Course ID: 12d – 2D

Two Day – Stormwater Drainage Design and Analysis

Summary:

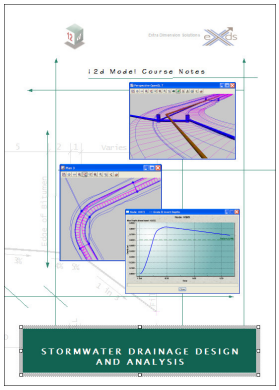
This course is for designers who wish to use 12d Model for the design and analysis of Stormwater Drainage Systems for urban and highway drainage
It is intended for people competent in the basics of 12d Model, who have an understanding of the concepts of stormwater drainage hydraulics and hydrology.

The first day of training covers creating the stormwater drainage network, modelling other utility services and checking for clashes, labelling the network, and producing plotted output for use in drawings.
The second day focuses on the hydrological and hydraulic design and analysis of the network. In our public training sessions we use 12d Model's Dynamic Analysis Engine for analysis, if the course is done in-house, we offer the choice of analysis in 12d Model or in Drains

Prerequisites:

Experience in 12d Model gained by completing the **One Day – Introduction to 12d Model Software** (12d – 1A) or working through the "Getting Started for Design" manual is required.

Course Contents:

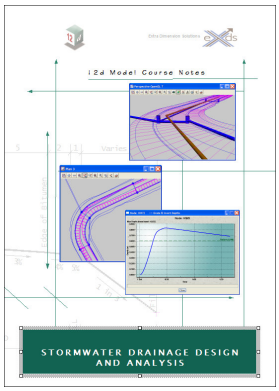


Stormwater Drainage Design & Analysis – Day 1

This session covers the creation of a network of pits and pipes for stormwater drainage, and creation of other necessary inputs to the design process.
The session introduces the Drainage Network Editor (DNE) as the main tool to size and grade pipes, set cover levels, and as the entry point for plotting and analysis.

Specific elements covered in the first day are:-

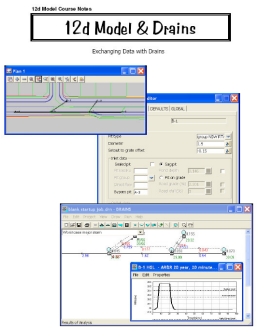
- Setting up a combined Finished Surface from road design and survey data.
- Locating (and marking) low points on the road design strings.
- Creating a network of pits and pipes, and grading the network using the Drainage Network Editor.
- Assigning pit names and labelling the pits.
- Identifying the parts of the road design relevant to the drainage design and creating a 'road design file' that lists these strings.
- Labelling the network with linestyles and symbology suitable for presentation drawings or export to CAD
- Modelling underground services (water mains and utility duct banks) in 3D, and checking for clashes between the services and the drainage lines.
- Adjusting the invert levels of the pipes to ensure clearance to other services.
- Introduction to 12d Model's use of Attributes, and how attributes on the drainage network are used to produce reports/setout tables and the like.
- Creating longsection plots of the network



Stormwater Drainage Design & Analysis – Day 2

The second day of the course will cover:

- Creating catchment, measuring areas, and the automatic and manual methods of assigning catchment areas to pits.
- Defining bypass flow routes, and how these are used to analyse width of gutter flow and ponding at sag pits.
- Defining ***inlet rating curves*** for pits.
- Using drafted flowpaths, to calculate Tc values.
- Using 12d Model to calculate Ku and Kw factors.
- Analysing the system using 12d Model's Rational Hydrology Engine. Calculating the HGL, and determining pipe flows and velocities. Calculating bypass flows and ponding depths at sag pits.
- Designing the system using the Rational Engine. Resizing pipes, and resetting invert levels based on HGL/ freeboard requirements
- Modelling an open channel and headwalls to carry discharge from the piped network
- Producing Hydrology and Hydraulic Reports
- ***Analysis of the network using the Dynamic Drainage Engine. Time/Area hydrology and dynamic routing of pipe and bypass flows.***
- ***Modelling a Detention Basin, Outlet Control Structure and an Overflow Weir***



12d Model and Drains (Alternative Day 2)

This course is available as an alternative to the standard second day of the course, and focuses on the techniques for using Drains as the Analysis/Design tool alongside 12d Model. This course is only available 'in-house' and is not offered in our Public Sessions.

For the '12d Model and Drains' option, Day 2 will cover:

- Creating catchment, measuring areas, and the automatic and manual methods of assigning catchment areas to pits.
- Defining bypass flow routes, and how these are used to analyse width of gutter flow and ponding at sag pits.
- Investigating 12d Model's pit and pipe database (the 'drainage.4d' file), and how ***Drains Pit Families*** are defined in this file.
- How road grade & cross fall are measured and used to determine the Drains Pit Family.
- Defining flowpaths, and calculation of Tc values.
- Using 12d Model to calculate Ku and Kw factors.
- The synchronising of pit and pipe databases in 12d and Drains to allow easy exchange of data between the two programs. Fixing problems with mis-matched databases.
- Exporting the Network to Drains.
- Changing design parameters inside Drains, and how 12d Model keeps track of changes to data sent from Drains to 12d Model.
- Analysing the drainage model in Drains, and importing results back to 12d for presentation (plan and long sections) and for engineering verification.
- Adding, deleting or moving a pit, and the process of synchronising the models in both programs.

Please note the content for all EXDS training is the use of 12d Model Software
EXDS does not teach Civil Engineering or Surveying principles.

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