



BIM for Small Business

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Introductory Residential Design  
Workbook Using

Cadsoft Envisioneer

SAMPLE

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# Overview

Welcome! This book will explore residential design and construction with guided design exercises using Cadsoft Envisioneer. This book provides an introduction to residential design for students. The goal of the manual is to introduce you to Cadsoft Envisioneer and residential design. Once you have completed the manual you should be able to apply all of the knowledge learned to design your own residential design project.

## How this book is Organized

Each Chapter in the book will include a topic of instruction, sample exercises, a review and additional activities. To succeed with the book always start by reading about the subject and then trying the sample exercise. The review section will note the most important information that you should have retained from the lessons. For extra practice try the additional activities listed.

The sample exercises use Cadsoft Envisioneer and include step by step instructions. Cadsoft Envisioneer is a very easy to use design software package that will offer your students immediate results.

## Helpful Tips

Following are some helpful tips so you can get the most out of this book.

First, commands selected from the menu are separated by an > . For example **File > Open** will indicate to you that you need to choose the File pull down menu and then select Open to open a new project.

If you need to type a value, the value will be indicated in bold font. For example **5'** will indicate that you need to type 5' on your keyboard.

We have used several icons throughout the book to draw your attention. Here is a brief explanation on what they mean.



Tips suggests alternate procedures.



Notes offer extra information to explain options or processes further.



Cross References outline that more information may be available on a given topic in another chapter of the book. The Cross Reference will point you to that section.



Reminder to Save, is just that a timely reminder to save you work!

## Envisioneer Introduction

The **Hands On Activities** throughout the workbook are completed in Cadsoft Envisioneer. Cadsoft Envisioneer is a residential design software package that Architects, Interior Designers, Builders, Designers, Landscape Architects and many other professionals use to develop design ideas and prepare full working drawings.

Since most of the features in Envisioneer are automated, it is very easy to learn and use. You can complete most tasks with a few clicks of the mouse. And with the built-in power of Cadsoft's advanced design technology, you can count on fast, accurate, professional-level drawings.

The information below is a brief look at the interface of Cadsoft Envisioneer to help you get started.

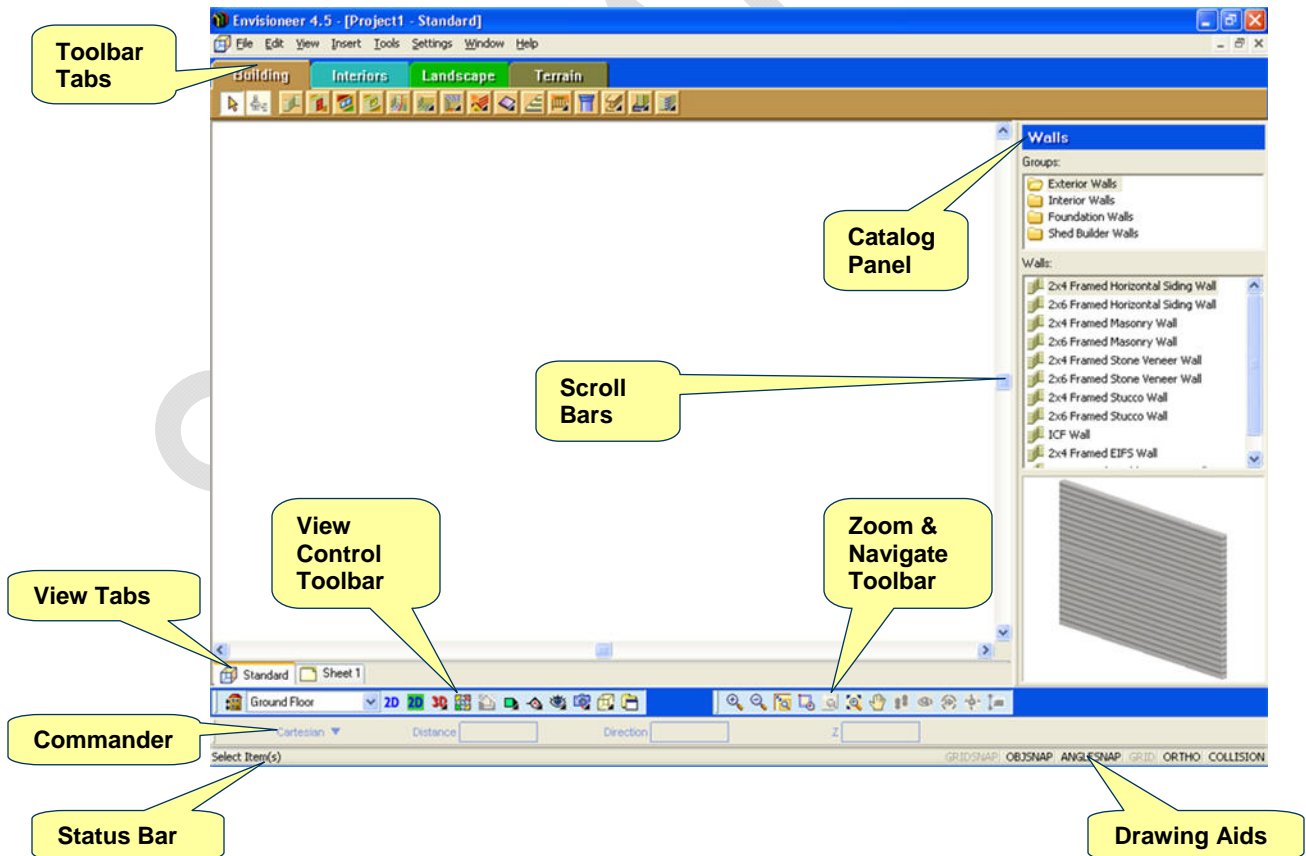
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## Starting Cadsoft Envisioneer

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1. On your *Windows* desktop, double-click the *Envisioneer 4.5* icon, or select **Start > All Programs > Cadsoft > Envisioneer 4.5**.

## Getting to Know the Interface



## **TITLE BAR**

The title bar runs across the top of the screen. It displays the name of your program, the name of the current project, and the name of the current view.

## **MENU BAR**

The menu bar is located directly below the title bar. This is where you select Envisioneer tools. You can select menu items using either the mouse or keyboard.

## **TOOLBAR TABS**

In Model View, four tabs are located just beneath the menu bar: *Building*, *Interiors*, *Landscape* and *Terrain*. In Worksheet View there are three tabs: *Draw*, *Modify* and *Tools*.

These are actually toolbars displayed in tabbed format. They provide you with instant access to Envisioneer tools, when you need them.

## **BUILDING TOOLBAR**

The Building toolbar contains the tools you need to build a home or any architectural structure. It includes tools such as Walls, Doors, Windows, and Roofs.

## **INTERIORS TOOLBAR**

The Interiors toolbar contains the tools you need to furnish, decorate and equip the interior of your home. It contains tools such as Cabinets, Appliances, Furniture, Lighting and Plumbing Fixtures.

## **LANDSCAPE TOOLBAR**

The Landscape toolbar contains all the tools you need to create a complete landscape plan for the exterior of your home. Tools include Plants, Fences/Gates, Decks, and Irrigation.

