



12d[®] Model
Civil and Surveying Software

12d Model Training

12d Model Training Courses
12d NZ Ltd

Version 12.0/14.0
6 December 2018



12d[®] Model

Do More With Your Software.



ROADS AND
HIGHWAYS



LAND
DEVELOPMENT



RAIL



DRAINAGE,
SEWER AND
SERVICES



AIRPORT
INFRASTRUCTURE



PORTS AND
DREDGING



MINING
INFRASTRUCTURE



SURVEYING



OIL AND GAS



RIVERS,
DAMS AND
HYDROLOGY



CONSTRUCTION



ENVIRONMENTAL



Disclaimer

12d Model V14.0 12d Model Training Courses Manual

V14.0 December 18

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1.0	TRAINING OVERVIEW	1
2.0	OFFERED COURSES	2
2.1	Formal Courses	2
2.2	In House Courses	2
2.3	Course Requirements	3
3.0	TRAINING MODULES	4
4.0	FORMAL TRAINING COURSES	5
4.1	Survey Basic Topographical	5
4.2	Survey Basic Cadastral	6
4.3	Design Basic	7
4.4	Design Features	7
	Design Master Class	8
	Design Alignments	9
4.5	Drainage Part 1 (Basic)	10
4.6	Drainage Part 2 (Advanced)	10
4.7	Drainage Part 3 (Dynamic)	11
4.8	Drainage Features	12
4.9	Drainage 2D Introduction (Road Flow)	12
4.10	Drainage 2D (TUFLOW)	14
4.11	BIM and Attribute Management	15
4.12	Cad & Plotting	15
4.13	General Course	16
4.14	NZ ASDM	17
4.15	Rail	18
5.0	COURSE MODULES	19
5.1	Base Modules	19
	B01 - Introduction	19
	B02 - Cad and Construction	19
	B03 - Cad Tools	20
	B04 - Customisation Configuration	20
	B05 - Sharing	21
	B06 - Chains	22
	B07 - Attribute Management	22

5.2	Alignments	23
	A01 – Super Alignment – IP Design	23
	A02 – Super Alignment – Element Design	23
	A03 – Super Alignments - Computator Roundabout	23
	A04 – Super Alignment – Computators and Kerb Return	24
	A05 – Super Alignments – Advanced Tools	24
	A06 – Super Alignments – Components	25
5.3	Design Modules	25
	D01 – Design	25
	D02 – Advanced Modifiers	25
	D03 – MTF Snippets	26
	D04 – Pavement Overlay	26
	D05 – Boxing Rules N/A	26
	D06 – MTF Boxing	26
	D07 – Snippet Trimesh Boxing	27
	D08 – Snippet Creation	27
	D09 – MTF Decisions	27
5.4	Tin Modules	28
	T01 – Tin Creation	28
	T02 – Tins and Volumes	28
	T03 – BIM Object analysis	29
5.5	Survey Modules	29
	S01 – Topographical Survey	29
	S02 – Cadastral Survey	30
5.6	Plotting Modules	30
	P01 – Plan Label Plotting	30
	P02 – Sections and Plotting	30
	P03 – Longplot Manager (Superseded)	31
	P04 – Multi Page Plot Sheets	31
5.7	Water Modules	32
	W01 – Network Creation	32
	W02 – Network Editor	32
	W03 – Network Analysis	32
	W04 – Network Export	33
	W05 – Network Bypass	33
	W06 – Network Quantities	33
	W07 – Dynamic Drainage	34
	W08 – Tractive Force Sewer	34
	W09 – Culverts (To Come)	34
	W10 – Drainage 2D - Introduction	35
	W11 – Drainage 2D - TUFLOW	35
	W12 – Rivers	36



1.0 TRAINING OVERVIEW

12d Model has been training users for over 25 years, and as such are committed to 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.

The training course modules and content described in this document are trained internationally by all 12d Model trainers and distributors. The dataset and workflow are the same no matter where you train for 12d Model in the world, with small regional specific differences and course timing. For example, in New Zealand the formal courses are generally one day in duration, with complimentary follow on courses. In Australia the introduction and complimentary course may be held back-to-back as two, or even three days duration.

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.

It is important to note that even though the trainers have vast industry knowledge, and may pass on anecdotal examples, the sole purpose of the training provided is to teach users the workflow and features of 12d Model software, **not** to teach the attendees best practice or give advice on Engineering or Survey specific disciplines. As such we in no way will claim to teach Users to be Engineers or Surveyors, just how to use the tools inside 12d Model to become more efficient in their chosen fields.

