You are viewing sample pages from our textbook:

"*The MicroStation Training Manual 3D Level 3*"

The first six pages of Module 4 are shown below. The first two pages are typical for all Modules - they provide the Module title and set out the learning objectives. The suggested time for completion of the Module is given at the end of Page 4-2.

Pages 4-3 to 4-6 are instructional pages and, in this case, discuss the Place Sphere, Place Cylinder, and Place Cone tools. The information and step-by-step instruction is typical throughout the 3D training manual.

If you require more information about the contents of this book, paste this link into your web browser:

http://www.micro-press.com/Contents_MicroStation_Level_3.html

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MicroStation V8 3D Level 3

Module 4

3D PRIMITIVE TOOLS

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MicroStation V8 Series	Module 4 of 18	Micro-Press.com

Module Information

Prerequisites:

Module 3 MicroStation 3D

Introduction:

AccuDraw provides a selection of tools to draw the basic "primitive" 3D shapes found in most "mechanical" type objects. The tools in this Module are an essential base from which to build more complex designs.

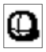
Objective(s):

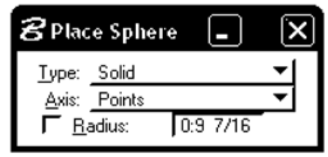
4.1 Understand and apply the Place Slab tool.
4.2 Understand and apply the Place Sphere tool.
4.3 Understand and apply the Place Cylinder tool.
4.4 Understand and apply the Place Cone tool.
4.5 Understand and apply the Place Torus tool.
4.6 Understand and apply the Place Wedge tool.
4.7 Apply standard editing tools to 3D elements.
4.8 Develop Primitive element skills through exercises.

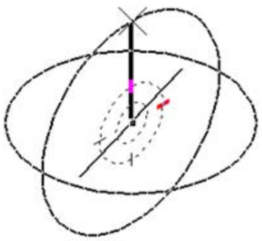
Time:

This Module should be completed within 4 hours.

4.2 PLACE SPHERE

 This tool is very easy to use. The only important point to keep in mind is the orientation of the sphere's axis. This is significant when editing a sphere, or attaching it to other elements.





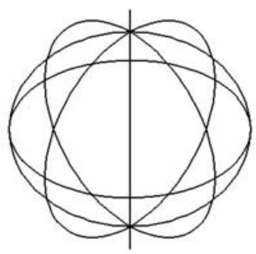
Steps 1 and 2.

Try placing a sphere with a vertical axis:

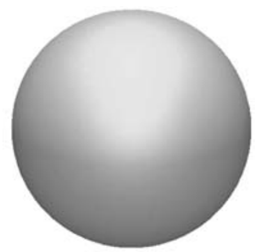
Step 1 *Start* the *Place Sphere* tool.

Step 2 *Rotate* the compass to *Front* orientation, *drag* upward and *data-point* to define the sphere's *radius*.

The sphere displays in wireframe and rendering as shown below.



Wireframe sphere.



Rendered sphere.

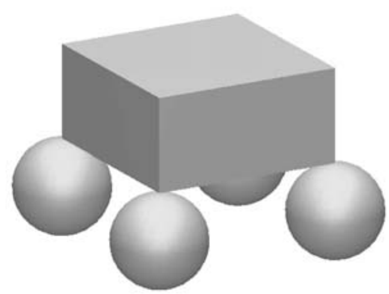
Try placing a few spheres yourself, varying the radius and axis orientation.

Now try this drawing exercise:

Step 1 *Draw* a solid *slab* with dimensions of 12" x 12" x 6" (300 x 300 x 150).

Step 2 *Draw* a *sphere* with a vertical axis and a radius of 3" (75). Draw the sphere away form the slab.

Now copy the sphere to each bottom corner of the slab so that the assembly looks like that at the right.



Spheres snapped at corners.

Step 3 *Start* the *Copy* tool and *snap* to the *north pole* of the sphere.

