University of Wisconsin–Madison

Designing and Implementing Alternative Earthen Final Covers for Waste Containment Facilities

January 31–February 1, 2001
in Los Angeles, California

In cooperation with UCLA Extension

Focus on:

- How Design of AEFCs Differs from Traditional U.S. EPA RCRA Cover
- Satisfying Regulatory Requirements for Waste Containment Cover Systems
- Climatic Considerations in Development of AEFCs
- Assessing Soil Properties
- Establishing and Maintaining Vegetation
- AEFC Types and Specifications
- Design and Analysis Procedures for Developing AEFCs
- Assessing Site Characteristics
- Determining AEFC Equivalency Criterion Based on Percolation and Risk Analysis
- Designing the Alternative Cover
- Appropriate Evaluation/Analysis
- Selecting a Model for Design and Evaluating Output
- Identifying Critical Events Affecting Percolation
- Defining Acceptable Characteristics for Soils
- Field Verification of AEFC Design
- Defining Verification Parameters
- Conducting Test Sections, Pilots, and Demonstrations

University of Wisconsin–Madison

Designing and Implementing Alternative Earthen Final Covers for Waste Containment Facilities

An in-depth course focusing on

- Techniques for design and implementation
- Environmental and financial benefits
- Regulatory experience, examples of successful implementation, and more!

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Department of Engineering Professional Development

Designing and Implementing Alternative Earthen Final Covers for Waste Containment Facilities

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Update Your Knowledge

This new course is your opportunity to learn about the latest environmental and financial benefits associated with incorporating alternative earthen covers into the design of landfills and other types of waste containment facilities. As a participant you will consider:

- How to take advantage of the natural properties of soils
- Cost-saving benefits of alternative earthen covers
- Techniques for building a very efficient final cover
- Advantages of soil covers when compared to current practice
- How to demonstrate equivalency of soil covers
- Regulatory experience with this new approach
- Examples of successful implementation of alternative final covers

Who Will Benefit

This course will assist you if your responsibilities include:

- Operating sanitary landfills
- Developing alternative strategies for capping waste disposal sites
- Implementing remediation projects
- Finding ways to save money at disposal and remediation sites
- Obtaining permits and plan approvals for new facilities
- Reviewing plans for regulatory compliance

For More Course Descriptions
http://epd.engr.wisc.edu/courses/

Your Instructors

Craig H. Benson has extensively researched and field-tested alternative earthen final covers at a variety of locations throughout the United States. He is a professor of civil and environmental engineering at the University of Wisconsin–Madison. The National Science Foundation, U.S. Department of Energy, and American Society of Civil Engineers have recognized his research work. Dr. Benson has a Ph.D. in geotechnical engineering from the University of Texas at Austin.

Mark D. Ankeny is a soil scientist and director of research and development for Daniel B. Stephens and Associates, Albuquerque, New Mexico. His area of expertise includes soil hydraulic properties, instrumentation for measuring water movement in the vadose zone, and alternate soil cover implementation. He has a Ph.D. in crop production and physiology from Iowa State University.

Course Outline

Welcome

Philip R. O'Leary
Program Director
Department of Engineering Professional Development
University of Wisconsin–Madison

Introduction of Instructors

Craig H. Benson
Professor
Department of Civil and Environmental Engineering
University of Wisconsin–Madison

Mark D. Ankeny
Soil Scientist, Director of Research and Development
Daniel B. Stephens and Associates
Albuquerque, New Mexico

Introduction to Alternative Earthen Final Covers

Alternative Earthen Final Cover Concept

- Definition of alternative earthen final cover (AEFC)
- Description of RCRA final covers for Subtitle D and C landfills

***Outline continues** inside...*

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How Design of AEFCs Differs from Traditional U.S. EPA RCRA Cover
- Soil water storage capacity
- Evapotranspiration (ET)
- Timing of meteorological events relative to growing season

Philosophy of AEFCs
- Low-cost
- Constructed with natural materials
- Self-maintaining barrier systems

Satisfying Regulatory Requirements for Waste Containment Cover Systems
- Equivalency
- Performance-based criterion
- Percolation threshold
- Risk-based criterion

Related Requirements Applicable to All Cover Systems
- Mechanical stability
- Erosion control
- Settlement
- Biota intrusion
- Methane gas control
- Long-term behavior

Scientific Expertise Applicable to AEFCs
- Agronomy
- Geotechnical engineering
- Soil physics

Essential Concepts for AEFCs Development

Climatic Considerations in Development of AEFCs
- Applicability in different climates: arid, semi-arid, and humid
- Temperature variables
- Pattern and type of precipitation
- Site elevation factors

Assessing Soil Properties
- Water flow in unsaturated soil
- Physical properties
- Geotechnical properties
- Agronomic properties

Establishing and Maintaining Vegetation
- Vegetation requirements
- Root systems
- Grasses
- Shrubs
- Trees

AEFC Types and Specifications
- Operational concepts
- Monolithic covers
- Capillary barriers
- Specialized barriers and covers

