GOVERNING
THE RESOURCE FOR STATES AND LOCALITIES

Governing Magazine
November 2007
March 2009
Circulation 85,050

Governing Magazine is a monthly local and national government publication edited for state and local government decision-makers, such as governors, legislators, mayors, city managers, council members and other elected, appointed and career officials. It has a circulation of 85,050 and a one-page ad rate of $13,550.

INFRASTRUCTURE

Unreconstructed

States are poised to spend billions on fixing infrastructure. They might want to fix the construction industry first.

By ZACH PATTON

Before dawn on April 29, the driver of a gasoline truck in Oakland, California, lost control of his rig and flipped it on an Interstate connector ramp. The tanker was carrying 8,600 gallons of fuel, and it exploded into a white-hot blaze that licked the steel underside of a roadway above it. A 168-foot section of that structure buckled and collapsed. It was an important strand in the tangle of ramps exiting off the Bay Bridge from San Francisco, known locally as the "MacArthur Maze." Caltrans, the state transportation agency, warned Bay Area drivers to expect traffic delays for months.

The crisis turned out a good bit better than that.

Caltrans offered construction companies a series of bonuses for getting repair work done fast and went on to sign a creative contract with C.C. Myers Inc. The firm offered to take the job for a base price of just $867,075. For each day it beat a state-set deadline, the company would receive an additional $200,000; for each day work went past the deadline, the firm would lose $200,000. Just 15 minutes after winning the bid, C.C. Myers' engineers began arriving at the site. The firm worked around the clock and finished the job in just 18 days — earning it a $5 million bonus. Although the final tab came in a bit higher than the $5.2 million Caltrans had initially estimated, gnarled traffic was moving smoothly again sooner than anyone had imagined possible.

If the quick work in Oakland sounds unusual, it's because construction projects so often stumble like one located just 30 miles north of the Maze. Caltrans opened a new northbound span on the Benicia-Martinez Bridge in August — seven years late and, at $1.3 billion, more than four times

the estimated cost. Construction was plagued by setbacks, including an unexpectedly soft rock bed under the Carquinez Strait and the fact that pile-driving noise was killing fish. Blown deadlines and escalating costs of this sort increasingly seem normal and maybe even expected. Many states and localities seem to accept them as simply part of the building process.

That's a big problem because in the aftermath of the I-35W bridge collapse in Minneapolis, states are poised to make some big infrastructure investments. As that calamity made clear, many of America's roadways, bridges and tunnels are in critical condition after decades of deferred maintenance. In some places, the needs are especially pressing. Massachusetts needs to spend $17 billion on repairs, according to one report. In Pennsylvania, the tab for bridge maintenance is $11 billion. In New Jersey, it's more than $13.5 billion. Overall, the American Society of Civil Engineers gives the nation's infrastructure system a grade of "D," and the group says that fixing the country's existing problems is a job with a $1.6 trillion price tag.

As states redouble their efforts on maintenance, the trick will be to produce more successful projects such as the MacArthur Maze and fewer tarnished ones along the lines of the Benicia-Martinez Bridge. It won't be easy. Issues of cost overruns and missed deadlines have plagued construction projects for years. And transportation departments will continue to deal with a construction industry that is, in many ways, antiquated, inefficient and wasteful. Minnesota, still shaking off the shock of seeing a key transportation asset crumble into the Mississippi River, is now grappling with its replacement cost soaring toward $400 million. That's 57 percent higher than the amount the federal government set aside for the bridge. And construction hasn't even begun yet.

LOTS OF LITTLE DIGS

For most public officials of this generation, the poster child of the public works project gone awry is the Big Dig. Finished five years late and many billions over budget, the tunnel under Boston was the nation's most expensive highway project ever. Yet a perusal of recent capital projects across the country reveals a growing number of Little Digs, in transportation facilities and beyond:

— Miami International Airport opened a new 1.7-million-square-foot South Terminal at the end of August. That was two-and-a-half years behind schedule and more than $300 million over budget. A review of the project found that progress had been mired in thousands of change orders and infighting among subcontractors.

