



**ARCH COAL, INC.**

**Arch Western Resources, LLC**

**Arch Western Bituminous Group, LLC.**

**Skyline Mine Overview**

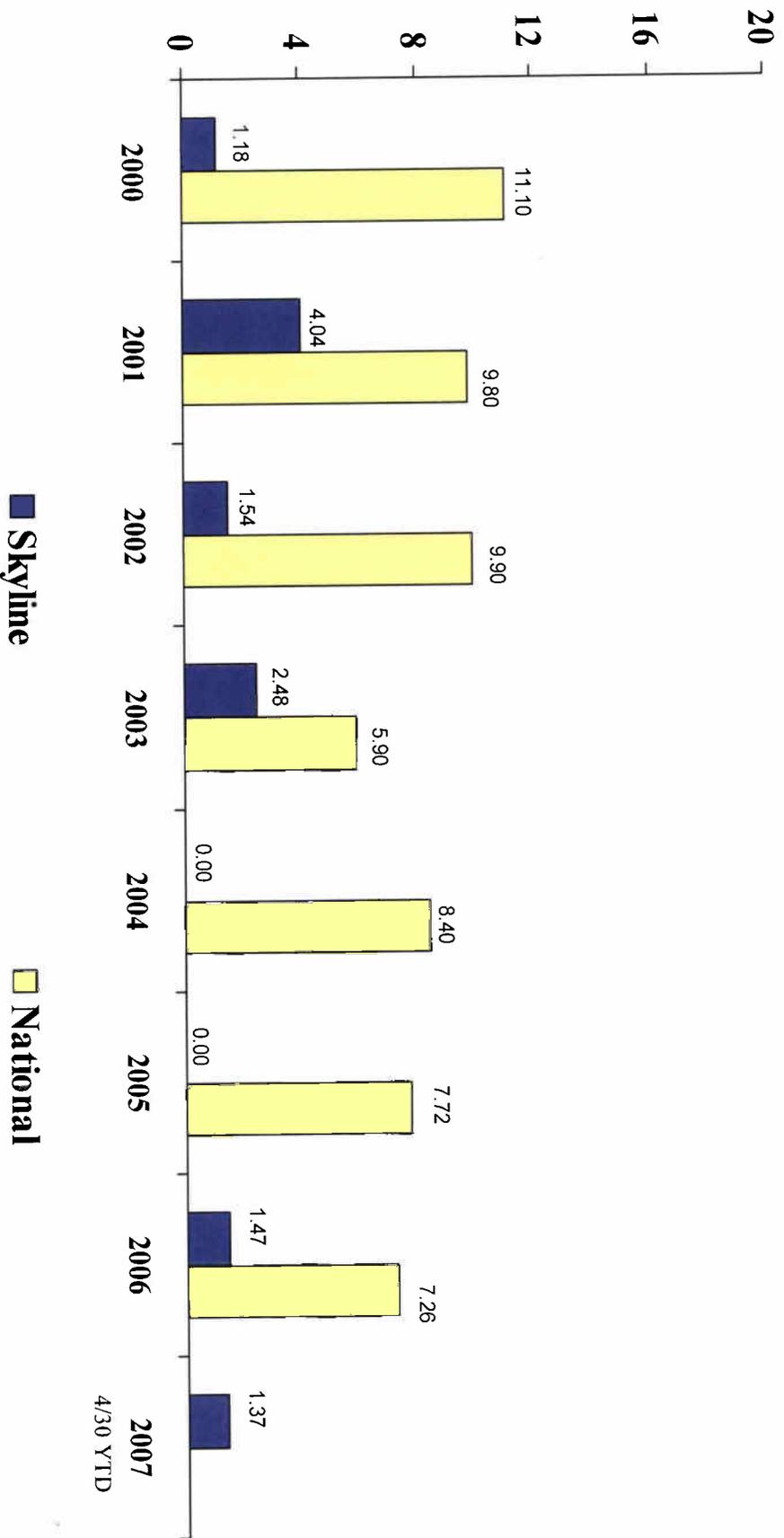
**MSHA Belt Air Technical Panel Visit**

**May 15, 2007**

# Skyline Health & Safety Performance

## MSHA Reportable Injury Incident Rate Comparison 2000 - 2007

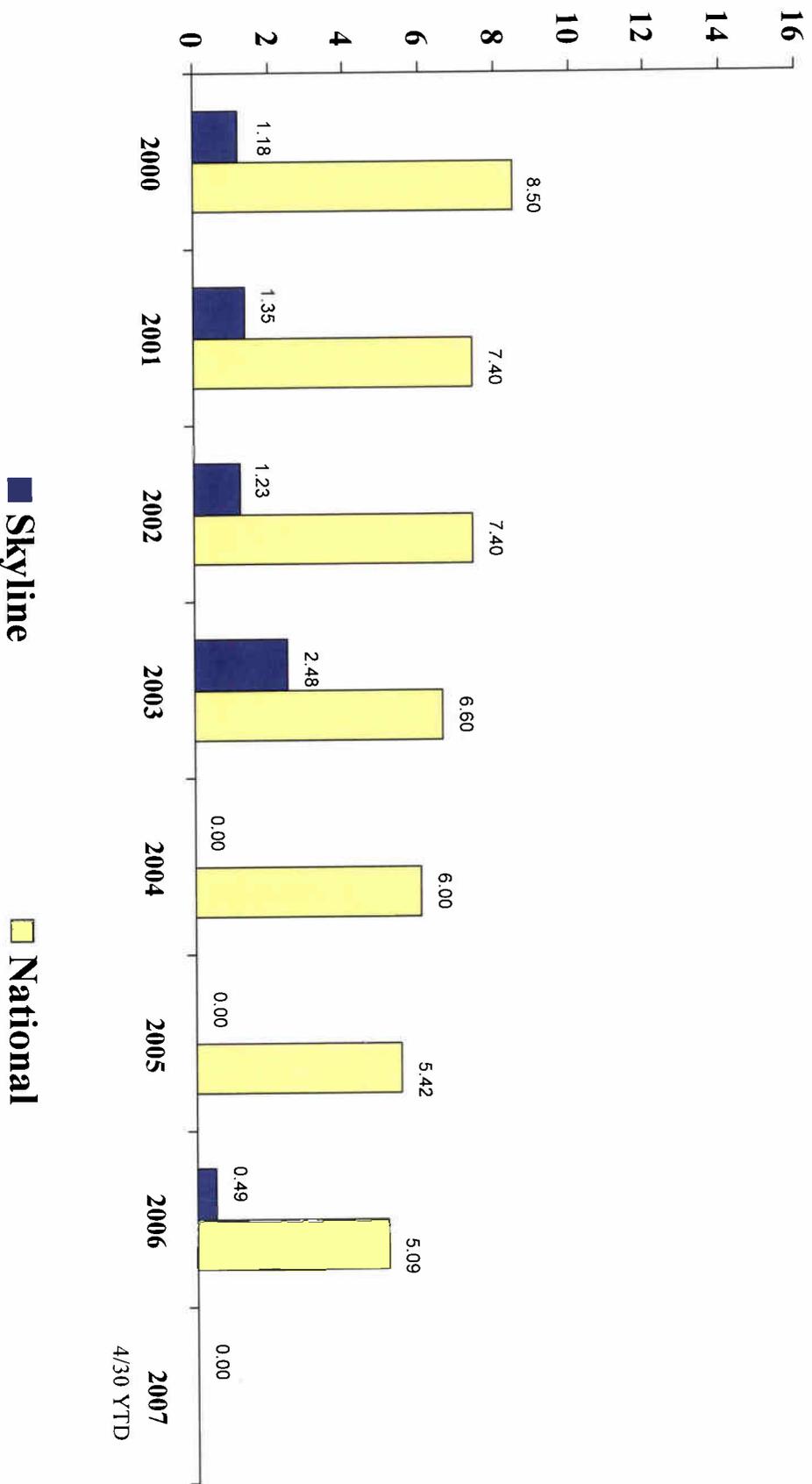
