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SUMMARY OF THE EFFECTS OF MONOLITHIC PUMPED PACKING AT LINGAN COLLIERY

P. Cain
Cape Breton Coal Research Laboratory

September 1985

Presented at a meeting between CBDC and CBCRL at Glace Bay, September 9, 1985.

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SUMMARY OF THE EFFECTS OF MONOLITHIC PUMPED PACKING AT LINGAN COLLIERY

by

P. Cain*

ABSTRACT

Recent research work into the effects of monolithic pumped packing in the 9E Coal Road at Lingan Colliery was presented to the staff of the Cape Breton Development Corporation. The presentation is summarised in this report.

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*Research Scientist, Cape Breton Coal Research Laboratory, CRL, CANMET, Energy, Mines and Resources Canada, Sydney.

BREF EXPOSÉ SUR LES EFFETS DU REMBLAYAGE MONOLITHIQUE PAR EXHAURE À LA HOUILLÈRE LINGAN

par

P. Cain*

RÉSUMÉ

Des travaux récents de recherche sur les effets du remblayage monolothique par exhaure dans la galerie 9E de la houillère Lingan ont été présentés à la Société de développement du Cap-Breton. Le présent rapport contient un sommaire de cette présentation.

*Chercheur scientifique, Laboratoire de recherche sur le charbon du Cap-Breton LRC, CANMET, Énergie, Mines et Ressources Canada, Sydney.

CONTENTS

INTRODUCTION

Research work undertaken at Lingan Colliery between March 1985 and August 1985 was summarised and presented at a meeting between Cape Breton Development Corporation (CBDC) staff and Cape Breton Coal Research Laboratory (CBCRL) researchers on September 9, 1985.

This summary report gives the essential details of the presentation made concerning strata mechanics aspects of the changeover to monolithic packing in the 9E Maingate. The presentation was based on a previous CANMET Divisional Report (1).

OBJECTIVE

To determine the effects of a change to monolithic pumped packing on roadway stability.

METHOD

Three detailed investigation sites were installed and monitored. One site was in a conventionally supported part of the roadway. Two were in the pumped pack section.

Additional surveys of gateroad height were made. At the detailed sites pack load, pack closure and gateroad closure were determined.

RESULTS

Despite some loss of data due to instrument failure and minor vandalism, it was possible to determine that the deformation behaviour of the gateroad was not severely affected. In fact, a minor (+13 cm) increase in gateroad height was recorded in the pump packed section.

DISCUSSION

The following points were discussed:

1) The equivalence of the pack support resistance between the conventional and pump packed sections.
2) Work in the U.K. seems to indicate that the pack support resistance is inadequate, despite the apparent stability of the gateroad.

Pack Support Resistance at all sites approximately equivalent
Pumped Pack and chock - 6 MPa/metre (870 psi/m)
Pumped Pack weaker but wider.

Support resistances in U.K. indicate 12 MPa is required to maintain roadway stability for this height of coal seam.

Roof Strata Tilt Analysis:

Site 1: 1.3° tilt after 17 m advance
Site 3: trend is similar

To prove the tilt analysis method, CBDC should increase pack strength over an experimental section and monitor the results.

CONCLUSIONS

1. The deformation process is similar to other sites at Lingan.
2. The concept of roof-strata-tilt is applicable.
3. Gateroad behaviour is similar at all three sites.
4. The change to pumped pack seems to have had no detrimental effect but floor heave was not monitored.

