

Coordinate Systems in PLS-CADD

Introduction

Version 8 of PLS-CADD introduced the capability to designate the coordinate system used by your project in order to make cartographic calculations. You use the *Terrain/Coordinate System* command to pick from the thousands of coordinate systems now built into PLS-CADD. Once this has been done you may use other commands that rely on knowing the project coordinate system such as the *File/Export KMZ (Google Earth)*, *Lines/Reports/Structure Longitude and Latitude Report* or the enhanced *Drafting/Attachments/TerraServer Image Download* which no longer requires PI coordinate input to download imagery for your project. Version 10.3 of PLS-CADD further extends this capability with Windows 7 GPS integration, attachment specific coordinate systems and reprojection of survey data on import.

Getting Started With Coordinate Systems

You select your project's coordinate system with the *Terrain/Coordinate System* command. This command displays the dialog shown at the right. You may wish to complete this dialog with the assistance of your Survey or GIS group.

First select from one of the eight categories:

1. *Unknown or Unavailable*: the default for all old projects. Cartographic calculations will be disabled if coordinate system is unknown.
2. *State Plane NAD27*: State Plane using the North American Datum of 1927.
3. *State Plane NAD83*: State Plane using the North American Datum of 1983.
4. *Custom*: Coordinate system developed by a particular utility or those that were added by PLS.

Coordinate System Selection

Please enter the coordinate system for your project if you know what it is. Setting the coordinate system here will not reproject your project, but is necessary before any cartographic calculations can be made.

If your system is not listed contact PLS technical support with the complete cartographic details to have it added.

Coordinate system category:
State Plane NAD27

Now pick a coordinate system or a zone from the category selected above.

Show only systems containing (this filters the coordinate systems listed):

4803: Wisconsin South

Finally, pick a grid shift file (this is optional and only required for HARN/HPGN data, NAD27/83 is built in).

Click to select a grid shift file

Foot Definition

Coordinates are in US Survey foot instead of International foot.

Note: all calculations in PLS-CADD are performed internally in Meters. To convert between Meters and Feet, PLS-CADD uses the International Foot.

If instead, your input (or output as appropriate) is in US Survey feet then check this box and PLS-CADD will apply the 0.999998 International foot to Survey foot factor as necessary for cartographic calculations.

OK Cancel

5. UTM: Universal Transverse Mercator projection using various ellipsoids (WGS84, International and Clark 1866).
6. *EPSG*: European Petroleum Survey Group which defines many coordinate systems around the world.
7. *ESRI*: Various coordinate systems used in conjunction with the ESRI GIS software.
8. World: Random coordinate systems the source of which is unknown.

Note: Initial experience with the ESRI and World categories has not been positive. If at all possible we recommend you select from EPSG instead.

Now pick a coordinate system or zone from within the category you picked in the first step. Note that you can use the “Show only systems...” input to filter this list down to a more manageable size. If you do not find your coordinate system then see “Adding Your Coordinate System” below. Users in North America, Australia and New Zealand may, after consulting with their Survey/GIS group, wish to select a datum grid shift file by clicking on the Grid Shift File selection button. Grid shift files provide for more accurate coordinate system conversions where available. Finally, users in the United States will need to check the “Coordinates are in US Survey Foot” option if their project was built with data in US Survey Feet. By default PLS-CADD uses the international definition of a foot.

Validating Your Coordinate System Selection

Before making use of any of the cartographic functionality you enabled in PLS-CADD by selecting your project’s coordinate system you should first validate that system. To do this we recommend generating the *Lines/Reports/Structure Longitude and Latitude Report*. You can then do a quick sanity check by using your GIS, Google Earth or other mapping software to jump to the location of one of the structures in your line. If the location appears to match then you are ready for the second phase of validation. In the second phase you should print out the *Structure Longitude and Latitude Report* as well as the *Lines/Reports/Construction Staking Table* and ask your Survey or GIS group to verify that the Easting and Northing from the latter report match the Longitude and Latitude from the former.

The coordinate system functionality in PLS-CADD is based on the PROJ.4 system originally developed by Gerald Evenden of the USGS. As such we have considerable confidence in the State Plane coordinate system conversions. There is less experience with the various EPSG, ESRI and World systems so we would recommend additional verification prior to using one of those systems. For more information on PROJ.4 please see <http://trac.osgeo.org/proj/>

Adding Your Coordinate System

Even though PLS-CADD comes with thousands of coordinate systems defined, it is possible that your project's coordinate system is not one of them. During development we discovered that the most common cause of a missing coordinate system is when a utility defines a custom coordinate system. An example is GA95 which is the Georgia Power 1995 system used to avoid transmission line designs that straddle state plane zones. GA95 as well as all other coordinate systems that are not defined by and included with the PROJ.4 system are stored in the *Custom* category. Should you have a custom coordinate system or simply a missing system then contact Power Line System's technical support at support@powline.com with the following information to have your system added to the *Custom* category:

Preferred definition: The PROJ.4 "+init" string. This is the ideal definition as it can be copied verbatim into PLS-CADD and does not require any interpretation.

Alternately: An ESRI ".prj" file for your coordinate system or the complete cartographic details of your system including datum, ellipse, projection, central meridian, etc.

In all cases you must also include the coordinates of at least two XYZ points in the desired coordinate system, UTM NAD83 or State Plane and as Longitude and Latitude. A PLS-CADD backup file (.bak file) of a project in the system would also be helpful.

List of Functions

Once the project coordinate system is defined it is used in the following functions in PLS-CADD:

- 1) *File/Export KMZ (Google Earth)*: Will create a KMZ representation of your model which can be loaded into Google Earth for visualization. For more information on Google Earth see <http://earth.google.com>
- 2) *Lines/Reports/Structure Longitude and Latitude*: This report can be helpful when you want to find a structure either with a GPS, with other software that takes longitude and latitude as input or when filling out government forms such as FAA 7460-1. It is also automatically included in *File/Export XML*.
- 3) *Terrain/Alignment/PI Report*: Provides information on what coordinate system was selected for the project.
- 4) *File/Export XML*: Includes information on the selected coordinate system as the following attributes of the *creator* tag: *coordinatesystem*, *zone*, *zonedescription*,

gridshift and surveyfoot.

- 5) Used as the default in the *F1/Survey Terrain Features/Coordinate System Calculator*. This calculator can be used to transform XYZ values between any two coordinate systems defined in PLS-CADD.
- 6) *Drafting/Attachments/TerraServer Image Download*: Uses the selected coordinate system to automatically calculate the UTM NAD83 coordinates required to import imagery from TerraServer.

Starting with version 10.3...

- 7) *Terrain/Enable GPS Tracking*: Leverages the Windows 7 Sensors and Location platform to integrate a GPS with PLS-CADD for real time tracking (panning of all views to the current GPS position) and logging of position (leaves a "breadcrumb" trail of XYZ points).
- 8) *Drafting/Attachments/Attachment Manager*: Allows you to directly attach raster (BMP, TIFF, ECW) or vector (DXF, SHP) files that are georeferenced in a different coordinate system than that used by your project by automatically reprojecting the attachment into the project coordinate system.
- 9) *Terrain/Edit/Merge Points From External File/Merge XYZ Points From User Defined XYZ File* and *Terrain/Edit/Merge Points From External File/Merge Points from XYZ File*: Accepts a coordinate system input for the points being merged which if different from the project coordinate system triggers reprojection of those points into the project coordinate system.