CHAMBER OF MINES
of South Africa

LEARNING FOR GOOD LEDGING PRACTICE

André van Zyl – MOSH FOG Adoption Team Manager
Day of Learning for Good Ledging Practice
Kloof Mine Recreation Club
27 October 2015

Background to this Presentation

- Following a number of Fatalities in Ledging areas it was felt that the Safety Risk in Ledging Operations had increased

- Request from CEO Elimination of Fatalities working group for MOSH FOG Leading Practice Adoption Team to include “Ledging” in their scope when identifying possible Leading Practices for Adoption by the Industry

This Presentation

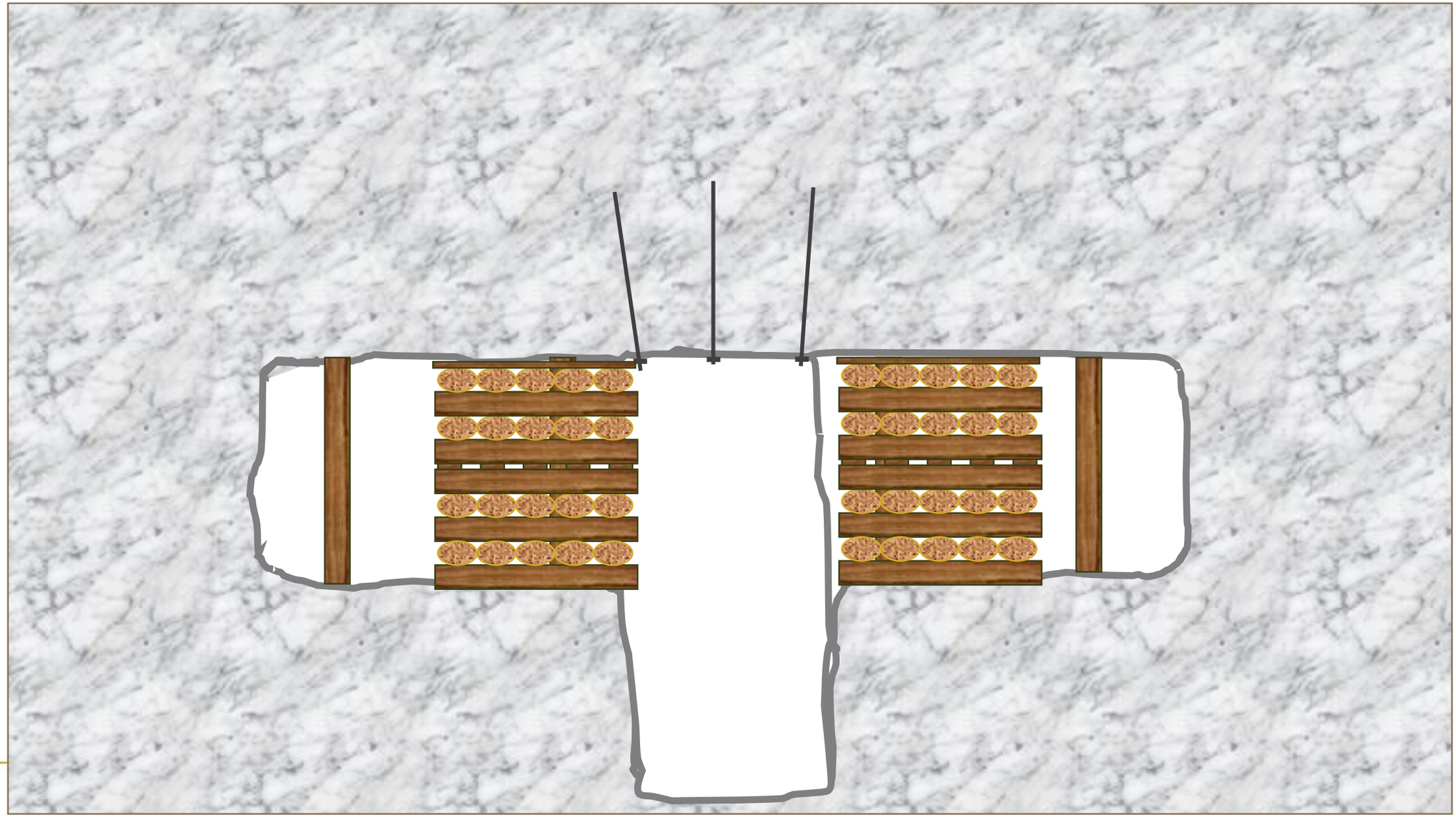
- We will look at primarily
  - stoping vs. ledging fatality statistics,
  - the methodology followed,
  - influencing factors and
  - the way forward

- Generally the risk exposure was normalised to square metres of hanging wall exposed

Process Followed

- MOSH FOG Industry Adoption Team Involvement
- Data gathering from (7) “Conventional Stoping” mines which engage in Ledging Activities
- Interviews with Management
- Analysis of Data
- Outcomes as per presentation

