Workplace Examinations with the NIOSH EXAMiner Software

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June 18th – 20th, 2019
Topics:

EXAMiner Research to Practice

EXAMiner Demonstration

Tips for Creating Custom Scenes in EXAMiner
Background

• Metal/nonmetal mining experienced an increase in fatal injuries between 2013 and 2015.

• To address this increase, the Mine Safety and Health Administration (MSHA) updated the Workplace Examination Rule (30 CFR Parts 56 and 57):
  • Workplace Examinations must be done before work begins or as mineworkers begin work in a location.
  • Examination records must include a description of the adverse conditions that are not immediately corrected.
  • Examination records must include the date on which an adverse condition was corrected.

Recognizing worksite hazards is critical to the workplace examination.
Recent NIOSH research identified differences in hazard recognition accuracy based on mineworker experience.
Participants with safety-specific experience identify significantly more hazards than other participant groups.

To address this deficiency, NIOSH created EXAMiner—a portable workplace examination simulation.
EXAMiner is available for download on the NIOSH website:

https://www.cdc.gov/niosh/mining/works/coversheet2050.html
EXAMiner includes:

- 31 panoramic pictures at 4 mine locations (pit, plant, shop, roadway)
- 106 hazards
- Workplace EXAMination search task
- Debrief session

EXAMiner uses materials developed for the NIOSH lab study
NIOSH designed EXAMiner for an instructor to use in a classroom setting

Who is the user?

• Metal/nonmetal mining sector
• Part 46 training: required by law
• Safety trainers during Instructor-led training
• Classroom setting with a projector and screen
• Customized material
Instructors can create custom training scenarios to address specific hazards or highlight specific mine locations.

A session includes the virtual workplace examination search task.

A scenario is a sequence of images or scenes the trainees search during the workplace examination search task.
EXAMiner includes guidance documentation to facilitate use

EXAMiner includes:

- Help guide
  - User instructions
  - Descriptions of software functionality
- Tips for the instructor
  - Suggestions for use during classes
- Appendices with all hazard information
- 9 NIOSH scenarios
EXAMiner addresses critical hazard recognition competencies using scientifically based training strategies.

**Hazard Recognition Competencies Theoretical Framework**

**Competencies**
- General hazard knowledge
- Site-specific hazard knowledge
- Visual search
- Pattern recognition

**Training Strategies**
- Information
- Demonstration
- Practice
- Feedback
NIOSH designed the workplace examination search task to improve trainees’ ability to search for and find hazards

**Workplace EXAMination Search Task**

- Used to demonstrate hazard recognition.

- Provides opportunity to practice visual search.

- Instructions: Please search as if you were performing a workplace examination at your work location.
Trainees perform a simulated workplace examination by searching high-fidelity panoramic scenes for hazards.
Trainees are able to search for variations of the same types of hazards to strengthen pattern matching skills.
The session debrief gives trainers the opportunity to review and discuss trainees’ performance during the search task

Session Debrief

• Critical for learning and retention.
• Opportunity to review searched scenes.
• Discuss hazards that were identified.
• Discuss hazards that were missed.
• Provide explanation for hazards.
• Discuss site-specific policies.
The session debrief provides feedback for all scenes searched in a scenario

Feedback
• Accuracy
• Search time
• Number of clicks
To reinforce hazard knowledge, NIOSH researchers provide additional information during the scene review.

**Accuracy Information**

- Hazards that were accurately identified
- Hazards that were missed
- Additional clicks

**Hazard Information**

- Brief description
- Injury statistics
- Mitigation strategies
The mining community is currently using EXAMiner

Field Observations

- NIOSH researchers observed 6 safety trainers using a beta version of the EXAMiner software.

- Safety trainers are using EXAMiner as an interactive training tool. The software:
  - Encourages active participation.
  - Can be used to evaluate trainees' knowledge.
EXAMiner Demonstration
Tips for creating custom scenes

1. Look at the data.

2. Talk to people.

3. Inspect your sites.

4. Can you create a panoramic image to visually represent hazards or a specific hazardous situation?
Identify critical hazards or hazardous situations your mineworkers are exposed to at your mine site(s)