## **TERRAIN TOOLBAR**

The Terrain toolbar contains tools that you can use to design a realistic terrain for your model, which is especially important in 3D views. Tools include Hills/Valleys, Slopes, Paths, Retaining Walls, and Site Boundary.

## **VIEW CONTROL TOOLBAR**

The View Control toolbar contains several essential view-related tools. The toolbar's building location drop box displays the current building location, which is important when inserting elements in your drawing. The toolbar also lets you quickly switch between 2D view and 3D view, and view and create elevations and sections. A display mode button lets you choose the current display type for the view (wireframe, hidden line, etc.). The Advanced View Control toolbar also provides instant access to the View Manager, where you can create new view windows if you want.

## **ZOOM AND NAVIGATE TOOLBAR**

Zoom tools on the Zoom and Navigate toolbar include Zoom In, Zoom Out, Zoom Realtime, Zoom Window, Zoom Previous, and Pan. The navigation features on the toolbar (Walk Around, Fly Around, Look Around, Slide, Reset Camera) are only active when you are in a 3D view. These tools let you change the view in real time using your mouse.

## **COMMANDER**

The Commander lets you enter precise values for length and direction when inserting or editing elements. Directions are based on 0° to the right of the drawing screen, 90° at the top of the screen, 180° to the left and 270° is at the bottom of the screen. Initially the Commander will look grayed out because it is inactive. It will become active when you insert or edit elements.

## **VIEW TABS**

By default, each project has two view tabs displayed to start: Standard (a Model View) and Sheet 1 (a Worksheet View). These view tabs help you easily switch between view windows. If you create new view windows, the tab display updates automatically.

## **MODEL VIEW VS. WORKSHEET VIEW**

When you open a new project, the Standard view window is displayed. This is a Model View window. It's where you build, edit and view your 3D model. By default, your project also has a view window called Sheet 1. This is a Worksheet View window. When you switch to a Worksheet View window, you go directly into 2D drafting mode. The drafting mode interface contains a number of different drafting tools that help you create professional-looking working drawings.

### SCROLL BARS

There are scroll bars on the right side and bottom of the drawing area. They let you scroll back and forth and up and down in the drawing area.

### CATALOG PANEL

The catalog panel, located on the right side of the screen, displays the elements contained in the program's Master Catalog, or whatever catalog is currently open. This is where you select elements to insert into your drawing.

### STATUS BAR

The Status bar is located at the bottom of the screen. It displays helpful prompts while you are working on your design project. For example, if you are inserting a wall, it may display "Pick first insertion point".

### Drawing Aids

The lower right of the screen includes a selection of drawing aid buttons that aid the user when placing objects into a model. When the drawing aids are listed in black, they are turned on. When they are grey the drawing aid has been disabled. Each of the drawings aids listed can also be set by going to **Settings>Program Settings** and selecting Drawing Aids in the selection list.



The drawing aid is on when it is black.

**Collision** The program's intelligent Collision Control feature prevents objects from being inserted where they do not fit. If you try to slide an object into an area that is too small, the object will flip or prevent you from moving it into the area. By default, Collision Control is on, but you can turn it off if you want more flexibility with object placement.

**Ortho** The Ortho feature restricts your cursor movement to 90-degree angles when you are inserting elements. This can be especially helpful when drawing elements like walls.

**Grid** A drawing grid is simply a set of horizontal and vertical lines that can help you orient objects to one another. By default, the spacing between grid lines is 1', but you can change this if you want. You can also control the color and style of the grid. Note that the drawing grid is a visual aid only, and will not be included in printouts.

**Angle Snap** When the Angle Snap feature is turned on, your cursor snaps to specific angles when rotating an element. If you set your snap angle to 10°, for example, your cursor will snap at 10° intervals as you rotate the element. By default, the Angle Snap is on and is set to 15°.

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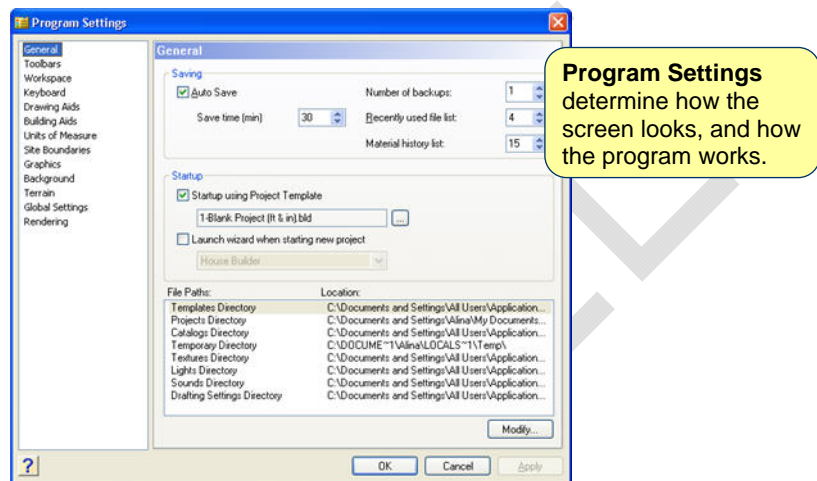
## Program Settings

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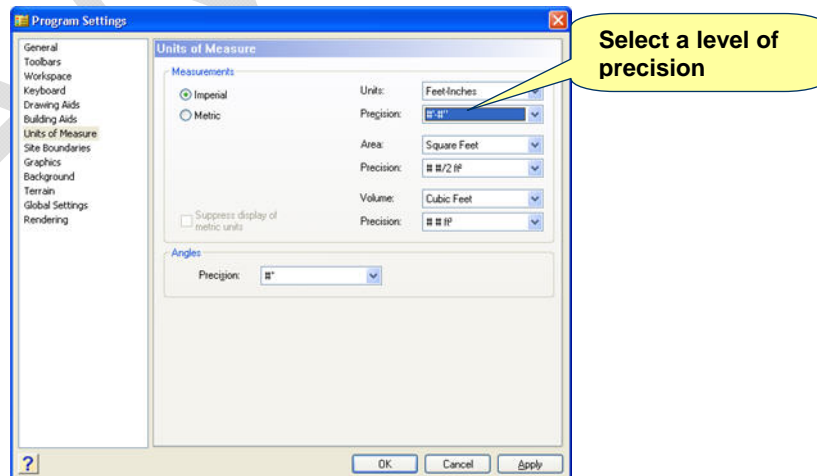
Envisioneer offers many options to customize the interface to suit individual preferences. There are two different types of settings available in Envisioneer: those that control how the program works and how the screen looks, and those that affect the actual model.

Most program-related settings are found in the Program Settings dialog. Let's look at these now.

1. Select **Settings > Program Settings**. Notice the list of setting types in the left pane.



2. In the left pane, select **Units of Measure**.
3. Click on the **Precision** drop box below the *Units* drop box, then select the full feet and inches option (#' -#"). This will make drawing walls quick and easy in the first exercise.