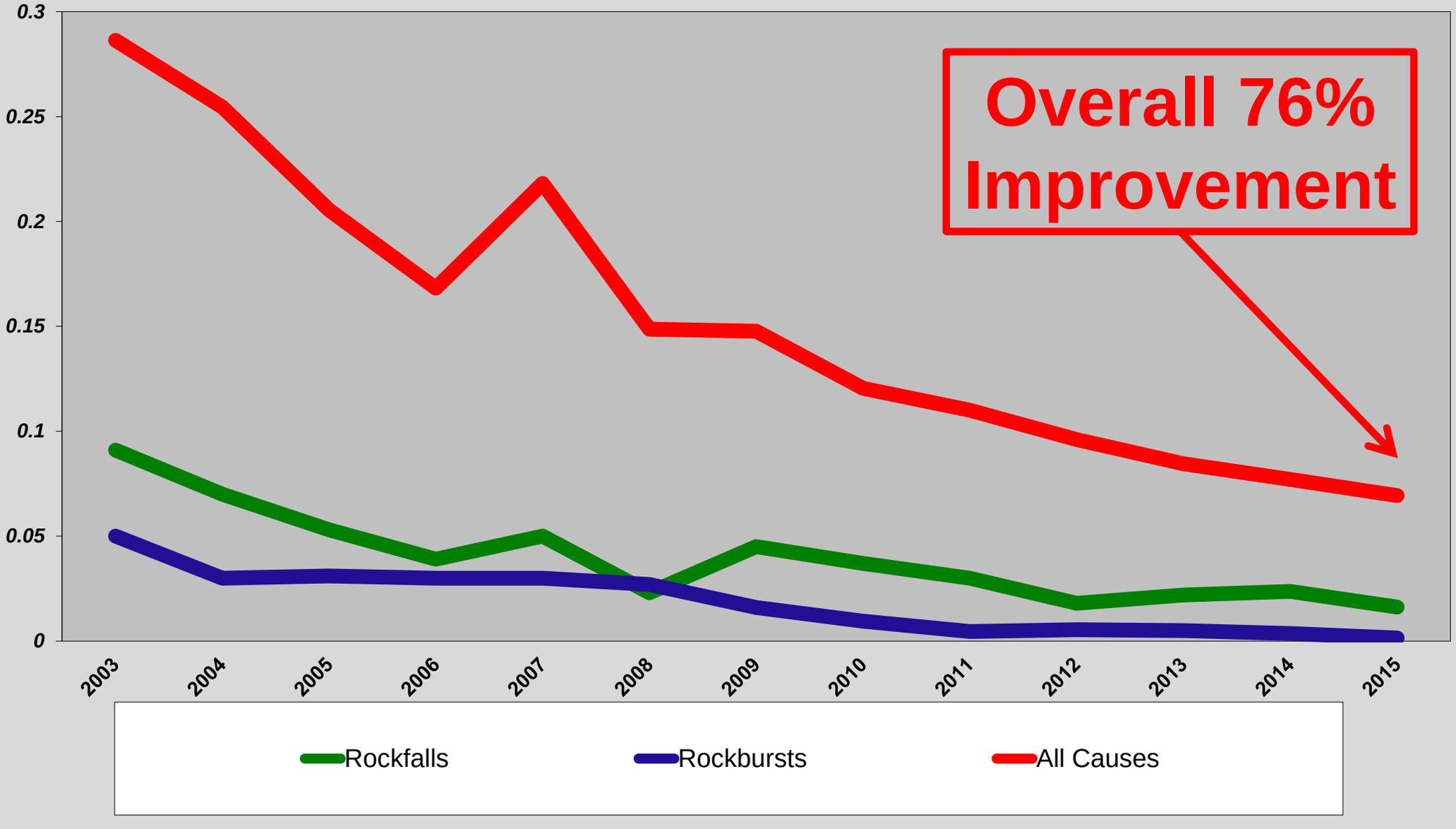
Ledging ------



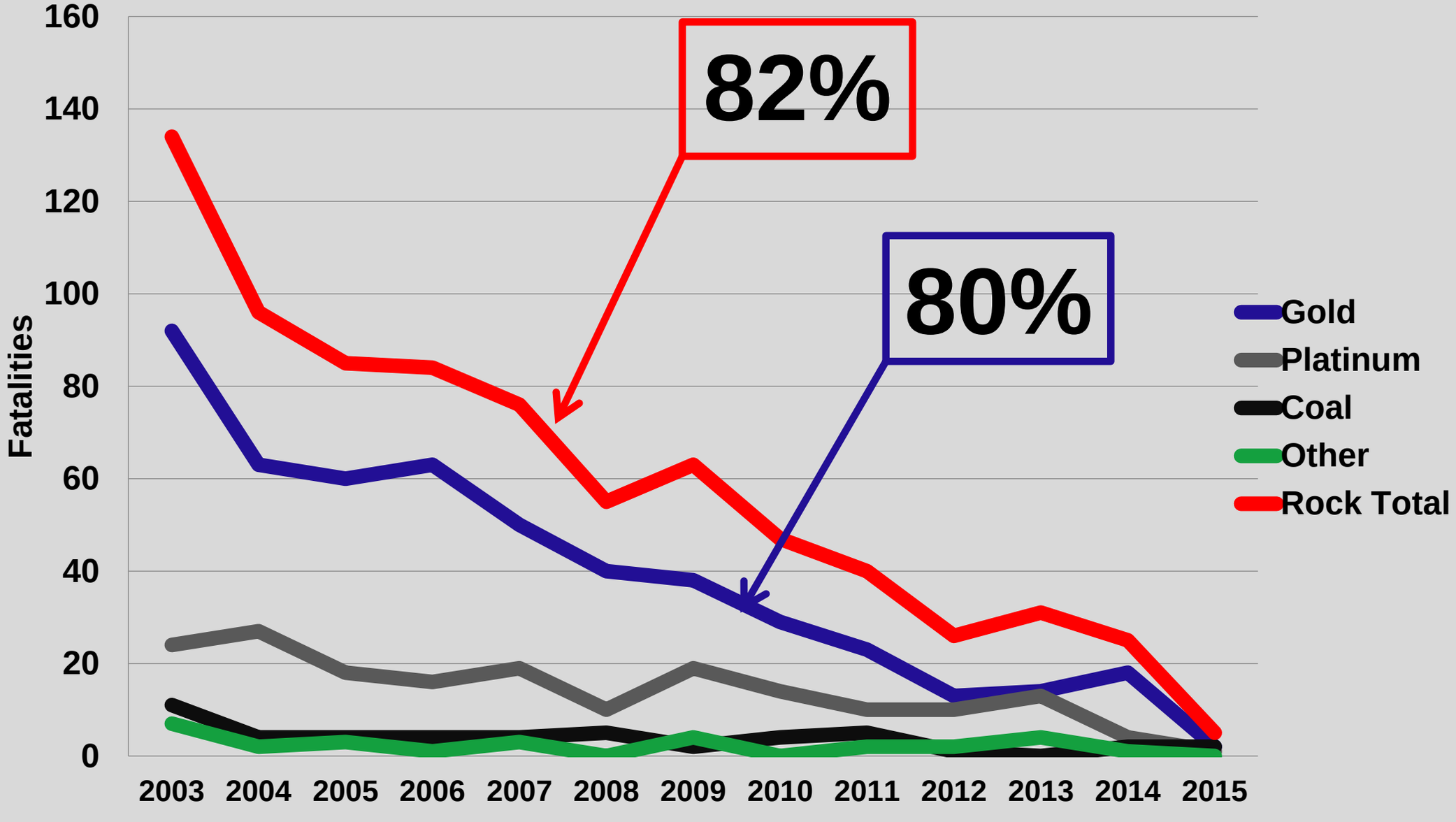
Observations

- Ledging should be a safe process – if we do the right stuff correctly.
- Some pockets of excellence do exist
  - Clear responsibilities and accountabilities before and during Ledging
  - Good integrated planning processes
