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Eagle Point Solution to a Frequently Asked Question

How to Place a Circular Concrete Tank

Summary:
This document explains the process of designing a layout of a TR-9 MWPS circular concrete tank in plan and profile views, and calculating excavation and drain quantities.

Product: Eagle Point Software™ 2002
Release: 2002 Q1 or 2.1.0 and greater
Platform: All
Related documents: *How to Create a Profile*

As always, should you have any questions regarding any phase of installation, contact Eagle Point Technical Assistance at (800) 477-0909.

Notation Method

Button to Press *Displayed Text* **Icon** Action {Text to Enter} *Menu Item…*

Placing a Circular Tank in the Plan View

1. In AutoCAD, click on the **Layer Manager Icon**.
2. Select the *W.Plan.Conc.New* layer. Set to Current.
3. Click OK close out of Layer Manager.
4. Click **Circle** and draw a circle that represents the diameter of concrete tank.
5. Click **Offset**.
6. Input the wall thickness of the tank in feet. E.g. {8/12}. Press Enter.
7. Select the circle that represents the inside diameter of the tank.
8. Click outside of the circle.
9. Click **Arc**.
10. Press {C} for Center. Press Enter.
11. Shift right click and click *Center*.
12. Click to the center snap of the circular concrete tank.
13. Calculate the radius of the tank and add the wall thickness + the exterior footing width + 2’ for additional excavation. E.g. 50’/2 + (8” + 12”)/12 + 2’ = 28.667.

Dimensions based on MWPS TR9 – NRCS Drawing IA900

Tank Depth	Dimension to add to radius to allow for wall thickness, footing width & 2’ of additional excavation	Footing Thickness
8’	3.667’	0.833’
10’	3.833’	1’
12’	4’	1’
14’	4.083’	1’

14. Input the start point of arc relative to the center of the tank: {@28.667,0}. Press Enter.
15. Input {A} to allow angle entry. Press Enter.
16. Input {359.99} to give a nearly closed arc. Press Enter.
17. From AutoCAD, click *NRCS/EP… Create Site Layout… Interpolate Additional Geometry…*.
18. Input the correct elevation for the excavation subgrade. E.g. Floor elev 56 - 0.833 footing thickness= 55.167. Use {55.167}.
19. Press Tab.
20. Input the correct elevation for the excavation subgrade. E.g. {55.167}.
21. Press Tab.
22. Uncheck *Make copy of object…*.
23. Click *Settings*.
24. Press Tab.
25. Input {5} for minimum length of segments. Press Tab.
26. Input {5} for maximum length of segments. Press Tab.
27. Click OK.
28. Click Apply.
29. Select the arc that represents flat pad subgrade.
30. Click Close.
31. Select the subgrade line (it is now a 3Dpolyline). Right click.
32. Click *Properties*. Pull down the layer to *C.Plan.Exca*
33. Update the Closed property to *Yes*.
34. Press Esc.

Placing the Toes of the Subgrade Excavation

1. From AutoCAD, click *NRCS/EP… Create Site Layout… Project Slopes to Surface Model…*.
2. Pull down to the original ground surface model name. E.g. {Ognd}.
3. Input the proper cut slope as a positive number. E.g. {1.5} as H/V.
4. Input the fill slope as a negative number. E.g. {-3} as H/V.
5. Uncheckmark *Erase all Existing Slope Projections…*
6. Click Apply.
7. Select the subgrade line.
8. Click on the outside of the subgrade line.
9. Press Enter. Click Close.
10. Select all of the slope projection lines and change their layer property to *C.Topo.Stex.Slop*.

Make the Outside Toe of the Excavation into a Closed Object

1. Select all of the lines that represent the bottom and top of excavation cut slope. Right click.
2. Click *Properties*. Pull down the layer to *C.Plan.Exca*.
3. Update the Closed property to *Yes*.
4. Press Esc.

Preparing Surface Model Settings for the Tank Excavation

1. From AutoCAD, click *NRCS/EP… Create Contours… Manage Surface Model…*.
2. Click the **New Surface Model Icon**. This brings up New Surface Model box.
3. Click on the **Library icon** (looks like books on a shelf) and select the *Structure Excavation* surface model library. Click Load Prototype. Click Yes. Click Close.
4. Input a Description name. E.g. {Tank Excavation}, which would represent excavation for the tank subgrade.
5. Once you have settings done click OK.
6. Click Close to close out Manage Surface Models.

