e-Construction

Final Participant Workbook

Every Day Counts 3 (EDC-3) Regional Summits

December 2014

AASHTO Innovation Initiative

U.S. Department of Transportation
Federal Highway Administration

Table of Contents

Background on e-Construction

The administration of highway projects requires a significant amount of documentation, and a new joint FHWA and AASHTO initiative is designed to assist States with implementation of a paperless construction administration and delivery process known as e-Construction. The e-Construction process includes electronic submission of all construction documentation by all stakeholders, electronic document routing/approvals (e-signatures), and digital management of all construction documentation in a secure environment allowing distribution to all project stakeholders through mobile devices.

Several State Departments of Transportation (DOT) and industry practitioners are already using or testing some aspects of e-Construction. Some are even in the process of mainstreaming many of the aforementioned e-Construction system practices. The proposed e-Construction system is supported by many tools and practices that currently exist to improve communication and make construction management practices more efficient. e-Construction has the potential to increase the quality, efficiency, environmental sustainability, and productivity of the construction industry at large while at the same time saving on printing costs, time, postage, and document storage as well as adding communication efficiencies. To date, e-Construction has been proven by several agencies. Through enhanced awareness and promotion of benefits and examples of its application, the highway industry is ready to reap the benefits of program-level implementation.

Organization of this Workbook

In order to assist States with implementation of e-Construction, FHWA's Every Day Counts 3 (EDC-3) Program, in conjunction with AASHTO's Innovation Initiative, hosted seven Regional Summits to share information about existing practices, agency successes, and how to find additional information. Each e-Construction session consisted of lead State presentations along with discussion on how to advance the state-of-the-practice, common challenges, and lessons learned.

This workbook is a culmination of all seven Summit sessions and provides a copy of all presentation slides. The first presentation given at each Summit is from FHWA and highlights the background on the joint initiative. The FHWA lead-in presentation was followed by presentations from two lead States, varying by Summit but including Michigan, Florida, Texas, Minnesota, Iowa, and Utah DOT.

These lead States presented on their e-Construction practices, challenges, and successes.

This workbook also includes a glossary of common terms used in e-Construction, along with a copy of a recently published fact sheet on the benefits and uses of e-Construction.

The final portion of each Summit included open discussion on suggestions for the types of activities that FHWA and AASHTO should undertake to help agencies further implement e-Construction nationally. An Implementation Plan will be published in early 2015, and FHWA and AASHTO will implement the recommendations from the plan during 2015 and 2016 to help advance e-Construction nationwide with the goal of improved efficiency, reduced paper, and reduced costs.

For more information, contact

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Typical Session Agenda

Topic	Presenter/Facilitator	Duration
Welcome and Introductions	All	5 min
Introduction to e-Construction: National Perspectives	FHWA	15 min
State Department of Transportation Presentation	Lead State Presenter	30 min
State Department of Transportation Presentation	Lead State Presenter	30 min
Round Table Discussion on Implementation Activities	All	25 min

Summit Locations and Presenters

Location/Dates	Lead State Presenters
Washington, DC – October 7-8, 2014	Jason Clark, Michigan DOT Roxana Garcia, Texas DOT
Louisville, KY – October 21-22, 2014	Jason Clark, Michigan DOT Richard Beckes, Minnesota DOT
St. Louis, MO – October 23-24, 2014	Stu Laakso, Michigan DOT Greg Mulder, Iowa DOT
Phoenix, AZ – October 27-28, 2014	Amy Tootle, Florida DOT Cliff Farr, Michigan DOT
Sacramento, CA – October 29-30, 2014	Amy Tootle, Florida DOT Cliff Farr, Michigan DOT
Portland, ME – November 13-14, 2014	Roxana Garcia, Texas DOT Cliff Farr, Michigan DOT
Charlotte, NC – December 9-10, 2014	Amy Tootle, Florida DOT Rob Wight, Utah DOT

Implementation Technical Working Group Members

We would like to acknowledge the input and participation from the following Technical Working Group members:

Amy Tootle Florida DOT	Rafiq Darji Florida Division Office, FHWA	Bryan Cawley FHWA Headquarters
Jason Clark Michigan DOT	Cliff Farr Michigan DOT	Robert Fijol Michigan Division Office, FHWA
Richard Duval Turner Fairbank Highway Research Center, FHWA	John Obr Texas DOT	Roxana Garcia Texas DOT
Rob Wight Utah DOT	Greg Mulder Iowa DOT	Richard Beckes Minnesota DOT
Stuart Laakso Michigan DOT	Mark VanPortFleet Michigan DOT	Greta Smith AASHTO

Glossary of Terms

As-Built Drawings – Record drawings of completed construction projects or project elements.

Audit Control – A process for assuring achievement of an organization's objectives in operational effectiveness and efficiency, and compliance with laws, regulations and policies.

Authentication – To establish the authorship or origin of conclusively or unquestionably; the use of digital certificates to establish validity and uniqueness.

Automated Forms – Electronic versions of forms that automatically populate or prompt users to enter data, and merges information into a completed version of the form.

Browser – A software program that allows the user to find and read encoded documents in a form suitable for display, especially such a program for use on the internet.

Business Process – A collection of linked tasks which find their end in the delivery of a service or product to a client; a set of activities and tasks that, once completed, will accomplish an organizational goal.

Concurrent Document Reviews – The collaborative review and co-authoring of documents in real time.

Construction Administration Delivery Process – The established process by which the oversight of construction activities is monitored, recorded, and tracked, including filing procedures, the tracking/logging of submittals, and the hierarchy of review.

Data Hosting – The activity or business of providing storage space and access for websites or file sharing applications.

Decryption – The process of converting encrypted data back into its original form, so it can be understood or read.

Design-Bid-Build – A project delivery method through which a project is designed first by an entity, then bid and constructed by a second entity.

Design-Build – A project delivery method through which a single contract is awarded to one entity to deliver both design and construction of a project.

Digital Signature – An electronic signature that can be encrypted, certified, and used on electronic forms and documents.

Electronic Approvals – Approval and signing process enabling individuals and organizations to quickly authorize and sign and approve documents and transactions in an electronic, or on-line forum.

Electronic Document Routing – A business process, where a generated document will be passed from one user to the other via email notifications and task assignments. Each user(s) in the path of the defined workflow will be able to perform a variety of tasks such as review a document, edit attached documents, add attachments, fill forms and much more before passing the batch to the next person or persons in the path.

Encryption – The conversion of data into a format that cannot be easily understood by unauthorized people.

Firewall – An application that monitors traffic between an internal network and the internet and regulates the type of network traffic that can pass through it.

HTTP (Hypertext Transfer Protocol) – A system used to retrieve hypertext files from remote hosts. A HTTP server (HTTPD) is a server that employs HTTP to transfer data. Hypertext transport protocol secure (HTTPS) is a protocol for accessing a secure web server.

Mobile Devices – A portable computing device, such as laptop, tablet computer, smartphone, that allows for connectivity to electronic media through networks or file-sharing systems.

Paperless – An environment in which the use of paper is greatly reduced, diminished, or eliminated; Filing systems are maintained through electronic means.

Project Collaboration Software – e-Construction software system developed and implemented to allow for electronic collaboration among project team members.

Proxy – To transfer data processing tasks to another program or device.

Radio Frequency Identification (RFID) Tags – The wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information.

Secure File Sharing – The public or private sharing of computer data or space in a network with various levels of access privilege.

Server – A computer or computer program that manages access to a centralized resource or service in a network.

SSL (Secure Sockets Layer) Encryption – A security technology for establishing an encrypted link between a server and a client.

System Integration – The process of bringing together the component subsystems into one system and ensuring that the subsystems function together as a system.

Transparency – A situation in which business activities are done in an open way with open access to all parties.

Version Control – A system that records changes to a file or set of files over time so that you can recall specific versions later and track authorship and time/date of revisions

Website – A location connected to the Web that maintains one or more pages on the internet.

Workflow – The sequence of processes through which a piece of work passes from initiation to completion

e-Construction Fact Sheet

e-CONSTRUCTION

What is e-Construction?

e-Construction is the collection, review, approval, and distribution of highway construction contract documents in a paperless environment.

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e-Construction is a paperless construction administration delivery process including: electronic submission of all construction documentation by all stakeholders, electronic document routing/ approvals (e-signature), and digital management of all construction documentation in a secure environment allowing distribution to all project stakeholders through mobile devices.

The administration of highway projects requires a significant amount of documentation. This has traditionally been accomplished through extensive paper-based documentation systems involving conventional postal delivery, project journals, note taking, stamped plan sets, design and construction submittals, and physical signatures on multiple copies of many documents. A paper-based system requires significant time and money to create process and store documentation. In an era of instant communication, on-the-fly information access, and a tech-savvy workforce, this state of affairs is fast becoming obsolete. This initiative aims to employ readily available established technologies which are available to the transportation community, such as digital electronic signatures, electronic communication, secure file sharing, version control, mobile devices, and web-hosted data archival and retrieval systems to improve construction documentation management.