— The cost of the new Los Angeles County/USC Medical Center has ballooned by 22 percent to $899 million — the priciest project in county history — and the center is scheduled to open a year late. County officials blame the trouble on contractor errors that allegedly forced fixes to the hospital's plumbing and ventilation systems.

— An expansion and renovation at the Indianapolis downtown library is more than two years behind schedule and more than 50 percent over budget. The final cost could be as much as $155 million, a figure that doesn't include legal fees in a court proceeding now underway to determine who's at fault for the increased project costs.

— Chicago's Dan Ryan Expressway is reopening this month, rebuilt at a cost that's nearly twice the original $550 million estimate. The project is on schedule, but the Illinois DOT attributes runaway costs to design changes and, among other things, skyrocketing expenses for materials.

As in Chicago's case, many cost overruns lately are blamed on the rising cost of concrete, steel and wood. That is part of the problem. Building booms in China and India have created worldwide shortages of construction materials. Prices have spiked even higher in the United States since rebuilding began after Hurricanes Katrina and Rita. Other factors, such as reconstruction in Iraq and higher gasoline prices, also affect the construction industry's bottom line. From April 2004 to April 2007, the overall cost of construction materials in the United States increased by 14.8 percent.

But that's only part of the story. Also at issue is an outdated, inefficient construction industry that can make it nearly impossible for states to control costs. Barry LePatner, a construction lawyer in New York City, says it's an industry that must be reinvented if states ever want to start reining in their project costs. If there's a guru of construction-industry reform, it's LePatner. An attorney in the industry for more than 30 years, he's the author of the recent book "Broken Buildings, Busted Budgets: How to Fix America's Trillion-Dollar Construction Industry." He also tracks news stories of project cost overruns on his Web site, www.brokenbuildings.com.

According to LePatner, the construction industry's first problem is fragmentation. Construction companies make up "the last mom-and-pop industry in the United States," he says. It's an industry comprising hundreds of thousands of tiny, specialized companies — the same basic makeup the field has had for a century. Of the nation's 7.6 million construction workers, 92 percent work in firms of no more than 20 people. Even the largest companies serve predominantly as overseers on a given project, working with teams of subcontractors. Because the industry has remained so splintered, it has never developed the innovation and economies of scale that every other major field has. The amount spent on new technology in construction is the lowest of any industry. "Nobody can afford to take risks," LePatner says. "Because these firms are so small, there's really no capital for them to draw on. The goal is just to stay around year after year."

Fragmentation in the construction industry stymies productivity. American industries have, in aggregate, increased the productivity of each worker by about 250 percent since 1964, according to the U.S. Bureau of Labor Statistics. But in the same time period, per-worker productivity in the construction industry dropped by 22 percent. Lack of coordination among all the different companies that may be working on a given project also inhibits efficiency. A 2005 survey by University of Pennsylvania researchers, published in the Journal of Construction Engineering and Management, found that up to 50 percent of all labor on construction sites is wasted because late deliveries and a lack of communication left workers idle.

Wayne Crew doesn't believe the situation is quite as dire as LePatner suggests. Crew is the executive director of the Construction Industry Institute, a consortium of contractors, non-construction corporations and government agencies based at the University of Texas at Austin. He agrees that fragmentation in the industry keeps innovation from spreading as quickly as in other industries. But innovation is happening nonetheless, he says, in areas such as materials

management and preventing accidents. "There are tools in the industry that can keep a firm's productivity up, and people are more and more embracing them."

Regardless, Crew says, the onus is on states and municipalities to keep construction costs down by keeping change orders to a minimum. "The owner ultimately has the responsibility to define the scope of the project before it starts. The data suggest that good upfront planning to define the scope, coupled with effective change control on the ground, can control 90-plus percent of the cost growth."

NEW CONTRACTING METHODS

What seems clear is that if states and localities want more projects to finish on time and on budget, they'll need a new relationship with the construction industry. On government's side of that pairing, project managers must work more aggressively to anticipate problems before they happen. "Managing your assets today means being knowledgeable about the construction process," says Michael Pagano, the interim dean of the College of Urban Planning and Public Affairs at the University of Illinois at Chicago, and a national expert on transportation and infrastructure. "Project monitoring has become much more important. States have to be more cautious, and they have to be more vigilant."

