AutoCAD CIVIL 3D Survey Features - Field to Finish

This session is an introduction to the Civil 3D Survey Tools. We will cover some basics of working with Survey Databases and Automated Linework. We will also look at some of the new features for Surveying in Civil 3D .

Who Should Attend:

Land Surveyors, Surveying Technicians, Civil Engineers, and Designer/Drafters.

Topics Covered:

- Civil 3D Survey Workflow
- The Survey Toolspace
- Figure Commands
- Figure Prefix Database and Figure Styles
- Linework Code Sets
- Linework Files
- Importing Survey Files
- Editing, Updating, and Adding Figures

About the Speaker:

Alex has more than 20 years experience with AutoCAD© and AutoCAD-based applications, starting with Release 9. Alex is currently Manager of Training and Technical Services for Rational Technology. Alex has been a Top-Rated speaker at the annual Autodesk University Conference and at the annual Montana Joint Engineers Conference. He has also been ranked in the Top Ten in three Autodesk User Group International (AUGI) Top-DAUG contests, an international CAD user contest. Alex is expert in numerous fields, including utilities drafting, civil/environmental engineering design, 3D hydraulic/electric machine design and fabrication, CADD project management, architectural drafting and design visualization, Autodesk-based GIS, CADD services systems/personnel management, IT Management, and Autodesk Training, Product Support and Implementation.

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AutoCAD Civil 3D Survey Features

Civil 3D Survey Workflow for creating linework from coordinate files

Data entered into the collector needs to follow the field code rules specified for Field Books or linework codes.

Coordinate files can be converted to Field Books, using the Survey Link, or, properly coded, can be used in their ASCII format with the Linework Code Sets.

Civil 3D needs to have all the necessary Styles and Settings to correctly organize the graphical data.

In the Civil 3D Drawing Template, this includes;

- Drawing Settings
- Feature Settings
- Command Settings
- Description Keys
- Point Groups
- Point and Point Label Styles
- Figure Styles

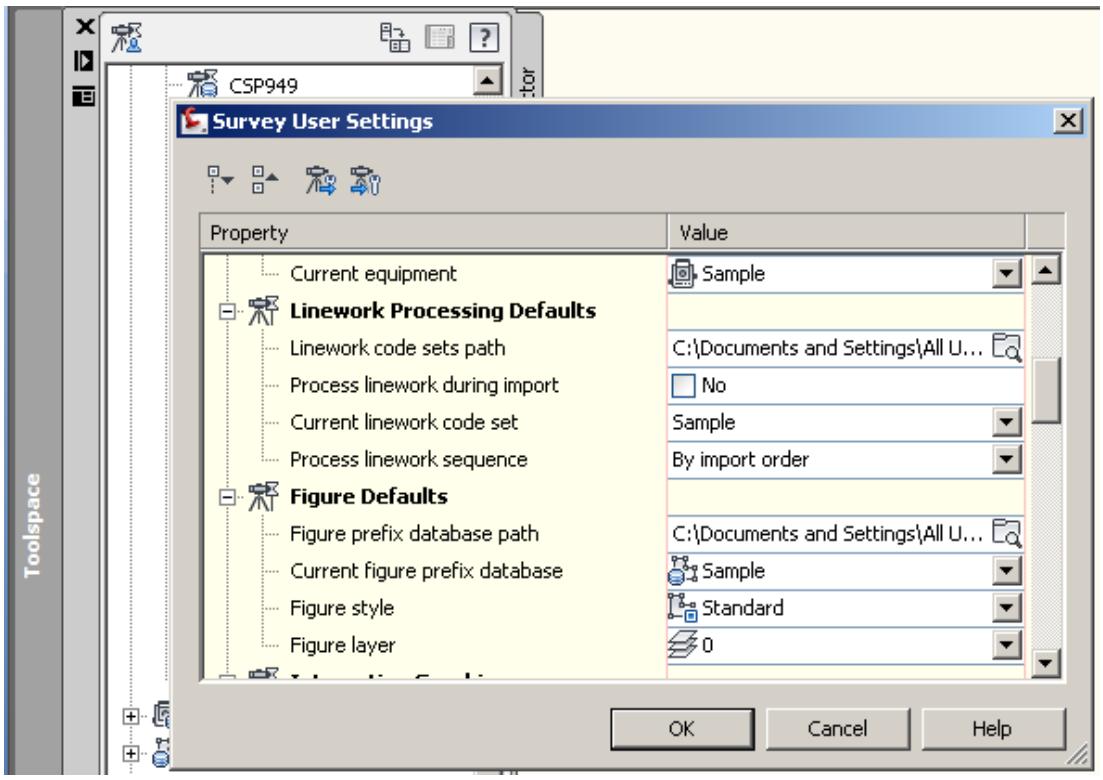
The following elements should be stored in a shared network location for access by the entire team;

