

e-Construction and Partnering: A Vision for the Future

Participant Workbook



Every Day Counts 4 (EDC-4) Virtual Summits
September 27 & 29, 2016



Session Agenda

Topic	Presenter/Facilitator
Welcome and Introductions	Tom Zagorski, Michael Baker International
Introduction to e-Construction and Partnering: A Vision for the Future	Kathryn Weisner, FHWA
State DOT e-Construction and Partnering	Rob Wight, Utah DOT
State DOT e-Construction and Partnering	Jim Foringer, Pennsylvania DOT
Presentation Q&A	Rob Wight, Utah DOT Jim Foringer, Pennsylvania DOT
e-Construction and Partnering Maturity Matrix	Tom Zagorski, Michael Baker International
Roundtable Discussion on Implementation Activities	Tom Zagorski, Michael Baker International

How to Use this Workbook

1. **Scan through the entire workbook** prior to session start.
2. **Take notes** in the open space during the presentations by answering the questions posed. Relate your answers to the presentation information given.
3. **Review the maturity matrix** for topics to focus on during the presentations. What areas are you most interested in learning about? What will help your agency the most?
4. Based on the maturity matrix topics review, **answer the discussion questions** with focus on what you need to advance e-Construction and Partnering in your State.
5. **Scan the QR code** from your mobile device to access the presentations before or after the session.



Background on e-Construction and Partnering

The Federal Highway Administration (FHWA), in cooperation with the American Association of State Highway and Transportation Officials (AASHTO) is promoting the implementation of e-Construction and Partnering through the Every Day Counts (EDC) initiative. EDC is a state-based model to identify and rapidly deploy proven but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental sustainability.

Why **e-Construction** and **Partnering**? Both topics, which are complementary, have stand-alone benefits and support improved project delivery. e-Construction technologies provide transparency across agencies between the owner and construction delivery teams while enhancing Communication, Coordination, and Collaboration. Partnering, whether formal or informal, is an exercise in delivering shared project goals through building relationships of mutual trust. Renewed interest in Partnering among industry stakeholders is driven by the desire to realize quantifiable reduction in claims as well as the prevalence of delivering mega-projects through alternate delivery methods. Figure 1 shows the primary benefits of e-Construction, the primary benefits of Construction Partnering, and the synergies between the two topics.

