



Eastern Longwall Bleeder Systems

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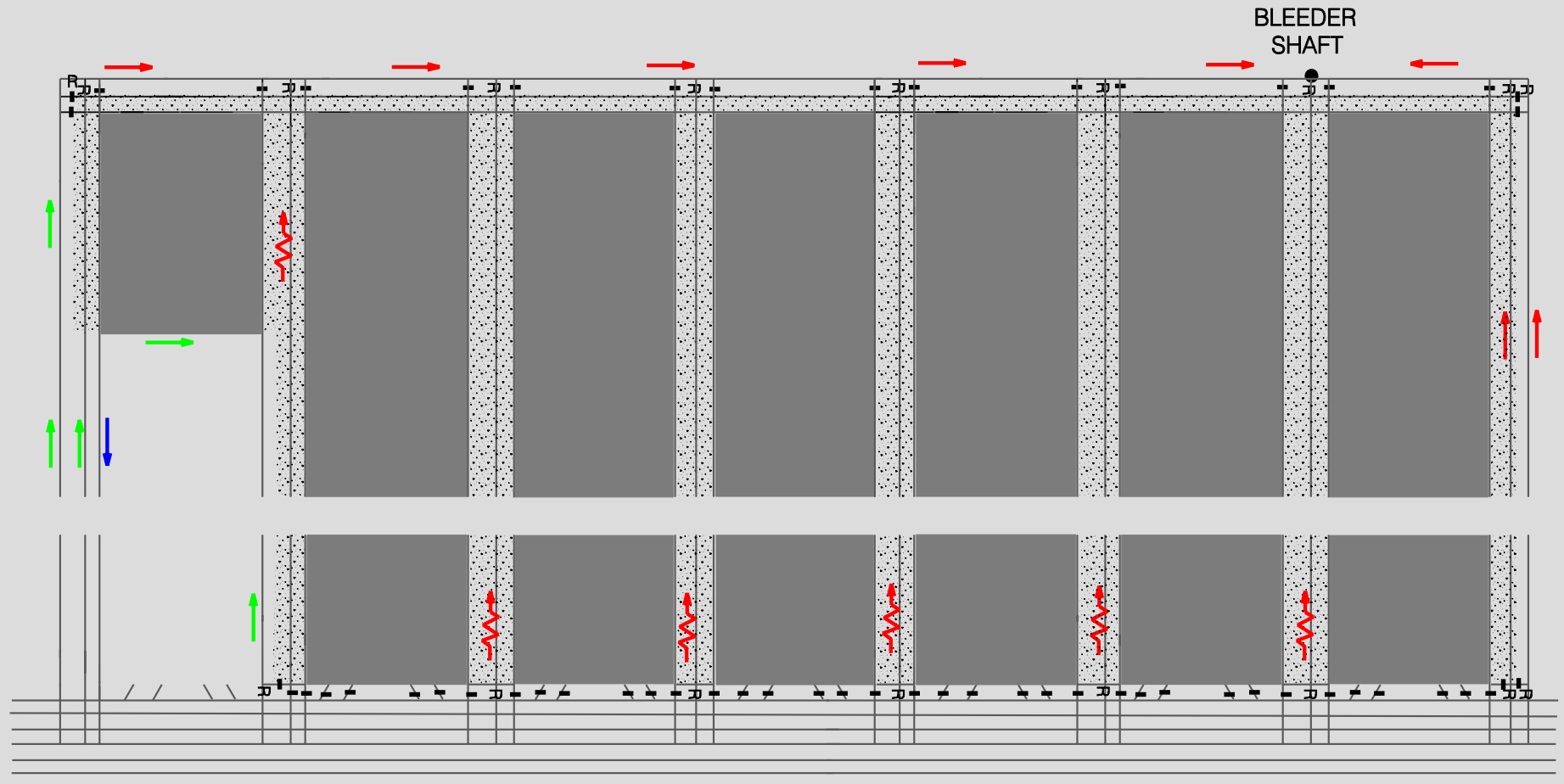
Eastern Longwall Operations

