

EXAMINATION PAPER

SUBJECT: CERTIFICATE IN STRATA CONTROL (COAL) SUBJECT CODE:COMSCC EXAMINATION DATE: 10 MAY 2016 TIME: 14:30 – 17:30	EXAMINER: Mark Henderson MODERATOR: Bernard Madden TOTAL MARKS: [100] PASS MARK: 60%
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NUMBER OF PAGES: 4

SPECIAL REQUIREMENTS:

1. Answer **ALL FIVE** questions
 2. References other than those provided are not permitted.
 3. Hand-held electronic calculators may be used.
 4. Put your examination number on the outside cover of each book used and on any graph paper or other loose sheets handed in.
- NB: your name must not appear on any answer book or loose sheets.**
5. **Write in ink on the RIGHT HAND SIDE of the paper only (only the right hand pages will be marked).**
 6. Show all calculations on which your answers are based.
 7. Illustrate your answers by sketches of diagrams wherever possible.
 8. In answering these questions, full advantage should be taken wherever necessary of your practical experience as well as of the data given.
 9. Answers must be given to an accuracy that is typical of practical conditions.
 10. Cell phones are **NOT** allowed in the examination room

QUESTION 1

Using the pillar strength formula $S=7.2w^{0.46}/h^{0.66}$

Danville colliery mines bord and pillar at 30m below surface at a mining height of 4m. The minimum w:h ratio applied by Danville is 3, minimum safety factor 1.6, and the road width is 6m. Assume square pillars. Show all calculations.

- 1.1) What size pillars does Danville require (5)
- 1.2) As part of their surface protection strategy, the Rock Engineer determined that mining height should be reduced to 2.5m. Following this, you have been requested to re-determine the required pillar size, and then compare the change in extraction percentage of the total volume of coal that would be achieved at 4m height to at 2.5m height (15)
- 1.3) In what ways can width to height influence pillar behaviour (5)

[25]

QUESTION 2

Maryville colliery, which mines at a 7m bord width, has a point anchored resin bolt system based on suspension of laminated material of 1.2m thick to overlying sandstone. At present, this is achieved using 20mm 1.8m bolts installed 2m apart between rows with 4 bolts per row, with 26mm holes.

Assume that the weakest interface is between the resin and the rock, at shear strength of 2MPa.

- 2.1) The Manager has asked whether bolt length can be reduced to 1.5m. Perform a calculation to determine whether bolt length can be reduced. Make allowance for reaming (15)
- 2.2) The Manager then considers using 1.2m bolts and changing the basis of the support system to beam building rather than suspension. Explain the principal and requirements of beam building to the Manager (5)
- 2.3) At a separate site, the colliery employs full column resin bolts. The Manager requests random pull tests of installed bolts to check installation quality and verify the 2mpa shear strength assumption. What is the problem with this request? What alternatives would you suggest? (5)

[25]

QUESTION 3

Bernville colliery is considering changing from 16 tonne to 20 tonne shuttle cars. As a result, it will be necessary to increase road width from 6.8m to 7.2m.

- 3.1) Calculate the percentage increase in tensile stress that the roof beam will be subjected to over the intersection (12)
- 3.2) Give typical values for compressive and tensile strength of 3 rock types on collieries where you have worked and name an example of igneous, metamorphic and sedimentary rock types (6)
- 3.3) Describe a rock mass characterization method of your choice. Make mention of limitations the method may have (4)
- 3.4) Sketch a cantilever beam and show where tensile and compressive stresses are concentrated (3)

[25]

QUESTION 4

- 4.1) Name 3 factors that may influence the result of a UCS lab test (3)
- 4.2) Explain how a Brazilian tensile test is performed (2)
- 4.3) Name 3 controls that may be increased to help manage falls of ground in the unsupported area while the CM is cutting (3)
- 4.4) Explain guttering and the management thereof (5)
- 4.5) Name, in rough order of importance, 5 considerations when evaluating joint exposure in a sidewall (5)
- 4.6) What causes sub-surface erosion (3)
- 4.7) Describe 4 ways of controlling blast damage (4)

[25]

TOTAL MARKS: [100]

Strata Control Formulae

$$S = 7,2 \frac{w^{0,46}}{h^{0,66}}$$

$$S = 5,47 \frac{w^{0,8}}{h}$$

$$S = 3,5 \frac{w}{h}$$

$$L = \frac{25 H C^2}{w^2}$$

$$\eta = \eta_o (1 + \frac{2 \Delta w_o}{w})^{2,46}$$

$$n = SF \frac{pgt}{Pf}$$

$$Lb = \frac{d_c^2 Lc}{D^2 - d^2}$$

$$\tau = \frac{Pf}{\pi . D . Lb}$$

$$\eta = \frac{\gamma L^4}{23 E t^2}$$

$$\sigma = \frac{\gamma L^2}{2 t}$$

$$FS = 288 \frac{w^{2,46}}{Hh^{0,66} (w + b)^2}$$

$$\sigma_s = 7,2 \frac{R_0^{0,5933}}{V^{0,0667}} \{ \frac{0,5933}{\varepsilon} [(\frac{R}{R_o})^\varepsilon - 1] + 1 \}$$

$$\tau = c + \sigma_n \tan \phi$$

$$V_s = \frac{4 \pi r^3}{3}$$