AUTOCAD® MAP 3D 2009

WHITE PAPER

Industry Toolkits

Introduction

In today's world, passing of information between organizations is an integral part of many processes. With this comes complexity in a company adhering to corporate standards or the need to pass along more data than just a picture can convey. The toolkits discussed in this paper offer assistance in supporting these requirements by incorporating standard AutoCAD® Map 3D software tools, symbol libraries, and data models. While these toolkits are focused on the specific industries of Electric Distribution and Water Distribution and Wastewater Collection, these concepts can be applied to any asset data to which users want to enforce mapping standards.

What is an Industry ToolKit:

The AutoCAD Map 3D Industry Toolkits are a downloadable set of tools to help AutoCAD Map 3D users working within the electric, water and wastewater utility industries and gain efficiencies during data creation and consolidation phases of a project.

The toolkits include:

- Data model - A set of industry objects with corresponding real-world attributes. For example, you can associate and store the voltage carried by an overhead conductor with its graphical representation (AutoCAD line work).

- A set of pre-configured industry symbols

- AutoCAD Map 3D Drawing and Object Classification templates (DWT and XML files)

- A set of annotation templates that maybe used to label objects using information input in the data model mentioned above.

- User documentation including user's guide, workflows and data model schema and Instructional videos.

These components are built on standard AutoCAD Map 3D features and are fully customizable.

Why an Industry Kit

Autodesk created the Industry toolkits to provide users with an additional tool to:
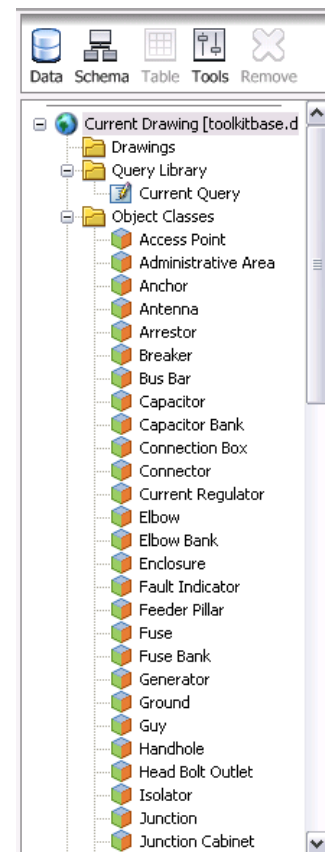
Help improve **productivity** by removing the tasks of setting layers, picking blocks, and attaching data models during their mapping processes. Learning curves are reduced and accuracy increased as a multiple point decision stream is reduced to a single pick.

Assist in enforcing **corporate standards** by producing and converting design and mapping files to established parameters. This creates files consistent with each other and in adherence with established standards.

Provide **data models** for objects so information can be compiled and utilized in other areas of the business. Information such as (Id, Manufacturer, install date) input efficiently in the early stages of a project will provide for better decisions in the field or by other groups as they operate, manage and maintain your system.

We understand that many organizations will have some form of standards that are well established, therefore, the data models and symbol libraries are intended to be a starting point. Because it is comprised of standard AutoCAD Map 3D objects, properties, and functionality the toolkits can be fully and easily customized. One item of note is that the toolkits are based on symbology and data models of Autodesk$^{®}$ Topobase™ allowing for easier migration to that system.

What is the benefit:

In a generic sense the Industry toolkits allow you to create or change graphics to your corporate standards they also attach an appropriate data model to each feature (pipe, pole, valve, etc.). With this additional information you have the ability to theme and annotate your system according to actual feature information.

More specifically, typical benefits you might see:

For Utilities:

- Improve drafting productivity of facilities for new and experienced staff (knowledge transfer).

- Define and apply data standardization (design standards) and intelligence (i.e., geographic location and facility information such as manufacturer, part number and material) into the drafting process.

- Easily integrate data coming from external contractors and other departments to match departmental/organization standards.

- Easily prepare engineering/CAD data for Geographic Information Systems (GIS) or mapping systems.

