

NCHRP 25-25, Task 111

Environmental Management System Perspectives for State DOTs

What We Will Cover Today

- Environmental Management Systems
 - What is an EMS?
 - Research Study
 - Findings and Applications
- EMS Information Array
 - User Guide
- Questions & Answers

Project Overview

OBJECTIVE: The objective of this research is to provide practical examples of how transportation agencies created and are using EMS to address their operational issues and goals in the context of an ISO-compliant system.

This research provides valuable information to help state DOTs already implementing or considering an EMS to identify tools and tips to streamline maintenance, construction, and/or operational processes.

Project Team

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Primary Work Products

- Literature Review
- Survey
- Interviews
- EMS Information Array
- Final Report

01

Environmental Management System

Environmental Management System (EMS)

- **E**nvironmental / Regulatory / Stewardship
 - Air
 - Water
 - Noise
 - Ecology
 - Cultural
 - Waste

Environmental Management System (EMS)

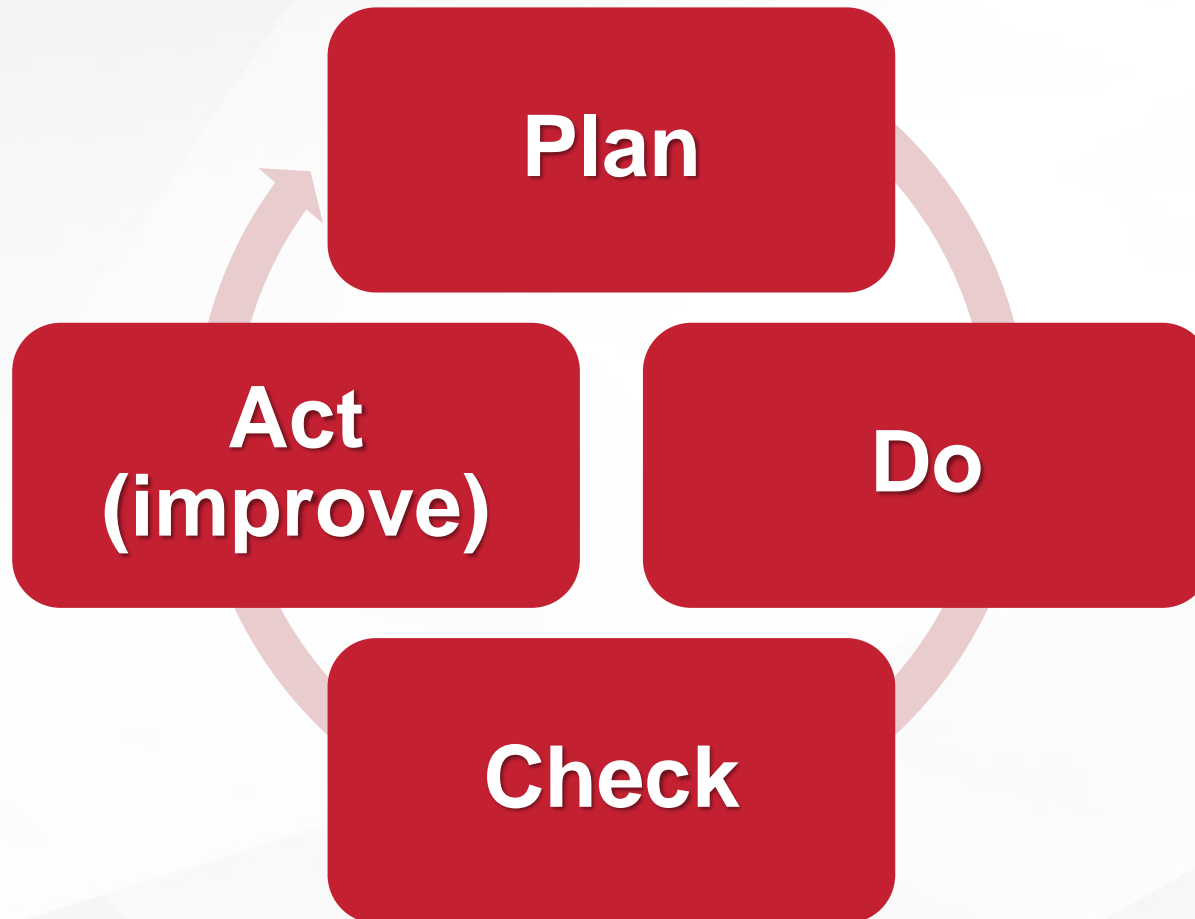
E M S

Management definition: the process of dealing with or controlling things or people

Synonyms: management, running, direction, control, governing, administration, supervision

Environmental Management System (EMS)