- **28 Eastern longwall mines producing from 500K to 11 million tons**
- **31 operating longwalls**
- **3-Entry gates mainly utilized for development**
- **4-Entry gates used for deeper gassier mines**
- **3 or 4-Entries driven on the set-up utilizing one or two as dedicated bleeder entries**

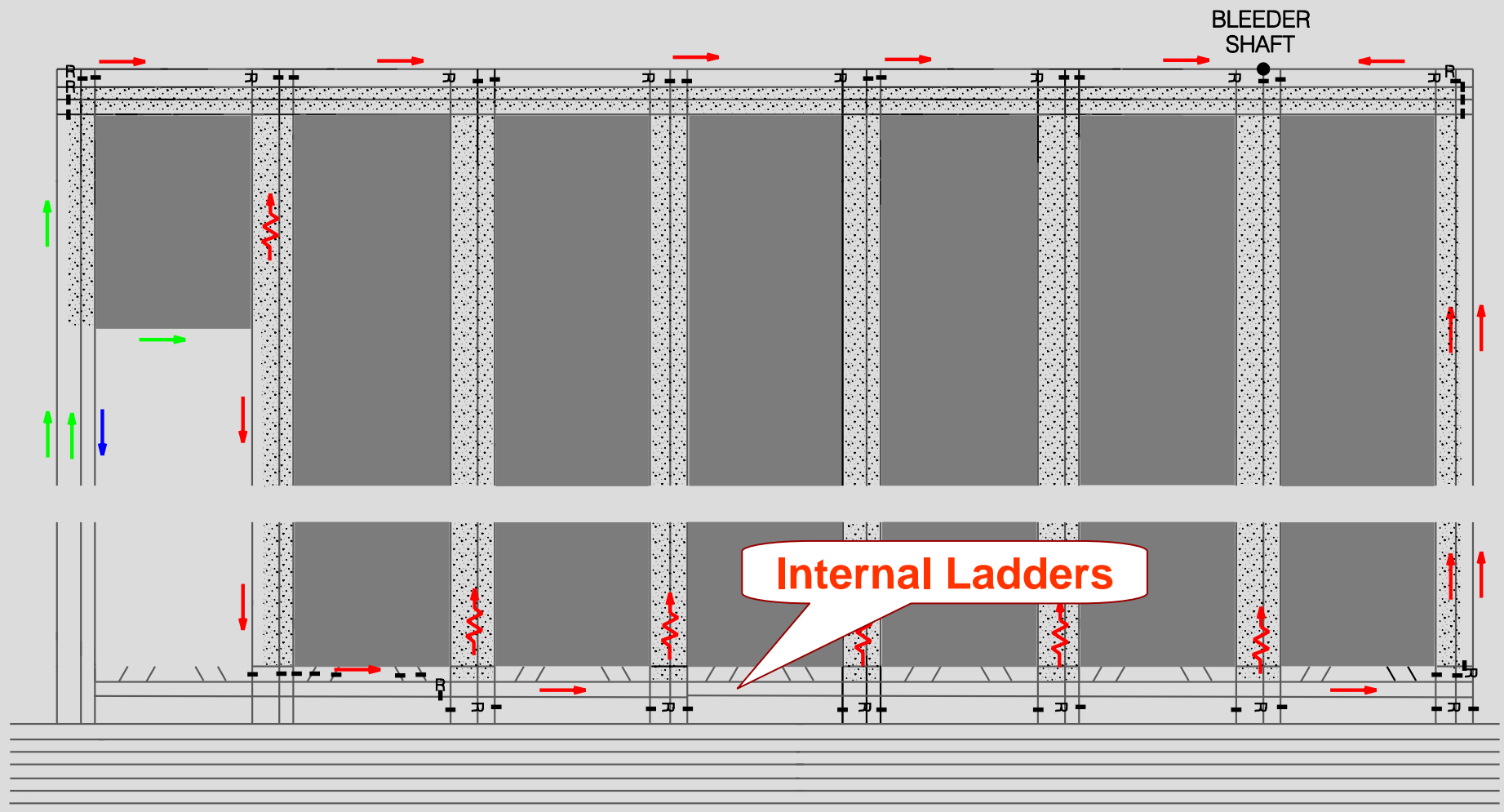
Bleeder System Design and Operation

- **Bleeder systems serve a twofold purpose:**
 - **Continuously dilute and move methane-air mixtures away from the active sections.**
 - **Relieve the expansion gas contaminants due to atmospheric pressure drops, directing them away from the active longwall section.**
- **Eastern longwall mines primarily use the flow-through bleeder system.**