- Linework Code Sets
- Figure Prefix Database

The paths for these elements are set in the Survey User Settings dialog.

In the Toolspace => Survey Tab you can access the Survey User Settings with the button in the upper left corner.

Figure 1) Survey User Settings



The Survey Toolspace

The Survey Toolspace is the area where you can work with Survey Databases and their corresponding Points, Figures, and Networks.

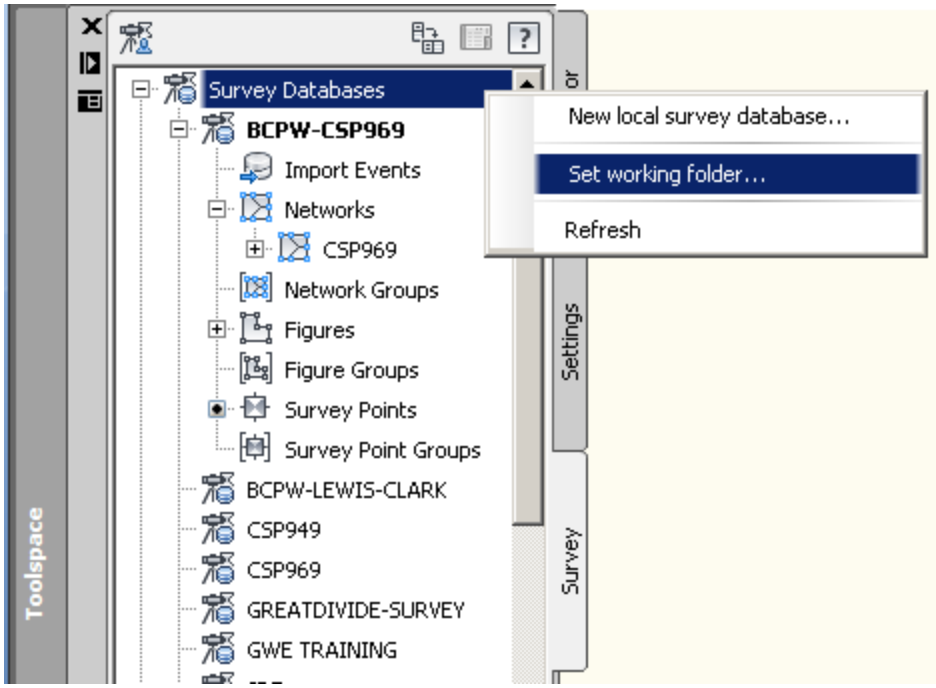
We can also access the Figure Prefix and Linework Code Set databases.

The Survey Toolspace is accessed through the Survey Tab in the Civil 3D Toolspace.

Figure 2) Launch the Survey Toolspace

If the Survey tab is not visible it can be launched from the Home Tab => Palettes Panel in the Ribbon.

Figure 3) The Survey Toolspace



The Survey User Settings button is in the upper left corner.

Right-click the Survey Databases heading to Set your Working (Project) folder and to create a new Survey Database.

You can use right-click functionality throughout the Survey Toolspace.

For instance you can import Text Files into a network, remove or insert figures and points to the drawing, zoom to specific figures and points, and edit points and observations.

Note: *If you are using Survey Databases, the survey points can be managed normally in Civil 3D using Point Groups, Point Styles and Point Label Styles, however, you can only Edit points inside the Survey Database Points area.*

Figure Commands

Figure commands are entered in the data collector in a point's raw description. A Figure command appears before or after the raw description with a space separating it from the raw description.

