12d® Model

Civil and Surveying Software

12d Model Training Notes

Training Modules for 12d Model

July 2020

12d® Model
Do more with your software.

12d Model V14.0 Training Modules for 12d Model Manual

July 2020

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12d Model is supplied without any express or implied warranties whatsoever.

No warranty of fitness for a particular purpose is offered.

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12d Model TRAINING OVERVIEW

We have been training users for over 25 years and have been refining our training methods not only as the product develops, but also from the feedback that we receive after every training session, from both trainers and users.

All our trainers have vast industry experience and are experts in the use of 12d Model. All training is conducted hands-on with the trainer projecting onto a screen while each attendee operates 12d Model on a laptop.

Our training sessions are intensive with a steep learning curve, which means that you can become a productive user within a matter of days. Some modules have prerequisites to ensure that all attendees are at the right learning stage to absorb advanced course information.

All 12d Training attendees are issued with comprehensive course notes, ensuring they get the most out of the experience on the day, and afterwards have useful reference material.

If you have questions about any of our training courses, or about in-house training, please contact us at qld.training@iscdt.com.au or vic.training@iscdt.com.au.

1.0 AVAILABLE TRAINING COURSES

The diagram below provides a handy summary of the public training courses offered for 12d Model software. The complexity of courses increases from left to right, and arrows indicate courses that are prerequisites to attend a course.

These courses have been made modular, so for clients requesting in-house training, 12d Solutions is able to customise a course to suit your needs.

12d Model Training Course Progression
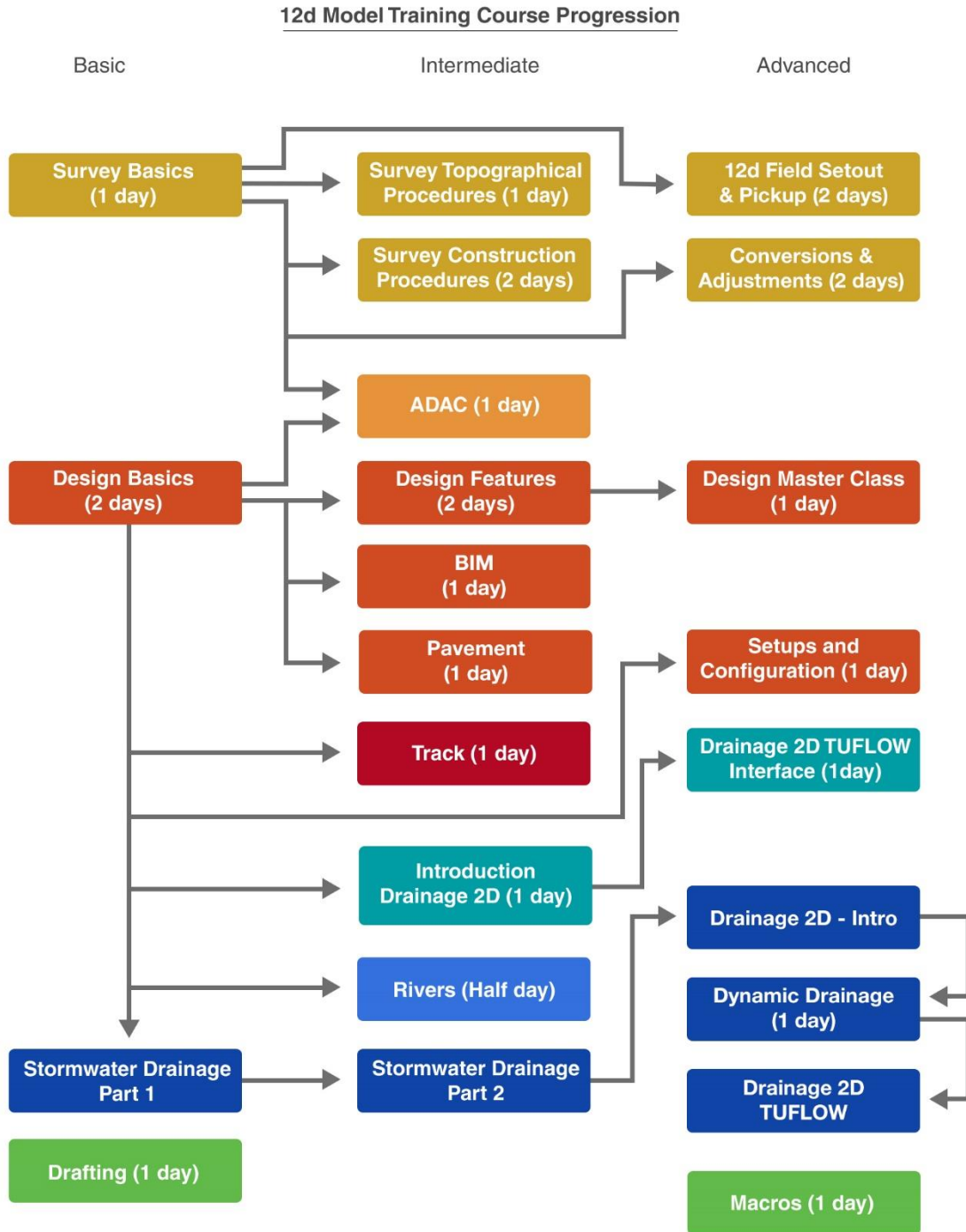
2.0 AVAILABLE TRAINING MODULES

