e-Ticketing Participant Workbook

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e-Ticketing Participant Workbook

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16. Abstract Historically, on highway construction projects truck drivers collect paper tickets for every truckload they haul to a job site from a material plant. This practice of paper tickets is cumbersome and outdated. Electronic ticketing (e-Ticketing) automates the process. e-Ticketing is a market-ready digital innovation that automates the recording and transfer of information in real time for materials as they are moved from the plant to the site. This report is an electronic workbook specifically developed for the participants of the Every Day Counts virtual summits. The participant workbook includes a technical description of e-Ticketing technologies, benefits, user stories of five State departments of transportation (DOTs), and a maturity matrix. Additionally, it includes the related presentation's slides and example specifications from two State DOTs.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1,000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2,000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2,000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	2.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

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TABLE OF CONTENTS

SUMMARY

WHAT IS E-TICKETING?

Electronic ticketing (e-Ticketing) is a market-ready digital innovation that automates the recording and transferring of information in real time for materials as they are moved from a plant or supplier yard to a construction site or storage facility. This paperless process uses technological solutions to create, share, track, document, and archive material information, such as quantities, sources, and delivery information, in electronic or digital format. The process typically involves the transfer of data to a server for immediate access by multiple stakeholders, via mobile devices, for material verification and real-time operational decisions. Using electronic means simplifies the handling and integration of material data into information systems for acceptance, payment, and source documentation.

WHAT PROBLEMS DOES E-TICKETING SOLVE?

The e-Construction practice highlights the drive toward paperless construction. Paper-based load delivery tickets on highway construction projects are a cumbersome and outdated practice. Collecting paper tickets from haul vehicles exposes construction inspectors and contractor personnel to safety hazards in work zones. Paper-based ticketing is a linear and resource-intensive practice that entails multiple "touchpoints" for handoff. These touchpoints include recreating information from paper tickets through manual entry with little traceability and few downstream data uses. Lost or damaged tickets are not an uncommon phenomenon.

Both departments of transportation (DOTs) and the private sector spend considerable resources to produce, deliver, sort, and archive paper tickets. With the chronic shortage of inspection staff facing DOTs, the paper-based practice demands an in-person "ticket taker" to collect tickets from truck drivers, record tonnage and location, calculate yield, and report daily summaries. Allocating that "ticket taker" to higher order activities improves the overall efficiency of the inspection process.

The 2020 construction season has made the move to e-Ticketing even more relevant by increasing the need for touchless operations and expanding the amount of project information that can be accessed digitally.

BENEFITS

e-Ticketing offers a safer, faster, less resource-intensive, sustainable, and streamlined process using technology. e-Ticketing data can be transmitted in real time directly or to the cloud for access by mobile devices to enable operational decisions in real time. This information creates a "single source of truth" that can be exchanged, via an application program interface, with DOT information systems such as construction management, asset management, or financial systems for data mining purposes. e-Ticketing facilitates integration with complementary technologies,

such as intelligent compaction, density meters, and thermal profilers. e-Ticketing offers a unique opportunity to collect critical quality and productivity data that is otherwise difficult to capture.

e-Ticketing saves lives, money, and time. Specifically, e-Ticketing:

- Reduces work zone risk.
- Improves data collection and prevents information loss.
- Enables data-driven decision making.
- Advances digital delivery and information management.

STATE OF THE PRACTICE

Since the first e-Ticketing pilot in 2015, the number of State DOTs adopting this technology has increased steadily. Two surveys published in 2020 by the National Cooperative Highway Research Program (NCHRP) Synthesis 545 and the National Asphalt Pavement Association (NAPA) found that 24 agencies use e-Ticketing (Dadi et. al 2020; NAPA 2020). Of those 24 agencies, 13 piloted e-Ticketing prior to the 2020 construction season, and 11 agencies began using e-Ticketing during the 2020 construction season. Five additional agencies are currently preparing for or considering pilot projects. While the impetus for initiating e-Ticketing varies with each agency, most DOTs agree that availability of real-time data in a digital format and the added safety benefits offered by e-Ticketing are significant motivators. Some DOTs are also using e-Ticketing as a gateway to future enhanced integration with their construction management systems.

Iowa DOT

Iowa DOT conducted its first e-Ticketing pilot in 2015 on asphalt projects and added concrete projects in 2016 and aggregate projects in 2020 (Dadi et. al 2020). Currently, e-Ticketing is being used on more than 80 projects.

In Iowa DOT's construction projects, e-Tickets are created at the plant and include important batch information for each truck. Using a mobile device, the inspector can access this information before the truck's arrival at the project site. The inspector adds test data to the ticket via a mobile device and accepts the material delivery. The data from the project tickets can be analyzed and sorted by mix, date, or other variables. The data can also be reviewed by the geolocation of the accepted tickets. At this time, Iowa DOT is not focusing on Global Positioning System (GPS) truck tracking, but it is exploring other technologies for electronic proof of delivery. The challenges around e-Ticketing for Iowa DOT are focused on managing various e-Ticketing vendors (i.e., having inspectors using different software and workflows), working with suppliers who have outdated load-out systems, standardizing the required data, and managing the reliability of mobile access in the field.

Iowa DOT is currently working with vendors to pilot the integration of e-Ticketing data directly transferred into the American Association of State Highway and Transportation Officials (AASHTO) software suite called AASHTOWare Project ™ (AASHTO 2021). In the future,

Iowa DOT plans to create specifications for moving e-Ticketing to a standard practice for all major infrastructure projects (Wilkinson 2020).

Alabama DOT

Alabama DOT (ALDOT) piloted its first e-Ticketing project in 2017 on an asphalt project (Dadi et. al 2020). As of 2020, it has used e-Ticketing on nine projects and has plans to expand to more pilots. ALDOT piloted e-Ticketing to improve reliability, quality, and efficiency of the ticketing process. Moving to e-Ticketing eliminates the traditional ticket taker and reduces the number of project staff exposed to hazards around delivery trucks. According to ALDOT estimates, eliminating paper tickets could save between $4 million and $8 million per yr, or 1 to 2 percent of construction costs, which could be fed back into other projects (Powe 2020).

ALDOT initially procured mobile devices for 60 percent of its inspection staff (currently, 79 percent of inspection staff are equipped with mobile devices). The mobile devices positioned ALDOT to implement both e-Ticketing and other e-Construction initiatives in a move away from paper (Powe 2020).

ALDOT has experienced the following issues with e-Ticketing:

- Having problems with Internet access in remote areas.
- Getting process buy-in from stakeholders to eliminate paper records and replacing them with digital sources.
- Getting the U.S. Department of Agriculture and industries to agree that paper can be eliminated.
- Overcoming the fear that contractors will provide ALDOT with too much data.

ALDOT's goals around e-Ticketing include expanding pilots to get more contractor buy-in and including smaller contractors who lack sophisticated load-out systems.

Utah DOT

Utah DOT (UDOT) conducted its first e-Ticketing pilot in 2019, and 36 projects have used e-Ticketing as of 2020 (Talbot and Sellars 2020). UDOT is using a solution developed in-house to pilot e-Ticketing. No new commercial e-Ticketing software has been purchased. UDOT's Feature Manipulation Engine server receives digital tickets (in JavaScript Object Notation [JSON] file format) from the supplier and sends the information to a UDOT geographic information system (GIS) database for storage. Construction inspectors can access the ticket information on their mobile devices in real time using a data gathering software application and update the ticket with additional data.

UDOT has identified several issues to resolve as it continues to pilot e-Ticketing. These issues include process logistics when the prime is not the material supplier, implications of bypassing ports of entry, and concerns in automation and scalability.

UDOT plans to develop standard operating procedures to document best practices for e-Ticketing, guidelines for problem-solving, and methods around data governance and integration into construction management systems. UDOT also plans to expand e-Ticketing to concrete and aggregates (Talbot and Sellars 2020).

Pennsylvania DOT

Pennsylvania DOT (PennDOT) piloted its first e-Ticketing project in 2017 on four hot mix asphalt/warm mix asphalt paving and milling projects in Allegheny County as part of a larger ongoing e-Construction initiative (Dadi et. al 2020). These four projects were also pilots for GPS tracking of equipment using multiple vendors. As of 2020, PennDOT has used e-Ticketing on more than 17 projects. PennDOT looked to e-Ticketing to eliminate paper tickets and the need to sort them, verify materials and tonnage, summarize tickets for contractor payments, and reduce worksite hazards for inspectors.

PennDOT is working to implement e-Ticketing statewide through a steering committee with members from the Federal Highway Administration (FHWA), highway contractors, material producers, and the hauling industry. The committee has four subteams investigating specifications, information technology solutions, haulers, and maintenance issues (Myler 2020). PennDOT's plans include:

- Implementing the newly developed statewide specifications on four to five projects in each district.
- Expanding e-Ticketing specifications to include concrete and aggregate.
- Providing maintenance material requirements for five materials (asphalt, liquid asphalt, concrete, aggregate, and salt).
- Developing strategies to address limited or no cellular or data service on construction sites.

One of PennDOT's goals is to provide a real-time data feed to engineering and construction management systems, smart data, and applications.

Minnesota DOT

Minnesota DOT (MnDOT) started piloting e-Ticketing in 2018 and has completed more than 40 projects as of 2020 (Dadi et. al 2020). MnDOT piloted e-Ticketing to improve the logistics performance of delivery trucks and initially targeted projects that were using intelligent compaction and paver-mounted thermal profilers. MnDOT focused on safer ticket collection,

real-time verification of material placement, and electronic documentation of construction data. MnDOT is currently leading an AASHTO task force on developing recommendations for the standardization and integration of digital e-Ticketing data. Future efforts will be focused on the integration of e-Ticketing with the AASHTOWare Project™ suite of applications to create an intelligent construction data management system.

