BEST PRACTICES
Bleeder System Design
Section 75.334(b)(1)

• During pillar recovery a bleeder system shall be used to

- Control the air passing through the area

- Continuously dilute and move methane-air mixtures and other gasses, dusts, and fumes from the worked-out area away from active workings

- And into a return air course or to the surface of the mine
Design Considerations

• Bleeder System Design Considerations
  Include:
  - Ground control issues
  - Life expectancy of the system
  - Airflow distribution
  - Methane drainage
  - Method of evaluation
  - Consideration for future sealing

• MSHA’s Bleeder and Gob Ventilation Systems course in 1996 discussed these
Today’s Bleeder Systems

• Today’s Longwall Bleeder Systems Are Larger
  - Longer Panels
  - Wider Faces
  - Increasing Number of Panels

• Ventilation Requirements Have Changed
  - Higher Pressure Fans
  - Methane Degasification (horizontal and vertical)
  - Increased Rate of Coal Production and Growth of the Pillared Area
Changing Bleeder Systems

• Ventilation Capacities Have Not Always Kept Pace
  - Fewer Bleeder Entries
  - Fewer Gate Entries
  - Support of Airflow Paths

• Resulting in...
  - Changes in Bleeder System Design
  - Travel and Access Issues
  - Evaluation Issues
  - Effectiveness Issues
Performance

Bleeder system performance depends on:

• the ability to provide the necessary airflow through the primary internal flowpaths

• and the ability to effectively distribute the airflow.
Factors Affecting Bleeder System Performance

• Complex Design or Arrangement

- **Unusual Configurations**
  • Intermixed short and long panels, staggers, stair-steps, simultaneous operation of multiple panels on same system
• **Complex Design or Arrangement**

  - **Unusual Configurations**
    - Intermixed short and long panels, staggers, stair-steps, simultaneous operation of multiple panels on same system

  - **Two or More Fans Ventilating the Area**
    - Air is pulled in opposing directions, often resulting in “dead areas” with no airflow and accumulated gases
    - Which way did it go?
What About in This Critical Flowpath?
What About Flow in This Critical Path?
Maybe No Flow At All ??
Factors affecting Bleeder System Performance

• Complex Design or Arrangement

  - **Unusual Configurations**
    • Intermixed short and long panels, staggers, stair-steps, simultaneous operation of multiple panels on same system

  - **Two or More Fans Ventilating the Area**
    • Air is pulled in opposing directions, often resulting in “dead areas” with no airflow and accumulated gases
    • Which way did it go?

  - **Inlets Located Near Outlets**
    • Why? Lack of adequate airflow through the worked-out area?
• **Complex Design or Arrangement**
  
  - **Unusual Configurations**
    - Intermixed short and long panels, staggers, stair-steps, simultaneous operation of multiple panels on same system
  
  - **Two or More Fans Ventilating the Area**
    - Air is pulled in opposing directions, often resulting in "dead areas" with no airflow and accumulated gases
    - Which way did it go?
  
  - **Inlets Located Near Outlets**
    - Why? Lack of adequate airflow through the worked-out area?
Location of Ventilation Controls that Separate the Gob from the Bleeder Entries

No Flow!!

Air Goes Out

Air Goes In

BEP 30

BEP 30B
Did You Really Find Out What You Needed to at BEP 30?

Flow Out Bleeder Connector Did Not Indicate Flow Thru Gob
Factors affecting Bleeder System Performance

• Complex Design or Arrangement

  - Influence of Other Splits on Bleeder Airflow
    • 2 Percent Methane Location
      - Other splits directly enter bleeder split
Factors affecting Bleeder System Performance

• Complex Design or Arrangement

- **Influence of Other Splits on Bleeder Airflow**
  - 2 Percent Methane Location
    - Other splits directly enter bleeder split
    - Other splits adjacent to bleeder airflow
      » Does significant leakage from separate split enter bleeder airflow?
117,000 cfm where the intake split begins

Intake Split Ventilates Bleeder Entry Pumping Station Located In by the Headgate of LW Panel

15,000 cfm intake air where it enters the bleeder split directly

30,000 cfm ventilated out old belt entry

117,000 cfm where the intake split begins
Intake Split Ventilates Bleeder Entry Pumping Station Located Inby the Headgate of LW Panel

180,000 cfm Out of Gob

Total Bleeder Airflow After All the Air that Ventilated Gob Entered Bleeder Entries Was 220,000 cfm

About 70,000 cfm Was Leakage From Intake Split

Total of 290,000 cfm "Bleeder Airflow" at Established 2% Limit Locations

ACTIVE LW PANEL
Factors affecting Bleeder System Performance

• Complex Design or Arrangement

- Influence of Other Splits on Bleeder Airflow
  • 2 Percent Methane Location
    - Other splits directly enter bleeder split
    - Other splits adjacent to bleeder airflow
      » Does significant leakage from separate split enter bleeder airflow?