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 in a PDF format, ensuring they get the most out of the experience on the day, and afterwards have useful reference material.

Should the training fall into a transition period between the release of new 12d Model Versions, the individual training providers will determine which Version is to be trained from a given period.

If you have questions about any of our training courses, or about in-house training, please contact us at office@12d.co.nz.



2.0 OFFERED COURSES

2.1 Formal Courses

12d NZ Ltd offers a suite of formal training courses which are offered nationwide on a regular basis. A list of the formal training courses and content available in New Zealand is shown in at the end of this document.

Depending on the level of complexity that the Users are undertaking, we feel that a User who has attended training and is undertaking a project of medium complexity will be productive with the software in a matter of weeks.

For Users who are just using the software to import survey or design data and creating a surface model to view or created contours etc., this uptake time will be even less.

Formal courses are those organized and run by 12d NZ Ltd at a regional location across New Zealand. 12d NZ Ltd organizes and secures the training location, provides the necessary computers and training documentation.

Invitations for these courses are sent via a training email notification by 12d NZ Ltd and email confirmations are sent to course attendees at a suitable period before the course is to take place.

All catering of morning tea, lunch and afternoon tea is organized and paid for by 12d NZ Ltd.

2.2 In House Courses

In addition to the 12d NZ formal training courses, in house training is also available on request. This training is generally tailored specifically for the organisation and their standard work practices. 12d NZ Ltd will work closely with the organisation involved to ensure the most appropriate curriculum which are generally to follow the standard training modules.

Should the trainers be requested to use the non-standard data-set, this may involve more preparation time if adequate lead-in notice is given. This also may involve additional time and costs.

The company that has requested the in-house organizes and secures the training location, and 12d NZ provides the computers and hardware. Soft copies of the training notes are generally emailed to the in-house course organizer who arranges for the hard copies to be available at the course.

All invites and confirmations are handled by the Company holding the training.

All catering of morning tea, lunch and afternoon tea is the responsibility of the Company holding the training.

The provided room should be adequate for training, a wall to project on to, a white board would be preferred, and we train to a maximum of 8 trainees, each with approximate 900mm seated desk width.





2.3 Course Requirements

Notes:

Limited numbers, one computer per person, Lunch provided for full day courses, Certificates for full day courses.

Cancellation Policy:

1 Week Prior to the Course – No Refund.

2 Weeks Prior to the Course – 20% Fee Applies.

As stated in Section 1.0, the courses are for showing how to **use 12d Model** when doing civil design or surveying. They **do not** teach civil design or surveying principles.



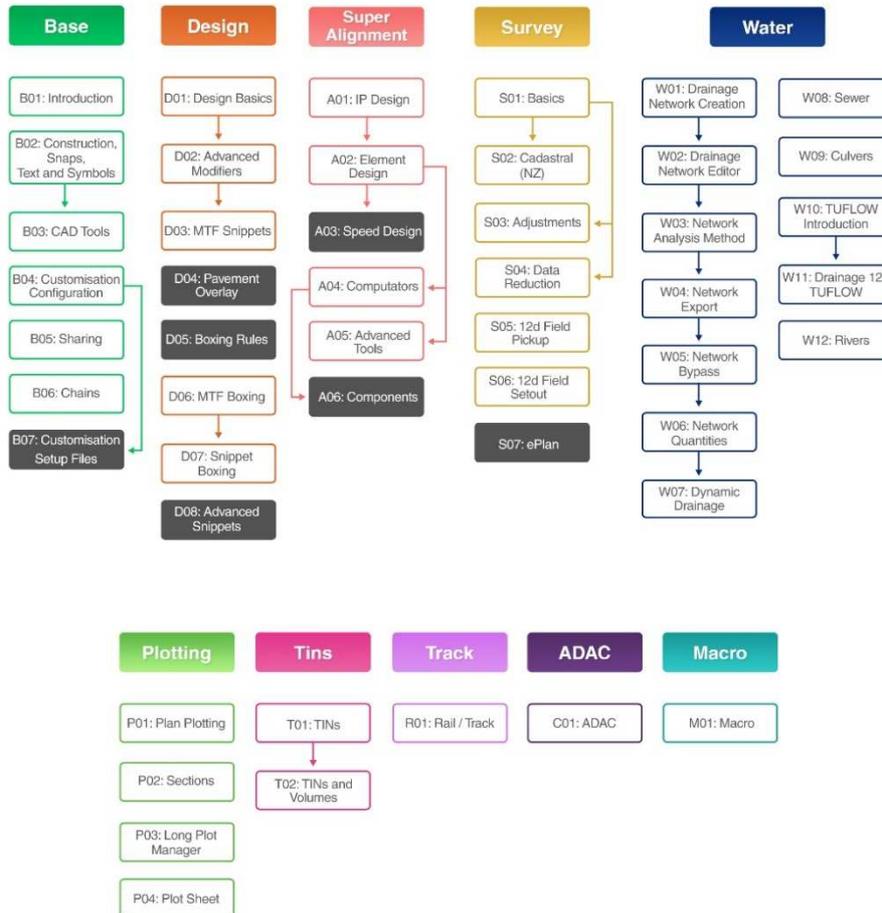
3.0 TRAINING MODULES

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.

