, SJTPO has access to a suballocation of Surface Transportation Program funds.

FHWA and the Roadway Safety Foundation recently selected SJTPO for a National Roadway Safety Award, and to date, over \$1.5 million in safety projects are complete or under construction on local roadways in the SJTPO area as a result of the Road Safety Audit Program.

COLLIER COUNTY, FLORIDA

Collier County decided to start an RSA program because of their high population of vacationers, seasonal residents, and older road users. They believe it is absolutely imperative that, as transportation professionals, they constantly review and improve the safety of their roadway systems. Collier County Transportation Services took part in the FHWA RSA case study program. The FHWA RSA Case Studies document will include the RSA conducted on the



Immokalee Road corridor. The County hosted an RSA workshop in cooperation with FHWA to help introduce the RSA program for use in Southwest Florida. Collier County Transportation Services will be performing RSAs on the existing Golden Gate Parkway and Collier Boulevard intersection and the 60 percent design plans for the Collier Boulevard four-lane to six-lane capacity

improvement project. Collier County believes if they can save one life in an intersection or improve safety through design revisions, the time and cost invested in the RSA will be well justified. They hope that performing RSAs and improving their corridor safety will demonstrate their commitment to the public and their dedication to set a new standard in safety.

IOWA DOT

Iowa DOT is conducting RSAs as part of their 3R program. A big benefit they have gained from conducting RSA is creating the awareness of staff of the benefits of low-cost safety improvements. A few years ago, Iowa DOT went from the central office planning and designing these projects to the Districts doing the work. At the beginning, the District staff was reluctant to making safety improvements with 3R projects, but after participating in a training course and

experiencing some RSAs, the Districts are recommending improvements to the Iowa DOT Central Office of Safety. The Districts have really bought into RSAs. Iowa DOT's Central Office of Safety believes that incorporating low-cost safety improvements into 3R projects will result in a much higher benefit/cost ratio as compared to spending larger amounts of safety funds at isolated intersections.

Another benefit to RSAs is that it helps Iowa DOT keep their institutional knowledge. They have had three early retirement packages and are losing their more experienced people. Including newer engineering staff with experienced engineering staff on RSA teams helps bridge the gaps and becomes a very educational experience.

If hadn't been for RSAs, Iowa would have missed a great opportunity to implement the rumble "stripe" countermeasure. Iowa DOT was conducting a RSA in a DOT District in Iowa and reviewed a narrow two-lane roadway that was programmed for resurfacing. The road had a pretty high rate of roadway departure injuries and fatalities. The District planned to pave the entire road top and stripe 12-ft lanes, which would have left them with little or no shoulder. An RSA team member informed them of the research that shows that the safety of a roadway is degraded when the speeds go up after resurfacing and recommended they consider the rumble stripe concept. Iowa DOT ended up going with that approach, placing 11-ft lanes and having 2 ½ ft of paved shoulder with the edgeline in the rumble strip. This was completed in June 2005.

CLARK COUNTY, WASHINGTON

Clark County participated in the FHWA RSA Case Studies project. The project selected for the RSA was improvements to Ward Road, a two-lane rural roadway, initially motivated by safety concerns resulting from high-severity off-road collisions. Subsequently, the County's Growth Management Act (1995) resulted in anticipated changes to the road network and hierarchy in the vicinity of the planned improvements, which resulted in the introduction of additional elements to the upgrades. The road improvements were the subject of considerable public interest and input, which had also influenced the design.

The planned improvements affected three roads: Ward Road (also known as 182nd Avenue), 172nd Avenue, and 119th Street. In addition to functioning as major rural collectors, these roads provided access to adjacent properties (residential and farm) and a small farming town.

At the time of the RSA, the improvements were in the County's current Transportation Improvement Program, and were in the final design stage. Overall construction costs were estimated at about \$9 million, including land acquisition costs.

Discussions with County staff indicated that, although improvements to Ward Road were initially proposed primarily to address high-severity off-road collisions, additional issues arose during the lengthy public consultation process concerning the level of traffic considered by different community groups to be

suitable on the improved roads. To reconcile the competing desires of these groups, and to provide a forum for the groups to contribute beyond the public consultation stage to the actual design, a Community Design Team (CDT) was established that included representatives of the adjacent communities.

The design that was adopted to meet the requirements of the CDT appeared to have expanded beyond the initial safety-related aim of reducing collisions, to include two additional (and potentially competing) aims of controlling traffic speeds by increasing the number of controlled intersections through which traffic would pass, and achieving a redistribution of traffic that the CDT deemed equitable. Although the County's efforts to include the public in the design process were in many ways laudable, the resulting reconfiguration of intersections and introduction of new traffic control devices was expected to compromise traffic safety by introducing additional conflict points. The RSA team felt it necessary to point out that that net result of directing formerly free-flowing traffic through controlled intersections was expected to be decreased severity, but increased frequency, of collisions compared with existing conditions. As a result of the RSA, County engineering staff started a re-examination of major elements of the project, which they expected would lead to a safer project at considerably less expense.

APPENDIX IV

RSA LEGAL ISSUES⁴

Some state and local agencies have been hesitant to conduct RSAs due to a fear that RSA reports will be used against them in tort liability lawsuits. Tort liability at the state and local level is a matter that is decided in accordance with state law and jurisprudence (court decisions).

A survey of state DOTs was conducted as part of NCHRP Synthesis project #336, Road Safety Audits. The survey asked questions about states' sovereign immunity. Sovereign immunity is the doctrine that government agencies are immune to lawsuits unless they give their consent to the lawsuit. A summary of the information in the synthesis follows.

There appeared to be no specific trend in applying RSAs (to new projects or to existing roads) and whether or not the state had sovereign immunity. Two states implementing RSAs indicated full immunity, and three indicated partial immunity. For states that use RSAs (in the design stage or on existing roads but not both), two indicated full immunity, four had partial immunity, and four had no immunity.

⁴ The information provided here is not legal advice, but is meant to assist public agencies in discussions with their attorneys on developing a policy for the implementation of RSAs.

The same survey also received this response related to liability: "Liability is one of the major driving factors in performing a good audit; it demonstrates a proactive approach to identifying and mitigating safety concerns. When findings cannot be implemented an exception report is developed to address liability and mitigating measures. Our attorneys say that once safety issues are identified, and we have financial limitations on how much and how fast we can correct the issues, then the audit will help us in defense of liability."

In the case of Kansas DOT, the RSA program was implemented to be proactive in identifying and fixing safety issues. The results of RSAs are for internal staff use only and are not available to the public or to lawyers representing claims against the state. There have been instances where these records were requested by outside legal counsel and to date, the information has remained at KDOT. The only instance where a RSA report was released was in a case where the state was being sued but the claim did not ask for any money. (Public disclosure laws require release of this information in many states. However, some states do not allow information gathered under public disclosure laws to be used in lawsuits.)

The Iowa DOT has had no instances of RSA records being requested or used in court by outside legal counsel. In both cases above, these states have successfully implemented RSA programs, which significantly improve the safety along public agency roads and assist in decision-making agency wide.

Federal law affords evidentiary and discovery protections that assist state and local highway agencies in keeping data and reports compiled or collected pursuant to various federal safety improvement programs from being used in tort liability actions. However, federal law does not protect data and reports from Freedom of Information Act requests.

The Highway Safety Act of 1973 was enacted to improve the safety of our nation's highways by encouraging closer federal and state cooperation with respect to road safety improvement projects. The Act included several categorical programs to assist states in identifying highways in need of improvements and in funding these improvements, including 23 U.S.C. § 152 (Hazard Elimination Program, "Section 152").ⁱ States objected to the absence of any confidentiality with respect to their compliance measures under Section 152, fearing that any information collected could be used as an effort-free tool in litigation against governments.

23 U.S.C. § 409 ("Section 409") was enacted to address this concern. This law expressly forbids the discovery or admission into evidence of reports, data, or other information compiled or collected for activities required pursuant to several federal highway safety programs [including Sections 130, and 152 (now 148)] or for the purpose of developing any highway safety construction improvement project, in tort litigation arising from occurrences at the locations addressed in such documents or data.ⁱⁱ In 2003, the U.S. Supreme Court upheld the Constitutionality of Section 409, indicating that it "protects all reports, surveys, schedules, lists, or data actually compiled or collected for § 152

purposes" (emphasis on original).ⁱⁱⁱ Some states consider information covered by Section 409 as an exemption to its public disclosure laws, but courts may not agree with this interpretation.^{iv}

Another approach could be to use RSA reports in tort liability suits to show the courts that the state or local agency is proactively trying to improve safety. Many litigants and their lawyers will hire an expert witness to conduct their own safety review of the location in question. The RSA report can be used to refute or counter the expert witness's report and to show the public agency's efforts at improving safety in that location. It is important to have a response to the RSA report in the file to show how the agency plans to incorporate the suggestions or why the RSA report suggestions will not be implemented.

Notes:

- I. Under the Surface Transportation Act of 1978, these categorical programs were merged into the Rail Highway Crossing program (23 U.S.C. 130) and the Hazard Elimination Program (23 U.S.C. 152). To be eligible for funds under Section 152, a state or local government must "conduct and systematically maintain an engineering survey of all public roads to identify hazardous locations, sections, and elements, including roadside obstacles and unmarked or poorly marked roads, which may constitute a danger to motorists, bicyclists, and pedestrians, assign priorities for the correction of such locations, sections, and elements, and establish and implement a schedule of projects for their improvement." The recently enacted section 1401 of SAFETEA-LU (Pub. L. 109-59, August 10, 2005) establishes a new Highway Safety Improvement Program in 23 U.S.C. § 148, which incorporates the elements of section 152 and which will be the source of funding for the activities eligible under that section. As a result of this provision of SAFETEA-LU, 23 U.S.C. § 409, cited in the next footnote, now references section 148, not section 152. Because activities eligible under section 152 will be funded under section 148, they will continue to be protected pursuant to section 409.
- II. Section 409 in its entirety states "Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data."
- III. Pierce County, Washington v. Guillen, 537 U.S. 129 (2003).
- IV. The New York Supreme Court recently held that 409 protects only from requests in litigation and, thus, does not create a public records exemption in New York. See Newsday v. State DOT, Supreme Court Appellate Division, Third Judicial Department (July 1, 2004).

APPENDIX V

RSA TECHNICAL RESOURCES

There are a number of technical resources developed or under development for use by practitioners wishing to learn more about RSAs. These resources are discussed briefly below. For more detailed information, please contact John Dewar in FHWA's Office of Safety Programs at John.Dewar2@dot.gov.

RSA Guidelines and Prompt Lists

The primary purpose of these guidelines is to provide a foundation for public agencies and tribal governments to draw upon when developing their own RSA policies and procedures and when conducting RSAs within their jurisdiction. These guidelines were developed by building upon experiences gained in the United States and in other countries. They are meant to present basic RSA principles, to encourage public agencies to implement road safety audits, and to embrace them as part of their everyday practice.

These guidelines are intended to provide information on road safety audits to policy makers, RSA teams, designers, planners, operations and safety analysts, project managers and clients and the general public. They are intended to promote awareness of road safety audits in terms of: societal benefits; principles, procedures, roles and responsibilities; qualifications of the audit teams; project cost and schedule implications; guidelines for selecting projects to audit; and tools, methods and resources available.

The guidelines are divided into three main sections. Part A provides general information on RSAs, information on how to implement an RSA program, and an overview of the RSA process. Part B describes the stages of an RSA and different types of audits, including preliminary design, detailed design, construction, pre-opening, and audits of existing roads. Part C describes RSA tools, namely prompt lists, and when and how to use them. Following the body of the guidelines, appendices that discuss approaches to road safety and the evolution of RSAs are provided. Several case studies are also provided, and a bibliography is included.

High-level and detailed prompt lists have been developed and may be used by RSA teams and designers. RSA prompt lists, even the most detailed ones, should be viewed as a prompt only. They are not a substitute for knowledge and experience; rather, they are an aid in the application of knowledge and experience. The RSA prompt lists are not all-inclusive, nor will they cover all potential issues and circumstances. Prompt lists can be downloaded from the FHWA Website at: <http://safety.fhwa.dot.gov/rsa/index.htm>.

RSA Software

A software tool for assisting the completion of RSAs has also been developed. The software facilitates team members in the collection of information as they proceed through the RSA process. It gives users access to comprehensive prompt lists and reduces the potential for users to simply “check” issues off a list. The prompt lists are comprehensive, helping users to identify issues that may be overlooked in the RSA process. They are presented in levels that users can drill into to get broad or detailed level prompts. With the software, users can link identified issues to user-defined locations in the study area and they can also provide accompanying comments with each issue. It also allows users to record suggestions for improvements that may be identified. Finally,

output from the RSA software group's findings, by issue, and exports the results to a Word compatible file that allows for quick completion of a formal RSA report.

RSA Case Studies

To demonstrate the effectiveness of RSAs, in December 2003 the FHWA Office of Safety sponsored an RSA of the Marquette Interchange in Milwaukee, Wisconsin. The RSA team reviewed the detailed design for an \$800 million interchange reconstruction project. Subsequently, in the summer of 2004, the FHWA Office of Safety commissioned a series of nine additional RSAs. Between 2004 and 2006, RSAs were conducted with the following agencies: Illinois DOT, Oklahoma DOT, Oregon DOT, Wisconsin DOT, Standing Rock Sioux Tribe, City of Cincinnati, City of Tucson, Clark County (WA), Collier County (FL), and the National Park Service. The aim of these case studies was to demonstrate the usefulness and effectiveness of RSAs for a variety of projects, project stages, and in a variety of agencies throughout the United States.

Each case study includes photographs, a project description, a summary of key findings, and the lessons learned. The aim of this document is to provide state and local agencies and tribal governments with examples and advice that can assist them in implementing RSAs in their own jurisdictions.

RSA for Locals Training Course

The Road Safety Audits for Local Governments workshop is designed to introduce road safety audits as an effective tool that can help to reduce injuries and fatalities on local road networks. The workshop will help local road agency professionals understand basic road safety audit concepts, risk and safety, and common issues.

Agencies interested in scheduling a training course should contact Eloisa Raynault at Eloisa.Raynault@dot.gov or phone: 202-366-3499.

RSA Training

NHI RSA Course

COURSE NUMBER: FHWA-NHI-380069

Course Title: Road Safety Audits and Road Safety Audit Reviews

Length: 2 Days CEU: 1.2 Units

FEE: \$270 Per Participant

CLASS SIZE: Minimum: 20; Maximum: 30

Description: Performing effective road safety audits (RSAs) and road safety audit reviews (RSARs) improves safety and demonstrates to the public an agency's dedication to accident reduction. This course provides practical information on how to conduct a road safety audit. Participants learn how to improve transportation safety by applying a new proactive approach to RSAs and RSARs. This approach includes

examination of a future or existing roadway by an independent, qualified audit team.

The course includes hands-on application of the training materials, which include information on the history and definition of RSAs, the importance of safety, the stages of a road safety audit, how to conduct a road safety audit, easy-to-use-checklists, and legal considerations. A copy of "Road Safety Audits and Road Safety Audit Reviews Reference Manual" is provided.

Outcomes: Upon completion of the course, participants will be able to:

- Express the road safety audit process terminology
- Perform a simple road safety audit, as a member of a team
- Assess the benefits of a road safety audit on a statewide basis

Target Audience: Federal, State, and local transportation personnel who are likely to serve on a road safety audit team. Consultants who conduct highway safety studies should also attend.