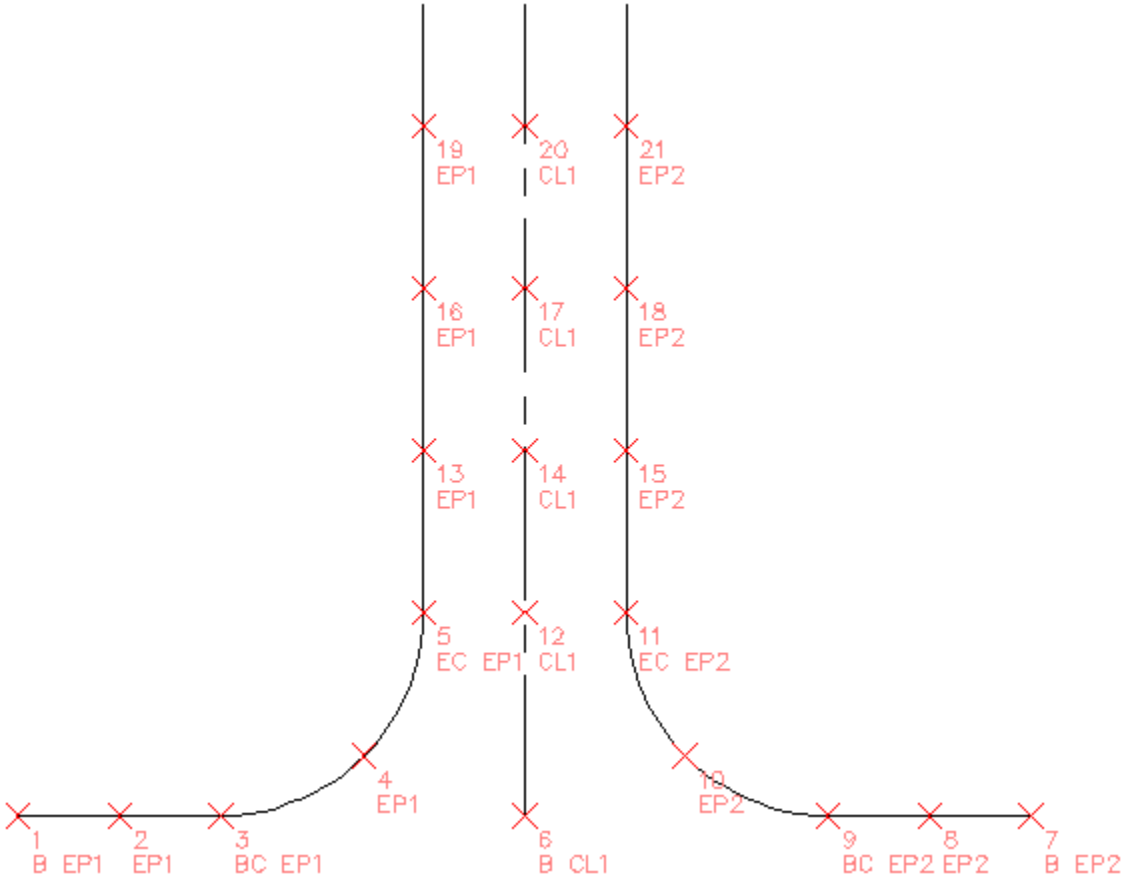
Example: `B EP1` or `EP1 B`

The most commonly used commands are:

B	Begins a figure
E	Ends a figure
BC	Starts a multi-point curve
EC	Ends a multi-point curve
CLS	Closes the figure back to the B (Beginning) command referencing the same code

When surveying lineal features for automated linework you can use unique numerical codes to designate these separate features. If the figure commands are used correctly it is not necessary to collect the points on lineal features consecutively.

Figure 4) Surveying features for automated linework



This figure illustrates collecting edge of pavement shots on both sides of a roadway.

The left side starts with B EP1 and the right side starts with B EP2. Upon import Civil 3D will recognize those codes and draw the linework accordingly.

Figure Prefix Database

The Figure Prefix Database assigns the figure a style, a layer, and can also automatically define whether the figure is a Breakline or a Lot line.

Figure Prefixes look at the point's Raw Description and organizes the associated Figures accordingly.

You do not need the wild card asterisk (*) as used in Description Keys. The Figure Prefix EOP will match EOP1 through EOP100.

Figure Prefixes should be preset and stored in a central location that the team members are pathed to.