12d Model Training





4.0

FORMAL TRAINING COURSES

The following course information is a breakdown of the 12d NZ Ltd standard one-day formal courses.

4.1 Survey Basic Topographical

Course Modules: B01, T01& S01

These course Modules are designed for someone wanting to understand survey reduction and tin creation within 12d Model.

Course prerequisite: Nil

The participant should be proficient in navigating around the menus within 12d Model. Any knowledge of 12d Model will be of an advantage for this beginners 12d Model survey training course.

Aim: To read in, reduce and edit a field data recorder file, create tins prepare data for uploading and setout.

Content:

- Creation of 12d Model Projects
- Navigate in the 12d Models graphical interface
- Create and edit mapping files for field coding
- Survey Reduction, downloading of survey instrument data
- Editing of the survey.4d file
- Download and convert field files
- Survey reduction
- Edit field data
- Creating and Editing Tins
- Tin Functions
- Contour and Labelling
- Draping strings
- Upload of Points/Strings
- Labelling data
- Super String Tools
- Plotting Sections
- Set out, Creating set-out files, off set points, reports title file
- Importing/Exporting of ASCII data (excel).

4.2 Survey Basic Cadastral

Course Modules: B01 & S02

These course Modules are designed for someone wanting to understand survey traverse spreadsheets and LINZ LandXML import / export within 12d Model.

Course prerequisite: Nil

The participant should be proficient in navigating around the menus within 12d Model. Any knowledge of 12d Model will be of an advantage for this beginners 12d Model cadastral training course.

Aim: To read in LINZ LandXML data, create traverse spreadsheet and export a LINZ LandXML file.

Content:

- Creation of 12d Model Projects
- Navigate in the 12d Models graphical interface
- Setup and edit a 12d model XML mapping file
- Importing of Landonline XML data.
- Configure TSS parameters
- Create a traverse spreadsheet
- Edit traverse blocks including
- Traverse, Radiation, Parcel blocks
- Split and Join observations
- Boundary intersection splitting
- Create TSS arcs and natural boundaries
- Pick and populate XML data into the TSS
- Point Information and naming for Landonline
- Report Traverse spreadsheet and parcels
- Plan drafting and plotting of the Traverse Spreadsheet
- Creating and edit an XML file.

4.3 Design Basic

Course Modules: B01, T01, A01 & D01

Course prerequisite: Nil

The participant should be proficient in navigating around the menus within 12d Model. Any knowledge of 12d Model will be of an advantage for this beginners 12d Model design training course.

Aim: To create two road designs and an intersection and plot the long and cross sections of the designed road.

Content:

- Creation of 12d Model Projects
- Navigate in the 12d Models graphical interface
- Create and edit mapping files
- Creating and Editing Tins
- Tin Functions
- Contour and Labelling
- Horizontal and vertical alignments creation using the alignments (IP method only)
- Investigate the tools available for accurately locating alignment geometry both horizontally and vertically
- Create design shapes via templates for roads (fixed, cut, fill and final)
- Creating and editing MTF files
- Apply and create the Road designs
- String modifiers including road widening, super elevation and more
- Create intersection via computer kerb returns
- Design triangulation and nulling
- Plotting long sections
- Plotting Cross sections

4.4 Design Features

Course Modules: A05, D02, D03 & D07

These course Modules are designed for intermediate to advanced 12d Users who have design experience and will be introduced to extended design features. These features are mainly from Super Alignments, MTF modifiers and are created to improve efficiency in all aspects of design modelling.

Course prerequisite: Modules: B01, A01 & D01

Should be experienced with creating and editing Super Alignments and understand the MTF and Apply MTF functions in 12d Model.