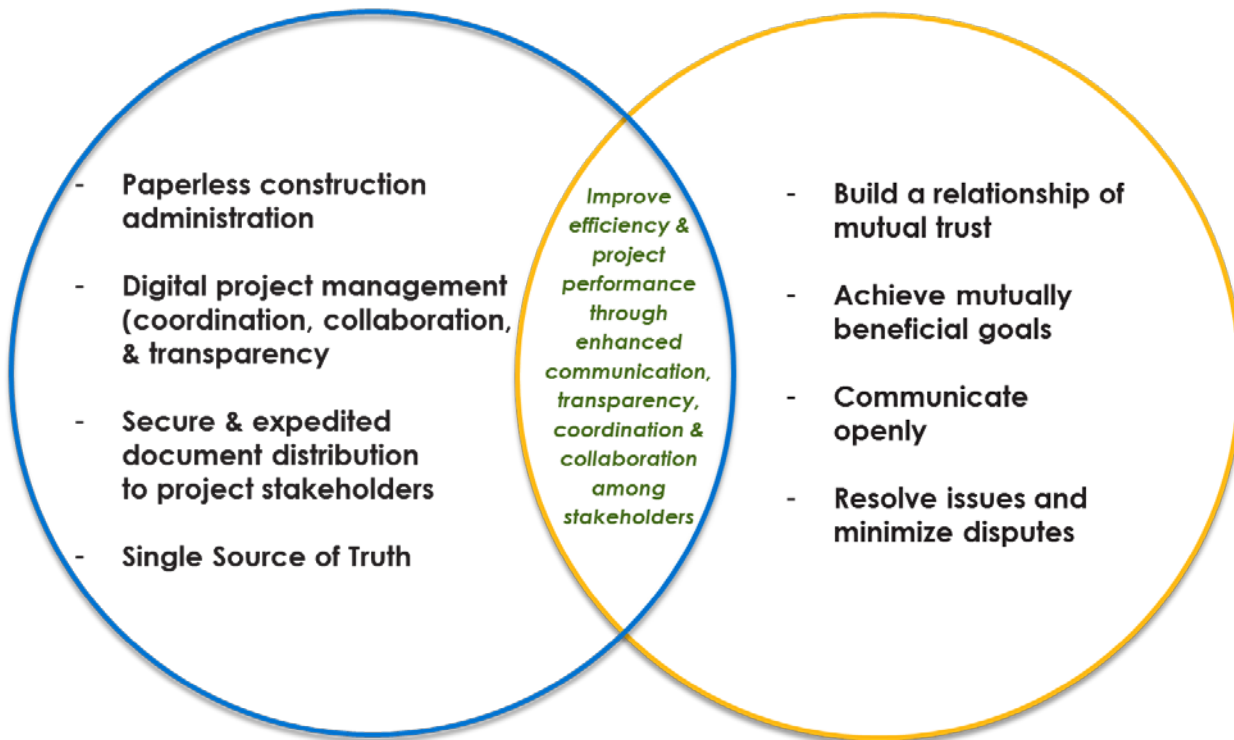


Figure 1. e-Construction and Partnering as Stand-Alone Topics with Benefits and Synergies

States are realizing the benefits of paperless project delivery using e-Construction technologies. e-Construction includes electronic processing of all construction documentation by project stakeholders including electronic document routing/approvals (workflows and e-signatures); digital management of all construction documentation in a secure environment allowing data collection and distribution to all project stakeholders through mobile devices and web-based platforms. This approach enhances partnering among stakeholders on project teams, helping to build a relationship of mutual trust within agencies, across agencies, and with the private sector. The full value of e-Construction is only fully realized by the use and implementation of effective partnering. By its nature, collaboration through e-Construction technology is an exercise in partnering, elevating the basic principles of partnering to a standard practice, through actions such as:

- Alignment/Integration of project teams

- Agreed-upon and published roles of project team members
- Tools to promote accountability
- Issue resolution through early identification
- Pre-established workflow/approval processes

Great progress has been made in the implementation of e-Construction technologies as a result of the EDC-3 Implementation Plan developed by FHWA. However, there is more that can be done to meet the goal of 30 State DOT's institutionalizing e-Construction technology by adopting the innovation as a standard process or practice. Some of the EDC-3 activities that have assisted State agencies, FHWA, contractors, IT staff, consultants, and suppliers include:

- coordination of peer-to-peer exchange workshops
- regional e-Construction workshops
- nationwide webinars
- FHWA Division Office mobile device pilot (tablets)
- a return on investment study performed by FHWA

