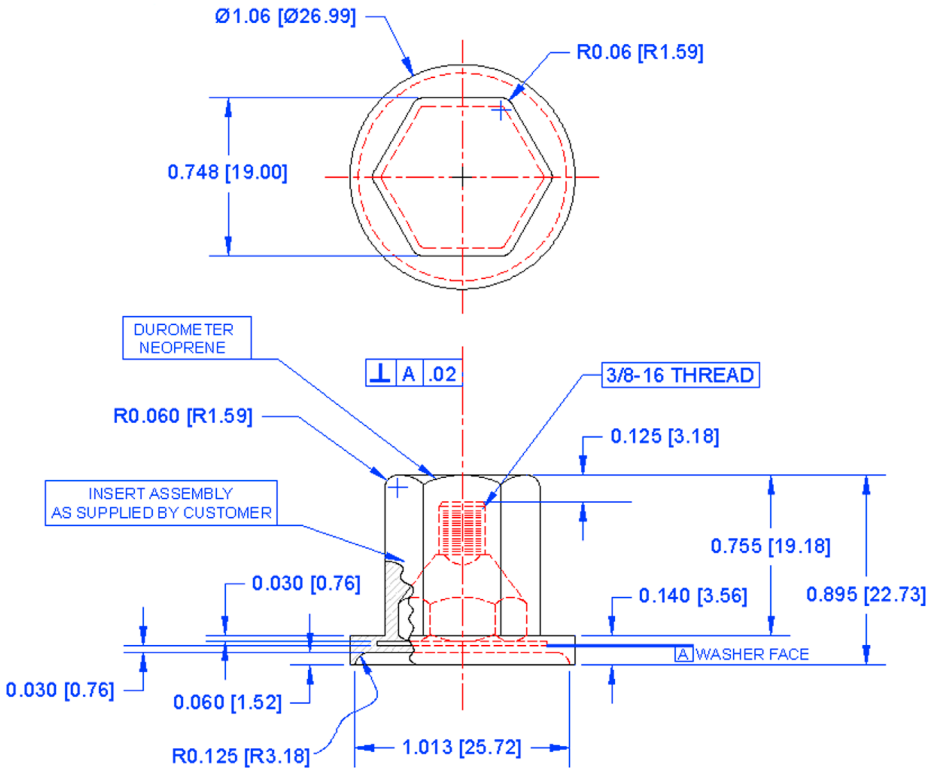
Chapter 6

Dimensions



Learning Objectives

In this chapter, we introduce the first parts of AutoCAD's extensive dimensioning capabilities and discuss the following:

- Linear (horizontal and vertical) dimensions
- Aligned dimensions
- Diameter and radius dimensions
- Angular dimensions
- Continuous and baseline dimensions
- Leader and multileader

Up and Running with AutoCAD 2017: 2D and 3D Drawing and Modeling. DOI: http://dx.doi.org/10.1016/B978-0-12-811058-4.00006-2

- Arc length dimensions
- Jogged and jogged linear dimensions
- Ordinate dimensions
- `ddedit`
- `ddim`
- Dimension units
- Dimension font
- Dimension arrowheads
- Dimension overall size
- Center marks and center lines

At the end of this chapter, you will be able to add dimensions to your floor plan.

Estimated time for completion of this chapter: 3 hours (lesson and project).

6.1 INTRODUCTION TO DIMENSIONS

Dimensioning in AutoCAD is a major topic, one so extensive that it is split into two separate discussions. In this chapter, we address the basics of what dimensions are, which ones are available, and how to use and edit them. In Chapter 13, Advanced Dimensions, we look at extensive customization and additional options and explore some relatively new additions to the dimensioning family: parametric dimensioning and the concept of constraints and dimension-driven design.

So, what are dimensions? They are simply visible measurements for purposes of conveying information to the audience that will be looking at your design. It is how you describe the size of the design and where it is in relation to everything else. Dimensions can be natural, meaning they display the actual value, or forced, when they display an altered value, such as when you dimension an object with a break line.

6.2 TYPES OF DIMENSIONS

The first step in learning dimensions is to know what is available, so you can use the appropriate type in any situation. The primary and secondary dimensions available to you are shown next. Commit them to memory, as you may need most of them on a complex project. AutoCAD 2017 features some rather fast methods for entering basic dimensions. We need to go over these but also mention other ways for those using slightly older releases.

Primary dimensions are the dimensions used most often by the typical architectural or engineering designer:

- Linear (horizontal and vertical)
- Aligned
- Diameter
- Radius
- Angular
- Continuous
- Baseline
- Leader

Secondary dimensions are used less often or are quite specialized but still need to be learned:

- Arc length
- Jogged
- Jogged linear
- Ordinate

Let us first take the primary list then the secondary and discuss the dimensions one by one to understand how each is used. In each case, you need to draw the appropriate shape to practice with, then add the new dimension(s) by following the step-by-step instructions.

As before, we use typing, toolbars, cascading menus, and the Ribbon. Keep in mind however, there are numerous ways to input dimensions into AutoCAD. The preferred methods for AutoCAD 2017 are the Ribbon and command-line typing. As it happens, both approaches lead to the same revised DIM command, which gives you a brand-new "one-touch" method of dimension creation and placement. For users of older versions of AutoCAD (that is, 2015 and older), the closest you have for this is the Quick Dimension (or QDIM). You can also rely on the "legacy" linear methods of selecting placement points for the new dimensions. The number of different methods can be a bit overwhelming, but you will quickly gravitate toward

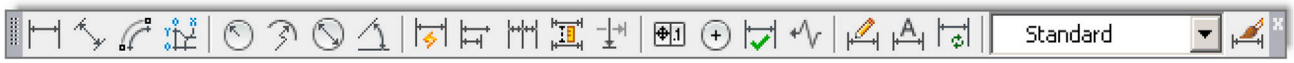


FIGURE 6.1 Dimension toolbar.

one over another. All methods are detailed exhaustively with the first linear dimension, and less so for the other ones, as the approach is quite similar.

If you are a toolbar user, go ahead and open up the Dimension toolbar (Fig. 6.1), adding it to those already on your screen.

Note an important point if typing dimensions: You need to type in `dim` and press Enter. This gets you into the dimension submenu, and you are able to operate with making new dimensions (and related features) but not with any other commands. Simply press Esc to get out of this.

Linear Dimensions

These are any dimensions that are strictly horizontal or vertical (Fig. 6.2). We describe a general approach next, applicable to either the horizontal or vertical dimension, so be sure to practice both of them. Before you begin, create a generic square or rectangle as seen in Fig. 6.2.

Keyboard: Type in **dim** or **qdim** or **dimlinear** and press Enter
Cascading menus: **Dimension→Quick Dimension** or **Linear**
Toolbar icon: **Dimension** toolbar → or
Ribbon: **Annotate** tab→**Dimensions** panel→ or or

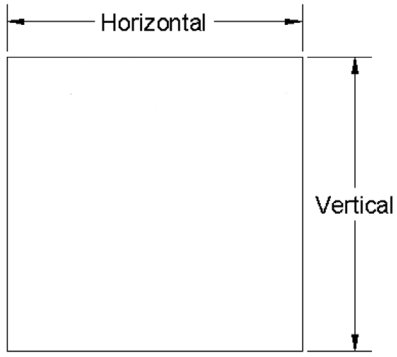


FIGURE 6.2 Linear (horizontal and vertical) dimensions.

For Ribbon or Typing Input (Dim, Primary Method)

Step 1. Press the first Ribbon icon in the command matrix (with the sunburst pattern), or type in `dim` and press Enter.

- AutoCAD says: `Select objects or specify first extension line origin or [Angular/Baseline/Continue/Ordinate/aliGn/Distribute/Layer/Undo]:`

Step 2. Hover the mouse over any vertical or horizontal line making up the square shape. It becomes dashed and a horizontal or vertical dimension appears in "preview" mode; shifting around as you move the mouse.

- AutoCAD says: `Select line to specify extension lines origin:`

Step 3. Click once and drag the dimension out to its appropriate location, just to the outside of the square.

- AutoCAD says: `Specify dimension line location or second line for angle [Mtext/Text/text aNgle/Undo]:`

Step 4. Click one last time to fix the dimension in place.
- AutoCAD says: `Select extension line origin as baseline or [Continue]:`

You are done at this point and can move your mouse to another line that you may wish to dimension. This "one-touch" method of entry was introduced last year for AutoCAD 2016, somewhat speeding up dimensioning, and it continues with AutoCAD 2017.

For Typing, Cascading Menus, Toolbar, or Ribbon Input (Quick Dim, Secondary Method)

Step 1. Type in `qdim` and press Enter, select Dimension→Quick Dimension from the cascading menus, or press the appropriate toolbar or Ribbon icon (with the basic dimension and lightning bolt).
- AutoCAD says: `Associative dimension priority = Endpoint`
  `Select geometry to dimension:`

Step 2. Pick any of the lines of your square, with the entire square becoming dashed.
- AutoCAD informs you: `1 found`.

Go ahead and press Enter.

Step 3. Drag the dimension out to its appropriate location, just to the outside of the square. You will not yet see the actual dimension, only the extension lines, as you move the mouse up and down.
- AutoCAD says: `Specify dimension line position, or [Continuous/Staggered/Baseline/Ordinate/Radius/Diameter/datumPoint/Edit/seTtings] <Continuous>:`

Step 4. Click one last time to fix the dimension in place. You are done at this point and can repeat the command for another location.

For Typing, Cascading Menus, Toolbar, or Ribbon Input (Linear Dim, "Legacy" Method)

Step 1. Type in `dimlinear` and press Enter, select Dimension→Linear from the cascading menus, or press the appropriate toolbar or Ribbon icon (with a basic horizontal dimension).
- AutoCAD says: `Specify first extension line origin or <select object>:`

Step 2. With the ENDpoint OSNAP select one of the corners of the square.
- AutoCAD says: `Specify second extension line origin:`

Step 3. With the ENDpoint OSNAP select any other nearby corner of the square—vertically or horizontally. A dimension appears; go ahead and drag it to its appropriate location.
- AutoCAD says: `Specify dimension line location or [Mtext/Text/Angle/Horizontal/Vertical/Rotated]:`

Step 4. Click one last time to fix the dimension in place. The dimension appears and the command line shows the same value you already saw on the screen (e.g., `Dimension text = 2.8422`).

To summarize, as you just saw, there are essentially three ways to create virtually any dimension. The first is via the relatively new "one-touch" method. This can be done only via the Ribbon and command-line input. This method allows you to begin the dimensioning command and "touch" any geometry you want to dimension, with the appropriate dimension appearing automatically. Second is the `qdim` approach. It has been around for a while and can be accomplished via all four methods of input. It is a bit more cumbersome than Dim, but not by much, giving you the dimensions of some, but not all, geometry selected. It is mostly limited to linear and radius/diameter dimensions. The final version is the much older, but still effective, Linear command. It can also be executed via all four input methods. It requires two points, not a line, to create a linear dimension and takes a bit more time to do.

For users of AutoCAD 2015 and older releases, you can also type in `Dim:`, press Enter, and type in `hor` for a horizontal or `vert` for a vertical dimension, then proceed to place it point by point following the previous Linear description. This method of command input is no longer available for AutoCAD 2017, but that does not matter much, as the more advanced Dim command can handle point-by-point dimension entry just as easily as the "one-touch" approach if you happen to pick corners instead of lines.

In general, linear dimensions are by far the most common in drawings and are also the basis for the continuous and baseline dimensions, to be covered later on. Be sure to run through both the horizontal and vertical linear dimensions, with all methods shown, before settling on one. Next is the aligned dimension, which gives the true distance of a slanted surface. We describe it using the brand new one-touch approach, but the command matrix shows all options.

Aligned Dimension

This dimension measures a slanted line or object, as seen in Fig. 6.3. To practice it, you first need to create a small- to medium-sized square and chop off any corner, as also seen in Fig. 6.3. Only the first Ribbon/typing approach is described in detail, but experiment with the other approaches (listed in the command matrix) if you prefer them.

Keyboard: Type in **dim** or **dimaligned** and press Enter
Cascading menus: **Dimension→Aligned**
Toolbar icon: **Dimension** toolbar
Ribbon: **Annotate** tab→**Dimensions** panel→ or

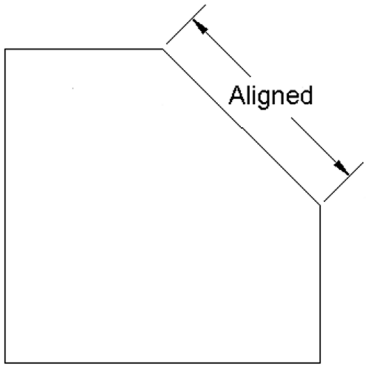


FIGURE 6.3 Aligned dimensions.