Every Day Counts — innovation, ingenuity, invention, imagination

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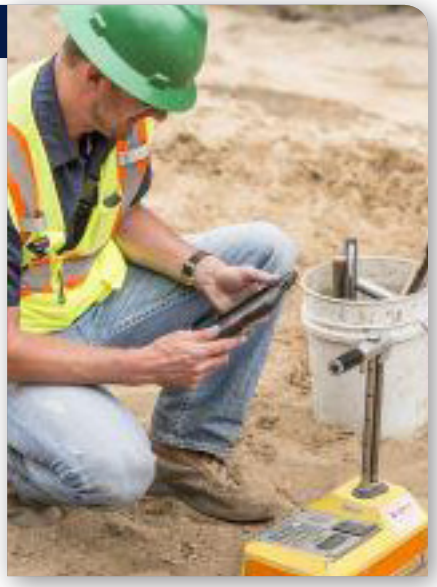
What are the Benefits of e-Construction?



This initiative will modernize construction document management through elimination of the cumbersome paper-based approach. In addition to saving money by decreasing paper use, printing, and document storage costs, this initiative also saves time by decreasing communication delays and transmittal time. The e-Construction process allows faster approvals, increased accuracy, and enhanced document tracking, all while increasing transparency. The improvement to communication and the transparency of the process has virtually eliminated all questions, claims, and disputes as on when (or if) a document was submitted. Additionally, all stakeholders can see the name of the document approver along with the exact timing of each step recorded. The process provides a better foundation to help improve communications and partnering.

What is the State-of-the-Practice for e-Construction?

Many State Departments of Transportation (DOT) and industry practitioners are already using or testing some aspects of e-Construction. Some are even in the process of mainstreaming many of the aforementioned e-Construction system practices. The proposed e-Construction system is supported by many tools and practices that currently exist to improve communication and make construction management practices more efficient. Examples include:

- Transfer of electronic plans (supported under EDC-2, 3D Engineered Models for Construction) and electronic contract specifications and special provisions;
- Mobile devices, software, and applications for field inspection and data collection;
- Data hosting services (data clouds, share sites, virtual review rooms);
- Electronic review and approval processes (digital signatures/reviews);
- Communications tools (e-mail, text, social media, smart phones);
- Radio frequency identification (RFID) tags for resource tracking; and
- Asset management, electronic as-built drawings, and quality assurance records.

Michigan DOT has applied e-Construction routinely to design-bid-build projects, while the Minnesota, Florida, Utah, Texas, Pennsylvania, and North Carolina DOT have applied this technology to design-build projects. Wisconsin and Iowa DOT have applied e-Construction to design-bid-build projects. The Michigan DOT, a leader in e-Construction, estimates that the agency saves approximately $12 million in added efficiencies and 6,000,000 pieces of paper annually by using electronic document storage for its $1 billion construction program, while reducing its average contract modification processing time from 30 days to three days.

How Can Industry Benefit Nationally?

The e-Construction system has the potential to increase the quality, efficiency, environmental sustainability and productivity of the construction industry at large, while at the same time saving on printing costs, time, postage, and document storage and adding communication efficiencies. To date, e-Construction has been proven by several agencies. Through enhanced awareness and promotion of benefits and examples of its application, the highway industry is ready to reap the benefits of program-level implementation.

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Efficiency through technology and collaboration

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e-CONSTRUCTION

Objectives

- What is e-Construction?
- Where did e-Construction come from?
- What can we expect to accelerate deployment of e-Construction:
  - AASHTO Innovation Initiative (Aii)
  - FHWA Every Day Counts (EDC-3)
- Tools under development

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e-CONSTRUCTION

e-Construction is the collection, review, approval, and distribution of highway construction contract documents in a paperless environment

- Electronically capturing construction data
- Electronic submission of all construction documentation
- Increased use of mobile devices
- Increased automation of document review & approval
- Essential use of electronic signatures by all parties throughout the process
- Secure document and workflow management accessible to all stakeholders on any device

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Where did e-Construction come from?

Federal Government

- "electronic" found 81 times within MAP-21
- Presidential Memorandum – Managing Government Records, Nov 28, 2011
  - Fullest extent possible, agencies eliminate paper and use electronic record keeping
- Government Paperwork Elimination Act (GPEA) 1998
- FHWA memo September 21, 1989
  - Secure
  - Reliability of Records
  - Storage of Records

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Where did e-Construction come from?

- State Government
  - Utah DOT using e-signatures and electronic payroll verifications for over 10 years
  - Texas DOT and contractors using mobile computing for project management on the Dallas Ft Worth Connector Project
  - Florida DOT administering an e-Construction pilot projects
  - Michigan DOT completed pilot projects and engaged full program implementation

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e-CONSTRUCTION

What can we expect from FHWA EDC-3 and AASHTO Aii to accelerate deployment of e-Construction?

- 4-months
  - 7 regional summits
    - Explanation of technology
    - 2 State Subject Matter Experts presenting how and why they adopted e-Construction
    - Collecting suggested activities to accelerate implementation nationally
  - Implementation plan for e-Construction
- 2015 and 2016
  - Support and deliver implementation plan activities

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Tools under development to accelerate deployment

- "How to guide" adopting e-Construction manual
  - Florida DOT
- FHWA e-Construction Research Study to document:
  - Cost savings, benefits expected, return on investment , and challenges when using e-Construction.

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e-CONSTRUCTION

For Additional Information

https://www.fhwa.dot.gov/construction/
http://www.fhwa.dot.gov/accelerating/edc3.cfm
http://aii.transportation.org/Pages/e-Construction.aspx

Michigan DOT Experiences in e-Construction

e-CONSTRUCTION

Michigan DOT
e-Construction Paperless Contract Administration

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Presenters:

- **R. Jason Clark, P.E.**
  Michigan DOT Construction Contracts Engineer
- **Cliff Farr**
  Michigan DOT Construction Technology & Training Engineer
- **Robert Fijol**
  FHWA Area Engineer
- **Stuart Laakso**
  Michigan DOT Construction Document Analyst

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Paperless Components Already in Place at MDOT

- Electronic Document Management System
- Construction Administration Software
- Electronic Plans & Proposals
- Electronic Bidding

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e-CONSTRUCTION

While these improvements clearly helped make us more efficient, why was there still so much paper on our projects?

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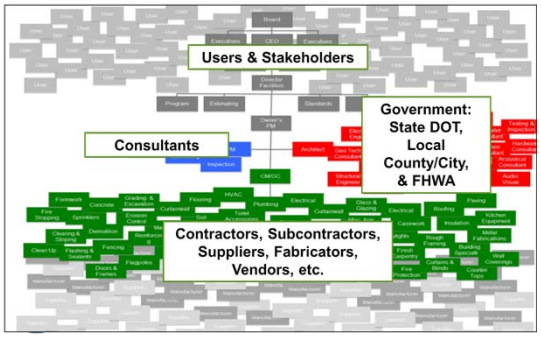
Number of People Involved in a Construction Project



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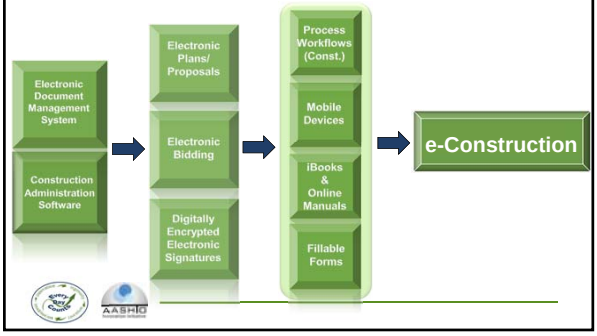
Final Steps to Reach "Paperless" Goal



e-CONSTRUCTION

What Does e-Construction Look Like?

Contractors

- Opportunities to cut costs resulting in lower bid prices / more competitive
- Precise knowledge when submittals are approved
- Transparent access to all project information, reducing claims
- Ability to efficiently monitor subcontractor/supplier submittals
- Faster payments

e-CONSTRUCTION

What Does e-Construction Look Like?

Inspectors

- **Efficiency gains**
  - Easier data collection with tools like voice data entry
  - Elimination of copying / faxing / scanning and distribution of field forms
  - Faster problem solving with interactive real-time access to statewide experts & partners (FaceTime)
  - Easier access to manuals, plans & project information in electronic format
  - Ability to markup plans on mobile device
- **Translates to more time on job site**

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What Does e-Construction Look Like?

Engineers

- Increased & timely oversight
- Access to all project documents remotely from mobile devices
- Paperwork starts & stays electronic
- Reduces lost paperwork
- Ability to electronically sign documents remotely
- Increased communication & efficiency
- Quicker management approvals

e-CONSTRUCTION

What Does e-Construction Look Like?

Management/FHWA

- Transparent oversight
- Access to all project documents remotely for reviewers, auditors, FOIA, etc.
- Ability to electronically sign critical documents on mobile devices between meetings
- Increased communication

e-CONSTRUCTION

Pilot Projects

- **2012 Pilots Projects Selected**
  - I-96 Latson Road ($25M)
  - M-231 Little Robinson Creek ($5M)
  - M-231 over the Grand River ($68M)
  - I-75 Zilwaukee Bridge ($35M)
- **2013**
  - Pilot projects under construction
- **2014**
  - Each field office had at least one e-Construction paperless project
  - Also utilized on large I-96 project ($160M)

e-CONSTRUCTION

Implementation Challenges

- **Digital Signatures & Legal Concerns**
  - Education and outreach
  - Compliance
- **Aligning DOT and IT Goals**
  - IT security
  - IT infrastructure
  - Costs

e-CONSTRUCTION

Implementation Challenges (cont.)