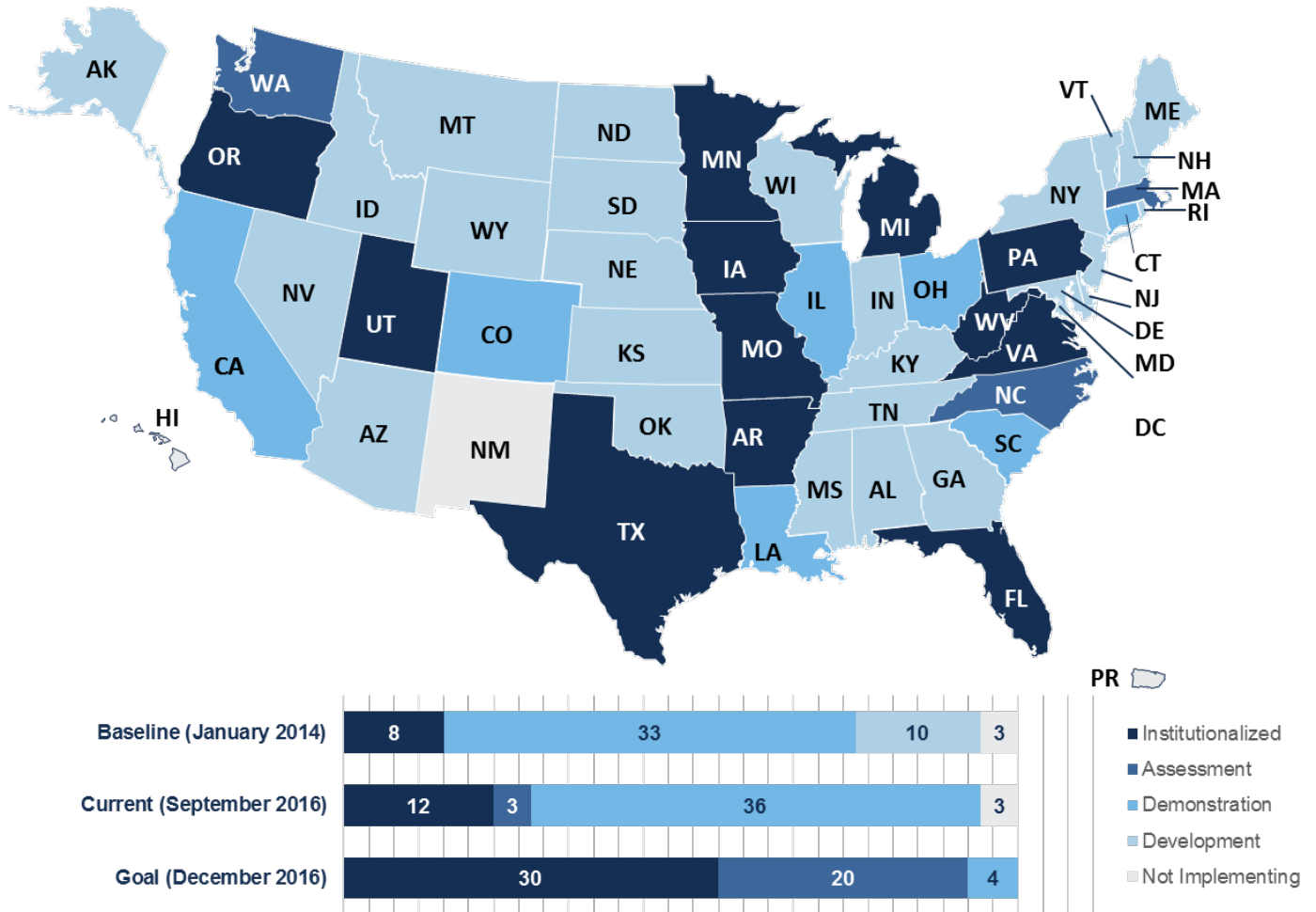
Nearly all States are exploring use of paperless project delivery.

The EDC-4 initiative will establish the following guidelines for **Innovation Implementation Stages**:

Not Implementing	The state is not pursuing the innovation.
Development	The state is collecting guidance and best practices, building support with partners and stakeholders, and developing an implementation process.
Demonstration	The state is testing and piloting the innovation.

Assessment	The state is assessing the performance of and process for carrying out the innovation and making adjustments to prepare for full deployment.
Institutionalized	The state has adopted the innovation as a standard process or practice and uses it regularly on projects.

Figure 2. e-Construction Lead States (August 2016)



e-Construction and partnering have the potential to increase the quality, efficiency, communication, collaboration, environmental sustainability, and productivity of the construction industry at large while saving on printing costs, time, postage, and document storage while increasing transparency for all stakeholders. Substantial savings are realized in the construction process by avoiding delays, eliminating rework, and accelerating construction through use of innovative technology and collaborative processes. Through enhanced awareness, promotion of benefits, and real-world examples of applications, the highway industry is ready to reap the benefits of implementation.

In order to assist States with implementation of e-Construction and partnering, FHWA and AASHTO sponsored this Regional Summit to share information about benefits, lessons learned, future enhancements, and how to find additional information and resources.

For more information, contact

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FHWA Presentation Notetaking

Consider the following questions as you document key points during the FHWA presentations.

Could your state benefit from a Peer Exchange?

Have you attended a regional e-Construction Workshop? Could you or your colleagues benefit from attending?

Where can you go to find resources for e-Construction?

Does your state have buy-in from upper management or executive leadership in moving forward with e-Construction technology?

How do you feel your state compares with others in use of e-Construction technology?

Does your State's partnering experience already integrate e-Construction tools and technology?

State DOT Presentation Notetaking

Consider the following highlights from each presentation and answer the questions on the next page about your current practices as they relate.

