accelerating project delivery

It's about time

American Association of State Highway and Transportation Officials

I-494, Minnesota. Photo by David R. Gonzalez

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Top: I-95/495, Virginia.
Photo by Trevor Wrayton
Bottom: I-25, Colorado.

foreword

Our job as state transportation leaders is to maintain and enhance the transportation system Americans use every day. The world we live in and the demands we face are changing very rapidly. There are areas experiencing large population growth. The North American Free Trade Agreement (NAFTA) and the expansion of global commerce have greatly increased freight transport, with more demands to come. Our highways and bridges are aging and have to be rebuilt, often while people are still using them.

All of these changes demand a much quicker means of putting highway improvements into place. I believe it's time we started to consider people's time as the paramount element in the way we plan and deliver a transportation project. Typically, a highway project takes five to seven years. We don't live in that kind of world. We have to speed up the process to get in and out in one to three years.

It's a challenge. We have to look at hard engineering and ask ourselves how do we do things—build things—so that we have the absolute minimum effect on traffic. We have to consider costs, but if we only consider the cost of construction, we're making a mistake. We have to also consider the costs of the total effects on our communities. If you include those costs, then it changes the entire equation.

We have to challenge our fellow agencies to work with us to speed up their reviews and involvement. Because the quicker you get in and out, the less impact you have on a natural environment.

We have to challenge our contractors to use all their creativity to deliver their work both faster and at the same quality standards we require.

This report highlights some of the accelerated construction techniques states are using right now. They may not work in every aspect of a job, but they will work in many. In the end, they may not always be less costly. But if the project is finished quicker, that's what citizens want more than anything. And that's who we're here to serve. It's about time.

Jack Lettiere
President, AASHTO
Commissioner,
New Jersey Department of Transportation

I-40, Oklahoma. Photo by Russell Perkins

preface

Accelerating the delivery of transportation projects has become a high priority for state departments of transportation for many reasons—to reduce traffic disruptions for customers, to stretch limited resources, and to speed safety improvements for the traveling public.

States are using a wide range of approaches beginning with advanced planning, coordination of environmental reviews with resource agencies and early consultation with community groups. Many of those advances have been highlighted in earlier publications including: *Environmental Successes in Transportation Project Development, Best Practices in Environmental Stewardship Competition; Smart Moves: Transportation Strategies for Smart Growth*; and other reports, all of which are available from AASHTO at **www.transportation.org**.

The focus of this report is largely on the post-planning stage of project development and construction, addressing areas such as innovative contracting, new technology and products, and tapping the creative abilities of state DOTs to move projects faster, safer and better.

The information here and many additional examples were provided by the men and women of our member departments who are daily finding new ways to deliver the transportation improvements on which our nation depends. We thank them for their contributions and congratulate them for their ingenuity, dedication and enthusiasm.

John Horsley,
AASHTO Executive Director

Left to Right: I-40, New Mexico. Photo by Marti Niman
I-40, New Mexico. Photo by Stefan Kosicki
Alder Creek beam installation, Oregon.

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Center and Right: Coast Fork bridge replacement project, Oregon.
I-25, New Mexico. Photo by Marti Niman

All photos: Bridge replacement project, New Jersey

"A highway project typically takes five to seven years. We don't live in that kind of world. We have to speed up the process to get in and out in one to three years."

— ***Jack Lettiere***
Commissioner, New Jersey Department of Transportation
President, American Association of State Highway and Transportation Officials

introduction

accelerating project delivery: it's about time

Freedom of movement is so essential to Americans that any restriction on it—even temporarily—causes consternation. As our population increases and our desire to travel multiplies, renewing our highways while keeping travelers moving is more and more a challenge.

As Missouri's Director of Transportation Pete Rahn says, "The traveling public, our customers, do not understand why it takes us five to seven years to develop a project and four to five years to construct it. Twelve years from the time that we identify a need is really an unacceptable answer to our customers. So we must find ways to reduce the time it takes for us to clear a project, design it, and construct it."

He adds, "The bottom line is that our customers are not going to wait a decade to see the benefits of increasing resources coming to the department of transportation.

"So we have got to find ways to deliver our projects faster."

The nation's state transportation departments are rising to the challenge.

This report examines the innovative approaches that state transportation agencies are adopting to speed project delivery. Some states have created new processes, such as New Jersey's HyperBuild and Indiana's Hyperfix, to accelerate project delivery, while others are using advanced technology and innovative contracting to step up the pace. The result is that the roadwork is less "in the way," letting citizens continue on their way.

Moving to a New Way

It has been decades since building a new road was as direct as clearing trees and rocks, grading, laying in a roadbed and paving it. Today, routes must be acceptable to the public, and the environmental, social, and economic impacts must be weighed. Permits must be obtained, and right-of-way acquired. Houses, businesses, and utilities may need to be relocated. Funding is crucial—not just *some* money—but enough to bring the project to completion, and to meet tests for fiscal constraints.

Even during reconstruction of an existing road, thousands of details require attention. Work zones must allow safe, efficient work; traffic may have to be diverted. Construction materials may not show up on schedule. Rain can postpone work for days while the ground dries out. Concrete needs time to cure.

But all of us have heard of extraordinarily speedy reconstructions—in response to weather incidents and truck or train accidents that destroy bridges, for example. Many DOTs have reopened key corridors—first with temporary construction, later with rapid, permanent structure—with amazing speed.

For example, last summer a bridge along Route 70 in New Jersey that carried 70,000 cars a day was washed out by

a 12-inch rainfall. Without disrupting traffic patterns, the New Jersey Department of Transportation shipped prefabricated materials to build a new bridge at exactly the same spot, quickly and inexpensively. Indeed, that project was the impetus for the state's new "HyperBuild" process.

The success of the bridge on Route 70 led Lettiere to set a new benchmark; "Make the extraordinary ordinary." And in state after state, transportation leaders are arriving at the same conclusion.

"What we've learned is that in emergency situations in transportation, not only in New Jersey but all over the country, we're able to do extraordinary things in a very, very short period of time," Lettiere says. "We eliminated those things that really weren't necessary" while maintaining good community relations and environmental protection.

Lettiere feels state DOTs must re-examine traditional approaches to cost estimates, designs and planning—typically the most time-consuming elements in road-project development, Lettiere says.

"Think creatively," he says. "And be prepared to take the risk."

In a fast-paced nation, where value is increasingly measured in hours as well as dollars, it is, literally, about time.

I-20 – STACK, Mississippi. Photo by Edward Robinson

smoother, safer, sooner …

faster! faster! faster!

Missouri Department of Transportation Director Pete Rahn says the need to deliver quality work as expeditiously as possible comes from a basic concept of good customer service.

"I'm told by staff here that my three favorite words are 'faster,' 'faster,' 'faster.' The traveling public—our customers—do not understand why it takes us five to seven years to develop a project, and then four to five years to construct it. Twelve years from the time that we identify a need is really an unacceptable answer to our customers, and so we must find ways to reduce the time that it takes for us to clear a project, to design it, and to construct it … our customers are not going to be happy until they can actually see that we are responding to that desire.

"We have undertaken a 'smooth roads' initiative in which we are prioritizing 2,200 miles of roads in Missouri that carry 60 percent of the state's traffic. Those 2,200 miles are going to be totally rehabilitated over the next 36 months, and our desire is to deliver a 'Wow!' to the citizens of Missouri when they can correlate providing additional resources to Missouri DOT and then seeing—on the road—the improvements that those resources have provided.

