

**Research and Development  
of  
Yield-Lok Bolt (Patent Pending)**

# Contents

- Industry requirement for yielding support
- Yield-Lok(patent pending) product overview
- Laboratory tests results
- Features and benefits



# Rockburst

One of the greatest challenges to ground control strategies

- A dynamic failure of rock mass
- Collapse of stopes and drifts
- Unpredictable time, location and scale
- More serious with increasing depth

# A Case of Rockburst



# Rockburst Prone Mines in Canada

- Vale INCO
- Xstrata nickel, copper and zinc
- Goldcorp – Red Lake Gold Mines
- Kirkland Lake Gold Mines
- Mattagami Mine



# Rockburst Prone Mines Globally

- Gold mines in South Africa
- Metal mines in Australia
- Coal mines in Poland, China and others
- Civil engineering projects



# Ground control in dynamic condition

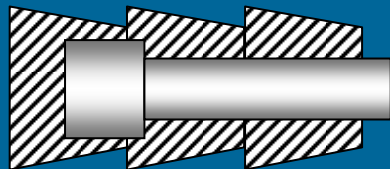
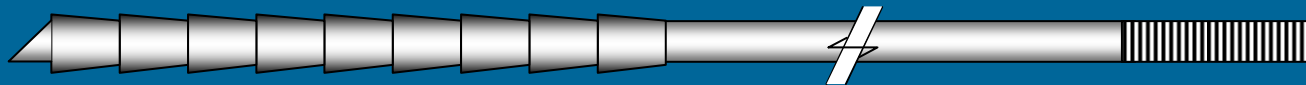
## General Principle

To transfer dynamic energy of a rockburst event to the yielding support system to facilitate energy absorption and controlled deformation of rock mass while providing containment of materials.

# Jennmar Yield-Lok Bolt

(patent pending)

- Design and Components -



- 3/4" - Gr75 steel round bar
- Bar is upset to specified dimensions to achieve designed performance under dynamic loading
- Upset encapsulated in engineered Polymer
- End profile angled to aid insertion of bolt and to provide shredding of resin cartridge

# Jennmar Yield-Lok Bolts

## - Principle and Functions-

1. Yield-Lok (patent pending) bolt is fully or partially resin grouted. Resin mixing is facilitated by deformations on polymer coating similar to rebar.
2. Provides immediate primary static support on installation
3. In dynamic loading conditions, the upset is pulled through the polymer at a constant rate of load/displacement throughout the full length of polymer encapsulation



# Dropping Test Equipment



CANMET, Ottawa

Testing Parameters:

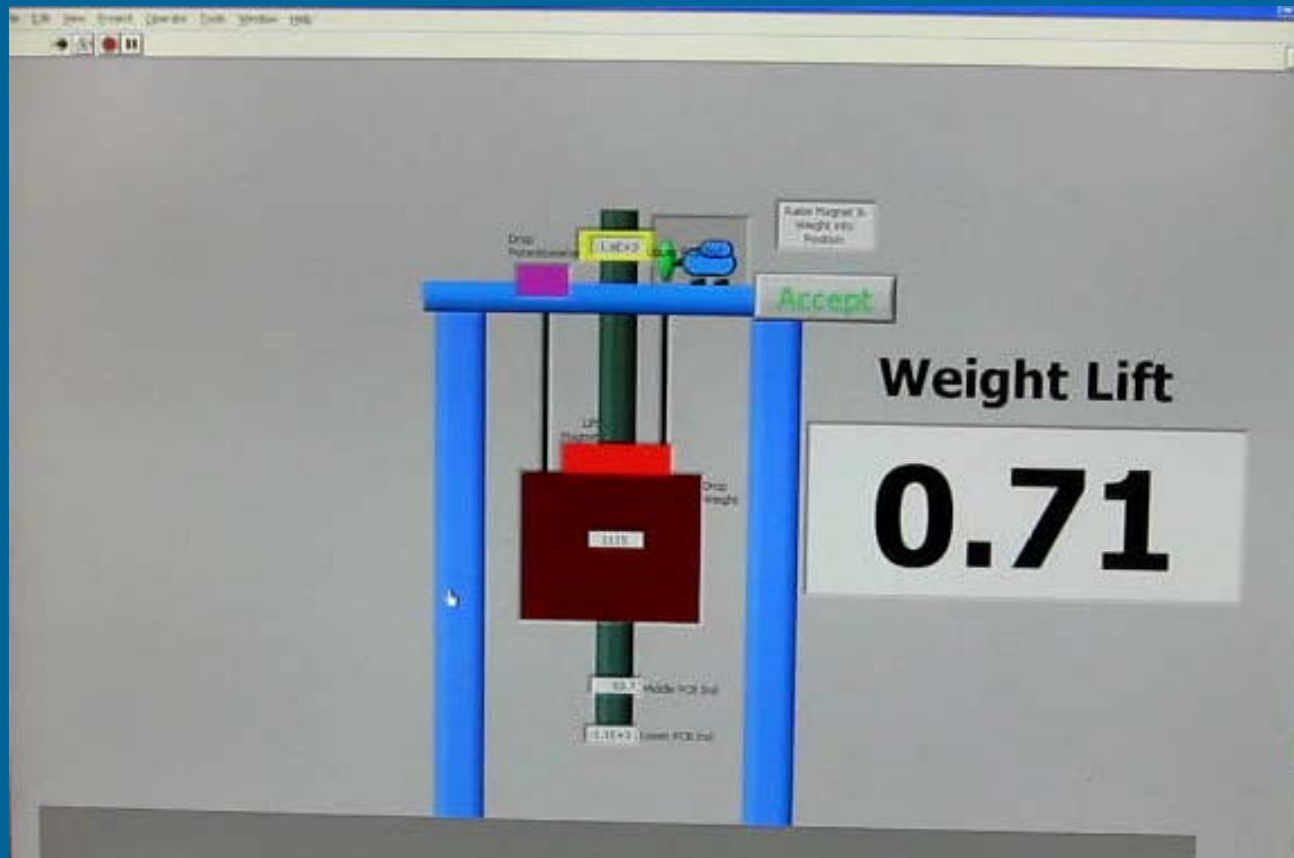
Dropping height: 1.5m

Dropping weight: 1115kg

Input energy: 16.4kJ

Impact Speed: 5.4m/sec

# Dropping Tests



# Dropping Tests

- Drop 1 -

Please refer to separate screen to  
watch videos

- Drop 2 -

Please refer to separate screen to  
watch videos

- Drop 3 -

Please refer to separate screen to  
watch videos

# Dynamic Performance

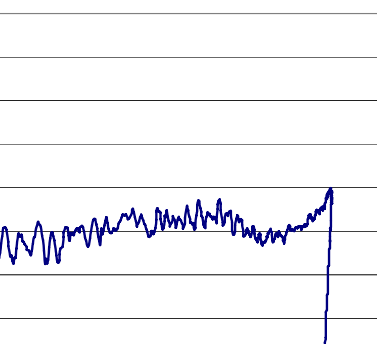


Drop 1

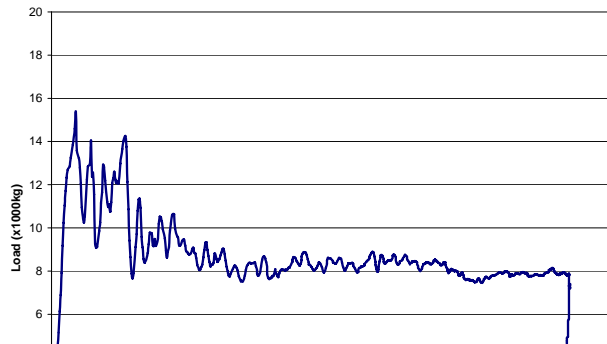
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Drop 3