### Underground Bituminous Coal Mines



# Skyline Health & Safety Performance

## MSHA Lost Time Injury Rate Comparison 2000 - 2007

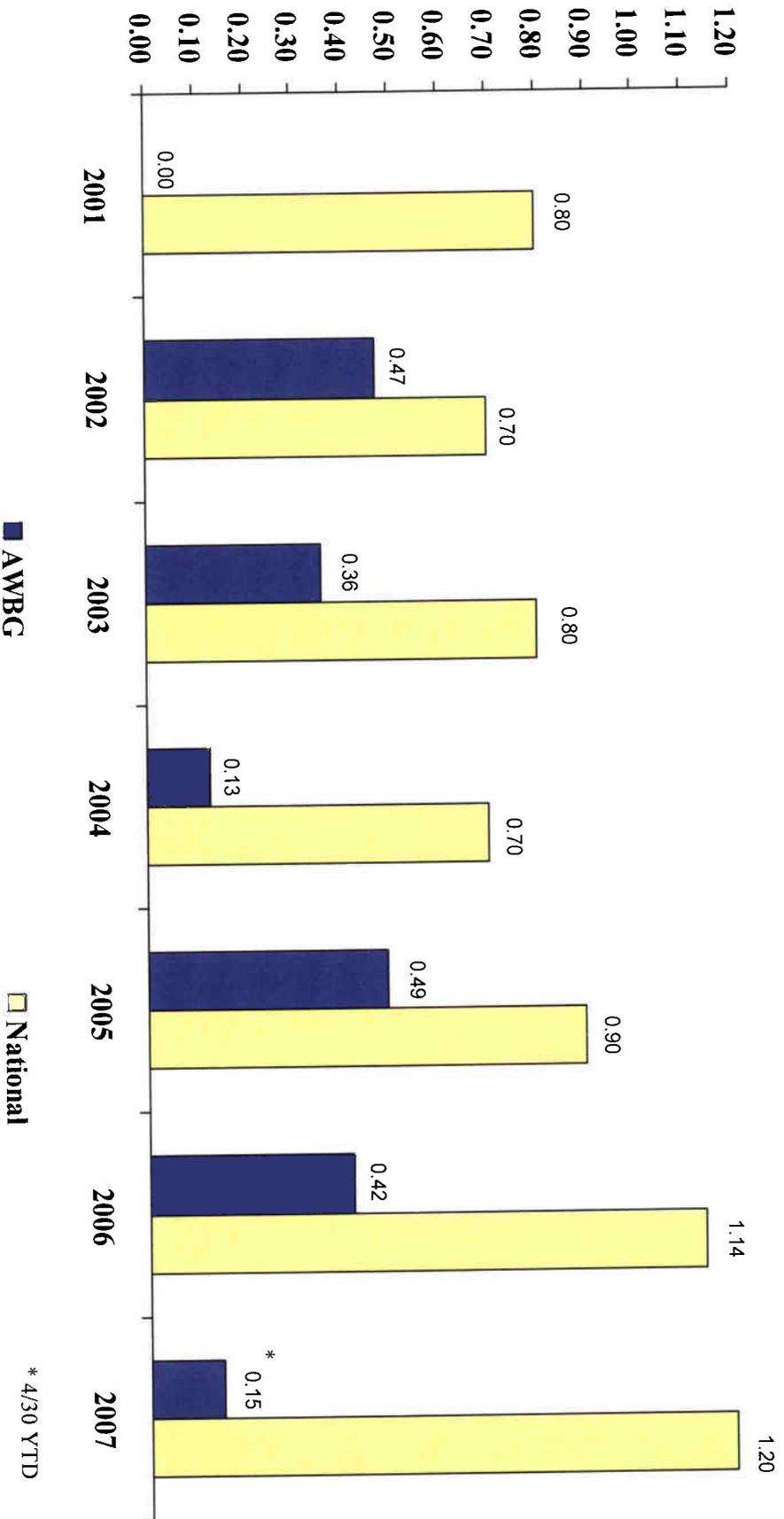
### Underground Bituminous Coal Mines



# Skyline Health & Safety Performance

## MSHA Citations Per Inspector Shift