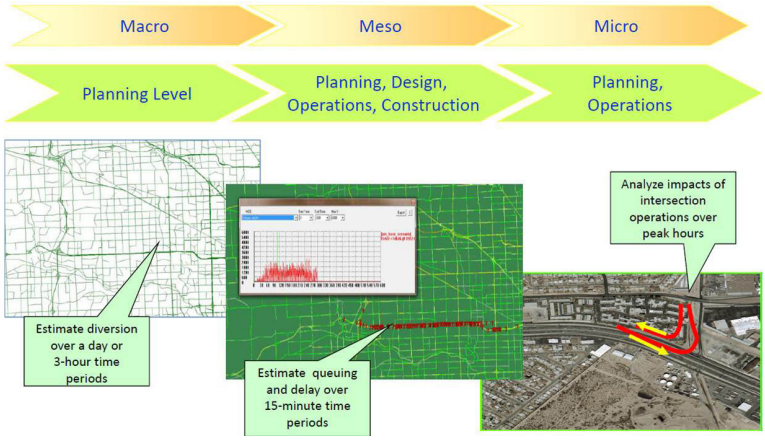
The I-96 design team made use of dynamic traffic assignment (DTA) modeling to develop and evaluate the different alternatives for maintaining traffic during this project. By using the DynusT software, a model was created to predict/estimate how drivers may shift to other routes or adjust departure time in response to the construction. This also provided a better understanding of how individual travel decisions impact congestion for the entire Michigan Department of Transportation (MDOT) Metro Region. The model was one of the tools used to assist the design team to develop user costs for each alternative, as well as create a visualization video that showed where congestion would occur and assist in determining the impacts on the other roadways within the region. These detour scenario videos can be viewed on the web at *www.96fix.com/project_information/*.

Nine different closure alternatives were developed and presented to the public at the first public meeting. For each of the nine closure alternatives, the following results were analyzed and presented:

- Change in traffic volumes
- Percent diversion of I-96 users
- Total travel time (all users and I-96 users)
- Vehicle minutes/hours of delay (all users and I-96 users)
- Cost of delay (all users)
- Cost of maintenance of traffic
- Length of construction (between one to three years)

The public was surveyed to see which alternative was preferred. They were allowed to vote in three different ways; by ballot at the meeting, mailing a ballot to the office, or voting online. Of the 1,787 voting/survey responses, 56 percent preferred closing the freeway during the project.

The model was then used to analyze how different bridge closure scenarios would impact traffic and to identify hotspots. This enabled the design team to identify areas where traffic signal timing would need to be adjusted and where temporary signals may need to be located.



There were several benefits to using the DTA model on the I-96 project. It was possible to model at a large regional scale and yet be detailed enough to consider signal timing of major intersections. The model had good traffic realism and included a time-dependent route choice logarithm. This greatly assisted the design team when making decisions on detour routes.

One of the lessons learned from using the DTA model was that it provides credibility to the decision- making. Customer satisfaction with the project was increased by including the public in the process and seeking their input on the maintaining traffic options.

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Since 2009, the Michigan Department of Transportation (MDOT) Office of Communications has enjoyed great success using social media to interact with the public, keeping them informed with project updates, lane incidents, and other project news. A leader in state government social media, MDOT has regularly placed in the top 10 among state DOTs in Twitter and Facebook followers, and YouTube videos viewed.

In order to keep the local community (residents, businesses, and motorists) up-to-date with a major reconstruction project on I-96 in Livonia, later known as the 96 Fix, MDOT required the project consultant, Parsons Brinckerhoff, to create not only a project website but also a Twitter account and Facebook page.

Launched to coincide with the first public meeting held March 2012 (a full two years before construction began), there are now more than 4,500 followers on Facebook and 1,200 followers on Twitter. Parsons Brinkerhoff staff members have interacted thousands of times with the public, with more than 2,000 comments received in the first 30 days after launch alone. Since March 2012, Parsons Brinckerhoff estimates that the 96 Fix Facebook page's posts have been viewed more than a million times.

At the first public meeting during the design phase, the public was presented with nine different options for maintaining traffic and were asked to vote on which one they preferred. The voting included: in-person, mailed-in ballots, and on Facebook and Twitter. During the following 10 days, 40 people filled out a paper copy at the meeting and 1,747 responses were received online.

These social media sites have been excellent tools in providing real-time closure information, as well as to answer questions and quickly provide feedback. The public is even posting their own pictures and videos of the project on the 96 Fix Facebook and Twitter sites, as well. This has gone a long way toward increasing customer satisfaction and communication on this project.

Demographics on Facebook users:

- 64% Women, 36% Men
- 31% ages 35-44
- 26% ages 25-34
- 24% ages 45-55
- 6% ages 18-24

Two examples of pictures shared on Facebook:

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LCPtracker™
Labor Compliance Software

Certified Payrolls - LCPtracker

LCPtracker is web-based software used to collect, verify, and manage prevailing wage certified payrolls and related labor compliance documentation. It can validate local, state, or federal Davis-Bacon prevailing wage regulations. The accurate and efficient collection of labor data allows reporting for equal employment opportunity (EEO), workforce analysis, apprentice utilization, residency, and other data that is essential to effective project administration. These standard reports are included within the software.

