

Getting Started with  
**Vectorworks Fundamentals**



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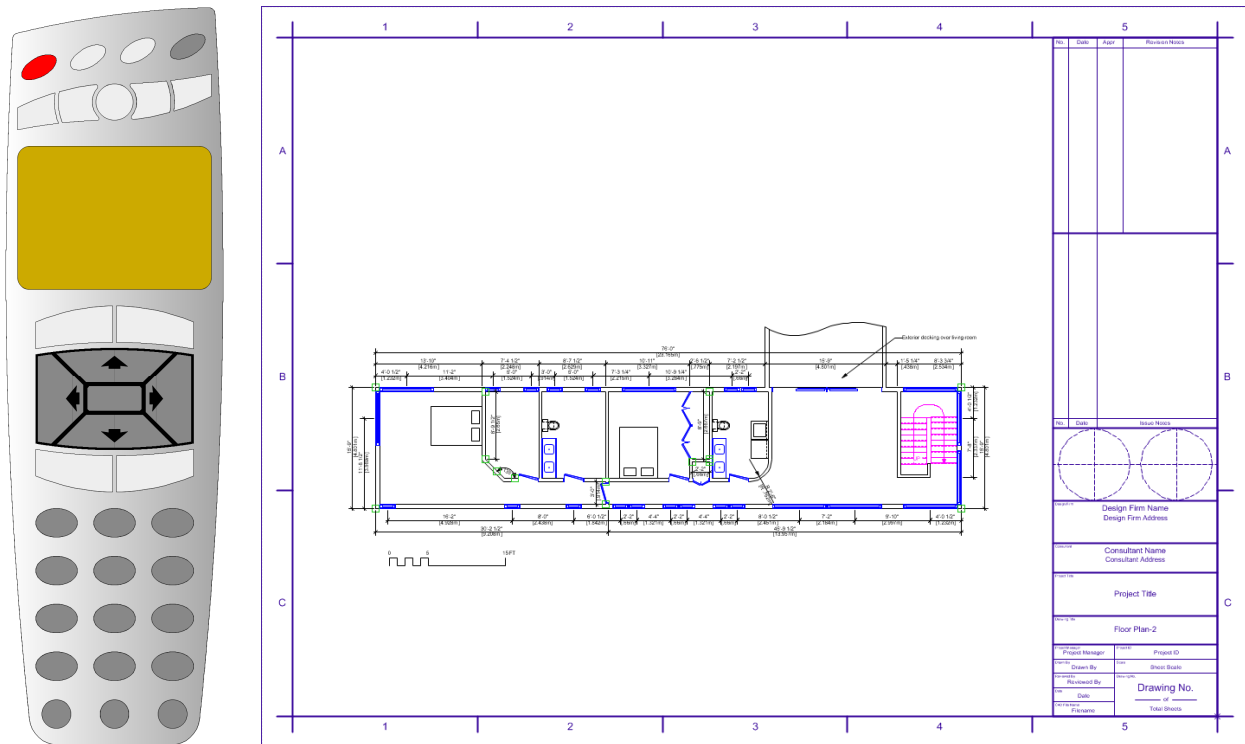
# Introduction

Welcome to Vectorworks Fundamentals! If you're new to Vectorworks, you may find it helpful to complete the QuickStart Guide before continuing. This tutorial will introduce you to key Vectorworks concepts and basic tools and techniques for drawing and editing, so you can explore the full power of Vectorworks Fundamentals on your own.

**Important:** For free tutorial updates, completed exercise files, and instructional videos, visit the [Fundamentals Getting Started website](#).

## Overview of the Tutorial

In this tutorial, you open files in various stages of completion, and then you either practice navigation controls or you create basic drawing objects using precision or dynamic drawing techniques. You use a variety of drawing and editing tools to create objects from scratch, or by reusing geometry from other objects. Working with these tools and techniques will help you understand fundamental Vectorworks concepts and functionality in true design context.



As you progress through 17 exercises, the following program features are introduced:

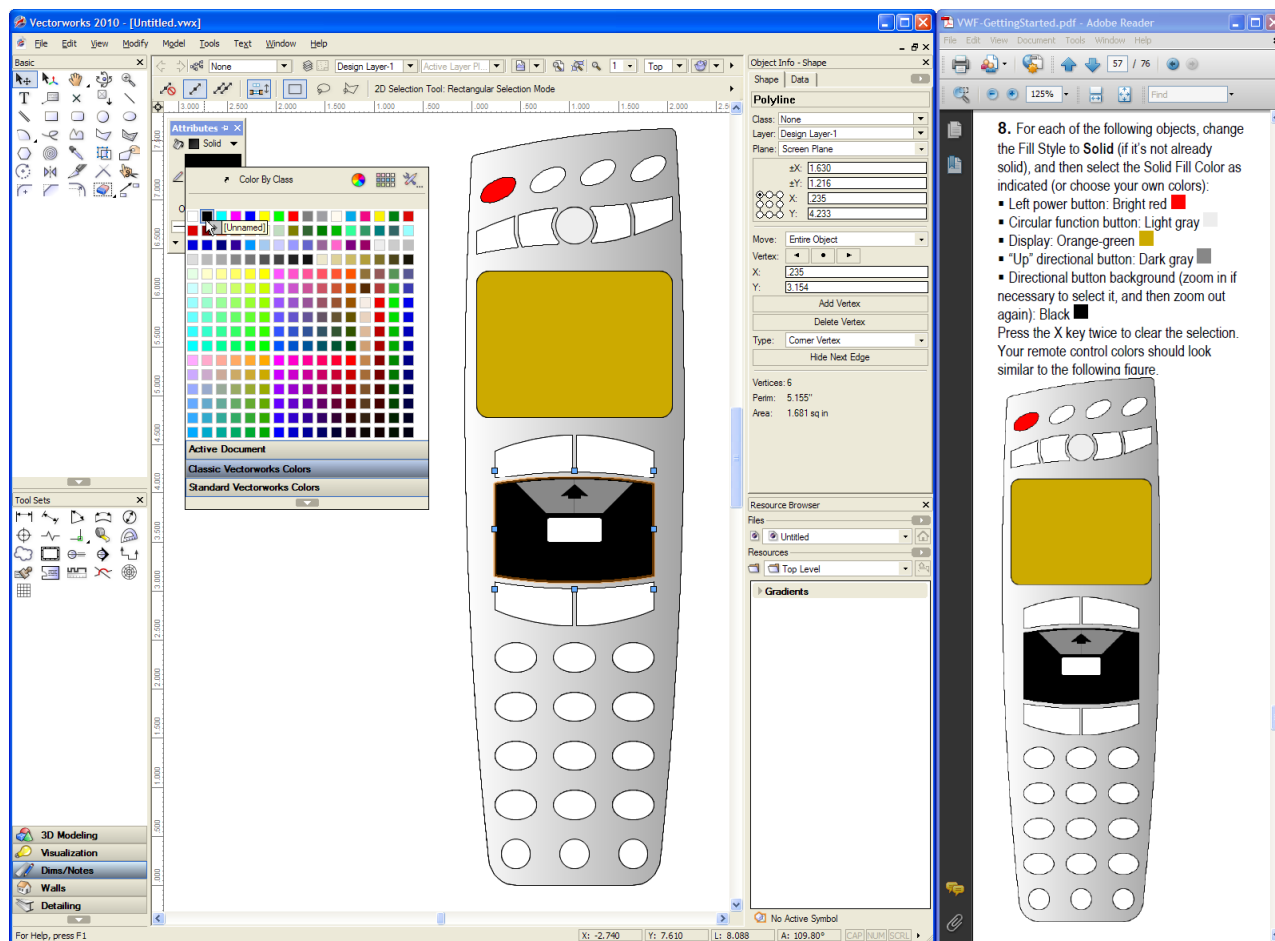
- [Program Installation and Setup](#)
- [Drawing Organization](#)
- [View and Visibility Controls](#)
- [2D Drawing Tools](#)
- [Manipulating and Modifying Objects](#)
- [Annotation Tools](#)
- [Drawing Presentation](#)

**Note:** Starting with [Exercise 5](#), you can optionally open and examine completed exercise files (available from the [Fundamentals Getting Started website](#)). See the [General Exercise Tips](#) section for more information.



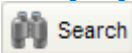
## How to Use This Tutorial

This tutorial is provided as an e-Book, in PDF format. You can print any or all pages for reference, or you can view the tutorial on-screen for enhanced electronic benefits including navigation links and search features.

If you choose to view the tutorial on-screen, you can optionally enable **Reflow** viewing mode (available from the View menu only in the Adobe Reader 7 or Adobe Acrobat 7 programs, available from the **View > Zoom** menu in newer versions) to display the text with a wrapping effect similar to a web browser. You can then adjust the Zoom level, and resize both the tutorial and Vectorworks windows to display them side-by-side as shown.





### Notes:

- 1) You can review workflow sequencing and locate specific procedures by scanning the process lists at the start of each section. The process lists are also hyperlinked to facilitate navigation.
- 2) If you view the tutorial on-screen, look for the **Previous View**  and **Next View**  tools at the bottom of the screen (or available in the Page Navigation toolbar in newer versions). These useful tools—available in Adobe Reader and Acrobat—let you revert or repeat navigational changes by page controls, bookmarks, and hyperlinks.
- 3) If you use **Reflow** viewing mode with the Adobe Reader window configured as shown in the figure above, you may need to temporarily increase the size of the window to see details in larger figures.
- 4) The Adobe Reader **Search** tool  provides more extensive options for searching text than the **Find** command.

## General Exercise Tips

Use the following tips to facilitate working with your exercise drawing files:

- Read each step *carefully* and make sure your results match the figures. If your results vary from the figures, stop immediately and review the previous steps. If you can't find the problem quickly, start the exercise over with the appropriate supplied file.
- Alternate methods are shown for activating many tools, commands, and modes. Use the method that works best for you.
- In many cases, you must click in the drawing area after using the Navigation palette before continuing with the next step.
- Watch for SmartCursor cues that appear when you hover your cursor over significant drawing object geometry. Pause briefly over snap points to display the red snap box, and watch for the red confirmation dot displayed temporarily after you complete the snap. When too many red snap boxes are displayed in congested areas, press the Esc key once to clear the display.
- For some operations, additional view adjustments may be required. For these cases, press the Z key for the **Snap Loupe** shortcut, or use the **Zoom**, **Pan**, and **Fit to Objects** tools as required. If you have a mouse wheel, use it to zoom in and out.
- To pan across the drawing at any time (even if a tool or command is active) hold down the Space Bar and drag the cursor.
- If you inadvertently cleared a selection required for an active tool or command, press Space Bar+X temporarily, and then select the object(s).
- Many tools have different operational modes, which you can select in the Tool bar (located above the drawing window).
- Keep the Object Info palette open (to open it, select **Window > Palettes > Object Info**). It displays valuable information, and provides access to key properties of selected objects.
- Press the Esc key to cancel any operation. If you are using a tool, it will still be active, but you can then start drawing again or choose another tool. Sometimes, you must press the Esc key before you use a keyboard shortcut to activate another tool.
- Use the **Undo** command in the Edit menu to revert steps as necessary (both drawing *and* view changes are reverted).
- For tools that create multiple segments (such as the **Wall** tool) press the Delete key once while the tool is active to revert a single segment, or press it repeatedly to revert additional segments.
- If multiple files are open, you may need to click the Resource Browser's **Home** button  if your house file isn't active.
- Object artifacts may remain in the drawing area after some drawing and editing operations. To refresh the screen and clear the artifacts, double-click the **Pan** tool  (in the Basic tools palette).
- Starting in [Exercise 5](#), save your files often to prevent data loss.

**Important:** *Exercise steps in this tutorial are based on default preference settings from a new installation of the Fundamentals program. Results for some steps may vary from the figures if your preference settings differ from the defaults.*

## Using Metric Units with Exercises

All exercise data set files for this tutorial are set to use imperial units. If you want to use metric values for the exercise steps, enter the values exactly as shown in [square brackets, with the unit mark], and Vectorworks will convert the values accordingly. If you want to measure distances or drawing objects for reference, use the appropriate dimension tool and object snaps to create temporary dimensions, which are set by default to display alternate units in metric values. Delete the temporary dimensions when finished.

**Note:** *For proper exercise operation—and to validate your results with the imperial figures—do not change the document's units setting to metric.*

## Keyboard Shortcuts

All keyboard shortcuts included in this guide are based on the Windows operating system. If you're using a Mac, use the Option key instead of the Alt key, and use the Cmd key instead of the Ctrl key. Refer to the Vectorworks 2010 Shortcuts PDF file (available from the Online Help) to print a complete list of your own keyboard shortcuts.

# Section 1: Program Installation and Setup

In this section, you start by installing the Vectorworks Fundamentals program. Following installation, two exercises cover the following program setup and interface adjustment processes:

- Activating the Standard workspace (pg 6)
- Opening the starting file (pg 7)
- Adjusting Vectorworks preferences (pg 8)
- Adjusting Grid and Smart Point settings (pg 9)
- Turning off the page boundary (pg 10)
- Setting the default font (pg 10)
- Adjusting the Attributes palette display (pg 10)

In these exercises, you activate (or reset) the Standard interface, and then you adjust program preference settings and adjust the interface.

## Installing the Vectorworks Fundamentals Program

*Note: If you have already installed Vectorworks Fundamentals, start with step 2 below.*

1. Follow the installation instructions in the **ReadMe** file located in the root folder of your installation DVD.
2. Start the program. You can do this by selecting **Programs > Vectorworks2010 > Vectorworks2010** from the Windows Start Menu.
3. From the menu, select **Help > Check for Updates**. If updating is necessary, follow the on-screen instructions.
4. After updating, close Vectorworks (if it's still running) to reset the program.

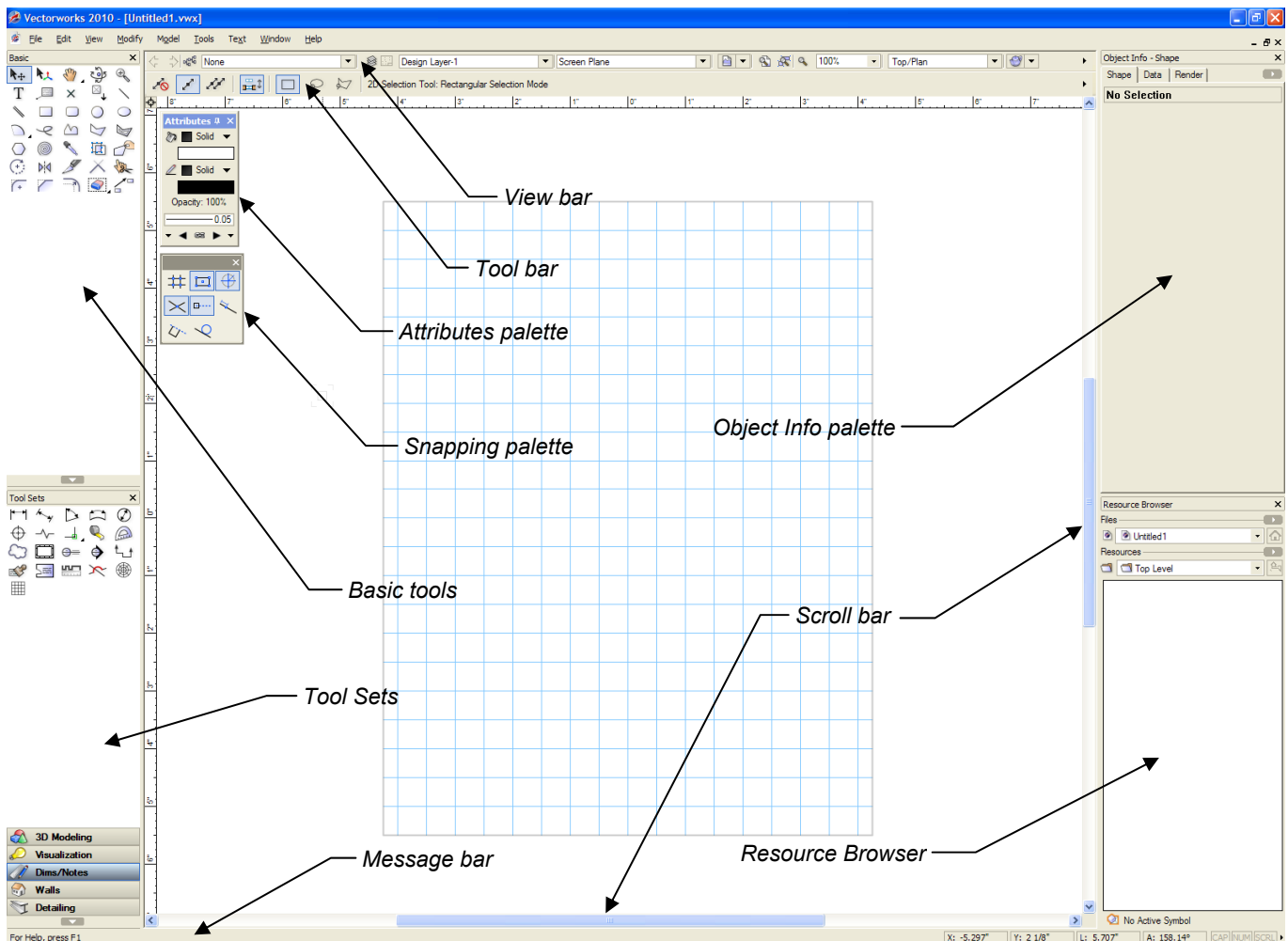
## Exercise 1: Launching the Program and Opening the Starting File

In this exercise, you launch the application and activate the Standard workspace. After a brief orientation of the Standard interface, you then open the supplied starting file.

### Activating the Standard workspace

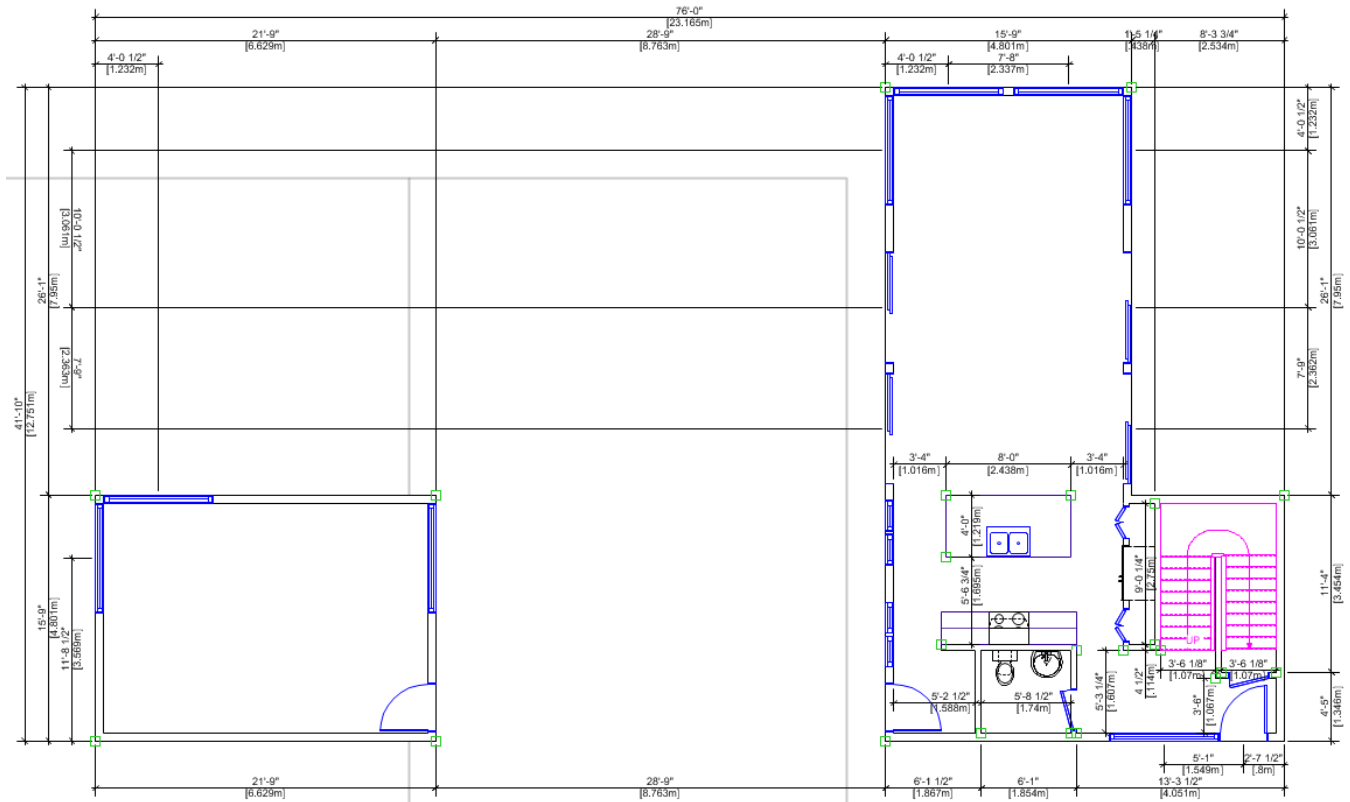
You start the exercise by launching the Vectorworks program.

1. From the Windows Start Menu, select **Programs > Vectorworks2010 > Vectorworks2010**.
2. From the menu, select **Tools > Workspaces > Fundamentals**. If the Fundamentals workspace is already active, select it again to reset the interface. Position the Navigation palette where shown, and examine key areas of the interface identified in the following figure.



## Vectorworks 2010 - 7

- Close any open files, and then from the menu, select **File > Open**. In the Open Vectorworks Drawing dialog box, open the Data Set folder and open the read-only **GS-VWFx01.vwx** file. The first floor plan is displayed, as shown (keep the file open for the next exercise).



**Note:** You examine the structure of this file in [Exercise 3](#).



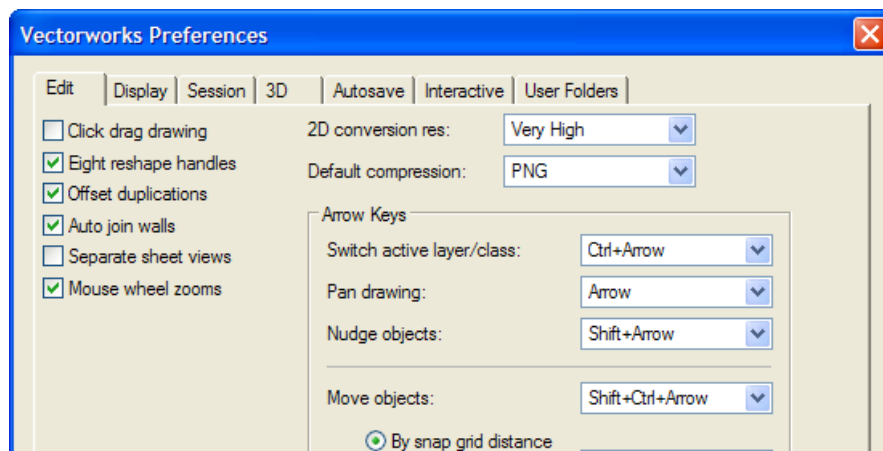
## Exercise 2: Adjusting Preference Settings

In this exercise, you verify and adjust program preferences.

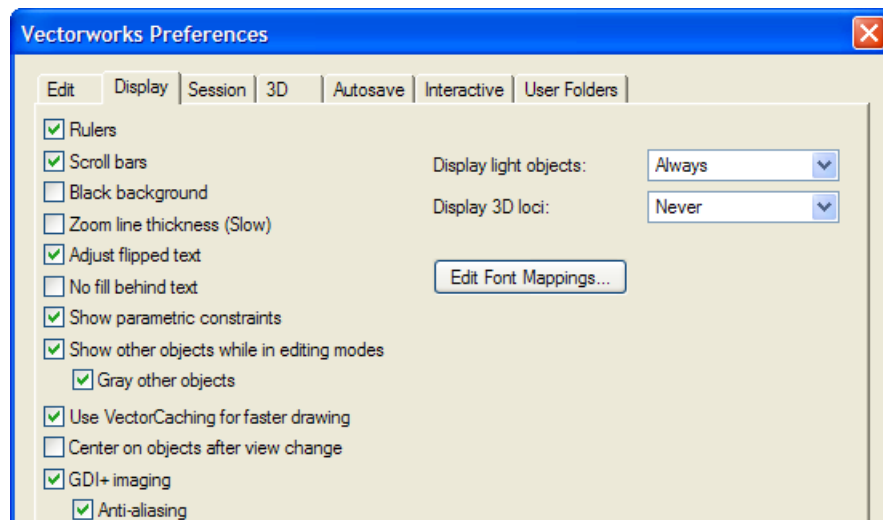
### Adjusting Vectorworks preferences

You start the exercise by verifying or adjusting key application preference settings to ensure proper exercise operation. You then turn on scroll bars to facilitate navigation, and then you increase the maximum number of undos so you can revert exercise steps if necessary.

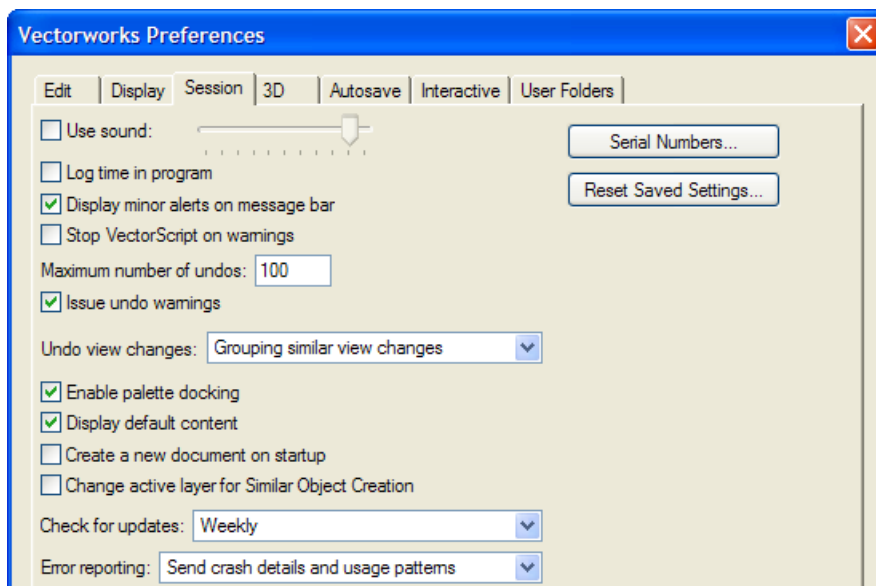
1. From the menu, select **Tools > Options > Vectorworks Preferences**. In the Vectorworks Preferences dialog box, select the Edit tab, and then verify or adjust settings as shown (keep the dialog box open for the next three steps).



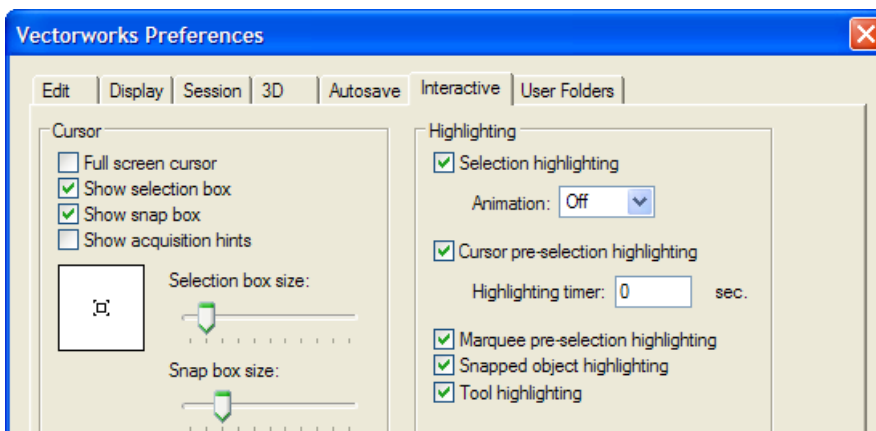
2. Select the Display tab, and enable the **Scroll bars** option, and then verify or adjust other settings as shown.



3. Select the Session tab, and then enter 100 in the **Maximum number of undos** field. Verify or adjust other settings as shown.

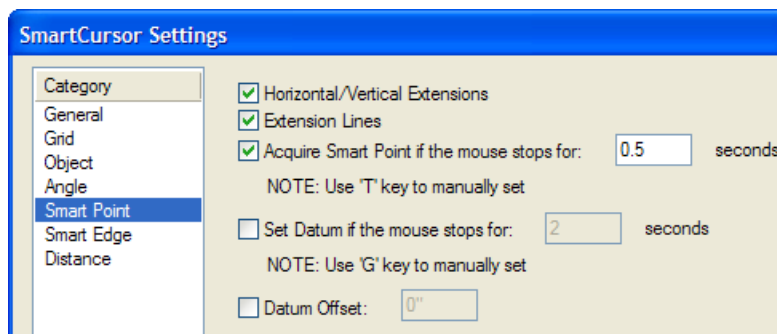
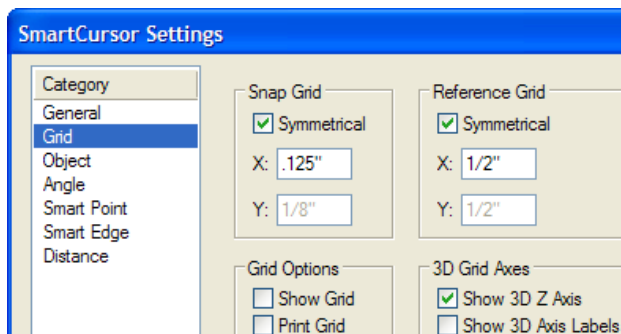


4. Select the Interactive tab, and then change the cursor's Selection box size, and Snap box size, and verify or adjust other settings as shown. Click **OK** to save the settings and close the dialog box.



## Adjusting Grid and Smart Point settings

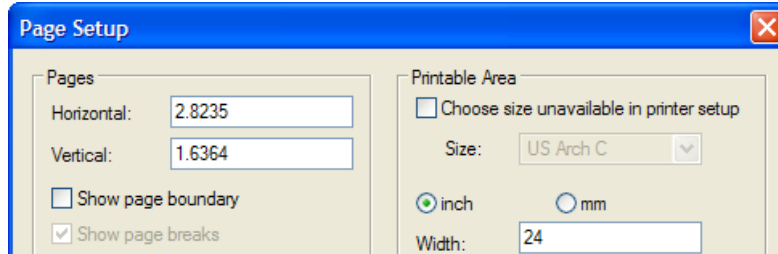
5. Press Ctrl+8 to display SmartCursor Settings dialog box, and then select **Grid** from the Category list. Clear the **Show Grid Lines** and **Print Grid Lines** checkboxes, and verify or adjust other settings (.125" [3.18mm], 1/2" [12.70mm]) as shown at left. From the Category list, click **Smart Point**, and verify or adjust settings, as shown at right. Click **OK** to close the dialog box and save the changes.



