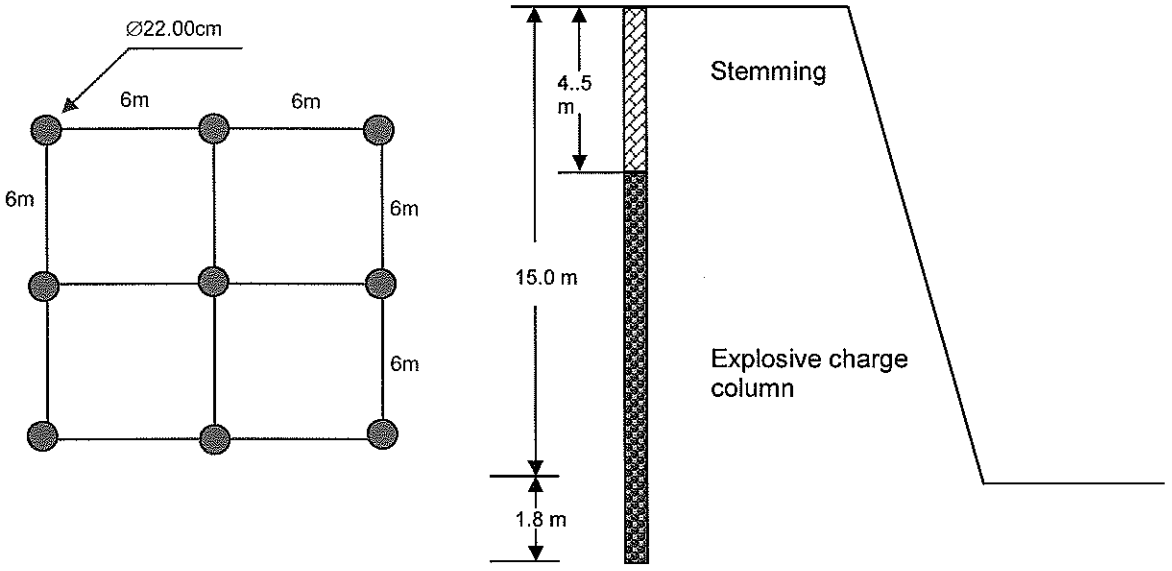
TA3110 Mining Engineering I
Final Exam, January 17th, 2008
Open Pit Section – Time 1.5 hours
This is an open book exam

Answer any three of the following five questions. All questions are of equal value.

1. A. There are various open pit mining systems which are used based on the orebody type and the type of product produced. Using the following methods describe the major differences which exist and the factors which are important in terms of excavation methods, material properties and economics which are important in ensuring a successful operation:
   - A dimension stone quarry
   - A quarry producing aggregate materials
   - A base metal operation.

   B. Discuss the three main methods of surface mining of coal in terms of their rehabilitation requirements.

2. An iron ore open pit mine is working with 15-meter bench height. The designed capacity of ore production is 65,000 tonnes/day with peak capacity of 70,000 tonne/day. The mine works 3 shifts/day,



A traditional rotary drilling system is used at this mine for rock breakage with the blast pattern being B X S = 6m X 6m pattern and each hole has a 1.8-meter sub-grade drilling (refer to the sketch). Site drilling tests suggest that

the selected drills:

- have an average penetration rate of 25 cm/min
- need about 10 minutes for relocation, and
- work for 7.5 hours per 8-hour shift, 3 shifts per day .

A. How many drills will be needed to meet the ore production requirement?

B. If the 22 cm diameter holes are loaded with ANFO that has density of 0.85 grams per cc. and the collar (stemming) height is 4.5 meters. Please calculate the powder factor of the blast, and judge if the blast design is reasonable.

3. You are planning a mining operation for a major open pit porphyry copper mine. Outline and discuss five factors you must consider in your design in order to ensure a successful mining operation from a cost, productivity and environmental perspective.

4. A critical aspect of cost and productivity in a large open pit mine is the interface between the loader and the haulage unit.

A. Describe the alternatives for the shovel-truck interface.
B: Discuss productive capacity versus productivity and how they affect mining costs.
C. Describe how ore variability might affect loader productivity

5. Provide definitions for or discuss the following aspects of open pit geometry.

A. Three factors limiting bench height.
B. The requirement for berms along a pit wall.
C. Alternatives for placing a haulage road in an optimized pit design.
D. The limitations on increasing the slope wall angle in an open pit.
E. How would you define a "pushback"?