4. Click **OK**.

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## Building Locations

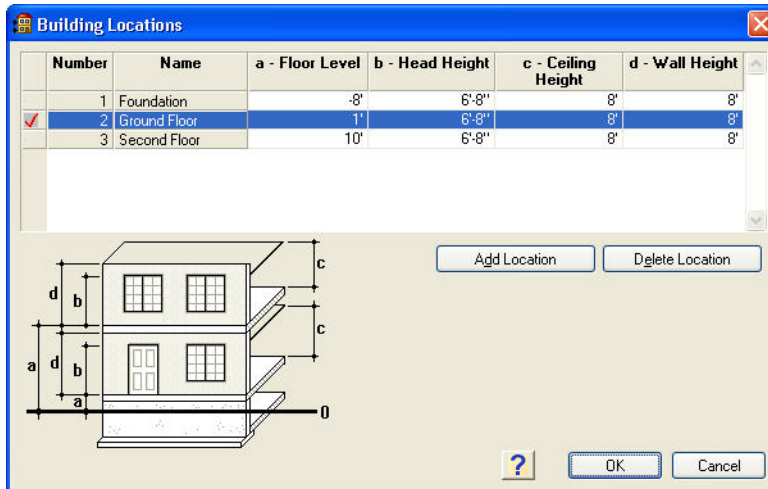
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The most important model-related settings are your Building Locations, which determine the heights and levels of your walls and other elements.

1. Select **Settings > Building Locations**.

When you insert an element in your drawing, it is inserted on the current building location. It is important to define your building locations before inserting elements, since building locations are the key to organizing elements and inserting them at the correct height. When you define building locations, you are basically doing two things:

- Setting the wall height for each floor (level) in your model
- Specifying where each floor is positioned relative to the ground (zero)



**Number.** A reference number for the location.

**Name.** The location's name (e.g. Ground Floor).

**Floor Level.** Height of floor above ground level (0).

**Head Height.** Height of tops of windows relative to the floor level.

**Ceiling Height.** Height of underside of ceiling surface relative to the floor level.

**Wall Height.** Physical height of the walls on the location.

# Residential Design

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## OBJECTIVES

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In this section you will cover the following topics:

- Comparing contemporary and traditional design
- Historic Design Review of Georgian Colonial, Gothic Revival, Frank Lloyd Wright's Prairie House and Art Deco residential designs in North America
- Drawing walls in Cadsoft Envisioneer

## History of Residential Design in North America

There have been many different styles of residential design throughout history. Styles are developed from materials, building techniques and regional needs. Each period style usually has one distinctive quality that one instantly recognizes of a house that has been either built during that time period or influenced by that style. From Neolithic architecture circa 10000 BC to the current “blobitecture” of the year 2000 design has progressed due to new building materials, techniques and personal needs in a residential space.

Generally speaking styles of design can be broken down into two major categories: Traditional or Contemporary.

A traditional style is influenced by history.

A contemporary style is focused on modern materials and methods and has little to no influence from history.

This chapter will focus on 4 styles, 2 traditional and 2 contemporary, that have had a great influence on North American architecture. The styles are distinctive because of the materials, roof styles, ornamentation and shape.

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### Georgian Colonial Design

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The Georgian style of Architecture was prevalent in Europe in the 1700's and was a very balanced style of architecture with ornate details that were a combination of Italian Renaissance, Greek and Roman influences. In North America, colonists were very impressed with the style and strove to imitate it but choose local materials such as clapboard siding and less ornate details. This new style was dubbed **Georgian Colonial**. This residential style is most recognizable because of the focus on symmetry with the front door being the center focal point with the most ornate detail. A Georgian colonial style home is all about proportions. Each window is exactly placed in the center of a room and the window size itself is in direct relation to the size of the room that it is installed. A chimney is typical on each end of the house. After the Revolution this style lost its popularity and revival styles became the fashionable choices.

Georgian Colonial is a traditional style of residential architecture.



*Georgian Colonial Sample*

**Materials:** Clapboard siding.

**Roof Style:** Gable Roof, low slope, little to no overhang.

**Ornamentation:** focal ornamentation around the door

**Shape:** is very important to this style as it is very proportional. Symmetrically placed windows that are installed in the center of a room and are proportional to the size of the room. A true Georgian Colonial will have exactly 5 windows across the front of the house on the second floor and 2 windows on each side of the front door on the main floor.

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## Gothic Revival

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From 1840-1880 many impressive homes were built throughout North America that were heavily influenced by the gothic style of architecture found in medieval cathedrals throughout Europe. This style had many different material usages depending on the availability ranging from masonry, stone and timber siding. The most distinctive characteristic of this design style is the steep roof pitches with a focal gable with a steep peak. Windows were tall and arched and flanked the ground floor porch that wrapped around the house. The millwork on the interior and exterior was elaborate or at the very least to a large scale and there was plenty of it around doors, windows and columns. The downfall to this design style is that it took many skilled tradesman to complete it properly thus adding to its expense and time to complete so it lost its popularity over time. Gothic Revival is an example of traditional residential architecture.



*Gothic Revival*

**Materials:** Clapboard siding, stone brick depending on where the house was built.

**Roof Style:** Steep gable roof with a wrap around porch on the main floor.

**Ornamentation:** Generous amounts of ornate wood work detailing on columns, around windows and doors and throughout the interior.

**Shape:** Gothic Revival is tall in shape in the windows and roof pitches. The shape of the overall building various and is not symmetrical.

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### Frank Llyod Wright's Prairie House

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Frank Lloyd Wright has had a dramatic role in the development of modern architecture. His work from 1900-1917 is a dramatic opposite to the Gothic Revival styles that had been so previously popular. The "Prairie Houses" of this time were dressed in low sloped roofs that had large overhangs. The materials were unfinished and natural that gave his designs an organic influence. The designs were said to complement the landscape and not compete with it. The "Prairie House" is the first example of open floor plans that continue to be popular in residential design. The interior of a Prairie house is the main architectural feature, the flow of one room to the next and beyond to the exterior. Frank Lloyd Wright designs are examples of contemporary residential architecture.



*Prairie House Example - Taliesin's drafting studio by Frank Lloyd Wright. Picture by K. Murphy.*

**Materials:** raw natural materials that compliment the surrounding landscape.

**Roof Style:** low slope roofs with large overhangs.

**Ornamentation:** only ornamentation that would compliment the landscape done in natural materials. Stone feature walls or wood columns.

**Shape:** Sprawling bungalows with open concept plans.

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## Art Deco

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In the 1920's design was all about modern methods and materials. After the 1925 *Exposition Internationale des Arts Decoratifs et Industriels Modernes* in France people were drawn to man made materials and the new style derived its name from this event: Art Deco. Smooth man made finishes, flat roofs and geometric cut outs are characteristic of this simplistically elegant design era. It offered a fresh new modern take on architecture after the oppressiveness of the World War. Art deco is an example of contemporary design.