## Turning off the page boundary

Next, you turn off the page boundary for clarity in the drawing area.

6. From the menu, select **File > Page Setup**. In the Pages section of the Page Setup dialog box, clear the **Show page boundary** checkbox, as shown. Click **OK** to save the settings, and notice that the page boundary is no longer displayed in the drawing area.



## Setting the default font

Next, you adjust the default font.

7. From the menu, select **Text > Font > Arial** to set the default font (if it's not set to **Arial** already), and then select **Text > Size > 12** to set the default font size to 12 point (if it's not set to **12** already).

## Adjusting the Attributes palette display

8. If your Attributes palette is not already displayed, from the menu, select **Window > Palettes > Attributes**, and then turn on **Auto Hide** (or **Window Shade** for Mac). Keep the file open for the next exercise.

## Section 2: Drawing Organization

In one exercise, this section provides an overview of the following file structure features:

- Using the Organization dialog box (pg 12)
- Examining layer structure (pg 13)
- Examining class structure (pg 15)
- Examining object attribute controls (pg 16)

In this exercise, you examine the structure of a sample architectural file so you can see how the drawing objects are organized.

## Exercise 3: Examining Key Drawing Structure Features

In this exercise, you open an architectural sample file, and then you examine the layer and class structure. You then learn the basic control options for displaying object attributes.

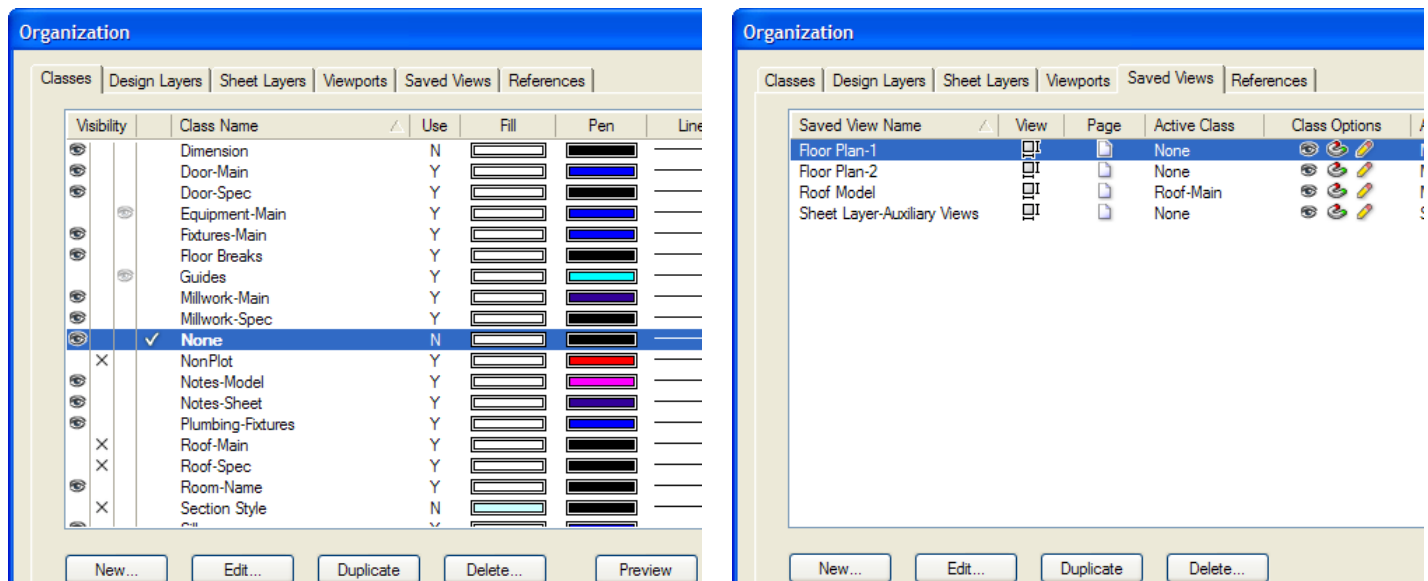
**Note:** Due to the complex nature and permutations of drawing structure features and controls, this exercise provides only an introductory overview. Refer to the Online Help for more detailed information.

### Using the Organization dialog box

You start the exercise by opening the Organization dialog box, and then you examine various tabs and control features.

**Note:** The Organization dialog box provides single-point viewing, creation, and modification control of drawing structure elements.

1. From the menu, select **Tools > Organization**. The Organization dialog box is displayed. Select different tabs, and then examine a few of the items listed on each tab, and notice (as shown in the following examples) that:
  - You can click an attribute column heading to sort the entire list (click the column heading again to toggle the sort order).
  - You can right-click an item (see Note below figures) or a blank area inside the list to display the context menu.
  - Different command buttons are displayed (on the bottom) for different tabs (keep the Organization dialog box open for the next step).



**Note:** The Reference tab has no items listed because there are no referenced files in this sample drawing.

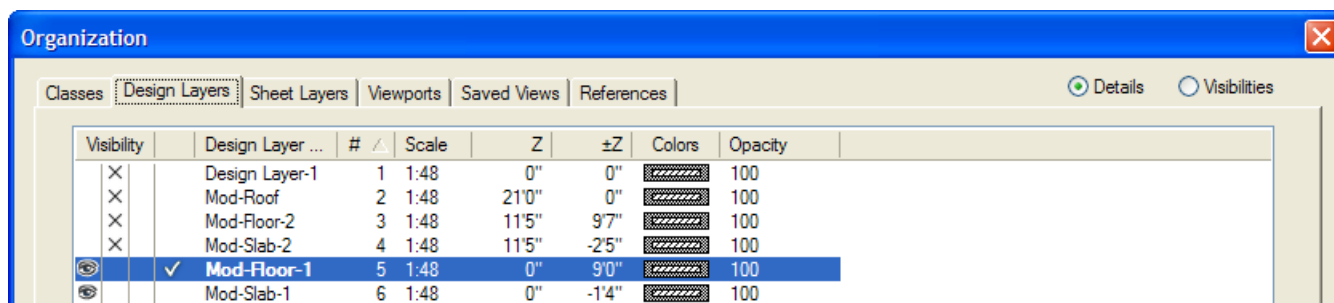
## Examining layer structure

Next, you examine key design layer attributes and controls, and then you explore the structure of design layers in this sample file.

### Notes:

- 1) Design layers are primarily used as spatial containers for creating drawing objects and/or to control object stacking order.
- 2) Sheet layers are primarily used as a 2D-only page layout environment for printing.

2. In the Organization dialog box, select the Design Layers tab, and examine the following key layer attributes:
  - *Spatial attributes* – The varying Z and  $\pm Z$  values define layer base heights (elevations) and thicknesses respectively
  - *Visibility attributes* – Visible, invisible, gray, colors, and opacity
  - *Stacking order attribute* - Integers indicate the display order (or which objects are on top of others; number 1 is on top of all others)



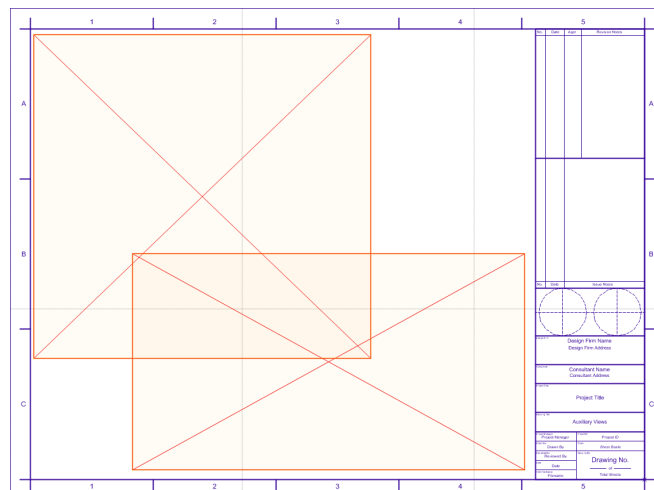
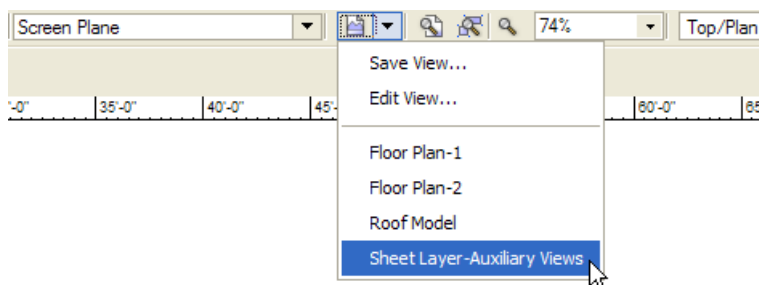
### Notes:

- 1) This file structure was created with Vectorworks Architect's setup commands.
- 2) This file uses layers primarily as spatial containers for architectural elements on different elevations.
- 3) Layer color overrides are used for clarity in the sheet layer viewports that you modify, starting with step 5.

3. Click **Cancel** to close the Organization dialog box without saving changes.

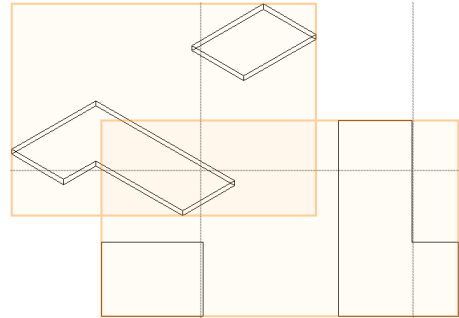
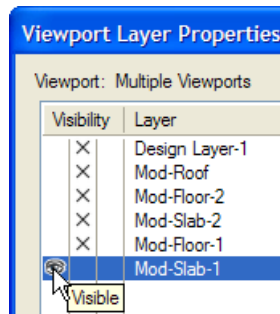
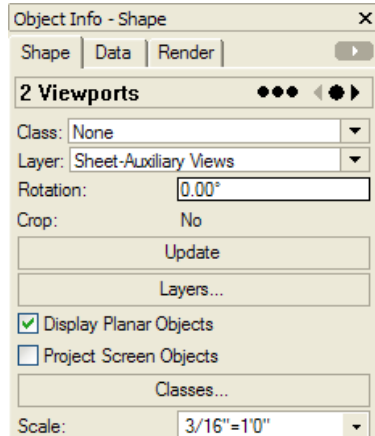
Next, you turn on visibility of layers in sequential order, simultaneously in two sheet layer viewports to expose the objects that they contain. As you virtually rebuild the design on-screen from the ground, up - you see exactly how layers act as spatial containers in this file.

4. In the View bar:
  - Click **Saved Views**, and then select the **Sheet Layer-Auxiliary Views** saved view from the drop-down list (as shown at left) to activate it.
  - Notice that the Sheet-Auxiliary Views sheet layer is now active, with 2 blank viewports selected, as shown at right.



5. In the Object Info palette:

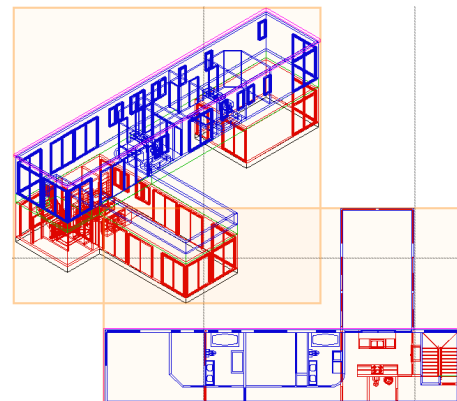
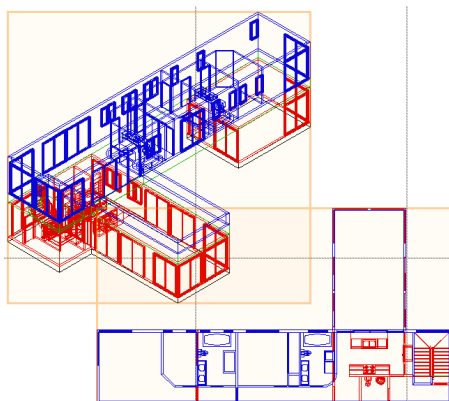
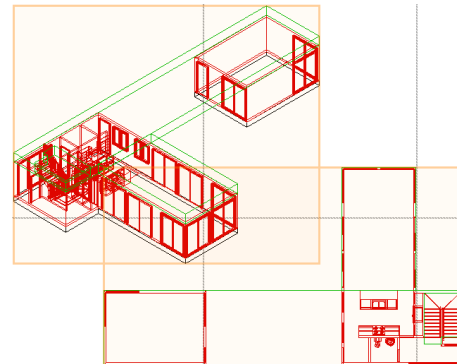
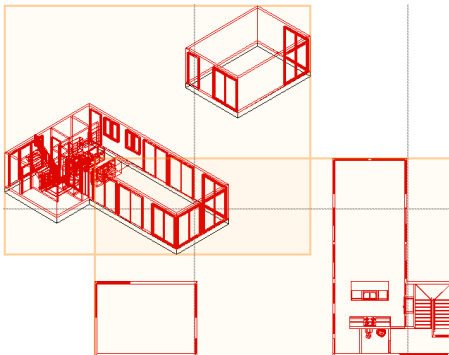
- Notice that 2 viewports are selected (see Note below figures), as shown at left.
- Click **Layers** to display the Viewport Layer Properties dialog box. Move the dialog box so you can see both viewports, and then turn on visibility of the **Mod-Slab-1** layer, as shown at center. Click **Preview**, and notice that floor objects in the Mod-Slab-1 layer are displayed in both viewports (in black color), as shown at right (leave the Viewport Layer Properties dialog box open for the next step).



**Note:** Sheet layer viewports are individual 2D “live camera view” objects that reside on sheet layers, but display 2D and 3D drawing objects on design layers. When you modify drawing objects on a design layer, the viewport itself doesn’t change, but it displays the design layer changes.

6. For each of the following layers—one at a time, in the order listed—turn on visibility, and then click **Preview**:

- **Mod-Floor-1** (wall and architectural element objects are displayed in red color, as shown at top left)
- **Mod-Slab-2** (floor objects are displayed in green color, as shown at top right)
- **Mod-Floor-2** (wall and architectural element objects are displayed in blue color, as shown at bottom left)
- **Mod-Roof** (the roof object is displayed in magenta color, as shown at bottom right)



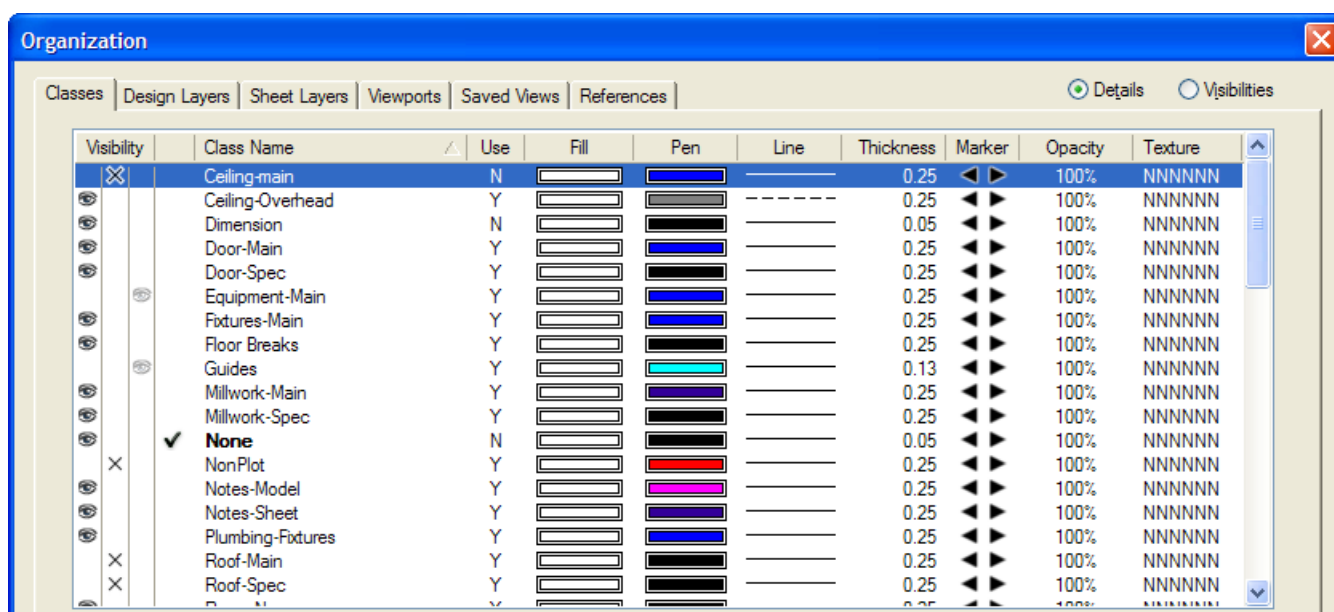
- Click **OK** to save the layer visibility changes and close the Viewport Layer Properties dialog box, and then press the X key twice to clear the selection.

## Examining class structure

Next, you examine key class attributes and controls, and then you explore the class structure of this sample file.

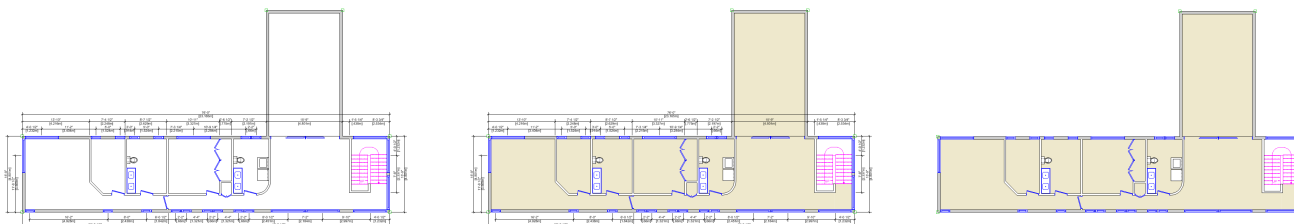
**Note:** Classes are primarily used to control display properties and visibility of drawing objects.

- In the View bar, click **Saved Views**, and then select the **Floor Plan-2** saved view from the drop-down list to activate it. Notice that the Mod-Floor-2 design layer is now active.
- Press Ctrl+Shift+O for the Organization dialog box shortcut, and then select the Classes tab. Notice that all attributes for classes either control visibility or object display, as shown.



Next, you change attributes or visibility of a few classes so you can see how classes are used in this file.

- Drag the Organization dialog box's lower left corner to reduce its size, and then move it as high up on the screen as possible. Scroll as necessary, and then for each of the following classes—one at a time, in the order listed—click in the Class Name column to select the class, then change the attribute as directed, and click **Preview** to see the effect.
  - Wall Exterior:** Click **Edit**, then select any light gray Fill Color in the Edit Class(es) dialog box (click the buttons at the bottom of the color palette to display other color palettes), and click **OK** to shade exterior walls, as shown at left.
  - Structural-Slab:** Click **Edit**, then select any light beige Fill Color in the Edit Class(es) dialog box (click the buttons at the bottom of the color palette to display other color palettes), and click **OK** to shade the floor, as shown at center.
  - Dimension:** Change Visibility to **Invisible** (click in the Invisible column) to hide the dimensions, as shown at right.



**Tip:** Double-click a class to open the Edit Class(es) dialog box.



11. Click **OK** to close the Organization dialog box and save the changes.


**Tip:** If one or more of your drawing objects has disappeared in your own files, the problem may be related to a class and/or layer assignment or visibility issue. Turn on the **Show/Snap/Modify Others** Layer Option, and then use the **Custom Selection** command (with appropriate criteria) to find it. You can then correct class and layer properties if necessary.

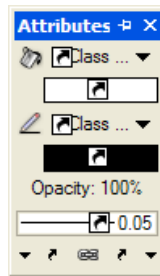
## Examining object attribute controls

Next, you examine object display controls in the Attributes palette.

12. If necessary, click the Attributes palette to expand it, and then examine the controls for object fill and pen styles, opacity, line style, and markers.

There are three primary methods you can use to apply these attributes (see Note below):

- **Default** – When no objects are selected, the current settings are applied to all subsequently created objects. Default settings are persistent, but you can change them at any time when no objects are selected.
- **By selection** – When objects are selected, any setting you change is only applied to the current selection. When you clear the selection, the prior default settings are restored.
- **By class** – The active class (or automatically assigned class) applies its settings to objects created. An arrow icon  indicates “by class” settings.



### Notes:

- 1) Certain types of objects (such as walls) provide their own control of these attributes, and are not affected by Attribute palette settings.
- 2) You use the Attributes palette later in [Exercise 5](#) and [Exercise 11](#).

13. Close your file. Do not save changes.

## Section 3: View and Visibility Controls

In one exercise, this section covers the following processes for navigating drawings and controlling the display of drawing objects:

- Zooming and panning (pg 18)
- Changing class and layer visibility options (pg 20)
- Creating a saved view (pg 21)
- Activating a saved view (pg 21)

In this exercise, you continue working with the sample architectural file from [Section 2](#) as you practice using navigation and visibility controls in a Vectorworks drawing with multiple layers and classes.

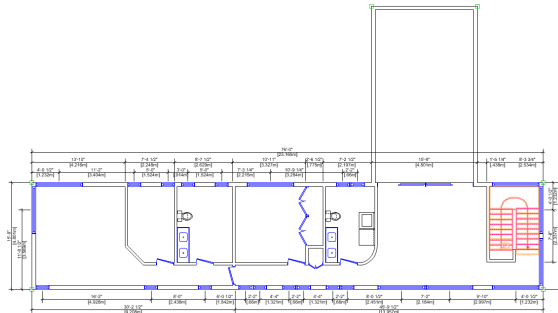
## Exercise 4: Working with View Controls



In this exercise, you learn how to navigate the drawing and control display of layers and classes. You complete the exercise by creating a saved view.

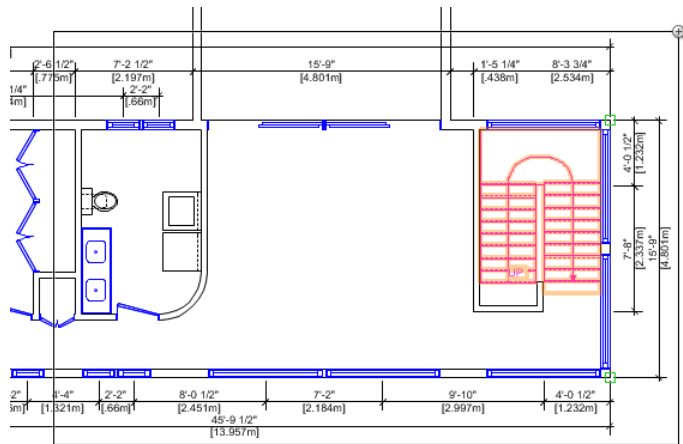
### Zooming and panning




You start the exercise by using different methods to control the display magnification.

1. Open the **GS-VWFx03.vwx** file in the Data Set folder. The file opens with the stair object selected on the second floor plan, as shown (leave the stair selected for the next two steps).





2. From the Basic tools palette, click the **Zoom** tool . In the Tool bar, enable **Marquee Zoom Mode**  (if it's not already active), and then draw a marquee from lower left to upper right to zoom in on the area around the living room, as shown.

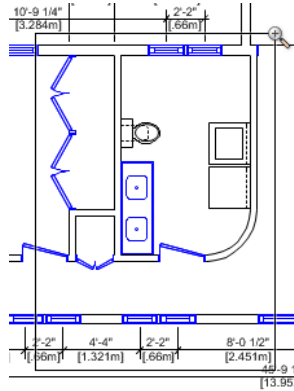


3. From the View bar, click **Fit to Objects** . The view is adjusted to fit the selected stair object to the screen.
4. Press the X key twice to clear the selection. From the View bar, click **Zoom In/Zoom Out** , once, and then click it again to zoom in on the center of the stair object.
5. Hold down the Alt key, and then click **Zoom In/Zoom Out**  twice to zoom out so you can once again see the entire stair object.
6. From the View bar, select **100%** from the Current Zoom drop down list to zoom out.


**Tip:** You can specify an exact value for the Current Zoom magnification level. To do this, click the Current Zoom value to highlight it, then type a new value and press **Enter** to incorporate the change.

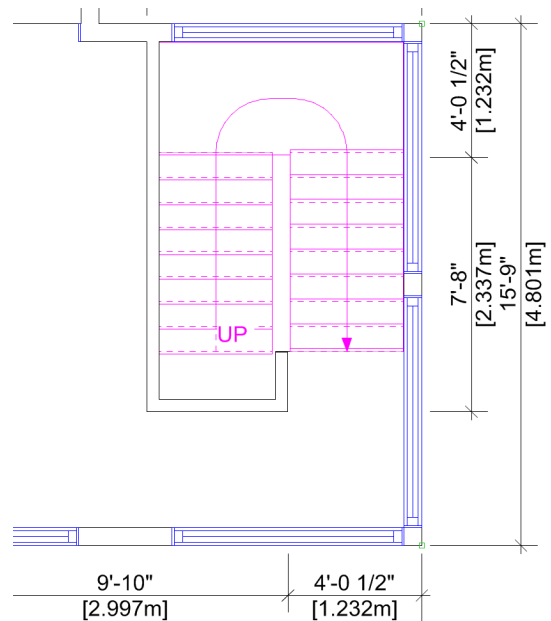
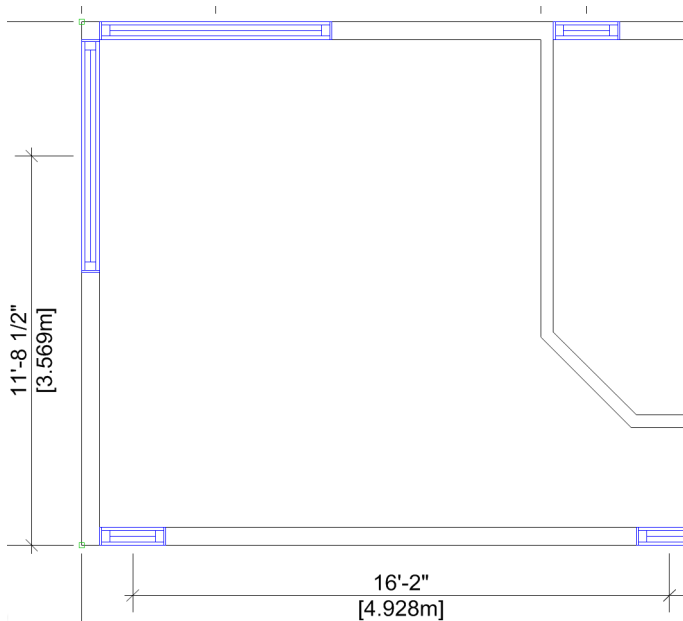
7. From the View bar, click **Fit to Objects** . Since no object is selected, the view is adjusted to fit all objects to the screen.

8. From the Basic tools palette, click the **Zoom** tool , and then zoom in on the hall bathroom and hallway, as shown.



Next, you use different methods to move the view.

9. From the Basic tools palette, click the **Pan** tool . To pan to the left side of the floor plan: Move the cursor to the left side of the screen, and then hold down the left mouse button and drag straight across to the right side of the screen. Repeat the process as necessary until you reach the left end of the floor plan (shown at left), and then reverse the direction to pan to the right until the stair object is visible, as shown at right.



10. Experiment panning the drawing using the scroll bars:

- Drag the bars to move the view up, down, left, or right.
- Click the arrows on the ends of the scroll bars to pan in smaller increments.
- Click the blank area between the scroll bars and arrows to pan one screen width at a time.

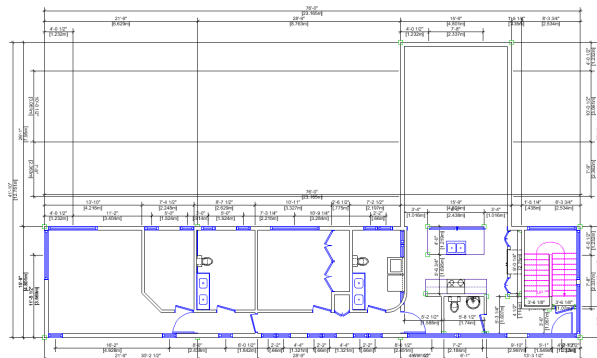
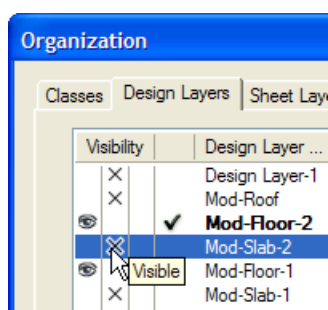
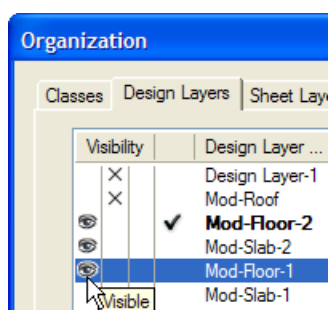
## Changing class and layer visibility options

Next, you adjust layer visibilities in the Organization dialog box, and then you change options for class and layer visibility.

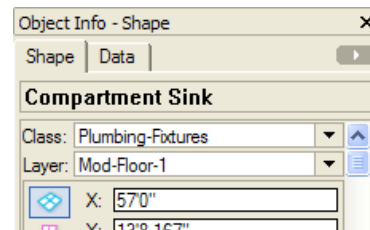
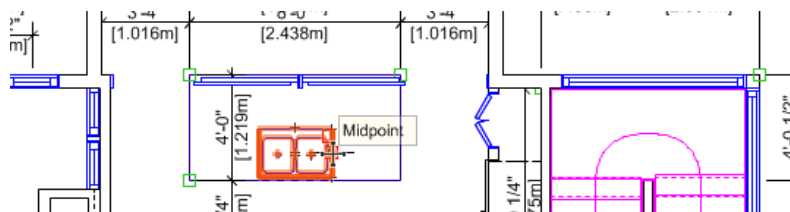
11. If any objects are selected, press the X key twice to clear the selection. Press Ctrl+6 for the **Fit to Objects** shortcut.