PATH FORWARD

Highway agencies have used multiple pathways to adopt e-Ticketing. The various developmental stages in the evolution and advancement toward the highest maturity levels in e-Ticketing are described in the following list and illustrated in figure 1:

- Paper tickets: The traditional process is to print delivery tickets on paper. Contractor or construction inspectors collect the tickets from truck drivers (originating from the batch or supplier plant systems) when the materials are delivered at the project site. The paper tickets serve as a bill of lading for the hauler and a source document to communicate material information and quantity and provide a basis for payment. The information from the paper ticket must be manually extracted and entered into the agency's construction management systems (CMS) for further processing and applications.

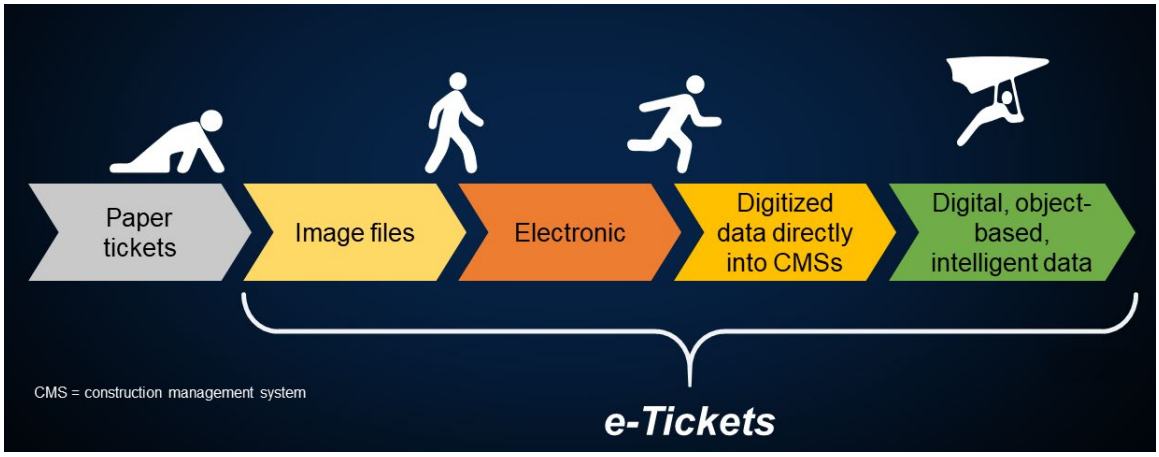
- Image files: The paper tickets are converted into an image form, such as a photo, portable document format, scan, or fax, to enable electronic transmittal. Some agencies have adopted this approach to ensure contactless delivery during the 2020 construction season. The original paper ticket is still needed to serve as the source document and must eventually be delivered to the project or retained by the contractor or supplier. Because the image files contain unstructured data, the information must still be manually extracted and entered into the agency's business information systems.

- Electronic tickets: The tickets are produced in an electronic format through an in-house developed or commercially available technology-based solution. The electronic tickets are transmitted in real time from load-out systems directly to field inspectors or through a server. The data may be compiled in comma-separated values, text, or dBASE formats and stored, queried, and used for further applications. Agencies that have implemented e-Ticketing solutions have at least achieved this developmental stage. The electronic ticket serves as a source document and must be securely stored and archived in electronic form.

- Digitalized tickets: Electronic tickets are digitalized into semi-structured data using compatible file formats, such as JSON or extensible markup language, using a standard data scheme for transmittal and exchange. The data fields are automatically extracted, transformed, and loaded via an application program interface into an agency's CMS for further applications and archived under the CMS's protocol.

- Object-based tickets: The ticket data are structured as defined elements that are grouped intelligently, organized hierarchically, and linked with other datasets using GIS or building information modeling file formats, such as shapefiles, file geodatabase,

InfraGML, or IFC Alignment. The object-based ticket enforces data quality rules to validate data attribute and relationship requirements. The object-based ticket also allows some operations, such as data retrieval or updating, to be automated using a set of procedures. These procedures make the data easier to use in extensive data mining applications. Using this approach, processes such as payment can be automated based on the e-Ticket data transfer.



Source: FHWA.

Figure 1. e-Ticketing Developmental Stages.

An agency can adopt an incremental approach by acquiring new capabilities gradually to advance through each developmental stage. Alternatively, an agency can "leapfrog" advancements, bypassing one or more of the developmental stages when it can leverage a combination of its current e-Construction technologies and market receptivity. For example, an agency can move from paper-based tickets to digitalized tickets when its information systems are aligned to receive data directly from the supplier and the contractor and can simultaneously exchange data with field inspectors through mobile devices.

An agency that is interested in e-Ticketing should consider adopting the following strategies as first steps toward implementation:

- Learn about e-Ticketing practices, benefits, and experiences with peer agencies through participation in Every Day Counts (EDC) activities such as webinars and peer exchanges.
- Communicate e-Ticketing benefits to agency leadership to gain buy-in and identify an implementation champion.
- Partner with industry groups to secure buy-in from contractors, plant producers, material suppliers, and third-party haulers.

- Develop an implementation approach. Consider an in-house developed or commercially available technology solution for electronic tickets. Also, select the material type(s) for piloting. Decide whether real-time tracking of material delivery is required or desired.
- Train leadership, internal staff, contractors, plant operators, and other stakeholders.
- Prepare special provisions or developmental specifications that outline the equipment, construction, data, transmittal, and technological requirements.
- Pilot e-Ticketing on construction projects using a project specification or contract modification.
- Ensure that the field inspectors are equipped with mobile devices to access real-time ticket information and have been properly trained.
- Ensure that the project is equipped with internet or cellular services via a tower, landline, or satellite provider. Include the use of wireless networking technology hotspots as needed. Ensure access to internet connectivity for data transmission at the project location in rural areas, when needed, by using wired or wireless technology services via cellular, antenna-based fixed wireless, cables, fiber optic lines, digital subscriber lines, and satellites.
- Investigate the use of e-Ticketing information in agency operations. This FHWA EDC Phase 6 (EDC-6) initiative will provide technical support and assistance to highway agency practitioners and industry stakeholders through webinars, peer exchanges, technical literature, informational videos, and vendor and data standards forums.

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Every Day Counts (EDC), a State-based initiative of FHWA's *Center for Accelerating Innovation*, works with State, local, and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery.

www.fhwa.dot.gov/everydaycounts

TECHNICAL WORKING GROUP MEMBERS

The Technical Working Group (TWG) is providing professional expertise to inform the implementation plan for this innovation. The members of TWG reflect a diverse group of stakeholders from Federal and State governments, academia, and industry organizations.

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Dennis Dvorak, FHWA

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Antonio Nieves, FHWA

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Rob Elliott, FHWA

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Gabe Dadi, University of Kentucky

Richard Willis, NAPA

Greg Mulder, Iowa Ready Mix Concrete

Tom Yielding, National Stone, Sand and Gravel Association

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PURPOSE OF THE WORKBOOK

The purpose of this workbook is to share information about this innovation. The remaining pages of the workbook present a presentation given by FHWA during e-Ticketing sessions at the Virtual Summit held on December 8–10, 2020. Following the presentation are appendixes that detail e-Ticketing practices in Kentucky and Pennsylvania.

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PRESENTATION ON E-TICKETING

INTRODUCTION

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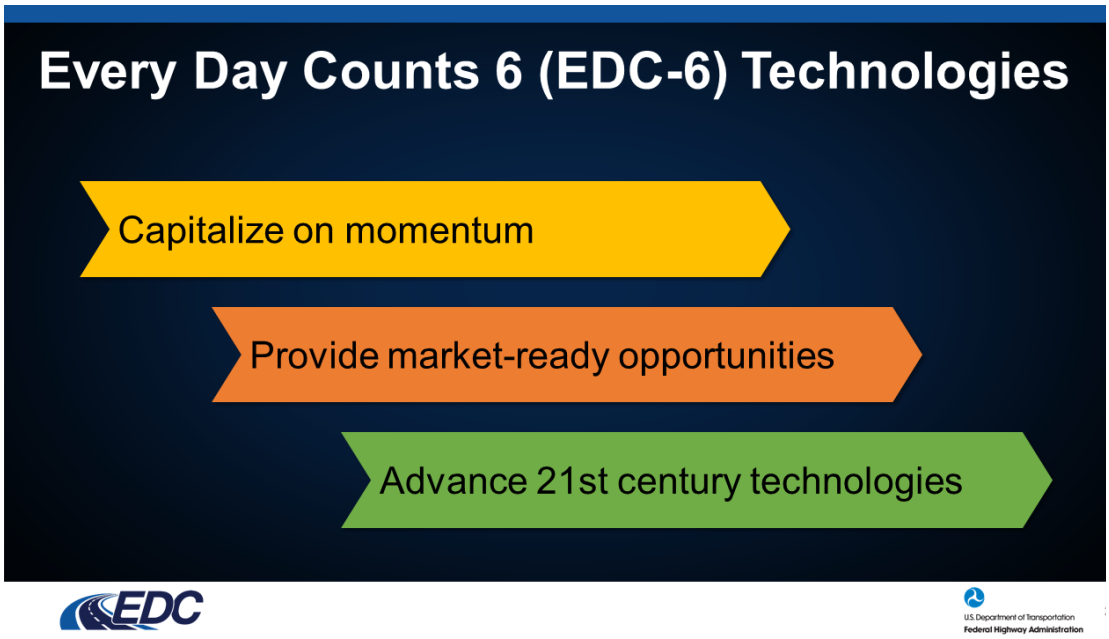