LCPtracker greatly reduces the hours needed to review hundreds of certified payroll records for the I-96 project known as the 96 Fix. This reduction is achieved by having contractors enter all information into an online certified payroll reporting form. LCPtracker will flag any errors or omissions the contractors may have reported. The contractor has immediate feedback of any violations. LCPtracker, Inc. maintains and upgrades the software to keep up-to-date prevailing wage rates and notifies all parties involved of any violation. It contains 53 validation checks that ensure all required documentation is submitted on every certified payroll.

There are three ways a contractor can enter payrolls in LCPtracker:

- Manual option (recommended for companies with less than 20 employees)
- Pre-defined spreadsheet interface (contractors use their payroll software to interface with LCPtracker). This option is compatible with approximately 20 different payroll softwares. The company is currently working to make all payroll software compatible.
- Direct payroll interface (contractor has to pay LCPtracker, who will then load payrolls into the system). Recommended for companies with more than 20 employees.

The 96 Fix project is a $148 million project involving more than 30 contractors. LCPtracker has greatly reduced the amount of time the 96 Fix team spends reviewing certified payrolls.

For more information, visit *www.lcptracker.com*.

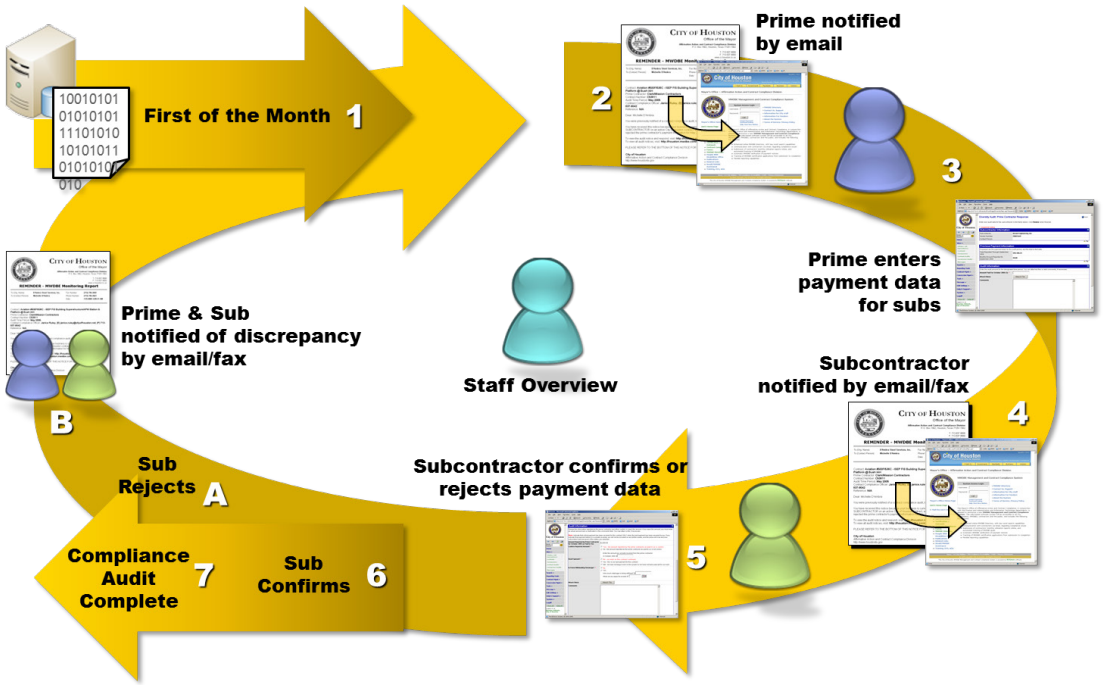
LCPtracker and B2Gnow Tracking Software

Diversity - Goal Tracking Software

B2Gnow is web-based software that provides document verification and management support to interactively monitor and report diversity goals/activity throughout the life of a project. Such diversity goals include the following: Disadvantaged Business Enterprise (DBE), Minority Business Enterprise (MBE), Woman Business Enterprise (WBE), and Small Business Enterprise (SBE). B2Gnow maintains compliance with federal, state, and local diversity programs. In addition to diversity goals, B2Gnow also can monitor prompt payment requirements. B2Gnow handles more than $200 billion in contracts monitored for diversity compliance, along with more than 150,000 certification records.

The oversight agency - in this case, the Michigan Department of Transportation (MDOT) - has the ability to customize the portal to meet the required information specified in the contract. The software allows the 96 Fix project team to quickly see whether the sub-contractor was paid, if it met the prompt payment spec, or if there were payment deficiencies (i.e., sub-contractor was not paid the full amount). The 96 Fix project has a DBE participation goal of 1.65 percent and uses B2Gnow to monitor the goal.

