CONCEPT

Stormwater Drainage Design and SuDS: Urban Hydrology, Storm Sewers and Flood Protection

21 – 25 November 2027
Dammam - Eastern Province five-star



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Ref: 417_13827 **Date:** 21 – 25 November 2027 **Location:** Dammam - Eastern Province five-star **Fees:** 19500 SAR

Introduction:

Stormwater drainage design fails in the same places across many cities: underpasses that pond after short cloudbursts, sewers sized from outdated rainfall data, ponds that silt up and wadi flows that bypass the network altogether. This Core Concept course gives drainage engineers a calculation route for an urban catchment, from rainfall analysis and IDF curves to runoff estimation, storm sewer and open channel hydraulics, detention storage and sustainable drainage systems SuDS. Participants build an Urban Catchment Drainage Design Pack for a case development, with sized pipes, inlets, attenuation and an operation plan.

Course Objectives:

- Derive design rainfall intensities from rain gauge records by fitting annual maxima and building IDF curves for selected return periods
- Estimate peak flows and runoff hydrographs for urban subcatchments using the rational method and unit hydrograph concepts
- Size storm sewers, gully and kerb inlets, manholes, culverts and lined or earth channels using open channel and pipe flow hydraulics
- Design detention and retention storage with outlet controls that limit discharge to an agreed allowable rate
- Select and lay out SuDS components such as swales, infiltration trenches, permeable paving and attenuation tanks along a management train
- Plan inspection, cleaning and asset records for a drainage network and test its performance against flash-flood and changing rainfall scenarios

Target Audience:

- Municipal engineers responsible for approving drainage submissions for new subdivisions, roads and public spaces
- Consultant design engineers responsible for storm sewer layouts, hydraulic calculations and drainage reports
- Infrastructure project engineers responsible for coordinating drainage works with roads, utilities and landscape packages
- Asset and maintenance engineers responsible for inspecting, cleaning and repairing storm drainage networks
- Flood protection engineers responsible for channels, embankments and diversion works where valleys meet urban areas

Course Outline:

Day 1: Urban Hydrology, Rainfall Records and IDF Curves

- Urban Water Cycle and Effect of Impervious Cover on Peak Runoff
- Catchment Delineation from Contour Plans and Digital Elevation Models
- Rain Gauge Data Screening and Annual Maximum Series Extraction
- Gumbel Distribution Fitting and Return Period Selection
- IDF Curve Construction with Sherman-Type Intensity Equations

Day 2: Runoff Estimation Methods and Design Storms

- Rational Method Inputs: Runoff Coefficient, Intensity and Contributing Area
- Time of Concentration: Overland Flow, Gutter Flow and Pipe Travel Time
- Composite Runoff Coefficients for Mixed Land Use Parcels
- Unit Hydrograph Principles: Linearity, Time Invariance and Direct Runoff
- Design Storm Hyetographs and Rainfall Loss Estimation

Day 3: Storm Sewer, Inlet, Culvert and Channel Hydraulics

- Manning Equation Pipe Sizing, Minimum Self-Cleansing Velocity and Cover Depth
- Gully and Kerb Inlet Capacity, Grate Clogging Factors and Sag Point Layout
- Manhole Spacing, Junction Losses and Hydraulic Grade Line Check
- Culvert Flow Under Inlet and Outlet Control with Headwater Limits
- Trapezoidal and Lined Channel Design with Freeboard and Scour Protection

Day 4: Storage, SuDS and Flash-Flood Protection

- Detention Basin Volume by Inflow and Outflow Hydrograph Routing
- Orifice and Weir Outlet Structures, Extended Detention and Retention Ponds
- SuDS Management Train per CIRIA SuDS Manual C753: Source Control to Site Control
- Swales, Infiltration Trenches, Permeable Paving and Attenuation Tanks
- Wadi Flash-Flood Protection: Diversion Channels, Embankments and Check Structures

Day 5: Network Modelling Build and Drainage Design Pack

- EPA SWMM 5 Model Set-Up: Subcatchments, Conduits, Storage Nodes and Outfalls
- Surcharge and Flooding Review Under Higher-Intensity Rainfall Scenarios
- Operation and Maintenance Plan: CCTV Survey, Jetting, Desilting and Asset Records
- Climate Resilience Checks: Uplift Factors, Exceedance Routes and Safe Flood Paths
- Urban Catchment Drainage Design Pack Presentation and Peer Review

Skills You Will Gain:

- Rainfall Frequency Analysis
- Urban Runoff Estimation
- Storm Sewer Hydraulic Sizing
- Inlet Capacity Assessment
- Detention Storage Routing
- SuDS Component Selection
- Flash-Flood Protection Planning
- Drainage Network Modelling

Why Attend This Course:

- Return with an Urban Catchment Drainage Design Pack containing IDF curves, runoff calculations, pipe and inlet schedules and storage sizing for a case development
- Review consultant drainage reports with worked checks for time of concentration, hydraulic grade line and culvert headwater
- Compare piped, storage and SuDS solutions on one catchment and explain the trade-offs to planners and asset owners
- Exchange drainage and flood practice with engineers from municipalities, consultancies, developers and utilities

Conclusion:

Urban drainage works when rainfall, runoff, conveyance and storage are designed as one system and then kept clean. The one week move from rainfall records and IDF curves to runoff estimation, then to storm sewer, inlet, culvert and channel hydraulics, then to detention, SuDS and flash-flood protection. The final day builds a network model, tests it against heavier storms, sets a maintenance plan and closes with an Urban Catchment Drainage Design Pack ready for use on the next development.