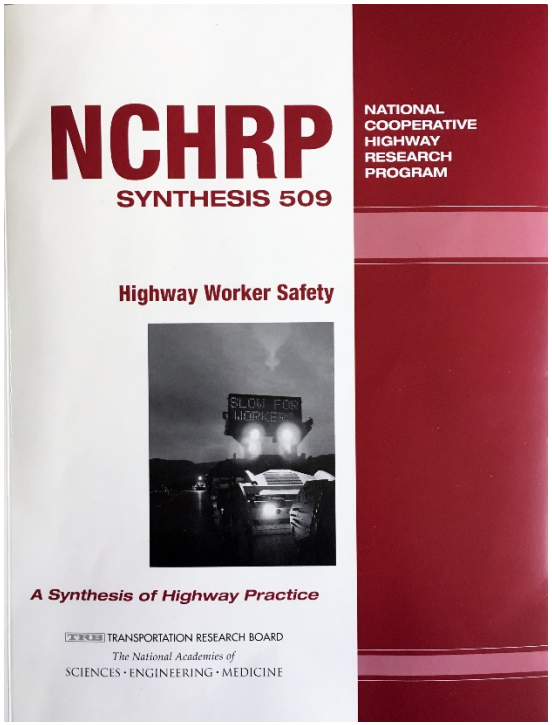
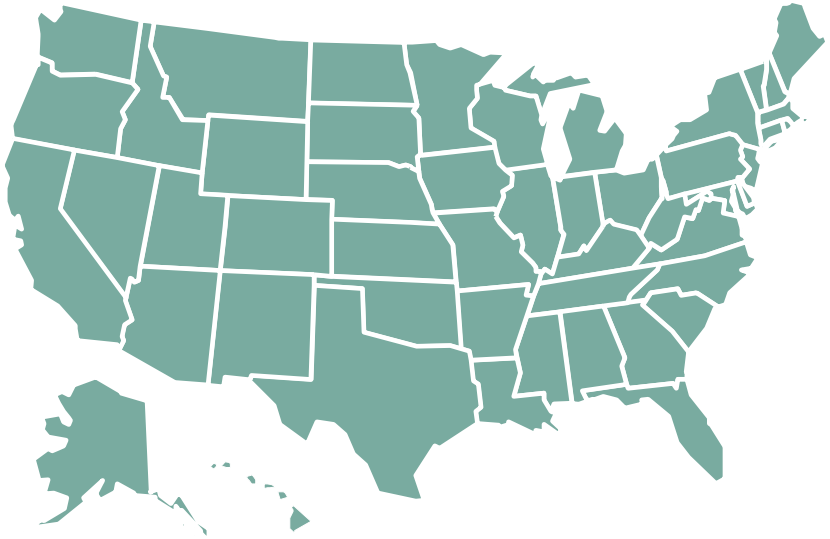
NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety



NCHRP is a State-Driven Program

- Sponsored by individual state DOTs who
  - Suggest research of national interest
  - Serve on oversight panels that guide the research.



- Administered by TRB in cooperation with the Federal Highway Administration.

Practical, ready-to-use results

- Applied research aimed at state DOT practitioners
- Often become AASHTO standards, specifications, guides, syntheses
- Can be applied in planning, design, construction, operations, maintenance, safety, environment

Today's Speakers

- **John Gambatese**, PhD, PE(CA)

  NCHRP Synthesis 20-05/Topic 47-16:
  Highway Worker Safety

- **David S. Hurwitz**, PhD , *Title of Presentation*

  NCHRP Synthesis 20-05/Topic 47-16:
  Highway Worker Safety

- **Keith Robinson**, PLA

NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety

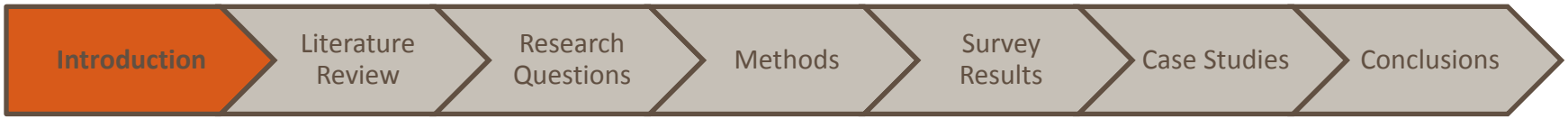
Presented by:

John Gambatese, PhD, PE(CA) & David S. Hurwitz, PhD
School of Civil and Construction Engineering
Oregon State University

NCHRP NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Introduction

- Problem Statement
- Scope and Purpose
- Key Terminology



Problem Statement

- Construction and maintenance of transportation infrastructure
  - Managed or conducted by state DOTs
- State DOT employees placed in high risk environments
  - Results in injuries and fatalities
- What are state DOTs doing to prevent injuries and fatalities?
  - How are state DOTs using historical data to develop their safety program elements?

Scope and Purpose

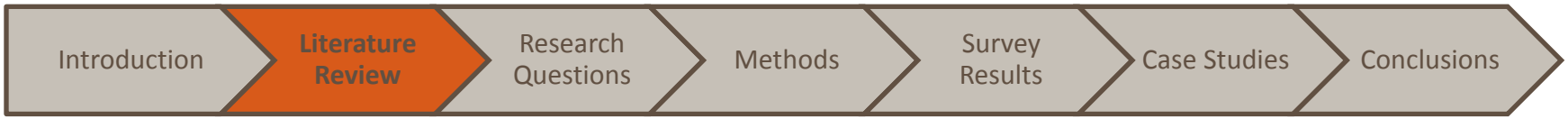
- Review state DOT health and safety practices
- Better understand state DOT diversity with respect to safety programs
- Explore the use of data in safety programs

Key Terminology

- **Highway worker** - An employee of a state DOT who is active in construction or maintenance work sites on state DOT right-of-way.
- **Incident** - Any disruption in the normal flow of work involving a highway worker employed by a state DOT in a construction or maintenance site that involves an injury, fatality, property loss, damaged equipment, work stoppage, or near miss.
- **Work site** - Any location where construction or maintenance work is being done on state DOT right-of-way.

Literature Review

- Prevalence and causality of highway worker incidents
- Legal standards and policy recommendations
- Availability of injury and fatality data



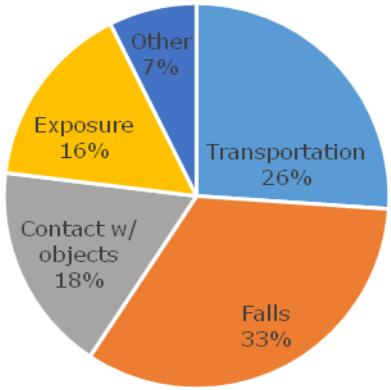
Prevalence and Causality of Incidents

- Types of work site incidents
  - Public vehicle
  - On-site vehicle
  - Other on-site hazard

