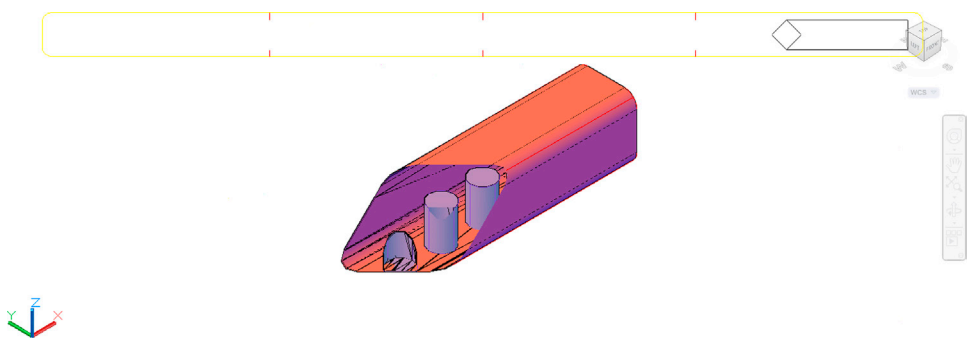
Chapter 29

Dview, Camera, Walk and Fly, Path Animation



Learning Objectives

In this chapter, we look at advanced presentation views and various animation options. The specific topics are as follows:

- `Dview`
- `CAmera`
- `TArget`
- `Distance`
- `POints`
- `PAn`
- `Zoom`
- `TWist`
- `CLip`
- `Hide`
- `Off`
- `Undo`
- Cameras
- Walk and Fly
- Path animation

By the end of this chapter, you will be able to present your model in new and unique ways as well as build basic walk-through animation.

Estimated time for completion of this chapter: 2 hours.

29.1 DYNAMIC VIEW

Dynamic view, or dview, is just one command but it has many options. Some of the options are less useful or duplicate existing commands, while a few others are very important and worth a closer look. The full list of dview commands includes `CAmera`, `TArget`, `Distance`, `POints`, `PAn`, `Zoom`, `TWist`, `CLip`, `Hide`, `Off`, and `Undo`.

Up and Running with AutoCAD 2017: 2D and 3D Drawing and Modeling. DOI: http://dx.doi.org/10.1016/B978-0-12-811058-4.00029-3

Out of these options, two are in high demand by AutoCAD designers and worth covering in detail. The first is the `Distance` option, which allows you to set perspective; the other is the `Clip` option, which allows you to set clipping planes and strip away parts of the design to look inside. We, of course, cover all of the mentioned options but with a special focus on these two.

Before we try any of these options, you need to get used to something unique to the `dview` command. In a blank file, go to SW Isometric and turn on shading. Then type in `dview` and press Enter (there is no Ribbon, toolbar, or cascading menu equivalent).

- AutoCAD says: `Select objects or<use DVIEWBLOCK>:`

Here, you are being asked to what you would like to apply dynamic view options. We do not yet have a 3D design, so just press Enter; you see the house in Fig. 29.1.

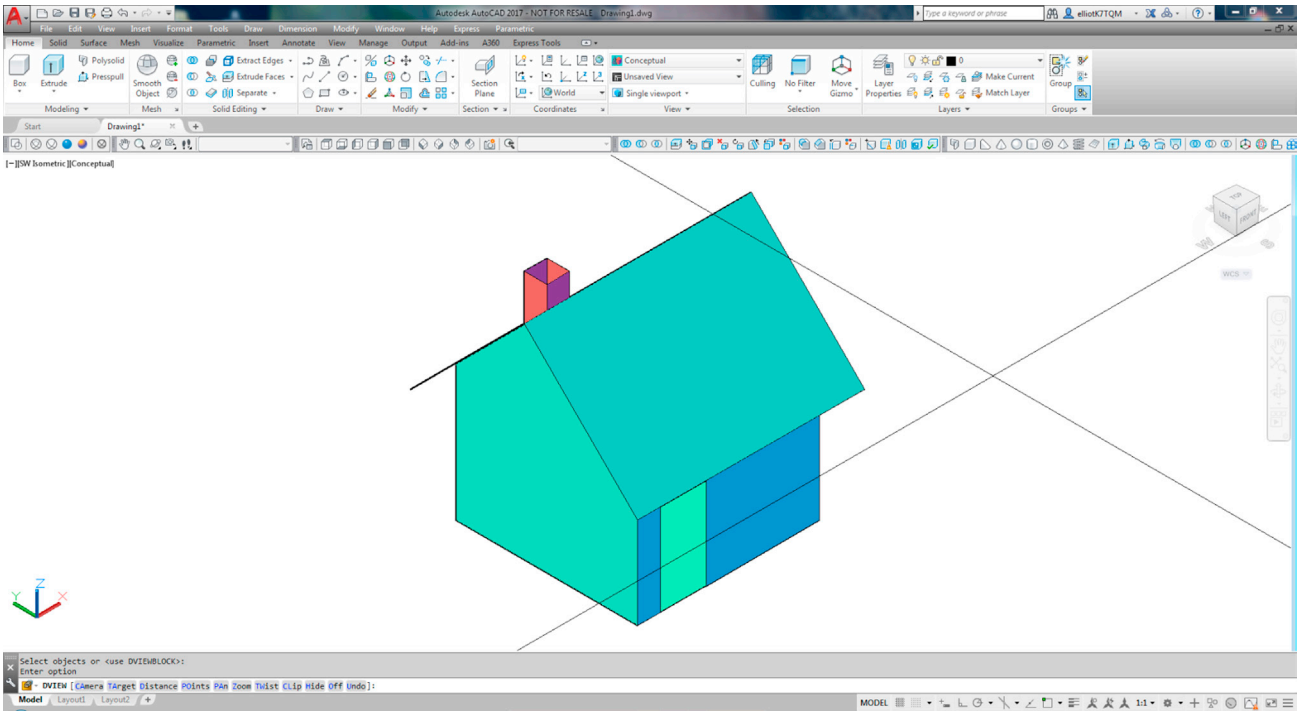


FIGURE 29.1 `Dview` "house."

This little house appears as a point of reference only if there is nothing else on your screen and is perhaps one of AutoCAD's oddest quirks, prompting many a student to exclaim "what the heck is that" in the middle of class. You can see the effect of whatever you do in `dview` on this house, but immediately after running the option, the house disappears. In the interest of keeping something permanent on the screen, draw a simple 20″ × 5″ rectangle and extrude it to 5″. Then, add a 1″ fillet to its sides, as seen in Fig. 29.2. Now, we can proceed with learning `dview`.

Camera

This command works on the principle of a camera rotating around an object. You are asked to enter the camera angle from the XY plane as well as the angle in the XY plane from the X axis. You are also given the option to use the mouse to just click on a suitable position, which is what most users end up doing.

To try it out, type in `dview` and press Enter. Select the block when prompted, and type in `ca` for `CAmera`. Spin your mouse around and observe the results.

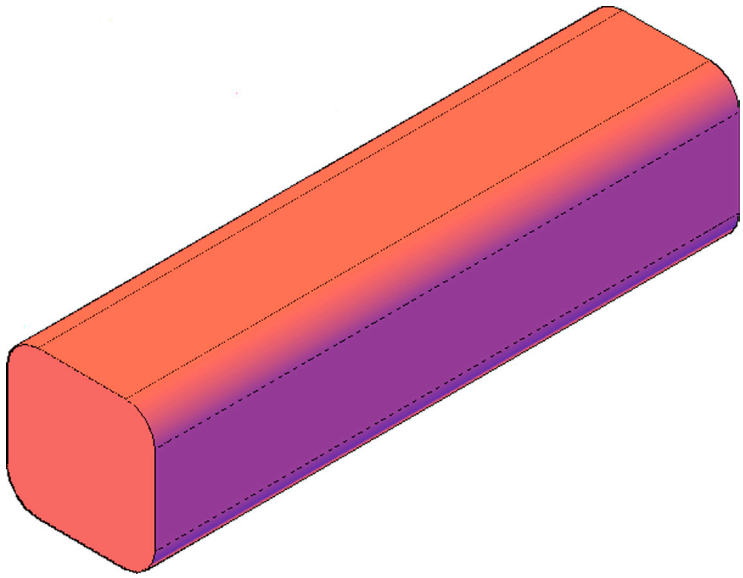


FIGURE 29.2 Extruded shape for `dview`.

Target

This command is similar to `CAmera`, but works on the principle of the target rotating around the camera. It has the same basic options of entering angle values or mouse clicking. To try it out, type in `dview` and press Enter. Select the block when prompted, and type in `ta` for `TArget`. Spin your mouse around and observe the results.

Distance

We explore this option in more detail. Distance is the method used to set a perspective view. These views of objects are more realistic and feature foreshortened geometry with lines that tend toward a vanishing point, as in reality. For more information on perspective views with detailed descriptions of 0-point, 1-point, 2-point, and 3-point perspectives (AutoCAD uses 3-point), see any graphic design or art textbook. Distance can be applied to any object, but just as in real life, the effect is more pronounced with larger objects.

Also, be aware that this view is only for presentations; it cannot be used during construction of the design, as perspective changes dimension values by its very nature. To try out this option, type in `dview` and press Enter as before. Select the object and press Enter. Then, type in `d` for the `Distance` option. A slider horizontal bar appears at the top of the screen, as seen in Fig. 29.3.