**Location: Shop**

<table>
<thead>
<tr>
<th>Accident Type</th>
<th>Examples</th>
<th>Necessary Tools/Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition or Explosion of gas accident</td>
<td>Flame (sparks) near flammable materials</td>
<td>Drum; Flammable material storage; Oxygen cylinder; Acetylene cylinders</td>
</tr>
<tr>
<td></td>
<td>Unmarked containers</td>
<td>Drum</td>
</tr>
<tr>
<td>Fall from ladder</td>
<td>Damaged ladder: missing wrung, broken foot</td>
<td>Righ inside/outside of door</td>
</tr>
<tr>
<td></td>
<td>Incorrectly used ladder</td>
<td>Under closing door</td>
</tr>
<tr>
<td></td>
<td>Propped in wrong place</td>
<td>Person; Tool/bucket</td>
</tr>
<tr>
<td></td>
<td>Angle of prop is too steep or shallow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 points of contact</td>
<td></td>
</tr>
<tr>
<td>Fall to same level</td>
<td>Trip hazard</td>
<td>Tool/bar/hose</td>
</tr>
<tr>
<td></td>
<td>Debris</td>
<td>Accumulation</td>
</tr>
<tr>
<td></td>
<td>Moving equipment over debris</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contaminant</td>
<td>Oil; Water; Slick material</td>
</tr>
</tbody>
</table>

![Image of a worker on a ladder in a mine shop](image-url)
Look to the data

Distribution of Occupational Fatalities by Accident Class, 2015 (N=26)

- Falling, rolling, or sliding rock or material: 15.4%
- Fall of ground (from in place): 15.4%
- Machinery: 30.8%
- Powered hoisting: 23.1%
- All other: 15.4%

U.S. Department of Labor
Mine Safety & Health Administration

NSSGA
NATIONAL STONE, SAND & GRAVEL ASSOCIATION
Talk to people
Inspect your worksites

Barriers to Hazard Recognition

Many factors such as experience, complexity of the work environment, and change in the work environment can affect hazard recognition. When thinking about potential barriers in your work environment, remember:

- **Experience** affects the number of hazards that mineworkers recognize. Think about:
  - How many years have my employee(s) worked in the mining industry?
  - Are my employee(s) knowledgeable of hazards in the work environment?
  - Are my employee(s) focused on safety?
  - Will my employee(s) be exposed to a new or unfamiliar location in the mine?

- **Complexity** affects the number of hazards a mineworker is able to find. Think about:
  - Are my employee(s) working in cluttered work environments?
  - Are my employee(s) working in busy (high traffic, divided attention) locations?
  - Are my employee(s) working in areas where multiple hazards may be present?
  - Are my employee(s) performing tasks that require multiple safety procedures?

- **Change** in the work environment can affect hazard recognition. Think about:
  - What conditions are my employee(s) exposed to? (e.g., weather, time of day, etc.)
  - What changes may be made to the mine plan? (e.g., traffic pattern, location of roads, etc.)
  - What changes may be made to tools, equipment, and structures?
  - Are my employee(s) fit for duty? (e.g., fatigue, illness, distraction)
Tips for Taking Panoramic Pictures for Use in EXAMiner
Take panoramic pictures for EXAMiner – *it’s EASY!*
Panoramic width

- 125x35 degrees
- 360x180 degrees
Panoramic overlay on spherical surface

125x35 degrees

360x180 degrees
Composition

1. Distances (foreground, subject, background)
2. Occlusion or visual clutter
3. Main pitfall – relative size of the subject
Pivot around the camera, not around your feet

Feet
Pivot around the camera, not around your feet
Motion and scene dynamics
Find your camera app on your phone

Android

Apple
Take a panoramic picture
Camera Activity: Practice taking a panoramic photo

1. Find your camera app
2. Set mode to panorama
3. Take a panoramic photo

Capture Panorama

- Open Camera App
  - Press camera icon
  - Center camera on horizon
  - Press circle (lower center)
  - Slowly rotate camera 360 degrees clockwise
  - Allow time for panorama to process
- Exit Camera App or Repeat
Camera Activity: Photoshoot

1. Identify the primary subject
2. Identify secondary subjects – at least one
3. Select point of view for shot (lighting and composition)
4. Capture panoramic image(s)

Capture Panorama

☐ Open Camera App
  o Press camera icon 📸
  o Center camera on horizon
  o Press circle (lower center)
  o Slowly rotate camera 360 degrees clockwise
  o Allow time for panorama to process

☐ Exit Camera App or Repeat
Transfer your pictures from your phone to your computer

1. File share service such as Google Drive
2. Email
3. USB cable to connect to PC.
Available now on NIOSH Mining Website:

https://www.cdc.gov/niosh/mining/works/coversheet2050.html

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