Figure 8) Figure Prefix Database panorama

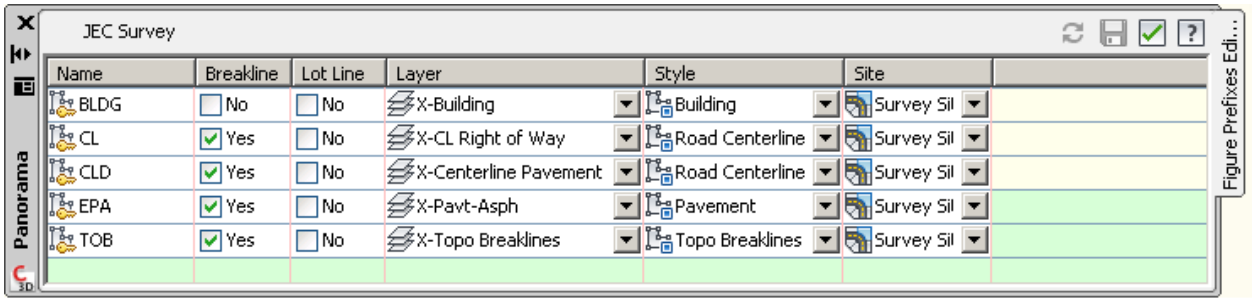
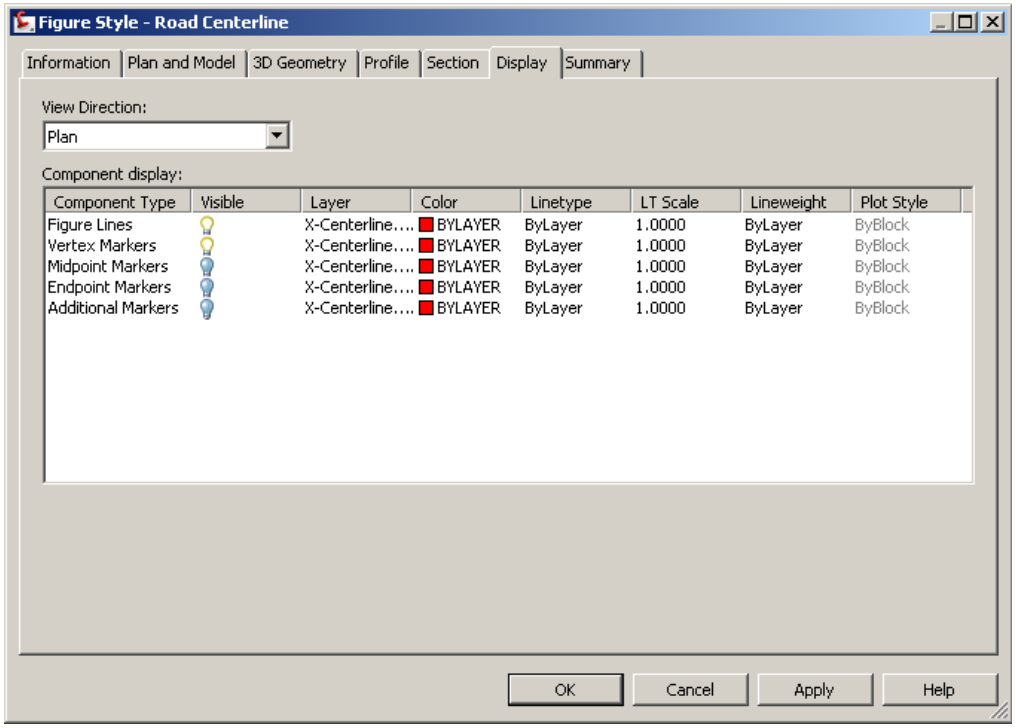


Figure Styles

Figure Styles are defined in your Civil 3D Template. They are matched to your Figures based on the point Raw Description and the Figure Prefix Database.

A Figure Style defines how your linework appears graphically in your drawing. Figure Styles control what Layer a Figure uses therefore also defining its Color, Linetype, and Lineweight.

Figure 9) The Figure Style Dialog



Figures are similar to AutoCAD 3D Polylines and to Civil 3D Feature Lines in that they are 3D objects, having elevations at each vertex based on the point elevation used to create them.