Each 12d Model training course is made up of smaller training modules, and these modules can be customised by 12d Solutions for clients requesting in-house training sessions – just let us know what you want out of your in-house training, and we'll design a programme to suit your needs and help you get the most out of the day(s).

The diagram below provides a handy summary of the training modules offered, with the full module outlines included in further detail throughout the rest of the document. The arrows indicate modules which are prerequisites to other modules.
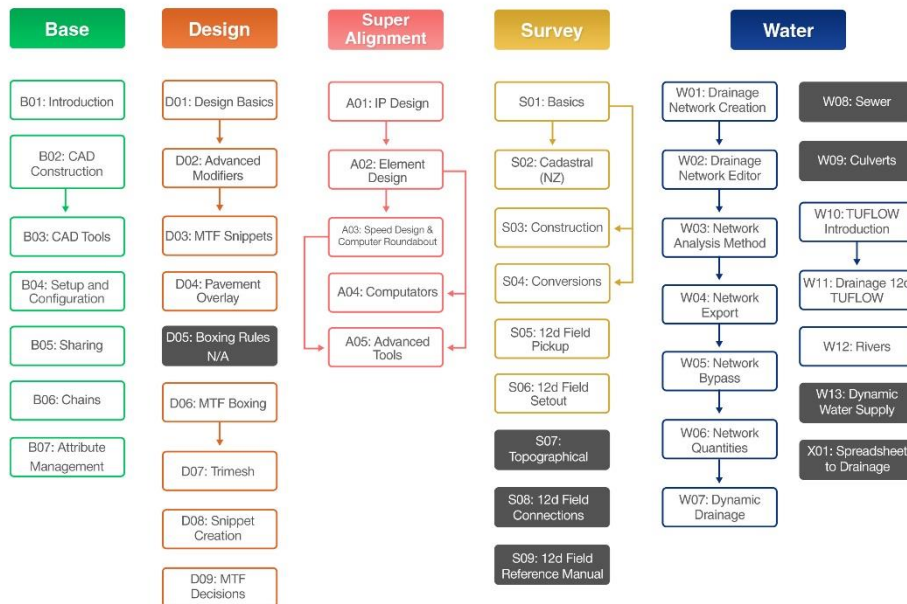
3.0 BASIC MODULES