- **Converting and Standardizing Construction Documentation Processes**
  - Converting paper processes to electronic workflows
  - Naming conventions
- **Increased Use of Mobile Devices**
  - Embracing new technology
  - Capital investment

e-CONSTRUCTION

Other Contract Administration Challenges

- MDOT Special Provision to Contracts
- FHWA Michigan Office formal approval of paperless contract administration process
- Compliance with FHWA Contract Administration Core Curriculum Manual & other applicable regulations
- Compliance with CFR 23 & CFR 49 DBE regulations
- Compliance with Federal Davis Bacon Prevailing Wage requirements/payrolls
- Insuring process is accessible for all parties & does not create artificial barriers

e-CONSTRUCTION

MDOT Staff Footprint

- **Document Management Administrator**
  - Embedded on business side with IT & business expertise
- **Experts on Loan**
  - Pilot offices representing development and delivery
  - MDOT experts from all business areas (Labs, etc.)
  - FHWA, Contractors, Consultants on pilot projects
- **Implementation Core Team**
  - Project Manager (Process Focused)
  - Seven subject matter experts (Diverse Focus)
- **Additional Positions Acquired**
  - 2 positions added to date
    - Experienced, skilled staff
  - Reorganization of existing staff

e-CONSTRUCTION

Results

- Estimated $12 M annual cost savings
  - Accounts for estimated contractor + DOT Savings
- Estimated 6 million pieces of paper saved annually
- Field staff on jobsite for higher percentage of time
- Increased employee & stakeholder engagement
  - Enthusiasm drove the process
  - Users presented ideas to further enhance process

e-CONSTRUCTION

MDOT's Goal:

Statewide Implementation

All trunkline projects will use e-Construction documentation process in 2015 Construction Season (October 3, 2014).

e-CONSTRUCTION

Where Is MDOT Today?

The following stakeholders are in production, including:

- All MDOT construction & materials offices
- 119 contracting firms
  - 322 contractor users
- 31 construction consultant firms
  - 156 consultant users
- 22 FHWA users
- 31 active contracts
  - $354 million as-let contracts

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Next Steps

- **Address Delivery Tickets**
- **Enterprise E-Signature Validations**
- **Broaden the User Base**
  - **Local Agency Programs**

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Michigan Division FHWA Implementation

- Document Management System installation coordination with IT
- Updated FHWA local office Standard Operating Procedures to allow for electronic signature & document storage
- Small learning curve with e-Signature & MDOT's Document Management System
- Forced our office to adopt paperless documentation procedures

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Michigan Division FHWA Benefits

- Ability to audit a project without leaving the office
- All supporting documentation for contract changes is accessible
- Faster Compliance Assessment Program (CAP) reviews
- Digital Signatures / Faster Approvals
- Electronic documentation storage/archiving

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Summary

- Reduces costs for all stakeholders
- Document distribution is immediate
  - No time or money wasted printing & mailing documents
- Documents approved faster
- Faster, more accurate payments to contractors
- Transparency: Documents available for viewing by all project partners
- Accountable: Submittal/approval dates readily available to all
- Portable: Available from any device, any time, any where
- Documents are secure & backed up
- Responds to reality of less staff
- Paper reduction supports "green" environment

e-CONSTRUCTION

Want to Learn More?

- **"Mobile Devices in the Field" video:** http://www.youtube.com/watch?v=y_9XCy2IQ2w
- **"e-Construction Process at MDOT" video:** http://www.youtube.com/watch?v=HAbYgqgnyB8
- **"MDOT e-Construction Technologies" video:** https://www.youtube.com/watch?v=ScB1b3fqjOo

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The End

FDOT's Path to e-Construction

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Amy Tootle, P.E. – FDOT

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Leaping into the 21st Century – Why Now?

1. Antiquated way of doing business
2. Keep up with our partners
3. Work $marter not harder
4. Transformational leadership
5. Generational change
6. Successful organizations continually improve
7. Design is already electronic

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Antiquated Way of Doing Business

- Documents and forms are printed, signed, scanned and emailed or mailed
- Multiple copies are made for multiple recipients
- Turnaround for approvals and contract change execution is sometimes very slow
- Special runners are sometimes employed to hand deliver contractual documents

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e-CONSTRUCTION

Keeping Up With Our Partners

- Consultants/contractors are utilizing advanced technology
  - ✓ Mobile Devices
  - ✓ Electronic As-Builts/Review of Plans (Blue Beam, Adobe, etc)
  - ✓ 3D Models > Automated Machine Guidance (AMG)
- Improved collaboration and data sharing amongst stakeholders

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Generational Change

Boomers
- Question Authority
- Idealistic
- Individuality
- Work Ethic

Generation X
- Comfortable with Technology
- Self Reliant
- Accept Diversity

Generation Y
- Tech Savvy
- Highly Educated
- Team Players
- Embrace Diversity

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e-CONSTRUCTION

Work $marter, Not Harder

- Florida's Work Program is one of the largest in the country
  - ➢ Total Funding & Budget for 2014/2015 – 2018/2019 = $41.8B
    - ✓47% for Construction
  - ➢ 535 Active Construction Contracts
    - ✓$11.5B
- State Highway System = 43,424 Lane miles
  - ➢ 287,977,300 Daily Vehicle Miles Traveled (DVMT)

e-CONSTRUCTION

Transformational Leadership

Step Up

- Bold, Innovative, and Inspirational
  - Bold: Ideas to make the department better, faster, smarter
  - Innovative: Ideas to fruition by defining specific objectives to accomplish
  - Inspirational: Get others excited about ideas

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Transformational Leadership

Step Up

- CPR
  - **C**onsistent: Decisions are made which are consistent with department policy
  - **P**redictable: Decisions are predictable, given the circumstances
  - **R**epeatable: Decisions are repeatable by others in similar situations

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Continuous Improvement

- If it Ain't Broke, Don't Fix It (Not acceptable!)
- Actively listen to industry and staff in the "trenches"
  - Their needs
  - Technology being used

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Design is Already Electronic

- Projects Let Electronically
  - Since 2005
- 3D Design Models
  - Few Design Projects
  - Revising Specifications for Construction
  - Implementation undetermined

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e-Construction Implementation

- Vision
- Systems Thinking
  - Overall picture
  - Interconnected relationships
  - There are no final answers
  - Every solution creates new problems
- Educate the Districts & Stakeholders

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e-Construction Implementation – The Parts

- Collaborative Sharing Site
  - Phased Implementation - November 2014
- Mobile Devices
  - Phased Implementation - Fall 2015
- Digital Signatures
  - Ongoing Implementation

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e-Construction Implementation – The Parts

- Form Automation
  - Ongoing Implementation
- Electronic As-Builts
  - January 2015

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Collaborative Sharing Site

- October 2013 – Management approval
- July 2014 – Procured consultant (Project Solve)
- August 2014 – First Project Activated (I-4 Ultimate)
- September 2014 – Team devising standard workflows
- November 2014 – Phased Implementation

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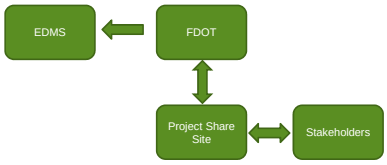
e-CONSTRUCTION

Collaborative Sharing Site



Collaboration Process

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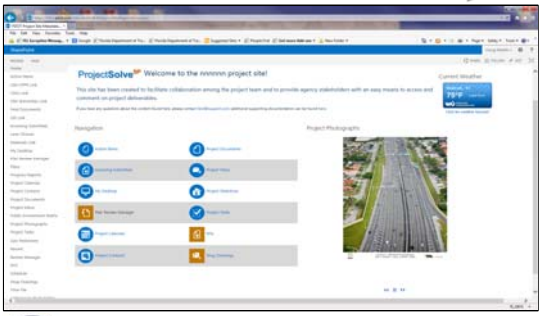
e-CONSTRUCTION



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Collaborative Sharing Site

- Expense
  - Budgeting into Work Program
  - $125 per month/contract
    - ✓ $800K/year

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Mobile Devices

- May 2014 – Begin E&O Windows based pilot
- November 2014 – End Windows based pilot
- Late 2014/Early 2015 – Construction pilot
- Fall 2015 – Phased implementation for construction

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Mobile Devices

- **Construction Specific Pilot Project**
  - Interface with project specific SharePoint site
  - Access to eBooks (specifications, standards, manuals)
  - Video/meeting capability
  - As-Built Plans
  - Email/calendar access

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e-CONSTRUCTION

20

e-CONSTRUCTION

Mobile Devices

- Legislative Budget Request 2015/2016
  - $630K First Year
    - ✓300 devices/accessories/data plans
    - ✓Training
    - ✓Custom software
  - $180K annually for data plans
  - $150K / 3 years for device replacement

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e-CONSTRUCTION

Digital Signatures

- July 2, 2013 – Initial purchase of 390 digital certificate vouchers
- July 29,2013 - Issued Memo of Understanding
- July 2014 – Awaiting approval for use of digital signatures on monthly estimates

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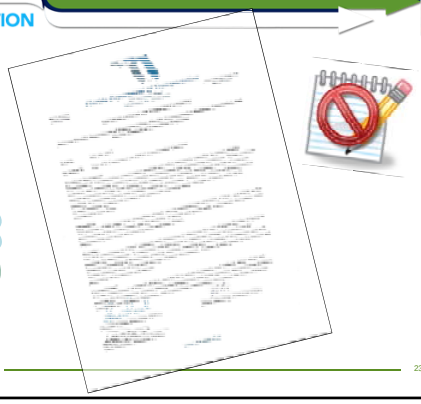
e-CONSTRUCTION



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e-CONSTRUCTION

Digital Signatures

- Laws
  - Florida Statue 668 – Electronic Commerce
  - Florida Statue 471.025 – Regulation of Professions and Occupations (Engineering)
- Rules
  - Florida Administrative Code 61G15-23.003 – Procedures for Signing and Sealing Electronically Transmitted Plans, Specifications, Reports or Other Documents.

