

# 12d<sup>®</sup> Model

Civil and Surveying Software



## 12d Model Training Notes

### Training Modules for 12d Model

November 2018

#### 12d<sup>®</sup> Model

Do more with your software.



ROAD AND  
HIGHWAYS



LAND  
DEVELOPMENT



RAIL



DRAINAGE,  
SEWER AND  
SERVICES



OIL AND GAS



RIVERS,  
DAMS AND  
HYDROLOGY



PORTS AND  
DREDGING



AIRPORT  
INFRASTRUCTURE



MINING  
INFRASTRUCTURE



CONSTRUCTION



FEATURE  
SURVEY



ENVIRONMENTAL





## 12d Model V11.0 Training Modules for 12d Model Manual

November 2018

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## 1.0 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.

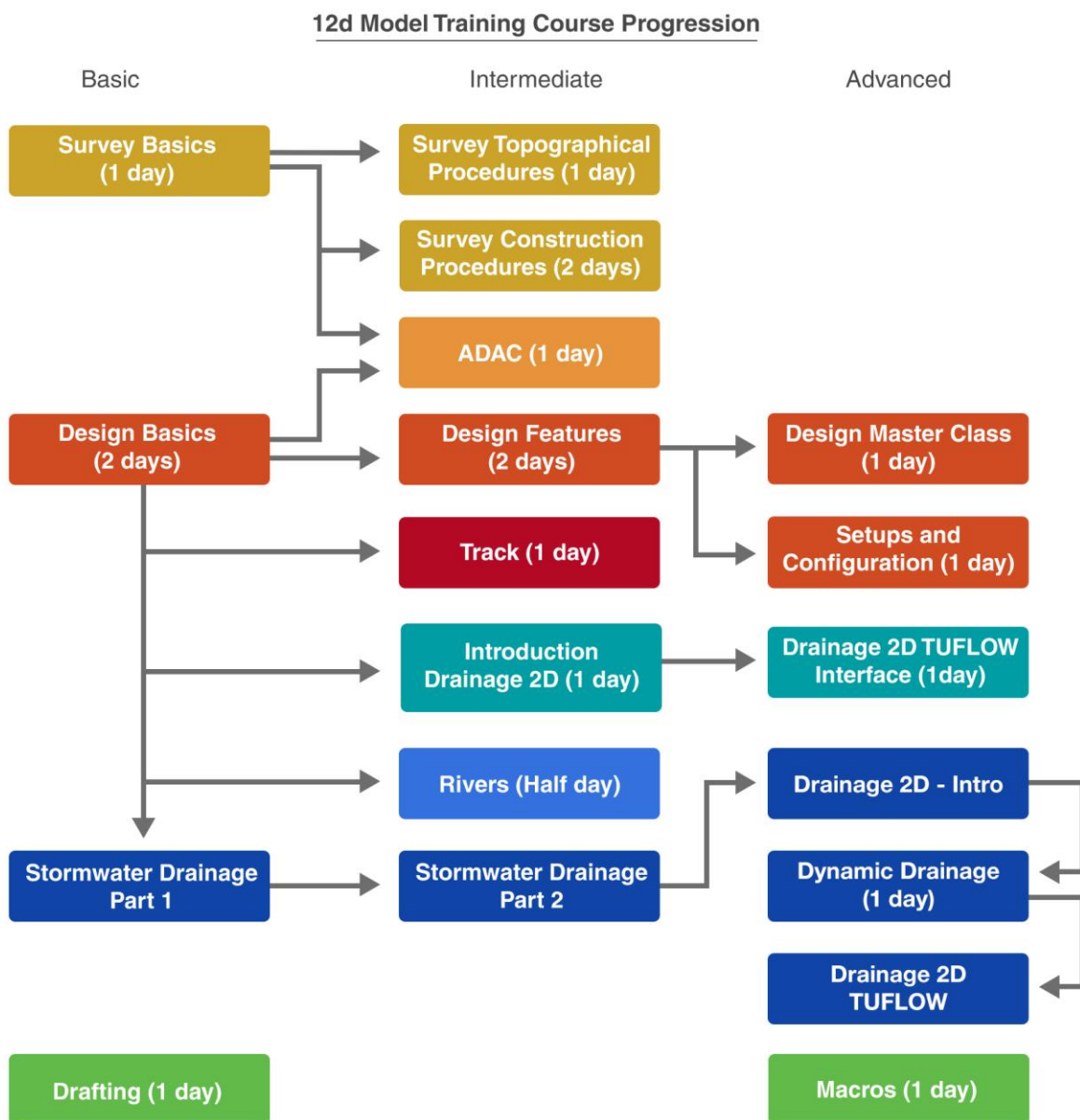
If you have questions about any of our training courses, or about in-house training, please contact us at [qld.training@iscdt.com.au](mailto:qld.training@iscdt.com.au) or [vic.training@iscdt.com.au](mailto:vic.training@iscdt.com.au).