RECOMMENDATIONS

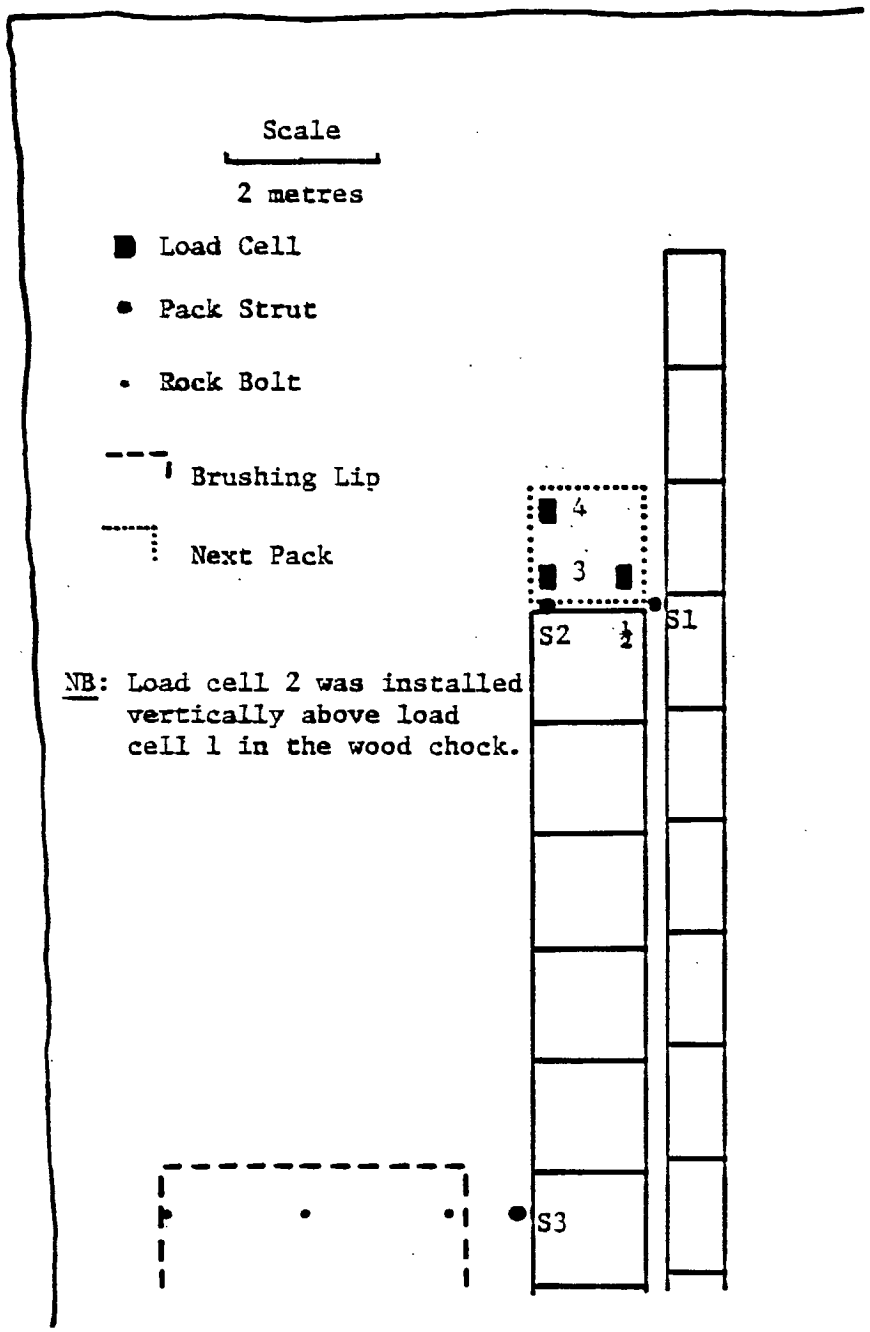
1. Implementation of systematic packing and lagging.
2. Provision of water heater for winter months or implementation of higher-solids method of packing.

3. Continue monitoring by gateroad survey method.
4. Experiment with a stronger pack mix to validate the design concept for the coalfield. Three additional sites are suggested:
    a) As is.
    b) 25% more cement in pack.
    c) 50% more cement in pack.