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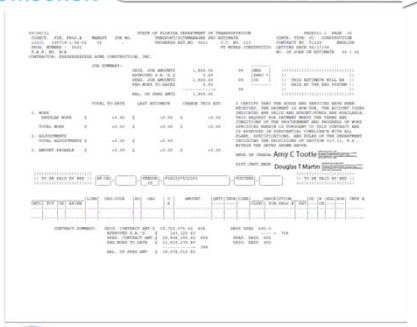
e-CONSTRUCTION



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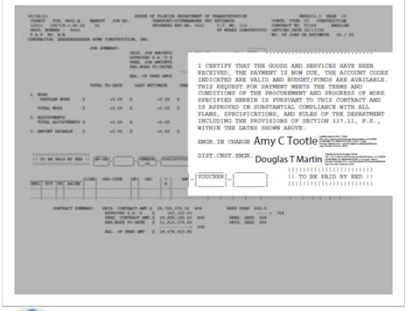

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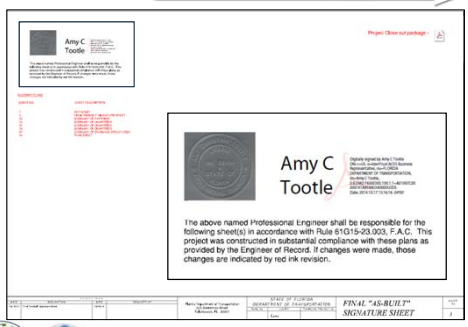

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e-CONSTRUCTION

Digital Signatures

- Expense
  - 390 Certificates
  - $100 per certificate / 2 years
    - ✓ $19,500/year
  - Paid by OIS

28

e-CONSTRUCTION

Form Automation

- Adding digital signature blocks
- Forms to be pre-populated with project specific data
- Transmittal forms revised to require electronic file #'s

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e-CONSTRUCTION

Electronic As-Built Plans

- Fall 2013 – Decision to go electronic with As-Built Plans
- Spring 2014 – Decision to use pdf software for As-Built Plans
- July 2014 – Evaluation of pdf software
- January 2015 – Implement electronic As-Built Plans

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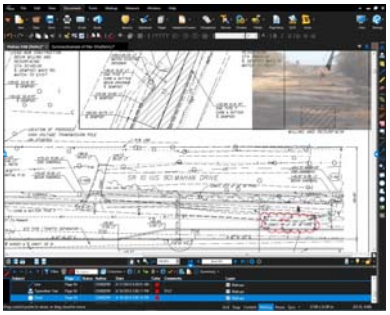

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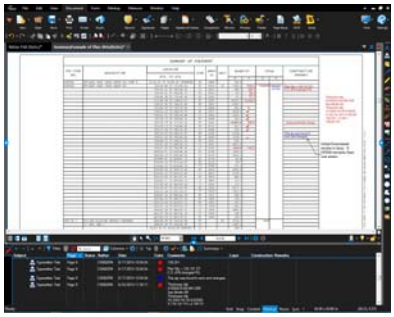

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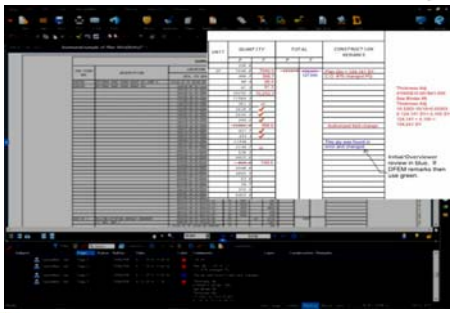

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Electronic As-Built Plans

- Expense
  - ➢ 401 Licenses statewide
  - ➢ $120 per license
    - ✓ $48,000
  - ➢ Reserve Money

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Summary

- ➢ Initial Investment: $1.5M
- ➢ Annual Recurring Expense: $834K - $1M
- ➢ Reduction in Scanning Costs: $125K
- ➢ Savings each year: ~ $22M

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e-CONSTRUCTION

Contact Information

Amy C. Tootle, P.E. – FDOT
Amy.tootle@dot.state.fl.us

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e-Construction at UDOT: Where We Are, Where We're Going

e-CONSTRUCTION

E-Construction at UDOT Where we are, Where we're going

Efficiency through technology and collaboration

U.S. Department of Transportation
Federal Highway Administration

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e-CONSTRUCTION

Presenter:

- Robert Wight, S.E.
  Director, Construction and Materials

UDOT
Keeping Utah Moving

2

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Utah

- 4 Regions
- 16 Resident Engineer offices
- 30 full time inspectors
- 500 cross trained Transportation Technician inspectors

3

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e-CONSTRUCTION

Current State of e-Construction at UDOT

– Program vs Large Project

• Large Innovative contracting projects

•Program for all other projects

4

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e-CONSTRUCTION

Large Projects

- Some Autonomy from typical UDOT processes
- Often co-located with Designer and Contractor
- More budget for e-construction
- Many innovative ideas, more nimble
- Every project re-invents the wheel

5

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e-CONSTRUCTION

Legacy Highway

- 3 separate 100 M DBB contracts, managed as one.
- E-construction initiatives
  – Electronic Plan Sets & Documentation
    • Field Laptops & Digital Cameras
  – Budget Tracking & Projections
  – Electronic Schedules & Monthly Submittals

6

e-CONSTRUCTION

Access Utah County

5 projects managed from satellite office
Total construction cost of 800 million, all Design Build

- Use of Smart phones and laptops to collect electronic inspection data
- Electronic Field Data collection
- Full ProjectWise Implementation
- Daily Reporting System (Access Database)
  - Logged Notes by Activity Code
- Cost loaded scheduling used to track budget
- Developed and used commitment database
- Project Dashboards

7

e-CONSTRUCTION

I-15 CORE Project

- 1.6 Billion dollar DB reconstruction/widening DB project 2008-2012
  - Microsoft SharePoint
    - Workflows
    - Common Communication Environment & Tool
    - Requests for Lane Closures
    - Control Point Notices
    - Common Calendar
    - Punchlist – Anyone on the project could access
    - Quality Management System provided by the Contractor (web-based) – All inspection and materials tracking included within
  - Wireless Paving
  - Full GIS model of pavement sections
  - iPADs were used (Contractor driven)
    - All changes were automatically incorporated in the plans each morning

e-CONSTRUCTION

Mountain View Corridor

- 250 million construction cost, greenfield construction CMGC
- Field Automated Communication System (FACS) – Documented against cost/schedule loaded activities; Great search feature built-in
- Used GIS to track materials testing
- Wireless Paving
- Full Machine Control (Subgrade, Granular Borrow, and UTBC)
  - Digital Rover supplied to UDOT to verify grade
    - $75,000 survey savings
    - Allowed for As-Built survey elevations on utilities
- Wavetronics Operated Bike Signal – Designated Lt Turn

9

e-CONSTRUCTION

Program: Where we are/have been

- Cost accounting/payment (PDBS)systems developed internally in the mid to late 90s. Currently outdated
- Contract Management System since late 90s
- Electronic Bidding at UDOT since 1999
- Early 2000's Mobile inspection used IPAQ system to input field data. Leading edge for its time
- Projectwise used to store project documents, but many have to be scanned.

10

e-CONSTRUCTION

Program: Where we are/have been

- 2010 – IPAQ programming/devices no longer supported – some dual entry of field data
- Historical lack of funding for program improvements
- Some 3D information released to contractors during and after bid

11

e-CONSTRUCTION

✓ Question:

- Why aren't we using the technology and systems from our major projects to improve overall program performance with e-construction?
- Integrated Project Delivery study started 2011
  - Look at what technologies would help improve efficiency
  - Mission Statement:

UDOT, its contractors and consultants will develop and use integrated business processes and tools to efficiently deliver projects in a consistent, transparent, and effective manner.

12

e-CONSTRUCTION

Ask Yourself

- Does it make it easier for the end user to do their job?