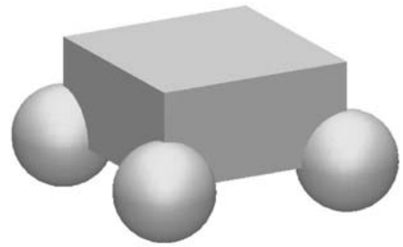
Step 4 *Try* to *snap* copies of the sphere to each corner of the slab.

You will have some difficulty doing this because AccuDraw forces the copies to lie on the compass plane which is not aligned with any of the corners (you looked at this problem in the previous Module). To solve this problem:

Step 5 *Turn AccuDraw OFF* and place the copes again.

You should have no problem this time since the copies are not restricted to the drawing plane. Dynamically rotate the drawing to see that the location of each sphere is correct as I have done in the illustration above.

Step 6 *Delete* the four spheres.
Step 7 *Copy* the original sphere to the *mid point* of each vertical corner of the slab as shown.



Spheres snapped at midpoints.

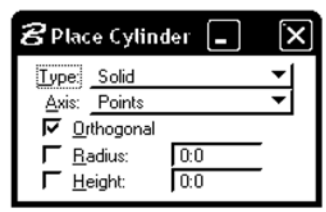
Notice how, in rendered mode, that the spheres *look* as though they have merged with the slab although they are separate elements. You will learn how to merge elements in a later Module.

Try placing a sphere with a radius set in the Tool Settings window.
The sphere displays as soon as you data-point and will dynamically rotate to set the axis orientation.

Turn AccuDraw back ON when you are finished.

4.3 PLACE CYLINDER

An equally simple tool to use.

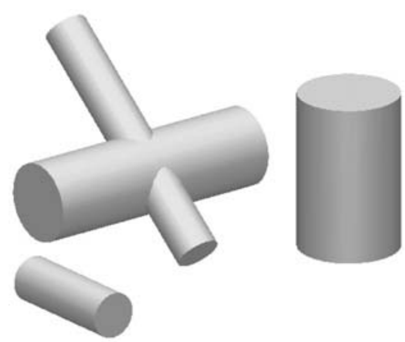


With the Radius and Height OFF in the Tool Settings window:

> *First data-point* locates the *center* of the circular base.
> *Second data-point* defines the *radius* of the base.
> *Third data-point* defines the *height* of the cylinder.

Try placing a few cylinders in your drawing. Draw them in different orientations by rotating the compass after the first data-point.

Try placing cylinders with AccuDraw turned OFF. This is how the thin cylinder passing though the horizontal cylinder on the right was drawn. It is very helpful to draw *construction lines* to use as snap points in complex cylinder orientations such as this.

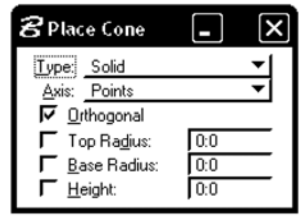


A selection of cylinders.

Presetting the Radius and Height places the cylinder at the first data point, but you must still define the orientation of the cylinder.

Cylinders can be drawn *non-orthogonal* in the same way you did in the Place Slab Section above.

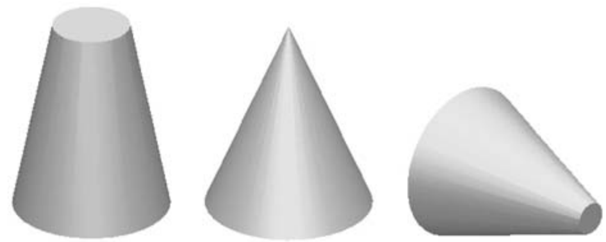
4.4 PLACE CONE



The *Place Cone* tool is similar to the Place Cylinder tool except that there are *separate radius values* for the *base* and for the *top* of the cone.

With the Radius and Height settings OFF in the Tool Settings window:

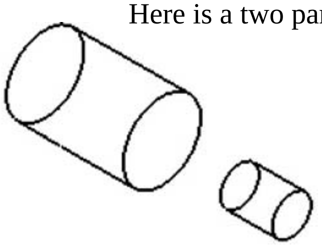
> *First data-point* locates the *center* of the circular *base*.
> *Second data-point* defines the *radius* of the base.
> *Third data-point* defines the *height* of the cylinder.
> *Fourth data-point* defines the *radius* of the *top*.