Aim: To introduce and train designers for intermediate to advanced design functions in 12d Model which will assist in design decisions, documenting and BIM collaboration



Content:

- Super alignment tools including;
- Named parts and named positions
- Design Standards (speed tables)
- Reporting
- Creating, Editing and using Label Styles
- Validation and graphing
- Converting and Properties
- Creating, Placing and Editing Components (parametric objects)
- Cul-de-sac
- Intersections
- Bus Bay
- Apply Many Manager
- Advanced MTF tools including
- Chainage Alias
- Regions
- Dynamic Start and End modes
- Multiple template design
- Intervals
- String grading
- Attribute creation
- Layers
- Editing Snippets and the Snippet Library
- Designing with Snippets
- Pavement Manager creation and editing
- Creating Snippet Trimesh boxing
- MTF seed file creation and application

Design Master Class

Course Modules: A03, A06, D04, D07, D08

Course prerequisite: B01, A01, D01 and D02

Should be an experienced 12d Model User with knowledge and confidence working with MTF files and Apply functions.

Aim: To introduce and reinforce advanced design capabilities of 12d Model design.

Content:

- Super Alignment Design standards (speed tables)
- Applying and overriding standards
- Super Alignment Computators (Roundabout)



-
- Creating, Placing and Editing Components (parametric objects)
 - Roundabout
 - Intersections
 - Cul-de-sac
 - Bus Bay
- Pavement Overlay
- Snippet Creation and editing including
 - User defined Parameters
 - Auto Parameters
 - Tokens and flow control
- Decisional Templates
- MTF Decisions including;
 - Flow Control
 - Tin decisions
 - Goto and labels
 - Slope Decisions
 - If exist decisions
 - Named grade and swap decisions
- Pavement Manager and snippet pavement creation

Design Alignments

Course Modules: A01, A02, A05 & A06

This course progresses from the use of IP design for Super Alignments and covers the IP Speed and element design (fixed and floating) functionality in 12d Model Super Alignments.

Course prerequisite: Modules B01, A01 & D01

Should be experienced with creating and editing Super Alignments and understand the MTF and Apply Many functions in 12d Model.

Aim: To introduce element Super Alignment design in 12d Model, including the use of Computators to link design elements together which is commonly used in complex intersection design and construction

Content:

- Super alignment named parts and named positions
- Super alignment IP speed standards design
- Super Alignment element design
- Super Alignment element computators
- Creating, Placing and Editing Components (parametric objects)
- Cul-de-sac
- Intersections
- Bus Bay
- Apply Many Manager
- Chains



4.5 Drainage Part 1 (Basic)

Course Modules: B01, W01, W02 & W03

Course prerequisite: Nil

Should be able to create a tin and be proficient around the menus within 12d Model.

Aim: To create and modify a stormwater drainage network. Assign catchments to the network and run a rational analysis to calculate peak flows and size the stormwater network.

Content:

- Creation of 12d Model Projects
- Navigate in the 12d Models graphical interface
- Create and edit mapping files
- Supertins
- Identify stormwater pit and pipe locations from design strings
- Create drainage strings
- Import drainage layouts from CAD Strings
- Network Editor for pipe invert alignment
- Set drainage network defaults
- Link structures to the roadway design for alignment and construction levels/setout
- Label drainage network and produce longsections
- Apply and label catchment areas.
- Hydrology methods for determining C and tc
- Set multiple catchment areas per inlet structure
- Direct input and catchment polygons
- Saving network settings
- Determine time of concentrations from length – slope strings
- Avoid service clashes.
- Determine pipe sizes and HGL in the drainage analysis module.
-

4.6 Drainage Part 2 (Advanced)

Course Modules: W03, W04, W05 & W06

Course prerequisite: W01, W02, W03

Have attended Drainage Part One or be a competent 12d user.

Aim: To identify overland stormwater flow paths and calculate and control both pipe and overland (bypass) flows for a drainage network. Plot network design, export and calculate pipe quantities.

Content:

- Design with bypass flows and inlet capacities
- Apply and label catchment areas per pit
- Review default hydrology methods for determining C and tc
- Drainage.4d editing including capacity configurations
- Create and alter pit types to model “on grade” and “SAG” inlet capacity.
- Export the stormwater system to a spreadsheet

- Edit spreadsheet, and import to changes 12d Model
- Customise network reports through spreadsheet interface
- Drainage quantity reports (By type and depths)
- Use 12d templates to calculate trench volumes
- 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
-

4.7 Drainage Part 3 (Dynamic)

Course Modules: W05 & W07

Course prerequisite: W01-W03

For experienced 12d Water Users. You must be fully familiar with the Drainage Network Editor (DNE) and know how to design drainage networks in 12d.

Aim: To assist experienced 12d Model designer to extend their Drainage design skills further. The course continues from the rational hydrology method to the dynamic hydrology methods and dynamic flow in pipes.

