Comprehensive Review of Culvert, Open Channel and Storm Sewer Design Training program

Course Description

Changes in land use affect urban drainage and, therefore, present challenges for engineers who must deal with drainage planning, runoff analysis, storm sewer hydraulics, and watercourse drainage within the government regulations. The course focuses on these topics, providing participants with a comprehensive understanding of culvert, open channel, and storm sewer design, and allowing designers already in the field to update their knowledge.

The course will also address the use of computer software for design work.

After participating in this course you will be able to do the following:

- consider technical issues in design by focusing on related planning and environmental impact
- enhance protection of property from flood damage and reduce pollution at a lower cost
- select computer software that is most suitable for your application of urban drainage design
- participate in public consultation meetings with confidence
- employ design methodology learned in the course on your next project for urban drainage

Objectives

- To increase participants' knowledge of the design process and design tools used in urban drainage
- To discuss the future of computer-aided design in urban drainageMunicipal engineers; developers; planners; consultants; hydraulic engineers; technicians and technologists; and other technical personnel responsible for drainage facilities, underground pipe systems, inlets, culverts, and catch basins. This course is particularly suitable for those who want a comprehensive review of drainage design methods.

Outline

Welcome, Introduction, Workshop Preview, Learning Outcomes, and Assessment Method

1. An overview of recent developments in Drainage Planning

- Watershed/subwatershed plans
- Complex Environmental Impact study requirements of the Natural Heritage System
- Long-term operation and maintenance
- Monitoring, why, what, when, and who

2. Basic Hydrology: Refresher

2.1 Rainfall Analyses

- Design storms or floods-how to cope with lack of long and reliable data sets
- Storm frequencies-the danger of extrapolation
- Intensity-Duration-Frequency (IDF) data
- Historical storms

2.2 Time of Concentration: Review of Design Equations, Charts and Their Limitations

- Bransby Williams equation
- Kirpich equation
- Airport formula

2.3 Methods of Computing Rainfall Losses

- Runoff coefficients
- SCS curve number method
- Infiltration

2.4 Estimating Flows for Drainage Design

- Peak flow methods: statistical analyses
- Rational method-is it still rational?
- Hydrograph and unit hydrographs
- Examples of Estimating Flows

3. Open Channel Flow: Refresher

3.1 Basic Hydraulic Theory

- Basic laws of hydraulics
- Types of flows
- Manning's equation
- Roughness coefficients
- Backwater effects
- Stream erosion and threshold velocities
- Effect of urbanization on stream hydraulics

3.2 Design of Open Channels

- Manning's equation
- Stable channels
- Composite channels
- Triangular channels and gutters

3.3 Introduction to Geomorphology-Is it a Science or Art?

- Rosgen method
- Stability analyses

4. Design of Storm Sewers

- Gravity flow sewers
- Hydraulic losses
- Simple spreadsheet design approach

5. Design of Culverts and Bridge Openings

- Culverts, inlet and outlet control
- Use of design charts
- Bridge openings

6. Effect of Climate Change on Drainage

- The effect of climate change-how to make allowance for it when we know so little?
- Predictions of changes in precipitation
- What a prudent designer should do

7. Drainage Design Software: A Review

- Available software tools
- Software selection
- Review of StormCAD, FlowMaster, CulvertMaster