This yellow and red slider is the camera to target distance meter, with 1″ being full size, and increasing to the right (decreasing to the left) of the 1x. Slide over to the right until you get to 9x and click. The object remains in perspective mode along with the UCS icon. Press Enter to accept the settings and get out of `dview`, being careful not to press Esc at this point. You can also set this view as described in an earlier chapter via the menu of the little house icon at the top right of the screen, as seen in Fig. 29.4.

This perspective view, while not of much use in small part engineering drawings, is quite useful for 3D architectural and civil engineering design presentation. Once in Perspective view, print the drawing and, to get out of this view, change to wireframe.

Points

This option allows you to select a specific view based on the locations of three points. The first is the current camera position, and you need to select the second (target point) and third (camera point) points. This tool has some interesting applications when you need to set a specific view, such as looking down a hallway in a building. You can then set your points in strategic locations, such as one end of the hallway for one point and the top of an opposing door for another point. For the most part, however, designers prefer to just use 3D Orbit and zoom or pan to get the right view.

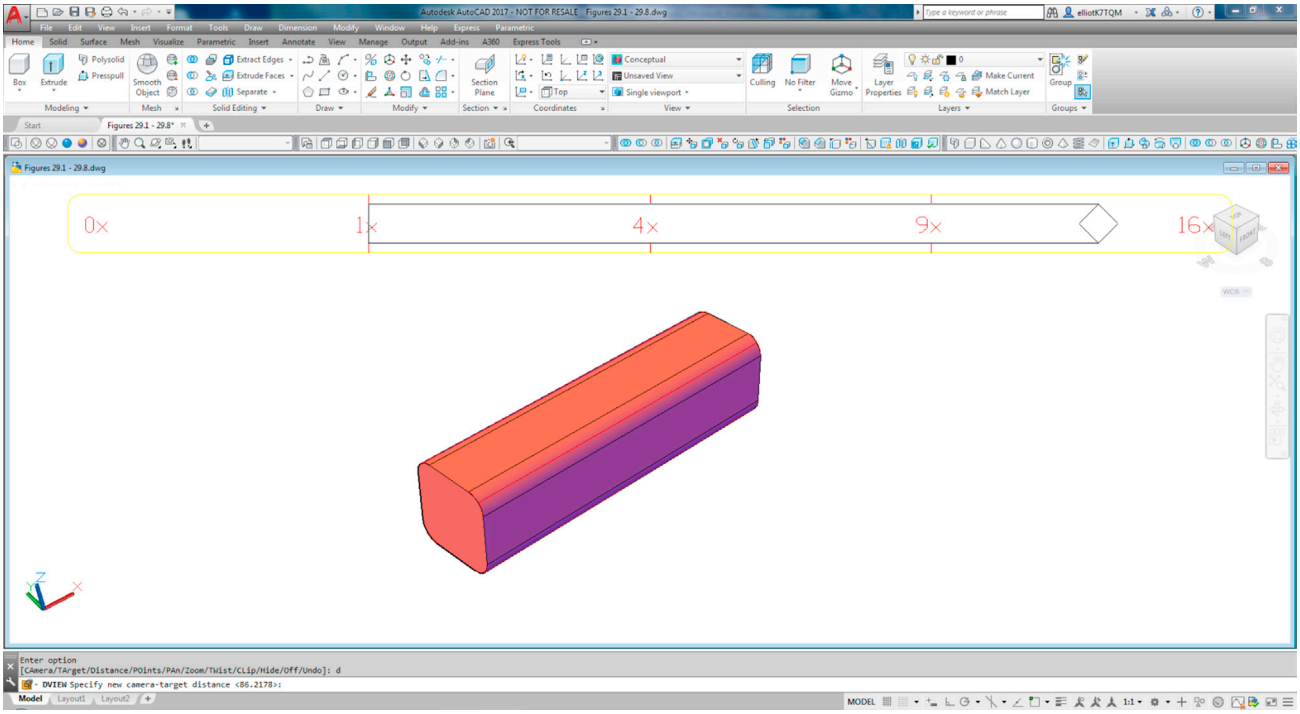


FIGURE 29.3 `Dview`, Distance option.

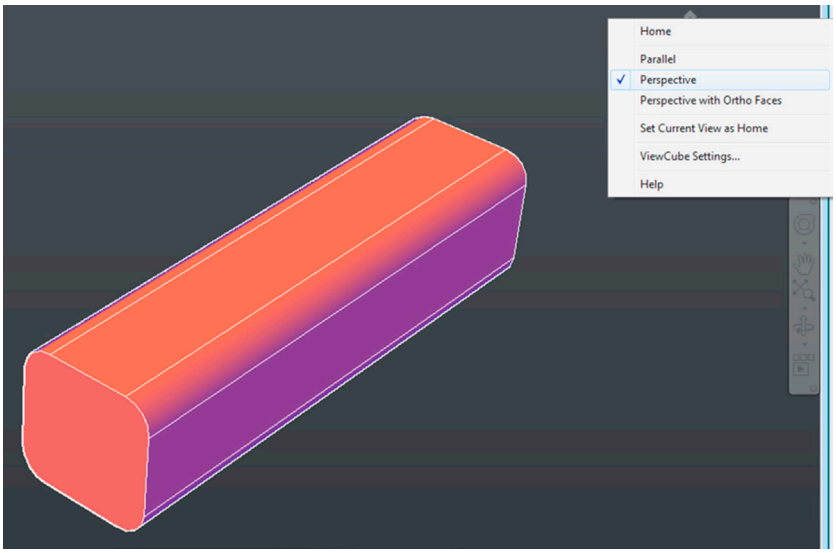


FIGURE 29.4 Perspective view, alternate settings.

Pan

This is just a variation on the basic pan command that shifts the image without changing the level of magnification. Give it a try.

Zoom

This is also just a variation on the zoom command that utilizes the same slider you first saw with the distance option. Give it a try.

Twist

This is another variation of the 3D Orbit command, where the object is rotated or "twisted" around. Give it a try.

Clip

This is the second of two dview commands that deserve a longer discussion. Clip introduces the concept of "clipping planes," which (in various forms) is a common tool in 3D computer-aided design. The idea is to create a flat plane that slices open a design to reveal the internal workings. The plane itself is invisible, only its effect is seen, and can be applied to the front or back of the object. When you reveal as much as you need to, you set the view and print the design. This tool, like most other `dview` options, is not meant to be permanent and is not for use during design work, only for final presentation.

To illustrate the Clip tool, add some geometry in the form of five 2″ diameter cylinders to the inside of the previously used block, as seen in wireframe mode in Fig. 29.5. In full shade mode, the inside geometry cannot be seen, as shown in Fig. 29.6.

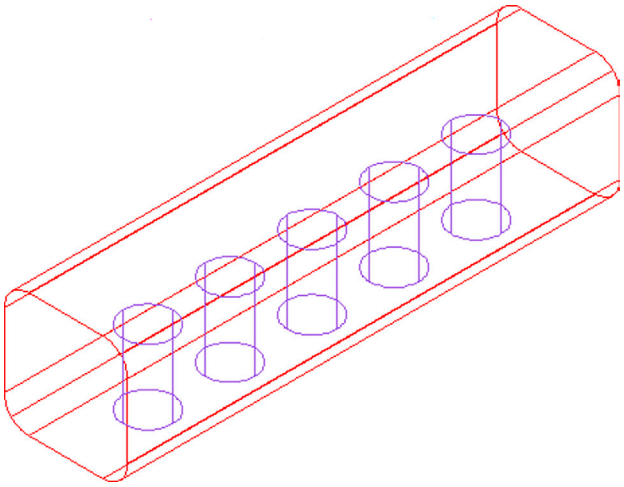


FIGURE 29.5 Internal geometry.

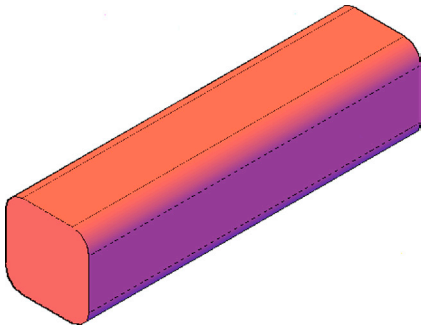


FIGURE 29.6 Shade mode.

Let us apply a clipping plane to the front and strip away some of the outside material to show the insides. Type in `dview`, press Enter, and select the object, pressing Enter again. Type in `cl` for `CLip` and press Enter.

- AutoCAD says: `Enter clipping option [Back/Front/Off]<Off>:`

Clipping planes can be thought of as flat plates, with one in the front and one in the back. As the object is moved back and forth, the clipping plane cuts in, or clips, the object either from the front or the back. Typically, you use the front clipping plane, so type in f and press Enter.

- AutoCAD says: `Specify distance from target or [set to Eye(camera)/ON/OFF]<451.8572>:`

You also see a yellow slider (similar to the one seen when learning distance), which can be moved back and forth to establish the position of the clipping plane, as seen in Fig. 29.7.