E M S



02

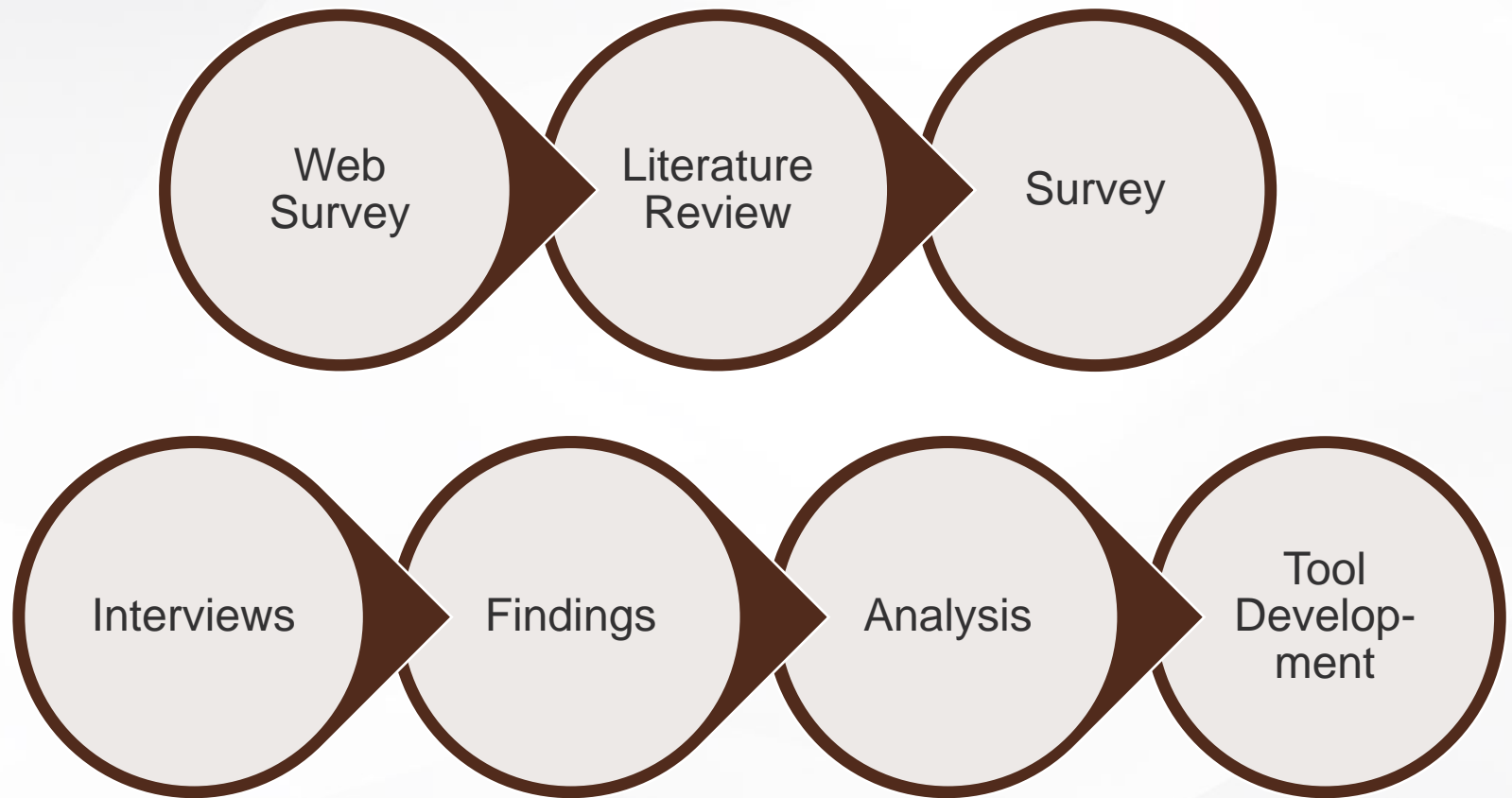
Study

Guided by PDCA



Plan	Written Procedures	Performance Targets	Integrated with Quality Assurance
Do	Training (all staff levels)	Record Keeping	Reporting
Check	Audit	Roll up to agency wide Compliance	
Act (improve)	Audit Follow up	Research	

Study Steps



03

Findings & Applications

General Framework & History at DOTs

- EMS is a standard business practice.
- DOT operational units have their own processes.
- EMS is essential to regulatory compliance.
- Only selected elements of the ISO 14001 EMS are employed by DOTs.
- Regulatory pressure was a consideration in EMS development.
- EMS is cost effective, and funding is not an issue.

Current EMS DOT Applications

- Equipment Maintenance
- Highway Maintenance Facilities
- Highway Maintenance Activities
- Bridge Maintenance
- NEPA compliance

EMS Monitoring – PDCA Analysis Methods

- Incident driven rather than systematic periodic monitoring
- Manual review of EMS data rather than database review
- “Check” and “act” aspects of the cycle are limited.