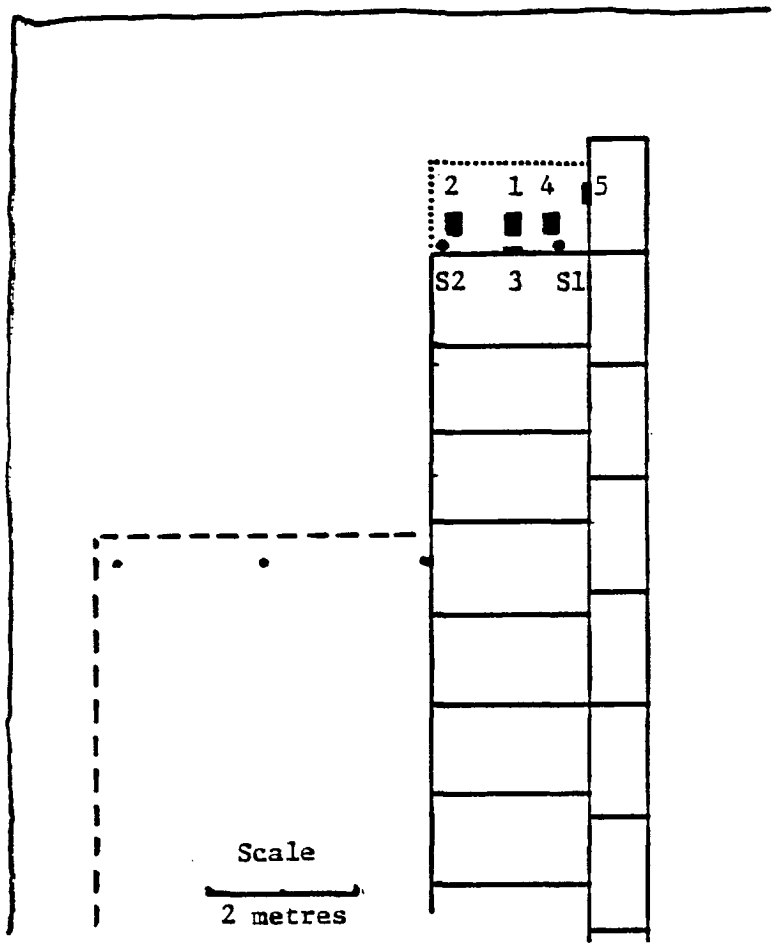
REFERENCES

1. Cain, P. "The effect of monolithic packing on gateroad performance at Lingan Colliery"; CANMET Division Report ERP/CRL 85-66(TR).

APPENDIX A: SLIDES PRESENTED



Layout of the 9E Maingate face end and instrumentation at the installation of Site 1