- “To Ventilate or Not to Ventilate?” – That Is the Question
  • Does most of the bleeder airflow ventilate the “gob” or does it just stay in the bleeder entries?
Stoppings Within Gob Reduce Airflow Through Mined-Out Area

107,000 cfm in Bleeder Entry

13,000 cfm Through TG Side of Mined-Out Area

Less Than 16,000 cfm Through Most of Inby Part of Mined-Out Area
Majority of Airflow Did Not Flow Through Mined-Out Area

Limited Airflow Through Most of Mined-Out Area

Majority of Airflow Did Not Flow Through Mined-Out Area
Factors affecting Bleeder System Performance

- Limited Capacity

  - Size Does Matter
    - Longer panels, wider panels generally mean greater airflow resistance, possibly more contaminants
Some Short LW Panels

Much Longer LW Panels

Probably Have Very Different Ventilation Requirements
Factors affecting Bleeder System Performance

• Limited Capacity

  - **Size Does Matter**
    • Longer panels, wider panels generally mean greater airflow resistance, possibly more contaminants

  - **Ahh ... Just One More !**
    • How many times has the longwall district been extended “this one last” panel?
One Large Bleeder System
Was Reported to Incorporate a Bleeder Shaft and Fan, **But ...**

Just One More Panel
Air Quantity in Bleeder Entries Nearly Constant

Solid Stoppings Isolate Worked-out Area from Bleeder Entries
Is Large Portion of Worked-out Area Ventilated at All?
Typical Indicators

• Limited Capacity
  - You Mean Actually Travel the Bleeder Entries?
    • Are they traveled in their entirety? - Why Not?
What Do You Know About the System Performance If You Just go to the Surface of the Bleeder Fan?
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What Do You Know About the System Performance If You Just go to the Surface of the Bleeder Fan?
Travel of Bleeder Entries
Actually Found Deep Water Accumulations, Roof Falls, Unexpected Airflow Direction In Bleeder Entries, Unknown “Split Points”, Airflow Too Low to Measure….
Typical Indicators

• **Oxygen Deficiency**

The Existence of Oxygen Deficiency Itself Is Not Indicative of an Ineffective Bleeder System ........

......... But Oxygen Deficiency that Prevents Continued Evaluation of the Bleeder System Does Indicate the Bleeder System Has Exceeded Its Capacity........

......... System Should be Sealed.
Active LW
What Can You Evaluate If You Don't Travel These Bleeder Entries ????

Focus of Evaluation
Typical Indicators

- **Oxygen Deficiency**

  Effective Bleeder Systems Provide Sufficient Airflow to Enable Safe Access to Necessary Examination Locations

  Lack of Access May Result in an Inability to Determine Bleeder System Effectiveness
Typical Indicators

- **Limited Capacity**

- **Traveling the Bleeder Entries**
  - Are they traveled in their entirety? - Why Not?
  - Is supplemental roof support installed?
    - All bleeder entries?
    - Is it adequate?
    - Are there roof falls blocking access or restricting airflow?
  - Are bleeder connectors accessible?
Deteriorating Roof Conditions

Affecting Accessibility to Examination Locations
Typical Indicators

• Limited Capacity

- Traveling the Bleeder Entries
  • Are they traveled in their entirety? – Why Not?
  • Is supplemental roof support installed?
    - All bleeder entries?
    - Is it adequate?
    - Are there roof falls blocking access or restricting airflow?
  • Are bleeder connectors accessible?
  • Are there water accumulations?
Factors affecting Bleeder System Performance

• Limited Capacity
  - More than One Bleeder Entry?
    • Is the airflow velocity in the bleeder entries high?
      - Is most of the pressure consumed in a single bleeder entry?
      - Is there any reserve capacity should methane liberation exceed expected amounts?

• One way in – one way out?
Roof Fall
Bad Top
Roof Falls
Single Intersections
Single Entry
Roof Fall
EXPOSURE?
Sustained Access?
Continued Performance?
Factors affecting Bleeder System Performance

• **Limited Capacity**

  - **Timber Where?**
    - Do the primary internal airflow paths conduct airflow?
    - Is supplemental roof support installed?
      - Is it adequate?
      - Are there roof falls restricting airflow?
Internal Primary Airflow Paths In the Gob

Floor to Roof Supports Installed to Protect Airflow Path – Designed With Long Term Intent

Important Internal Airflow Paths That Allow for Dilution and Removal of Gases
Single Roof Fall in Critical Internal Path

Drastically Affected Flow Through Gob

Resulted in Decreased Dilution of Gob Gases

Roof Falls

No Standing Roof Supports

Imported Internal Airflow Paths That Allow for Dilution and Removal of Gases

High Resistances

Limited Capacity

- Timber Where?
- Do the primary internal airflow paths conduct airflow?
- Is supplemental roof support installed?
  - Is it adequate?
  - Are there roof falls restricting airflow?
Factors affecting Bleeder System Performance

• Limited Capacity

  - Timber Where?
    • Do the primary internal airflow paths conduct airflow?
    • Is supplemental roof support installed?
      – Is it adequate?
      – Are there roof falls restricting airflow?
    • Are there water accumulations?
May Contribute to High Resistance of Primary Airflow Paths
Approximated Coal Contours

Possible Swags

Drastically Impeded Airflow

Water Accumulations

May Contribute to High Resistance of Primary Airflow Paths
Inlets from Intakes

• Low Pressure Differentials
  - Possibly Susceptible to Inadvertent Changes
    • One reported example
A Check Curtain with 0.07” in the Headgate Regulated this Airflow

The Air in the Track Entry in the Mains was Supplied by Intake Air Entering the 8D Panel
A Condition of the Check Curtain with 0.07” in the Headgate Could Change the Airflow and Pressure in the Track Entry on the Section and in the Mains

This Check Curtain Would be Routinely Removed to Bring Supplies to the Longwall Face
Small Pressure Differentials and Low Airflow Could Allow Contaminants from the Gob to Enter the Track Entry
BEST PRACTICES
Bleeder System Design