



# TcpMDT

## Digital Terrain Model – V9

### Professional

aplitop

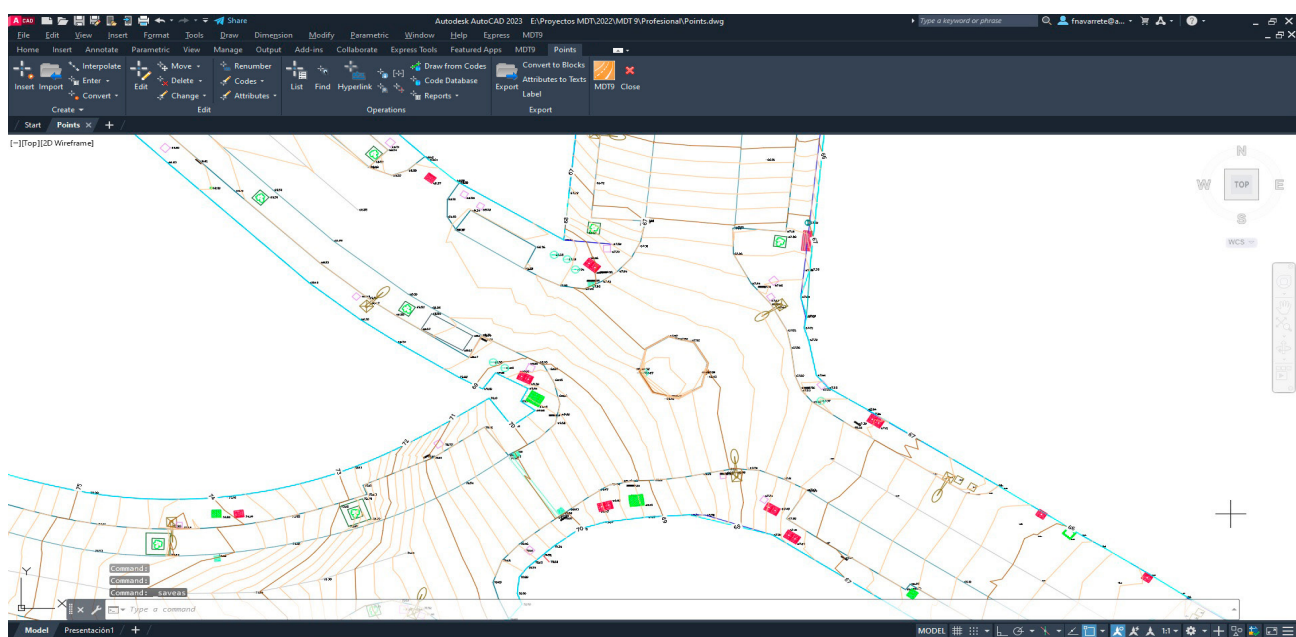
## Introduction

The Professional Version is designed to assist the user at all stages of developing a project in the context of Surveying and Civil Engineering, including all the functionality of the Standard Version. Its main users are public administrations, construction companies, engineering, architecture and town planning studies and companies involved in earthworks, running quarries, mining, the environment etc. as well as free-lance professionals.

MDT is an application that is installed as a plugin on AutoCAD®, BricsCAD®, GstarCAD® or ZWCAD®. It offers a powerful set of tools for easy learning and has a modular structure. It shows great versatility through the import and export of files in the most common formats, such as LandXML, DWG and many more. In addition, APLITOP is a pioneer in the integration of topographic and road data in OpenBIM workflows, through the IFC format and the extensions IFC Alignment and IFC Road.

## Topographic Points

The program starts to run from coordinates obtained by total stations or GNSS receivers, converting files from field applications. If TcpGPS has been used, in addition to the coordinates, the raw data of the observations are imported, as well as the linked photographs. It is also possible to create new points from CAD entities drawn by other programs. If codes have been assigned to points in the field, the program will automatically draw the planimetry and blocks defined by the user. In addition, we can run all kinds of editing and filtering operations.



## Surfaces

Break lines can be defined graphically, by sequence of points, codes or by importing files. Triangulation can be created from points, with or without break lines and by applying angle controls, maximum length, flat triangles minimization and automatic gap repair.

Topographic surfaces of natural terrain and geotechnical layers can be created from survey data or seismic profiles.

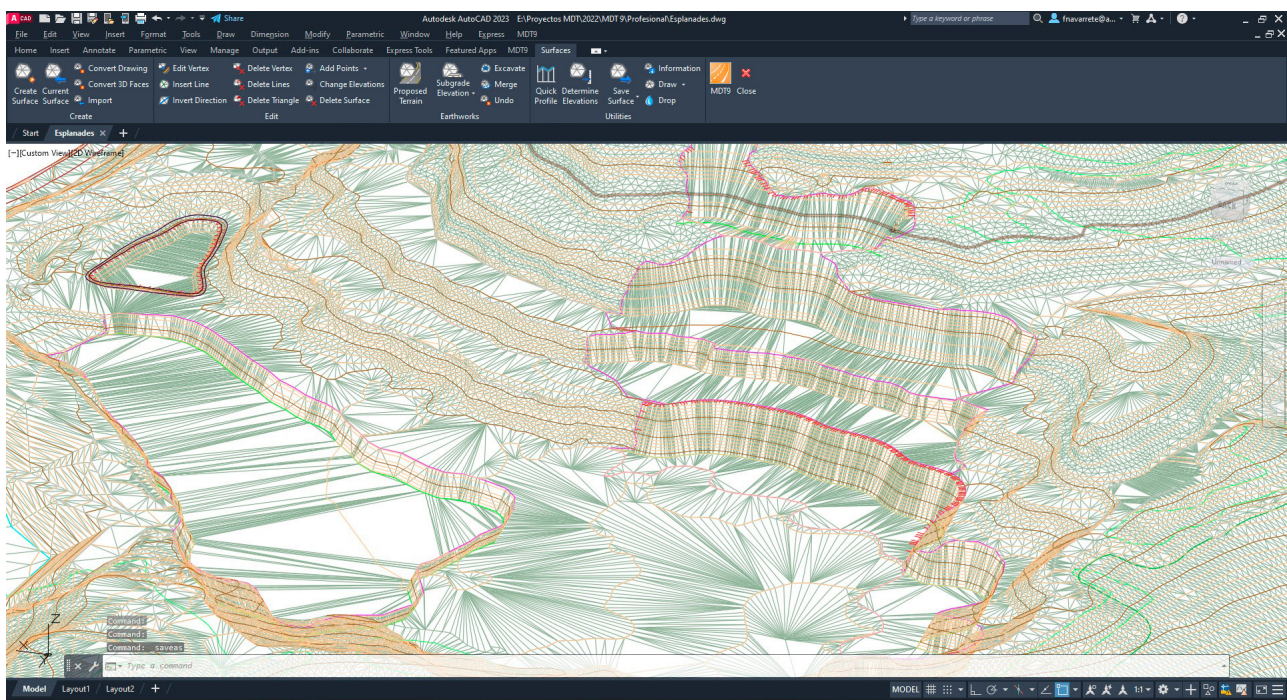
There are commands for interactive editing of the surface, and it also offers tools to detect and repair errors.

The surfaces can have multiple boundaries or islands, and can be drawn as lines, 3D faces or meshes.

Advanced grading commands include tools for esplanade creation with fixed or variable elevation, head or foot of cutting or embankment, slope between surfaces and more.

These commands include options for determining the optimum elevation to balance the cut and fill volumes.

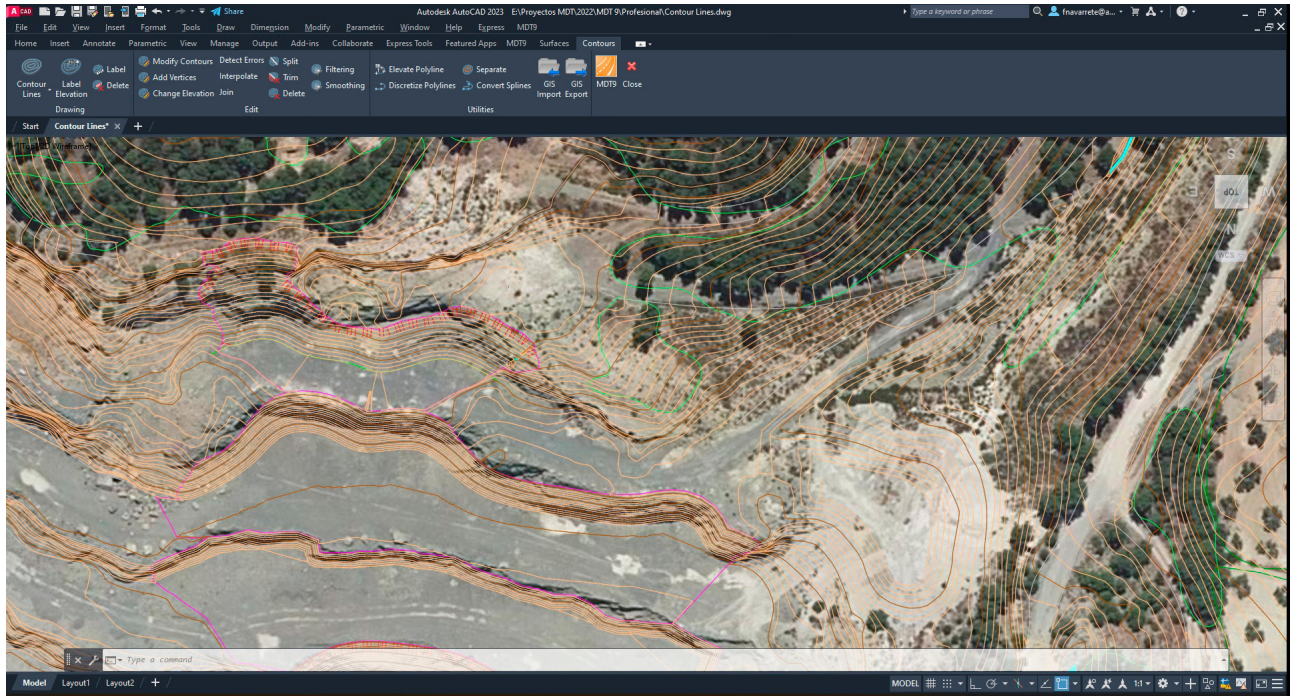
The program includes the import and export of the most common formats, including CAD applications, BIM, machine control, 3D modeling and virtual reality.





## Cartography and Contour Lines

MDT can generate contour lines from surfaces or meshes, with an interval or at special elevations and they are updated automatically with each change in triangulation. The contour lines can be labelled manually or automatically and additional labels to be placed anywhere on the surface.