12. Press Ctrl+Shift+O for the Organization dialog box shortcut. Select the Design Layers tab, and then:

- Turn on visibility of the **Mod-Floor-1** layer (click in the Visible column), as shown at left
- Turn off visibility of the **Mod-Slab-2** layer (click in the Invisible column), as shown at center
- Click **OK** to close the Organization dialog box and update the display, as shown at right



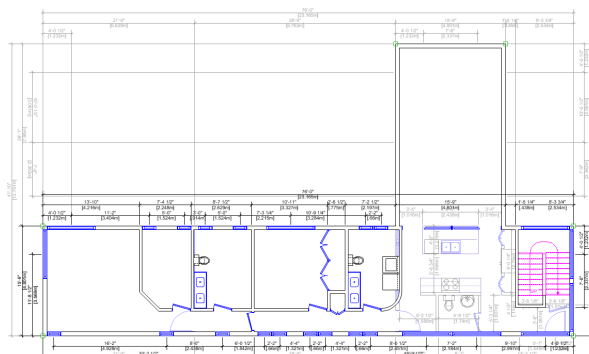
13. Press the X key, and then try to select (left-click) the kitchen sink on the first floor. Although the cursor previews the sink's snap points, you can't select it because the Show/Snap Others layer option is currently active. From the menu, select **View > Layer Options > Show/Snap/Modify Others**. Move your cursor over the sink and notice that the pre-selection highlight is now displayed, as shown at left. Select the sink and notice the Class and Layer properties in the Object Info palette's Shape pane (shown at right), and then press the X key twice to clear the selection.



**Warning:** Use caution when the **Show/Snap/Modify Others** layer option is active. You should only use this option temporarily (do not enable this option in your saved views) until you become more comfortable using Vectorworks.

**Tip:** You can also right-click an object on an inactive layer or class and use the **Force Select** context menu command to select it, but this command also changes the active layer.

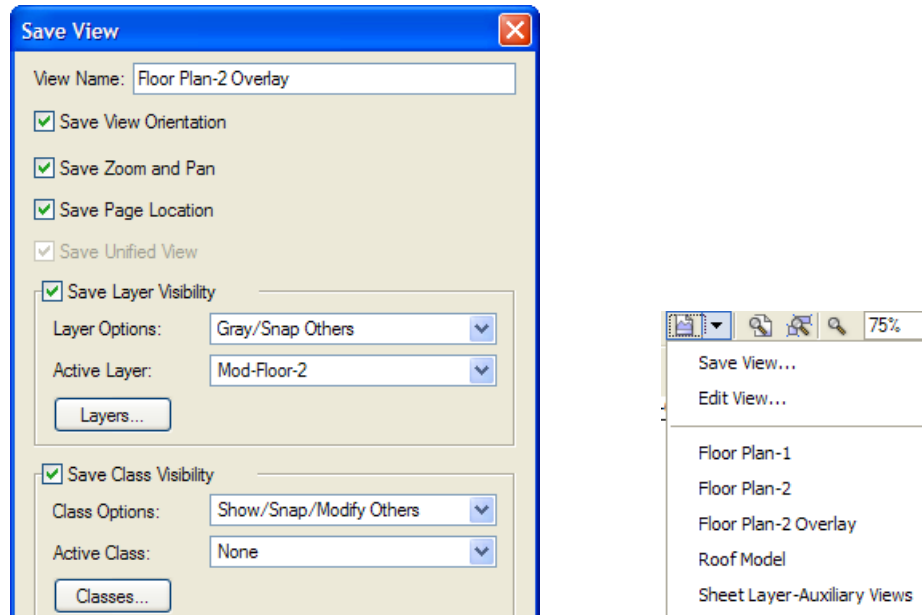
14. Right-click the drawing background (outside the exterior dimensions), and then select **Layer Options > Gray/Snap Others** from the context menu. Objects on the first floor (the Mod-Floor-1 layer) are now grayed, as shown.



## Creating a saved view



Next, you create a saved view based on the current display settings.

15. From the menu, select **View > Save View**. In the Save View dialog box, adjust the settings as shown at left, and then click **OK** to save the view. In the View bar, click **Saved Views**, and notice that the new view is now displayed in the list, as shown at right.



## Activating a saved view

Next, you revert previous views, and then you activate the view you just saved to verify that all settings are restored.

16. In the View bar:
- Click **Previous View**  repeatedly (until it's grayed out ) to restore the view that was active when you opened the file.
  - Select **Floor Plan-2 Overlay** from the Saved Views drop-down list, and notice that the view is restored exactly as you configured it.
17. Close your file. Do not save changes.

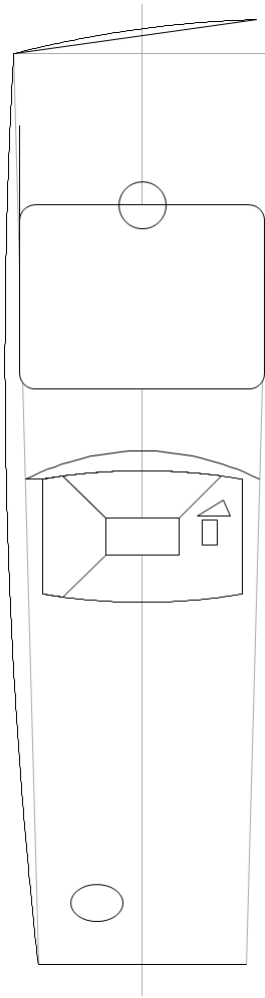
## Section 4: 2D Drawing Tools

In two exercises, this section covers the following processes for drawing basic 2D objects:

- Drawing rectangles (pg 23)
- Drawing lines (pg 24)
- Drawing arcs (pg 26)
- Drawing a circle (pg 27)
- Drawing an oval (pg 27)
- Drawing polygons (pg 28)
- Drawing a polyline (pg 30)

In these exercises, you use basic 2D drawing tools to start drawing the outline and components of a remote control transmitter.

After completing the exercises in the section, your drawing should look similar to the following figure.



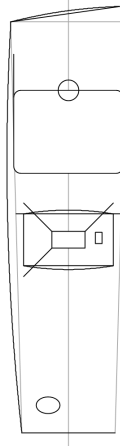
### Notes:

- 1) You develop the remote control transmitter design over the next 8 (continuing) exercises.
- 2) For educational purposes, most drawing operations in these exercises are grouped by similar functions. As a result, you don't draw many of the remote control's components in the normal order of creation—from start to finish. For these cases, you draw a portion in one exercise, and then you continue drawing or modifying geometry in one or more subsequent exercises.

## Exercise 5: Drawing 2D Objects

In this exercise, you start laying out the remote control components by drawing basic 2D objects.

The completed exercise is shown in the following figure.




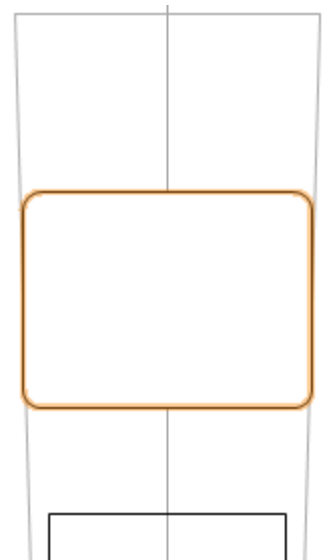
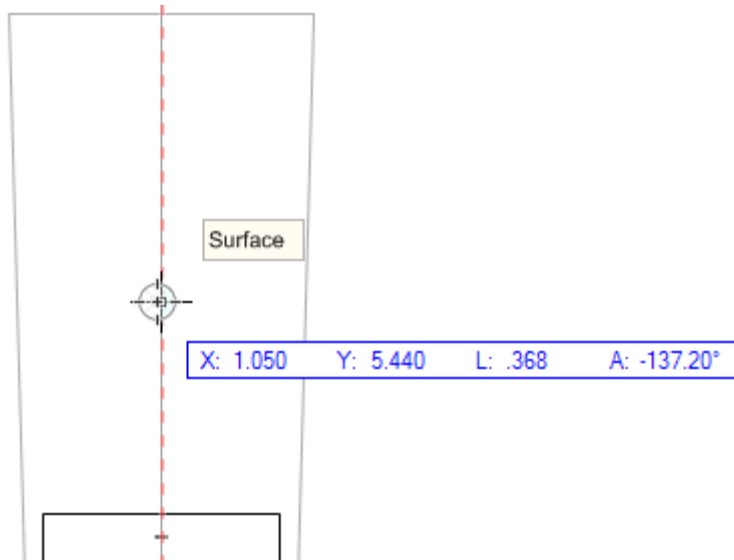
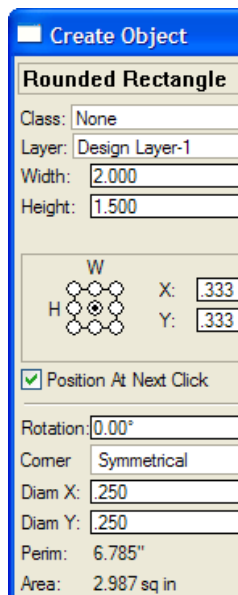
### Drawing rectangles

You start the exercise by drawing different types of rectangles to represent various components of the remote control.

1. Open the **GS-VWFx05-Step01.vwx** file in the Data Set folder. The file opens with some construction geometry (gray lines), a rectangle, and a line already drawn.


Next, you use the **Rounded Rectangle** tool to draw the remote control's LED display panel.

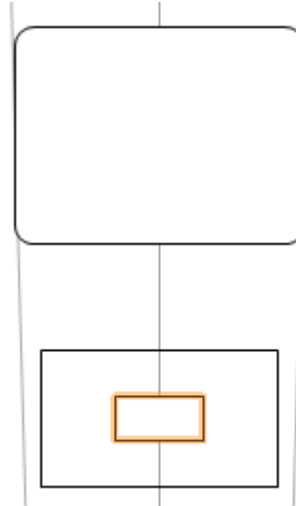
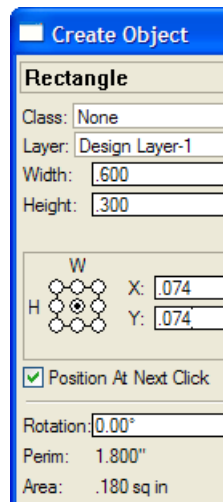
2. From the Basic tools palette, double-click the **Rounded Rectangle** tool  to display the Create Object dialog box. Change the settings (2.000 [50.80mm], 1.500 [38.10mm], .250 [6.35mm]; ignore X and Y settings) as shown at left. **Important:** Make sure the Box Position (fixed point) is set to center, and the **Position At Next Click** option is enabled. Click **OK**, and move the cursor over the gray vertical centerline and press the T key to set a surface snap. Snap (left-click when the Surface SmartCursor cue is displayed) to the centerline approximately where shown at center, to create the rounded rectangle, as shown at right.





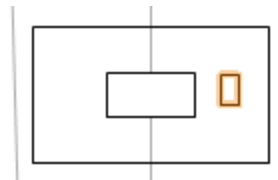
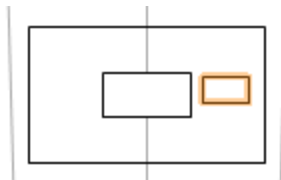
Next, you use the **Rectangle** tool to draw the remote control's enter button (at the center of the directional buttons).

- From the Basic tools palette, double-click the **Rectangle** tool  to display the Create Object dialog box. Change the settings (.600 [15.24mm], .300 [7.62mm]; ignore X and Y settings) as shown at left. **Important:** Make sure the Box Position (fixed point) is set to center, and the **Position At Next Click** option is enabled. Click **OK** and then snap to the center of the large rectangle (shown at center), to create the small rectangle, as shown at right.




Next, you draw a rectangle to form the base of an arrow indicator on the directional buttons.

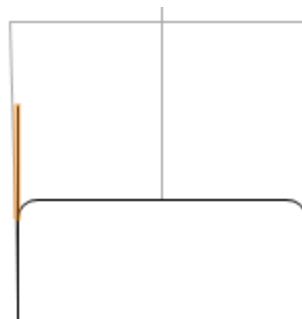
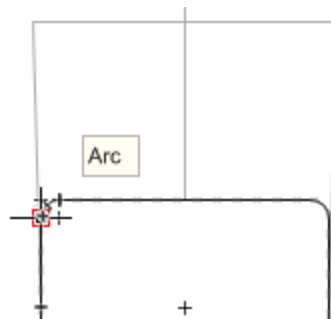
- With the **Rectangle** tool still active, click the lower left and upper right corners to create another rectangle approximately where shown at left. In the Object Info palette, select the Shape tab (if it's not already active). Change the Width to .120 [3.05mm] and the Height to .200 [5.08mm], and then press Enter to resize the rectangle, as shown at right.



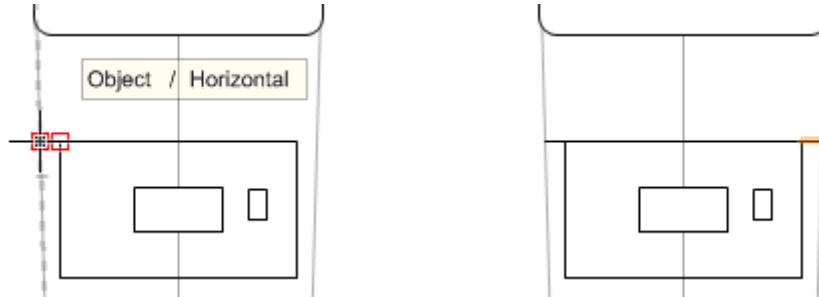
## Drawing lines

Next, you draw lines to divide the directional controls and provide boundaries and guidelines that you use later in this exercise, and in [Exercise 6](#).

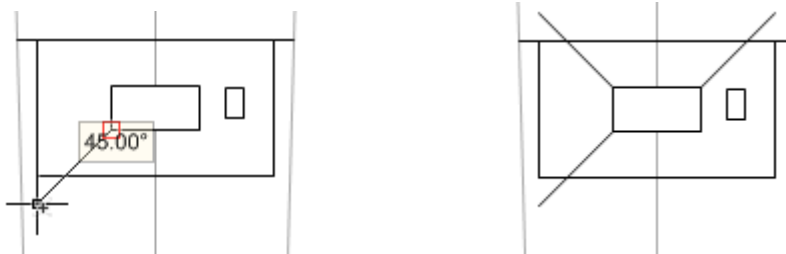
- From the Basic tools palette, click the **Line** tool . Snap to bottom end of the rounded rectangle's top left arc, as shown at left. Hold down the Shift key to constrain the line vertically, and then click directly above the start point to complete the line, approximately where shown at right.



6. With the **Line** tool still active, snap to the top left corner of the existing rectangle, and then hold down the Shift key to constrain the line horizontally, and then snap to the angled guideline to complete the line, as shown at left. Repeat the process to create another horizontal line on the opposite side, as shown (highlighted) at right.

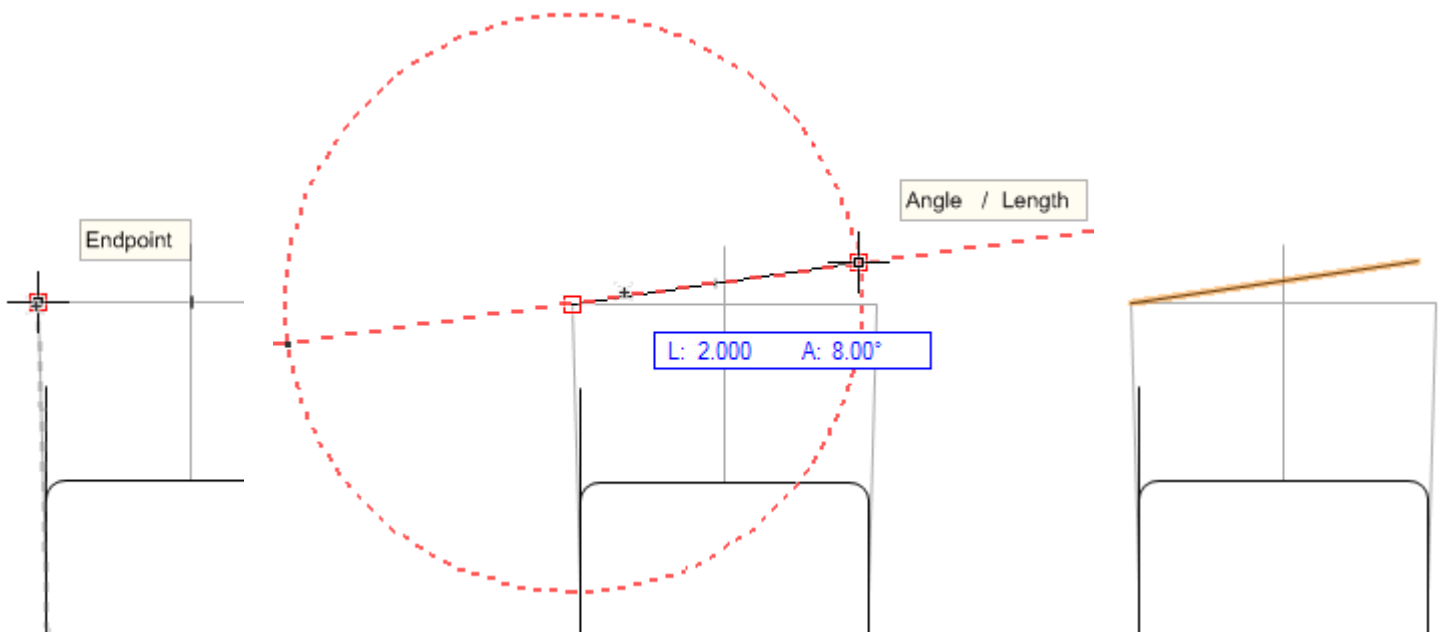




7. With the **Line** tool still active, create a guideline at a 45 degree angle by snapping to the bottom left corner of the enter button, and then using the Shift key, as shown at left (make sure the line extends outside the large concentric rectangle). Repeat the process to create two more guidelines (for a total of three) at 45 degree angles, as shown at right.



Next, you use the floating data bar to draw the top (transmitter) edge of the remote control.



8. With the **Line** tool still active, snap to the top left corner of the profile guideline, as shown at left. Start moving your cursor towards the right. Enter **2** [50.80mm] to activate the floating data bar's L field and set the value, then press Tab (a circular constraint indicator is displayed) and enter **8** for the Angle. Press Enter once to display the constraint (shown at center), and then press it again to create the angled line, as shown at right.

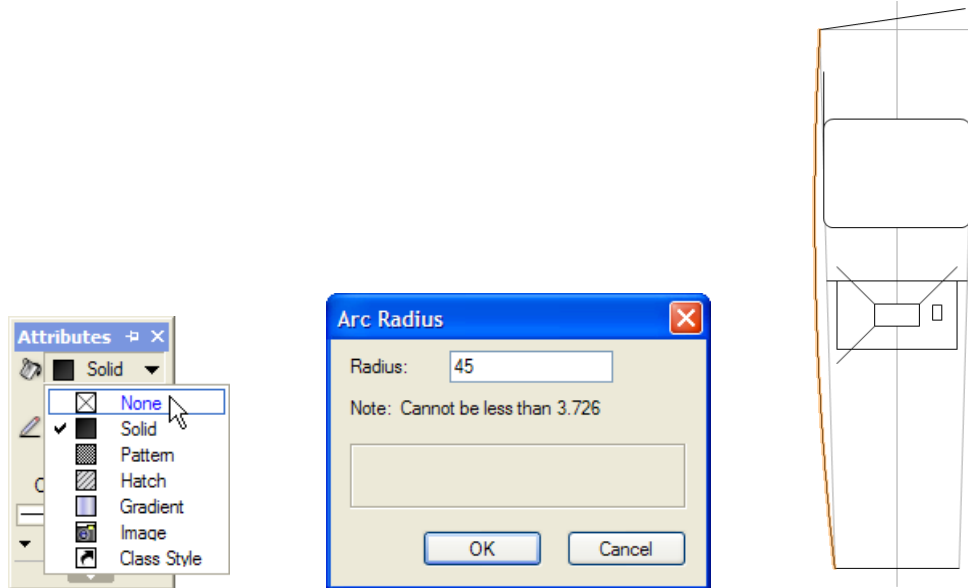


**Tip:** You can check the length and angle of this line (when it's selected) by clicking the polar coordinate button  in the Object Info palette. If you do this, be sure to click the Cartesian coordinate button  when finished to ensure proper operation of exercises in this tutorial.


## Drawing arcs

Next, you turn off object fills in the Attributes palette, and then you draw arcs for the remote control's left edge and for the top and bottom edges of the directional controls.

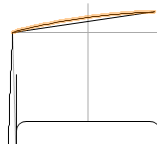
9. Press the X key twice to clear the selection. In the Attributes palette, change the Fill Style to **None**, as shown at left. From the Basic tools palette, click the **Arc** tool . In the Tool bar, enable **Arc by 2 Points and a Specified Radius Mode** . Click the bottom vertex of the remote control's left edge (angled gray line), and then click the top vertex (the start point of the last line you drew). In the Arc Radius dialog box, enter **45** [1143.00mm] for the Radius value (shown at center), and then click **OK** to create the arc, as shown at right.



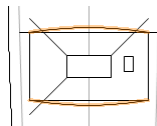
### Notes:

- 1) You change the Fill Style to **None** to prevent arcs and subsequent drawing objects from obscuring other drawing and construction geometry.
- 2) You enter precise radius values for all arcs in this exercise to ensure accuracy. In your own designs, you can dynamically determine an appropriate radius by using the **Arc** tool's **Arc by 2 Points and a Point on Arc Mode** , which you use later in [Exercise 8](#).

10. With the **Arc** tool still active, repeat the process draw an arc (from left to right) with an radius of **9** [228.60mm] on the endpoints of the remote control's top edge (the line at an 8° angle), as shown.





11. With the **Arc** tool still active, repeat the process draw an arc (from left to right) with a radius of **4.88** [123.95mm] on the top edge of the large concentric rectangle, then draw an arc (from right to left) on the bottom edge and the same radius, as shown (highlighted for clarity).

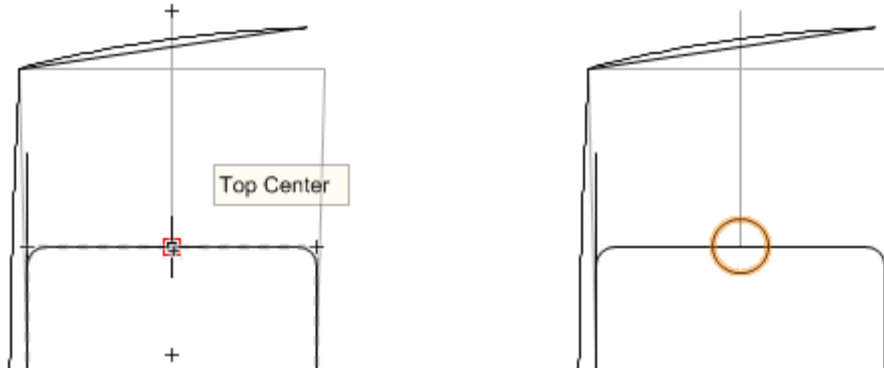


**Note:** You would normally use one of the copy operations to create the bottom arc by duplicating the top arc, but you draw it in this exercise to practice creating arcs.

## Drawing a circle

Next, you draw a circle for the center function button.



12. From the Basic tools palette, click the **Circle** tool . In the Tool bar, enable **Circle by Radius Mode** . For the center point, click the top center of the rounded rectangle (shown at left), and then start moving the cursor and type **.19** [4.83mm] to set the floating data bar's L (radius) field. Press Enter twice to complete the **.380** [9.65mm] diameter circle, as shown at right.



*Note: You move this circle into its correct position later in [Exercise 8](#).*

## Drawing an oval

Next, you draw an oval to represent the lower left keypad button.

13. From the Basic tools palette, click the **Oval** tool . In the Tool bar, enable **Oval by Box Mode** . Draw a diagonal line from lower left to upper right to create an oval, approximately where shown at left. In the Object Info palette, change the Width to **.430** [10.92mm], change the Height to **.300** [7.62mm], and then press Enter. Press the X key twice to clear the selection, and examine the completed oval, as shown at right.

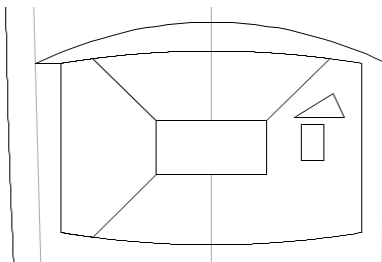


14. Save the file.

## Exercise 6: Drawing Multi-Segment 2D Objects



In this exercise, you continue laying out remote control components by drawing polygons and polylines.

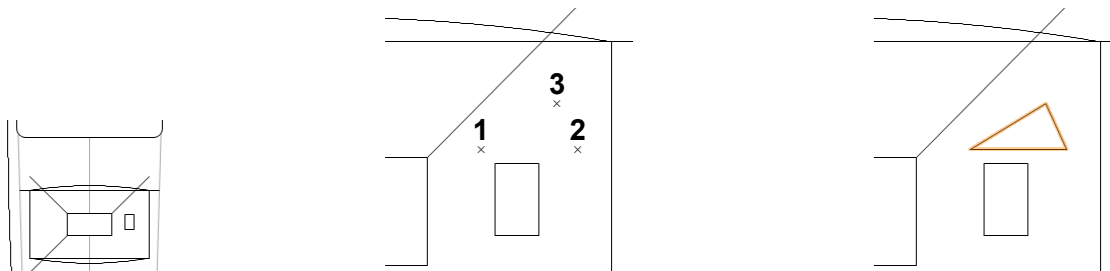
The completed exercise is shown in the following figure.



### Drawing polygons

You start the exercise by using the **2D Polygon** tool to draw a triangle that you use as an arrowhead indicator for the directional buttons.


1. Open the **GS-VWFx05.vwx** file in the Data Set folder.
2. Zoom in on the area shown at left. From the Basic tools palette, click the **2D Polygon** tool , and then in the Tool bar, enable **Polygon From Vertices Mode** . Start the polygon by clicking approximately where point 1 is shown (at center). Hold down the Shift key to constrain the cursor horizontally, and then click approximately where point 2 is shown. Click point 3, and then click the start point again—when the Endpoint SmartCursor cue is displayed—to close the polygon (see Notes below figure), as shown at right.

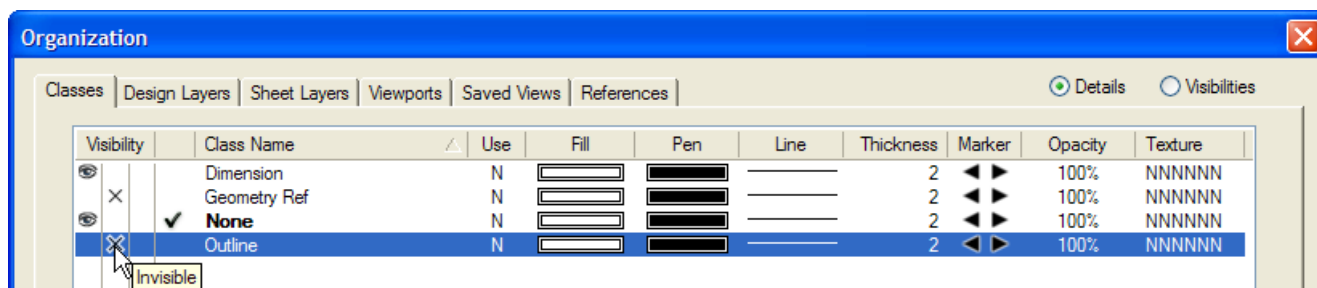


#### Notes:

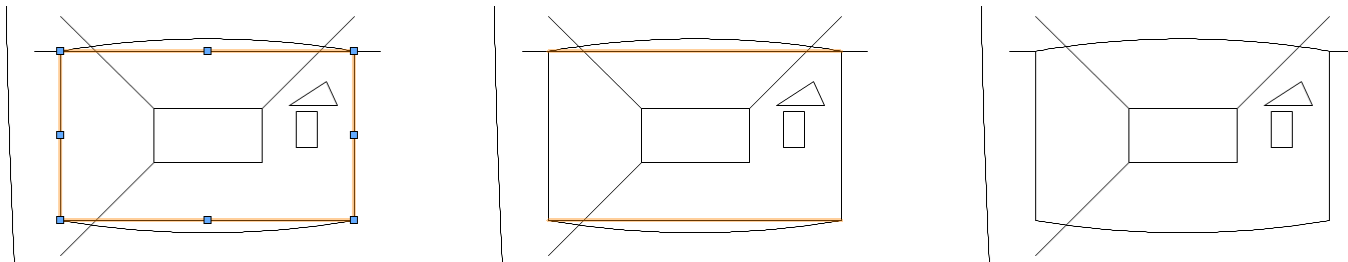
- 1) The polygon closes and terminates when you click the start point. If your polygon doesn't close, press the Delete key to undo the last segment, and then click the start point again.
- 2) Do not be concerned about the accuracy or the intentional asymmetrical shape of your polygon because you reshape it later in [Exercise 7](#).

Next, you temporarily turn off visibility of a class, and then you modify the outer concentric rectangle to facilitate creation of the directional buttons.


3. From the View bar, click **Classes** . In the Organization dialog box, turn off visibility of the **Outline** class, as shown, and then click **OK**.

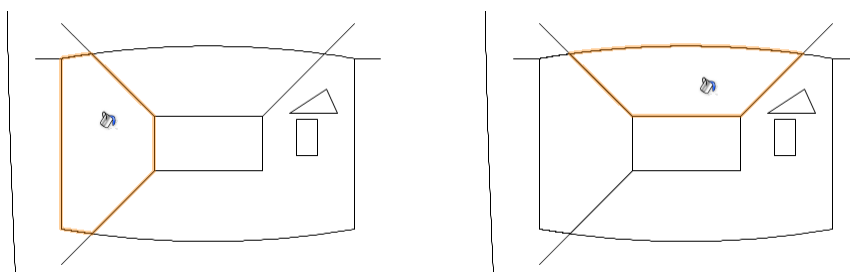



- Press the X key, and then select the outer concentric rectangle (only the rectangle should now be selected), as shown at left. From the menu, select **Modify > Decompose**. In the Object Info palette, notice that 4 lines are now selected. Hold down the shift key, and click both vertical lines to remove them from the selection (2 lines should now be selected), as shown at center. Press the Delete key to remove the horizontal lines from the drawing, as shown.

