Safety of Workers – A NIOSH Perspective
Overview

• NIOSH Background

• Worker Safety: High-risk Sectors
  – Motor Vehicle Safety
  – Personal Protective Equipment
  – Mining
Every Day...

- 9,000 U.S. workers sustain disabling injuries
- 13 die from a work injury
- 137 die from work-related illnesses
**Vision:** Delivering on the Nation's promise: safety and health at work for all people through research and prevention.

**Mission:** To provide leadership in research to prevent work-related illness, injury, disability, and death.
NIOSH Locations

Washington, DC
Atlanta, GA
Cincinnati, OH
Morgantown, WV
Pittsburgh, PA
Spokane, WA
Denver, CO
Anchorage, AK
Motor vehicle safety
Strategic Goal: Preventing Occupational Deaths and Injuries from Motor Vehicle Incidents and Crashes

- Truck Drivers
- First Responders
- Construction Workers
Industry Sector Goals that Include Motor Vehicle Safety

- Transportation, Warehousing and Utilities
- Construction
- Public Safety Sector
- Oil and Gas Extraction
- Wholesale and Retail Trade
Warning Beacon Research Can Help Reduce Occupational Motor Vehicle Incidents by Improving Beacon Performance for:

The motoring public, work vehicles, and workers on foot

WHILE NOT...

impacting vision of motoring public, distracting or drawing motoring public toward work sites
Preventing Injuries & Deaths From Backing Construction Vehicles & Equipment

Vehicles Causing the Most Backover Fatalities 2005-2010*

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dump Truck</td>
<td>67</td>
</tr>
<tr>
<td>Semi/Tractor Trailer</td>
<td>40</td>
</tr>
<tr>
<td>Truck</td>
<td>30</td>
</tr>
<tr>
<td>Forklift</td>
<td>21</td>
</tr>
<tr>
<td>Garbage Truck</td>
<td>20</td>
</tr>
<tr>
<td>Pick-up Truck</td>
<td>16</td>
</tr>
</tbody>
</table>

*OSHA Integrated Management Information System data

Preventing Worker Injuries and Deaths from Backing Construction Vehicles and Equipment at Roadway Construction Worksites

Summary

Workers on roadway construction work are exposed to possible injury and death from moving construction vehicles and equipment. Workers and supervisors must be aware of and in control of roadway work zones to prevent injuries and deaths from backing construction vehicles and equipment.

The National Institute for Occupational Safety and Health (NIOSH) recommends that specific procedures and controls be in place at roadway construction work sites to help prevent injuries and deaths from backing construction vehicles and equipment.

Description of Exposure

According to Bureau of Labor Statistics data, the 963 total workplace fatal roadway construction strikes from 2003 to 2010, 448 were due to worker being struck by a vehicle or mobile equipment. In 2010, workers were fatally struck 143 times by a vehicle or mobile equipment that was backing up. In 14 of those cases, the worker was fatally struck by a dump truck that was backing up.

Between 1992 and 2009, NIOSH and state partners investigated 26 deaths of workers killed by backing construction vehicles or equipment on roadway construction work sites through the Fatality Assessment and Control Evaluation (FACE) Program.

Case Study

In October 2006, a 23-year-old laborer was backed over by a track truck (Figure 1) while working as a flagger on an asphalt resurfacing job in a roadway work zone. The victim was standing with his back to the backing track truck where a dump truck driver attempted to warn him by waving his arms. The track truck struck the victim; the driver thought he had passed over a manhole cover and continued backing. The track truck driver stopped when he saw the dump truck driver running and waving his arms in his lane. Both drivers found the victim at the front of the track truck lying face down on a manhole cover on the ground.

Employers, including Contractors, and Sub-Contracts

NIOSH and State FACE investigations identified the following controls that employers, contractors, workers, and construction vehicle and equipment manufacturers should take to protect workers from injury while working around backing construction vehicles and equipment on roadway construction work sites.

Standard Operating Procedures

- Develop, implement, and enforce standard operating procedures that address worker safety and minimize work to be performed near vehicles and equipment.
Preventing Struck-by Incidents

Blind Area Diagrams for 38 pieces of equipment

Show areas that cannot be seen by operator

Useful for training aids

Test procedures available
Forklift Safety
2010 Forklift Injury Causation Statistics

- 32 falls
- 46 struck by falling/moving object or load
- 36 struck by forklift
- 15 forklift overturned
- 29 crushed or caught in forklift/load and an object
- 10 caught in amputation
- 5 burns / fire
- 3 CO, 1 Ammonia
Personal Protective Equipment

- NIOSH plays a critical role in certifying respirators, developing PPE standards, performing PPE research, and disseminating best practices for using all forms of PPE to protect workers.