Prevalence and Causality of Incidents

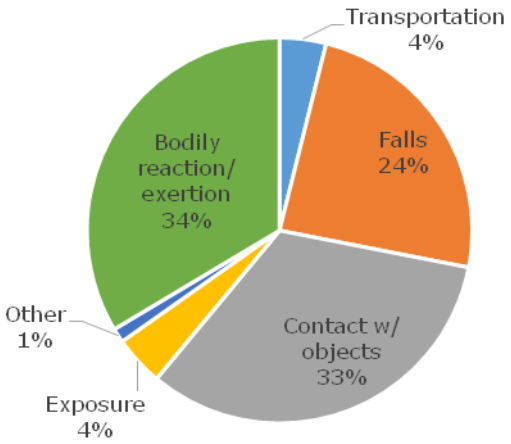
- Types of work site incidents
  - Public vehicle
  - On-site vehicle
  - Other on-site hazard

Total = 802 deaths



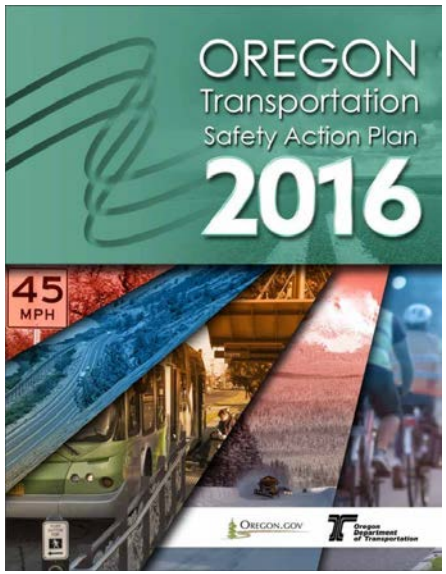
- Construction Chart Book (CPWR, 2013)
  - 2010 construction industry statistics

Total = 74,950 injuries



Legal Standards and Policy Recommendations

- Strategic Highway Safety Plans (SHSP)
  - Federal requirement for state DOTs



- Sections related to work sites
  - Enforcement of existing work zone speed laws
  - Education of public, law enforcement, and first responders
  - Higher visibility of workers and work zones

Availability of Safety Data

- Bureau of Labor Statistics (BLS)
- Occupational Safety and Health Administration (OSHA)
- National Institute for Occupational Safety and Health (NIOSH)
- Fatality Analysis Reporting System (FARS)
- Strategic Highway Research Program (SHRP2)

Availability of Safety Data

Data Set	Strengths	Limitations
BLS	Able to separate by state; numerically based data separated by categories	Illness and Injury data not well coded to isolate for highway work sites; little known about individual incidents
OSHA	Short written description regarding each incident	Difficult to search by state
NIOSH	Very detailed reports and specific recommendations	Poor geographic diversity and few recent reports for highway work zones
FARS	Detailed, comprehensive database	Cannot isolate highway workers
SHRP2	High volume of naturalistic driving information	Not as available to non-academic researchers at state DOTs

Research Questions

Research Question #1: *How do state DOTs respond when an incident with a highway worker occurs on a work site?*

Research Questions

Research Question #2: *What is the current state of practice for using data to develop, implement, and evaluate state DOT worker safety programs?*

Research Questions

Research Question #3: *How does the size and scope of a state DOT influence the agency's highway worker health and safety programs?*

?

Methods

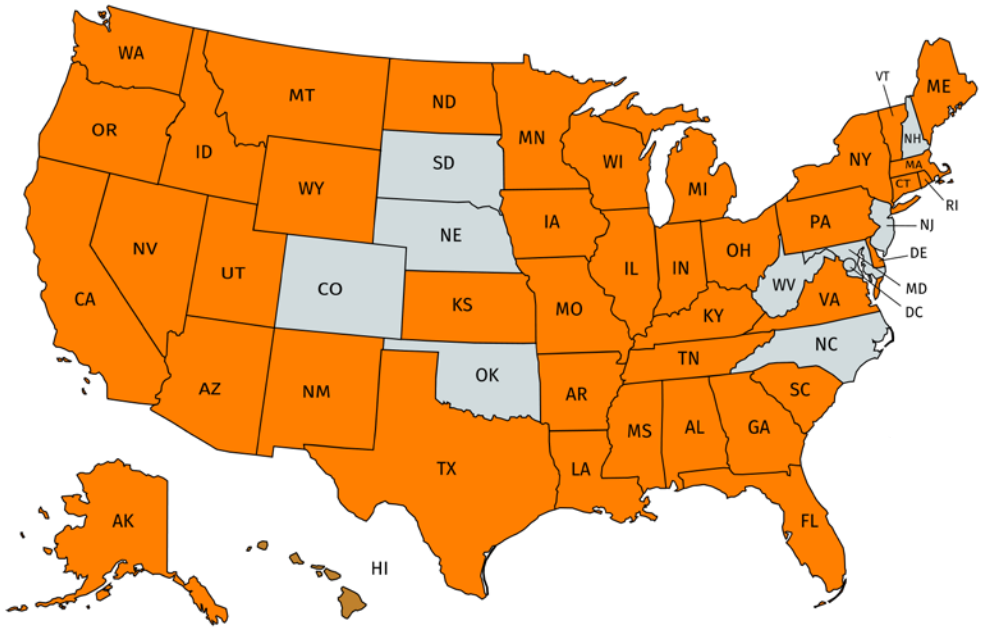
- Research Tasks
  - Survey of state DOTs
  - Case studies of selected safety programs

Survey Method

- Survey questions developed from research questions
- Questions coded into Qualtrics software
- Link to survey questions distributed to members of:
  - North American Association of Transportation Safety and Health Officials (NAATSHO)