- Content:
-

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
-

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
- Creating Basin links and link types
- Analysis of basin storage and elevation
- Multiple outlets design (combining spillway, control pipe, orifice)
-

Storage Tank Design

- Estimating storage to meet the pre-development discharges via discharge control pipes, orifice and weirs
-

4.8 Drainage Features

Course Modules: W13

Course prerequisite: W01-W03, W05

Should be proficient around the menus within 12d Model. View control, model management, basic CAD drawing skills.

Completion of Dynamic Drainage Training is highly recommended.

Aim: To introduce 12d users to existing and new drainage options that enhance the creation, positioning and 3D modelling of water networks.

Content:

- Drainage.4d Edits including;
- Nodes and Link creation
- Applying thickness values for nodes and links
- Node dimensions
- Creating and referencing 3d trimesh to nodes
- Extended base and riser shapes
- User defined house connections

Culvert creation

Downhill strings advanced

3D Headwall creation

3d HGL creation

Node diagram production

3D clash detection

4.9 Drainage 2D Introduction (Road Flow)

Course Modules: W10

Course prerequisite: W01-W03, W05

Should be proficient around the menus within 12d Model. View control, model management, basic CAD drawing skills.

Completion of Dynamic Drainage Training is highly recommended.

Aim: To introduce 12d users to modelling overland flows using the 2D Roadflow functionality. This can be used by experienced water modelers, drainage designers or anyone who requires overland flow analysis and modelling.



Content:

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
Create results
- Create 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
-

Coupled 1D/2D modelling

- Prepare 1D dynamic drainage network for analysis
- Running a coupled model
- Adjusting 1D connection modes
- Bypass nodes for 2D model input
- Refining the connection zones and catchment distribution
-

Visualisation and Fly Overs

- Create time lines viewing flooding from a stationary perspective



4.10 Drainage 2D (TUFLOW)

Course Modules: W11

Course prerequisite: W01-W03, W05

Should be proficient around the menus within 12d Model. View control, model management, basic CAD drawing skills.

Completion of Drainage 2D – Introduction and Dynamic Drainage Training is highly recommended.

A basic understanding of TUFLOW modelling using the TUFLOW control file commands would be an asset but not required.

Aim: To utilise both the full power of 12d Model drainage tools together with the capabilities of the TUFLOW 2D engine to produce both 2D and couple 1D/2D hydrological and hydraulic models.

Content:

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 Dam Options (Dam Break)

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

4.11 BIM and Attribute Management

Course Modules: G04, T03, B07

Course prerequisite: B01

Should be proficient around the menus within 12d Model.

Aim: For a surveyor, engineer or information manager that wants utilize the functionality inside 12d Model to collaborate and coordinate models from different project disciplines. Being able to import and share BIM model data, access, manipulate and coordinate attribute/meta-data information, create and report trimesh models.

Content:

- Import and manage open BIM IFC files
- 3d Helmert transformation of models
- 12d Model Data Management
- Mapping data with attributes
- Creating and using the attribute manipulator
- Create and apply attribute label map files
- Labelling and exporting attributed data
- Trimesh creation and editing tools
- Trimesh reporting and volumes
- Creating trimesh objects from 12d objects
- Export open BIM IFC files

4.12 Cad & Plotting

Course Modules: B02, B03, P01, P02 & P04

These course modules are designed for someone wanting to understand cad string construction, management and plotting within 12d Model.

Course prerequisite: Nil

The participant should be proficient in navigating around the menus within 12d Model. Any knowledge of 12d Model will be of an advantage for this beginners 12d Model Cad training course.

Aim: To introduce new and existing users to cad construction and plotting techniques within 12d Model.

Content:

- Creation of 12d Model Projects
- Navigate in the 12d Models graphical interface
- Drawing and CAD snaps
- CAD Modification tools
- String Properties
- Symbols, Text
- Toolbars

- Super String Tools
- Measuring
- Rasters
- Tin functions and Labelling
- CAD dimensions, leaders and tables
- Labelling data
- Plotting Plans
- Plotting long sections
- Plotting Cross sections
-

4.13 General Course

Course Modules: B03, B04, T02 & P02

Course prerequisite: B01 and T01

Should be able to create a tin and be proficient around the menus within 12d Model.

Aim: For a surveyor or engineer that wants to do many different tasks within 12d. This course is not aimed at a basic or an advanced user but will cover some of the day to day tasks in detail looking at some of the other options available.

