A Review of the Requirements for the Testing of the Strength of Ventilation Structures to be Used in Queensland Mines.

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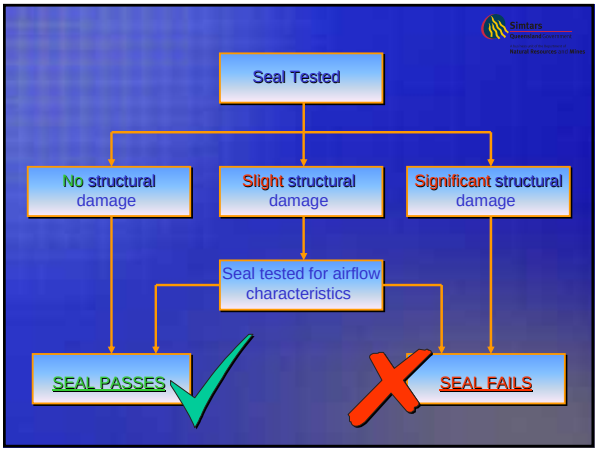
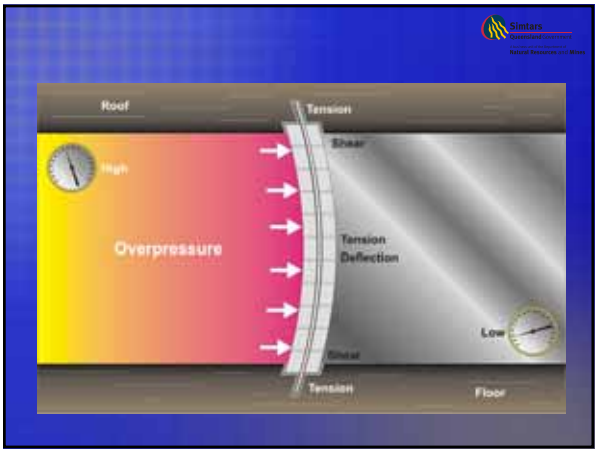
Reasons for the work

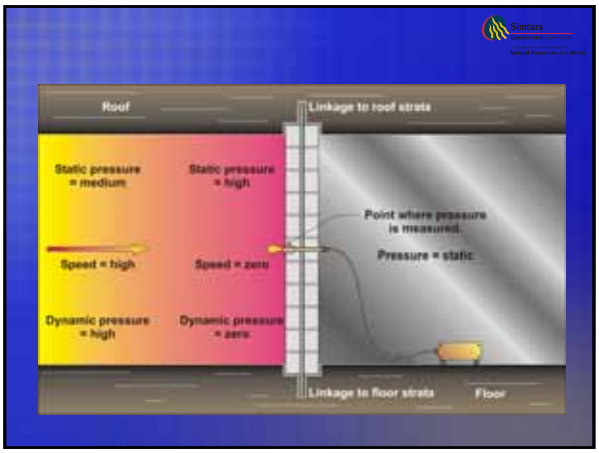
- High cost for testing overseas
- Standard replaced by specifications in regulations
- Standard did not make provision for ventilation devices
- New and cheaper testing methods becoming available.

Queensland Ventilation Structure Strength Criteria.

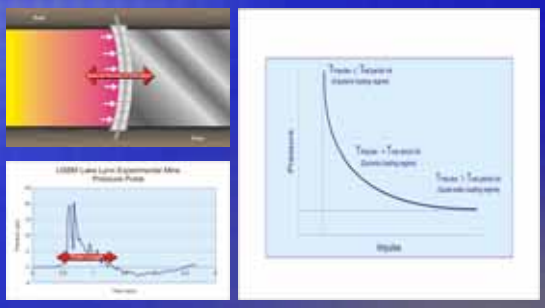
Design Criteria	Location
Type A (2psi) 14kPa	Limited Life Production Panels
Type B (5psi) 35kPa	Main Roadways
Type C (20psi) 140kPa	Sealed Areas
Type D (50psi) 345kPa	Sealed Areas in the event of explosive conditions.
Type E Pressure Relief (10psi) 70kPa	Surface Infrastructure