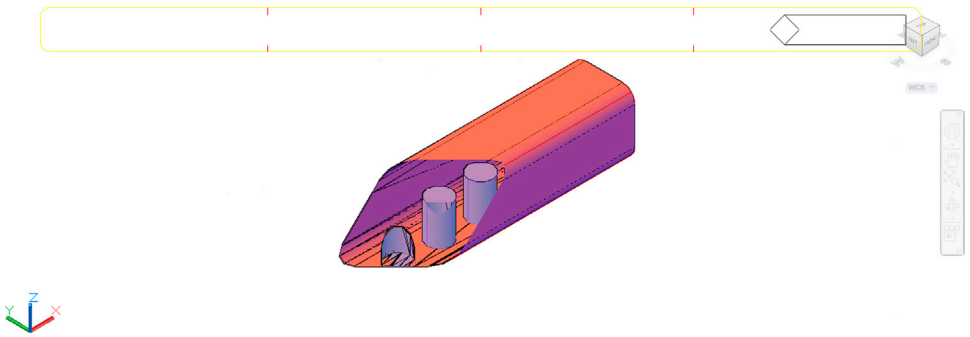


FIGURE 29.7 Front clipping plane.

As you can see, the internals of the part can be revealed easily. Fig. 29.8 shows a view with the back clipping plane set in a similar manner, though the results are not as useful.

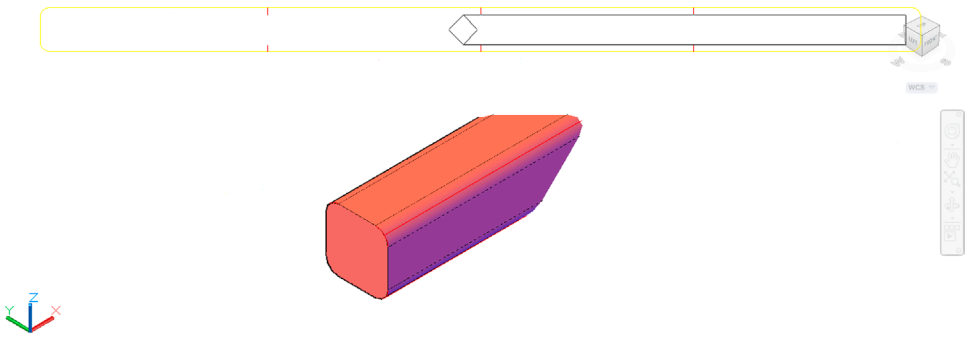


FIGURE 29.8 Front clipping plane.

You can actually 3D Orbit through a clipping plane and get a full view of the internal workings of a design from any angle. To remove the planes, you have the off command in the clipping menu.

Hide

This command is essentially the same as the standard hide command learned in Chapter 21, 3D Basics.

Off

This command turns off perspective viewing, although you can do the same thing by switching to wireframe mode.

Undo

Undo basically undoes the last command in `dview` and can be used multiple times, just like the regular undo command in 2D AutoCAD.

29.2 CAMERAS

The camera tool provides an interesting twist on setting views. The idea is pretty much what it sounds like: You set up a camera at some strategic location and a view is created that looks out through that camera in perspective. This view is saved in the View Manager, and you can double-click on it to go into it. You generally stay in that view but are able to move around (rotate, pan, zoom, etc.). These views are used for presenting and plotting a design, and you can easily switch out of them at will. Let us take a look at some of the details.

Step 1. First of all, create a few random blocks of any size, and then shade and color them while in SW Isometric, as seen in Fig. 29.9.

Keyboard: Type in **camera** and press Enter
Cascading menus: View→Create Camera
Toolbar icon: View toolbar→ 
Ribbon: none

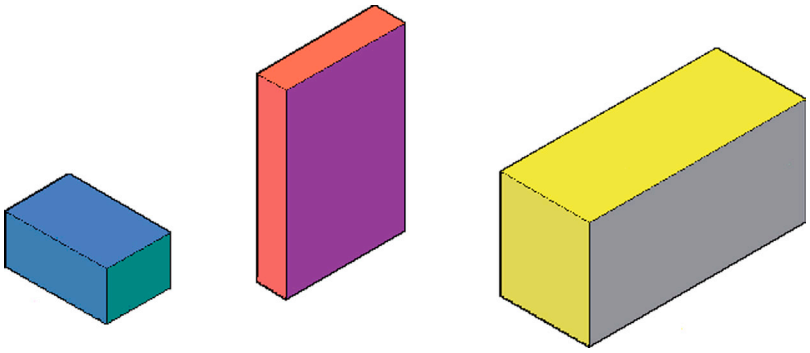


FIGURE 29.9 Blocks for cameras.

Step 2. Start the camera command via any of the preceding methods.

- AutoCAD says: `Current camera settings: Height=4.0000 Lens Length=100.0000 mm`
  `Specify camera location:`

Your values may of course be different, but they all can be adjusted. You also see a small camera symbol attached to the mouse, as shown in Fig. 29.10.

FIGURE 29.10 Camera symbol.

Step 3. Position the camera in a location that is some distance away from the objects and at a good angle to view the blocks. As soon as you click to position the camera, you see the "target view cone" shown in Fig. 29.11. This is the camera's field of view.

- AutoCAD also says: `Specify target location:`

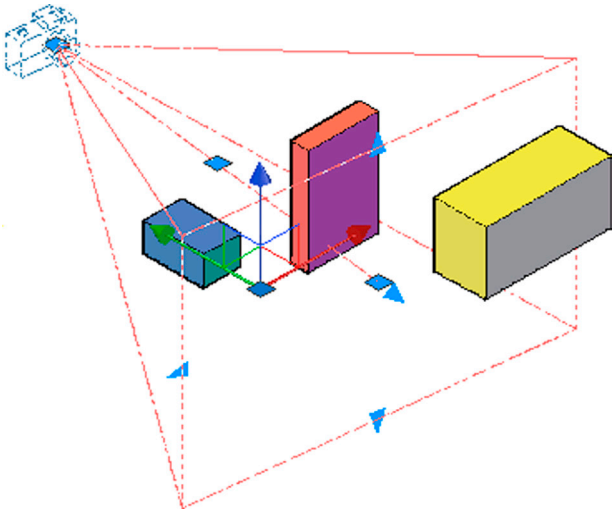


FIGURE 29.11 Camera field of view.

Step 4. Drag out the view cone to cover the blocks and click again.

AutoCAD says: `Enter an option [?/Name/LOcation/Height/Target/LEns/Clipping/View/eXit]<eXit>:`

Here, you can change some of the camera values, but for now just press Enter. The little camera symbol sits at the location you specified, looking in the direction you pointed. If you check the View Manager, you find Camera 1 there. Before you go into that view, however, you may want to first check what it looks like by clicking on the camera. You see what is shown in Fig. 29.12.

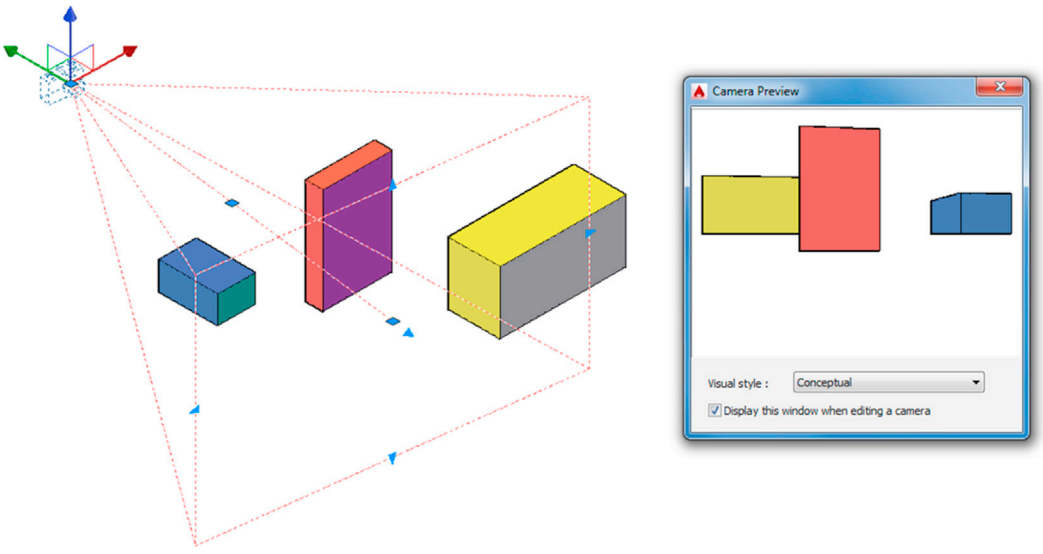


FIGURE 29.12 Camera Preview.

You can now adjust the camera settings via the blue grips (e.g., widen the field of view), and these actions are reflected in the preview window on the right. When done, go to the View Manager (via the view command) and select the Camera 1 view, as seen in Fig. 29.13. Press Set Current, then OK.

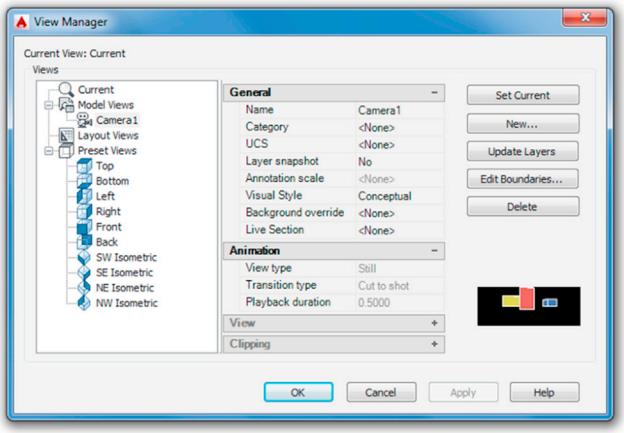


FIGURE 29.13 View Manager with Camera 1.