Step 1. Press the first Ribbon icon in the command matrix (with the sunburst pattern) or type in `dim` and press Enter.
- AutoCAD says: `Select objects or specify first extension line origin or [Angular/Baseline/Continue/Ordinate/aliGn/Distribute/Layer/Undo]:`

Step 2. Hover your mouse over the slanted line of the square shape. It becomes dashed and an aligned dimension appears in preview mode, shifting around as you move the mouse.
- AutoCAD says: `Select line to specify extension lines origin:`

Step 3. Click once and drag the dimension out to its appropriate location, just outside the square.
- AutoCAD says: `Specify dimension line location or second line for angle [Mtext/Text/text aNgle/Undo]:`

Step 4. Click one last time to fix the dimension in place.
- AutoCAD says: `Select extension line origin as baseline or [Continue]:`

You are done at this point and can move your mouse to another line that you may wish to dimension

The next two dimensions, diameter and radius, are essentially similar, although we cover them separately for clarity. Note the primary differences: the symbol indicating diameter (Ø) and the symbol for radius (R) prior to the value. Although you can set this up, by default there is no line crossing the circle halfway for radius or all the way across for diameter, so you have to read the values carefully and look for the appropriate symbol to know what you are looking at.

Also, note the location of the values. They are positioned at roughly 10, 2, 4, and 8 o'clock relative to the circle. Do not just put them anywhere; hand-drafting rules still apply in CAD, and designers have typically left them in these positions for clarity, consistency, and style.

Diameter Dimension

This dimension measures the diameter of a circle or an arc, as seen in Fig. 6.4. To practice it, you first need to create a small- to medium-sized circle, as also seen in Fig. 6.4. Only the first Ribbon/typing approach is described in detail, but experiment with the other approaches (listed in the command matrix) if you prefer them.

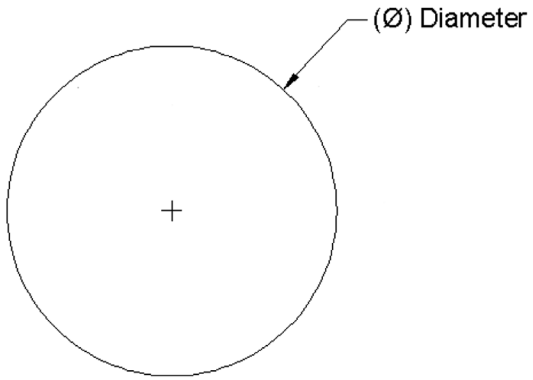


FIGURE 6.4 Diameter dimension.

Keyboard: Type in **dim** or **qdim** or **dimdiameter** and press Enter
Cascading menus: **Dimension→Diameter**
Toolbar icon: **Dimension** toolbar or
Ribbon: **Annotate** tab→**Dimensions panel**→ or or

Step 1. Press the first Ribbon icon in the command matrix (with the sunburst pattern) or type in `dim` and press Enter.
- AutoCAD says: `Select objects or specify first extension line origin or [Angular/Baseline/Continue/Ordinate/aliGn/Distribute/Layer/Undo]:`

Step 2. Hover your mouse over any part of the circle. It becomes dashed and a diameter dimension (along with a center mark) appears in preview mode, shifting around as you move the mouse.
AutoCAD says: `Select circle to specify diameter or [Radius/Jogged/Center mark/Angular]:`

Step 3. Position your mouse somewhere to the upper right of the circle (rarely inside, usually outside) at 2 o'clock or at any of the other accepted positions.
AutoCAD says: `Specify diameter dimension location or [Radius/Mtext/Text/text aNgle/Undo]:`

Step 4. Click one last time to fix the dimension in place. You are done at this point and can move your mouse to anything else that you may wish to dimension. You have a value with a diameter symbol (e.g., `ø2.25`).

Radius Dimension

This is a dimension that measures the radius of a circle or an arc, as seen in Fig. 6.5. To practice it, you first need to create a small- to medium-sized circle (or retain the one you already have), as also seen in Fig. 6.5. Only the first Ribbon/typing approach is described in detail, but experiment with the other approaches (listed in the command matrix) if you prefer them.

Keyboard: Type in **dim** or **qdim** or **dimradius** and press Enter
Cascading menus: **Dimension→Radius**
Toolbar icon: **Dimension** toolbar or
Ribbon: **Annotate** tab→**Dimensions panel**→ or or

Step 1. Press the first Ribbon icon in the command matrix (with the sunburst pattern) or type in `dim` and press Enter.
- AutoCAD says: `Select objects or specify first extension line origin or [Angular/Baseline/Continue/Ordinate/aliGn/Distribute/Layer/Undo]:`

Step 2. Hover your mouse over any part of the circle. It becomes dashed and a radius dimension (along with a center mark) appears in preview mode, shifting around as you move the mouse. *Note an important point:* If AutoCAD shows the diameter dimension (left over from the last attempt) instead of the expected radius, then simply press `r` for `Radius`,

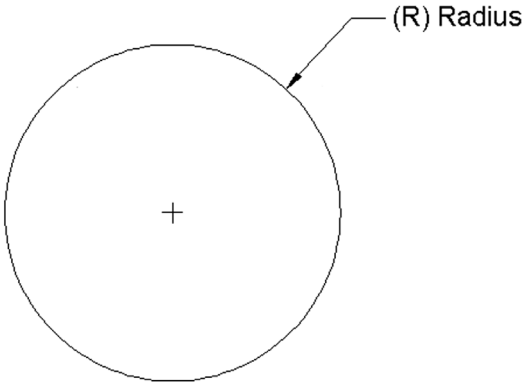


FIGURE 6.5 Radius dimension.

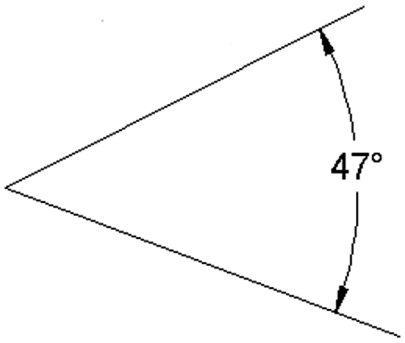


FIGURE 6.6 Angular dimensions.

as seen in the menu that follows, and AutoCAD switches to a radius instantly. The same goes for the other way around, if you are expecting a diameter and get a radius, press `d` when you get to this point.

- AutoCAD says: `Select circle to specify diameter or [Radius/Jogged/Center mark/Angular]:`

Step 3. Position your mouse somewhere to the upper right of the circle (rarely inside, usually outside) at 2 o'clock or at any of the other accepted positions.

- AutoCAD says: `Specify diameter dimension location or [Radius/Mtext/Text/text aNgle/Undo]:`

Step 4. Click one last time to fix the dimension in place. You are done at this point and can move your mouse to anything else that you may wish to dimension. You have a value with an R (e.g., `R1.25`).

Angular Dimension

This dimension measures the angle between two lines or objects, as seen in Fig. 6.6. To practice it, you first need to create two lines at some random angle to each other, as also seen in Fig. 6.6. For this particular dimension command, using the older toolbar icon or the equivalent Ribbon one is easier than the one-touch newer method, so we detail that one only, but experiment with the other approaches (listed in the command matrix) if you prefer them.

Keyboard: Type in **dim** or **dimangular** and press Enter
Cascading menus: **Dimension→Angular**
Toolbar icon: **Dimension** toolbar 
Ribbon: **Annotate** tab→**Dimensions** panel→  or 

Step 1. Begin the angular dimension command via the Ribbon's Angular icon.

- AutoCAD says: `_dimangular`
  `Select arc, circle, line, or <specify vertex>:`

Step 2. Pick the first line (either one).

- AutoCAD says: `Select second line:`

Step 3. Pick the second line, and an angular dimension appears, attached to every move of your mouse.

- AutoCAD says: `Specify dimension arc line location or [Mtext/Text/Angle/Quadrant]:`

Step 4. Drag the mouse out and move it around, selecting the best position for the new dimension and click when you find a spot you like. Be careful, as the supplement of the degree value shows if you move behind the lines, which of course may be desirable in some cases. Upon that final click, AutoCAD gives you a value on the command line that matches what is on the screen (e.g., `Dimension text = 47`).

Note that, if you do use the new one-touch approach, the procedure is more or less the same as in all the previous dimensions, but AutoCAD does not recognize that you are asking for an angle value right away when you touch the first line

and attempts to give you an angular reading. Only when you touch the second line does the software "get it" and gives an angular dimension. So, as stated earlier, in this particular case, the new approach is actually a bit more cumbersome.

Angular completes the basic set of new fundamental dimensions. Next, we have continuous and baseline, which are not really new, as we will see, but rather an extension (or automation) of the linear dimension learned earlier. We then conclude with a leader, not so much a true dimension but a useful member of that family.

Continuous Dimensions

These are continuous *strings* of dimensions, as seen in Fig. 6.7.

A short explanation is in order, as continuous and baseline dimensions sometimes give new students initial problems. Continuous dimensions are nothing more than a string of familiar horizontal or vertical ones. The idea here is to create one of those two types of linear dimensions, then start up the continuous dimension where you just left off and let AutoCAD quickly fill them in as you pick contact points. It is really the same as using linear dimensions over and over again but faster and more accurate since it is partially automated.

The easiest way to practice continuous dimensions is to draw a set of squares attached to each other. These represent a simplified view of building and room walls. Draw one random-sized square and copy it, endpoint (lower left corner) to endpoint (lower right corner), until you have what is shown in Fig. 6.8.

The next step is to draw one horizontal linear dimension, as you already have done (it could have easily been a vertical line, too, if the rectangles were stacked vertically). Locate it about where you would like the entire string to go, as seen in Fig. 6.9.

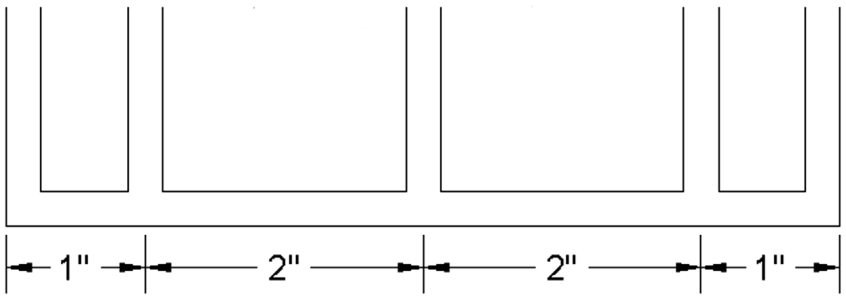


FIGURE 6.7 Continuous dimensions.

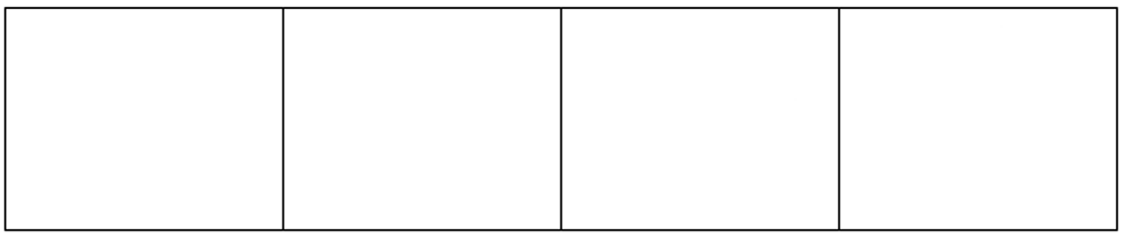


FIGURE 6.8 Setup to practice continuous dimensions.

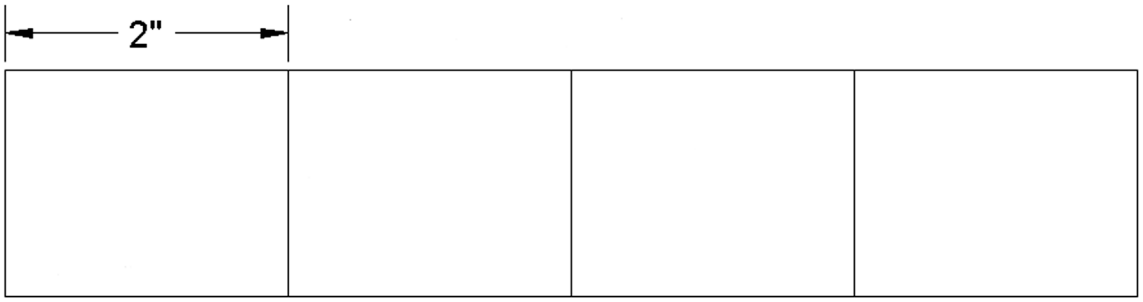


FIGURE 6.9 First step to create continuous dimensions.

