

GRADING A SIMPLE STORAGE POND

This guide covers the procedure for creating a grading object that represents a simple storage pond. In this example, the pond will first be graded from a bottom footprint to a top elevation, over a given distance to represent the top of the berm, and then back down to a ground surface. The same structure will then be graded again starting at the outside of the top berm and working inward to the bottom footprint to show you how the resulting grading object differs.

1. Setting up the Grading

The bottom footprint representing the floor of the pond can be represented by a rectangle, 2D or 3D polyline or a feature line. The footprint object can have elevations assigned to it to streamline the grading process.

Once you have a footprint object, go to the *Grading* drop-down menu and select *Create Grading...* This will open the *Grading Creation Tools* window. Set up the grading group by clicking on the *Set the Grading Group* button on the *Grading Creating Tools* toolbar. The *Create Grading Group* window will appear. Provide a name and description for the grading group. There is an option to automatically create a surface based on the grading group. If this option is selected you can also specify a separate surface that will be used as a comparison for volume calculations. Click on the OK button to create the grading group.

Next, set a surface to be used as a grading target by clicking on the *Set the target surface* button. This is the surface that will be used when you grade the outside berms of the pond.

The Minnesota drawing template will automatically place the grading group objects on the layer C.Plan.Grad. You can change this layer by clicking on the *Set the grading layer* button.

2. Grade the Inside of the Pond

In the *Grading Creation Tools* window, make sure that *Project to Relative Elevation* is selected from the list of grading options and click on the *Create Grading* button. Select the bottom footprint object when prompted to select the feature.

If the bottom footprint is not a feature line, such as a polyline, a window will appear where you will convert the object to a feature line. In the *Create Feature Lines* window, select a site, name, style and layer for the new feature line. You can also choose to erase the entity being converted, assign elevations to the feature line, or weed out points that are close together. Click on the OK button to continue.

Next, you will be prompted to select the grading side. This is the side to which you want the grading to extend. In this example, we are grading the bottom floor of an excavated pond, so we want to choose the outside of the footprint as the grading side.

Next, you will be asked whether the grading will be applied to the entire length of the footprint object. It is possible to assign different grading properties to different sides of the footprint object, but in this example we will answer *Yes* to apply the grading to all sides of the footprint object.

Enter the relative elevation that you want to grade to at the command line. This is the change in elevation from the footprint object. A positive relative elevation will project the grading upward and a negative value will project it downward. If the pond bottom is flat instead of sloped, you can also choose the *Project to Elevation* option and specify a top elevation and achieve the same results. If the pond bottom were sloped, however, choosing the *Project to Elevation* option would result in a flat top at a given elevation with sides of different length depending on how far the slope extends to reach the top elevation, and the *Project to Relative Elevation* option would result in a sloped top a set distance above the floor.

After you provide the elevation to project above the footprint, you will then specify the slope of the grading object. Type S at the command line when prompted for a grade or slope value, then enter a numeric value for the side slope (for example, enter 3 for a 3:1 slope).

The grading object representing the inside of the pond will be placed in the drawing. Hit *Enter* again to exit the grading commands.

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3. Grade the Top of the Berm

Next, you will create a level grading object to represent the berm at the top of the pond. In the *Grading Creation Tools* toolbar, change the grading option to *Project to Distance* and click on the *Create Grading* button.

When prompted to select a feature, select the outside edge of the grading object that you created in Step 2.

When asked whether to apply to the entire length, answer yes.

At the command line, provide a distance for the top width of the berm and a relative elevation for the top berm. A relative elevation of 0 will model a flat top berm.

The grading object representing the top berm will be placed in the drawing. Hit *Enter* again to exit the grading commands.

4. Grade the Outside Berm to the Original Ground Surface

Finally, you will create a final grading object to represent the outside slope of the pond from the top berm down to where the bank ties into the original ground surface. In the *Grading Creation Tools* toolbar, change the grading option to *Project to Surface (Cut and Fill)* and click on the *Create Grading* button.