On projects other than the 96 Fix, MDOT requires the prime contractor to fill out Form 2124, called "Prime Contractor Bi-Weekly Statement of Subcontractor/Supplier Payments." This form tracks all of the sub-contractor payments, deductions, and other information on a bi-weekly basis. At the end of a project, sub-contractors would sign off on the document to verify they were paid the proper amount. B2Gnow allows the contractor to verify payments on a weekly/bi-weekly basis. While the program does not save time for the contractors, it does ensure that all of the sub-contractors have been paid the proper amount throughout the project. For the 96 Fix, sub-contractors log in to B2G and verify they received payment from the prime contractor. MDOT expects fewer payment issues as a result of B2Gnow tracking software.



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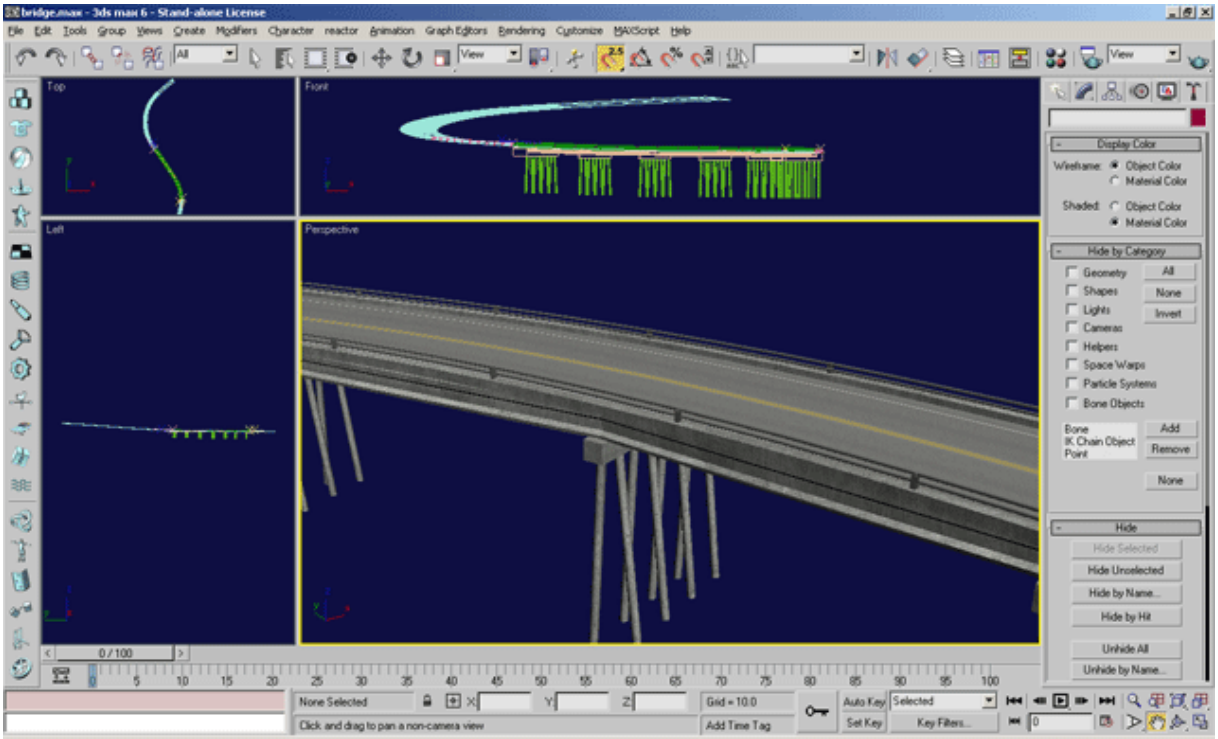
For more information, visit *www.b2gnow.com.*

Electronic 3D Models for Design & Construction

MDOT
Michigan Department of Transportation

For the last 25 years, MDOT has used technology to automate design deliverables. The first step in deliverable changes took design deliverables from hand drawn paper plans to virtual paper plans while leaving construction deliverables relatively unchanged. Over the last 25 years, MDOT designers have realized automation efficiencies from our computers with respect to plan production without passing those efficiencies onto construction. The next step in automation has arrived: electronic 3D Models. The move toward electronic 3D models began in 2007 with the MACH 1 (Michigan Construction Highways) project. 3D models provide accurate representations of existing and proposed site conditions and allow construction to realize many design automation efficiencies. Electronic 3-D models have significant advantages to traditional design including: enhanced visualization, automated quantity calculation, clash detection, and geospatial relevance for ease of use with Automated Machine Guidance / Control. The eventual objective is to have the 3D model supersede the virtual paper plans as the contract vehicle for projects.



MDOT is ready to implement model based design as standard practice. Requirements for deliverables and recommendations for developing 3D models are being developed and are near publication. MDOT generated the 3D model requirements in partnership with representatives from Michigan's consulting, contracting, and survey communities. These requirements are in alignment with a national effort within the transportation industry, and the MDOT/FHWA Every Day Counts II - Electronic 3D Models Initiative, to fully implement 3D modeling to promote automated construction and increase the efficient flow of data from design to the field. Such requirements will unify and standardize MDOT model deliverables.

