

INTRODUCTION TO HIGHWAY HYDRAULICS

OBJECTIVES:

This course is based on Hydraulic Design Series No. 4 (HDS-4), "Introduction to Highway Hydraulics." The objective of the course is to provide a broad overview of basic highway drainage concepts. Fundamental hydraulic concepts are discussed, followed by open-channel flow principles and design applications of open-channel flow in highway drainage, including the design of stable channels, and pavement drainage. Closed-conduit concepts and applications in highway drainage include the application of culvert and storm drainage design. The presentation concludes with an introduction to concepts and design of energy dissipators. Detailed design criteria are drawn from other Hydraulic Design Series manuals and Hydraulic Engineering Circulars (HECs), providing a broad overview of all components of highway drainage design with an emphasis on practical applications. A portable hydraulic flume is set up in the classroom for the participants to observe numerous hydraulic principles. The participants take velocity and discharge measurements from the flume while in various setups and use the information to make design calculations.

***Participants should bring their calculators and straight edges to the course.**

OBJECTIVES:

Upon completion of the course, participants will be able to:

- Calculate design discharge using the rational method or regression equation procedures
- Apply the continuity and energy equation to solve practical design problems
- Use the Weir equation to calculate the flow overtopping a roadway embankment
- Use Manning's equation to calculate velocity or flow depth in simple or compound channels and recognize when this equation cannot be appropriately applied
- Evaluate channel flow conditions (subcritical, critical, or supercritical) using the Froude number
- Design a stable channel using basic hydraulic concepts and Hydraulic Engineering Circular HEC-15
- Apply basic pavement drainage concepts in calculation procedures described in HEC-22
- Design a simple culvert crossing using the procedures in HDS-5
- Design a simple storm drain and calculate the Hydraulic Grade Line (HGL) using the energy equation and HEC-22
- Describe which energy dissipaters are useful for culvert or storm drain applications based on HEC-14

TARGET AUDIENCE:

Entry-level engineers or engineering technicians who are performing highway drainage calculations on transportation facilities. It will also be useful as a refresher course on hydraulic fundamentals for experienced personnel.

INSTRUCTORS:

Jim Bakken is a registered Professional Engineer in Michigan, Minnesota, and Wisconsin, and has 33 years as a practicing consulting engineer specializing in water resources analysis and design. Experience includes storm drainage systems, detention ponds, hydraulic design of spillways, streambank stabilization, flood plain analysis, stable channel design, and bridge and culvert crossings. He is a frequent instructor for this class and also teaches the Culvert Design and Urban Drainage Design courses.

Dr. Jim Schall is a registered Professional Engineer in Colorado, Nevada and California, and has 25 years as a practicing consulting engineer specializing in water resources. Highway and urban drainage design experience includes large storm drainage systems, detention pond design, stable channel design and culvert crossings. He is an author of HDS-4, the text for the Introduction to Highway Hydraulics course, and is a frequent instructor for the class. He also teaches the Culvert Design and Urban Drainage Design courses.

Registration Procedure

- 1) Please contact Gail Ikeda at 956-8367, 956-8851 (FAX) or gail@eng.hawaii.edu by **Tuesday, June 13, 2006**.
- 2) Attendance is limited to 30 participants, and preference is given to local government employees.
- 3) Private company registration fee is \$550 (includes parking pass).

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 cancellation is received at least 3 working days prior to the workshop date.

Parking

Parking for the East West Center is \$4/day (total \$12). If you would like to a parking pass, please contact us by June 13, 2006. Make checks payable to **Research Corporation of the University of Hawaii (RCUH)** and mail to:

Hawaii LTAP
University of Hawaii
Dept of Civil and Environmental Engineering
2540 Dole St, Holmes 383
Honolulu, HI 96822
Attn: Gail Ikeda

INTRODUCTION TO HIGHWAY HYDRAULICS

June 27 – 29, 2006

East-West Center
Jefferson Hall
Asia Room
8:00 a.m. – 4:00 p.m.

Workshop sponsored by the

**Hawaii Department of Transportation
and the
Hawaii Local Technical Assistance
Program**

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

Hawaii Local Technical Assistance Program

University of Hawaii at Manoa
Department of Civil & Environmental Engineering
2540 Dole Street, Holmes Hall #383
Honolulu, Hawaii 96822