B01: Introduction

- 12d Model Interface
- String Picking Concepts
- Creating and Editing Strings
- Display Settings
- 12d Principles and Folder Structure

B02: CAD Construction

- Creating a Project
- Drawing and CAD snaps
- Modification tools including:
  - Move, Rotate and Copy
  - Clip
  - Parallel
  - Trim, Extend and extend by length
- Properties
- Symbols
- Text

B03: CAD Tools

- Sharing
- Toolbars
- String Properties
  - Changing and Editing
  - View Settings
- Super String Tools
  - Tinability
  - String Symbols
  - Pipe / Culvert properties
- Measuring
- Raster
  - Importing
  - Cad Holes
- Creating a TIN
- Contouring and Labelling

B04: Setup and Configuration

- Create a Project
  - o Environment Configuration File
- Custom Files
  - o User and Customer User Folders
  - o User and Customer Libraries
- Folder Structure
- Environment Files
- Setup Files
  - o Project Details
  - o Workspace
  - o Project Tree
  - o Saving setup files
  - o Defaults
  - o User defined function keys
- Linestyles
- Symbols
- Text Styles
- Toolbars
- Plotting

B05: Sharing

- Making Models and TINs shared
- Sharing in or Removing Models and TINs
- Synchronising Data
- Sharing Map Files
- Share Master Files
- Sharing Variables

B06: Chains

- What is a Chain
- Creating a Chain, menu and toolbar
- Inserting chain commands, Recording in a chain
- Chain Commands types
- Basic Chain
- Chain with Parameters

B07: Attribute Management

- Attribute overview
- Viewing and Editing Attributes
  - Project attributes
  - Manual Addition
  - Mapping file
  - Clearing attributes
  - Apply Map file for Design
  - Apply Map file for Visualisation
- Attribute Manipulator File
  - Create
  - Apply
  - Map Attributes and String Properties
  - Apply to Kerb Only
  - Factors and Values
- Using Attributes
  - Labelling
  - CAD Leaders
  - Custom Exporting/Reporting
  - BIM Export

4.0 ALIGNMENT MODULES

A01: Super Alignment – IP Design

- Create Super Alignment
- Create and edit horizontal alignment using IPs
- Create and edit vertical alignment using IPs

A02: Super Alignment – Element Design

- Design Toolbars
- Create Super Alignment
- Horizontal element geometry
- Vertical element geometry
- Named parts
- Named positions
- Introduction to Computators

A03: Super Alignment – Speed Design and Computator Roundabout

- Design Standards
  - Apply Design Standards
  - Overriding Design Standards
- Computator Elements
  - Roundabout
  - Drivelines
  - Roundabout Kerb returns
  - Traffic Islands

A04: Super Alignment – Computators

- Using computator elements
- Computator kerb return tool
- Widening function
- Modifiers with computators

A05: Super Alignment – Advanced Tools

- Super Alignment Toolbars
- Introduction to Components
- Design Speed Standards
- Super Alignment Tools
  - Information

- o Styles
- o Reports
- o Validation
- o Dependency Graph
- Super Alignment Pipeline

5.0 DESIGN MODULES

D01: Design - Basics

- Template Creation and Edit
- MTF File – Inserting design templates
- Apply MTF
- Modifying the design

D02: Design – Advanced Modifiers

- Import templates
- Apply MTF defaults
- Apply MTF Manager
- Modifiers using smart chainages, Named Parts and Named Positions
- Modifiers using layers
- MTF features, Alias, Regions and copy and paste

D03: Design - MTF Snippets

- Design Using Snippets
  - o What are Snippets?
  - o Basic Snippet edits
  - o Applying Snippets
- Seed Files
- Design Modifications Using Snippets
- Design TIN and SuperTIN

D04: Design – Pavement Overlay

- Pavement Overlay
  - o Using Offset and Default Crossfall
  - o With Cutback Strings
  - o With Super Alignment Standards