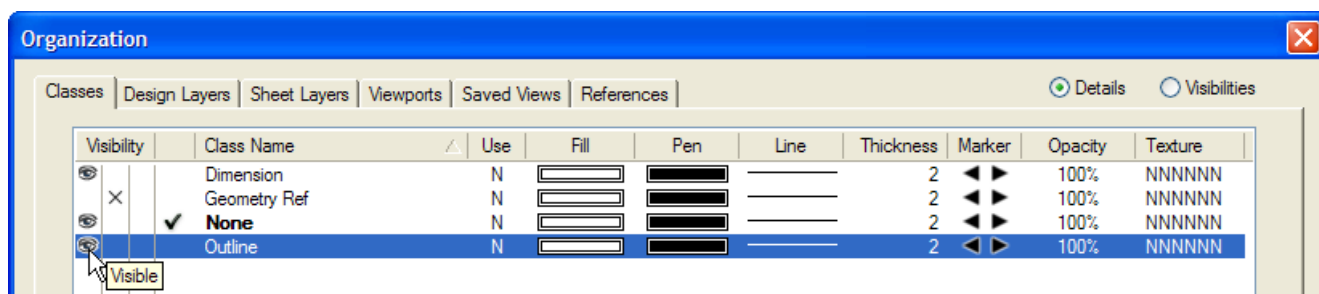


Next, you use the **Polygon** tool to create the directional buttons from the inner boundaries of other drawing objects.

- Press the 8 key for the **2D Polygon** shortcut, and then enable **Polygon From Inner Boundary Mode**  in the Tool bar. Click anywhere inside the “left” directional button’s boundary lines to create the polygon, as shown at left. Click again anywhere inside the “up” directional button’s boundary lines to create another polygon, as shown at right.





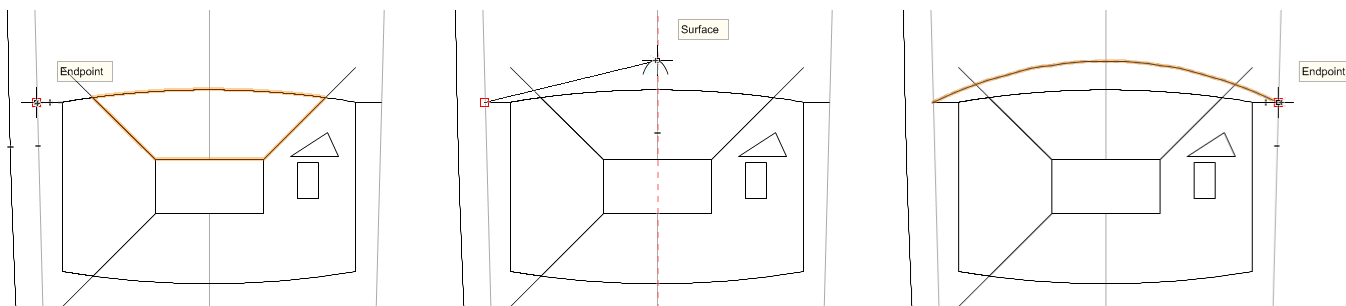
- From the View bar, click **Classes** . In the Organization dialog box, turn on visibility of the **Outline** class, as shown, and then click **OK**.



## Drawing a polyline

Next, you draw a polyline by cubic vertices to create curvature that is more pointed than an arc for the top edge of the volume/channel buttons.

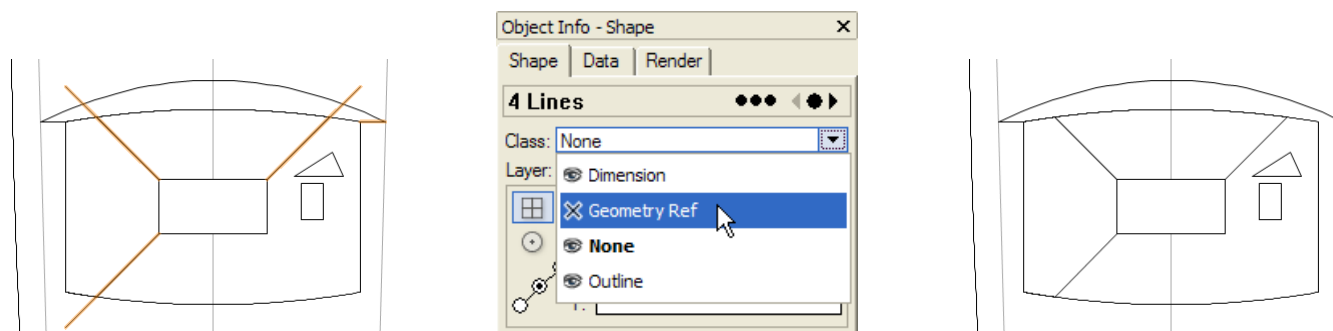
- From the Basic tools palette, click the **Polyline** tool . In the Tool bar, enable **Cubic Vertex Mode** , and then specify the start point by snapping to the left vertex of the left horizontal guideline, as shown at left. For the midpoint, move the cursor over the gray vertical centerline and press the T key to set a surface snap. Snap to the centerline, approximately where shown at center. Complete the polyline by double-clicking the right vertex of the right horizontal guideline, as shown at right.



**Note:** You draw a multi-segment polyline using different modes in the [Cropping a viewport](#) section in [Exercise 16](#).

Next, you hide some of the construction lines by changing their class property to the Geometry Ref class (which is already set to invisible).

- Press the X key twice to clear the current selection, and then hold down the Shift key and select the right horizontal guide line, and all 3 angled lines that divide the directional buttons (if you accidentally select one of the other objects, select it again to remove it from the selection set), as shown at left. In the Object Info palette, select **Geometry Ref** from the Class drop-down list, as shown at center, to hide the construction lines, as shown at right.



**Tip:** Use this method in your own designs to preserve construction geometry in case you need to modify the design later.

- Save the file.

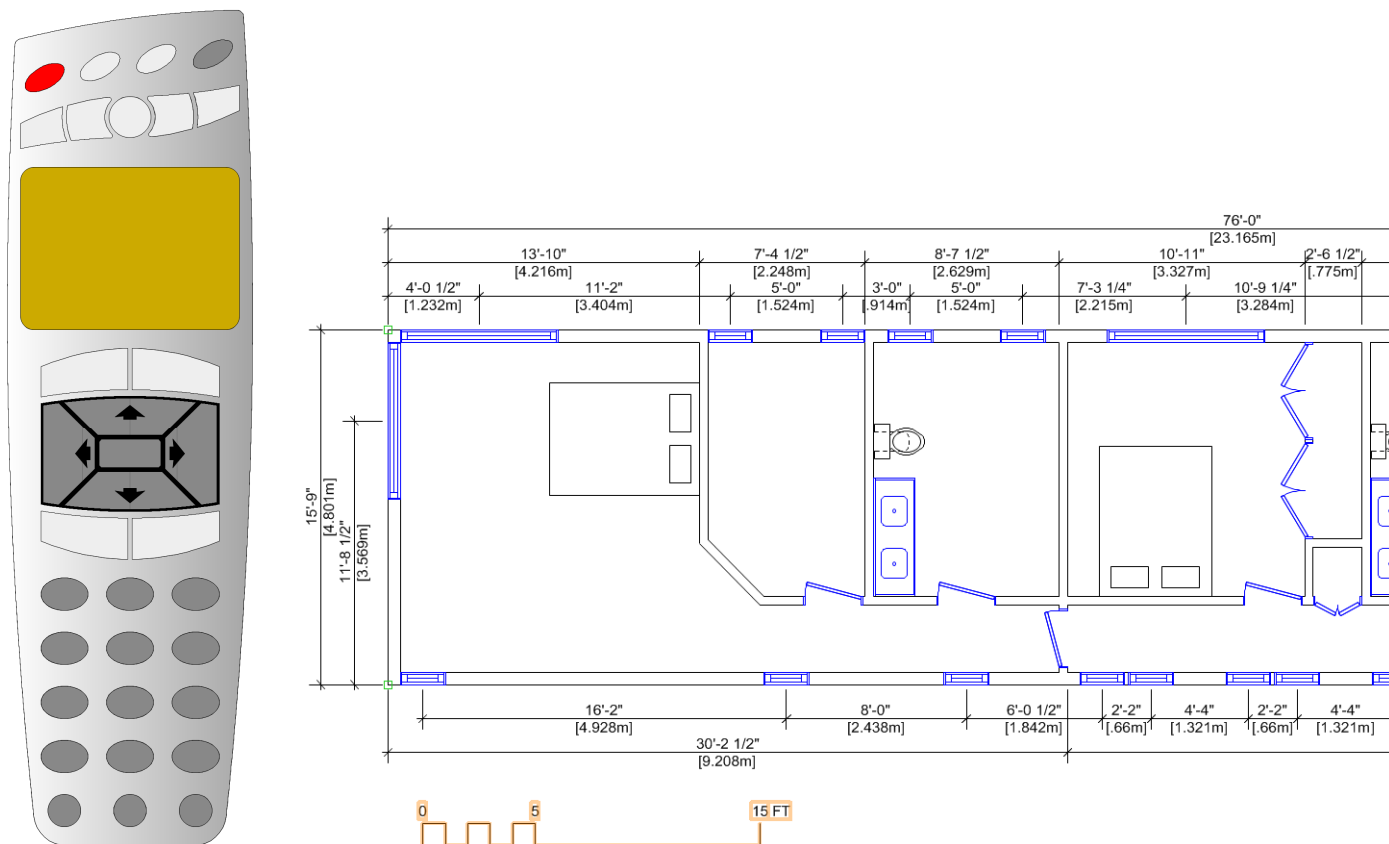
## Section 5: Manipulating and Modifying Objects

In six exercises, this section covers the following commonly used processes for modifying, moving, and duplicating existing drawing objects:

- Moving a reshape handle (pg 32)
- Using the **2D Reshape** tool (pg 33)
- Interactively scaling objects (pg 33)
- Copying objects (pg 35)
- Rotating objects 90 degrees (pg 37)
- Moving and nudging objects (pg 37)
- Offsetting objects (pg 38)
- Creating the volume button with a polygon fill (pg 39)
- Creating a duplicate array (pg 39)
- Mirroring objects (pg 40)
- Resizing an arc (pg 40)
- Duplicating objects along a path (pg 41)
- Creating rotated copies of objects (pg 42)
- Using the **Move by Points** tool (pg 42)
- Creating the outer function button with a polygon fill (pg 43)
- Creating groups (pg 44)
- Aligning objects (pg 45)
- Combining objects (pg 47)
- Subtracting objects (pg 48)
- Intersecting objects (pg 48)
- Clipping objects (pg 49)
- Creating fillets (pg 50)
- Creating chamfers (pg 51)
- Hiding construction geometry (pg 52)
- Creating objects for color fills (pg 53)
- Changing object stacking order (pg 54)
- Modifying object attributes (pg 55)
- Transferring object attributes (pg 57)
- Creating a symbol (pg 58)
- Inserting a plug-in object (pg 60)

In these exercises, you complete the remote control transmitter design by modifying and/or duplicating the 2D geometry you created in [Section 4](#). You then continue working with the sample architectural file from [Section 3](#) as you learn how to create and insert symbols.

After completing the exercises in the section, your drawings should look similar to the following figure.

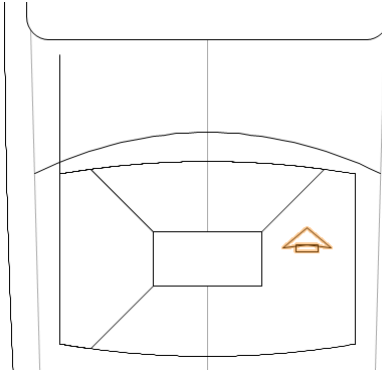




## Exercise 7: Resizing and Reshaping Objects



In this exercise, you use different methods to change the orientation, size, and shape of existing objects.

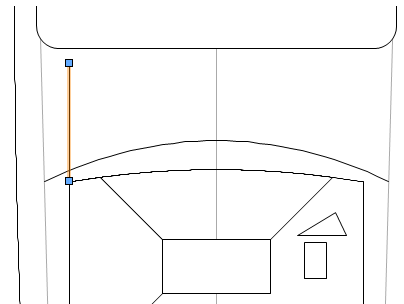
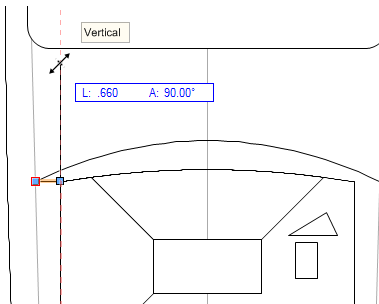
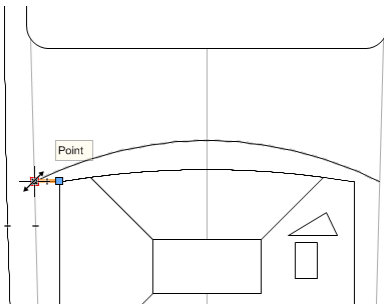
The completed exercise is shown in the following figure.



### Moving a reshape handle



You start the exercise by moving a reshape handle to change the left horizontal guideline to a vertical guideline.

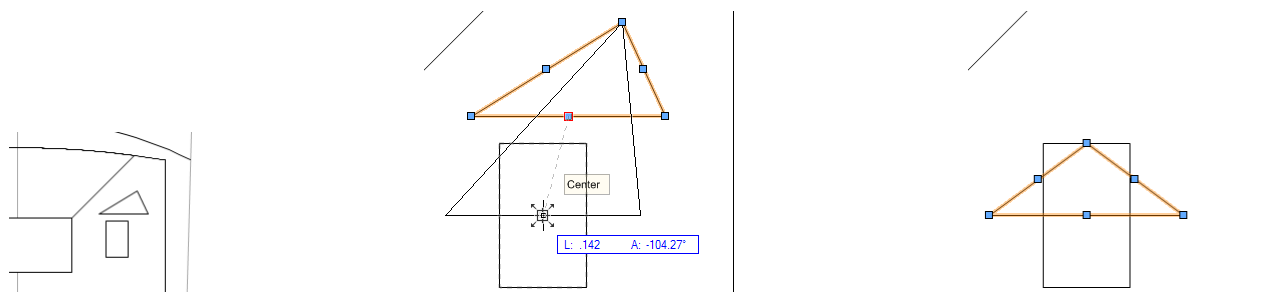
1. Open the **GS-VWFx06.vwx** file in the Data Set folder.
2. From the Basic tools palette, click the **2D Selection** tool . In the Tool bar, make sure **Single Object Interactive Scaling Mode**  is active. Select the left horizontal guideline, and then click the left vertex to “pick it up”, as shown at left. Move the cursor over the left edge of the left directional button, and then press the T key to set a surface snap. Click the surface extension line—when the Vertical SmartCursor cue is displayed—near the bottom of the edge of the display (approximately where shown at center) to change the line's orientation to vertical, as shown at right.




## Using the 2D Reshape tool

Next, you reshape the arrowhead indicator for the directional buttons.

3. Zoom in on the area shown at left. Press the X key twice, and then double-click the arrowhead polygon. Notice that all of the polygon's reshape handles are now displayed directly on it. Also notice that the **2D Reshape** tool  (in the Basic tools palette) is now active. In the Tool bar, enable **Move Polygon Handles Mode** , then click the bottom center reshape handle to "pick it up". Click the center of the rectangle to reshape the edge (and center it with the rectangle), as shown at center. Click the arrow point reshape handle, and then click the top center point of the rectangle. The arrow is now symmetric, as shown at right.



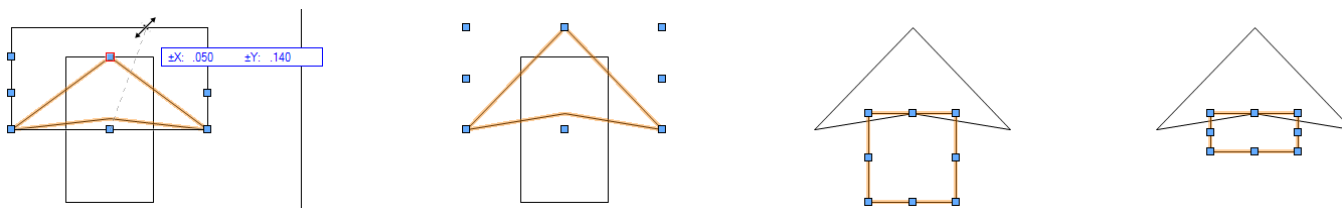
4. With the **2D Reshape** tool still active, enable **Add Vertex Mode**  in the Tool bar. Click the bottom center reshape handle (shown at left) to add a vertex. Hold down the Shift key and move your cursor slightly above the point, and then click to position the new vertex and change the triangle to a wedge, as shown at right (leave the polygon selected for the next step).






## Interactively scaling objects

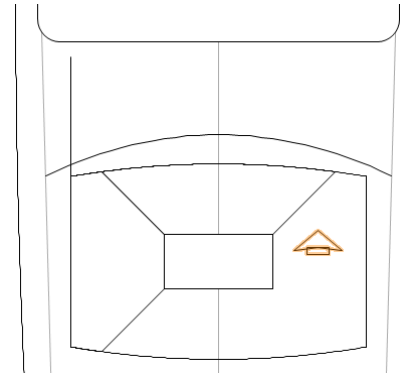
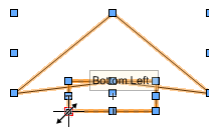
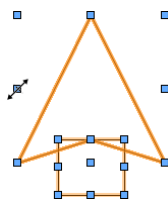
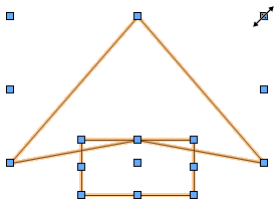
Next, you use the **2D Selection** tool to scale the arrowhead indicator.

5. Press the X key to activate the **2D Selection** tool. Notice that reshape handles are now displayed on the polygon's bounding box. Click the top center reshape handle, and then click above—and to the right of—the point, as shown at left. Notice that moving a bounding box reshape handle maintains the arrowhead's symmetry (even though you clicked to the right), as shown in the next figure. Select the rectangle, and then move its top center reshape handle to the interior wedge vertex, as shown in the next figure. Shorten the arrow's tail by moving the rectangle's bottom center reshape handle, approximately where shown at right.



6. In the Tool bar, enable **Unrestricted Interactive Scaling Mode** . Hold down the shift key and click the arrow wedge to add it to the current selection. In the Object Info palette, verify that 2 objects are selected. Click the arrow's top right reshape handle and then move the cursor and click to complete the reshape operation, approximately where shown at left. Notice that both objects are now scaled together. Experiment with changing the overall shape of the arrow by moving different reshape handles, as shown in the next two figures.

When finished experimenting, reset the **2D Selection** tool's default mode by enabling **Single Object Interactive Scaling Mode**  in the Tool bar. Click **Previous View**  in the View bar so you can see all resized and reshaped objects, as shown at right.

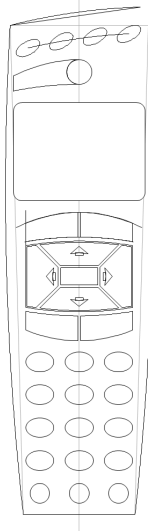


7. Save the file.

## Exercise 8: Moving and Copying Objects

In this exercise, you use a variety of precise and dynamic methods to move or copy existing drawing objects.

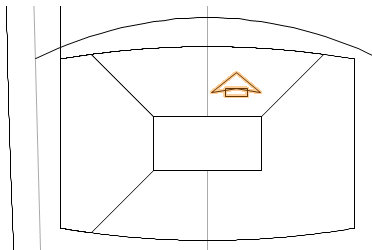
The completed exercise is shown in the following figure.



### Copying objects

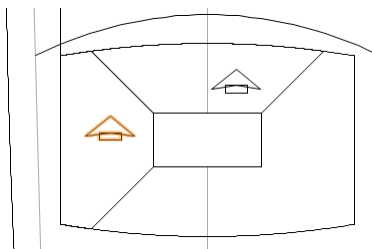
You start the exercise by moving the arrow objects into the “up” directional button.

1. Open the **GS-VWFx07.vwx** file in the Data Set folder. The file opens with the arrow wedge and rectangle already selected.
2. Press the X key to activate the **2D Selection** tool. Hold down the left mouse button on the top edge of the arrow rectangle, and then start moving the cursor to “drag” both arrow objects. Release the mouse button when the arrow objects are inside the “up” directional button, approximately where shown at left.



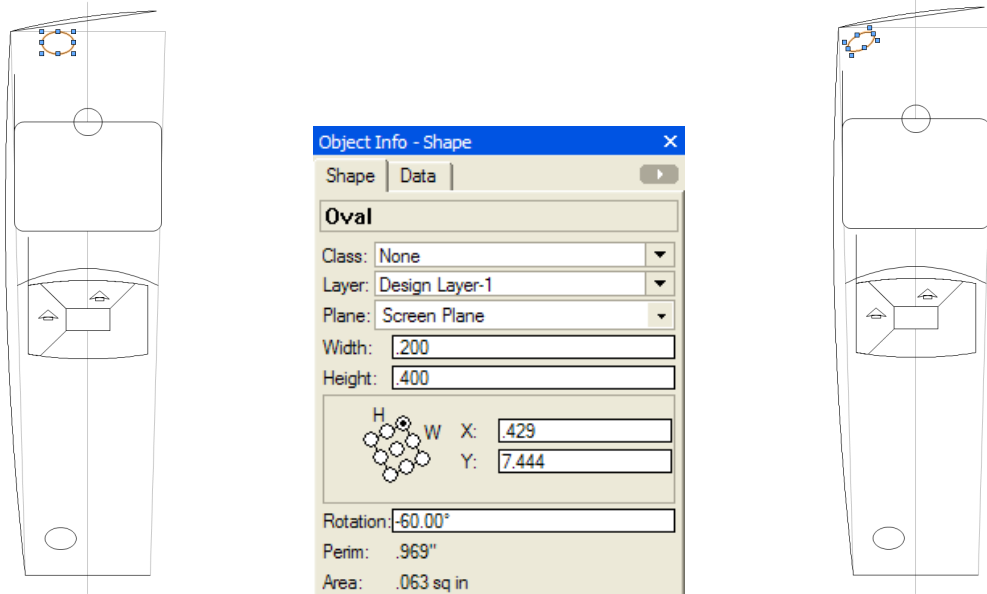
Next, you use the “Ctrl+drag” method to copy the arrow objects into the “left” directional button.

3. Start dragging the arrow objects to the left, and then hold down the Ctrl key (notice a plus sign **+** is displayed near the cursor to indicate copy mode is active) and release the mouse button to copy the arrow objects when they are inside the “left” directional button, approximately where shown.



Next, you copy the keypad oval, and then you resize and rotate it for first top power button.

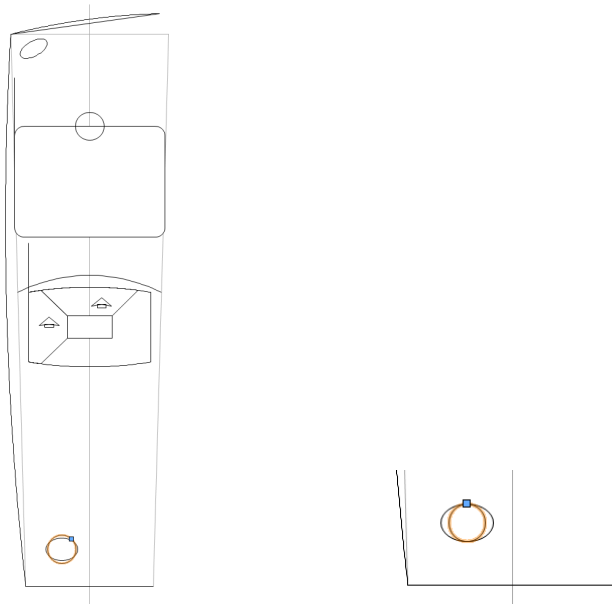
4. Press the X key twice to clear the current selection, and then press Ctrl+6 to display all drawing objects. Use the Ctrl+drag method to copy the keypad button (oval) to the top of the remote control, approximately where shown at left. In the Object Info palette, change the Width (.200 [5.08mm]), Height (.400 [10.16mm]), and Rotation (-60.00°) values, as shown at center, and then press Enter. Press the X key twice to clear the selection, and examine the completed power button, as shown at right.



**Tip:** In addition to resizing the oval, you can also rotate it (and many other 2D objects) dynamically with the **2D Selection** tool by pressing the **Alt** key and dragging a corner reshape handle.

Next, you copy the center function button to create a round button for the keypad.

5. Use the Ctrl+drag method to copy the center function button (circle) to the center of the keypad oval, as shown at left. Click the circle's radius reshape handle, and then snap it to the oval's top center point to resize the circle's diameter to match the oval's height (.300 [7.62mm]), as shown at right.



**Note:** You copy and reposition the round keypad button later in this exercise.

## Rotating objects 90 degrees

Next, you rotate the copied arrow objects 90 degrees to orient them correctly for the “left” directional button.

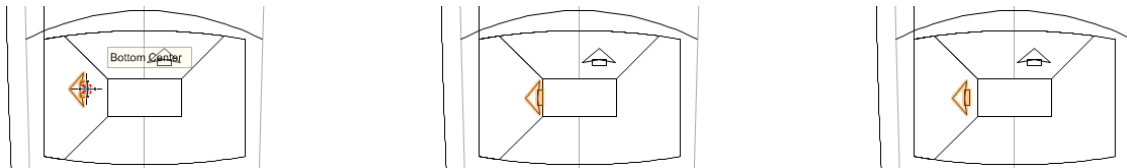
6. Press the X key twice to clear the selection, and then hold down the shift key and select the arrow wedge and rectangle in the left directional button, as shown at left. From the menu, select **Modify > Rotate > Rotate Left 90°**. The arrow objects now point to the left, as shown (leave the arrow objects selected for the next step).



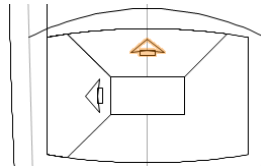
## Moving and nudging objects

Next, you move the arrowheads by the center point of the rectangular base to center them with the directional buttons.

7. Start dragging both arrow objects by the bottom center point of the rectangle (as shown at left), and then release the mouse button on the right midpoint of the “left” directional button, as shown at center. Hold down the Shift key and then press the Left arrow key repeatedly to nudge the arrow into position, approximately where shown at right.

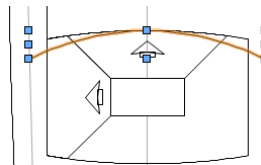


8. Press the X key twice to clear the selection, and then hold down the Shift key and select both arrow objects for the “up” directional button. Repeat the centering and nudging process (with the Shift and Up arrow keys) to position the objects approximately where shown.

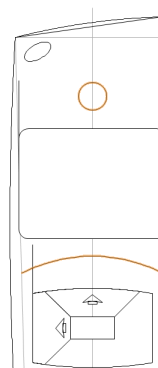
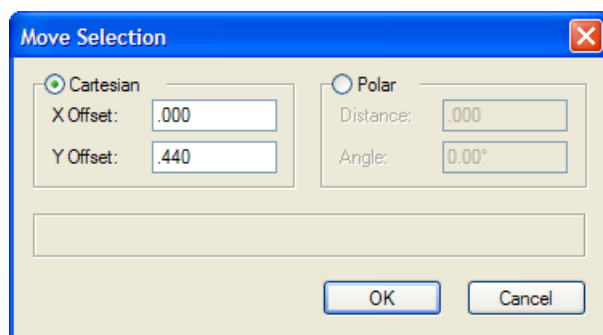


Next, you move the polyline to index its position relative to the top edge of the directional button's arc, and then you use the **Move** command to raise the polyline and function button (circle) into position.

9. Drag the curved polyline by its midpoint to the midpoint of the “up” directional button's arc, as shown.






10. Hold down the Shift key, and then select the function button (circle) to add it to the current selection (2 objects should now be selected). From the menu, select **Modify > Move > Move**. In the Move Selection dialog box, change the Y Offset value to **.440** [11.18mm] (as shown at left), and then click **OK** to move both objects, as shown at right.



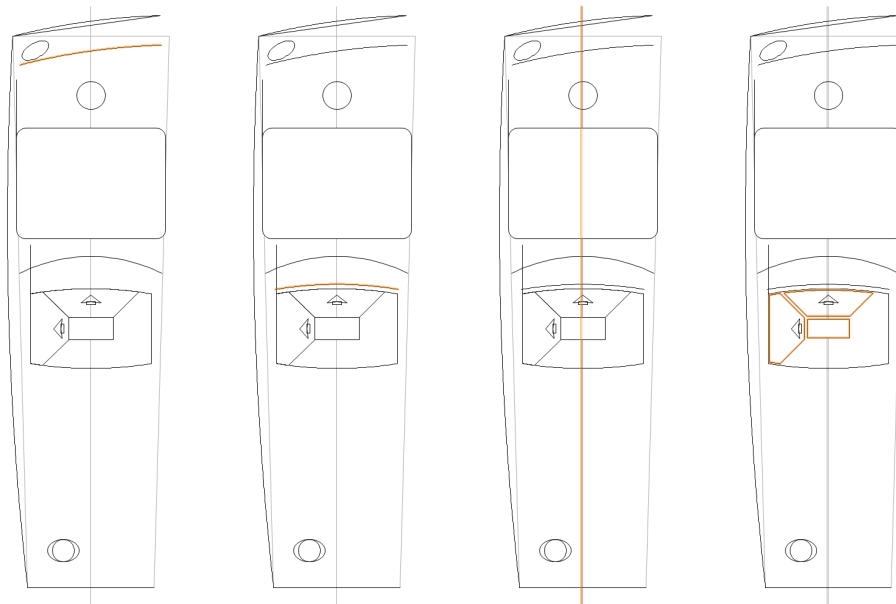
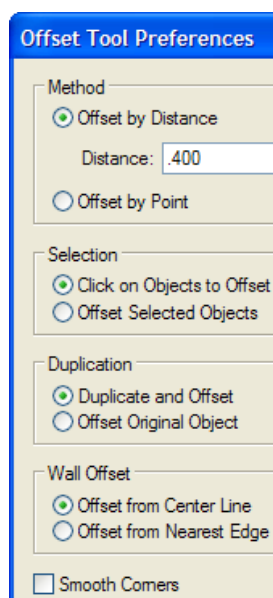
## Offsetting objects

Next, you offset several objects to either create new boundary or centerline objects, or to change the original object's size.