- For details see: http://www.cdc.gov/niosh/npptl/
Multiple initiatives since 9/11 to address the unique emergency responder PPE challenges

- Provide chemical warfare agent protection
- Replenish expended cylinders
- Determine cartridge end-of-service-life
- Provide interoperable cartridges
Responders needed a capability to rapidly replenish expended cylinders.

Rapid intervention connection requirement provided way to replenish SCBA cylinders.

Rapid Intervention Crew/Company-Universal Air Connection (RIC-UAC)
Responders needed capability to interchange cartridges in emergency

NIOSH CBRN APR Standards require interoperable canisters for use in emergency situations (2003)
Isolation gown study is leading to product changes and increasing CDC and FDA awareness of potential issues.

- Collaboration with ASTM F23 committee to develop new isolation gown standard
- 22 models of isolation gowns from 6 different manufacturers were evaluated for a variety of performance requirements
- Only 13/20 models met their stated AAMI liquid barrier performance standards
- Preliminary findings incorporated into updated CDC guidance

Next steps: submit manuscript in FY16 Q2, finalize ASTM std FY17 Q1, present findings at conferences
Mine worker safety
Visual interventions for miner safety

1. Reduce pin-by, struck-by accidents
   - Visual Warning System
   - Saturn area lamp
   - NIOSH LED cap

2. Reduce slip/trip/fall accidents
   - Saturn area lamp
   - NIOSH LED cap

3. Self-escape:
   - Escape markers
   - Lighted lifeline
Visual Warning System
Reduce pinning/striking accidents
VWS: Five warning modes
1. None: no visual warning is given at any time
2. Static: all luminaires turn on and stay on as long
3. Blink: 4-Hz flash
4. Directional: 4-Hz direction sequence
5. Progressive: luminaire turns on & stays on sequentially
Visual Warning System

Detection time (milliseconds)

Warning lights

No VWS

VWS blink mode

1.5 feet of machine travel
Miner self-escape

Escapeway markers: Passive beacons

1. Federal law requires marking & primary and secondary escapeways
2. Every second counts when an emergency strikes
3. Problems:
   - No color code
   - More than 11 colors
   - Various sizes and shapes
   - Various retroreflective materials
4. Pilot tested red, green, blue markers

Photo courtesy of CAB Products
Escapeway marker visibility in smoke

Green

Red

Blue
Lifelines for Miner Self-escape

Problem: Mine disasters typically produce smoke; how can miners find the lifeline?

- Required by law for underground coal mines
- Tactile objects indicate:
  - escape direction
  - locations of safety resources

Image from CAB Products http://www.cabproducts.com/high-visibility-reflectors/
Lighted-lifeline for Miner Self-escape

170 micron diffuse-optical fiber illuminated by lasers

• Collaboration with Corning
• Prototype expected by 11/29/16
• Next steps:
  • Human subject testing
  • Field evaluation
  • Phase II
    • Communications
    • Distributed sensing system: temperature, sound, strain
Lighted Lifelines for Miner Self-escape
Saturn area light

Roof bolter is one of the most dangerous machines to operate
Traditional LED cap lamp

NIOSH LED cap lamp

+79% peripheral detection
struck-by/pinning accidents

+94% floor hazard detection
slips/trips/falls

33% to 50% less power

No glare issues
Summary

• NIOSH worker safety
  – Motor vehicle
  – Forklifts
  – PPE
  – Mining

• One common thread
  – Pinned-by & struck-by accidents

• Solutions
  – Training & controls
  – Improved standards and technologies
  – Visual interventions
Acknowledgements

The presentation’s technical review and content for motor vehicles, forklifts, and PPE were provided by:

Dawn Castillo, MPH
Director, NIOSH Division of Safety Research

Christine Branche, PhD
Principal Associate Director, and Director, Office of Construction Safety and Health

Maryann D’Alessandro, PhD
Director, National Personal Protective Technology Laboratory
Worker Safety – NIOSH Perspective

Presented by: John J. Sammarco, PhD
Contact info: (412) 386.4507  JSammarco@cdc.gov

NIOSH is a division of the Centers for Disease Control and Prevention within the Department of Health and Human Services  www.hhs.gov

Disclaimer: The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health. Mention of any company or product does not constitute endorsement by NIOSH.

www.cdc.gov/niosh