D05: Design – Boxing Rules (N/A)

Superseded by D06 and D07

D06: Design – MTF Tri-mesh Boxing

- Modifier boxing with layers
- Named grades
- Asphalt surface, Kerb shapes and Subgrade layers
- Overlay and Widening

- Corrector Infill Layers

D07: Design – Snippet Tri-mesh Boxing

- Snippet Pavement Attributes
- Boxing with Snippets
- Subgrade TIN
- Overlay and Widening
    - Corrector Infill Layers
- Apply MTF Recreate
- Pavement from TINs
- TINs From Trimeshes

D08: Design – Snippet Creation

- Creating Snippets
    - From MTF file
    - Comments
    - Start / End Modes
    - Run the Snippet
- Snippet Parameters
    - Input Parameters
    - Auto Parameters
- Snippet Pre-Processor
    - Tokens
    - Conditional Flow Control
    - Choice and Optional Parameters
- Create a Parking Bay Snippet
- Start/End Extensions
- Formulas in Snippets
- Snippet Variables
- Snippet Debugging

D09: Design – MTF Decisions

- Using Decisions
- Template Decisions Tables
    - Tests
    - Flow Control
    - Links

- o End
- o Complete and Applying
- MTF Fixed Decisions
  - o Tests
  - o Flow Control
  - o Links
- Using Multiple TINs

6.0 RAIL MODULES

R01: Track

- Calculate the Track Centreline (3D) from the Surveyed Rails

- Use of Linear & Arc Regression (though not actually part of the Track Tools, Regression is essential for developing a CL off Surveyed Data when no Design Data is available).

- Track Slew: Creating Reports, Spreadsheets & Diagrams & Plotting the Slew.

- Rail Profiles. Producing &/or Extracting a Rail Profile.

- Turnouts: Creating & Editing Turnouts & then Placing Turnouts.

- Chainage Equalities: Equality Types & Definitions. Their use + Inquiring on Equality Chainages

- Rail Cant: Cant design, Virtual Cant, Altering Speeds to Adjust Cant, Spreadsheets & Graphs & applying the Cant to the Rails.

- Plotting the Rails, Ballast & Sleepers. A quick look at producing a Circular (Bored) Tunnel.

- Setting and running structure gauge

- Some Long Section Plot Settings/Tweaks.

7.0 ADAC

C01: ADAC (Asset Design and As Constructed)

- Examining the ADAC 4.1 XML schema as provided by the IPWEA (Institute of Public Works Engineering Australasia)

- Looking at what is an ADAC Asset in **12d Model**

- Assigning ADAC Assets to points, lines and polygons

- Explaining and running the 12d-ADAC chains

- Validating the ADAC Assets

- Creating an ADAC Header

- Generating an ADAC Report

- Generating an ADAC.XML file

- Reading in an ADAC.XML file

- Creating and using an ADAC Map file

- Creating and using an 12duaf file

- Use of more advanced features of map files (Attributes)

- UAF (12 and User defined)

- Label map files

- ADAC tools for data preparation

- User_lib and local defined systems

8.0 SURVEY MODULES

S01: Survey – Basics (Coming)

S02: Survey – Cadastral LINZ (Coming)

S03: Survey – Construction (Coming)

S04: Survey – Conversions (Coming)

S05: Survey – 12d Field Pickup

• Tablet setup	• Grid
• Coding and mapfiles	• Pile
• Instrument connection	• Total Station Pickup Menus
• Total Station	• SDR
• GNSS	• SDR Function
• User Settings and Menus	• Reading and Coding
• Total Station Control Bar	• Favourites and Template
• Total Station Options	• Basic
• Station setup	• Face / Scan
• Checks	• Tunnel
• Setout	• Section
• String	• Measure Rounds
• Segment	• Total Station TPS Menus
• Batter	• GNSS Control Bar
• Tin	• GNSS Options
• Crossfall	• Localisation
• Point	• Utilities
• Tunnel	• Checks
• Crown	• Setout
• Drainage	• Pickup