Course Scheduling: NHI Training Team (703) 235-0534

RSA PEER-TO-PEER PROGRAM

Technical or procedural questions often arise before and during an RSA. To provide assistance to agencies considering or actively conducting RSAs, FHWA's Office of Safety has established a Peer-to-Peer (P2P) program. The RSA P2P program is provided at no cost to state, local and tribal transportation agencies, and it is easy to access the support of a knowledgeable peer.

An agency can request assistance either by email or by calling the toll-free number describing their needs to the FHWA-sponsored P2P coordinator. The coordinator will match the agency with a transportation professional that is experienced and knowledgeable in RSAs, including expertise with particular issues or types of RSAs.

The matched peer will then contact the agency to work out the details of the assistance to be provided within the program framework, which can include a site visit as needed.

To contact the Road Safety Audit Peer-to-Peer Program, call (866) P2P-FHWA or email: SafetyP2P@fhwa.dot.gov.

U.S. Department of Transportation
Federal Highway Administration
Highways for LIFE
1200 New Jersey Ave, SE
Washington, DC 20590
www.fhwa.dot.gov/hfl
Phone 202.366.5508
Kathleen.Bergeron@dot.gov



U.S. Department of Transportation
Federal Highway Administration

Marketing Plan

Making Work Zones Work Better

HIGHWAYS FOR LIFE

Accelerating Innovation for the American Driving Experience.



March 2007



U.S. Department of Transportation
Federal Highway Administration

Marketing Plan Making Work Zones Work Better

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Marketing Plan Making Work Zones Work Better

INTRODUCTION

A review of historical documents reveals a steady progression in the construction tools used to build roadways in the United States. Early road machinery pulled by horses and oxen evolved to motorized equipment, and then to state-of-the-art equipment featuring lasers and global positioning systems (GPS). But what sometimes goes unnoticed in analyzing photos of those early efforts is what's *not* there—designated work zones. Those early workers are shown simply doing their jobs with little regard for traffic. Of course, a significant amount of road construction at that time was new construction, on sites not opened to traffic. When work was performed on an existing road, apparently traffic demands were so low that carving out a portion of the roadway for workers was not necessary.

By the time the Interstate System was in full swing, things had changed. *America's Highways*, a coffee table style book published in 1976 by the Federal Highway Administration (FHWA), describes how highways evolved in this country. The book notes that, from 1964 to 1974:

As highway facilities became more and more congested and more people with their respective vehicles were fighting for this precious space on the streets and highways, the public began to resent the highway worker with his equipment taking up space on the public right-of-way, even if it had to be maintained. The cry was, "Can't you find some other time to do that; you can't block the road at this time of day." So a new emphasis was placed on road maintenance....Since 1971, the Federal Highway Administration, when requested, has assisted State organizations interested in discussing the basic components of a maintenance management program.

Today, of course, "space on streets and highways" has become even more precious. Considering that the number of new facilities being constructed each year is limited and the number of vehicle-miles traveled is rising, more and more highway construction is occurring under traffic conditions. Today, work zone-induced delay and congestion already represents 10 percent of the total nationwide delay and congestion, and approximately 1,020 highway workers and the driving public lose their lives each year in work zones.

That impact is increasing. Highway construction projects are getting larger, more complex, and costs often enter the billions of dollars. Their importance to the public is such that elected officials are keenly aware that the success or failure of a transportation project or program can have a major impact on their administrations. Surveys bear this out:

- The 2001 report, "Moving Ahead," which presents the findings of three public satisfaction surveys, showed that the driving public equates highway construction with congestion. The report notes, "There has been a large increase

(20 percentage points average) in dissatisfaction with all elements of traffic flow on major highways during the past five years. In 2000, 43 percent of respondents expressed dissatisfaction with traffic flow, compared to 23 percent in 1995. This may explain some of the 6 percentage point increase in dissatisfaction with highways. *Thirty-two percent of respondents expressed dissatisfaction with work zones, the second highest indicator of dissatisfaction among attributes of major highways.*

- The 2005 version of the annual "Drive for Life" survey conducted by Mason-Dixon Polling and Research, Inc., showed that traffic delays were second only to other drivers' behavior in the rankings of what aggravates drivers most.

The time is ripe for a dramatic change in how work zones are created and managed. On September 9, 2004, the FHWA published the Work Zone Safety and Mobility Rule. This new rule updates and renames the former regulation on "Traffic Safety in Highway and Street Work Zones" in 23 CFR 630 Subpart J. All state and local governments that receive Federal-aid highway funding are required to comply with the updated provisions no later than October 12, 2007.

Along with its sponsorship of the rule, FHWA determined to offer significant assistance to states in conforming to the rule's requirements, and the agency's Office of Operations determined to develop a multi-faceted program to that end. This would include communications, one-on-one assistance, and scanning tours and demonstrations of successful applications.

Meanwhile, the Highways for LIFE (HfL) program was established to find ways of getting innovations and new highway technologies put into practice faster, thereby dramatically improving the American driving experience. These innovations might be ways of building highways faster, smoother, safer, or of better quality so that there would be less frequent repair crews disrupting traffic. Every highway construction project has to deal with the traffic management issue, so the goals of the Office of Operation and HfL with regard to making work zones work better obviously had common ground.

HfL determined that one way of accelerating the rate that members of the highway community embraced new technology might be through improving the process used in what is referred to as "technology transfer." In the late 1990s, FHWA underwent an organizational restructuring. One piece of the restructuring was the dissolving of the existing organizational unit which had the corporate responsibility for technology delivery. Funds previously used by that entity were distributed to the individual program offices (Infrastructure, Safety, Operations, etc.), and these program offices were charged with managing their own efforts of deployment.

The HfL team therefore made a proposition to the heads of the three program offices: If they would select an innovation or technology that they believed their office urgently needed to get implemented nationally, the HfL program would support it

with funding, marketing expertise, and by championing it to the leadership of the agency, as well as the highway community as a whole. The following were the selected innovations:

- Office of Infrastructure: Prefabricated Bridge Elements and Systems (PBES)
- Office of Safety: Road Safety Audits (RSA)
- Office of Operations: Making Work Zones Work Better (herein referred to as MWZWB)

Each of the Offices agreed to assemble a team of individuals with expertise in the particular area of innovation, and these were to include people from all areas of the organization—headquarters, resource center, and divisions. Where possible, the Federal Lands Highways division would be included as well.

The teams were encouraged to meet with the HfL team offsite for a day-long discussion of what Highways for LIFE was all about, what sort of goals they were being asked to strive for, and to develop a preliminary approach to attaining those goals.

The intent of the MWZWB plan is two-pronged. It will assist state departments of transportation (DOT) in implementing strategies, ideas, and technologies designed to improve safety, reduce congestion and construction times, as well as in achieving compliance with the Work Zone Safety and Mobility rule. The MWZWB program will reach these goals through three primary efforts:

1. Work zone peer-to-peer (P2P) program
2. Focused technical workshops
3. Project assessment assistance

CORPORATE PHILOSOPHIES

As noted in the introduction, the HfL program and the MWZWB program developed by the Office of Operations have closely aligned goals. It is important to recognize the MWZWB program first and foremost as a philosophy to mitigate the impact of work zones upon all facets of the general public (travelers, nearby residents, and adjacent businesses), rather than simply a collection of techniques, strategies, or technologies. The focus of the MWZWB program is upon reducing impacts by reducing:

- The number of work zones that are required
- The exposure of travelers and workers to work zones that have to occur
- Safety and mobility impacts to those remaining travelers and workers who encounter and endure work zone conditions when present

Both the highway community as a whole and the FHWA in particular have been diligent in seeking out and finding innovative solutions to highway challenges. Each

year, teams of engineers, planners, and other professionals scan the globe, looking for potential innovations for highway facilities. The Office of Operations has accumulated a large database of strategies, techniques, and technologies that address one or more of these three focus areas. In 2000, FHWA published the *Work Zone Operations Best Practices Guidebook*, which lists specific examples of things that can be done to mitigate work zone impacts on the public. Obviously, the list of these innovations is significant, and it continues to grow. Whereas the initial list of practices numbered slightly over 100 ideas, the FHWA website now outlines well over 150 such innovations (see ops.fhwa.dot.gov/wz/practices/best/search_results.asp). A summary of the categories of strategies, techniques, and technologies that fall under the MWZWB philosophy in this guidebook are listed below.

- Agency work zone quality improvement strategies
 - Awards and contests
 - Committees, workshops, tours, committees
 - Organizational approaches
 - Toolkits, checklists, strategy lists, surveys
- Analysis efforts
 - Cost analyses
 - Lane closure analyses (queue length, delay)
 - Traffic analyses
 - Value engineering
- Community involvement
 - Community impact mitigation strategies
 - Public relations initiatives
 - Stakeholder forums and discussions
 - Task forces
- Constructability reviews to reduce construction time, minimize traffic disruptions
- Construction methods to speed progress, minimize impacts to drivers/public
- Education and outreach efforts
 - Driver education
 - Public outreach/information campaigns
 - Staff/contractor education and training
- Enforcement
- Equipment
- Evaluation
- Incident management
- Innovative contracting
 - Adjusting contract start times or duration
 - Different contract types
 - Lane rental
 - Performance warranties
- Coordinating multiple projects
 - Corridor management
 - Multiple project coordination
- Public relations
- Research efforts underway
- Traffic management technologies

- Traffic management/control planning and application
 - Applications
 - Transit improvements
 - Comprehensive transportation management plan implementation
 - Checklist, strategies, misc. guidance
 - Roles and responsibility definitions
- Traveler information
 - Periodic public information
 - Real-time traveler info systems
- Work zone lane management
 - Design for lane closures
 - Lane closure restrictions
 - Managing lane closures
 - Total roadway closures (to reduce total contract time)
- Work zone speed management
- Worker safety
 - Intrusion alarms
 - Positive protection devices
 - Use of robotics

The Office of Operations has also been supporting the MWZWB philosophy with the organization and conduct of workshops nationwide. Since 2002, 27 such workshops have been held in 24 different states. Each workshop consists of a series of short presentations on topics identified by the state and local agencies as interesting and important to them. The agencies designing the workshop choose from one or more presentations listed under the following main topic areas:

- Intelligent Transportation Systems (ITS) and Mitigation Techniques
- Work Zone Information Systems
- Innovative Technology
- Integrating Operations
- Reduce Demand
- Innovative Contracting

In addition, the FHWA is supporting work zone related research and activities in the areas of traffic management, worker safety, user safety, signage, mobility/delay, performance analysis, user costs, ITS, public relations/outreach, exposure to work zones, reduction/duration, time conscious methods, corridor plans, incident response efforts, and utility work. Consequently, the list of strategies, techniques, and technologies that fall under the MWZWB philosophy umbrella continues to grow, along with attendant support and guidance materials.

The FHWA has the overall lead in improving the safety and mobility of the nation's roadway infrastructure. The agency has identified three "vital few" focus areas that have been targeted for greater attention and resources: safety, environmental stewardship, and congestion mitigation. Two of these three goals tie directly to MWZWB. One of the objectives of the vital few congestion goals is to reduce work

zone delay by ensuring that all states are engaged in aggressively anticipating and mitigating congestion induced by highway work zones, and the safety goal is to reduce the national highway fatality rate from 1.5 to 1.0 deaths per 100 million vehicle miles traveled. The efforts of the MWZWB program will make a difference in achieving these goals.

SITUATION ANALYSIS

Two efforts have been initiated recently, in an effort to address the increase in the number of work zones and the level of work zone congestion.

The first is the Work Zone Safety and Mobility Rule published by FHWA on September 9, 2004. This rule updates and renames the former regulation on "Traffic Safety in Highway and Street Work Zones" in 23 CFR 630 Subpart J. All state and local governments that receive Federal-aid highway funding are required to comply with the provisions of the rule no later than October 12, 2007. A copy of the rule is included as Appendix A.

For states to be in substantial compliance with the new rule, they are required to:

- Develop an over-arching work zone policy
- Define and identify significant projects
- Develop traffic management plans for significant projects, which will include temporary traffic control plans, traffic operations, and public information components
- Collect and analyze congestion and safety data, and
- Perform work zone process reviews

While guidance has been developed and support is being provided to help state highway agencies comply with the rule, many agencies will likely need assistance in implementing some provisions of the rule.

A second development is the Highways for LIFE program, created by the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). HfL was created to address the problem of a national highway system that is well beyond its design life. Bringing the system up to an appropriate level of quality using current construction methods would require an enormous capital investment. And even if such a sum were available, the congestion such a massive construction program would cause, again in terms of current methods, could cripple mobility. The HfL approach says that, just as innovations in such industries as consumer electronics and automobiles have resulted in lower cost, better quality, and higher value, one should be able to apply the concept of innovation implementation in the highway construction field—including managing highway construction projects to minimize congestion. This program is designed to rapidly implement innovative ideas that build projects faster, better, and safer into state DOT day-to-day practice. Key elements of the HfL program include the following:

- Improving current approaches to technology transfer
- Developing partnerships with industry
- Funding of pilot projects with each state DOT
- Communicating the innovations and approaches to the highway community, as well as to highway users

An important aspect of the HfL approach is the need to focus on the highway user. As identified in the previous section, improved community involvement and public relations efforts are important innovations within the MWZWB initiative as well. Establishing and maintaining good communications with all affected audiences before and during construction and maintenance activities has long been acknowledged as highly effective in helping to mitigate the impacts of these activities on the public.

It is important to understand that coming up with innovations has never been the problem; the challenge has been the process of integrating innovations into day-to-day practice in a reasonable amount of time. Regrettably, the process often takes decades. This is unacceptable and accomplishes next to nothing toward the improvement of the users' driving experience.

Feedback received from state DOTs during a national review on "Meeting the Customer's Needs for Mobility and Safety During Construction and Maintenance Operations" indicated the following when it comes to technology transfer:

- They expect the FHWA to keep them advised of successes and failures from around the country
- The amount of information and number of periodicals and reports is overwhelming
- They want and need the FHWA to assist them in identifying new ideas, best practices, and technologies that will help them solve their problems and improve their operations
- Once these new ideas, best practices, and technologies have been identified, they look to the FHWA to assist in implementation
- They stressed the need to recognize that "one size does not fit all"
- They felt that for technology transfer to be successful, the FHWA's efforts must be adapted to an individual agency's needs
- They were very supportive of the FHWA's past efforts of sponsoring regional workshops, peer reviews, and scanning trips
- Many states are very strict on out-of-state travel, and the FHWA's assistance is seen as a necessity for technology sharing to be successful

Based on this feedback, and with input from selected FHWA work zone practitioners¹, the following elements are being advanced as key components for making work zones work better:

- Work Zone Peer-to-Peer Programs
- Focused Technical Assistance Workshops
- Project Assessment Assistance

These components, which will be described in more detail in the following section, will allow the FHWA to assist state DOTs in becoming more proactive and effective in adopting more effective ways and technologies in making work zones work better.