This is the essential first step in creating both continuous and baseline dimensions. Note that you *can* create an initial linear dimension then do something else for a while. AutoCAD remembers (at least in most cases) the last place you left off and starts the new string from there. This changes a bit once you create another similar dimension somewhere else. Then, AutoCAD does not know to which one you are referring, so you have to slightly modify your approach and pick the dimension that will be the start of the continuous string. In the instructions to follow, we assume you began to create the string right after making an initial linear dimension.

Keyboard: Type in **dim** or **dimcontinuous** and press Enter
Cascading menus: **Dimension→Continue**
Toolbar icon: **Dimension** toolbar
Ribbon: **Annotate** tab→**Dimensions** panel→

Step 1. Once you have the squares and one linear dimension, as seen in Fig. 6.9, start up the continuous command via any of the preceding methods.

- AutoCAD says: `Specify a second extension line origin or [Undo/Select] <Select>:`

Step 2. A new dimension appears. Pick the *next* point (corner) along the string of rectangles and click on it (always using OSNAP points, no eyeballing).

- AutoCAD says: `Dimension text = 2.0`

Your value, of course, may be different.

Step 3. You can continue this until you run out of objects to dimension; at that point, just press Esc. Your result is shown in Fig. 6.10. Notice how all the values are neatly spaced in a row.

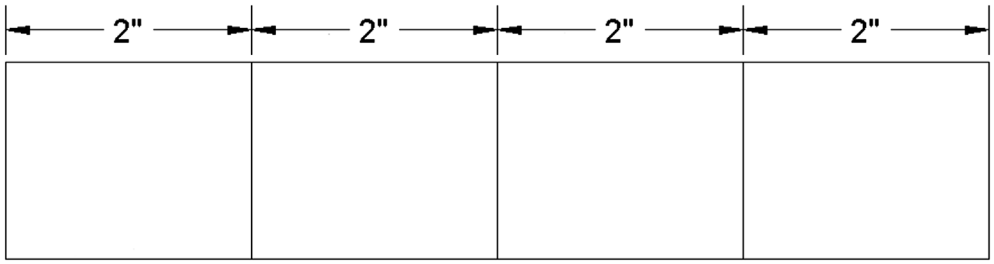


FIGURE 6.10 Continuous dimensions result.

Occasionally (and for a number of reasons), AutoCAD may not automatically know what the source for the continuous string may have been and may ask you to Select continued dimension:. Just pick the linear dimension you wish to serve as the "source" and continue with Step 2 as before.

Baseline Dimensions

These are continuous *stacks* of dimensions, as seen in Fig. 6.11.

The baseline dimension, as mentioned before, is very similar in principle to the continuous dimension. The goal is to make a neat stack of evenly spaced dimensions that all start at one point (the base in baseline). To begin, erase the previous continuous dimensions (leaving the squares) and once again draw one linear (horizontal) dimension, as seen before in Fig. 6.9.

Keyboard: Type in **dim** or **dimbaseline** and press Enter
Cascading menus: **Dimension→Baseline**
Toolbar icon: **Dimension** toolbar
Ribbon: **Annotate** tab→**Dimensions** panel→

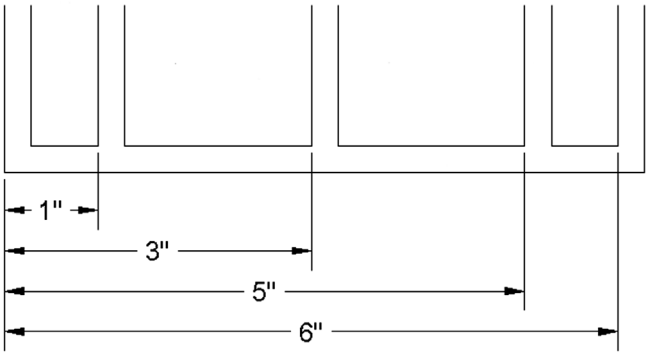


FIGURE 6.11 Baseline dimensions.

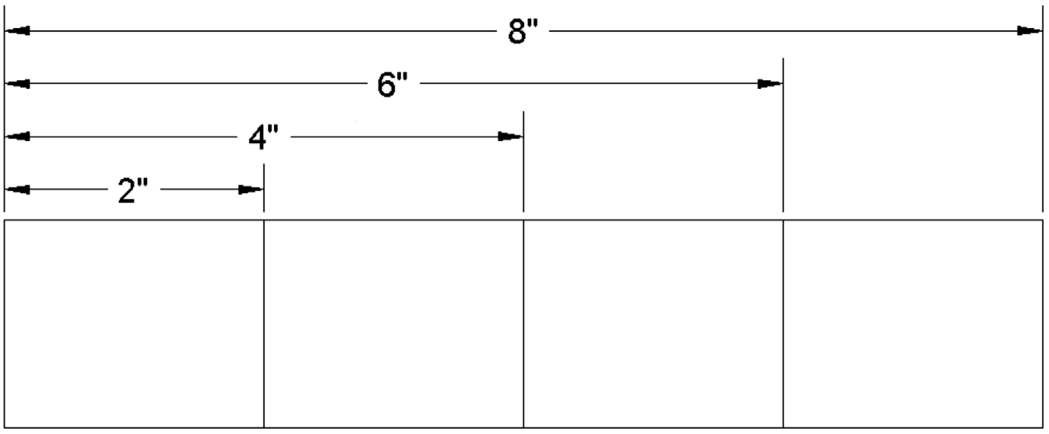


FIGURE 6.12 Baseline dimensions result.

Step 1. Once you have the squares and one linear dimension, start up the baseline command via any of the preceding methods.
- AutoCAD says: `Specify a second extension line origin or [Undo/Select] <Select>:`

Step 2. A new dimension appears. Pick the *next* point (corner) along the string of rectangles and click on it (always using OSNAP points, no eyeballing).
- AutoCAD says: `Dimension text = 4.0`

Your value, of course, may be different.

Step 3. You can continue this until you run out of objects to dimension; at that point, just press Esc. Your result is shown in Fig. 6.12.

Occasionally, just like with the continuous dimension, AutoCAD may not automatically know what the source for the baseline string may have been and ask you to Select base dimension:. Just pick the linear dimension you wish to serve as the "source" and continue with Step 2 as before.

Leader and Multileader

This is an *arrow and label* combination pointing at something (Fig. 6.13).

While a leader is not a true dimension by definition, it is still a very common and necessary member of the dimension family. The values shown by the leader can be not only numerical but also text comments from the designer, concerning the part or object to which it is pointing.

Leaders are so important that AutoCAD has given them a major rework in recent releases. We go over the two main options in increasing order of complexity, starting with the basic leader command, followed by the more feature-rich multileader, with its Add, Remove, Align, and Collect options.

Leader

Step 1. Draw a small box on your screen, making sure Ortho is off. Type in the command leader and press Enter.
- AutoCAD says: `Specify leader start point:`

Step 2. Click with OSNAP precision on your shape, perhaps a midpoint on the top side, as seen in Fig. 6.13.
- AutoCAD says: `Specify next point:`

Step 3. Move your mouse at a 45° angle away from the first point and click again at a reasonable distance away. You create the *leader line and arrowhead* seen in Fig. 6.14.
- AutoCAD says: `Specify next point or [Annotation/Format/Undo] <Annotation>:`

Step 4. Turn Ortho back on and draw a short line to the right, clicking when done; this is your *horizontal landing*, as seen in Fig. 6.15.
- AutoCAD says: `Specify next point or [Annotation/Format/Undo] <Annotation>:`

Step 5. You are done, so press Enter.
- AutoCAD says: `Enter first line of annotation text or <options>:`

Type something in, pressing Enter if you wish to do another line, and Enter again if you are done, as seen in Fig. 6.16.

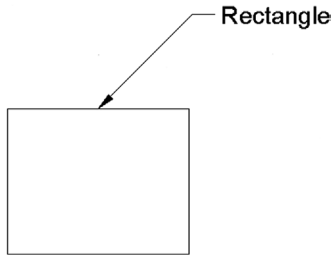


FIGURE 6.13 Leader.

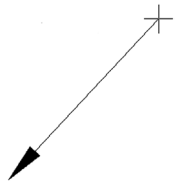


FIGURE 6.14 Leader, Step 3.

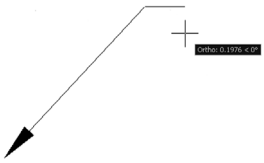


FIGURE 6.15 Leader, Step 4.

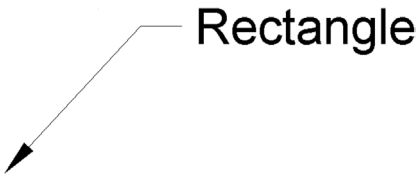


FIGURE 6.16 Leader, Step 5.

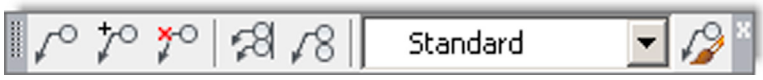


FIGURE 6.17 Multileader toolbar.

Multileader

This method is relatively new and is meant to add more flexibility and usefulness (and inadvertently some complexity) to the leader command. To work with this, you need to bring up the Multileader toolbar, shown in Fig. 6.17.

There is something new to the Multileader that you did not have with the basic leader. You can set up a Multileader style, so all leaders have the exact look you want. In our sample case, we give our Multileader a bubble in which to add text. Press the very last button on the right (mleader with a paint brush) and the dialog box shown in Fig. 6.18 appears.

Press New… and give the Multileader a name, such as `Sample Style`, and press Continue. You are taken to the Modify Multileader Style dialog box (Fig. 6.19). Examine the three tabs, Leader Format, Leader Structure, and Content, carefully. Most of the options are reasonably self-explanatory, and you will see some of them again later on. Under the Content tab, select Multileader type: as Block and Source block: as Detail Callout. Finally, press OK, Set Current, and Close. Now, let us try out our new Multileader style.

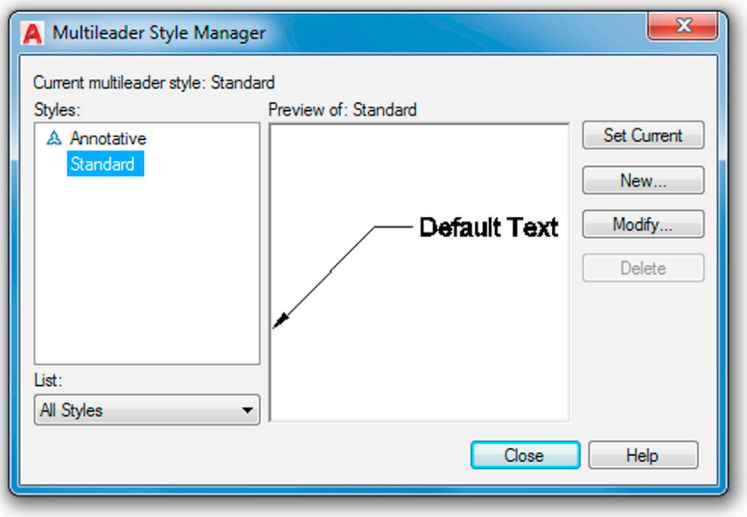


FIGURE 6.18 Multileader Style Manager.

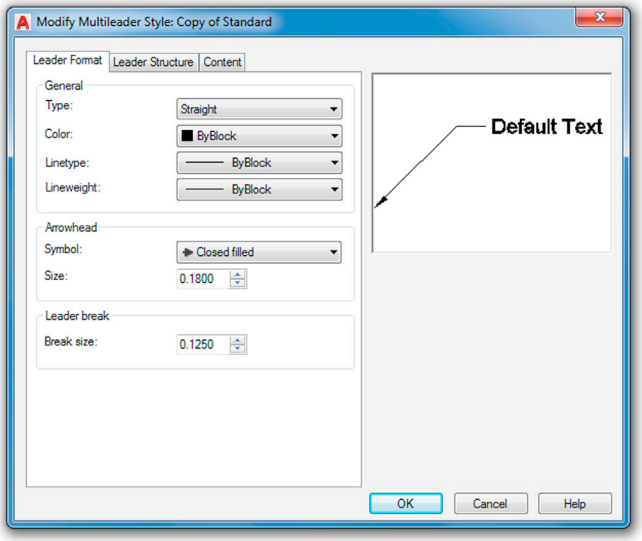


FIGURE 6.19 Modify Multileader Style.