## 2.0 AVAILABLE TRAINING COURSES

The diagram below provides a handy summary of the training courses offered with the full courses outlines included in further detail throughout the rest of the document. 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 in the so for clients requesting in-house we are able to customise a course to suit your needs.





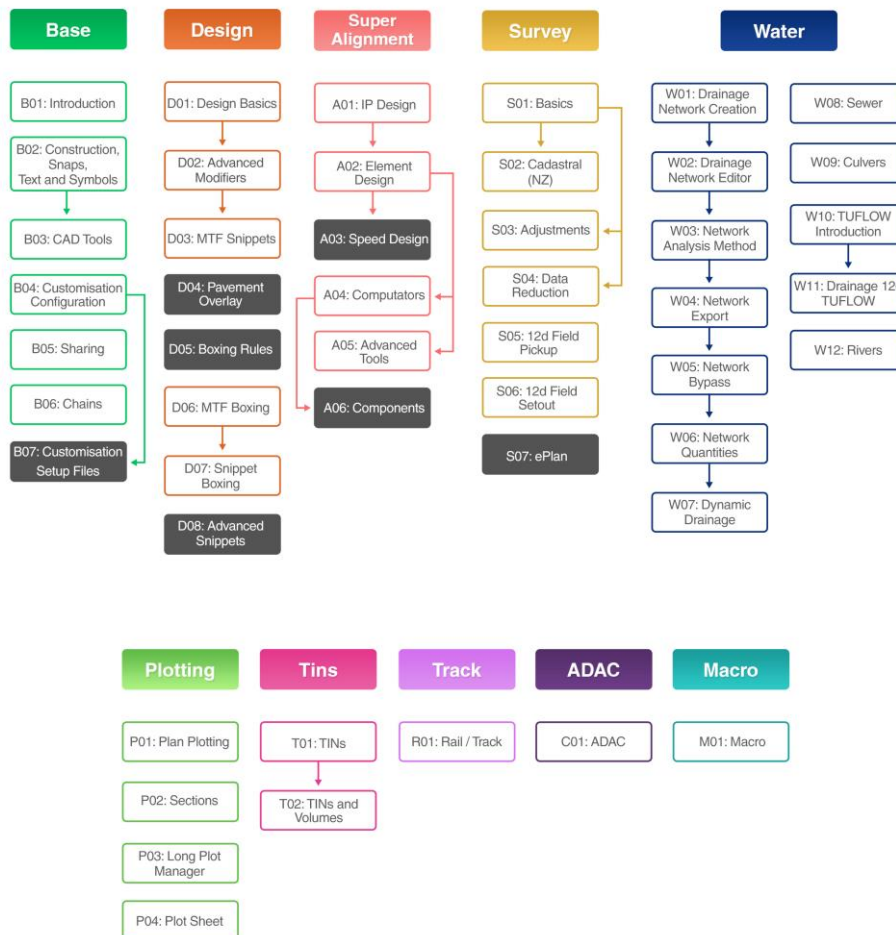


### 3.0 AVAILABLE TRAINING MODULES

Each 12d Model training course is made up of smaller training modules and these modules can be customised for clients requesting in-house training sessions.

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.

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





## 4.0 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: Customisation Configuration**

---

- Create a Project
  - Environment Configuration File
- Custom Files
  - User and Customer User Folders
  - User and Customer Libraries
- Folder Structure
- Environment Files
- Setup Files
  - Project Details
  - Workspace
  - Project Tree
  - Saving setup files
  - Defaults
  - User defined function keys

## **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 (Coming)**

---

## **B07: Customisation Setup Files**

---

- Linestyles
- Symbols
- Text Styles
- Toolbars



## 5.0 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 (Coming)

---

### A04: Super Alignment – Computators

---

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

### A05: Super Alignment – Advanced Tools

---

- Super Alignment Toolbars
- Super Alignment Tools
  - Information
  - Styles
  - Design Standards (Super Elevation)
  - Named Parts
  - Named Positions
- Introduction to Components
- Super Alignment Pipeline