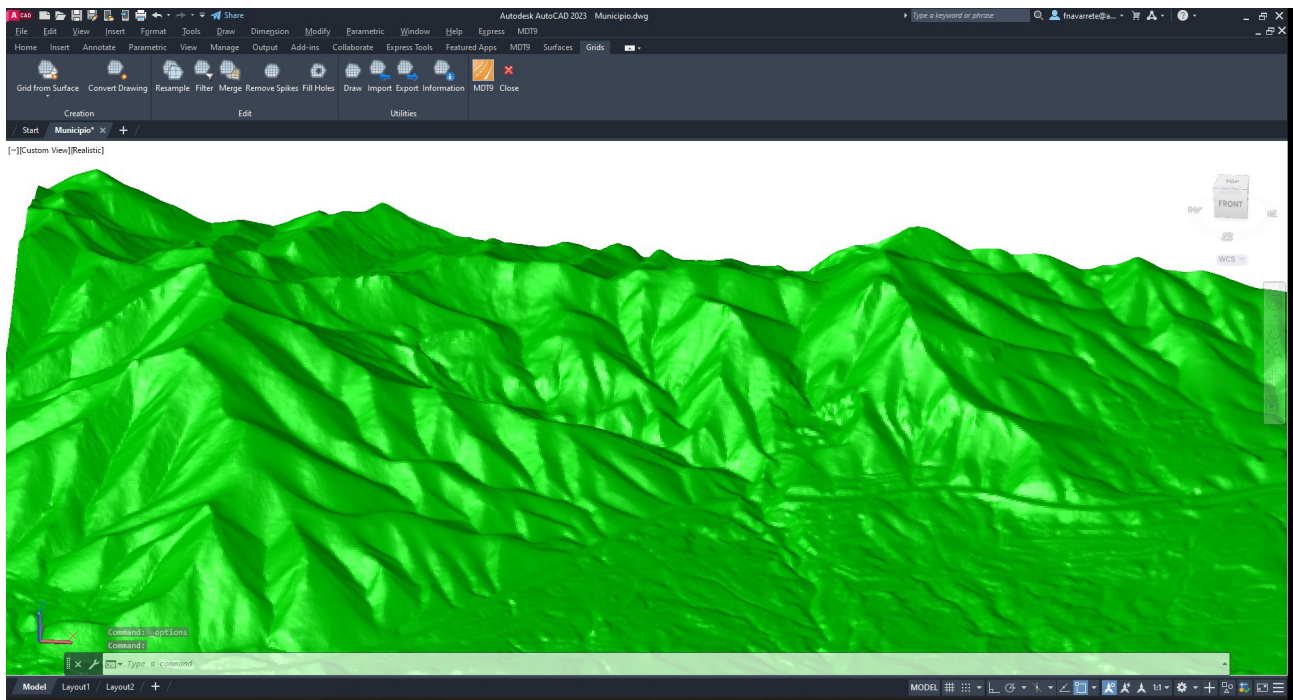


There are also other commands for interpolating, breaking and joining curves, adding vertices, editing curves, discretizing polylines and splines, detecting elevation errors etc. Other tools make it possible to import and export point, lines and polygon GIS files in formats shape, GML, GeoJSON and more. You can also import vector data from entity web services (WFS).

## Meshes

Meshes may be created from a surface, contour lines, 3D entities or mesh files in various known formats (ArcView, LAS, GeoTIFF, etc.) or web coverage services (WCS). Large files can be converted from LiDAR or photogrammetry applications, with the possibility of resampling and without the need to draw them in CAD.

It also has commands for mesh processing, such as merging, filtering and resampling, smoothing, removing peaks, filling gaps, etc. They may be represented as 3D faces, polyface mesh or image, all being suitable for export to realism and animation programs.



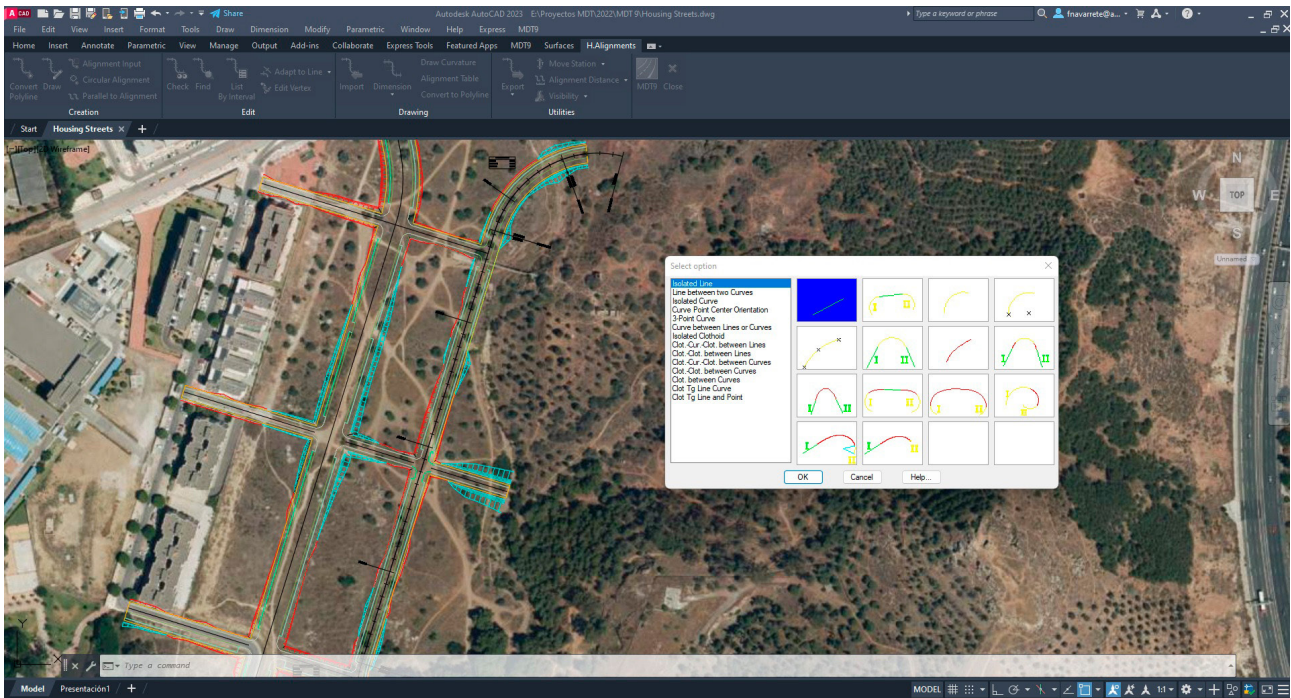
## Horizontal Alignments

The horizontal alignments which will be used on longitudinal and cross sections may be created interactively, drawing on the screen and from polylines, numeric input or importing files in the most usual commercial formats as LandXML, IFC, etc. Other commands also allow alignments to be integrated based on lines, circular arcs and clothoids and which may be fixed, rotating or coupled, greatly making easier the layout drawing.

The alignments are automatically dimensioned with customizable styles and their vertices may be edited. It may also be checked whether the radius and setting values comply with the road standards. MDT includes other tools for labelling curve tables, the generation of reports by intervals, the calculation of distances and intersections between alignments etc.

Once the alignment has been generated, superelevations and widenings can be generated, being able to choose the applicable tables according to the country. An MDT road comprises the horizontal and vertical alignment, longitudinal profiles and cross sections, superelevations, widenings and template sections. Then it is possible to draw the project longitudinal profiles and cross sections, represent the modified terrain and obtain all kinds of reports for measurements, settings out etc.

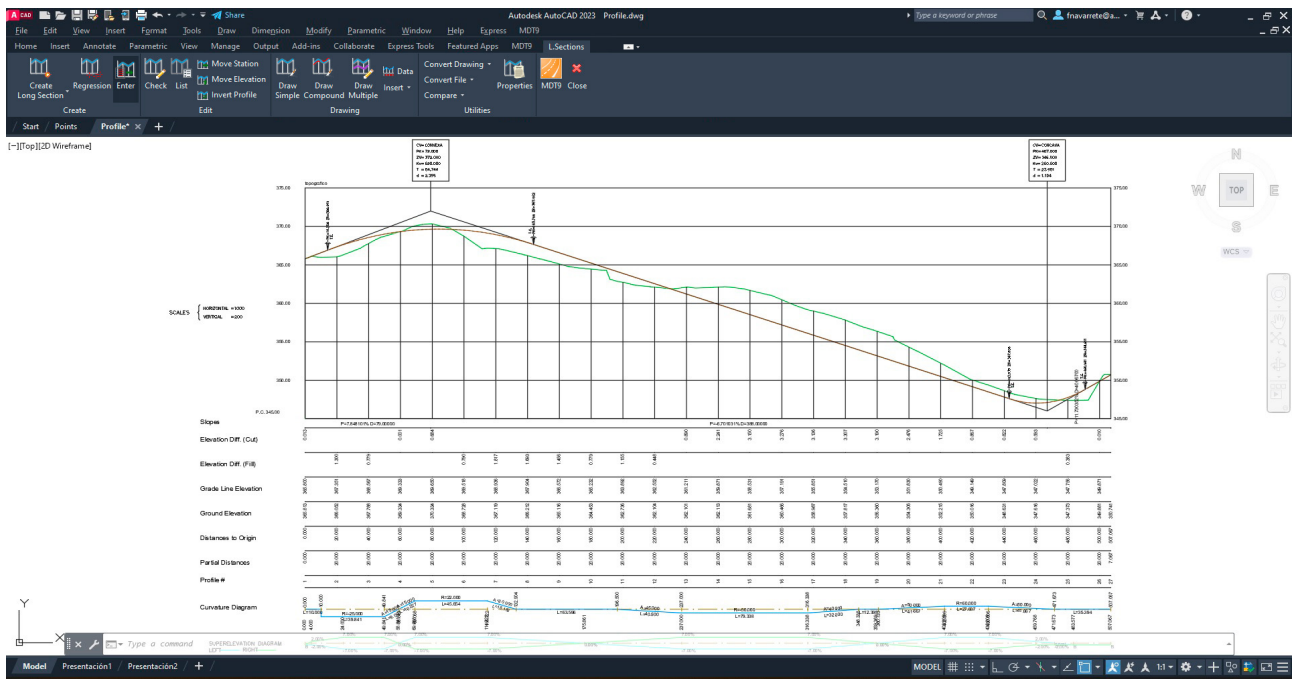




## Long Sections

The profiles may be calculated based on a surface, 3D cartography or by regression from points near the alignment. The quick profile command allows the user to draw a line on the surface and quickly show the profile. The profiles may be updated automatically when the original alignment or surface have changed. Furthermore, it has a powerful CAD independent profile editor which allows graphic and numerical editing. The drawing is fully customizable, including the use of paper space or model, sheet templates, style, justification and text sizes. The numerical information to be labelled on the profile can also be chosen from a broad list of elements. Blocks defined by the user can also be inserted at the desired locations.