11. From the Basic tools palette, click the **Offset** tool . Click **Preferences**  in the Tool bar, and then adjust settings as shown at left. Click **OK**, and then click the arc that forms the top curved edge of the remote control outline. Click below the arc to offset it .400 [10.16mm] (to the inside) to create the power switch array centerline, as shown in the next figure. For each of the following offset operations, start by clicking



**Preferences** , then change the:

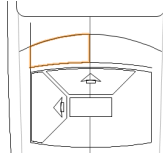
- Distance to **.060** [1.52mm], and then click **OK**. Offset the arc (click it to the right of the "up" functional button, and offset it to the outside) at the top of the directional button rectangle to create the lower boundary for the volume button, as shown highlighted in the next figure.
- Distance to **.020** [.51mm], and then click **OK**. Offset the vertical centerline (to the left) to create the right boundary for the volume button, as shown highlighted in the next figure.
- Duplication to **Offset Original Object**, and then click **OK**. Offset the "left" and "up" directional buttons, and then the enter button (.020 [.51mm] to the inside) to resize them, as shown highlighted at right.



## Creating the volume button with a polygon fill

Now that all boundary objects are in place, you create a polygon for the volume button.

12. From the Basic tools palette, click the **2D Polygon** tool . In the Tool bar, enable **Polygon From Inner Boundary Mode** . Click anywhere inside the volume button boundaries to create the polygon, as shown.

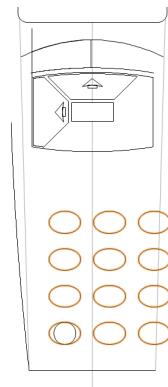
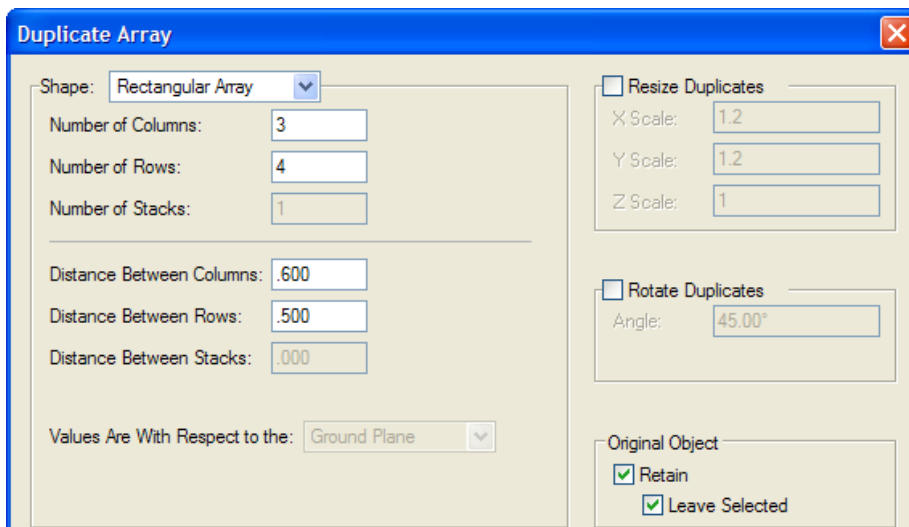


13. Press the X key twice to clear the selection, and then carefully select only the offset centerline (the offset line that formed the right boundary of the volume button), and then press the Delete key to remove it from the drawing (do not delete the remote control centerline).

## Creating a duplicate array

Next, you create a rectangular array of the oval-shaped button.

14. Select the oval keypad button (do not select the round button inside it). From the menu, select **Edit > Duplicate Array**. In the Duplicate Array dialog box, adjust settings (.600 [15.24mm], .500 [12.70mm]) as shown at left, and then click **OK** to create the keypad array, as shown at right.





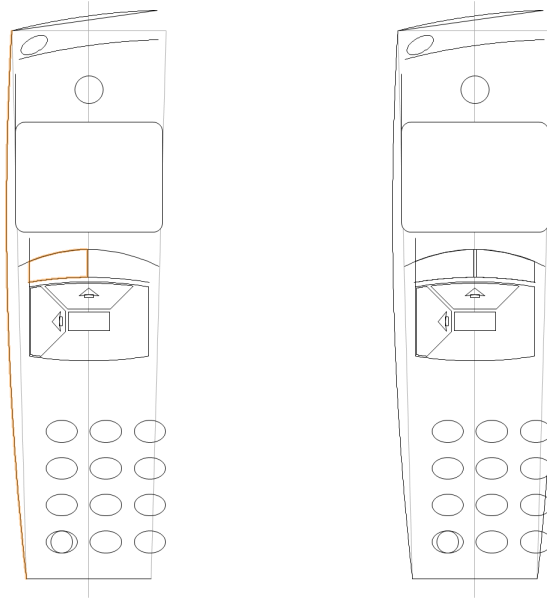
**Note:** Do not be concerned if your keypad button array is not centered, you align them with other components later in this exercise.



## Mirroring objects

Next, you use the **Mirror** tool to create opposite-hand copies of the remote control's left edge and volume button.

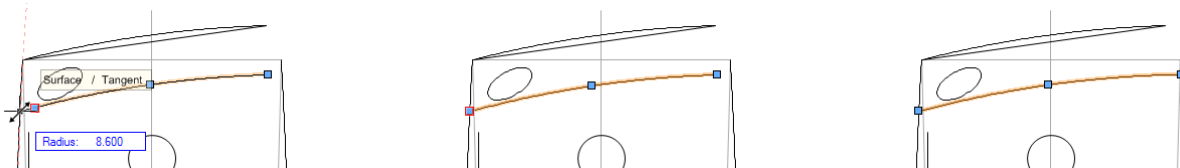
15. Press the X key twice, then hold down the Shift key and select the volume button (polyline) and the remote control's left edge (arc), as shown at left. From the Basic tools palette, click the **Mirror** tool , and then enable **Duplicate and Mirror Mode** . Snap to top and bottom endpoints of the remote control's centerline to specify the mirror line and create mirrored copies of the objects. Press the X key twice to clear the selection, and examine the mirrored copies, shown at right.



## Resizing an arc

Next, you use the offset arc's reshape handles to extend it to the remote control's right and left edges.

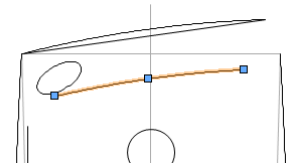
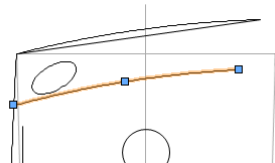
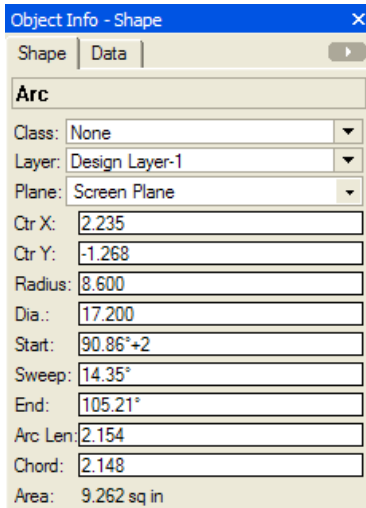
16. Select the arc offset from the top edge, as shown at left. Click the left reshape handle, and then move your cursor over the left edge of the remote control and press the T key to set a surface snap on the edge. Click the edge when the Surface/Tangent SmartCursor cue is displayed, as shown at left, to resize the arc, as shown at center. Repeat the process to extend the arc's opposite end (see Note below figure), as shown at right.



**Note:** You may need to press the Z key to activate the snap loupe so you can temporarily zoom in and select the right edge with the Surface/Tangent SmartCursor cue.

Now that the arc is flush with the left and right edges, you shorten the arc (and keep it centered) by using equations to change the Start and End angle values in the Object Info palette.

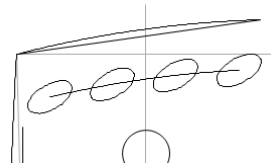
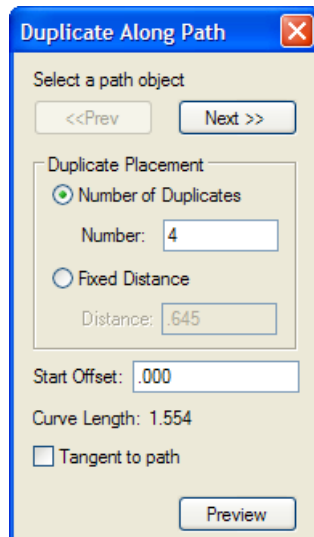
17. In the Object Info palette, enter +2 (to add 2 degrees) at the end of the Start value, as shown at left. Press Enter to incorporate the change and notice that the arc is now shorter on the right side, as shown at center. Repeat the process to subtract 2 degrees (enter -2) from the End value, and then press Enter to shorten the left side of the arc, as shown at right.



## Duplicating objects along a path

Next, you duplicate the power button along the offset arc path to create an array that follows the curvature of the top edge.

18. Hold down the Shift key and select the power button (rotated oval) to add it to the current selection (2 objects should now be selected). From the menu, select **Edit > Duplicate Along Path**. In the Duplicate Along Path dialog box, adjust settings as shown at left, and then click **OK** to create the duplicates. Press the X key twice to clear the selection, and examine the power button array, as shown at right





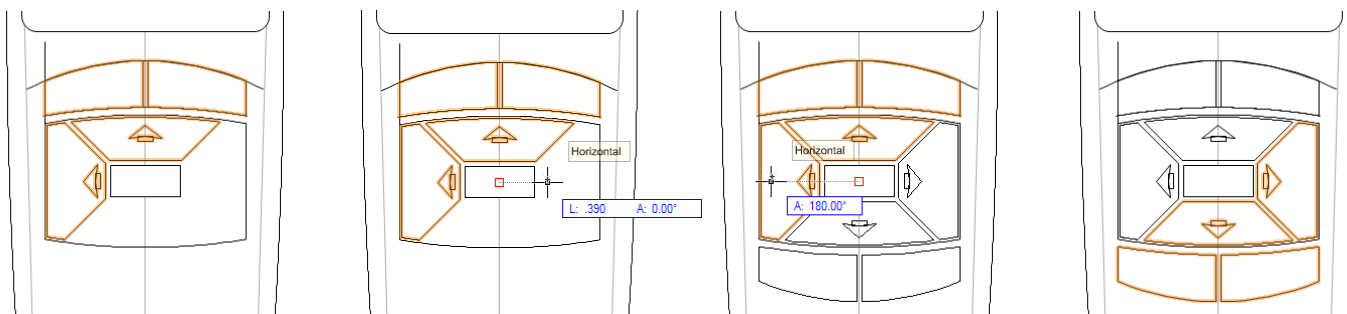
### Notes:

- 1) The position of the rotated oval (before the duplication) does not affect the results.
- 2) You use the **Duplicate Along Path** command instead of the creating a circular array to evenly distribute the power button copies along the path.

## Creating rotated copies of objects






Next, you use the **Rotate** tool to copy multiple objects 180 degrees.

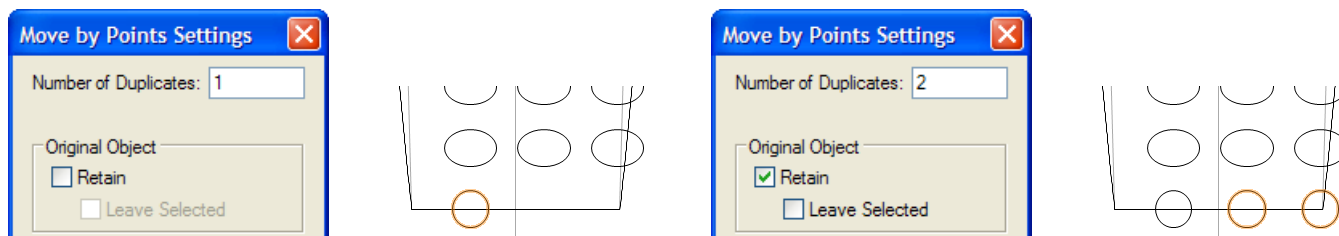
- 19.** Hold down the Shift key and select the volume and channel buttons, the “left” and “up” directional buttons, and all four arrow objects, as shown at left (in the Object Info palette, verify that 8 objects are selected). From the Basic tools palette, click the **Rotate** tool . In the tool bar, enable **Duplicate and Rotate Mode** . For the center of rotation, snap to the center of the enter button, and then hold down the Shift key to constrain the cursor horizontally, and click to the right of the first point (approximately where shown in the next figure) to set the reference angle. Hold down the Shift key, and then click on the other side of the center point (approximately where shown in the next figure) to specify the new angle and create the rotated copies, as shown at right.





## Using the Move by Points tool

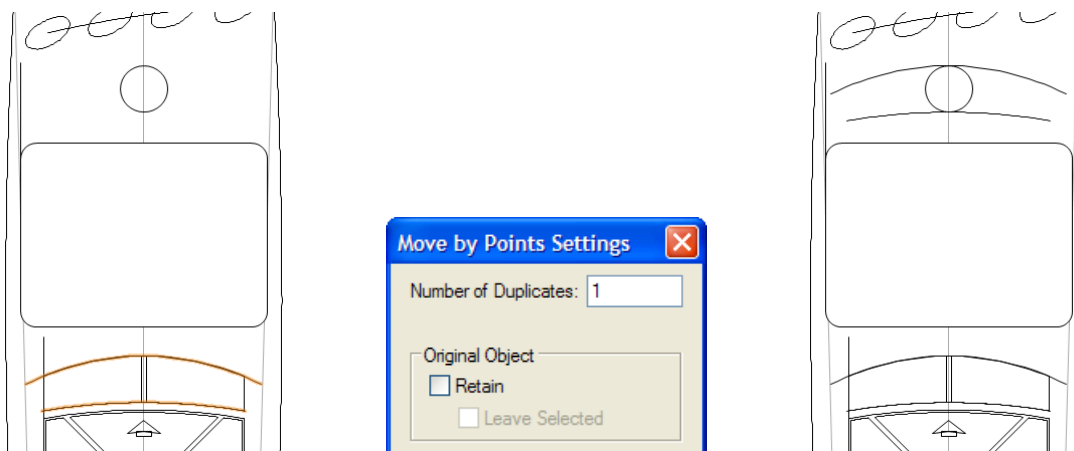
Next, you use the **Move by Points** tool to move the circular keypad button, and then you use **Distribute Mode** to create two copies and complete the new bottom row of circular buttons.

- 20.** Press the X key twice to clear the selection, and then select the circular keypad button (inside the lower left keypad oval button). From the Basic tools palette, click the **Move by Points** tool . In the Tool bar, enable **Move Mode** , then click **Move by Points Preferences** . Adjust settings as shown at left, and then click **OK**. For the start point, snap to the center of the oval directly above the circle in the next row, and then snap to the center of the circle to move it down and maintain equal row spacing, as shown in the next figure. In the Tool bar, enable **Distribute Mode** , and then click **Move by Points Preferences** . Adjust settings as shown in the next figure, and then click **OK**. Snap to the center of the lower left oval, and then snap to the center of the lower right oval. The copies are distributed over the selected distance, and now match the keypad column spacing, as shown at right.



Next, you use the **Move by Points** tool to copy the volume button's profile geometry (arc and polyline).

- 21.** Press the X key twice to clear the selection, and then hold down the Shift key and select the volume button's arc (at either end or at the middle) and polyline, as shown at left. Press Shift+M for the **Move by Points** tool shortcut, and then look at the Tool bar while pressing the U key two times to cycle through options until **Move Mode**  is enabled. Click **Move by Points Preferences** , and adjust settings as shown at center, and then click **OK**. Snap to the top center point of the polyline (the Fix SmartCursor cue is displayed) to specify the start point. Hold down the Ctrl key to activate copy mode, and then snap to the top center of the circular function button to complete the copy operation. Press the X key twice to clear the selection and examine the copied objects, as shown at right.



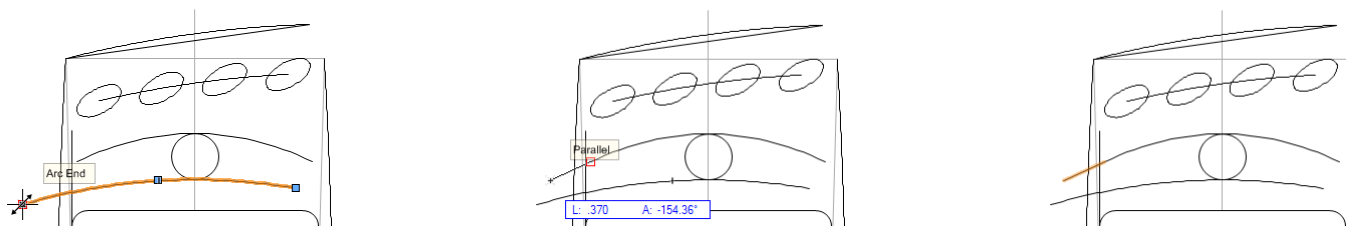
**Tip:** Press the U key to cycle through modes for all tools.

**Note:** You can keep the **Retain** option enabled if you prefer, but you may find it easier to keep the default "move" behavior, and use the Ctrl key to activate copy mode.

## Creating the outer function button with a polygon fill

Next, you extend the arc to form the bottom boundary for the fill operation, and then you extend the polyline by drawing a short line segment to form the top boundary for the fill operation.



- 22.** Select the arc you just copied (that forms the bottom boundary of the outer function button), and then click the left reshape handle and click again outside of the remote control's left edge to lengthen the arc, approximately where shown at left. Press the 2 key for the **Line** tool shortcut. Snap to the endpoint of the polyline, and then click approximately where shown at center to draw a parallel line that terminates outside of the remote control, as shown at right.



### Notes:

- 1) You create an extension line because the **Connect/Combine** tool doesn't work with cubic vertex polyline objects, and other reshaping methods change the curvature, which for this design is intended to match the curvature of the volume button.
- 2) In this case, a parallel line is sufficiently accurate for the short gap. If you need to match curvature more precisely or over a longer distance, draw an arc using **Arc by 2 Points and a Point on Arc Mode**, and then snap all arc points on the polyline near the end you want to extend. You can then adjust the arc's reshape handles accordingly.

Now that all boundary objects form a closed area, you create a polygon for the outer function button.

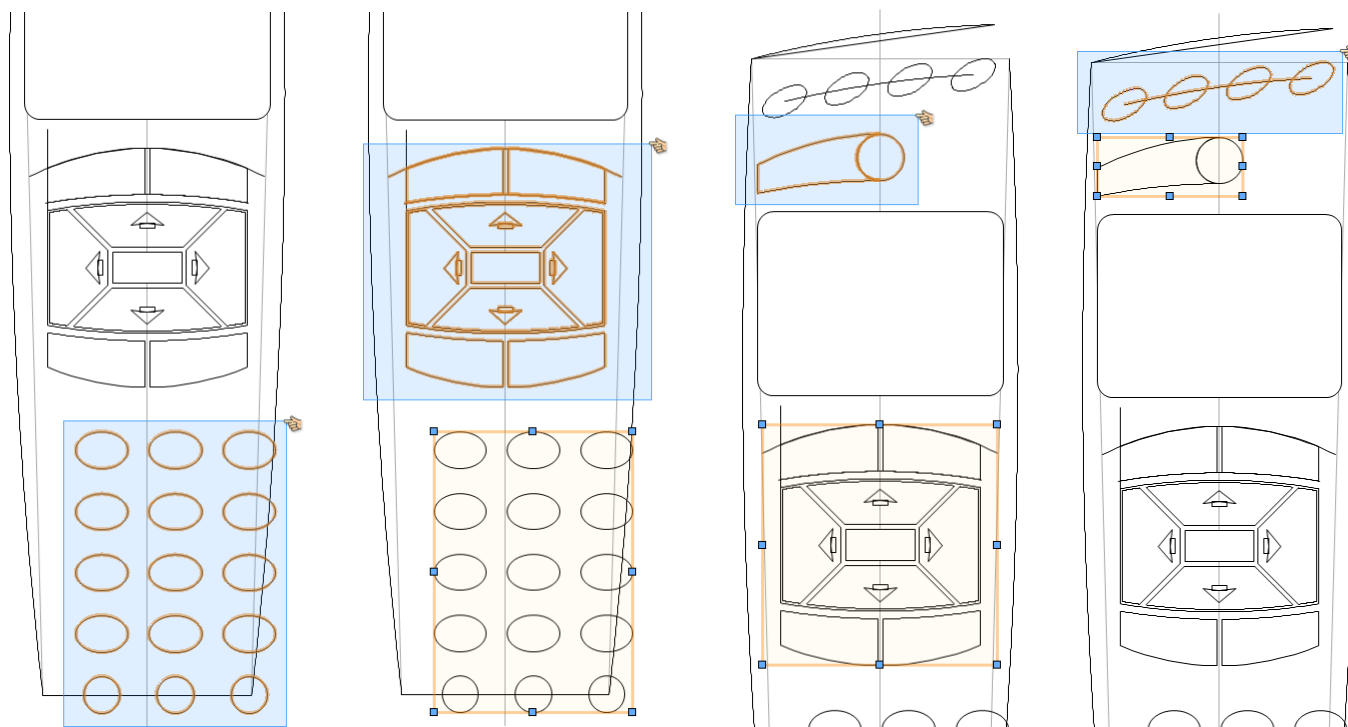
- 23.** Press the 8 key for the **2D Polygon** tool  shortcut. In the Tool bar, make sure **Polygon From Inner Boundary Mode**  is still active. Click anywhere inside the function button boundaries to create the polygon, as shown at left. Press the X key twice to clear the selection, and then hold down the Shift key and select the function button's construction objects (vertical line, polyline, arc, and extension line). In the Object Info palette, select **Geometry Ref** from the Class drop-down list to hide them, as shown at right.



## Creating groups

Next, you create groups of objects so you can align the groups with each other.

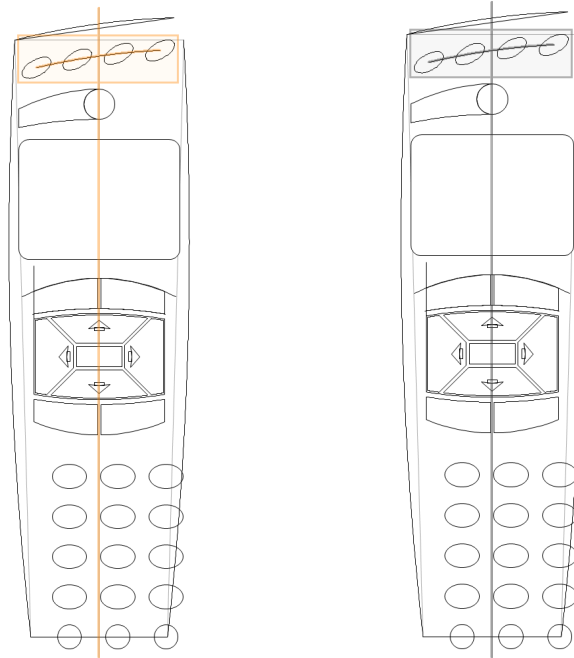
- 24.** Draw a selection marquee from lower left to upper right around all 15 oval and round keypad buttons, as shown at left. From the menu, select **Modify > Group** to create a single group object from all 15 buttons. Repeat the marquee selection process to create three more groups from the following objects:
- The directional buttons, and all four volume and channel buttons (also include the construction geometry, except for the vertical guide line), as shown in the next figure
  - The outer function button and the circular function button, as shown in the next figure.
  - The four power buttons (ovals) at the top of the remote control. **Important:** hold down the Shift key and select the arc centerline to remove it from the selection after you draw the marquee (as shown) and before you create the group.



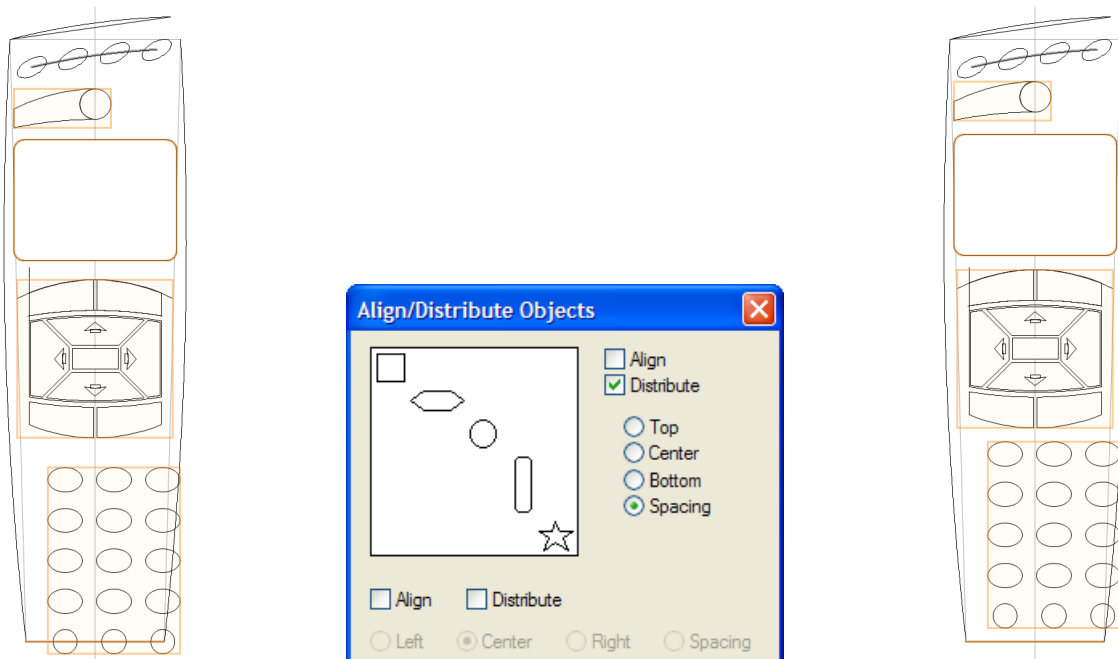
## Aligning objects

Next, you lock the position of some components, and then you distribute and align the objects to place them in their final positions.

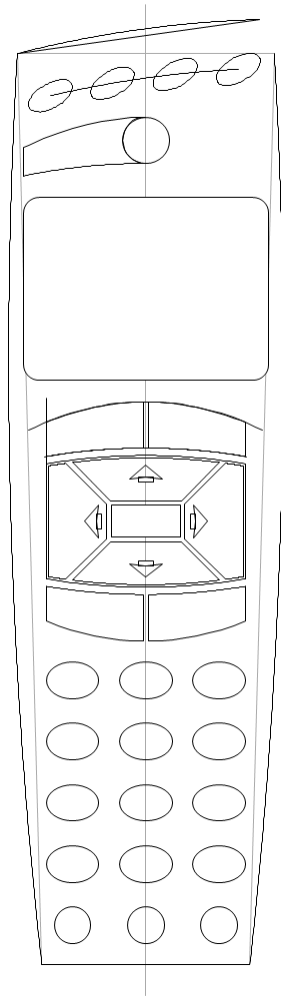
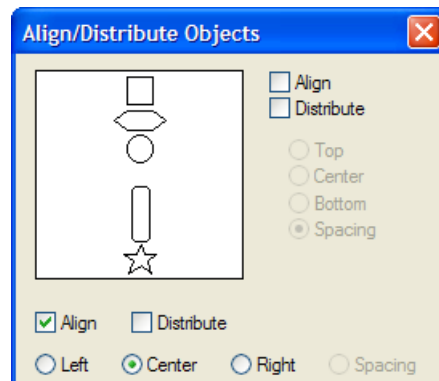
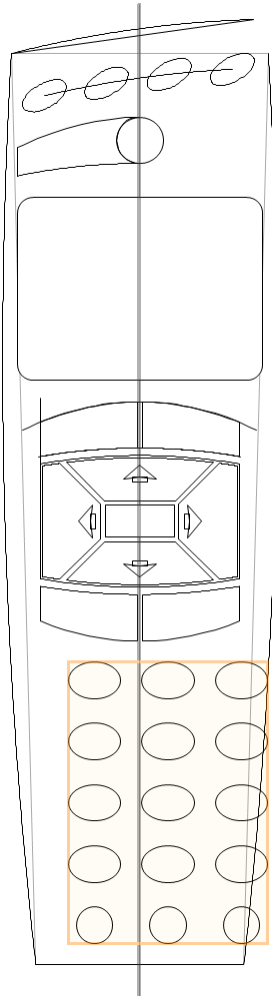
- 25.** Press the X key twice, and then hold down the Shift key and select the remote control's vertical centerline, power button group, and the power button arc centerline, as shown at left. Right-click the vertical centerline, and then select **Lock** from the context menu. The selection highlight color turns gray to indicate the objects are locked, as shown at right.



- 26.** Press the X key twice to clear the selection, and then hold down the Shift key and select the locked arc centerline, the function button group, the display, the volume/channel/directional button group, the keypad group, and the remote control's bottom horizontal line, as shown at left (in the Object Info palette, verify that 6 objects are selected). From the menu, select **Modify > Align > Align/Distribute**. In the Align/Distribute Objects dialog box, adjust settings as shown at center, and then click **OK** to evenly distribute the objects along the vertical (Y) axis, as shown at right.



27. Press the X key twice to clear the selection, and then hold down the Shift key and select the keypad group, and the locked vertical centerline, as shown at left. From the menu, select **Modify > Align > Align/Distribute**. In the Align/Distribute Objects dialog box, adjust settings as shown at center, and then click **OK** to center the keypad group with the centerline. Press the X key twice to clear the selection, and examine the completed layout, as shown at right.

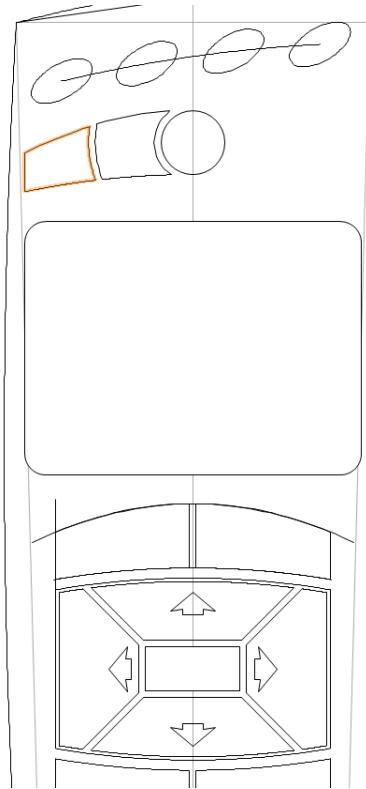


28. Save the file.

## Exercise 9: Modifying Objects with Boolean Operations

In this exercise, you use the area of existing objects (or you draw specific shapes) to modify objects or create new objects.