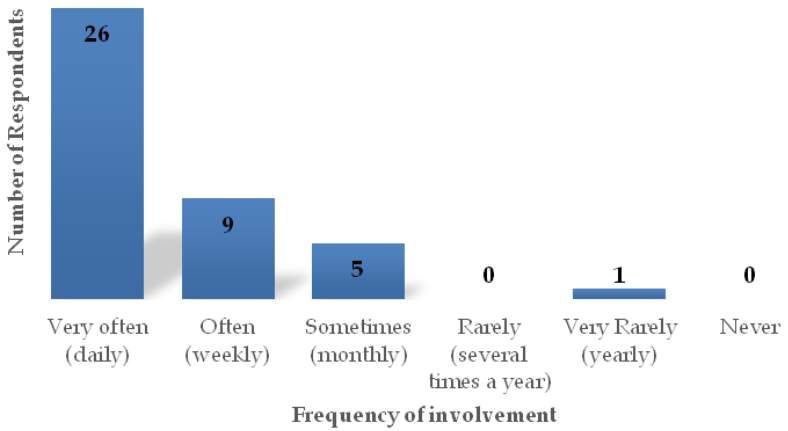
Survey Results

- Demographics
- Incident Reporting
- Data Collection
- Data Utilization

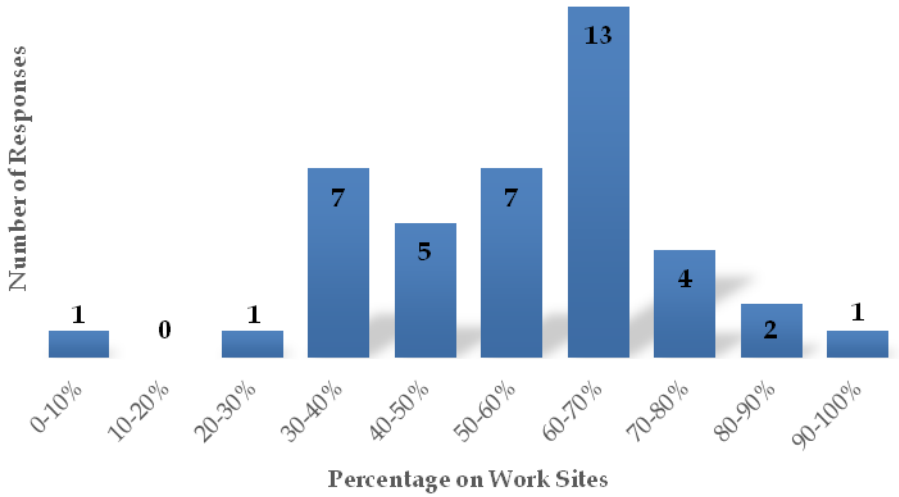


Demographics

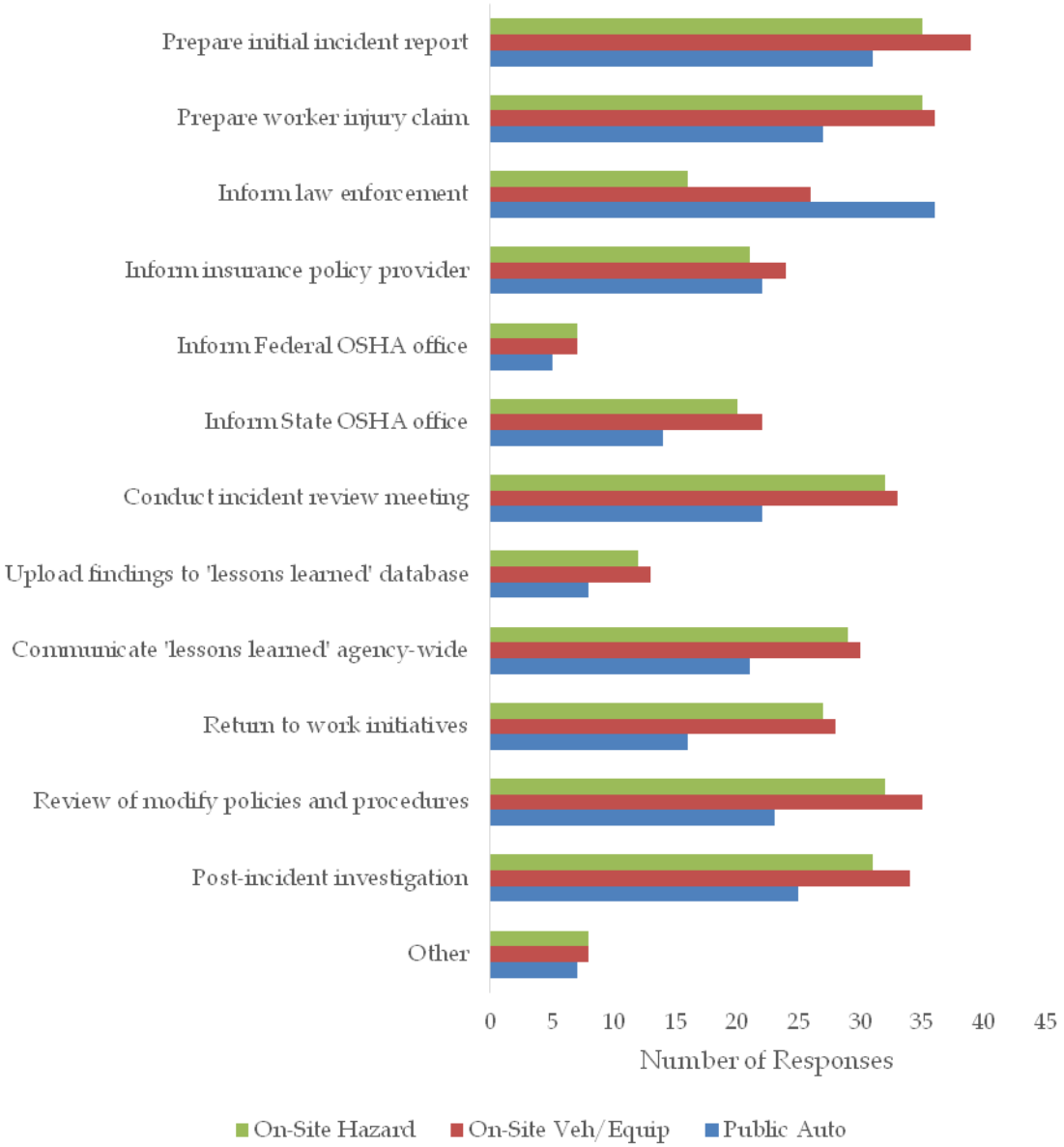
- Frequency of involvement with injury claims and prevention programs



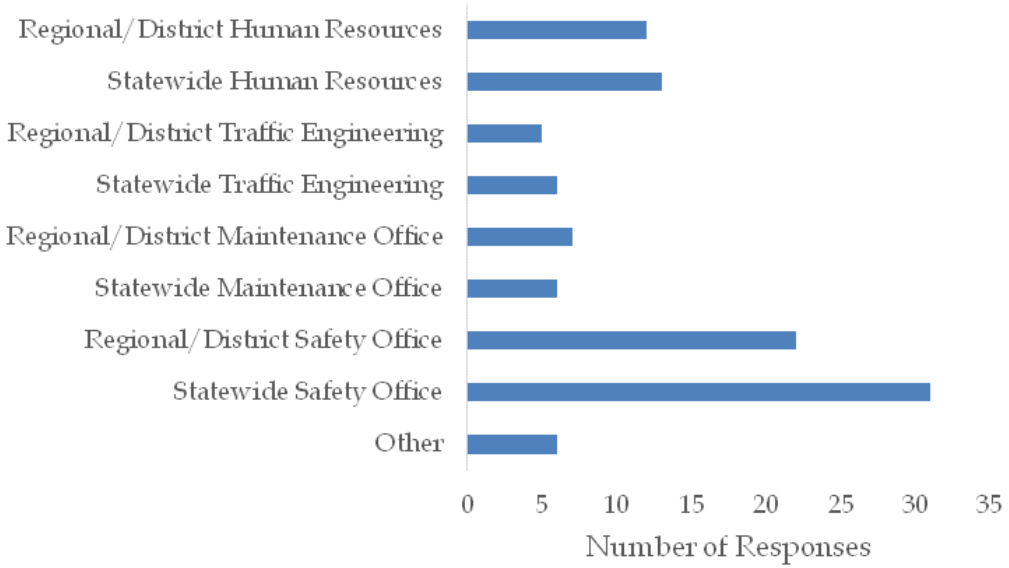
- Percentage of DOT employees regularly on work sites