"'Smoother, safer, sooner' is the slogan that we have attached to all projects that are being undertaken as a part of a package, in which the citizens of Missouri are providing us $2 billion dollars in additional revenues to fix their highways. The challenge for MoDot is to reduce the development and construction time on these projects by half, and we believe that is the way that our customers are going to be able to see a difference in the performance of our organization.

"We're using a number of technologies to address accelerated project delivery … and we believe that there are more out there … there are different iterations and blendings of these technologies, and we are very confident that with emphasis placed on delivering projects faster that we can deliver what our customers expect.

"We as DOTs, I believe, have got to put an extraordinary amount of effort into minimizing the inconvenience that we are imposing upon our customers as we try to deliver this improved system.

"The Nemo Bridge over the Pomme de Terre Lake is an example. Using pre-formed deck panels and accelerated contracting methods, we were able to ensure that there was no work occurring during the daytime hours when the bridge was most heavily used; and that whatever work we undertook at night was completed so that the bridge was fully operable during the day.

"What we call 'practical design' is to use engineers' talents and knowledge and focus them directly on every single project, to ensure that we do not have a feature within our project that is not required of that particular project and terrain. Generic national standards can tend to increase the cost of projects through the application of standards that might not apply to the particular region or project that's being constructed, so we have to get away from 'cookbook' solutions and use the knowledge and talents of our engineers to ensure that we are getting the maximum value out of every dollar."

"There are two main reasons to accelerate projects: first, to address our needs now—our growth is so overwhelming that we have to step up the pace to keep from getting further and further behind. The second reason is purely economic—as materials costs, and the costs associated with doing business continue to rise, it makes sense doing as much as possible with today's dollars."

— ***Harold Linnenkohl***
Commissioner, Georgia Department of Transportation

Clockwise from Bottom: I-20 – STACK, Mississippi. Photo by Edward Robinson
I-5, California. Photo by Ed Anderson
I-25, New Mexico. Photo by Marti Niman

shortening the road-building process

The first step in turning a transportation need from a concept to reality is seeing what the challenge is in a given corridor, and deciding whether a road or transit solution best meets a community's need.

If building a road is the best option, planning for it takes from six months to two years. As a new component of a regional and state highway system, the route must fit into regional plans aimed at balancing economic and life-quality needs. State and local officials hold public hearings, gauge public reaction, identify credible funding sources and then approve or disapprove the proposed new road.

With an approval in hand, state officials can begin work on a detailed road design, which normally takes from 15 months to two years. State officials determine how many lanes can accommodate likely traffic, analyze data to select a likely route, and draw up a preliminary design, which also typically goes to public hearings. Later, the formal design for the highway is completed, with such details as interchanges and choice of construction materials.

The three leading causes of delay in the road-building process are environmental review, right-of-way acquisition and utility relocation, according to a 2002 survey of 20 state transportation departments by AASHTO's Standing Committee on Quality and the Federal Highway Administration. The report is available online at

http://downloads.transportation.org/Quality-FinalReport_Partnering.pdf

Environmental Review

Major road projects are subject to review under the National Environmental Policy Act (NEPA). That law requires an examination of all possible alternatives, including not building the road, with an eye to preservation of air quality, low noise levels, architecture and wildlife. NEPA review typically takes nine to 36 months.

If environmental impact is low, state officials are handed a "finding of no significant impact," or FONSI, the go-ahead to begin design, acquire right-of-way, and move on to construction.

In the past, many reviews, both local and federal, have been done one after another instead of simultaneously. In some cases, the law required the sequential action. But in recent years, state transportation departments have sought and won the right to have the reviews done simultaneously, and that has saved significant time. Environmental streamlining which involves getting environmental regulatory agencies engaged in the process earlier and more often has had very positive results.

The expression, "time is money" is especially true for designing and constructing transportation projects. The greatest factor in reducing cost for projects is reducing the delivery time.

According to a 2003 AASHTO Report, *Strategies for Reducing Project Time and Cost*, the environmental process, utility relocations process, and right-of-way acquisitions are the three of the most critical causes of project delay in both the design and construction phases of a project. As many state DOTs search to reduce project delivery time and cost, some progress has been made.

Environmental Process

The streamlining of the environmental review process including issuance of environmental permits is perhaps the singular area that has helped states accelerate project delivery in recent years. Among the examples of streamlining are the following state programs.

New Jersey DOT's Attitude on Environmental Stewardship Is Key to Success—NJDOT has recently stepped up efforts to enhance relationships between NJDOT and the resource agencies. In the past, NJDOT staff believed that their job was to build highways and obtain permits. Today, NJDOT environmental employees operate with the mindset that their job is to be stewards of the environment and be responsible for protecting the environment. As a result, relations with the resource agencies have improved significantly.

Maryland's Streamlined Environmental and Regulatory Process—The Maryland State Highway Administration (MDSHA) has incorporated the streamlining provisions of TEA-21 into its environmental process. By modifying its process, the agency ensures concurrences are obtained by the specific due date, and issues are not revisited unless there is substantive new information that warrants a reevaluation.

Kentucky's Checklists Process—To reduce the cycle time for environmental processes, the Kentucky Transportation Cabinet (KYTC), in concert with FHWA, has initiated a method of using Guidance and Accountability Forms (GAF) for key environmental processes. The GAF is basically a checklist that contains what is expected and references to identify the level of effort expected. Also, it is designed to coordinate key stakeholders of the process, which includes accountability for quality features.

Many state DOTs have established partnering or memorandum of understanding (MOU) agreements with their resource agencies to foster cooperation, establish timeframes for review period, and obtain commitment by top management.

To address resource agencies' staffing shortages, some state DOTs fund positions at the federal or state resource agencies to focus on the review and approval of state DOT projects.

Florida and North Carolina, for example, signed agreements with local, state, and federal agencies to conduct simultaneous environmental reviews. More roads in those states are now being completed on-time and under budget.

Right-of-Way Acquisition

Many states have found that acquiring right-of-way to build or expand a roadway is a major cause of delay in moving projects forward. In cases where homes or businesses must be relocated, it takes from one to two years to get right-of-way purchases made once negotiating has begun.

Methods that have helped speed up that portion of the process include:

- Offering "signing bonuses" that offer a set percentage increase to a landowner if he or she is willing to release the property or relocate within a specified time;
- Raising the nominal dollar thresholds for low-cost parcels, which lets appraisers or negotiators make an attractive offer to property owners on the spot. That takes many of the transactions out of the formal bargaining process, cutting time. Some states report that more than 80 percent of their parcels are now being acquired in this fashion.
- Allowing above-fair-market offers, where several states let their right-of-way negotiators make offers above fair market value, noting that real costs of the acquisition may also include the avoidable costs of the condemnation process or the avoidable costs of project delays.
- Letting the landowner select the appraiser from an approved list, building the sense of trust the landowner has that he or she is getting a fair deal, and thereby reducing the number of parcels that must go through the condemnation process.

For example, the South Dakota Department of Transportation (SD DOT) plans to work with local governments to purchase rights-of-way for roads to be built 15–20 years hence. These are roads that local governments already have identified in land-use plans for rapidly developing communities.

1-70 and I-35 Kansas City, Missouri. Photo by Cathy Morrison

"The birth of HyperBuild occurred after we had a washout of a bridge on I-70 after Hurricane Ivan. We had to get a bridge back in place, it was a major shore thoroughfare. And we literally got a temporary structure there within three days, and a complete replacement in 110 days. From that we got together and said, if we could do that once, why can't we do this time and time again."