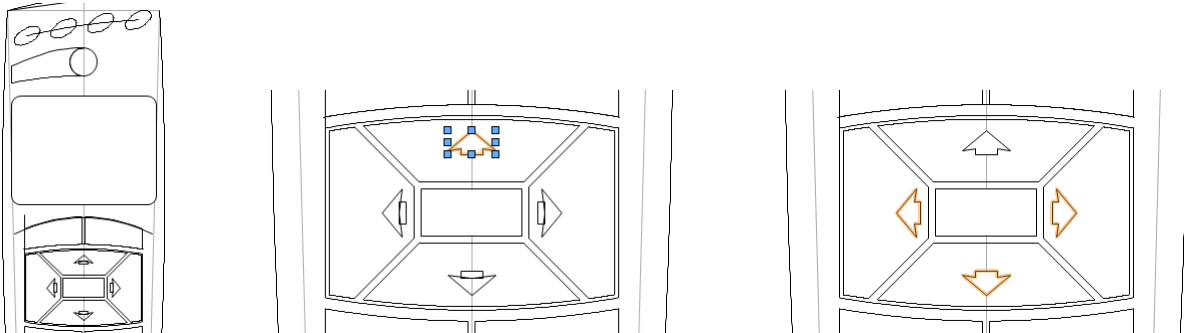
The completed exercise is shown in the following figure.



### Combining objects

You start the exercise by ungrouping the directional button group, and then you use the **Add Surface** command to join the arrow objects together.

1. Open the **GS-VWFx08.vwx** file in the Data Set folder.
2. Zoom in on the area shown at left. Press the X key, and then right-click the arrow in the “up” directional button and select **Ungroup** from the context menu. Press the X key twice, and then hold down the Shift key and select both arrow objects (wedge and rectangle) inside the “up” directional button. Right-click the arrow, and then select **Add Surface** from the context menu. The area of both objects is added together to form a single polygon, as shown at center. Repeat the process three times to join the arrow objects in the other directional buttons, as shown (highlighted for clarity) at right.

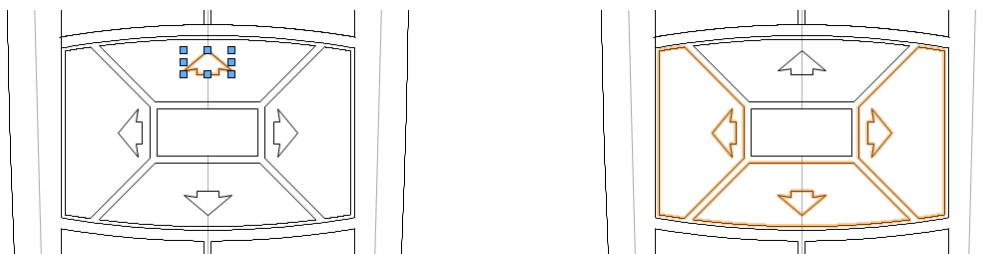




## Subtracting objects

Next, you change the stacking order of the arrow objects, and then you use the **Clip Surface** command to create arrow-shaped holes in the directional buttons.

3. Hold down the Shift key, and then select all four arrow objects. From the menu, select **Modify > Send > Send to Front**. Press the X key twice to clear the current selection. Hold down the Shift key and select the “up” directional button, and then select the arrow inside it. Right-click the arrow, and then select **Clip Surface** from the context menu. The area of the arrow is subtracted from the directional button, and only the arrow object is now selected (as shown at left). Press the Delete key to remove it from the drawing. Repeat the surface clipping and arrow deleting process three times to subtract the arrows from the other three directional buttons, as shown (highlighted for clarity) at right.




### Notes:

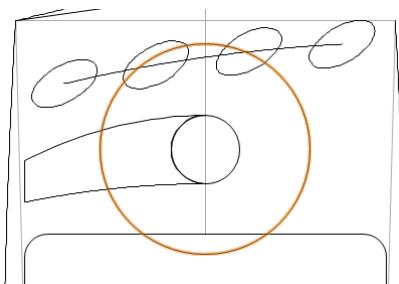
- 1) You changed the stacking order of the arrows because the clipping objects must be on top of objects that they clip.
- 2) You see the effect of the arrow holes later in [Exercise 11](#).
- 3) You could have combined the arrow objects and subtracted them from the directional buttons before you created rotated duplicates, but in this case, it's better to verify the arrow “diamond” pattern first.

**Tip:** You can use the **Edit Polyline** command to modify or remove holes in polylines, or to copy hole geometry for use outside of the clipped polyline.

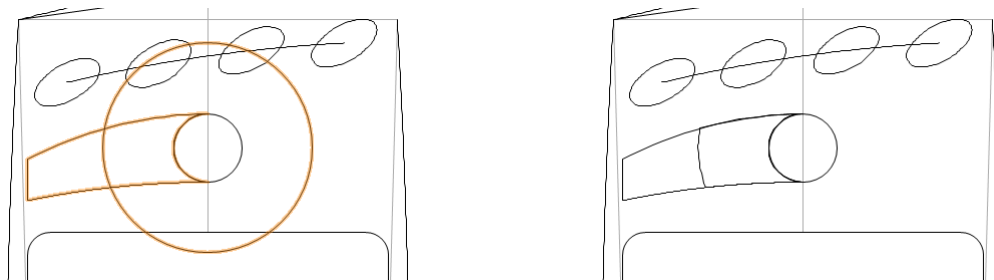
## Intersecting objects

Next, you ungroup the functional button group, and then you draw a circle and use the **Intersect Surface** command to create an inner function button from the existing outer function button.

4. Right-click the circular functional button group and select **Ungroup** from the context menu. Press the 6 key for the **Circle** tool shortcut. In the Tool bar, make sure **Circle by Radius Mode**  is enabled. For the center point, snap to the center of the circular function button, and then type **.580** [14.73mm] to set the floating data bar's L (radius) field. Press Enter twice to complete the 1.160 [29.46mm] diameter circle, as shown.






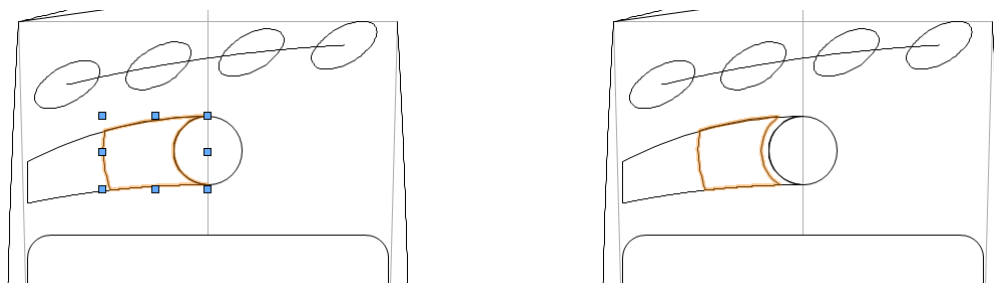
5. Press the X key, and then hold down the Shift key and select the outer function button to add it to the current selection, as shown at left. Right-click the outer function button, and then select **Intersect Surface** from the context menu. The common area of both objects is converted into a new polyline (the inner function button). Select only the intersecting circle (which is now a polyline), and then press the Delete key to remove it from the drawing so you can see the left edge of the new polyline, as shown at right.



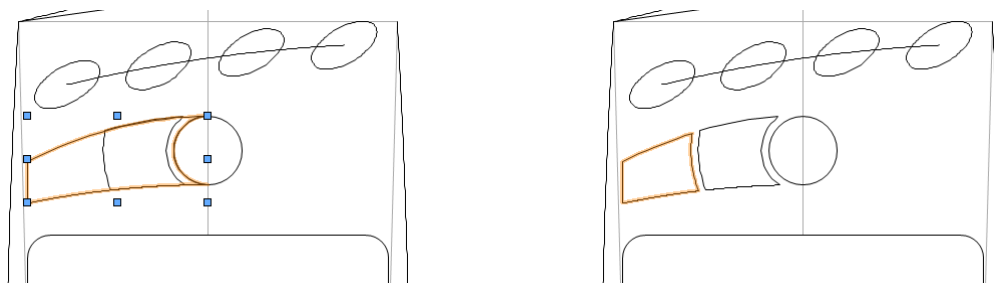
## Clipping objects

Next, you use the **Clip** tool to complete both inner and outer function buttons.

6. Select the inner function button (created in the previous step), as shown at left. From the Basic tools palette, click the **Clip** tool . In the tool bar, enable the **Removes Inside Mode**  and **Clipping by a Circle Mode**  options. Snap to the center of the circular function button to start the clipping circle, and then type **.230 [5.84mm]** to set the floating data bar's L (radius) field. Press Enter twice to complete the circle, and clip the inner function button, as shown at right.



7. Press the X key, and then select the outer function button, as shown at left. Press Shift+N for the **Clip** tool shortcut, and then repeat the clipping process with a **.620 [15.75mm]** radius clipping circle to create clearance between the inner and outer function buttons, as shown at right.

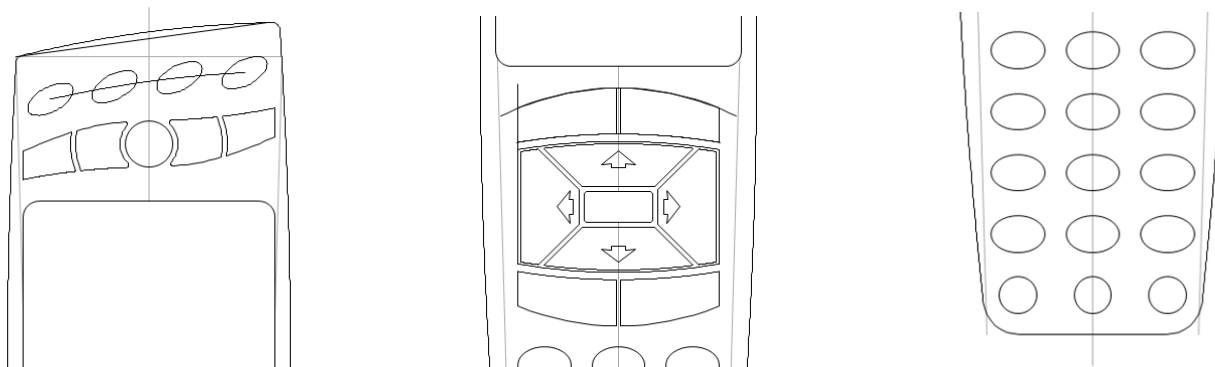


8. Save the file.

## Exercise 10: Creating Fillets and Chamfers





In this exercise, you complete various components by rounding or chamfering corners.

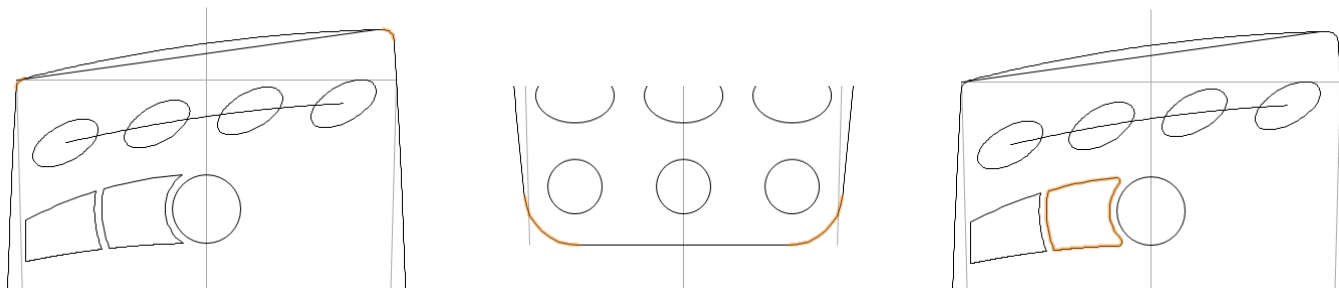
The completed exercise is shown in the following figures.



### Creating fillets

You start the exercise by creating fillets on the corners of the remote control outline.


1. Open the **GS-VWFx09.vwx** file in the Data Set folder.
2. Press the X key twice to clear the selection, and then adjust the display so the remote control fills the screen. From the Basic tools palette, click the **Fillet** tool . In the tool bar, enable **Fillet and Trim Mode** , and then click **Fillet Preferences** . In the Fillet Settings dialog box, change the Fillet Radius to **.060** [1.52mm], and then click **OK**, and then click adjacent arc edges (away from the corners – see Notes below figures) at the top of the remote control to create two fillets shown (highlighted for clarity) at left. For each of the following fillet operations, start by clicking **Fillet Preferences** , and then change the Fillet Radius value to:
  - **.300** [7.62mm], and then click **OK**. Click adjacent edges at the bottom of the remote control to create two fillets shown (highlighted) at center.
  - **.020** [.51mm], and then click **OK**. Click adjacent edges at the inner function button's inside corners to create two fillets, shown (highlighted) at right.

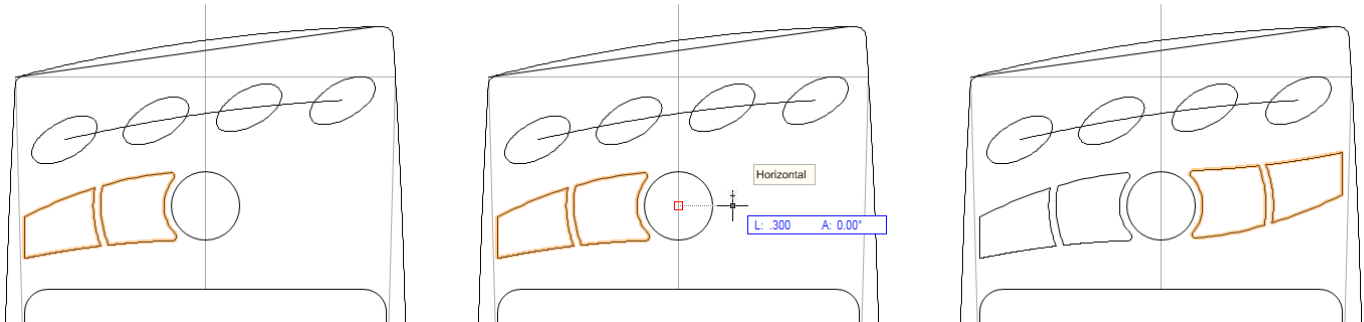


#### Notes:

- 1) Some arcs may not display pre-selection highlighting before you click them, but the fillet will be created anyway.
- 2) If you select the arc too close to the corner, the wrong side of the arc will be trimmed. If this happens, undo the fillet and try again by clicking farther away from the corner.
- 3) You will see the upper left corner fillet clearly in [Exercise 11](#), after you hide the construction geometry.




Now that the function buttons are complete, you create rotated copies for the function buttons on the right side of the circular function button.

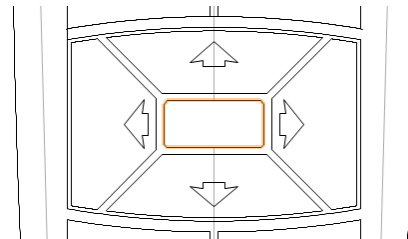
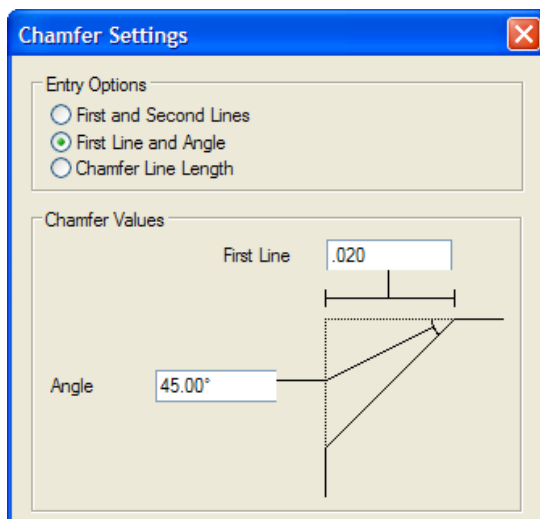
- Press the X key, and then hold down the Shift key and select the inner and outer function buttons, as shown at left. Press Alt+= for the **Rotate** tool shortcut. In the tool bar, make sure **Duplicate and Rotate Mode**  is enabled. For the center of rotation, snap to the center of the circular function button, and then hold down the Shift key to constrain the cursor horizontally, and click to the right of the first point (shown at center) to set the reference angle. Hold down the Shift key, and then click on the other side of the center point to specify the new angle and create the rotated copies, as shown at right.



## Creating chamfers

Next, you create chamfers on the enter button corners.

- From the Basic tools palette, click the **Chamfer** tool . In the tool bar, enable **Chamfer and Trim Mode** , and then click **Chamfer Preferences** . In the Chamfer settings dialog box, adjust settings (.020 [.51mm]) as shown at left, and then click **OK**. Click the enter button's edges to create 4 chamfers, as shown (highlighted) at right.

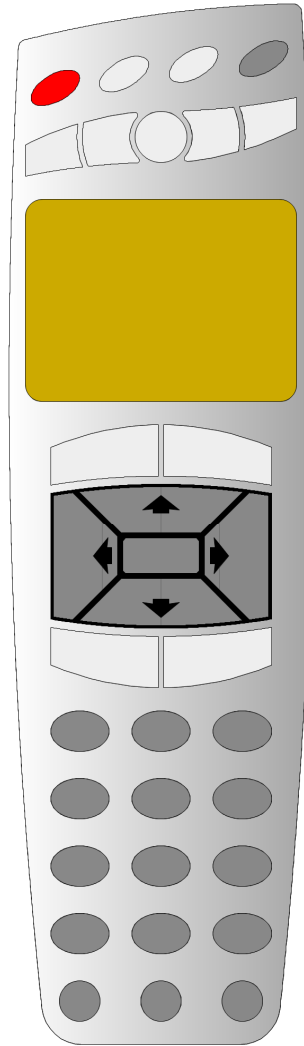


- Save the file.

## Exercise 11: Modifying Object Properties

In this exercise, you complete the remote control design by hiding all remaining construction geometry, creating special “fill” polygons, and then adding appropriately colored gradient and solid fills.

The completed exercise is shown in the following figure.

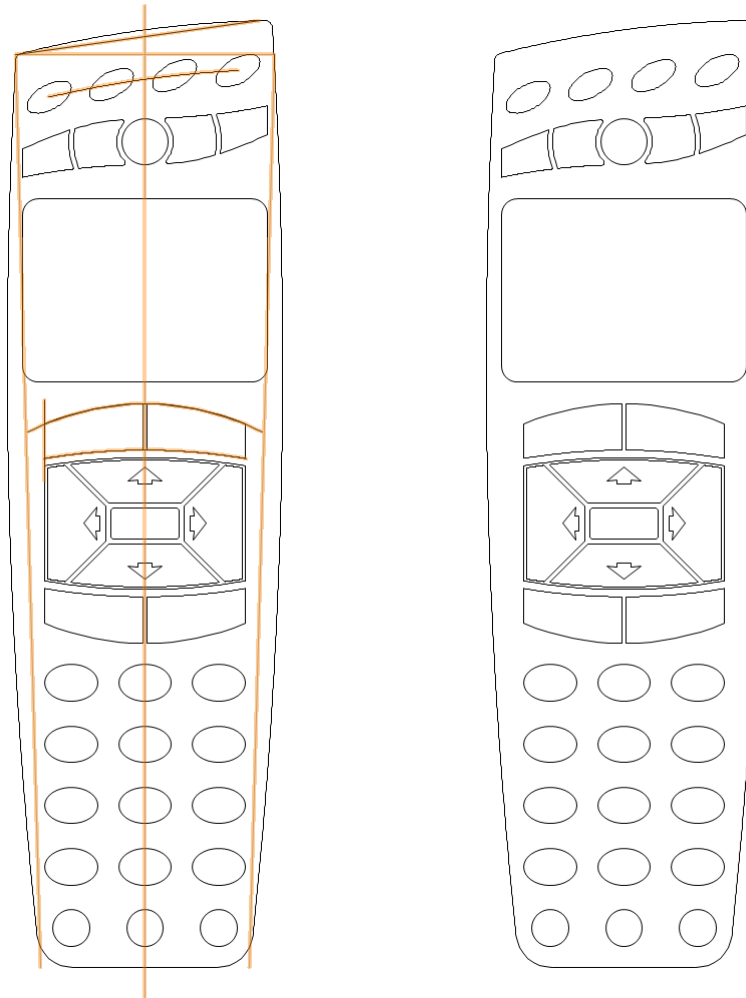


### Hiding construction geometry

You start the exercise by unlocking and ungrouping all objects, and then you change the class property of all construction geometry to the Geometry Ref class (which is already set to invisible).

1. Open the **GS-VWFx10.vwx** file in the Data Set folder.
2. From the menu, select:
  - **Edit > Select All** to add all drawing objects to the current selection set.
  - **Modify > Unlock** to unlock any locked objects.
  - **Modify > Ungroup** to ungroup any grouped objects.

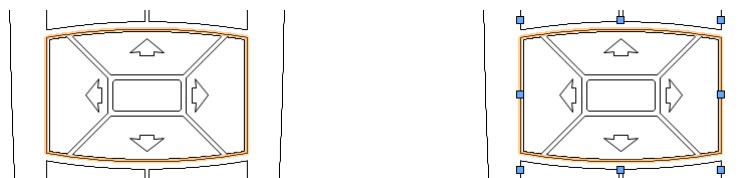
3. Press the X key twice to clear the current selection, and then hold down the Shift key and select all 9 construction geometry objects (if you accidentally select one of the remote control components, select it again to remove it from the selection set), as shown at left. In the Object Info palette, select **Geometry Ref** from the Class drop-down list to hide the construction geometry. Only the remote control's components should now be visible, as shown at right.




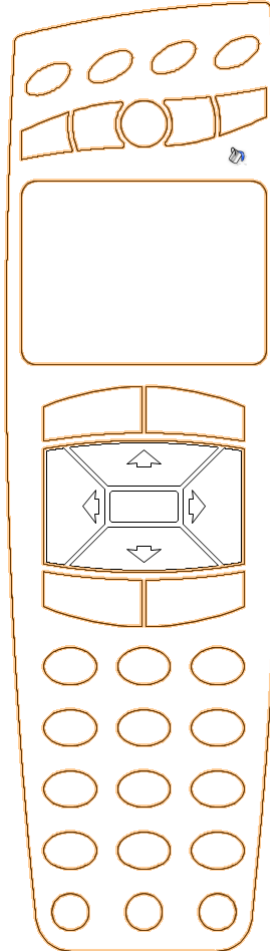
## Creating objects for color fills

Next, you use the **Compose** command to join existing geometry to create a polyline to serve as a background for the directional buttons, and then you create a polygon for the remote control body.

4. Hold down the Shift key and select the perimeter objects of the directional buttons (2 lines and 2 arcs), as shown at left. From the menu, select **Modify > Compose**. Notice that selection handles are now displayed around the new polyline object, as shown at right.



5. Press the X key twice to clear the current selection, and then press 8 for the **2D Polygon** tool shortcut. In the Tool bar, make sure that **Polygon From Inner Boundary Mode**  is still active. Click anywhere inside the remote control boundaries, away from other components to create the polygon, as shown (leave the polygon selected for the next step).



## Changing object stacking order

Next, you change the stacking order of the polygon you just made to facilitate selecting other components.

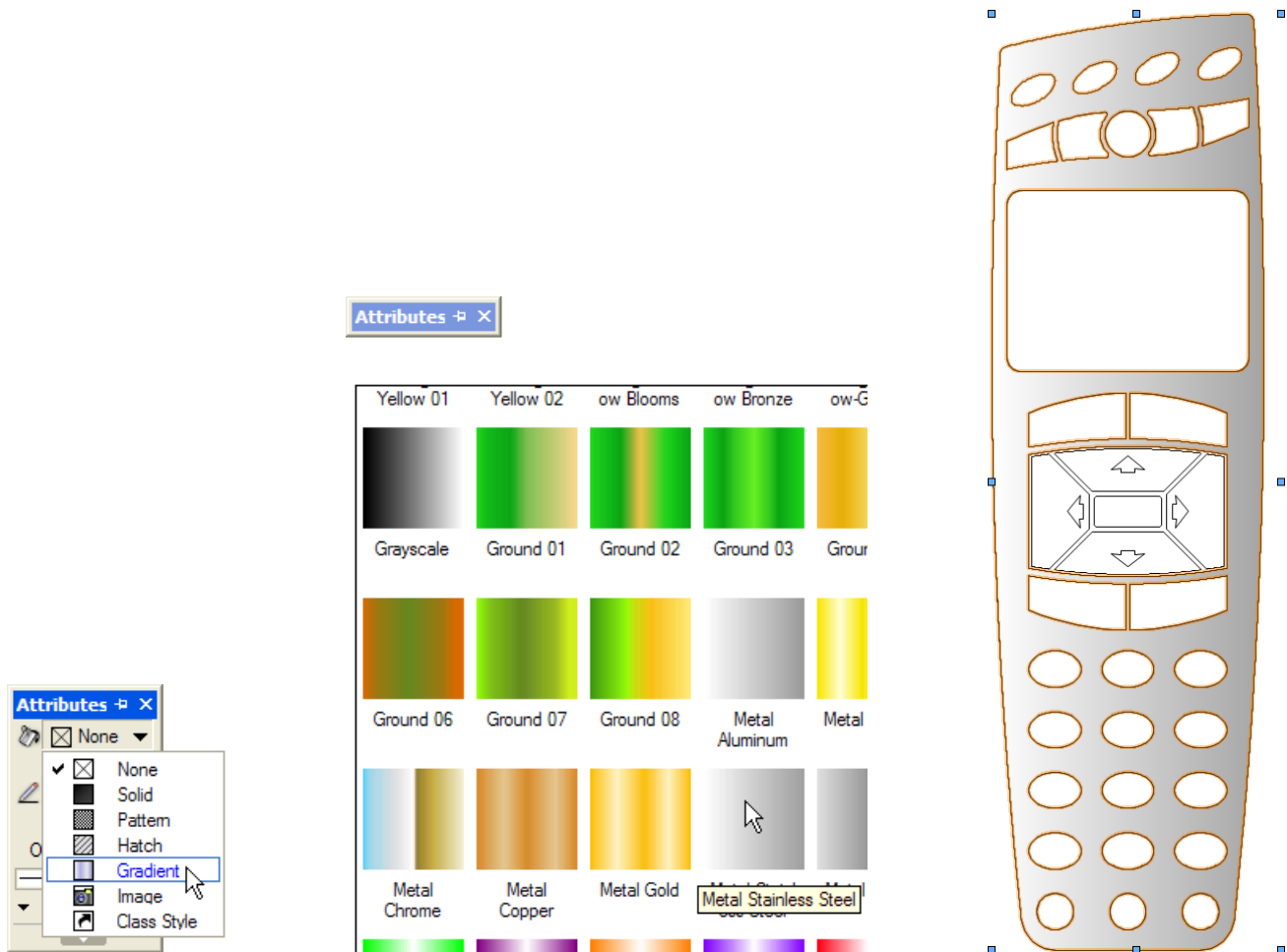
6. Press the X key, and then right-click the polygon you just made and select **Send > Send to Back** from the context menu (leave the polygon selected for the next step).

*Note: You can't see the effect of the stacking order change, but if you tried to click other components to select them before sending the polygon to the back of the stacking order, you would always select the polygon.*

## Modifying object attributes

Next, you apply gradient and solid color fill attributes to various components.

7. In the Attributes palette, select **Gradient** from Fill Style drop-down list (shown at left), and then click **Fill Gradient**, and scroll down the list and select **Metal Stainless Steel** (shown at center) to complete the remote control body fill, as shown at right.



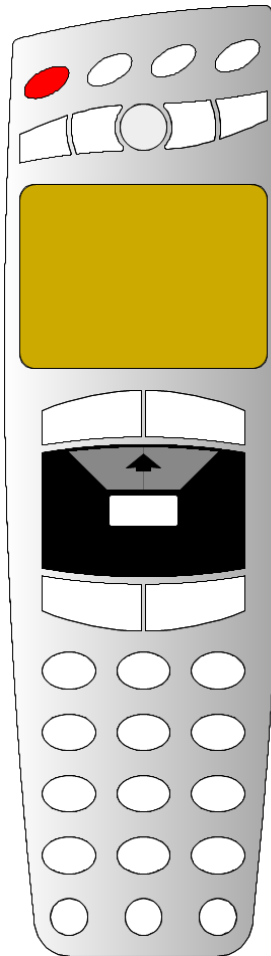


Next, you repeat the fill changing process for multiple objects.

**Note:** Change only one of each type of object as indicated. You transfer properties to similar objects in the next section of this exercise.


8. For each of the following objects, change the Fill Style to **Solid** (if it's not already solid), and then select the Solid Fill Color as indicated (or choose your own colors):
- Left power button: Bright red ■
  - Circular function button: Light gray ■
  - Display: Orange-green ■
  - "Up" directional button: Dark gray ■
  - Directional button background (zoom in if necessary to select it, and then zoom out again): Black ■

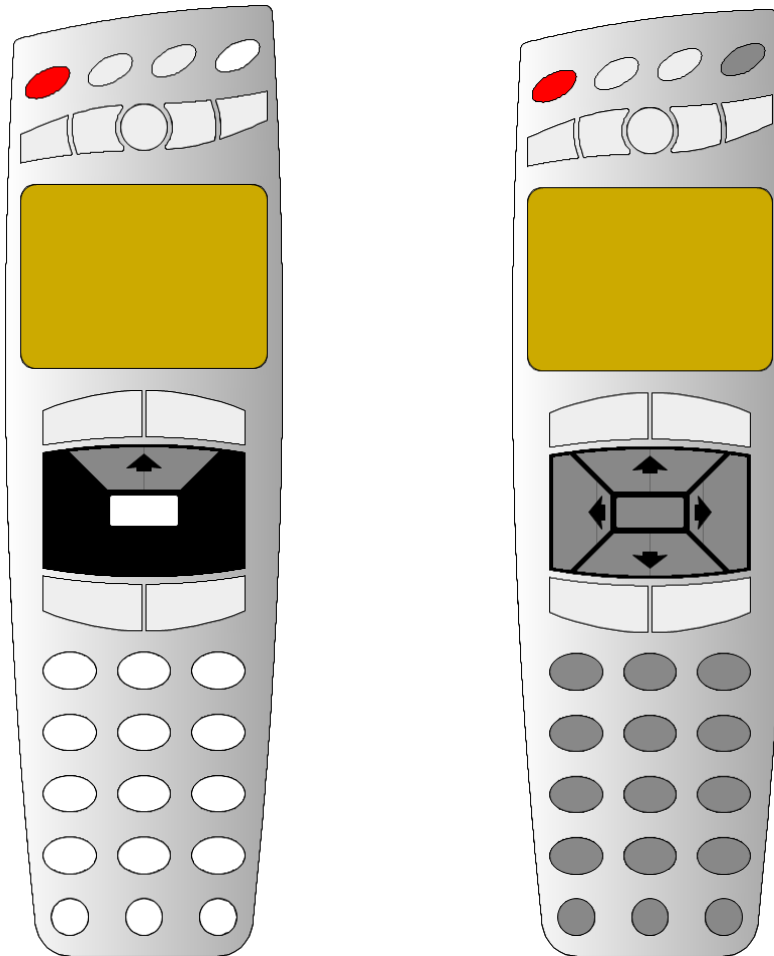
Press the X key twice to clear the selection. Your remote control colors should look similar to the following figure.