The effect of pulse length

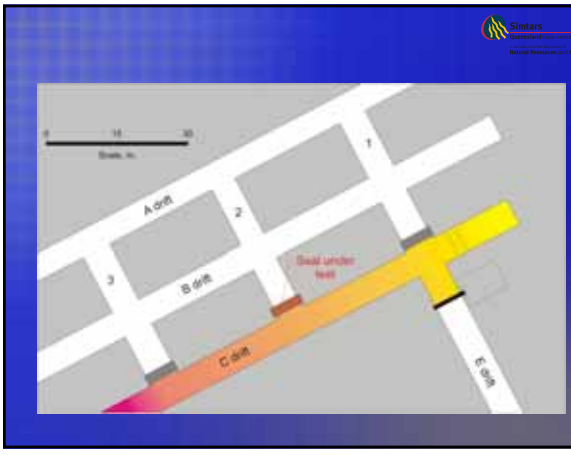


Issues surrounding the pressure pulse.

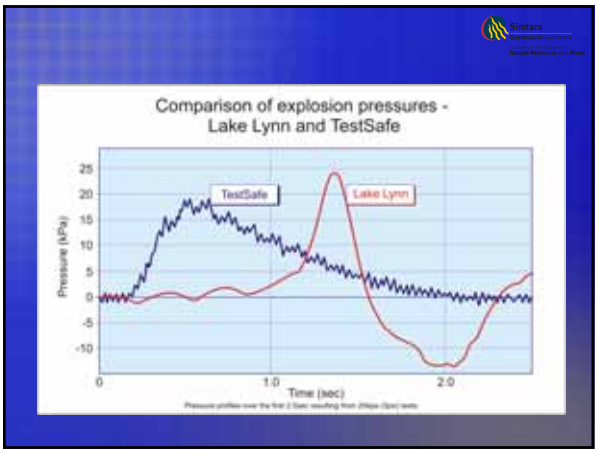
- The specifications are given in terms of "Overpressure"
- The explosion is altered to suit the required pressure
- The pulse length has an influence on the load exerted
- The static pressure is measured.

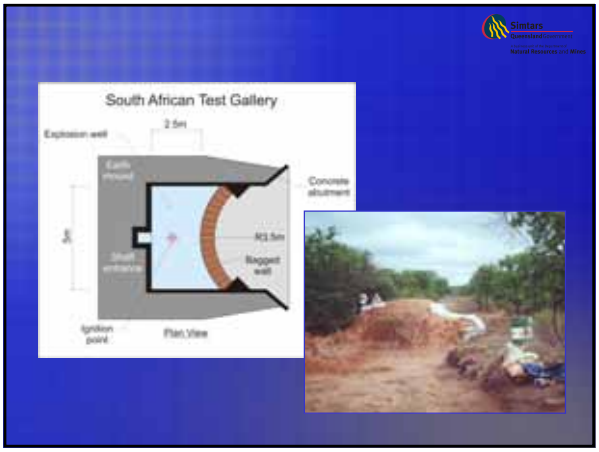
The progression of testing methods.

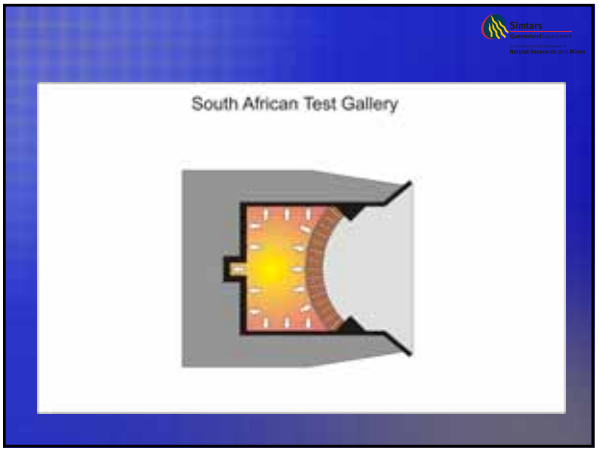
- Traditional or "as conducted in an internationally accepted test gallery"
- Non traditional but used more lately