— *Jack Lettiere*
Commissioner, New Jersey Department of Transportation

Left to Right: Context-sensitive design, New Jersey. Alder Creek beam installation, Oregon.

unleashing creative minds through new approaches

Responding to the need to accelerate project delivery, some states have re-engineered their entire approach to tap creativity and then use new techniques through many projects.

New Jersey's HyperBuild

The New Jersey DOT created a concept known as "HyperBuild" to upgrade the value placed on people's time as a factor in its transportation projects.

"HyperBuild is a philosophy, it's not a series of steps," Lettiere explains. "It's a change in a mindset in our engineering and administrative staff to look at every project, from concept to construction, to find out the most innovative, cost-cutting, and efficient ways to produce this project. Not only, how quickly can we design it, but are there new construction methods, are there new products. Now every project is being evaluated like that. We started out with 15, now they are too numerous to mention, we have five or six dozen of them."

HyperBuild places value not only on the time and cost of the projects now being approached that way, but also incorporates designs drawn up to minimize the impact on the surrounding community.

As one example, the department is building a $300 million interchange in the southern part of the state, between Interstates 276 and 695. To minimize traffic disruptions, the agency is considering building the interchange below the road surface, which allows traffic to continue with little disruption on the existing roadways.

Another pending project is the replacement of the aging Route 52 causeway connecting Somers Point to Ocean City. New Jersey DOT plans to replace the deck and superstructure of the causeway, heavily used by beachgoers, by 2009. Under traditional practices, the work would have taken until 2013.

Methods likely to be used to save those years of time include rolling or swinging prefabricated bridge spans into place instead of building each span on-site. An added public-safety benefit is shorter duration of the work zones that would be necessary rebuilding the causeway without the prefab elements.

When HyperBuild was launched, there was concern that speeding up the work would give short shrift to the environment, says Jack Lettiere, Commissioner of the New Jersey DOT and current President of AASHTO. But having resource agencies in from the beginning has hastened projects, and resulted in less disturbance to the natural environment.

HyperBuild integrates innovative contracting, accelerated construction and the community-inclusive input known as "context-sensitive design" into a finished road or bridge. Under the initiative, all projects in the state's construction priority list are gone over in a search for innovative, cost-cutting approaches, timesaving design and construction

methods, and non-traditional contracting that can lead to saving both time and money.

North Carolina's Team of 30

Building upon its experience with design-build, North Carolina's Department of Transportation (NCDOT) has reorganized to create an Alternative Delivery Unit, State Highway Administrator Len Sanderson explains, to handle design-build, value engineering, and alternative contracting methods. "That unit's responsibility is to be sure we pick the right project and use the right technique. The second things are to identify lessons learned and make sure we use those lessons on other projects in our organization," he said.

Photos on both pages courtesy of the North Carolina Department of Transportation.

The 30-member team examines each pending or current state road project to see if these methods can be applied. Last year, the group submitted nine road projects valued at about $700 million for construction using the nationally successful "design-build" approach.

The team has even tried design-build for emergency work. When a stretch of Interstate 40 was washed out, NCDOT used design-build in making on-site wall repairs. The department hired a local contractor and allowed him to sign on a specialty subcontractor, who could assist with major wall construction.

NCDOT also is using prefabricated materials for emergency repairs on bridges and roads, and letting incentive/disincentive contracts that factor in construction time, road-closure time and total construction cost.

California's "Project-Acceleration Toolbox"

Similarly, the California Department of Transportation (Caltrans) has set up a "project-acceleration toolbox" that lists the steps Caltrans has taken to speed up the road-building process. They include using a single agent to negotiate rights-of-way with property owners instead of the three agents previously required.

Caltrans also now uses a single agreement rather than several when collaborating with a local government on road building; employs geographic information systems technology to create an "apples-to-apples" comparison of plans and maps with those already developed by environmental agencies, and uses multifunctional teams of designers, planners, and engineers to take charge of a project from inception to construction. California also has

a program database where taxpayers can track each project's status under state and federal programs.

This project-tracking transparency has also been embraced with zeal in Virginia, which titles its web-based system "Dashboard."

Virginia's Dashboard Project Monitoring System

One incentive to getting a job done on time is knowing that someone's watching.

In Virginia, the state Department of Transportation has won kudos from citizens, transportation professionals and even a few editorial writers with its Dashboard web site, which lets its taxpayers—or anyone else, for that matter—track the actual progress it is making on its road projects against initial projections. The site, recently updated to broaden the categories people can check on, is on the internet at http://www.virginiadot.org .

The creation of Dashboard was coincident with a project oversight improvement initiative in the state that pushed VDOT's on-time performance in construction in four years from 20 percent of projects in 2001 to 75 percent in fiscal year 2005. The agency's project completion within budget also improved significantly.

"By a click of a button on the internet, you can find out how the Virginia Department of Transportation is spending tax dollars on building, maintaining, and operating 57,000 miles of roads and bridges across the state," the *Clarke* (Virginia) *Times-Courier* stated.

"Since March 2003, you could access the online Dashboard, which instantly shows the status of VDOT's construction projects. Now, the Dashboard expands six fold by showing the latest performance of all other core business areas."

Work-Zone Management—or Elimination

Roadway work zones can cause delay or flow disruption when traffic must be rerouted through a work zone. In addition, work zones increase the risk of crashes and fatalities because they require both drivers and workers to adapt to circumstances not normally found on the road. Failure to adapt to shifting lanes, changing vehicle speeds or intermittent halts in traffic were among the factors that caused 1,028 work-zone traffic deaths in 2003—and four-fifths of those killed were drivers and passengers.

Significant roadwork is now done at night, when roads tend to be less crowded with traffic, and that helps minimize traffic slowdowns for motorists.

"Yes, we use night work and a lot of it, so we don't intrude on the motoring public during working hours," Lettiere says.

State transportation departments, working in concert with AASHTO and the Federal Highway Administration, have invested untold hours of research and information-sharing in an effort to design work zones that minimize the danger factor.

Several states have reduced the risks in work zones to zero by taking the movement of traffic through a work area completely out of the picture—and closing the road entirely during work.

Although that approach requires painstaking planning prior to the closure, including coordination with the freight industry, major public-relations efforts to notify motorists for a significant distance in all directions of the closure, it has proven its value on Interstate 65 in Kentucky and in the reconstruction of a major arterial in Washington, DC.

I-494, Minnesota. Photo by David R. Gonzalez

Top Right: I-40, Oklahoma. Photo by Russell Perkins. Top Left and Bottom: Bridge replacement in Oregon.

reaping rewards of advanced technology

Prefabricated Bridges

Because the loss of a bridge may result in difficult detours to an alternate crossing, the acceleration of bridge repair or replacement has become a high priority for both states and motorists nationwide.

Prefabricated structural elements are one of the techniques that have sped the reconstruction of numerous bridges in the United States in recent years.

Probably the most widely known example in recent years was the speedy reconstruction of the Interstate 40 Bridge at Webbers Falls, Oklahoma, which was destroyed when a barge, plying the Arkansas River below, went significantly off-course and collapsed four supports, well out of the shipping lane area. The bridge was closed 59 days, and the work was done in about half the time previously considered the minimum, using prefab materials and an array of time-saving contracting techniques.

