PILLARING @ CRANDALL SEPT 2006

CRANDALL'S ANALYSIS

- USED ARMPS MODELING (NIOSH)
- CALCULATED MINIMUM sf FOR CRANDALL
  - 1ST NORTH LEFT BLOCK HISTORICAL SECTION
  - .37 MINIMUM CALCULATED
  - USED .40 AS LOW sf
- CALCULATED sf FOR PILLARING
  - .53 - .67

MI ANALYSIS

- HISTORICAL ANALYSIS
  - .42 MINIMUM sf

- ANALYZED BOTH PILLAR SECTIONS
  - .34 - 1.0
  - .27 - .91
- COULD NOT ANALYZE 3RD SECTION W/OUT LAMODEL

FUNDAMENTAL DIFFERENCES

- IN SITU COAL STRENGTH
  - 1640 psi VS. 900 psi
- MODELING GEOMETRY
  - HISTORICAL
    - GOB
    - BARRIER PILLAR
    - ACTIVE GOB
  - CURRENT
    - 2 GOBS
    - DIFFERENT SIZED BARRIER PILLARS
    - SEE ATTACHED CHARTS

REPORT OF SEPTEMBER 2006 CURSORY REVIEW
8/7/07

A preliminary plan was submitted to the Roof Control Division of the Coal Mine Safety and Health Administration's District 9 office in August of 2006. The plan was to solicit feedback on the proposed development of two barrier pillars at the Crandall Canyon Mine in Huntington, Utah. The submission consisted of a report by Agapito Associates, Inc. on the stability of the pillar extraction using two different numerical modeling techniques. Technical staff performed a separate analysis using the ARMPS software developed by the National Institute of Occupational Safety and Health (NIOSH). A letter was sent to the Crandall Canyon Mine addressing concerns that the technical review raised.

ARMPS

Analysis of Retreat Mining Pillar Stability (ARMPS) was developed by NIOSH using 250 case histories of successful and unsuccessful retreat mining. The software uses various inputs including geometry and depth to compute a stability factor (SF) for retreat mining. ARMPS is increasingly conservative as depths increase and it is recommended to use site-specific data to establish minimum SF when available.

Historical Pillaring

Using data from a P.E. certified map, an analysis of historical pillaring data was performed using ARMPS to establish a minimum SF for retreat mining. The analysis was done on the 9th Left Panel. Since the panel was the 9th Panel mined in succession, the loading condition was established as one side gob and one active gob with a 375-foot barrier pillar. Cover was between 1600 and 1800 feet, so SFs were calculated using both depths of cover and an average was taken. No strength data was available for the in-situ coal strength, so 900 psi was used. See Figure 1 for model geometry.

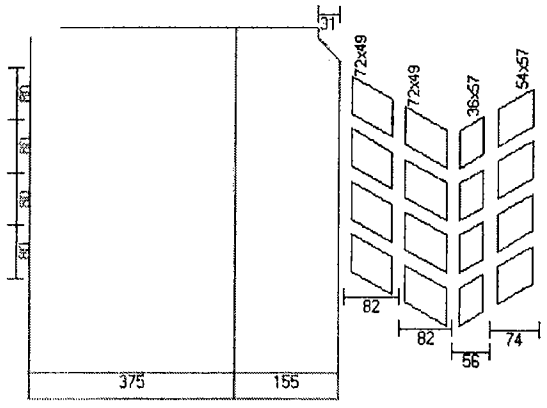


Figure 1: Historical Model Geometry

Mining progressed through the 9th Left Panel until unfavorable conditions caused the mine to leave remnant pillars. Stability was calculated at various places along the entire panel and the SFs were graphed to determine the minimum SF for successful pillaring. See Figure 2.