Content:

- Customisation, workspace, text, symbols, tinalbe, DDFs
- String Properties
- Symbols, Text
- Toolbars
- Super String Tools
- Measuring
- Rasters
- Create and edit mapping files
- Creating and Editing Tins
- Tin Functions
- Tin Analysis via Range Files
- Pads - Basic pad creation
- Volumes – Exact and End Area
- Depth Range Files
- Stock piles and Volumes
- Plotting Plans
- Plotting long sections
- Plotting Cross sections

4.14 NZ ASDM

Course Modules: TBA

Course prerequisite: B01

New Zealand Asset Data Meta Standard (NZASDM) is a standard for Constructed data format.

NZADMS is a vendor independent XML format for the description and transmission of 3D asset design and 'as constructed' data. It was created to allow for efficient design, capture, transmission, delivery and use of standardized public works asset format.

The NZADMS.XML file is the one source of truth.

Aim: Creation of as built xml files for survey and design disciplines

Content:

NZADMS Assets from XSD

- Edit assets types
- Create user types
- User assets defined by code
- User assets by code and attribute
- Attributes in a UAF
-

Council Guidelines

- Map File and UAF
- Map File Creation

NZADMS to Validation

- 12d NZADMS chains
- NZADMS Validation

Data Prep

- Global Settings
- Set Pit Invert attribute from pipes
- Set Pit Number attribute
- Set Pipe Line number attribute from pits
- Set sewer connection attributes
- Set lot numbers [Auto]

Validation attribute

- Stormwater Pits and Pipes
- Sewer Maintenance Holes
- Sewer Pipes
- Water Pipes

-

NZADMS Reports

- Creating a Header
- Write an XML
- Data Labelling
- Plotting

Design to NZADMS

- General 3d data to NZADMS
- Set up within 12d
- Data Preparation

Google Out and other Features

- Read in NZADMS XML
- Export Attributes to Google Earth
-

4.15 Rail

Course Modules: R01

Course prerequisite: B01, A01 & A02

Should be proficient around the menus within 12d Model. Completion of the Design Basics Course and some experience/use after the course is essential plus a reasonable knowledge of Element Based Super Alignments.

Experience in Rail Design & Rail Terminology is strongly recommended.

Aim: To train and familiarize 12d Designers and Rail designers with the comprehensive Rail design capabilities of 12d Model.

Content:

- 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.

5.0 COURSE MODULES

5.1 Base Modules

B01 - Introduction

1 hour 50 min

Unit prerequisite: Nil

Modules Used: Base

Content:

- Start-up
- Interface navigation
- String Concepts
- Picking Concepts
- Snaps and Cad snaps
- Typed Entry
- Importing Data
- View toggles/settings
- View Control
- View Favourites
- View Positions
- Model Management

B02 - Cad and Construction

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Drawing and CAD snaps
- Modification tools including:
 - Move, Rotate and Copy
 - Clip
 - Parallel
 - Trim, Extend and extend by length
- String Properties
- Symbols
- Text
- Cad Snaps
- Cad and Construction
- Cad Text and Symbols
- Filtering Points



B03 – Cad Tools

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- 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

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- 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

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

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



12d Model Training

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B06 – Chains

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Creating Chains
- Conditionals
- Interactive modes
- Recording
- Parameters

B07 – Attribute Management

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- 12d Model Data Management
- Project Attributes
- Model Attributes
- Tin Attributes
- String, vertex and segment attributes
- Mapping data with attributes via;
 - Manually
 - Map File attribute creation
- Attribute manipulator application
- Create and apply attribute label map files
- Labelling and exporting attributed data



5.2 Alignments

A01 – Super Alignment – IP Design

1 hour 50 min

Unit prerequisite: B01, T01

Modules Used: Base & Alignments

Content:

- Create Super Alignment
- Create and edit horizontal alignment using IPs
- Create and edit vertical alignment using IPs
- IP calculation tools
- IP modification tools
- Convert strings to super alignments
- Edit IPs via tree and table
- Super Alignment Information

A02 – Super Alignment – Element Design

1 hour 50 min

Unit prerequisite: A01

Modules Used: Base & Alignments

Content:

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

A03 – Super Alignments - Computator Roundabout

1 hour 50 min

Unit prerequisite: A02

Modules Used: Base & Alignments

Content:

- Fixed, floating and free design elements for;
- Roundabout
- Intersections
- Using computator elements
- Computator kerb return tool
- Modifiers with computators
- Components



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A04 – Super Alignment – Computators and Kerb Return

1 hour 50 min

Unit prerequisite: A01

Modules Used: Base & Alignments

Content:

- Fixed, floating and free design elements for;
- Intersections
- Bus Bay
- Cul-de-sacs
- Fixed Compound
- Fixed points tins and offset grade
- Fixed arcs
- Fixed lines
- Fixed String
- Widening function