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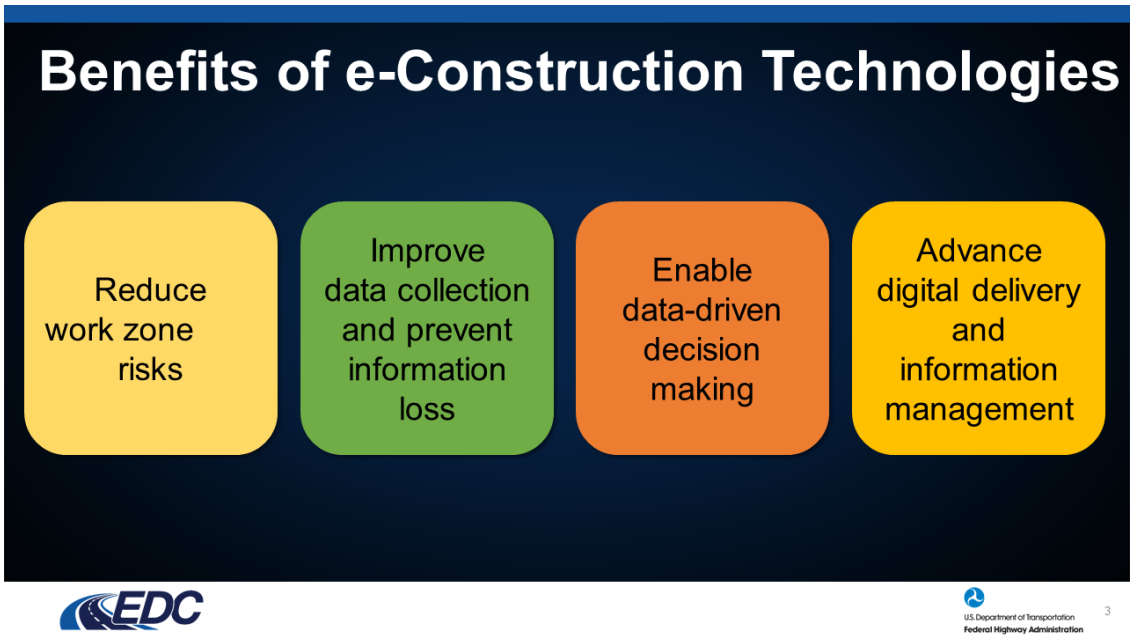

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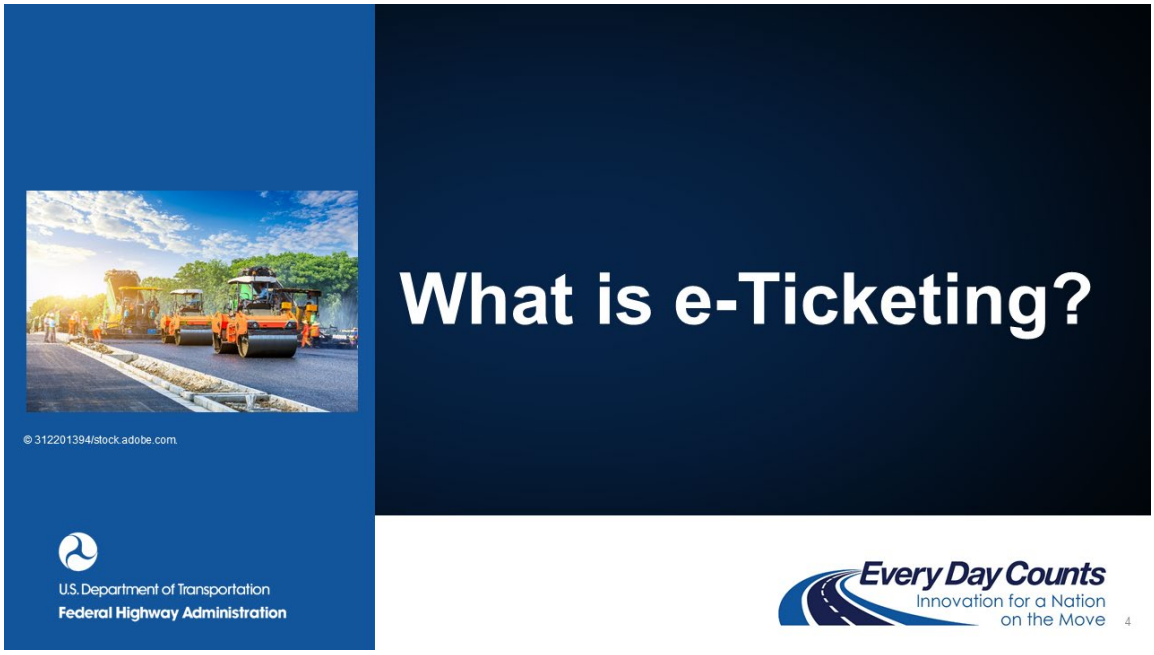
WHAT IS E-TICKETING?



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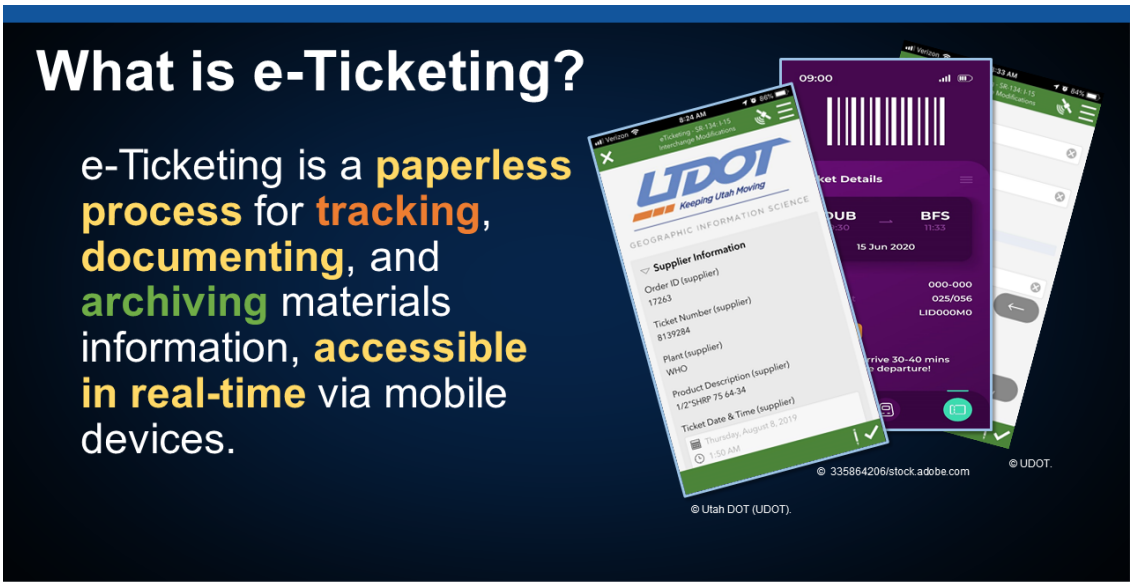

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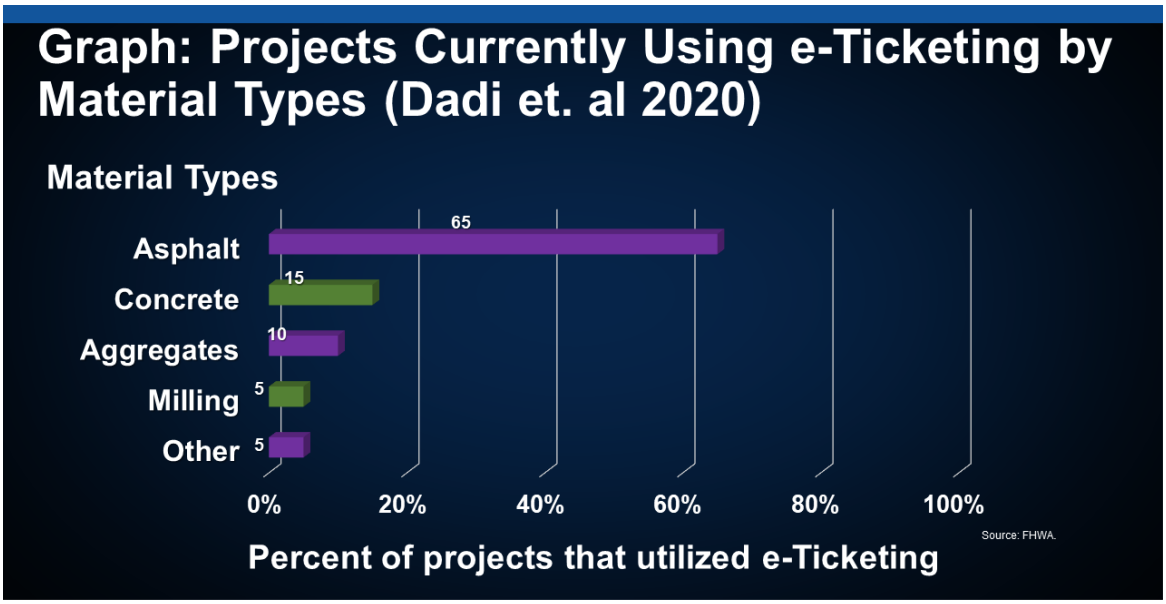