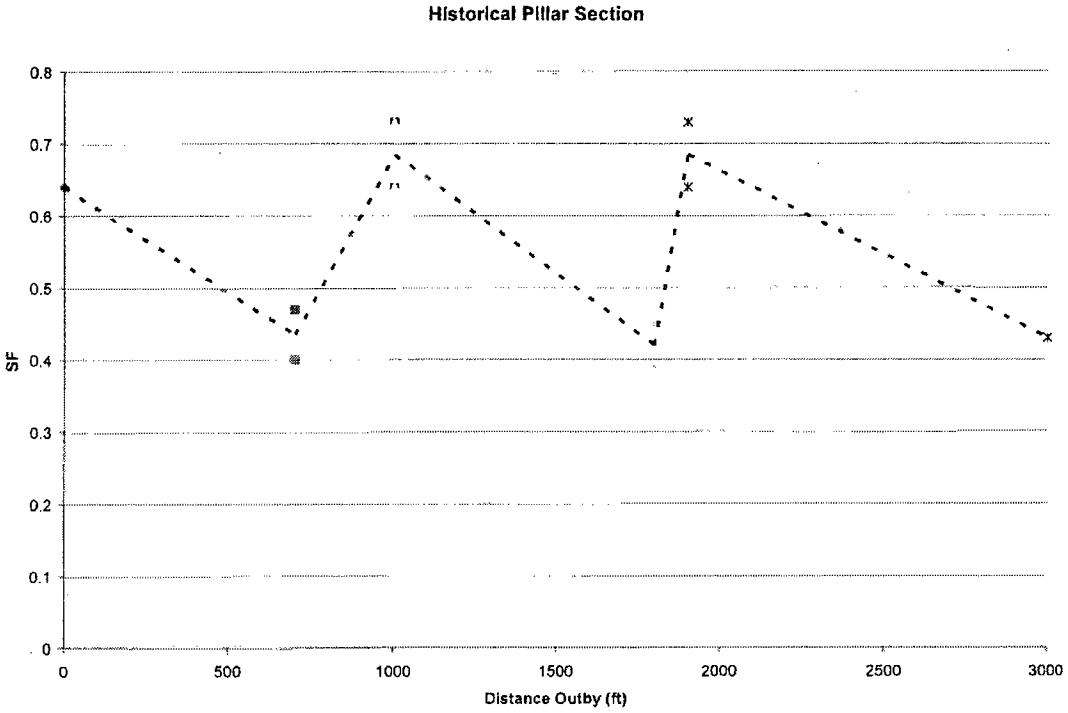


Figure 2: SF of 9th Left Panel

Low points show where the mine encountered unfavorable conditions and left remnant pillars, giving rise to better stability, seen as peaks. A minimum SF was determined as 0.42 when unfavorable conditions begin to develop. See Appendix A for complete model inputs.

North Pillar Section

An analysis was performed of the North Barrier Pillar. It was proposed to drive four entries parallel to the sealed Main West leaving a 55-foot barrier. Since Main West had been sealed since November 13, 2004, roof conditions could not be determined. Caving could have began to occur or could occur during retreat of the North Barrier Pillar. For simplicity, the 55-foot barrier was modeled as a 60-foot pillar line. To conservatively account for possible conditions in the sealed area, it was modeled as eight pillars being fully extracted (four pillars for Main West, one pillar for 55-foot barrier pillar, and three pillars from development). The loading was determined as two side gobs and an active gob with a 130-foot barrier pillar on one side and a 430-foot barrier pillar on the other side. Depths

ranged from 1500 feet to 2000 feet. Various SFs were calculated and a trend line was graphed to illustrate expected conditions. See Figure 3.

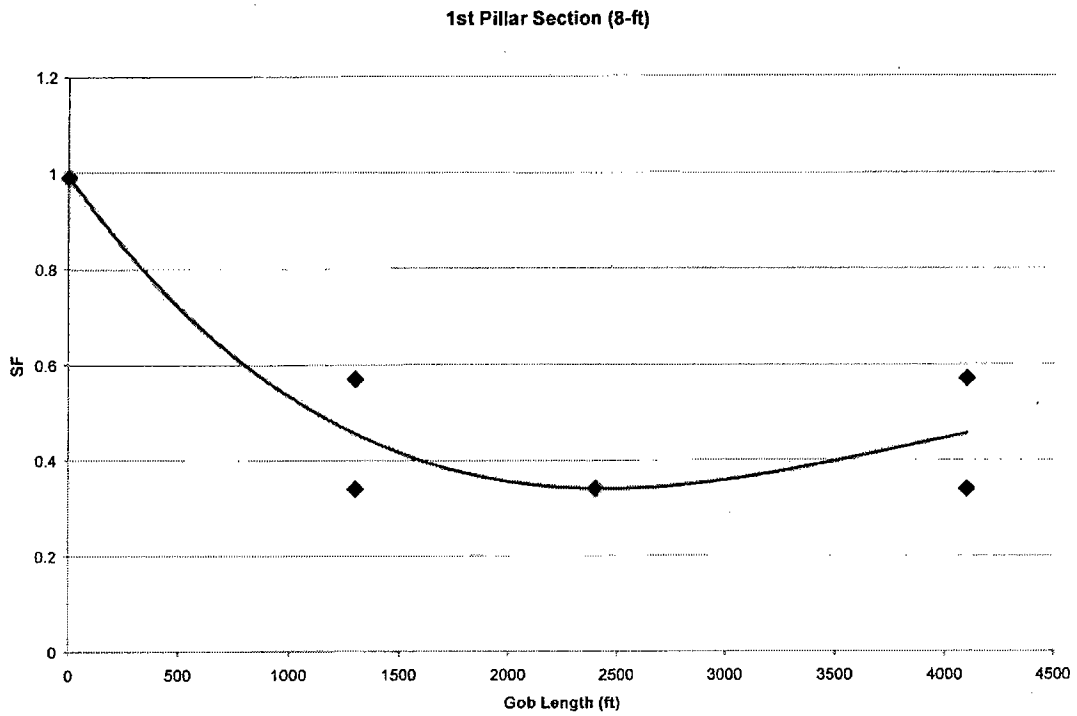


Figure 3: SF of North Barrier Pillar Extraction

It was determined that development could be completed under favorable conditions, and retreat could be expected to be favorable for 1300 feet. See Appendix B for complete model inputs.