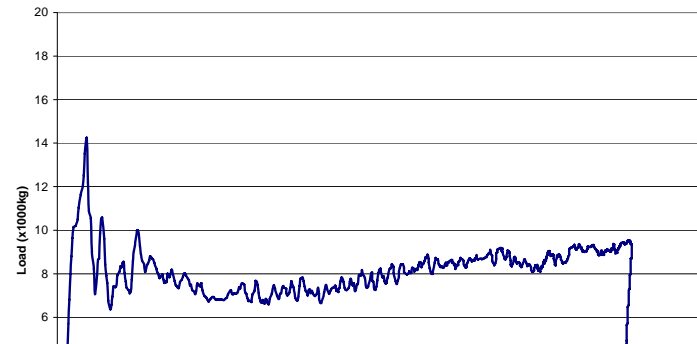
Jen-50 - Drop 1



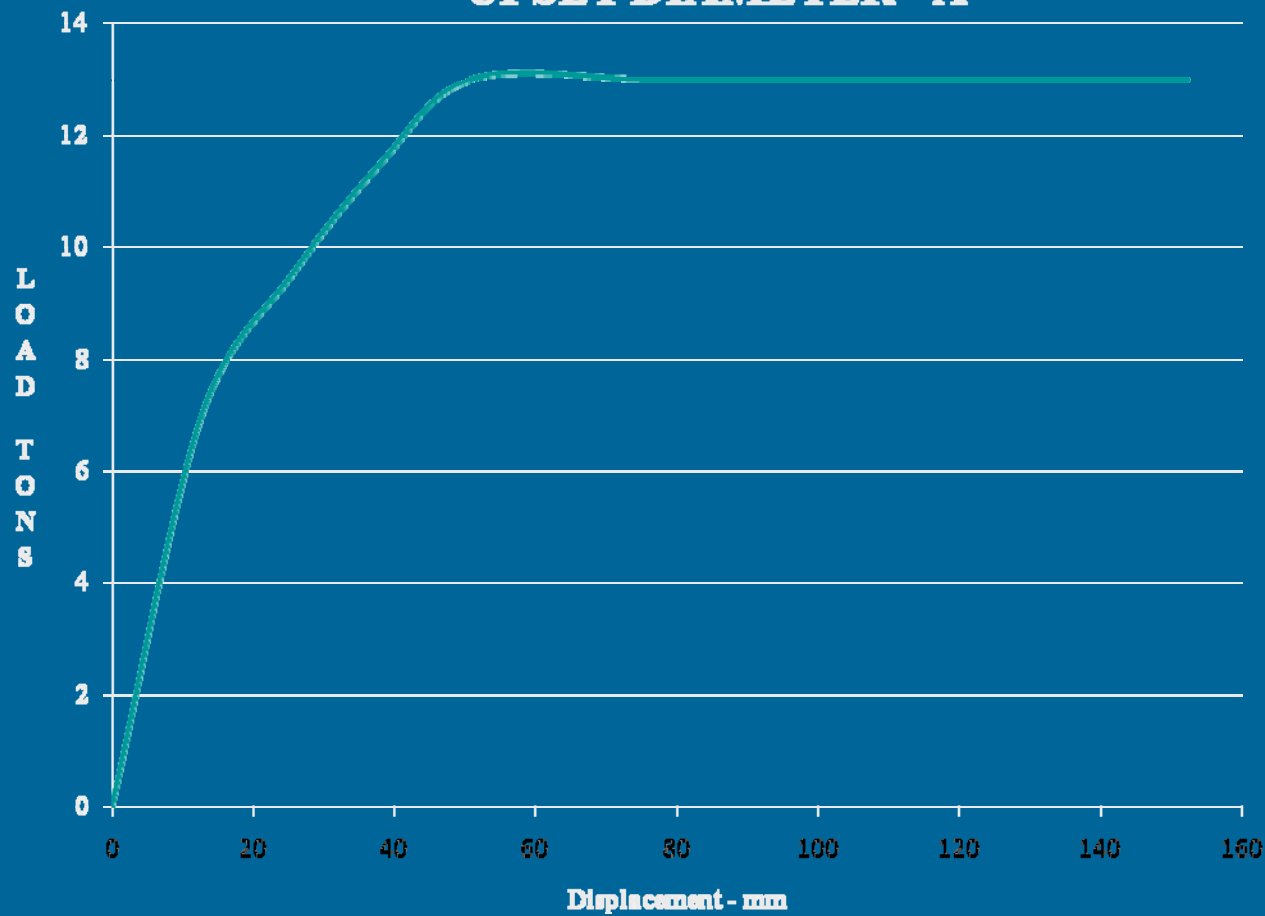
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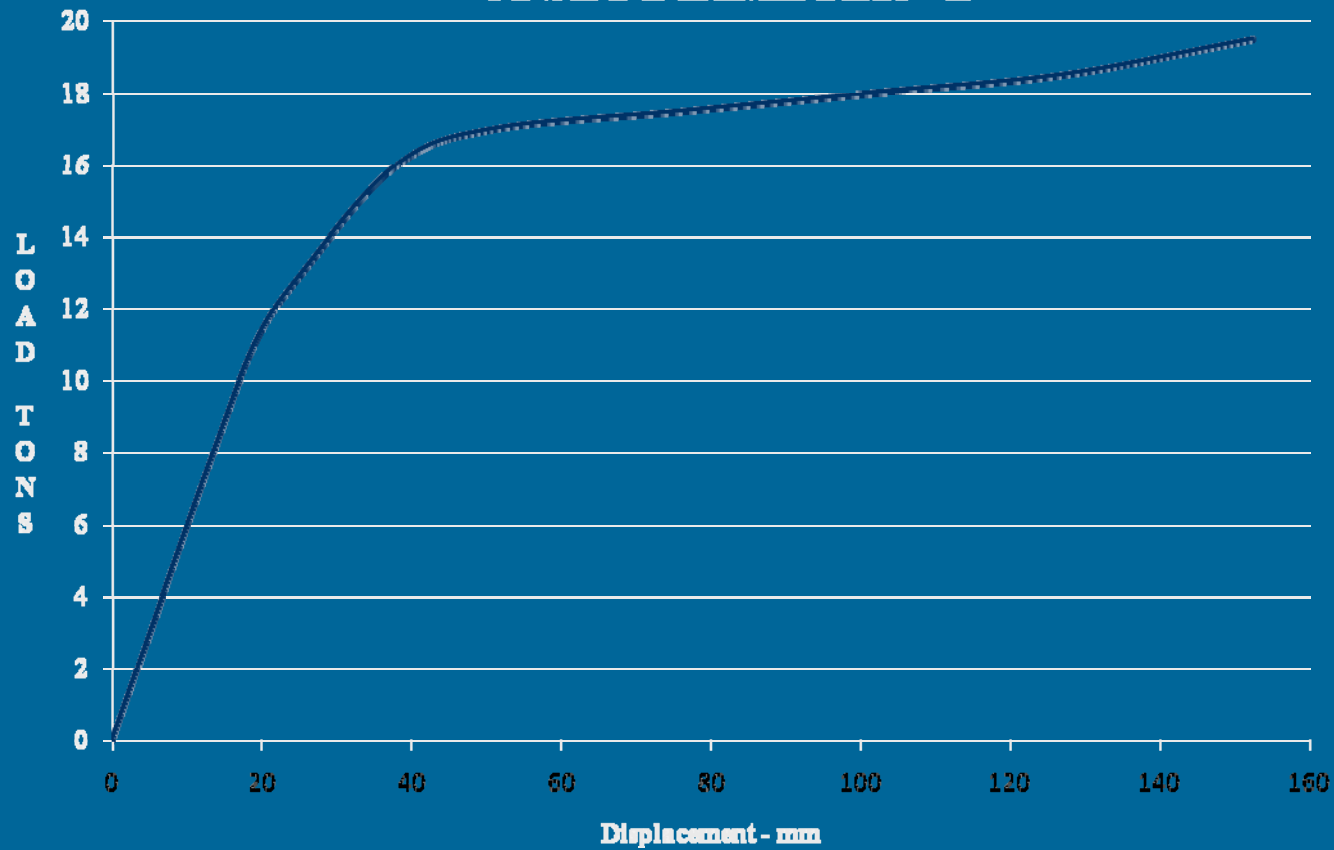
Jen-50 - Drop 3



## CONVERGENCE BOLT - STATIC PULL TEST UPSET DIAMETER "A"



## CONVERGENCE BOLT - STATIC PULL TEST UPSET DIAMETER "B"





# Features and Benefits of Yield-Lok Bolt (patent pending)

1. Suitable in static and dynamic load conditions
2. Applicable as primary support
3. Performance independent of bore hole diameter and resin properties
4. Suitable for typical mechanized and/or hand-held installation practices
5. Performance characteristics are consistent through multiple and varying amplitude of impacts
6. Cost effective installation and application
7. Can be configured to provide constant yield in convergence conditions
8. Engineered Polymer performs to -70 degrees Celsius