Comparison 2001 - 2007

### Underground Bituminous Coal Mines



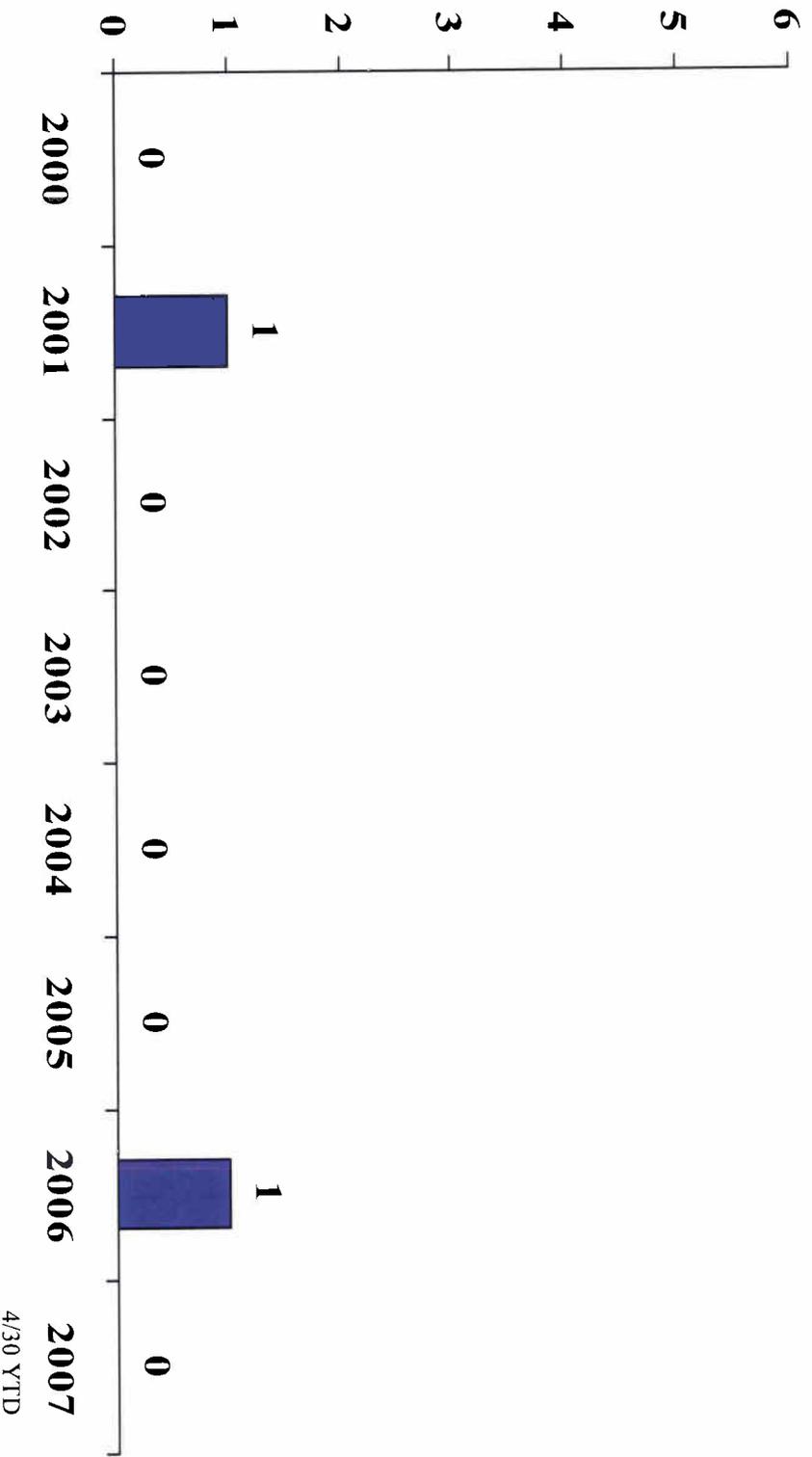
## **Skyline Mine Safety Is A Value**

- A non compromising commitment to achieve an injury free and environmentally responsible workplace
- Skyline Mine considers protection of the environment, maintaining healthy work conditions, and ensuring the safety of all personnel to be core values
- Core belief is that all injuries can be prevented
- Focus on behavior
- Monthly Standup For Safety meetings have been a key element to safety success
- MSHA/NMA 2005 Sentinel of Safety Award for large underground coal
- UDOGM 2007 Earth Day Award for Musk Thistle control