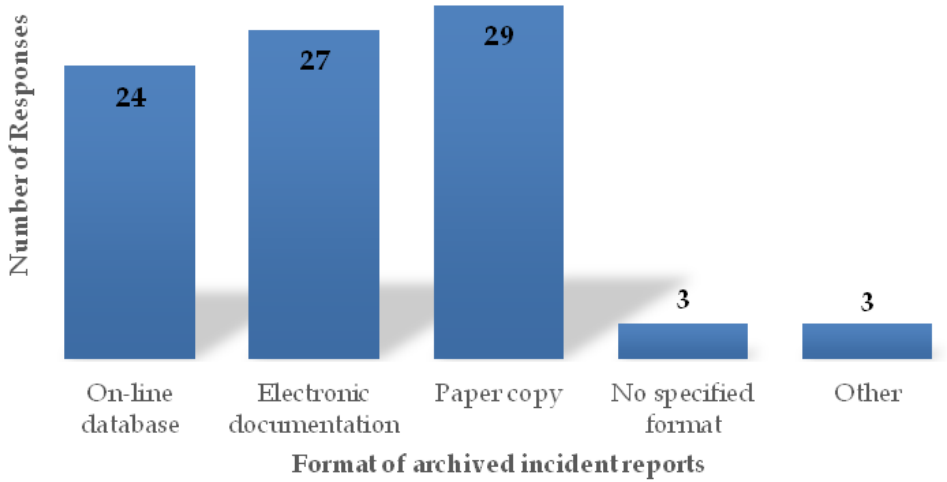
Incident Reporting: DOT response to an incident



Incident Reporting: State DOT Incident Reports



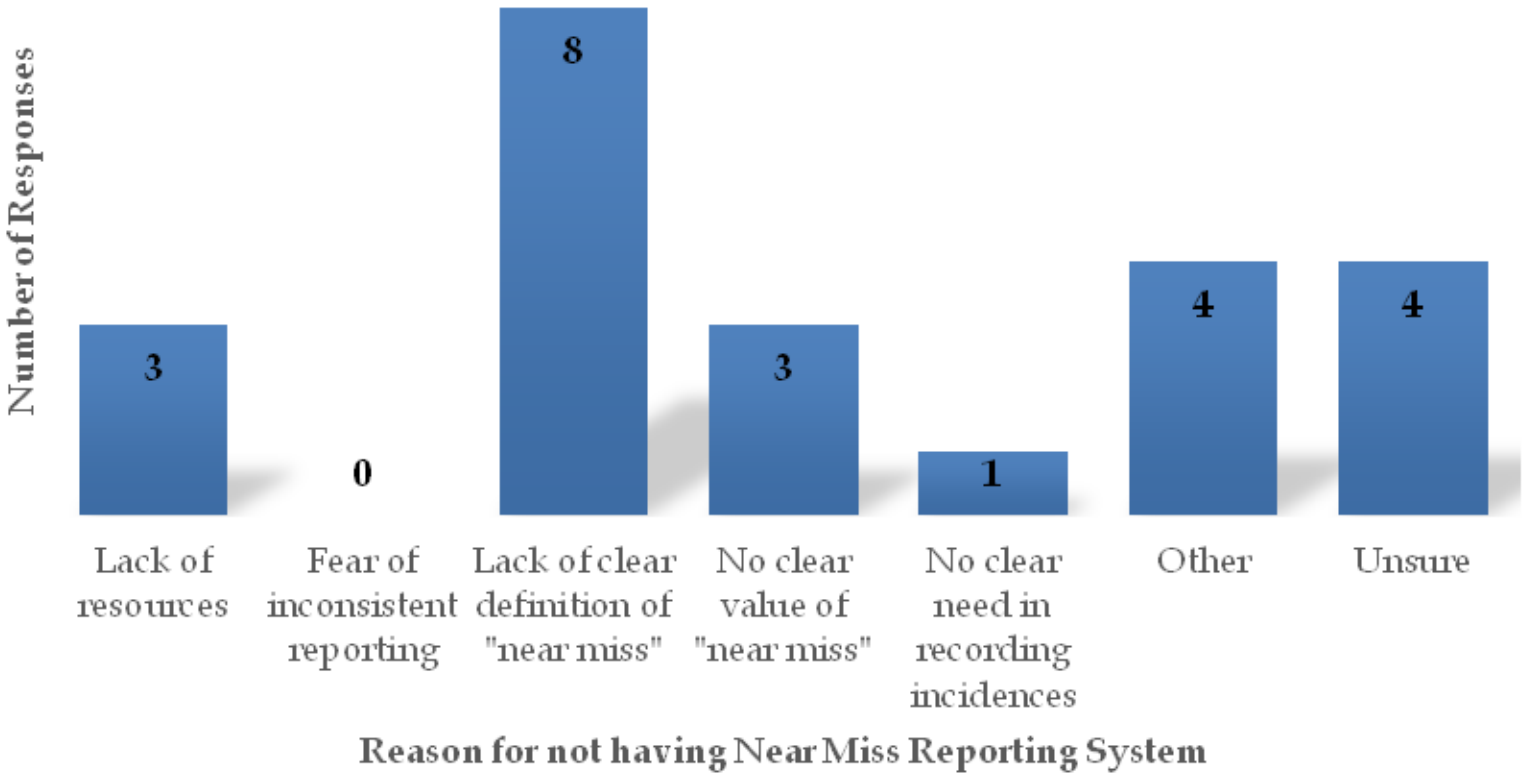
Location of Archive



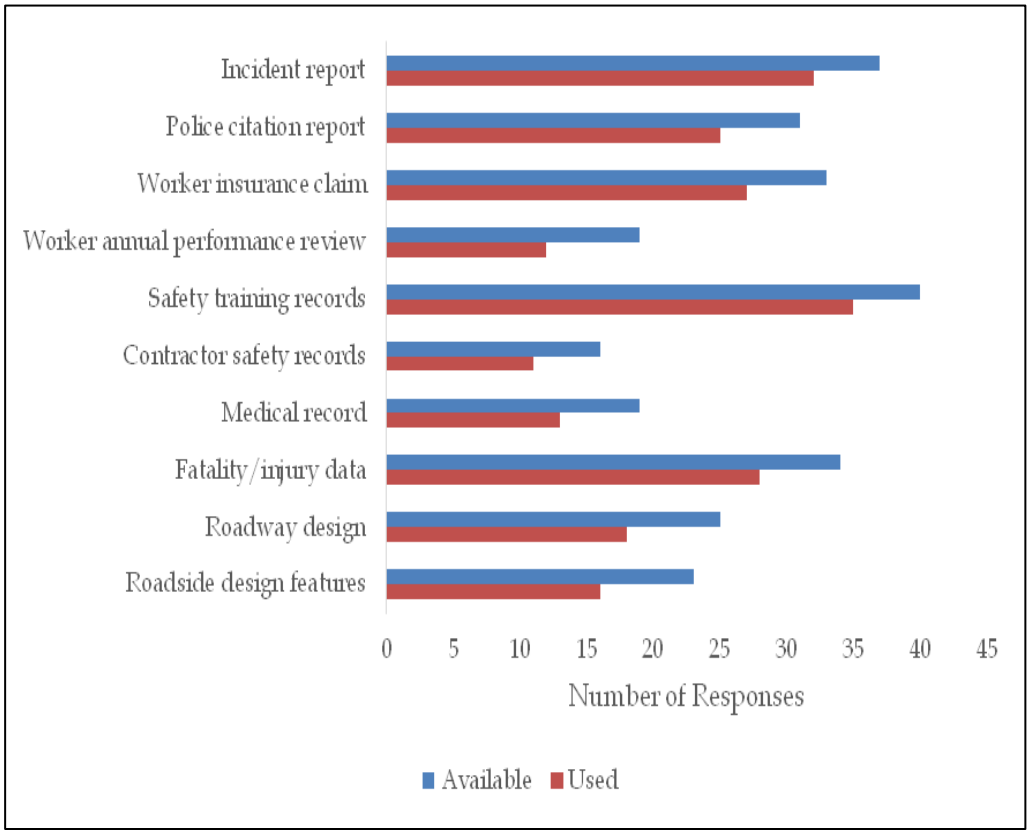
Format of Archive

Incident Reporting: Near Miss Reporting System

18 of 41 states do not have a “near miss” reporting system



State DOT Data Collection



Data set	Average Completeness Rating
Incident report	4.0
Police citation report	3.9
Worker insurance claim	4.2
Worker annual performance review	3.7
Safety training records	3.6
Contractor safety records	2.9
Medical record	3.3
Fatality/injury data	4.1
Roadway design	3.9
Roadside design features	3.9