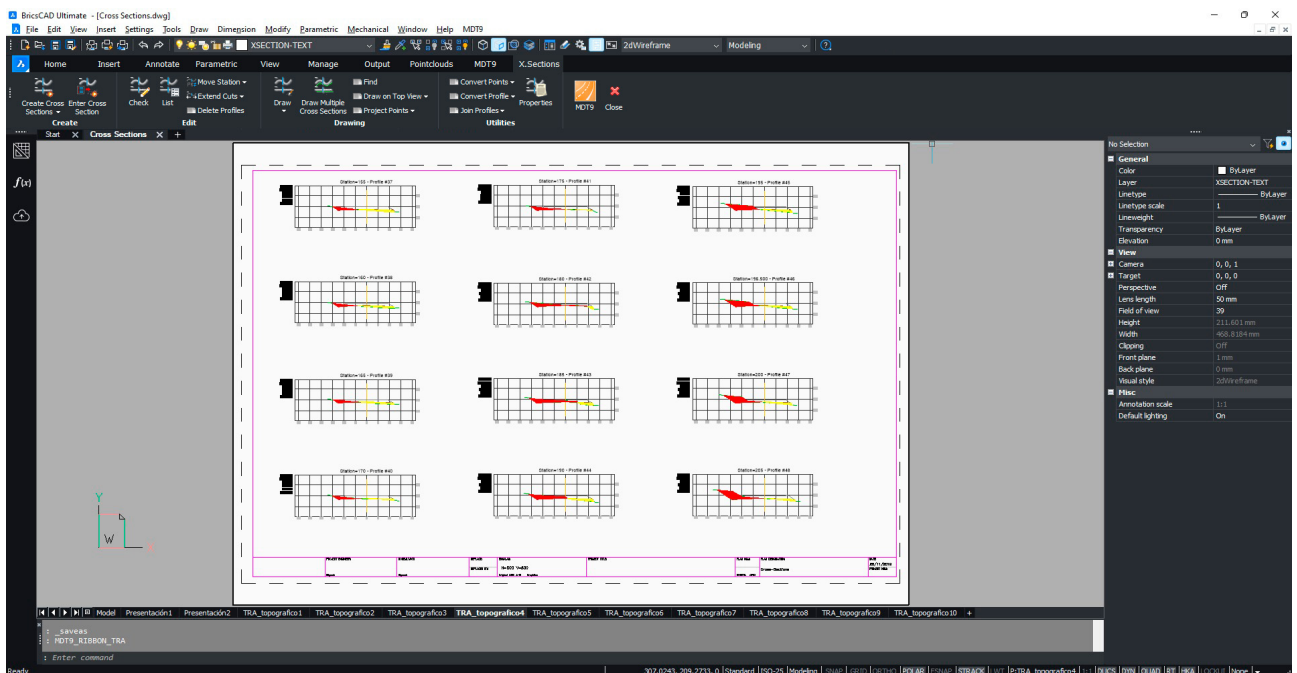
It is possible to represent on one single profile one or several terrains and vertical alignments, including the tables with vertical curve characteristics, curvature diagram and superelevations, intersection with other roads etc. MDT has utilities to draw profiles of power lines including poles, catenaries, etc.



## Cross Sections

The terrain cross sections may also be obtained from points, a surface or mesh, 3D cartography or by the conversion of files from the most usual formats. The project profiles are generated, also bearing in mind the standard sections, superelevations and widenings.

The drawing is highly customizable in such a way that we can decide on those elements which must be labelled (chainage, terrain elevation, gradient elevation, areas and volumes, superelevation etc.). In addition, we can see them in real time simply by moving the cursor on the drawing on the horizontal alignment or on the longitudinal profile. It is also possible to insert blocks and project 3D polylines on the profiles.





MDT allows users to draw several profiles simultaneously to see different layers or stages of evolution of the project. A powerful editor allows the profiles to be graphically modified by moving the vertices or numerically by modifying distances or elevations.

If the original surface or alignment are modified, the profiles may be automatically updated. MDT also incorporates special commands for drawing piping sections, allowing the definition of their terrain layers, bedding material, pipe diameter etc.

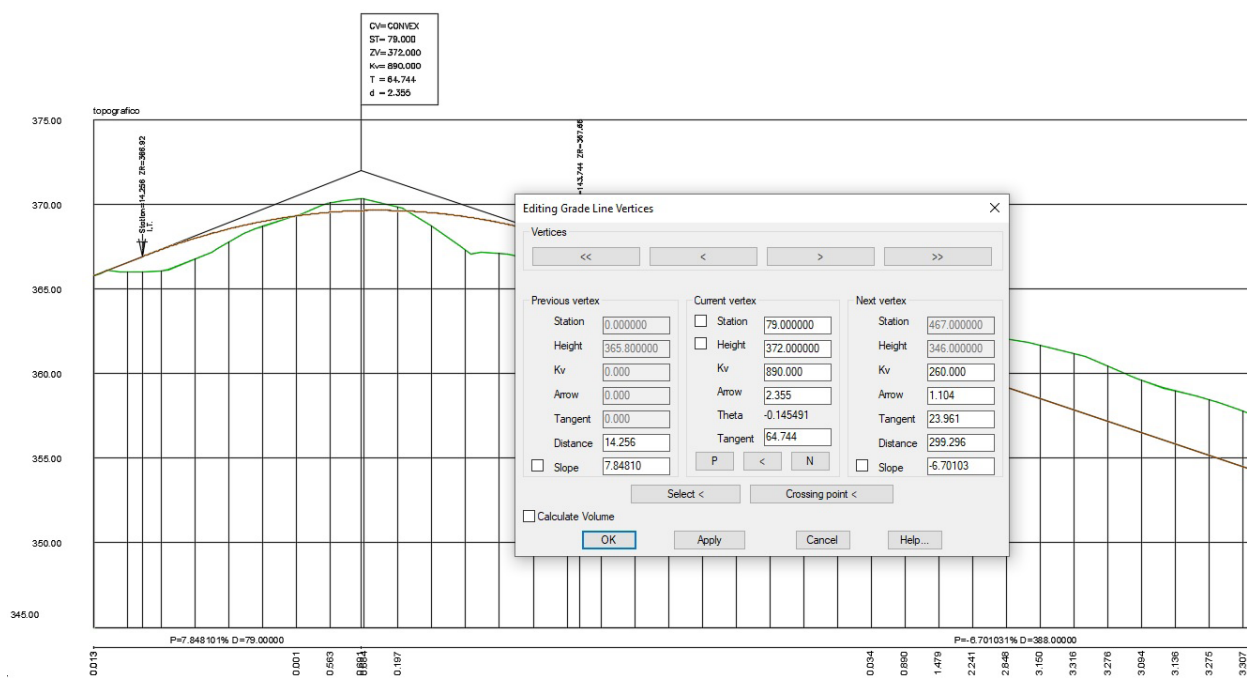


## Vertical Alignments

Vertical alignments can be defined from a polyline, parameters (chainage and elevations or distances and slopes) or by importing files. Vertical curves may be circular or parabolic (symmetrical or asymmetrical) and they may be edited by changing their radius or parameter, tangent, maximum ordinate or crossing point, showing all the information about estimated elevations, slopes and volumes in real time.

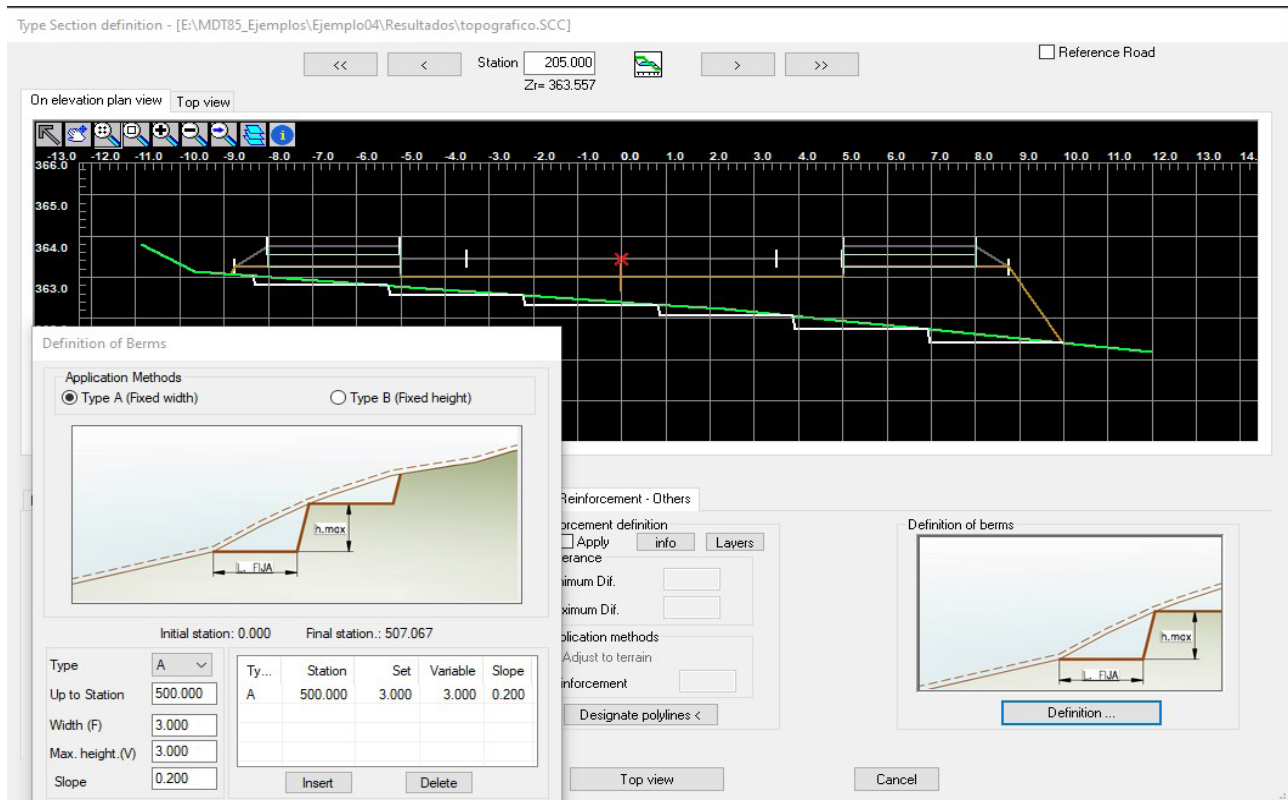
The drawing is updated automatically if the alignment or surface is changed. MDT includes tools for generating the optimum gradient, applying displacements in chainage or elevation, extracting it from a longitudinal profile, comparing two gradients etc.