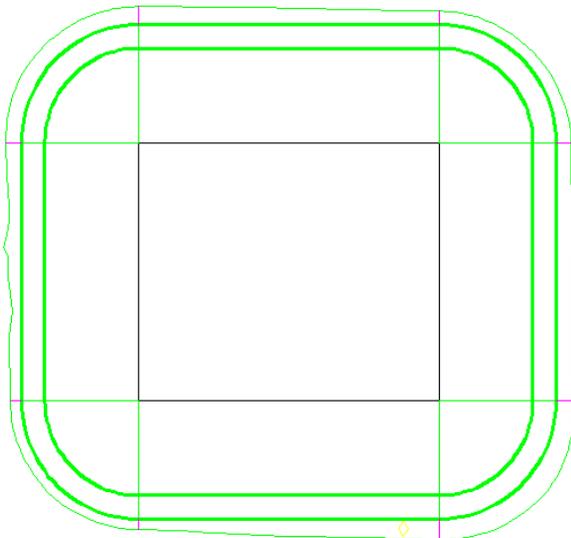
When prompted to select a feature, select the outside edge of the grading object that you created in Step 3.

When asked whether to apply to the entire length, answer yes.

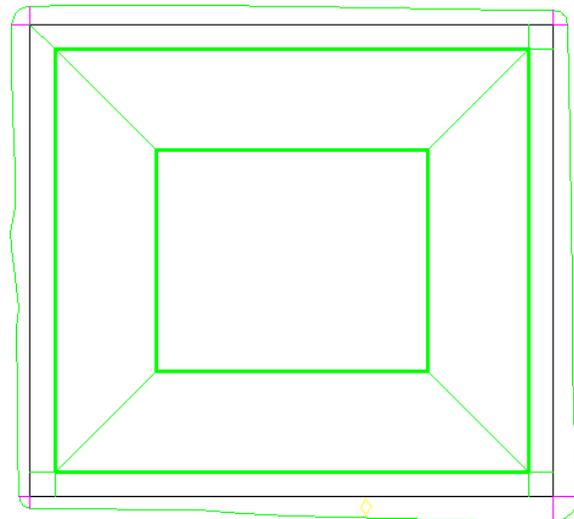
When asked to provide a cut slope, type S to specify a slope and provide a value for the cut slope. Repeat to provide the settings for a fill slope.

The grading object representing the outside slope will be placed in the drawing. Hit *Enter* again to exit the grading commands.

The grading object created using the procedure above will look like the structure on the left below, with rounded edges at the corners. If you were to grade the structure starting at the outside of the top berm and working in to the bottom of the pond, the resulting grading object will look like the structure on the right below with squared corners.



Grading from the Outside In



Grading from the Inside Out

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Editing Grading Objects

The properties of a grading object can be edited by going to the *Grading* drop-down menu and selecting *E*dit *G*rading from the *E*dit *G*rading menu. Select the grading object that you want to edit and enter a new value at the command line.

The footprint object used to create a grading object or group can also be edited, which affects all of the grading objects associated with it. This is done using the commands on the *E*dit *F*eature *L*ine *E*levations menu or the *E*dit *F*eature *L*ine *G*eometry menu on the *Grading* drop-down menu. For instance, the elevation of the footprint object in the above example can be edited to raise or lower the floor of the pond using the *R*aise/*L*ower command on the *E*dit *F*eature *L*ine *E*levations menu.

The commands to edit feature line elevations and geometry are also located on the Feature Lines toolbar. The commands to edit feature lines and grading objects can also be accessed by selecting the object and right clicking to open the shortcut menu.

Grading Surfaces

If you chose to automatically create a surface from the grading group in Step 1, you will find a surface listed on the Prospector tab of Toolspace that represents the collection of grading objects in the grading group. You can choose to create a surface from a grading group at any time by going into the grading group's properties and turning on the option for automatic surface creation.

Grading Volumes

If you set the original ground surface at the volume base surface in the grading group properties, you will be able to obtain cut and fill volumes by going to the *G*rading *U*tilities area on the *Grading* drop-down menu and selecting *G*rading *V*olume *T*ools...