SURFACE SUBSIDENCE ENGINEERING (MinE 612)

Class Room: ESB-E 211
Monday 2:00 – 4:50 PM

Instructor

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Text Book

- Peng, S.S., 1992, *Surface Subsidence Engineering*, SME, Littleton, CO. 161 pp.
- Distributed lecture notes
- Distributed technical papers

Main Topics to be Covered

Introduction

- History, regulatory issues, etc.
- Examples of subsidence problems and solutions

Basics

- Mining induced strata movements and surface subsidence
- Terminology
- Subsidence parameters
- Final subsidence basin
- Dynamic subsidence process associated with longwall mining

Subsidence Prediction Methods

- Commonly used subsidence prediction methods
- Final subsidence prediction
    - Influence functions and mathematical models
    - Final subsidence along major cross-sections
    - Final subsidence over an rectangular opening
    - Final subsidence over irregular opening
    - Determination of final subsidence parameters
    - Final subsidence due to mining in multiple panels
    - Final subsidence in hilly terrain (read only)
    - Final subsidence over high extraction room-and-pillar mines
- Dynamic subsidence prediction
    - Dynamic subsidence processes associated with longwall mining
    - Normal dynamic subsidence process
    - Subsidence initiation process
    - Residual subsidence process

Subsidence Influence Assessments

- Type of subsidence damages to surface structures and disturbance to environment
- Various critical values
- Assessment techniques to common structures

Subsidence Damage Mitigation

- Approaches to mitigate subsidence damage
- Mitigation measures to common surface structures

Subsidence Monitoring & Data Processing

- Subsidence monitoring techniques
- Subsidence monitoring program
- Data processing techniques

Grading:

- Four homework assignments, 13 points each
- Four unscheduled quizzes (2 points each)
- Two exams (middle and final), 20 points each
- Bonus: Class attendance and discussion participation, 0 – 5 points

Expected Learning Outcomes:

The students are expected to understand the engineering and public relation issues of mining subsidence, to learn the theories and prediction methods of final and dynamic mining subsidence, methods to improve subsidence predictions, techniques to assess and mitigate subsidence influences, methods to conduct subsidence survey and research. By the end of the semester, the students are expected have fundamental knowledge and basic tools to handle common mining subsidence issues faced by the coal mining industry.

Table 1.1 Formulae for Predicting Heights of Caved and Fracture Zones (Liu, 1981)

(For replacement of Table 1.1 on page 7)

Rock Type	Caved Zone SI System	Caved Zone English System	Fracture Zone SI System	Fracture Zone English System
Hard and strong rock (Good water conductivity)	$h_c = \frac{100m}{2.1m + 16}$ σ = ±2.5	$h_c = \frac{100m}{0.64m + 16}$ σ = ±8.2	$h_c = \frac{100m}{1.2m + 2.0}$ σ = ±8.9	$h_c = \frac{100m}{0.37m + 2.0}$ σ = ±29
Medium hard rock (Worse water conductivity)	$h_c = \frac{100m}{4.7m + 19}$ σ = ±2.2	$h_c = \frac{100m}{1.43m + 19}$ σ = ±7.2	$h_c = \frac{100m}{1.6m + 3.6}$ σ = ±5.6	$h_c = \frac{100m}{0.49m + 3.6}$ σ = ±18.4
Soft and weak rock (Bad water conductivity)	$h_c = \frac{100m}{6.2m + 32}$ σ = ±1.5	$h_c = \frac{100m}{1.89m + 32}$ σ = ±4.9	$h_c = \frac{100m}{3.1m + 5.0}$ σ = ±4.0	$h_c = \frac{100m}{0.94m + 5.0}$ σ = ±13.0
Weathered soft and weak rock (Bad water conductivity)	$h_c = \frac{100m}{7.0m + 63}$ σ = ±1.2	$h_c = \frac{100m}{2.13m + 63}$ σ = ±3.9	$h_c = \frac{100m}{5.0m + 8.0}$ σ = ±3.0	$h_c = \frac{100m}{1.52m + 8.0}$ σ = ±10.0