Because the bridge was on an interstate highway, and re-routing traffic resulted in a detour of 57 miles eastbound and 12 miles westbound, it was imperative that reconstruction be as speedy as possible. Motorists several states away had to be warned away from the reconstruction zone.

The Oklahoma Department of Transportation set up interviews with four consulting firms even before Oklahoma's state police completed rescue and recovery work at the site. The interview and selection process took two days. A cost-plus contract was signed, based on an hourly rate rather than a lump sum, and a work order was ready

I-40, Oklahoma. Photo by Russell Perkins

three days after the accident—and two days before Oklahoma DOT even took control of the site.

Work began immediately, with the Federal Highway Administration on-site. Design contractors brought in their completed plans in 12 days—they had promised them within 16 days. Then ODOT's Office of Engineering sorted out bonding requirements and two weeks after the bridge outage, held an on-site, pre-bid meeting, requiring all interested bidders to attend. The maximum acceptable bid would complete the work in 65 days, or 1,553 hours, using a modified design-build process with contract incentives and disincentives.

Bids were opened June 12 at 11 a.m. The state transportation commission met in special session and made the award by 2 p.m.

The contractor brought in equipment from three other states to get the job underway. ODOT sent 12 engineers to live on-site to supervise the work. Portions of the reconstruction material were delivered to the site prefabricated, while cutting-edge equipment was used to measure the cure rate of concrete, again saving time.

When all was said and done, the bridge opened to traffic a full 10 days ahead of the main contractor's schedule, earning more than $1.5 million in bonus incentives. The bridge closure cost to the public had been $430,000 a day. Ultimately, the reconstruction cost about $24 million, of which about $15 million went to demolition, cleanup, and repairing the bridge itself.

Another $12 million was spent on asphalt resurfacing, upgrades, maintenance on detour routes and safety upgrades at rail crossings made newly busy by necessary traffic detours.

Hot In-Place Recycling

Roads that need resurfacing but feature an underlayment in good condition are candidates for a process known as "hot in-place recycling," which has been used at least experimentally in 32 states and more extensively in 10.

The process is a time-saver in that it uses specialized equipment to heat and then remove between one and two inches of surface asphalt from the road to be resurfaced, and then the material is heated and processed with some non-recycled hot-mix asphalt right on the site to allow it to be reapplied to the roadbed.

Though state transportation departments have been recycling asphalt surfaces successfully for many years, hot in-place recycling saves not only time as a result of its on-site approach but also cost, because conventional recycling requires the removed asphalt to be stored and hauled prior to its reapplication.

States with more extensive experience in this technology include Arkansas, Colorado, Florida, Kansas, Maryland, New York, Ohio, Texas, Utah, and Virginia.

Geofoam

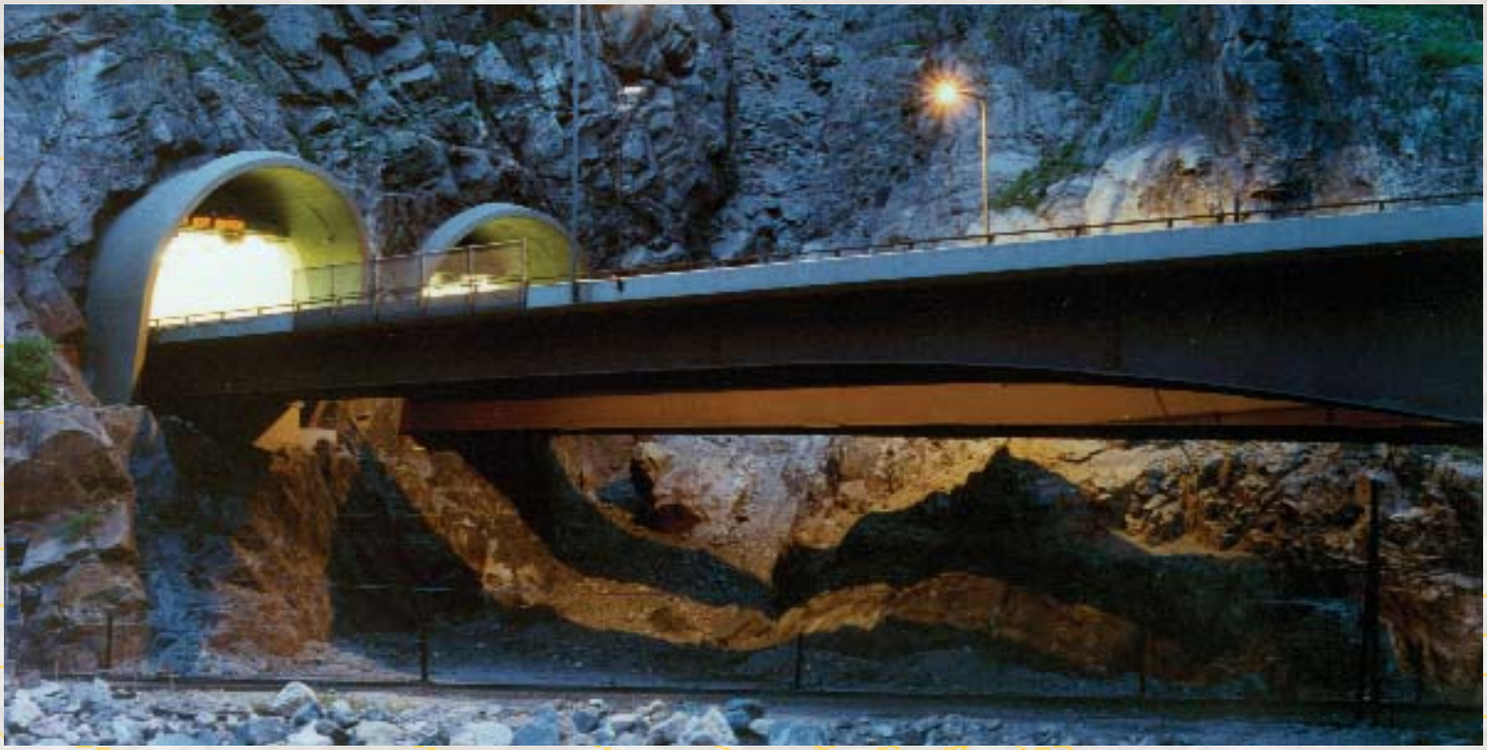
New materials are also providing engineers with high-speed options for soil stabilization.

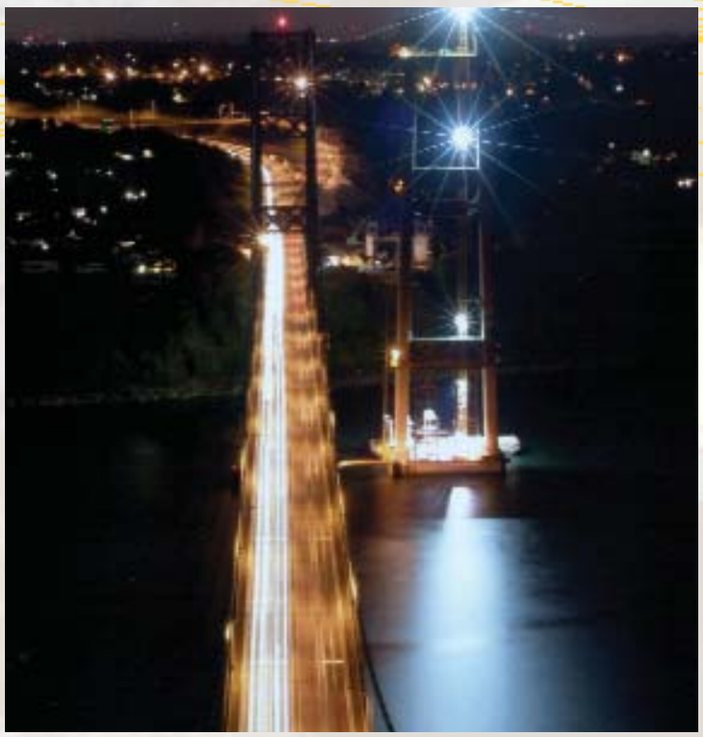
A cutting-edge material finding wide use in speedy construction or reconstruction is expanded polystyrene geofoam, which is used to shore up loose or soft soils that become the sub-base for roads carrying heavy vehicle loads.