You then see the Camera Perspective view (Fig. 29.14), which in this case is a floor level view of the blocks. Notice also how the screen is split between a "ground" and a "sky." This view can be rotated and zoomed or panned. Go ahead and try all of those. To get out of it, go to the little "house" introduced earlier (Fig. 29.15) and select Parallel.

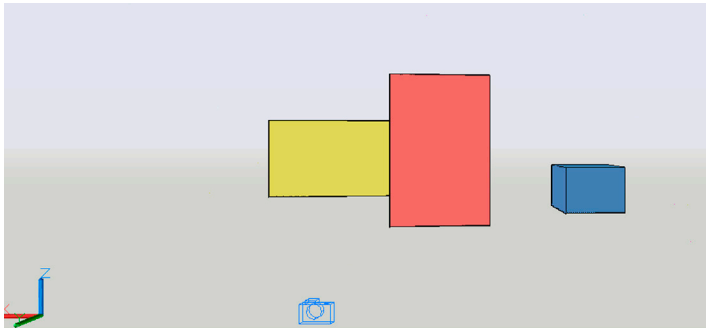


FIGURE 29.14 Camera 1 view in perspective.

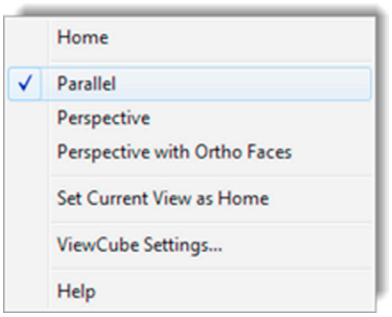


FIGURE 29.15 Exiting Camera 1 view.

Camera placement is an extensive topic that allows for creativity in where you put the camera and the resulting generation of some unique views. You should spend some time exploring this further.

29.3 WALK AND FLY

Walk and Fly sound fancier than they really are. All we are talking about here is the ability to move around and through a 3D design using keyboard input (typically the arrow keys). Walking involves forward/reverse and left/right movements and you remain in the XY plane. Flying is the same movements but unconstrained by the XY plane, so you have the appearance of flying through the design as you move forward and in reverse.

The best analogy to this is the experience of playing a first person action video game, where you see what the character sees as you move through hallways and rooms while shooting at the bad guys—that last part of course is missing in AutoCAD, though a few well-placed petitions to Autodesk may get designers thinking!

All the Walk and Fly movements can be saved and played back in an animation, and this is usually how things would be done, as a client would typically not want to sit around as you stumble your way through a 3D house model. It takes practice to smoothly toggle between Walk and Fly modes; we are not talking precise joystick control here. During your strolls, you can keep track of where you are in the big picture via a Position Locator palette, which also allows you to fine-tune some aspects of Walk and Fly. Walk and Fly are always conducted in perspective view, and AutoCAD sets that view automatically (after a prompt) before anything begins.

To begin exploring this, we need a small architectural floor plan with which to work. Our apartment, first started in Level 1 and worked on throughout some of the chapters, fits the bill perfectly. If not, you can use any 3D model. If you still have the apartment model saved, bring it up in 2D and clean it up a bit by removing everything but the walls, as seen in Fig. 29.16.

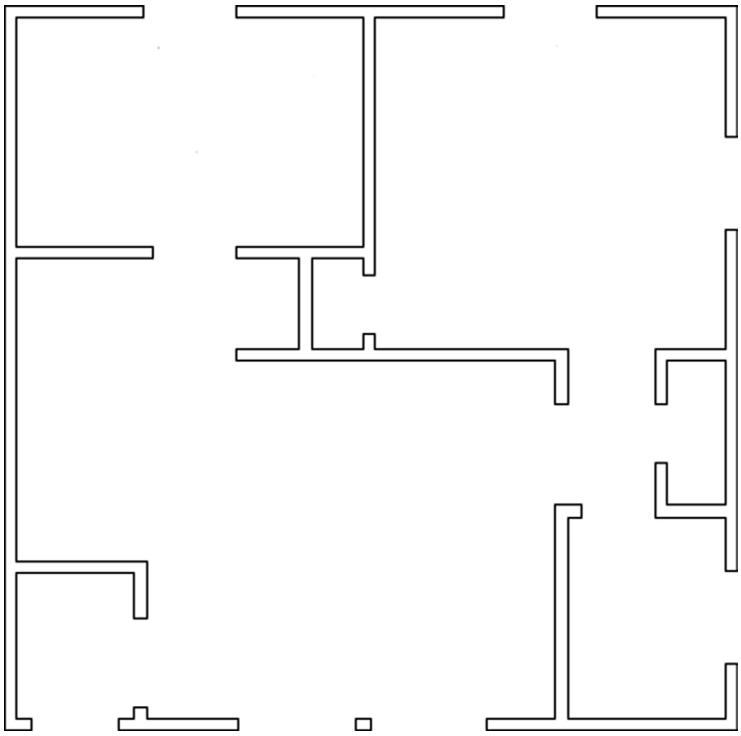


FIGURE 29.16 2D apartment.

Now, pedit all the visible linework. Then, extrude all the walls out to a height of 8′ (96″). You should have what is shown in Fig. 29.17 after shading, coloring, and switching to the SW Isometric view.

To finish the design, let us add a floor and fill in the gaps in the wall where there needs to be windows. For the floor, simply draw an extruded rectangle from corner to corner of the apartment, making sure that it is located at the bottom (no roof at this time), of course. Then, draw rectangles above and below the window openings, extruding 24″ down and 36″ up. That makes for 36″ windows.

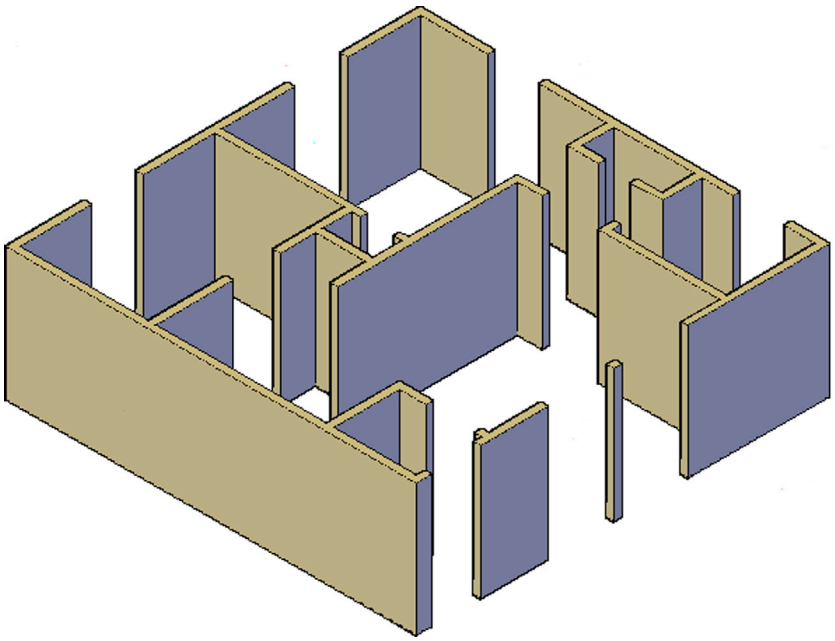


FIGURE 29.17 3D apartment: extruded, colored, and shaded.

Do the same for the door openings, extruding 12″ down, thereby making the doors 96″ − 12″ = 84″, or 7′ tall. Finally, add the doors themselves where needed, according to the original floor plan (see Level 1 images). The result is shown in Fig. 29.18. Be sure to union the wall sections together and add some color for clarity.

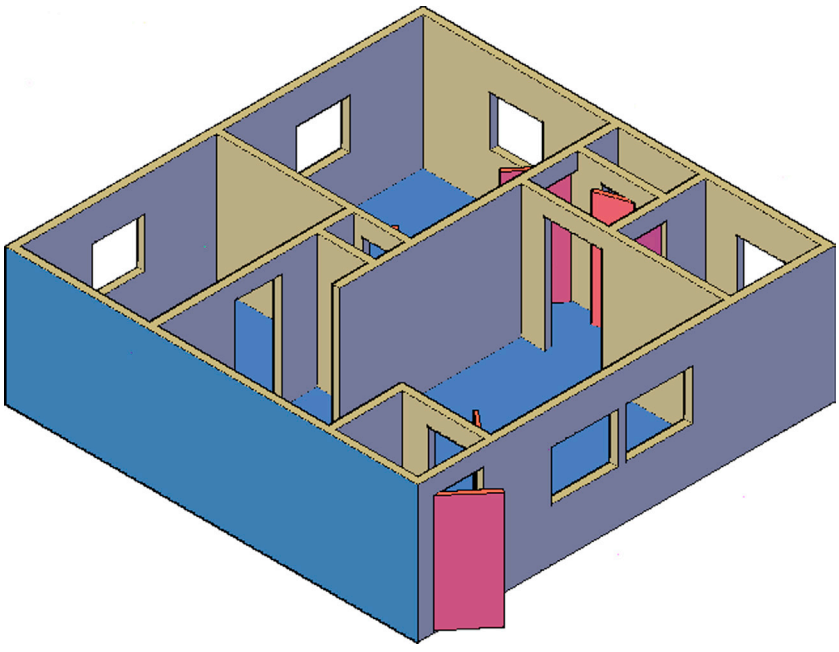


FIGURE 29.18 3D apartment with windows, doors, and floor.