## Transferring object attributes

Next, you use the **Eyedropper** tool to quickly transfer the attributes to similar objects.

9. From the Basic tools palette, click the **Eyedropper** tool , and then use pre-selection indicators as you:
- Click the circular function button (to pick up its attributes), and then hold down the Ctrl key (to put down the attributes) and click the two middle power buttons, the inner and outer function buttons, and all four volume/channel buttons, to change their attributes as shown at left.
  - Click the “up” directional button, and then hold down the Ctrl key and click the right power button, the other three directional buttons, the enter button, and all oval and round keypad buttons, to change their attributes as shown at right.

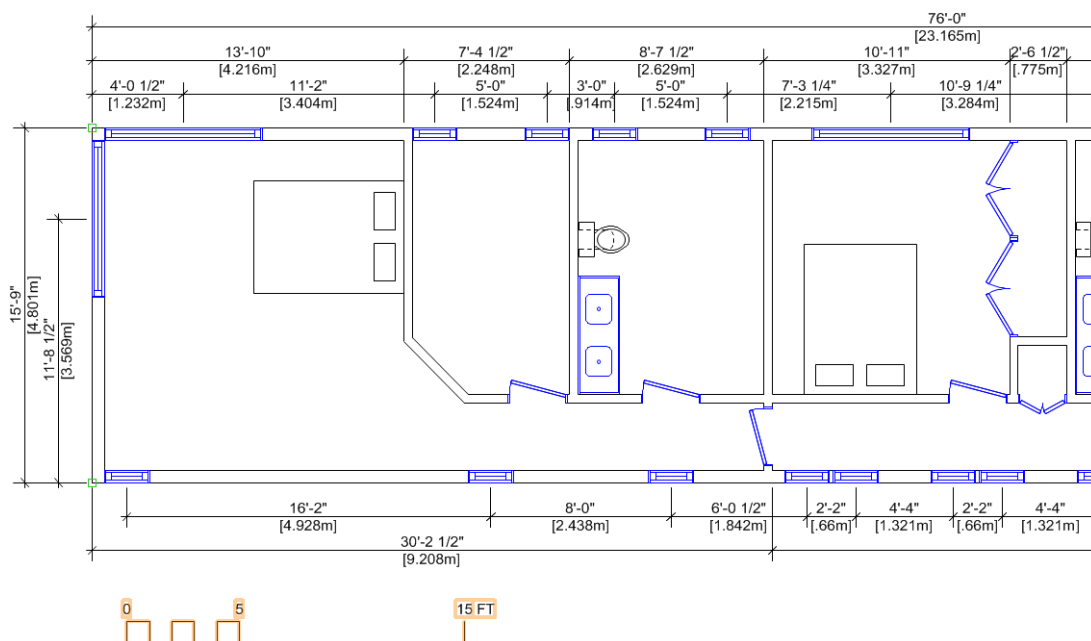


10. Save the file.

## Exercise 12: Working with Resources

In this exercise, you create a symbol, and then you insert two instances. You complete the exercise by inserting a scale bar plug-in object.

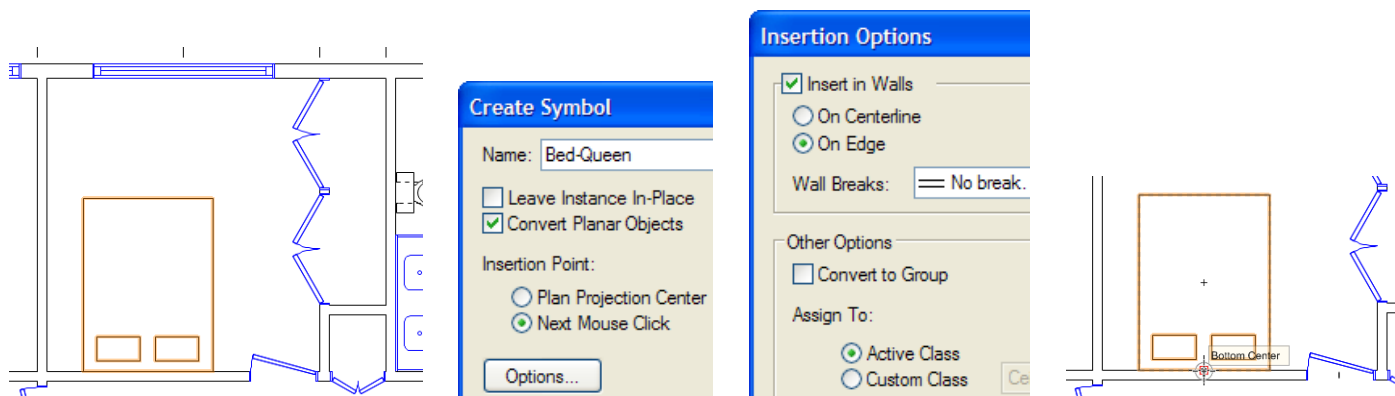
The completed exercise is shown in the following figure.








### Creating a symbol

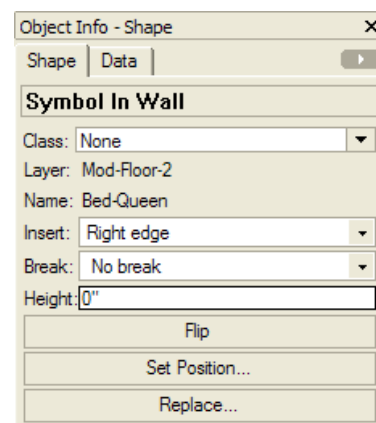
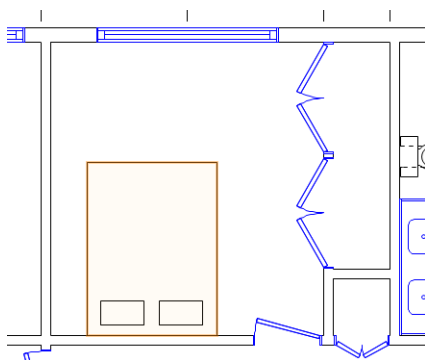
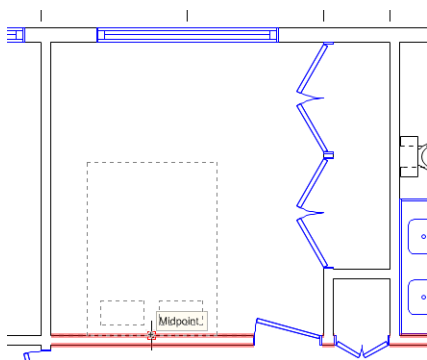
You start the exercise by opening an architectural file, and then you create a symbol of a queen size bed.

1. Open the **GS-VWFx12-Step01.vwx** file in the Data Set folder. The file opens with the second floor of the house displayed.
2. Press the X key, and then hold down the Shift key and select the three rectangles (bed and two pillows) in the hall bedroom, as shown at left. From the menu, select **Modify > Create Symbol**. In the Create Symbol dialog box, adjust settings as shown at left, and then click **Options**. In the Insertion Options dialog box, adjust settings, as shown in the next figure, and then click **OK** twice (the cursor changes shape to indicate that an insertion point must be specified). For the insertion point, snap to the bottom center of the bed rectangle, as shown at right. In the Create Symbol dialog box, click **OK** to place the symbol in the default destination folder, and remove the symbol geometry from the drawing.



Next, you insert two instances of the Bed-Queen symbol in the floor plan.

3. In the Resource Browser, verify that your file is active (if not, click the **Home** button ) , and then scroll down and open the Symbols/Plug-In Objects folder (if it's not open already). Scroll down the list, and then double-click the **Bed-Queen** symbol. In the Basic tools palette, notice that the **2D Symbol Insertion** tool  is now active. In the Tool bar, make sure **Standard Insertion Mode** , **Wall Insertion Mode** , and **Align Actual Insertion Point Mode**  are all active. Click the hall bedroom wall's midpoint once, where shown at left. Move your cursor above and below the wall (notice how the symbol flips), and then click above the wall to place the bed symbol in the wall, as shown at center. In the Object Info palette, verify that the symbol is inserted in the wall (see Notes below figure), and examine the available properties for a 2D symbol, as shown at right.

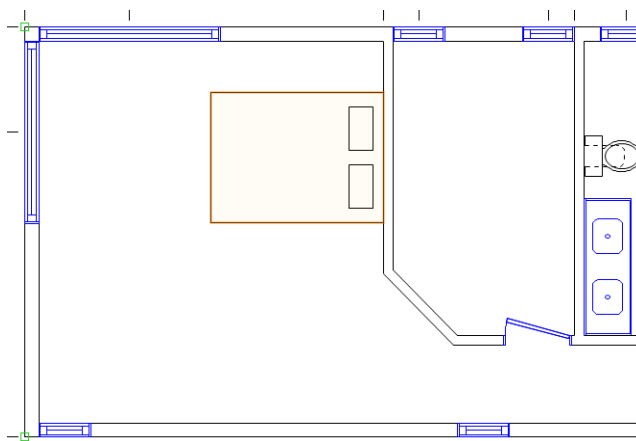


### Notes:

- 1) If the symbol is not inserted in the wall, press the Delete key to remove it from the drawing and try again.
- 2) You insert the symbol in the wall so that if you move the wall, the bed symbol moves with it.


**Tip:** Use symbols in the early design stages as temporary placeholders for geometry that you fully develop later in the design process. You can incorporate changes by editing symbols, or by replacing symbol instances with other symbols.

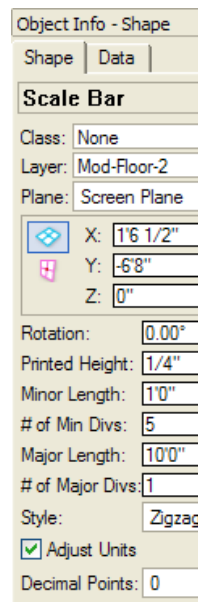
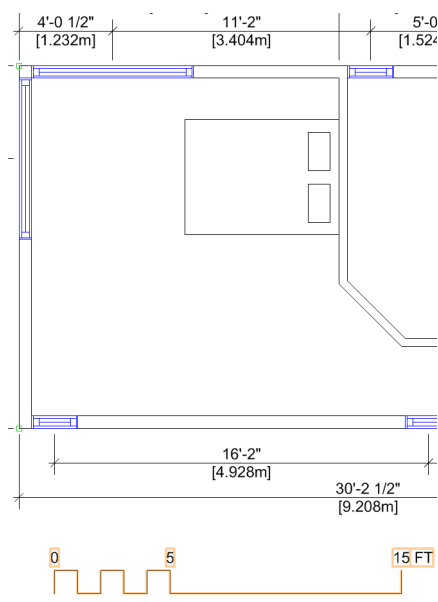
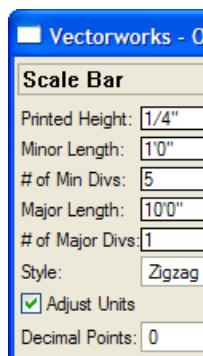
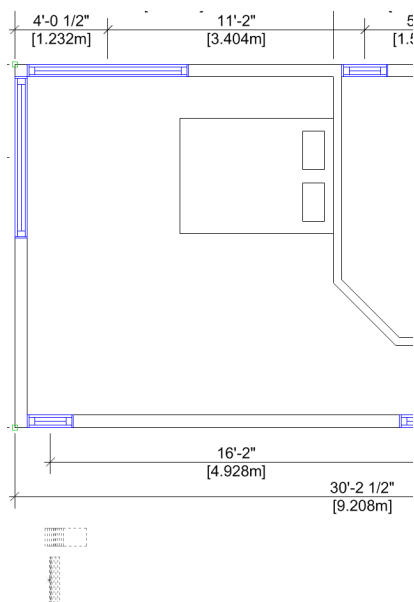
4. With the Bed-Queen symbol still active, insert another instance in the master bedroom's vertical wall (at the midpoint), oriented as shown.



## Inserting a plug-in object

Next, you insert a scale bar plug-in object into the drawing.

- From the Dims/Notes tool set, click the **Scale Bar** tool . Double-click approximately where shown at left to display the Object Properties dialog box. Adjust settings (1/4" [6.35mm], 1'0" [3.05m], 10'0" [3.048m]) as shown in the next figure, and then click **OK** to create the scale bar plug-in object (shown in the next figure).  
In the Object Info palette, notice that unlike the simple Bed-Queen symbol, the plug-in object has parameters that let you change the size and configuration of each instance, as shown at right.



- Save the file.

## Section 6: Annotation Tools

In two exercises, this section covers the following key processes for adding text and dimensions to your drawings:

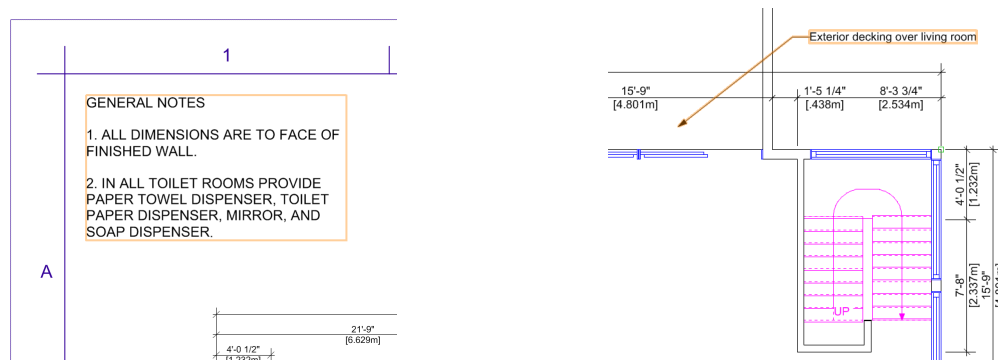
- Creating text (pg 62)
- Creating a callout (pg 63)
- Setting dimension preferences (pg 65)
- Creating constrained linear dimensions (pg 66)
- Creating an angular dimension (pg 67)
- Creating a radial dimension (pg 67)

In these exercises, you continue working with the sample architectural file from [Exercise 12](#) as you create general notes in a sheet layer, and then you activate a design layer to create a callout and floor plan dimensions.

## Exercise 13: Creating Text

In this exercise, you create a text block on a sheet layer, and then you create a callout in a design layer.

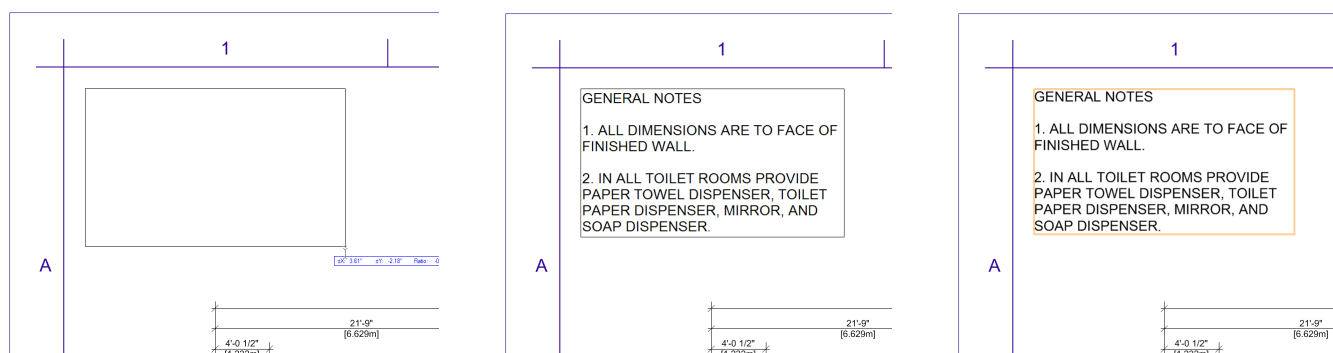
The completed exercise is shown in the following figure.



### Creating text

You start the exercise by creating a couple of standard notes in a text block.

1. Open the **GS-VWFx13-Step01.vwx** file in the Data Set folder. The file opens with the first floor plan sheet layer active.
2. Zoom in on the upper left corner of the drawing sheet. From the Basic tools palette, click the **Text** tool . Click and drag the cursor to draw the text limits, approximately where shown at left. A temporary text box is displayed, and the Object Info palette displays text controls. In the Object Info palette, select **14** from the Size drop-down list, then select **Left** from the Horiz. Align drop-down list. Click inside the text box, and then enter the text shown at center. Press the Esc key to close the temporary text box and create the standard notes, as shown at right (press the X key, and then drag the text box to reposition it, and/or drag a corner reshape handle to resize it, if necessary).

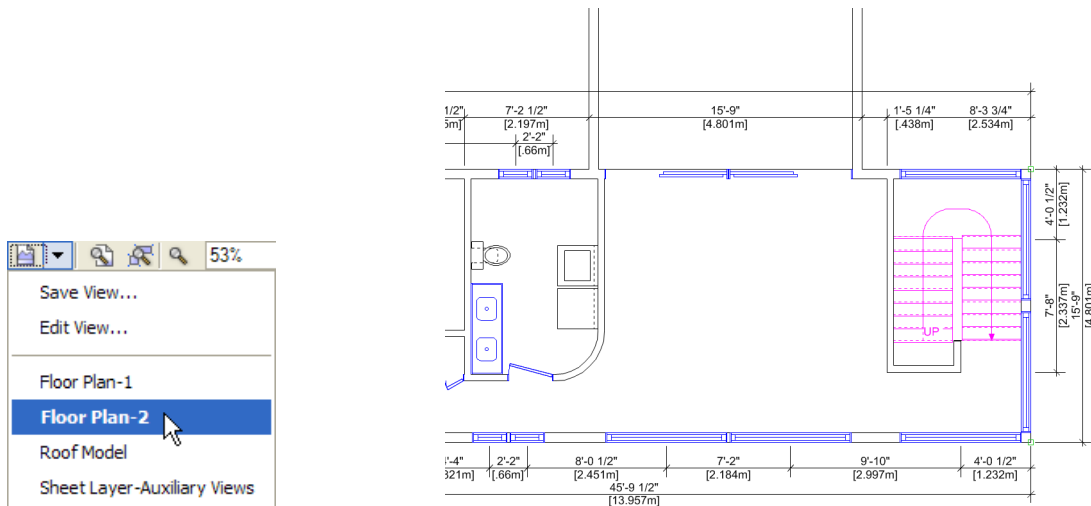






**Note:** To create a single line of text in your own drawings: Click the **Text** tool , and then click to specify a start point. You can then either start typing the text, or adjust text settings in the Object Info palette before you type the text. Press the Esc key when finished.

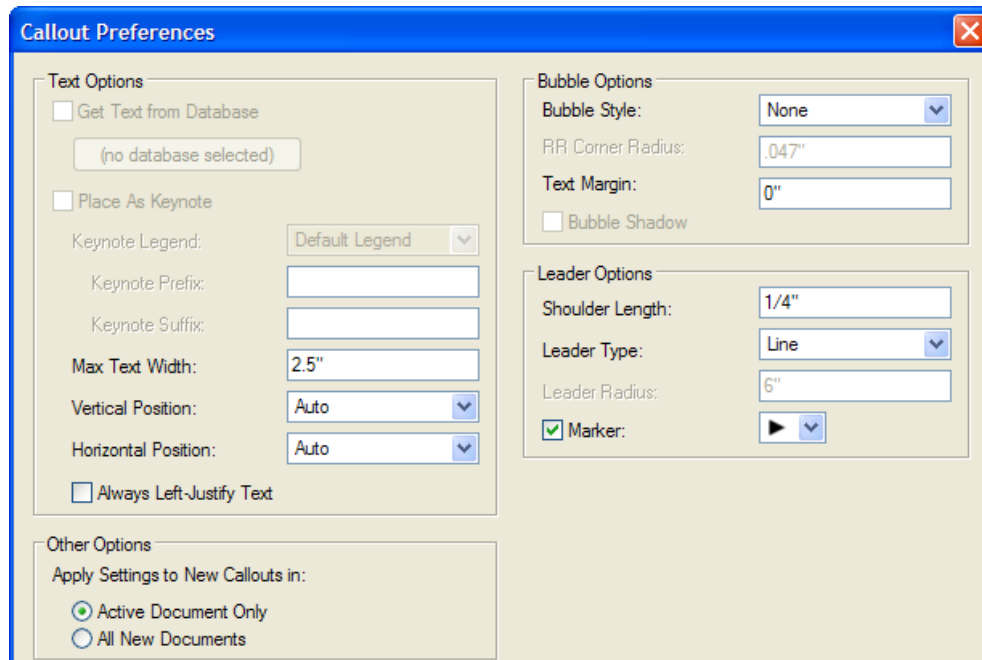
## Creating a callout

Next, you activate a saved view, and then you create a callout in the Mod-Floor-2 design layer to identify exterior decking.

- From the View bar, select **Floor Plan-2** from the Saved Views drop-down list (shown at left) to activate it. In the View bar, notice that the Mod-Floor-2 design layer is now active. Zoom in on the area shown at right.

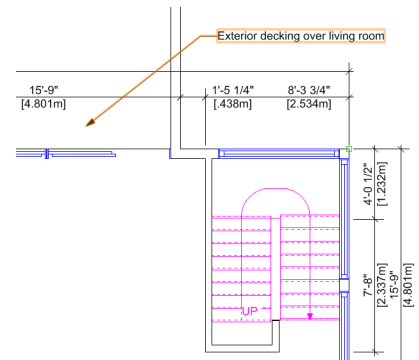
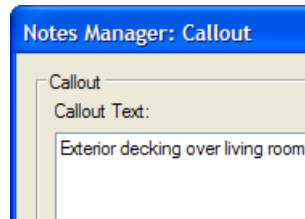
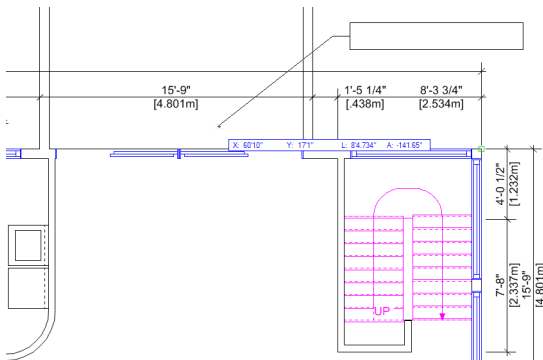


- From the Basic tools palette, the **Callout** tool . In the Tool bar, enable **Towards target mode**  and **Two-point mode** , and then click **Callout Tool Preferences** . In the Callout Preferences dialog box, adjust settings as shown (2.5" [63.50mm], 1/4" [6.35mm]), and then click **OK** to save the settings.





- Click two points in order—start outside the deck above the dimensions, and then click inside the deck for the second point—approximately where shown at left. In the Notes Manager: Callout dialog box, enter the callout text (shown at center), and then click **OK** to place the callout in the drawing, similar to the one shown at right.

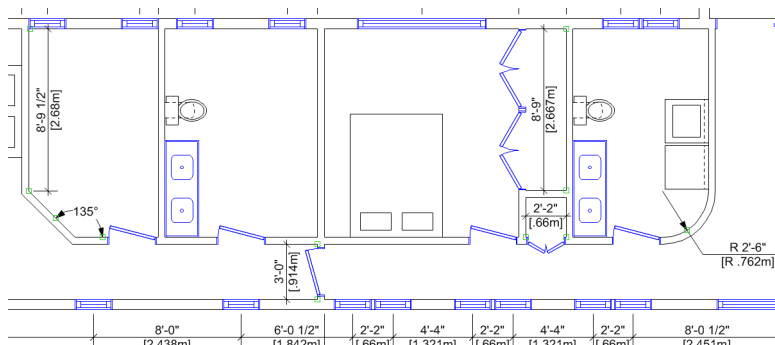


- Save the file.

## Exercise 14: Creating Dimensions

In this exercise, you create a few different types of dimensions.

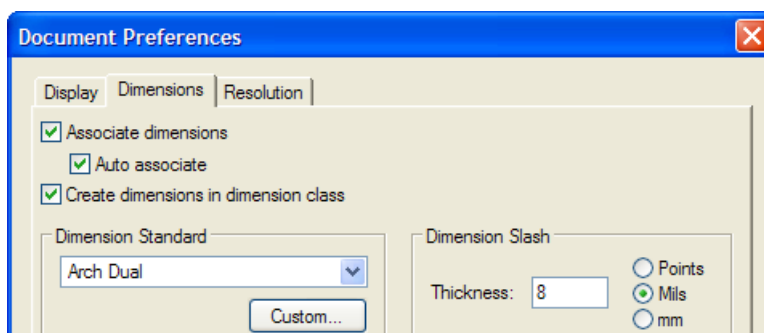
The completed exercise is shown in the following figure.



### Setting dimension preferences

You start the exercise by adjusting dimension creation and precision preferences.

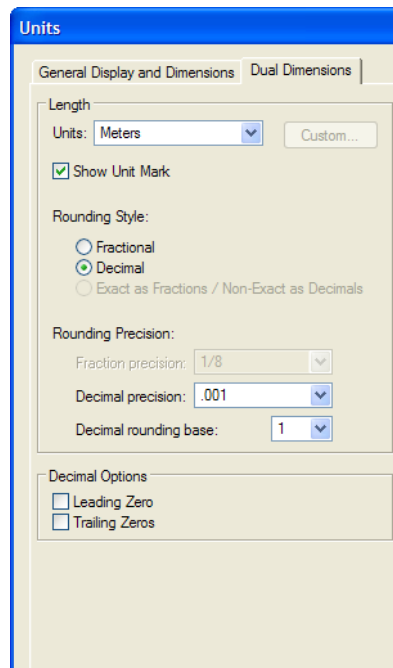
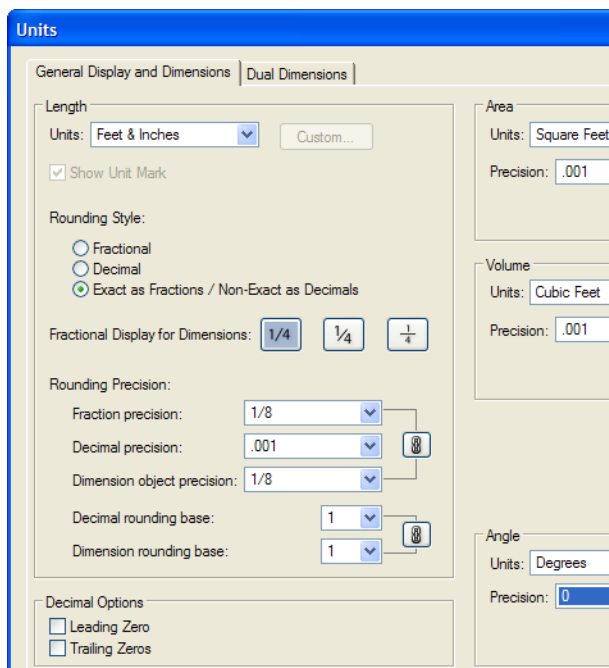
1. Open the **GS-VWFx14-Step01.vwx** file in the Data Set folder. The file opens with the Mod-Floor-2 design layer active.
2. Right-click a blank area and select **Document Preferences**. In the Document Preferences dialog box, select the Dimensions tab. Adjust settings (8 Mils [.2032mm]) as shown, and then click **OK**.



#### Dimension Notes:

- 1) Associative dimensions “attach” themselves to drawing objects by placing parametric constraints on vertices of selected geometry. Parametric constraints let dimensions move and update values when you move or resize associated geometry, or (for linear and chain dimensions only) modify associated geometry if you change the Length parameter.
- 2) To turn off display of the parametric constraints, select **Tools > Options > Vectorworks Preferences** from the menu, and then select the Display tab and turn off the **Show Parametric Constraints** option (leave the display on for these exercises).
- 3) If the **Associative Dimensions** option is disabled, any dimensions you create will not be attached to—or control—geometry you snap to.
- 4) Refer to the Online Help’s Associative Dimensioning topic for more information.
- 5) In your own files, you can create or import custom dimension standards and use them individually, or to replace default standards (in the active drawing only) if you need to adjust any parameters such as Offset Text size. Refer to the Online Help’s Using Custom Dimension Standards topic for more information.
- 6) For your own drawings with dimensions based on multiple standards, you can set the current dimension standard from the Tool bar when any dimension tool is active.

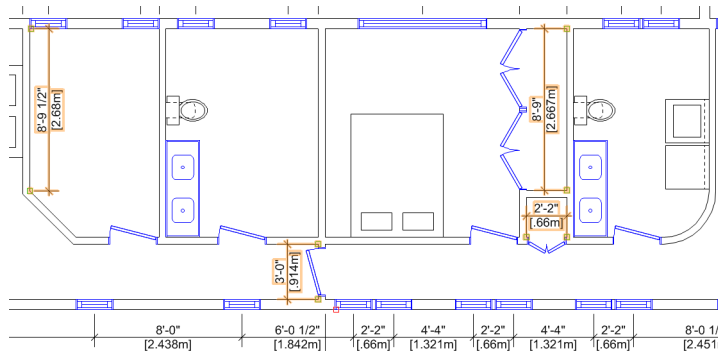
- From the menu, select **File > Document Settings > Units**. In the Units dialog box, select the General Display and Dimensions tab. Change the Angle Precision to 0 (zero), and then verify or adjust other settings, as shown at left. Select the Dual Dimensions tab, and then verify or adjust settings as shown at right. Click **OK** to save the settings.



## Creating constrained linear dimensions

Next, you use the **Constrained Linear Dimension** tool to create orthogonal dimensions in the floor plan.

- From the Dims/Notes tool set, click the **Constrained Linear Dimension** tool . Snap to object vertices marked with green squares (parametric constraints of associative dimensions) to create dimensions approximately where shown (highlighted - see Notes below figure).




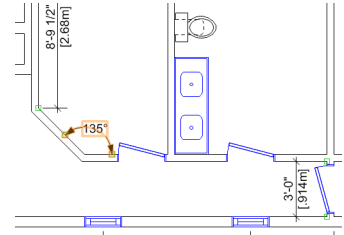
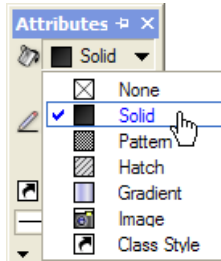
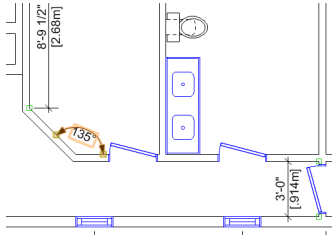
### Notes:

- The first two clicks determine dimension points; the third click orients and places the dimension.
- Pick up points of existing dimension geometry, and then use SmartCursor cues to align new dimensions as you create them.
- Press the X key, and then drag dimension lines or text if you need to move either.