Creating a Surface Model for the Tank Excavation

1. From AutoCAD, click *NRCS/EP… Create Contours… Triangulate Surface Model…*.

2. Pull down the name. E.g. *Tank Excavation*.
3. Pull down to set boundary line to *Select*.
4. Place a checkmark by *Display Model* if you want to see a temporary set of triangulation. Place a checkmark by *Place Triangles* if you want to have triangulation objects placed into the drawing.
5. Click Apply.
6. Use AutoCAD selection methods to pick the excavation lines. Press Enter.
7. Select the outer line of the excavation.
8. Click Close on the Triangulate Surface Model.

Verifying the Tank Excavation Surface Model

1. From AutoCAD, click *NRCS/EP… Create Contours… Make Intermediate & Index…*.
2. Verify the surface model name *Tank Excavation*.
3. Usually no checkmarks are place in any of the boxes.
4. Click Apply. Contours will appear in CAD.
5. Click Close.
6. Review the contours to determine whether the surface model is correct.
7. From AutoCAD, click *NRCS/EP… Create Contours…Track Coordinates…*.
8. Verify the surface model name *Tank Excavation*.
9. Click Apply.
10. Move cursor around in CAD and elevations will be displayed.
11. Click Close.
12. From AutoCAD, click *NRCS/EP… Create Contours… Erase Existing Objects…*.
13. Checkmark *Contours* and any other items that have been placed into CAD. Click Apply. Click Close.

Computing the Excavation Volume

1. From AutoCAD, click *NRCS/EP… Volumes… Calculate Prismoidal…*.
2. Pull down original surface model to *Ognd*.
3. Pull down final surface model to *Tank Excavation*.
4. Click Apply. Click the **Printer Icon** to print.
5. When done click Close.

Creating a Profile Reference Line in the Plan View

1. Set the current layer to *C.Plan.Alin*.
2. Click **Polyline**.
3. Shift right click and click *Quadrant*.
4. Click to a quadrant of the circular concrete tank.
5. Shift right click and click *Quadrant*.
6. Click to the opposite quadrant of the circular concrete tank.
7. Press Enter.
8. Repeat 2 through 7 for a second alignment 90 degrees to the first one.
9. Click **Scale**.
10. Select the profile alignment lines.
11. Press Enter.
12. Shift right click and click *Center*.
13. Click to the center of the tank circle.
14. Input a multiplying factor to increase the line length {2}.
15. Trim or extend the profile alignment lines if desired.
16. If rotation of the alignments is needed, click **Rotate**.
    a) Select the profile alignment lines.
    b) Press Enter.
    c) Shift right click and click *Center*.
    d) Click to the center of the circle.

e) Move your cursor to give the correct new rotation and click. Or input a rotation amount and press Enter. (0 degrees is to the right, counterclockwise is positive). E.g. {45} would rotate the lines 45 degrees counterclockwise.

17. From AutoCAD, click *View… Named Views… New…*.
18. Input a view name. E.g. {Tank Plan View}. Click OK. Click OK.

Creating the Reference Location for a Profile in the Drawing

1. From AutoCAD, click *NRCS/EP… Profiles/Sections…Setup Profile Coordinate System…*.
2. Click the **New Profile Coordinate System Icon**.
3. Input a Profile name. E.g. {Tank North to South}.
4. Click into the X box. Click the **Pick In CAD** button.
5. Select a location in the drawing that will not overlap a profile with the plan view part of the drawing.
6. Click into the Station box. Input a Stationing that you want to correspond to this reference location in the drawing. E.g. {0}. Press Tab.
7. Input an elevation that you want to correspond to this reference location in the drawing. E.g. {50}. Press Tab.
8. Click OK.
9. Click Close.

Creating the Profile in the Drawing

1. From AutoCAD, click *View… Named Views…*.
2. Highlight a view name. E.g. {Tank Plan View}. Click Set Current. Click OK.
3. Decide the horizontal and vertical scales that you want for the profile view.
4. From AutoCAD, click *NRCS/EP… Plot Scale…*.
5. Input the horizontal and vertical scales. E.g. Horz ={10}, Vert = {5}.
6. Click OK.
7. Determine the Reference station of the starting end of the Profile alignment. E.g. {0}.
8. From AutoCAD, click *NRCS/EP… Profiles/Sections…Profile from Surface Model…*.
9. Highlight the Surface Models that you want profiles of. *Ognd*, *Tank Excavation.*
10. Click OK.
11. Select a Profile alignment line.
12. Select the same line.
13. Click near the starting end of the line.
14. Input the beginning stationing of the line. E.g. {0}. Click OK.
15. Locate the Profile view within the drawing and zoom in around it.
16. From AutoCAD, click *View… Named Views… New…*.
17. Input a view name. E.g. {Tank profile N to S}. Click OK. Click OK.
18. Select the Original Ground line and change the layer property to *C.Prof.Ognd*.
19. Select the Excavation line and change the layer property to *C.Prof.Exca*.