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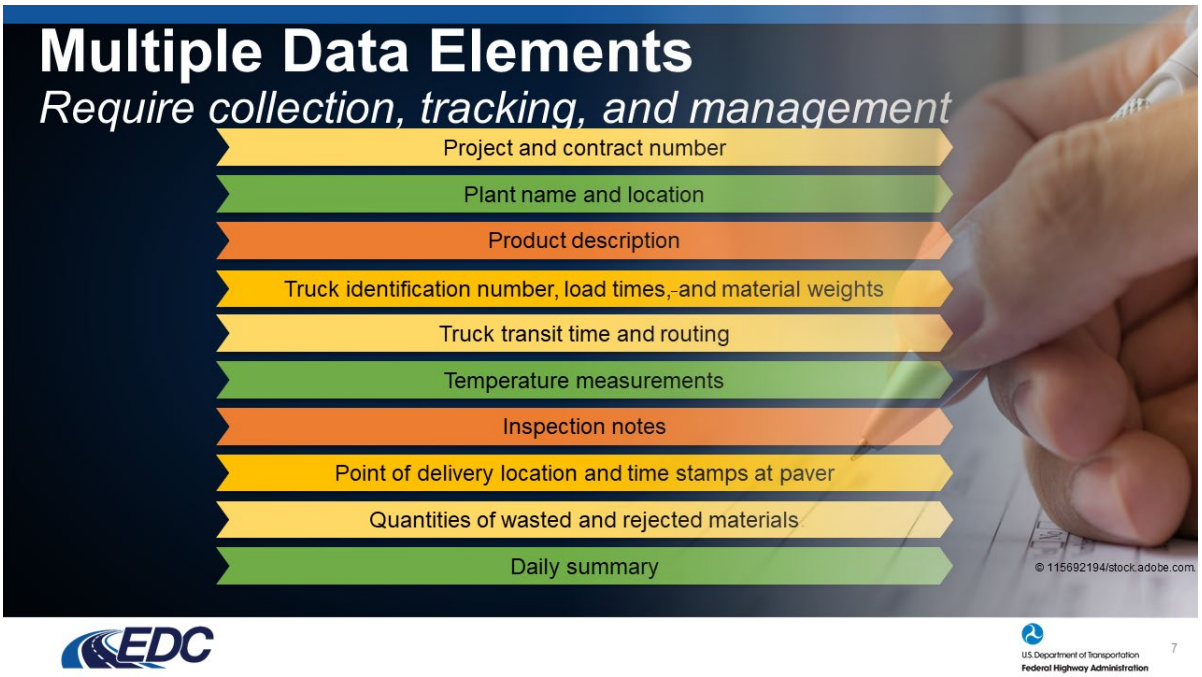

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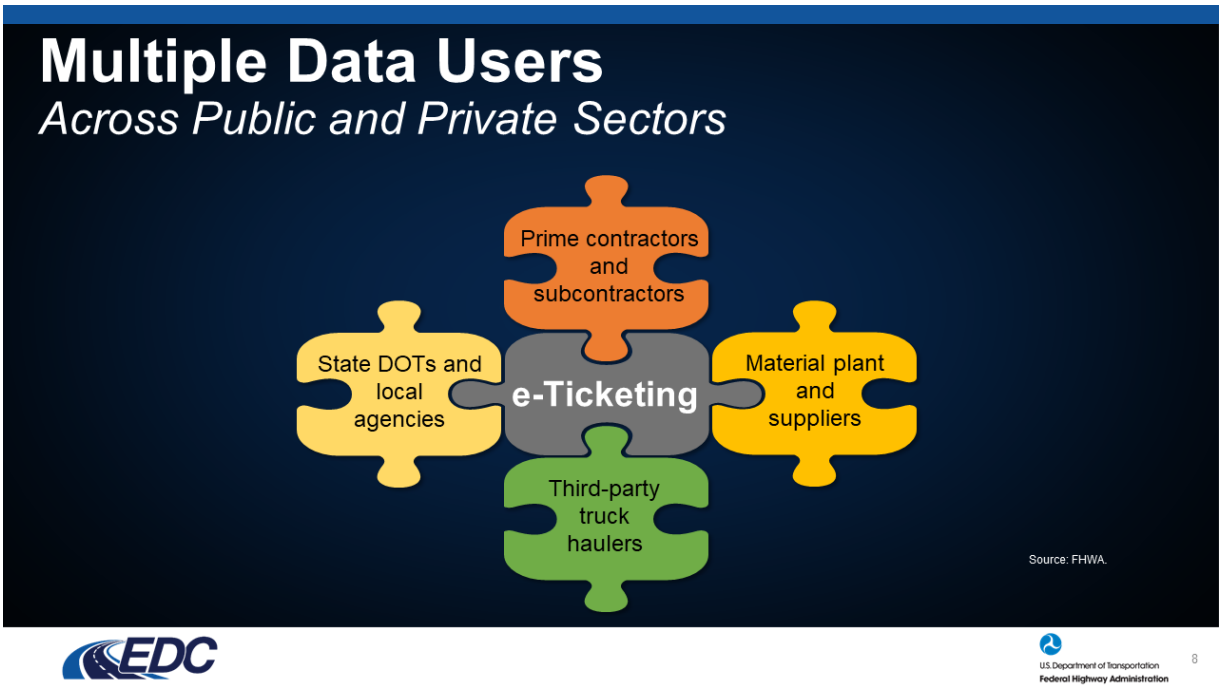

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BENEFITS

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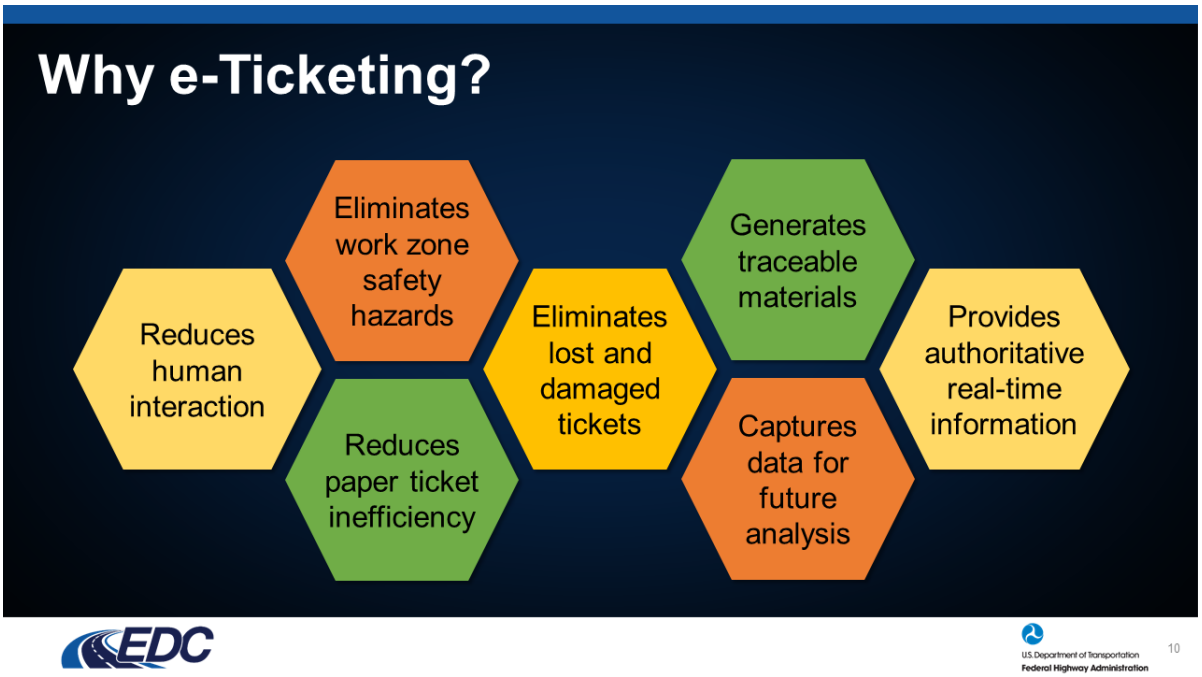

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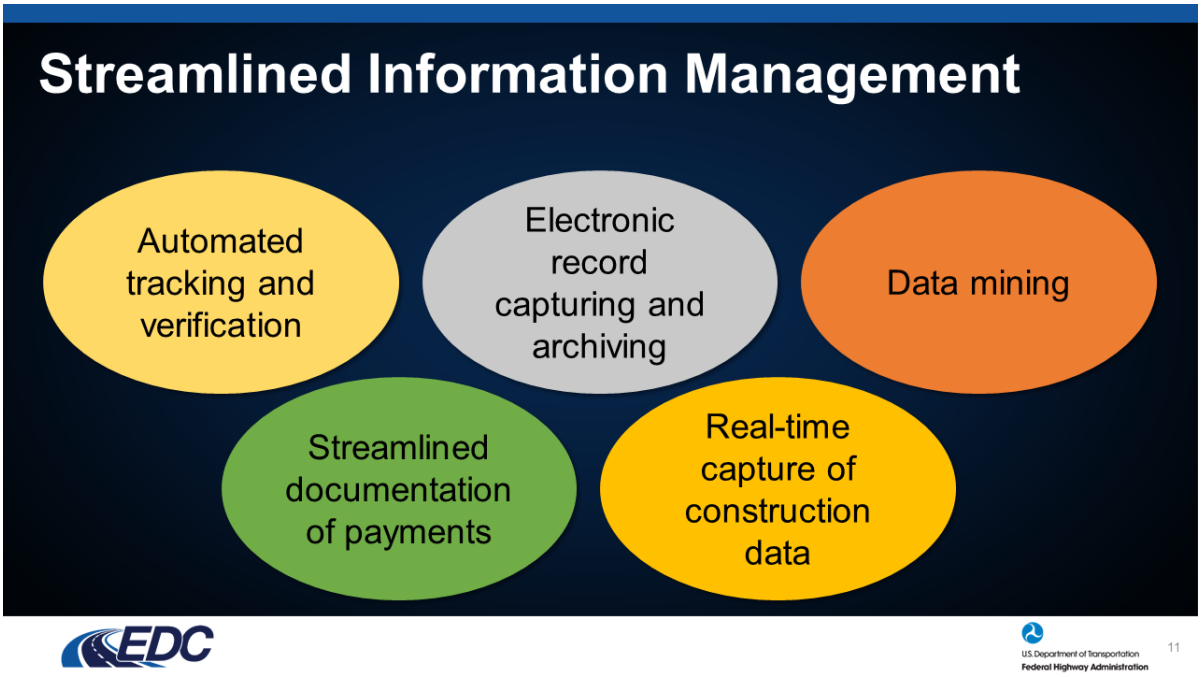