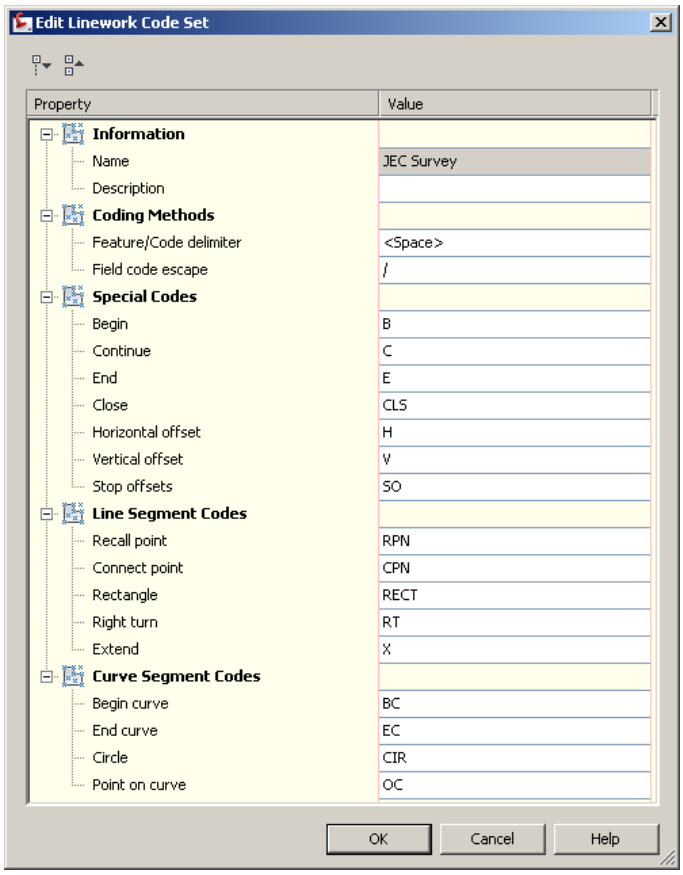
Linework Code Sets and a Linework File

Linework Code Sets were introduced in Civil 3D 2010. If you use Linework codes in your coordinate file you do not need to convert it to a Field Book to get the automated linework.

When importing the data you can choose to Process the Linework. You can also process the linework after the points are imported.

Linework Code Sets can be customized. The next image shows the Linework Code Sets dialog and the default codes.

Figure 10) Edit Linework Code Sets



A sample of Linework Code Set point file for a multi-point curve is as follows:

```
175,466.0829,481.8260,100.0000,BC1 B
176,462.3638,538.8656,100.0200,BC1 BC
177,464.2371,553.2380,101.0500,BC1
178,469.7670,562.4632,101.0700,BC1
179,476.2186,569.2898,101.0400,BC1
180,490.4407,575.4662,101.0400,BC1 EC
181,517.6959,580.9047,101.0440,BC1
```

Linework Code Sets are stored in an external database and, like Figure Prefixes, should be stored in central locations that the rest of the team is pathed to.

Working with Figures

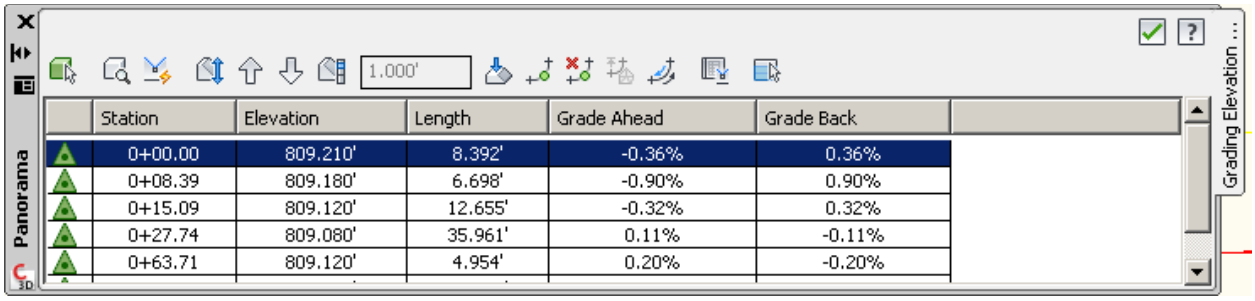
We can Edit, Update, and Modify Figures in our drawing similar to other AutoCAD and Civil 3D objects.