For Engineering firms:

- Reduce drafting expenditures on projects by more efficiently and accurately meeting client requirements for standards, data capture, and deliverables.

- Increase domain expertise credibility by providing clients industry structured design data.

- Gain competitive advantage by enabling clients' to easily integrate engineering/CAD data into their GIS or mapping systems.

- Add object intelligence (location and attributes) during the drafting process allowing design data to be more effectively understood and used throughout the organization.

How do I get the Industry Toolkits:

One of several advantages to being an Autodesk® Subscription Member is access to the AutoCAD Map 3D Industry Toolkits is provided as free downloads to AutoCAD Map 3D customers. The toolkits are available from within Autodesk Subscription Center at

www.autodesk.com/subcriptioncenter

For international users you will find localized versions available for:

- UK English
- French
- German
- Italian
- Spanish

These localized versions have also had the symbology adjusted to reflect the standards of their respective regions.

The AutoCAD Map 3D Industry Toolkits are for use only with licensed AutoCAD Map 3D software, and are subject to the terms and conditions of the Autodesk Software License Agreement that accompanies that licensed software.

What are they:

The toolkits include several standard AutoCAD Map 3D components "bundled" in an object class definition. This definition is supplemented with an annotation function that lets your data do the labeling work.

Below is a general discussion of each of the main components of the toolkit. This section is not intended to be a tutorial but simply informational as to what the pieces are and how they interact. As mentioned earlier each of the individual components are standard AutoCAD Map 3D functions allowing the user to modify the toolkit as needed.

Classification definitions (XML)

Object classification is used to organize objects in your drawing based on the real-world features that they represent, for example, pipes or manholes. When you create an object using object classification, the object automatically has properties and values assigned to it based on its object classification definition. In addition, you can find or select all objects in an object class.

These definitions set the parameters for any object created or later classified. These parameters include standard AutoCAD® software properties (items such as layer, linetype, color) and data (see discussion on data model that follows) along with constraining which AutoCAD entity is used to create the object.

Once the definition is created you can create classified objects or classify existing objects which "forces" the property standards of layer and such plus the data fields onto the object.

As you would expect this definition helps make all the objects representing a particular feature (i.e. valve) the same. This varies only in its location and in the user's ability to input "attribute" information about the object as appropriate. The definition also has the ability to apply defaults and ranges to these data fields which further adds to the overall consistency and quality of your system map.

Data Model

The data model is stored in AutoCAD Map 3D using a technology called object data. Object data is feature attribute data that is attached to individual objects and stored in tables in the drawing. Object data tables can store both text and numerical information related to an object.

The data model that is provided with the Industry toolkits was created from the complex data model contained in the Autodesk Topobase product. Using this model as a foundation provides a detailed data structure already tested by industry. Having similar data models also facilitates a migration to the more robust asset management environment Autodesk Topobase provides. The data model, as are all other components, is fully customizable to meet your current and future data capture requirements.

Symbols

The symbol libraries that are provided with the Industry toolkits, are at their most basic component, AutoCAD blocks. These blocks as with the data model mentioned above, mimic our Autodesk Topobase product. This provides a consistent environment across those Autodesk products.

The industry kits have been localized in both language and symbology for US English, UK English, French, German, Italian, and Spanish.

The blocks are contained within the drawing template file which makes them easy to manage and modify. The data model (object data) is attached to the symbols in the classification definition making modification and customization of these symbols as simple as creating another AutoCAD block.

Annotation templates

The annotation template is the one component of the toolkits that is not part of the classification process. It is very complementary to object classes as it can utilize any of the data input into the data model to dynamically label features in your drawing. In the Industry tool kits each of the defined object classes have a corresponding annotation template. A user is able to post labels on all of the objects in an object class or just a few in the area you are focused. You are able to adjust location and size of the labels creating the look you desire. In addition to the data model values that can be displayed by the annotation template you also have the ability to display properties, such as a line weight; or geometric values, such as the line direction. It is

also possible to add graphics to your annotation, such as arrows, static text, or other geometry, using standard AutoCAD drawing commands.