Presently, the ability of FHWA (and the state and local agencies themselves) to estimate how well work zones are “working” is limited to data being obtained through a *Work Zone Self-Assessment* process that the Office of Operations initiated in 2003. The self-assessment has occurred annually since then, with the results through the 2006 assessment available from the FHWA Office of Operations website (ops.fhwa.dot.gov/wz/decision_support/self-assess.htm). The goals of the self-assessment process are:

- Raise an agency’s level of awareness of practices and strategies used in mitigating work zone congestion and crashes
- Facilitate communication and sharing of best practices among transportation professionals
- Identify gaps in existing efforts to mitigate work zone-related congestion and crashes
- Provide an opportunity to benchmark progress
- Provide information to FHWA helpful in measuring the effectiveness of the National Work Zone Program and also for shaping that program

The self-assessment focuses attention on six main emphasis areas where high-leverage opportunities exist to minimize work zone impacts upon the public:

- Leadership and Policy
- Project Planning and Programming
- Project Design
- Project Construction and Operation
- Communications and Education
- Program Evaluation

¹ February 22, 2006, MWZWB/HfL meeting at Turner-Fairbank Highway Research Center, with following participants: Ken Opiela, Deborah Curtis, Chris Newman, Guan Xu, Daniel Grate, Joe Geigle, Mike Davies, Martha Kapitanov, Gus Shanine, Tracy Scriba, Kathleen Bergeron, Chung Eng.

Under each emphasis area, the Office of Operations staff has identified a series of questions to assess specific topics or activities that agencies could be doing to minimize work zone impacts. A total of 46 such questions were ultimately identified, examples of which include the following:

- (*Under the area of Project Design*) – During project design, does the agency perform constructability reviews that include project strategies that are intended to reduce congestion and traveler delays during construction and maintenance activities for type I & II projects?
- (*Under the area of Project Construction and Operation*) – In bidding type I & II projects (those with higher potential impact on the public), does the agency include road user costs in establishing incentives or disincentives to minimize road user delay due to work zones (e.g., I/D, A+B, Lane Rental, etc.)?

A full list of the questions under each emphasis area is presented in Appendix B. For each question posed, the state was asked to rate its own degree of adoption of that topic. A qualitative rating scale was used, as shown in Table 1. The scoring range allowed in each adoption phase allows the agency to assess whether it is currently giving minimal, moderate, or extensive effort to this topic.

Table 1. Work Zone Self-Assessment Scoring Criteria.

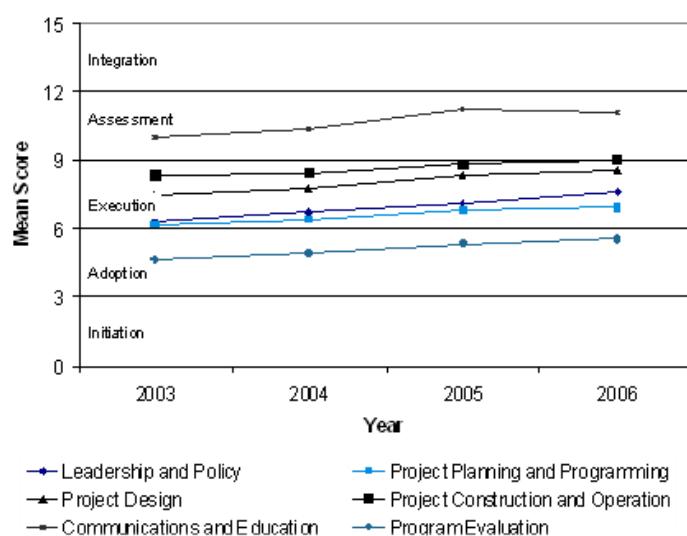
Adoption Phase	Scoring Range	Description
Initiation	(0-3)	Agency has acknowledged a need for this item and supports further development of the requirements of this item
Development	(4-6)	Agency has developed a plan or approach to address requirements of this item
Execution	(7-9)	Agency has executed an approach to meet requirements of this item
Assessment	(10-12)	Agency has assessed the performance of this item
Integration	(13-15)	Agency has integrated the requirements of this item into agency culture and practices

Figure 1 illustrates the mean scores for topic questions in each of the six emphasis areas over the 4-year history of the self assessment. Overall, the data indicate gradual increases in adoption of the topics measured in the assessment. On average, state agencies are in the execution phase of adoption in most of the emphasis areas. Program evaluation is lagging slightly, whereas communications and education efforts are believed to have evolved to the assessment phase.

Tabular scorings of the 46 individual topic questions over this same time period are provided in Appendix B.

Overall, the self-assessment is a good first step in measuring state highway agency efforts to mitigate the impacts of work zones upon the public. The data suggest that agencies are recognizing the need and implementing processes and techniques for improving work zone safety and mobility in all phases of agency operations and the project development process. Although data from individual states are not made available publicly (and are not likely to be made so in the foreseeable future), it is possible for agencies to critique themselves against these overall trends and identify additional opportunities for improvement.

Figure 1. Yearly Mean Scores by Emphasis Area.



At a national level, the information from the self-assessment scores is encouraging. Of course, these are only averages based on state DOT perceptions (quite possibly only the perceptions of one or two individuals in those agencies) of their own performance. Undoubtedly, the quality and quantity of information available will improve as states begin a more regular program of process reviews, as required by the new work zone safety and mobility rule. However, in the interim, the information provided via these assessment, coupled with other available congestion and safety data, has allowed the Office of Operations to identify an initial list of states to "target" with this initiative. The selected states possess three distinct characteristics:

- Total average self-assessment scores below 8.0, indicating that they have significant opportunity to improve their level of execution of innovations to mitigate the impacts of work zones upon the motoring public
- One or more metropolitan areas within the 100 most congested cities nationally, implying that efforts to mitigate the mobility impacts at work zones in these areas are likely to result in significant benefits to roadway users

- Work zone fatalities and rates that imply a potential to mitigate safety impacts within work zones statewide

Table 2 lists a dozen states to be targeted initially and the statistics supporting the emphasis to be placed on those states. The initial six (New Mexico, Kentucky, Arizona, Alabama, Louisiana, and Pennsylvania) have the lower average self-assessment scores that imply greater opportunities for improvement. The second six (Massachusetts, Georgia, Arkansas, North Carolina, Missouri, and Nevada) have self-assessment scores that suggest they are in the early execution phase of practicing the MWZWB philosophy.

Table 2. Performance Statistics for Initial Target States.

Target States	Average Self-Assessment Score (2006)	Million-Vehicle-Miles Traveled Statewide per Work Zone Fatality (2005)	Rankings in the Top 100 of Congested Cities Nationally (2003)
State "A"	4.5	2993	X
	4.7	4302	X
	6.1	2606	X
	6.2	1514	X
	6.5	2478	X
	6.8	3727	X
State "G"	6.7	13693	X
	7.1	3413	X
	7.1	1439	X
	7.3	2592	X
	7.4	3833	X
	7.6	1759	X

Certainly, it will be possible for additional states to obtain the assistance being offered under the initiatives of this program. However, the targeted states are where initial outreach efforts will be focused. As additional information from state DOT process reviews begins to be developed, it is expected that additional "opportunity states" will be identified.

PRODUCT ANALYSIS

The intent of the MWZWB plan is two-pronged. It is designed to help state DOTs better understand the potential impacts from work zones, meet their needs as they identify ways to improve their work zone management programs, and implement innovations to best mitigate the impacts of these work zones upon the public. It is also intended to assist the DOTs in achieving compliance with the regulations and spirit of the Work Zone Safety and Mobility rule.

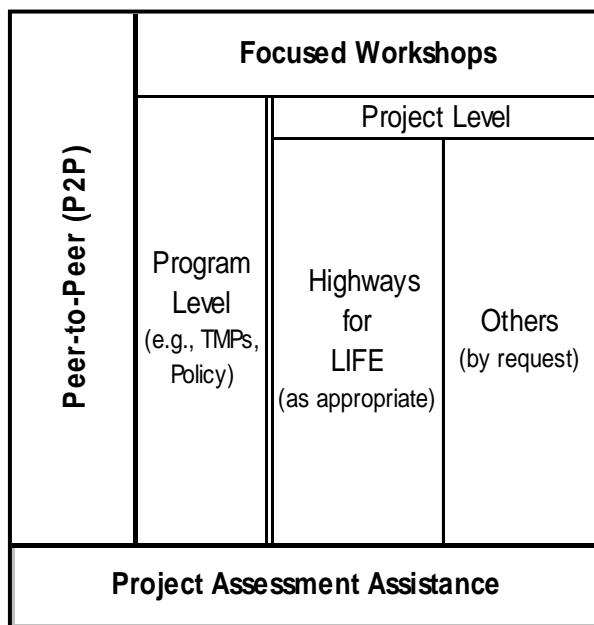
The unique aspect of this particular program is that market research is continuous. The MWZWB program will need to continue monitoring and identifying additional needs of the state DOTs and take action to develop solutions to fill those needs. As soon as one need is filled, more than likely, another will surface. This is where the dynamic ability of this program will shine. In essence, the P2P and focused workshop components themselves are marketing components, as their function is to provide information necessary for users to adopt new and improved procedures and technologies.

In promoting better, more effective work zones, one has to realize that there are not one or two innovations which, if employed, could serve as a panacea for all work zone challenges. As noted earlier in this plan, there are dozens of approaches and products that, when used appropriately, can make the vital difference. These can range from highly sophisticated electronic equipment used to notify drivers of real time vital road conditions, to simple modifications in construction processes or phasing of activities. Efforts to date by the Office of Operations suggest that the overall concept of making work zones work better is fairly well understood among practitioners. The publication of the Work Zone Safety and Mobility final rule has further raised the awareness of this issue. Consequently, the need is not one of marketing the overall concept, but on assisting state DOT and local personnel in their efforts to understand how the myriad processes, strategies, techniques, and technologies can be best pared down to the one or few which will provide, for a given set of local conditions, the best return on the investment in time and money..

The fact that there are so many options that could be used to make “work zones work better” is perhaps itself a significant obstacle to accomplishing the ultimate goal of adopting innovation as the normal way of doing business. Wholesale adoption of all strategies at all work zones, for example, would be tremendous overkill and likely lead to a very inefficient use of financial resources. Not all work zones require the same type or degree of treatment in order to address the critical components that drive the congestion and safety impacts that occur. However, knowing which processes/strategies/techniques/ technologies and combinations thereof are best-suited to a set of work zone conditions (and understanding the various interdependencies between strategies and those conditions) requires expertise that may be beyond the skills of the decision-making personnel of many agencies. Furthermore, even if the knowledge exists, formal processes are not in place to address work zone issues at the appropriate points in the project delivery sequence, and process owners are not identified.

Figure 2 shows the overall layout of the MWZWB marketing initiative. The P2P component will be deployed first, followed by the focused workshops and the project assessment assistance. Ongoing feedback will be used to further refine each of the component areas and the interactions between them. Details on each facet of the program are described below.

Figure 2. Organization of the MWZWB Marketing Initiative.



PEER-TO-PEER PROGRAM

The first phase of the MWZWB program will be to implement the P2P component. This activity will be an informal and easy-to-use tool that will serve customers' needs through several communications channels. The approach will be modeled after the ITS P2P program. By tapping into the programmatic and technical expertise of transportation professionals across the country, the approach will save state DOTs time and expense in implementing new innovations.

While the P2P program will be available to assist the state DOTs with all of their work zone questions, the primary function of the program is to aid the states in implementing innovative work zone strategies and technologies that will help improve the public's driving experience and help the state DOTs comply with the Work Zone Safety and Mobility rule.

The availability of the P2P program will be marketed via the posting of details on the Work Zone Management website within the FHWA Office of Operations website, and through targeted e-mail communications from the Office of Operations to the FHWA division offices. Information about the program will also appear in boilerplate copy included in news releases about the program. There is also an opportunity to

use the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Operations and its Technology Implementation Group (TIG) to promote these efforts. A program brochure and business card will be developed to help facilitate program outreach and marketing.

Having a knowledgeable and well-respected group of experts available to provide technical assistance covering a wide variety of work zone related topics is the keystone of the P2P program. This group of experts will be able to assist the customer (their fellow work zone specialists) through e-mail, telephone, and as necessary, face-to-face support. Moreover, they will be accessible to review material and participate on scanning tours. The vision is that state DOTs will be able to use the panel of experts to review their documents at the policy, process, and project levels. Examples could be the particular state's Work Zone Safety and Mobility Policy or the specifications for an ITS work zone.

While the primary function of the P2P program is to provide human resources to solve identified problems, other elements may be incorporated into the program as needed. For example, both scanning tours and open houses are valuable ways to gather or disseminate information. Based on need determined from requests, the work zone self-assessments, or other pertinent information, these two approaches may be applicable to the MWZWB effort.

A scanning tour would allow a select group of individuals to visit states that have integrated innovative practices into their program. Typically, the group takes the knowledge they obtained from the tour and drafts a report to disseminate the information to interested parties. It may be ideal for representatives from states that are not as advanced to participate in the tours. Information gathered first-hand often is more valuable and likely to be used than information read in a report.

Another valuable opportunity available through the P2P program is the hosting of open houses. Open houses are events that are focused around projects that are being constructed using the set of particular technologies/strategies appropriate for the unique project circumstances. For example, if one state is using ITS in a work zone, it becomes an opportunity to bring engineers from other states to see the process as it develops. They get a chance to discuss aspects of the project with the project engineer as the work is being done. This may be an ideal fit for those interested in the work zone aspects of HfL projects.

FOCUSED WORKSHOPS

The primary difference between the P2P program and the focused workshops is that the P2P program is to be available to individuals who proactively request assistance, whereas the intent of the focused workshops is to approach and provide assistance to states identified by the FHWA. While a focused workshop may be requested via the P2P program, the workshops will most likely be offered to states identified as having specific needs to either substantially comply with the Work Zone Safety and Mobility rule or to improve their work zone self-assessment scores.

As seen in Figure 2 above, the focused workshops are geared to offer assistance at both the program level and the project level. Project-level workshops are further subdivided into two categories, HfL projects and other projects. These workshops are not intended to be training courses. In the previous MWZWB workshops, the information presented was fairly broad, and it did not translate easily from abstract examples of past applications to the needs and potential uses by the workshop attendees. Consequently, these focused workshops are intended to allow a state DOT to tap into the expertise of multiple experts to allow collaboration and critiquing of alternatives for especially complex and challenging work zone projects and agency processes to be accomplished from various expert perspectives (something that will generally not be possible through the peer-to-peer program). Upon conclusion of the workshop, it is expected that either a solution to a problem has been identified and accepted by the state or formal recommendations have been left with the state DOT with the understanding that the state would take action on the recommendations.

In the short term, emphasis will be placed on the targeted states listed in Table 2. Input from the FHWA division offices will be an integral part of an initial program assessment to help identify the topic areas to focus upon. The division office and the target state, as appropriate, will assist in prioritizing the areas that would provide the most benefit. Also, the division office will be able to inform the MWZWB coordinators whether their partner state DOT would be receptive to one or more focused workshops. In the long term, other states may solicit assistance in conducting a workshop based on their own program assessments, FHWA division office encouragement, or other data.

The program-level workshops will likely be the most frequent type of workshops held initially. As stated above, these tailored workshops will be offered to states identified by the self-assessment scores and division offices. These workshops will be tailored to aid states in policy and process development, particularly in regards to meeting the requirements of the new work zone rule.

The other workshops would be tailored towards specific projects. Where appropriate, HfL projects will be reviewed for an opportunity to provide a workshop that would assist the state DOT in implementing an innovative feature into their work zone. Non-HfL projects would most likely be identified for a tailored workshop either through the FHWA division office or through a P2P request. The successful model of Accelerated Construction Technology Transfer (ACTT) workshops could be employed.