South Pillar Section

Finally, an analysis of the South Barrier Pillar section was completed. It was proposed to drive four entries parallel to the south of the Main West section. It was assumed that only the north three pillars had been extracted and full caving had occurred, thus leaving a 180-foot gob with a 60-foot barrier pillar. The section was modeled similarly as the North Barrier Pillar in that the Main West section could cave during extraction or may have caved. Full extraction of eight pillars was modeled (four pillars for Main West, one pillar for 55-foot barrier pillar, and three pillars from development). Overburden depths ranged from 1500 feet to 2000 feet. Various SFs were calculated and a trend line was graphed to illustrate expected conditions. See Figure 4.

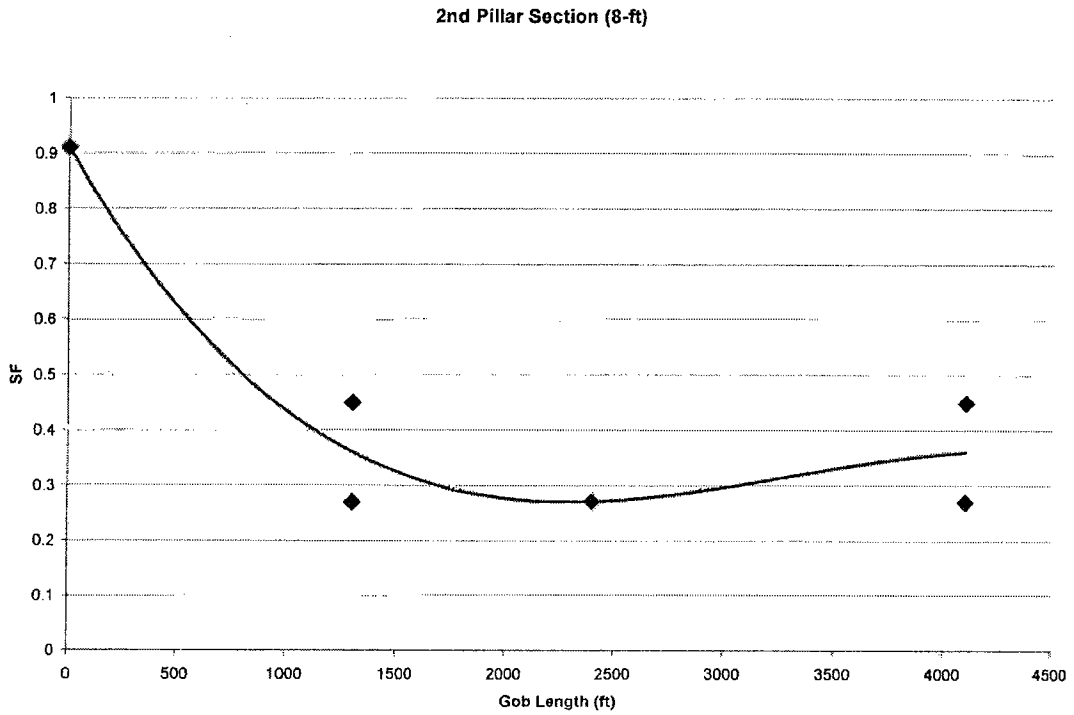


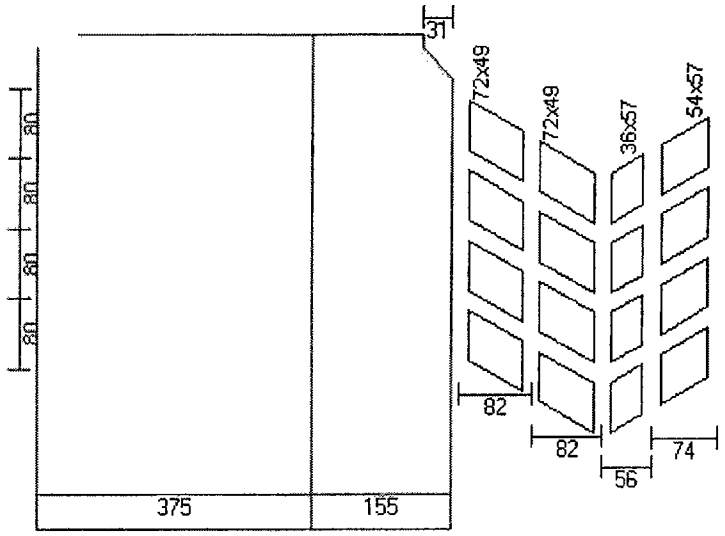
Figure 4: SF for South Barrier Pillar Extraction

It was determined that development could be completed with favorable stability, but extraction should only be expected as stable for 900 feet. See Appendix C for complete model inputs.