Data Utilization: Data Driven Safety Programs

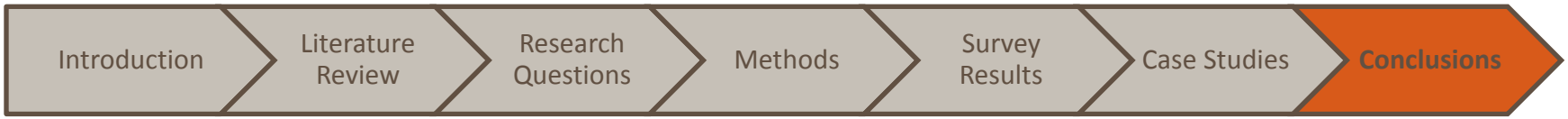
Policy/Practice	Number of Responses	Percentage of Responses
Additional training for workers	37	90%
Additional Training for Supervisors	34	83%
New standards for work site traffic control plans	28	68%
Driver awareness programs	27	66%
Worker behavior assessment programs	13	32%
Safety incentive programs	10	24%
Drug/alcohol abuse programs	18	44%
Other	4	10%
None	0	0%

Data Utilization: Sharing of Data

Organization	Number of Responses	Percentage of Responses
Federal agencies	19	46%
Other State DOTs	23	56%
County/Municipal governments	7	17%
Private Organizations	6	15%
Other	10	24%
None	9	22%

Conclusions

- Discussion
- Limitations
- Future Research



Discussion

Research Question #1: *How do state DOTs respond when an incident with a highway worker occurs on a work site?*

- Consistency of response across types of incidents
- Variability among which steps are used

Discussion

Research Question #2: *What is the current state of practice for using data to develop, implement, and evaluate state DOT worker safety programs?*

- Data sources are often available, but not always used
- Data sources are often incomplete, making them ineffective

Discussion

Research Question #3: *How does the size and scope of a state DOT influence the agency's highway workers health and safety programs?*

- Structural differences in DOTs might impact their ability to implement certain programs
  - Smaller DOTs were more likely to have the following characteristics
    - Faster access to data
    - A drug/alcohol abuse program

Limitations

- 41 of 50 states responded to the survey
- Only one information source (e.g., State Safety Officer) for each survey/case study

Future Needs

- Integration of nationally available data sources
- Establishment of a consistent “near miss” definition
- Exploration of a framework to allow quantitative evaluations of safety programs

Acknowledgements

- Funded under NCHRP Topic 47-16 (Highway Worker Safety) for Project 20-05
- Zach Barlow, PhD Student, Oregon State University

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Questions?

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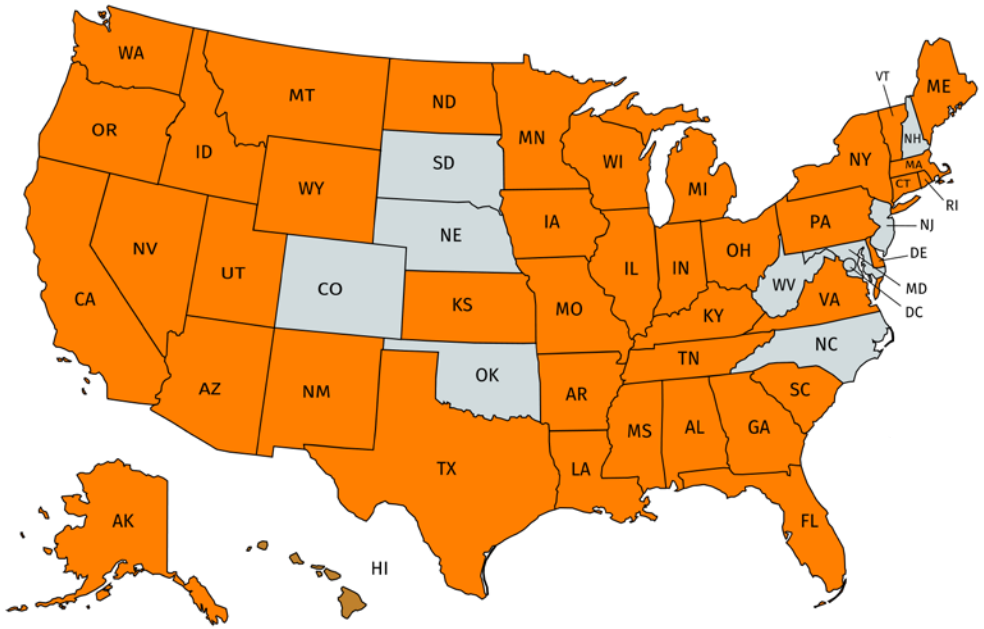
Research Question: *Are there examples of current or recent data driven worker safety programs that have been implemented by state DOTs?*

Methods

- Research Tasks
  - Survey of state DOTs
  - Case studies of selected safety programs

Survey Results

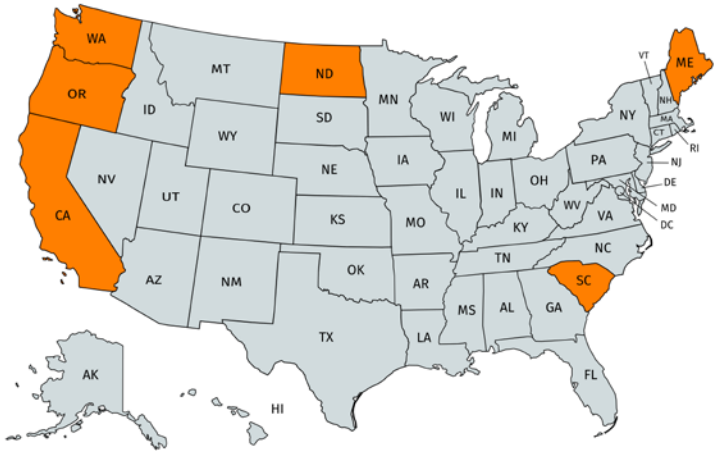
- Demographics
- Incident Reporting
- Data Collection
- Data Utilization



Research Questions → Methods → **Survey Results** → Case Studies → Conclusions

Case Study Methods

- Follow-up from survey responses
- Target areas:
  - Potentially innovative safety program
  - Geographical diversity
  - Willingness to participate