PROJECT ASSESSMENT ASSISTANCE

The third component to the MWZWB program to be marketed under this plan targets the improvement in the understanding and use of tools and guidance for conducting work zone impact analyses. Such analyses are necessary to help identify significant projects, guide the selection of mitigation strategies for these projects, and provide data for the process reviews that state DOTs will be required to conduct under the Work Zone Safety and Mobility Rule. The FHWA Office of Operations has

published general guidance on performing work zone impact assessments. However, this guidance is fairly high-level in nature, and it does not provide the detailed guidance that some practitioners may need to help them:

- Select appropriate analysis tools for their particular situation or phase of project development (one tool may be appropriate during planning while another is more appropriate during final traffic control plan development, for example)
- Select appropriate default values or assumed values when input data for a particular tool is not available
- Determine how to utilize the tool properly to evaluate the type of work zone situation (and alternatives) being proposed
- Evaluate the results of the analyses generated by the tools

Consequently, the Office of Operations will initiate an effort to develop a primer, guidance on selecting work zone traffic analysis tools, and guidelines on applying these tools to perform work zone impact analysis. It is envisioned that this guidance will be consistent with guidance currently in the traffic analysis toolbox (see ops.fhwa.dot.gov/trafficanalystools/toolbox.htm) and will ultimately be made a part of this toolbox.

Once this guidance is developed, further assistance in this area may be provided under either the P2P program or through the focused workshops. A focused workshop at the program level, for example, might examine which of the available tools would be most beneficial for the state to adopt and develop internal expertise in using. Meanwhile, a workshop at the project level might emphasize the use of a particular tool in the analysis of specific project alternatives.

ADDITIONAL MWZWB RESOURCES

In addition to the P2P, focused workshops, and project assessment assistance, supporting resources also play a role in the MWZWB program. These materials may include brochures, websites, guidance documents, Best Practices Guidebook, traffic analysis tools, and case studies. As the program matures and further market research data become available, other resources may be developed under this program. The Office of Operations will continue to support the development and dissemination of success stories and such under this program on its MWZWB website (see ops.fhwa.dot.gov/wz/about/wz_story.htm). Links to these stories and information will then be easily accessible to those interested. This information will also be available (via active links) to visitors to the National Work Zone Safety Information Clearinghouse (workzonesafety.org).

ADDITIONAL HfL RESOURCES

To provide the best return-on-investment to the HfL program, it is recommended that an integrated communications approach be developed to extend across the MWZWB, PBES, and RSA initiatives. It could act as a unifying strategy to instigate change, raise awareness, and measure results for the program as a whole, as well

as for the three component initiatives. This campaign should be two-pronged, deploying a series of templated news releases on developments under the three programs. Links should be made to the MWZWB website where resources on improving work zones are already available. News releases to publicize an innovation being introduced on a project, a life saved because of an innovation in place, a quick turnaround on a project, savings realized on a project, etc. should be coordinated and housed. News releases could follow a “Swiss cheese” format, with all relevant program messaging in place; only the details of the specific triggering event would need to be added. The news releases related to MWZWB efforts could provide a link to the MWZWB website where reporters and other audiences could learn more about work zone safety issues.

FOLLOW UP

To ensure that each of the MWZWB elements is operating effectively, a monitoring and follow-up plan will be established. The key objectives will be to 1) ensure that the DOT's needs were met and that progress has been made in improving the work zone program, and 2) using the user's feedback to develop ways to improve the overall system. Follow-up should occur no more than 3 months from the time that a resource was provided.

GOALS/MEASURES OF EFFECTIVENESS

There are several ways to measure the general effectiveness of the MWZWB effort:

- Number of P2P requests made
 - Requested supports supplied via phone/email
 - Requested supports supplied via face-to-face
 - Number of requests able to support
- Number of scanning tours held
- Number of workshop requests made
- Number of workshop requests able to support
- Number of workshops initiated by the MWZWB coordinators
- Number of project assessment assistance requests handled
- MWZWB website use statistics, media hits
- Success stories
- Estimate of the road user costs, delays, etc. mitigated through the adoption of the MWZWB philosophy on a particular project or within a particular state DOT
- Number of state DOTs that have put into practice formalized processes to consider and incorporate work zone innovations on projects where appropriate.

However, while it is important to measure the use of the tools within this program, it is imperative to keep in mind that “use” does not always equal “progress.” The resources provided must result in a change in philosophy or produce an actual product (i.e., the adoption of a policy or the integration of an innovative technology into their program).

CUSTOMER-CLIENT ANALYSIS/TARGET MARKETS

The market for MWZWB is fairly extensive, since all road construction projects have work zones. MWZWB will have a positive effect on the roadway owners and roadway users.

While not the primary target of this new program, FHWA division offices will be the initial targets of the marketing. As their primary role will be leaders and disseminators of the program, it is essential for them to be aware of and understand the program as early as possible. Division offices have much closer ties to their corresponding DOT than do the Office of Operations or the HfL Office, and so generally have more credibility with them. In addition, division office personnel are closer to the specific issues and constraints facing their respective DOTs and should be in a better position to identify potential areas to target. The challenge in addressing this specific target market is that they tend to think more as a DOT (operationally) and do not automatically accept and embrace efforts that are promoted from FHWA headquarters. In addition, it is important to realize that, in most cases, it is the division personnel who decide whether a DOT is complying with any rules or regulations handed down from headquarters. If division staff are not on board with a concept or requirement, their likelihood of pushing it forward within the DOT obviously is going to be lower.

With the program being designed to assist in compliance with the new work zone rule and adoption of innovation through the HfL program, the primary target of the marketing will be state highway agencies. The primary message to the DOTs will be, "Leap, Not Creep" in proactively improving work zone safety and congestion. Within the DOTs, the initial marketing efforts clearly need to begin at the chief engineer or Deputy Secretary for Highway Operations level. Below that level, there exist at least two sub-target markets to be addressed. The first of these are the personnel who make up the various central division offices (traffic, construction, design, etc.). These individuals typically are tasked with identifying and helping to draft policy and guidelines that govern agency operations, but they are not involved in day-to-day decisions regarding innovation application to a specific project or set of projects. The overall consequences of policy and guidance recommendations upon such things as project costs, tort liability, and similar concerns do weigh on their decisions, however. Central division and administration personnel within a DOT likely will have general awareness of the MWZWB concepts, but their grasp of all of the nuances and specific innovations that can fall underneath this concept may be limited.

The other major sub-target market within DOTs is the field personnel who operate from district or regional offices. The degree of autonomy with which these districts operate varies substantially from state to state. These individuals generally are responsible for individual project development, as well as the conduct of the work once a contract is initiated. These individuals are very well versed in the specific challenges and problems encountered in the field across the range of projects to which they have been exposed. However, their breadth of experience and awareness of potential innovations may lag behind slightly (often because of day-to-

day pressures of keeping a particular project on task and budget). Personnel positioned at this level in the DOT are also highly cost conscious and typically have budget needs in excess of funds allocated to their group for projects. Furthermore, although societal costs associated with work zone projects (delays, increased crash risk, etc.) are acknowledged as important, they do not impact the district's budget the way that expenditures for innovations to mitigate those impacts do. As a result, it is important to this group for innovations to provide significant benefits that far outweigh the costs of implementation, and that the risk of failure to provide such benefits by an innovation is fairly low. As DOTs continue to downsize and increase workloads on those who remain, the ability of district personnel to have time to develop enough expertise and understanding to facilitate innovation implementation on their projects continues to diminish. The end result of these pressures is towards the maintenance of the status quo, or towards the adoption of only those innovations which have low potential risk and consequences of "failure." That is exactly why this MWZWB program needs to begin at the executive level—at the end of the day, the degree to which it will be implemented is a policy-level decision.

Considering that many DOTs rely on the consultant industry to design their traffic management plans, a secondary target will be consultants. Thus, in addition to identified industry-specific marketing channels, it will be essential for the division offices and DOTs to reach out to this segment of the target audience. It is important to recognize that this audience generally is directed fairly closely by DOT district staff. District personnel hire and fire consultants through the bid-reward process as well. Whereas there may be a desire on the part of the consultant to include and promote innovation during the design or plan specification and estimation [PS&E] process, this group generally will defer to their sponsor when challenged about a decision to include such innovation. Fortunately, this group is also fairly well insulated from any public backlash for any innovations that do not turn out as intended.

Local transportation agencies also will benefit from the P2P program; however, the resources needed to assess their individual needs adequately and provide appropriate assistance currently are not available. Therefore, the first phase of marketing may not specifically target this audience.

Finally, it may be necessary to include the highway contractor community at some point in this process. Part of the reason is that innovations that improve worker safety have traditionally been viewed as the responsibility of the contractor rather than the DOT or local agency owning the roadway. The other part of the reason is that highway contractors typically do have the opportunity to suggest changes to the plans and processes originally proposed by the DOT (and may be less risk averse in doing so), so long as the cost of the project is not affected adversely. The contractor is likely to suggest changes that improve worker safety and worker mobility to and through the work zone. Since congestion in the vicinity of work operations constrains material deliveries and other facets of construction, it may indeed be possible for innovations to benefit both the public and the contractor in some instances.

Additionally, those outside the highway community play a critical role in the success of this program. The foremost reason for involving the public is that the laws, regulations, and traditions of our society demand involvement of the public in governmental affairs. Also, of course, it is public funds that support the entire program. In fact, the demands of an informed and knowledgeable public may be the ultimate driver to a successful MWZMB program.

STRATEGIC PLAN TO DELIVER AND DEPLOY MWZWB

The P2P phase of the MWZWB program is on the verge of implementation. Through advance funding provided for this component, a task order has already been executed, and recruitment of work zone peers to support the program is well underway. The P2P program is expected to be ready for launch by spring 2007. A P2P brochure and business card are being developed to help with program outreach and marketing. Division offices will be engaged to help ensure that their DOT partners are familiar and comfortable with the resources available through the P2P program. Another opportunity will be to present the MWZWB information at the FHWA Operations/ITS annual meeting.

While the focused workshops are not as close to implementation as the P2P program, the intent is to conduct two pilot workshops and up to four additional workshops during fiscal year 2007. The workshops will draw from the pool of experts created for the P2P program. Contact will be made with division offices in the identified initial target states to begin discussions and to further assess needs and identify potential focus areas based on these needs. The state will be involved as determined appropriate by the division. Once the need for a focused workshop has been confirmed and its focus identified, formal planning for the workshop will begin. Experience from these initial workshops will be used to shape the longer term aspects of providing focused workshops. During this initial phase, only the targeted states and their respective divisions will be made aware of the focused workshops. As the focused workshops become more established, their availability will broaden and appropriate marketing will occur. A statement of work is being developed to support the provision of focused workshops.

The initial and key component of the project assessment assistance effort will be the development and distribution of the primer and guidance on work zone traffic analysis tools. This will be supplemented by technical assistance provide through the P2P and focused workshop components as appropriate. A statement of work has been drafted for the development of the primer and guidance.

Supporting resources will be developed and made available based upon needs identified through the P2P, focused workshops, self-assessments, and other interactions with the DOTs.

CHALLENGES

As elements of the program are developed, marketed, and implemented, it is important to keep in mind several key challenges that this program will have to

overcome. With the passing of SAFETEA-LU came several new programs and requirements for states to implement. To compete with the demand and requirements of these new programs, the MWZWB effort must be able to show the DOTs “what’s in it for them.”

Limited manpower, high turnover, and limited travel are other challenges that need to be considered. These challenges will play a significant role in identifying experts to support the MWZWB program. It may be that some states do not have the manpower to spare an expert to travel to another state at the request of the P2P or focused workshop. It will be crucial to identify which experts will be allowed travel when provided adequate advance warning.

In addition to limited manpower, in recent years, both the FHWA and the DOTs have been asked to do more with smaller budgets. Therefore, it is critical to ensure that any funds spent in an effort to improve work zone safety and mobility be at a high benefit-to-cost ratio.

Another obstacle to overcome is the perception that high tech and innovative equates to added work and higher costs. In fact, often the opposite is true. Technology and innovation lead to more efficient processes and better, longer lasting products. A good example is the computer industry; computers today are cheaper than they have ever been yet are multiple times faster and are capable of doing many more functions than their predecessors.

SCHEDULING OF ACTIVITIES

To implement this plan efficiently, it may be advantageous to use a project manager program to keep track of dates, activities, and responsibilities. The following is an example of activities that need to be completed in order to put the program into operation:

- Completion of preliminary marketing plan – February 2007
- Establish base of experts and champions willing to participate
- Work zone team workshop to revalidate approach – February/March 2007
- Completion of marketing plan – early spring 2007
- Launch P2P – spring 2007
- Create release template and media schedule – late spring 2007
- Develop P2P brochure and business card – February 2007
- Begin website redesign – late spring 2007
- First news releases sent – mid-summer 2007
- Cost out focused workshops and develop statement of work – February/March 2007
- Identify two pilot locations and up to four other locations for workshops – spring 2007
- Schedule and design pilot workshops – summer 2007
- Cost out work zone traffic analysis tools primer and guidance and develop statement of work – February/March 2007

ROLES OF VARIOUS FHWA OFFICES/UNITS

- Division Offices – champion for their state, promote the program and disseminate info as appropriate to DOT and industry, assist in application process, provide success stories and regional project updates for public relations purposes
- Federal Lands – disseminate info as appropriate to industry, may not have any projects
- Resource Center – assist in providing experts for P2P and workshops, promote program
- Operation Council's Work Zone Working Group – sounding board for new ideas and improving old ones, may be tapped as expert resources, promoting program

MAKING WORK ZONES WORK BETTER PROGRAM GOALS

- By October 2007, all 52 state highway agencies are to be in substantial compliance with the new Work Zone Safety and Mobility rule.
- XX Tailored workshops. (5 per year is an appropriate number)
- XX number of states putting formal processes in place to consider at the right stage of project delivery sequence the incorporation of innovative strategies in work zones
- XX number of states actively using work zone traffic analysis tools to assess the impacts

Long range goal – follow up with states that utilized a tailored workshop for a Highways for LIFE project to identify adaptation of information/innovation obtained from workshops into other highway projects.

MARKETING STRATEGY

Generally speaking, the MWZWB marketing strategy is to leverage all resources that will aid in delivering the initiative throughout the country. By utilizing experts across the country, as well as the success of states that have advanced work zone programs, other states, local agencies, and consultants will be apprised of how the program can improve their transportation systems.

The two primary objectives of the marketing strategy are to raise awareness of the MWZWB program and to get customers to buy into the concept. If marketed correctly, this program has the potential to have an immediate impact in improving work zone safety and mobility.

CHANNELS OF DISTRIBUTION

One-on-one meetings will be one of the key components to a successful program. This allows the other person to actually get involved in a dialog, rather than simply reading a brochure or listening to a speaker at a conference or workshop. It also

allows the FHWA representative to probe into reasons why a DOT would resist using a new technology. Whatever the reason, one-on-one meetings are great tools for digging out answers while creating personal relationships. Further, any hesitation to using a new technology can be overcome easier because the FHWA representative is there to reassure and provide encouragement.

While less effective than one-on-one meetings, presentations and exhibits delivered at meetings and conferences are excellent ways of providing the MWZWB message to the greatest number of people. Conferences that should be targeted include:

- American Association of State Highway and Transportation Officials (AASHTO)
- Local Technical Assistance Programs (LTAP)
- Institute of Transportation Engineers (ITE)
- Transportation Research Board (TRB)
- FHWA's Annual Safety Leadership Conference
- FHWA's Annual Operations/ITS Conference

Marketing communication tools, such as videos, brochures, PowerPoint presentations, and websites can be used as vehicles for delivering the MWZWB message. However, while they are excellent tools, care must be taken not to rely on them to carry the message alone. Using them in conjunction with a formal presentation or one-on-one meeting is much more effective than simply delivering it via mail. There is a need to convince and get commitments from the executive level decision-makers.