After you are done, bring up the Walk and Fly toolbar, as shown in Fig. 29.19. The toolbar consists of Walk (the feet), Fly (the airplane), and a third icon for settings, which we explore as well. Let us try the Walk tool. When you first attempt to use it, you likely get the prompt shown in Fig. 29.20. After clicking on Change, the design enters Perspective view and the Position Locator palette appear on the screen (Fig. 29.21).

FIGURE 29.19 Walk and Fly toolbar.

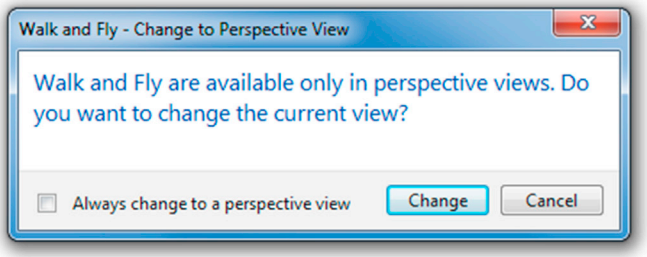


FIGURE 29.20 Walk and Fly warning prompt.

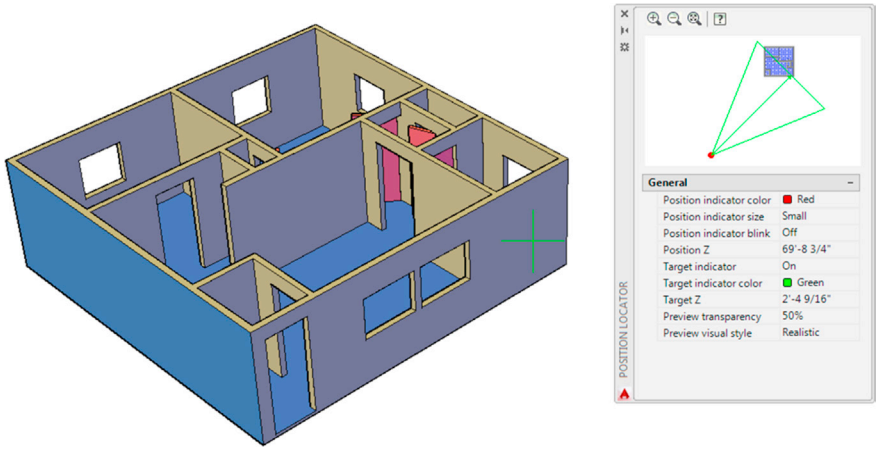


FIGURE 29.21 Position Locator palette.

We look at this palette in detail later on, but for now set it aside and let us focus on navigating the design. You can navigate it (walk) via the tools shown in Fig. 29.22.

Up arrow / W key	Move forward
Down arrow / S key	Move backward
Left arrow / A key	Move left
Right arrow / D key	Move right
Drag mouse	Look around & turn
F key	Toggle Fly mode

FIGURE 29.22 Walk and Fly navigation tools.

The information needed to use Walk and Fly is spelled out in the list. While you can certainly use the letter keys (`W`, `S`, `A`, and `D`), it is probably easier to use the keyboard arrows (Up, Down, Left, and Right). To toggle between Walk and Fly, press the `F` key. Take some time to practice walking and flying via the four keyboard arrows, with the letter `F` key as the toggle between the two. Once you have the basic idea of Walk and Fly, let us take a look at the settings icon. When you press that, you see the box shown in Fig. 29.23.

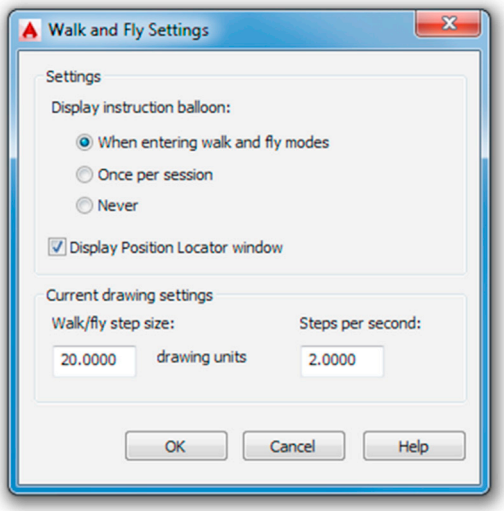


FIGURE 29.23 Walk and Fly settings.

The main settings have to do with the Display Instruction and Display Position window and palette. You can get rid of both of them if needed; although they are helpful, they are not essential to Walk and Fly operation. Just as important, however, is what is found at the bottom of the dialog box, the drawing units and Steps per second. You can increase both to Walk and Fly through the design faster.

Do not forget also to use the mouse itself to rotate and spin the design around if needed. Walk and Fly are just part of the equation. Let us take another look at the Position Locator. In the top window, you see the design's position relative to you, the observer, as seen in Fig. 29.21. Although you are not likely to get lost while traveling through this simple one-bedroom design, you may in a more sophisticated walk-through, and this "bird's-eye view" of where you are can be helpful. The rest of the general settings below that preview window are related to how the preview window looks.

29.4 PATH ANIMATION

Path animation has to do with creating animations of designs. These animations are not the classic type, where we have objects moving and interacting (e.g., AutoCAD cannot animate the motions of pistons inside cylinders of a car engine model). Rather, what we refer to is an animated walk-through, a sort of frame-by-frame set of scenes strung together into a smooth motion.

To begin animation, type in `anipath` and press Enter. Alternatively, you can use the drop-down menu: View→Motion Paths Animation…. The dialog box shown in Fig. 29.24 appears.

This is the combined settings and animation dialog box. Here, you can set your preferences, preview the animation, and export it to the desired format. Some of the options are listed in more detail:

- *Frame rates*: This is the number of frames per second that play at normal playback speeds: the more frames, the larger the output file. The maximum is 60, and 40 is usually just fine. The number of frames divided by the duration yields the Frame rate (FPS).
- *Resolution*: This determines how sharp the image is: The larger is the resolution, the larger is the output file. The range is from 160× 120 to 1024× 768. The default, 320× 240, is usually adequate.
- *Format*: The available exporting formats are `avi`, `mov`, `mpg`, and `wmv`.
- *Camera or Target*: You can specify either one; we use camera.

As the name implies, motion path animation depends on a path. Once the path is defined, along with a number of animation-related parameters, AutoCAD sends a camera down the path and plays back what it sees as it travels. It is smooth and continuous and a good way to present a tour of an entire building.

To try this out, cancel the dialog box and create a path in the building using pline. This is by far the hardest and most time-consuming task, and it is also the most important. A good path ensures a clear, smooth view of the interior. Here are some tips for path placement:

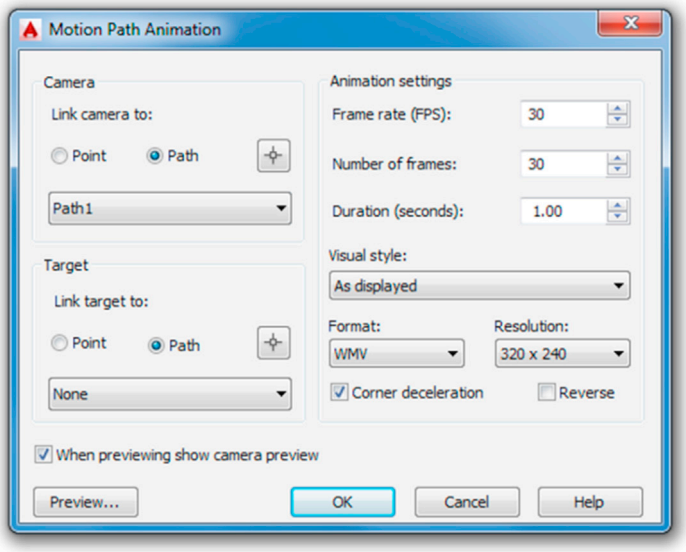


FIGURE 29.24 Motion Path Animation.

- Place the path in the middle of doorways using temporary guidelines. If you use the edges of the door, the camera literally slams into the door frame as it travels, and the view is briefly obscured.
- Add fillets to round out the turns instead of right angles for smoother motion.
- Create a realistic and steady path, like one that a real person would walk. Do not jump from floor to ceiling without a good reason.

In Fig. 29.25, several doors are removed for clarity, and a sample path through our 3D apartment is carefully drawn in using pline. The path comes in through the front door and walks through the living room and into the kitchen, following a typical path a person would take.

