INNOVATION SNAPSHOTS

Outside-the-Box Thinking from Michigan DOT Employees

Bright Ideas, Big Impact

The stories on these pages highlight some of the innovative ways that MDOT employees are saving time and money, improving safety, and increasing quality in everything we do.

September 2016

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Installing extra supports and steel cables added 75 years of life to this bridge. page 2

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A neighborhood blight cleanup project served as a hands-on training ground for construction students. page 3

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Through a public-private partnership, MDOT is lighting up Detroit's freeways with high-efficiency LED fixtures. page 4

MDOT

THINKING INSIDE THE BOX

Innovative box bridge project saves $35 million on US-131

Reinforcements: Steel cables inside the box bridge add strength.

Sometimes the most exciting innovations happen right under travelers' noses, like the repairs to the US-131 bridges over the Muskegon River near Big Rapids.

MDOT added 75 years of life to the bridges, with the bulk of the rehabilitation happening below the driving surface. This meant (mostly) frustration-free travel on this vital north-south artery as MDOT crews installed 21st century technology into the aging spans.

Built in 1982, the northbound and southbound twin bridges over the Muskegon River were not designed for the punishment of today's traffic loads. Though the roadway was in good condition, every crack in the bridge piers pointed to the need for early – and costly – reconstruction. The prospect of a $40 million price tag and major traffic disruptions for vacationers and commercial drivers alike begged a better solution.

Fortunately, the 21st century has brought more than just heavy traffic. "Instead of replacing the bridges, we drew on a range of new techniques to rehabilitate them," explains Corey Rogers, Engineer of Bridge Field Services for MDOT. The plan checked all the boxes: cost savings, time savings and less bridge downtime.

Watch the inner workings of the bridge at https://youtu.be/gkiO0APOMGI.

NEW TECHNOLOGY MEANS NEW LIFE FOR OLD BRIDGES

MDOT's repairs, completed in 2015, involved running heavy-duty steel cables through the internal structure of the box girder bridges, anchoring them at the ends, and putting them in tension. The cables are in a unique "double harp" configuration, providing internal forces that pull the structures together, effectively stopping future cracking. In addition to using cables, engineers also incorporated special permanent jacks to better distribute the weight of the bridges on their foundations.

Travelers appreciated the low impact on traffic. "We only had to shut down traffic twice for three days each time," Rogers says. "This kept travelers moving along in peak vacation season." By contrast, full reconstruction would have meant a year of rerouting.

The traveling public was impressed by the work. "Allowing media access inside the belly of the bridge created a lot of excitement," says MDOT Communications Representative John Richard. "This was not a typical bridge rehabilitation, and their news stories showed we were performing advanced engineering to save the public time and money. This created a lot of interest and support from the general public."

FAST FACTS

$5 million bridge repair

$35 million savings vs. cost to replace

Steel-and-concrete "tendons" and permanent jacks add 75 years of life

Neighborhood Cleanup Project Becomes Hands-On Training Model

Residents of Detroit's McDougall-Hunt neighborhood had been working for years to improve several parcels of overgrown vacant land that had become magnets for criminal activity. But obtaining the resources and permits they needed to clean up the land was daunting.

The land needed so much work – utility repairs, tree removal, regrading and more – that the cleanup was essentially a small construction project. MDOT had the expertise and resources to get the job done. To get the department involved, the project team had an idea: Turn the cleanup into a hands-on training site for community members interested in construction careers. MDOT's Disadvantaged Business Enterprise Program, which helps minority- and women-owned businesses begin working with MDOT, agreed to participate.

After months of planning and coordination, in September 2015 the team spent four days cleaning up 11 parcels of land. Contractors lent the team an excavator, bulldozer and backhoe, and unions provided equipment operators and professional laborers who helped construction students gain hands-on experience at the job site. Community residents volunteered their time, and MDOT donated planting materials. In all, donations of equipment, labor and materials topped $31,000.

"A big part of what made the project so successful was the fact that it started and ended with the community," says Scott Douglas, assistant engineer on the M-1 Rail project, who helped plan the cleanup during a graduate program at University of Detroit Mercy. Team members documented their experience in a step-by-step guide to developing land cleanup partnerships – a resource designed to help other neighborhoods succeed in doing the same.

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>
> Scott Douglas, project co-planner

Before and after: Clearing overgrown vegetation revealed a buried sidewalk.

eStore Puts Bike Maps into More Riders' Hands, Faster

By making its popular bicycle maps available online, MDOT has made the message clear to cyclists: Michigan's bike lanes and shared-use paths are open for your touring pleasure.

Customers can now pay for the easy-to-carry, weather-resistant maps by credit card (shipping and handling of $5 each) and receive them in a matter of days. By bringing ordering in-house and using the eStore portal built by the Michigan Department of Natural Resources, MDOT is saving $15,000 annually while serving many more tourists.

Sales have been brisk, and Michigan is now reaching a global community of riders. "More than half of the orders received through the eStore have been from out of state," says Debra Alfonso, supervisor of the Intermodal Services Unit. "Orders have come in from across Canada and a few countries in Europe."

Bike maps available at https://media.state.mi.us/MichiganeStore

Collaborating for results

Using the existing Michigan eStore portal built by DNR saved MDOT time and money.

A BRIGHT IDEA

Public-private partnership restores light to Detroit's freeways

A few years ago, Detroit's freeway lighting system was in distress. Fixtures were damaged and broken, lights were burned out, and thieves were ripping out valuable copper wire. At one point, 30 percent of the freeway lights in Detroit's tri-county area had gone dark. Getting the lights back on was a top safety priority for the department.

Most of the 15,000 lights on Detroit's freeways were older high-pressure sodium or metal halide fixtures, which are being phased out in favor of energy-efficient light-emitting diode (LED) lights. Replacing the older fixtures with energy-saving designs and installing theft-deterrent measures would yield long-term benefits. To fund the project, MDOT turned to an innovative contracting method: a public-private partnership, or P3, that would bring in financing from the private sector. (P3 contracts allow for greater private-sector involvement in financing and delivering a project than traditional contracts.)

P3s must meet very specific financing requirements, and no state had ever found a way to use a P3 for a freeway lighting project. But MDOT saw an opportunity to use the project's ongoing energy savings as part of a financing mechanism that would give the contractor incentive to make the new system as energy-efficient as possible. "It was exciting to explore the nuances of this contracting method," says Charlie Stein, manager of the Innovative Contracting Unit.

SUCCESS: BRIGHTER, SAFER FREEWAYS

The creative approach worked. With a proposal incorporating several energy-saving and theft-resistant features, a consortium of contractors called Freeway Lighting Partners won the 15-year contract to rebuild and maintain the lighting system. The P3 approach will save an estimated $13 million over the life of the contract, and the P3 contract structure builds in a guarantee of high-quality contractor performance, including pay deductions if contract requirements aren't met. This unique P3 – which was also MDOT's first use of P3 contracting – has drawn national attention. Stein reports that several states have contacted him about following MDOT's contracting model for their own freeway lighting projects.

Read more about this project at http://michiganfreewaylighting.com

FAST FACTS

- **$13 million savings over 15-year contract**
- **Budget constraints prevented traditional contracting**
- **P3 approach allowed private financing solution**

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