As mentioned earlier, many DOTs are using consultants to design their traffic management plan, which makes industry an important target of the MWZWB message. The integrated communications campaign will direct releases publicizing innovations and successes to a pre-determined media list that will reach critical audiences in both the public and private sectors. The website will also be optimized using key words and phrases that direct visitors directly to the MWZWB website when they search on those terms.

One of the best ways to market the program is to capitalize on success stories. By developing and distributing a quarterly newsletter with success stories and other pertinent information to the FHWA division offices and DOT contacts, it keeps the value and opportunities of the program at the forefront of their minds.

MARKETING MEASURES OF EFFECTIVENESS

It is important to measure the effectiveness of the marketing aspect of the program. It is essential to know that our target market is getting the intended message of the MWZWB program.

A few methods to measure the effectiveness may be:

- Number of peer-to-peer program requests.
- Number of web site users

- Requests for releases from the regions
- Media hits (rated for message and reach)
- Responses to a survey specially designed to measure marketing effectiveness.
- Adoption of processes to consider MWZWB innovations
- Inclusion of MWZWB innovations in projects

PROJECTED PROGRAM MARKETING AND OPERATING COSTS

(Suggested activities for consideration)

FY07:

- [See communications plan deliverables on p. 25: HWM can create detailed budgets and schedules for outlined PR and Web content and deliverables upon request]
- Develop and Print P2P Fact Sheet: \$X,XXX
- P2P Contract for implementation and O&M: \$XXX,XXX
- 5 Pilot Focused Workshops: XX,XXX
- Rotational Assignment: \$XXXX
- Other Marketing Tools: \$X,XXX
- Conference attendance for presentations and exhibits: \$X,XXX

FY08:

- Hiring a team member for a year: \$XXXXXX
- Funding for P2P: \$XXXXXX
- Focused project level Workshops: \$XXXXXX (# @ \$XXXX)
- Conference attendance for presentations and exhibits: \$XXXXXX
- Scanning Tour: \$XXXXXX
- Other Marketing Tools: \$XXXXXX

FY09:

- Rotational Assignment: \$XXXX
- Funding for P2P: \$XXXXXX
- Focused Workshops: \$XXXXXX (# @ \$XXXX)
- Scanning Tour: \$XXXXXX

FY10:

- Funding for P2P: \$XXXXXX
- Focused Workshops: \$XXXXXX (# @ \$XXXX)
- Scanning Tour: \$XXXX

APPENDIX A – FINAL RULE

[Federal Register: September 9, 2004 (Volume 69, Number 174)]

[Rules and Regulations]

[Page 54562-54572]

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[DOCID:fr09se04-3]

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 630

[FHWA Docket No. FHWA-2001-11130]

RIN 2125-AE29

Work Zone Safety and Mobility

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Final rule.

SUMMARY: The FHWA amends its regulation that governs traffic safety and mobility in highway and street work zones. The changes to the regulation will facilitate comprehensive consideration of the broader safety and mobility impacts of work zones across project development stages, and the adoption of additional strategies that help manage these impacts during project implementation. These provisions will help State Departments of Transportation (DOTs) meet current and future work zone safety and mobility challenges, and serve the needs of the American people.

DATES: Effective Date: October 12, 2007.

The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of October 12, 2007.

FOR FURTHER INFORMATION CONTACT: Mr. Scott Battles, Office of Transportation Operations, HOTO-1, (202) 366-4372; or Mr. Raymond Cuprill, Office of the Chief Counsel, HCC-30, (202) 366-0791, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590-0001. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION: ELECTRONIC ACCESS

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BACKGROUND

History

Pursuant to the requirements of Section 1051 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), (Pub. L. 102-240, 105 Stat. 1914; Dec. 18, 1991), the FHWA developed a work zone safety program to improve work zone safety at highway construction sites. The FHWA implemented this program through non-regulatory action by publishing a notice in the Federal Register on October 24, 1995 (60 FR 54562). This notice established the National Highway Work Zone Safety Program (NHWZSP) to enhance safety at highway construction, maintenance, and utility sites. In this notice, the FHWA indicated the need to update its regulation on work zone safety (23 CFR 630, Subpart J).

As a first step in considering amendments to its work zone safety regulation, the FHWA published an advance notice of proposed rulemaking (ANPRM) on February 6, 2002, at 67 FR 5532. The ANPRM solicited information on the need to amend the regulation to better respond to the issues surrounding work zones, namely the need to reduce recurrent roadwork, the duration of work zones, and the disruption caused by work zones.

The FHWA published a notice of proposed rulemaking (NPRM) on May 7, 2003, at 68 FR 24384. The regulations proposed in the NPRM were intended to facilitate consideration and management of the broader safety and mobility impacts of work zones in a more coordinated and comprehensive manner across project development stages, and the development of appropriate strategies to manage these impacts. We received a substantial number of responses to the NPRM. While most of the respondents agreed with the intent and the concepts proposed in the NPRM, they recommended that the proposed provisions be revised and altered so as to make them practical for application in the field. The respondents identified the need for flexibility and scalability in the implementation of the provisions of the proposed rule; noted that some of the terms used in the proposed rule were ambiguous and lent themselves to subjective interpretation. Respondents also

commented that the documentation requirements in the proposal would impose undue time and resource burdens on State DOTs.

In order to address the comments received in response to the SNPRM, the FHWA issued a supplemental notice of proposed rulemaking (SNPRM) on May 13, 2004, at 69 FR 26513. The SNPRM addressed the comments related to flexibility and scalability of provisions, eliminated ambiguous terms from the language, and reduced the documentation requirements. We received several supportive comments in response to the SNPRM. Most respondents noted that the SNPRM addressed the majority of their concerns regarding the originally proposed rule. However, they did offer additional comments regarding specific areas of concern. In the final rule issued today, the FHWA has addressed all the comments received in response to the SNPRM that are within the scope of this rulemaking.

The regulation addresses the changing times of more traffic, more congestion, greater safety issues, and more work zones. The regulation is broader so as to recognize the inherent linkage between safety and mobility and to facilitate systematic consideration and management of work zone impacts. The regulation can advance the state of the practice in highway construction project planning, design, and delivery so as to address the needs of the traveling public and highway workers. The key features of the final rule are as follows:

A policy driven focus that will institutionalize work zone processes and procedures at the agency level, with specific language for application at the project level.

A systems engineering approach that includes provisions to help transportation agencies address work zone considerations starting early in planning, and progressing through project design, implementation, and performance assessment.

Emphasis on addressing the broader impacts of work zones to develop transportation management strategies that address traffic safety and control through the work zone, transportation operations, and public information and outreach.

Emphasis on a partner driven approach, whereby transportation agencies and the FHWA will work together towards improving work zone safety and mobility.

Overall flexibility, scalability, and adaptability of the provisions, so as to customize the application of the regulations according to the needs of individual agencies, and to meet the needs of the various types of highway projects.

SUMMARY DISCUSSION OF COMMENTS RECEIVED IN RESPONSE TO THE SNPRM

The following discussion provides an overview of the comments received in response to the SNPRM, and the FHWA's actions to resolve and address the issues raised by the respondents.

PROFILE OF RESPONDENTS

We received a total of 33 responses to the docket. Out of the 33 total respondents, 27 were State DOTs; 4 were trade associations; and 2 provided comments as private individuals. The 4 trade associations were namely, the Laborers' Health and Safety Fund of North America (LHSFNA), the American Traffic Safety Services Association (ATSSA), the Associated General Contractors (AGC) of America, and the Institute of Transportation Engineers (ITE). We classified the American Association of State Highway and Transportation Officials (AASHTO) as a State DOT because they represent State DOT interests. The AASHTO provided a consolidated response to the SNPRM on behalf of its member States. Several State DOTs provided their comments individually.

The respondents represented a cross-section of job categories, ranging from all aspects of DOT function, to engineering/traffic/safety/design, to construction and contracting.

OVERALL POSITION OF RESPONDENTS

We received several supportive comments in response to the SNPRM. Most State DOTs, the AASHTO, and all private sector respondents greatly appreciated the FHWA's continued effort to receive input during the development of the proposed rule, and particularly in issuing the SNPRM. Most respondents also noted that the SNPRM addressed the majority of their concerns regarding the originally proposed rule.

The respondents also offered comments on specific areas of concern, and recommended changes to improve the rule's language. The State DOTs and the AASHTO offered comments, which relate to their continued concern that the rule allow for adequate flexibility and scalability while limiting unintended liability and cost. Private sector respondents also offered specific comments on certain areas of concern.

Details regarding these issues and FHWA's specific response are discussed in the following section, which provides a section-by-section analysis of the comments.

The level of support for the SNPRM is indicated by the fact that 23 of the 33 respondents expressed overall support for the provisions proposed in the SNPRM. It is to be noted that these respondents were not necessarily supportive of all the provisions, but rather that, their overall position on the SNPRM was supportive. Many of these respondents provided suggestions on modifications and revised language for specific provisions as they deemed appropriate. Of the 23 respondents who were supportive, 21 represented State DOTs and 2 represented trade associations.

Of the remaining respondents, 2 opposed the issuance of the rule, 2 agreed with the intent and the concepts but did not agree with many of the mandatory provisions, and the remaining 6 did not expressly indicate their overall position.

One of the two respondents who opposed the issuance of the rule was the Iowa DOT. It expressed that it supports the goals of improved safety and reduced congestion, but opposes the proposed rule as it would not necessarily help achieve these goals. It believes that its current work zone policies are sufficient to provide for a high standard of safety and mobility. It noted that the rule is not flexible enough, and that it would require significant commitments from its limited staff.

The other respondent that opposed the rule was the Kansas DOT. It suggested that the FHWA retract the rule and, instead, issue the information on work zone safety and mobility as a guide for use by State DOTs. It believes that encouraging State DOTs to review and improve their current practices on work zone safety and mobility, through closer contact with FHWA and other partners, would be more effective than mandating specific processes. It also suggested changes to specific sections, and recommended that the FHWA implement the AASHTO's recommendations, if retraction of the rule was not an option.

SECTION-BY-SECTION ANALYSIS OF SNPRM COMMENTS AND FHWA RESPONSE

Section 630.1002 Purpose

There were no major comments in response to this section. The overall sentiment of the respondents was supportive of the language as proposed in the SNPRM, and therefore, we will retain the language as proposed in the SNPRM.

Section 630.1004 Definitions and Explanation of Terms

Most respondents were supportive of this section. Some respondents offered specific comments on some of the definitions proposed in the SNPRM. They are discussed as follows:

- **Definition for ``Mobility.''** The AGC of America remarked that the definition for mobility seems to imply a greater emphasis on mobility than on safety. It recommended that we change the second sentence of the definition to imply that work zone mobility should be achieved without compromising the safety of highway workers or road users. To address this comment the FHWA has amended the definition by adding the words, ``while not compromising the safety of highway workers or road users'' at the end of the second sentence. In addition, the word ``smoothly'' after the phrase, ``mobility pertains to moving road users,'' has been replaced by the word ``efficiently.''
- **Definition for ``Safety.''** The AASHTO and several DOTs recommended that the term, ``road worker(s)'' be changed to ``highway worker(s)'' for the sake of consistency. We agree with this observation, and made this change. The Georgia DOT recommended that the term ``danger'' be changed to ``potential hazards'' to reduce potential liability. We agree with this recommendation, and therefore, replaced the word ``danger'' with ``potential hazards'' in the first sentence. In the second sentence, we rephrased ``minimizing the exposure to danger of road users'' with ``minimizing potential hazards to road users.''

- **Definition for ``Temporary Traffic Control (TTC) Plan.'** We moved the definition for the TTC plan from Sec. 630.1004, Definitions and Explanation of Terms, to Sec. 630.1012(b), Transportation Management Plan (TMP), where the requirements for the TTC plan are laid out. This is in response to a comment from the Georgia DOT that the language under the TTC plan section of Sec. 630.1012(b) was not consistent with the Manual On Uniform Traffic Control Devices (MUTCD).¹ Since the definition for the TTC plan was referenced from the MUTCD, it was removed from the definitions section and placed in Sec. 630.1012(b)(1), where TTC plans are discussed.

¹ The MUTCD is approved by the FHWA and recognized as the national standard for traffic control on all public roads. It is incorporated by reference into the Code of Federal Regulations at 23 CFR part 655. It is available on the FHWA's Web site at mutcd.fhwa.dot.gov and is available for inspection and copying at the FHWA Washington, DC Headquarters and all FHWA Division Offices as prescribed at 49 CFR part 7.

- Definitions for ``Work Zone'' and ``Work Zone Crash.'' There were several comments recommending changes to certain terminology in both these definitions. For example, the AASHTO and several DOTs suggested that the term, ``traffic units,'' in the first sentence of the Work Zone Crash definition be changed to ``road users.'' However, we have decided not to adopt the changes in order to maintain consistency with other industry accepted sources--the definition for ``work zone'' being referenced from the MUTCD, and that for ``work zone crash,'' from the Model Minimum Uniform Crash Criteria Guideline (MMUCC).²

² ``Model Minimum Uniform Crash Criteria Guideline'' (MMUCC), 2d Ed. (Electronic), 2003, produced by National Center for Statistics and Analysis, National Highway Traffic Safety Administration (NHTSA). Telephone 1-(800)-934-8517. Available at the URL: www-nrd.nhtsa.dot.gov. The NHTSA, the FHWA, the Federal Motor Carrier Safety Administration (FMCSA), and the Governors Highway Safety Association (GHS) sponsored the development of the MMUCC Guideline which recommends voluntary implementation of the 111 MMUCC data elements and serves as a reporting threshold that includes all persons (injured and uninjured) in crashes statewide involving death, personal injury, or property damage of \$1,000 or more. The Guideline is a tool to strengthen existing State crash data systems.

SECTION 630.1006 WORK ZONE SAFETY AND MOBILITY POLICY

The majority of the respondents supported the proposed language in this section. The AASHTO and several DOTs recommended the removal of the second clause in the second to last sentence, ``representing the different project development stages.'' These respondents believe that this change would grant the States maximum flexibility to implement the most appropriate team for each project. The FHWA agrees with this observation and has deleted the phrase in question.

The ATSSA recommended that we specifically include or encourage the participation of experienced industry professionals in the multi-disciplinary team referenced in the second to last sentence. The FHWA believes that States will solicit the participation of industry representatives if required for the specific project under consideration.

The Kansas DOT commented that the use of the words ``policy'' and ``guidance'' in the same sentence could be confusing, as policies usually carry more weight than guidance. This comment refers to the second sentence, the first part of which reads, ``This policy may take the form of processes, procedures, and/or guidance * * * '' The FHWA disagrees because we believe that policies do not necessarily have to be mandates. For example, it may be a State DOT policy that it ``shall'' consider and manage work zone impacts of projects, but the actual methods to do so may be provided as guidance to its district/region offices which may vary according to the different types of projects that they encounter. The underlying purpose of the work zone safety and mobility policy section is to require State DOTs to implement a policy for the systematic consideration and management of work zone impacts, so that such consideration and management becomes a part of the mainstream of DOT activities. How a State chooses to implement the policy is its prerogative--and it may take the form of processes, procedures, and/or guidance, and may vary upon the work zone impacts of projects.