*Art Deco*

**Materials:** Smooth man made materials: metal, glass, stucco were prominent.

**Roof Style:** Flat roof

**Ornamentation:** Geometric shapes and the sunburst pattern were prevalent in design.

**Shape:** Geometric shapes are very important to this design in both the walls, windows, doors and any ornamentation.

As design has progressed throughout history many new styles of architecture have developed because of the cross usage of materials and building techniques brought upon by international travel. Many styles have enjoyed "revivals" and cross used with other popular styles. It therefore becomes difficult to determine an exact style as many different "labeled" styles have been intermixed. A more generic label of "contemporary" or "traditional" can be applied to residential design styles.

## Hands On Activity I - Residential Design History

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### **For You to Try – This exercise requires the use of Cadsoft Envisioneer**

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Cadsoft Envisioneer includes many sample homes in their library that we will use in this exercise to understand the difference between contemporary and traditional design.

Label the following residential buildings as either Contemporary or Traditional. Can you go further and identify individual design influences in details and their period in history? Explain why you have made the design choice.

1. **File >Open Samples.**
2. In the **Open** dialog box select Sample 1.bld and click **Open**.
3. A plan view of a house will appear. Let's take a look at it in a 3D view. Select **View>3D Camera Views>Front View**.

4. The front of the home will appear in a 3D model.

Looking at the 3D view, write down the design styles that have influenced the model.

5. **File>Close.**

6. Repeat this for all of the Sample models included in the samples directory.

## Hands On Activity II - Residential Design History

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### For You to Try – This exercise requires the use of Cadsoft Envisioneer

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Next we will begin laying out the shell of a building that has characteristics of a Georgian Colonial style home. We will build upon this home throughout the workbook as a constructive exercise in each unit and add influences from other design eras as well.



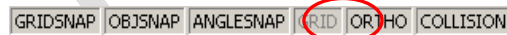
Refer to the Envisioneer Introduction in the Overview unit for help on how to get started with Cadsoft Envisioneer.

You can draw walls by simply pointing and clicking with your mouse. By default, every exterior wall in the catalog is defined as a composite. A composite wall is a structural wall and veneer wall put together, with an air space in between.

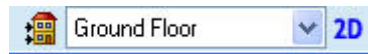
Perimeter walls are drawn *on center* in Envisioneer. Using the Insert by Boundary option, you can insert perimeter walls to the outer veneer, or interior wall dimensions.

1. **File >New.**

2. Make sure your **ORTHO** is on. If it is on, it appears enabled on the status bar below the drawing area. If it is not enabled, just click on it to enable it.



3. Look at the View Control toolbar and ensure the current location is the **Ground Floor**.

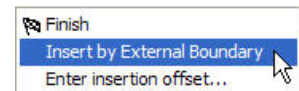


4. Select **Insert > Walls**, or click the Walls button on the Building toolbar.



5. In the catalog panel, select the **2x6 Framed Horizontal Siding Wall** element in the **Exterior Walls** category.

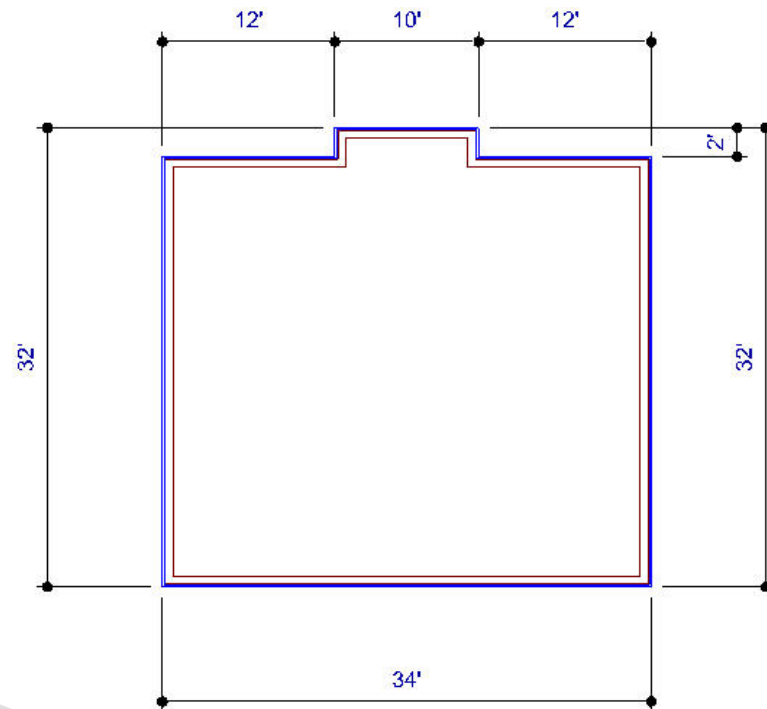
6. Position your cursor in the drawing area, then right-click and select **Insert by External Boundary**.



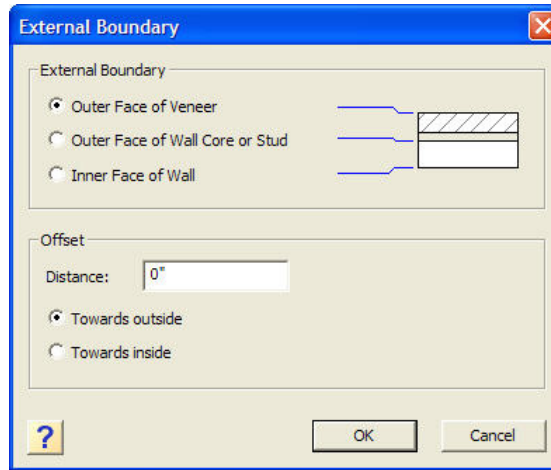
**NOTE:** This option lets you draw a wall outline, and then offset the walls from that baseline. This provides precise control of your wall measurements. By default walls are drawn by their centerline, the External Boundary command gives you control over if the dimensions entered are to the centerline, exterior or interior finishes.

7. Select a point in the lower left corner of the drawing area.

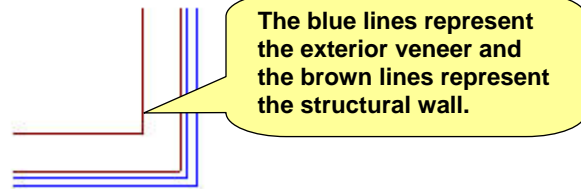
8. Move your cursor to the right and type 34' and press Enter.
9. Continuing from the endpoint of the first wall, move your mouse upward (in the 90° direction). Notice the *Direction* in the Commander reads 90°. Notice also that the *Distance* changes as you move your cursor.
10. Type **30'** and press Enter.
11. Referring to the diagram below, continue inserting walls in sequence by typing their lengths.



12. When all the walls are finished, right-click and select **Finish**.



13. In the **External Boundary** dialog, make sure the **Outer Face of Veneer** option is selected, and then click **OK**.



14. **File>Save**.

**Note:** If drawing composite walls, the veneer appears only if the walls connect to form a closed layout. Otherwise, only the structural wall is displayed. If you have chosen a composite wall and only the structural wall is showing, check your corners to ensure that you have formed them properly.