Compliance with the road standards can also be verified in terms of visibility, slopes and curve characteristics.





MDT allows the drawing of road sections applicable to each segment of an alignment, both on urban and road projects. The platforms are defined from vectors such as lane, median, berm, hard shoulder... The user may create his own vectors library and he may customize the dimensions and behavior of each to decide how to apply superelevations, textures or road surface layers.

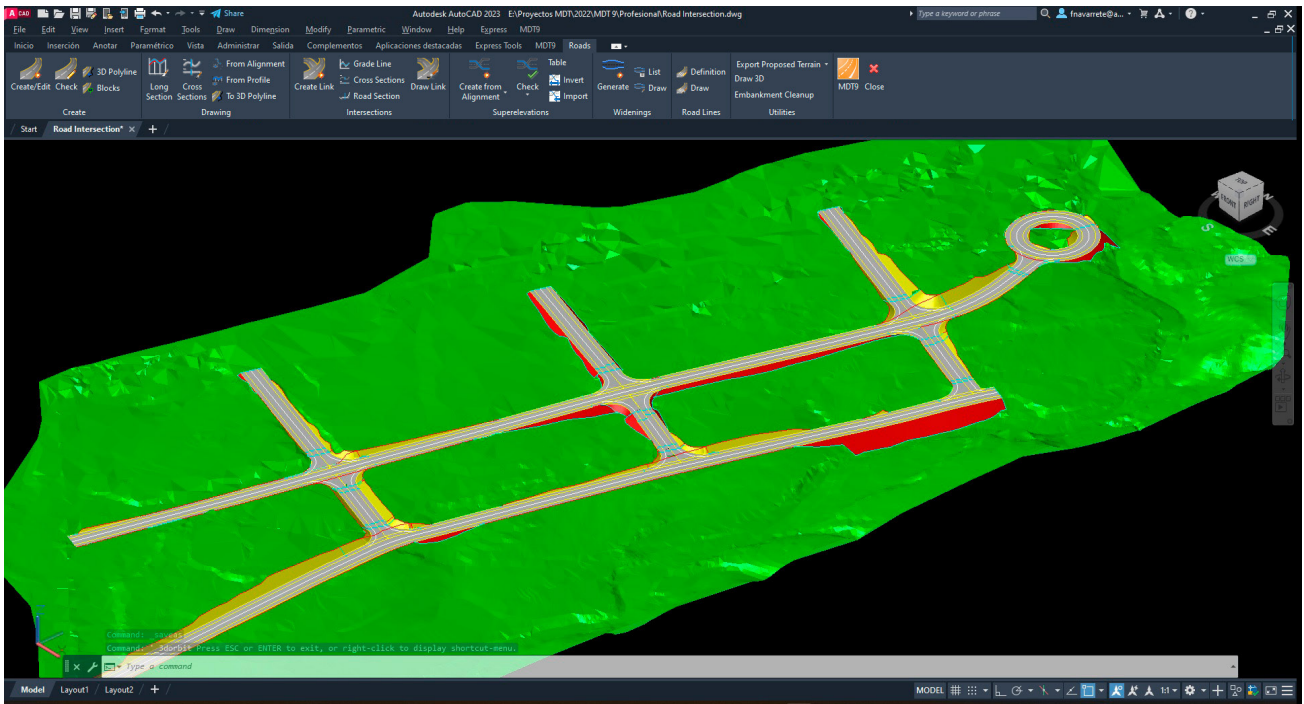


The road surface layers may also be defined separately for each platform vector as well as the sub gradient application conditions (constant slope, parallel, depending on the superelevation or variable). We can also apply different inclinations on the left and right of the alignment as well as in the interior or exterior of the median. Finally, different materials can be assigned to each of the road surface layers, being possible to distinguish between the materials of overlaps to the left and right of the roadway.

It includes tools for the creation of intersections between roads, allowing to define separately each one of the links that make it up. These intersections can be built on both roads and roundabouts. Additionally, it is possible to obtain the volume report resulting from executing the intersection, as well as its 3D representation.

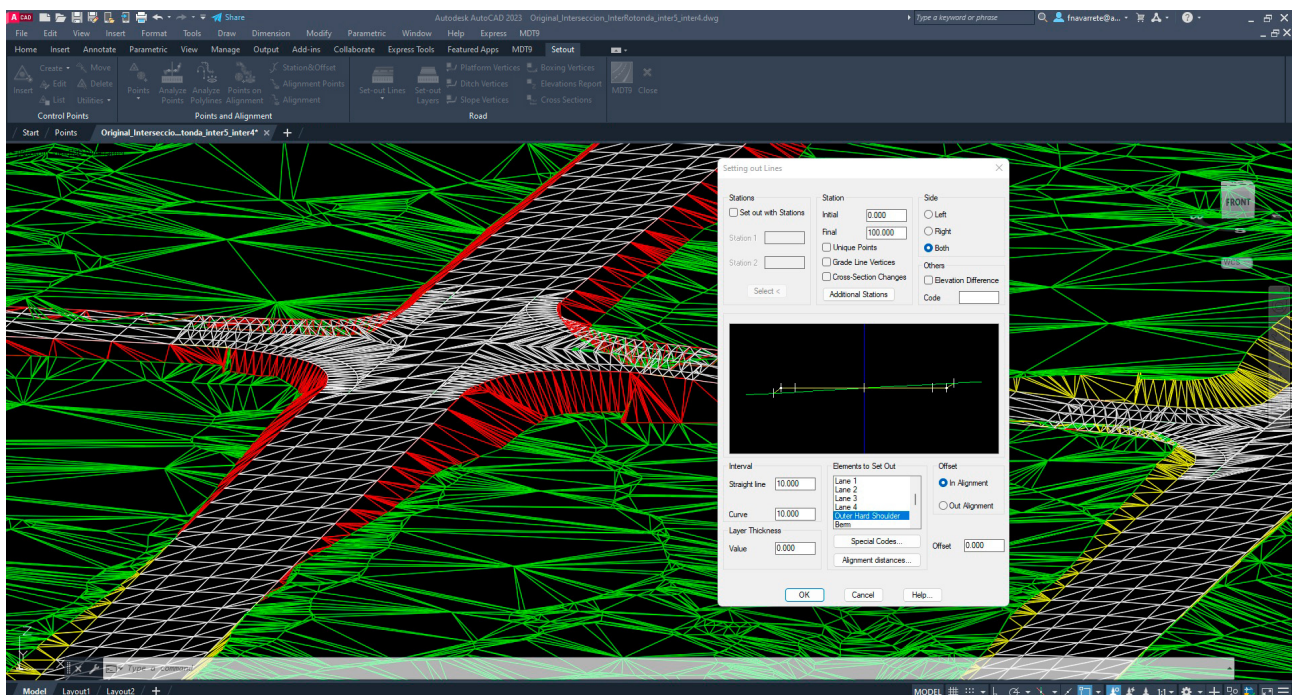
The ditches are defined from vector elements and they may be applied on the left or right and cut or fill. Another option allows the definition of reserve ditches conditioned by the height difference from the natural ground. There are different options for defining the cut and fill slopes: constant slope, berms or variables. You can also assign conditional slopes for height, layers of geology, slope dimensions, etc.

In addition, the standard section may include geology layers, walls and structures, reinforcements and expansions. It also includes tools for the automatic creation of sections from a drawing in top and front views, being able to define geometrically medians, walls, curbs, etc.



## Setting out

Setting out bases can be created using various methods and it is possible to set out isolated points, points on an alignment, chainages and displacement, intervals, polyline vertices etc. with their own coordinates or regarding bases. All set out points are analyzed in line with the alignment, indicating their chainage, offset and azimuth.





It also includes numerous roads setting out tools with the possibility of calculating and analyzing section elements, generating lists of platform vertices, ditches, slopes, vertices, road surface layers, elevations etc. Other useful commands allow the analysis, control and report on a survey based on a modified terrain digital model and/or on proposed profiles.

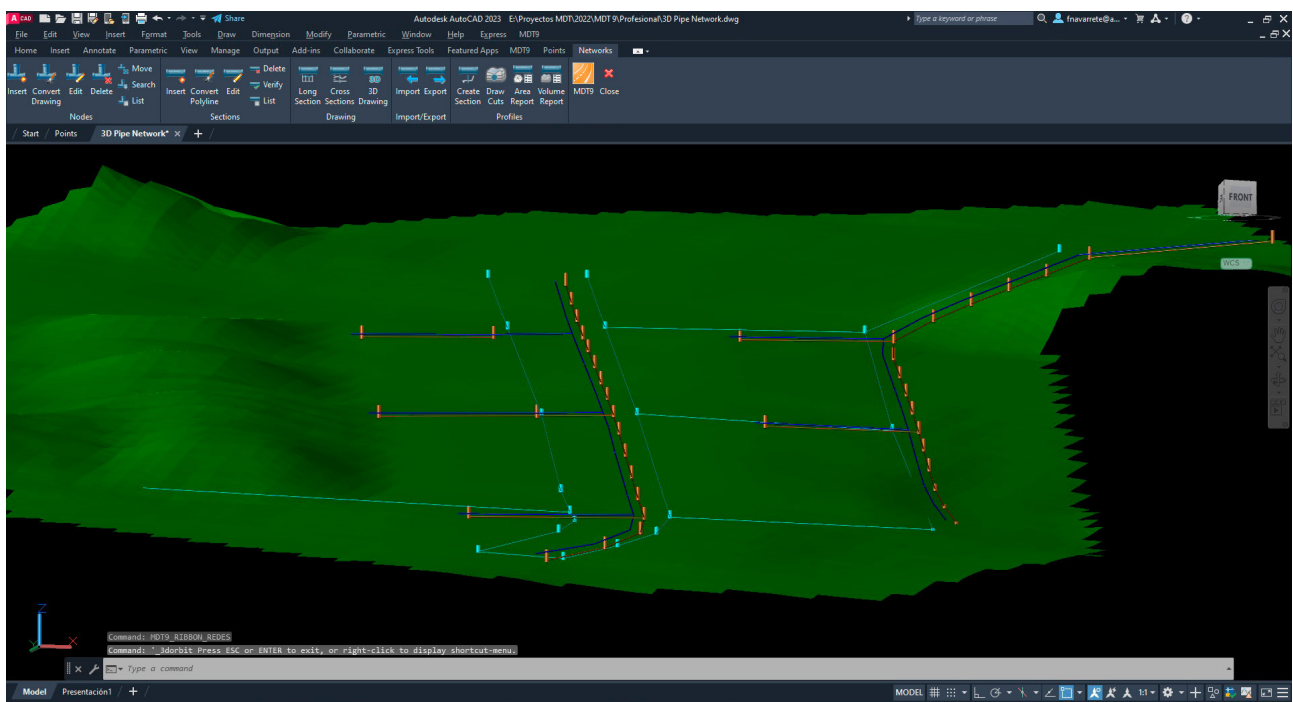
## Networks

The networks menu offers functions for the drawing in top or profile views of water, sewerage, rainwater networks, etc. The nodes can be imported from file, converted from points or blocks, or inserted manually. The pipe sections are created by joining nodes or converting 2D or 3D polylines, giving diameter and material from a customizable list.