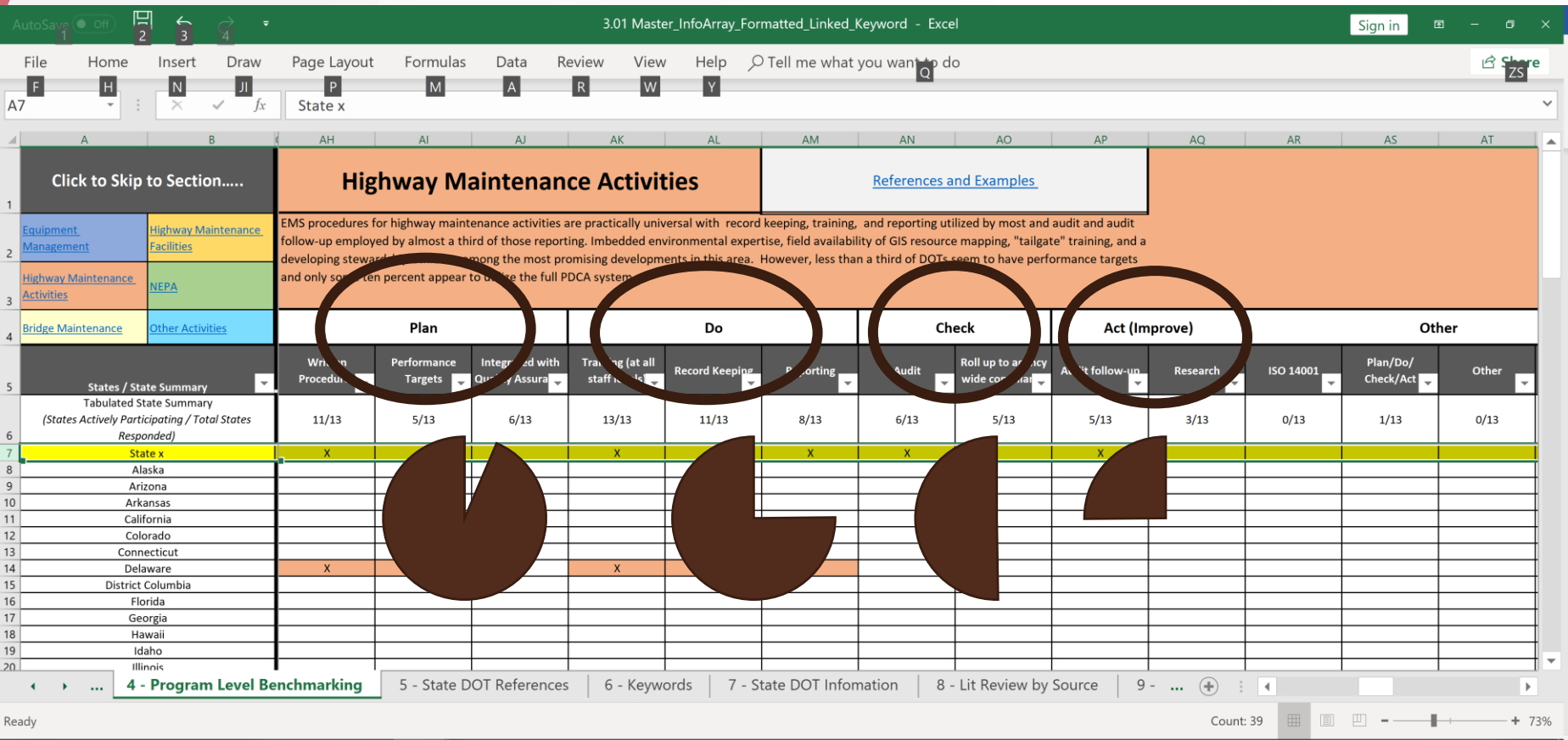
EMS Improvement – Lessons Learned

- Ownership fosters follow through in applying EMS.
- Integration with other processes improves efficiency.
- Staff engagement stimulates feedback.
- Training improves performance.

Additional Benefits – Spinoff Applications

- Environmental streamlining is a common EMS benefit.
 - Standardized interactions with regulatory agencies (e.g., MOU, MOA, PA)
 - Building relationships with regulatory agencies
- Spinoff applications include using EMS for vegetation and endangered species management.
- Use of the PDCA approach in EMS may encourage its use in other areas.

Current Practice by Program Area



04

EMS Information Array

Need for EMS IA

- Comprehensive PDCA EMS processes is lacking.
 - Identification and awareness of these gaps should be encouraged
- No method for systematic EMS assessment exists.
 - A method for conducting these assessments should be provided.
- DOT Environmental Units may not have full Agency wide involvement.
 - Increased awareness should be facilitated.