## History of Residential Design Review

1. Residential design has been influenced by:
  - a. Building materials available to regions.
  - b. Design requirements based on social behaviours.
  - c. Building methods.
  - d. Personal taste.
2. To determine the era that a house was designed look at the following key factors:
  - a. Materials
  - b. Roof Style

c. Ornamentation

d. Shape

## Envisioneer Review

1.

## Design requirements

## Additional Activities

For more practice at recognizing different architectural styles, try the extra activities below.

1. Using Cadsoft Envisioneer, layout the external walls for an Art Deco home.
2. Take a walk through several different subdivisions. Depending on the year the subdivision was completed the architectural styles may reflect various styles. Take pictures of different houses and try to determine their age and style of architecture.
3. Divide into groups and each group study a separate residential design style. Those covered in the workbook and other styles of interest. Find examples of the styles and further descriptions that depict the style.

# Room Requirements

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## OBJECTIVES

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In this section you will cover the following topics:

- The functions of different rooms in a home
- The space requirements of rooms
- The co-functions of different rooms and their best positions
- Drawing interior walls in Cadsoft Envisioneer

SAMPLE

## Room Functions

Each room in a house has a specific function and each function in a home has specific space requirements. As you are planning a home you must take a look at the specific needs of the owners and the associated space requirements. Then combine the rooms to create the home.

Let's take a closer look at the individual rooms and their requirements.

## The Kitchen



The Kitchen has an obvious function of a space to store and prepare food but now it has also developed a social function as well. Kitchens have become the center point of a home, where the family meets, eats and entertains. All of these factors must be taken into consideration when laying out a kitchen space.

1. How many people are in the home? Space requirements when designing eating areas in the kitchen.
2. Who prepares the meals? If there are multiple "chefs" in the house than space consideration in the kitchen area must accommodate multiple people.

The key factor when designing a kitchen is adequate workspace that is accessible. A kitchen should leave a 36" -42" working aisle in front of the counters so that one person can work at the counter and others can walk freely in the kitchen without causing interruption.



See Interior Design chapter for more information on laying out a kitchen.

## The Living Room



The Living Room, formally known as the Parlor, is a room where guests are entertained. The living room needs to accommodate furniture for people to sit, relax and converse comfortably, so depending on the size of the home and the number of guests that the occupants entertain this room can change in dimensions. In the living room you must also consider the architectural elements in the room: windows, doorways, fireplaces. These elements and their placement in a room can have a large impact on the design of the room. Traffic must flow through the room but it should not interrupt the designated entertaining areas. A fireplace is a great focal point in a room, but again, it shouldn't take over the room so that the purpose of the room; to entertain, sit and relax, is interrupted.

Designing a living room is a two part process;

1. Make a list of the functions of the room that are important to the occupants.
  - i. Is it a room strictly for entertaining guests? If so it needs to be an impressive space with adequate seating for the size of crowd normally entertained.
  - ii. How many people are in the family? This will effect seating requirements in the room
  - iii. Will this room hold a television? This will affect the size of the room and the layout of the space.
2. Make a list of the architectural elements of the room.
  - i. Doorways for access to the room
  - ii. Windows to add light and views to the room
  - iii. Fireplaces and entertainment units add a focal point to a room but also can break up a room and require thoughtful consideration for placement.

Remember, one of the most important functions of the living room is a place to sit and talk. Leave enough space in the room so furniture can be adequately arranged in the room for this purpose without the interruptions from architectural elements.

## The Sleeping Areas



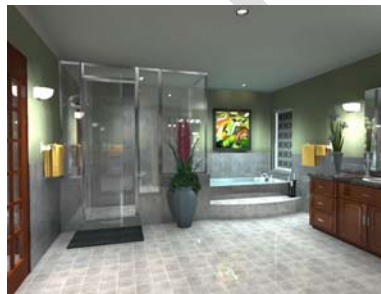
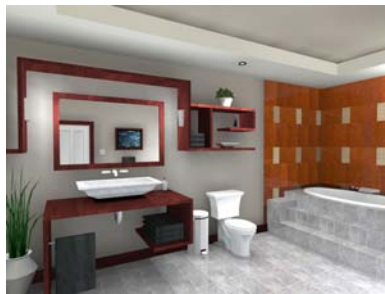
The Bedroom has two essential tasks; a place to sleep and storage of clothing and personal belongings.

What is important to remember about a bedroom is what is stipulated by the local building codes. Since this is a sleeping area, careful consideration should be made in relation to the size of the windows and the size of the room. All bedrooms must have a proper means of egress in case of fire and have a stipulated minimum room area as laid out by local building codes. Check local building codes for size requirements in your area.

Consideration should also be made in the size of the furniture that will be placed in a room. Below is a chart of average bed sizes in North America (countries around the world have different sizing standards). Consult the chart to ensure that the bedroom space designed is large enough to hold the bed and storage furniture.

Crib	Twin	Double	Queen	King
28" x 52	39" x 75	54" x 75"	60" x 80"	76" x 80"

## The Bathroom



Even though it is the smallest room in the home, the bathroom involves the largest number of professionals to install. A plumber, tiler, electrician, flooring installer, painter and cabinet installer are just a few of the skilled tradesman required, which is why the bathroom is one of the most expensive rooms, based on cost per square foot, that you will spend in a home. Thousands of dollars in fixtures are found in as small as 50sq. feet.

The necessities of a bathroom include sink, toilet, tub and shower. New homes, however, are being built with special attention given to luxurious bathrooms with multiple sinks, toilet and bidet, separate tub and shower stalls.

Ensure that you give consideration to materials when designing the bath. Bathrooms are prone to high condensation and water. Design the space with materials that are resistant to moisture and mold. Ventilation systems should also be installed to alleviate the problems moisture can cause.

## Storage

An integral part of any home is storage space.

INSERT TEXT

## Creating a Floor plan

Certain rooms function best in close proximity to others. Plan a zone for activities done in each room: cooking, dining, entertaining, media viewing, conversation, play, and, importantly, unobstructed passageways through the house that won't disturb ongoing activities. Now look at how these rooms function together.

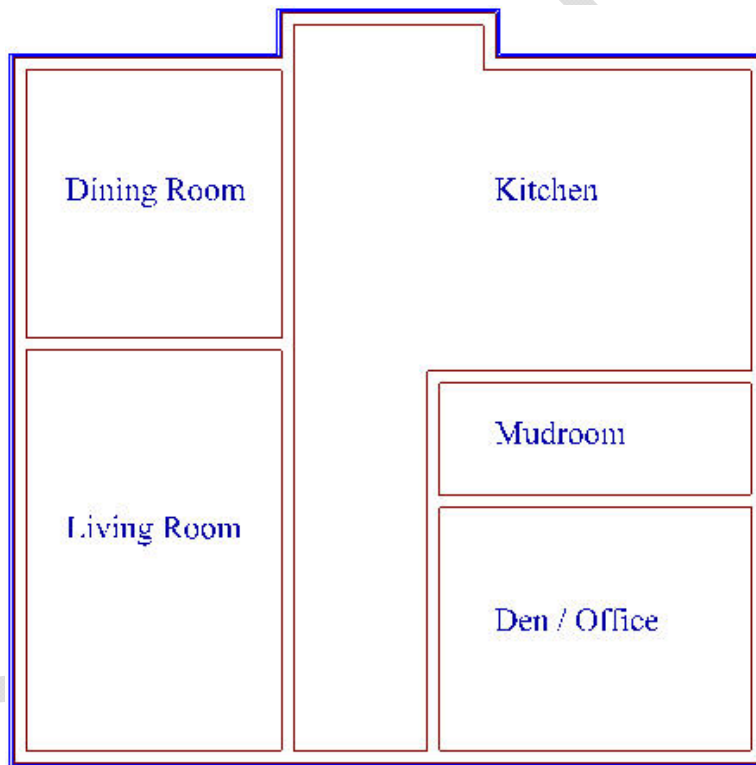
The kitchen and dining room, as an example, should be close together so food can be served in an efficient manner. You want an area in your home for entertaining but you also want to offer personal space. Try to arrange the rooms used for entertaining; living rooms and dining rooms away from spaces that will be used for the families own personal space; bedrooms, family room.