The Virginia DOT commented on the second sentence of this section that it does not agree with the ``shall'' requirement to address work zone impacts through the various stages of project development and implementation. It justified its objection by saying that ``addressing work zone impacts through the various stages of project development and implementation'' will not work from a practical standpoint due to unforeseen field conditions and circumstances, and that the shall clause could result in potential litigation. The FHWA disagrees with the Virginia DOT. We would like to mention that the second sentence by itself, when taken out of context, doesn't quite convey the message of the entire section. The preceding sentence and the following sentence need to be considered in interpreting what the second sentence means.

The first sentence requires that State DOTs implement a policy for the systematic consideration and management of work zone impacts on all Federal-aid highway projects. The second sentence further qualifies the term ``systematic'' by saying that the policy shall address work zone impacts throughout the various stages of project development and implementation--this implies that the consideration and management of work zone impacts progresses through the various stages. The third sentence further clarifies that the methods to implement this policy may not necessarily be absolute requirements, but rather be implemented through guidance. Further, the third sentence provides a more specific delineator by saying that the implementation of the policy may vary based upon the characteristics and expected work zone impacts of individual projects or classes of projects.

SECTION 630.1008 AGENCY-LEVEL PROCESSES AND PROCEDURES

The AASHTO and several State DOTs remarked that there is inconsistency with the use of ``Agency'' and ``State Agency,'' and that this needs to be resolved. Further, a few State DOTs sought clarification as to whether ``agency'' applies to the State transportation agency or other entities that might be involved in the project

development process (i.e., county and/ or local governments and authorities). In response to this comment, we changed all instances of the terms ``State Agency'' and ``Agency'' in the entire subpart to the term ``State,''' as referenced in the rule.

SECTION 630.1008(A), SECTION INTRODUCTION

There were no specific comments in response to the language in this paragraph. In the second sentence, to remove ambiguity and for clarity, we replaced the words ``well defined data resources'' with the words, ``data and information resources.''

The North Carolina DOT observed that the language in this paragraph is an introduction to the section, and that it should not be labeled as ``(a).'' We did not make this change because the Office of the Federal Register (OFR) requires paragraph designations on all text in a rule. Section 630.1008(b), Work Zone Assessment and Management Procedures. Most respondents were supportive of the language in this paragraph.

SECTION 630.1008(C), WORK ZONE DATA

Most State DOTs and the AASHTO opposed the mandatory requirement to use work zone crash and operational data towards improving work zone safety and mobility on ongoing projects, as well as to improve agency processes and procedures. One of the key reasons cited for this opposition was the difficulty and level of effort involved in obtaining and compiling data quickly enough to take remedial action on ongoing projects. A few DOTs also stated that using data to improve State-level procedures was feasible but not at the individual project level. The AASHTO also observed that there is already a reference to data in Sec. 630.1008(e), ``Process Review," where the use of data is optional and not mandatory. Some States recommended that we clarify the term ``operational data," whether it is observed or collected data. They also noted that the ``shall" clauses in the first two sentences are inconsistent with the ``encouraged to" in the last sentence, and questioned as to how the use of data can be mandated when the data resources themselves are optional. The California Transportation Department (CalTrans) questioned the objective of developing TMPs and conducting process reviews if appropriate performance measures and data collection standards are not identified for determining success.

The FHWA provides the following comments and responses to the above stated concerns:

The purpose of the provisions in this section is not to require States to collect additional data during project implementation, but rather, to improve the use of available work zone field observations, crash data, and operational information to: (1) Manage the safety and mobility impacts of projects more effectively during implementation; and (2) provide the basis for systematic procedures to assess work zone impacts in project development. For example, most agencies maintain field diaries for construction projects. These field diaries are intended to provide a log of problems, decisions, and progress made over the duration of a project. In many

States, these diaries log incidents and actions such as the need to replace channelization devices into their proper positions after knockdown by an errant vehicle, or to deal with severe congestion that occurred at some point during the day. These log notes, when considered over time, may provide indications of safety or operational deficiencies. To address such deficiencies, it may be necessary and prudent to improve the delineation through the work zone to prevent future occurrences of knockdown events, or to alter work schedules to avoid the congestion that recurs at unexpected times due to some local traffic generation phenomena.

Police reports are another example of an available source of data that may be useful in increasing work zone safety. Provisions are made in many agencies for a copy of each crash report to be forwarded to the engineering section immediately upon police filing of the crash report. Where a work zone is involved, a copy of this report should be forwarded as soon as possible to the project safety manager to determine if the work zone traffic controls had any contribution to the crash so that remedial action can be taken.

These applications do not necessarily require that agencies gather new data, but there may be a need to improve processes to forward such reports to the appropriate staff member for review during project implementation and/or to provide guidance or training to facilitate interpretation of these reports. Agencies may choose to enhance the data they capture to improve the effectiveness of these processes by following national crash data enhancement recommendations and/or linking it with other information (e.g., enforcement actions, public complaints, contractor claims). This same data and information can be gathered for multiple projects and analyzed by the agency to determine if there are common problems that could be remedied by a change in practices. The information may also be used for process reviews.

The first sentence of this paragraph was revised to convey that States are required to use field observations, available work zone crash data, and operational information at the project level, to manage the work zone impacts of specific projects during project implementation. This provision requires States to use data and information that is available to them, so as to take appropriate actions in a timely manner to correct potential safety or mobility issues in the field. Operational information refers to any available information on the operation of the work zone, be it observed or collected. For example, many areas have Intelligent Transportation Systems (ITS) in place, and many others are implementing specific ITS deployments to manage traffic during construction projects. The application of this provision to a project where ITS is an available information resource, would result in the use of the ITS information to identify potential safety or mobility issues on that project.

The second sentence was also revised to convey that work zone crash and operational data from multiple projects shall be analyzed towards improving State processes and procedures. Such analysis will help improve overall work zone safety and mobility. Data gathered during project implementation needs to be maintained

for such post hoc analyses purposes. Such data can be used to support analyses that help improve State procedures and the effectiveness of future work zone safety and mobility assessment and management procedures.

The respondents indicated that the use of ``encouraged to'' in the last sentence is inconsistent with the ``shall'' clauses in the first two sentences. Further, the phrase, ``establish data resources at the agency and project levels'' does not clearly convey the message of the provision. This provision does not require States to embark on a massive data collection, storage, and analysis effort, but rather to promote better use of elements of their existing/available data and information resources to support the activities required in the first two sentences. Examples of existing/available data and information resources include: Project logs, field observations, police crash records, operational data from traffic surveillance devices (e.g., data from traffic management centers, ITS devices, etc.), other monitoring activities (e.g., work zone speed enforcement or citations), and/or public complaints. We revised the last sentence to convey that States should maintain elements of their data and information resources that logically support the required activities.

In response to CalTrans' comment regarding establishing performance measures and data collection standards, we appreciate the value of the input, but we believe that we do not have adequate information at this time to specify performance measures for application at the National level. State DOTs may establish such performance measures and data collection standards as applicable to their individual needs and project scenarios. For example, the Ohio-DOT mandates that there shall always be at least two traffic lanes maintained in each direction for any work that is being performed on an Interstate or Interstate look-alike. We believe that such policies need to be developed and implemented according to individual State DOT needs, and hence we maintain a degree of flexibility in the rule language.

SECTION 630.1008(D), TRAINING

Most State DOTs and the AASHTO opposed the mandatory requirement that would require training for the personnel responsible for work zone safety and mobility during the different project development and implementation stages. These respondents noted that the proposed language implied that State DOTs would be responsible for training all the listed personnel, including those who do not work for the DOT itself, and that this would create a huge resource burden, as well as increase the liability potential for the DOTs. These commenters also ratified their opposition by quoting the MUTCD training requirement, which does not mandate training, but suggests that personnel should be trained appropriate to the job decisions that they are required to make. Some DOTs, including the New York State DOT (NYSDOT), requested that the reference to personnel responsible for enforcement of work zone related transportation management and traffic control be clarified as to whether it refers to law enforcement officers or to field construction/safety inspectors.

The FHWA provides the following comments and responses to the above stated concerns:

The FHWA agrees that the first sentence in the training section seems to imply that the State would be responsible for training all mentioned personnel; therefore, we changed the sentence to convey that the State shall ``require'' the mentioned personnel be trained. This change will require the State to train direct State employees only, and takes away the burden from the State to train personnel who are not direct employees. We believe that personnel responsible for the development, design, operation, inspection, and enforcement of work zone safety and mobility need to be trained, and this requirement will allow for training to be provided by the appropriate entities. The responsibility of the State would be to require such training, either through policy or through specification. For example, the Florida DOT has developed and required work zone training of their designers and contractors by procedure and by specifications. Similarly, the Maryland State Highway Administration (MD-SHA) provides a maintenance of traffic (MOT) design class to personnel responsible for planning and designing work zones, including consultants and contractors.

Further, in keeping with the MUTCD language on training, we added the phrase, ``appropriate to the job decisions each individual is required to make'' to the end of the first sentence. This clarifies that the type and level of training will vary according to the responsibilities of the different personnel. For example, Maryland State Highway Police officers attend a 4-hour work zone safety and traffic control session at the Police Academy.

We also revised the second sentence to convey that States shall require periodic training updates that reflect changing industry practices and State processes and procedures. Since we revised the first sentence to convey that training of non-State personnel is not a State responsibility, in the second sentence, we deleted the phrase, ``States are encouraged to keep records of the training successfully completed by these personnel.''

In response to the request that ``personnel responsible for enforcement'' of work zone related transportation management and traffic control be clarified, we believe that this group is inclusive of both law enforcement officers and field construction/safety inspectors.

SECTION 630.1008(E), PROCESS REVIEW

Most respondents were supportive of the language in this section. The AASHTO and several State DOTs recommended that States should have maximum flexibility to implement the most appropriate team for each project. These commenters suggested that the fourth and the fifth sentences of the section be deleted, and that the clause, ``as well as FHWA'' be added to the end of the third sentence.

The FHWA agrees with the observation made by the AASHTO and State DOTs that States should have maximum flexibility to implement the most appropriate review team for each project. Therefore, as suggested, we deleted the fourth and

the fifth sentence of the section, and added the clause, ``as well as FHWA" to the end of the third sentence. Further, in the third sentence, we changed the phrase ``are encouraged to" to ``should."

SECTION 630.1010 SIGNIFICANT PROJECTS

All respondents agreed with the concept of defining significant projects, and the requirement to identify projects that are expected to have significant work zone impacts; however, most State DOTs and the AASHTO opposed the requirement to classify Interstate system projects that occupy a location for more than three days with either intermittent or continuous lane closures, as significant. They cited that all Interstate system projects that occupy a location for more than three days would not necessarily have significant work zone impacts, particularly on low-volume rural Interstate sections. Several DOTs remarked that designation of significant projects purely based on the duration would not be prudent, and that the volume of traffic on that Interstate should be taken into account. They also noted that such classification is not consistent with the MUTCD. They remarked that this provision could not be effectively applied to routine maintenance activities performed by State DOT maintenance crews, and that requesting exceptions to such routine work would be unreasonably arduous.

These respondents also objected to the associated exemption clause for the same provision, commenting that it would be very cumbersome to implement. Some States also requested clarification on whether general exceptions would be granted for work categories for defined segments of Interstate projects where the work would have little impact.

The DOTs of Idaho, Montana, North Dakota, South Dakota, and Wyoming commented that the threshold for designating the reference Interstate projects as significant was too low. They suggested that low volume Interstates and rural Interstates should be excluded, and that, the duration should be extended well above the three-day duration.

The AASHTO and the State DOTs also remarked that the identification of significant projects in ``cooperation with the FHWA" should be changed to ``in consultation with the FHWA."

The FHWA provides the following responses and proposed action in response to the referenced concerns:

- We agree with the majority of the concerns raised by the respondents.
- We changed the significant projects clause as applicable to Interstate system projects, to require States to classify as significant projects, all Interstate system projects within the boundaries of a designated Transportation Management Area (TMA), that occupy a location for more than three days with either intermittent or continuous lane closures. We believe that this change addresses all the concerns raised by the respondents. The delineation of projects by the boundaries of a designated TMA will address the work zone impacts of lane-

closures on Interstate segments in the most heavily traveled areas with recurring congestion problems. We believe that in general, areas with recurring congestion tend to be severely impacted by lane closures as compared to those without recurring congestion. We also believe that the areas that are already designated as TMAs tend to exhibit patterns of recurring congestion on their Interstates due to heavy traffic demand and limited capacity. This revision, in most cases, would also not require low-volume rural Interstate segments to be classified as significant projects.

- We revised the exemption clause provisions related to the applicable Interstate system projects to allow for exemptions to ``categories of projects.'' This will provide for blanket exemptions for specific categories of projects on Interstate segments that are not expected to have significant work zone impacts. This will eliminate the burdensome procedural aspect of seeking exemptions for Interstate projects on an individual project basis.
- We also reorganized this section to consist of paragraphs (a), (b), (c), and (d). Paragraph (a) provides the general definition for a significant project, with no changes in language from what was proposed in the SNPRM. Paragraph (b) enumerates the purpose of classifying projects as significant, and lays out the requirements for States to classify projects as significant. This language is also the same as what was proposed in the SNPRM. Paragraph (c) provides the revised definition of significant projects as applicable to Interstate system projects. Paragraph (d) provides the revised exemption clause as applicable to significant projects on the Interstate system. In keeping with the overall recommendation of respondents, we changed all instances of ``Agency'' and ``State Agency'' to ``State.''
- We do not agree with the recommendation that the identification of significant projects should be done in ``consultation'' with the FHWA rather than ``cooperation with the FHWA.'' We believe that this is a cooperative process, rather than requiring just consultation. Therefore, we did not make any change to this terminology.

SECTION 630.1012 PROJECT-LEVEL PROCEDURES

- **Section 630.1012(a).** The North Carolina DOT observed that the language in this section is an introduction to the section, and that it should not be labeled as ``(a).'' We did not make this change because the OFR requires paragraph designations on all text in a rule. The ITE recommended that the FHWA should encourage consideration of work zone impacts prior to project development, at the corridor and Transportation Improvement Program (TIP) and program development stage. It provided examples of decisions that would be made at the earlier stages, such as, life-cycle cost decisions, and project scheduling decisions. We appreciate ITE's input and agree with the general intent of its suggested content. We believe that the language in Sec. Sec. 630.1002, Purpose and 630.1010, Significant Projects covers some of the issues to which

the ITE refers. Specifically, the following two sentences from the respective sections address the ITE's concerns:

- **From Sec. 630.1002, Purpose:** ``Addressing these safety and mobility issues requires considerations that start early in project development and continue through project completion.''
- **From Sec. 630.1010, Significant Projects:** ``This identification of significant projects should be done as early as possible in the project delivery and development process, and in cooperation with the FHWA.''
- **Section 630.1012(b), Transportation Management Plan (TMP).** Most respondents were supportive of the provisions in this section. The Florida DOT requested further definition for the phrase ``less than significant work zone impacts.'' We believe that the definition for ``work zone impacts'' as provided in Sec. 630.1004 and the clauses for identification of projects with significant work zone impacts, as stated in Sec. 630.1010 adequately describe the phrase ``less than significant work zone impacts.'' We did not take any action in response to this comment. The New Jersey DOT recommended that, in order to facilitate maximum flexibility to States, the term ``typically'' be introduced before the word ``consists'' in the third sentence of this section. We do not agree with the suggested edit because for significant projects, a TMP shall always consist of a TTC plan, and address Transportation Operations (TO) and Public Information (PI) components, unless an exemption has been granted for that project. We did not take any action in response to this comment.
- **Section 630.1012(b)(1), Temporary Traffic Control (TTC) Plan.** In general, most respondents were supportive of the provisions in this section, except the provision regarding maintenance of pre-existing roadside safety features. Most State DOTs and the AASHTO were opposed to the provision, which required the maintenance of pre-existing roadside safety features in developing and implementing the TTC plan. They recommended that the FHWA either remove the requirement or change the mandatory ``shall'' to a ``should.'' Several DOTs stated that maintenance of all pre-existing roadside safety features would be very difficult, especially, in urban areas. Other DOTs requested clarification on what ``pre-existing roadside safety features'' would entail--whether it would include items like signs, guardrail, and barriers, or it would include features like shoulders, slopes and other geometric aspects. On that note, several DOTs mentioned that maintenance of pre-existing roadside safety ``hardware'' would be more practical than maintaining pre-existing roadside safety features. The Laborers Health and Safety Foundation of North America (LHSFNA) continued to stress the requirement for Internal Traffic Control Plans (ITCPs) for managing men and materials within the work area, so as to address worker safety issues better, and to level the playing field for contractors.