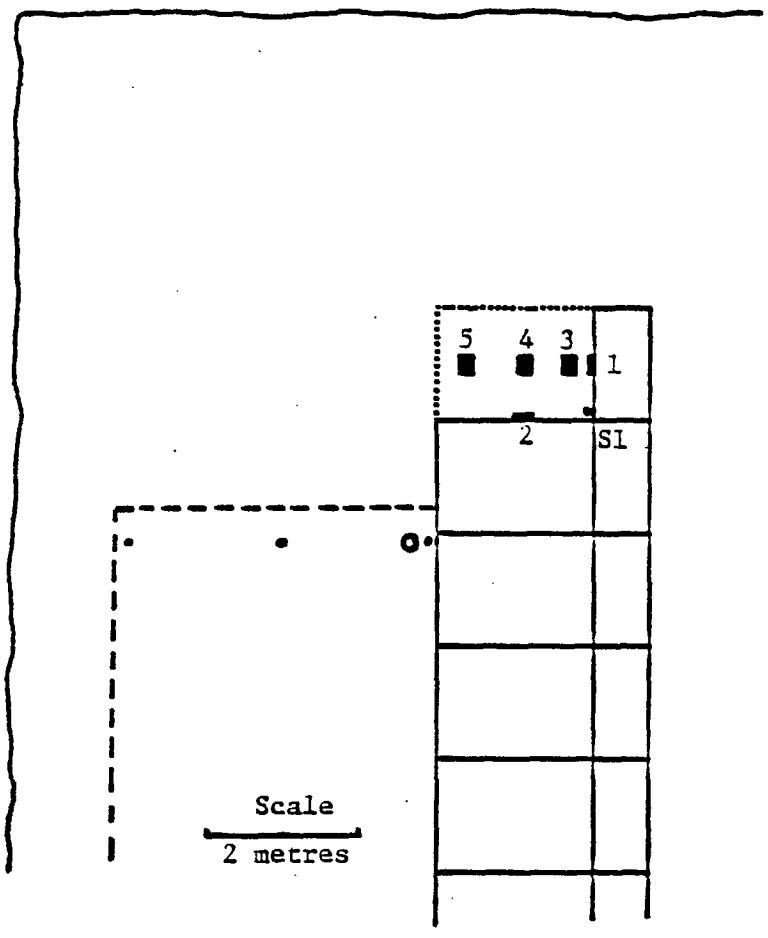


■ Horizontal/Vertical Load Cells ● Pack Strut • Rock Bolt

Next Pack

Brushing Lip

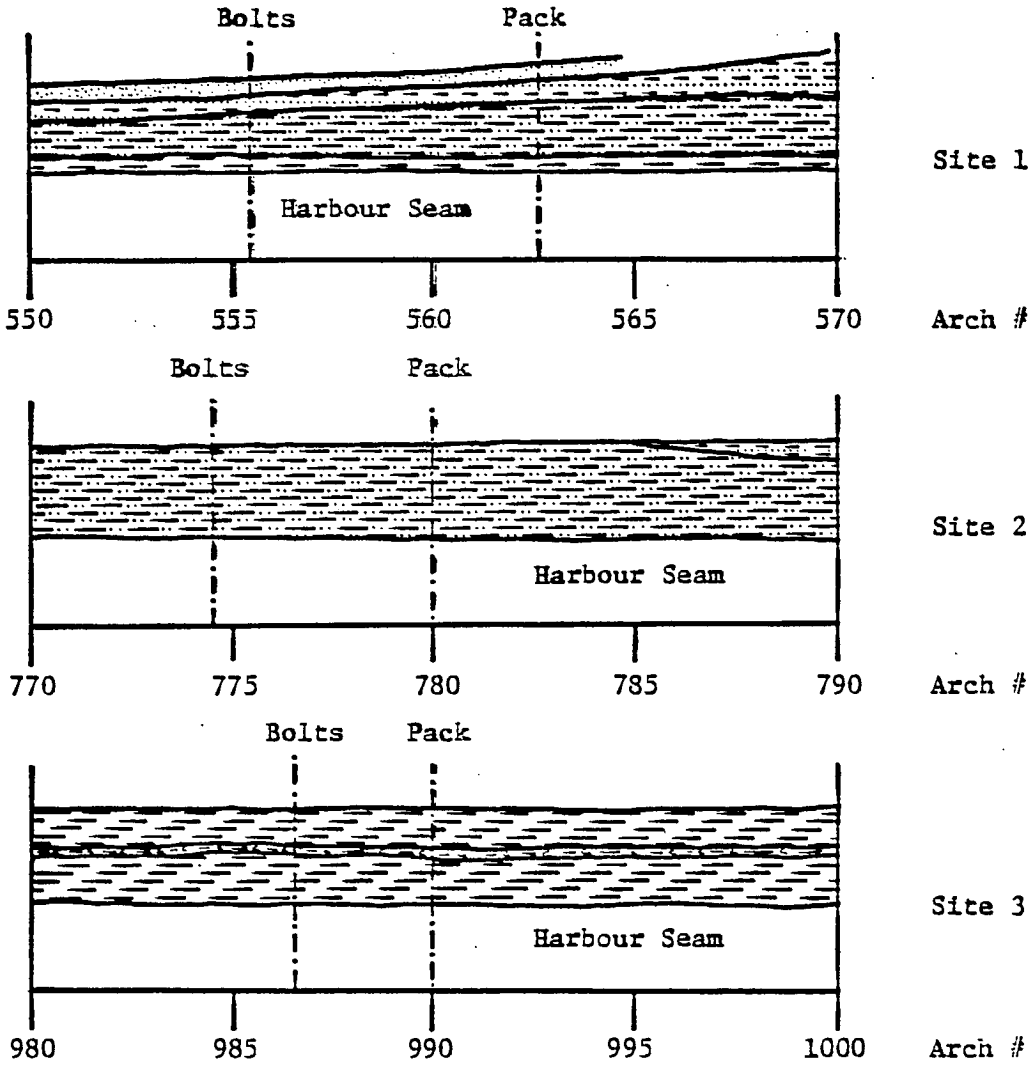
Layout of the 9E Maingate face end and instrumentation at the installation of Site 2



