12d[®] Model[™] 12d[®]

200

40

.913%

3.239%

80

12d Model is powerful surveying, terrain modeling & civil engineering software. It allows fast production in a wide variety of projects including mapping, site layouts, road, rail and highway design, residential & land developments, and environmental impact studies.

It is the complete, SURVEY, MAPPING & DESIGN solution.

45

25

55

239%

1000100 00 01010

1 913%

40

- 4 %

60

50

Contents

- Base Product- DTM Builder 1
- Survey 2
- Volumetrics, Tin Analysis & Earthworks 4
- Detailed Alignment Design 5
- Urban Drainage 6
- Rivers & Flooding 7
- Visualisation 8
- Input / Output 9
- Additional Modules 10
- Technical Specifications 12



Base Product- DTM Builder

The 12d Model base product contains all the options necessary to produce a digital terrain model (DTM or TIN), including fast triangulation, contouring and sectioning routines. It is graphically interactive to give immediate feedback to the user.

The 12d Model base product was written from the ground up for the civil and surveying market. Work flow follows traditional engineering ideas, making it very easy to learn and use. The base includes the string types 2d, 3d, 4d, interface, pipe, text, alignment and super to allow accurate civil engineering and survey modelling. Alignment strings provide independent horizontal and vertical geometry and are created and edited interactively on plan and section views.

The base includes ability to do simple road and rail designs, building platforms, storage ponds, dams and canals while the Detailed Alignment Design module is available for more complex work. When adjustments are made to the strings or templates, a simple recalc facility automatically removes redundant information and replaces it with the updated geometry and volumes. This is particularly useful when many trials are needed to determine the best position for the final design.

Three types of views – plan, section and perspective – can be created by the user for examining, constructing and editing information. All views are automatically linked so that data can be viewed and manipulated using more than one view. The 12d Model section view extends the concept of a section to include a corridor either side of the string being profiled. Any strings in the corridor can be displayed in the section view. Hence potential clashes between the profile string and utilities are easy to detect. The 12d Model 'super string' provides a simple tool for 3d modelling of utilities such as telephone lines, electricity cables, gas lines and drainage and water pipes.

Plots and reports of any of the data in the views can be created at any time. Plots can be output in a variety of formats including Windows printers and DWG & DXF. Plot parameters are provided for tailoring long and cross section plots. Final quality plots are produced from 12d Model, including title blocks, true type fonts, line styles and symbols.



A powerful object based programming language is included in the base product. With this language, users can build their own options using 12d Model's vast library of graphics and analysis commands or by defining their own routines.







Survey

With the survey module, users are able to reduce survey data, apply adjustments and transformations, create and label subdivision (estate) lots, create traverse spreadsheets, and create and upload setout data.

With the survey module, users are able to reduce survey data, apply adjustments and transformations, create and label subdivision (estate) lots, create traverse spreadsheets, and create and upload setout data.

Raw data from survey instruments is downloaded by 12d Model or read from a PC Card and converted to 12d Model's 'Field File', ready for reduction.

During reduction, a



mapping file is used to apply line styles and symbols, colors and line weights, and to separate the data into models (layers), all based on your field coding.

Field data is automatically 'strung' based on field codes. Coding by Field Templates is supported, allowing dramatic increases in field productivity for string based surveys.

Field pickup includes arcs, pipes and culverts.

Corrections to field data (typically mis-coding or misnumbering of strings) are done on screen, and the corrections are written back to the Field File. This provides an audit trail of the office work, and allows an UNDO facility to be provided. The original observations are always available.

12d includes both solar and star reductions without requiring almanac details.

Geodetic calculations include interactive reporting of longitude and latitude, Easting and Northing, projection bearing and distance, and ellipsoid distance. Full geodetic calculations are available in reduction.

Traverse adjustment by Transit, Bowditch, Crandall, Compass or Least Squares.



Zone to Zone and general conversions between Latitude/Longitude and Universal Transverse Mercator (UTM) projections, Transverse Mercator and most other projections.

Transformations include affine, 2D Helmert, seven parameters and NTv2 Grids. These include converting between AMG/ISG co-ordinates and MGA co-ordinates for Australia and converting between old and new Circuits for New Zealand.