Utah Department of Transportation (UDOT)

UDOT oversees construction for approximately 170 projects per year, covering a \$700-\$800 million program. UDOT's adoption of e-Construction technology included an analysis of their project management process, including determination of the adequacy of legacy systems as compared to committing to new systems. UDOT has institutionalized:

- automated field data collection system through a proprietary program that was publicly-procured (MasterWorks by Aurigo)
- ProjectWise for document storage and archiving
- use of mobile devices for collection of construction data in the field, including various laptops, tablets, and smartphones, which are all compatible with their field data collection system

Pennsylvania Department of Transportation (PennDOT)

PennDOT is directly responsible for approximately 40,000 roadway miles and 25,000 bridges in Pennsylvania, maintaining a transportation network in strong partnership with federal and local governments, planning partners, and communities. PennDOT's implementation of e-Construction technology was a grass-roots effort, including development of tools technology in-house to best meet their needs. PennDOT has institutionalized:

- project collaboration portal sites on a SharePoint platform to manage submittals and provide collaboration resources
- automated field data collection system through an internally-developed program
- a web-based electronic construction and materials management system
- electronic document management system for records retention
- use of iPads for collection of construction data in the field

Consider the following questions as you document key points during the State DOT presentations.

How are your e-Construction and Partnering practices similar to or different from the State DOT presentations you heard?

What e-Construction technologies is your state piloting in the next 12 months?

Which technologies do you see as providing the greatest benefit to your agency (mobile inspection software, as-built drawing generation tools, etc.)?

What plans do you have for using e-Construction data for advanced applications such as asset management or use on P3/Design-Build mega-projects?

What types of partnering practices are you most interested in from the presentations?

e-Construction and Partnering Maturity Matrix Tool

This maturity matrix tool is designed to allow users to assign ratings to an organization's current practices. The tool will help assess activities, identify actions and priority areas for improvement, establish a baseline, allow for monitoring of changes over time, and facilitate sharing of practices among transportation professionals.

Consider the elements of the assessment tool during the session and complete the handout worksheet; revisit your responses annually to monitor implementation of e-Construction and partnering. This tool can be shared with others within your organization or completed using a facilitated team meeting.

Scoring

Using the following scoring guidelines, score each question on a scale of 1 to 10, with a rating of 6 representing that the agency has implemented the item:

Phase	Rating and Characteristics
Initiation	<p><i>Agency has acknowledged the need for this item (scoring range: 1-2)</i></p> <ul style="list-style-type: none"> • Does agency management acknowledge the need for a particular item? • Has exploratory research taken place to assess the benefits of this item? • Does management support further development of this item's requirements?
Development	<p><i>Agency has developed a plan or approach to address this item (scoring range: 3-4)</i></p> <ul style="list-style-type: none"> • Has the agency developed a plan or approach to address the item's requirements? Has the agency started to investigate the feasibility of implementation? • Does the agency have standards and guidance to enable the item's implementation? • Does the agency have the approvals necessary for implementation? • Are resources in place to support the adoption of this item?

<p>Plan Execution / Demonstration</p>	<p><i>Agency is executing or has executed a plan or approach to address this item (scoring range: 5-6)</i></p> <ul style="list-style-type: none"> • Is the agency implementing/carrying out the requirements of this item? • Has the agency allocated financial or staff resources necessary for the item's execution? • Have appropriate personnel been trained to execute the item's requirements? • Has a process owner been established?
<p>Assessment</p>	<p><i>Agency has assessed this item's performance and its success in achieving agency goals and objectives (scoring range: 7-8)</i></p> <ul style="list-style-type: none"> • Has the agency assessed how well this item performs in reducing costs, time, and improving quality? • Has the agency assessed the process for carrying out this item? • Has the agency implemented appropriate changes to the requirements of this item based on performance assessments?
<p>Adoption / Institutionalization</p>	<p><i>Agency has institutionalized this item into its project execution process and culture (scoring range: 9-10)</i></p> <ul style="list-style-type: none"> • Has the agency integrated the requirements of this item into quality improvement processes? • Are the requirements of this item integrated into agency culture? • Are the requirements of this item included as part of the employee performance rating system?