As Pagano sees it, part of the new relationship requires tighter contracting when it comes to big construction projects. "Contract clauses are starting to get a little more powerful," he says, noting that some public contracts these days penalize firms for finishing over budget by making it harder for them to win another contract later. Project managers also need to manage expectations, especially with the media, when it comes to the most complex construction jobs. Pagano asks: "Is a 5 percent increase 'over budget'? Is a month 'late'? Of course it depends on the project. But that's what states are still trying to figure out."

One place states will be looking to for answers is Missouri. Officials there are implementing a novel plan to repair or rebuild 800 bridges in just five years. Already developed before the Minneapolis bridge collapse, Missouri's program involves having contractors front the $400 million to $600 million in infrastructure repairs. The state will then reimburse the companies over the next 25 years using federal bridge funds. And there's a warranty: The private firms are required to keep the bridges in good shape for those 25 years. There are a couple of challenges. For one, the plan addresses only smaller, rural bridges — not any of the state's larger spans. And there aren't many firms that could make the kind of commitment Missouri is asking for. Still, states will be watching to see if this unique financing structure pays off.

Meanwhile, states continue to experiment with a different contracting method known as design-build. That's a form of project management that gained popularity in the 1990s, but it's actually a throwback to the way the construction industry was organized a century ago. With a design-build contract, there's one "master builder" who handles the entire project from inception to completion. Projects from the Egyptian pyramids to the Brooklyn Bridge were built this way. But as construction became more complicated at the turn of the 20th century, firms became more and more specialized, and a project site became a conglomeration of several different companies.

Some states see promise in a return to the design-build approach. It can help provide price certainty, since the government sets the amount it's willing to spend. The contractor assumes the risk for cost overruns. And design-build can speed delivery time, since builders can begin work on a project before the designs are finalized. This contracting method is estimated to save 6 percent on construction costs and cut delivery time by 12 percent, according to the Construction Industry Institute. In recent years, several states have begun implementing design-build contracts for certain projects, including roads and bridges. This year alone, 10 states, including Colorado, Iowa, Mississippi, North Carolina, Texas and Washington, passed laws either creating or expanding their authority to use design-build.

But while design-build may streamline construction, it has its drawbacks. First, because a single contractor handles design and implementation, the process involves much less competition than states traditionally have required. "There's a real value to ensuring that there's more than one set of eyes or one group involved," says Pagano. "With competition, you get competitive oversight. You're more likely to identify problems when there are other groups involved." For that reason, quality control becomes a bigger concern. And design-build also raises questions about graft. "You probably can save time and money," Pagano says, "but you may end up glossing over some of the possible flaws. And you possibly open the process up to more corruption and favoritism."

THE BONUS STRATEGY

Then there's the bonus-incentive approach, which worked so well on the MacArthur Maze reconstruction in California. To be sure, that was something of a special case. C.C. Myers was a construction firm with a history of delivering on time, and the firm was working on a relatively straightforward job under daily scrutiny from the local media. Plus, the urgent nature of the project encouraged Caltrans to focus intensely on collaborating with the contractor. "We worked closely with them throughout the process," says Bay Area Caltrans spokeswoman Lauren Wonder. "We brought in small businesses to meet with the contractors to let them know what services they were able to provide. They could literally shake hands across the table and see how they could work together." State engineers even flew to Arizona to inspect steel girders being built there before they were shipped to the project site.

Of course, California reserves that level of attention for its most high-profile construction projects. And the state utilizes contract bonuses only in emergency situations, when speed and cost control are extremely important. "It works best for more of a distinct project we need to get done quickly," says Wonder. "We don't do that as a general practice." Some lawmakers in California, impressed by the Maze project, have begun advocating for more bonus-based contracts on large projects. A similar approach might help other states get a handle on the runaway costs of construction.

In a way, there exists today a unique opportunity for reform. Since the Minneapolis bridge tragedy, the public is beginning to see deteriorating infrastructure as an issue that's urgent, nonpartisan and worth spending money on. But political support will wither quickly if the new focus on road and bridge maintenance merely produces one more boondoggle after another. "If we contract the same way we have been, we're going to be losing hundreds of billions of dollars," says LePatner. "We can't turn over that kind of money without first changing the rules."