Elevation (height) adjustments including a simple constant, user defined planes or difference surfaces.

Setout points, triangulations, centre line alignments and design cross sections can be created and uploaded to Total Stations and GPS controllers. 12d Model provides seamless interface with TP Setout and TP Stakeout and full support for Trimble Link.

A full suite of COGO functions is included.

Complete plan drawings including line styles, symbols, hatching and title blocks can be produced. Extensive drafting operations are available so a separate CAD system is not required.





Traverse Spreadsheets

Plane and projection traverse spreadsheets exist for entering cadastral work by either using the keyboard or selecting from the screen. Data entered at the keyboard is immediately displayed on the screen. Sophisticated traverse spreadsheet drafting eliminates most, if not all, manual drafting. Line work is automatically

drawn in grid (Easting and Northing) co-ordinates but is labelled with observed bearings and distances with user defined rounding to suit most authorities. Adjustments include Bowditch, compass, transit and least squares. There is no limit on the number of traverse spreadsheets that can be created and reedited. In the Lot Check option, existing plan dimensions are entered and used to check area calculations as well as ensuring lots are closed to prescribed limits.

Estate Lots

House lots are created for residential developments by a variety of methods including parallel, perpendicular and swinging sides. Minimum frontages and areas can be preserved. Existing lots can be subdivided. Arcs and areas are positive can be subdivided by chords or tangents according to either Lots are types su areas, nu bearings and crea arcs. Lot lot type, Function for settin



| ubulvided by chords | of tangents according | 118 | | | |
|---|--|---------------------------------|---------------|--|-----------|
| number, length or an | arc-to-chord tolerar | nce BE | GIN APPLY TEN | IPLATES FUNCTION | REPORT - |
| numbered and can h ch as lot, park or roa | be given user defined ad. Lot labelling inclu | l-sectional infor desrmation | mation | intermed | iate inf |
| umbers, types, labelli and distances (with ting chort acgment t | ing the side of lots w user defined roundir | ithcut area ngpalance | afill area | | cut vol |
| reports include area or area. Lots can be | ables for lines and/or as sorted by lot numb coloured by area. | per, -19.882 0.000 | 0.000 | | |
| s exist to create poir g out the lots. | nt numbers and repo | rts -25.380 -221.641 | 0.934 | | -226.311 |
| | 440.000 167780.218 | -752.408 96142.574 | 0.000 | | -3856 |
| | 445.000 167780 .218 | -717.585 92467.592 | 0.000 | | -3674.982 |
| | 450.000 167780.218 | -685.454 88959.995 | 0.000 | | -3507.59 |
| | 471.838 167780.218 | -556.739 | 0.000 | | -0.020 |
| | 490.000 167780.218 | -456.241 66221.458 | 0.000 | Software Solution for Surveying & Civil Design 3 | -4352.110 |
| | | | | | |



Volumetrics, Tin Analysis & Earthworks

12d Model provides a very systematic approach to volume calculations with good provision for independent calculation checks. It is a general-purpose volume computation routine suitable for a wide variety of applications.

This module is used for calculating earthworks volumes within a user defined polygon using either end area or exact calculations. Volumes can be calculated between a triangulated model and a fixed height or between two triangulated models. Reports of cut and fill areas and volumes are given on a section by section basis using the end area method, a height range basis by the cell method, or on a depth range basis using exact volumes. Depth volumes can be colour coded for validation and plots.





The triangulation analysis module has options to calculate surface area, depth contours (isopachs), the intersection of triangulations, and options for slope, aspect and viewshed analysis. Colour coding can be used for the slope and aspect analysis. Land use studies, landscaping and other civil design tasks can benefit from this comprehensive suite of triangulation analysis options.





Detailed Alignment Design

Alignment design adds another dimension to 12d Model, providing the tools to carry out full range civil design work, from basic roads to multi lane highways with major intersections and exits.

The Detailed Alignment Design module provides design capability and string modifier operations to allow interactive design of the most complex civil situations.

The modifiers include:

- modifying design cross-fall, road width and string height between chainages
- · projecting the cross-fall between two existing strings
- · widening out to an existing string
- creating cross sections at user specified chainages
- modifying the height and/or offset of the hinge string (allows easy design of roads with offset crown).