The longitudinal profile draws the wells with their attributes and the pipes, with their diameter, material, slope, intersection with other pipes, etc. The cross profiles include the representation of the pipes at their real position with respect to the ground.

In addition, all networks can be drawn in 3D with their actual dimensions.

Networks can be exported to LandXML formats, shape for integration in GIS and JSON.



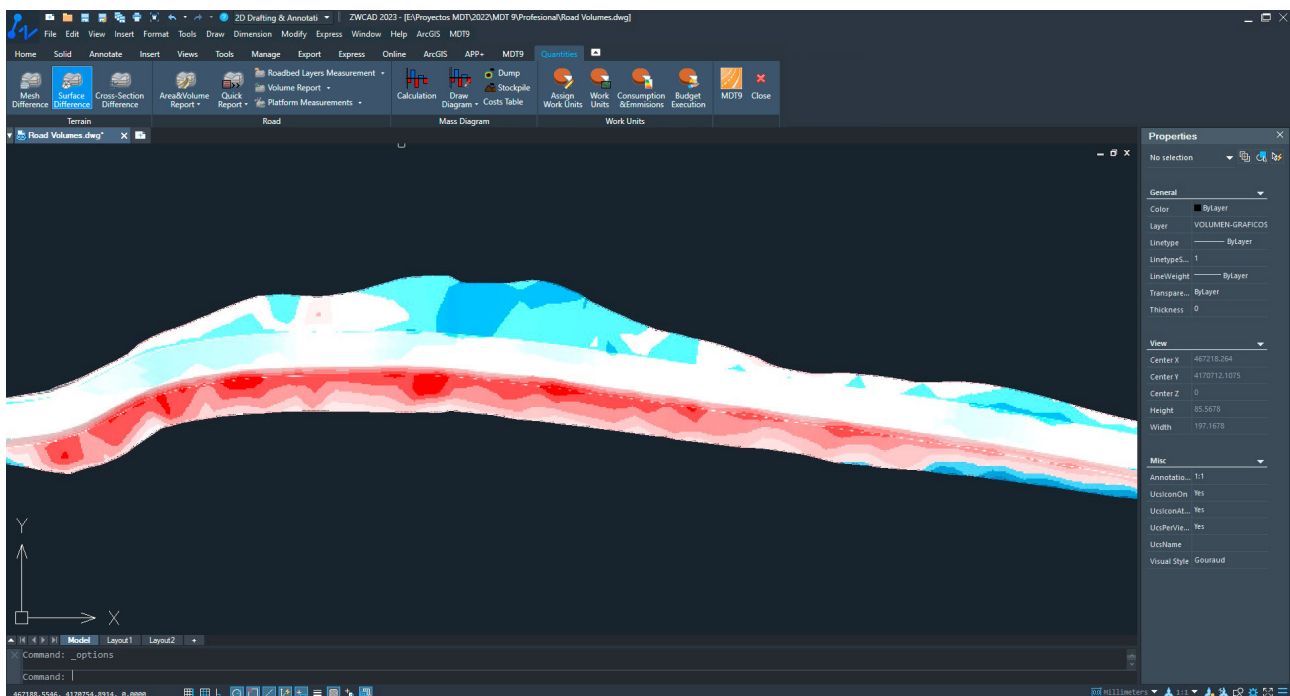
## Areas and Volumes

Cut and fill volumes can be calculated from a comparison between meshes, surfaces or cross sections. The results of meshes and surfaces are represented by areas using color palettes, with a customizable legend and interval. Calculation by cross sections allows the application of the curvature corrections in line with the geometry of the horizontal alignment and excluding intervals that do not form part of the measurement.

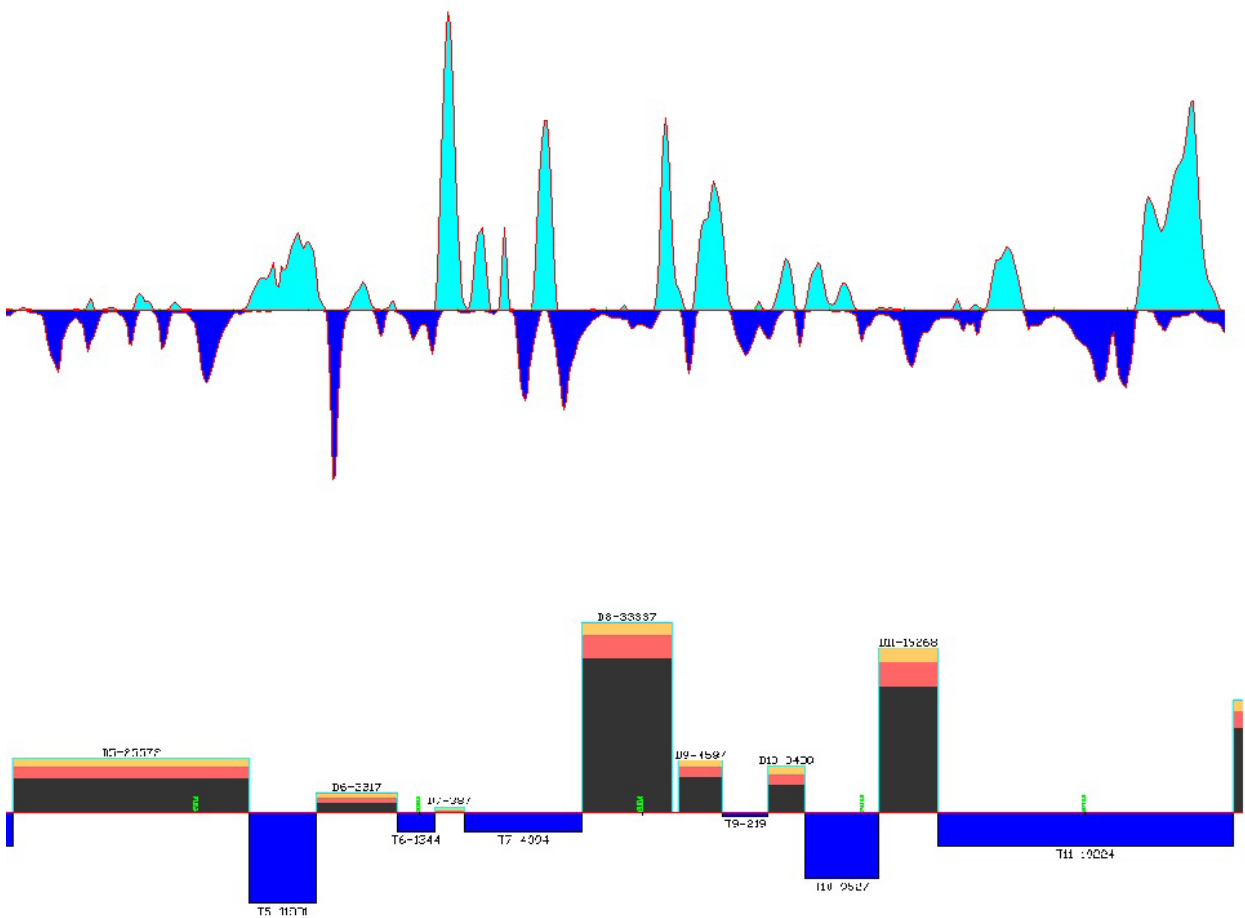
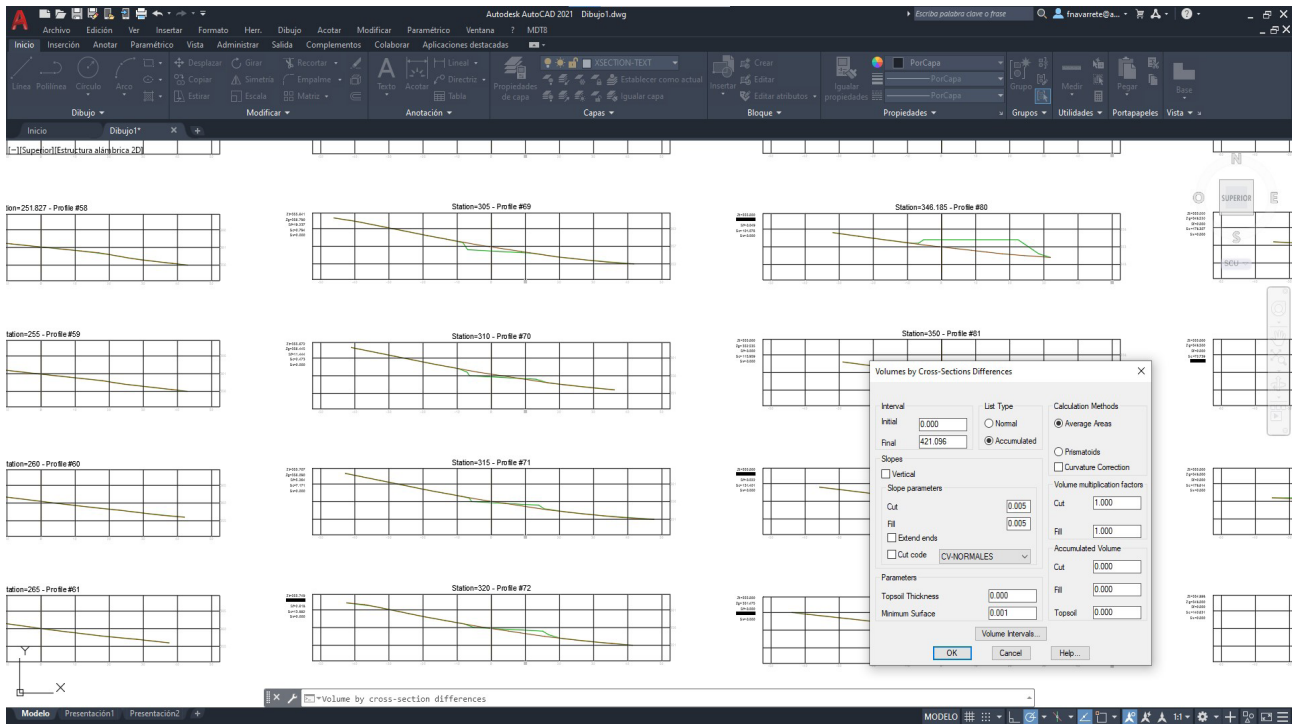
A utility allows you to quickly calculate the volumes of stockpiles of material defined by polylines drawn on a surface. The calculation of road surface layer volumes includes the detailed breakdown of each of the volumes calculated: cut, fill, topsoil when cutting, topsoil when filling, reinforcements etc.