Texas is planning to use geofoam to provide supporting material for a culvert that will pass under Interstate 10 when it is widened. One property of geofoam that makes it easy to deploy quickly and cheaply is its light weight. It does not need to be shipped on heavy trucks or moved into place using heavy equipment. Texas officials say using geofoam in place of concrete in that situation will halve both the time and cost of that part of the project.

Geofoam also was used to create embankments on two other high-profile construction projects—the reconstruction of Interstate 15 in Utah and the Central Artery/Third Harbor Tunnel project in Massachusetts (the "Big Dig"). In those projects, state oversight agencies selected geofoam to build large embankments while keeping up with tight construction schedules impossible to achieve using previous approaches.

I-40, New Mexico. Photo by Marti Niman





"There are a whole host of new technologies, and there's a brand new series of design-development tools that help us produce designs more quickly. On the construction side, there are new materials, there are new methods. Not only building in place, but also manufacture the parts and roll them into place. There are new deck materials used … the technologies exist, and companies are willing to work with us."

—Jack Lettiere

Top: I-70, Colorado. Photo by Gregg Gargan
Bottom: Tacoma Narrows Bridge, Washington. Photo by Owen Freeman

working in new ways with innovative contracting

Design-Build

Unleashing the creative collaboration of contractors can result in substantial time-savings over traditional contracting methods. One cannot over-emphasize the revolution innovative contracting has brought in the road-building industry. Innovative contracting has changed the combative nature among state agencies, engineers, and contractors to one of cooperation and innovation. State DOTs want quick turnarounds on quality roads and bridges with minimal traffic disturbance. What better way than to set up contracts in which a contractor is not only held liable for meeting the cost of construction, but also for meeting the final completion date. A contractor is spurred into action with the addition of incentive-disincentive options for finishing a project ahead of schedule. With the design-build method, contractors who take charge of a project from design to construction are free to use materials, techniques, and equipment as long as they can meet performance criteria of long-lasting quality.

Washington State Olympics Prep

The Washington State Department of Transportation (WDOT)—which has until 2010 to prepare for hosting the Olympic Winter Games to be held just across Washington's northern border in Whistler, British Columbia—is employing the design-build techniques Utah pioneered to add high-occupancy-vehicle lanes to a 5-1/2 mile stretch of Interstate 5 in Everett, north of Seattle.

Until a year ago, the project's target was a 2012 opening, but now it will be ready for traffic by 2007, said Patrick McCormick, WDOT's chief engineer for the Everett HOV-design project. Fast-tracking is being helped by adequate funding. In recognition of the international exposure the Olympic Games bring, the Washington legislature recently added a nickel to the state's gasoline tax to provide a dedicated funding source for the project.

design-build

One novel process traditionally used in vertical construction but rapidly becoming standard in highway construction has saved immense time and money. "Design-build" lets the construction begin before the design is 100 percent complete.

Rapidly gaining popularity among state DOTs, design-build also lets state agencies award one engineering and design contract to a single firm rather than to separate companies, saving the time and cost of holding separate bid-lettings and awards. The Utah Department of Transportation pioneered the approach in its time-sensitive, 17-mile rehabilitation and expansion of Interstate 15 through Salt Lake City. The project normally would have taken eight years, but it had to be complete in 4.5 years—in time for the 2002 Winter Olympics to be held in the area. The $1.6 billion job was completed six months early, and Utah's Winter Olympics was a success.

Since then, design-build has swept the nation as a time-conscious and cost-effective way to accelerate project delivery.

Colorado's T-REX and COSMIX

In Colorado, where Interstate 25 is the major north–south corridor connecting the cities of the Front Range, the Colorado Department of Transportation is 22 months ahead of schedule using design-build to complete "T-REX," a $1.186 billion renovation project that will incorporate new light rail along the highway corridor.

Further south along I-25, CDOT is using another variation of design-build on the renovation of the highway through burgeoning Colorado Springs. That $123 million project, dubbed "COSMIX," employs a contract with a maximum guaranteed price and provision for additional requested elements, if they arise during the design and building process.

Indiana I-70 Corridor

Indiana has taken a few of the contracting approaches and amended them to suit its needs. The state highway agency has set up a continuous design-construction interface program for projects such as the Interstate 70 corridor improvements, which required multiple construction contracts. This program brings all players, design, and construction engineers, to the table so that design time is reduced and project delivery is sped up. The Indiana Department of Transportation (InDOT) finished improvements to the I-70 corridor in downtown Indianapolis in 30 months. The task, which required relocation of two miles of environmentally sensitive creeks, two new interchanges, and construction of four miles of highway pavement, was accomplished by using a lane rental provision in the contract. In this provision, a contractor is charged a varying amount for the time a lane is kept closed for construction during peak- and off-peak rush hours.

The A-B-C's of Contracting

In North Carolina, the state transportation department uses an alternate contracting approach that features bid packages with incentives and disincentives attached. With such an approach, a price can be placed on an undesirable but controllable element, such as roadwork delay, which is measurable in dollars per day. Incentives and disincentives based on those factors and their costs are built into the bid.

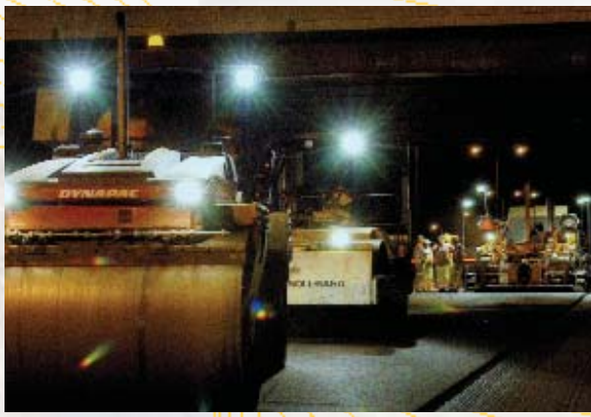
This is known as the A+B approach, where A is the cost to build the road and B is the time it takes to complete the job. North Carolina rounds out the "ABC" with a third factor—road-closure time. Oregon also has been successful in using the A+B approach to reduce construction times on several projects, notably the Medford Viaduct, which 23 calendar days were saved.

The one common factor among all innovative contracting approaches is the freedom to allow a contractor to choose the best technique and materials for the project, whether building or paving a bridge, road or ramp. State DOTs are cognizant of this vital factor and also of the need to specify performance criteria, which emphasize the quality of the end-product, not the means by which it was accomplished. Rigid performance specifications, which marked traditional contracts, are considered undesirable for innovative contracts because then a contractor is hesitant to assume risk for a design process in which there is little or no input.