A separate Kerb return function uses the grades and cross-falls at the ends of the kerb return to automatically create vertical geometry. This enables the user to rapidly create and edit kerb return alignments and gives the ability to immediately see the effects of the entire intersection design.



Decisions can be used in the design cross section to allow, among other things, complicated cut and fill requirements (multiple strata), decisions based on depth below one or more strata or strings, multi-level decisions (i.e. depth decisions, etc) and extended battering including repetitive battering, fixed width batters and battering relative to a string or strata.

Alignment design is fully interactive, changes can be made with design at any stage, these changes will be automatically reflected in other segments of your projects (i.e. volume calculations, cut & fill sections). Many operators use a three dimensional perspective view to check their design as it progresses.





Urban Drainage

The 12d Model substantially reduces the time required to design a complete drainage network, and increases design quality through holistic handling of design surfaces, utilities (e.g. water, gas, electricity), clash checking and trench quantities.

12d Model substantially reduces the time required to design a complete drainage network, and increases design quality through holistic handling of design surfaces, utilities (e.g. water, gas, electricity), clash checking and trench quantities.

12d is the tool to create your drainage network. Layout your drainage network on screen or by importing data from 12d drawings and spreadsheets. When laying down the network, 12d obeys minimum pipe cover and grading. Powerful graphics helps avoid service clashes.



12d measures catchment areas, selects pit inlet capacities, and determines bypass routes.

The drainage module interfaces with

hydrology/hydraulic design and analysis programs including Drains, ILSAX, MicroDrainage, PC Drain, RAT 2000, Spreadsheets, XP-SWMM, and XP-STORM. This combines the "real world" power of 12d's terrain modelling with specialised hydraulic design packages.

Analysis results can be brought back into 12d with hydraulic data going directly onto your drainage profile (long section) plots. Drainage profile drawings are complete with hydraulic grade line, pipe flows, velocity, and construction data. You select the data to include.



12d creates plan drawings with pipes to scale or stylized using line types for pipe sizes/classes. Automatically generate "intelligent" title blocks to plot directly to your plotter, complete with your logos





and auto incremented drawing numbers. The user determines the look of the drawings.

Excavation volumes and pipe system quantities can be calculated within 12d. User defined templates are applied for trench shapes that vary with depth and pipe size. Excavation volumes may be summarised by depth (volumetrics module). Pipe schedules are categorised by pipe types, sizes and/or depths. You specify the ranges and groupings.

Construction schedules can be printed or the data exported to spreadsheets including road chainages, easting, northing, invert levels, diameters, pit types, and remarks. You can also use the powerful 12d programming language to create your own reports.

Flooded widths and roadway depths are shown graphically in 12d. 12d calculates the width of flow using normal depth calculations. For more detailed analysis, HEC RAS projects can be created with discharge results from your hydraulic design program.

Surcharge volumes from drainage pits are difficult to conceptualize. 12d displays surcharge volumes as the flooded area and identifies where spill from the flooded area will occur. Volumes are read directly from your design program/spreadsheet, or they can be manually entered.



Rivers and Flooding

12d Model's Rivers modules offer river engineers and mappers new levels of flexibility, power, and productivity. 12d Model substantially reduces modelling setup time for river, flood plain, and open channel studies.

12d Model's Rivers modules offer river engineers and mappers new levels of flexibility, power, and productivity. 12d Model substantially reduces modelling setup time for river, flood plain, and open channel studies.

Start with survey data, airborne laser scanning (LIDAR), cross-section data, USGS DEM data, CAD data, or a combination of these to create a ground surface for your river. Include buildings, roads, and channel improvements and design.



12d Model efficiently handles several million points, making it ideal for the dense data that results from LIDAR, photogrammetry and traditional surveys of large areas.

For additional clarity, aerial photographs can be used as backdrops for your work.

The user specifies the river centre line, overbanks and cross-section (straight line or bent) locations. 12d Model automatically determines river levees and exports the 3d river system to programs such as HEC RAS, Mike 11, UNET, ISIS and XP SWMM. ISIS and XP SWMM storage/reservoirs receive stage-area curves directly from the surface tin.

The water levels are read from the output files or users can create their own flood level files to map observed





floods. Calculated flood limits can be shown in plan, section or perspective views. Flood inundation maps with depth contours and coloring by depth ranges can be quickly and easily prepared.