Flow-Through Bleeder Method



Flow-Through with Internal Ladder



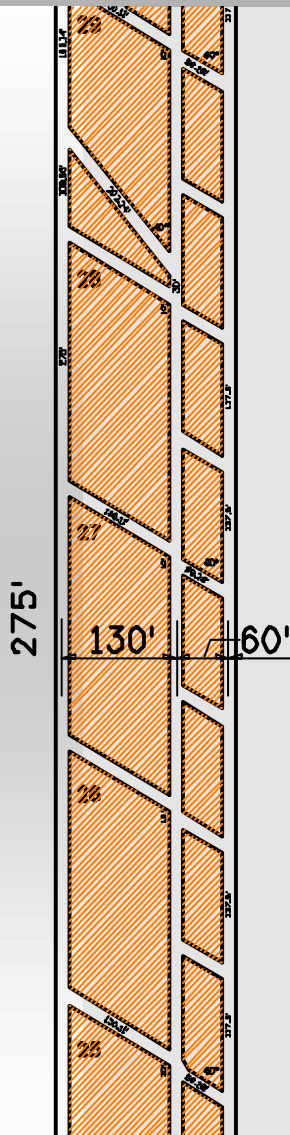
Longwall Mining Operational Changes

- **Advances in equipment design, automation technology & improved operating procedures**
- **Results**  **Enhanced Safety**
 **Higher Productivity**
- **Not coincidence or a trial-and-error approach**
- **Based on sound engineering design with cooperation of MSHA**

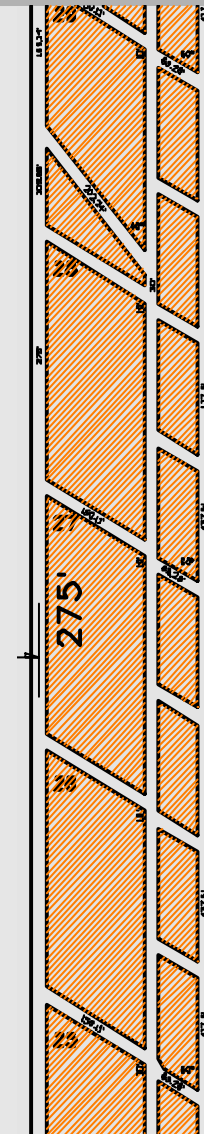
Improved Panel Geometry

- **Increased Face Widths:**
 - 500' → 700' → 900' → 1100'
 - Extended up to 1450'
- **Extended Panel Lengths:**
 - 6,000' → 10,000' → 12,000'
 - Extended up to 14,500'
- **Accomplished using engineering principles**
- **Enhanced safety with less miner exposure during longwall recovery operations**

Optimized Panel Development



- **Central & Northern App. mines use 3-entry gates**
- **Southern Appalachian gassy mines use 4-entry gates**
- **Enhanced miner's safety by reducing exposure to roof & rib hazards**
- **Improved ventilation : longer blocks and fewer crosscuts decreases leakage**