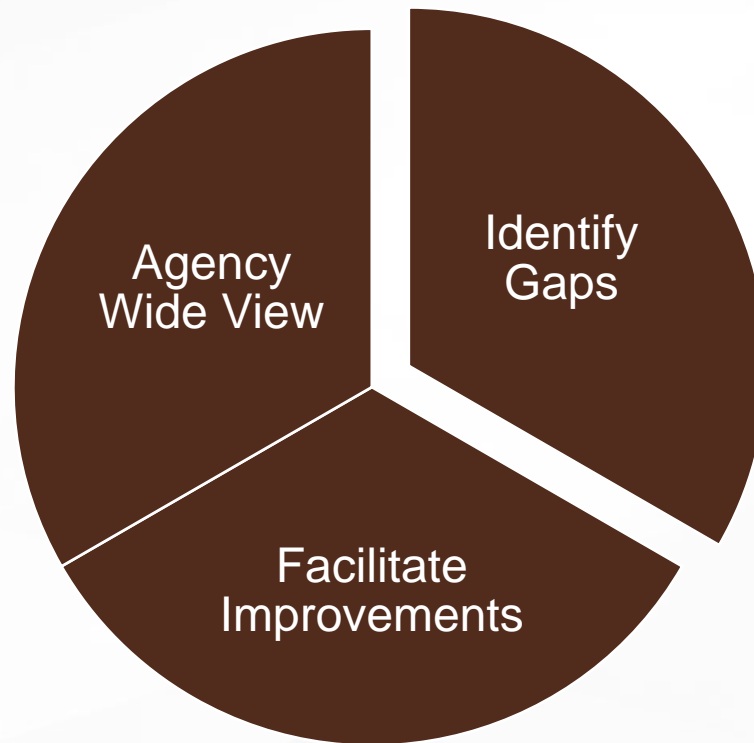
EMS IA

For use by DOT Environmental Staff, Design Mangers, Maintenance Engineers, Operation Managers, and Executive Staff to understand and access reference material on:

1. What an EMS is
2. How to successfully initiate / expand / benchmark an EMS
3. How to improve EMS effectiveness using peer resources, and
4. How to quickly access EMS literature and survey data.

Information Array (IA)

Benchmarking tool



One Size Will Not Fit All

- Ownership is essential
- PDCA may be universal, but different institutional settings
 - Culture
 - Setting
 - Capacity
 - Leadership
- Planning ≠ Design ≠ Maintenance

EMS Benchmarking Tool

Benchmarking Tool		Plan			Do			Check		Act (Improve)	
Program Area	Special Features	Written Procedures	Performance Targets	Integrated with Quality Assurance	Training (of all staff levels)	Record Keeping	Reporting	Audit	Roll up to Agency Wide Compliance	Audit Follow-Up	Research
Equipment Management	Materials recycled, good housekeeping practiced.										
Highway Maintenance Facilities	Materials, fuels, stormwater, wastes under active management.										
Highway Maintenance Activities	Sensitive resources factored into planning, training, audit and support.										
NEPA	Commitments tracked through construction and maintenance.										
Bridge Maintenance	Sensitive resources, factored into planning, training, audit and support.										
Other Activities	Specialized support engaged.										

05

DOT EMS IA Example

Instruction Page

NCHRP DOT Environmental Management System Information Array (DOT EMS IA)

Background

For use by DOT Environmental Staff, Design Mangers, Maintenance Engineers, Operation Managers, and Executive Staff to understand and access reference material on:

1. What an EMS is,
2. How to successfully initiate / expand / benchmark an EMS,
3. How to improve EMS effectiveness using peer resources, and
4. How to quickly access EMS literature and survey data.

Information Access / Benchmarking Instructions

Practitioners may begin by reviewing the DOT EMS Prototype Benchmarking Tool at [Tab 3: DOT EMS Benchmarking Tool](#) with their agency's Plan/Do/Check/Act procedures to gain an agency-wide perspective of EMS practice across all program areas.

[Benchmarking Tool Click here!](#)

For more detailed analysis of agency EMS practices within each program area, [Tab 4: Benchmarking Lookup](#). Tab 4 allows practitioners to compare their (or other) states survey data with commonly accepted Plan/Do/Check/Act conventions. The Benchmarking Look up Tool also allows the user to search and screen by topic and by state by clicking on the "arrow" icons of the various "column" tabulations.

[Benchmarking Lookup Click here!](#)

Further background, references, and examples from the survey may be found at [Tab 5: State DOT Information](#).

[State DOT Information Click here!](#)

Additional tabs contain suggested search terms ([Tab 7: Keywords](#)), literature summaries ([Tabs 8-11: Literature Reviews](#)), and links as specified. A webinar presentation, including an example application of this Information Array, may be opened by clicking on the link to the right.