Engineering type drawings (river profiles and cross sections) showing bed levels and multiple water level profiles are produced. Drawings are complete with "intelligent" title blocks containing both custom and automatically generated data.

3D images of flood levels and 'flights' down the river are recorded in AVI movie format. Movies of the project showing flood limits and buildings are perfect for public presentations.

Full design features for engineered waterways as well as volume calculation for storage areas, excavations and embankments are also available.



Visualisation

The Visualisation module quickly produces realistic perspective scenes of your design. Surfaces can be shaded, photos draped onto the terrain, textures applied to surfaces and shapes extruded along strings.

A rendered perspective view or drive through provides a realistic three dimensional image which is often the easiest way to convey a design to a non-technical audience.

The Visualisation module has a large number of tools to quickly build and display realistic scenes of terrain and design data.

Aerial photographs can be draped over triangulated surfaces to produce realistic backgrounds for the renderings.

Shading and textures are used on the new design to improve realism.







A library of objects such as trees, lights, guard rails, fences and walls is supplied with 12d Model so that new users can immediately produce results. New objects can be created using faces and extrusions to cover almost all situations.

Routines to create road line markings, signs and billboards complete the overall effect.

Drives down roads and fly overs can be written to Avi files for future replaying and use in presentations.

The Visualisation module uses Windows OpenGL to render the perspective scene.



| -2.641%-1.913% | - 4 % | 0% | | 3.239% | | 4 | 4.43% | -3.907 | ' % |
|----------------|-------|----|----|--------|---|----|-------|--------|-----|
| 40 | 60 | 50 | 50 | | V | 80 | 7 | 5.467 | |



Input / Output

12d Model offers comprehensive input/output options for seamless transfer of data with third party packages.

ArcView Shape Files Input/Output

The ArcView module will read ArcView shape, shx and dbf files into 12d Model. The mapping of any attributes found in the ArcView file can be specified by the user.

Because the ArcView shape format has no string name, colour, model or layer information this data can be passed as attributes when writing data from 12d Model to ArcView files.

DWG/DXF Input/Output

The DWG/DXF reader recognises most AutoCAD entities, including blocks, and makes appropriate interpretation in terms of 12d Model elements. The DWG/DXF output module write out plots, three dimensional data and triangles in DWG/DXF format.

Genio Input/Output

The Genio input/output module is used to read and write Moss GENIO data files. The Genio reader recognises the two default Genio input formats (version 6 and 7) and the Genio options 001 and 003 used for format variations. Moss free format (using commas and the "field-number = "syntax) is allowed. 2d, 3d, 4d, 6d, and G Strings are recognised (with names preserved) as well as triangulations. Genio models can be read directly into 12d Model models, or the genio data can be mapped with users defined models, colours, breakline type and linestyles.

LandXML Input/Output Nov 15 11:03:59

LandXML is a developing standard for transferring ^{0:32} some geometric data between software packages. 12d Model endeavours to support this evolving ive standard.

MapInfo Mif/Tab Input/Output

The MapInfo module reads MapInfo Mif/MID or Tab files into 12d Model. The mapping of attributes in these files is under user control.

| 0.000 | -19.882 0.000 | 0.00 |
|-----------------------|-----------------------|------|
| 10.000 4.669 | -25.380 -221.641 | 0.93 |
| 440.000 167780.218 | -752.408 96142.574 | 0.00 |

ation



Microstation (dgn) Input/Output

The Microstation input/output module is used to read specific information from a Microstation .dgn file and to write out plots, three dimensional data and triangles directly to Microstation .dgn files.

Geocomp Input

The Geocomp reader reads and interprets the data contained in the Geocomp points and strings files. 12d Model macros are also provided to read Geocomp lot files.

CivilCad Input

The CivilCad reader reads and interprets the data contained in the CivilCad ascii file format. Both Version 4 and Version 5 CivilCad ascii formats are supported.