Ventilation Changes

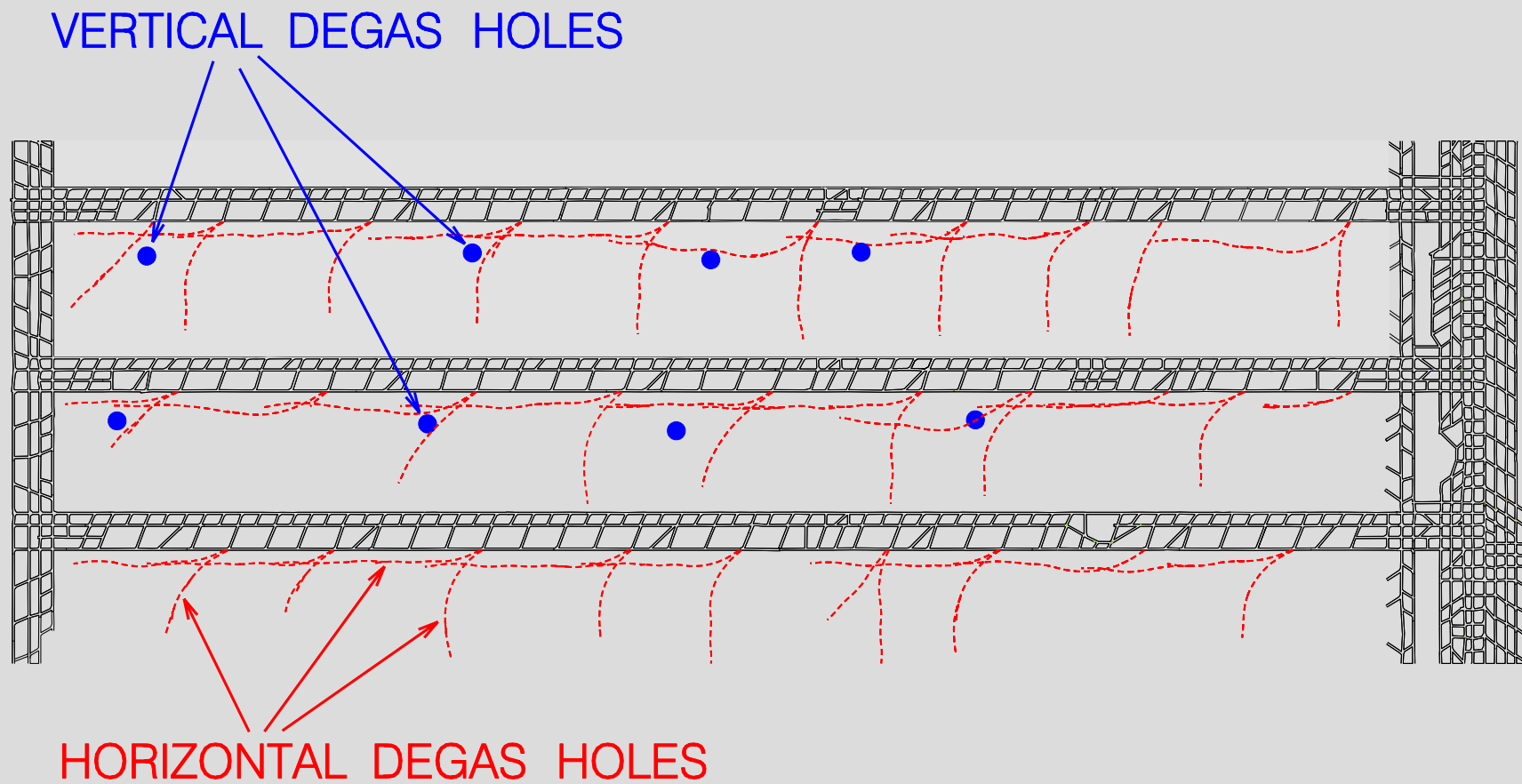
- **Typical air quantities increased 150 to 200%**
- **Fewer wrap-around bleeder systems**
- **Increased capacity of flow-through systems**
 - **Larger diameter shafts**
 - **Greater capacity and higher pressure fans**
 - **Increased fan motor horsepower**
 - **Improved bleeder and tailgate support**

Methane Extraction Systems

- **Used on as needed basis**
- **Supplement the mine's bleeder system**
- **Use vertical frac, horizontal in-seam and vertical gob holes**
- **Vertical frac holes used for gassy, deep, low-permeability coal seams**