  - Setting up of raises for efficient ledging and stoping to follow etc.
  - There are companies who ledge safely
- The quality of the Ledge dictates the efficiency of the Stope

Fatality rate in all South Africa mines 2003 to 2015 (11 August)



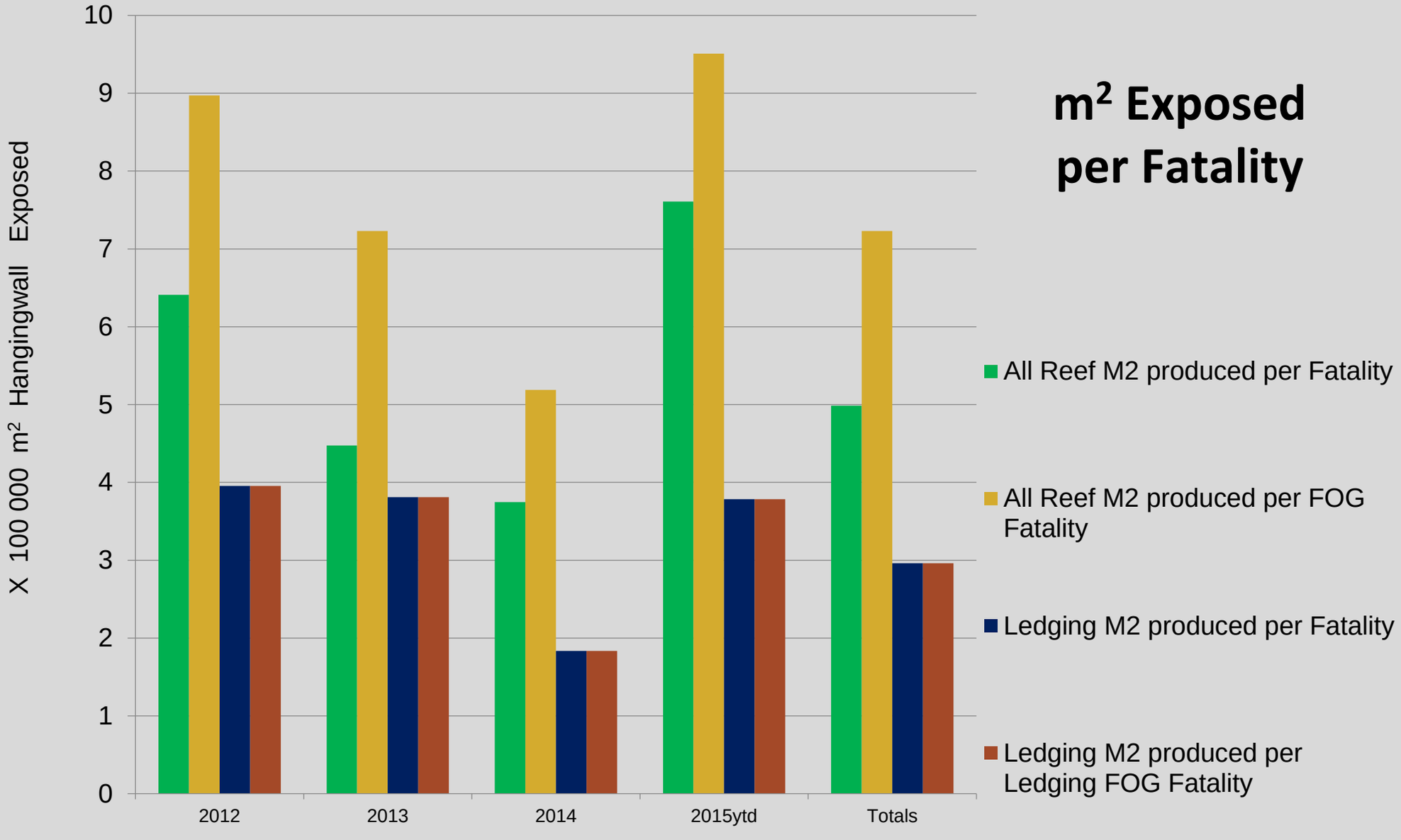
Rock Related Fatalities 2003 – 2015 (11 August)
Sectors and Total



