

# Built-in-Place Refuge Alternatives

**MSHA, A&CC**

**Applied Engineering Division**



# Built-in-Place Refuge Approvals

- **Require 3 part 7 component approvals**
  - **Breathable air**
  - **Air-monitoring**
  - **Harmful gas removal**
- **Structural components consist of 15 psi stoppings constructed prior to an event.**
  - **2018 structural deadline does not apply**
  - **Approved by the District Manager**

# Built-in-Place Refuge Advantages

- **Facilitate escape planning**
  - Gathering point
  - Ability to communicate in fresh air
  - SCSR changeover
- **Typically more space**
- **When supplying air through boreholes or piping using fans or compressors:**
  - Provide unlimited fresh air to trapped miners
  - Negate the need for chemical scrubbing
  - Provide direct air and communication line to the surface
  - Heat removal through air volume exchange

# Current Built-in-Place Usage

- 19 installations in 5 mines
- Occupancies range from 20 to 40 miners
- Exceed 15 ft<sup>2</sup> and 30-60 ft<sup>3</sup> per person
- Mines conduct periodic testing
  - Fans/compressors
  - Communications
  - Generators
  - Deployment

# Breathable Air Component

- **Provide 12.5 cfm air per person**
  - All installations exceed this requirement
- **Borehole from the surface**
  - Portable trailer with fans/blowers and generators
  - Permanent installations (blower or compressor) with line power and generator
- **Some boreholes are dual purpose**
  - Used for Emergency Communication System
  - Coupled with nitrogen inerting system