**A06: Super Alignment – Components (Coming)**

---



## 6.0 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
- Modifiers using layers
- MTF features, Alias, Regions and copy and paste

### D03: Design - MTF Snippets

---

- What are Snippets?
- Basic Snippet edits
- Applying Snippets
- Design TIN and SuperTIN

### D04: Design – Pavement Overlay (Coming)

---

### D05: Design – Boxing Rules (N/A)

---

### 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

---

- Boxing with Snippets



- Named grades
- Asphalt surface, Kerb shapes and Subgrade layers
- Overlay and Widening
- Corrector Infill Layers

**D08: Design – Advanced Snippets (Coming)**

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## 7.0 RAIL MODULES

### R01: Track

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- 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.





## 8.0 SURVEY MODULES

**S01: Survey – Topographical (Coming)**

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**S02: Survey – Cadastral LINZ (Coming)**

---

**S03: Survey – Advanced (Coming)**

---

**S04: Survey – 12d Field Pickup (Coming)**

---

**S05: Survey – 12d Field Setout (Coming)**

---

**S06: Survey – ePlan (Coming)**

---

**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



## 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



## 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

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- 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

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- 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

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- 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

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## W09: Culverts

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## W10: Drainage 2d Introduction

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- **Creating a rainfall on grid 2d model**
  - Create and run a TUFLOW model using the Roadflow quick start panel.
  - Add ridges, gullies to enhance the 2D grid.
  - Add roughness polygons for a second roughness.
  - Link a 12d drainage model to the 2d grid.
- **Review check files and results**
  - Review the grid z pts, ridges/gully, 1d-2d link and boundary control check files.
  - Create and display tin varying grid tin results for water depths, velocity and hazard. This is done in plan, section and 3d perspective views.
  - Create results legends and customise result colour bands.
- **Time Results**
  - Create time plots of results of velocity, depth, water level and hazard.
  - Create flow measurement lines to total the flow over the line.
- **Visualisation and Fly Overs**
  - Create time lines viewing flooding from a stationary perspective
  - Create flight and target paths for project flyovers of flood results.

## W11: Drainage 2d TUFLOW

---

- **TUFLOW control file (TCF) editor**
  - Use the 12d model (tcf) editor to review and update the tcf, tbc and tgc files created by the Roadflow quick start panel.
  - Modify active area polygons and boundary conditions.
  - Use the String attribute editor for advance attribute manipulation and the attribute to spreadsheet tool for bulk changes.
- **TUFLOW string editor (TSE)**
  - Use the TSE to create and update string attributes and csv database files.
- **Hydrology Options**
  - Create strings for inflow hydrographs (SA & QT),
  - Rainfall hyetograph regions (RF).
- **Boundary Conditions**
  - Tidal boundaries.
  - Head discharge (HQ)
  - Initial water levels.
- **Soil Types**
  - Soils file.
  - Infiltration methods.



- **Structures**
  - Storage Reduction factors.
  - Form Loss Coefficients
  - 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.

## X01: Spreadsheet to Drainage (Coming)

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## 11.0 PLOTTING MODULES

### P01: Plot – Plan Plotting

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- Labelling Data
- Plan Plotting

### P02: Plot – Sections

---

- Plotting Long Sections
- Plotting Cross Sections

### P03: Plot – Long Plot Manager (Coming)

---

### P04: Plot Sheets

---

- CAD dimensions, Leaders and Tables
- Plot Sheet



## 12.0 VISUALISATION MODULES (COMING)





## 13.0 BIM

**One Day**

**Course ID:** 1DBIM

### Summary:

---

For a surveyor, engineer or information manager who wants to utilise the functionality inside 12d Model to collaborate and coordinate models from different project disciplines. Being able to import and share BIM (*i.e.* Building Information Modelling) model data, access and coordinate attribute/metadata information and trimesh models.

### Prerequisites:

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**Some experience** in 12d Model is necessary along with **basic computer skills** and the ability to understand and write in the English language.

### Course Content:

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- Import and manage BIM data including open BIM IFC files
- 3d Helmert transformation of models
- 12d Model Data Management
- Mapping data with attributes
- Recreate MTF files from design strings
- Pavement Manager and Snippets for trimesh BIM creation
- Trimesh creation and editing tools
- Trimesh reporting and volumes
- Creating trimesh objects from 12d objects
- Create and edit an attribute manipulator file
- Create and apply attribute label map files
- Export open BIM IFC files
- Investigate 3d clash detection rules; apply and report on 3d object clashes.