The quick volume utility allows the ascertainment of the percentage of the works carried out based on a points file X, Y, Z or chainages and elevations, generating different reports for each of the methods and estimating the maximum error. Other additional reports are areas, volumes, cross section measurements, road surface measurements, slope measurements, volumes by simple section etc.

Finally, MDT has a group of commands for managing mass diagrams with different representations, the calculation of earthworks, the definition of landfill and stockpiling areas, transport costs table and the generation of reports with an expression of volumes of land displaced, transport distances, associated costs etc.







## Quantity Take-off

MDT includes the possibility of selecting a database of work units in BC3 format, organized in chapters, groups and items. In these items you can edit its description, detail, measurement unit, execution price, etc. In addition, it is possible to associate the data on CO2 emissions, water and fuel consumption, energy consumption and waste emissions to each work unit.

These work units can be assigned to earthworks, road surface layers and other elements of the drawing. For example, for the road surface layer the density and factors are indicated, and it can be applied to the total volume, upper surface or lower surface of the layer.

With this data, it is possible to automatically generate the reports: work unit measurements, material execution budget and consumption and emissions for the entire project.

**Analysis of Work Unit Life Cycle**

Code: 211.0000 Unit: t

Description: ASPHALT BITUM B15/25 (B 13/22)

CO2 emission (Kg)	206.059	Energy (MJ)	122.787
Fuel (l)	10.500	Energy (kWh)	127.333
Water (l)	442.030	Waste (t)	0.050

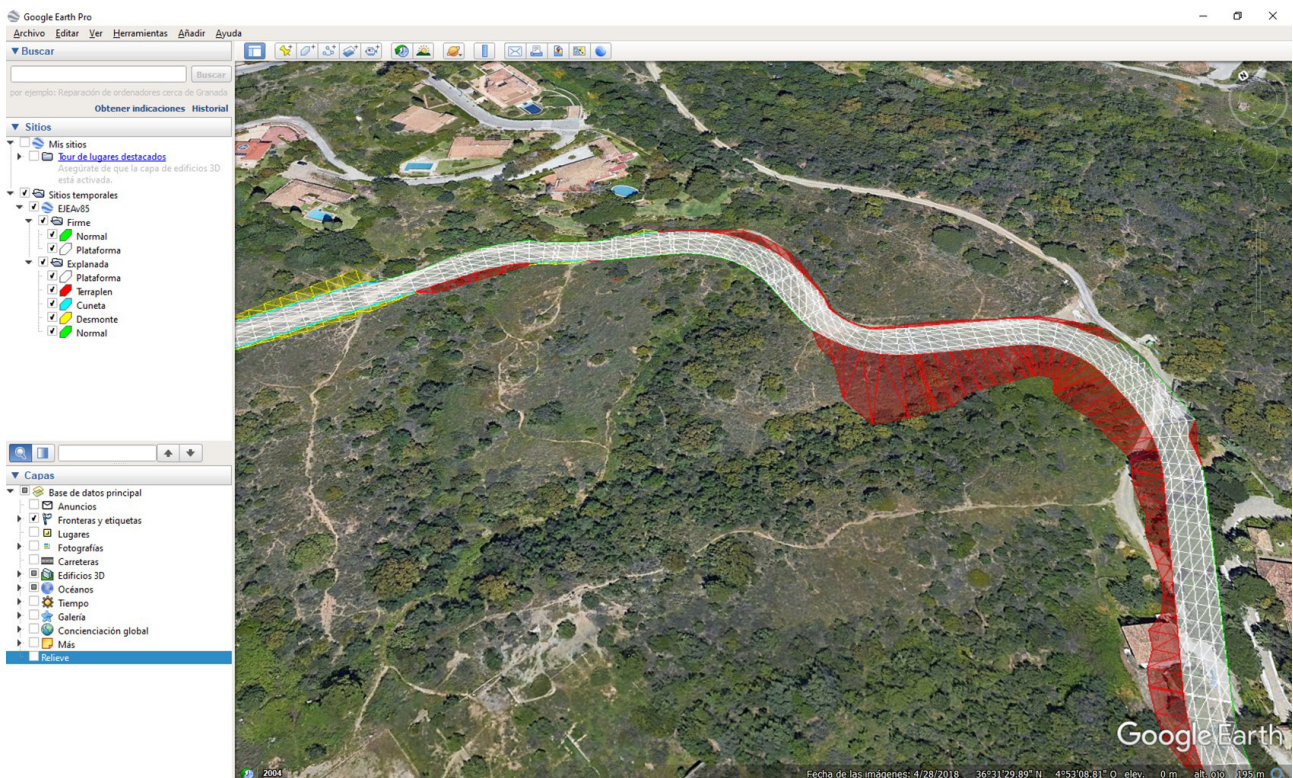
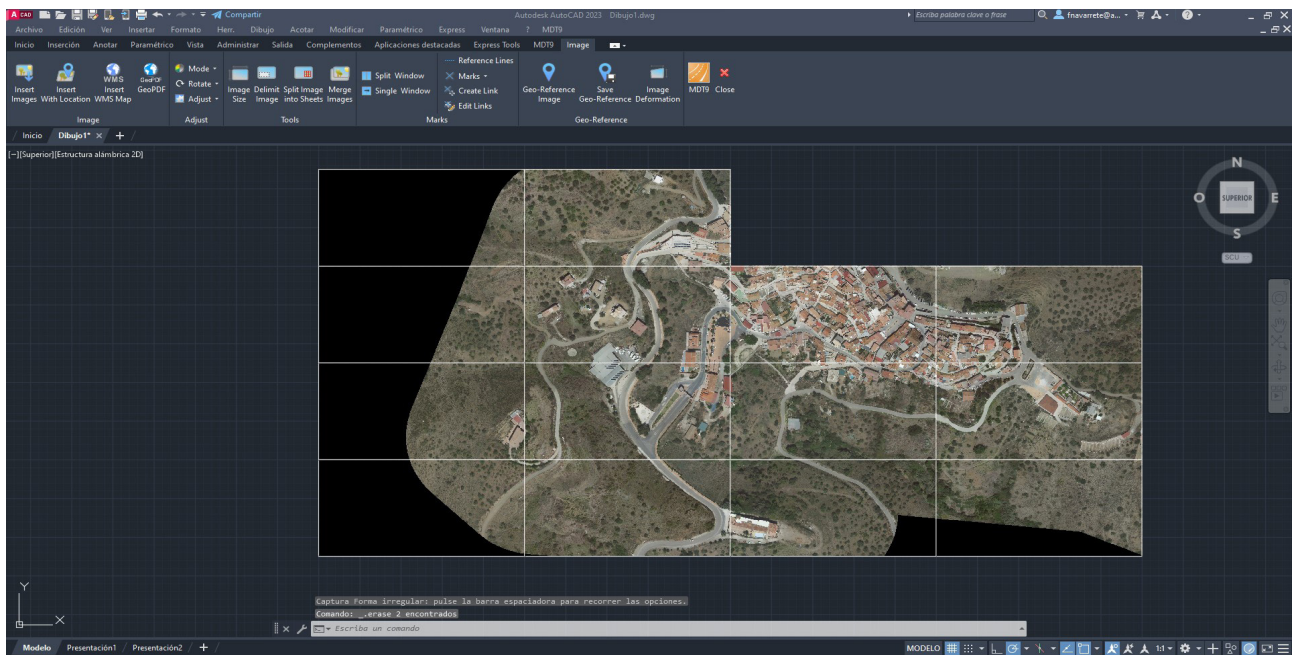
OK Cancel Help...

Measurement - Work Units									
Chapter	Work unit	Code	Description	Geo.Measurement	Measurement	Density	Amount	Total	Unit
02 - DRENAJE	B.R. Mix	211.0000	ASPHALT BITUM B15/25 (B 13/22)	1507.122 m3		1.0000000	1.0000000	1507.122 t	
02 - DRENAJE	B.R. Mix	211.0040	BETÚN MEJORADO CON CAUCHO PROCEDENTE DE POLVO DE NFS, TIPO BC35/50	1507.122 m3		1.0000000	1.0000000	1507.122 t	
05 - FIRMES	Soil concrete	513.0010	SUELO-CEMENTO FABRICADO EN CENTRAL	1714.669 m3		1.0000000	1.0000000	1714.669 m3	
05 - FIRMES	Crashed stone concrete	513.0020	GRAVA-CEMENTO FABRICADO EN CENTRAL	1587.555 m3		1.0000000	1.0000000	1587.555 m3	

OK Help Print...



MDT has commands for inserting georeferenced images , orthophotos and GeoPDF files in their real position on the terrain and assigning them to a surface or assigning predefined textures to surfaces, and place photos with position at their real location on the map. It also allows access to the web map services (WMS, WMTS) provided by public and private entities in such a way that the user must only specify a window, choose the service and the program will automatically insert the image in the right place on the drawing. Another utility enables the user to export points, surface and layers of the drawing and 3D objects to Google Earth and OBJ format.