AASHTO's *Primer on Contracting for the 21st Century* describes both innovative and traditional contracting and contract administration techniques that are currently being used by contracting agencies in their transportation programs and provides contacts within these agencies for use in obtaining additional information. This report was prepared and is periodically updated by the Contract Administration Task Force of the AASHTO Highway Subcommittee on Construction. It is available at http://www.transportation.org/download/ContractPrimer.pdf

I-25, Colorado. Photo by Gregg Gargan

Top: Prefabricated bridge construction in New Hampshire.
Bottom, left to right: Covered walkway, Rhode Island Department of Transportation.
I-395, Virginia. Photo by Dean Covey
I-494, Minnesota. Photo by David R. Gonzalez



adding tools to accelerate projects

AASHTO's Technology Implementation Group

As research began to bring a wider selection of cutting-edge technologies to state transportation departments, AASHTO's Board of Directors created a Technology Implementation Group (TIG) to identify and champion the wider use of certain technologies likely to bring significant benefits to the users.

The purpose of the TIG is to identify and champion the implementation or deployment of a select few "ready-to-use" technologies, products, or processes that are likely to yield significant economic or qualitative benefits. The TIG works with the Standing Committee on Research (SCOR) and the Research Advisory Committee (RAC) as well as others, to identify new technologies promising for state DOTs.

Since it's inception in 2001, TIG has identified 12 Focus Technologies, including several from the Accelerated Construction Technology Transfer program that seeks to spread the application of new processes and programs through work sessions focused on a specific project. Other technologies include:

- **Prefabricated Bridge Elements and Systems (PBE)**
  Traffic and environmental impacts are reduced, constructability is increased, and safety is improved because work is moved out of the right-of-way to a remote site, minimizing the need for lane closures, detours, and use of narrow lanes. Prefabrication of bridge elements and systems can be accomplished in a controlled environment without concern for job-site limitations, which increases quality and can lower costs.

- **ITS in Work Zones**
  The use of ITS technology in work zones, such as ramp metering systems, intrusion alarms, and queue detection information, is aimed at increasing safety for both workers and road users and ensuring a more efficient traffic flow. ITS technologies in work zones are an emerging area. These technologies provide the means to better monitor and manage traffic flow through and around work zones.

- **Air Void Analyzer (AVA)**
  The Air Void Analyzer (AVA) is a portable device that measures the entrained air void structure of fresh concrete in about 30 minutes. Test results correlate closely with ASTM C-457 values obtained on hardened concrete. The AVA can be used at the job site to make admixture adjustments that can dramatically improve the air void structure and thus the freeze-thaw durability of the concrete.

- **Global Positioning Systems (GPS)**
  GPS technology, which utilizes a constellation of satellites that transmit signals continuously, can have numerous highway applications, such as surveying pavement condition and inventorying highway assets. It offers such benefits as increased accuracy and reductions in labor, time, and costs.

- **Fiber Reinforced Polymer (FRP) Repair of Aluminum Overhead Sign Structures**
  Overhead Sign Structures (OSS) supports the signs that makes travel safer by informing the driver well before any action is required. However, these helpful structures can become a serious hazard if they are not properly maintained. This new technology is proving effective in repairs as strong as the original weld.

- **Road Safety Audits (RSA)**

  Long used internationally, Road Safety Audits are being implemented in the United States through the encouragement of the Federal Highway Administration, and the adoption of this technology by the TIG.

- **Cable Median Barrier (CMB)**

  Cable barrier is a cost-effective flexible traffic barrier that is ideally suited for use as a retrofit design in existing relatively wide and flat medians to prevent crossover crashes.

Taking the ACTT on the Road

"Accelerated construction," is not a traditional product or technology. Rather, it is an approach to highway construction employing many different techniques and technologies. Such a non-traditional product requires a non-traditional implementation plan—the Accelerated Construction Technology Transfer initiative, cosponsored by TIG and FHWA.

ACTT sponsors two-day seminars in various locations around the nation to bring local transportation officials together with a multi-disciplinary team of experts in speedy construction techniques. Together they analyze local-area projects with potential for accelerated construction.

In addition to simply building things faster, current concepts of accelerated construction imply planning and design for a highway corridor comprised of several related projects so that planning and design decisions are made in an environment that provides maximum flexibility. Also implied are the use of innovative contracting procedures and extended life for the finished project.

Concepts, ideas, and approaches must be defined if plans to implement them into highway engineering practice are to be fulfilled. The definition of accelerated construction for the purposes of implementation planning is, a process to encourage the use of innovative technologies and techniques to accelerate the construction of major highway projects with extended service lives for the purpose of reducing user delay and community disruption.

Since the program's inception in 2002, AASHTO and the FHWA have conducted more than 15 workshops in Indiana, Pennsylvania, Texas, New Jersey, Louisiana, California, Montana, Washington state, Tennessee, Minnesota, and Wyoming. In each state, the ACTT workshops have devised strategies with much success.

In California, the workshop examined the $75 million French Valley Parkway project on Interstate 15 between Temecula and Murrieta counties. The recommendations included an entire bridge span be prefabricated, addition of high-occupancy-vehicle lanes, paving the median to serve as a detour during construction, design changes to eliminate two unnecessary bridge spans, and a dedicated incident management plan.

In Louisiana, a 40-year-old bridge was in need of rehabilitation on Interstate 40. The ACTT workzone and an aggressive incident management plan with performance-based wrecker service.

Among other projects that have been the focus of ACTT workshops are:

- the $760 million Project Pegasus reconstruction of two Dallas freeways,
- replacement of the Evergreen Floating Bridge across Lake Washington in Seattle; and
- the $160 million reconstruction of I-40 in Knoxville, Tennessee.

For additional information, visit the web site at http://www.fhwa.dot.gov/construction/accelerated/

an effective partnership

"In two short years, FHWA and AASHTO's Technology Implementation Group have sponsored 15 Accelerated Construction Technology Transfer (ACTT) workshops, with more in the planning stage. Each attracts national transportation experts in specific skill sets who team up with colleagues from the host states to spotlight ways to shorten construction time, curb work-zone congestion, and better serve motorists through improved quality. The workshops literally accelerate technology transfer by bringing innovative ideas to the table in concentrated two-day sessions.

ACTT has cemented a track record of success in its workshops to date, according to participant feedback and results. Most agencies have found ways to slice construction time by 30 percent or more. Recurring recommendations have emerged recognizing solutions with application to other highway projects across the states. The new approach to highway project development and construction is taking root as a standard practice."

— ***ACTT II Report***
Federal Highway Administration

I-20 STACK, Mississippi. Photo by Glenn Smith

The Future Strategic Highway Research Program (F-SHRP)

Established in 1987, the five-year $50 million Strategic Highway Research Program was focused on targeted research with potential high payoff in improving the durability, safety, performance, and efficiency of the nation's highway system. Aimed at four primary areas, asphalt, concrete, highway operations, and pavement performance, the research generated more than 100 products with billion dollar benefits to transportation. Among the products are Superpave, high-performance concrete, preventive maintenance strategies, snow and ice control advances, and many more. Equally important to the research was the effort made by the Federal Highway Administration, AASHTO and industry to quickly implement the technical advances in state DOTs.

AASHTO's state DOTs have applied the fruits of research in recent years with phenomenal success in improving long-lasting pavements, improved processes and materials, and perhaps most importantly, road-safety improvements.