MINNEAPOLIS SPEEDWAY

BYLINE: Josh Goodman

SECTION: FEATURE; Pg. 34

LENGTH: 2612 words

HIGHLIGHT: A bridge collapsed. Minnesota's DOT replaced it in just 13 months. Here's how they did it.

John Chiglo is looking up from the banks of the Mississippi River at a huge ivory monolith. It's the new I-35W bridge, built on the site in Minneapolis where an old span collapsed suddenly on August 1, 2007, killing 13 people. The four giant support piers on each side of the river curve gently into the superstructure, giving the new bridge a slightly arced appearance when viewed from a distance. But up close, from where Chiglo stands, what's most striking is how polished a brand-new bridge looks, before the rust and grime of age settle in. "That's 50,000 yards of concrete," Chiglo says, sounding like a baseball fan rattling off the slugging percentage of his favorite player. "Seventeen million pounds of steel, 740 miles of post-tension steel strands."

Chiglo served as the Minnesota Department of Transportation's project manager for the I-35W bridge, also known as the St. Anthony Falls Bridge. He has good reason to be proud of it. The new span opened to traffic barely a year after the tragic collapse. Not only did MinnDOT beat an almost ludicrously ambitious deadline by three months, but it did so without any serious injuries to workers. The project came in respectably close to its budget--it went less than 2 percent over.

In the world of bridge construction, this story is a bit unusual. Bridge projects, like other big infrastructure endeavors, have a way of dragging out months or years behind schedule--and blasting through their budgets. It doesn't have to be that way. That's especially important to remember as the federal government hands some $36 billion over to states for road, bridge and transit projects in an effort to get the economy going again. MinnDOT's handling of the I-35W rebuilding demonstrates that states can spend lots of money, put people to work and make something with lasting value--and do those things both quickly and efficiently.

Getting the process right isn't easy, however. For bridge construction to work better, states have to manage delicate relationships with contractors and force different levels of government to work together more cooperatively. And, as the collapse of the old I-35W bridge made all too clear, construction is only half of the nation's infrastructure challenge. Maintenance and inspection of old bridges remains a huge problem in many states, even after the Minneapolis tragedy. The federal government lists 12 percent of all bridges in the United States as structurally deficient, and an additional 13 percent as functionally obsolete. So as states begin spending their stimulus money, they should not be thinking only about how to build bridges quickly and cheaply. They also should be strategizing about how to keep these assets in good condition for decades to come.

How was the new I-35W bridge built so quickly? The short answer is that the state of Minnesota didn't give the construction company in charge of the bridge, Flatiron Construction Corp., much of a choice.

Flatiron's base contract was for $234 million. In addition, the company was offered up to $27 million if it completed the project early--and faced financial penalties if it finished late. That was incentive enough for construction workers to adopt a 24-hours-a-day, 7-days-a-week schedule. Says Chiglo: "We worked holidays, weekends, day, night, rain, snow, sleet, ice." Ultimately, Flatiron received a $25 million bonus.

But while Minnesota demanded precisely WHEN the bridge should be built, the state left to Flatiron the details of HOW the bridge should be built. That's not the way state-issued construction contracts typically work. The most common process is what's known in the construction world as "design-bid-build." State employees design what needs to be built, then they put it up for bid and the private sector builds it based on the state's specifications. Those specifications can be exceptionally prescriptive. Often, they don't just stipulate what needs to be built--they also order the contractor to build it using a specific process.

By contrast, the new I-35W span was erected through a method known as "design-build." Under this model, many of the details of a project are left to the contractors, which allows them to put their expertise to work. Design-build isn't universally embraced among DOTs; the results are only as good as the contractors selected. But the big advantage of design-build is that initial construction can begin before the final design decisions are made, often allowing projects to get started swiftly. That's exactly how it worked out in Minneapolis, where construction began, remarkably, just three months after the old bridge fell.