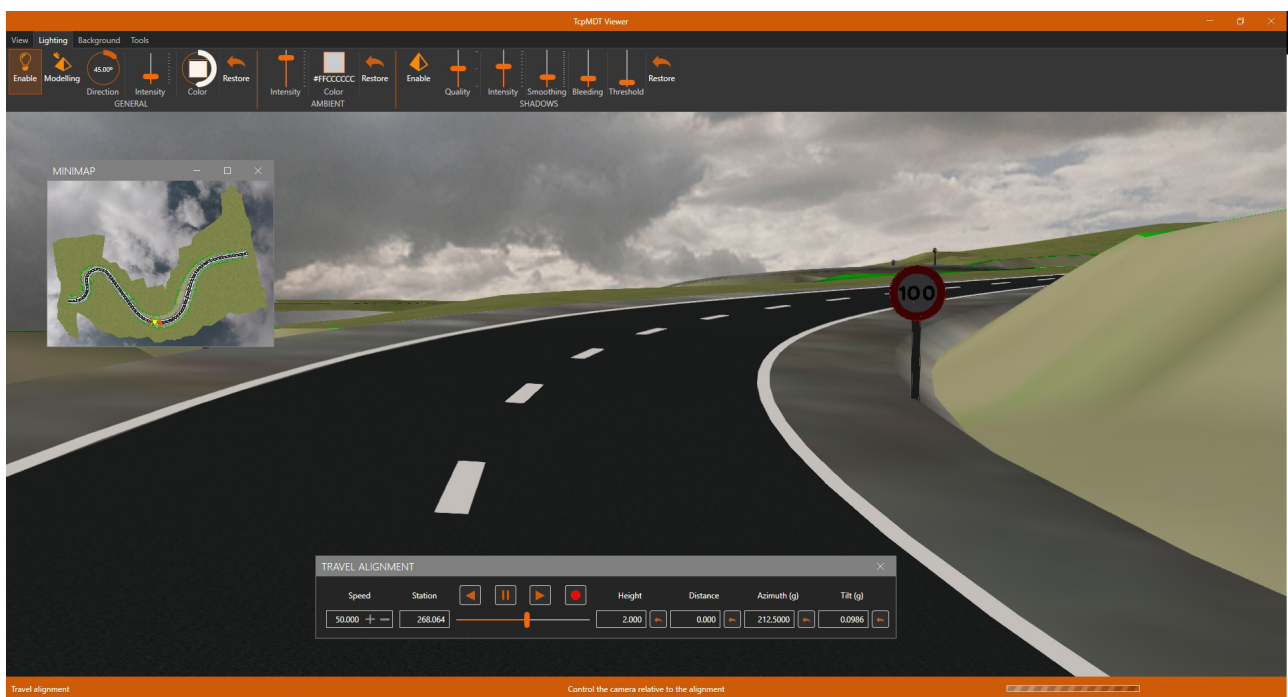
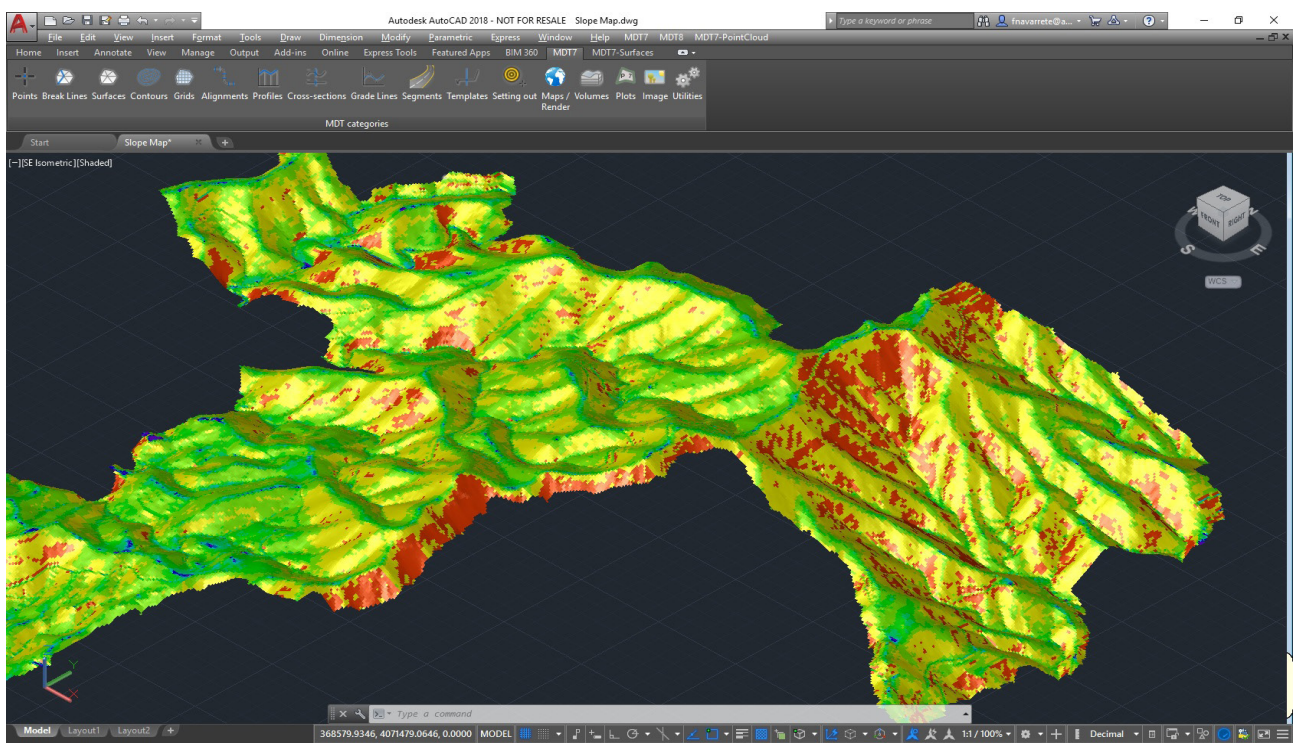




## Maps - Render

MDT can draw a 3-D mesh based on contours or surface and maps of elevations, slopes, orientations or visibility from a point can be generated. It includes a powerful terrain or road viewer in which the lighting conditions and shades can be changed .

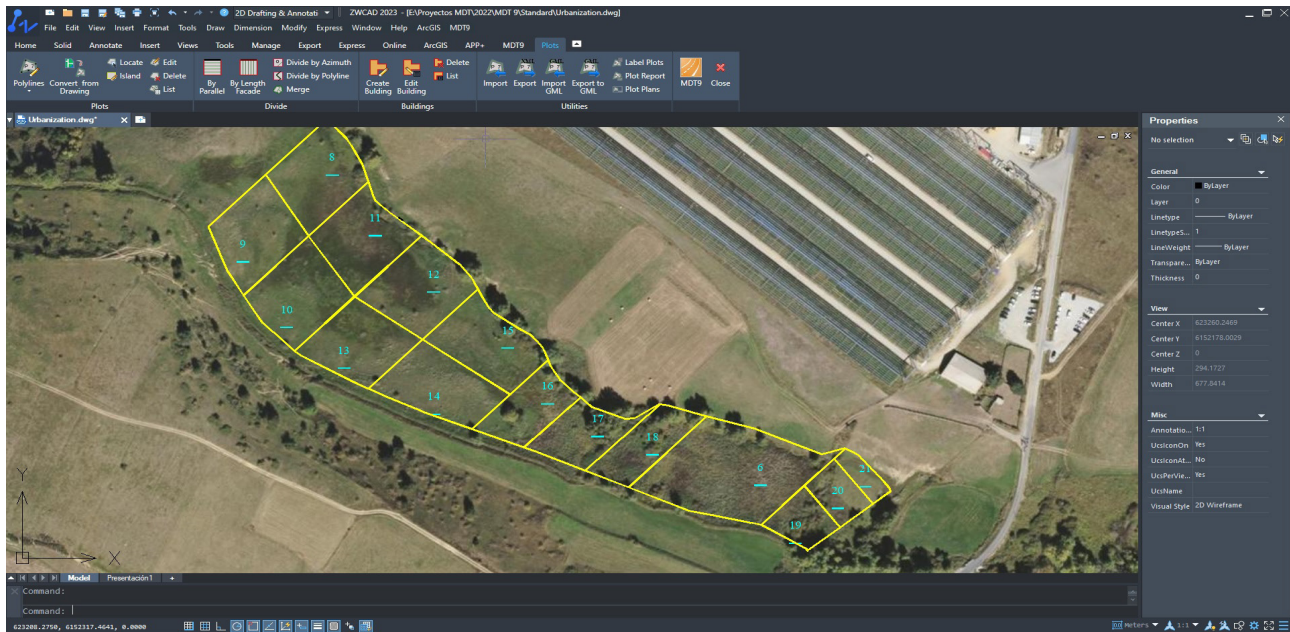
It includes a ready-to-use library of textures to apply to models, and another of 3D objects with trees, vegetation, rocks, signs, street furniture, etc. useful to enhance presentations. A 3D model editor is also provided, to facilitate the adaptation of objects from external libraries. Videos of the tour can be generated in up to 4K resolution.



## Plots

This menu includes options for creating and editing plots and buildings. It also has tools for grouping, plot division by area, parallel and perpendicular to one side, azimuth, length of facade, etc.

Other utilities allow you to dimension parcels, label vertices coordinates and length of sides, generate reports and plans, draw 3D constructions, etc. The data can be exported to standard formats such as GML and LandXML, shape for GIS projects and other specific ones required by the Cadaster in different countries.