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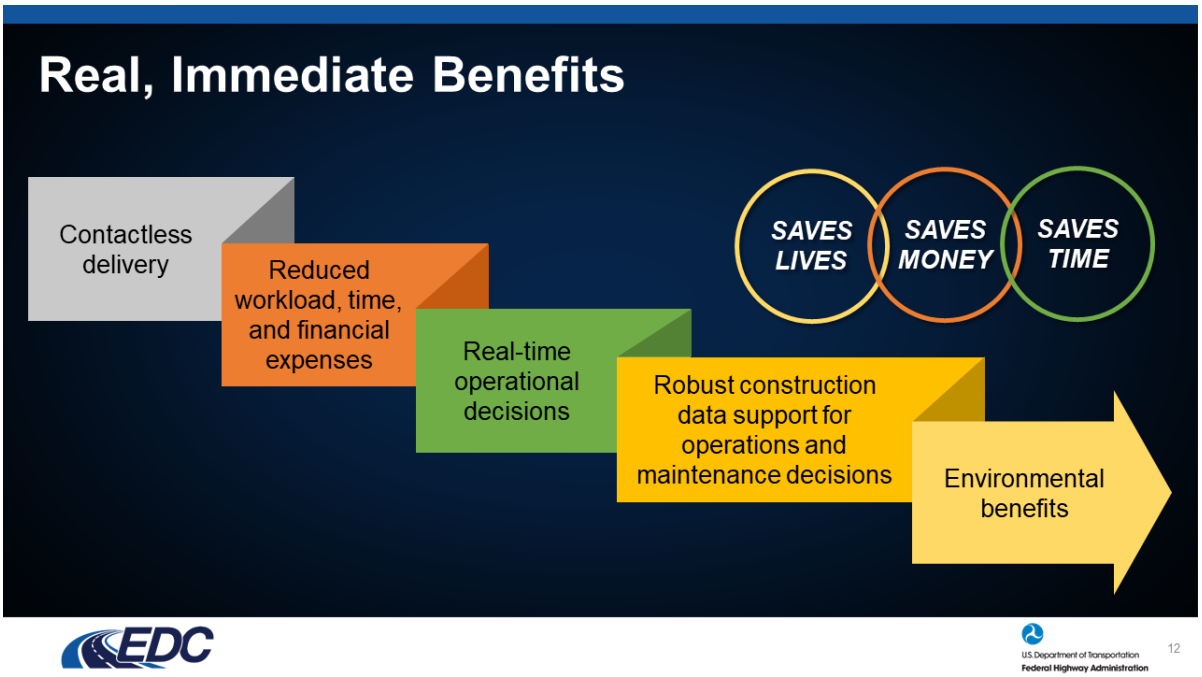

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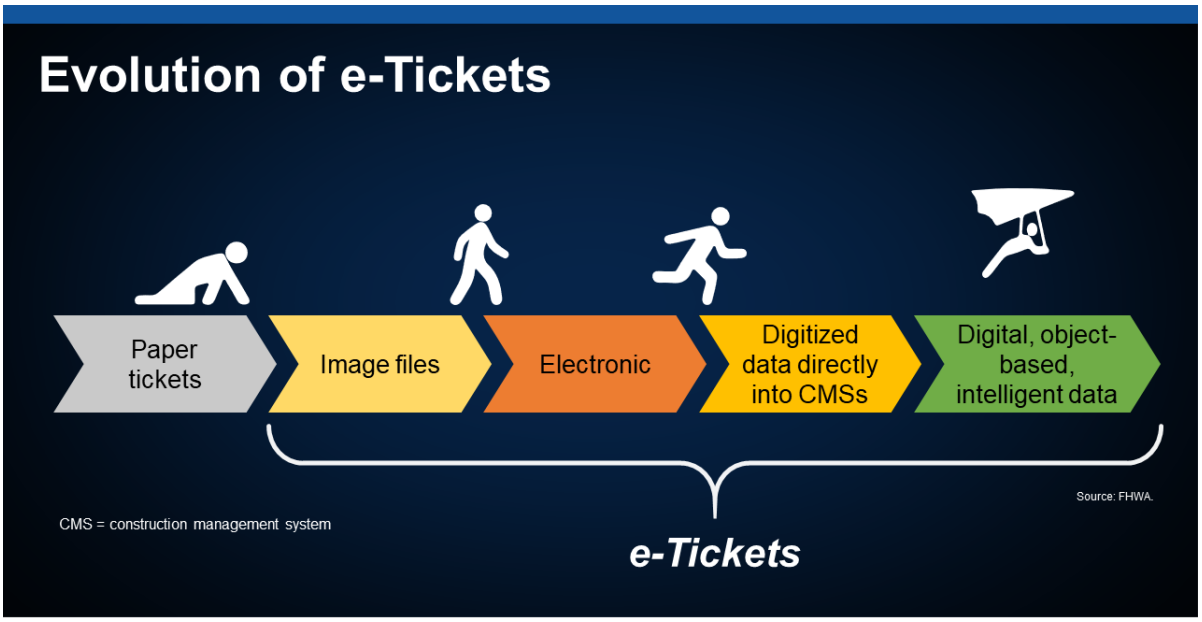

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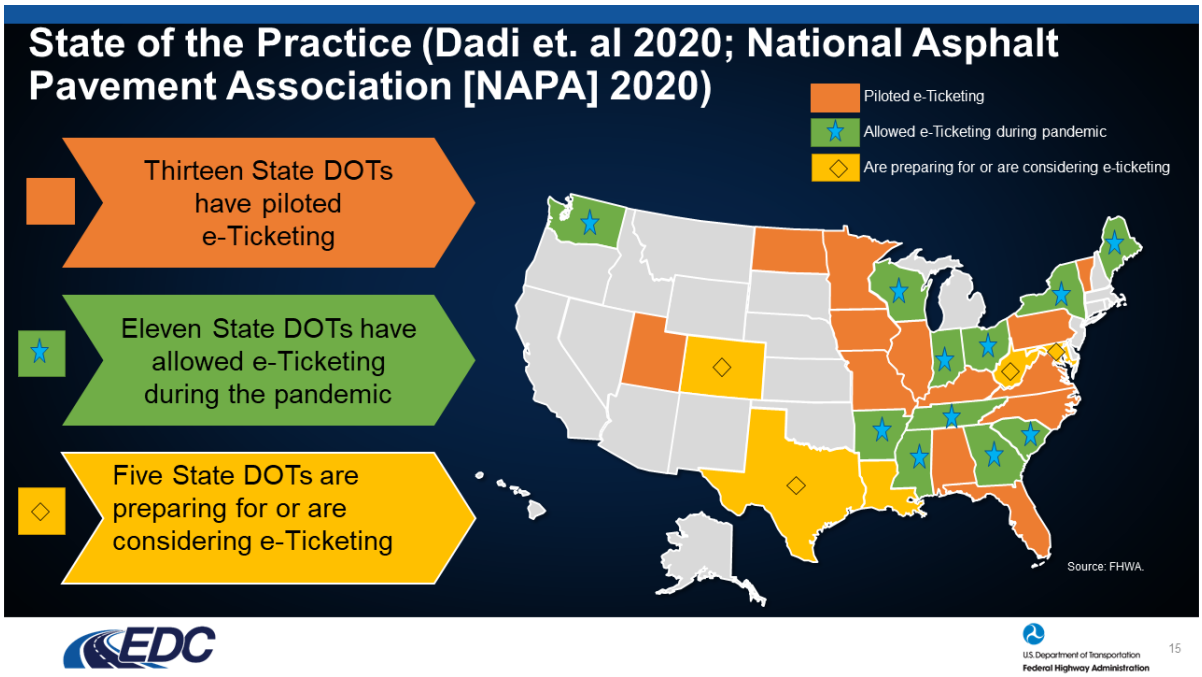

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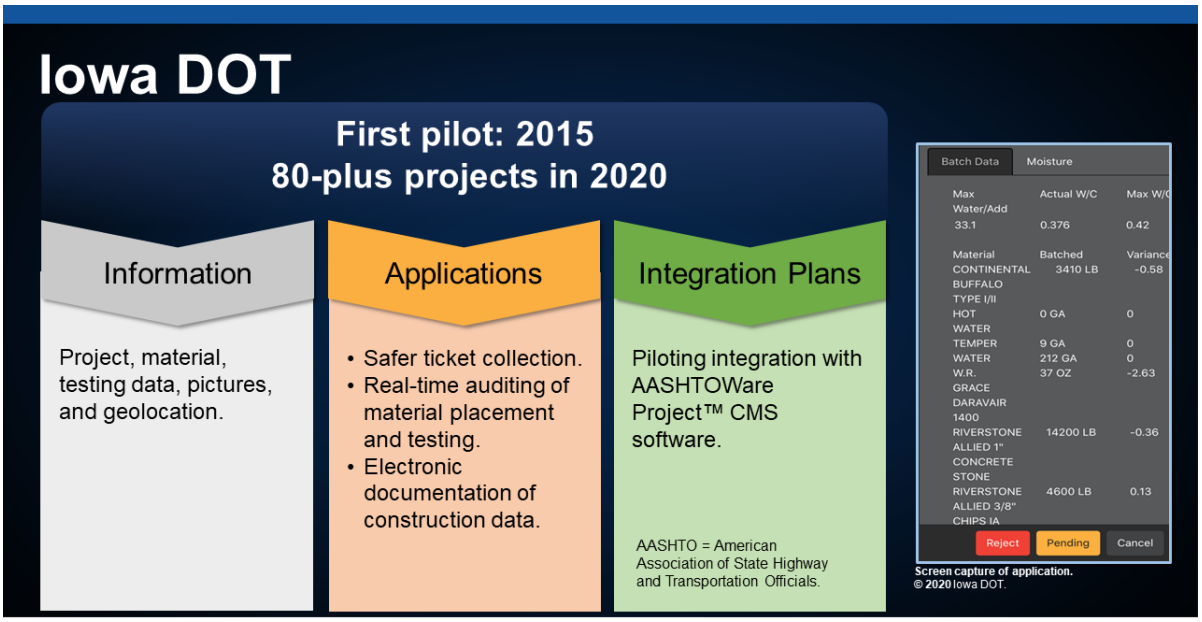