Ledging Risk (7 Mines)

2012 to 2015 (1st Qtr)	
Reef Horizon Fatalities	59
Reef Horizon FOG Fatalities	41
Ledging Fatalities	10
Ledging FOG Fatalities	10
Reef Horizon Serious Injuries*	741
Reef Horizon Serious FOG Injuries*	430
Ledging Serious Injuries*	39
Ledging Serious FOG Injuries*	15

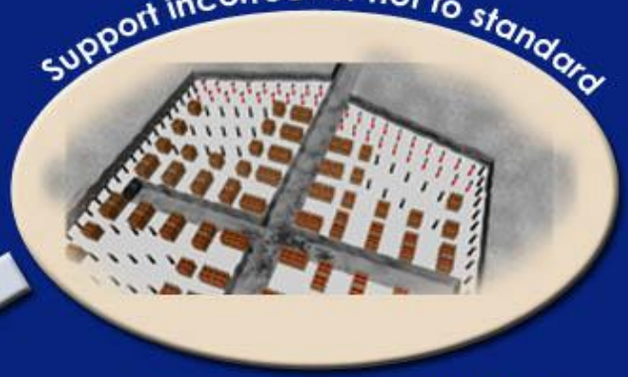
Ledging Risk



Contributing Factors

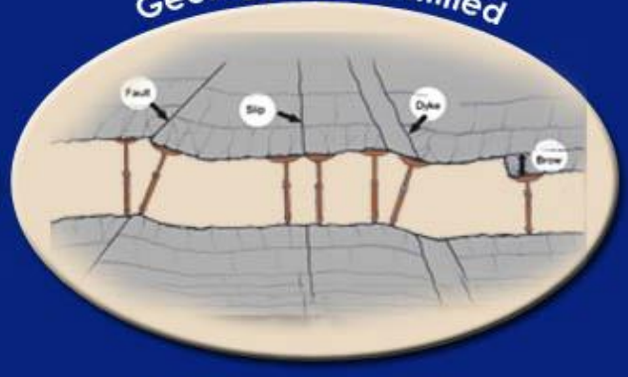
Not barred or made safe

Support incorrect or not to standard

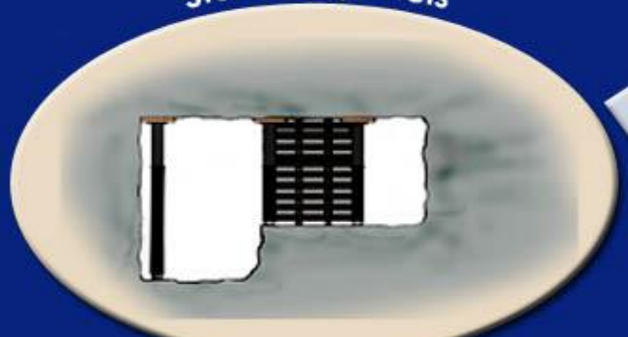


Not conforming to mining geometry

Geology not identified



Standing panels



Poor drilling & blasting practices

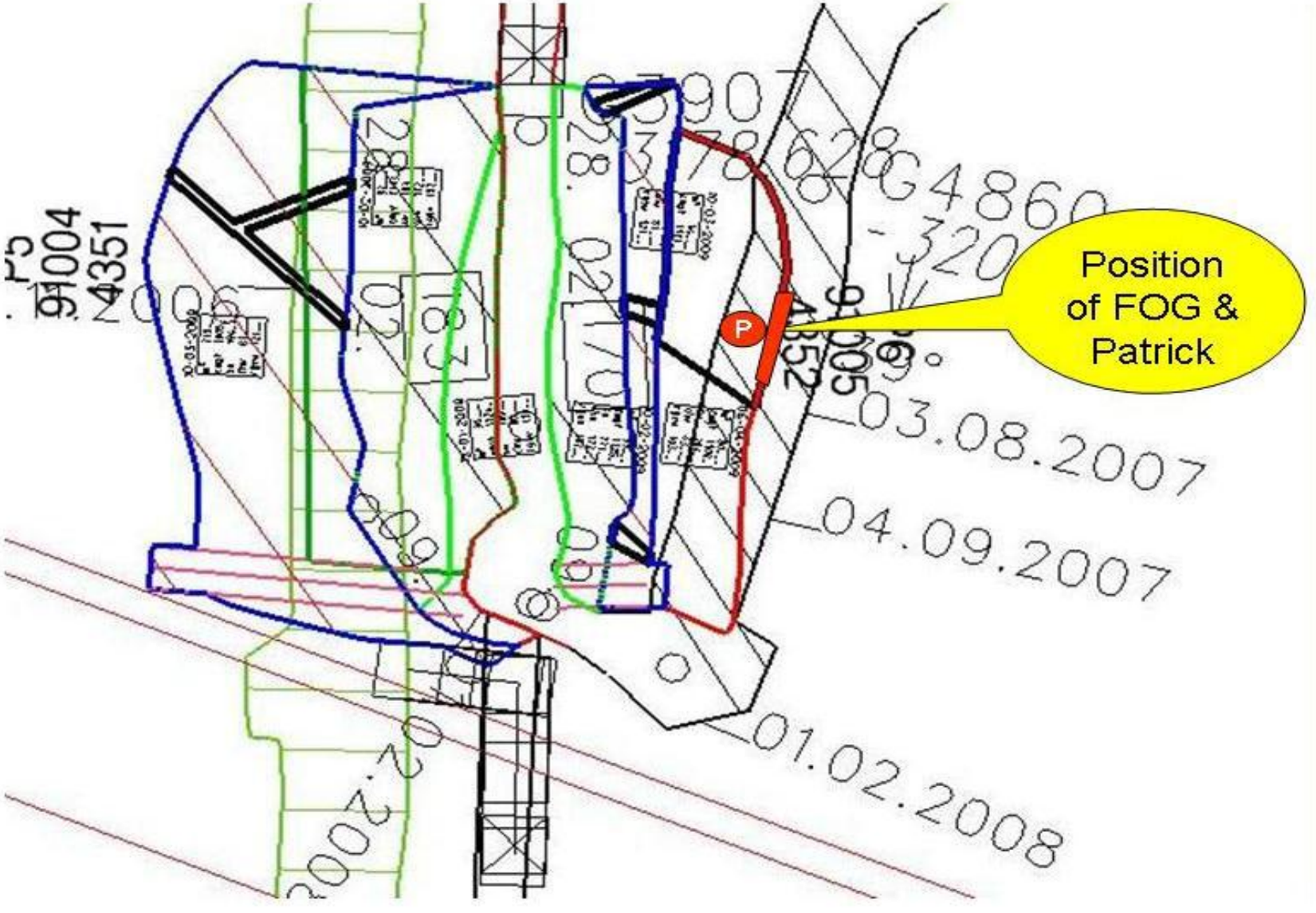
Contributing Factors – Ledging Incidents