Capped and pointed cones.

Try placing a few cones to see the tool's action.

Here is a two part exercise that will increase your skills with AccuDraw:



Steps 1 and 2.

Step 1 *Place* a *Cylinder* in *horizontal orientation* with a Radius of 3" (75) and a Height of 9" (225).

Step 2 *Place* a second *Cylinder* with a Radius of 1.5" (35) and a Height of 4" (100). *Align* this cylinder on the *axis* of the *first cylinder* with a *distance* between them of 5" (125) as shown at the left.

Use AccuDraw to make the alignment, rotating the compass as necessary. Confirm the alignment in the Top and Front views.

Now place a cone *between* the two cylinders, using the radii of the cylinders as the reference for the cone:

Step 3 *Start* the *Place Cone* tool and *snap* to the *center* of the *end face* of the large cone.
Step 4 *Rotate* the compass to *Front* orientation.
Step 5 *Data-point* on the *edge* of the *cylinder* to define the first radius of the cone.

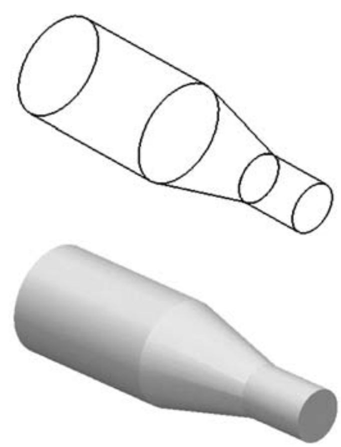
The compass automatically rotates for the height definition.

Step 6 *Snap* to the *center* of the *end face* of the *small cylinder*.

The compass automatically rotates again.

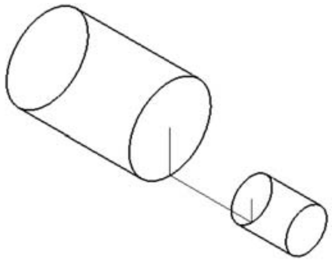
Step 7 *Snap* to the *edge* of the *small cylinder* to define the second radius of the cone.

The cone should now be fitted between the two cylinders.



Steps 3 to 7.

Now try a variation with the same elements. You are going to move the small cylinder so that both cylinders are aligned to their bottom quadrants, then place a non-orthogonal cone between them.

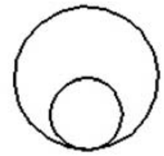


Steps 1 and 2.

Step 1 *Delete* the cone between the two cylinders (or copy the two cylinders).

Step 2 *Move* the small cylinder so that its lower quadrant is aligned with the lower quadrant of the large cylinder.

It is quicker to do this in one of the orthographic views than in the Isometric view. The Right view will work well if you make use of *SmartLock* and the *View* compass orientation. When you are done, the Front view should look like that at the right.



Aligned cylinders

It will help further if you draw three construction lines, shown at the left, to provide snap points for the next operation. The horizontal line snaps to the bottom quadrants of the end faces, and the two vertical lines snap to the circle centers. You don't actually need the lines but they will help for your first try at this operation.

Now place the cone:

Step 3 *Start* the *Place Cone* tool and turn *Orthogonal* OFF.

Step 4 *Snap* to the *center* of the face of the *large cylinder*.

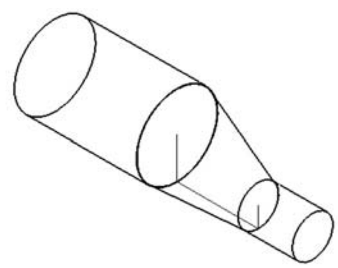
Step 5 *Press* "F" for Front compass rotation and *snap* to the *bottom* of the *vertical line* (lower quadrant of the circle).