Using the toolkits

You will see below that the process of using the toolkits is simple and direct. It actually reduces several steps from the workflow of adding system information using standard AutoCAD tools.

Creating Classified Drawing Objects

Easier than 1,2,3.
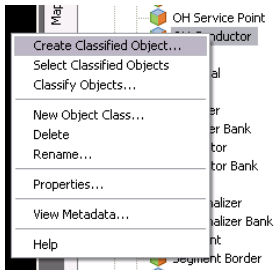
1. In Map Explorer, right-click an object class and choose *Create classified object*….

2. Pick a location in the drawing to insert the object, and then follow the prompts on the command line. These prompts are identical to the familiar *INSERT* or *PLINE* command from the command line. When you create the object, object data, external data, and topology data, if applicable, are attached.

You can return back to the map explorer and select your object class, right click and select classified objects to see your new feature is selected along with the others that were previously part of the object class.


Adding Attribute Data

1. Right-click the object and select Properties.

2. On the Properties palette, click the Object Class tab.

3. Enter the values for each data field.
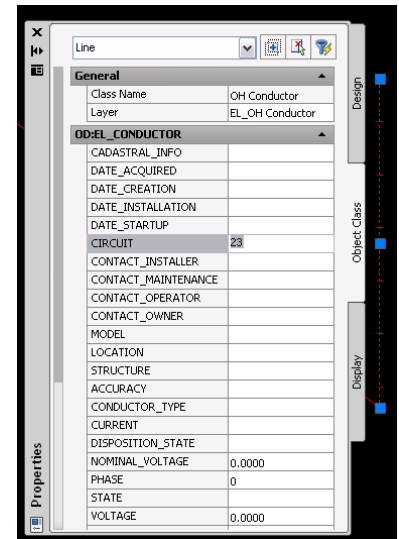
Adding Annotation

1. Enter the MAPANNINSERT command.

2. Select an annotation template.

3. Make sure that the template name check box is selected. To insert annotations based on multiple templates, select the check box for each template.

4. Optionally, click Advanced to insert annotations with override options and properties. These would include items like size and color. The override information is applied only to the highlighted template. If you subsequently use the Update command with this annotation template, you must use the Retain option or these overrides will be lost.

5. Click Insert.

6. Select the objects to annotate. Press Enter.

The resulting labels maybe moved for clarity if necessary. If one of the values being used to create the labels is changed in the Properties Palette and the
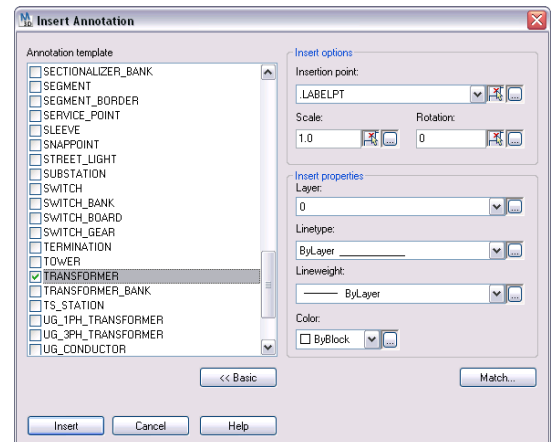
MAPANNREFRESH command is executed you will see the values update on your map.

Some of your potential Benefits

Below are three possible workflow illustrations with a brief statement on what you might expect for a benefit after applying one of the Industry Toolkits. Even though the scenarios below represent one specific toolkit please keep in mind that similar tasks are possible with all of them.

Electric Toolkit – Incorporate work from others

Often it is necessary to use older archived drawings or design files from contractors that, in their original form, do not meet the current company data standards. To bring these files into compliance you might need to alter symbology or add the intelligence required for labeling or loading into the corporate geospatial data store. The toolkit is effective at resolving all of these scenarios.