The FHWA offers the following in response to the comments and concerns raised above:

- The FHWA agrees with most of the concerns raised by the respondents.

- In the fourth sentence of paragraph (b)(1), we changed the term ``pre-existing roadside safety features," to ``pre-existing roadside safety hardware." We believe that this change will address all the concerns raised by the respondents, and eliminate ambiguity and subjectivity from the requirement.
- In response to the LHSFNA's comment regarding ITCPs, we agree that ITCPs are important for providing for worker safety inside the work area, but we still believe that this issue is outside the purview of this rulemaking effort and this subpart. In order to be consistent with the remaining sections of this subpart, and to eliminate ambiguity, we deleted the first sentence of this section, and replaced it with the definition for TTC plan as stated in Sec. 630.1004. Consequently, we removed the definition for TTC plan from Sec. 630.1004.
- **Section 630.1012(b)(2), Transportation Operations (TO) Component.** Most respondents were supportive of the provisions in this section. The AASHTO and several DOTs suggested that ``traveler information" be removed as a typical TO strategy because ``traveler information" fits more logically in the PI component. The New Jersey DOT recommended that the phrase ``transportation operations and safety requirements" be changed to ``transportation operations and safety strategies," so as to soften the tone of the language. We agree with both of the above observations; therefore, we removed ``traveler information" from the listing of typical TO strategies in the second sentence. We also changed the phrase ``transportation operations and safety requirements" to ``transportation operations and safety strategies" in the last sentence.
- **Section 630.1012(b)(3), Public Information Component.** Most respondents were supportive of the provisions in this section. The AASHTO and several DOTs suggested that ``traveler information" be included as a typical PI strategy rather than a TO strategy, because ``traveler information" fits more logically in the PI component. The New Jersey DOT recommended that the phrase ``public information and outreach requirements" be changed to ``public information and outreach strategies," so as to soften the tone of the language. We agree with both of the above observations; therefore, we added a new sentence after the first sentence, to indicate that the PI component may include traveler information strategies. We also changed the phrase ``public information and outreach requirements" to ``public information and outreach strategies" in the third sentence.
- **Section 630.1012(b)(4), Coordinated Development of TMP.** Most respondents were supportive of the provisions in this section. The AASHTO and several DOTs recommended that the terminology, ``coordination and partnership" in the first sentence, be changed to ``consultation," so that it doesn't imply active and direct participation from all the subjects. They explained that the term ``coordination" implies that all participants have veto/negative powers which may delay project delivery as it is impossible to satisfy everybody. Further, the DOTs of Idaho, Montana, North Dakota, South Dakota, and Wyoming commented that the use of ``i.e." for the list of stakeholders implies that all those stakeholders are required for all projects. So they recommended that we

change the ``i.e.'' to ``e.g.'' so that it would imply that the list provides examples of possible stakeholders, and that all of them need not be involved in all projects. The FHWA agrees with both of the above observations and recommendations; therefore, we changed the phrase ``partnership and coordination'' to ``consultation'' in the first sentence of this section. We also changed ``i.e.'' to ``e.g.'' for the list of stakeholders.

- **Section 630.1012(c), Inclusion of TMPs in Plans, Specifications, and Estimates (PS&Es).** Most respondents were supportive of the provisions in this section. The DOTs of Idaho, Montana, North Dakota, South Dakota, and Wyoming noted that the last sentence in this section could imply that the State shall approve any TMP that is developed by the contractor, irrespective of whether it meets the standards or not. They recommended that the sentence be revised for clarity. The FHWA agrees with the above observation. We revised the last sentence of this section to convey that contractor developed TMPs shall be subject to the approval of the State, and that the TMPs shall not be implemented before they are approved by the State. This clarifies the language and explicitly states the notion that it is the State that is ultimately responsible for approving any contractor developed TMP.
- **Section 630.1012(d), Pay Items.** Most respondents were supportive of the provisions in this section. However, the ATSSA and the AGC of America opposed the option in Sec. 630.1012(d)(1) for States to use lump sum pay items for implementing the TMPs. The ATSSA believes that unit bid items provide greater specificity and are a better indicator of the direct cost of work zones. Conversely, the use of a lump sum pay item provides less comprehensive data, and may, in some cases, limit, or eliminate the contractor's ability to make a profit on certain projects due to unknown equipment or device requirements either during bidding or project implementation. It cited that unit pay items, especially for the TTC plan, would require that all the identified work zone safety and mobility strategies/equipment/devices be provided for by the contractor. This would level the playing field, and not place conscientious contractors (those who lay emphasis on work zone safety and mobility and include them in their bids) at a disadvantage. The FHWA recognizes ATSSA's and AGC's concerns, but we believe that States have the required understanding of when to use unit pay items and when not to, and that the requirement for unit pay items on all projects is not practical for real-world application. Therefore, we did not remove the option for DOTs to use lump sum contracting. We changed ``i.e.'' to ``e.g.'' for the list of possible performance criteria for performance specifications in Sec. 630.1012(d)(2), to remove the implication that the list is an exhaustive list of performance criteria.
- **Section 630.1012(e), Responsible Persons.** Most respondents were supportive of the provisions in this section. A few State DOTs remarked that the terms ``qualified person,'' ``assuring,'' and ``effectively administered,'' in Sec. 630.1012(e) were ambiguous and lent themselves to subjective interpretation. The FHWA agrees with the above observations. We changed the term ``qualified'' to ``trained,'' as specified in Sec. 630.1008(d) so as to clarify the

requirement for the responsible person. We also changed the phrase ``assuring that'' to ``implementing,'' and deleted the phrase, ``are effectively administered.''

- **Section 630.1014 Implementation.** Most respondents were supportive of the provisions in this section. We did not make any changes to the language in this section.
- **Section 630.1016 Compliance Date.** Most respondents were supportive of the provisions in this section. We did not make any changes to the language in this section.
- **Rulemaking Analyses and Notices Executive Order 12866 (Regulatory Planning and Review) and U.S. DOT Regulatory Policies and Procedures.** The FHWA has determined that this action is not a significant regulatory action within the meaning of Executive Order 12866 or significant within the meaning of the U.S. Department of Transportation regulatory policies and procedures. This final rule is not anticipated to adversely affect, in a material way, any sector of the economy. In addition, these changes will not create a serious inconsistency with any other agency's action or materially alter the budgetary impact of any entitlements, grants, user fees, or loan programs; nor will the changes raise any novel legal or policy issues. Therefore, a full regulatory evaluation is not required.
- **Regulatory Flexibility Act.** In compliance with the Regulatory Flexibility Act (RFA) (Pub. L. 96-354, 5 U.S.C. 601-612), the FHWA has evaluated the effects of this final rule on small entities and has determined that it will not have a significant economic impact on a substantial number of small entities. This rule applies to State departments of transportation in the execution of their highway program, specifically with respect to work zone safety and mobility. The implementation of the provisions in this rule will not affect the economic viability or sustenance of small entities, as States are not included in the definition of small entity set forth in 5 U.S.C. 601. For these reasons, the RFA does not apply and the FHWA certifies that the final rule will not have a significant economic impact on a substantial number of small entities.
- **Unfunded Mandates Reform Act of 1995.** This final rule will not impose unfunded mandates as defined by the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, March 22, 1995, 109 Stat. 48). The final rule will not result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$120.7 million or more in any one year (2 U.S.C. 1532).
- **Executive Order 13132 (Federalism).** This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132, dated August 4, 1999, and it has been determined that this action does not have a substantial direct effect or sufficient federalism implications on States that would limit the policymaking discretion of the States. Nothing in this document directly preempts any State law or regulation or affects the States' ability to discharge traditional State governmental functions.

- **Executive Order 12372 (Intergovernmental Review) Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction.** The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.
- **Paperwork Reduction Act of 1995 Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501, et seq.).** Federal agencies must obtain approval from the Office of Management and Budget (OMB) for each collection of information they conduct, sponsor, or require through regulations. The FHWA has determined that this final rule contains a requirement for data and information to be collected and maintained in the support of design, construction, and operational decisions that affect the safety and mobility of the traveling public related to highway and roadway work zones. This information collection requirement was submitted to and approved by the OMB, pursuant to the provisions of the PRA. In this submission, the FHWA requested the OMB to approve a single information collection clearance for all of the data and information in this final rule. The requirement has been approved, through July 31, 2007; OMB Control No. 2125-0600. The FHWA estimates that a total of 83,200 burden hours per year would be imposed on non-Federal entities to provide the required information for the regulation requirements. Respondents to this information collection include State Transportation Departments from all 50 States, Puerto Rico, and the District of Columbia. The estimates here only include burdens on the respondents to provide information that is not usually and customarily collected.
- **Executive Order 13175 (Tribal Consultation).** The FHWA has analyzed this action under Executive Order 13175, dated November 6, 2000, and believes that this action will not have substantial direct effects on one or more Indian tribes; will not impose substantial direct compliance costs on Indian tribal governments; and will not preempt tribal law. This rulemaking primarily applies to urbanized metropolitan areas and National Highway System (NHS) roadways that are under the jurisdiction of State transportation departments. The purpose of this final rule is to mitigate the safety and mobility impacts of highway construction and maintenance projects on the transportation system, and would not impose any direct compliance requirements on Indian tribal governments and will not have any economic or other impacts on the viability of Indian tribes. Therefore, a tribal summary impact statement is not required.
- **Executive Order 13211 (Energy Effects).** The FHWA has analyzed this action under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution or Use. We have determined that this is not a significant energy action under that order because it is not a significant regulatory action under Executive Order 12866 and is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Further, we believe that the implementation of the final rule by State departments of transportation will reduce the amount of congested travel on our highways, thereby reducing the fuel consumption associated with congested travel.

Therefore, the FHWA certifies that a Statement of Energy Effects under Executive Order 13211 is not required.

- **National Environmental Policy Act.** The FHWA has analyzed this action for the purposes of the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347 et seq.) and has determined that this action will not have any effect on the quality of the environment. Further, we believe that the implementation of the final rule by State departments of transportation will reduce the amount of congested travel on our highways. This reduction in congested travel will reduce automobile emissions thereby contributing to a cleaner environment.
- **Executive Order 12630 (Taking of Private Property).** The FHWA has analyzed this final rule under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights. The FHWA does not anticipate that this action will affect a taking of private property or otherwise have taking implications under Executive Order 12630.
- **Executive Order 12988 (Civil Justice Reform).** This action meets applicable standards in sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.
- **Executive Order 13045 (Protection of Children).** The FHWA has analyzed this action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. The FHWA certifies that this action will not cause an environmental risk to health or safety that may disproportionately affect children.
- **Regulation Identification Number.** A regulation identification number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

LIST OF SUBJECTS IN 23 CFR PART 630

Government contracts, Grant programs--transportation, Highway safety, Highways and roads, Incorporation by reference, Project agreement, Traffic regulations.

Issued on: September 1, 2004. Mary E. Peters, Federal Highway Administrator.

In consideration of the foregoing, the FHWA amends title 23, Code of Federal Regulations, Part 630, as follows:

PART 630 — PRECONSTRUCTION PROCEDURES

1. The authority citation for part 630 continues to read as follows: Authority: 23 U.S.C. 106, 109, 115, 315, 320, and 402(a); 23 CFR 1.32; and 49 CFR 1.48(b).

2. Revise subpart J of part 630 to read as follows: Subpart J--Work Zone Safety and Mobility Sec. 630.1002 Purpose.

630.1004 Definitions and explanation of terms.

630.1006 Workzone safety and mobility policy.

630.1008 State-level processes and procedures.

630.1010 Significant projects.

630.1012 Project-level procedures.

630.1014 Implementation.

630.1016 Compliance date.

Sec. 630.1002 Purpose. Work zones directly impact the safety and mobility of road users and highway workers. These safety and mobility impacts are exacerbated by an aging highway infrastructure and growing congestion in many locations. Addressing these safety and mobility issues requires considerations that start early in project development and continue through project completion. Part 6 of the Manual On Uniform Traffic Control Devices (MUTCD) \1\ sets forth basic principles and prescribes standards for the design, application, installation, and maintenance of traffic control devices for highway and street construction, maintenance operation, and utility work. In addition to the provisions in the MUTCD, there are other actions that could be taken to further help mitigate the safety and mobility impacts of work zones. This subpart establishes requirements and provides guidance for systematically addressing the safety and mobility impacts of work zones, and developing strategies to help manage these impacts on all Federal-aid highway projects.

\1\ The MUTCD is approved by the FHWA and recognized as the national standard for traffic control on all public roads. It is incorporated by reference into the Code of Federal Regulations at 23 CFR part 655. It is available on the FHWA's Web site at mutcd.fhwa.dot.gov and is available for inspection and copying at the FHWA Washington, DC Headquarters and all FHWA Division Offices as prescribed at 49 CFR part 7.

Sec. 630.1004 Definitions and explanation of terms. As used in this subpart:

- Highway workers include, but are not limited to, personnel of the contractor, subcontractor, DOT, utilities, and law enforcement, performing work within the right-of-way of a transportation facility. Mobility is the ability to move from place to place and is significantly dependent on the availability of transportation facilities and on system operating conditions. With specific reference to work zones, mobility pertains to moving road users efficiently through or around a work zone area with a minimum delay compared to baseline travel when no work zone is present, while not compromising the safety of highway workers or road users. The commonly used performance measures for the assessment of mobility include delay, speed, travel time and queue lengths.

- Safety is a representation of the level of exposure to potential hazards for users of transportation facilities and highway workers. With specific reference to work zones, safety refers to minimizing potential hazards to road users in the vicinity of a work zone and highway workers at the work zone interface with traffic. The commonly used measures for highway safety are the number of crashes or the consequences of crashes (fatalities and injuries) at a given location or along a section of highway during a period of time. Highway worker safety in work zones refers to the safety of workers at the work zone interface with traffic and the impacts of the work zone design on worker safety. The number of worker fatalities and injuries at a given location or along a section of highway, during a period of time are commonly used measures for highway worker safety.
- Work zone \2\ is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last temporary traffic control (TTC) device.