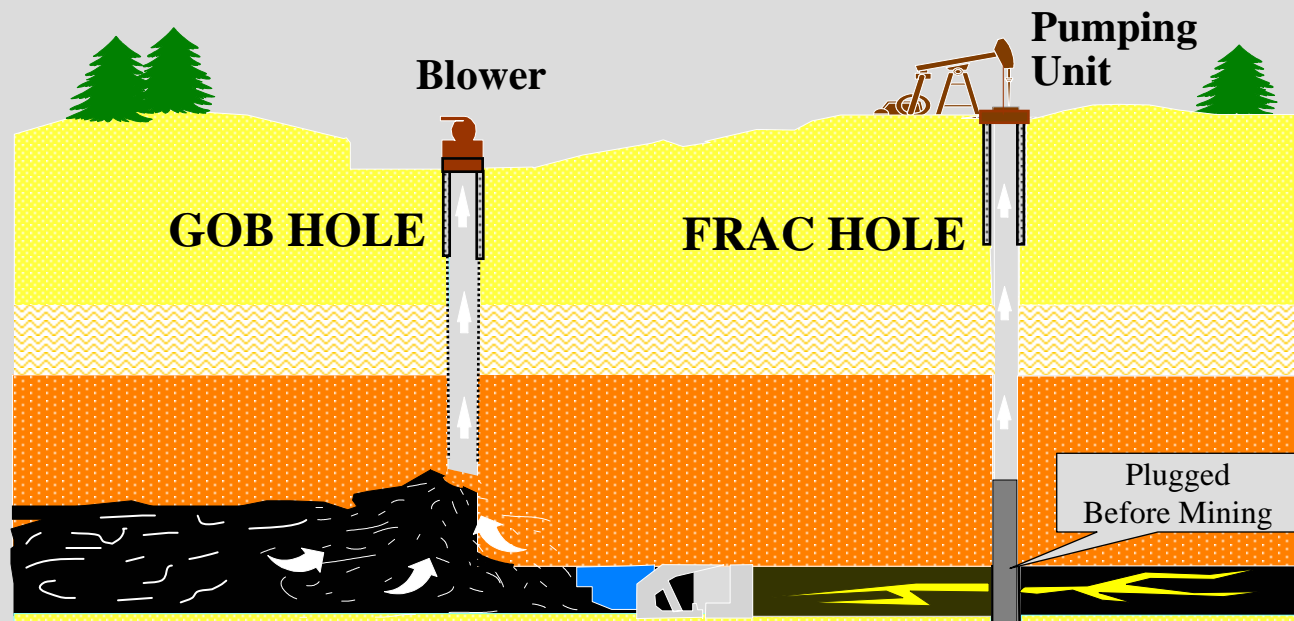


Horizontal & Gob Hole Layout

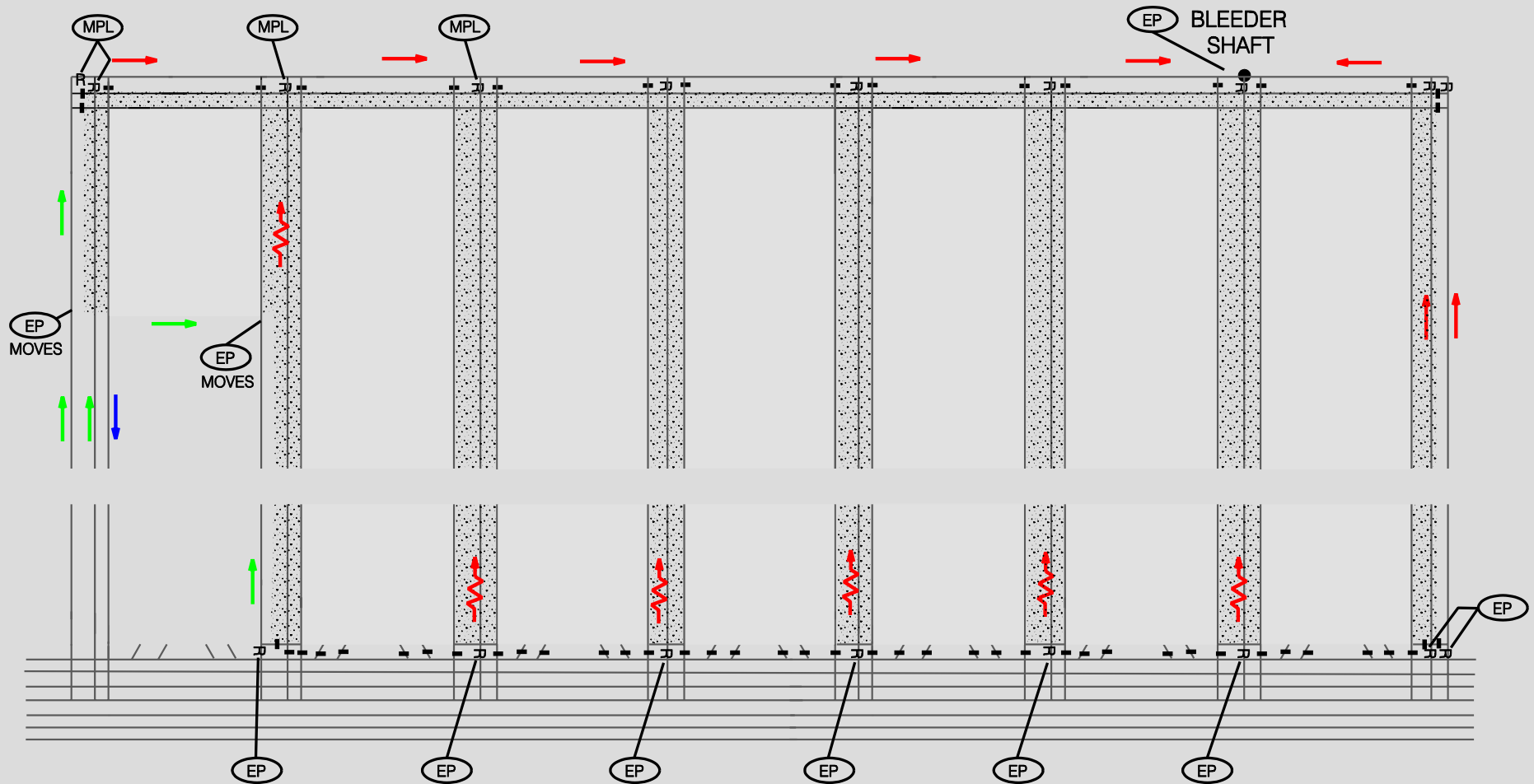


Vertical Methane Extraction Techniques

- **Vertical gob holes help control methane in bleeder system**
- **Gob hole efficiency is improved by use of blowers and/or compressors**