Benefit: Existing drawings either internal or from others can be classified to be brought up to current corporate standards. This includes the addition of attribute data that can be used for labels or to populate data tables during an upload to a geospatial data store

Water Toolkit – Making smarter more compliant system maps more efficiently

Traditional CAD drafting is often tedious for the user trying to maintain corporate standards. These users must remember and apply proper symbology during the drafting process which adds several steps, each an opportunity for error. Reducing steps is especially beneficial to new users on a steep learning curve. Add the additional benefit of adding "intelligence" to the objects drafted and you begin to create maps that can help you manage your system rather than just display features.

Benefit: Using the toolkit can improve drafting accuracy and efficiency, and adding data to your features adds flexibility for presenting information.

Wastewater Toolkit – Label using attributes and prepare for import into another spatial data store

 Your system map consists of simple lines and blocks. Labeling these features with standard text is cumbersome and prone to inaccuracies as system information changes over time. The toolkit provides a dynamic labeling environment that will update feature annotation and provide an additional benefit of efficient migration of your system drawing to a more robust spatial data store environment (with data fields populated during the import).

Benefit: Existing drawings can become more intelligent as attribute data can be added and used for labels or to populate data tables during an upload to a geospatial data store.

Let's get technical

The remainder of this document will discuss techniques for using and modifying the Industry Toolkits. For more detailed help please refer to the AutoCAD Map 3D Help sections for Annotation Templates, Blocks, Classification and Object Data.

Customizing the kit

As was mentioned earlier, because the components of these Industry Toolkits are standard AutoCAD Map 3D components each one is customizable. The following processes step you through modifying the provided components and constructing entirely new ones

This is a good place to note that to create or make changes to the definition of an object class you need have Map 3D superuser privileges. You can log in as a superuser by initiating the MAPLOGIN command. The default superuser login name is SuperUser (case insensitive) and the password is SUPERUSER (case sensitive). If security is an issue, make sure you change the default superuser login and password. Please see the Map 3D help for additional ways to take advantage of Map 3D User Privileges.
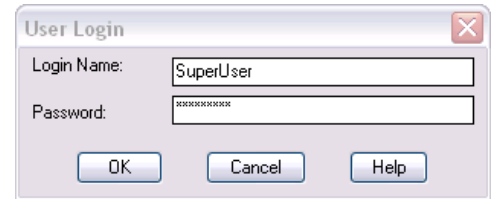
Edit existing classes

Modifying color, linetype and line thickness

You modify the display of linear object classes by changing the properties of the AutoCAD layer they are drawn on.

1. Type layer to access the Layer Properties Manager.

2. In the Layer Properties Manager, for the specific layer, change the color, linetype, etc.

3. Click OK.

Modifying a Point Symbol for an Object Class

Each object class that represents a point uses an AutoCAD block for its symbol. The AutoCAD block used by each object class is specified on the Class Settings tab of the Define Object Class dialog box. To change the AutoCAD block used by an object class, select a different block for its create method.

1. Login with Superuser privileges.

2. In the Task Pane, on the Map Explorer tab, right-click on an object class and click Properties.

3. In the Define Object Class dialog box, click the Class Settings tab.

4. In the Create Method frame, under Geometric Settings, choose a block to represent the object class.

If your symbol does not currently exist, you will need to create an AutoCAD block representation of it to
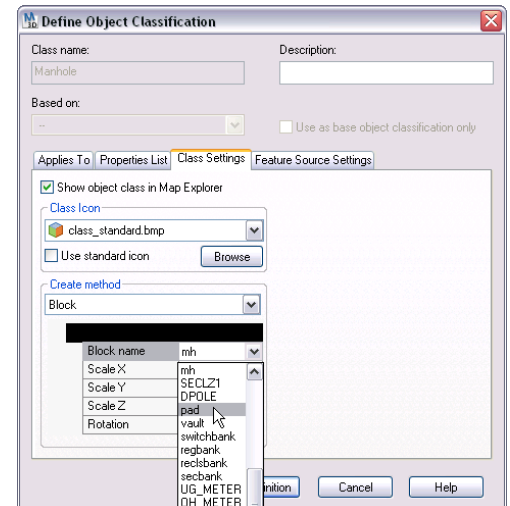
change the Object class definition. In addition you will want to add the block to the template file used in conjunction with the Industry tool kit you are modifying.