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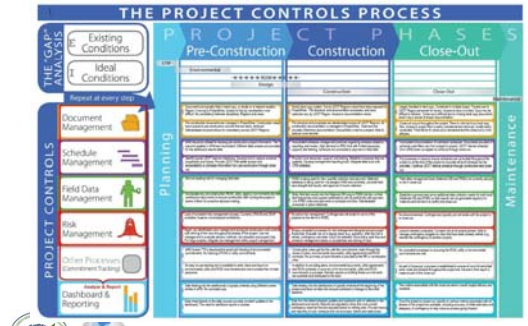
e-CONSTRUCTION



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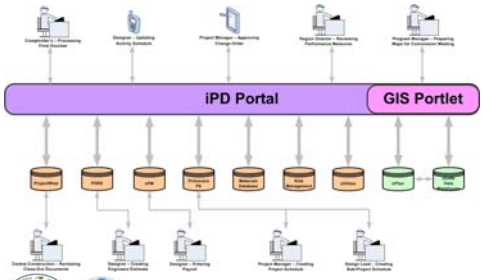
Proposed Solution



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e-CONSTRUCTION

Construction Modules

Schedule Management	Financial Management & Claims	Field Data Management
Electronic Document Management	Risk Management	Automation of Business Processes Through Work Flows

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e-CONSTRUCTION

Where to Start?

- Securing Leadership Support and Funding
  - 1st Overall Request of 5 Million in Funding for IPD Integrated Project delivery
  - 2nd Request Piecemeal request of 500K
  - 3rd Request – Project money to develop "Portal"
  - 4th Request to re-appropriate 900K of current budget to Construction - Approved by Legislature

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e-CONSTRUCTION

✓ Prioritize

- Most pressing need was Field Data Management
- Document Management also a need
- Currently Evaluating RFP to select vendor for Document management
- Used Project Funding to develop project Portal, which we have branded "Interchange"

18

e-CONSTRUCTION

The Portal "Interchange"

- Developed for 2 projects based on I-15 Core project, but able to be used program wide
- Single point of user access to all UDOT's systems
- Uses MS Sharepoint platform
- Funded with Project money
- Focus on Program rather than Project

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INTERCHANGE

- Construction Portal
- Non-Project Portal
- Team Portal
- My Sites

e-CONSTRUCTION

Sites Available…

Construction Portal

- Used in Construction
- Broad user base
- Flexible for type of project
- Task Management
- Meeting Minutes
- Document Submittal
- Document Workflow
- Design Review

Non-PIN Projects

- Track team projects that are not assigned a PIN
- Task Management
- Meeting Minutes
- Document library with option to apply ProjectWise attributes
- Document review workflows

Team Sites

- Team Task Management
- Team Projects
- Announcements
- Meeting Minutes
- Team discussions
- Document library with option to apply ProjectWise attributes
- Team Calendar

My Sites

- Personal Task Management
- Calendar
- Personal Document library
- Newsfeed for projects and teams user is part of
- Contact information management

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Where are we going?

3 D design

- Short-term plan, April - December 2014:
  - Provide electronic files on 10 or more projects as "For Information Only" **Completed**
- Mid-range plan, January - December, 2015:
  - Develop special provisions for file availability
  - Modify AMG special provision
  - Advertise some projects with electronic files as legal copy and paper copy "For Information Only"
  - Incorporate tools on construction side – determine how to use
  - mobile devices in field that utilize models
  - Use CMGC methods to maximize model use throughout project

e-CONSTRUCTION

Where are we going?

- Long-range plan, January - December 2016 3-D Design
  - Advertise projects with model as legal document and paper as "For Information Only"
  - Develop QC/QA for models
  - Address electronic signature for models
  - Address file transfer and model ownership challenges
- RFP for IPD Award in December
  - Supply field data management
  - Off-line entry of data
  - Cost Control, management
  - Contract Management
  - Reporting
  - Schedule Management

25

e-CONSTRUCTION

Information Sharing/ Lessons learned

- Develop a Long Term Plan – Look at overall solution
- Build the case for needs with Management/Legislature early
- Funding needs to be consistent, as with other systems think long term
- Don't build a system around an inefficient process, change process along with software
- Get help from industry – Ask "What business are we in"?

Texas DOT Experiences in e-Construction

e-CONSTRUCTION

Managing Highway Construction Projects in a Paperless Environment

Efficiency through technology and collaboration

U.S. Department of Transportation
Federal Highway Administration

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e-CONSTRUCTION

TxDOT's Perspective - Why go e-construction?

- Texas has 254 counties, covering 268,820 sq.mi.
- 25 Districts
- 90+ Area Offices
- 700+ construction inspectors

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e-CONSTRUCTION

TxDOT's Perspective - Why go e-construction?

Last year:

- Prequalified 1,066 contractors
- 12,738 proposal requests(ave . 1,062/mo)
- 4,981 electronic bids
- State-let 1,037 projects; local let 975 projects

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e-CONSTRUCTION

TxDOT's Perspective - Why go e-construction?

Currently:

- 1,405 active construction contracts
  1,739 active maintenance contracts
- Ave. 4,000 change orders/yr
- Contracts valued at $13.3 B

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e-CONSTRUCTION

TxDOT's Perspective - Why go e-construction?

- Customer Service
- Time Savings
- Cost Savings
- Data Integrity
- Manage our system

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e-CONSTRUCTION

TxDOT's Experience with e-construction

- Design (ProjectWise and 3D Modeling)
- Pre-letting (Advertising, BPRS, Pre-bid Questions)
- Letting (CDA)
- Contract Administration (SiteManager, P6, EPRS, iPads, YouTube)
- Archiving (EDMS)
- Upcoming Initiatives (Electronic Data Collection, Materials, Core Custody)

e-CONSTRUCTION

Pre-letting and Letting

- Contractor Prequalification (2013)
- Electronic bid advertising (2013), Letting Schedule, Notice to Contractors (2013), Plans On-line, Bidder's List, Bid Item Index
- Pre-bid questions and answers shared through FTP Website (2013)
- Bid Proposal Request System (BPRS) (2002)
- Digital Certificates (2009), Contractors Desktop Application (CDA)(2009), Electronic bonding (2009)
- ~ 90% voluntary participation in electronic bidding

7

e-CONSTRUCTION

Contract Administration

- SiteManager implemented in construction contracts in 2000; implemented in maintenance contracts in 2013; created training videos and various reporting tools (.xlsx); available through Citrix
- Primavera Scheduling (P6) implemented in design (2009)and updated construction contracts from P3/P5 and SureTrak
- Electronic Project Records System (EPRS)(2007);

8

e-CONSTRUCTION

Contract Administration

- Inspector Development Program (IDP)(2007)
- Enterprise Document Management System (EDMS – P8)(pilot in 1997, statewide 2007)
- iPad pilot (2013); deployed 113 iPads in 25 Districts
- YouTube training videos (2013)

9

e-CONSTRUCTION

Upcoming Initiatives

- ProjectWise
- 3D Modeling
- Electronic Data Collection (DWRs, prequalification, reporting requirements, insurance, certifications)
- QR Code (for materials, core custody)

10

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

- The Inspector Development Program (IDP) is a formal mentoring program with the goal of improving the overall quality of construction on Department projects.
- Launched the iPad pilot program to contribute to the creation of the digital jobsite and mobile project inspection.

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

- Apple iPad 2
- 32G
- Verizon 4G LTE
- Unlimited Data
- OtterBox
- Bluetooth keyboard

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

The OtterBox case provides the protection needed for use on the construction site.

13

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

Viewing area limited when using on-screen keyboard.

Full screen available for viewing when using Bluetooth keyboard.

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

Dropbox allows users to transfer plans, specs, manuals, pictures, and more to the iPad.

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Digital Jobsite & Mobile Project Inspection

PDF-Notes reads PDF documents and allows the user to annotate and save changes.

16

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

PDF-Notes

17

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

Photo Skitch allows the user to annotate photos and send via email or instant message.

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

Photo Skitch

19

e-CONSTRUCTION

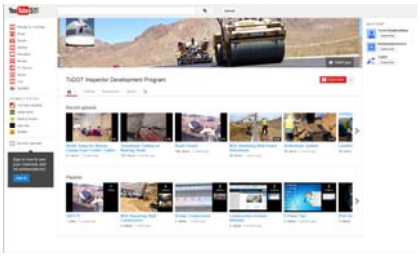
Digital Jobsite & Mobile Project Inspection

YouTube is used to view training videos on the project site.

20

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection



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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

YouTube Topics:

- Safety
- Navigating the TxDOT website

- Adding links to e-plans and PDFs
- Setting up SiteManager
- Test Procedures

22

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

YouTube Topics:

- Foam bedding placement for precast concrete panels
- MSE retaining wall foundation grading
- MSE retaining wall panel placement
- Underdrain system
- Leveling pad placement
- Soundness testing on bearing seats

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

The Free Citrix Receiver App allows users to access network drives as well as SiteManager.

24

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

FaceTime allows users to communicate in real time with others who have iPads or iPhones. Users can see who they are talking to or use the camera feature to show activity happening on the project.

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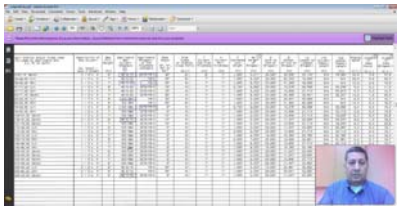
e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

FaceTime



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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

Theodolite is a multi-function augmented reality app that combines a compass, GPS, map, photo/movie camera, rangefinder, and two-axis inclinometer.