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## Depicting Walls in a Floor Plan

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To create a floor plan you must depict the layout of the walls looking down upon the house from above. The walls are drawn to scale showing the actual width of the wall.



## Hands On Activity - Creating Rooms in a Floor Plan

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### For You to Try – this exercise requires the use of Cadsoft Envisioneer


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We will now insert several interior walls in our model to create interior spaces using the following insertion methods:

- Point-and-click method
- *Insertion Offset* option

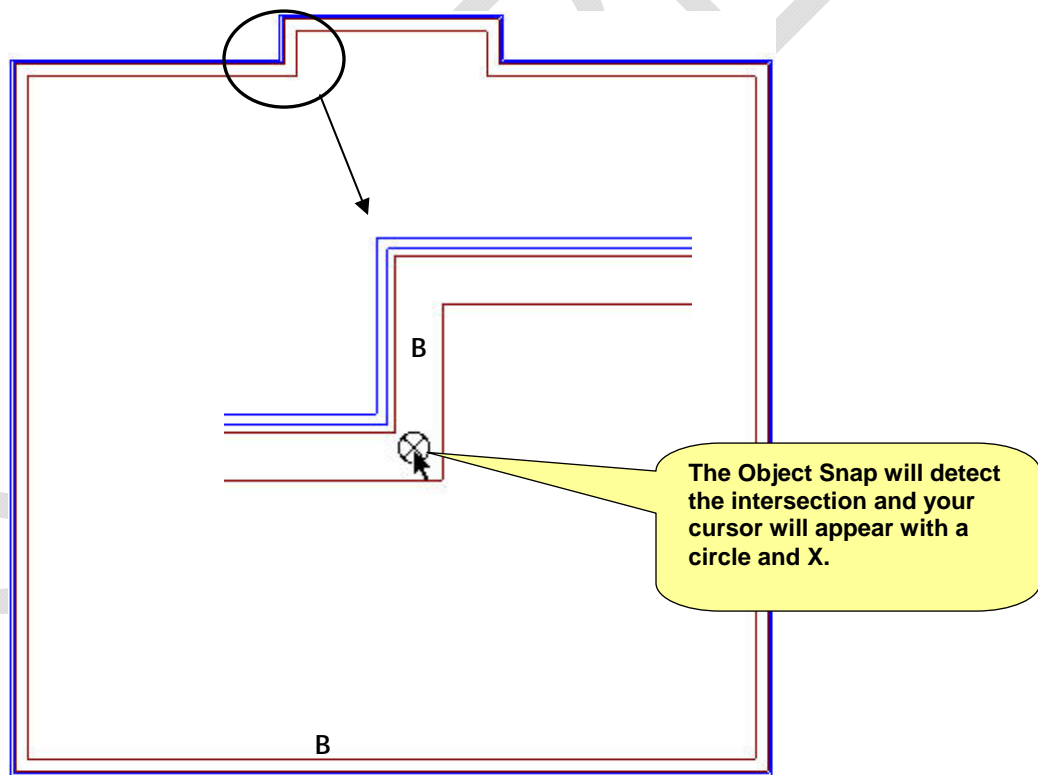
- Copying existing walls

### Drawing Walls Using Your Mouse

1. Select **Insert > Walls**, or click the Walls button on the Building toolbar. 
2. In the catalog panel, select the **2x6 Wood Framed Wall** element in the **Interior Walls** category.
3. Move your cursor onto the drawing screen area. Place your cursor near the intersection enlarged on the diagram below. As you move your cursor towards the intersection the Object Snap drawing aid will detect the walls and snap to them. Left click to start drawing the wall.



**NOTE:** The snap will ensure that you create a clean intersection.



**TIP:** To draw straight walls ensure the **ORTHO** drawing aid is on. If you want to draw walls on an angle, **ORTHO** should be turned off. For this lesson ensure **ORTHO** is turned on.

GRIDSAP | OBJSNAP | ANGLESNAP | **ORTHO** | COLLISION

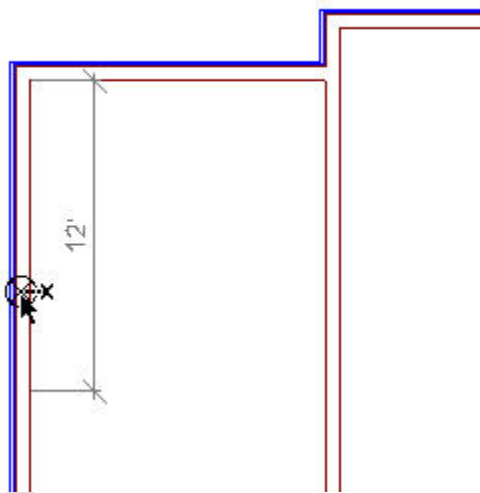
4. Move your cursor downwards. Its length is shown as you draw the wall. Move your cursor down to the perpendicular wall below (marked **B** in the diagram above) and left click in the exterior wall when the object snap cursor appears again.

The first interior wall is drawn.

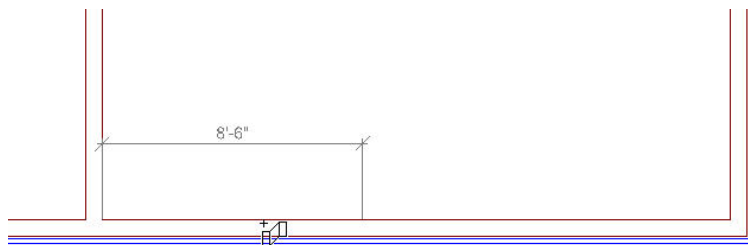
### Drawing Walls Using the Insertion Offset Option

Now we're going to draw some walls using the *Insertion Offset* option, which lets you start a wall a specified distance away from the endpoint of an existing wall.

1. With the **Walls** tool still active, right-click and select **Enter insertion offset**.
2. In the **Enter insertion offset** dialog, type **12'**, then click **OK**.



3. Position your cursor inside the left exterior wall as indicated in the diagram above. When the 12' dimension line appears from the top, left click.
4. Your cursor will jump to the 12' position. Move your cursor to the left and left click inside the perpendicular interior wall.
5. Right-click and select **Enter insertion offset**.
6. In the **Enter insertion offset** dialog, type **8'6"**, then click **OK**.