Modifying a Polygon Hatch Pattern

The Industry Toolkits use MPolygons for feature classes represented by polygon objects. MPolygons have an associated hatch pattern used in conjunction with a scale to determine their display. You can change the hatch pattern, scale, color, and so on. The display of an MPolygon hatch pattern can also be controlled by the FILLMODE system variable. The Electric Industry Toolkit drawing template has the FILLMODE variable set to 0 (no hatch pattern displayed). To view MPolygon hatch patterns the FILLMODE variable must be set to 1.

1. Login with Superuser privileges.

2. In the Task Pane, on the Map Explorer tab, right-click on a polygon object class and click Properties.

3. In the Define Object Class dialog box, click the Class Settings tab.

4. In the Create Method frame, under Geometric Settings, change the Pattern Name to the desired hatch pattern.

Modifying the Data Model

Adding and Deleting Attribute Fields

You can add or delete attribute fields in your object class definitions. By deleting unused attribute fields, you can reduce your file size.

If you delete the object data fields, but leave the fields checked in the object classification, storage for those fields will be added back to the table when you view your data. To keep your data as clean as possible, you should delete the attribute fields and uncheck them in your object classification definition. For Block Attributes, storage for deleted fields will not be added back when you view the data.

1. At the Command prompt, enter ADEDEFDATA.

2. In the Define Object Data dialog box, under Table, select the object data table to modify.

3. Click Modify.

4. In the Define New Object Data Table dialog box, delete, add, or update the fields:

- To add a field, under Field Definition, enter a name, type, description, and default value for the field. Click Add.

- To modify a field, under Object Data Fields, select the field to modify. Under Field Definition, change any information. Click Update.
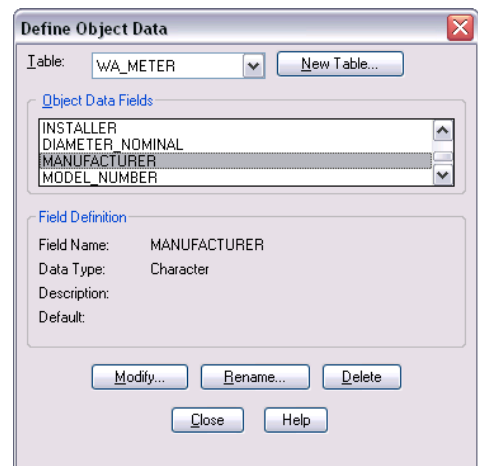
- AutoCAD Map 3D updates the object data field and all instances of it attached to objects. If you change the data type of a field from Real to Integer, AutoCAD Map 3D drops everything to the right of the decimal point, leaving only the value to the left of the decimal point.

- To delete a field, under Object Data Fields, select the field to delete. Click Delete. This will only remove fields that contain no data.

Another way to adjust the Data Model that is assigned to each object type is via the Classification definition properties. In this dialog you can check only the fields you would like attached to your data and set parameters for their population (i.e. value ranges).