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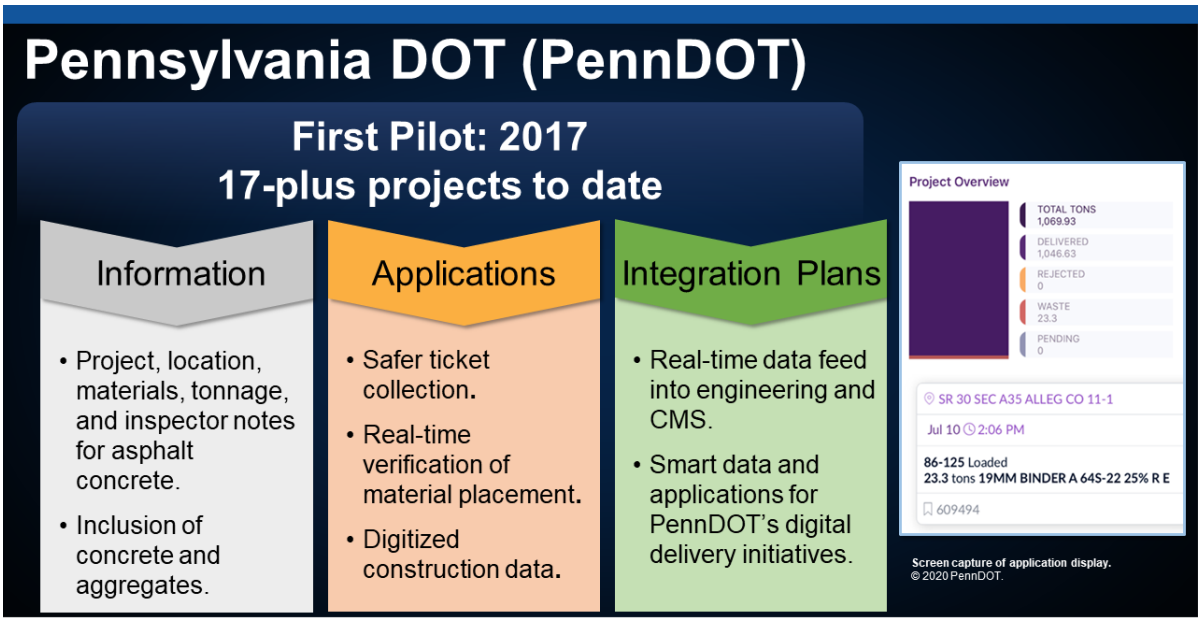

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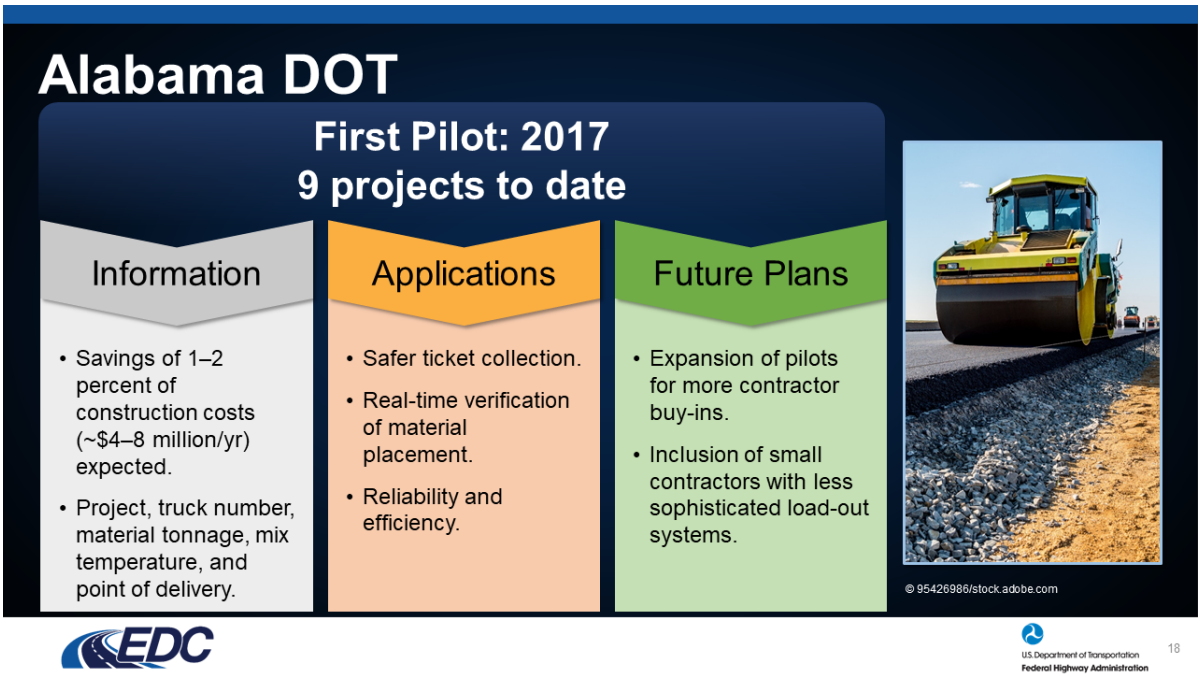

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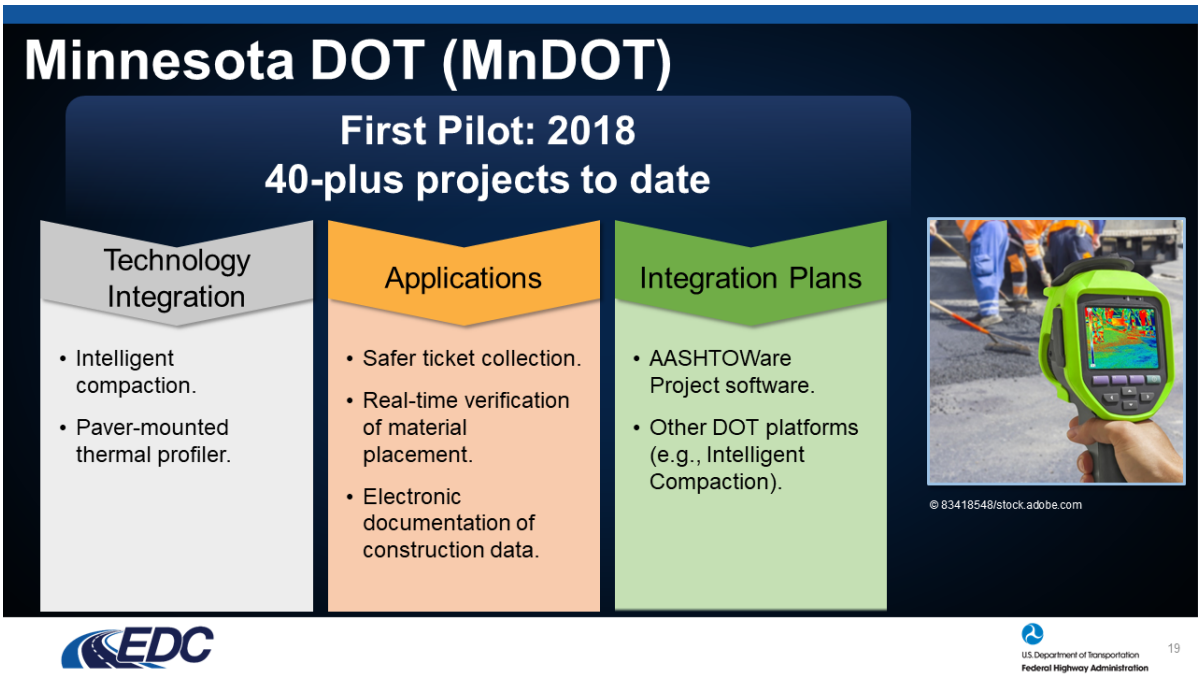

