INNOVATION
SNAPSHOTS
Outside-the-Box Thinking from Michigan DOT Employees

Mobile Processing

Remotely accessible from laptops, tablets and smartphones, MDOT's digital file cabinet delivers big savings in time and money. page 2

Contracting

Performance-based contracts for highway rest area maintenance save costs by giving contractors more flexibility in how they meet MDOT standards. page 3

Maintenance

Using LiDAR to inspect bridges damaged by high-load hits eliminates the need for lane closures. page 4

MDOT

DIGITAL REVOLUTION
Electronic file cabinet takes the paper out of paperwork

Signed, sealed, delivered: Secure electronic signatures speed project approvals.

Waiting for critical documents to arrive by U.S. mail and digging through e-mail chains to find electronic files are tasks that eat up workers' limited time and resources. Thanks to an innovative electronic file cabinet system, these inefficiencies are quickly becoming things of the past at MDOT.

A "SINGLE SOURCE OF TRUTH"

MDOT staff and limited-access external users can use the digital file cabinet system anywhere via computer, tablet or smartphone. Powered by Bentley's ProjectWise software, the network-based system holds the most current version of each project file – "the single source of truth," in the words of Heather VerHage, MDOT's system administrator for ProjectWise.

That's just the start of the benefits. ProjectWise reduces costs (in terms of paper and ink as well as labor hours) and speeds processes (from calls for projects to document approval to contractor payment).

See MDOT e-construction in action at https://youtu.be/HAbYgqgnyB8.

It also improves transparency and accountability through digital audit trails. Steep reductions in paper consumption and trips to the office to retrieve paperwork are a relief to the environment as well.

A companion innovation supporting ProjectWise is the digital pen, which lets document reviewers provide handwritten comments using a high-tech pen and specially printed paper. The system converts written comments into digital ones for review in ProjectWise.

On top of that, MDOT has digitized older documents (plans and proposals dating back to 1992, and as-built drawings dating back more than a century), providing quick and ready reference to vast stores of information.

DEPARTMENT-WIDE IMPACT

Assigning a dollar value to the savings generated by the digital file cabinet system is not easy. "FHWA's Every Day Counts initiative on e-construction is currently working at the national level to quantify the bene-

fits," VerHage says. Still, the system's value is clear. Greg Vanis, ProjectWise design consultant support for MDOT, gave an example. "Consider the fact that typical invoice approval has gone from 60 days to two weeks," Vanis says. "That's a big deal."

The approach is steadily making its mark across MDOT. Such varied areas as environmental, safety, rail, aeronautics and research are in various stages of putting ProjectWise to work to manage documentation and accelerate billing. The move represents a new standard for savings, efficiency and forward-thinking process management.

FAST FACTS

Remotely accessible digital file cabinet

Used for proposals, planning, construction and invoicing

Cuts costs, speeds processes and improves accountability

Innovative Contracting Reduces Maintenance Costs for Highway Rest Areas by 15 Percent

> "This was a great opportunity to try something different."
>
> Bill Wahl,
> associate region engineer,
> MDOT North Region

Most of us are familiar with highway rest areas, located at regular intervals to allow drivers to take a break without exiting onto other roads. But we may be less aware of the significant effort required by state departments of transportation (DOTs) to keep them clean and serviceable.

MDOT uses its own staff to handle larger maintenance tasks at rest areas, such as replacing plumbing or electrical fixtures. But the department contracts out janitorial tasks (such as cleaning bathrooms) and lawn care. As is the case with many other DOTs, MDOT's contracts for rest area maintenance have traditionally been highly prescriptive: They tell vendors what tasks to perform and when to perform them. They also precisely define staffing requirements.

As an alternative, MDOT's North Region is investigating the use of performance-based contracts, in which vendors are paid a fixed amount to maintain facilities to an agreed-upon level of service, which includes not only the visible condition of the facility but also the frequency of some cleaning activities. North Region staff inspect the facilities regularly to make sure contractors are meeting the standards. But the region leaves it up to vendors to determine how to do it.

"Prescriptive contracts work well, but they don't leave a lot of flexibility for innovation on the part of contractors," says Bill Wahl, associate region engineer for the North Region. "This typically makes them more expensive than performance-based contracts for a similar level of service."

The North Region piloted the use of performance-based contracts at its Topinabee and Hebron rest areas starting in 2014 and has seen savings of more than 15 percent. Based on this success, the region is planning to use performance-based contracting in all of its rest areas starting in spring 2017. Wahl is also sharing these results with other MDOT regions.

Performance-based contracts for maintenance are relatively new nationwide, and are used by just a handful of states. Wahl had the idea to try the approach based on the example of Florida DOT, which uses performance-based contracts even for non-janitorial rest area maintenance.

"This was a great opportunity to try something different," Wahl says. "Performance-based contracts provide opportunities for vendors to be creative and flexible with staffing in ways that reduce our costs while meeting our needs and maintaining a high level of service."

Finding what works

North Region staff modeled the pilot project on a cost-effective approach used by Florida DOT.

A LASER FOCUS ON RESULTS

LiDAR measures bridge damage without lane closures

Every year, hundreds of trucks around the country crash into bridges that are too low for the height of the load they are carrying. Michigan is no stranger to these "high-load hits," which occurred more than 700 times statewide between 2001 and 2013.

> "LiDAR is a really cost-effective and efficient way to do something that normally requires a lot of effort."
>
> Alexander Shteynvil, bridge safety engineer, MDOT Metro Region

Dealing with high-load hits can be very costly. When the bridge on Warren Avenue over M-10 in the Metro Region was hit by a truck in 2014, inspecting the damage required closing two southbound lanes and three northbound lanes on the overpass. And then there was the expense of using several trucks, temporary signs and about 15 workers.

These inspections can take a full day because inspectors are not only looking for structural cracks and broken bolts, but also taking numerous manual measurements of steel beams bent by the impact. This inspection data is critical to assessing the structural capacity of damaged beams and determining next steps: whether the overpass will need to be closed, and whether bent beams can be safely repaired by heating and straightening them.

It occurred to Alexander Shteynvil, bridge safety engineer for MDOT's Metro Region, that the cost of these inspections could be reduced using a technology called LiDAR (light detection and ranging). LiDAR takes detailed remote measurements of objects by illuminating them with a laser and analyzing the reflected light. "LiDAR measurements are just as accurate as those taken manually, but they can be taken from the roadway shoulder in just a few minutes, eliminating the need to close lanes," Shteynvil says.

MDOT's Metro Region started using LiDAR for high-load hit inspections in 2014, resulting in the region saving thousands of dollars per incident in equipment and labor alone. "But the real savings comes from avoiding lane closures," Shteynvil says. "Closures are hugely disruptive to traffic and ultimately very costly to the public."

The Metro Region plans to continue to expand its use of LiDAR for high-load hit inspections, Shteynvil says. "LiDAR is a really cost-effective and efficient way to do something that normally requires a lot of effort," he says. "We're looking forward to this innovation helping us further reduce the costs and delays involved in dealing with high-load hits."

Quick read: Damage from high-load hits can be measured using LiDAR in about 30 to 40 minutes per span.

For more information about any of these innovations, contact mdot-research@michigan.gov.