The first radius of the cone is now defined and the compass has rotated for the cone's height. However, the tool has invoked *SmartLock* to define the height and you must turn it off before you can snap to the center of the small cone's face:

Step 6 *Drag* the cursor toward the small cylinder and press *Enter* to turn *SmartLock* OFF.

Step 7 *Snap* to the *center* of the small circle.

Step 8 *Snap* to the *end* of the *horizontal line* (lower quadrant of the small circle).



Steps 3 to 8.

What is important to note is that all the snap points are in the *plane* of the two vertical and single horizontal construction lines, and therefore in the plane of AccuDraw's compass. You will have great difficulty using AccuDraw if you don't stay within the appropriate planes. In this case the plane is in the Side compass orientation. Clearly a little thought is required before starting a drawing procedure such as this.

You can avoid the difficulties with AccuDraw by turning it OFF or by using one of the *Axis orientations* in the *Tool Settings* window. Try this drawing again using the *Drawing Y* setting in the *Axis option*. This constraint does essentially the same thing as AccuDraw did above, but does not lock the height to the compass plane. For a further exercise with the Drawing Y setting, move the small cylinder to the left or right of the large cylinder and draw the cone between them. Your drawing should look like that shown at the right.

Offset cylinders.

Pages 4-16 and 4-17 below are typical of the exercises contained in each Module. Each exercise is designed to further the user's skill and knowledge.

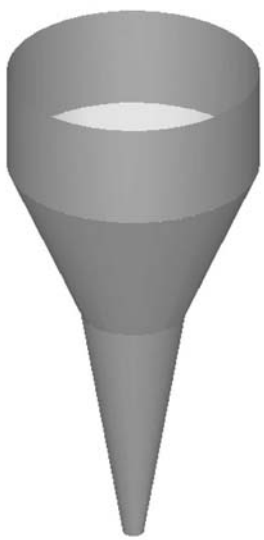
4.8 EXERCISES

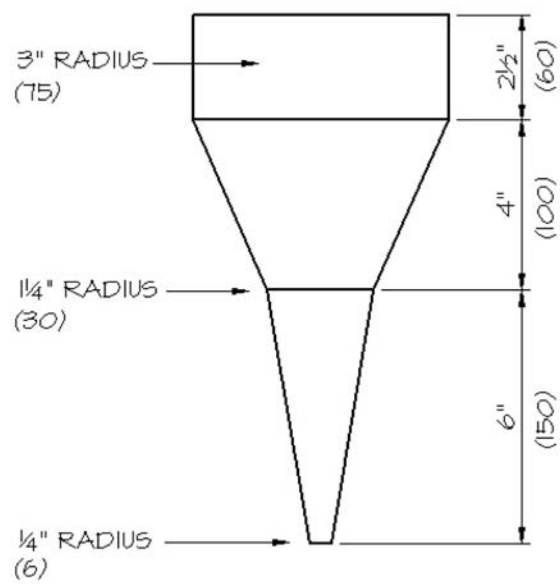
You will find four exercises on the following pages. All contain primitive elements and should provide you with excellent practice.

For some of the exercises you will find it necessary to work in the Isometric *and* Orthographic views, while at least one can be done entirely in a maximized Isometric view. Remember that AccuDraw's drawing plane is an important consideration when placing elements, and that AccuDraw will need to be turned off for some drawing actions.

FUNNEL EXERCISE

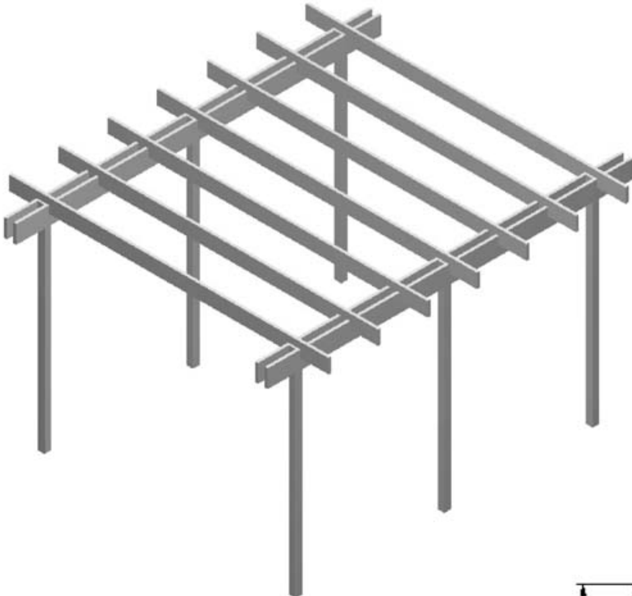
Draw the funnel shown here. The funnel elements must, of course, be Surface types.