## Creating an angular dimension

Next, you create an angular dimension in the floor plan.




- From the Dims/Notes tool set, click the **Angular Dimension** tool . Click the inside wall edges (near the arrow points), and then click to place the angular dimension approximately where shown at left. In the Object Info palette, select **Horizontal** from the Text Rot drop-down list. In the Attributes palette, select **Solid** from the Fill Style drop-down list (shown at center), to complete the angular dimension, as shown at right.

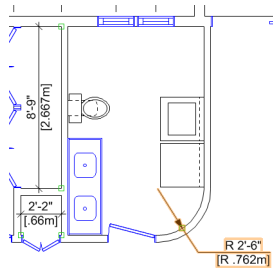


**Note:** You change the Fill Style to Solid because dimension fills are turned off (by the Dimension class setting) in this file to properly display dual dimensions.

## Creating a radial dimension

Next, you create a radial dimension in the floor plan.

- From the Dims/Notes tool set, click the **Radial Dimension** tool . In the Tool bar, enable **Interior Radial Dimension mode**  and **Right-Hand Shoulder mode** . Click the inside edge of the curved wall, and then click to place the radial dimension approximately where shown.



- Press the X key twice to clear the selection, and then save the file.

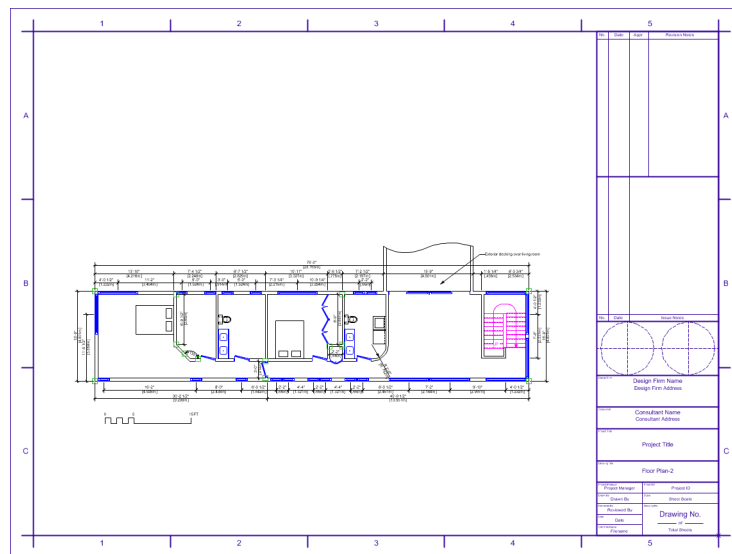
## Section 7: Drawing Presentation

In three exercises, this section covers the following processes for printing drawings set up with viewports on sheet layers:

- Duplicating a sheet layer (pg 69)
- Adjusting page setup settings (pg 70)
- Cleaning up the new drawing sheet (pg 70)
- Creating a viewport (pg 71)
- Cropping a viewport (pg 72)
- Setting up the printer (pg 74)
- Printing to a file (pg 75)

In these exercises, you duplicate a sheet layer, and then you create a floor plan viewport (that display objects on multiple design layers) on the new sheet layer. You then crop the viewport to hide extraneous objects. You complete the tutorial by setting up your printer, and then you print the floor plan drawing to a file.

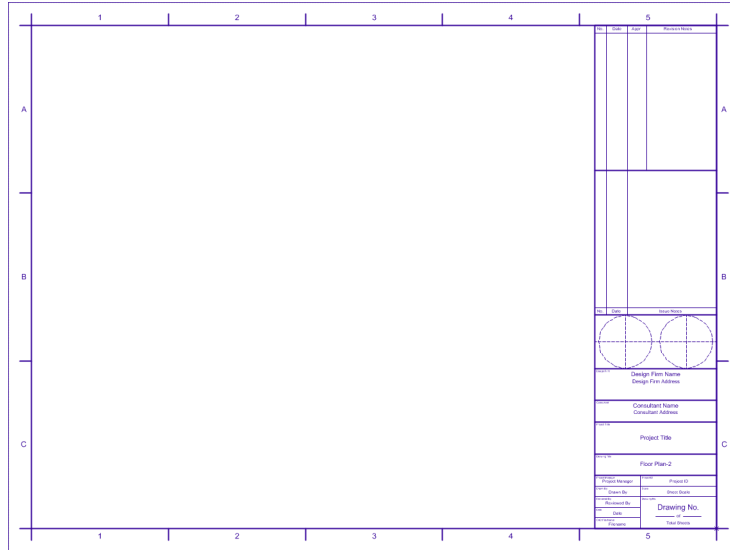
After completing the exercises in the section, your drawing should look similar to the following figure.



## Exercise 15: Working with Sheet Layers

In this exercise, you duplicate an existing sheet layer, and then you modify its display properties and page setup settings.

The completed exercise is shown in the following figure.



### Duplicating a sheet layer

You start the exercise by duplicating an existing sheet layer.

1. Open the **GS-VWFx15-Step01.vwx** file in the Data Set folder. The file opens with the first floor plan sheet layer active.
2. Press Ctrl+Shift+O for the Organization dialog box shortcut. Select the Sheet Layers tab, then right-click the **Sheet-Floor Plan-1** sheet layer and select **Duplicate** from the context menu. Notice the sheet number for the new sheet layer was automatically incremented, as shown at left. Right-click the **Sheet-Floor Plan-2** sheet layer and select **Edit** from the context menu. In the Edit Sheet Layers dialog box, change the Sheet Title to Sheet-Floor Plan-2, as shown at right (keep the Edit Sheet Layers dialog box open for the next step).

Organization					
Classes	Design Layers	Sheet Layers	Viewports	Saved Views	References
Sheet Number	Sheet Title	DPI	X	Y	
Sheet-Auxiliary Views	Sheet-Auxiliary Views	72	0"	0"	
Sheet-Elevations-1	Sheet-Elevations-1	72	0"	0"	
Sheet-Floor Plan-1	Sheet-Floor Plan-1	72	0"	0"	
✓ Sheet-Floor Plan-2	Sheet-Floor Plan-1	72	0"	0"	
Sheet-Roof Plan	Sheet-Roof Plan	72	0"	0"	

Edit Sheet Layers

Sheet Number:

Sheet-Floor Plan-2

Sheet Title:

Sheet-Floor Plan-2

DPI:

72

Origin

X: 0"

Y: 0"

Page Setup...

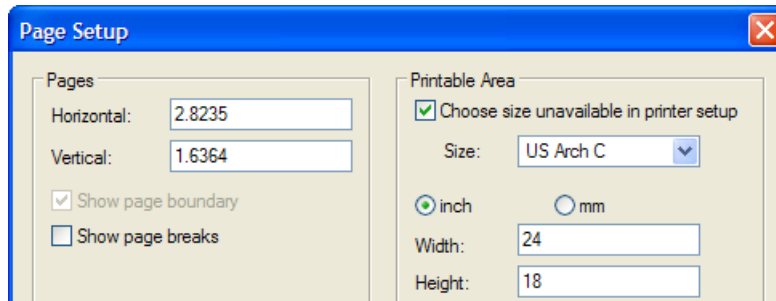
#### Notes:

- 1) In your own drawings, click **New** if you don't have any existing sheet layers in the file.
- 2) You can also optionally create a new sheet layer when you create a viewport (in this tutorial, you create a viewport in [Exercise 16](#)).

## Adjusting page setup settings

Next, you change page setup properties for the new sheet layer.

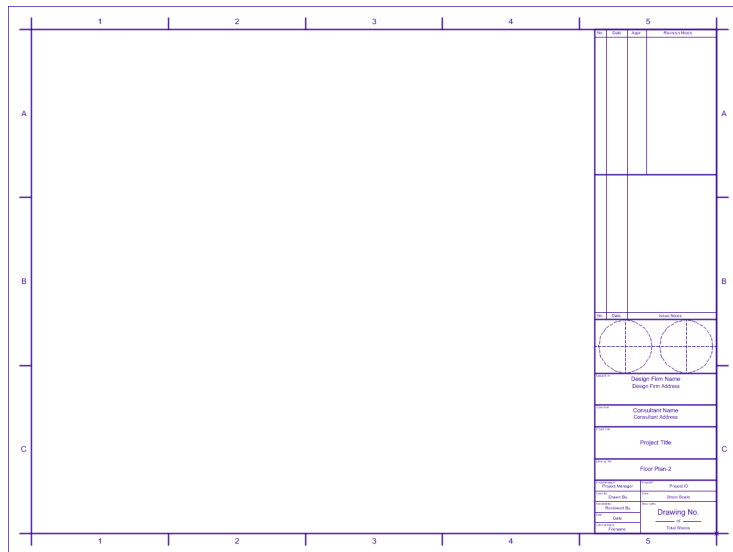
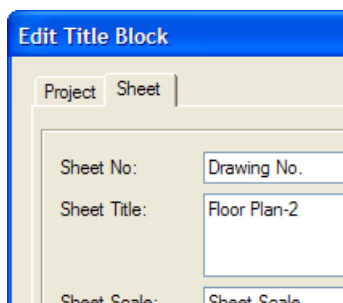
3. Click **Page Setup**, and adjust settings in the Page Setup dialog box, as shown. Click **OK** three times to save the settings and close all open dialog boxes.



*Note: Your Horizontal and Vertical values in the Pages section may vary.*

## Cleaning up the new drawing sheet

4. In the View bar, notice that the Sheet-Floor Plan-2 sheet layer is now active. Press the X key, and then hold down Shift key and select the general notes (text object) and viewport. Press the Delete key to remove them from the sheet.
5. Select the drawing border, and then scroll down in the Object Info palette, and click **Edit Title Block**. In the Edit Title Block dialog box, select the Sheet tab, and then change the Sheet Title, as shown at left. Click **OK** to save the change, and then press the X key twice to clear the selection, and examine the new (empty) drawing sheet, as shown at right.

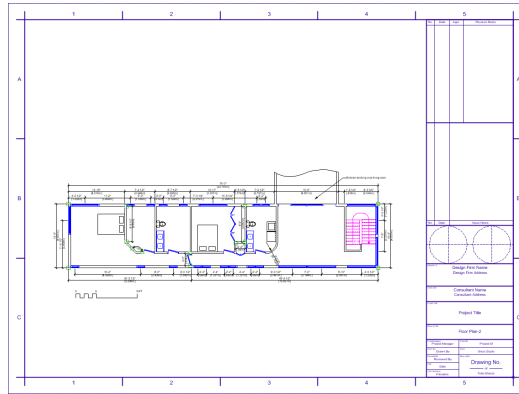


6. Save the file.

## Exercise 16: Working with Viewports

In this exercise, you create and crop a viewport.

The completed exercise is shown in the following figure.



### Creating a viewport

You start the exercise by creating a viewport on the new sheet layer from [Exercise 15](#).

1. Open the **GS-VWFx15.vwx** file in the Data Set folder. The file opens with the (blank) second floor plan sheet layer active.
2. From the menu, select **View > Create Viewport**. In the Create Viewport dialog box:
  - Change the Viewport Name to **VP-Floor Plan-2**.
  - Change the Drawing Title to **Floor Plan 2**.
  - Select **3/16"=1'0"** from the Scale drop-down list.
  - Verify other settings (shown at left).
  - Click **Layers**. In the Viewport Layer Properties dialog box, adjust visibilities as shown at center, and then click **OK**.
  - Click **OK** to create the viewport.

Drag the viewport into the approximate center of the drawing border, as shown at right.

**Create Viewport**

Viewport Name: VP-Floor Plan-2

Drawing Title: Floor Plan 2

Sheet Layer: Sheet-Floor Plan-2

Layers...

☒ Display Planar Objects

☒ Project Screen Objects

Classes...

Scale: 3/16"=1'0"

Custom Scale 1: 64.000

View: Top/Plan

Set View...

Rendering: Wireframe

Render Settings...

RW Background: None

Projection: 2D Plan

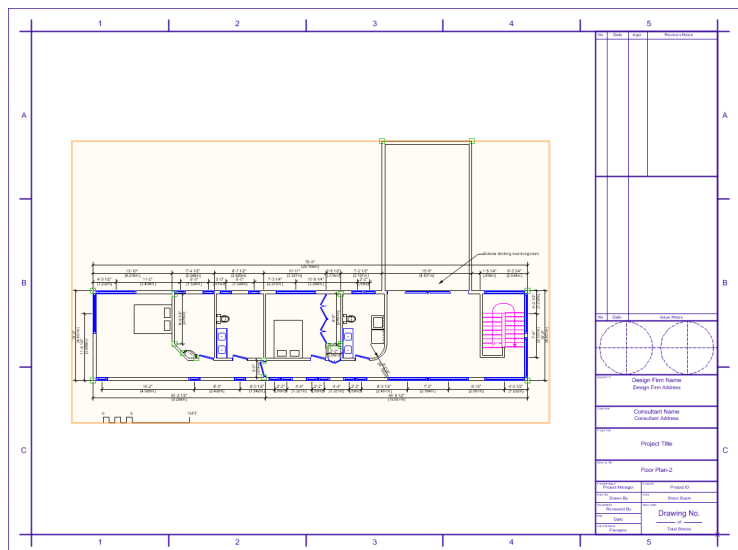
Perspective Type: Normal

Perspective Dist: 9.760

**Viewport Layer Properties**

Viewport: VP-Floor Plan-2



Visibility	Layer
<input checked="" type="checkbox"/>	Design Layer-1
<input checked="" type="checkbox"/>	Mod-Roof
<input checked="" type="checkbox"/>	Mod-Floor-2
<input checked="" type="checkbox"/>	Mod-Slab-2
<input checked="" type="checkbox"/>	Mod-Floor-1
<input checked="" type="checkbox"/>	Mod-Slab-1

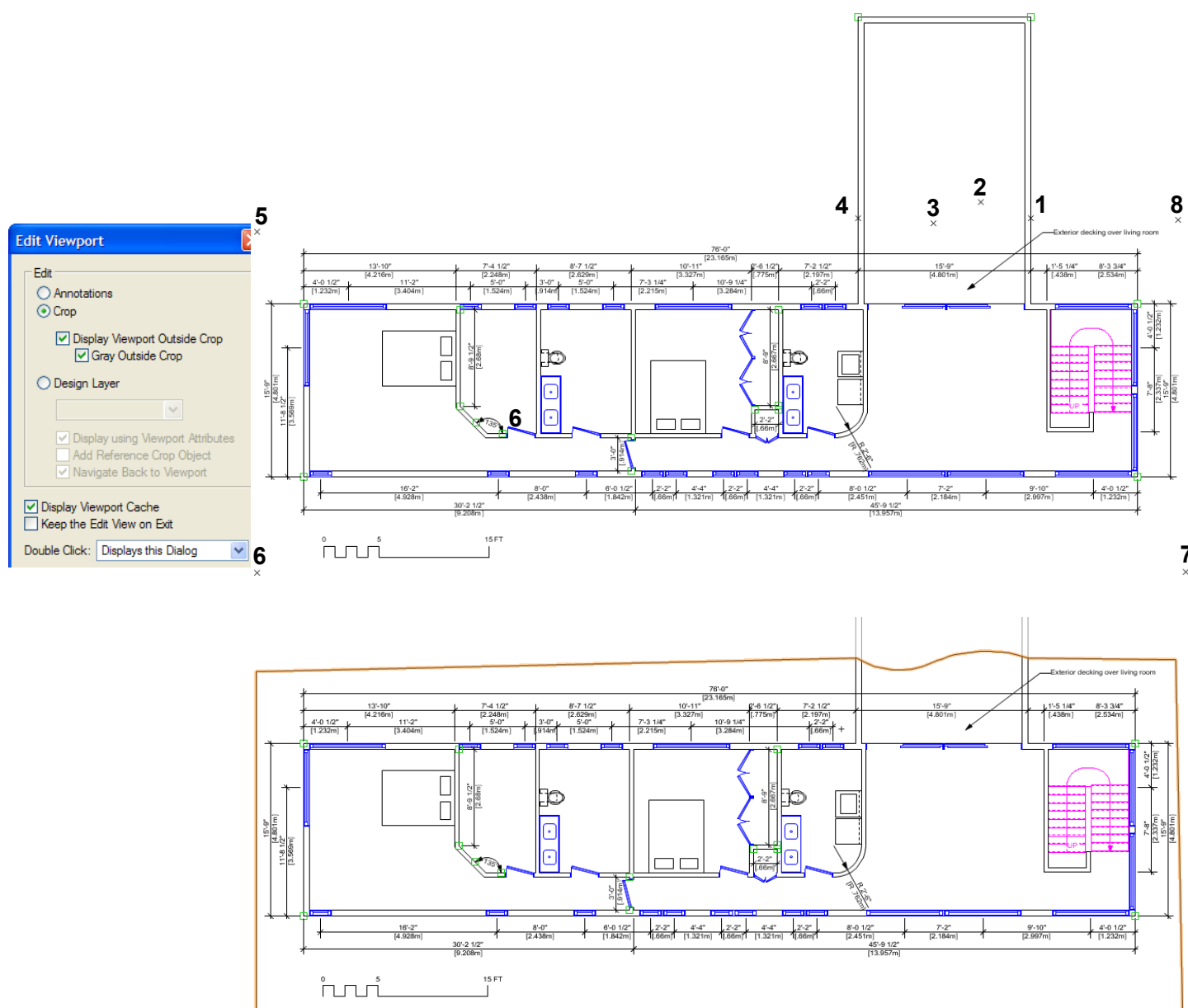





## Cropping a viewport

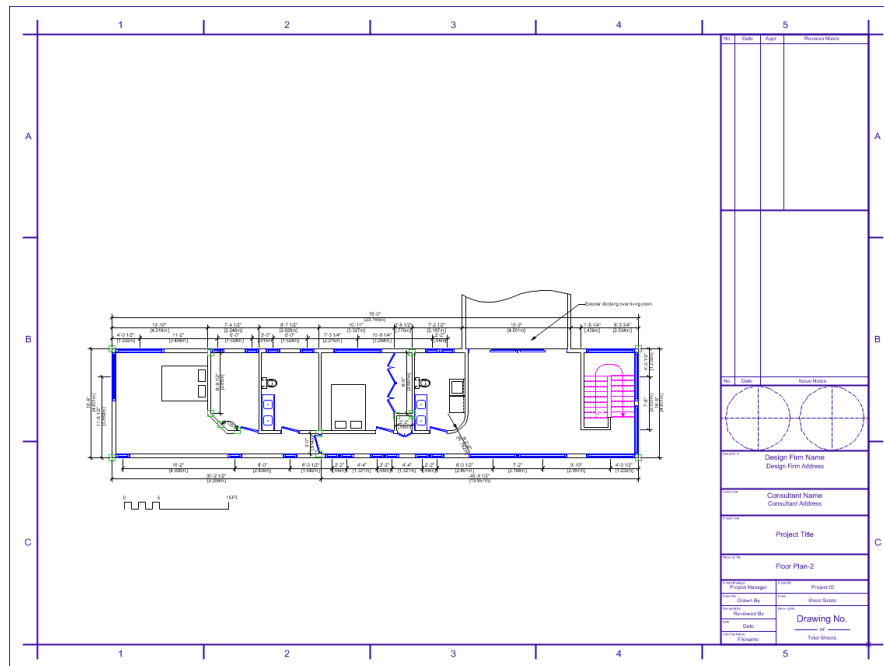
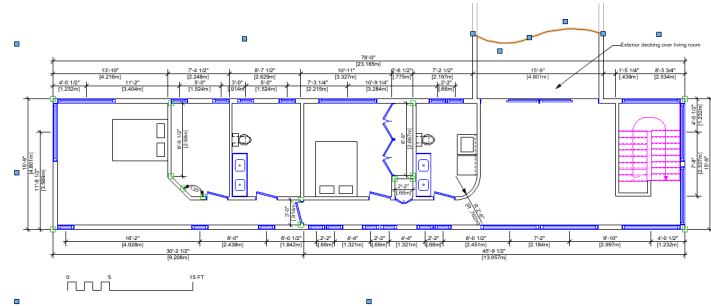
Next, you crop the viewport to create a curved break line for the deck.

- Press Ctrl+6 to zoom in on the selected viewport. Double-click any object in the viewport to activate editing mode. In the Edit Viewport dialog box, select the **Crop** option, as shown at top left, and then click **OK** to enter Viewport Crop mode. Press 5 for the **Polyline** tool shortcut, and then enable **Tangent Arc Mode**  in the Tool bar. Start by snapping to the outside wall line, approximately where point 1 is shown (at top right). Continue clicking approximately where points 2 and 3 are shown, and then snap to the outside wall line approximately where point 4 is shown (do not terminate the polyline yet) to create the curved section of the polyline. For the next vertex, enable **Corner Vertex Mode**  in the tool bar, and click approximately where point 5 is shown. Continue clicking points 6 thru 8, and then snap to the start point to close and complete the polyline and crop the viewport, as shown at bottom (leave the polyline selected for the next step).



Next, you use the **2D Reshape** tool to hide the straight edges of the crop polyline.

4. Press the – key for the **2D Reshape** tool shortcut. In the tool bar, activate **Hide or Show Edges Mode** , and then click the midpoint reshape handle for each of the polyline's five straight segments to hide them so that only the curved portion is now visible, as shown at top. Click **Exit Viewport Crop** to return to the sheet layer, then press the X key twice to clear the selection, and then press Ctrl+6 to adjust the display. Examine the completed viewport crop, as shown at bottom.



5. Save the file.

## Exercise 17: Printing the Drawing

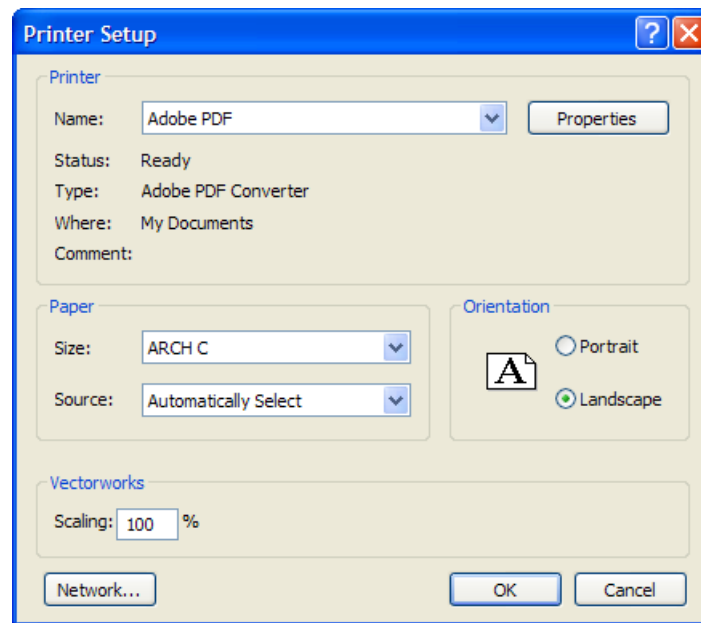
In this exercise, you set up your printer, and then you print the sheet layer with the cropped viewport from [Exercise 16](#).

**Note:** To save paper, you practice using print commands by printing to a file.

### Setting up the printer

You start the exercise by setting your printer's properties.

1. Open the **GS-VWFx16.vwx** file in the Data Set folder. The file opens with the second floor plan sheet layer active.
2. From the menu, select **File > Page Setup**. In the Page Setup dialog box, click **Printer Setup**. In the Printer Setup dialog box, select the name of the desired printer (see Notes below figure), and then choose a paper size—or specify dimensions for a custom size—to match the 24" x 18" US Arch C size that you specified in the [Adjusting page setup settings](#) section in [Exercise 15](#). Your printer setup dialog box might look similar to the following figure:



**Notes:**

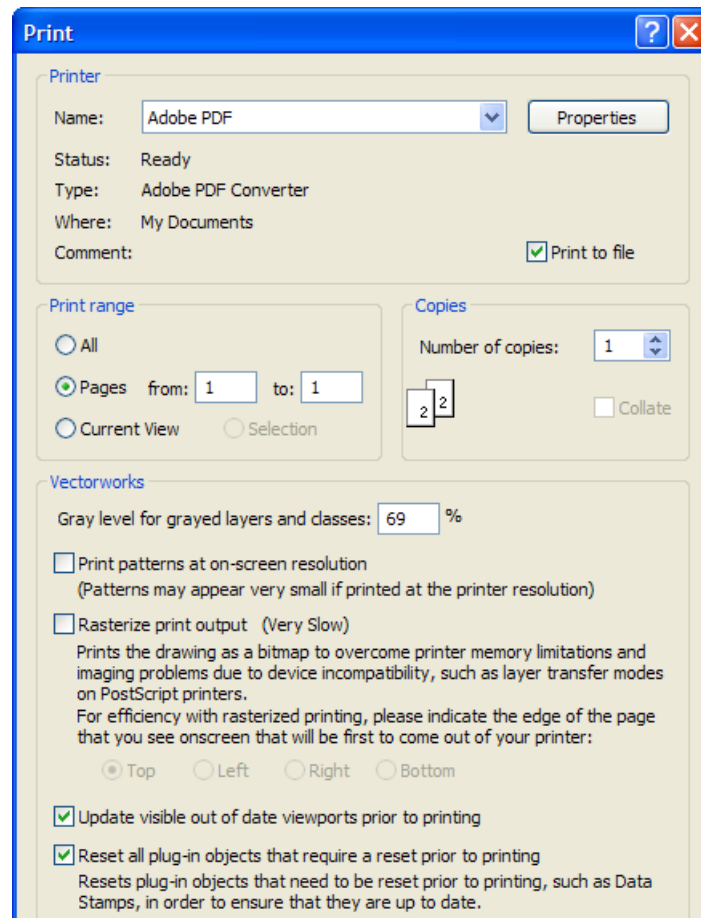
- 1) The printer selection above is for illustration purposes only. Due to the extensive variety of printers available, it's impossible to provide explicit instructions and illustrations of settings for your particular printer. For best results, select a printer that you're familiar with.
- 2) For some printers, you may have to adjust page size and/or scaling for proper operation.

3. Click **OK** twice to save the settings and close both dialog boxes.

## Printing to a file

Next, you print the active sheet layer to a file.

4. From the menu, select **File > Print**. In the Print dialog box, enable the **Print to File** option, and then enable the **Pages from 1 to 1** option. Your Print dialog box might look similar to the following figure. Click **OK**, and then specify a file name and location in the Print to File dialog box. Click **Save** to print the drawing to the location you specified.

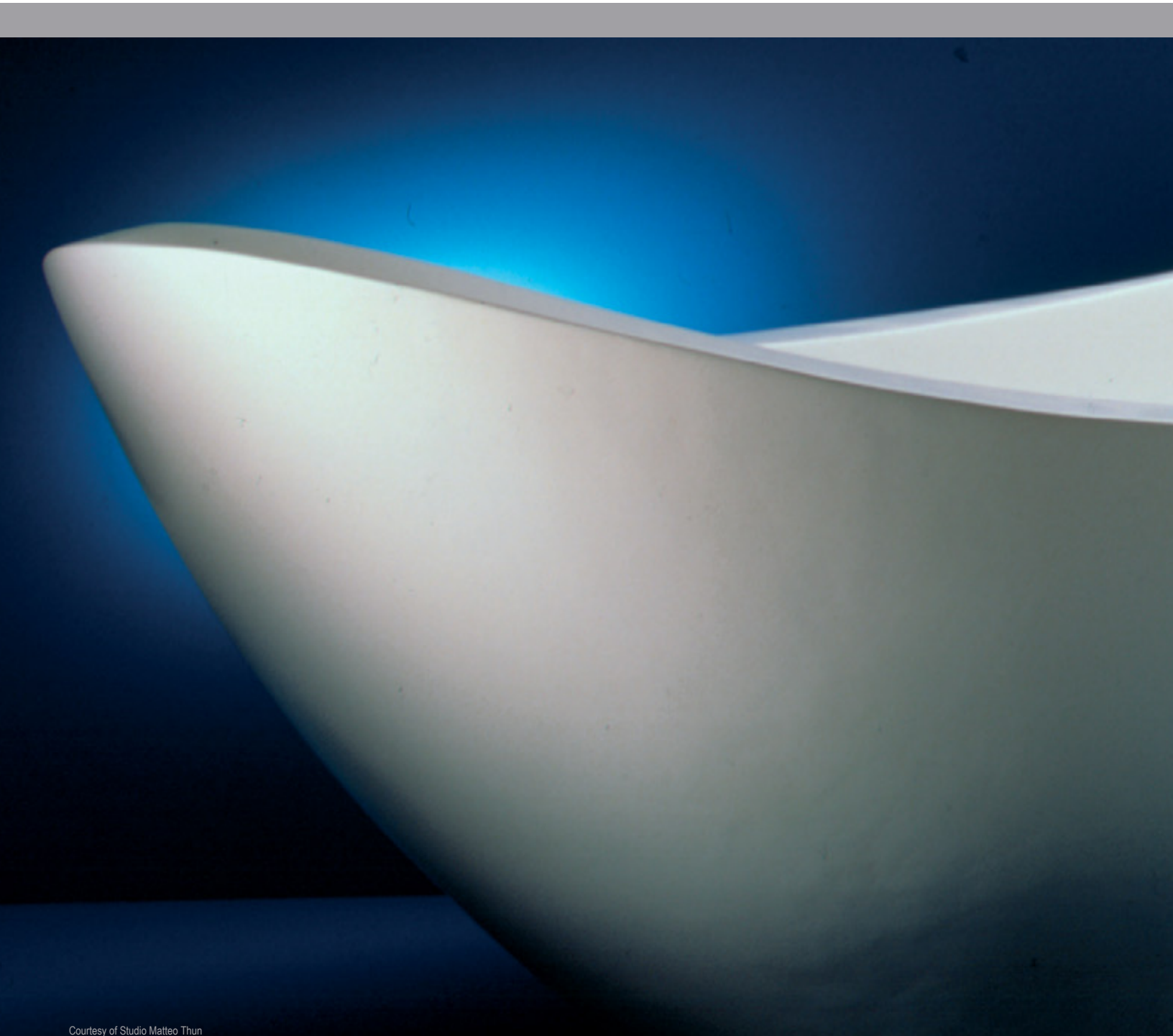


5. Save the file. Congratulations - you have now completed the tutorial!

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Courtesy of Studio Matteo Thun