1. Login with Superuser privileges.

2. In the Task Pane, on the Map Explorer tab, right-click on an object class and click Properties.

3. Scroll to the data field that you want to set parameters.

4. In the right hand side pane add default values and ranges as desired.
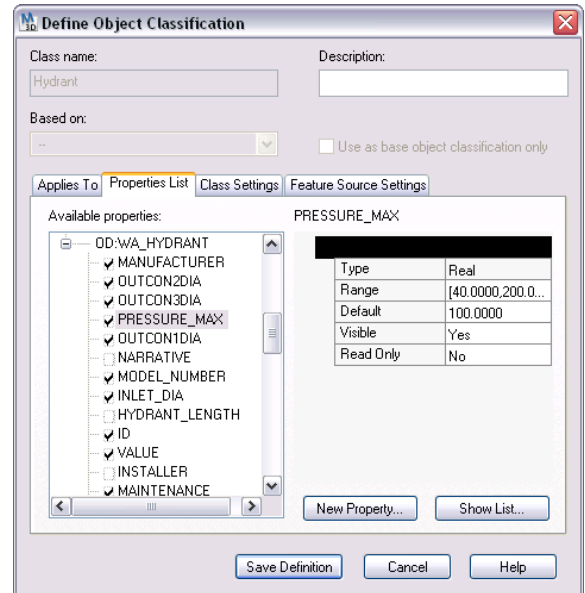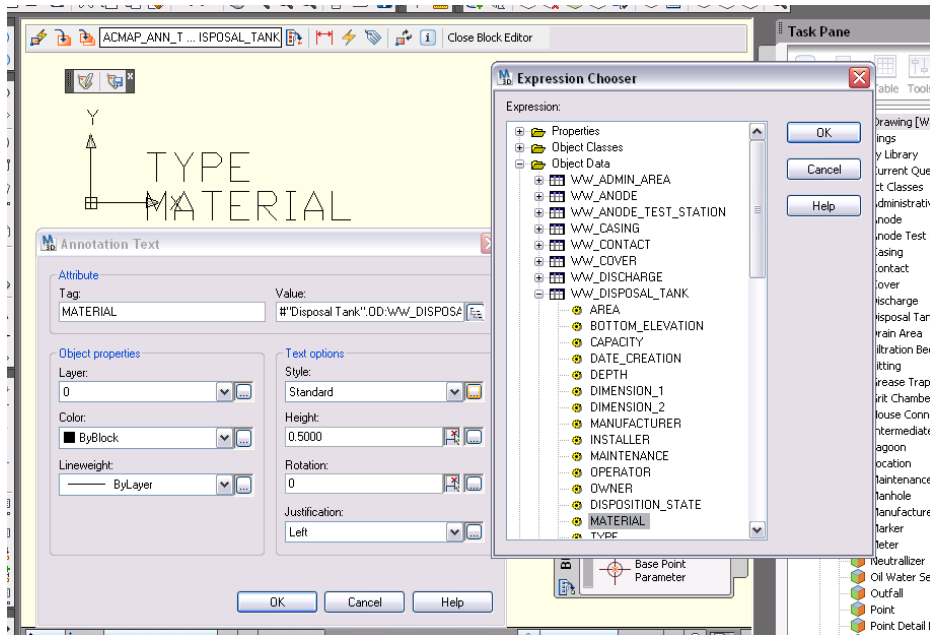
Changing the Annotation Template

Selecting Attributes to be Displayed Using the Annotation Template

The items in the data model that are currently assigned to be used as labels are highlighted in yellow within the toolkit's InfrastructureLibrary2009.doc. This document is installed with its corresponding Industry Toolkit. You can select which attributes to display in your map by modifying the annotation template.

1. Click Setup menu > Define Annotation Templates.

2. In the Template Name list, click the template to change.

3. Click Edit Template Contents. A new drawing window called Map Annotation Template Editor opens.

4. Click the Edit Annotation Text button, or enter MAPANNTEXT at the command line.

5. In the Annotation Text dialog box, under Attribute, enter a Tag name and Value for the annotation text. For the value, enter static text or an expression that displays different text depending on the object being annotated. Click the tree button to select from a list of available properties and attributes. Note: To add multiple pieces of text to a template, each one must have a tag name that is unique within that template.

Modifying the Annotation Template

You can also modify the annotation template to change the appearance of the text. You can change text style, rotation, insertion point, and height.

1. Click Setup menu > Define Annotation Templates.

2. In the Template Name list, click the template to change.

3. Click Edit Template Contents. A new drawing window called Map Annotation Template Editor opens.

4. Click the Edit Annotation Text button, or enter MAPANNTEXT at the command line.

5. In the Annotation Text dialog box, edit the text options as desired.

New Object Classes

Creating a New Object Class

An object class definition is based on an object in the drawing, such as a line, block, or polygon. Before the drawing object is used to define an object class, it should have all properties such as, layer, linetype, object data tables, etc applied as you want the object class to be defined.

1. Login with Superuser privileges.

2. Verify that the objects from which you want to create an Object Class exist in the drawing with all the appropriate properties.