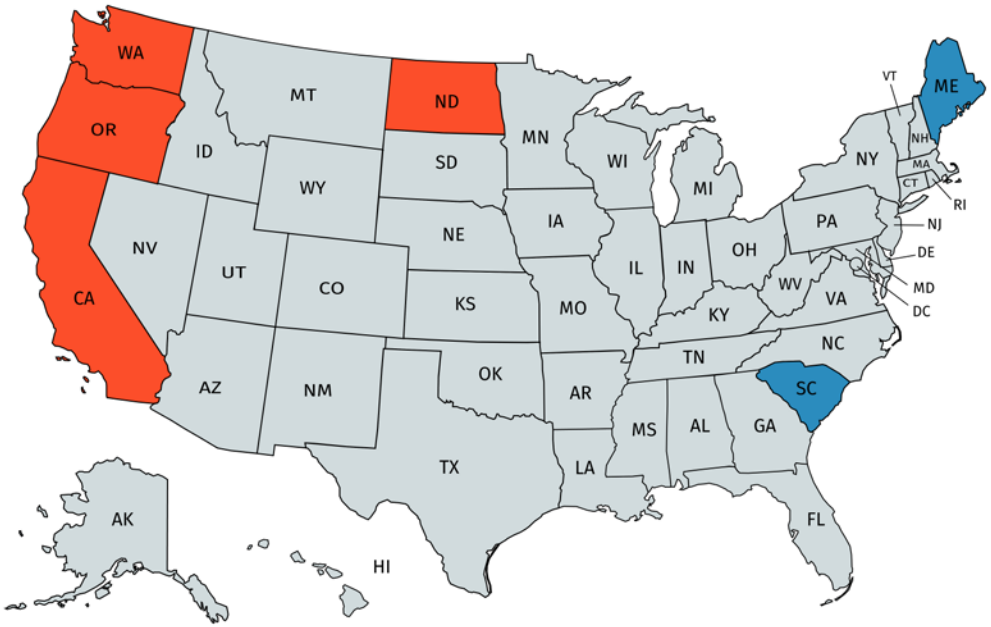
State	Population (2015 est.)	Population Rank (2015 est.)
California	39,144,818	1
Maine	1,329,328	42
North Dakota	756,927	47
Oregon	4,028,977	27
South Carolina	4,896,146	23
Washington	7,170,351	13

Case Study Methods

- Interview protocol drafted
- Phone interview with state DOT safety officer
- Interviewer information combined with survey data and publically accessible information

Case Studies

- 6 case studies conducted
  - CA, ME, ND, OR, SC, WA
- 4 to be highlighted
  - California
  - North Dakota
  - Oregon
  - Washington



Research Question → Methods → Survey Results → **Case Studies** → Conclusions

Case Studies

- Explore details of specific safety programs
  - Actions and strategies
  - Data sources

Case Study	Safety Program
California	**Design for Safety Initiative**
Maine	Safety Idea Incentive Program
North Dakota	**Leading Indicator Initiative**
Oregon	**Oregon Work Zone Executive Strategy Steering Committee**
South Carolina	Work Zone Safety Enforcement Campaign
Washington	**Near Miss Reporting Program**

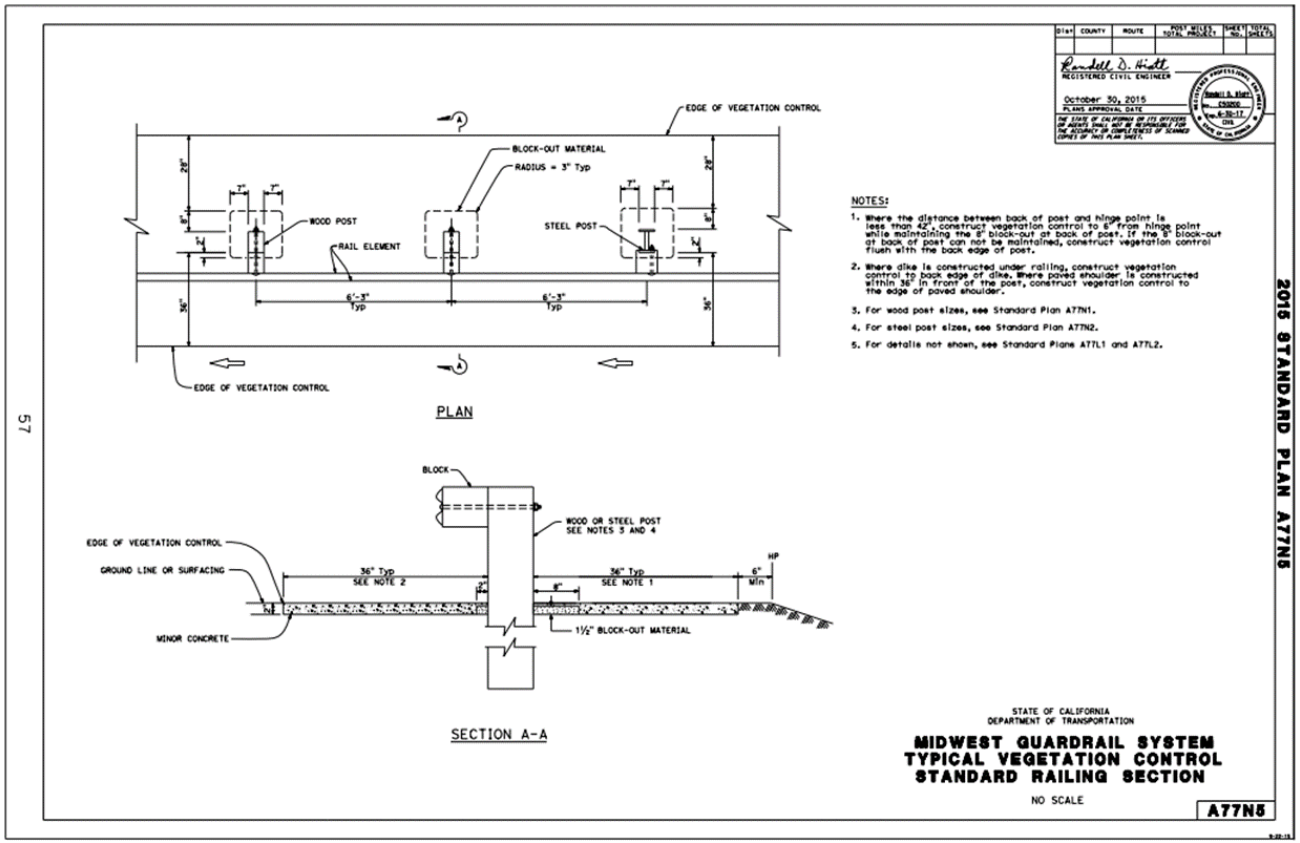
California

CALIFORNIA DEPARTMENT OF TRANSPORTATION

- Design for Safety Initiative
  - Data identified hazards
    - State fatality and injury records
- Roadside Safety Program Guidance
  - Provided to Caltrans Employees
  - Describes objectives of Design for Safety
  - Results in updated standard plans
    - Mitigate safety issues
    - Remove hazards