# Skyline Environmental Performance

## NOTICES OF VIOLATION

### 2000 - 2007



## **Skyline History**

- 1962** First Coal Lease Acquired By McKinnon Family
- 1974** Reserve Drilling Started
- 1978** Coastal Corporation Acquired Skyline Coal Properties
- 1979** Getty Mining Became A Joint Venture Partner
- 1980** Permits Approved/Initial Construction
- 1981** Initial Production Mine 3 – Lower O’Connor A Seam
- 1982** Initial Production Mine 1 – Upper O’Connor Seam
- 1985** Getty Interest Bought Out By Coastal Corporation
- 1985** First Unit Train Shipped From New Loadout To IPA
- 1986** Longwall Commissioned – KB face
- 1991** Second Longwall Commissioned – Gullick Face
- 1993** Overland Pipe Belt Began Operation
- 1994** Used Longwall Purchased and Rebuilt – Meco Face

## **Skyline History**

- 1995** Initial Production Mine 2 Began – Lower O’Connor B Seam
- 1996** Arco & Itochu Corporation Bought Skyline From Coastal And Formed Canyon Fuel Company, LLC
- 1998** Acquired by Arch Coal, Inc.
- 2001** Spontaneous Combustion Mine Fire
- 2001** High Water Inflow Encountered In 10 Left Development
- 2003** Mine 1 Portals Sealed
- 2004** Operations Idled Because of Geologic And Water Inflow Problems
- 2005** Operations Restarted In North Lease with continuous miners
- 2006** Longwall mining operations resumed

# Skyline Mine

## Geological Challenges

- **Roof/Rib Control Impacted By**
  - **Depth of Cover**
    - 1,000 ft to 2,200 ft of overburden results in high vertical stress and increased longwall abutment pressure
    - Pillar bump potential reduced with 2 entry
  - **High Horizontal Stress**
    - Principal Direction = N 80 W
    - Magnitude Typically 2 X Vertical Stress
    - Reduced exposure to horizontal stress damage with 2 entry
  - **Faults**
    - Displacement 1 ft to 15 ft
    - Reduced exposure to fault-weakened roof and rib with 2 entry
  - **Igneous Dikes**
    - Width 5 ft to 100 ft ?
    - Hardness 3,000 psi to 20,000 psi
    - Reduced amount of rock mining with 2 entry
    - Rock mining often requires use of drilling and blasting methods...not part of miners' normal routine

# Skyline Mine

## Geological Challenges

- **Sandstone Channels**
  - Channel washouts and scours are often associated with difficult roof conditions along channel edges
  - Reduced exposure to channel-edge roof problems with 2 entry
- **Multi Seam Mining**
  - Stress footprint of overlying mine works on an underlying seam is critical to mine design in underlying seam
  - Large multi-entry chain pillars cause high stress zones in the underlying seam, contributing to high amounts of deformation of roof and ribs in underlying seam
  - The use of 2 entry yield pillar design eliminates most of the stress footprint beneath overlying chain pillars
- **Surface Subsidence**
  - Multi-entry chain pillars tend to leave an uneven surface subsidence profile which can have adverse effects on sensitive surface features such as perennial streams and escarpments.
  - The use of 2 entry yield pillar provides a uniform subsidence profile

## **Skyline Mine Belt Air**

- **Belt Air Petition For Modification Submitted October 27, 2000**
  - **To Provide Higher Volumes of Air at the Working Face**
    - Reduce Exposure to Respirable Dust
  - **To Reduce The Number of Entries Required**
    - Reduce Exposure to Injury From Roof & Rib
  - **To Align Belt Entry Air Flow and Water Flow Direction**
    - Enable Fire Fighting From Fresh Air Side
- **Belt Air Petition For Modification Approved May 22, 2001**

## **Skyline Mine Two Entry**

- **Two Entry Petition For Modification Submitted March 28, 2000**
  - **To Reduce The Number of Entries Required**
    - **Reduce Exposure to Injury From Coal Bursts, Roof Falls, and Rib Rolls Related to Mining Under Deep Cover By Reducing the Occurrence of These Incidents**
- **Two Entry Petition For Modification Approved July 13, 2001**