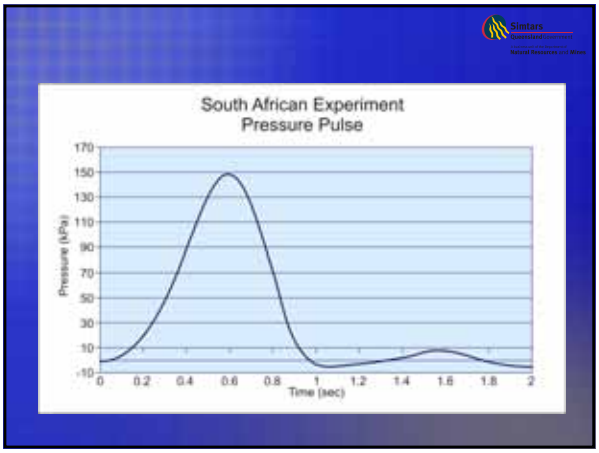



A drift
B drift
C drift
E drift
Seal under test
Double Brattice
Diagram of Seal Test Area in the LLEM - test seals set close to C drift.

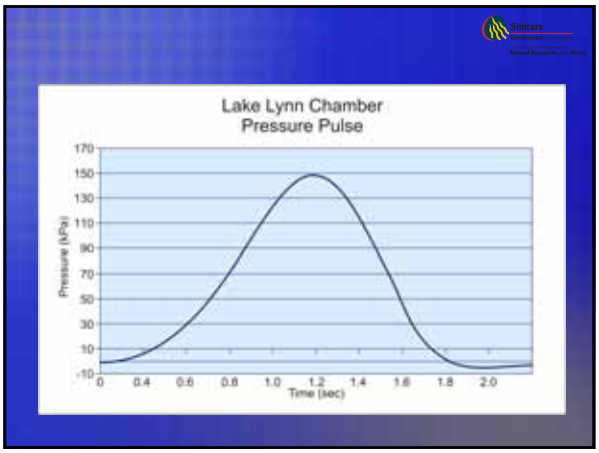

Comparison of explosion pressures - Lake Lynn and TestSafe
TestSafe
Lake Lynn
Pressure (kPa)
Time (sec)

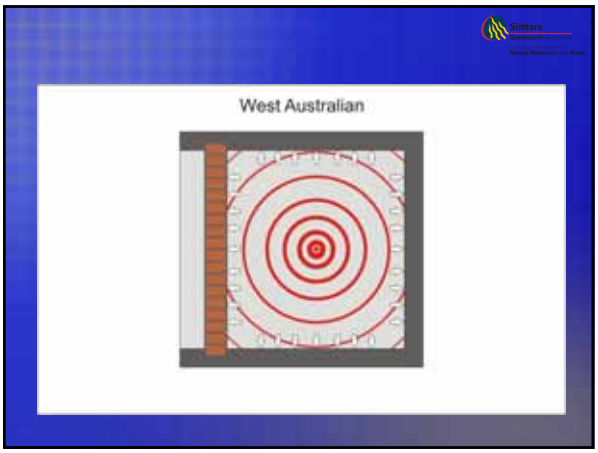

South African Test Gallery
Explosion well
2.5m
Concrete abutment
R3.5m
Ignition point
Plan View

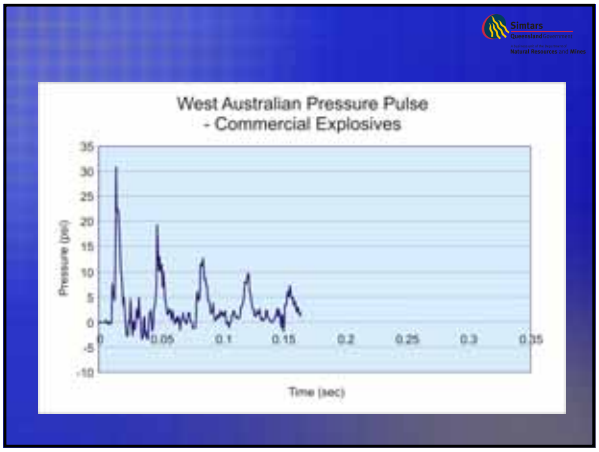

South African Test Gallery


South African Experiment
Pressure Pulse
Pressure (kPa)
Time (sec)