[EMS Webinar Link - Click here!](#)

EMS IA Excel Tips and Tricks

- 1.The information in this Excel spreadsheet is presented in "read only" mode but may be downloaded and modified for local use.
- 2.The spreadsheet contains hyperlinks and an occasional "mouse-over" feature. Clicking on embedded links will take you to the associated webpage or location within a tab. "Mouse-over" comments will appear when your cursor selects the active cell.
- 3.Pressing "Control + F" activates a search function within the document. This can be used to search for a specific word or phrase. A listing of common search terms is available at [Tab 7: Keywords](#).
- 4.Tabs at the bottom of the page access separate topics as labeled. The arrow keys to the left of the first tab can be right-clicked to view and select from available tabs.
- 5.For additional instructions on the use of Excel, please see the "Tell me what you want to do..." in the menu at the top of this page, or press "Alt+Q" and begin typing a question or keywords.

DOT EMS IA - Instructions

- Prototype Benchmarking Tool at Tab 3: A agency-wide perspective of EMS
- Assess program areas, Tab 4: Benchmarking Lookup Compare survey by topic and by state
- Research background, references, and examples
 - Tab 5: State DOT Information.
 - Tabs 8-11: Literature Reviews
 - Tab 7: Keywords

Benchmarking Lookup – Deeper Dive

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Equipment Maintenance

References - Send to "reference tab"

Examples - Send to "reference tab"

Equipment Management Highway Maintenance Facilities

Highway Maintenance Activities NEPA

Bridge Maintenance Other Activities

Written Procedures Performance Targets Integrated with Quality Assurance Record Keeping Reporting Audit Roll up to agency wide compliance Audit follow-up Research

STATES / References/ Examples/ Summary

Tabulated State Summary

14/15 7/15 6/15 15/15 11/15 12/15 4/15 11/15 3/15

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Delaware Delaware Delaware

4 - Benchmarking Lookup 5 - State DOT Information State DOT Reference Materials EMS IA LR 1. LR by Source 2. LR by Location 3. LR Prev. Surveys 4. LR EMS Histor ...

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Equipment Maintenance

[References and Examples](#)

Equipment Management Highway Maintenance Facilities

Highway Maintenance Activities NEPA

Bridge Maintenance Other Activities

Written procedures, record keeping, and training followed by audits are core EMS processes, so their predominance is indicative of a serious interest in EMS for equipment maintenance. However, less than half of the organizations responding have performance targets and less than a quarter report PDCA capabilities.

	Plan	Do	Check	Act (Improve)	Other									
	Written Procedures	Performance Targets	Integrated with Quality Assurance	Training (at all staff levels)	Record Keeping	Reporting	Audit	Roll up to agency wide compliance	Audit follow-up	Research	ISO 14001	Plan/Do/Check/Act	Other	Not Sure / No Answer
States / State Summary														
Alabama	X			X	X	X	X		X					
Maine	X	X	X	X	X	X	X	X	X	X		X		
Massachusetts	X			X	X	X	X		X					
Minnesota	X		X	X	X									
Mississippi	X			X	X	X	X		X					
Nevada	X	X		X	X	X				X		X		
New Hampshire	X	X	X	X	X	X	X	X	X					
New Hampshire	X	X			X	X	X		X		X	X		
North Carolina	X		X	X	X									X
Oregon	X	X		X	X	X	X	X	X					
Pennsylvania	X													
South Carolina	X			X	X		X		X					
Tennessee	X	X	X	X	X	X	X	X	X					
Virginia	X	X		X	X	X	X			X		X		
Virginia	X			X	X		X		X					

1 - Title Page 2 - Instructions 3 - DOT EMS Benchmarking Tool 4 - Benchmarking Lookup 5 - State DOT Information 6 - State DOT References 7 - Keywords 8 - Lit Review by Source 9 - Lit Review ...