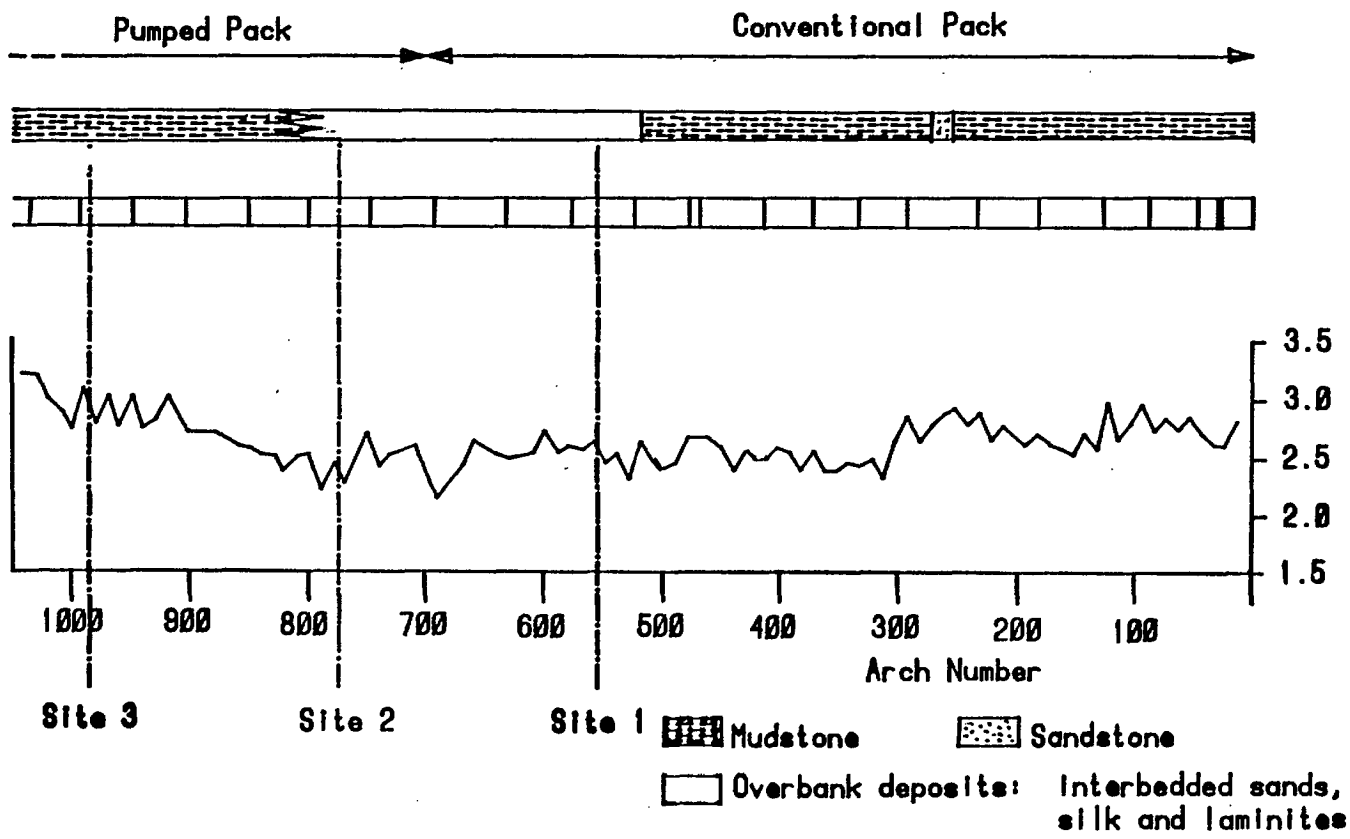
■ ▌Horizontal/Vertical Load Cells ● Pack Strut • Rock Bolt

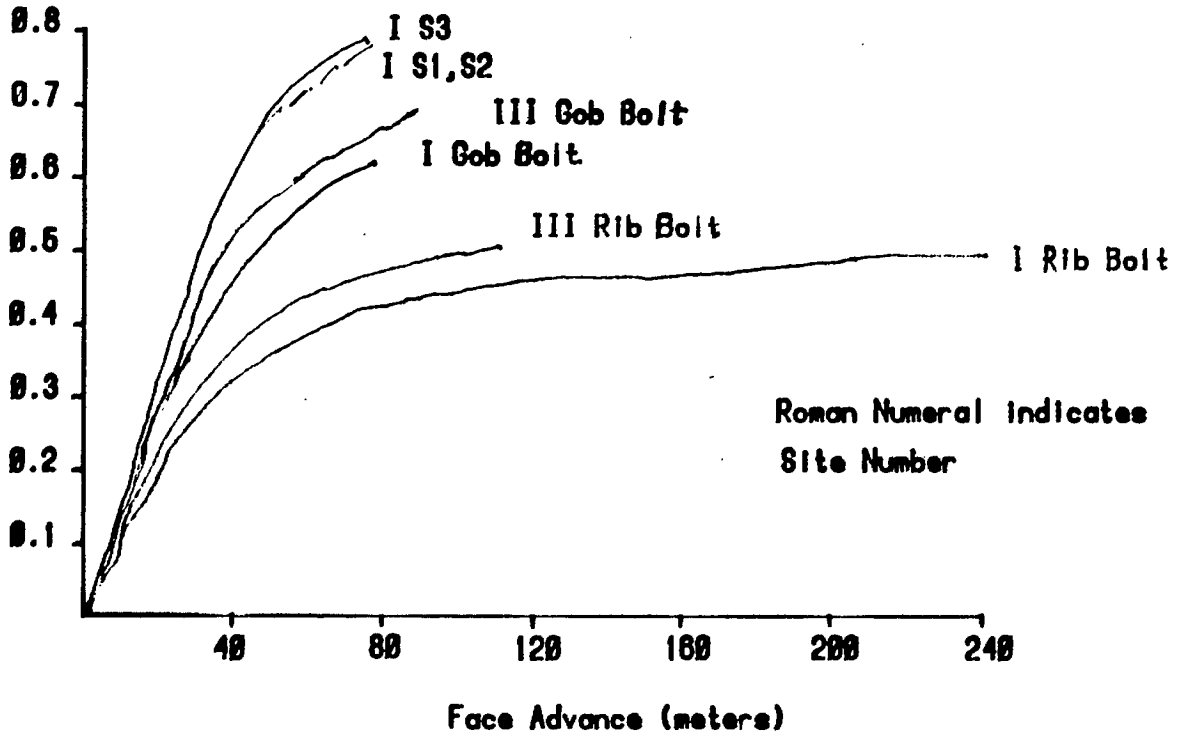
o Extensometer Hole Brushing Lip Next Pack

