

1. NEW CONCEPTS IN AUTODESK LAND DESKTOP

1.1. The Project

AutoCAD command to demonstrate topic: [see file structure in D:\Land Projects 3\Tutorial1](#)

In AutoDesk Land Desktop, files are organized into projects. These files may include surveying data, information about road alignments, drawings of site surface contours as well as information about the styles (e.g., text, point label, contour labels, dimension, etc.) used to create the drawings.

All of the files used in the project are located within the project folder. This folder has the following additional sub-folders that help to organize the project files:

- All point data is contained in the **cogo** folder, including Microsoft® database (.mdb) files for point groups, description keys, and user-defined external data references.
- The **dwg** folder contains the drawing files associated with the project and the .dfm files (which are ASCII text files that contain default drawing settings).
- The **survey** folder is where raw files downloaded from data collectors are stored, as well as field book, observation database, and traverse adjustment files. This folder is empty until you use Autodesk Survey to populate the folder with these files.
- Additional folders are automatically created when you use Autodesk Land Desktop to work with surfaces (**dtm**), alignments (**align**), parcels (**lots**), and volumes (**er**).
- Additional folders are automatically created when you use Autodesk Civil Design to work with pipes (**pipewks**), hydrology (**hd**), and sheet manager (**cd**).

1.2. Points

AutoCAD command to demonstrate topic: [D:\Land Projects 3\Tutorial2\lesson-4.dwg](#) use **Points->list points**

Another new feature used extensively in the AutoDesk Land Desktop software suite is the **point**. A point is simply a point in space that has some coordinate as well as some additional information associated with it (e.g., a number, possibly a name, etc.). In the AutoDesk Land Desktop software you will create three-dimensional surfaces using primarily point data. In setting up a project, you need to define how you will represent points, including how, exactly, the x-y-z coordinates of the point will be defined, whether or not the point will have a name and if so how long the character string defining the name will be, how long the point number string will be.

Point objects have the following characteristics:

- Points are saved to an external database.
- Points can be grouped.
- Points have multiple data fields associated with them. Points can be searched, grouped and modified on the basis of these fields
- In displaying points
 - Points can appear at their actual elevation or at a fixed elevation.
 - Points have markers and text; both have styles that can be modified. Points can also be labeled using a label style.
 - Markers and text can have either relative or absolute sizes controlling their appearance in the drawing.
 - Point text can be separated from its associated point marker by grip editing, with a leader automatically generated to graphically link the marker and text.

- Point descriptions can be either raw (as defined in the point database) or full (as specified by the description key).
- Point text appears on the same layer as the point marker, but the visibility of the text is controlled by individual settings.
- Point coordinate display in dialog boxes can be specified as Northing/Easting, Easting/Northing, x,y, or y,x.
- The AutoCAD UNDO command works with point objects.
- Point objects align with the World UCS.

2. PROJECT

At the end of the discussion of Projects, [create a new project in D:\Land Projects 3\](#)

2.1. Project Management

Used to create new projects, copy existing projects, re-define the location of data files, re-define the prototype (see below) that is used for the project.

2.1.1. Coordinate Systems

The x-y-z location of a point may be described using a standard coordinate system (always preferred) or a coordinate system that is unique to a project site. Typically, a standard coordinate system is preferred as this ensures that there will be no miscommunication between the various parties on the construction site about the location of structures or site features. There are thousands of “standard” coordinate systems, each is uniquely defined by the datum and the way in which the surface of the earth is projected into two dimensions.

2.1.1.1. What are the NAD27 and NAD83 coordinate datums?

Used almost exclusively, the two horizontal datums in North America are the North American Datum of 1927 (NAD27) and the North American Datum of 1983 (NAD83).

- **NAD27:** The North American Datum of 1927 represents the shape of the earth by using the Clarke spheroid of 1866. The origin of this datum is a point on the Earth referred to as Meades Ranch in Kansas.
- **NAD83:** Using the GRS80 spheroid, the North American Datum of 1983 is based upon both observations from the Earth and satellites. The Earth's center of mass is the origin for this datum.

2.1.1.2. Why do I need to convert my coordinates?

In most services, the FCC requires sites coordinates to be referenced to the NAD83 datum on applications for station authorization. The coordinates in Comsearch's database are also referenced to the NAD83 datum. However, many of the USGS topographical maps as well as legacy databases reference the NAD27 datum. This utility provides an easy method to convert between datums.