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

- ✓ Communication:
  Inspectors are able to spend more time on the project performing inspection duties while still getting their recordkeeping done.

"The iPad has been very invaluable to the Gainesville Area Office operations. I think we had a unique look at how if this program was expanded to cover all construction personnel in an area office. With an Area Engineer, a Project Engineer, and a Field Inspector all having an iPad, we were able to communicate and operate so much more efficiently. Mundane tasks were made so much easier, and communication was only a fingertip away."

Aaron Bloom
Transportation Engineer

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

- ✓ Efficiency:
  District auditors and record keepers can use real-time communication with email and FaceTime to get answers quickly and efficiently.

"I have truly enjoyed the iPad. It is a great tool. I could not imagine not having it now. I visit all projects in our district and train inspectors. It is very handy to have all the plans and specifications right at my fingertips. I use the iPad to communicate with the Area Engineer and send pictures from the field to the office instantly. This works so well and is such a time savings."

Cliff Hallford
Abilene Construction Auditor

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

- ✓ Capacity:
  Inspectors have instant access to plans, specs, email, and TxDOT project management software, as well as up to the minute weather information—all in a small, portable tablet.

"A huge asset in the field. Constant connectivity. Can get to any information needed from emails to weather to spec. book and plans.....anything at any time. I have found it to be easy to document pay reports, send out emails and fill out daily work reports. Use of iPads as an inspector's tool is a giant step forward for me. I would not want to go back to being tied down to a laptop or desktop computer."

Mark Alldredge
Construction Inspector

30

e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

PROS

- Increased productivity
- Communication
- Portability
- Capacity
- Durability

CONS

- Limited ability to print
- Working in Microsoft Office required Citrix access
- No USB port

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector:

- Develop, design and reconstruct nearly $1 billion of improvements to SH 114/SH 121
- Groundbreaking: 2010; Completion: 2014
- The 8 mile project will improve mobility and air quality through expanded roadway capacity, toll managed lanes and continuous frontage roads
- Up to 14 main lanes
- 28 lanes at widest point (frontage, main and toll managed lanes)
- New toll managed lanes and direct connections

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Intelligent Compaction

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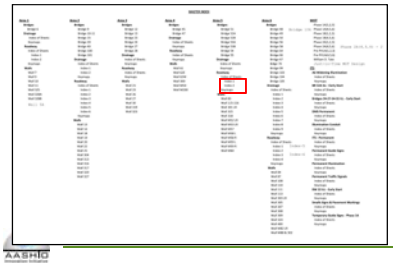
Digital Jobsite & Mobile Project Inspection

DFW Connector: Digital Plan Sheets w/hyperlinks



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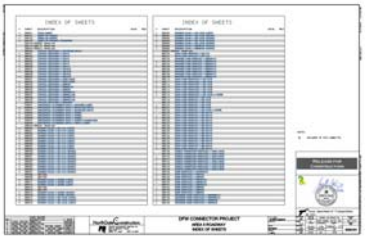
e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Digital Plan Sheets w/hyperlinks



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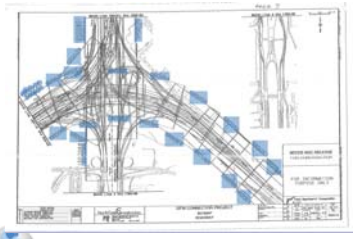
e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Digital Plan Sheets w/hyperlinks



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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Automated Scale Kiosk

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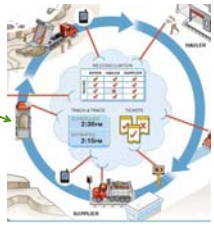
e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Fleet Management

Web-based GPS fleet tracking and driver timecard solution for real-time fleet management.



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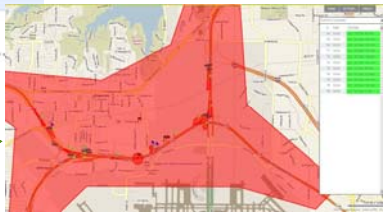
Digital Jobsite & Mobile Project Inspection

DFW Connector: Fleet Management

Shared orders and fleet.



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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Equipment Dashboard

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Equipment Dashboard

Telematics Cell / Satellite units

- Real time accurate equipment / vehicle / unit location
- Equipment runtime and utilization reporting
- Geo-Fencing and lockdown parameters
- Idling & speed tracking / control

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Digital Jobsite & Mobile Project Inspection

DFW Connector: SW3P (100+ sheets)

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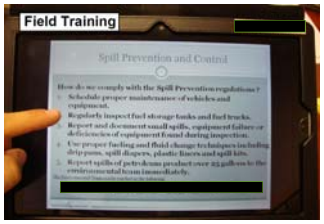
e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: SW3P (100+ sheets)



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Digital Jobsite & Mobile Project Inspection

DFW Connector: SW3P (100+ sheets)

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Digital Jobsite & Mobile Project Inspection

DFW Connector: Sharing information with the public

- Website (ave. 24,000/mo visitors, 1,400 inquiries to date)
- E-mail alerts (Dally alerts & weekly look-ahead)
- Toll-free hotline

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Digital Jobsite & Mobile Project Inspection

DFW Connector: Sharing information with the public

- Monthly newsletter
- SMS text messaging
- Social media (Twitter, Facebook, TxDOT Road Conditions)
- Mobile application

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e-CONSTRUCTION

Digital Jobsite & Mobile Project Inspection

DFW Connector: Sharing information with the public

Mobile application functions include:

- Lane closure information
- Live Google map of traffic conditions
- Links to DFW Connector website, Twitter, Facebook and TxDOT Road Conditions
- Project photos

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e-CONSTRUCTION

QUESTIONS?

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Roxana García, P.E.
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YouTube - Search / Browse Channels "TxDOT IDP"

- http://youtu.be/z-xnMj-QryU?list=UUcn90MuiRI545MYrdcW1xqg
- http://youtu.be/8zHvBkytnmw?list=UUcn90MuiRI545MYrdcW1xqg
- http://youtu.be/mfa7zl9G-Q0

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Iowa DOT Experiences in e-Construction

e-CONSTRUCTION

Managing Highway Construction Projects in a Paperless Environment

Efficiency through technology and collaboration

U.S. Department of Transportation
Federal Highway Administration

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e-CONSTRUCTION

Presenter:

- Greg L. Mulder, P.E.
  Director, Office of Construction and Materials

IOWA DOT
SMARTER | SIMPLER | CUSTOMER DRIVEN

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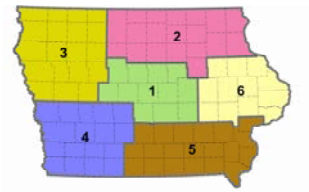
Iowa

- 6 Districts
- 14 Resident Construction Engineer offices
- 157 full time inspectors
- 150 cross trained inspectors used



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e-CONSTRUCTION

e-Construction… e-Everything!

- What does e-Construction look like?
- Should it only be e-Construction?
- Why not e-**everything**?

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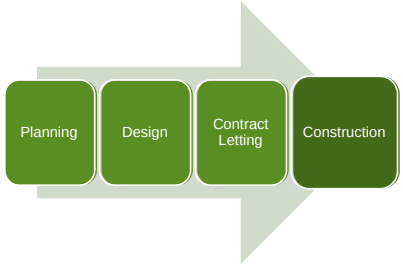
e-Construction… e-everything!



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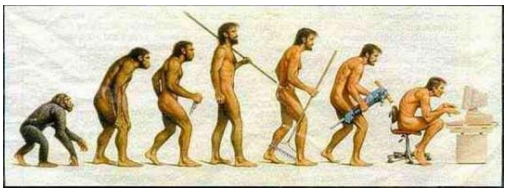
e-Construction… e-everything!



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Paperless or e-construction

- What does e-construction mean to Iowa?
- To us **e-construction** meant:
  - Complete as much work as possible using electronic means.
- **Piloted 4 contracts in 2014**
- 1 small project – Bridge replacement
- 1 HMA overlay with CIP recycling
- 2 major interstate reconstruction contracts with 4-5 projects tied together.

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Paperless Projects

- ✓ Project plans – Electronic from Design
- ✓ Contract/Proposal – Electronic from Contracts
- ✓ Spec Book/Construction Manual/Materials IMs/Road Standards – Available from ERL, Website or preferred, 1 PDF file each.
- ✓ Materials/paperwork – DocExpress
- ✓ Contractor pay – FieldManager/FieldBook
- ✓ As-builts – Currently, redline PDF. Future? GIS?

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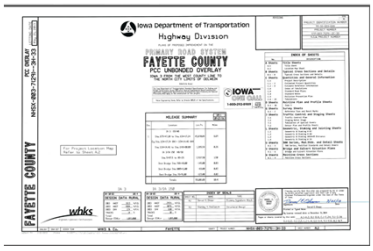
✓ Project plans – Electronic from Design



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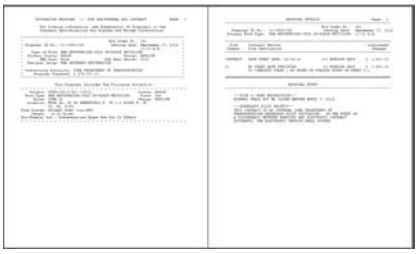
✓ Contract/Proposal – Electronic from Contracts



e-CONSTRUCTION

✓ Electronic Records Library

- Spec Book (electronic or paper)
- Construction Manual (electronic only)
- Materials IMs (electronic only)
- Road Standards (electronic only)

- Available from ERL, Website or preferred, 1 PDF file each.