Conclusions

The cursory review performed by the Technical Division resulted in considerable differences from those submitted by Agapito Associates, Inc. The modeling inputs were reviewed from the report submitted by Agapito Associates, Inc. and the following differences were noted: the in-situ coal strength was noted as 1640 psi vs. 900 psi and the modeling geometry employed was different A letter was sent to the Crandall Canyon Mine requesting additional information regarding the numerical model inputs. An on-site evaluation was scheduled to better determine stability during extraction.

APPENDIX A: HISTORICAL MODEL INPUTS



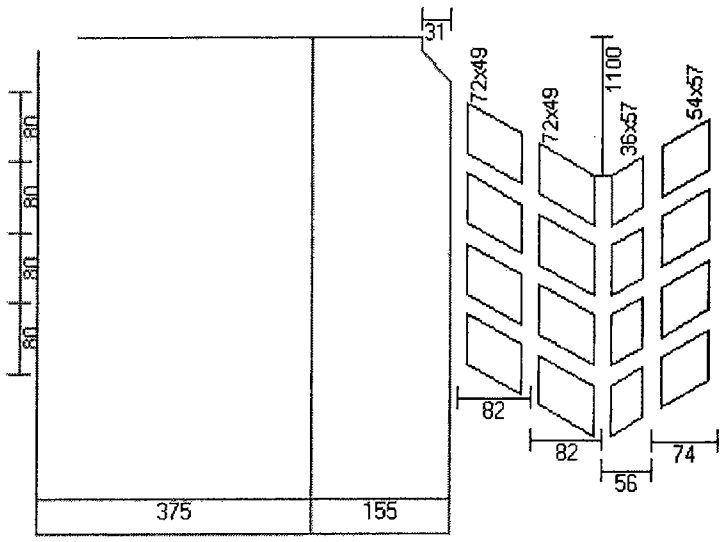
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1600 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....200 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....0 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.79
ACTIVE GOB.....0.79
ONE SIDE + ACTIVE GOB.....0.73



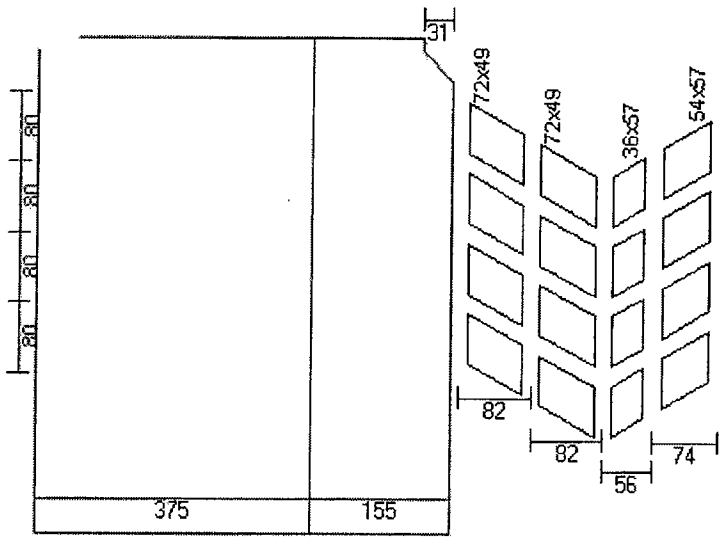
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1600 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....200 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....1100 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.79
ACTIVE GOB.....0.61
ONE SIDE + ACTIVE GOB.....0.43



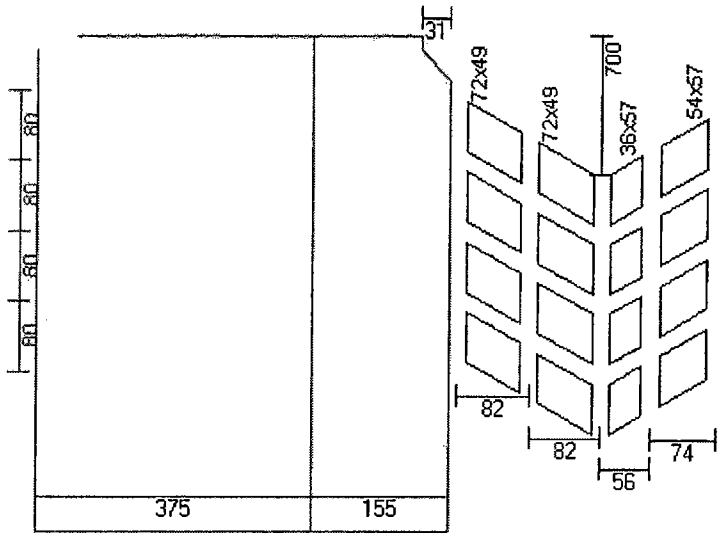
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1800 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....212 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....0 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.71
ACTIVE GOB.....0.71
ONE SIDE + ACTIVE GOB.....0.64