Figures can be grip-edited and then updated, or pushed back into the Survey Database.

Figures can be used as Surface Breaklines.

We can select a Figure, Right-click, and choose Elevation Editor… to see the Figure elevation and grade information in a Panorama.

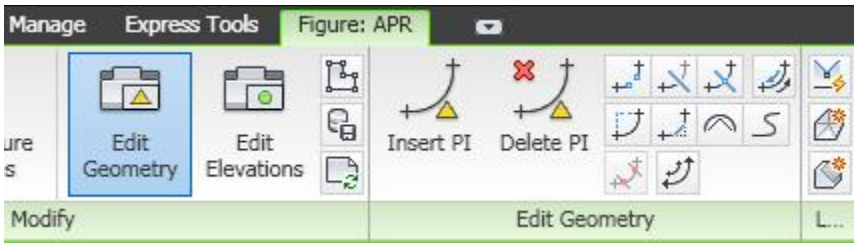
Figure 19) Figure Elevation Editor



Station	Elevation	Length	Grade Ahead	Grade Back
0+00.00	809.210'	8.392'	-0.36%	0.36%
0+08.39	809.180'	6.698'	-0.90%	0.90%
0+15.09	809.120'	12.655'	-0.32%	0.32%
0+27.74	809.080'	35.961'	0.11%	-0.11%
0+63.71	809.120'	4.954'	0.20%	-0.20%

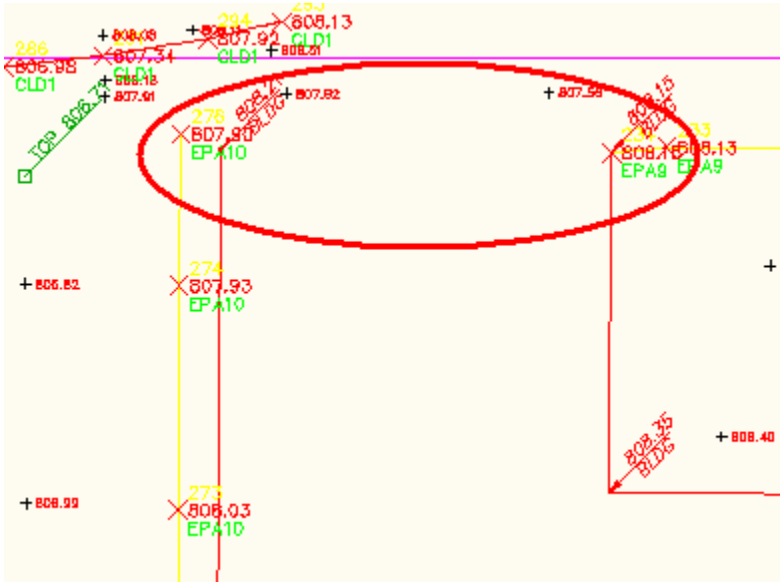
When a Figure is selected you can click the Edit Figure Geometry button in the Ribbon where you can Add or Remove vertices, Edit Curves, and use Stepped Offset, among other editing capabilities.

Figure 20) Edit Figure Geometry



In some cases it will be more desirable to edit any problems in the Field Book and then Re-Import.

Figure 21) The Building Figure



In this example the Building Outline is not closed.

With some minor work in the Field Book we can correct that and then Re-Import.

Summary

This is, of course, a Quick Spin on using Field-to-Finish techniques and automated linework.

Although it may change our field survey collection processes, using the Survey Database, and either Field Book files or Linework Code Sets, we can very quickly automate the creation of geometry in our projects.

This Linework can also be used as Breaklines or used to define Lot Lines and Parcels as well.

It is, again, important to note the elements that must be defined ahead of time before using this process.

In the Civil 3D Drawing Template we need to check:

- Drawing Settings
- Feature Settings
- Command Settings

We also need to set or define:

- Description Keys
- Point Groups
- Point and Point Label Styles
- Figure Styles

The following external databases need to set in a shared network location:

- Linework Code Sets
- Figure Prefix Database

I hope you all enjoyed this session.

I do Thank You for taking your valuable time to be here.

Please feel free to contact **Rational Technology, Inc** if we can answer any questions about this session or if we can help with additional training in these features.

Best Regards,

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