2.1.1.3. How are the coordinates converted?

The algorithm used to convert these coordinates is based on Nadcon, which was developed by the National Geodetic Survey. This algorithm converts coordinates between NAD83 and the following datums: NAD27, Old Hawaiian Datum, Puerto Rico Datum, St. George Island (Alaska) Datum, St. Paul Island (Alaska) Datum and St. Lawrence Island (Alaska) Datum. For organizational purposes, the latter six datums are referred to as NAD27 within the program. Within Canada, the algorithm used to convert coordinates is based upon the Canadian National Transformation Version 2 (NTV2), a datum transformation package distributed by the Geodetic Survey Division of Geomatics Canada.

2.2. Prototype Management

Prototypes are like templates, they include information about settings used in the files included in the project. These settings include a wide variety of things such as layer naming schemes for typical components (contours, points, etc.), the way points are labeled, created, etc. The Prototype management menu allows you to choose from a list of project prototypes.

2.3. Prototype Settings

The prototype setting menu allows you to view prototype settings. Double clicking on a prototype name gets you to the edit drawing settings menu for that particular prototype and allows you to edit any of the settings.

2.4. Data Files

This allows you to change specific styles, such as a line label style, that may be imported into a prototype. These styles may be defined in other projects, saved and imported for use in the current project.

2.5. Edit Drawing Settings

This menu allows you to change any of the many, many drawing settings included in the prototype. For the most part, every one of these drawing settings may be accessed elsewhere from another menu. This is just a convenient way to edit one or more settings.

2.6. Drawing Setup

These are all the settings that are defined when you create a new drawing. When we were using AutoCAD, this was the units of the drawing, how angles are measured, the drawing limits, etc. For a Land Desktop project, this includes units, the scale of the drawing, the zone used to define point coordinates, the text style, a border for the drawing, etc. As with AutoCAD, these are defined initial when you start a drawing and this menu is simply to modify the parameters once the drawing has been created.

Drawing setup parameters typically are defined by choosing a prototype for the project. This is analogous to using a template to create an AutoCAD drawing.

2.7. Transformation Settings

This is used to transfer points from one coordinate zone to another.

2.8. Import / Export LandXML

LandXML is a standardize format for CAD data pertaining to civil drawings that can be used by most software used to create civil drawings. For example, points, contour lines, surface meshes, etc. used and created in any of the drawings we've looked at could be exported to the LandXML format so that they could be imported into a Microstation (or other) drawing.

3. POINTS

Land Desktop tutorial: [D:\Land Projects 3\Tutorial2\lesson-4.dwg](#)

3.1. Point Settings

The default values for these settings are defined in the project prototype and may be re-defined for a particular project. Of particular interest are the following settings:

3.1.1. Create

This defines the way in which new points are created and added to the point database. You may choose to have these points inserted into the drawing as they are created. Typically you will want to choose sequential numbering of new points and you may need to identify the first number of a new point to correspond to a

gap in point numbering or the last number in the point file (note that you can't override an existing point number). You may choose automatic elevation if you are adding a number of points with the same elevation. Manual elevation forces you to define the elevation for every new point.

3.2. Point Management

3.2.1. Point Groups

Allows you to define point groups. Point groups may be used to correct point coordinates, import particular groups of points in to the project, work only with points that define a particular feature such as an alignment or a streambed or ...

3.2.2. Description Key Manager

Points can have particular descriptions which are used to define particular symbols that appear when the point is included in the document.

Example:

1. From the Project Name list, select TUTORIAL2, from the Select Project Drawing list, select Lesson-7.dwg
2. On the Points -> Point Settings menu, choose using the Search Path for Symbol Block Drawing Files Land Desktop 3\Data\Symbol Manager\Cogo_metric
3. In the Points -> Point Labeling
 - verify that the Use the Current Point Label Style When Inserting Points check box is selected.
 - Click the Description Keys tab. In the Matching Options section, verify that the Match on Description Parameters (\$1, \$2, etc.) check box is selected, and then click OK.
4. On the Points -> Point Management Description Key Manager to display the Description Key Manager dialog box.
 - Create DescKey File icon (the left-most icon) to display the Create Description Key File dialog box.
 - Enter CREW-B for the File name, and then click OK to return to the Description Key Manager dialog box.
 - Click on CREW-B to display the Create Description Key dialog box.
 - Enter Tree for the DescKey Code,
 - Enter \$2mm \$1 Tree for the Description Format
 - Enter PNT_TREE for the Point Layer.
 - Select tree in the Symbol Insertion section
 - Enter TREE for the Symbol Layer.
 - Click the Scale/Rotate Symbol tab,
 - select the Description Parameter check box, select 2 from the \$ list,
 - clear the Current Drawing Scale: 1:1000 check box.
5. On the Labels menu, click Edit Label Styles to display the Edit Label Styles dialog box.
 - Click the Point Label Styles tab, and
 - from the Name list, select active desckeys only (by selecting this style, the Text section of the dialog box is cleared). And Verify that the Text section of the dialog box is blank.
 - Enter DescKey Only - Crew-B for the Name.
 - In the Description Keys section, verify that the DescKey Matching On check box is selected, and then
 - from the DescKey file list, select CREW-B.

- Verify that the Substitute DescKey Description and Insert DescKey Symbol check boxes are selected.
 - Click Save, and then click OK.
6. On the Labels menu, click Settings to display the Label Settings dialog box.
 7. Click the Point Labels tab. From the Current Label Style list, select DescKey Only - Crew-B, and then click OK.
 8. Create a new point and give it the description of Tree Maple 120

3.3. Create Points

Self explanatory. There are lots of ways to create points. They can be created individually, over a grid, along a line or curve, etc. One thing you want to watch is the elevation settings.

3.4. Import / Export Points

Use [D:\Land Projects 3\Tutorial2\Lesson-8.dwg](#)

This is how you import points into the drawing from a data source. Need to use manager first to define new style, then set import options to correct style, then import points. [Import topo_pnt.txt](#)

3.5. List Points / Lock Points / Edit Points / Check Points

These simply manage points within the project. These don't modify points in the database. Check points compares points in the drawings against points in the database and updates one or the other as is desired.

3.6. Insert / Remove Points

Shows or removes points from the drawing. Doesn't remove points from the project or database.

3.7. Stakeout

Create points that will eventually be given to a surveyor to stake out a new alignment, foundation, etc.

4. LINES / CURVES

These are tools for creating lines and curves that are uniquely suited to civil projects. We'll use these more in a couple of weeks

5. ALIGNMENT

An alignment is a series of lines, curves, spirals, etc. that are stored in an alignment database for use in multiple drawings within a project. The Alignment menu helps in the creation of alignments.

6. PARCELS

A parcel is an area of land. The Parcel menu helps in the creation of parcels.

7. LABELS

Styles for labeling lines, points, contour lines, etc. With the exception of description keys that are critical, labeling is really a matter of appearance. We may / may not cover in the labs.

8. TERRAIN

This menu includes the commands that allow you to create a surface, create contour lines and create sections.

8.1. Terrain Model Explorer

Use [D:\Land Projects 3\Tutorial1\Lesson-12.dwg](#)

8.1.1. Create new surface

Surfaces are created using point groups, point files, contours, breaklines (these are breaks in the contour lines such as a wall that has a jump in elevation or a streambed that represents a low point), boundaries.

Example: create a new area, area1 points, the contour lines, defining a breakline at the stream, the outline and proximity breaklines (proximity to 2d polylines) for the roadway. Use the layer manager to id the polylines.

8.2. Edit Surfaces

Use [D:\Land Projects 3\Tutorial1\Lesson-13.dwg](#)

You need to import the surface as 3D lines to edit. Then you can add points, flip faces, etc.

8.3. Surface Border / Display / Utilities

Surface display is most critical for the time being. The quick view gives a temporary view of the current surface. This view cannot be edited. The other options actually save the triangulation data. To edit, you need to import the surface as 3D lines.

8.4. Contour Style Manager / Create Contours / Contour Labels / Contour Utilities

Use [D:\Land Projects 3\Tutorial1\Lesson-14.dwg](#)

Contour Style Manager controls the smoothness of the contours and labeling, create contours is self explanatory.

8.5. Sections

Use [D:\Land Projects 3\Tutorial1\Lesson-15.dwg](#)

Creates sections for multiple and single surfaces.

8.6. Volumes

These commands are used to compute site volumes. We'll use this in the next couple of weeks.

9. INQUIRY

Like DIST and AREA. These are a series of commands that provide information about points, contours, etc.

10. UTILITIES

Misc. utilities