Keyboard: Type in **mleader**
Cascading menus: **Dimension→Multileader**
Toolbar icon: **Multileader** toolbar
Ribbon: **Annotate** tab→**Leaders** panel→

Step 1. Start the Multileader command via any of the preceding methods.

- AutoCAD says: `Specify leader arrowhead location or [leader Landing first/Content first/Options] <Options>:`

Step 2. Click anywhere and extend your mouse (Ortho off) at 45° to the right.

- AutoCAD says: `Specify leader landing location:`

Step 3. Click again to place the Multileader and bubble. You see something like Fig. 6.20.

- AutoCAD says: `Enter view number <VIEWNUMBER>:`

Step 4. Enter in some value.

- AutoCAD says: `Enter sheet number<SHEETNUMBER>:`

Step 5. Enter in another value.

Once you do this, you see the final result (Fig. 6.21), the appearance of which can, of course, be fine-tuned.

Now that you have one leader on the screen, it is easy to experiment with other interesting options. Move across the toolbar, starting first with Add Leader (Fig. 6.22) and get rid of it via Remove Leader. Then, after adding it back in, create a new set of leaders and line them up using Align Multileaders (Fig. 6.23), which aligns the leaders with one that you pick as the primary. Finally, Collect Multileaders (Fig. 6.24) combines them into one string.

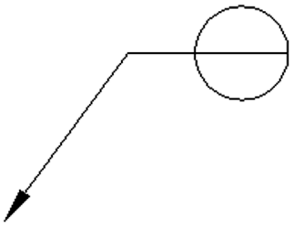


FIGURE 6.20 Multileader.

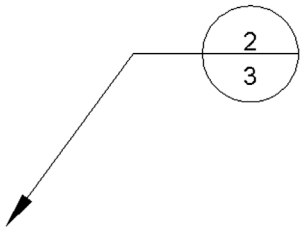


FIGURE 6.21 Multileader with block.

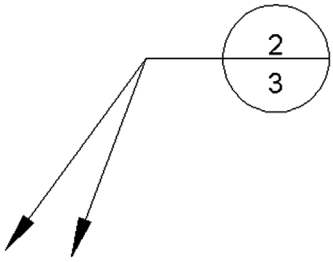


FIGURE 6.22 Add Leader.

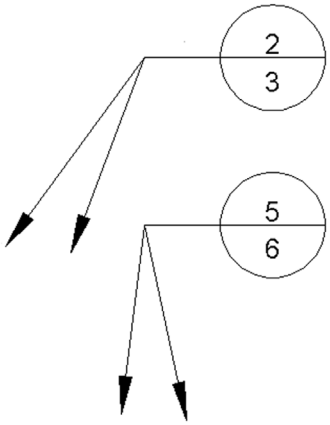


FIGURE 6.23 Align Multileaders.

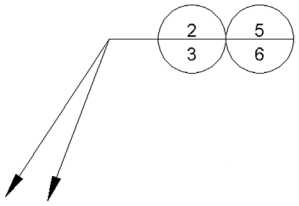


FIGURE 6.24 Collect Multileaders.

Secondary Dimensions

It was mentioned that some dimensions are secondary, meaning they are not used as often. We briefly discuss them here, and you may want to also go over them in detail on your own, especially if you feel one or more of them may be extremely useful to your particular field. They are

- Arc length
- Jogged
- Jogged linear
- Ordinate

Arc length, as you may have guessed, measures the length of an arc. Simply select the toolbar icon and click on the arc you want to measure, as seen in Fig. 6.25. You can place the dimension value outside or inside the arc itself.

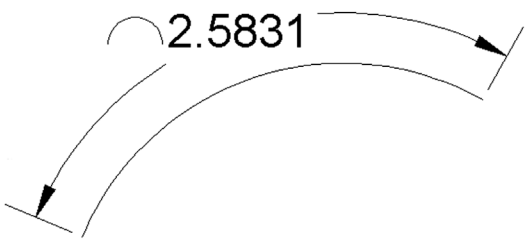


FIGURE 6.25 Arc length dimension.

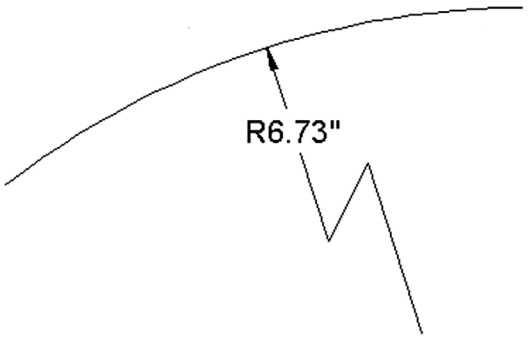


FIGURE 6.26 Jogged dimension.

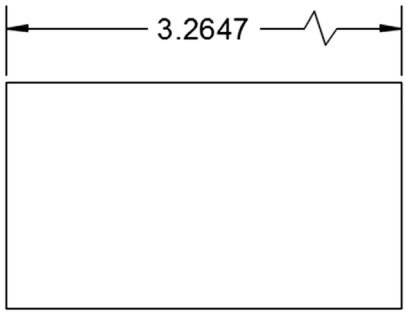


FIGURE 6.27 Jogged linear dimension.

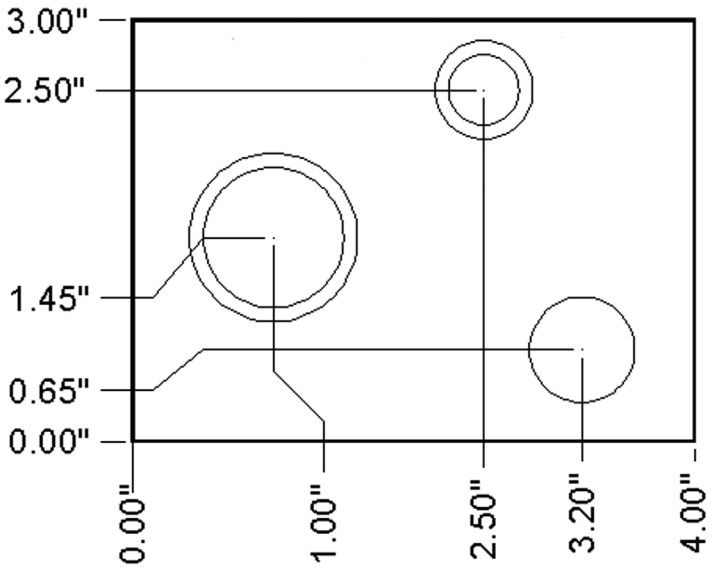


FIGURE 6.28 Ordinate dimension.

Jogged dimensions are useful when the radius or diameter dimension's center is off the sheet of paper and cannot be shown directly, so a "break line" of sorts is used. You simply select the arc or circle then the center location override, and a jogged dimension appears (Fig. 6.26).

Jogged linear dimensions are useful for representing break lines in a linear format. Jogged linear is not a dimension type as much as a modification to a linear (horizontal, vertical, or aligned) dimension. To try it out, create a horizontal dimension, as you have done numerous times before, and press the Jog linear icon on the Dim toolbar or Ribbon Dimensions panel (it is also available in the Dimension cascading menus). Then, click the dimension line of the linear dimension you wish to modify and one more click to position the jog. If you do not select a location for it, AutoCAD will do it for you. The final result is seen in Fig. 6.27.

Ordinate dimensions (Fig. 6.28) measure horizontal or vertical distances from a datum point (0,0 in this case). They are used in manufacturing to prevent accumulation of errors that can occur using continuous measurements. Draw the shapes shown in Fig. 6.28, positioning the lower left corner of the rectangle at 0,0, and begin the ordinate dimension. Then, click major points along the way in either horizontal or vertical directions to get precise values at that location from the origin.

There are other dimension options we have not yet explored. We come back to them in Level 2. For now, we must move on and learn how to do editing and customizing.

6.3 EDITING DIMENSIONS

You should now be quite familiar with the types of dimensions available and how to apply them to basic shapes. The next step is to be able to edit them or change their values, if needed. This is a very simple and short topic.

You already learned that you can edit text and mtext by double-clicking on it. The text in the dimensions is essentially editable mtext, so go ahead and double-click any part of the dimension to edit it. Recall also, in Chapter 4, Text, Mtext, Editing, and Style, we covered `ddedit` and mentioned it was also useful for editing purposes. You can use that command as well, and indeed with AutoCAD versions prior to 2013, you needed to use `ddedit`, as double-clicking on the dimension brings up the Properties palette. The "issue" was resolved for later releases.

What happens next depends on whether you have the Ribbon on your screen or not. If you do not, then you see the basic mtext editor, as in Fig. 6.29. You can just edit the value and press OK. If you do have the Ribbon active, then the editing field appears but not the rest of the mtext editor, with the Ribbon's Text Editor tab highlighted instead.

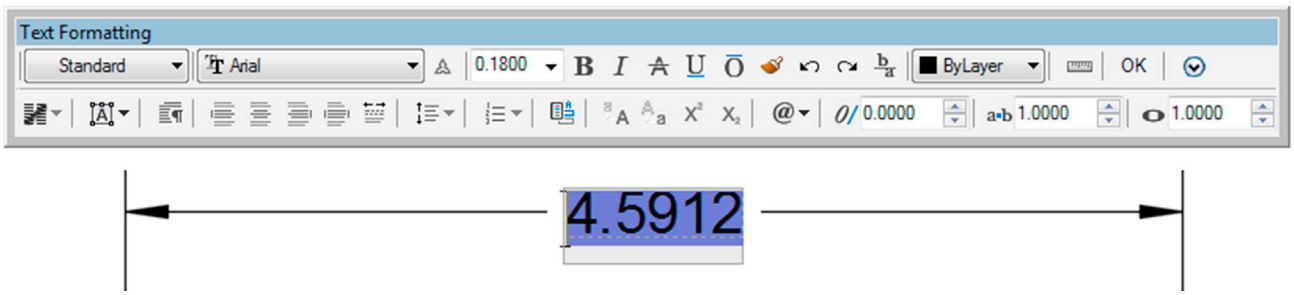


FIGURE 6.29 Mtext edit of dimensions.

Here is a useful tip. If you want to reset your forced dimension value back to its natural value and you forgot what that was, just type in <>. These two "alligator teeth" brackets restore the natural value. Type them in instead of the forced value and click on OK. Try it yourself.

6.4 CUSTOMIZING DIMENSIONS

We have one more topic to cover on our way to proficiency in basic dimensioning. It is customization; and as mentioned at the start of this chapter, it is an extensive subject, necessitating it being split into the fundamentals here and advanced customization in Chapter 13, Advanced Dimensions. The goal here is to learn what experience has shown to be the most important four customization tools. This allows you to be productive in most of the drafting situations you are likely to encounter as a beginner. Later, you will add to this knowledge by learning tools used by CAD administrators and senior designers.

So, what customization is necessary at this level? We need to learn how to

- Change the *units* of the dimensions.
- Change the *font* of the dimensions.
- Change the *arrowheads* of the dimensions.
- Change the *fit* (size) of the dimensions.

To be able to change any of these, we need to introduce a new tool, the Dimension Style Manager dialog box, or *dimstyle* for short. There, you find a button to bring up the Modify Dimension Style dialog box. It is a "one-stop-shopping" dialog box for dimension modification that you will eventually need to learn backward and forward.

Dimstyle

Keyboard: Type in **dimstyle** or **ddim**
Cascading menus: **Dimension→Dimensions Style…**
Toolbar icon: **Dimension** toolbar
Ribbon: **Annotate** tab→**Dimensions** panel→ **arrow**

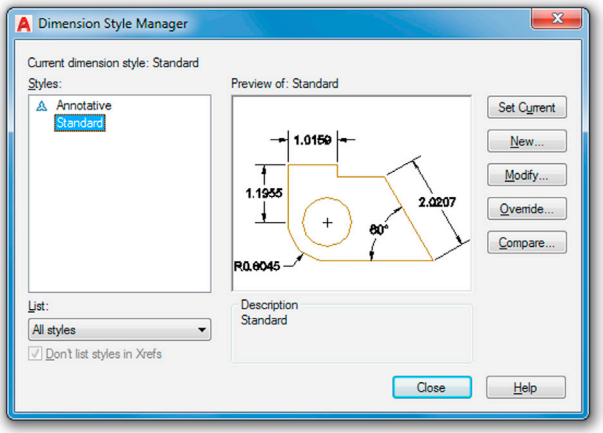


FIGURE 6.30 Dimension Style Manager.