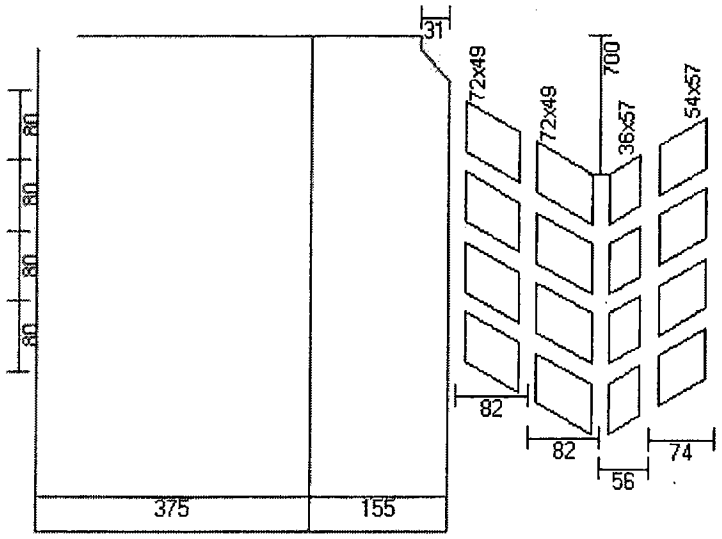
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1800 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....212 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....700 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.71
ACTIVE GOB.....0.55
ONE SIDE + ACTIVE GOB.....0.40



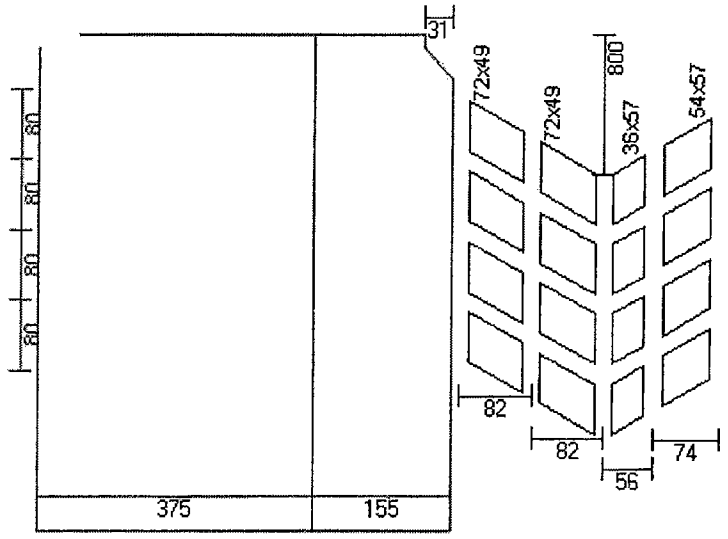
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1600 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....200 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....700 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.79
ACTIVE GOB.....0.61
ONE SIDE + ACTIVE GOB.....0.47



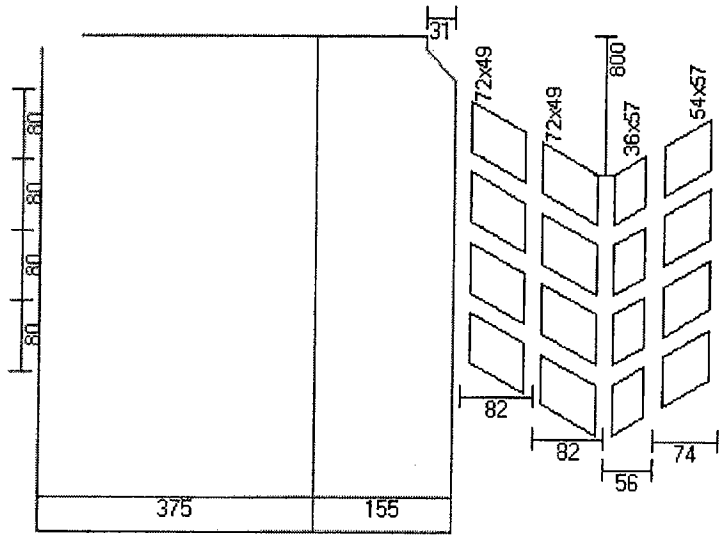
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1800 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....212 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....800 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.71
ACTIVE GOB.....0.55
ONE SIDE + ACTIVE GOB.....0.39



[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1600 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....20 (ft)
Number of Entries.....5
Crosscut Spacing.....80 (ft)
Center to Center Distance #1.....82 (ft)
Center to Center Distance #2.....82 (ft)
Center to Center Distance #3.....56 (ft)
Center to Center Distance #4.....74 (ft)