Placing a Tank Section into the Profiles

1. From AutoCAD, click *Insert… Block…Browse…*.
2. Browse to the desired tank based on correct wall height. {C:\My Projects\Symbols and Blocks\bConcTank100x8.dwg}. (All 4 tank depths are 100’ diameter. The diameter will be increased or decreased later). Highlight the filename. Click Open.
3. Checkmark *Insertion Point On Screen*.
4. Uncheckmark *Scale On Screen*. Uncheckmark *Uniform Scale*.
5. X scale and Z scale = 1. Input Y scale value as the Horizontal plot scale divided by the Vertical plot scale as set up for this profile coordinate system. (10/5=2) {2}.
6. Uncheckmark *Rotation Angle On Screen* {0}. Click OK.
7. Snap the block to the left edge of the subgrade excavation in the profile.
8. Click **Explode**.
9. Select the tank block. Press Enter.
10. Click **Stretch**.

11. Crossing Window (Right to Left) around the right half of the tank and right cut slope. Use {r} to remove other objects from the selection.
12. Press Enter.
13. Click anywhere.
14. Using the change in diameter relative to the 100' tank, input the amount to stretch the tank. E.g. {@-40,0} would reduce the tank to a 60' diameter. Press Enter.

Placing a Grid on the Profiles

1. From AutoCAD, click *NRCS/EP… Profiles/Sections…Grid…*.
2. Check *Paper Units* and input the grid dimensions for the paper. E.g. For Grids that fill the full title block: (You can use less than the full height) .
   For 11x17: Length={14}, Height={10}, Area Height ={.25}, Elev Width ={.5}.
   For 22x34: Length={28}, Height={20}, Area Height ={0.5}, Elev Width={1}.
3. If used for 11x17: click the **CAD settings icon** and change the Datum Elev and Stations Text size to {0.12} and click Apply for each one.
   For 22x34: Datum Elev={.24}, Stations={.24}.
4. Click OK.
5. Input desired Station Interval labeling. E.g. {10} and input desired Datum Elevation Interval labeling. E.g. {5}. (Usually use the same as the Horizontal & Vertical Scales).
6. Click OK.
7. Click to place the outline of the Grid to enclose the Profile lines.
8. If Grid is not the right size or not placed correctly, select it and press Delete.

Select the grid then use AutoCAD *Tools… Display Order… Send to Back…*. Turning off the 3.Grid.Fine layer can be helpful for viewing the profile in CAD.

Labeling Elevations on an Object in the Profile

1. From AutoCAD, click *NRCS/EP… Profiles/Sections…Annotate Point/Grade Break…*.
2. Click *Point*, checkmark *Leader* & *Smooth*.
3. Click in *Station*.
4. Click the **Pick In CAD icon**.
5. Osnap to the top of tank wall.
6. Verify the Elevation Box.
7. Click Apply.
8. Click a first point slightly away from the snapped location.
9. Click a second point that is farther away from the snapped point.
10. Click a third point for the location of the text end of the line.
11. Press Enter.
12. Click the location for the text.
13. Click Close.

Drawing the Drainfill Objects with Uneven Elevations

1. Review the profiles and decide a planned elevation of the top of drain at each quadrant of the tank.
2. From AutoCAD, click *View… Named Views… New…*.
3. Highlight the plan view name. E.g. {*Tank Plan View*} Click Set Current.
4. Click OK.
5. Set the current layer to *W.Plan.Drai*.
6. Right click on Osnaps. Click Settings.
7. Checkmark *Center* & *Intersection* & *Object Snap On*.
8. Click OK.
9. Click **Arc**.
10. Input {C} for Center. Press Enter.
11. Snap to the center snap of the circular concrete tank.
12. Snap to the intersection of an alignment line and the outer diameter of the tank.

13. Snap the next counter clockwise intersection of an alignment line at the outer diameter of the tank.
14. Repeat steps 9 to 13 for the remaining 3 quadrants of the circle.