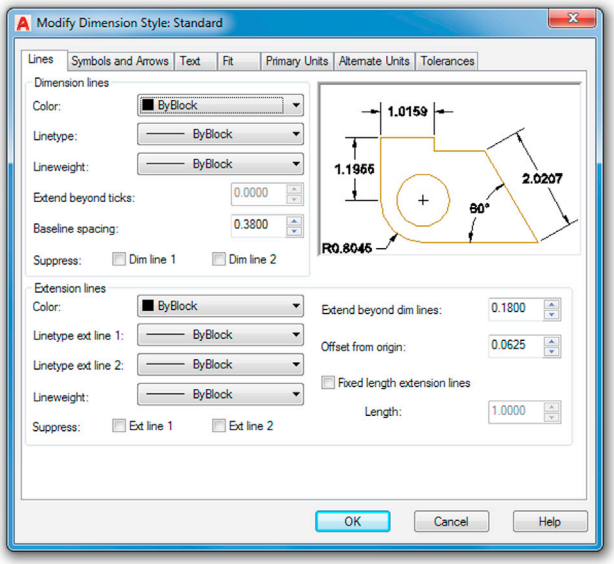


FIGURE 6.31 Modify Dimension Styles (Lines tab).

Using any of the preceding methods, bring up the Dimension Style Manager, as seen in Fig. 6.30.

The Dimension Style Manager dialog box has some options for creating a new dimension style or just modifying an existing one. For us at this point, it really does not matter which we pick, so just press Modify….

You then are taken to the Modify Dimension Style dialog box, shown in Fig. 6.31. Note that you may not necessarily see the Lines tab as the open tab, as seen in Fig. 6.31. If you do not, just click on it to have the same thing on your screen as what is in the text.

This rather imposing dialog box contains tools to significantly modify any dimension. We, in fact, do so in Chapter 13, Advanced Dimensions, as we explore nearly every feature. For now, we just want to focus on learning how to modify the handful of items shown in the bulleted list at the start of Section 6.4.

Step 1. Change the Units of the Dimensions

Pick the Primary Units tab and simply select the drop-down menu at the very top left, where it says Unit format:. The default value is Decimal; change it to Architectural and select the appropriate Precision in the menu just below it (the default value is fine). That is all we need from that tab for now. Notice how the preview window on the upper right reflects your choice of units, as seen in Fig. 6.32.

Step 2. Change the Font of the Dimensions

To do this you need to click on the Text tab. You then see Text style: on the upper left. If you just opened a new AutoCAD file to practice dimensions, you probably do not have a font set and get only Standard as your choice if you click the down arrow. Fortunately, Standard is now a more attractive Arial font, not the stick-figure Simplex it used to be, so changing fonts is optional but still useful to know. For example, the RomanS font is a popular alternative.

Something else to keep in mind is that, in a real working drawing, you would likely set your text style before you work on any dimensions (an important point, take note). Then, you would just select the font from the list. The idea here is to match up your regular font used in text and mtext with the font used in dimensioning, another important point. In general, you should stick to one font in a given drawing and just vary the size as needed. The title block is exempt from this, as that may have special fonts, logos, and the like.

AutoCAD, of course, anticipates that you may not have set a font style when you first set up dimensions and allows you to do this from the Text tab by bringing up the Style box when you click on the button just to the right of the Text style menu (with the three dots, …). Go ahead and set a different font if you wish, RomanS 0.25″ perhaps, and the new setting appears, as seen in Fig. 6.33.

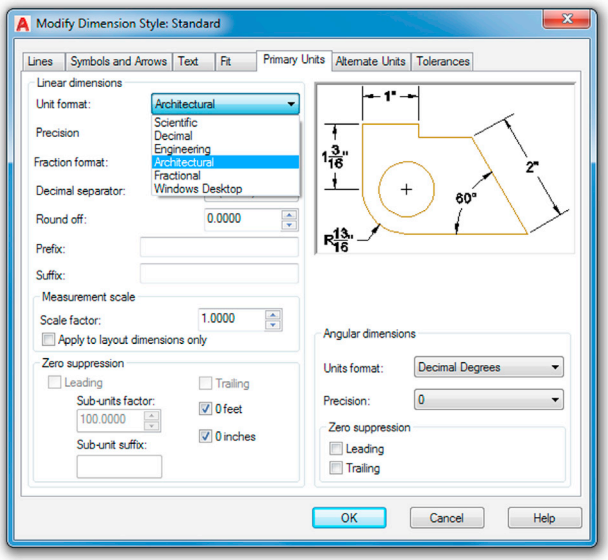


FIGURE 6.32 Selecting Architectural units.

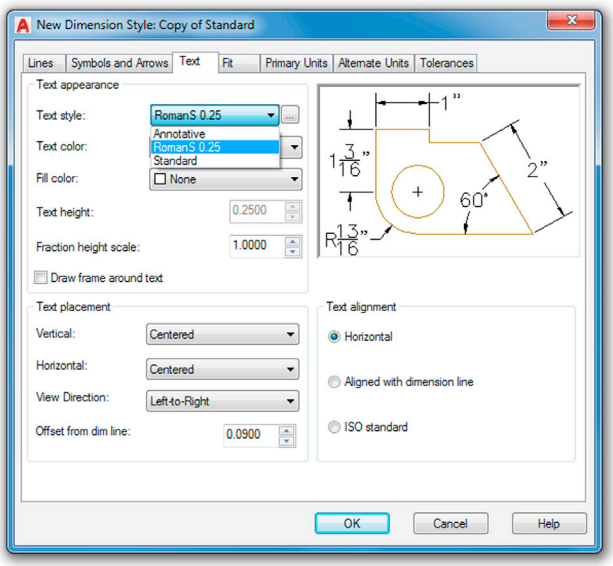


FIGURE 6.33 Setting a new font.

Step 3. Change the Arrowheads of the Dimensions

The default for all dimensioning is the standard arrowhead. You can easily change that to any other type, including the Architectural tick, popular with architects. You can even create a custom arrowhead (not something we try to do here).

Click over to the Symbols and Arrows tab. In the upper left corner under the Arrowheads section, you see First:. That is the first arrowhead type, and if you change it, AutoCAD assumes you want the second one to be the same and changes it as well. Simply click the down arrow and select the Architectural tick. Leave everything else the same. The result is shown in Fig. 6.34.

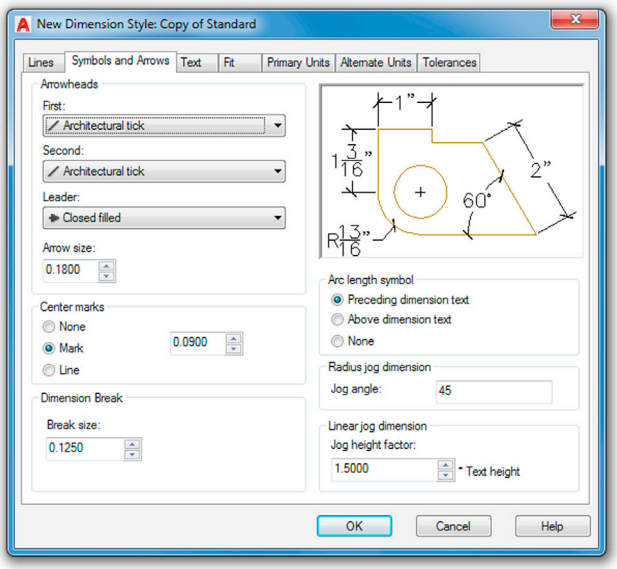


FIGURE 6.34 Changing the arrowheads.

Step 4. Change the Fit (Size) of the Dimensions

This function is quite important. Located in the Fit tab, just underneath the preview window, it features only a few lines and is shown in Fig. 6.35.

The idea here is to increase the size of the dimensions proportionately, so everything scales up evenly and smoothly in step with the size and scale of your overall drawing. This concept, however, opens up a number of questions. Chief among them: What value do you enter there and why? We are not ready to discuss this yet, but we do in Chapter 10, Advanced Output—Paper Space (on paper space). So, for now, do not enter in anything but be aware of how to do it when needed. When you get to dimensioning the floor plan in the next section, enter `15` in that space.

This is it for now; just click on OK and AutoCAD returns you to the Dimension Style Manager, where you can just press Close. Try creating a dimension and see what it looks like now. Fig. 6.36 shows a set of horizontal dimensions before the changes we just went through and another one afterward. The difference is obvious. For now, this is all you need to make professional-looking dimensions. Review and memorize everything you learned.

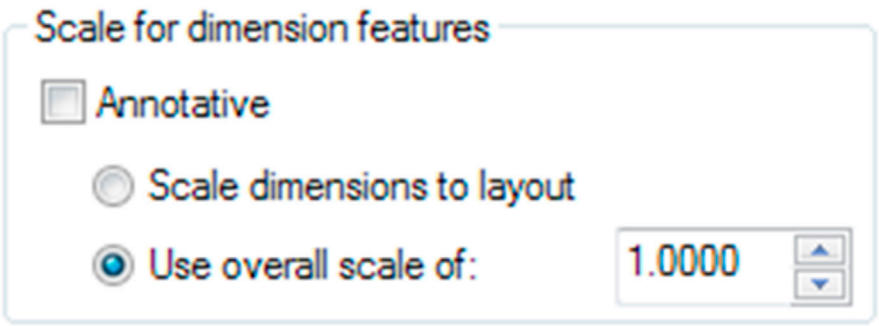


FIGURE 6.35 Scale for dimension features.

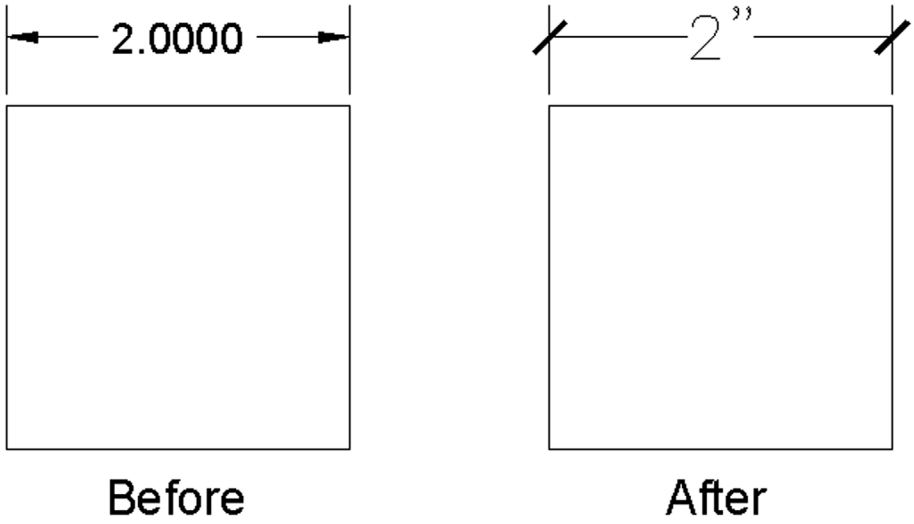


FIGURE 6.36 Scale for size of dimension.

6.5 CENTER MARKS AND CENTERLINES

This feature is new for AutoCAD 2017 and is a very welcome addition. For years creating center marks and especially centerlines was a somewhat tedious process that involved a few steps. A simple example of creating circle centerlines is shown in Fig. 4.18 back in Chapter 4, Text, Mtext, Editing, and Style. Good drafting practice requires these centerlines to be even and properly centered, with use of the correct linetype. A typical example of two circular and one rectangular part with centerlines is shown in Fig. 6.37.