7. Position your cursor inside front exterior wall as indicated in the diagram above. When the 8'6" dimension line appears, left click.
8. Your cursor will jump to the 8'6" position. Move your cursor upwards and type **17'** and press ENTER. (The distance appears in the Commander's *Distance* edit box as you are typing.)
9. Move your cursor to the right and left click when the object snap appears in the perpendicular exterior wall.
10. Right click and select **Finish**.

### Creating Walls by Copying Existing Walls

Walls can be copied to create new walls. You can click and drag the copy to a new position, or use the Commander to specify a precise move distance and direction.

1. Click on the new wall you just created.
2. Right-click and select **Duplicate**. The *Drag to new position* prompt appears on the status bar.
3. Click a point on the wall. A copy of the wall is now attached to your cursor. Holding the left mouse button down, pull it downward. Watching the distance value in the Commander when it is approximately 5' release the mouse button.
4. A copy of the wall is created.
5. Dimensions will appear to place the new wall from the original and the wall below. Left click on the upper dimension.
6. In the **Edit Dimension** dialog box, type **5'** and click OK.
7. The wall will move to be exactly 5' away from the wall above.
8. **File>Save**.



### Spatial Planning Review

- Each room in a home has a specific function and those functions require a specific amount of space.
- Certain rooms function best in close proximity to others. A home is "functional" if the rooms have been laid out in an efficient manner.
- When designing a floor plan remember to designate areas for entertaining (dining rooms, living rooms) and distance those areas away from the areas for personal space (bedrooms, family rooms).

### Additional Activities

Understanding the space requirements for a house is a very critical design step. Take the time to do these additional activities

1. Measure the rooms in your own home. Layout out the rooms in Cadsoft Envisioneer. Move the walls around to form new spaces and see if you can make the home more functional.
2. Review several floor plans from a home plan book. Rate the designs on their functionality. Did they group the entertaining and personal spaces adequately? Is the dining room close to the kitchen? Is there too much wasted space used in hallways?
3. Visit a kitchen design studio. Speak with the designer to obtain more tips on kitchen space planning.

SAMPLE

# Materials and Methods

As time has progressed, so have the materials and methods that are used in residential construction. Today homes are not merely constructed to provide basic shelter but also engineered to make a home environmentally friendly by limiting the resources required for the home. This chapter will offer an introduction to the various materials used to build a home and the methods of construction.

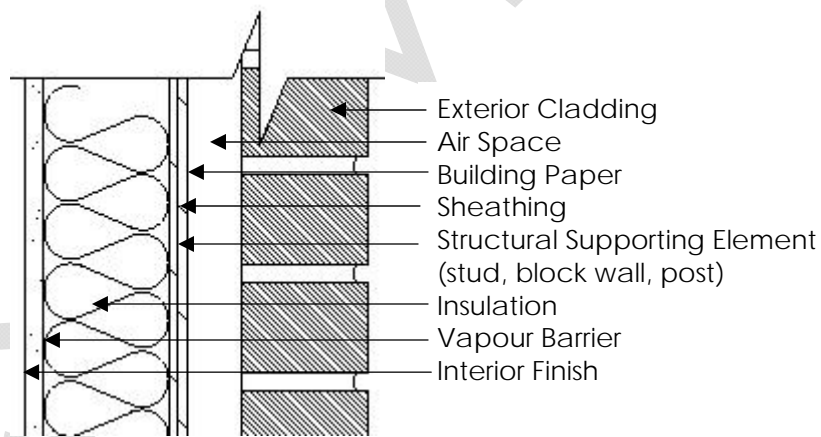
## Wall Construction

Simply stated, walls are used to enclose and define living spaces. A wall can be used for structural purposes to support the floor and roof structure above or it can simply be a partition to divide a space. If a wall is a structurally supportive wall it will be specially designed to ensure that it can carry the load of the floors and roof above as well, in some zones, wind and earth quake forces.

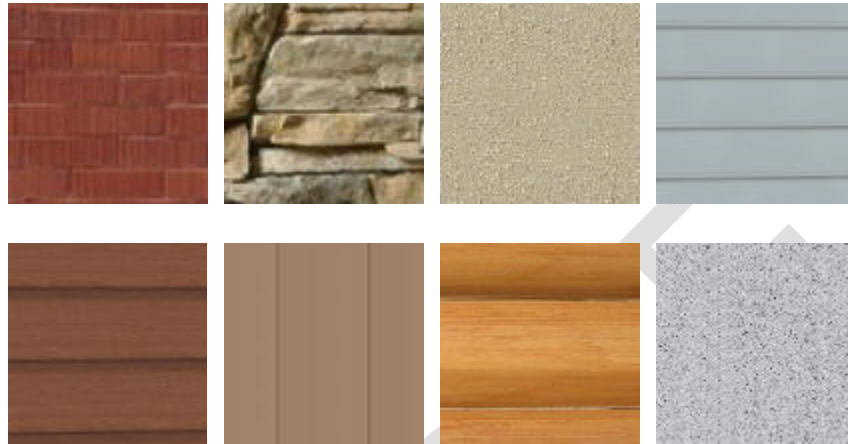
## Exterior Walls

Exterior walls protect the interior conditioned space of a home from the surrounding environment. The materials used in the wall system should be durable to offer protection from the sun, rain, snow and wind and also stop the transfer of cold and hot air and moisture through the wall, going in either direction. To do this walls must be well insulated and offer a protective exterior cladding that is water resistant and an internal membrane that stops the flow of air through the wall.

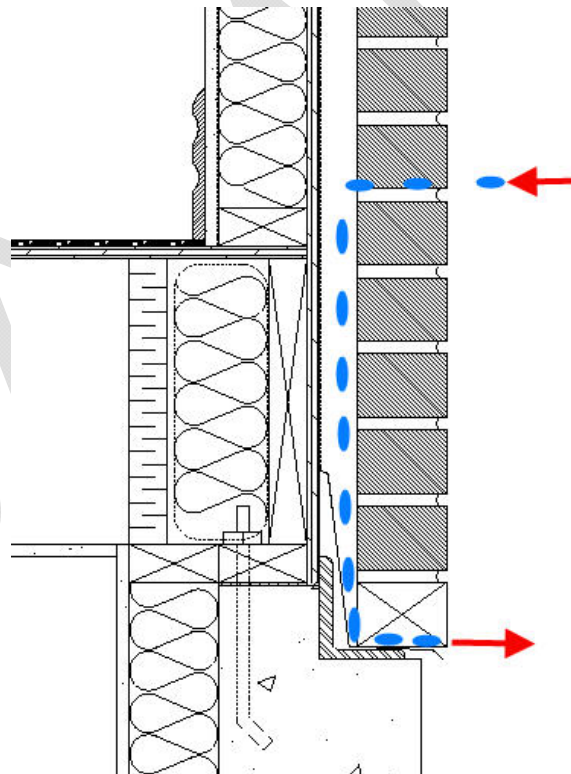
When building a wall you must think of all materials within the wall as a “system” that work together. Let’s look at the individual materials in brick and stud wall construction.