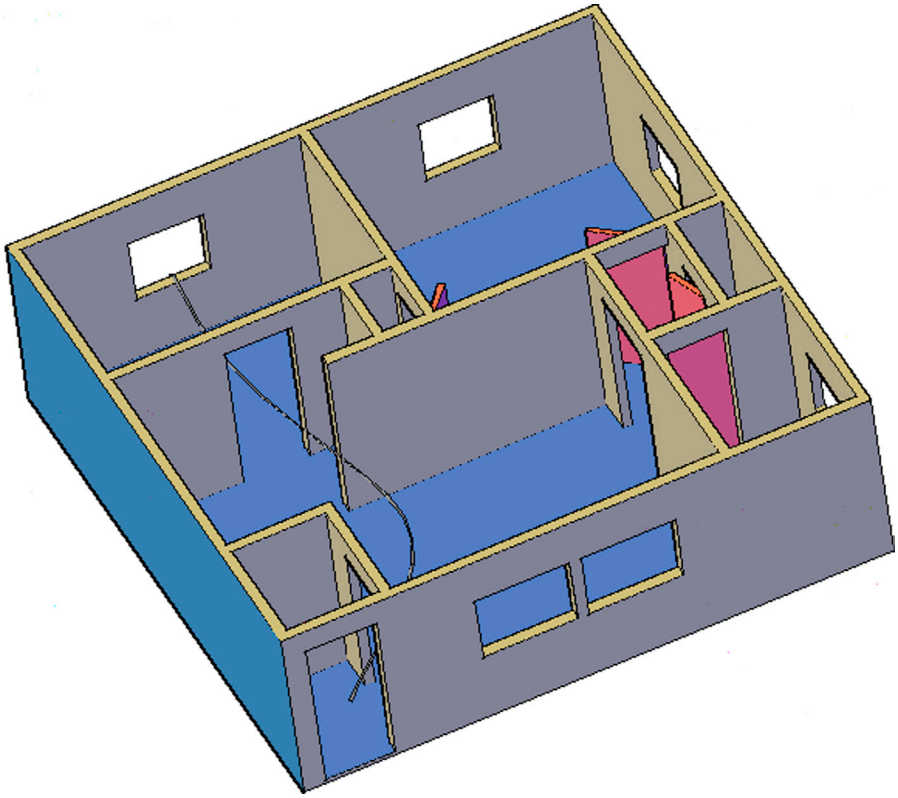


FIGURE 29.25 Motion pathway.

This path may or may not be ideal and may have to be fixed later, but it is fine for now. When done, select View→Motion Paths Animation… again, and follow these steps:

Step 1. The first step is to link the camera to a point or a path. Typically, the camera is linked to the path, so in the upper left-hand area, use the button to select the path and confirm its name as `Path 1` in the field.

Step 2. Next, you need to link the target to a point or a path. If you choose Path, then the Target and Camera settings are the same, meaning the camera follows the path and turns when the path turns. If you choose Point (and select a distant point), then the camera is always fixed on that point as it follows its path.

Step 3. Now, you need to run through the animation settings. Here, everything should be more or less intuitive, as all three fields are linked. So, if you select a frame rate of 10 and specify 120 frames, then 120/10= 12, so there will be 12 seconds of "footage" or animation. Select values that are appropriate to the task at hand. If you have a large walk-through, you may need to run the animation for a minute or more. Just be aware that the files generated can get big very quickly, and overall performance and quality also depend on your computer (RAM, video card, etc.).

Step 4. Finally, select the Visual Style, Format, and Resolution and press Preview…. A preview window appears and runs through the animation, as seen in Fig. 29.26.

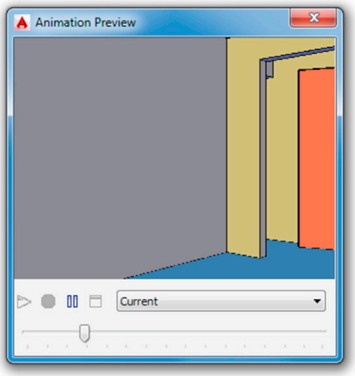


FIGURE 29.26 Animation Preview.

When done, simply close the Animation Preview via the `X` in the upper right corner; you are taken back to the Motion Path Animation dialog box. Press OK, and you are taken to the Save As dialog box and asked where you would like to save the file, as well as to confirm the output format (Fig. 29.27). Select a location and the generation sequence commences, as seen in Fig. 29.28. The file is generated and you can watch it with whatever player you have on your computer.

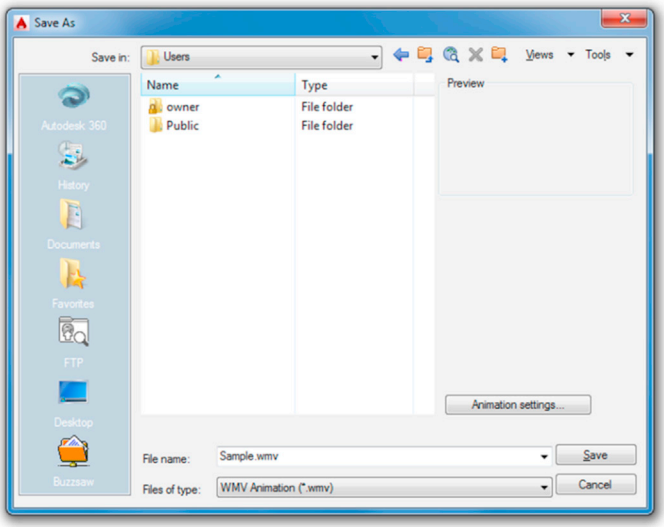


FIGURE 29.27 Saving animation.

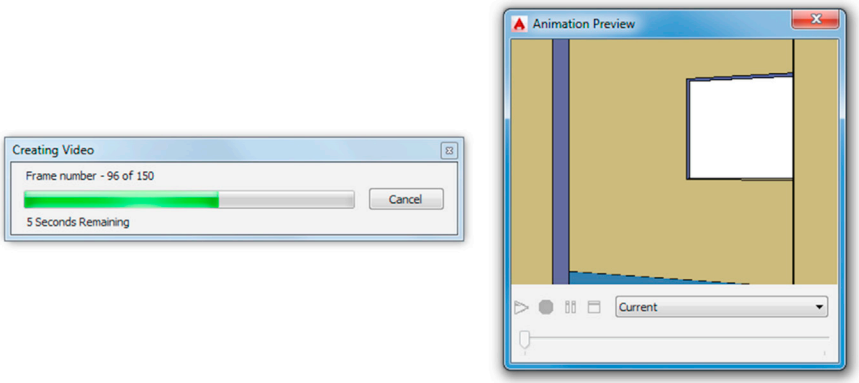


FIGURE 29.28 Animation generation.

29.5 SUMMARY

You should understand and know how to use the following concepts and commands before moving on to Chapter 30, Lighting and Rendering:

- `Dview`
  - `CAmera`
  - `TArget`
  - `Distance`
  - `POints`
  - `PAn`
  - `Zoom`
  - `TWist`
  - `CLip`
  - `Hide`
  - `Off`
  - `Undo`
- Cameras
- Walk and Fly
- Path animation

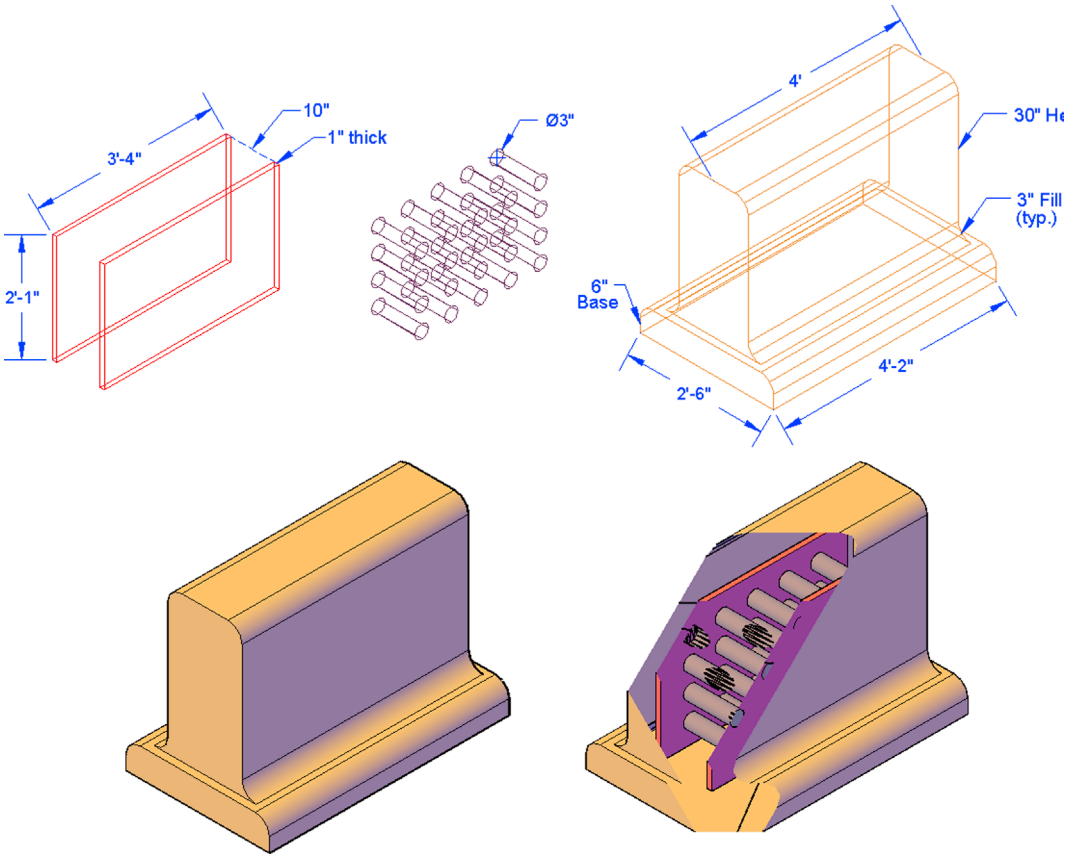
Review Questions

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

1. List all 11 `dview` functions and what they do.
2. List any additional views that are covered.
3. What is the purpose of Walk and Fly?
4. How are the Walk and Fly functions controlled?
5. How do you create path animations?