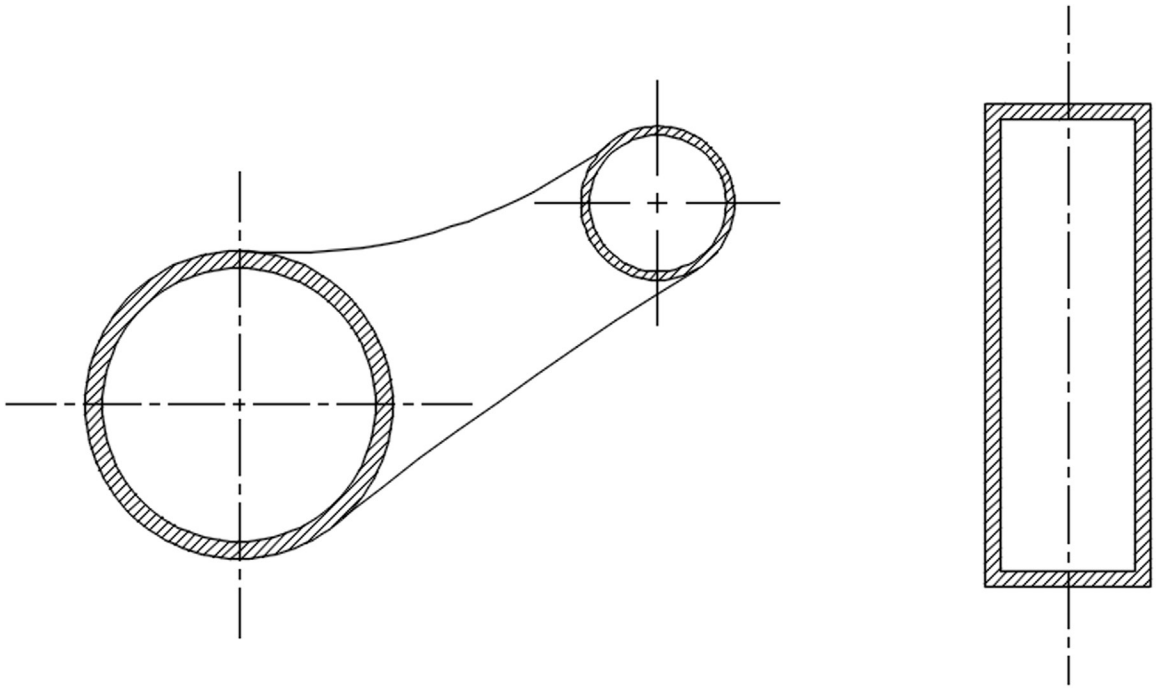


FIGURE 6.37 Centerlines in use.

These center marks and centerlines can now be created quickly and easily with just a few clicks—though what you will get will be default centerlines, that use the Center2 linetype, and of a fixed size relative to the part you are annotating. If you need something different, outside those parameters, including an actual center mark, things do get slightly more involved. The command is still a big time-saver and definitely speeds up the process.

To try this out, first create a few circles, then for some variety, a rectangle and a pair of parallel lines, as seen in Fig. 6.38. Next, locate the new buttons on the Ribbon, under the Annotate tab, Centerline panel, as seen in Fig. 6.39.

Go ahead and click the Center Mark button. AutoCAD says: `Select circle or arc to add centermark:` at which point, just click each of the circles. In the same manner select the Centerline button and select the parallel lines (both the rectangle and free drawn). The result is shown in Fig. 6.40.

These centerlines are editable via grips, and of course, additional options are available to customize them further. In Fig. 6.41 a double-click of the centerline brought up the options palette, and two of the extensions have been changed to a new length and color.

Some additional commands to control center mark and center line appearance include

- CENTEREXE: This controls the length of extension line overshoot (the amount of line outside of the shape). Determining what looks right may require some trial and error. Setting a value here will then apply it to all future centerlines. The ones already created remain the same until manually updated.

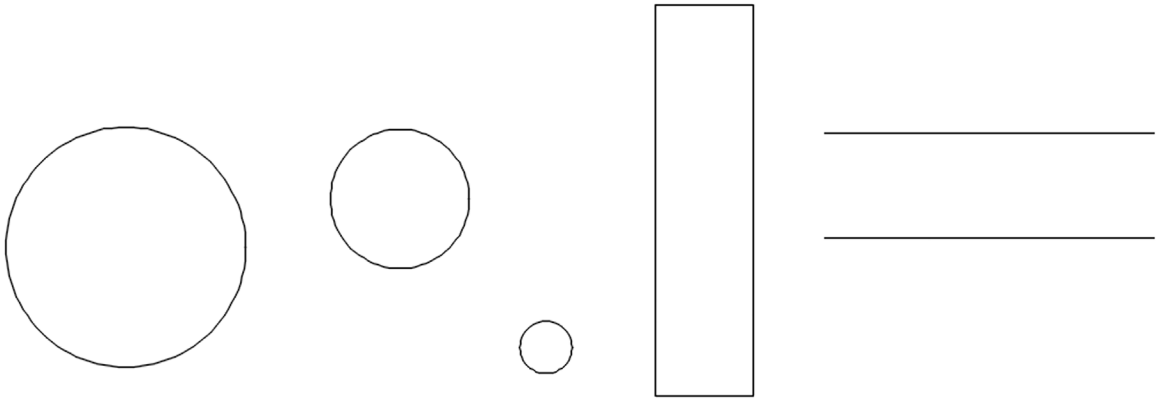


FIGURE 6.38 Basic shapes for center mark and center lines.

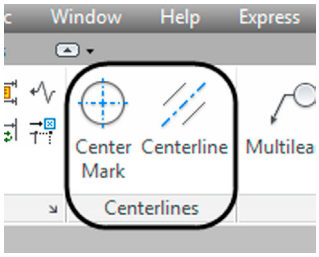


FIGURE 6.39 Centerlines panel.

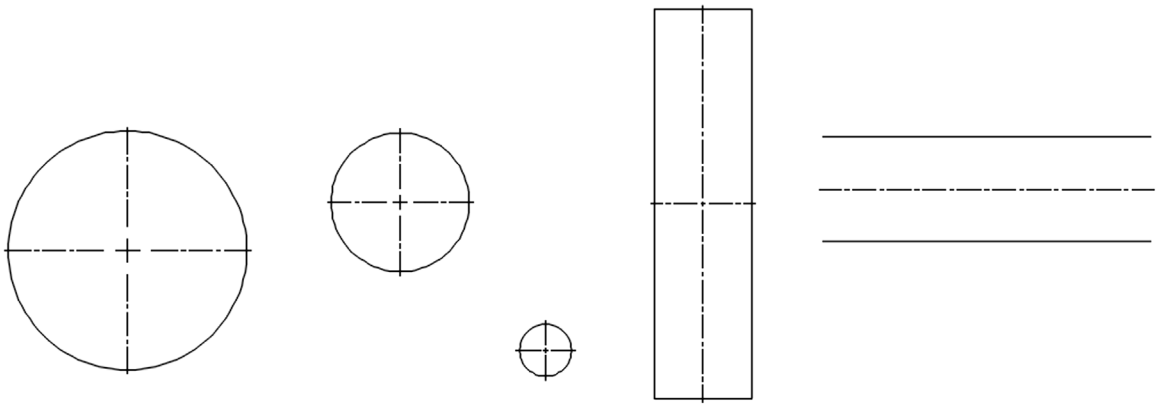


FIGURE 6.40 Completed centerlines.

- CENTERMARKEXE: This command creates true center marks, with no extension lines (basically a small "plus" sign inside the circle). It is of the On/Off variety; either it is a center mark or a centerline. Setting a value here applies it to all future marks. The ones already created remain the same until manually updated.
- CENTERLTYPE, CENTERLAYER, and CENTERLTSCALE: These specify the linetype, layer, and linetype scale, respectively. Enter the desired type, layer, and scale when promoted. The settings apply globally to all future center marks or centerlines. The first two items can also be entered locally on a case-by-case basis via the properties palette seen in Fig. 6.41.

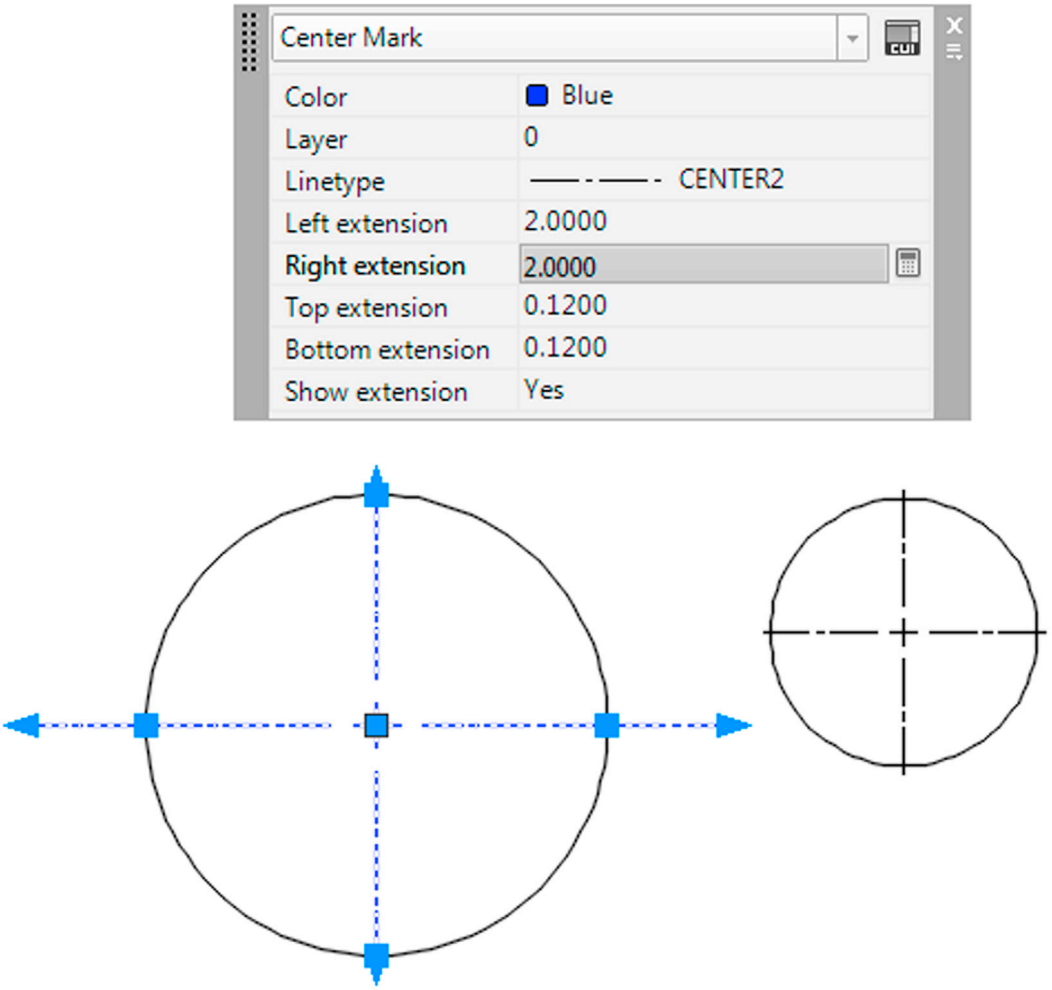


FIGURE 6.41 Manual modification of centerlines.

There are a few more of these commands, and the full listing can be found in the Help files, but these are the essential ones need to customize this useful new feature of AutoCAD. Some of these commands hint at what are called *system variables*. We mention them again in Chapter 15, Advanced Design and File Management Tools.

6.6 IN-CLASS DRAWING PROJECT: ADDING DIMENSIONS TO FLOOR PLAN LAYOUT

Let us now apply what we learned to the floor plan. Open the file and freeze all the layers except the walls and windows. If you really want to get fancy, put the wall solid hatch on its own (visible) layer and freeze the regular floor hatch layer so the carpeting and floors do not show. Next, create a new layer for the dimensions, `A-Dim`. Finally, set up the dimensions: Use Architectural units and Arial 6″ font, leave the arrowheads as they are, and change the scale under the Fit tab to `15`. Dimension the floor plan any way you want; what is shown in Fig. 6.42 is a guide but not the only way to do it. Note that the outer dimensions are continuous.