To be sure, some of that urgency came from the emergency nature of the collapse. Bureaucracies moved at record speed, and cooperated across every level of government. Federal permits that normally take months to obtain were ready in days. The City of Minneapolis rapidly gave approval to the design of the new bridge. "Nobody," says Bob French, Flatiron's chief operating officer, "wanted to be the individual or agency that stopped that bridge from getting built." The unusual amount of political momentum that emerged out of the crisis is a big reason why French thinks it would be difficult to replicate this success story elsewhere.

There's another reason, too. Ironically, the collapse itself made it easier to get the new bridgework done quickly. Under less tragic circumstances, one of the big challenges in replacing an old bridge with a new one is keeping the existing span operating while the work goes on. Transportation officials are loathe to shut down a critical artery before the new one is ready, for fear of tying traffic in knots. At the same time, however, the old bridge inevitably gets in the way, complicating the construction process. In Minneapolis, of course, the old bridge was gone.

Unusual as that situation was, it raises an interesting question: When an old bridge, road or any piece of infrastructure is so worn out that it must be replaced entirely, should it simply be shut down to make way for the construction crews? One person who believes that the answer is yes--at least in some cases--is Tom Warne, a former Utah transportation director who now works as a consultant. In the 1990s, when Utah was rebuilding I-15 in and around Salt Lake City, Warne

polled drivers on what they would prefer: the acute, if temporary, disruption of widespread road closures, or keeping the roads open and under construction for a longer period of time. The response: Close the roads. Utah followed the advice, which accelerated the project dramatically. "We should be bolder about that sort of thing," Warne says. "The public understands it and they'll adjust."

While the Minneapolis bridge collapse shook up the DOT in Minnesota, the tragedy's impact on the rest of the country has been surprisingly muted. In the immediate aftermath of the collapse, state officials everywhere described the disaster as a wake-up call. Since then, many of them have hit the snooze button.

One year after the collapse, an Associated Press analysis looked at each state's 20 most heavily traveled structurally deficient bridges. Of the bridges analyzed, only one in 10 had been fixed up in the year after the collapse.

People in the industry don't dispute that less has happened since August 2007 than they would have liked. Part of the reason is that the scale of the problem is so enormous. The American Association of State Highway and Transportation Officials estimates that $140 billion is needed to repair more than 150,000 bridges that are structurally deficient or functionally obsolete. That's only a fraction of the $2.2 trillion the American Society of Civil Engineers estimates for the nation's total infrastructure needs. With state revenue foundering and gas taxes in particular drying up, the past year and a half has proven to be a difficult time for states to make new investments.

But the problems run deeper than that. Glacial permitting processes mean that, for large projects, it can take a dozen years for a new bridge to become reality. The construction industry is deeply fragmented, with separate teams of suppliers, engineers and contractors needed just to build a bridge. "It would be a seismic event for the construction industry to change itself in one year," says **Barry LePatner,** a New York construction lawyer. "It remains a truly inefficient industry."

Nonetheless, there have been gradual signs of change. More and more states are following the Minneapolis model by making a contractor's payments contingent on getting the work done on time. Design-build was considered novel when Warne was using it in Utah a decade ago. Now, it's becoming more commonplace.

And, there's at least some reason to believe that the federal economic stimulus will continue these trends. "Shovel-ready" is the buzzword of the moment--the feds want to fund projects that can put people to work immediately. Since design-build can hasten the start date for projects, it may be the tool of choice for state DOTs in the months ahead.

If there's one state that isn't shy about trying new ideas, it's Missouri. A couple of years ago, Missouri proposed an experiment, known as the Safe and Sound bridge program. The intent was nothing less than to upend most of the basic tenets of bridge building and maintenance in the United States.

The state had 802 bridges, most of them small and in rural areas, which had fallen into poor condition. Normally, a state would bid out repair work on each bridge separately. Instead, Missouri offered them all up in one giant contract. Normally, the state would prescribe how each bridge would be brought into good condition. But Missouri wasn't telling the contractors whether they had to repair the existing bridges or replace them. And, normally, contractors are paid in full when bridgework happens. In Missouri's case, the contractors were to finance all the costs for the first five years. Payment to the team in charge of the bridges was to be contingent on the contractors' keeping them in good shape for an additional 25 years.