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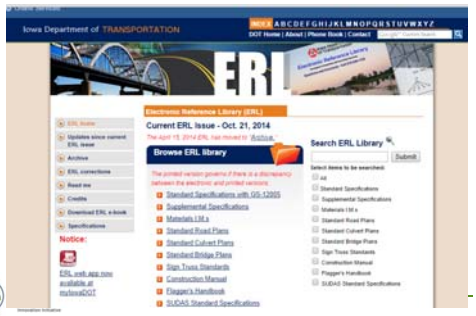
✓ Electronic Records Library



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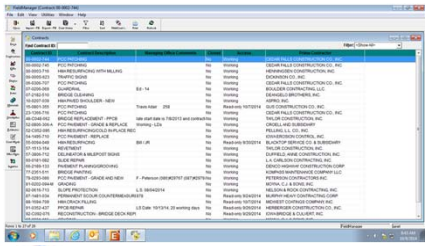
✓ **Contractor pay – FieldManager/FieldBook**



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Current technology

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New technology!

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✓ **Materials/paperwork –** Doc Express®

The Doc Express Evolution in Iowa

- Partial Pilot Projects in 2010
- Full Pilot Projects in 2011
- Initial Focus was on Materials Certification
- Added Diaries and Payrolls in early 2012
- Changed Diaries to Contract Docs in 2013
- Added electronic signatures in early 2014
- Added a working drawer in 2014

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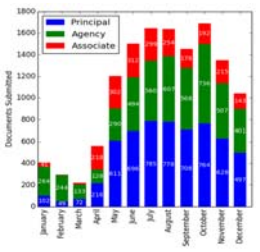
Doc Express® Statistics

- As of March 25th: July 23, 2014
  - 162 Contracts 258 Contracts
    - 70 Contracts awarded in 2013 Awarded Amount $336.7 mil
    - 11 Contracts Final Payment
  - 22,236 documents 35,034 doc
    - Largest Contract has 1,452
  - 230 DOT Users 289 Users
  - 187 Non- DOT Organizations
    - 458 users 603 Users 222 Org



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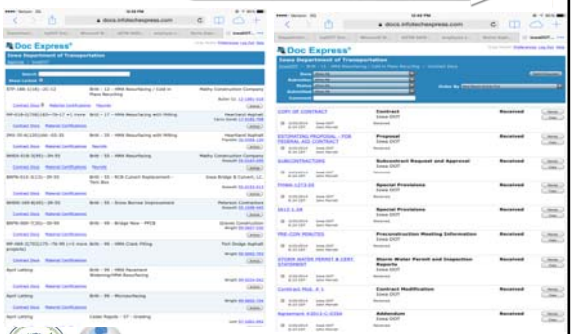

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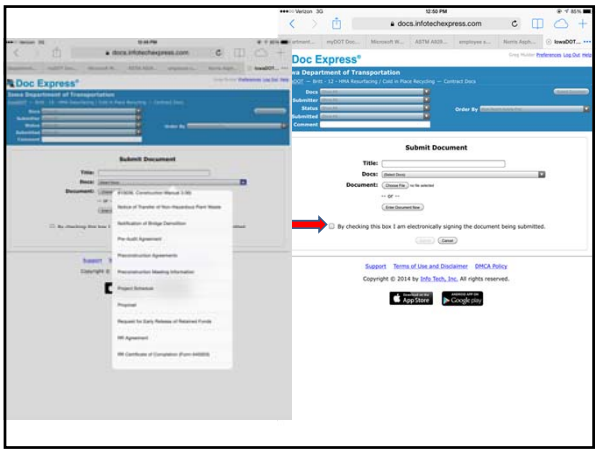
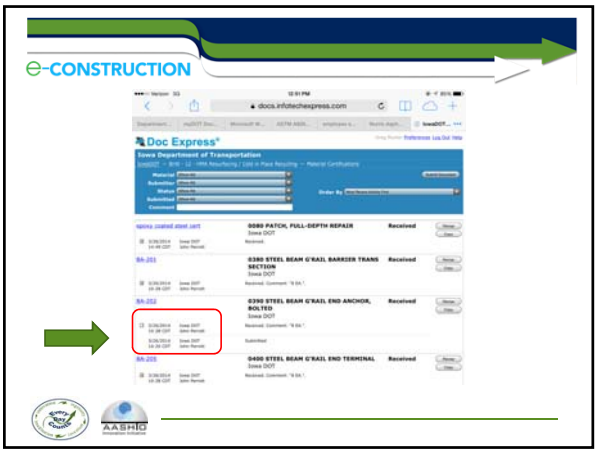

Doc Express®
Submit Document
Title:
Docs:
Document:
By checking this box I am electronically signing the document being submitted.
Support
Terms of Use and Disclaimer
DMCA Policy
Copyright © 2014 by Info Tech, Inc. All rights reserved.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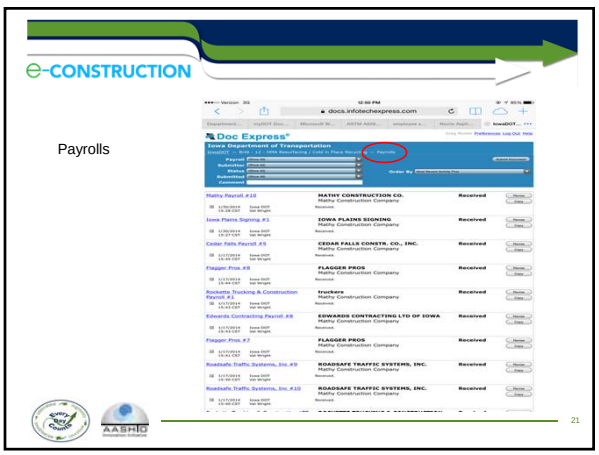
Doc Express®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Payrolls
Doc Express®
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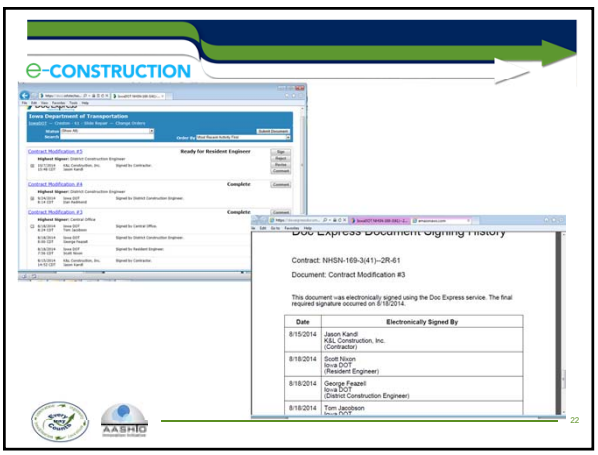
e-CONSTRUCTION
Contract: NHSN-169-3(41)--2R-61
Document: Contract Modification #3
Date
Electronically Signed By
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Where are we going
As let plans from Contracts
Electronic as-builts in the field (Data only?)
New electronic shop drawing process (DocExpress)
Straight line diagraming for project plans?
3D project plan vision
GIS based smart plans?
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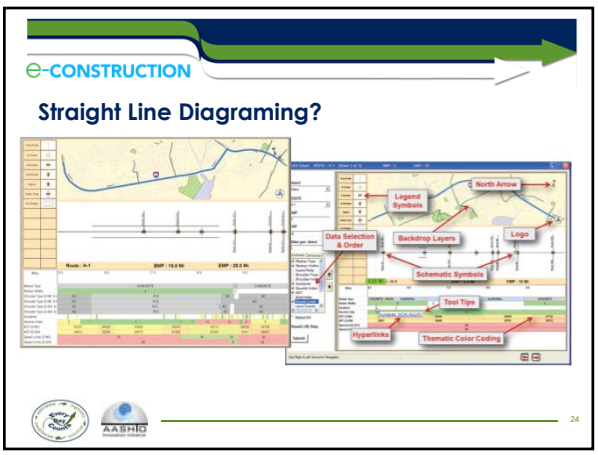
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Straight Line Diagraming?
Legend Symbols
North Arrow
Data Selection & Order
Backdrop Layers
Logo
Schematic Symbols
Tool Tips
Hyperlinks
Thematic Color Coding
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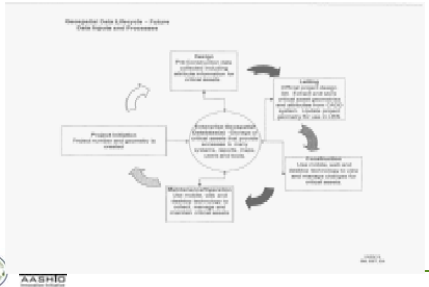
Asset Management



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Data Collection: From the field to the desktop

IOWA DOT

Office of Maintenance
Iowa Department of Transportation

Current Practice
Fulcrum App

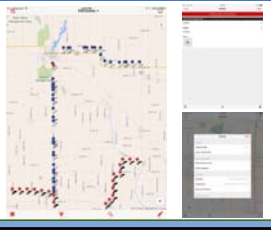
Fulcrum app is currently being utilized as a "stop-gap" measure in order to continue the cycle of data collection while also refining procedures and developing standard operating procedures in the usage on a hardware level vis-à-vis the tablets and on the application level with improvements in collection techniques and developing familiarity with the capabilities of the collection apps themselves.