3. In the Task Pane, on the Map Explorer tab, right-click over the Object Classes branch, select Define Object Class.

4. Select the drawing object that represents the object class to be defined.
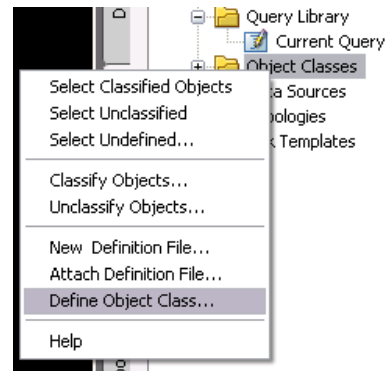
5. In the Define Object Classification dialog, enter a class name and description.

6. Select the "Applies To" tab.

7. Select the object type that this object class represents.

8. Select the "Properties List" tab.

9. Select the default properties to be applied to the Object Class from the Available Properties window.

10. Use the Class Icon drop down list from the Class Settings tab, to add a specific icon to be displayed in the task pane.

11. Click *Save Definition*.

Creating an Annotation Template for a New Object Class

The Industry Toolkits use Annotation Template to build labels for each object class based on object class attributes. When new object classes are added, new Annotation Templates will need to be created to label them.

1. Click Setup menu > Define Annotation Template.

2. Click New.

3. In the New Annotation Template Name dialog box, type a name for the template, and click OK. A new drawing window opens, called Map Annotation Template Editor. Define the template in this window and save it before returning to the Define Annotation Template dialog box.
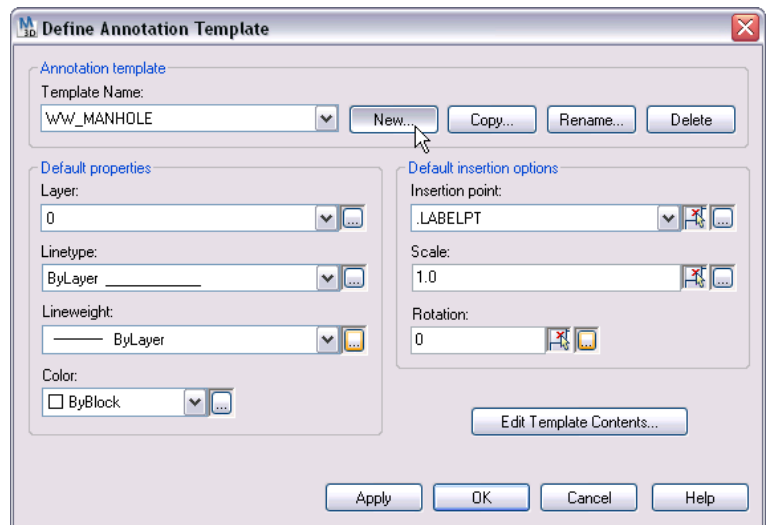
4. Click the Edit Annotation Text button on the AnnTemplate toolbar, or enter MAPANNTEXT at the command line. This opens the Annotation Text dialog box, in which you specify what text will be included in the annotation template.

5. In the Annotation Text dialog box, under Attribute, enter a Tag name and Value for the annotation text. For the value, enter static text or an expression that displays different text depending on the object being annotated. Click to select from a list of available properties and attributes. Note: To add multiple pieces of text to a template, each one must have a tag name that is unique within that template.

6. Specify the Object Properties and Text Options for the annotation text. Enter static values or expressions that are evaluated against the object to annotate. Click to select from a list of available properties and attributes.

7. Click OK.

8. In the Map Annotation Template Editor window, click where the text should start.

9. Optionally, to include geometry as a part of the annotations, create it in the Map Annotation Template Editor.

10. When you finish adding elements to the template, click Save Annotation on the AnnTemplate toolbar. The Map Annotation Template Editor window closes, returning to the Define Annotation Template dialog box.

11. In the Define Annotation Template dialog box, specify default properties and insertion options. These settings control the appearance of the annotation template block. If you selected ByBlock for any of the properties or options in the Annotation Text dialog box, these are the settings that will be used.