Exercises

1. Create the following fictional concrete barrier with steel reinforcing. All dimensions are given. First, model the interior panels and circular cross members. Then, enclose everything in the outer structure, aligning the elements carefully. Finally, after coloring and shading, use the `dview` command with the Clip option to Front clip the design to the approximate depth illustrated. For extra practice, set up a series of viewports via the mview command to display the wireframe, shaded, and the clipped design as shown. (Difficulty level: Intermediate; Time to completion: 30–45 minutes.)

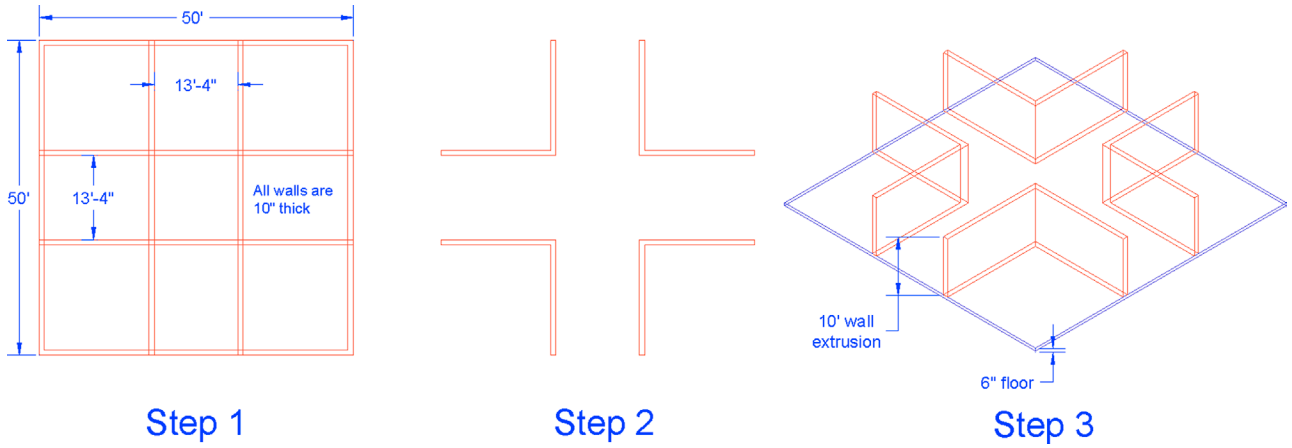


2. The following exercise is more in-depth and requires some set up. When you are done, you will get a chance to practice the camera, Walk and Fly, and the path animation commands, all using the same model. (Difficulty level: Advanced; Time to completion: 30–45 minutes for setup, 60–90 minutes for exercise.)

Step 1. In 2D, create a basic floor plan using the given dimensions. The dimensions themselves are only for your reference and are not needed in the drawing.

Step 2. Trim out all the necessary linework to form four independent "cross-shaped" sections as shown. Everything in the design is symmetrical. Pedit all the wall sections and double-check for stray lines and any other errors.

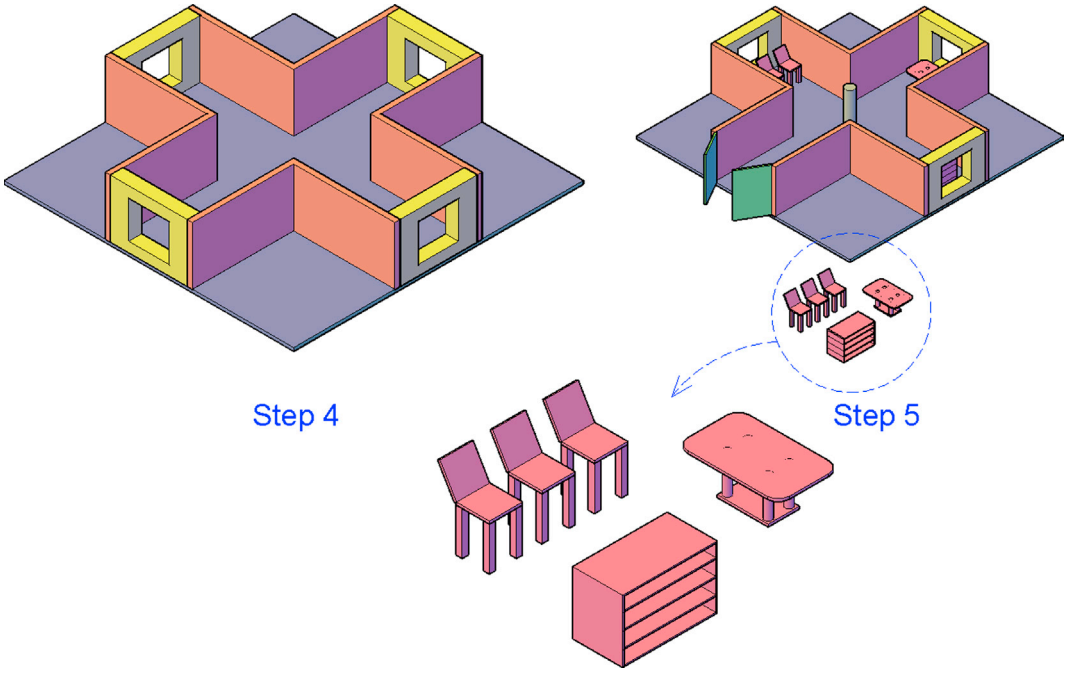
Step 3. Extrude all four sections to the height shown. Add a floor to the design, extruded to the depth shown.



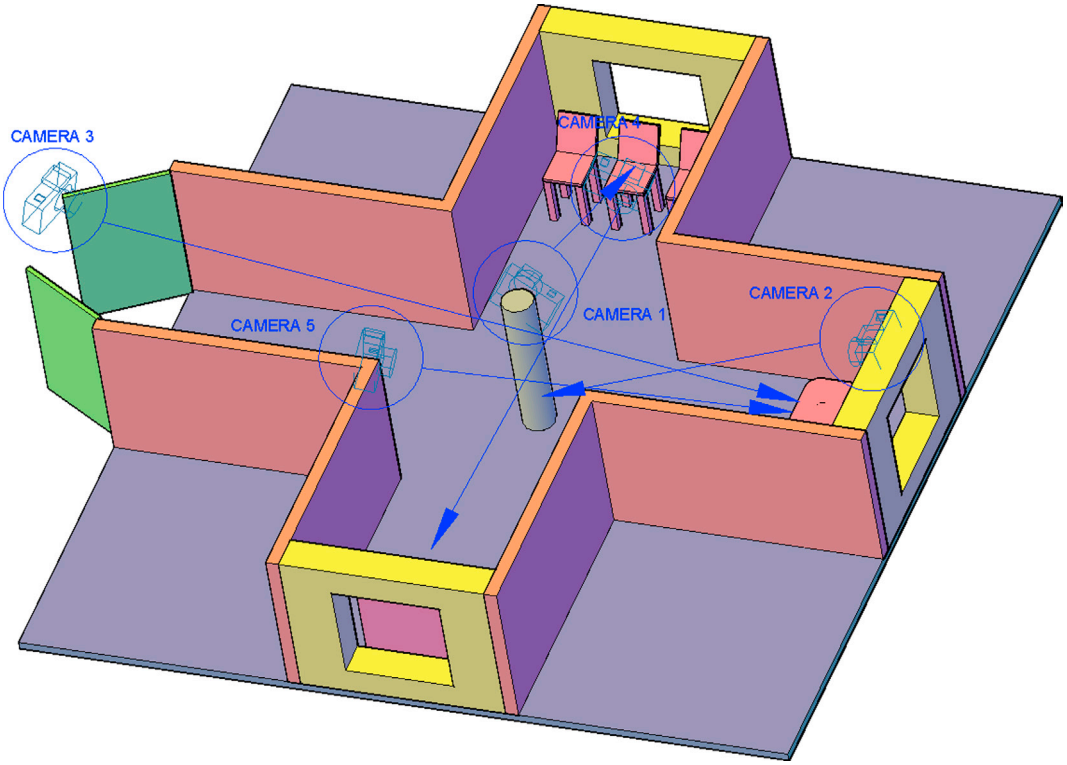
Step 4. Add four walls with windows to the four openings of the floor plan design as seen in the diagrams. These can be of any thickness, and the windows can be of any size, but make sure they are centered and all walls match up without gaps or overlaps. Color and shade your model.

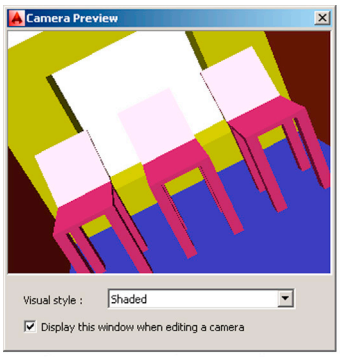
Step 5. Add in furniture to three of the four "hallways" of the design. The furniture can be what is shown (a detail is provided) or something of your own design. Be sure to position it evenly and center it on the floor space. Add a set of swinging doors to the one end that has no furniture. Door sizing is up to you.