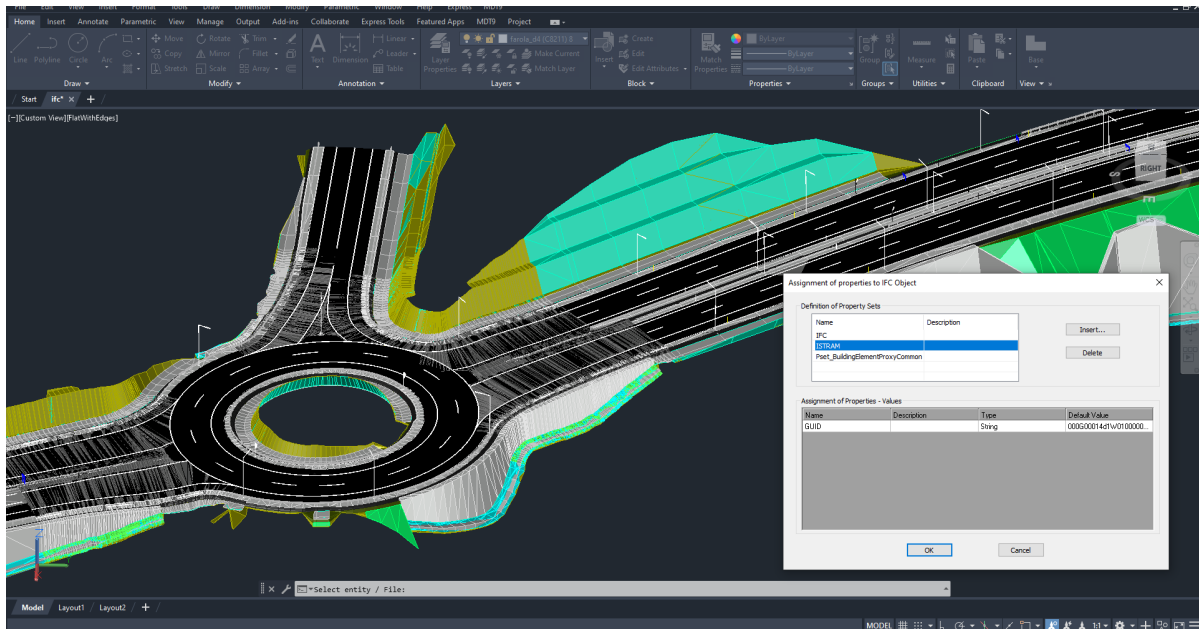


## BIM

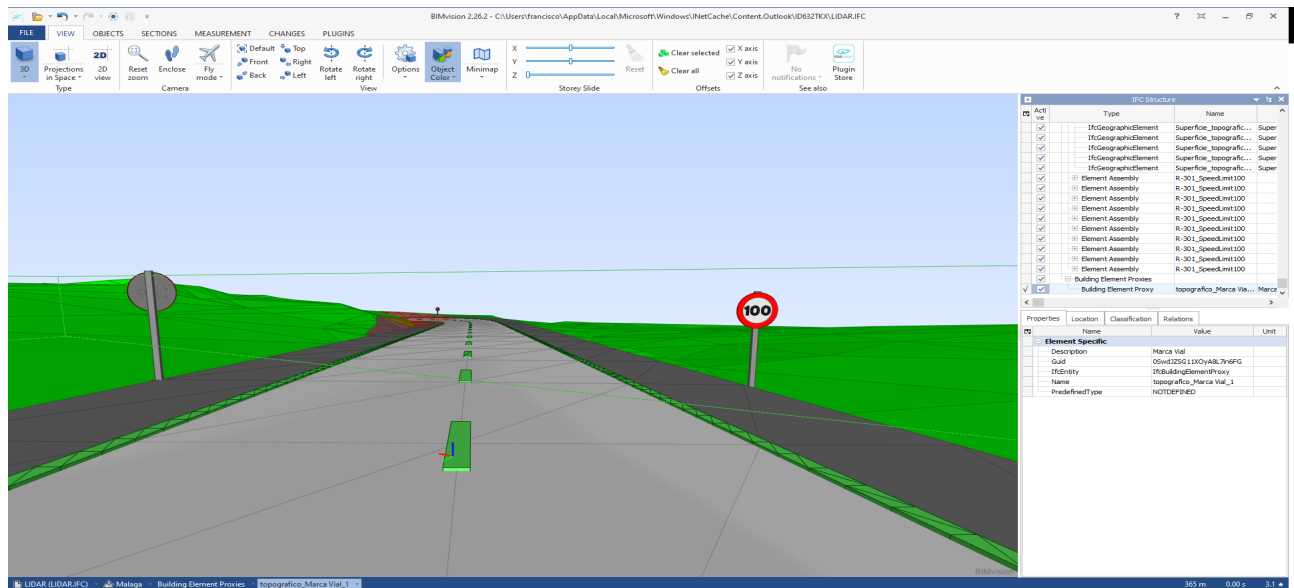
APLITOP has actively collaborated with buildingSMART International for the development and implementation of the IFC Alignment and IFC Road formats, which aim to simplify the exchange of road and infrastructure data through the BIM methodology.

MDT can import and export IFC (Industry Foundation Classes) format files having surfaces, volumes, alignments, road surface layers, networks, etc. Properties and properties sets can be defined as established in the technical specifications and BIM Execution Plans, as well as applying classifications of objects.

MDT 9 allows you to create and edit incidents in OpenBIM workflows, managing their details, the associated image and the point of view in files with the standard BCF format, compatible with applications in this sector.



In addition, you can export to IFC all the information necessary for preparing measurements and quantity take-off (BIM-5D) as well as consumption and emissions data for sustainability indicators (BIM-6D). It is makes possible to use data generated by MDT in applications such as BIM Vision, Solibri Model Checker, Revit, ArchiCAD, Navisworks, Infravworks, BIMserver center, etc.

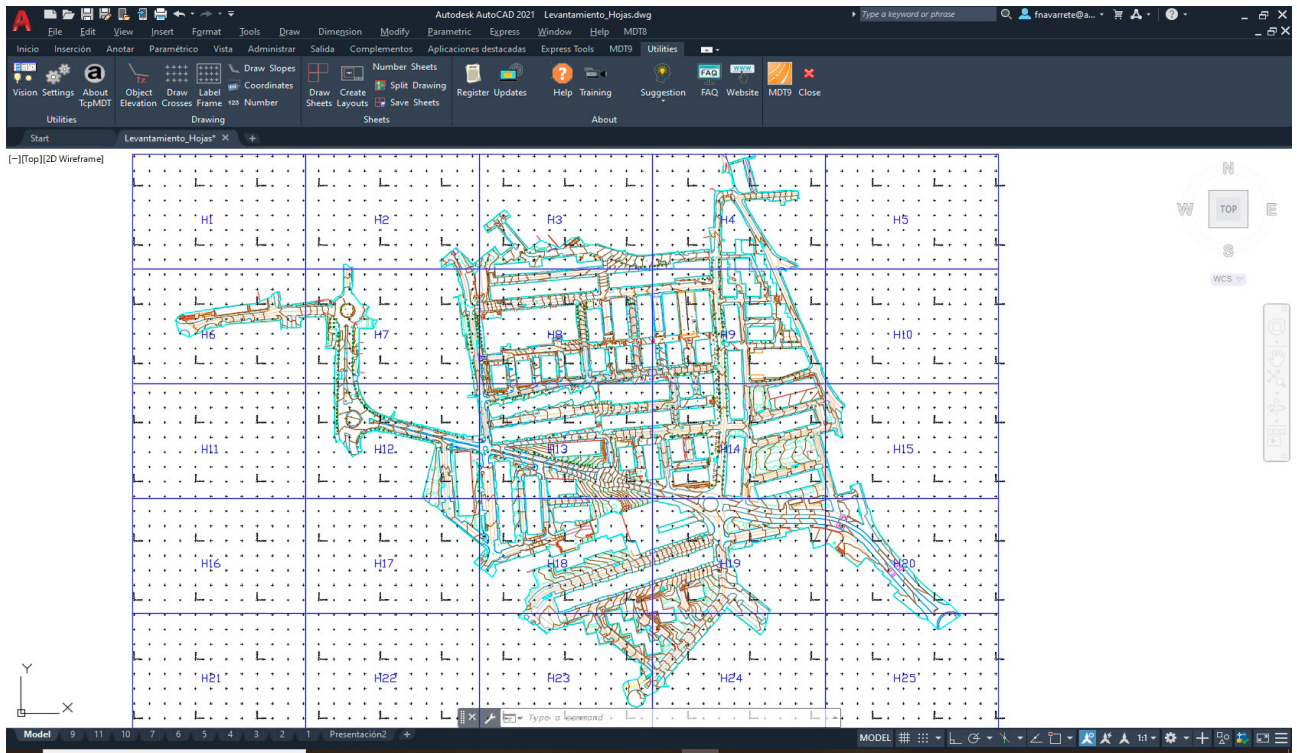


## Utilities

MDT has multiple additional tools for the presentation of drawings such as the numbering of objects, draw coordinates and grids, slope drawing, division onto sheets, layer control, entity elevation, dimension, etc. The feature elevation utility allows you to quickly assign elevations to features drawn in 2D, using a surface or indicating extreme values to interpolate the rest.

The support submenu offers options to open the help system and training videos, report issues or suggestions, check for updates, etc.





## Reports

The results offered by MDT can be customized by the user, including its graphic representation and reports.

In these you can define the header and footer content, font types, sizes and colors, add company logo, configure margins, line spacing... In addition, the reports can be exported directly to Word, Excel, text, PDF and drawing as a table in the CAD itself.

### PRINT

Print Profile

Last print profile Load

☐ Close after print

Copies: 1 Excel Word .txt CAD

**Printer**

VersaLink C7030 PCL 6 Search

All Pages 1 3

**Settings**

Portrait Orientation

**A4 Paper**  
210mm x 297 mm EDIT

**Normal Margin**  
< 30 mm A: 25 mm  
> 30 mm V: 25 mm EDIT

Header ... Footer ...

**Fonts**

**A** Titles ... **A** Headers ... **A** Rows ...

**Lists**

☒ Table borders ☒ Alt row colors ☐ Alt rows color

Save Profile ...

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04/03/2019

### SETTING OUT LIST

Station	X Coord.	Y Coord.	Azimuth	Distance	
BR-STATION 40	279.524	267.211	62.5567	10.684	
BR-ORIENTATION 41	286.413	273.139			
X Coord.	Y Coord.	Z Coord.	Azimuth	Distance	Code
267.636	264.181	46.576	292.0667	21.624	2
250.916	274.491	46.760	321.0162	21.950	3
260.730	284.925	47.130	348.1274	25.022	5
262.003	290.434	47.436	364.9184	31.052	6
265.617	301.429	47.560	375.1445	35.861	8
270.104	311.112	47.854	386.5438	44.989	9
272.757	315.505	48.180	391.1888	48.760	10
278.382	323.311	48.050	396.7556	55.172	11
282.097	331.671	48.700	3.3382	64.548	12
284.979	338.837	50.290	4.8391	71.833	14
285.349	346.624	50.910	4.8512	79.626	15
287.608	346.685	51.140	8.4708	80.088	16 ALB
292.947	347.153	51.120	10.5000	81.051	17 ALB
296.339	347.075	51.170	13.2186	81.610	18 ALB
296.773	343.130	51.120	12.1957	87.336	19 ALB
284.724	373.268	52.160	3.1189	105.184	20 CSM
280.749	372.250	51.240	4.3717	105.295	21 ALB
291.602	372.486	51.130	7.3254	105.694	22 ALB
296.463	380.140	51.120	9.8873	107.076	23 ALB
288.823	343.606	50.600	7.6233	78.327	24 AES
290.617	339.895	50.940	9.5510	73.100	26 ALB
296.076	334.620	51.260	9.8532	68.829	27 AES
285.482	332.620	49.960	5.7461	65.877	28 AES
293.558	336.682	48.200	12.7973	70.280	29 DT
295.114	339.459	48.200	5.5196	64.165	30 DT
283.615	324.281	47.820	4.5667	57.746	31 DT
274.145	313.660	47.650	392.5652	45.163	32 DT
267.333	300.942	47.180	377.8775	35.491	33 DT
245.305	290.313	46.730	367.4544	28.873	34 DT
263.682	281.614	46.310	346.7527	21.343	35 DT
261.105	272.471	46.120	316.7470	19.074	36 DT
268.062	256.843	45.080	271.1814	20.922	37 DT
260.617	246.336	45.440	247.8525	28.574	38 DT
279.269	252.746	45.540	251.1222	14.467	39 APPROX
279.224	267.211	46.020	0.0000	0.000	40 DT, LITE
286.413	273.139	46.280	62.5567	10.684	41 LITE, LITE

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## Requirements <sup>(1)</sup>

CAD	AutoCAD® versions 2007 to 2025 and compatible versions BricsCAD® BIM/Pro/Ultimate versions 16 to 24 GstarCAD® Professional versions 2021 to 2024 ZWCAD® Professional versions 2012+ to 2025
Operating System	Windows 8 / 10 / 11 in x64 architecture <sup>(2)</sup>
Peripherals	Mouse or pointing device
Graphic Card	CD-ROM Reader 1280x720 pixels, compatible with OpenGL 3.3 or better Nvidia or ATI chipset recommended
Drive	10 Gb free space
Memory	Minimum 4 Gb

*(1) Consult the website for further details*

*(2) Operation via a remote desktop and similar services are not guaranteed, nor on virtualization platforms. Write to [sopORTE@aplitop.com](mailto:sopORTE@aplitop.com) to ask about these special cases.*

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