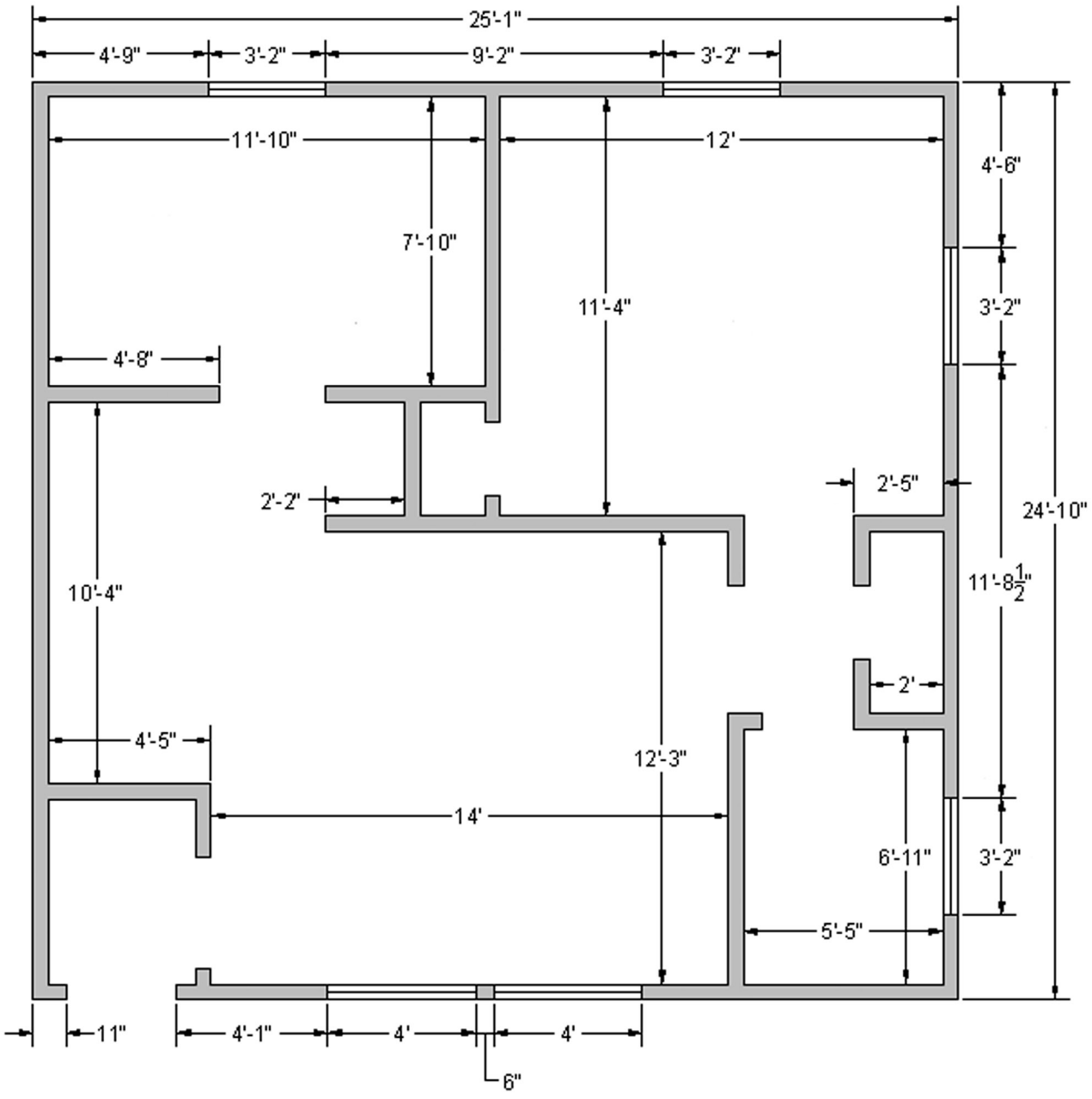


FIGURE 6.42 Adding dimensions to floor plan.

6.7 SUMMARY

You should understand and know how to use the following concepts and commands before moving on to Chapter 7, Blocks, Wblocks, Dynamic Blocks, Groups, and Purge:

- Dimensions
  - Linear (horizontal and vertical)
  - Aligned
  - Diameter
  - Radius
  - Angular
  - Continuous
  - Baseline
  - Leader and multileader
  - Arc length
  - Jogged
  - Jogged linear
  - Ordinate
- Editing dimension values
  - ddedit
  - The effect of <>
- `ddim` command
- Dimension units
- Dimension font
- Dimension arrowheads
- Dimension overall size
- Center marks and centerlines

Review Questions

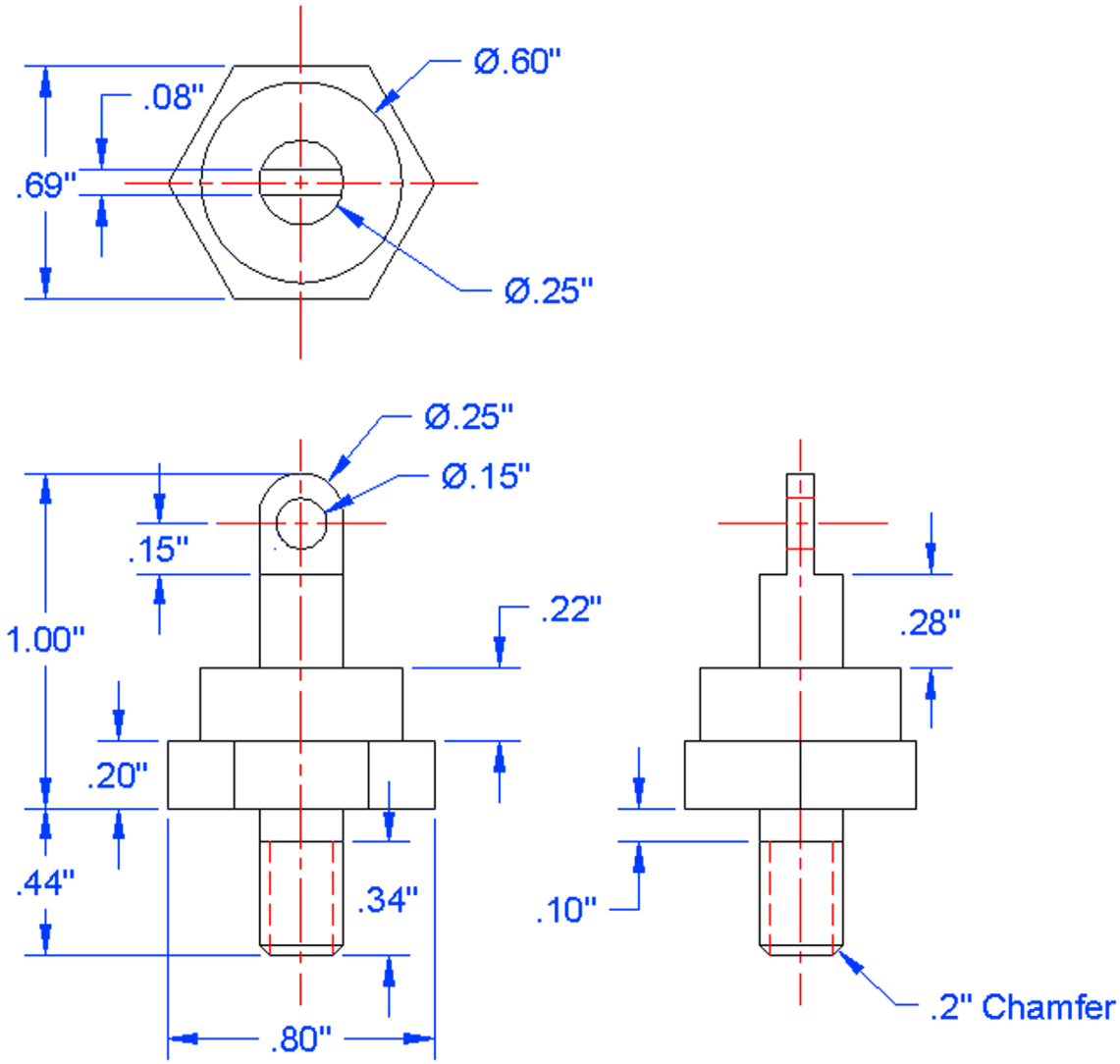
Answer the following based on what you learned in this chapter:

1. List the 11 types of dimensions discussed.
2. What command is best for editing dimension values?
3. What is the difference between natural and forced dimensions?
4. How do you restore a natural dimension value when you have forgotten what it was?
5. List the four items that needed to be customized in our dimensions.
6. What command brings up the Dimension Style Manager?
7. What type of arrowhead do architects usually prefer?

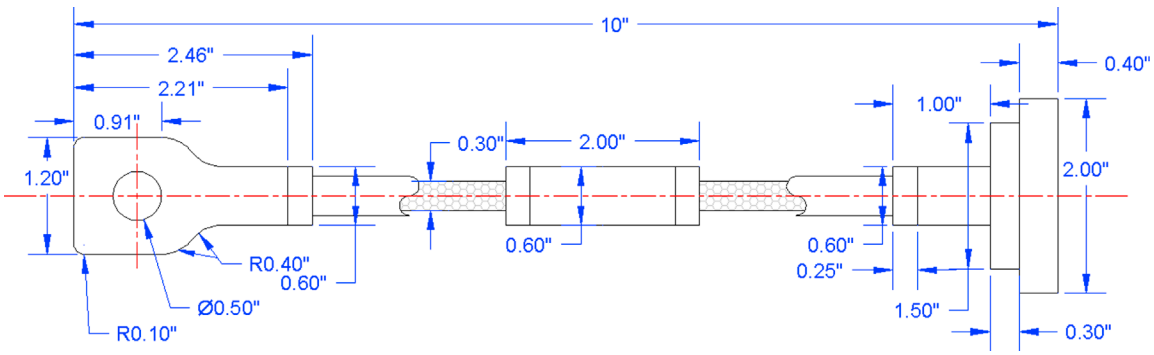
Exercises

1. Retrieve Exercises 2, 3, 4, 5, and 6 from Chapter 3, Layers, Colors, Linetypes, and Properties, then set up and add all shown dimensions. (Difficulty level: Easy; Time to completion: 10 minutes/exercise.)
2. Retrieve Exercises 5, 6, 7, 8, and 9 from Chapter 4, Text, Mtext, Editing, and Style, then set up and add all shown dimensions. (Difficulty level: Easy; Time to completion: 10–15 minutes/exercise.)
3. Retrieve Exercises 5, 6, 9, and 10 from Chapter 5, Hatch Patterns, then set up and add all shown dimensions. (Difficulty level: Easy; Time to completion: 10–15 minutes/exercise.)

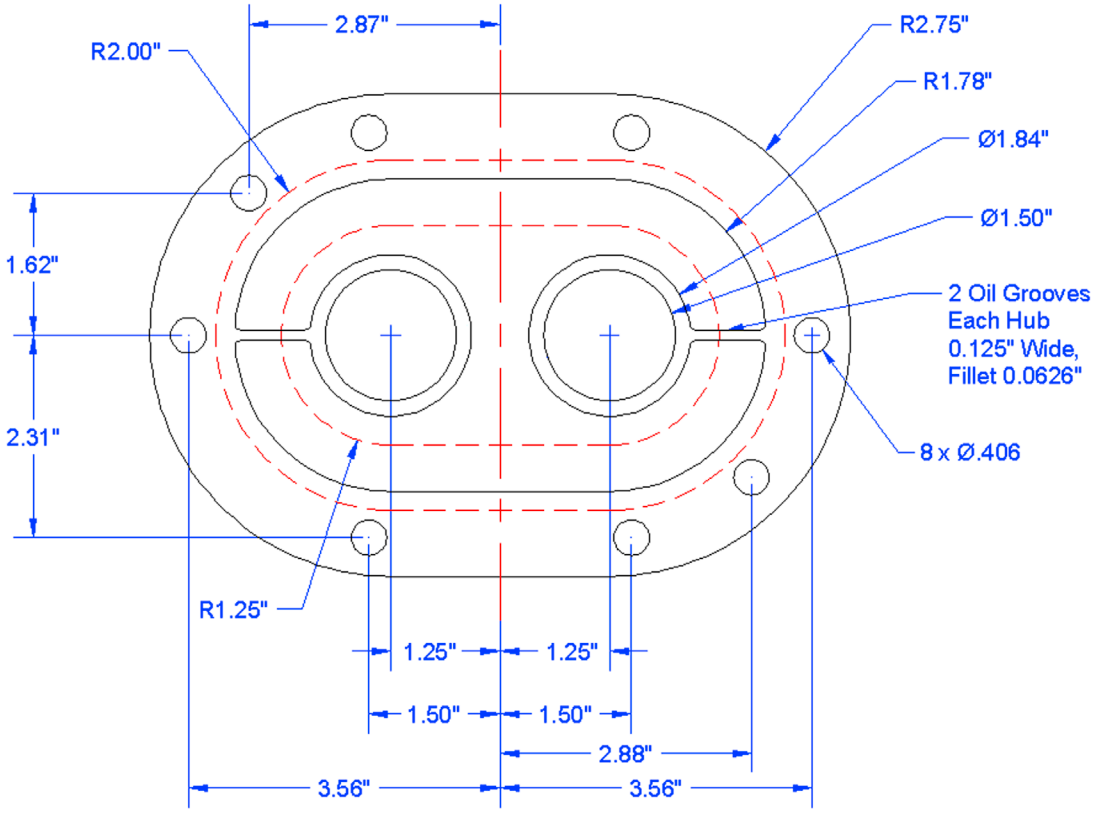
4. In a new file, set up the appropriate layer, colors, and linetypes. Then, draw and fully dimension the following mechanical part. Select Decimal as the dimstyle, with a precision of 0.00 and inch symbols (") for a suffix. (Difficulty level: Easy/Moderate; Time to completion: 35–45 minutes.)