Working to Maintain the Data Lifecycle and Keep Data Current

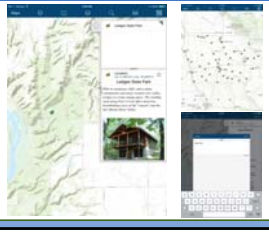
In Development
ArcGIS Collector

A new contract has been signed with ElectData Solutions who will develop the next field collection application for mobile devices at the Iowa DOT. This app leverages the ArcGIS Collector app by ESRI and works with existing DOT infrastructure to enable effective collection and storage of all data that is collected in the field with the intent of empowering leaders with up-to-date info.

Fulcrum App by Spat a Networks



ArcGIS Collector by ESR



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Summary

- Reduces costs for all stakeholders
- Document distribution is immediate
  - No time or money wasted printing & mailing documents
- Documents approved faster
- Faster, more accurate payments to contractors
- Transparency: Documents available for viewing by all project partners
- Accountable: Submittal/approval dates readily available to all
- Portable: Available from any device, any time, any where
- Documents are secure & backed up
- Responds to reality of less staff
- Paper reduction supports "green" environment

AASHTO

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Minnesota DOT Experiences in e-Construction

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Managing Highway Construction Projects in a Paperless Environment

Efficiency through technology and collaboration

U.S. Department of Transportation
Federal Highway Administration

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Minnesota DOT.....MnDOT

- Minnesota has 87 counties
- 8 Districts
- 24 Resident Construction Offices (6 Metro and 18 Out-State)

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2013 MN Highway Construction Project Summary

- Number of Projects Awarded 276
- Awarded Amount ($ million) $1,187.06
- Total Number of Bidders 913

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Minnesota perspective_Why e-Construction

- Access to Information
- Productivity and Efficiency
- Cost Savings
- Collaboration
- Data Integrity
- Because I said so....State of Mn Sustainability Plan

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Current e-Construction Practices

- Letting, Award, and Approval
- Contract Administration--Central Office
- Contract Administration/Inspection--Projects

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Lettings, Award, and Contract Approval

- e-Plan Room
- Electronic Bidding
- Contracts Signed Electronically
- Contract Documents transmitted Electronically
  - *Special Provisions
  - *Plans

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Contract Admin—Central Office

- Work flow to rout Contract Change documents...Supplemental Agreements for electronic signature
- Partial Estimates for Payment...Contract Payment Group receives e-mail notification; ready for further processing

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Contract Admin/Inspection....Projects

- Hardware
- Applications

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Hardware

- iPhones
- iPads
- Laptops with "Air Cards"
- Windows Tablets...currently in Pilot

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Applications...In Use Today

- Internet
- Citrix
- Adobe Reader
- FieldOps
- TRACS
- Primavera P6v7 Desktop
- Primavera P6v8 Enterprise Project Management Sys

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Internet

- Construction Tools-References
- http://www.dot.state.mn.us/const/tools/references.html

- Construction Tools-Contractor Payments
- http://www.dot.state.mn.us/const/tools/forms.html

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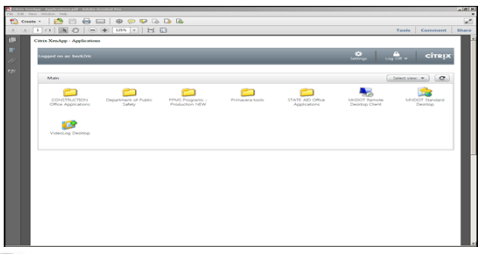
Citrix



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Adobe Reader

- When used in conjunction with the iPad; enables the Inspectors to have copy of the Contract documents electronically...Special Provisions, Plans, and Specifications

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FieldOps

- MnDOT Construction Contract Management System Field Operations Module
- Used by Project personnel to document quantities, create diaries, produce estimates, etc.
- Developed in-house...has evolved over 25 years to it's current version
- Visual FoxPro based program

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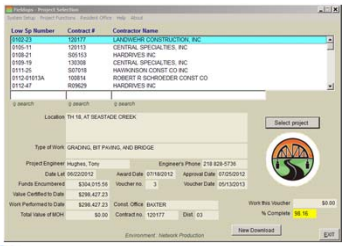
FieldOps-Project Selection



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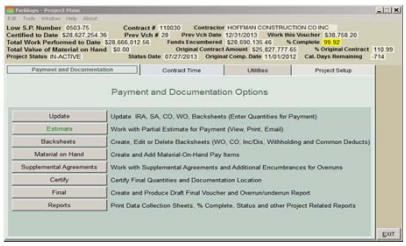
FieldOps-Project Main



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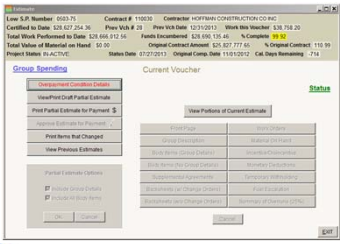
FieldOps-Estimate



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TRACS

- Transit Automated Control System
- Developed in partnership w/Consultant
- Visual FoxPro based program

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TRACS

- All projects automatically have access to TRACS
- Design Build projects use many of modules
- Many DBB (All Metro) use Document Management
- Many DBB Projects utilize Daily Report
- Some projects utilize Materials Module

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TRACS

- Contractor document control submission
- LIMS-TRACS document mngt/distribution
- Collaboration Module
- Materials Certification
- Submittal Control

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TRACS-Main Menu

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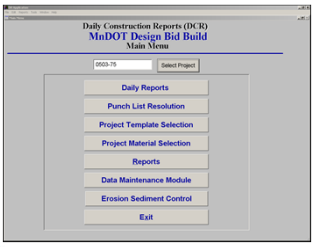
TRACS-Daily Construction Reports (DCR)



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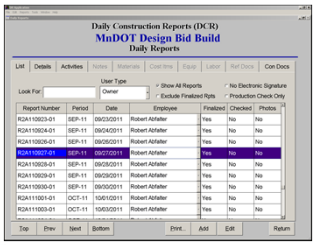
TRACS-Daily Reports Selection



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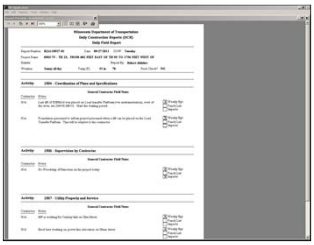
TRACS-DCR



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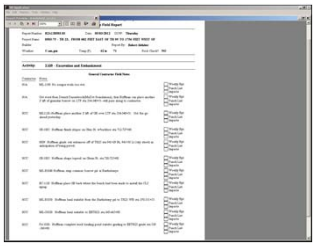
TRACS-DCR



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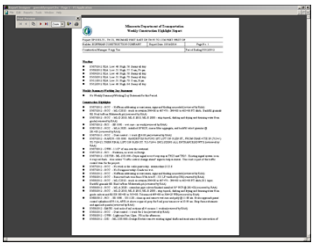
TRACS-Weekly Construction Highlight Report



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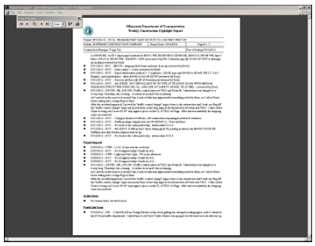
TRACS-Weekly Construction Highlight Report



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Primavera P6v8-Enterprise Management

- For projects with Critical Path Method (CPM) schedule requirement; Contractor's are required to build and maintain schedules on MnDOT servers

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Minnesota-The Future of e-Construction

- FieldOps and TRACS are in poor technical health (VFP); will be replaced
- AASHTOware Project Construction & Materials 3.0 scheduled to replace FieldOps
- MnDOT will pilot C&M 3.0 on approximately 25 projects in 2015
- Find replacement for TRACS....SharePoint????
- Rover

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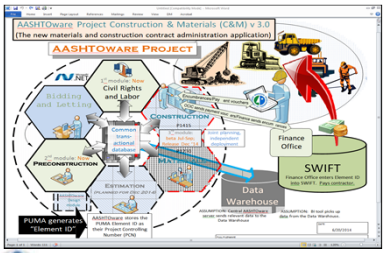
Construction & Materials 3.0



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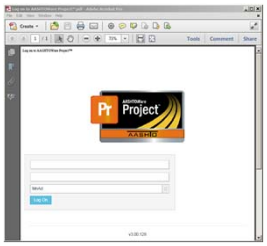
Construction & Materials Log On



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Rover...Trimble R8 GNSS

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Minnesota Challenges to Implement e-Construction

- Connectivity
- Security
- MN IT Services
- End User Acceptance

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Questions???

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(651) 366-4236

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