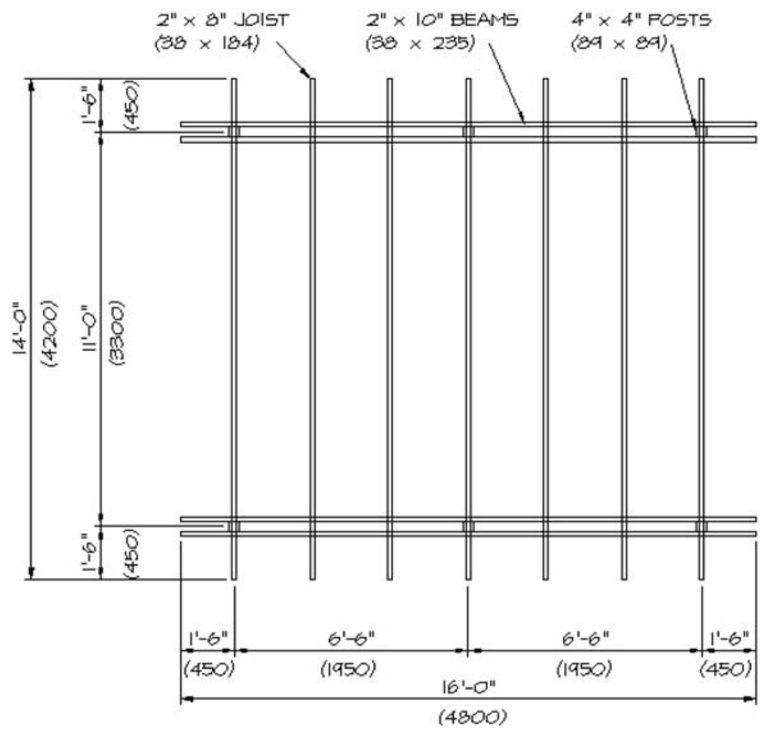




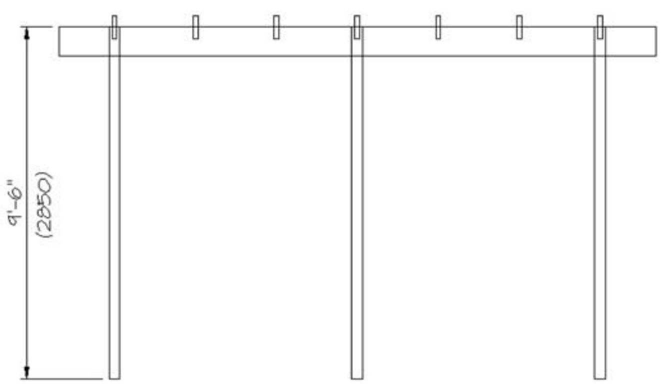
ARBOR EXERCISE

In this exercise on the next page you construct a garden arbor. When drawing this type of design it is helpful to assemble a collection of standard "unit" shapes that can be copied and lengthened to suit the job requirements. For example, if you draw a 2" x 8" (38 x 184) *unit joist* 1'-0" (100 - for easy stretch dimensions) long, you can use that as the *base* for all other such joists in the design. All you need do is *copy* and *stretch* the unit joist to the *length* you need, and you can do this as many times as necessary. You will need three unit items to complete this drawing. At the moment you are restricted to plain end to the joists and beams, but in the next Module you will learn how make end details of any shape.





Plan dimensions.



Elevation dimensions.