12. Click OK.

Other Good stuff to Know

Exporting DWG™ Object Classification to an FDO Data Store

You can export your DWG™ Object Classification data to an FDO data store, such as Autodesk SDF. You can also export to SHP, Oracle®, ESRI® ArcSDE®, and other non-FDO formats. Moving your data from DWG files to the SDF format allows you to manage your data more effectively and with better scalability. It also allows you to take better advantage of thematic and styling tools in the Display Manager, data management through the Data Table, and other functionality only available for geospatial features. You can still share your data with AutoCAD users by saving out to and importing from DWG format. For detailed information on working with FDO data, see the AutoCAD Map 3D User's Guide.
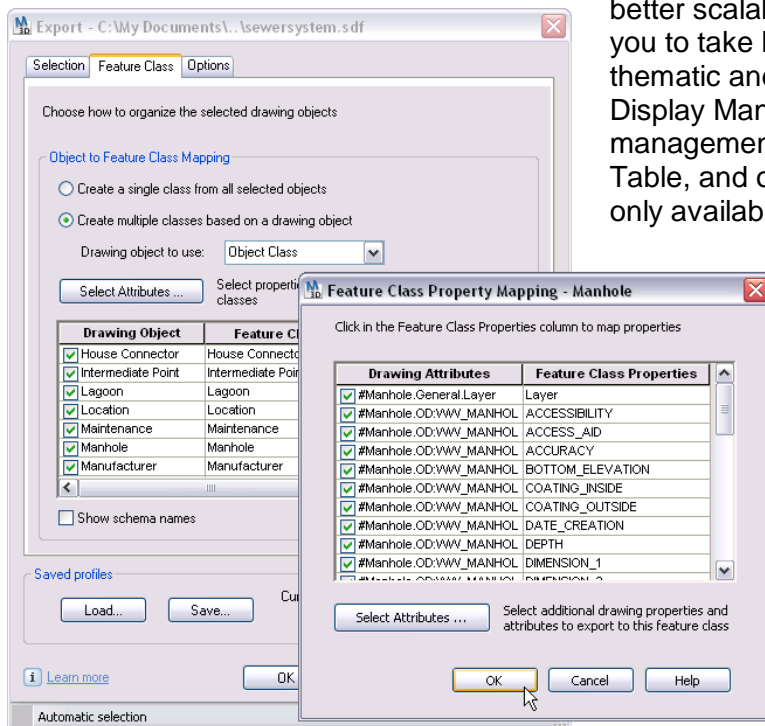

1. Click File menu > Convert DWG To > Autodesk SDF.

2. On the Selection Tab of the Map Export dialog box, specify which objects to export.

3. On the Feature Class Tab, click Select Attributes.

4. In the Select Attributes dialog box, check the attributes you would like to export.

5. Click OK.

6. In the Map Export dialog box, click OK.

Modifying a Point Symbol using the Express Tools

Each object class that represents a point feature uses an AutoCAD block for its symbol. Once a classified block has been placed in the drawing, you can use the Express Tools > *Replace block with another block* command to replace a block with another block while maintaining its object classification.

1. Click Express Tools menu > Blocks > Replace block with another block.

2. In the BLOCKREPLACE dialog box, select the block to be replaced.

3. Click OK.

4. In the BLOCKREPLACE dialog box, select the block to replace the existing block.

5. Click OK.

6. When prompted to *Purge unreferenced items when finished*, choose NO.
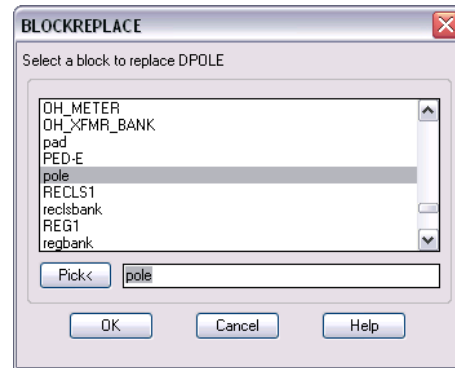
Note: Purging unreferenced blocks may result in object classifications becoming unable to function properly.