# AutoCAD Civil 3D 2010
# Education Curriculum Instructor Guide, Unit Overview
# Unit 2: Create Ground Data

Autodesk

## Unit 2 – Create Ground Data

Unit 2 addresses the collection and reduction of data required to begin the engineering planning and design process. Ground data represents the existing information of a site prior to the creation of the design and construction. Ground data is the information upon which important decisions during the planning and design phases are based. The ground data provides the constraints, and the opportunities, to create a cost-effective and sustainable design. Ground data can consist of survey data, points, surfaces, and images.

It is important to be able to efficiently work with ground data to adequately portray existing conditions prior to beginning a design. Engineers and technicians must be aware that the quality and accuracy of their designs is wholly dependent on the quality and accuracy of the ground data upon which designs are based. Understanding how to efficiently create, manage and analyze ground data is critical the engineering process.

The lessons contained in Unit 2 include the following:

- Lesson 1 – Create Survey Data
- Lesson 2 – Create Points
- Lesson 3 – Create Surface
- Lesson 4 – Insert Images

Lesson 1 exposes students to the principles and practice of working with Total Station survey data for the purpose of creating points and surface. Lesson 2 addresses the creation, management, and display of points. Lesson 3 teaches students how to create existing ground surface models from points, breaklines, and other data. Lesson 4 introduces students to images and how to insert images to supplement other drawing data. Following are detailed summaries of the lessons.

# Lesson 1 – Create Survey Data

In this lesson, you learn how to use the survey functionality in AutoCAD Civil 3D. This functionality enables you to automatically create pre-engineering base plans and existing ground surface models directly from field survey data.

When you use the Survey features, you can use total station and GPS observation data to automatically create pre-engineering base plans and existing ground surface models. You can also edit field data to adjust control coordinates, backsight angles, prism heights, and any other type of observed data.

Surveyors produce information upon which a design can be based. This information is provided to site designers, and usually consists of a pre-engineering base plan, an existing ground surface model, and a reduced coordinate point file.

## Objectives

After completing this lesson, you will be able to:

- Configure and identify the main components of the Civil 3D survey environment.
- Create a survey database and network.
- Create figure styles to control the display of figures.
- Create figure prefixes to assign figure styles to figures.
- Describe the main characteristics of the Autodesk field book file format.
- Import a field book file to Civil 3D.
- Make changes to observation data in the survey database.
- Create points and figures from survey data.

## Exercises

The following exercises are provided in a step-by-step format in this lesson:

1. Review the Survey Environment
2. Create Survey Database
3. Create a Survey Network
4. Create Figure Styles
5. Create Figure Prefixes
6. Import Survey Data
7. Edit Survey Data

# Lesson 2 – Create Points

In this lesson, you learn how to work with points in AutoCAD Civil 3D. Points are one of the most fundamental elements in site development and transportation projects. They can be used to represent existing conditions and proposed construction locations. Point data that represents existing conditions is usually created from survey data files generated from total station survey, GPS, or LiDAR survey equipment.

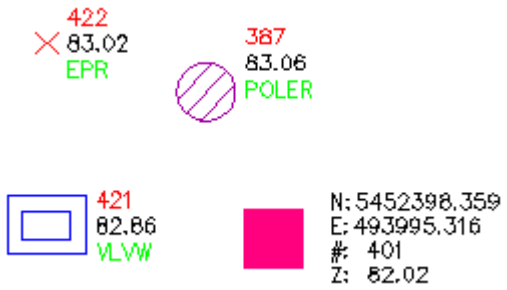
Engineers and construction personnel create points required for construction from design data. Once a design is completed, engineers extract point data from the design, and then send this information to the field for construction staking. Points created during the design are uploaded to GPS and Total Station survey equipment, and used for construction staking.

In common terms, a point represents a singular location in space. It is usually characterized with an X and Y (easting and northing) coordinate pair in two-dimensional (2D) space, or an X, Y, and Z (easting, northing, and elevation) coordinate triplet in three-dimensional (3D) space.

In Civil 3D, points are represented with a point object, which is an intelligent object with the following properties:

- Number
- Description
- Elevation
- Northing
- Easting

Point objects are as shown in the following illustration.




The Civil 3D point object consists of a marker and a label. The display of the marker is controlled with a point style. In this illustration, you can see how different point styles can be used to show different types of points. The display of the label is controlled with a point label style. Different label styles can be used to show specific point data.

## Objectives

After completing this lesson, you will be able to:

- Explain how points are used in different phases of an engineering project.
- Describe how to use grips to modify points and point labels.
- Describe which objects can be used to create points in a drawing.
- Import points from an external text file into a drawing.
- Describe how point groups are used to identify characteristics shared by points.
- Explain the function of point tables.
- Create a description key.
- List the guidelines for managing points.
- Create points manually.
- Create point groups.

