

Introduction to Highway Hydraulics

Workshop Sponsored by the
Hawaii's Local Technical Assistance Program
in cooperation with
the Hawaii State Department of Transportation,
University of Hawaii's Department of Civil Engineering,
and Federal Highway Administration

When: February 23 - 26, 1999
Where: Honolulu, HDOT Oahu District Conference room
Time: 8:00 AM - 4:30 PM
Cost: FREE!!
Instructors: Jim Schall --- Ayres Associates, Fort Collins, Colorado
Arlo Waddoups --- FHWA, San Francisco, California
Contact: Juli Kobayashi at 956-9006, 956-8851 Fax or juli@wiliki.eng.hawaii.edu
Deadline to register is Friday, February 12, 1999

DESCRIPTION

This course is based on the revised and renamed Hydraulic Design Series No. 4 (HDS-4), "Introduction to Highway Hydraulics," providing participants with information on current hydraulic techniques. The emphasis is placed on methods suitable to small drainage areas, such as storm drains, roadside ditches, etc., servicing primarily small drainage areas. In addition, fundamental hydraulic concepts are discussed, followed by open-channel flow principles and design applications of open-channel flow in highway drainage, including open-channel applications and the design of stable channels, pavement and drainage. Closed-conduit concepts and applications in highway drainage will be presented, as well as the application of culvert and storm drainage design. The presentation concludes with an introduction to concepts and design of energy dissipaters and a comprehensive design workshop. Detailed design criteria are drawn from other Hydraulic Design Series manuals and Hydraulic Engineering Circulars, providing a broad overview of all components of highway drainage design with an emphasis on practical applications. A portable hydraulic flume is set up for the participants to observe numerous hydraulic principles and see the effects of weir shapes improved inlets for culverts, pipe slope, corrugated versus smooth pipe and hydraulic jump. The participants take velocity and discharge measurements from the flume while in various setups and use the information to make actual design calculations.

OBJECTIVES

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

1. Calculate design discharge using the Rational Method or Regression Equation procedures.
2. Apply the continuity and energy equation to solve practical design problems.
3. Use the Weir equation to calculate the flow overtopping a roadway embankment.
4. Use Manning's equation to calculate velocity or flow depth in simple or compound channels, and recognize when this equation cannot be appropriately applied.
5. Evaluate channel flow conditions (subcritical, critical or supercritical) using the Froude number.
6. Design a stable channel using basic hydraulic concepts and HEC-15.
7. Apply basic pavement drainage concepts in calculation procedures described in HEC-22.
8. Design a simple culvert crossing using the procedures in HDS-5.
9. Design a simple storm drain and calculate the HGL using the energy equation and HEC-22.
10. 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 doing highway drainage calculations on transportation facilities. It will also be useful as a refresher course on hydraulic fundamentals for experienced personnel.