California

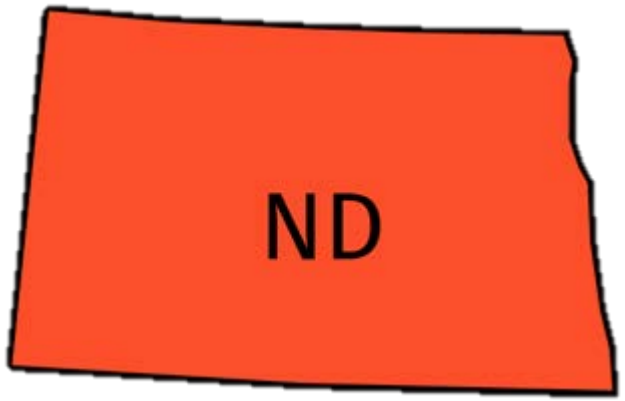
- Caltrans Design for Safety – Guardrail Typical Section



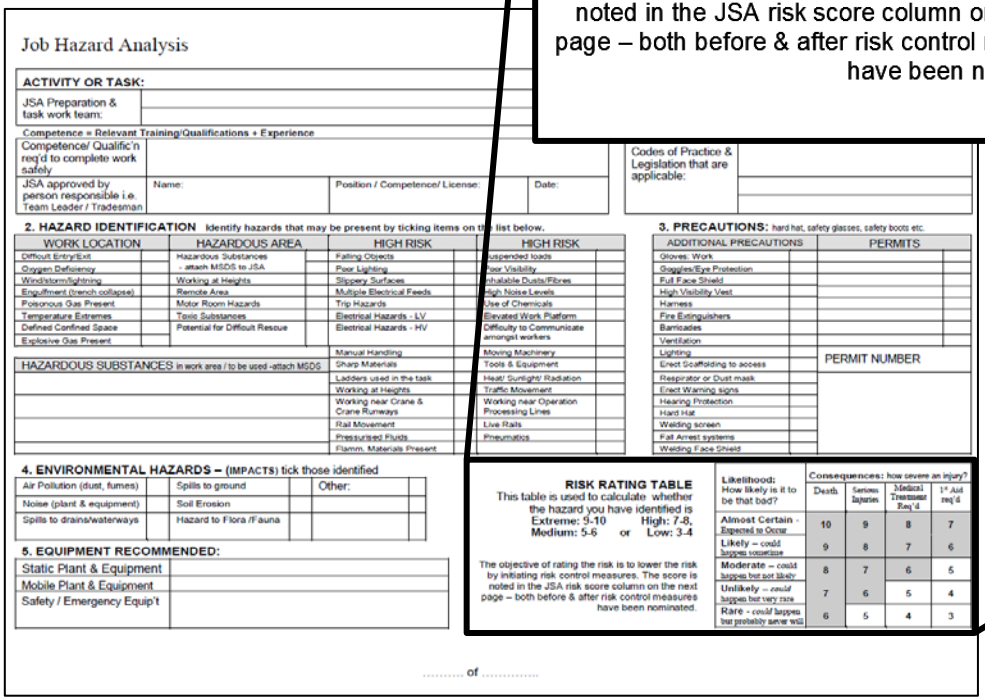
North Dakota

NDDOT
North Dakota
Department of Transportation

- Leading Indicator Initiative
  - Leading vs. Lagging
  - NDDOT's Job Hazard Analysis worksheet
    - Document risks associated with various tasks
    - Risk rating table



North Dakota



Job Hazard Analysis

ACTIVITY OR TASK:

JSA Preparation & task work team:

Competence = Relevant Training/Qualifications + Experience

Competence/ Qualific'n req'd to complete work safely

JSA approved by person responsible i.e. Team Leader / Tradesman | Name: | Position / Competence/ License: | Date:

Codes of Practice & Legislation that are applicable:

2. HAZARD IDENTIFICATION Identify hazards that may be present by ticking items on the list below.

WORK LOCATION	HAZARDOUS AREA	HIGH RISK	HIGH RISK
Difficult Entry/Exit	Hazardous Substances - attach MSDS to JSA	Falling Objects	Suspended loads
Oxygen Deficiency	Working at Heights	Poor Lighting	Poor Visibility
Wind/storm/lightning	Remote Area	Slippery Surfaces	Inhalable Dusts/Fibres
Engulfment (trench collapse)	Trip Hazards	Multiple Electrical Feeds	High Noise Levels
Poisonous Gas Present	Toxic Substances	Electrical Hazards - LV	Use of Chemicals
Temperature Extremes	Potential for Difficult Rescue	Electrical Hazards - HV	Elevated Work Platform
Defined Confined Space		Manual Handling	Difficulty to Communicate amongst workers
Explosive Gas Present		Sharp Materials	Moving Machinery
HAZARDOUS SUBSTANCES in work area / to be used -attach MSDS		Ladders used in the task	Tools & Equipment
		Working at Heights	Heat/ Sunlight/ Radiation
		Working near Crane & Crane Runways	Traffic Movement
		Rail Movement	Working near Operation Processing Lines
		Pressurised Fluids	Live Rails
		Flamm. Materials Present	Pneumatics

3. PRECAUTIONS: hard hat, safety glasses, safety boots etc.

ADDITIONAL PRECAUTIONS	PERMITS
Gloves: Work	
Goggles/Eye Protection	
Full Face Shield	
High Visibility Vest	
Harness	
Fire Extinguishers	
Barricades	
Ventilation	
Lighting	
Erect Scaffolding to access	PERMIT NUMBER
Respirator or Dust mask	
Erect Warning signs	
Hearing Protection	
Hard Hat	
Welding screen	
Fall Arrest systems	
Welding Face Shield	

4. ENVIRONMENTAL HAZARDS – (IMPACTS) tick those identified

Air Pollution (dust, fumes)		Spills to ground		Other:	
Noise (plant & equipment)		Soil Erosion			
Spills to drains/waterways		Hazard to Flora /Fauna			

5. EQUIPMENT RECOMMENDED:

Static Plant & Equipment	
Mobile Plant & Equipment	
Safety / Emergency Equip't	

..... of .....

RISK RATING TABLE

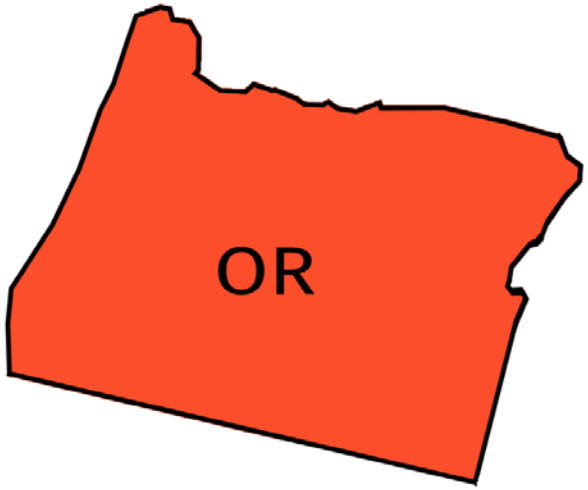
This table is used to calculate whether the hazard you have identified is
Extreme: 9-10 **High: 7-8,**
Medium: 5-6 or **Low: 3-4**

The objective of rating the risk is to lower the risk by initiating risk control measures. The score is noted in the JSA risk score column on the next page – both before & after risk control measures have been nominated.