Apply the Correct Top of Drain Elevations to the Arcs

15. From AutoCAD, click *NRCS/EP… Create Site Layout… Interpolate Additional Geometry…*.
16. Input the correct elevation for the top of drainfill at one end of the first arc. E.g. {52}.
17. Press Tab.
18. Input the correct elevation for the top of drainfill at the other end of the arc. E.g. {54}.
19. Press Tab.
20. Uncheck *Make copy of object…*.
21. Click *Settings*.
22. Press Tab.
23. Input {5} for minimum length of segments. Press Tab.
24. Input {5} for maximum length of segments. Press Tab.
25. Click OK.
26. Click Apply.
27. Select the drainfill arc near the "starting endpoint" elevation that you want applied.
28. Repeat steps 15 to 27 for the remaining 3 arcs. Make sure that the end point elevations of the adjacent quadrants are equal.
29. Click Close.
30. From AutoCAD, click *NRCS/EP… Create Site Layout… 3D Join…*.
31. Select 4 quadrants of the drainfill lines. Press Enter.
32. Select the toe to see if has all become one 3D Polyline. If not ends grips may need to be re-snapped to ends of adjoining lines.

Placing the Toes of the Drainfill

1. From AutoCAD, click *NRCS/EP… Create Site Layout… Project Slopes to Surface Model…*.
2. Pull down to the tank excavation surface model name. E.g. {Tank Excavation}.
3. Input the fill slope to be nearly level. E.g. {-0.01} as %S.
4. Uncheckmark *Erase all Existing Slope Projections…*.
5. Click Apply.
6. Select the drainfill line.
7. Click on the outside of the drainfill line.
8. Press Enter. Click Close.
9. Select all of the slope projection lines and change their layer property to *W.Topo.Drai.Slop*.
10. Select all of the lines that represent the edges of drainfill slope. Right click.
11. Click *Properties*. Pulldown the layer to *W.Plan.Drai*.
12. Press Esc.

Preparing Surface Model Settings for the Tank Excavation

1. From AutoCAD, click *NRCS/EP… Create Contours… Manage Surface Model…*.
2. Click the **New Surface Model Icon**. This brings up New Surface Model box.
3. Click on the **Library icon** (looks like books on a shelf) and select the *Drainfill* surface model. Click Load Prototype. Click Yes. Click Close.
4. Input a Description name. E.g. {Drainfill}, which would represent the top of the drainfill around the tank.
5. Once you have settings done click OK.
6. Click Close to close out Manage Surface Models.

Creating a Surface Model for the Drainfill

1. From AutoCAD, click *NRCS/EP… Create Contours…Triangulate Surface Model…*.
2. Pull down the name - for example *Drainfill*.
3. Pull down to set boundary line to *Select*.
4. Pull down to set Void Regions to *Select*.

5. Place a checkmark by *Display Model* if you want to see a temporary set of triangulation. Place a checkmark by *Place Triangles* if you want to have triangulation objects placed into the drawing.
6. Click Apply.
7. Use AutoCAD selection methods to pick the inner and outer edge of drainfill lines. Press Enter.
8. Select the outer catchline of the drainfill.
9. Select the inner line of the drainfill. Press Enter.
10. Click Close on the Triangulate Surface Model.

Verifying the Drainfill Surface Model

1. From AutoCAD, click *NRCS/EP… Create Contours…Track Coordinates…*.
2. Verify the surface model name *Drainfill*.
3. Click Apply.
4. Move cursor around in CAD and elevations will be displayed.
5. Click Close.
6. From AutoCAD, click *NRCS/EP… Volumes…Track Depths…*.
7. Pull down the Original surface model name *Tank Excavation*.
8. Pull down the Final surface model name *Drainfill*.
9. Click Apply.
10. Move cursor around in CAD and elevations will be displayed.
11. Click Close.

Computing the Drainfill Volume

1. From AutoCAD, click *NRCS/EP… Volumes… Calculate Prismoidal…*.
2. Pull down Original surface model to *Tank Excavation*.
3. Pull down Final surface model to *Drainfill*.
4. Click Apply. Click the **Printer Icon** to print.
5. Click Close. Click Close.

Plotting the Profiles in Paperspace

Refer to *How to Create a Profile* for Plotting a Profile in Paperspace and Setting Fine Gridlines to Grayscale.

Submitted by Norman Friedrich.