A05 – Super Alignments – Advanced Tools

1 hour 50 min

Unit prerequisite: A01

Modules Used: Base & Alignments

Content:

- Super Alignment Toolbars
- Super Alignment Tools
- Information
- Styles
- Editing Design Standards
- Applying Design (speed) templates
- Named Parts
- Named Positions
- Super Alignment Settings
- Introduction to Components
- Super Alignment validation and graphing
- Super Alignment Pipeline



A06 – Super Alignments – Components

1 hour 50 min

Unit prerequisite: A01

Modules Used: Base & Alignments

Content:

- Components including;
- Roundabout Intersections, standard and high entry
- Cul-de-sac
- Bus Bay
- Chain creation for components
- Component library and setup
- Vehicle Path Tracking

5.3 Design Modules

D01 – Design

1 hour 50 min

Unit prerequisite: A01

Modules Used: Base & Alignments

Content:

- Template Creation and Editing
- MTF File – Inserting design templates
- Apply MTF Function
- MTF Modifiers
- Computator Kerb Return
- Apply Many Manager

D02 – Advanced Modifiers

1 hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

- Import templates
- Apply MTF defaults
- Apply MTF Manager
- Modifiers using smart chainages
- Advance Modify features, Alias, Regions, Create, Remove
- Modifiers using layers
- Trimesh shape creation

D03 – MTF Snippets

2hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

- What are Snippets
- Snippet Editor
- Basic Snippet edits
- Applying Snippets
- Creating MTF Seed Files

D04 – Pavement Overlay

1hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

- Apply Many Manager
- Pavement Overlay function including;
- Minimum overlay depth calculation
- Sampling existing and design super elevation
- Depth range colouring
- Scarification

D05 – Boxing Rules N/A

1hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

- Boxing Files and Rules

D06 – MTF Boxing

1hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

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

D07 – Snippet Trimesh Boxing

1 hour 50 min

Unit prerequisite: D01

Modules Used: Base & Alignments

Content:

- Pavement Attribute Manager
- Boxing with Snippets
- Named grades
- Asphalt surface, Kerb shapes and Subgrade layers
- Overlay and Widening
- Corrector Infill Layers

D08 – Snippet Creation

1 hour 50 min

Unit prerequisite: D01, D03

Modules Used: Base & Alignments

Content:

- Apply MTF Manager
- Creating a snippet from
- User Parameters in snippets
- REAL
- TEXT
- CHOICE
- OPTIONAL
- Auto snippet parameters
- Tokens (def_tok)
- AUTO_LR
- If_val
- Maths in snippets
- Snippet Start/End Modes and extensions

D09 – MTF Decisions

1 hour 50 min

Unit prerequisite: D01,

Modules Used: Base & Alignments

Content:

- Apply MTF Manager
- MTF decisions including;
- Tin decision
- Above Link
- Goto
- Label
- Conditionals

5.4 Tin Modules

T01 – Tin Creation

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Importing data
- Map files
- Triangulation
- Creating TIN
- Nulling
- Boundary creation and application
- Editing a TIN
- Tin information and Inquiry
- Contouring and labelling
- Importing a Raster
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T02 – Tins and Volumes

1 hour 50 min

Unit prerequisite: T01

Modules Used: Base & Volumes

Content:

- 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
- Depth Contours
- Depth Range Tabulation



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T03 – BIM Object analysis

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base & Volumes

Content:

- Trimesh from tins
- Trimesh from polygons
- Trimesh from planar polygons
- Trimesh from string profile
- Trimesh from 12d objects
- Contour and label trimesh objects
- Trimesh volume and reporting
- Editing Trimesh objects
- 3D clash detection

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5.5 Survey Modules

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S01 – Topographical Survey

3 hour 50 min

Unit prerequisite: B01 & T01

Modules Used: Base & Survey

Content:

- Mapping Files
- Create Field File
- SDR Function (Survey Data Reduction)
- Editing Field Book
- SDR Tools
- Label Map File
- Cad Edits and Drafting
- Plan Plotting
- Import and export text/upload files
- Helmert Adjustment



S02 – Cadastral Survey

5 hour 50 min

Unit prerequisite: B01

Modules Used: Base, Survey & LINZ XML

Content:

- LINZ XML Input
- Traverse Spreadsheet
- XML Creation
- TSS Reporting
- TSS Draughting

5.6 Plotting Modules

P01 – Plan Label Plotting

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Data Label Including;
 - Information Leader
 - Label Map File
 - Bearing Distance Label
- Text
- Quick Sheet Plot
- Plot Frames Creation and Plotting