Electronic 3D Models for Design & Construction

MDOT currently provides electronic model data to the construction industry as Reference Information Documents (RIDS) at the time of advertisement. This information includes electronic copies of 3D engineered models, surface data, alignment data and cross sections. It can be used by the contractor to expedite bids and perform takeoffs with a lower risk factor, used at time of construction for material placement, clash detection and by MDOT's construction engineering and inspection providers for quality assurance purposes.

MDOT has been actively participating in the FHWA Technical Working Groups (TWG) developing resources for 3D engineered models. Recorded webinars, a help desk-line, valuable resources, sample specifications and web-based training modules are (or will be) available at the following website:

www.fhwa.dot.gov/construction/3d/

A forthcoming Domestic Scan report on Civil Integrated Management also has MDOT participation and information is available at the following website:

www.domesticscan.org/13-02-advances-in-civil-integrated-management-cim

MDOT has produced several educational webinar recordings for training on 3D engineered modeling available at the following website:

www.michigan.gov/mdot/0,4616,7-151-9625_21540_36037_65127---,00.html

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MDOT
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Stringless Paving Technology

Stringless paving technology is a great innovation that, in time, will become the standard for grade control. This is the next step in the advent of electronic plans, bidding and project control.

Under current construction practice, a profile grade line is calculated, to the nearest two decimal points, for points located at 25-to-50-foot intervals. Cross slope calculations establish additional parallel grade lines. Surveyors set grade on lath or hubs, and these points are transferred to a string line with measuring tapes and carpenter levels. Typical survey tolerance is about 0.02 feet for line and grade. After the string line has been initially set, it is eyeballed for irregularities and adjusted by the contractor crews. This same process may be repeated several times on a project as each layer of the pavement is constructed. Inspection staff has an opportunity to compare and check the string line with the survey hubs. In most cases, transition grades from the new pavement to an existing structure are warped into a best-fit condition in the field.

With stringless paving, this entire process of establishing the profile lines and grade fine-tuning is completed in a 3-D model. Profile adjustments are now back in the hands of the design engineer, rather than being delegated to the crew setting the string line. Once a surface profile has been established, it can be used to control the grade of any number of lower layers.

Stringless Paving Technology

There are some key steps that must be addressed by all parties

DOT Design:

The design information needs to include a greater degree of accuracy with figures to the nearest 0.0001, or greater, which is beneficial for establishing the design profile grades. "Stringless" requires key control points and curve equations, not the standard 50-foot spot grade calculations. It is critical to check the transitions between vertical curves. The proposed grade profile can be run through the Federal Highway Administration's (FHWA) ProVal software, and an estimated IRI can be established for each segment of pavement. It is recommended that a design-grade IRI target of 10 inches per mile be established for each lane of pavement. IRI is sensitive to grade breaks and slope breaks. This becomes even more critical as you add more driving lanes. A one-time review of the centerline through a project is not enough. Typically, the centerline is the cleanest line on the project and the longitudinal joint lines outside of that require more attention since that is where the greatest slope transitions take place.

Contractor files:

Need to be reviewed for accuracy and ride compliance. Additionally, the project surveyor should field-verify all tie-in points prior to paving and adjust the files to match correctly. It also makes sense for the team to understand what kind of long slope they are tying into so the new pavement can be "warped" to smooth the transition if it makes sense with the long-term plans for that stretch of road. The nice thing about working with the digital files is that it is relativity easy to keep the design engineer in the loop should any differences show up.

Project Control:

The project control points, spaced at 250-foot intervals should be established with an accuracy of at least +/- 0.001 foot. As the contractor moves through the job, small differences between control points can be compounded, which could lead to issues when tying into a final fixed point. When the contractor sets up a total station, a minimum of three control points should be hit and the accuracy values of that shoot-in should be recorded and be within maximum tolerances established.

Paving:

A grade-checking rover should be operational at all times while paving to ensure accuracy. Dry runs before concrete arrives with a new set-up (paver and location on the job) are helpful to ensure that the paver is on line and grade. The interaction between your stringless paving system and the paver computer need to be understood. The sensitivity settings on both need to be fine-tuned before and during paving to ensure that the paver will respond properly. Adjustments to the elevation and alignment while paving should be kept to a minimum to improve ride. Action limits for alignment, elevation tolerances and physical depth checks should be established and monitored. To assure a smooth connection into existing structures, the design location scale can be reduced within 200 feet of the tie in point along with an increase in rover check frequency.

QA Inspection:

A grade-checking rover can be set up on any unoccupied control point and grade checks can be recorded at any point.

MDOT
Michigan Department of Transportation

A+B and Modified Best Value Contract Provisions

A+B Contracting

Due to the interference and inconvenience to the motoring public caused by a full I-96 freeway closure, the Michigan Department of Transportation (MDOT) knew it was imperative that the work be completed as soon as possible. Taking this into account, award of the contract was based on an A+B Contractor bid, with the "A" portion being the total pay item work and the "B" portion being the number of days the contractor projected the freeway being closed multiplied by a predetermined user delay cost per day. The contractor would be awarded an incentive (supported by the estimated user delay cost) for each day prior to the number of days bid that the freeway was open to traffic. Likewise, a disincentive, or liquidated damages, would be assessed for each day after the number of days bid the contractor failed to open the freeway to traffic.