This year, with the signing into law of the Safe, Accountable, Flexible, Efficient Transportation Equity Act—a Legacy for Users (SAFETEA-LU)—$205 million in federal funds will be directed over to new programs over four years to fund research into:

- Highway renewal approaches;
- Highway safety;
- Improving road congestion and operations to give motorists more reliable travel; and
- Research into how best to balance transportation capacity needs.

"States have set a high priority on funding the research that is needed to identify the cutting-edge projects and processes we need for the future. And they are committed to putting the results to work as rapidly as possible," said John Horsley, AASHTO Executive Director.

Increasing Flexibility for Contracting Innovations

Standard construction practices of decades' standing had their roots in careful engineering and, often, oversight practices meant to prevent shoddy workmanship or even fraudulent bidding. Some of the novel approaches to contracting were not only out-of-the-mainstream, but in some cases, were disallowed by existing law.

Left: I-20 STACK, Mississippi.
Photo by Glenn Smith
Center Photos: I-494, Minnesota.
Photos by David R. Gonzalez
Right: Alder Creek beam installation, Oregon.

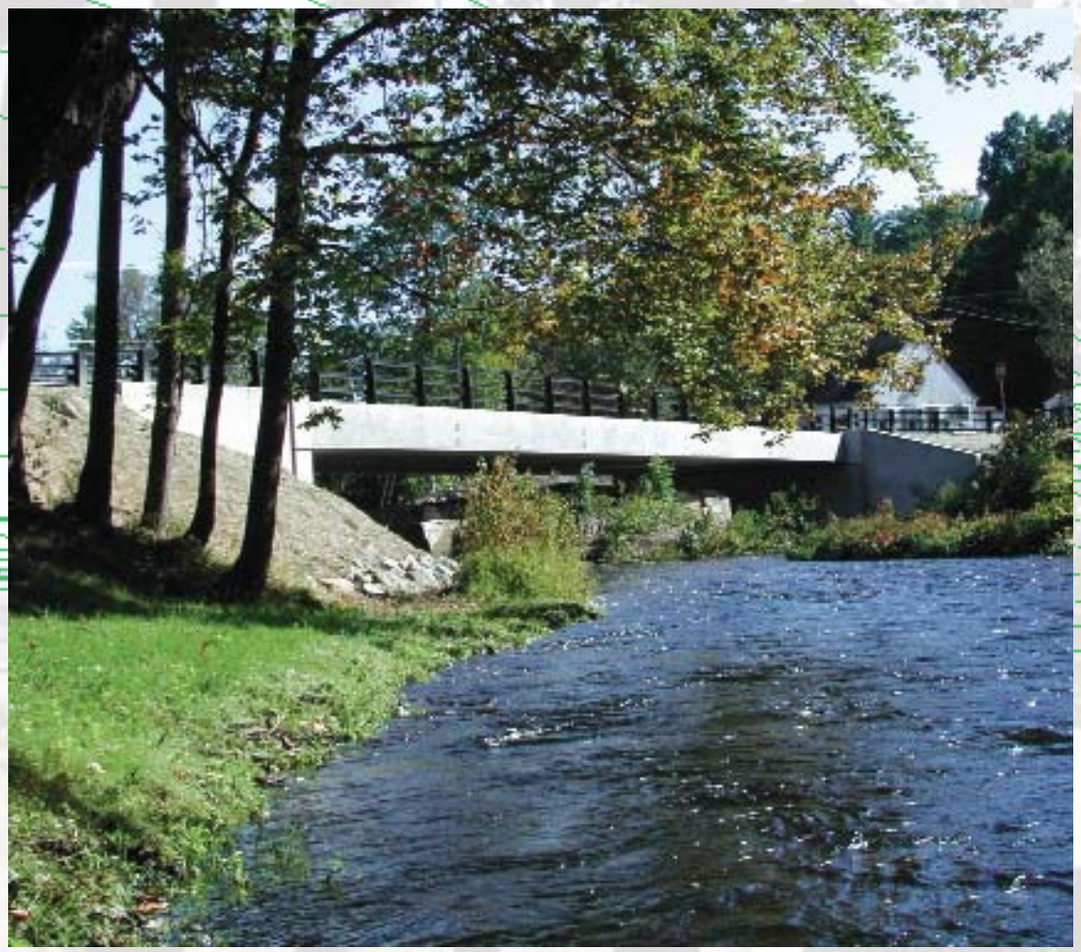
Over time, however, state transportation officials and the Federal Highway Administration recognized the time and cost constraints that traditional construction practices were imposing on cash-strapped states. In 1991, FHWA issued guidance to give states more flexibility to explore innovative contracting approaches.

Traditionally, state agencies awarded construction jobs to the lowest bidder after a design had been completed and approved. While that approach helped control cost, it failed to factor in the expense of time and was not necessarily a guarantee of quality.

A decade after FHWA first allowed more contracting flexibility, in 2001 it approved four innovative-contracting methods: design-build and cost-plus-time (A + B) bidding, both described in detail previously; and also road and bridge "warranties" that require a contractor to repair or maintain a road that fails to live up to a projected service life and "lane rental," in which a contractor is charged for the amount of time road closure inconveniences the public.

The warranty approach used in states including New Mexico, Utah, Michigan, Montana, Florida, Oregon, Pennsylvania, Utah, and West Virginia has more to do with cost and quality than with speed of project delivery. However, lane rental has been explored by several states as a project expediter:

- In Oklahoma, ODOT charged a contractor $5,000 for each day it occupied a lane while reconstructing the Interstate 35–40 interchange;
- The Colorado DOT charged $2,850 each day for a single lane occupied during construction of a Denver-area interchange ramp; and
- Maine DOT charged up to $2,000 per day for lane occupancy during overlay and bridge-deck replacement on Interstate 295 in Portland.



"Accelerating project delivery is more than simply learning how to turn dirt faster . . . Our customers are demanding we change our ways to reduce the time it takes us to get through the processes we have created and others have created for us."

— *Pete Rahn*
Director, Missouri Department of Transportation

Above: Reconstructed rural bridge in New Hampshire.
Top right: Elements of New Hampshire bridge construction.
Bottom right: I-35E, Minnesota.
Photo by David R. Gonzalez

the road ahead

The nation's highway system is aging and needs repair and replacement. States are finding that their taxpayers are willing to foot the bill for improvements, as long as they get timely and quality results. Accelerating project delivery promises both.

"It's about time," says Jack Lettiere, "that we recognize that the real cost of a project is not just what we pay out to a contractor, but also what we cost the community when we are disrupting traffic and impacting businesses."

Pete Rahn concludes, "Accelerating project delivery is more than simply learning how to turn dirt faster … Our customers are demanding we change our ways to reduce the time it takes us to get through the processes we have created and others have created for us."

AASHTO Project Delivery Activities

AASHTO and others continue to push the envelope when it comes to moving projects forward in innovative ways. The following lists just some of the activities occurring during the next year that will bring even more ideas to light for speeding up project delivery.