Using the following table, score each statement based on the above rating guidelines and record the score in the box to the right of each question. For example, if the agency has implemented digital signatures but is not yet evaluating the process to generate ideas for improvement, consider assigning a rating of 5. A rating of 6 or above means that the agency has implemented the item in the statement.

e-Construction Statements My Agency...	Rating (1-10)
1. has DOT or State agency IT staff members that are directly involved and actively participating in e-Construction deployment	
2. has adopted electronic or digital signatures (has done away with wet signatures)	
3. digitally seals design documents and/or plans for bidding and contracts	
4. uses a formal document management system for document transmission and managing correspondence on construction projects	
5. uses electronic bidding which requires contractors to submit all bids through e-mail, a website, or portal. Documents are at least emailed with no discs, hard copy mailings, postage, or in-person delivery.	
6. uses an electronic construction management system to store and manage construction data (ex: inspection reports, materials, labor compliance, etc.)	
7. uses mobile devices to capture data for inspection reports and to perform quality assurance on construction projects	
8. uses project collaboration tools for electronic approvals within project management workflows, including approvals from outside entities.	
9. has electronic tools to gather material data delivered to the project site (ex: RFID tags, bar or QR codes, e-ticketing)	
10. has electronic tools to gather material test results for data storage and analysis	
11. has electronic tools to receive and analyze labor compliance information (ex: AASHTOWare Civil Rights and Labor, eMars, LCP Tracker)	
12. has electronic tools to document as-built conditions (as-built drawings) (ex: BlueBeam Revu, etc.)	
Partnering Statements My Agency...	Rating (1-10)
1. has a formal Partnering program	
2. has established Partnering tools (ex: Partnering Manual, training, standard	

specifications, special provisions, etc.)	
3. has a process to track and evaluate Partnering Performance Measures for schedule impacts, change orders, cost growth, disputes / claims, etc.	
4. analyzes Partnering metrics to determine project performance in terms of cost and schedule	
5. analyzes Partnering metrics to determine project performance in terms of safety and quality	
6. applies Partnering concepts to oversight of local agency projects	
7. uses informal partnering concepts in day-to-day project administration to resolve project issues and disputes	
8. uses information technology (ex: e-Construction, 3D-4D modeling) as a tool to facilitate project Partnering	
9. uses formalized Partnering on traditional Design-Bid-Build projects	
10. uses formalized Partnering on projects using alternative delivery methods (ex: Design/Build, CMGC, P3)	

e-Construction and Partnering Roundtable Discussion

During the roundtable discussion, the facilitator will pose the following questions for input from participants. Consider these questions before the session begins and document the primary needs of your organization in further implementation of the concepts presented.

e-Construction

- What are your observations/suggestions regarding EDC-3 activities?
- What barriers exist to your agency's implementation?
- FHWA implementation plan: What can we do to further advance the deployment of e-Construction?

Partnering

- How does your agency use/view construction partnering and what benefits have you experienced ?
- What are some of the barriers?
- FHWA implementation plan: What can we do to further advance the renewal of Partnering?

e-Construction/Partnering Synergies

- What are the synergies for your agency that you see in the implementation of the e-construction and partnering principles presented?

- How might the current partnering practices of your agency accelerate or enhance the implementation and benefits derived from e-construction?

e-Construction and Partnering Resource Links

FHWA Every Day Counts website

<https://www.fhwa.dot.gov/innovation/everydaycounts/>

FHWA e-Construction website

<https://www.fhwa.dot.gov/construction/econstruction/>

FHWA Construction Partnering website

<http://fhwa.dot.gov/construction/partnering/>

Florida DOT e-Construction How-To Guide

<https://www.fhwa.dot.gov/construction/econstruction/florida/howto.pdf>

Michigan DOT e-Construction Wiki website

<http://mdotwiki.state.mi.us/construction/index.php/E-Construction>

Article on Iowa DOT e-Ticketing pilot project

<http://www.transportationmatters.iowadot.gov/2015/12/eticketing-show-promise-of-speeding-process-and-improving-accuracy-at-asphalt-job-sites.html>

Field Guide to Partnering on Caltrans Construction Projects

http://www.dot.ca.gov/hq/construc/partnering/documents/Field_Guide_to_Partnering_on_Caltrans_Construction_Projects_final.pdf

Glossary of e-Construction and Partnering Terms

Alternative Dispute Resolution (ADR) – Utilizing a method of mediation or arbitration as a means to resolve disputes as opposed to litigation.