A+B incentive/disincentive contract provisions are not new, and have been used by MDOT in the past to accelerate construction work where appropriate. However, because the number of days "B" were part of the bidding process, previous versions of A+B contracts made no allowance for legitimate changes in the work that might result in increased costs or extensions of time. When such issues arose, it made negotiations of how to address those issues and keep the project schedule appropriately accelerated difficult, and often caused the Federal Highway Administration (FHWA) to refuse to participate in any further acceleration costs. Consequently, MDOT began using other forms of incentive/disincentive provisions, such as lane rental. As the department analyzed the options for I-96, A+B really did seem to offer the best way to accelerate the job and take advantage of contractor efficiencies. MDOT successfully re-wrote the A+B provisions with FHWA to allow for reasonable extensions of time or acceleration costs for items outside of the contractor's control, while maintaining a level playing field for all bidders. Thus far, the new A+B provisions have worked as intended.

A+B and Modified Best Value Contract Provisions

Modified Best Value Contracting

In addition to the efforts to minimize the freeway closure timeframe, early pre-bid community engagement identified potential "Quality of Life" concerns during construction. Taking these community needs and resident sensitivities into consideration, the contractor was required to provide a technical proposal with work plans and corrective action plans addressing air quality, noise, safety and mobility, property damage prevention and utility outage avoidance, and local contractor and workforce participation. Regular monitoring and weekly discussion takes place surrounding the contractor commitments and adherence to their proposed plans. Fielding public calls and having an avenue to address those concerns is significantly eased by having the contractor work plans, engagement and commitment to address these issues.

The requirement to provide these work plans is a modification of a best value performance-based contracting effort MDOT used on a previous project to rebuild a portion of the M-39 freeway in northwest Detroit several years ago. On M-39, similar "Quality of Life" issues existed, and MDOT awarded the project on a true "best value" basis: the bidders technical proposals were scored and that technical score was combined with the contractors' bids to determine the lowest responsive bid. While the M-39 project was quite successful in improving contractor engagement and responsiveness and the outcomes important to the adjacent community, it came at a significant risk that the low bid price might not be the lowest responsive bid. In order to mitigate this risk, MDOT has been trying several modifications of the best value provisions to isolate them from the bidding process, while still making the technical proposals a contract requirement. One variation used on a streetscape project in southwest Detroit made the technical proposals part of a supplement qualifications step in a two-step bidding process. Bidders had to submit technical proposals, which were reviewed to determine if they were sufficiently adequate to allow the contractors' to submit a price bid. In the case of the I-96 (96 Fix) project, the technical proposal was not required until after the price bids were submitted, but having an adequate technical proposal was a requirement before the contract was awarded. MDOT is still evaluating the benefits and risks of these modifications to the best value provisions.

The original evaluation of the M-39 best value performance-based contract can be found at:

www.fhwa.dot.gov/programadmin/contracts/sep14m392012.pdf

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All work under the I-96 (96 Fix) contract is accounted for on a Critical Path Method (CPM) schedule. A pilot contract specification was prepared to further define and strengthen CPM schedule submittal requirements in an attempt to improve progress monitoring and enhance schedule oversight. Previous iterations of the CPM schedule specification in Michigan did not provide for an effective tool to evaluate time impacts or carry any measures for enforcing compliance.

With this pilot specification, a baseline schedule must be submitted prior to the start of construction and monthly progress schedule updates must follow. Lacking an approved baseline schedule or submission of monthly update CPM schedules, the engineer may withhold pay estimates. In addition, the contractor may request a contract time extension only after demonstrating delay through an un-impacted vs. impacted schedule analysis. No delays that occur prior to having an approved CPM schedule will be considered for an extension of time.

Given the complexity of the work to be performed, the aggressive execution schedule, and the requirements of the pilot CPM specification, MDOT enlisted the expertise of a project scheduling professional to better address the review and analysis of any CPM schedule submitted by a contractor. This has proven quite beneficial to ensure both a timely and thorough review and understanding of the contractor's schedule and plan for executing the work.

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Facilitated Partnering with Construction Contracts

Facilitated Partnering was a tool used by the Michigan Department of Transportation (MDOT) over a decade ago on a fairly frequent basis. The purpose of partnering is to develop a proactive effort and spirit of trust, respect, and cooperation among all stakeholders. The hopeful outcomes of the program include improved team-building and decision-making skills, sound business relationships, open communications, a reduction in the number of disagreements and claims, and improved project quality.

For a number of reasons the practice subsided but there has been renewed interest in recent years to reinstitute the practice where practical, especially for large, complex and significant projects. MDOT has developed an updated specification that outlines the requirements and expectations for the Facilitated Partnering effort. Under this specification, there is to be an initial partnering session, update sessions and a post-construction review.

Facilitated Partnering sessions are a requirement under the I-96 (96 Fix) contract. To date, only the initial partnering session has occurred, with the first update session pending. However, there appears to be some merit to the approach as evidenced by the lack of claims and general willingness to work together to resolve issues.