Bleeder System Evaluation



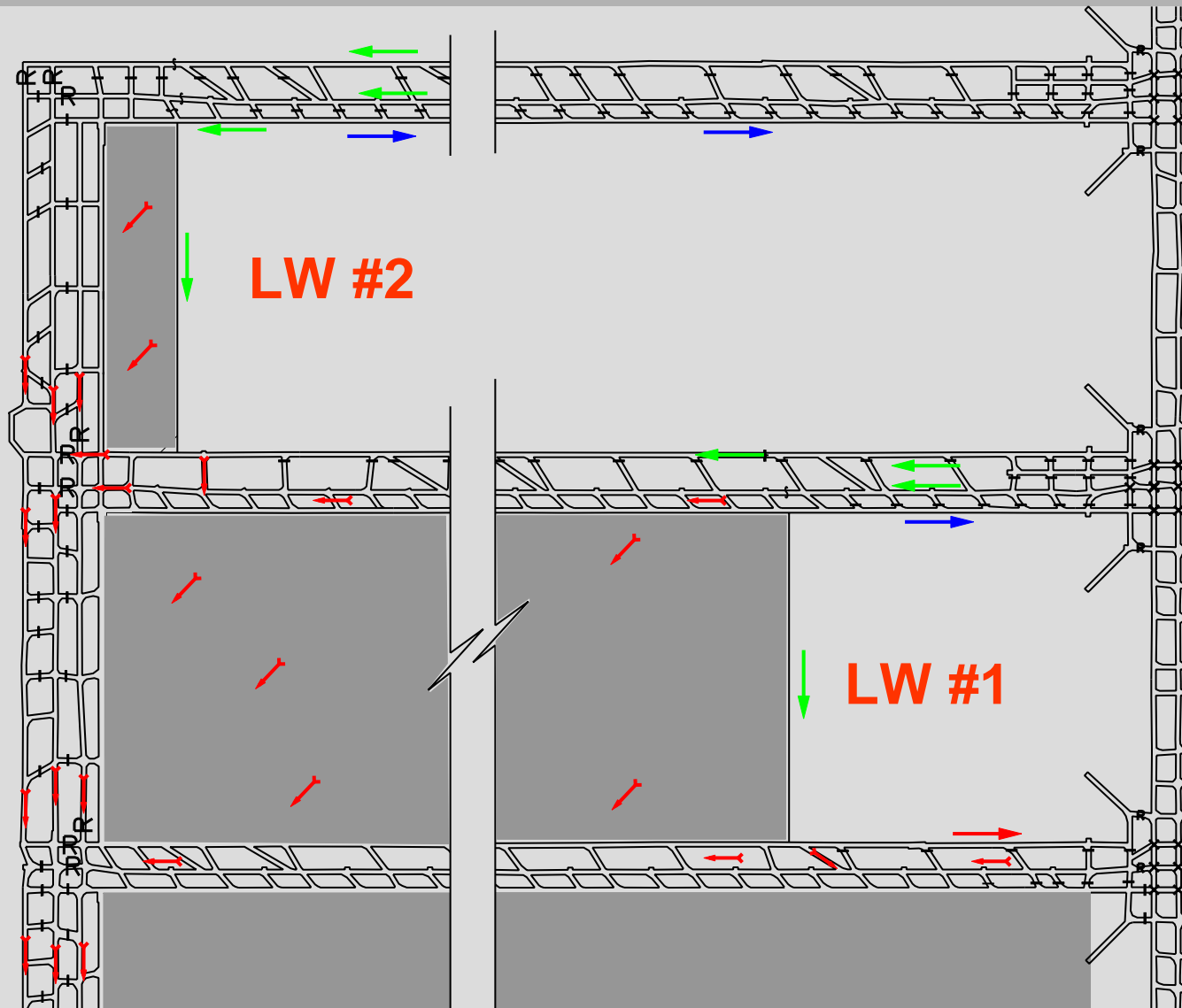
Single Bleeder Fan Districts

Mine	No.	Acres	Width	Length
A	18	4,500	880'-1086'	9000'
B	14	3,180	735'-985'	8,750'
C	10	3,030	980'	11,500'
D	13	2,900	985'	10,000'
E	9	2,880	1050'	12,400'
F	14	2,570	730' – 980'	10,050'
G	9	2,360	990'	10,000'