Disregard for Standards and Rules	85%
Not barred or made safe	46%
Support incorrect or not to Standard	38%
Not conforming to Mining Geometry	23%
Standing Panels	23%
Geology not Identified	15%
Poor Drilling and Blasting Practices	15%

Contributing Factors – Ledging Incidents

“Condoning” deviations from Standards and Rules	85%
Not barred or made safe	46%
Support incorrect or not to Standard	38%
Not conforming to Mining Geometry	23%
Standing Panels	23%
Geology not Identified	15%
Poor Drilling and Blasting Practices	15%

Ledging Discipline.....



Ledging Discipline

Ledging Discipline.....

Investigation

A: Prevent Excess damage

List all design or compliance to design failures. Need to consider mining span, regional pillar dimension, bracket pillar dimension, sequencing, approach angles, preconditioning, face length, face shape, volume mined, gully dimensions, advance knowledge of geology. For development consider proximity to geological structure, abutments, and changes in strata, changes in stress, size and shape of excavation.

Failure to adhere to Ledging Procedure as per XXXXXXX Mine Standard 7.1

Was there a special instruction for this working place?

Yes

What was the special instruction? - Refer Document XXX-12-295

Was the special instruction/s complied with? No

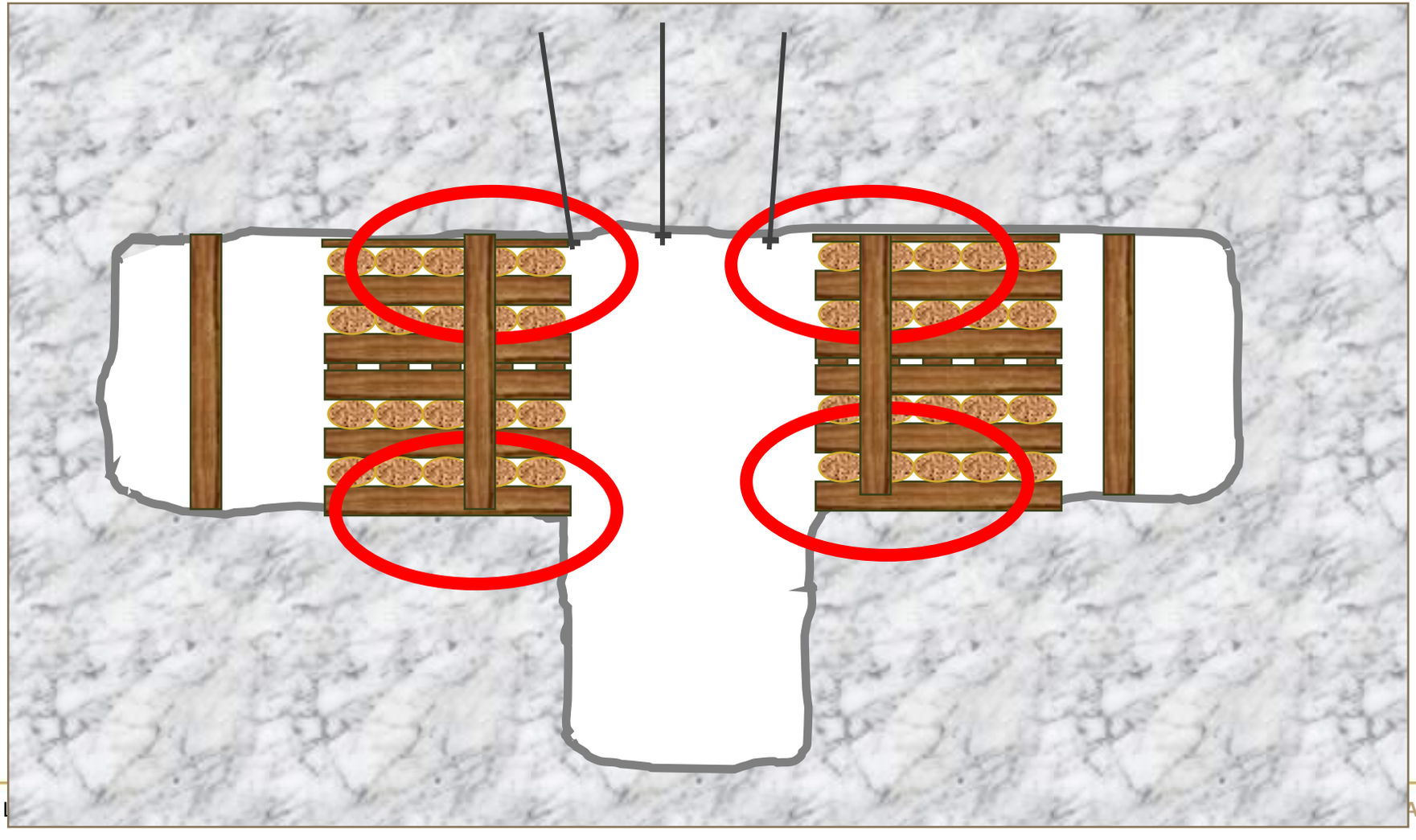
Number of design failures 0

Number compliance failures 1

How long did the panel/end stand, between blasts? (Days) None

Our Aim:

Maintain Hanging wall Integrity throughout
Maintain a sound Ledge for effective Support
Keep the Stoping Aorta alive and well for the life of the Stope