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Supporting Specifications, Guidelines, and /or Procedures

Link to MDOT e-Construction Special Provision:
http://mdotcf.state.mi.us/public/specprov/index.cfm?sy=439690#b126c3ed-ba97-4c6c-92a1-1315d7e1b057

Link to Digital Signatures guidance documentation:
http://www.michigan.gov/documents/mdot/MDOT_IM12-02_378056_7.pdf?20140204085319

(Additional information on use of mobile devices to digitally sign documents on same page)
http://michigan.gov/mdot/0,1607,7-151-9622_11044_20469---,00.html

Link to e-Construction YouTube video of digital signature process and ProjectWise document management process in action on a large project: *http://www.youtube.com/watch?v=JbwlvmOTUrI*

Link to YouTube video showing field staff using mobile devices to administer an e-Construction highway construction projects without using paper: *http://youtu.be/To48dmqgVvI*

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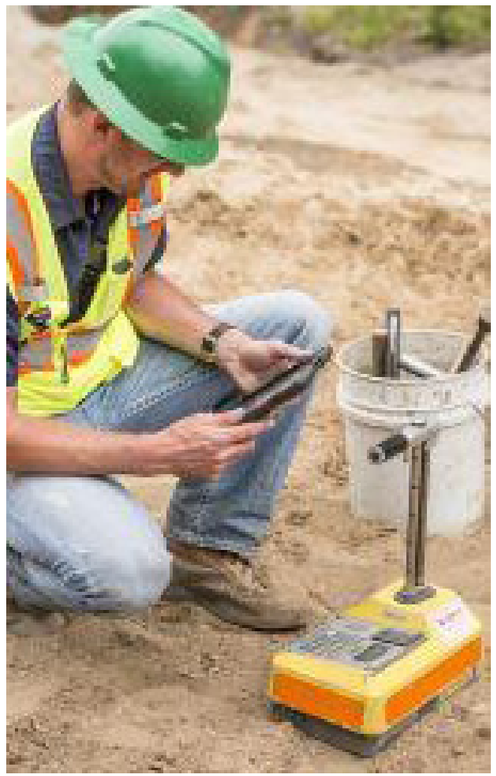

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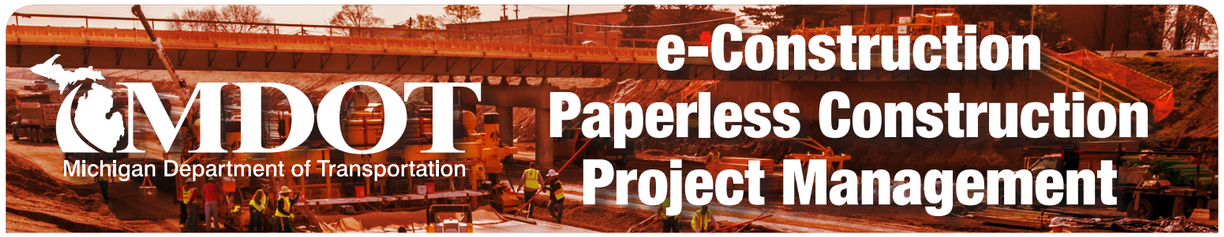

e-Construction
Paperless Construction Project Management

The administration of a project through the design and construction process requires significant communication and documentation of events. This has traditionally required substantial amounts of paper documentation from field staff, contract administration staff, laboratories, contractors, suppliers, inspectors and consultants. The management of this paperwork, the printing/mailing of documents, maintaining large file cabinets and file rooms, and the process to obtain physical signatures on paper not only contributes to volumes of paper documents, but also a very time-consuming process to complete document approvals.

The Michigan Department of Transportation (MDOT) is the first state DOT in the country to pilot and put into production "paperless construction projects." Multiple new technologies being used by MDOT are revolutionizing the contracting process while making it faster and cheaper for agencies and firms to do business. MDOT has completed its pilot projects and has moved to implement production of the new process with a stated goal of 100 percent of its trunkline projects being paperless by October 2014.

"e-Construction" is the term used by MDOT to describe its paperless construction documentation process. With the increased use of digitally encrypted electronic signatures and enhanced document management tools, a faster paperless construction documentation process is now possible. This includes mandatory use of digital signatures by all parties, significant process improvements by laboratories and testing staff, increased automation by field inspectors using mobile devices, and recreating new inspection processes on fillable forms. The forms are then completed electronically in the field by inspection staff and uploaded to secure document management software (ProjectWise) that all project contractors, engineers, suppliers, fabricators, testing personnel, and inspectors have access to and is the only method they can use to submit all documents on e-Construction projects. The ProjectWise document management software also incorporates new automated workflows to help efficiently route documents to the correct approver/reviewer for their electronic approval and digital signature.