Lake Lynn Test Gallery
Test Seal

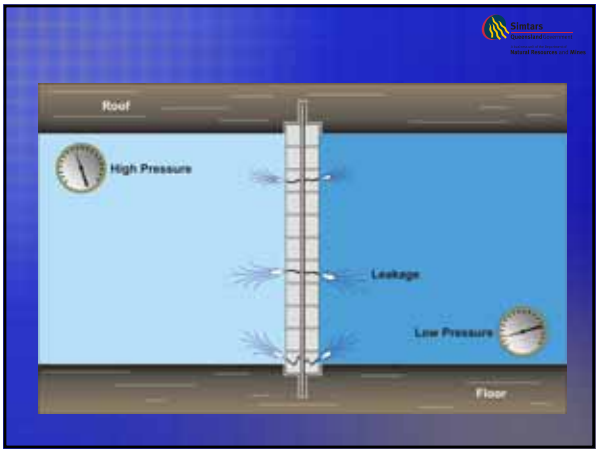






Conclusion regarding overpressure

- Sufficient proof to use alternative methods.
- Can use in –situ or special galleries.
- Can use different types of explosions.
- Can obtain pressure pulses and test results at significantly reduced costs.

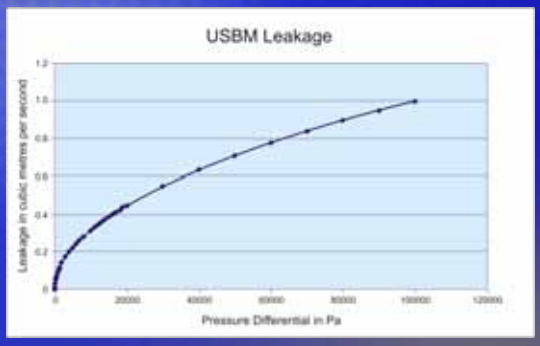


Leakage rates

- Seals – to ensure no egress of air and serve as measure of integrity
- Stopping and cross-overs – to provide ventilation after an incident.

Leakage represented as:

- A hole
- A resistance
- A pressure airflow / relationship



New Standard for Ventilation Devices.

- Lower standard required to maintain ventilation flow.
- Based on getting fresh air to workers in a 3000m panel with 50 m^3/ sec air.
- Using resistance as indicator of leakage.
  50% residual airflow in last through road
- Simulated and validated using simulations.

Derivation of leakage criteria

- Simulation – cannot do in reality
- 3km panel- cut-through at 100m
- Determined the resistance to enable air to reach a worker walking upwind within 30 minutes (600m)
- Added factor of safety
- Derived the resistance / hole size / pressure airflow relationships
- Validated using real mine models.

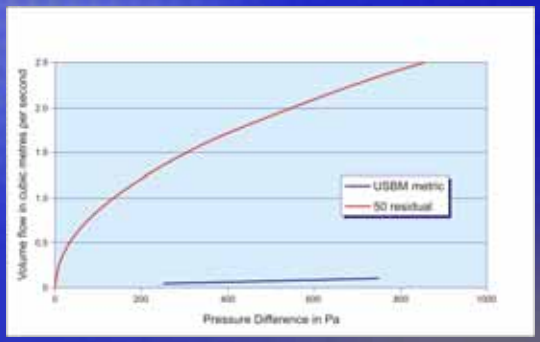
Comparison

- USBM
- Resistance. 10,000 Ns^2/M^8
- Holes size - Matchbox

- New leakage for VCDs
- 135 Ns^2/M^8 vs
- Holes size - A4 paper.

Pressure Airflow relationship.

Comparison Between USBM Leakage Rates and QLD Leakage Rates for Ventilation Devices.



Findings on future tests in Australia

- Local Galleries can be used to do tests
- Pulse length longer than 100ms
- Explosive gases or commercial explosives can be used.
- Availability of portable measuring equipment can allow flexibility.
- Adapted leakage rates will satisfy intent and be practical.

Acknowledgements

- ACARP
- Simtars
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- Blastronics
- NIOSH