S06: Survey 12d Field Setout (Coming)

S07: Survey – Topgraphical (Coming)

S08: Survey – 12d Field Connections (Coming)

S09: 12d Field Reference Manual (Coming)

9.0 TIN MODULES

T01: TINs

- Environment Configuration File
- Importing data
    - Map files
- Triangulation
    - Creating
    - Nulling
    - Boundary
- Editing a TIN
- Tin information and Inquiry
- Contouring and labelling
- Importing a Raster
- Advanced TIN edits
    - Add Breaklines
    - Flip Triangles
    - Checking Breaklines

T02: TINs and Volumes

- Advanced TIN Edits
    - Importing data and Checking Breaklines
- Create a TIN
    - Quick TIN
- TIN Analysis
    - Height Colouring
    - Range Files
    - Label Lines
- Edit a TIN
- Pad Platform Design
- Volume of Pad
    - Updating with a chain
- Super TIN
- Appendix
    - Depth Contours
    - Depth Range Tabulation

T03: BIM Objects Analysis

- Trimesh Objects
- Create a Trimesh
    - From TIN
    - From Polygon
    - From Typical Section
    - From 3d Planar Polygons
    - Exporting Trimeshes
- Contour and Label Trimesh
- Create Dynamic Trimesh
- Trimesh Volumes
- 3d Clash Detection
- Import and Position 3d Model

T03: BIM Objects Analysis

10.0 WATER MODULES

W01: Drainage Network Creation

- Trainees will start from creating a super tin to use with the drainage design
- Create (using templates) and edit a 12d drainage string and import designs from CAD
- Use the powerful network editor for pipe invert alignment including detecting and avoiding service clashes
- Link structures to the roadway design for structure alignment and construction levels/setout
- Additional techniques to calculate structure coordinates with grate and cover elevations

W02: Network Editor

- Parameters for determining energy losses in pipes
- Pit pressure loss Coefficients (K) in 12d Storm analysis
- Culvert design with inlet control calcs
- Size pipes and box culverts

W03: Network Analysis - Rational Method

- Review default hydrology methods for determining C and tc
- Set multiple catchment areas per inlet structure via
- direct input and catchment polygons
- Determine time of concentrations from length – slope strings

W04: Network Export

- Produce detailed hydrology, hydraulic and construction setout reports
- Produce drainage plan and long section drawings with user defined data, pipes as linestyles and manholes as symbols

W05: Network Bypass

- Flooded width, section capacity and velocity*depth calculations for roadway and channels
- Bypass nodes for combining flow paths
- Alter n values, max flooded width and proportion catchment flows along bypass flow paths
- Analyse flooded areas resulting from ponding at SAG pits
- Bypass flow with detailed inlet capacity for SAG and on grade inlets
- Surcharging flows during major flow event analysis

W06: Network Quantities

- Customise pipe and pit quantity reports by type and depths
- Use 12d templates to calculate trench volumes

- Import/export to spreadsheets

- Customise pit schedule reports through spreadsheet interfaces

- Customised drainage long sections with hatching under roads and adding of user defined data

- Customised plan drawings with user defined pit symbols and data

- Bring your own inlet capacity curves, pit symbols, reports, long sections or plan drawings that you want to customise in 12d (otherwise we will use our examples at this training session)

W07: Dynamic Drainage

Dynamic Drainage
- **Hydrology**
  - Rainfall runoff methods discussed will vary with regions (SCS, ILSAX or EPA SWMM)
  - Moving from rational "C" to Soil types
  - Additions to the 12d rainfall file including Rainfall fixed time and variable temporal patterns.
  - Reviewing graphical outputs
  - ARR 2016
- **Hydraulics**
  - Modelling diverging flow conditions
  - Bypass flow using surface flows with section shapes cut from the design tin.
  - Time series for tail water conditions.
  - Modelling natural channels using section shapes cut from the design tin.
- **Detention Basin Design**
  - Estimating storage to meet the pre development discharges,
  - Creating detention basins and extracting elevation area curves from the tin,
  - Multiple outlets design (combining spillway, control pipe, orifice)
- **Storage Tank Design**
  - Estimating storage to meet the pre development discharges via discharge control pipes and orifice plates.
- **Infiltration Tank and Swale Design**
  - Using discharge rating curves to model infiltration in swales and tanks.