This open and transparent document management system has significant benefits for project delivery. This virtually eliminates "lost" documentation and traditional claim conflicts involving document submittal or approval for a project. If documentation is missing for a project, it is much more readily apparent and leads to better project audits and increased availability of project documentation to all parties. The document management software is available free of charge, as MDOT has chosen to pay the enterprise software license for all parties. Users can access project documentation on their desktop/laptop PC through a locally installed software version of ProjectWise Explorer or they can view documents from remote locations on mobile devices through either a web portal access or a dedicated iPad application.

Combined with the increased use of mobile devices and other technology, the entire construction administration process can now be completed without paper documentation. For those documents still received in the field in paper form, inspectors are using applications on their mobile devices to scan documents into a PDF and then digitally sign the documents. Many more documents have been converted into fillable forms for easier data entry in the field and faster submission of project documents directly into ProjectWise from mobile devices. Applications also are being tested that use the GPS feature of devices to plot the inspector's current location on geo-coordinated PDF construction plan documents, allowing both inspectors and the general public to gain a better understanding of where they are and what they are looking at on project plans. Additionally, some inspectors are using applications allowing them to fill out electronic forms with voice recognition, edit PDF plans in the field, and even obtain light metering information for night work. In addition to these "apps," staff also have access to the full range of Microsoft Office suite of software and office network file drives via a secure CITRIX connection from their mobile devices.

The e-Construction process has accelerated the entire decision-making process, allowed for faster project delivery, and significantly reduced costs for all parties. Some additional benefits are improved communications and partnering, decreased cost of printing and mailing services, and greater opportunities to perform parallel work activities.

e-Construction Paperless Construction Project Management

Greater Goals

MDOT's e-Construction process requires contractors to submit all construction documents electronically to MDOT's document management system, and mandates the use of digitally encrypted electronic signatures. However, the e-Construction pilot process also includes staff from several divisions, including Survey, Design, Materials/Laboratories, Records, and the Federal Highway Administration (FWHA). The overall department goal, termed e-Project, is to keep data electronic throughout the life of the project (from planning to design to bidding to construction to asset management, operations, and maintenance). An internal study of four construction projects revealed that less than 1 percent of the construction project documentation was hand-generated. Why print out data on a paper form for project records when it is already electronic? MDOT has a stated goal to try to keep electronic data in its electronic format so that it is more easily available and eliminate printing documents just for record keeping.

The desire to keep data intact from concept to construction requires the increased use of document management software already in use throughout the design and planning stages for projects. Adding the construction documentation was a logical step; however, it is only the beginning. The actual plans used to construct projects are often delivered to contractors in a PDF format as they bid on projects electronically through Bid Express. These PDF plans are electronic, but they are still two-dimensional representations of what is intended to be built. MDOT is taking the next step to deliver these construction documents as fully developed 3-D models since most design is already accomplished in 3-D. By allowing contractors to use 3-D models in bidding projects, additional costs-savings and reduced error transcription also is achieved. Contractors are able to directly use the project data in their bidding software to accurately bid projects and more precisely estimate the work required to construct the project. This also allows contractors to use native design model data in their GPS equipment on the job site for automated machine guidance as they construct the project.

The last logical step is to change the inspection data collection/as-built drawing process to stop manually marking up PDF files in two dimensions. Instead, inspectors will use modern survey equipment/devices to create a true 3-D as-built model of the project. This data will then be available for use for design/planning of future projects at the same location, asset management software and accurate GIS mapping of the highway network. Most features do not move over time and accurate data easily available to maintenance/operations staff can greatly reduce utility conflicts, allow precise replacement of items in same location, and keep better track of the entire system. Ultimately, with maintenance/operations staff having the ability to easily use mobile devices to review accurate GIS model data in the field, significant benefits can be realized for both long-term financial savings and increased safety to staff.

From Pilot Projects to Full Implementation

MDOT's e-Construction process is designed to take full advantage of multiple existing innovations, technologies, and process improvements in project management to revolutionize MDOT's highway construction program administration. It embraces state-of-the-art design/construction survey, 3-D design modeling, electronic document submittals, automated document approval workflows, electronic records storage, and mandates the full use of digitally encrypted electronic signatures by all parties.

MDOT piloted the e-Construction process in 2013 on four major highway contracts worth more than $140 million in construction. These four pilots included new construction, rehabilitation/reconfiguration, interstate highway interchanges, and a construction manager/general contractor (CMGC) project on one of Michigan's largest freeway bridges.

- I-96/Latson Road – Howell, Michigan - $25 million new interchange construction.
  Prime Contractor: Kamminga Roodvoets
- M-231 over the Grand River – Grand Haven, Michigan - $68 million new state highway and new large bridge construction.
  Prime Contractors: C.A. Hull and E.A. Hardman
- M-231 over Little Robinson Creek – Grand Haven, Michigan - $9 million new state highway/interstate interchange construction and bridges.
  Prime Contractor: Milbocker and Sons
- Zilwaukee Bridge – Zilwaukee, Michigan - $35 million CMGC contract for bearing replacement on I-75.
  Prime Contractor: PLC of Tampa, Florida

MDOT has completed the pilot process and has now begun the implementation phase. Statewide implementation is occurring throughout the 2014 construction season as staff conduct training in every MDOT field office throughout the state. Full implementation has been set for October 2014, at which time paperless construction and the mandatory digital signatures special provision will be a part of all MDOT jobs bid from that date on. As responsible stewards of taxpayer dollars, MDOT can no longer afford to conduct business the old way and must move forward with these cost-saving, innovative technology advancements.