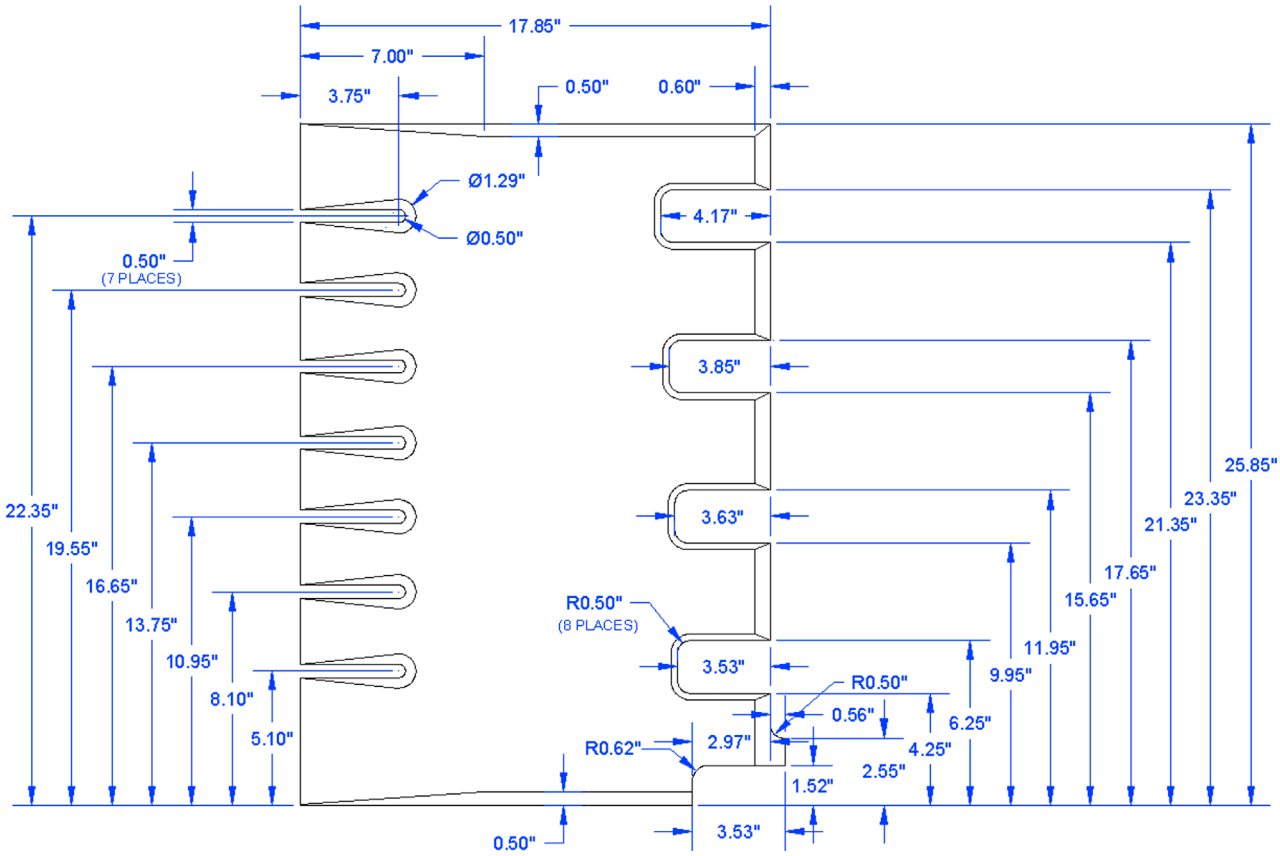
5. In a new file, set up the appropriate layer, colors, and linetypes. Then, draw and fully dimension the following mechanical part. Select Decimal as the dimstyle, with a precision of 0.00 and inch symbols (") for a suffix. Make careful use of mirror to minimize redundant work. All sizing is based on the smallest two circles and their position from an arbitrary centerline. (Difficulty level: Moderate; Time to completion: 35–45 minutes.)



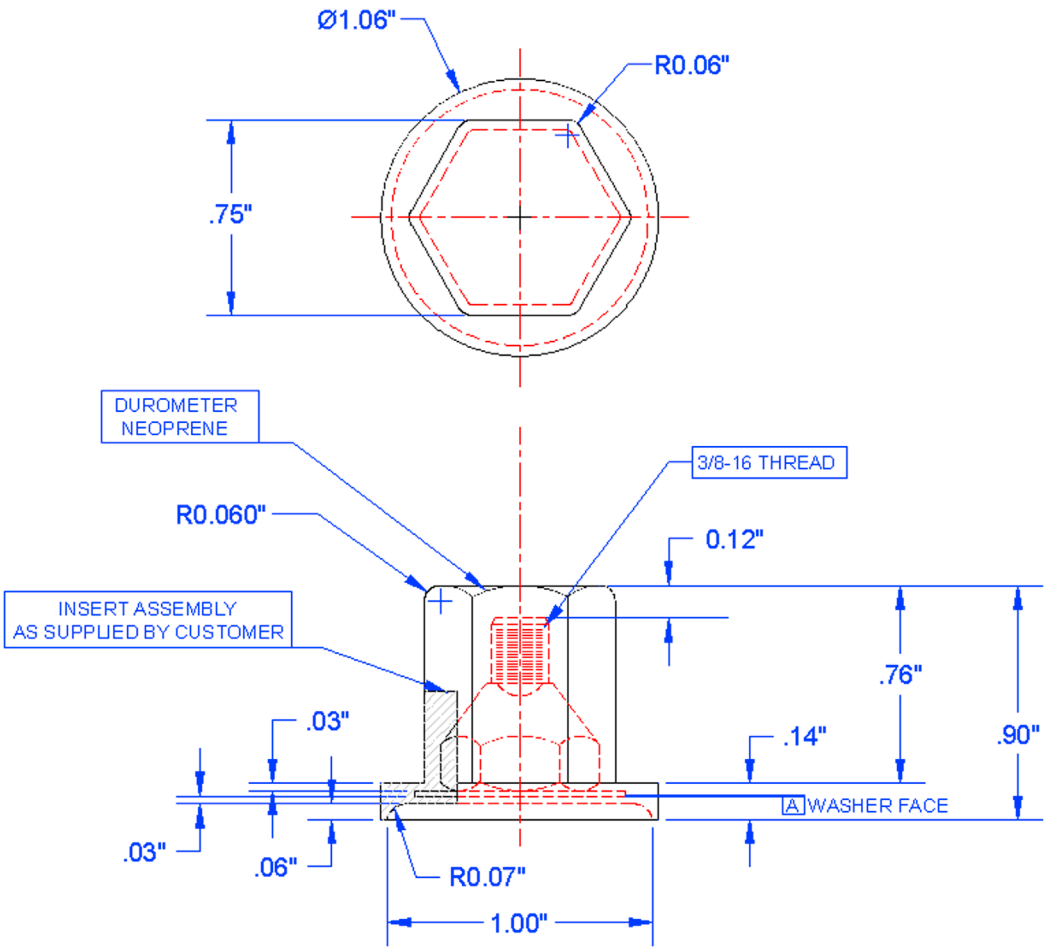
6. In a new file, set up the appropriate layer, colors, and linetypes. Then, draw and fully dimension the following mechanical part. Select Decimal as the dimstyle, with a precision of 0.00 and inch symbols (") for a suffix. (Difficulty level: Moderate; Time to completion: 35–45 minutes.)



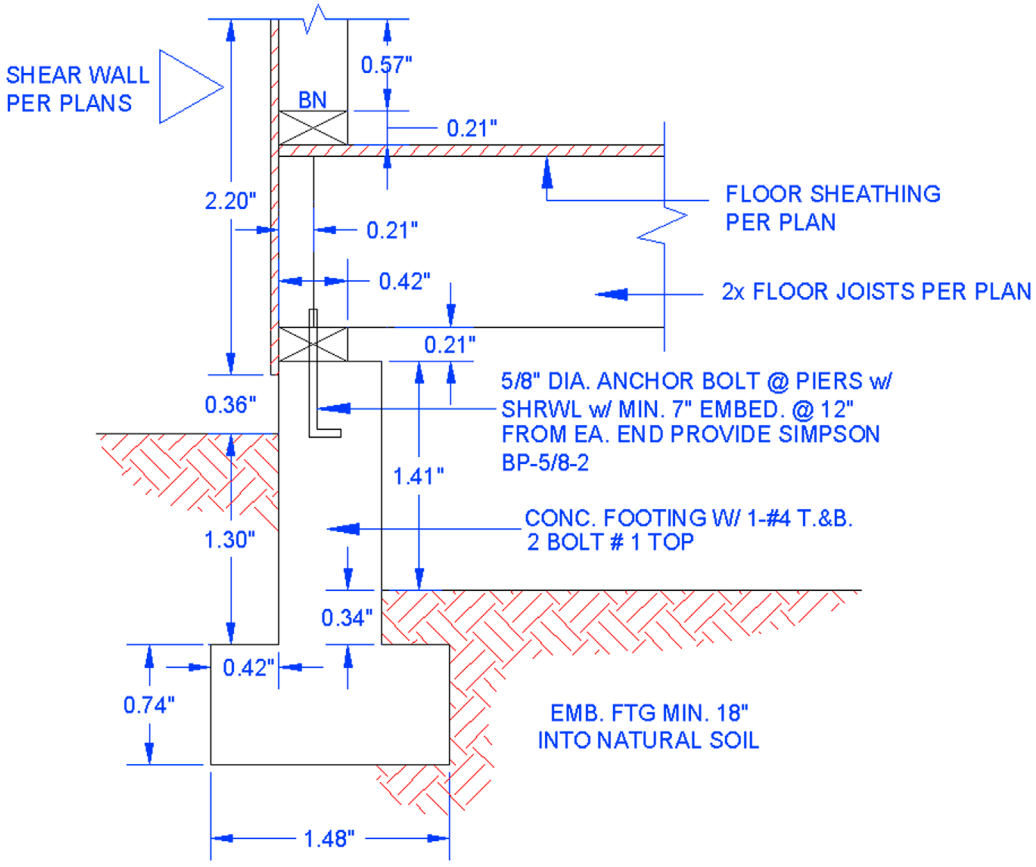
7. In a new file, set up the appropriate layer, colors, and linetypes. Then, draw and fully dimension the following mechanical part. Select Decimal as the dimstyle, with a precision of 0.00 and inch symbols (") for a suffix. (Difficulty level: Moderate; Time to completion: 35–45 minutes.)



8. In a new file, set up the appropriate layer, colors, and linetypes. Then, draw and fully dimension the slightly simplified version of the bolt assembly seen on the opening of this chapter. Select Decimal as the dimstyle, with a precision of 0.00 and inch symbols (") for a suffix. Note that no dimensions are available for some internal parts of the bolt; you have to improvise. (Difficulty level: Moderate/Advanced; Time to completion: 60 minutes.)



9. In a new file, set up the appropriate layer and colors. Then, draw and fully dimension (including text) the following architectural detail. Any dimensions not expressly given can be assumed. The `bhatch` borders were created using arcs that were later erased. (Difficulty level: Moderate/Advanced; Time to completion: 60 minutes.)



10. The final exercise of this chapter is a basic floor plan to keep your drawing skills sharp. It also features some electrical symbols, which you should get used to seeing, as they are standard in any electrical layout. Create one copy of each, and duplicate them throughout. We cover blocks for this purpose in the following chapter. The numbers inside the rectangles are the doorway dimensions. A few secondary dimensions are not given due to space limitations; you need to make a best estimate. Use proper layers and add text and dimensions as shown. (Difficulty level: Moderate/Advanced; Time to completion: 90 minutes.)