SDRMap & Design

The SDRMap & Design reader allows existing SDRMap & Design users to import their existing data into 12d Model.

| | 4.669 | -226.311 |
|-------|------------------|------------------------|
| -22 | | |
| -7163 | 0.000 | -3856.882 |
| | Solution for 9 | Softwar Surveying & |
| | 0.000 | -3674.982 |
| _7521 | | |

----cut vol ---fill vol



Additional Modules

In addition to covering all facets of survey, mapping and design, 12d Model offers optional modules covering a wide range of applications, so the user can complete the job within one software package.

AMG to MGA

This module handles conversions between the Australian AGD datum and GDA datum using parameters or NTv2 Grids. That is, it can convert between AMG/ISG co-ordinates and the new MGA co-ordinates. The Survey module includes this functionality but the AMG to MGA module may also be purchased separately.

Digitizing

This module is used to capture existing drawings for use as base data. Optional "stream mode" allows fast capture of strings, especially contours. A filter may be applied at capture time, preventing clustered points in the captured data.



An affine transformation is calculated using control points, and is applied as the data is captured, correcting for both map scale and paper distortions.

Digitizer button functions are completely user assignable, giving operators the freedom to configure the system to their liking.



The digitizing module is especially useful for capturing contour maps rapidly, thus allowing a DTM to be formed and design work to commence.

Estate Lots

With this module, users can create and label subdivision (estate) lots. This functionality is included in the Survey module but may also be purchased separately. For more details on Estate Lots please see the Survey section of this brochure.

LINZ Landonline

Landonline is Land Information New Zealand's electronic database of land title and survey information. With this module, data extracted from Landonline can be used in 12d traverse spreadsheets without the need for re-keying information. Cadastral data prepared in 12d traverse spreadsheets can be electronically lodged with Landonline.

Pavement Overlay Optimizer

Overlay of asphalt pavement is used to extend the life of existing roads.

12d Model uses a sophisticated optimization routine to determine the most efficient placement of material to achieve design overlay thickness while providing improvements to ride quality.

Road edges are allowed to 'flap' within a specified crossfall range so that best use is made of available resources.



Pipeline

This module is used to support the design of major pipelines of any diameter (for example, 2000 mm) and any length.

The module allows for the extraction of long sections and cross sections against the digital terrain model for the proposed route, plus all the obstructions that run parallel or cross a corridor of user given width on either side of the centre line of the route.

The joint deflection for pipes of a user nominated length is calculated and interactively displayed along the pipeline.

Earthwork volumes for trenches can be calculated along the selected design line.

The special pipeline longitudinal plots show the existing surface, design pipeline, depth of cut or fill to pipe invert, percentage grades and vertical curve data or deflection angles, and all obstructions.





Sewer - Waste Water Reticulation

The Sewer module is an extension of the drainage module and supports the design of gravity operated waste water reticulation systems, typically those required for new land subdivisions and development projects.

The user enters proposed manholes, pipelines and end of line points. Obstructions which pass over, under or parallel to the design lines within a user specified corridor about the design line will be shown on long and cross section views.

When satisfied with the design invert levels, connections from the design line to the individual house blocks can be added and reported on.

Earthwork volumes for trenches can be calculated along the selected design line.

The special waste water reticulation longitudinal plots show existing surface, manholes, design pipelines, pipe grades, property connection points and all obstructions. Long section plots to the Melbourne Water standard are included.





Technical Specifications

SOFTWARE REQUIREMENTS

Windows 98, ME, NT4, 2000, XP and above

HARDWARE REQUIREMENTS

Pentium II Ram: 128MB Hard drive: Minimum 100MB of free space Monitor: XGA and above Parallel or USB Port required Mouse: Three-buttoned/wheel mouse preferred

MAINTENANCE AGREEMENT

All 12d Model purchasers have the option of a Maintenance Agreement covering software support and updates. Maintenance agreements are typically in blocks of 12 months and in that time the agreement covers all electronic copies of revised versions of 12d Model containing updates and improvements as and when the software becomes commercially available. It also covers telephone and email technical support. Customers on maintenance will incur no additional license charges for the provision of the updates of 12d Model although a charge may be incurred for the supply of CDs and printed material. Customers on maintenance are also eligible for discounts on additional copies of 12d Model.













12D Solutions Pty Ltd

PO Box 351 Narrabeen NSW 2101 Australia Tel: +61 (2) 9970 7117 Fax: +61 (2) 9970 7118 Email: info@12d.com