Likelihood: How likely is it to be that bad?	**Consequences:** how severe an injury? Death	Serious Injuries	Medical Treatment Req'd	1st Aid req'd
Almost Certain - Expected to Occur	10	9	8	7
Likely – could happen sometime	9	8	7	6
Moderate – could happen but not likely	8	7	6	5
Unlikely – *could* happen but very rare	7	6	5	4
Rare - *could* happen but probably never will	6	5	4	3

Oregon

- Oregon Work Zone Executive Strategy Steering Committee (OWZESSC)
  - Established in December of 2013
  - Partnership between ODOT; Oregon Trucking Association, Inc.; Associated General Contractors, Oregon Columbia Chapter; Oregon State University; American Automobile Association; and the Oregon State Police
  - 4 task forces: Separation and Mobility; Law Enforcement; Engineering Enhancements; Communications Resource Team
  - Group meets semi annual to discuss WZ safety solutions



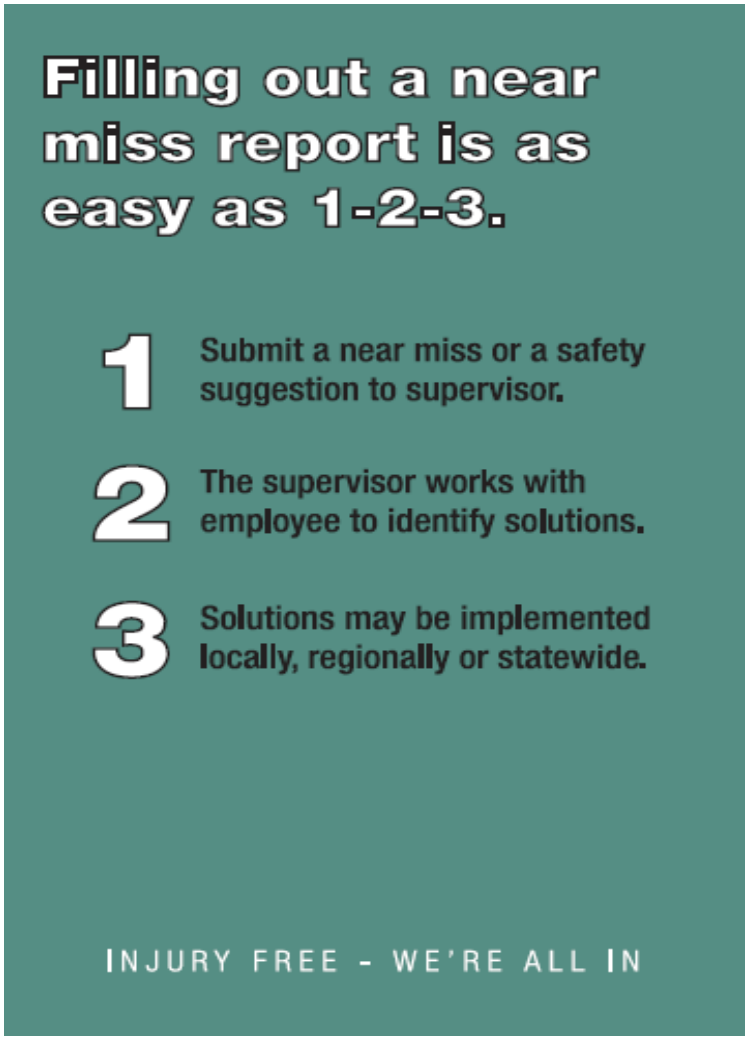
Washington

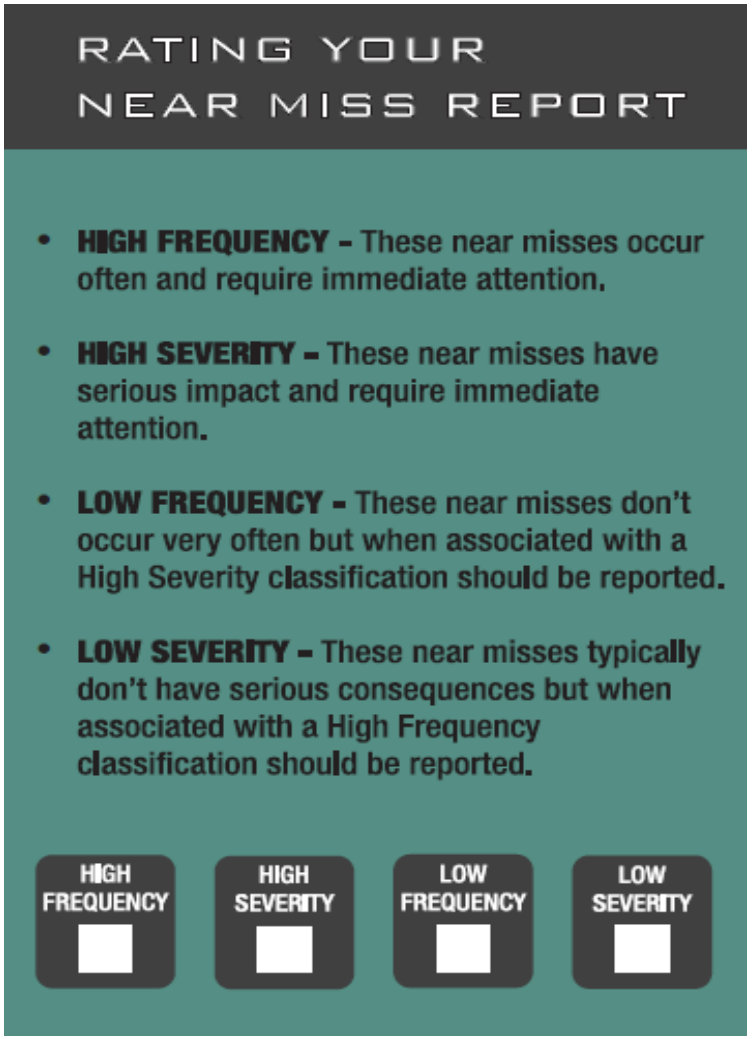
- Near Miss Reporting Program
  - Submit short report of “near miss”
  - Creation of booklet
  - Implemented statewide
  - 35 reports submitted
  - Small lottery-style monetary incentive

Washington

- Near Miss Booklet
  - 3”x5” to fit in a pocket
  - Instructions for submitting a report
- “Near Miss” Definition
  - Near misses describe incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred

Washington


Filling out a near miss report is as easy as 1-2-3.
1
Submit a near miss or a safety suggestion to supervisor.
2
The supervisor works with employee to identify solutions.
3
Solutions may be implemented locally, regionally or statewide.
INJURY FREE - WE'RE ALL IN


RATING YOUR NEAR MISS REPORT
• HIGH FREQUENCY - These near misses occur often and require immediate attention.
• HIGH SEVERITY - These near misses have serious impact and require immediate attention.
• LOW FREQUENCY - These near misses don't occur very often but when associated with a High Severity classification should be reported.
• LOW SEVERITY - These near misses typically don't have serious consequences but when associated with a High Frequency classification should be reported.
HIGH FREQUENCY
HIGH SEVERITY
LOW FREQUENCY
LOW SEVERITY

Conclusions

- Discussion
- Limitations
- Future Research

Discussion

Research Question: *Are there examples of current or recent data driven worker safety programs that have been implemented by state DOTs?*

- Survey highlighted existence of programs
- Case studies reviewed these programs (varied data use)
  - Leading Indicator Initiative
  - Worker's Memorial
  - Near Miss Program

Limitations

- 41 of 50 states responded to the survey
- Only 7 willing participants for case studies

Acknowledgements

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