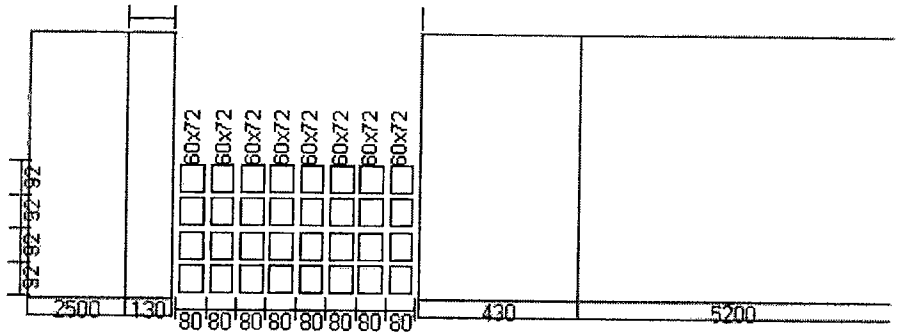
[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....200 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....ONE SIDE + ACTIVE GOB
Extend of Active Gob.....800 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....375 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....155 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....31 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.79
ACTIVE GOB.....0.61
ONE SIDE + ACTIVE GOB.....0.45

APPENDIX B: NORTH BARRIER PILLAR MODEL INPUTS



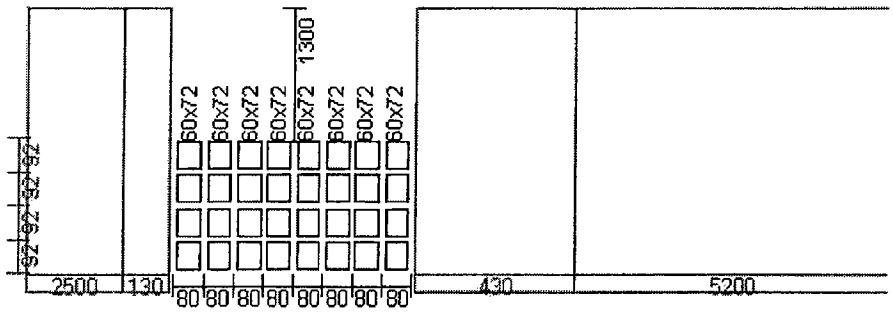
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1500 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....193 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....0 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....2500 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....1.12
ACTIVE GOB.....1.12
ONE SIDE + ACTIVE GOB.....0.99
TWO SIDES + ACTIVE GOB.....0.99



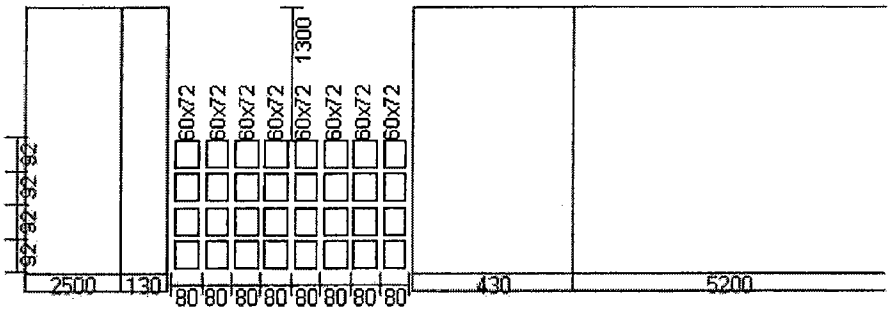
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1500 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....193 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....1300 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....2500 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....1.12
ACTIVE GOB.....0.69
ONE SIDE + ACTIVE GOB.....0.57
TWO SIDES + ACTIVE GOB.....0.57



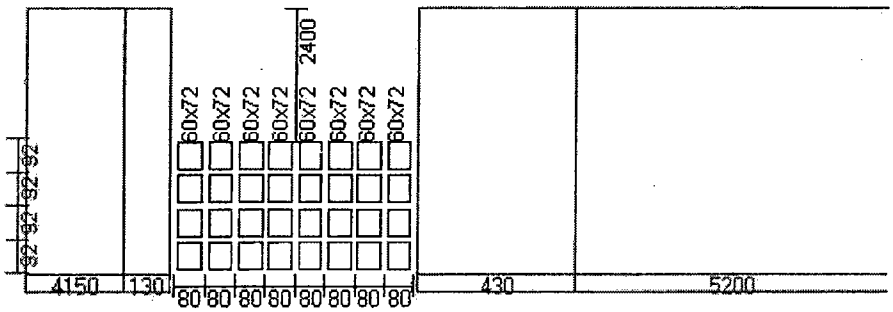
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....1300 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....2500 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.34
TWO SIDES + ACTIVE GOB.....0.34



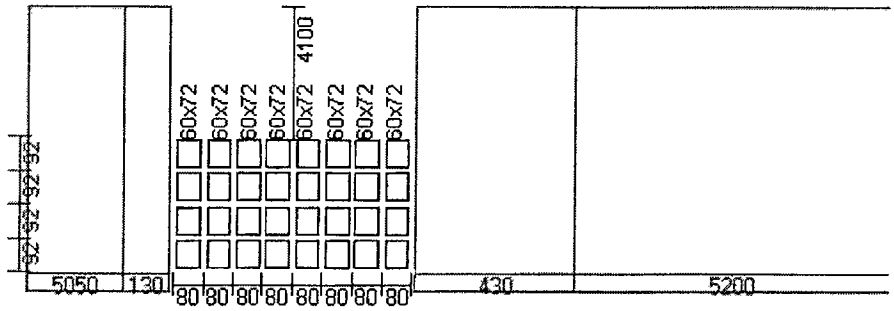
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....2400 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....4150 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.34
TWO SIDES + ACTIVE GOB.....0.34