## **Skyline Mine**

### **Belt Air Advantages**

- **Essential for Utilization of the Two Entry System**
  - **Reduces Exposure to Injury By Reducing the Occurrence of Hazards Such As Coal Bursts, Roof Falls, and Rib Rolls Related to Mining Under Deep Cover in Faulted and High Geologically Stressed Areas**
- **Provides Higher Volumes of Air at the Working Face**
  - **Reduces Exposure to Respirable Dust and Black Lung Disease By Reducing the Level of Dust That Miners Are Exposed To During the Coal Extraction Process**

## **Skyline Mine Belt Air Advantages**

- **Provides Air Direction in Belt Entry Toward Working Section**
  - **Facilitates Detection of Fire By Smell in the Event All Other Detection Systems Fail.**
  - **Enables a Fire in the Belt Entry to be Fought From the Fresh Air Side of the Fire.**
- **Provides Lower Air Velocity In Main Travel Way**
  - **Reduces Exposure to Respirable Dust and Black Lung Disease By Reducing the Level of Dust That Miners Are Exposed To in the Travel Way**

## **Skyline Mine Belt Air Advantages**

- **Lowers Main Fan Operating Point and Mine Ventilation System Pressure**
  - **Reduces the Risk of Spontaneous Combustion**
    - **Pillars**
    - **Gob**
  - **Reduces Exposure to Strains, Sprains, Falls, and Contacted-By Injuries Associated With High Pressure Ventilation Doors.**

## **Skyline Mine Belt Air and Two Entry System**

- **Utilization**
  - **Development Mining**
    - **Belt is Return Airway From Belt Tail to Near Belt Drive**
  - **Longwall Mining**
    - **Belt Air Is Intake Airway From Drive to Face**

## **Skyline Mine Belt Air and Two Entry System**

- **Safety Precautions**
  - **Fire doors**
    - Intake and Belt Line with Tools to Cut Belt
  - **Rock Dust**
  - **Intake Fire Risers**
    - Water Risers in Intake Every 300 ft With Hose at Strategic Locations
  - **CO Monitoring**
    - Diesel Discriminating Sensors
    - Alert @ 10 ppm Above Ambient
    - Alarm @ 15 ppm Above Ambient
    - Alert/Alarm Device on Section Intake and Belt
  - **Methane Monitoring**
    - All Belt Air Monitored For Methane

## **Skyline Mine Belt Air and Two Entry System**

- **Safety Precautions (continued)**
  - **Communication**
    - **Two Distinct Methods of Communication Are Provided**
  - **No Compressor Stations or Portable Compressors Allowed in Two Entry**
  - **Diesel Equipment**
    - **Call-In Procedure When Entering Two Entry**
    - **Idle Down Notification**
    - **Call-In Procedure When Leaving Two Entry**
    - **Special Protection of Fuel and Hydraulic Systems**
    - **Fire Suppression Systems and Fuel Shut Off**
    - **Diesel Fuel Cannot Be Stored in Two Entry System**





## **Skyline Mine**

### **Belt Air and Two Entry System**

- **Belt Infrastructure Maintenance Is Key**
  - **Isolation of Belt Air with Effective Stoppings**
  - **AMS Monitoring System**
  - **Thorough Pre-Shift and On-Shift Exams of Belts**
  - **Sprinkler Fire Suppression Systems**
  - **Belt Wipers Must Be Maintained**
  - **Cleanup**
  - **Service of Drives, Take-Ups, Head Pulleys and Tail Pulleys**

## **Skyline Mine Belt Air and Two Entry System**

- **Belt Materials**
  - **All Underground Belting Meets MSHA Requirements**
    - **MSHA Schedule 2-G, EM&R, or NCB 158 Flame Test**
    - **DM&R or NCB 158 Drum Friction Test**
    - **NCB 158 Propane Burner Test**
    - **DM&R or NCB 158 Electrical Resistance Test**

## **Skyline Mine Belt Air and Two Entry System**

- **Results at Skyline**
  - **No Reportable Roof Falls In Two Entry Mining**
  - **Mined Four Panels Successfully**
  - **Monitoring System Has Provided Early Warning**
    - **Example:**
      - + **Hot Idler Bearings Have Been Detected**