Design and Analysis Procedures for Developing AEFCs

Assessing Site Characteristics
- Geological investigation
- Defining hydrogeological setting
- Depth to groundwater table
- Seismic conditions
- Identifying desirable materials
- Borrow soil source characterization

Determining AEFC Equivalency Criterion Based on Percolation
- Existing data on RCRA covers
- Limitations of measurements
- Modeling approach
- Using pseudo-geomembrane layer
- Limitations of model accuracy
- Suggested equivalency values

Determining AEFC Equivalency Based on Risk
- Risk factors
- Assessment models
- Regulatory considerations

Designing the Alternative Cover
- Suitability of soils
- Simple calculations to estimate layer thickness
- Identifying local, robust vegetation
- Achieving adequate transpiration potential

Appropriate Evaluation/Analysis
- Field input data vs. estimates
- Duration of design simulations (1, 5, or 10 years)
- Critical meteorological periods for evaluating performance
- Five or ten wettest years
- Snowfall, snowpack, and snowmelt
- 500-year or 1000-year events
- Assessing vegetation
- Sensitivity of design to model assumptions

Selecting a Model for Design
- Characteristics of a suitable model
- Follow-up with more sophisticated models
- HELP model
- Other models
- Model verification

Evaluating Model Output
- Comparing results to percolation criterion
- Daily comparison
- Annual comparison
- Multi-year average

Identifying Critical Events Affecting Percolation
- Storage capacity of barrier layers
- Design modifications to ameliorate weaknesses
- Return period for critical events

Defining Acceptable Characteristics for Soils
- Texture triangle
- Holding capacity diagram

Additional Design Elements
- Erosion control
- Frost damage control
- Biota intrusion
- Differential settlement
- Gas control
- Monitoring

Field Verification of AEFC Design

Defining Verification Parameters
- Relevant local experience available
- Natural analogs for verification
- Monitoring constructed cover vs. evaluating a test section
- Consequences of not meeting a performance requirement

Conducting Test Sections, Pilots, and Demonstrations
- Monitoring water balance parameters
- Boundary conditions
- Need for mass balance
- Caution with lysimeters

Registration and Course Schedule

Course registration will be Wednesday, January 31 at 8:00 a.m. at Covel Commons, Sunset Village, Los Angeles, California. Daily sessions will begin at 8:15 a.m., Wednesday's adjournment will be at 4:30 p.m., and final adjournment on Thursday will be at 4:00 p.m. The daily schedules will include morning and afternoon refreshment breaks and lunch at noon.

Examples of Successful Designs and Installations

Each section of the course will include examples demonstrating application of regulations, climate, type of design, and permits obtained. Sites to be presented include:

- Hanford
- RMA
- FE Warren
- Sandia
- Glendale, Arizona

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Engineering Registration, Dept. 107
The Pyle Center
702 Langdon Street
Madison, Wisconsin 53706

Internet:
http://epd.engr.wisc.edu/brochures/A450.html

Need to Know More?

Call toll free 800-462-0876 and ask for

Program Director: Philip R. O'Leary

Program Assistant: Jane Sauer

Or **e-mail** oleary@engr.wisc.edu

General Information

Fee Covers Notebook, course materials, break refreshments, lunches, and certificate.

Cancellation We prefer enrollment in advance. If you cannot attend, please notify us immediately. We will refund your fee, or you can have someone take your place.

Location Covel Commons, Sunset Village, Los Angeles, California.

Accommodations A block of sleeping rooms for course participants has been reserved ($109/single or double, plus tax) at the DoubleTree Hotel, 10740 Wilshire Boulevard, Los Angeles, California. Please call 310-475-8711 or 800-472-8556 before December 29, 2000 and mention that you will be attending this University of Wisconsin course.

Enrollment Form

Important–please enter the 3-digit UW# Code from the mailing label.

UW# ❑ ❑ ❑

Please advise us at time of enrollment if you are a person with a disability and desire special accommodations. Requests will be kept confidential.

Course Information

❑ Please enroll me in **Course #A450** **Designing and Implementing Alternative Earthen Final Covers for Waste Containment Facilities**
January 31–February 1, 2001 in Los Angeles, California Fee: $795 (1.2 CEU)

❑ I cannot attend at this time. Please send me information on future offerings.

Personal Information

Please type or use ink; print information as you'd like it on your record.

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone (_____) _____ Fax (_____) _____

E-mail _____ Soc. Sec. Number (Optional) _____

Billing Information

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Voluntary information collected to enhance UW programming

❑ Female ❑ Male

Birthdate: Month Day Year

Heritage:
❑ African American 1
❑ Asian/Pacific Islander 2
❑ American Indian/Alaskan Native 3
❑ Hispanic/Latino 4
❑ White/Other 5

Occupational Area: ❑ Engineering, Architecture & Surveying 3
❑ Other 13

Are you enrolled in this program primarily for career purposes?
❑ Yes ❑ No

UW–Madison provides equal opportunities in employment and programming, including Title IX requirements. This course is supported in part by funds administered through UW–Extension.

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