W08: Sewer (Coming)

W09: Culverts (Coming)

W10: Drainage 2d Introduction

- **Creating a rainfall on grid 2d model**

- o Create and run a TUFLOW model using the Roadflow quick start panel.
  - o Add ridges, gullies to enhance the 2D grid.
  - o Add roughness polygons for a second roughness.
  - o Link a 12d drainage model to the 2d grid.

- **Review check files and results**
  - o Review the grid z pts, ridges/gully, 1d-2d link and boundary control check files.
  - o Create and display tin varying grid tin results for water depths, velocity and hazard. This is done in plan, section and 3d perspective views.
  - o Create results legends and customise result colour bands.

- **Time Results**
  - o Create time plots of results of velocity, depth, water level and hazard.
  - o Create flow measurement lines to total the flow over the line.

- **Visualisation and Fly Overs**
  - o Create time lines viewing flooding from a stationary perspective
  - o Create flight and target paths for project flyovers of flood results.

W11: Drainage 2d TUFLOW

- **TUFLOW control file (TCF) editor**
  - o Use the 12d model (tcf) editor to review and update the tcf, tbc and tgc files created by the Roadflow quick start panel.
  - o Modify active area polygons and boundary conditions.
  - o Use the String attribute editor for advance attribute manipulation and the attribute to spreadsheet tool for bulk changes.

- **TUFLOW string editor (TSE)**
  - o Use the TSE to create and update string attributes and csv database files.

- **Hydrology Options**
  - o Create strings for inflow hydrographs (SA & QT),
  - o Rainfall hyetograph regions (RF).

- **Boundary Conditions**
  - o Tidal boundaries.
  - o Head discharge (HQ)
  - o Initial water levels.

- **Soil Types**
  - o Soils file.
  - o Infiltration methods.

- **Structures**
  - o Storage Reduction factors.
  - o Form Loss Coefficients
  - o Variable Form Loss Coeff.

- **Variable Z Options (Dam break)**

- Adding a culvert connecting to multiple 2D cells.
- Distributing 1D hydrology results onto a 2D grid.

W12: Rivers

- Identify the river strings required for the HEC-RAS project.

- Create and locate cross sections along the river.

- Export the data from 12d Model to HEC-RAS.

- Open the HEC-RAS Project, and analyse the river for a design discharge.

- Use HEC-RAS to interpolate cross sections.

- Export the river water levels and channel shape data from HEC-RAS

- Import the data from HEC-RAS into 12d Model

- Create an inundation map using the water levels from HEC-RAS

- Create plans and cross sections from the HEC-RAS data suitable for use in reports. This includes multiple water level results and depth

- Contours.

- Create a 'fly down the river' .avi movie file of a rendered 3d perspective view.

W14 – Dynamic Water Supply (Coming)

X01: Spreadsheet to Drainage (Coming)

11.0 PLOTTING MODULES

P01: Plot – Plan Plotting

- Labelling Data
- Plan Plotting

P02: Plot – Sections

- Plotting Long Sections
- Plotting Cross Sections

P03: Plot – Long Plot Manager (Coming)

P04: Multi Plot Sheets (MPS)

- Setup Plot Views
- CAD dimensions, Leaders, Label Point Numbers and Tables
- Multipage Plot Sheet

12.0 VISUALISATION MODULES (COMING)

NOTES: