

**U.S. Department of Labor**

**MSHA**

**Mine Safety & Health Administration**

**ASSISTANT SECRETARY  
JOSEPH A. MAIN**

**Mine Emergency Operation Improvements  
Since 2009  
Pittsburgh, PA**

**January 5, 2017**

# MSHA Mine Emergency Operations

**November 2009,**

## **Assistant Secretary Main Begins Complete Review of Mine Emergency Response Preparedness:**

- November 2009, Assistant Secretary Main tasks MSHA Technical Support and MSHA's Mine Emergency Unit to identify gaps in mine emergency preparedness and propose solutions.
- January 2010 Technical Support responds outlining priorities, shortcomings and improvements needed at MSHA and with industry mine rescue teams.
- Assistant Secretary Main immediately establishes a funding plan to modernize MSHA's MEO and mine emergency communications system and engage stakeholders.

# MSHA Mine Emergency Operations

## Prior to 2009, MSHA MEO has:

### Pittsburgh

- Mobile gas lab
- Ventilation monitoring truck & Remotec robot
- Analog seismic system

### Beckley

- Basic command center office
- MEU team truck
- Laboratory-only chromatograph
- Rescue capsule
- Basic surface communications

### Price

- Basic command center office
- MEU team truck
- Semi-mobile gas chromatograph

## Prior to 2009, MSHA MEO was:

- Distant from the mining areas with long response times
- Using dated equipment
- Using separate coal and metal and nonmetal mine rescue teams
- Not taking advantage of the newest technologies

# MSHA Mine Emergency Operations

## Prior to 2009, MSHA Seismic Location System is:



- The original seismic location system recommended by the National Academy of Engineering in 1970
- An analog system using components that were out-of-date
- Not a system that MSHA could rely upon to locate miners in an emergency

# MSHA Mine Emergency Operations

## Assistant Secretary Main's 2009 Directive of Overhauling MEO:

- Adds a new Midwest Mine Rescue Station to improve response times
- Adds 23 new MEO vehicles across the US that support
  - Gas monitoring and analyses
  - Surface and underground communication
  - The mobile command staff
  - Rescue teams and equipment
- Upgrades all four MEO stations with standardized equipment including:
  - Infra-red gas analysis
  - Chromatographic analysis
  - Surface communications
  - Mine emergency team personnel and equipment
  - New state-of-the-art underground communications, tracking, mapping, and atmospheric systems
- Improves command and control and MEO staffing and training
- Develops new state-of-the-art seismic location system

# MSHA Mine Emergency Operations

## MSHA Changes in 2010 and 2011:

**MSHA's PEIR joins with MEO to develop a new surface communications system in 2010. This system corrects the communication problems encountered during the Upper Big Branch Mine rescue and recovery operations.**



**A new state-of-the-art mobile command center is put into service at the Pittsburgh Station in 2011. This vehicle supports the on-site command staff during a mine emergency.**

# MSHA Mine Emergency Operations

## MSHA Changes in 2012:

- Completes engineering trailer, which is put into service to support onsite engineering staff during mine emergencies
- Installs a specially designed underground transportation vehicle that supports mine rescue needs at the MEU at the Beckley station
- Installs a new PEIR communications HUB, new mobile gas lab and a new MEU team truck at the Denver/Price station
- Conducts a Mine Emergency Response Drill (MERD) with Consol Energy at its BMX Complex in Western Pennsylvania



# MSHA Mine Emergency Operations

## MSHA Changes in 2013:

**MSHA Coal and Metal and Nonmetal Mine rescue units combine to form one MEU.**



**MSHA opens a new mine rescue station at a temporary location in MSHA Coal District 10 offices in Madisonville, KY.**



# MSHA Mine Emergency Operations

## MSHA Changes in 2013:

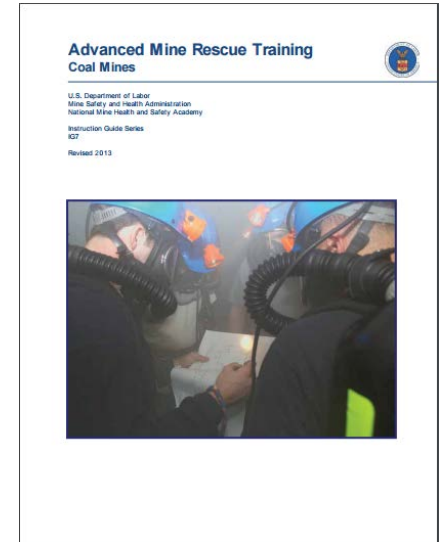
- Revamps Mine Rescue Contests in both Coal and Metal and Nonmetal to:
  - ❑ Improve training
  - ❑ Expand participation to include mine rescue stakeholders
- Joseph A. Holmes Mine Safety Association establishes the Holmes Mine Rescue Association to provide support and guidance for mine rescue nationwide
- Establishes October 30 as Mine Rescue Day to honor mine rescuers, past and present



# MSHA Mine Emergency Operations

## MSHA Changes in 2014:

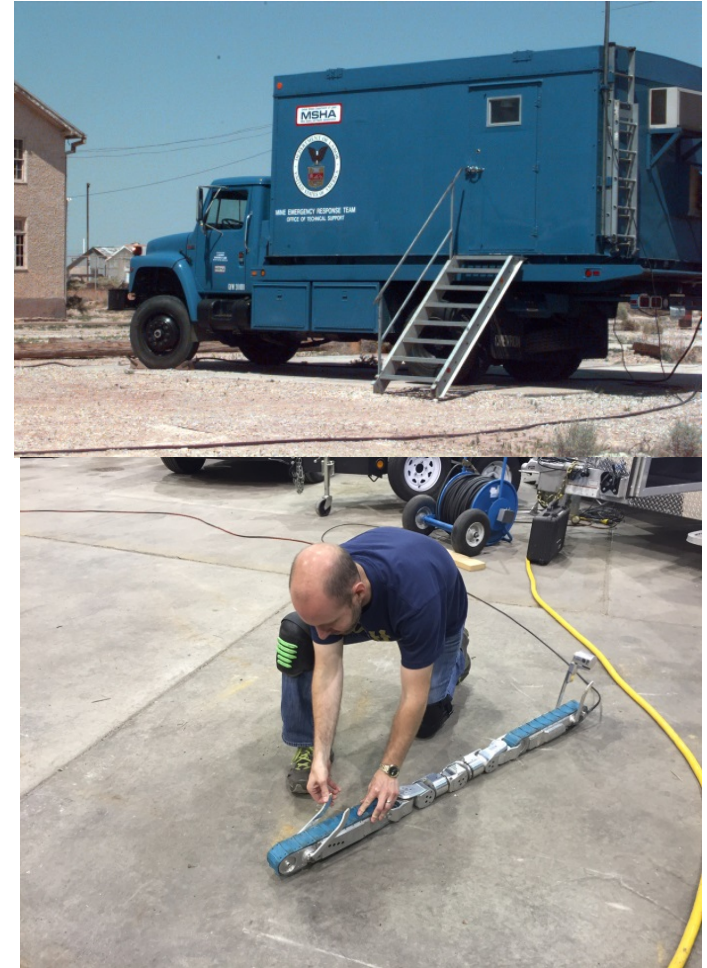
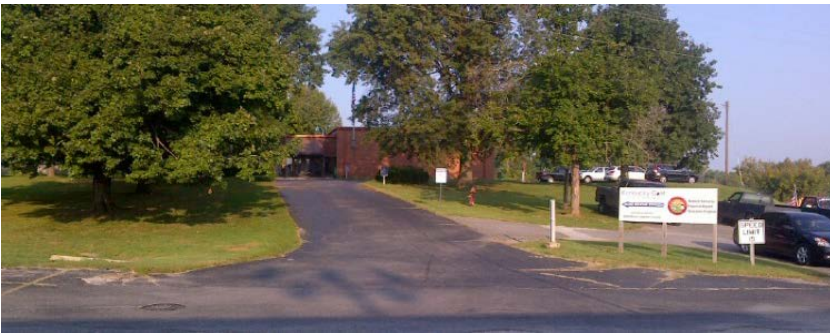
- Updates mine rescue training guide and creates an Advanced Skills Training guide for mine rescue teams
- Aids NIOSH's development of explorer and a snake robots to deploy down a borehole
- Finalizes new Mine Emergency Response Drills (MERD)
- Acquires a 28 inch drill steel capable of drilling a large hole for a rescue capsule
- Develops an electronic log to provide a digital version of events during an emergency
- Develops a MEO mapping tool providing real-time mapping
- New state-of-the-art underground communication system installed at Pittsburgh station



# MSHA Mine Emergency Operations

## MSHA Changes in 2015:

- Opens a new fully equipped facility at the Kentucky Coal Academy in Madisonville, KY, to service the Midwest
- Electrical Division takes over the development of the seismic location system response
- Robotic Response Team formed in Pittsburgh to work with the new robots being obtained from NIOSH



# MSHA Mine Emergency Operations

## MSHA Changes in 2016:

- MSHA establishes a group of mine emergency specialists that train the company and state mine rescue teams on the use of state-of-the-art communications equipment



# MSHA Mine Emergency Operations

## MSHA Changes in 2016:

- Assembled a team to compete in international competition
- Electrical Division takes over the development of the seismic location system response
- Robotic Response Team formed in Pittsburgh to work with the new robots being obtained from NIOSH