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State DOT EMS Reference Materials

Topic	Link	Date	Document
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-2Form2aActivityInventory_052017.pdf		
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-2Form2bActivityRankings_042017.pdf		
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-2Form2cActivityRankingCriteria050317.pdf		
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-3-Form3aGeneralLegalandOtherRequirements0114.pdf		
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-3-Form3bEnvironmentalPermitsLicenses050317.pdf	2017	EMS Environmental Permits, Licenses, and Authorization Register
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-6Form6aEnvironmentalOrganizationalChart7212016.pdf	2015	EMS Environmental Organization Chart
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/EIP-8-Form8bEnvironmentalEventLog011817.pdf	2017	Environmental Event Log
EMS Highway Maintenance Facilities	https://www.nh.gov/dot/org/operations/highwaymaintenance/documents/envreviewchecklistfillable2017jan.pdf		
EMS Highway Maintenance Facilities	https://www.oregon.gov/ODOT/Maintenance/Documents/blue_book.pdf		
EMS Highway Maintenance Facilities	https://www.oregon.gov/ODOT/Maintenance/Documents/ems_manual.pdf		
EMS Highway Maintenance Facilities	https://www.oregon.gov/ODOT/Maintenance/Pages/Environmental-Programs.aspx	2012	Maintenance Yard EMS Policy and Procedures Manual drums
EMS Highway Maintenance Facilities	https://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/haz-mat.html		Hazardous Materials Toolkit Webpage
EMS Highway Maintenance Facilities	OHDOT ChecklistDraft9.docx		
EMS Highway Maintenance Facilities	Linked Documents/OHDOT D5 ECR Report 5-18.pdf		
EMS Highway Maintenance Facilities	Linked Documents/ORDOT ems_user_guide.pdf		
EMS Highway Maintenance Facilities	PennDOT Fact Sheet Table of Contents 5-31-2018.xlsx		
EMS Highway Maintenance Facilities	PennDOT M-74.xlsx		
EMS Highway Maintenance Facilities	Documents/PennDOT M-75.pdf		
EMS Highway Maintenance Facilities	Documents/PennDOT M-900 (1-13) - SEMP Checklist Template, protected.xlsx		
EMS Highway Maintenance Facilities	PennDOT M-900.xlsx		
EMS Highway Maintenance Facilities	PennDOT M-901 (1-13) - SEMP Checklist Record Sheet Template.xlsx		
EMS Highway Maintenance Facilities	trans.vermont.gov/sites/aot/files/enviromanual/documents/VTrans%20FHWA%20CE%20PA.pdf	1999	FHWA Memorandum of Understanding for Categorical Exclusions
EMS Highway Maintenance Facilities	www.dot.state.oh.us/Divisions/Planning/Environment/NEPA_policy_issues/EnvironmentalDocumentation%20OES%20Guidance%20for%20Writing%20Environmental%20Commitments_October.pdf	2017	OES Guidance for Writing Environmental Commitments
EMS Highway Maintenance Facilities	www.wsdot.wa.gov/environment/technical/commitments-compliance		
EMS NEPA	http://www.wsdot.wa.gov/Publications/Manuals/M31-11.htm	2018	Environmental Manual

Find and Replace

Find Replace

Find what: drums

Options >>

Find All Find Next Close

1 - Title Page 2 - Instructions 3 - DOT EMS Benchmarking Tool 4 - Benchmarking Lookup 5 - State DOT Information 6 - State DOT References 7 - Keywords 8 - Lit Review by Source 9 - Lit Review ...

Ready

1.4 EMPTY CONTAINERS

- **Empty drums should be stored in a manner that indicates the drum is empty.** Examples of ways to show the drum is empty include storing the drum sideways with the bungs horizontal, labeling the drum "empty," or keeping the drum in an area signed "empty drums" or similar wording. Refrain from storing drums that previously contained liquids upside-down.

Figure 1-1: Examples of ways to store a drum that indicate the drum is empty.