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

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.

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.

Claim – A demand or assertion by one party seeking payment of money or other compensation with respect to the terms of the Contract, or a dispute in question between Owner and Contractor in reference to the contract.

Collaboration – The action of working with someone to produce something, with the goal of a successful delivery of a highway construction project.

Common Goals – Goals established for the benefit of more than one party that have a defined end result that is mutually beneficial.

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.

Dispute - Disagreement over the existence of a legal duty or right, or over the extent and kind of compensation that may be claimed by a party for a breach of such duty or right.

Dispute Resolution (or Review) Board (DRB) – A group of neutral individuals selected by parties to provide review of project documents and provide advisory recommendations to assist in resolving disputes.

Dispute Resolution Plan (DRP) – A written plan governing the settlement of disputes between parties through a set of rules and processes.

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 document is passed from one user to the other, often via a project collaboration site, using 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.

Formal Partnering – An official, specific commitment between parties involved in delivering a construction project, including the owner, consultants, contractors, and other key stakeholders to deliver the project with goals and communication.

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.

Informal Partnering – An unofficial, non-facilitated commitment and understanding between construction project Owner, Consultants, Contractors, and other key stakeholders to share project goals.

Issue Resolution/Escalation Process – the process by which entities evaluate disagreements in order to resolve them at the lowest level possible without disrupting the project and while preserving business relationships.

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, as filing systems are maintained through electronic means.

Partnering – a formal or informal business practice designed to assist the project team with setting goals, resolving disputes, and improving outcomes.

Project Charter – A description of the commitment made by all stakeholders that includes a delineation of roles and responsibilities for a project, how it will be performed, and the goals of the project team.

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.

Risk-Based Partnering – All project partners working together to identify the risks to project execution, prioritizing the levels of risk, and develop a risk mitigation strategy.

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

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

Speaker Biographies

Tom Zagorski



Tom has more than 30 years of experience in the construction management discipline, 29 of which has been with Michael Baker International. He is currently Senior Vice President, National Director, Construction Services and is the technical services manager for Construction Services, with a focus on improving and sharing industry knowledge, fostering innovation in project delivery, and continual improvement of quality management. Mr. Zagorski is currently Lead Subject Matter Expert consultant for FHWA's EDC-3 and EDC-4 e-Construction initiatives, facilitating an e-Construction implementation plan and peer exchanges among state DOTs.

Kathryn (Kat) Weisner



Kathryn is a Construction & Contract Administration Engineer for the FHWA's Resource Center focusing on innovation deployment, claims analysis and avoidance, PS&E development, bid package preparation, bid analysis, change orders, work zone traffic control, construction site safety, and construction inspection, management, and oversight. Kat is responsible for the development and delivery of training in Federal-aid Contract Administration, Construction Inspection, 3D Modeling, and e-Construction. She is a frequent organizer and speaker at industry Construction Career Day events nationwide helping attract, develop and train a qualified work force.

Robert Wight



Rob is the Director of Construction and Materials at the Utah Dept. of Transportation. Rob earned a bachelor's degree in Civil Engineering in 1993 and a master's degree in Engineering Management in 1994 from Brigham Young University. Most of his 20 years at UDOT has been in the construction management and maintenance areas, and is currently leading the implementation of UDOT's e-

Construction initiative. He has been a member of the AASHTO Subcommittee on Construction since 2011 and currently serves as the chair of the Safety Environmental and Workforce Development Section. He is a licensed Professional and Structural Engineer in the State of Utah.

James Foringer



Jim has been PennDOT's District 11 Assistant District Executive (ADE) for Construction since 2007. As ADE for Construction, Jim plays an integral part in delivering key infrastructure improvements for the Western Pennsylvania region, including directing numerous high profile projects for PennDOT. For the past three years he has been the statewide champion for e-Construction in Pennsylvania, spearheading the development of Mobile Construction, PennDOT Project Collaboration System and updates to the Construction Documentation System. Jim is a 1985 graduate from the University of Pittsburgh with a B.S. degree in civil engineering.

Implementation Plan Technical Working Group Members

We would like to acknowledge the input and participation from the following Technical Working Group members and subject matter experts in e-Construction and Partnering:

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