# MSHA Mine Emergency Operations

## MSHA Status in 2016:

- MEO has mine rescue stations in:
  - Pittsburgh, PA
  - Beckley, WV
  - Madisonville, KY
  - Price, UT.
  - Denver, CO (sub-station of Price)
- Each of the four stations have standardized equipment including:
  - Infra-red gas analysis
  - Chromatographic analysis
  - Surface communications
  - Mine emergency team personnel and equipment, and
  - Underground communications
- Command centers and additional underground communications located at the Pittsburgh station and Denver sub-station
- The Robotic Response and Seismic Location System Response Teams located at the Pittsburgh Station

# MSHA Mine Emergency Operations

## MSHA Status in 2016:

- Newly developed seismic location system tested at 8 mines and found reliable to detect miners signaling at depths of 1300 ft, including:
  - Aracoma Mine (WV) - Oct 2014 Depth 350 ft
  - Sugar Creek (MO) - Nov 2015 Depth 120 ft
  - Pinnacle Mine (WV) - Jun 2015 Depth 1100 ft
  - Cass #1 Mine (PA) - Apr 2016 Depth 200 ft
  - American Rock Salt (NY) - Aug 2016 Depth 1300 ft
  - Lowry Mine (PA) - Oct 2016 Depth 400 ft
  - Gibson Mine (IN) - Nov 2016 Depth 500 ft
- Recently developed seismic system located in Pittsburgh
- Future testing plans include depths approaching 2000ft and locating additional systems and/or components of the system at other stations



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Infra-red Gas Monitoring Trucks at all four stations

These trucks carry a variety of instruments used for continuous sampling and recording of mine gases, including infra-red and electrochemical analyzers.





# MSHA Mine Emergency Operations

## MSHA Status in 2016: Mobile Gas Laboratories at all four stations

These trucks carry a fully-functional gas laboratory (chromatographs) for analyzing samples of mine air for gases such as methane, ethane, acetylene, oxygen, nitrogen, hydrogen, carbon dioxide, carbon monoxide, ethylene and argon.



# MSHA Mine Emergency Operations

## MSHA Status in 2016:

### Surface Communication Systems at all four stations

- New state-of-the-art surface communications systems
  - Cisco systems
  - IP phones
  - Secure radio system
  - Satellite
  - Repeater systems

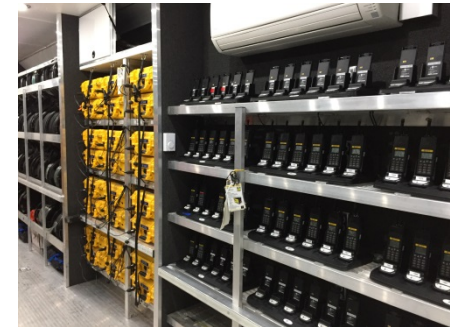
**Tower and Generator  
for Repeater**



**Secure Radios**



**Satellite and Cisco**



# MSHA Mine Emergency Operations

## MSHA Status in 2016: MEU Team Trucks at all four stations

Team trucks provide a workspace for the MSHA mine rescue team members to store and maintain equipment such as emergency breathing apparatus, communications, and handheld gas detectors.



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Underground Communications Equipment

- Equipment allows voice and data communication between underground mine rescue teams and the surface command center
- Pittsburgh and Denver can communicate a full 20,000 ft underground
- Price, Madisonville, and Beckley can establish a first response communication up to 5,000 ft underground



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Underground Vehicles

- Pittsburgh – 2 Electric Mine Utility Vehicles (EMUs)
- Price – 1 Diesel Utility Vehicle
- Madisonville – 2 EMUs
- Beckley – 1 Damascus



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Command Vehicles

Provides an information hub, secure meeting/working location, and MSHA's on-site headquarters during a mine emergency response or recovery operations.



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Mine Conference Room Command Center Equipment at Pittsburgh and Denver

Deployable visual/audio equipment that can be placed in the mine office or facility to **securely** disseminate information needed during an event



# MSHA Mine Emergency Operations

## MSHA Status in 2016: Robotic Response at the Pittsburgh Station

- Remotec robot remotely explores underground mine workings when conditions are too hazardous for rescue personnel
- Gemini Scout robot provides a nimble, quick maneuvering tool
- Sarcos Snake robot can be deployed through a borehole from the surface





# MSHA Mine Emergency Operations

## MSHA Future Technological Developments For Mine Rescue

- Participation with in the NIOSH Breathable Air Partnerships along with the National Mining Association, Bituminous Coal Operators Association, United Mine Workers and mine operators, promoting advances in escape respirator technology.
- Through-the-earth (TTE) voice and data communication systems.
- Autonomous robots for mine mapping and exploration.
- Hardened, post-accident communication systems that transmit voice or data over existing mine infrastructure.



# MSHA Mine Emergency Operations

## MSHA Future Technological Developments For Mine Rescue

- Intrinsically safe helmet camera so that real-time images from the underground rescuers can be viewed by persons above-ground
- Wireless remote gas sensors to allow quick placement of underground, real-time gas monitoring stations
- Voice communications integrated into the mine rescue mask so that communication is clear, fast and readily understood
- WiFi connectivity at the fresh air base