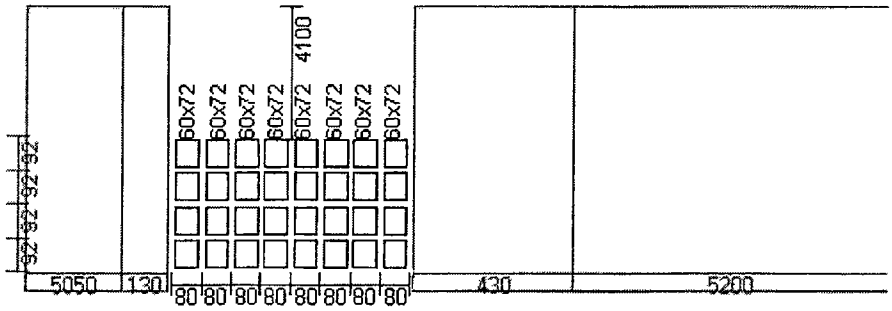
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....4100 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....5050 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.34
TWO SIDES + ACTIVE GOB.....0.34



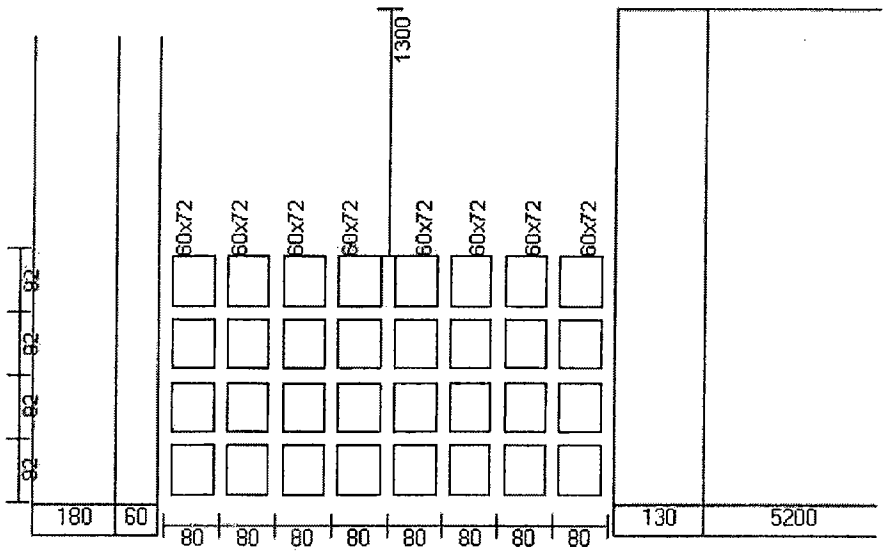
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....4100 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....5050 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....430 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.34
TWO SIDES + ACTIVE GOB.....0.34



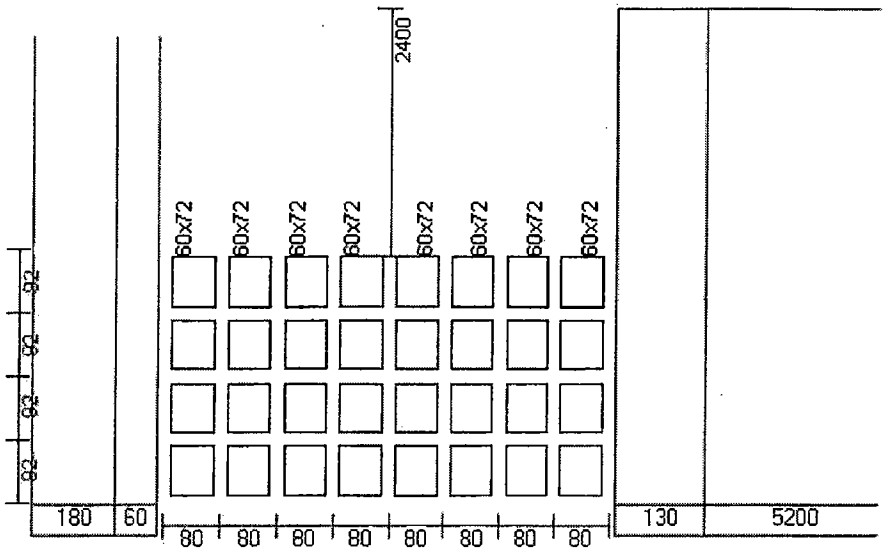
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....1300 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....180 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....60 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.39
TWO SIDES + ACTIVE GOB.....0.27