Although it was formulated before the I-35W bridge collapsed, Missouri's plan represents a logical extension of the ideas coming out of Minneapolis. You can tell that from its name: "design-build-finance-maintain." Many of the goals--giving contractors more flexibility, but paying them only for getting results--are the same.

That, says Don Hillis, director of System Management for the Missouri Department of Transportation, is a big reason for the state's optimism about the concept. The idea here is that handing hundreds of the bridges over to one team can reap economies of scale--especially when the contractors have free reign to design their own approach. Because of the maintenance component, the pressure is on the contractors to produce work that would stand the test of time. Plus, private funding is seen as a way to speed up work in spite of the limited public money available. The contract required that all 802 bridges be in good shape within five years.

As it turned out, the decision to use private-sector funds was the plan's Achilles' Heel. Missouri selected its team of contractors, but as the availability of credit tightened last fall, they were unable to obtain financing. The plan in its original form had to be scrapped and revised.

Missouri's new plan is still groundbreaking. This spring, it will hand out a single design-build contract for 554 of the original 802 bridges. Government-issued bonds will fund the project, and it won't have the 25-year maintenance component. Nonetheless, the experiment will test whether putting a single team in charge of hundreds of bridges can lead to more efficient construction."We still think it's a good concept," says Hillis. "When the private sector has the ability to muster funds at very good rates, I think it's something that could happen again."

Not everyone is so sure that Missouri has discovered the formula of the future. The state's plan would have greatly expanded the role of the private sector in bridge financing and maintenance, placing public assets in private hands. While private control of infrastructure is common in Europe and Canada, it remains controversial in the United States. But if there's one point that Missouri clearly had right, it's this: States need to focus just as much on bridge maintenance as they do on construction.

That's because maintenance is just as big a problem area as construction. Basic steps are routinely neglected, such as painting bridges regularly to prevent rusting and removing corrosive road salt. The result is that bridges have to be repaired or replaced years earlier than if they were maintained properly.

Some observers fear that the federal stimulus will only make the situation worse, by creating more bridges and roads that need upkeep. "We can't even maintain the size of the infrastructure that we have now," says Michael Pagano, an infrastructure expert at the University of Illinois at Chicago. "We're going to add to it? I think that's insane."

The reasons for the maintenance problem are diverse. One of the most troubling is that there's a built-in disincentive to do the right thing. When bridges fall into disrepair, they become eligible for federal funds to replace them. So there's little motivation for states and localities to be proactive and spend their own money on maintenance up front. Another problem: Bridge inspections remain shockingly rudimentary. Examiners spend most of their time doing a visual once-over. They might tap various bridge parts with a hammer to see if metal has corroded, but these techniques often miss serious problems developing within the bridge structure.

Peter Vanderzee is one of a growing number of people who believe that there is a better way. Vanderzee runs a company that sells sensors that allow for computerized monitoring of bridges. He compares the current inspection regimen to that of a doctor who makes a diagnosis simply by looking at the patient.

The purpose of the sensors isn't primarily to identify an imminent bridge collapse on the order of the one in Minneapolis. Instead, the main purpose is to find subtle stresses and cracks early on, before those problems turn into visible signs of trouble. Plus, Vanderzee sees another benefit to the sensors. He's the rare person who thinks the condition of American bridges is considerably better than is commonly recognized. His argument: With visual inspections, lots of bridges are lumped together as needing repairs. Sensors, he says, can tell which ones need help more than others. "If it's in better shape, we can delay repairs and we can delay replacement," Vanderzee says. "If it's in worse shape, at least we know."

While this technology has been around for quite a while, it hasn't been widely utilized. States are reluctant to pay the upfront costs of installing the sensors based on the promise of long-term savings. (They also aren't eager to go drilling holes into old bridges and perhaps weakening them even more.) One span that does have them, though, is the new I-35W bridge in Minneapolis--it has 323 sensors to be precise. Data from those sensors will be fed to MinnDOT and the University of Minnesota, where staff will be able to monitor the bridge's condition in real time.

The sensors are just one reason that almost everyone in Minnesota views their new bridge as a success. But, as a result, Minnesotans also have higher expectations for the Department of Transportation going forward. "That didn't take long," Chiglo says. "People are already asking why we can't build every bridge so fast.