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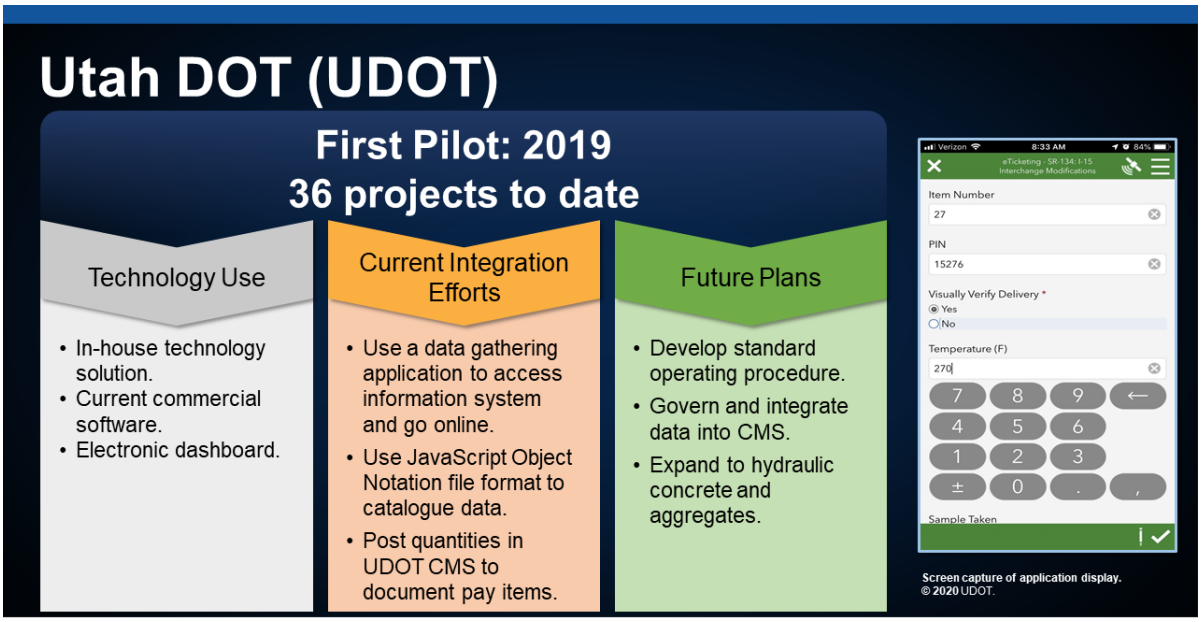

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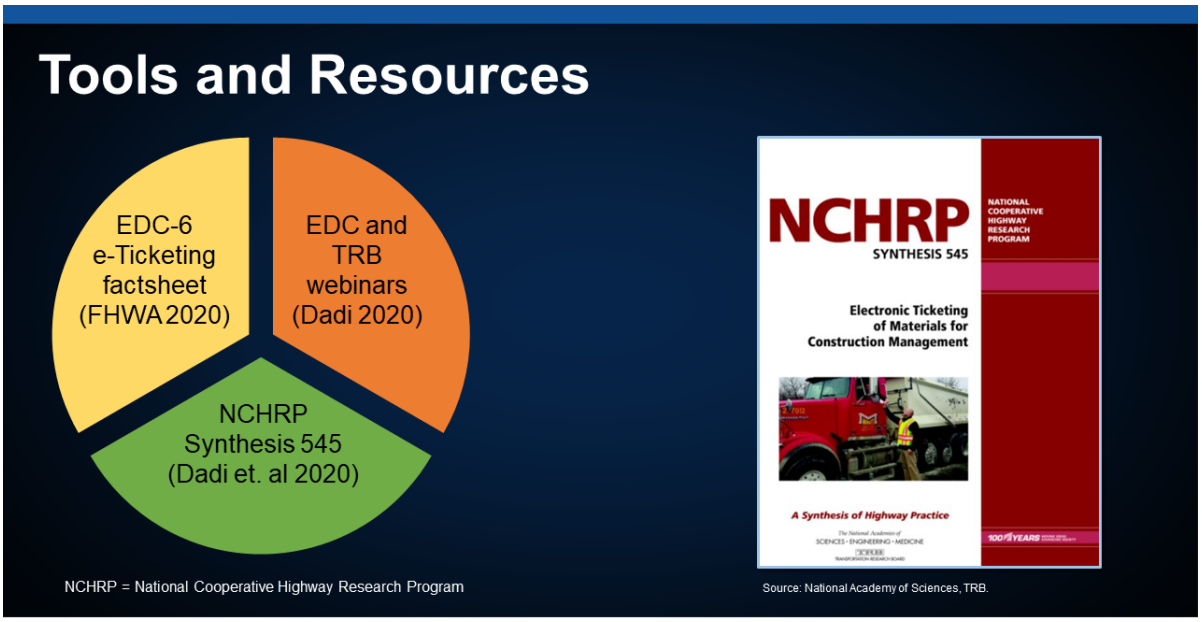

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IMPLEMENTATION TOOLS, TACTICS, AND GOALS

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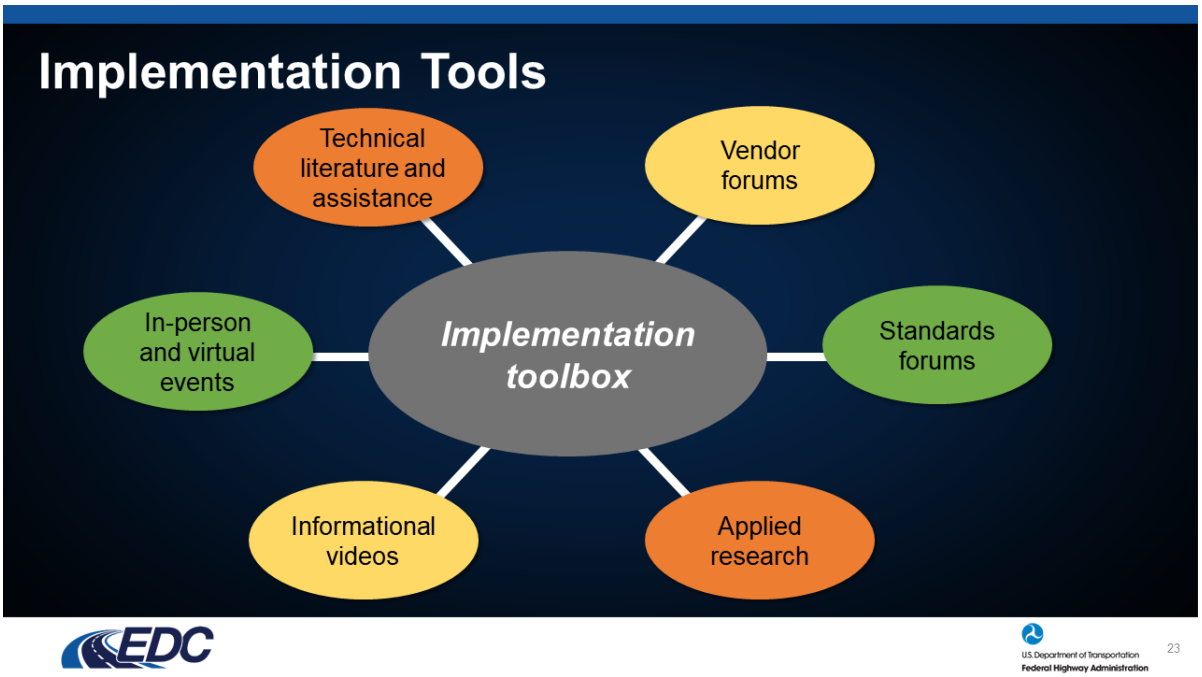

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Every Day Counts
Innovation for a Nation on the Move

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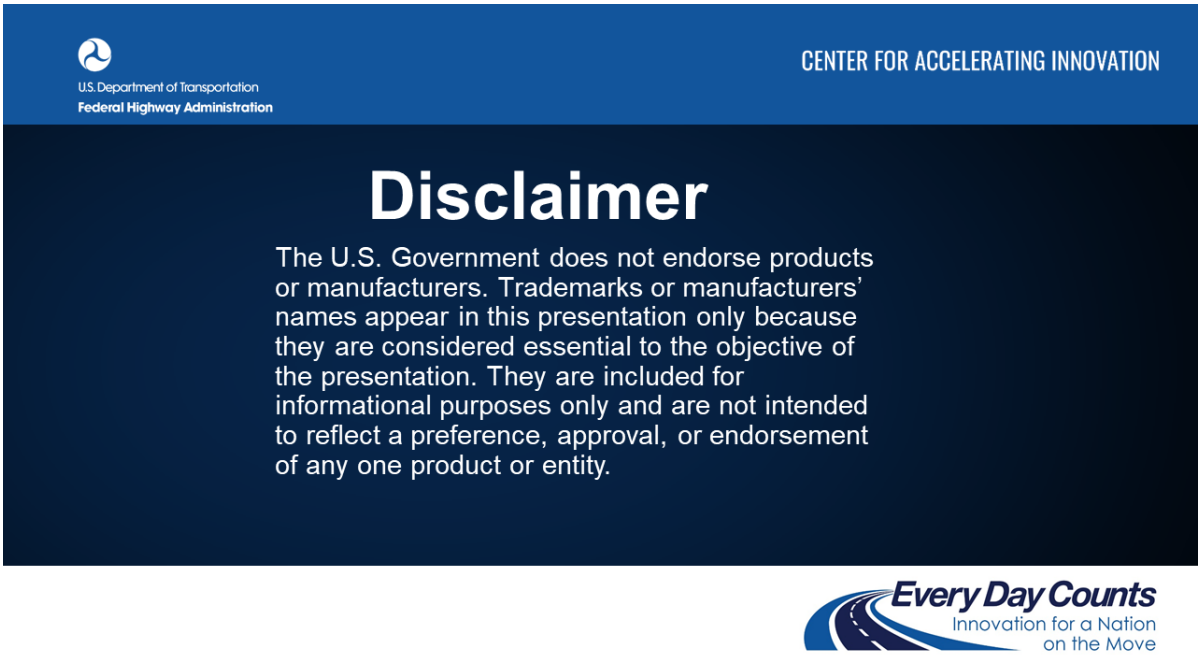

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APPENDIX A: KENTUCKY TRANSPORTATION CABINET SPECIAL NOTE FOR HMA ELECTRONIC DELIVERY MANAGEMENT SYSTEM

[The following text is excerpted from "Appendix D: Special Note" in *NCHRP 545: Electronic Ticketing of Materials for Construction Management* (Dadi et al. 2020)].

This Special Note will apply when indicated on the plans or in the proposal. Section references herein are to the Department's Standard Specifications for Road and Bridge Construction current edition.