Benefits of e-Construction

One of the largest benefits of the e-Construction process is its transparency. Every party knows to the tenth of a second when a document was submitted and approved, thus eliminating disagreements about approvals, lost documents or miscommunication. All parties are accountable and all parties can view the approval process.

MDOT is using already established technologies and proven tools. New standards were drafted to help mandate the use of digital signatures and other changes to help provide the change to a less paper-intensive construction administration process, but little to no investment is needed by any stakeholders to begin using the new process. Mobile devices and smart phones are now extremely common with the majority of the U.S. population now using these devices on a regular basis, and nearly all MDOT field staff already had access to either a laptop computer or tablet device, thus most offices were able to begin implementing the e-Construction processes with less concern for large investments in electronic hardware. All current processes being used can easily be performed on a laptop computer in the field with an air-card or Wi-Fi access. However, the pilot projects did show significant improvements in field staff efficiency using tablets and smart phones over those using traditional laptops. Thus, the paperless e-Construction process is already easily available to be shared and deployed nationally.

MDOT performed a detailed review of one of the pilot projects, a large $25 million new interstate highway interchange construction project on I-96 and found the savings, just from paper, printing, postage, envelopes, labels, and other fixed actual overhead costs, totaled more than $300,000. Every document on the project was reviewed and compared to the estimated costs if it had been a traditional paper-driven project. These costs revealed an estimated $180,000 in savings for MDOT and $120,000 for the contractors/stakeholders. It was estimated to have eliminated more than 170,000 pieces of paper. Also assuming every document that would have been mailed would take two days to arrive, the mail time saved on the job was a staggering 150,000 days. This is not only a significant "green" environmental savings, but a green cash-savings as well to all parties involved in the project. From suppliers, to subcontractors, prime contractors, consultants, laboratories and MDOT/FHWA staff time, the potential savings and efficiencies can be significant. Projected out to the entire MDOT construction program, this is almost $12 million in savings just in measurable fixed-overhead costs for all stakeholders. The much more significant savings from staff efficiencies, reduced claims, and faster project delivery are harder to quantify, but would be magnitudes above and beyond the stated measurable cost-savings.

The numbers above did not take into account the massive savings potential possible in becoming far more efficient by going paperless. Inspectors are able to cut hours per day by entering data into mobile devices in the field instead of driving back to the office to enter data into a computer (i.e., overtime, lost documents, claims, etc.). These savings are realized by contractors, consultants, subcontractors, and suppliers as well. In general, it could also be said that the potential savings realized increases when smart phones and tablets were used. Long laptop startup times, less reliability and difficulties obtaining Wi-Fi access often illustrated significant savings potential for field staff using iPads/tablet devices over traditional laptop computers.

In addition, the use of digitally encrypted electronic signatures is making it faster and cheaper for contractors to do business with MDOT. In fact, documents are now often approved within minutes. In 2012 and 2013, contractors choosing to begin using one small part of e-Construction, using digital electronic signatures, saw approval times significantly drop and were statistically proven to have paid four to five times faster than their competitors who did not use this process. MDOT has received dozens of thank you notes from contractors commenting that they have already seen the benefits of reduced paper, reduced overhead costs, and faster payments. They are much more competitive and financially stable as a result of using digital signatures. It is expected that long-term savings will be passed on through lower bid prices and will benefit the entire program.

The Michigan Department of Transportation (MDOT) has made efforts in recent years to improve the process of resolving contract disputes and expediting the contractor claim process. As part of those efforts, MDOT has been investigating alternatives to the traditional claims process. Based on research and discussions with Florida and other state DOTs, MDOT is piloting a Dispute Review Board (DRB) process on several contracts. The concept of a DRB is to establish an independent panel of construction experts to assist the project team (owner and contractor) in addressing disputes they are unable to resolve at their level. The DRB evaluates and provides recommendations as to the entitlement of claims arising out of the work under contract. The DRB consists of one member selected by MDOT, one member selected by the contractor, and a third member mutually selected by the first two selected members who will act as the DRB chairperson. The purpose is to fairly and impartially consider claims and provide recommendations for their entitlement and resolution at the project level in an expeditious manner.

In establishing this pilot process, MDOT also consulted with the national industry DRB Association for guidance on both specifications, as well as the necessary structure to enable the process to happen. This included establishing a pool of qualified DRB panel members through an application and training process. Establishing a sufficiently large enough pool has been a challenge due to statutory restrictions on the hiring of retired state employees and conflict of interest provisions in the DRB specifications.

A DRB was established for all work under the I-96 (96 Fix) contract. To date, there hasn't been a need for a formal DRB hearing for any work under this contract. However, it also is believed that simply having the presence of an independent DRB discourages frivolous claims and encourages a more cooperative approach to resolving contract disputes at the lowest level.

For More Information

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