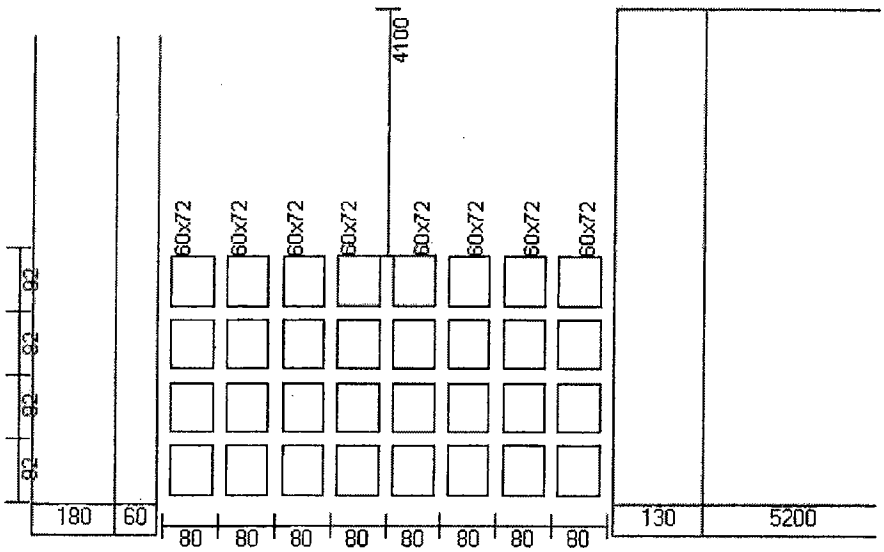
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....2400 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....180 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....60 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.38
TWO SIDES + ACTIVE GOB.....0.27



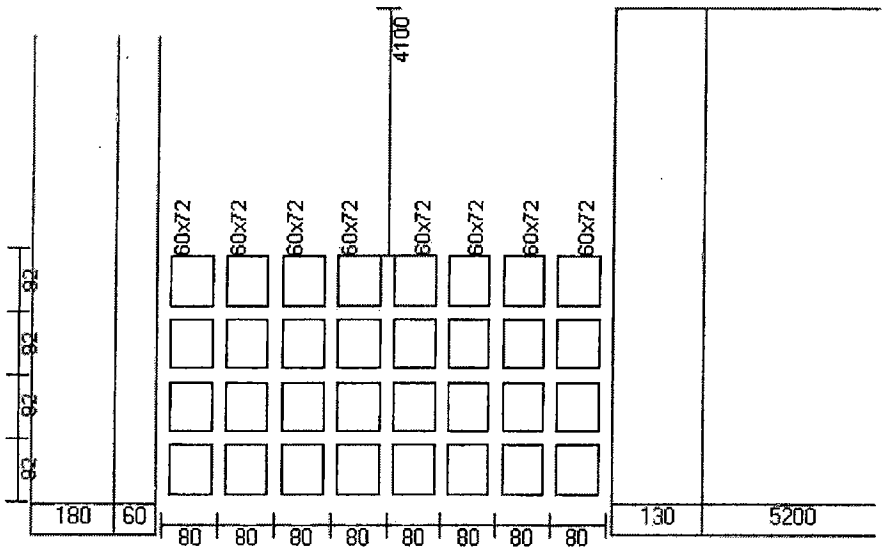
[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....2000 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....223 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....4100 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....180 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....60 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....0.84
ACTIVE GOB.....0.54
ONE SIDE + ACTIVE GOB.....0.38
TWO SIDES + ACTIVE GOB.....0.27



[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....8 (ft)
Depth of Cover.....1500 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....20 (ft)
Number of Entries.....9
Crosscut Spacing.....92 (ft)
Center to Center Distance #1.....80 (ft)
Center to Center Distance #2.....80 (ft)
Center to Center Distance #3.....80 (ft)
Center to Center Distance #4.....80 (ft)
Center to Center Distance #5.....80 (ft)
Center to Center Distance #6.....80 (ft)
Center to Center Distance #7.....80 (ft)
Center to Center Distance #8.....80 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....193 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....TWO SIDES + ACTIVE GOB
Extend of Active Gob.....4100 (ft)
Abutment Angle of Active Gob.....21 (deg)
Extend of First Gob.....180 (ft)
Abutment Angle of 1st Gob.....21 (deg)
Barrier Pillar Width of 1st Gob.....60 (ft)
Depth of Slab Cut in Barrier Pillar of 1st Gob....0 (ft)
Extend of Second Gob.....5200 (ft)
Abutment Angle of 2nd Gob.....21 (deg)
Barrier Pillar Width of 2nd Gob.....130 (ft)
Depth of Slab Cut in Barrier Pillar of 2nd Gob....0 (ft)

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....1.12
ACTIVE GOB.....0.69
ONE SIDE + ACTIVE GOB.....0.53
TWO SIDES + ACTIVE GOB.....0.45