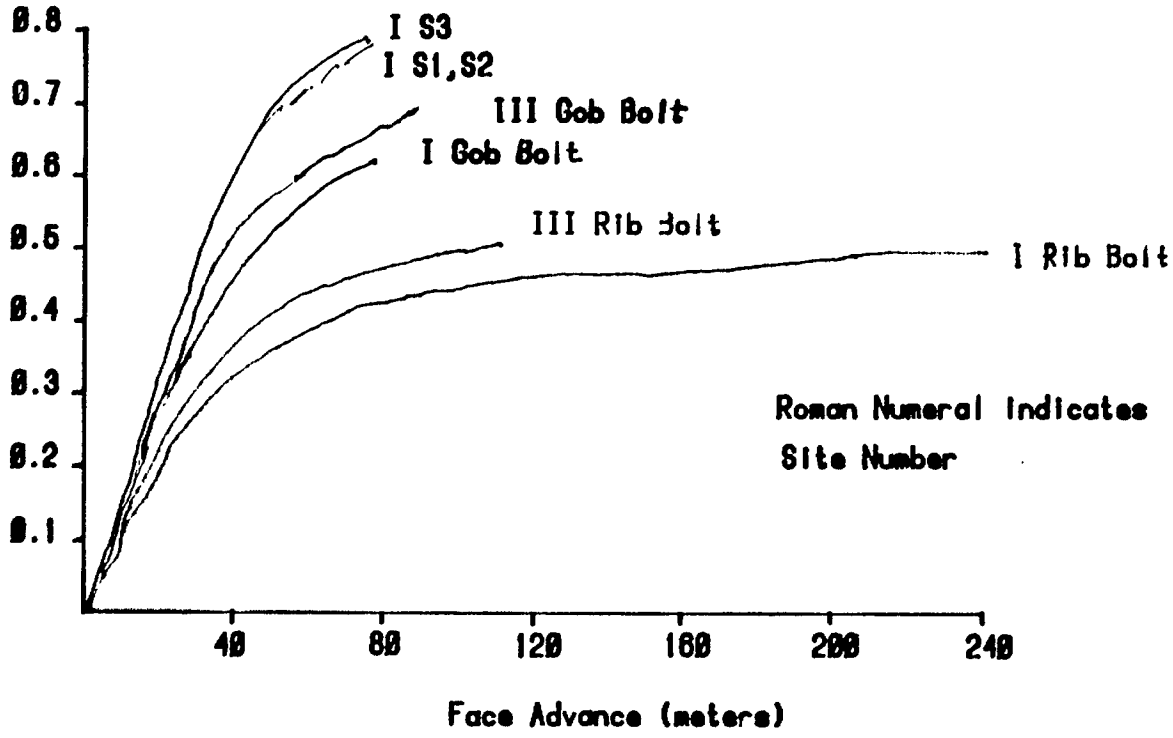
Layout of the 9E Maingate face end and instrumentation at the installation of Site 3