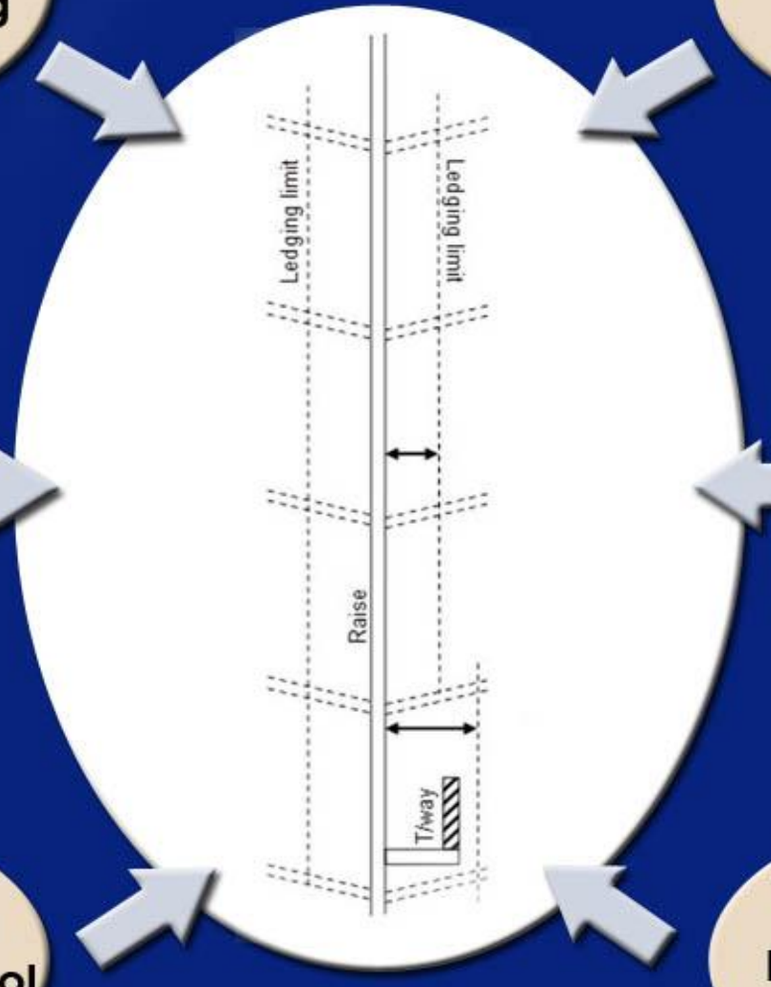


Pre Ledge Process

Good Minerals Resource Planning

Pre-Ledging inspection and Assessment

Project Plan Production Manager takes Control



Micro Planning for 7 Means of Flow

Men, Ventilation, Material , Compressed Air, Water, Electricity, Broken Rock

Good Layout and Development Control

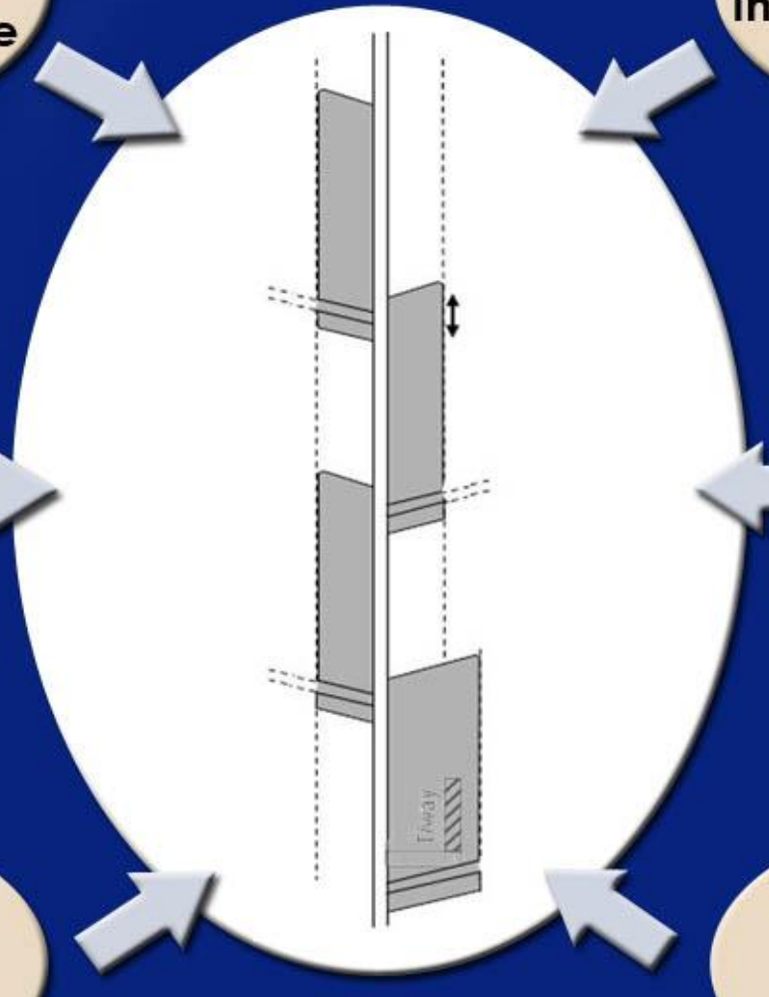
Setting up for Effective Ledging Process

Ledging Process

Sign off Pre-ledging Construction and Set-up Programme

Initial Reef Cut and Initial Ledge Support

Detailed Planning with Ledger and Ledging Team



Sign off Programme on each Critical Ledging Step

Pre-First Cut Inspection and Assessment

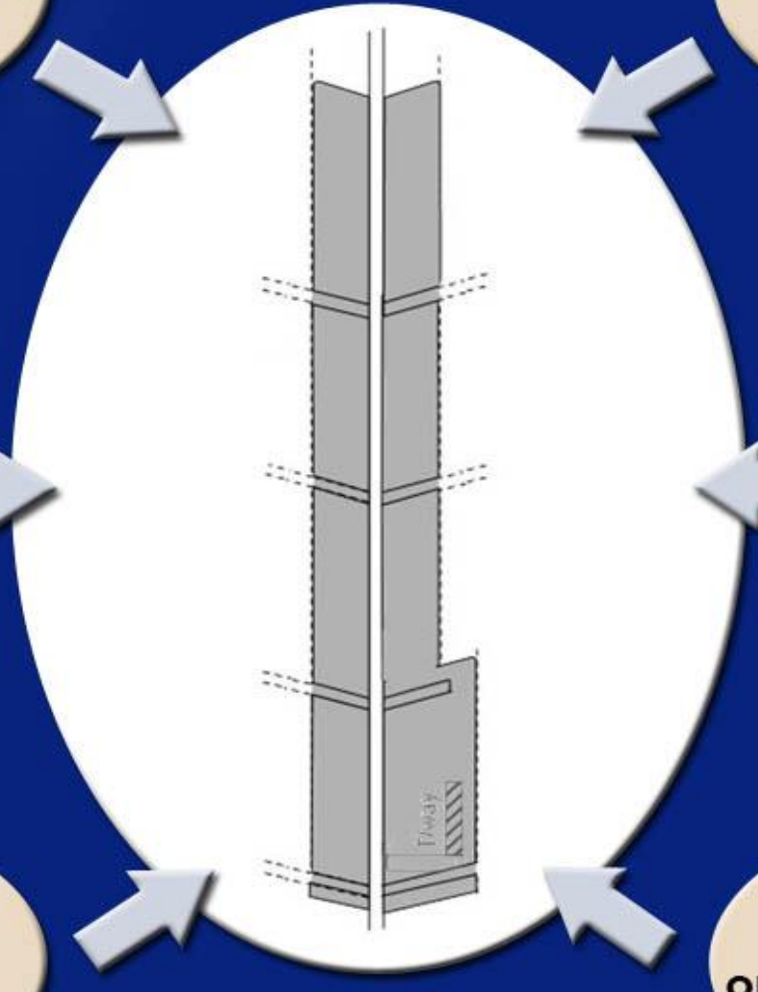
Critical Controls and Evaluations Programme

Post Ledge Process

Pre-Footwall Excavation Inspection and Evaluation

Ensure Resting Panel Support

Critical Sign off on Gully, Winch etc. excavations



Ensure Starting up Stope Panel Precautions

Pre Equipping Inspection and Assessment

Critical Sign off on Equipping Stages

Influences

- Causes of Ledging Accidents not really different to those of Stoping Accidents, however some factors relate:
  - Poor development of raises (especially damage to hanging wall, off line and over break)
  - Disorganisation of Services during Ledging
  - Unskilled “Ledging Crews” – (Do you know what your function is?)
  - Dynamic changing environment – stoping has a rhythm
  - Resting faces increase the FOG risk, especially at depth
  - Differing Bonus payments have differing outcomes etc.

Influences – Unique to Ledging….