- If an **empty container** will be reused, the original label should be removed. The container should be relabeled with the intended contents, such as "trash" or "metal parts."
- Empty drums should be returned to the vendor for reconditioning, where available.
- Where available, recycling is recommended for **empty containers** that are not reused or returned to the vendor (e.g. recycling unwanted metal drums and cans as scrap metal). Contact local recyclers for availability and requirements.
- **Empty containers** that are not recycled, reused, or returned to the vendor should be managed as **solid waste** (i.e. trash). A list of permitted municipal landfills and transfer stations is located in Appendix J. Plastic drums should be cut into two separate pieces prior to disposal. Contact the local landfill for specific requirements.

Further EMS IA Information

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This tab contains... the full survey record as compiled by the topics listed in the hyperlinks to the left. They may be accessed individually by the hyperlinks, or sequentially by scrolling to the right. State responses are by row and Row 6 drop-down "arrows" may be used to sort/filter.

References and Examples.

SURVEY RESPONSE

See the Final Report for additional background and detail. [HYPERLINK]

GENERAL FRAMEWORK AND HISTORY

1) Application of EMS elements across various state DOT operations have expanded over the past few decades to become a standard business practice, however application of the complete Plan-Do-Check-Act approach is practice.
 2) Most operational units have developed and implemented their own processes and procedures in response to actual or potential regulatory violations with varying degrees of support and leadership from their environment limited input from outside agencies or information sources.
 3) Virtually all state DOTs are using elements of the ISO 14001 EMS Standard, but only a few have applied them comprehensively or are currently certified for even a fraction of their operational scope.
 4) EMS programs have been a key to realizing streamlining and other efficiencies and have benefited in varying degrees from the development of a "Plan-Do-Check-Act" across other DOT functions.
 5) While clearly important, funding has generally not been a driving (or a limiting) issue.
 6) Regulatory pressure was a consideration in the past but does not appear to be a direct driver of EMS in most states at the present time.

6a: Using the definition above, please indicate how your agency applies environmental management, using the following means, to your operations units. (Please check all that apply)

STATE	4: Agency name	5: Which of the following best describes your role?	Comprehensive written procedures	Integration with safety and other quality assurance concerns	Performance targets	Records keeping	Reporting	Periodic audits	Audit follow up	Training	Research	I'm not sure or don't know how our agency applies environmental management	None of the above applies to our agency	Notes
Alabama	ALDOT	DOT Environmental Director/Staff	Part	Part	At least once	Part	Part	At least once	At least once	At least once				
Alabama	Alabama Department of Transportation	Other - Environmental Construction Engineer	Part	All	Part	All	Part	Part	Part	All	Part			
Alaska	Alaska DOT&PF	DOT Environmental Director/Staff												
Arizona	Arizona Department of Transportation	DOT Environmental Director/Staff	At least once	At least once	At least once	Part	Part	At least once		At least once	At least once			
Arizona	Arizona Department of Transportation	DOT Environmental Director/Staff	At least once	At least once	At least once	At least once	At least once	At least once	At least once	At least once	At least once			
Arizona	ADOT	DOT Environmental Director/Staff	Part	Part		Part				Part				We don't have all of this in a comprehensive "EMS" for all areas.
Arizona	Arizona Department of Transportation	Executive / Executive Staff	All	All		All	All			All	All			

5 - State DOT Information 6 - State DOT References 7 - Keywords 8 - Lit Review by Source 9 - Lit Review by Location 10 - Lit Review Prev Surveys 11 - Lit Review EMS History

Ready

Including Final Report

NCHRP 25-25 Task 111 - Task 5 Report 0.126

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NCHRP 25-25 Task 111 Environmental Management System Perspectives for State DOTs
Task 5/6 Draft Final Report

NCHRP 25-25, Task 111
ENVIRONMENTAL MANAGEMENT SYSTEM
PERSPECTIVES FOR STATE DOTs
TASK 5 / 6: DRAFT FINAL REPORT (0.5)

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AASHTO Committee on Environment and Sustainability

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October 2, 2018

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Questions / Comments

For Further Information

Website location(s)

Name | Number | @email