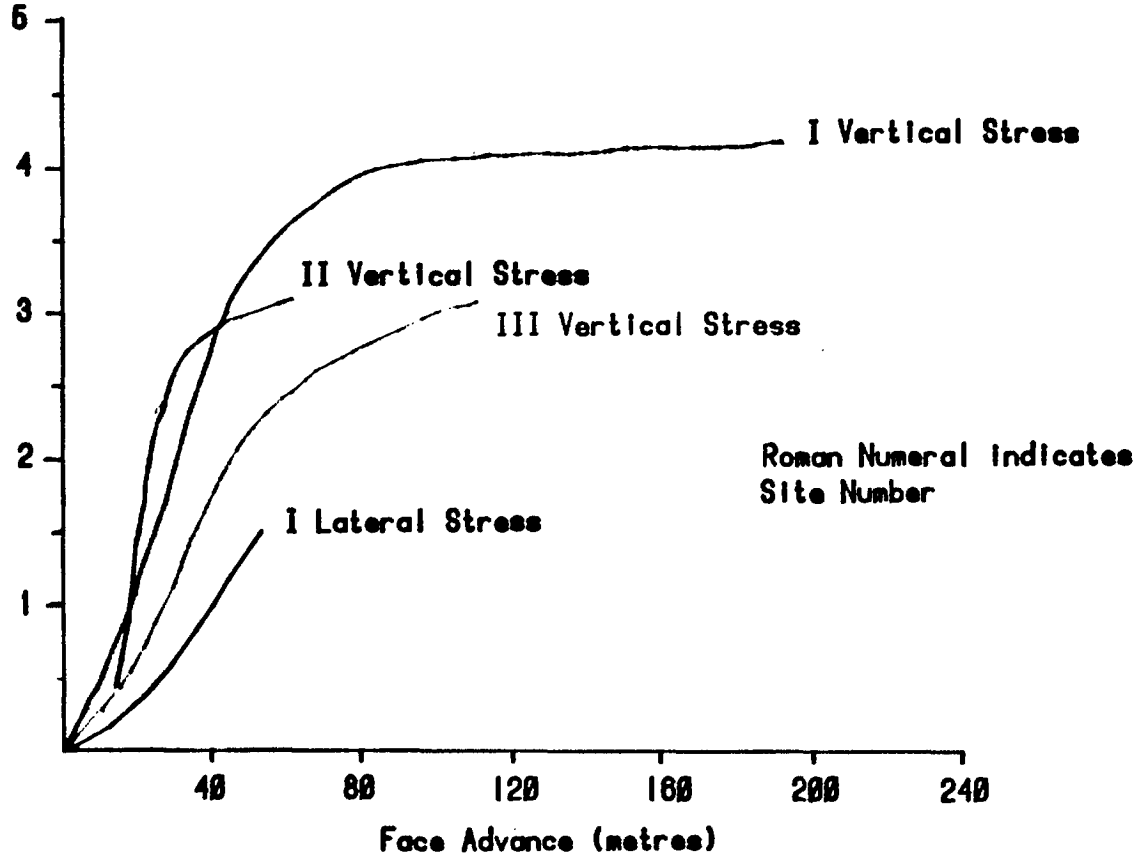


Detailed roof lithology at the investigation sites in the 9E Maingate

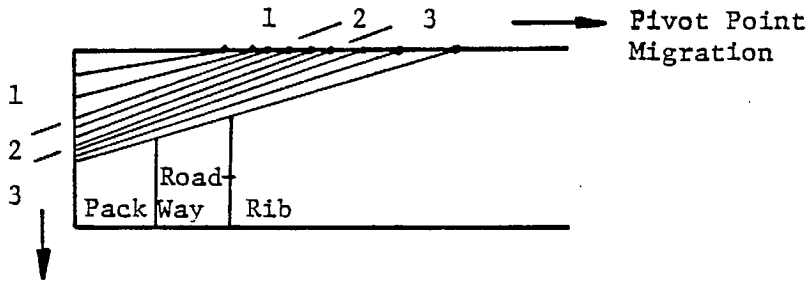

Pumped Pack
Conventional Pack
3.5
3.0
2.5
2.0
1.5
1000
900
800
700
600
500
400
300
200
100
Arch Number
Site 3
Site 2
Site 1
Mudstone
Sandstone
Overbank deposits: Interbedded sands, silk and laminites

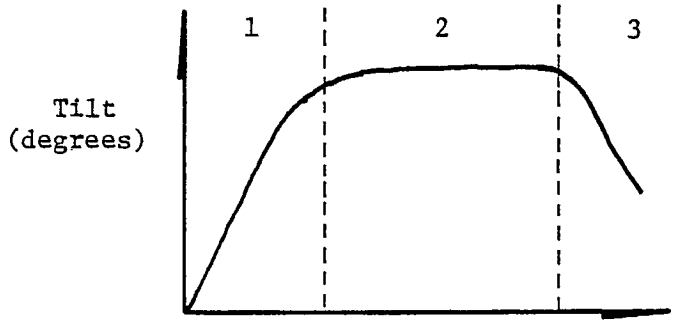

0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
I S3
I S1,S2
III Gob Bolt
I Gob Bolt
III Rib Bolt
I Rib Bolt
Roman Numeral Indicates
Site Number
40
80
120
160
200
240
Face Advance (meters)


