Appendix 5-4

Coal Pillar Safety Factor Calculations

COAL PILLAR SAFETY FACTORS

Methods used to calculate coal pillar safety factors appear in Appendix 12-1. Average uniaxial compressive strength (C_p) and overburden pressure gradient (S_v) values used in section 12.3.2 are used in calculation of right-of-way, now part of Lease UTU-68082, safety factors.

EQUATIONS:

Pillar Strength (C_p): $C_p = C\ (.778 + .222\ (W/H))$

C = Coal Uniaxial Compressive Strength
W = Width of Pillar
H = Height of Pillar

Recovery Factor (R): $R = A_o/A_t$

A_o = Area of Entry
A_t = Total Area

Safety Factor (F.S.): $F.S. = C_p\ (1-R)/S_v$

S_v = Vertical Stress = 1 psi/foot of overburden

CALCULATIONS:

Eastern end of the right-of-way (area with smallest pillar height):

Criteria:
H = 5 feet
S_v = 1650 psi
C = 2200 psi
W = 60 feet
Pillar length = 140 feet
Pillar centers = 80 and 160 feet

$C_p = 2200(.778+.222(60/5)) = 7572$ psi

$R = 20(80+140)/80x160 = .34$

$F.S. = 7572(1-.34)/1650 = 3.03$

COAL PILLAR SAFETY FACTORS

Methods used to calculate coal pillar safety factors appear in Appendix 12-1. Average uniaxial compressive strength (C_p) and overburden pressure gradient (S_v) values used in section 12.3.2 are used in calculation of Lease UTU-60682 Lease UYU-6-692 safety factors.

EQUATIONS:

Pillar Strength (C_p): $C_p = C\ (.778 + .222\ (W/H))$

C = Coal Uniaxial Compressive Strength
W = Width of Pillar
H = Height of Pillar

Recovery Factor (R): $R = A_o/A_t$

A_o = Area of Entry
A_t = Total Area

Safety Factor (F.S.): $F.S. = C_p\ (1-R)/S_v$

S_v = Vertical Stress = 1 psi/foot of overburden

CALCULATIONS:

Eastern end of the right-of-way (area with smallest pillar height):

Criteria:
H = 5 feet
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Pillar length = 140 feet
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$C_p = 2200(.778+.222(60/5)) = 7572$ psi

$R = 20(80+140)/80x160 = .34$

$F.S. = 7572(1-.34)/1650 = 3.03$