1.0 DESCRIPTION

Incorporate a GPS Fleet Management System for all HMA delivered to the project in order to monitor, track, and report loads of HMA during the construction processes from the point of measurement and loading to the point of incorporation to the project.

2.0 MATERIALS AND EQUIPMENT

Submit to the Engineer for approval, no fewer than 30 days prior to HMA placement activities, a GPS fleet management system supplier that can provide a qualified representative for on-site technical assistance during the initial setup, pre-construction verifications, and data management and processing as needed during the Project to maintain equipment.

1. Provide operator settings, user manuals, training videos, and required viewing/export software for review. Provide equipment that will meet the following: A wireless fleet management or GPS device that is capable of tracking all delivery trucks (both company owned and third-party) must be installed on all trucks and equipment (dump trucks, belly dumps, side-load dumps, transfer vehicles, pavers, or any other trucks/vehicles) used to transfer and incorporate HMA into the project. KYTC personnel shall have the ability to access Real Time monitoring through the use of a mobile device such as an iPad, smartphone, etc.

2. The fleet management system shall be fully integrated with the Contractor's Load Read-Out scale system at the HMA plant site.

3. The fleet management system shall have the ability to measure and track vehicles and their contents (weights and material types) continuously from the plant site to the project site. The system shall have internal battery backup capabilities due to loss of power, and have the ability to store data if GPS connectivity is lost and transmit that same data when unit re-establishes connectivity. To be considered continuous, no two data points shall be more than 60 s apart unless the vehicle is stopped. Duration of stop time for any reason shall be recorded.

3.0 CONSTRUCTION

Provide the Engineer with the manufacturer's specifications and all required documentation for data access at the pre-construction conference.

A. Construction Requirements

1. Install and operate equipment in accordance with the manufacturer's specifications.
2. Verify the GPS is working within the requirements of this Special Note.

B. Data Deliverables

Provide to the Engineer a means in which to gather report summaries by way of iOS apps, web pages, or any other method at the disposal of the Engineer. The Engineer may request data at any time during paving operations.

1. Real-time Continuous Data Items

Provide the Engineer access to a GIS map-based data viewer which displays the following information in real-time with a web-based system compatible with iOS and Windows environments.

- Each Truck
  - Unique Truck ID
  - Truck status
    - Time At Source
    - Time At Destination
    - Time At Paver
    - Time At Scale
    - Time to and from plant/job
    - Time Stopped with Engine Running
  - Time of last transmission
  - Location (Latitude and Longitude in decimal degrees to nearest every 60 seconds
  - Description of Material being transported (i.e. asphalt base, asphalt surface)
  - Mix Design Number
  - Net Weight of material being transported to the nearest 0.01 ton
  - Running Daily Total of Net Weight of material being transported to nearest 0.01 ton.
  - Project Number
    - Scale Location
    - Project Location

- Point of Delivery (i.e., paver)

2. Daily Summary

The following summary information shall be provided to the Engineer electronically within 4 hours of beginning operations on the next working day.

- For each Material
- List of Individual Loads
    - Contractor Name
    - Project Number
    - Unique Truck ID
    - Net Weight For Payment (nearest 0.01 tons)
    - Date
    - Mix Temperature at Time of Loading, Fahrenheit (to be key entered by plant)
    - Time Loaded
    - Time Unloaded
    - Delivery Location (Latitude/Longitude in decimal degrees to nearest 0.0000001)

- For each Bid Item
    - Total Quantity for Payment (nearest 0.01 tons)

4.0 MEASUREMENT

The Department will measure the HMA electronic delivery management system as a lump sum item.

5.0 PAYMENT

The Department will make payment for the completed and accepted quantities under the following:

1. Payment is full compensation for all work associated with providing all required equipment, training, and documentation.

2. Delays due to GPS satellite reception of signals or equipment breakdowns will not be considered justification for contract modifications or contract extensions.

3. Payment will be full compensation for costs related to providing the GPS system, including all equipped pavers and transfer vehicles, integration with plant load-out systems, and any software required for the construction and reporting process. All quality control procedures including the

GPS systems representative's technical support and on-site training shall be included in the Contract lump sum price.

Code	Pay Item	Pay Unit
24986EC	HMA ELECTRONIC DELIVERY MANAGEMENT SYSTEM	LS [lump sum]

APPENDIX B: PENNDOT DRAFT SPECIFICATIONS

[The following text is excerpted from PennDOT's "e-Ticketing Construction Specification" (nd)].

PENNDOT E-TICKETING CONSTRUCTION SPECIFICATION

I. Description

This work is providing an electronic ticketing system for aggregate, concrete, and asphalt deliveries to a project, to report individual and cumulative loads of material delivered during the construction process.

II. Material

The electronic ticketing system must be fully integrated with the load readout system at the plant. The system software and hardware must prevent alteration of the data inputs from the scales. For acceptance on a project, the electronic ticket must contain the following information:

a. Aggregate

ECMS [Engineering and Construction Management System] Number or Purchase Order Number
Plant Supplier Code
Material Type/Class/Number
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Name and license number of Licensed Public Weighmaster
Running Daily Total in Tons of material being transported

b. Concrete

ECMS Number or Purchase Order Number
Plant Supplier Code
Class of concrete
JMF [job mix formula] number
Date and Time Ticketed
Net Cubic Yards of concrete being transported
Indicate total yards shipped to total yards ordered

c. Asphalt

ECMS Number or Purchase Order Number
Plant Supplier Code
Material Type/Class/Number

JMF Number
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Running Daily Total in Tons of material being transported
Name and license number of Licensed Public Weighmaster

III. Construction

a. Construction Requirements

1. Submit details of the proposed electronic ticketing system to the Department at the preconstruction meeting or through PPCC for approval at least 30 days before the placement of material. Include details for how supplemental paperwork and certifications will be delivered to the Department.

2. Incorporate the electronic ticket system process into the Contractor's applicable QC Plan.

3. Confirm all e-ticketing requirements with the Department at the pre-construction meeting or pre-placement meeting. If the project contains locations with limited cellular service, an alternative course of action must be agreed upon; e-ticketing submissions must also be sent between the producer and the Department.

4. Provide access to the electronic ticketing system to personnel identified by the Representative or in the QC Plan.

b. Data Deliverables

1. Provide to the Representative a means to gather report summaries by way of iOS apps or web browser in real-time.

2. Provide an available space for the Representative to add comments pertaining to the material on each ticket. Record the user's name for all entered and updated information.

3. Provide access to all ticket information in a CSV or Excel file to the Department.

IV. Measurement and Payment: Incidental

For all costs related to providing the electronic ticketing system and all equipment required for the reporting process. Include all quality control procedures.

PENNDOT E-TICKETING MAINTENANCE SPECIFICATION

[The following text is excerpted from PennDOT's "e-Ticketing Maintenance Specification" (nda)].

I. Description

This work is providing an electronic ticketing system for deliveries or pick-up of aggregate/anti-skid, concrete, asphalt, liquid asphalt, and salt material to a project or stockpile to report individual and cumulative loads of material.

II. Material

The electronic ticketing system must be fully integrated with the load read-out system at the plant. The system software and hardware must prevent alteration of the data inputs from the scales. For acceptance on a project, stockpile or picked-up the electronic ticket must contain the following information:

a. Aggregate/Anti-Skid

SAP [Systems, Applications, and Products (SAP Online Tutorial 2021)] Purchase Order Number
Purchase Order Line Item Number
Plant
Storage Location/Stockpile
Plant Supplier Code
Material Type/Class/Number (SAP)
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Name and license number of Licensed Public Weighmaster
Running Daily Total in Tons of material being transported by Purchase Order Line Item Number

b. Concrete

SAP Purchase Order Number or Credit Card Purchase (last 4 digits of credit card number)
SAP Purchase Order Line Item Number
Plant
Delivery Location
Plant Supplier Code
Class of concrete/Number (SAP)
JMF number
Date and Time Ticketed
Net Cubic Yards of concrete being transported

Indicate total yards shipped to total yards ordered

c. Asphalt

SAP Purchase Order Number
Purchase Order Line Item Number
Plant
Storage Location/Stockpile
Plant Supplier Code Material Type/Class/Number (SAP)
JMF Number
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Running Daily Total in Tons of material being transported by Purchase Order Line Item Number
Name and license number of Licensed Public Weighmaster

d. Liquid Asphalt

SAP Purchase Order Number
Purchase Order Line Item Number
Plant
Storage Location/Stockpile/Delivery Location
Plant Supplier Code
Material Type/Class/Number (SAP)
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Running Daily Total in Tons of material being transported by Purchase Order Line Item Number

e. Salt

SAP Purchase Order Number
Purchase Order Line Item Number
Plant
Storage Location/Stockpile
Plant Supplier Code
Material Type/Class/Number (SAP)
Date and Time Ticketed
Unique Truck ID
Mass (Weight), Gross, Tare, Net
Running Daily Total in Tons of material being transported by Purchase Order Line Item Number
Name and license number of Licensed Public Weighmaster

III. Maintenance

a. Maintenance Requirements

1. Electronic ticketing system requirements will comply with DGS contract terms.

2. Incorporate the electronic ticket system process into the Contractor's applicable QC Plan.

3. If the project contains locations with limited cellular service, an alternative course of action must be agreed upon; e-ticketing submissions must also be sent between the producer and the Department.

4. Provide access to the electronic ticketing system to personnel identified by SAP role.

b. Data Deliverables

1. Provide to the Representative a means to gather report summaries by way of iOS apps or web browser in real-time. Provide an available space for the Representative to add comments pertaining to the material on each ticket. Record the user's name for all entered and updated information.

2. Provide access to all ticket information in a CSV or Excel file to the Department.

IV. Measurement and Payment—Incidental

For all costs related to providing the electronic ticketing system and all equipment required for the reporting process. Include all quality control procedures.

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