

# ROCK SLOPES

NHI Course 132035

## DESCRIPTION:

The Rock Slope course is a basic geotechnical course that will provide practical knowledge for both generalists and those planning to take more advanced geotechnical courses in the future. The course content is divided into three distinct phases as follows. The first phase covers the geotechnical data required for the design of rock slopes, namely structural geology, rock shear strength and groundwater. Each of the chapters on these topics includes the theoretical background to their use in design, and methods of data collection. The second phase covers rock slope design, and shows the design methods for four types of rock slope instability – planar, wedge, toppling and circular – and the methods of identifying each type. The third phase covers rock slope stabilization, and the application of the design methods discussed in the earlier part of the course. Participants will receive a comprehensive reference manual (FHWA-HI-99-007).

## OBJECTIVES:

The course objective is to impart to the participants the necessary knowledge and skills to determine the appropriate level of geotechnical effort needed for both the design of new rock cuts, and the stabilization of existing cuts. Upon completion of the course, each participant will achieve the following objectives:

- Understand the three types of information needed to design rock slopes, i.e. structural geology, rock strength and ground water;
- Understand the principles of using stereonet plots to plot structural geology data;
- Use stereonet plots to recognize different types of slope failure, i.e., planar, wedge, toppling and circular;
- Recognize three different classes of rock strength, i.e., discontinuities, rock mass and intact rock, and the geological conditions applicable to these three classes;
- Understand how to determine the strength of the three classes of rock;
- Recognize the importance of ground water on slope stability, and how to measure ground water pressures in slopes;
- Understand planar failure stability analysis, and how to use the design equations;
- Understand the principles of wedge failure stability and the use of wedge analysis design charts;
- Understand the principles of circular failure stability analysis, and the use of circular analysis design charts;
- Recognize the causes of rock fall hazards on highways and how these hazards can be managed;
- Understand the fundamentals of design and construction of rock slope stabilization methods, including rock bolts, shotcrete, drainage, scaling, trim blasting and rock fall protection measures such as ditches and fences.

## WHO SHOULD ATTEND:

The course will be of most benefit to geotechnical design engineers involved with highway design and maintenance in mountainous areas of their state. The course will also be of interest to maintenance supervisors who have responsibility for the operation and safety of highways in mountainous terrain.

## INSTRUCTORS:

**Norman I. Norrish** has 28 years of experience in the application of rock mechanics to mining, transportation, and civil construction projects including senior level project responsibility for the investigation, design and construction management of transportation projects in mountainous terrain throughout Western North America. Mr. Norrish contributed significantly to Transportation Research Board Special Report 247, *Landslides: Investigation and Mitigation* and has presented the NHI training course "Rock Slopes" to over 20 state DOTs.

**Duncan Wyllie** is a Principal in the company Wyllie & Norrish Rock Engineers, an engineering company specializing in rock mechanics; Mr. Wyllie has a total of 34 years of experience in this field. He has worked on slope, landslide, tunnel and foundation projects throughout North America, as well as overseas. The major portion of this work is for highways and railways, and involves both new construction and the evaluation and remediation of existing slopes and tunnels. Mr. Wyllie has also been involved in preparing textbooks and manuals for the Federal Highway Administration and Transportation Research Board. These include *Rock Slopes* (1980, 1989 and 1999 editions), *Landslides, Investigation and Mitigation* (1996). These publications have been used to teach courses on rock slope engineering to highway engineers across the United States. He is also the author of the book *Foundations on Rock* (1992, 1999 editions).

### Registration Procedure

- 1) Please contact Holly Suyama at 956-8719, 956-8851 (FAX) or [suyama@eng.hawaii.edu](mailto:suyama@eng.hawaii.edu) by **Friday, June 18, 2004**
- 2) Attendance is limited to 30 participants, and preference is given to local government employees.
- 3) Private company participation is on a space available basis at a fee of \$350. We will contact you indicating whether a seat has been reserved for you by June 25, 2004.

### Cancellations

Please contact us if you must cancel your registration or if someone will be substituting for you. Refunds will be made if notice of cancellations is received at least 5 workdays prior to the workshop date.

### Parking

Parking for the University of Hawaii is \$3/day in the lower campus parking lot. There are no in/out privileges and parking fees will be collected by University parking attendants at the guard station.

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**June 29-30, 2004**

University of Hawaii at Manoa,  
Campus Center, Room 309  
2465 Campus Road  
8:00 a.m. – 4:30 p.m.

Workshop sponsored by the  
**Hawaii Local Technical Assistance  
Program**

in cooperation with the  
*Hawaii State Department of Transportation  
University of Hawaii's Department of Civil &  
Environmental Engineering  
and the Federal Highway Administration*

### Hawaii Local Technical Assistance Program

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