P02 – Sections and Plotting

1 hour 50 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Creating sections
- Plotting Long Sections
- Plotting Cross Sections
- Cut definition and labelling
- Paired Cuts



P03 – Longplot Manager (Superseded)

1 hour 00 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Longplot Manager
- Paired Cuts

P04 – Multi Page Plot Sheets

1 hour 00 min

Unit prerequisite: B01

Modules Used: Base

Content:

- Linked Tables
- Dimensions and Leaders including
 - Styles
 - Associated Dimensions
 - Leaders
 - Information Leaders
 - Overriding Styles
 - Changing Styles
- Multi Page Plot Sheet create
- Plot and Manage multi page plot sheets including
 - Creating Sheets
 - Creating and editing frames
 - Inserting Symbols
 - Inserting Text

5.7 Water Modules

W01 – Network Creation

1 hour 50 min

Unit prerequisite: B01 & T01

Modules Used: Base & Drainage

Content:

- Super tin to use with the drainage design
- Locate and label design crest/sag locations
- Set drainage defaults
- Viewing the drainage.4d file
- Drainage string create options
- Create and edit a 12d drainage strings
 - From scratch
 - From CAD layouts
- Preparing for Drainage Network Editor

W02 – Network Editor

1 hour 50 min

Unit prerequisite: W01

Modules Used: Base & Drainage

Content:

Drainage Network Editor

- Manage and grade drainage network
- Specific Pit and Pipe overrides
- Label and plot drainage network
- Link structures to the roadway design
- Calculate structure coordinates with grate and cover elevations
- Parameters for determining energy losses in pipes
- Pit pressure loss Coefficients (K) in 12d Storm analysis
- Culvert design with inlet control calcs

W03 – Network Analysis

1 hour 50 min

Unit prerequisite: W01 & W02

Modules Used: Base, Drainage & Analysis

Content:

- 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
- Analyse and size drainage pipes with Rational Analysis
- Size and grade pipes for design flows
- Check for service clearances



W04 – Network Export

1 hours 50 min

Unit prerequisite: W01-W03

Modules Used: Base, Drainage & Analysis

Content:

- Export the stormwater system to a spreadsheet
- Edit spreadsheet, and import to changes 12d Model
- Customise network reports through spreadsheet interface
- Drainage quantity reports (By type and depths)
- Produce detailed reports for
 - Hydrology
 - Hydraulic
 - Construction setout reports

W05 – Network Bypass

1 hours 50 min

Unit prerequisite: W01-W03

Modules Used: Base, Drainage & Analysis

Content:

- Review W03 module settings
- 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

1 hours 50 min

Unit prerequisite: W01-W03

Modules Used: Base, Drainage & Analysis

Content:

- 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
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W07 – Dynamic Drainage

6hours 50 min

Unit prerequisite: W01-W03, W05

Modules Used: Base, Drainage, Analysis, Dynamic Drainage

Content:

- Review W05 Network Bypass settings and application
- 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.
 - Soil loss types and values
 - Time series tailwater settings
- Reviewing graphical outputs via time series graphs
- 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.
- 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)
- Estimating storage to meet the pre-development discharges via discharge control pipes, orifice and weirs
- Running dynamic hydrology and hydraulics and evaluating storage parameters.
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W08 – Tractive Force Sewer

1hours 50 min

Unit prerequisite: W01-W02

Modules Used: Base, Drainage, Sewer

Content:

- Sewer Design based on Christchurch City Council IDS standards for Tractive Force Sewer Design

W09 – Culverts (To Come)

6hours 50 min

Unit prerequisite: W01-W03, W05

Modules Used: Base, Drainage, Analysis, Dynamic Drainage



W10 – Drainage 2D - Introduction

6hours 50 min

Unit prerequisite: W01-W03, W05

Modules Used: Base, Drainage, Analysis, Dynamic Drainage, Roadflow, Visualisation

- 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 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
Create results
- Create Legends and customise result colour bands.
- Create time plots of results of velocity, depth, water level and hazard.
- Create flow measurement lines to total the flow over the line
- Create time lines viewing flooding from a stationary perspective
- Create flight and target paths for project flyovers of flood results

W11 – Drainage 2D - TUFLOW

6hours 50 min

Unit prerequisite: W01-W03, W05

Modules Used: Base, Drainage, Analysis, Dynamic Drainage, Roadflow, Visualisation

- 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

6hours 50 min

Unit prerequisite: W01-W03, W05

Modules Used: Base, Drainage, HEC-RAS

- 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.