- Lack of proper cleaning facilities often lead to “maak n plan” resulting in support removal or damage etc.
- Accumulations of Stof cause difficulties for installation of support
- Installation and re-installation of especially pack support for gullies
- Non adherence to “Ledging Limits” and mining blue-print requirements
- Lack of preparation for ledging operations, Development, time coordination, ore transport, ventilation, services etc.
- Lack of complete standards

Considerations

- Good Planning processes, starting from good development and Involved Pre-Ledging Assessments to good **control** systems
- Enhanced **controls** to ensure good mining discipline and coordination of mining sequences
- Set up “Professional Ledgers” and crews
- Ledging is a “Set-up” phase and not an Easy Production Phase.
- Look at setting up a complete but uncomplicated “Good Ledging Practice”

Considerations

- Consider “Resting Panel Support” standards for waiting ledged panels
- Good **Leadership** Practices for ensuring compliance
- Look at inclusion of a Value case for a good leading practice
- No substitute for good Geological Information up front!
- Fixed responsibilities, accountabilities and “consequences” for especially control failures.

Way Forward

- Active participation in the Day of Learning
- Identify possible Leading Practice(s) for Industry Wide Adoption
  - i.e. Not only change a process or methodology, but how to engineer the enhance human interventions.....
- Support by Industry for Learning Hub Interventions to follow
- Produce Guide on Good Ledging Practice (Booklet)
- Learning Hub is available as facilitation tool for learning and roll-out of Adoption Programmes

For more information contact the Chamber of Mines

LEARNING HUB

at

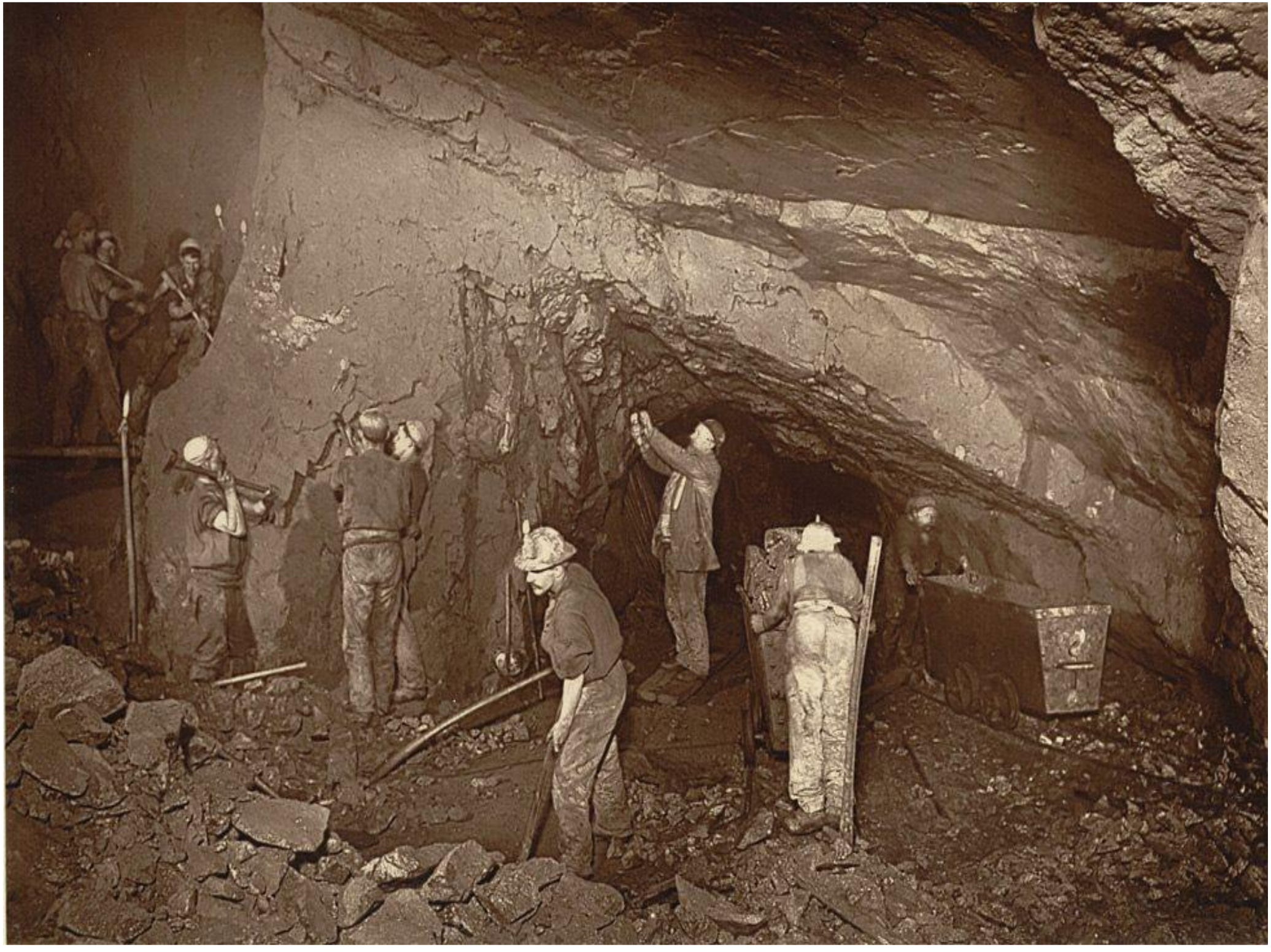
011 498 7100

FOG Team Andre van Zyl
anvanzyl@vodamail.co.za

FOG Team Duncan Adams
Duncanjohn.a@gmail.com

FOG Team Christopher Legodi
CLegodi@chamberofmines.org.z

Head of the Learning Hub
Stanford Malatji
SMalatji@chamberofmines.org.za



CHAMBER OF MINES
of South Africa

ANY QUESTIONS?