\2\ MUTCD, Part 6, ``Temporary Traffic Control," Section 6C.02, ``Temporary Traffic Control Zones."

- Work zone crash \3\ means a traffic crash in which the first harmful event occurs within the boundaries of a work zone or on an approach to or exit from a work zone, resulting from an activity, behavior, or control related to the movement of the traffic units through the work zone. This includes crashes occurring on approach to, exiting from or adjacent to work zones that are related to the work zone.

\3\ ``Model Minimum Uniform Crash Criteria Guideline" (MMUCC), 2d Ed. (Electronic), 2003, produced by National Center for Statistics and Analysis, National Highway Traffic Safety Administration (NHTSA). Telephone 1-(800)-934-8517. Available at the URL: www-nrd.nhtsa.dot.gov. The NHTSA, the FHWA, the Federal Motor Carrier Safety Administration (FMCSA), and the Governors Highway Safety Association (GHSA) sponsored the development of the MMUCC Guideline which recommends voluntary implementation of the 111 MMUCC data elements and serves as a reporting threshold that includes all persons (injured and uninjured) in crashes statewide involving death, personal injury, or property damage of \$1,000 or more. The Guideline is a tool to strengthen existing State crash data systems.

- (a) Work zone impacts refer to work zone-induced deviations from the normal range of transportation system safety and mobility. The extent of the work zone impacts may vary based on factors such as, road classification, area type (urban, suburban, and rural), traffic and travel characteristics, type of work being performed, time of day/night, and complexity of the project. These impacts may extend beyond the physical location of the work zone itself, and may occur on the roadway on which the work is being performed, as well as other highway corridors, other modes of transportation, and/or the regional transportation network.

Sec. 630.1006 Work zone safety and mobility policy.

(b) Each State shall implement a policy for the systematic consideration and management of work zone impacts on all Federal-aid highway projects. This policy shall address work zone impacts throughout the various stages of the project development and implementation process. This policy may take the form of processes, procedures, and/or guidance, and may vary based on the characteristics and expected work zone impacts of individual projects or classes of projects. The States should institute this policy using a multi-disciplinary team and in partnership with the FHWA. The States are encouraged to implement this policy for non-Federal-aid projects as well.

Sec. 630.1008 State-level processes and procedures.

- (a) This section consists of State-level processes and procedures for States to implement and sustain their respective work zone safety and mobility policies. State-level processes and procedures, data and information resources, training, and periodic evaluation enable a systematic approach for addressing and managing the safety and mobility impacts of work zones.
- (b) Work zone assessment and management procedures. States should develop and implement systematic procedures to assess work zone impacts in project development, and to manage safety and mobility during project implementation. The scope of these procedures shall be based on the project characteristics.
- (c) Work zone data. States shall use field observations, available work zone crash data, and operational information to manage work zone impacts for specific projects during implementation. States shall continually pursue improvement of work zone safety and mobility by analyzing work zone crash and operational data from multiple projects to improve State processes and procedures. States should maintain elements of the data and information resources that are necessary to support these activities.
- (d) Training. States shall require that personnel involved in the development, design, implementation, operation, inspection, and enforcement of work zone related transportation management and traffic control be trained, appropriate to the job decisions each individual is required to make. States shall require periodic training updates that reflect changing industry practices and State processes and procedures.
- (e) Process review. In order to assess the effectiveness of work zone safety and mobility procedures, the States shall perform a process review at least every two years. This review may include the evaluation of work zone data at the State level, and/or review of randomly selected projects throughout their jurisdictions. Appropriate personnel who represent the project development stages and the different offices within the State, and the FHWA should participate in this review. Other non-State stakeholders may also be included in this review, as appropriate. The results of the review are intended to lead to improvements in work zone processes and procedures, data and information resources, and

training programs so as to enhance efforts to address safety and mobility on current and future projects.

Sec. 630.1010 Significant projects.

- (a) A significant project is one that, alone or in combination with other concurrent projects nearby is anticipated to cause sustained work zone impacts (as defined in Sec. 630.1004) that are greater than what is considered tolerable based on State policy and/or engineering judgment.
- (b) The applicability of the provisions in Sec. Sec. 630.1012(b)(2) and 630.1012(b)(3) is dependent upon whether a project is determined to be significant. The State shall identify upcoming projects that are expected to be significant. This identification of significant projects should be done as early as possible in the project delivery and development process, and in cooperation with the FHWA. The State's work zone policy provisions, the project's characteristics, and the magnitude and extent of the anticipated work zone impacts should be considered when determining if a project is significant or not.
- (c) All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects.
- (d) For an Interstate system project or categories of Interstate system projects that are classified as significant through the application of the provisions in Sec. 630.1010(c), but in the judgment of the State they do not cause sustained work zone impacts, the State may request from the FHWA, an exception to Sec. Sec. 630.1012(b)(2) and 630.1012(b)(3). Exceptions to these provisions may be granted by the FHWA based on the State's ability to show that the specific Interstate system project or categories of Interstate system projects do not have sustained work zone impacts.

Sec. 630.1012 Project-level procedures.

- (a) This section provides guidance and establishes procedures for States to manage the work zone impacts of individual projects.
- (b) Transportation Management Plan (TMP). A TMP consists of strategies to manage the work zone impacts of a project. Its scope, content, and degree of detail may vary based upon the State's work zone policy, and the State's understanding of the expected work zone impacts of the project. For significant projects (as defined in Sec. 630.1010), the State shall develop a TMP that consists of a Temporary Traffic Control (TTC) plan and addresses both Transportation Operations (TO) and Public Information (PI) components. For individual projects or classes of projects that the State determines to have less than significant work zone impacts, the TMP may consist only of a TTC plan. States are encouraged to consider TO and PI issues for all projects.

- 1) A TTC plan describes TTC measures to be used for facilitating road users through a work zone or an incident area. The TTC plan plays a vital role in providing continuity of reasonably safe and efficient road user flow and highway worker safety when a work zone, incident, or other event temporarily disrupts normal road user flow. The TTC plan shall be consistent with the provisions under Part 6 of the MUTCD and with the work zone hardware recommendations in Chapter 9 of the American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide. Chapter 9 of the AASHTO Roadside Design Guide: ``Traffic Barriers, Traffic Control Devices, and Other Safety Features for Work Zones'' 2002, is incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51 and is on file at the National Archives and Record Administration (NARA). For information on the availability of this material at NARA call (202) 741-6030, or go to www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

The entire document is available for purchase from the American Association of State Highway and Transportation Officials (AASHTO), 444 North Capitol Street, NW., Suite 249, Washington, DC 20001 or at the URL:

www.aashto.org/bookstore. It is available for inspection from the FHWA Washington Headquarters and all Division Offices as listed in 49 CFR Part 7. In developing and implementing the TTC plan, pre-existing roadside safety hardware shall be maintained at an equivalent or better level than existed prior to project implementation. The scope of the TTC plan is determined by the project characteristics, and the traffic safety and control requirements identified by the State for that project. The TTC plan shall either be a reference to specific TTC elements in the MUTCD, approved standard TTC plans, State transportation department TTC manual, or be designed specifically for the project.

- 2) The TO component of the TMP shall include the identification of strategies that will be used to mitigate impacts of the work zone on the operation and management of the transportation system within the work zone impact area. Typical TO strategies may include, but are not limited to, demand management, corridor/network management, safety management and enforcement, and work zone traffic management. The scope of the TO component should be determined by the project characteristics, and the transportation operations and safety strategies identified by the State.
 - (a) The PI component of the TMP shall include communications strategies that seek to inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions on the project. This may include traveler information strategies. The scope of the PI component should be determined by the project characteristics and the public information and outreach strategies identified by the State. Public information should be provided through methods best suited for the project, and may include, but not

be limited to, information on the project characteristics, expected impacts, closure details, and commuter alternatives.

- (b) States should develop and implement the TMP in sustained consultation with stakeholders (e.g., other transportation agencies, railroad agencies/operators, transit providers, freight movers, utility suppliers, police, fire, emergency medical services, schools, business communities, and regional transportation management centers).
- (c) The Plans, Specifications, and Estimates (PS&Es) shall include either a TMP or provisions for contractors to develop a TMP at the most appropriate project phase as applicable to the State's chosen contracting methodology for the project. A contractor developed TMP shall be subject to the approval of the State, and shall not be implemented before it is approved by the State.
- (d) The PS&Es shall include appropriate pay item provisions for implementing the TMP, either through method or performance based specifications.
 - 1) For method-based specifications individual pay items, lump sum payment, or a combination thereof may be used.
 - 2) For performance based specifications, applicable performance criteria and standards may be used (e.g., safety performance criteria such as number of crashes within the work zone; mobility performance criteria such as travel time through the work zone, delay, queue length, traffic volume; incident response and clearance criteria; work duration criteria).
- (e) Responsible persons. The State and the contractor shall each designate a trained person, as specified in Sec. 630.1008(d), at the project level who has the primary responsibility and sufficient authority for implementing the TMP and other safety and mobility aspects of the project.

Sec. 630.1014 Implementation.

Each State shall work in partnership with the FHWA in the implementation of its policies and procedures to improve work zone safety and mobility. At a minimum, this shall involve an FHWA review of conformance of the State's policies and procedures with this regulation and reassessment of the State's implementation of its procedures at appropriate intervals. Each State is encouraged to address implementation of this regulation in its stewardship agreement with the FHWA.

Sec. 630.1016 Compliance Date.

States shall comply with all the provisions of this rule no later than October 12, 2007. For projects that are in the later stages of development at or about the compliance date, and if it is determined that the delivery of those projects would be significantly impacted as a result of this rule's provisions, States may request variances for those projects from the FHWA, on a project-by-project basis.

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APPENDIX B – WORK ZONE SELF-ASSESSMENT SUMMARIES

EMPHASIS AREA / TOPIC	Assessment Year			
Leadership and Policy				
Has the agency developed a process to determine whether a project is impact type I, II, or III?				
Has the agency established strategic goals specifically to reduce congestion and delay in work zones?				
Has the agency established strategic goals specifically to reduce crashes in work zones?				
Has the agency established measures (e.g., vehicle throughput, queue length, etc.) to track work zone congestion and delay?				
Has the agency established measures (e.g., crash rates, etc.) to track work zone crashes?				
Has the agency established a policy for the development of Transportation Management Plans to reduce congestion and crashes due to work zones?				
Has the agency established work zone performance guidance that addresses: maximum queue lengths, number of open lanes, maximum traveler delay, etc.?				
Has the agency established criteria to support the use of project execution strategies (e.g. night work and full closure) to reduce public exposure to work zones, and reduce the duration of work zones?				
Has the agency developed policies to support the use of innovative contracting strategies to reduce contract performance periods?				
Has the agency established Memoranda of Understanding (MOUs) between utility suppliers that promote the proactive coordination of long range transportation plans with long range utility plans to reduce project delays and minimize the number of work zones on the highway?				

Project Planning and Programming				
Does the agency's planning process actively use analytical traffic modeling programs to determine the impact of future type I & II road construction and maintenance activities on network performance?				
Does the agency's planning process include developing alternative network options (e.g., frontage roads, increased capacity on parallel arterials, beltways, strategically placed connectors, etc.) to maintain projected traffic volumes due to future road construction and maintenance activities?				
Does the agency's planning process manage the transportation improvement program to eliminate future network congestion due to poorly prioritized and uncoordinated execution of projects?				
Does the agency's transportation planning process include a planning cost estimate review for work types I, II, & III that accounts for traffic management costs, (e.g., incident management, public information campaigns, positive separation elements, uniformed law enforcement, intelligent transportation systems (ITS), etc)?				
Does the agency's transportation planning process include active involvement from the planners during the project design stage to assist in the development of congestion mitigation strategies for type I & II projects?				
Does the agency's transportation planning process engage the planners as part of a multidisciplinary/multi-agency team in the development of Transportation Management Plans involving major corridor improvements?				
Project Design				
During project design does the agency have a process to estimate and use road user costs to evaluate and select, based on road user costs, project strategies, (e.g., full closure, night work traffic management alternatives, detours, etc.) for work type I & II projects?				
During the project design does the agency develop a Transportation Management Plan that addresses all operational impacts specifically focused on project congestion for work type I & II projects?				
During project design, does the agency use multidisciplinary teams consisting of agency staff to develop Transportation Management Plans for type I & II projects?				

During project design, does the agency perform constructability reviews that include project strategies that are intended to reduce congestion and traveler delays during construction and maintenance activities for type I & II projects?				
During project design, does the agency use independent contractors or contractor associations to provide construction process input to expedite project contract time for type I & II projects?				
During project design, does the agency use time and performance based scheduling techniques such as Critical Path Method or parametric models to determine contract performance times for work type I & II projects?				
During project design, does the agency have a process to evaluate the appropriate use of Intelligent Transportation System (ITS) technologies to minimize congestion in and around work zones for type I, II, & III projects?				
During project design, does the agency have a process to consider the use of life cycle costing in selecting materials that reduce the frequency and duration of work zones for type I, II & III projects?				
Does the agency have a process to assess projects for the use of positive separation devices for type I & II projects?				
During project design, does the agency anticipate and design projects to mitigate future congestion impacts due to repair and maintenance activities for type I, II & III projects?				
In developing the Traffic Control Plan for a project, does the agency use contractor involvement in the development of the Traffic Control Plan for type I & II projects?				
In developing the Traffic Control Plan for a project, does the agency use computer modeling to assess Traffic Control Plan impacts on traffic flow characteristics, e.g., speed, delay, capacity, etc. for type I & II projects?				
Project Construction and Operation				
Is the letting schedule altered or optimized to reflect the available resources and capabilities of the construction industry?				
Is the letting schedule altered or optimized to minimize disruptions to major traffic corridors?				

In bidding type I & II projects, does the agency include road user costs in establishing incentives or disincentives to minimize road user delay due to work zones (e.g., I/D, A+B, Lane Rental, etc.)?				
In bidding type I, II, & III contracts, does the agency use performance-based selection to eliminate contractors who consistently demonstrate their inability to complete a quality job within the contract time?				
In bidding type I & II project contracts, does the agency use incident management services (e.g., wrecker, push vehicles, service patrols, etc.)?				
In bidding contracts, does the agency use flexible starting provisions after the Notice to Proceed is issued?				
During project types I, II, & III does the agency use uniformed law enforcement?				
Does the agency provide/require training of contractor staff on the proper layout, and use of traffic control devices?				
Does the agency provide training to uniformed law enforcement personnel on work zone devices and layouts?				

Communication and Education

Does the agency maintain and update a work zone website providing timely and relevant traveler impact information for project types I, II & III that allows travelers to effectively make travel plans?				
Does the agency sponsor National Work Zone Awareness week?				
Does the agency assume a proactive role in work zone educational efforts?				
During type I, II, & III project construction does the agency use a public information plan that provides for specific and timely project information to the traveling public through a variety of outreach techniques, (e.g., agency website, newsletters, public				

meetings, radio, and other media outlets)?				
During type I, II, & III projects, does the agency use intelligent transportation system (ITS) technologies to collect and disseminate information to motorists and agency personnel on work zone conditions?				
Program Evaluation				
Does the agency collect data to track work zone congestion and delay in accord with agency established work zone congestion and delay measures?				
Does the agency collect data to track work zone safety performance in accord with agency work zone crash measures?				
Does the agency conduct customer surveys to evaluate work zone traffic management practices and policies on a statewide/area-wide basis?				
Does agency develop strategies to improve work zone performance based on work zone performance data and customer surveys?				

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