Step 6. As a final step, add a pole with a 2′ diameter and 10′ height to the geometric center of the design as shown. This step concludes the basic design. Check it over before proceeding to the first part of the actual exercise; the camera command.

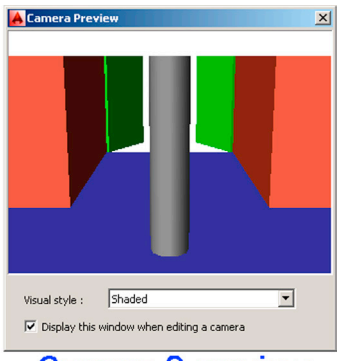


Camera: To practice the camera command, first set up a few cameras at various strategic locations in your new 3D floor plan. Recall from earlier in this chapter that you need to use OSNAPs to position where the camera is located with the first click, then where it is pointing with the second click. Every time you position the camera, check to see what exactly it is seeing by clicking on it and bringing up the Camera Preview. When done, use the View Manager to view each of these views. A sample positioning of five cameras is shown with arrows giving you a rough idea of what they are looking at. Finally, three sample previews are shown, followed by one full view. Be sure to pick varied and interesting camera locations on your 3D model to recreate something similar to what is shown, or an entirely new set of vantage points of your choosing.

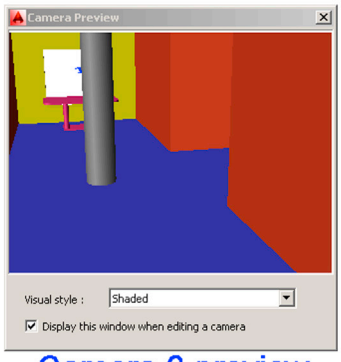




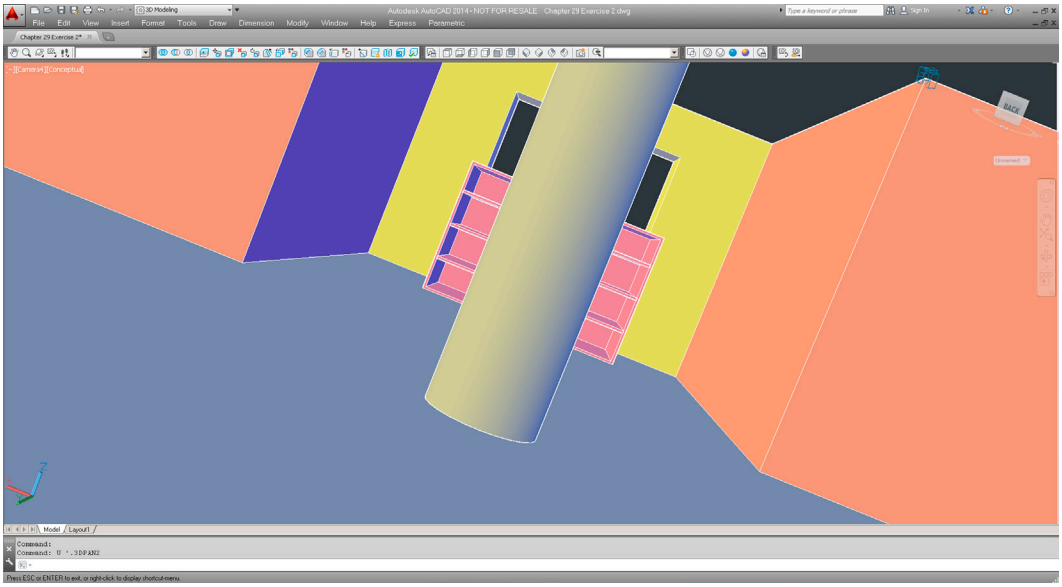
Camera 1 preview



Camera 2 preview

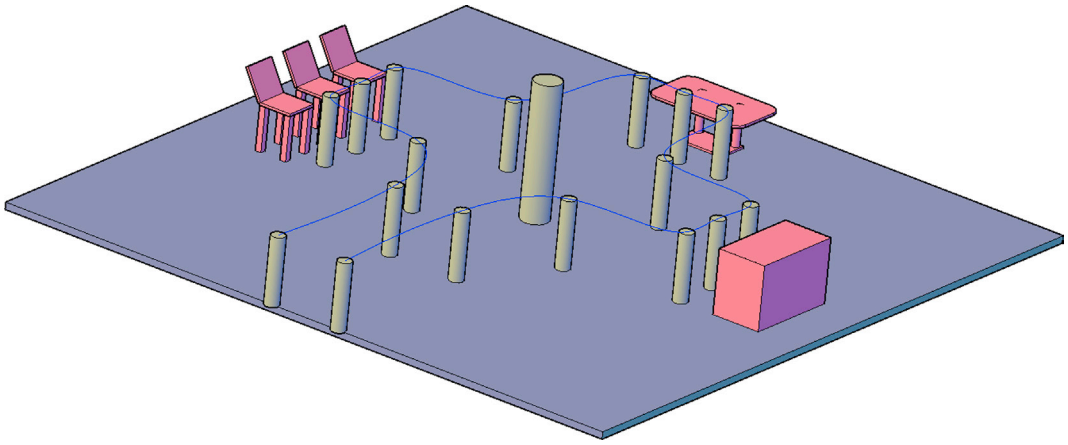


Camera 3 preview

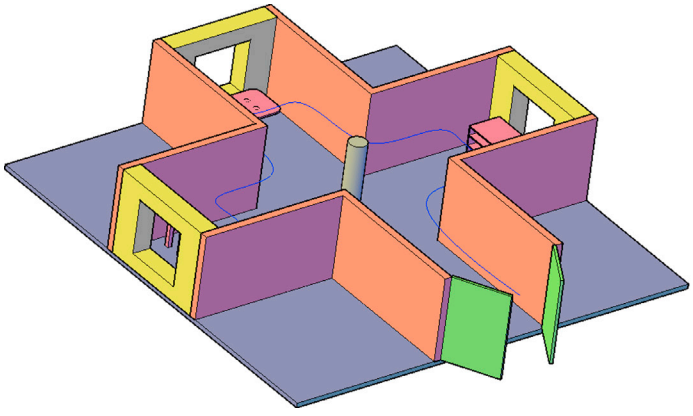


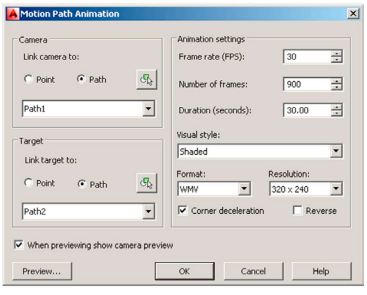
Walk and Fly: To practice walk and fly simply begin at the front entrance and navigate your way through any of the hallways of the 3D model. There is no need for any images to illustrate this, but do try to walk into all the far corners of the model.

Path Animation: Begin the path animation command by setting up a reasonable path to follow around all corners of the 3D model, similar to the Walk and Fly "trip" that you just did. Keep the path at eye level (5′ off the ground) and create a smooth pline or spline path. One way to do this is to carefully position ½ size copies of the main center pole at strategic locations all around the inside of the model as shown next (with several layers frozen for clarity). Note how the spline path is overlaid on the top surfaces of the smaller poles. When these poles are deleted you will have a well-positioned path for the animation camera to follow.

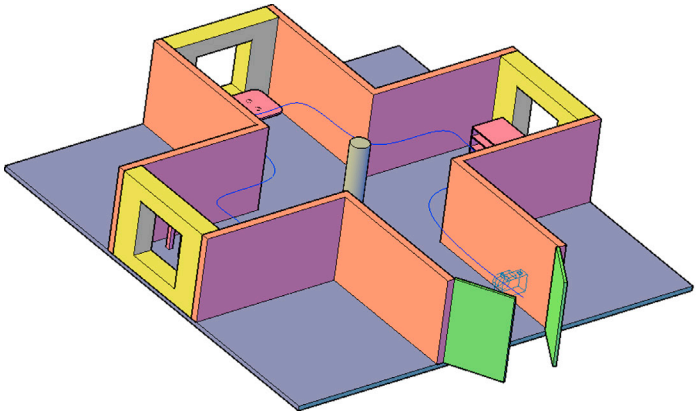


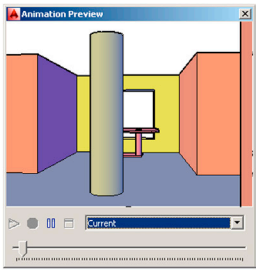
Here, the path is cleared of all poles and `Path1` and `Path2` are chosen. Set the duration to 30 seconds, and leave the default FPS and Number of frames.





A shot of the animation preview is shown next. Set up several varying paths inside and outside your mode for additional practice.





3. The third and final exercise of this chapter has nothing to do with the tools introduced here but rather serves as a "cleanup" of our tire and suspension model presentation. Using the Chapter 28, Advanced UCS, Views, Text, and Dimensions in 3D, Exercise 1 design, set up a title block and viewports as shown in the following illustration. (Difficulty level: Advanced; Time to completion: 20 minutes.)