# Breathable Air Component

- Portable blower and generator trailers



# Breathable Air Component

- Inside view of trailer





# Breathable Air Component

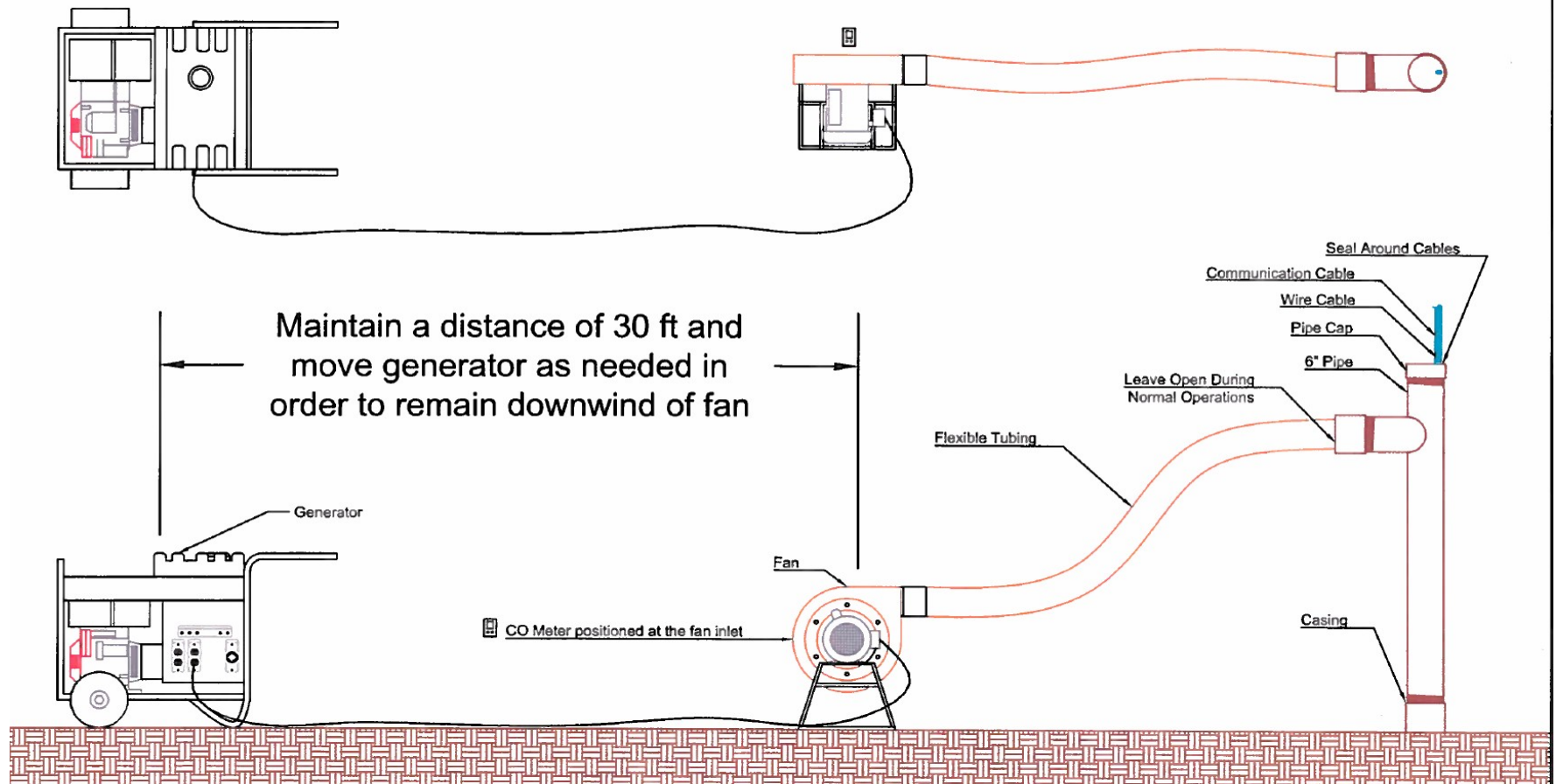
- Surface borehole site





# Breathable Air Component

- Drawing of blower to borehole setup



# Breathable Air Component

- Permanent blower set up in housing



# Breathable Air Component

- Borehole coming into BIP



Borehole location for this BIP-RA

# 15 psi Stoppings

- **Approved by the District Manager; Pittsburgh Tech Support may assist in review**
- **Include stopping and door systems**
- **Display airlock and total occupancy on exterior**
- **Display approval tag with maximum mine air temperature rating**



# Structural Component

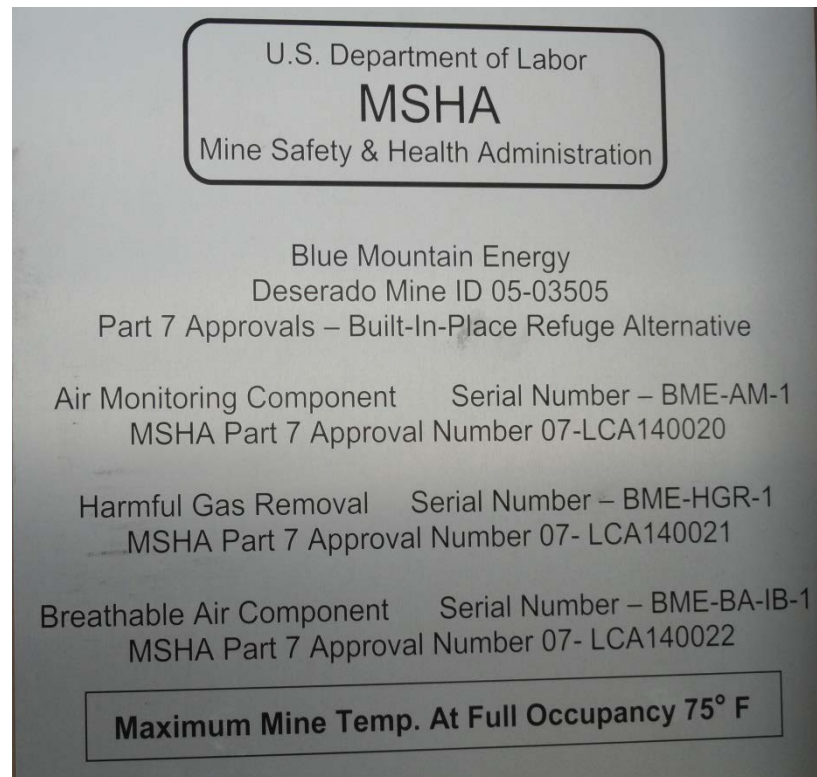
- 15 psi stopping and door to airlock





# Structural Component

- MSHA approval tag



# Harmful Gas Removal Component

- Check valve to prevent airflow from the mine to the interior volume
- Airlocks are used on many installations
- No airlock is needed if testing shows positive pressure is maintained during normal mining
- Extra SCSRs are provided in the event there is a delay in starting the surface blower

# Harmful Gas Removal Component

- Check Valve



# Air Monitoring Component

- Current installations use MX6 for Refuge Alternatives
- Sampling ports provided to monitor exterior air



# Air Monitoring Component

- Storage method for MX6 and other provisions





# Applied Engineering Division

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