0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
I S3
I S1,S2
III Gob Bolt
I Gob Bolt
III Rib Bolt
I Rib Bolt
Roman Numeral Indicates
Site Number
40
80
120
160
200
240
Face Advance (meters)

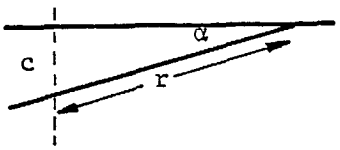

5
4
3
2
1
I Vertical Stress
II Vertical Stress
III Vertical Stress
Roman Numeral Indicates
Site Number
I Lateral Stress
40
80
120
160
200
240
Face Advance (metres)

Stage 1 - Roof Strata Tilt Increasing
Stage 2 - Roof Strata Tilt Constant
Stage 3 - Roof Strata Tilt Decreasing



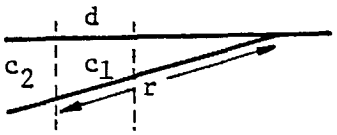


Lines of Measured Convergence



c and α measured

$$r = c/\alpha$$



Lines of Measured Convergence

$c_1 c_2 d$ measured

$$\alpha = \frac{c_2 - c_1}{d}$$

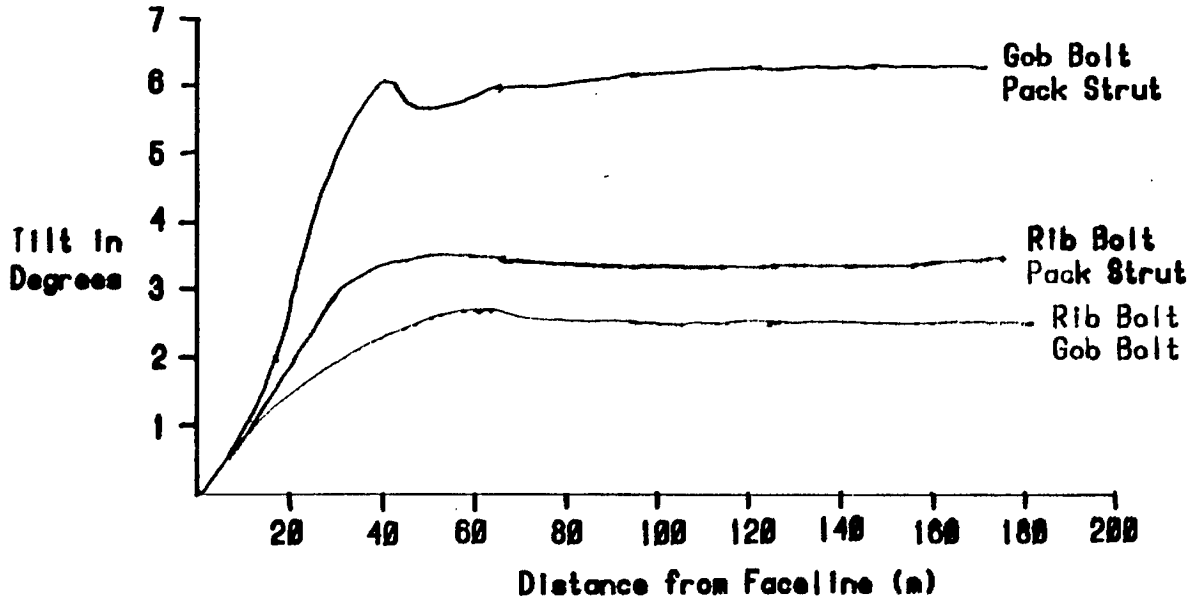
$$r = c_2/\alpha$$

c = Measured Convergence

d = Distance between Convergence Points

α = Tilt in radians

r = Radius to Pivot Point


Tilt in Degrees
7
6
5
4
3
2
1
20
40
60
80
100
120
140
160
180
200
Distance from Faceline (m)
Gob Bolt
Pack Strut
Rib Bolt
Pack Strut
Rib Bolt
Gob Bolt