Developing New Processes for Delivering our Services to the Public

- AASHTO continues to share best practices related to innovative methods for delivering services, such as recent experiments with closing roadways for short periods instead of doing construction under traffic to shorten construction times.
- Utilizing outside resources to their best advantage is the focus of NCHRP Project 20-7, Task 205, Project Delivery Workforce Management Review, which is a $50,000 project that will conduct a survey and workshop in late 2005/early 2006 on workforce management.
- Developing and documenting best practices for state DOTs for program delivery in a constrained fiscal environment is the focus of NCHRP Project 20-24(31), Effective Program Delivery in a Constrained Fiscal Environment (18 months, $200,000).
- AASHTO continues to support pilot programs delegating responsibilities such as environmental reviews, consultation, decision making, or other actions, as espoused by the recent SAFETEA-LU legislation.
- The Standing Committee on Quality's Subcommittee on Project Delivery is working to establish a project delivery network to identify, communicate, and replicate project delivery best practices, as well as the establish of a communications network to link project delivery initiatives.

Identifying and Promoting Tools

- AASHTO continues to support peer review processes such as the Accelerated Construction Technology Transfer (ACTT) program, which is jointly administered by FHWA and AASHTO's Technology Implementation Group (TIG).
- AASHTO's Technology Implementation Group (TIG) is promoting market-ready products that can be installed in the field more quickly, such as prefabricated bridge elements, as well as longer lasting products, such as

longer-life pavements, which will help minimize future disruptions due to maintenance and reconstruction.

- AASHTO is working to promote innovative contracting methods through a Fall 2005 CEO workshop that is being developed through NCHRP Project 20-24/43.

Sharing Information

- AASHTO is working with FHWA, CUTC, and others on the development of a national summit on workforce education.

- The web site for AASHTO's Center for Environmental Excellence is a one-stop source of environmental information for transportation professionals, providing state DOTs with pertinent resources (e.g., contacts, linkages, programmatic documents, etc.) to effectively and efficiently incorporate environmental stewardship goals into the programmatic functioning of their state agencies

- The Center for Environmental Excellence is also developing a Programmatic Agreements Library to provide DOTs with models for forming partnerships, particularly with resource agencies, saving several DOTs significant time in delivering transportation projects

- AASHTO has actively been promoting the benefits of Environmental Management Systems (EMS) to State DOTs, including development of an EMS implementation guide and web cast training.

- AASHTO will convene a national land use and transportation workshop in late 2005 to share best practices, including teams from several states that include representatives of the state DOT and state departments of community development, county or city officials with jurisdiction over land use, developers, and citizens groups. A report on the workshop will be prepared and distributed. (NCHRP 20-24/45)

- Through NCHRP Project 20-7, Task 201, AASHTO has committed $100,000 to hold an AASHTO/AGC/ARTBA forum on the use of warranties in highway construction in late 2005/early 2006.

Showcasing Best Practices

- AASHTO recently held a Context-Sensitive Solutions Best Practices Competition, which culled best practices from around the country. AASHTO is also under contract to provide support for national efforts to institutionalize Context Sensitive Solutions through peer-to-peer technical assistance, workshops, and information sharing.

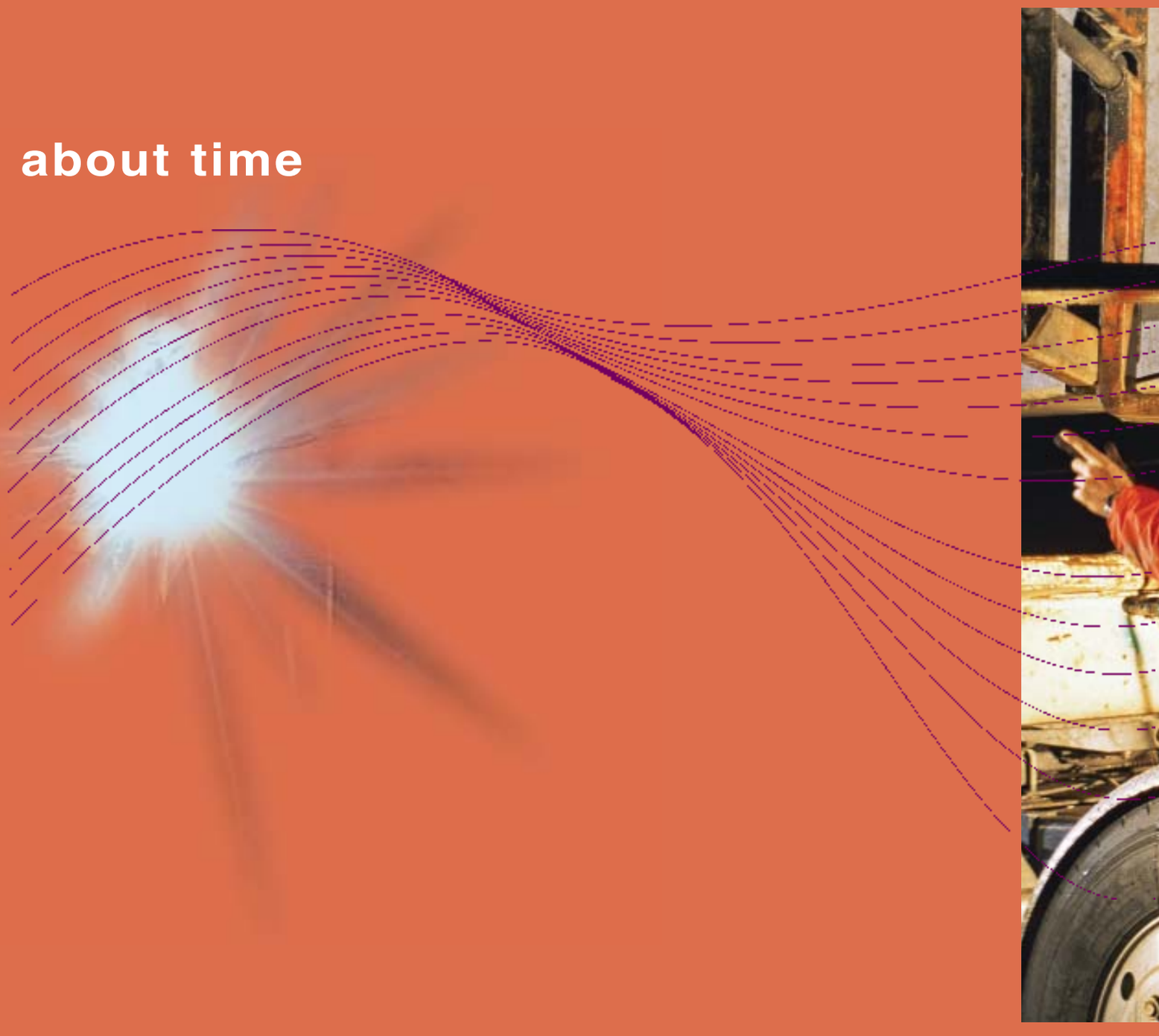
- The recently completed Compendium of Environmental Stewardship Practices in Construction and Maintenance, posted on the web site of the Center for Environmental Excellence, is a compilation of approximately 7,000 environmental practices employed by DOTs, including current research in a wide range of construction, maintenance, and organizational categories. AASHTO will assist the implementation of recommended practices contained in this compendium through web-based marketing, training, and the establishment of a web-based community of practice.

Partnering with Outside Organizations

- AASHTO continues to work cooperatively with the American Council of Engineering Companies (ACEC) to address concerns from FHWA regarding the quality of environmental documents and the speed with which they are approved. A national workshop has been held and an action plan has been developed. AASHTO has convened a National Task Force comprised of state DOT, FHWA and ACEC representatives to develop an action plan to follow through on the workshop's recommendations.

Setting of first beam, New Hampshire bridge project.

It’s about time



Alder Creek beam installation, Oregon.

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