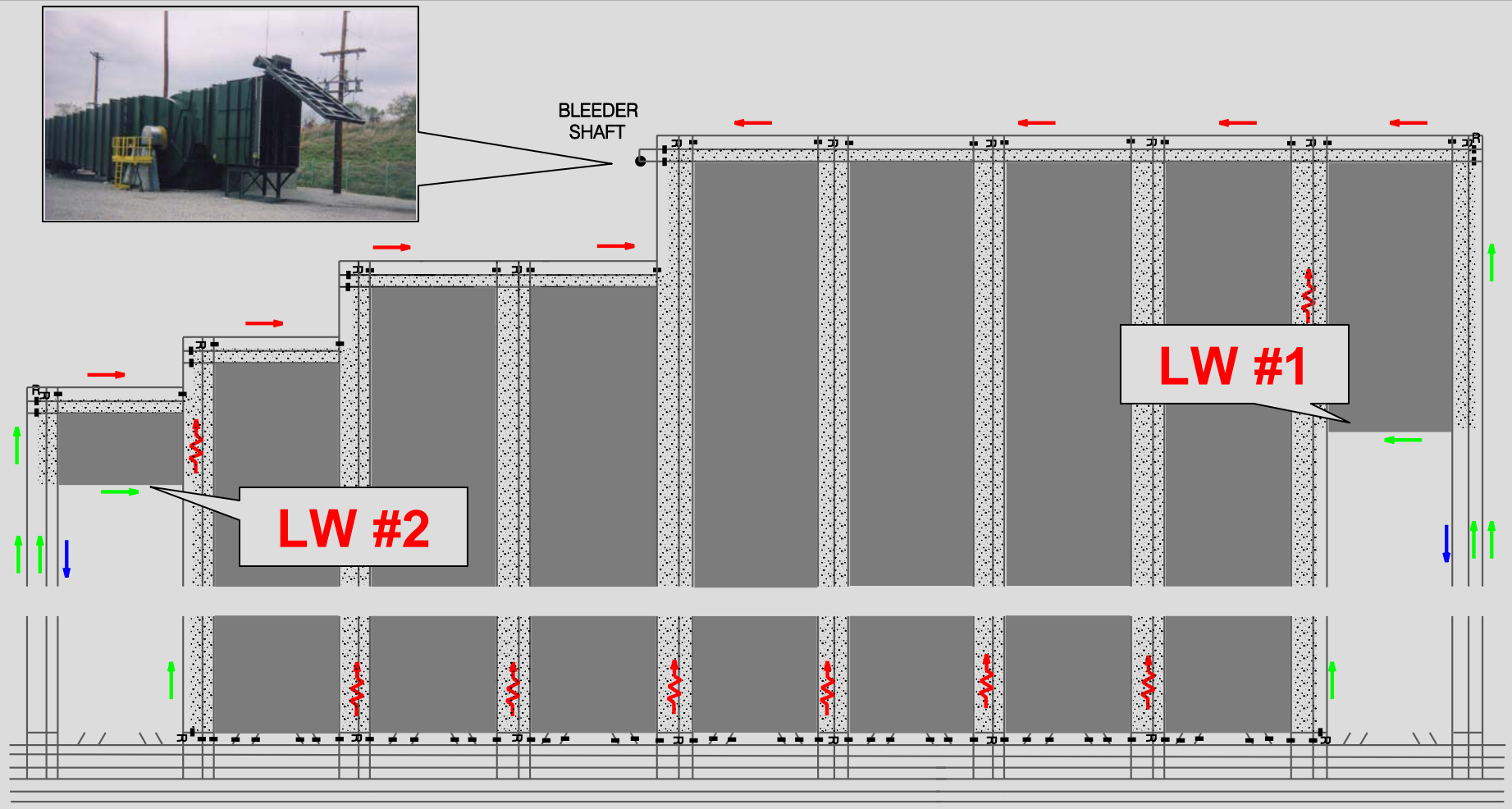
Multiple Fan Bleeder Districts

Mine	No.	Acres	Width	Length
A	23	6,070	735' – 1086'	9,700'
B	20	5,830	985' – 1086'	10,600'
C	20	3,620	585' – 735'	8,000'
D	17	3,500	735' – 985'	9,000'
E	10	3,050	800'	10,000'
F	11	2,800	742' – 1050'	9,500'
G	10	2,190	1,080'	4,300'-8,650'

Two Longwalls in Adjacent Panels



Two Longwalls in the Same District



Major Issues

- **Prescriptive bleeder system requirements rather than performance based.**
- **Regular examinations of areas considered to be Gob.**
- **Arbitrary limits on number of panels in a district.**

Looking Forward

- **Tailor systems to site-specific conditions**
- **Learn from large flow-through bleeder systems**
- **Better utilize available industry wide technical & field expertise**
- **Form joint panels to study proposed regulatory directives**



**Ventilation Summit
National Mine Health and Safety
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