## Exercises

The following exercises are provided in a step-by-step format in this lesson:

1. Import Points
2. Create Description Keys
3. Create Points Manually
4. Create Point Groups

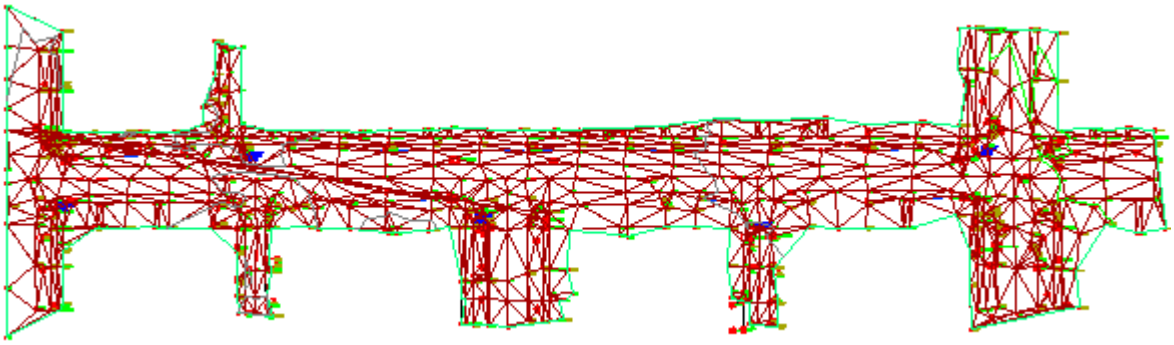
# Lesson 3 – Create Surfaces

In this lesson, you learn how to work with surfaces in AutoCAD Civil 3D. Surfaces are three-dimensional objects used to represent both existing and proposed terrain conditions.

The display of a surface is controlled with a surface style. Surfaces can be displayed with different components including contours, triangles, and points. Surfaces can also be annotated with contour elevations, spot elevations, and slopes. Engineers usually display existing terrain surfaces on their plans with contours.

During the design process, engineers regularly work with existing terrain surfaces. These surfaces are used to check the interaction between the proposed design and the existing terrain.

Engineers also create surfaces representing proposed conditions during the design process. These surfaces are used to help visualize the design, calculate material quantities, and to generate data required for construction staking.



## Objectives

After completing this lesson, you will be able to:

- Describe surfaces.
- Describe how breaklines are used for surface modeling.
- Create a surface from points and breaklines.
- Create and apply surface styles.
- Apply contour, slope and spot elevation labels to a surface.
- Export a surface to Google Earth.

## Exercises

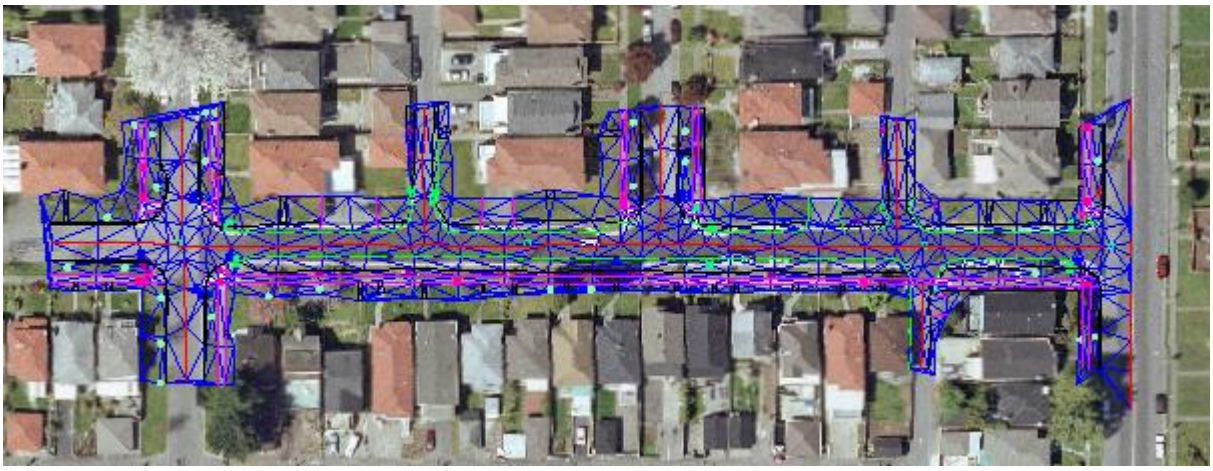
The following exercises are provided in a step-by-step format in this lesson:

1. Create a Surface
2. Modify Surface Properties
3. Edit a Surface
4. Create Surface Styles
5. Assign a Contour Style and Apply Surface Labels
6. Export a Surface to Google Earth

# Lesson 4 – Insert Images

In this lesson, you learn how to insert external image files into Civil 3D. Image files are typically aerial photographs that show information representing the existing conditions, and they often complement other base mapping generated from points collected with total station and GPS equipment. Image files are also generated from other sources such as Google Earth and USGS (United States Geological Survey) topographical maps.

The following illustration shows an image used to supplement base plan mapping, and an existing ground surface model for a road reconstruction project in Vancouver, Canada.



## Objectives

After completing this lesson, you will be able to:

- Explain different methods for inserting images.
- Insert an image representing an aerial photograph to a drawing.
- Remove an image from a drawing.
- Insert an image representing a USGS topographic map to a drawing.
- Insert an image to a drawing from Google Earth.

## Exercises

The following exercises are provided in a step-by-step format in this lesson:

1. Insert an Image Using the Insert Image Command
2. Insert an Image Using the Data Connect Utility
3. Import an Image from Google Earth