**Exterior cladding** is the first line of defense a wall system has against the elements. Ideally it is water resistant and aesthetically pleasing. Examples of exterior cladding include: brick, stone, stucco, vinyl siding, wood lap siding, board and batten, logs and concrete. There are many more options that have developed over time as materials and building methods evolve.



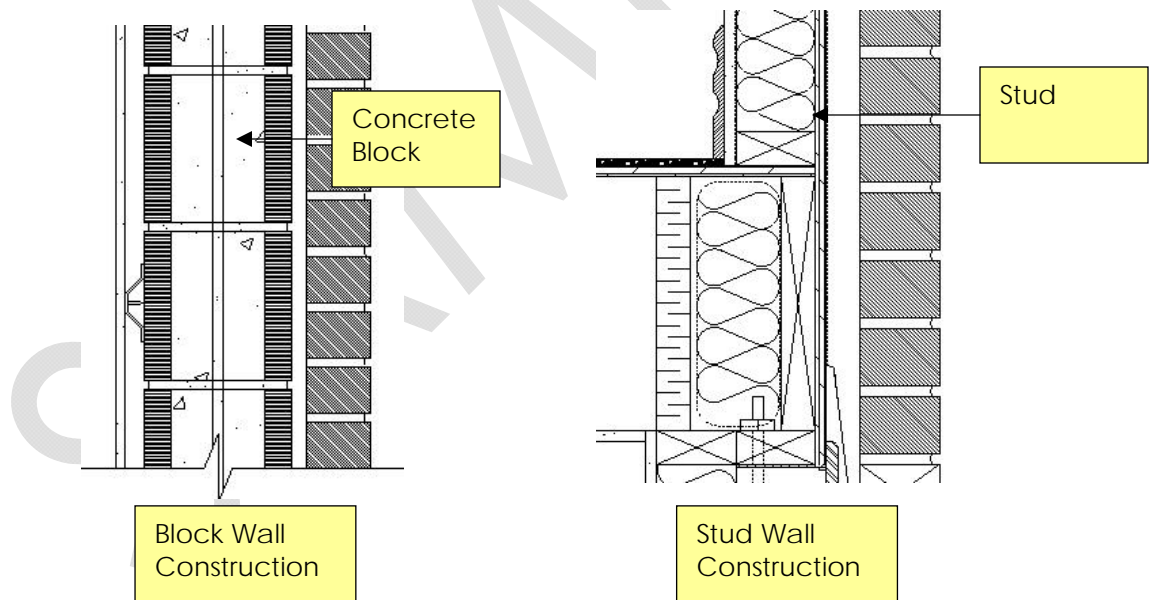
An **Air Space** is used for the inevitable penetration of water. The air space allows water that penetrates through the masonry cladding in a wall system to flow down the air space and exit through weep holes and flashing that has been installed.



**Building Paper** is a type of water resistant paper that works as a backup barrier in a wall if water does penetrate past the exterior cladding. Wind-driven rain and moisture can saturate walls, creating a breeding ground for mold, mildew and wood rot. The building paper works as a defense line to prevent damage from moisture. It also stops airflow through a wall in both directions because the paper is dense. Airflow through a wall can create warm or cold spots in a home decreasing the comfort level. There are many different types of building paper manufacturers do an internet search to research the different types available.

**Sheathing** adds shear strength to a wall system by binding the studs in a wall together so they work together as a unit. It also provides a nailing surface for exterior wall cladding materials such as siding.

**Structural Support Element** such as studs or masonry blocks provides the main structural support in a wall system. Spaced in regular intervals the studs in a wall system provide vertical stability and in a supporting wall support the floors above. In North America the most popular residential construction methods are stud wall construction or block wall construction but there are several different types of structural wall systems. Some are pre-manufactured in controlled environments, where others are constructed on site. Do some research on Insulated Concrete Form (ICF's) wall, Adobe Wall construction, Straw Bale Construction as alternative supporting wall construction.



**Insulation** is used to stop the transfer of cold or hot air in either direction in a wall system. Different types include batt, foam, loose fill, rigid or blanket and each type is used depending on the type of wall construction. Insulation is rated for the amount of resistance (R value) of the flow of warm or cold air through the insulation material. The higher the R value the greater resistance of cold or warm air transfer through the material.



**NOTE:** Green Building is focused on increasing the level of efficiency in a home so it uses fewer resources. By decreasing the level of heat transfer through a wall system,

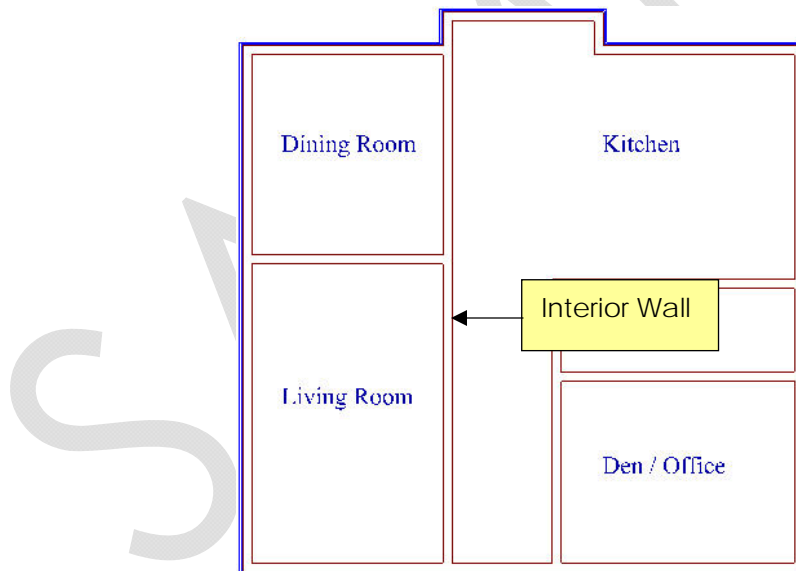
less energy is required to heat/cool a home. There are many ongoing, innovative research projects that are focused on Green Building like new insulation techniques to decrease heat transfer.

The **Vapour Barrier** has a key role in the wall system by stopping the flow of moisture from inside a home to the wall system. Nothing is more damaging to a wall system than the presence of water which can destroy the wall system materials. Vapour barrier is placed on the warm side of a wall and stops moisture from escaping from the home into the wall system. The vapour barrier is a continuous application of impermeable material fastened directly behind the interior finish material. The most common vapour barrier material used is polyethylene sheets.

**Interior Finishing** materials are used for aesthetics and to protect the wall system from damage caused by every day living in the inside of a home. Drywall, gypsum board, cement board, lath and plaster and wood paneling are a few common materials used. They provide a smooth finish for painting or wall paper hanging so home owners can personalize the space with various colour finishes.

### Interior Walls

Interior walls divide the interior of home into rooms and can also have structural properties to support the floor and roof loads above. Walls provide privacy in rooms both visually and acoustically and walls are also used to chase mechanical ductwork and electrical wires throughout a home.



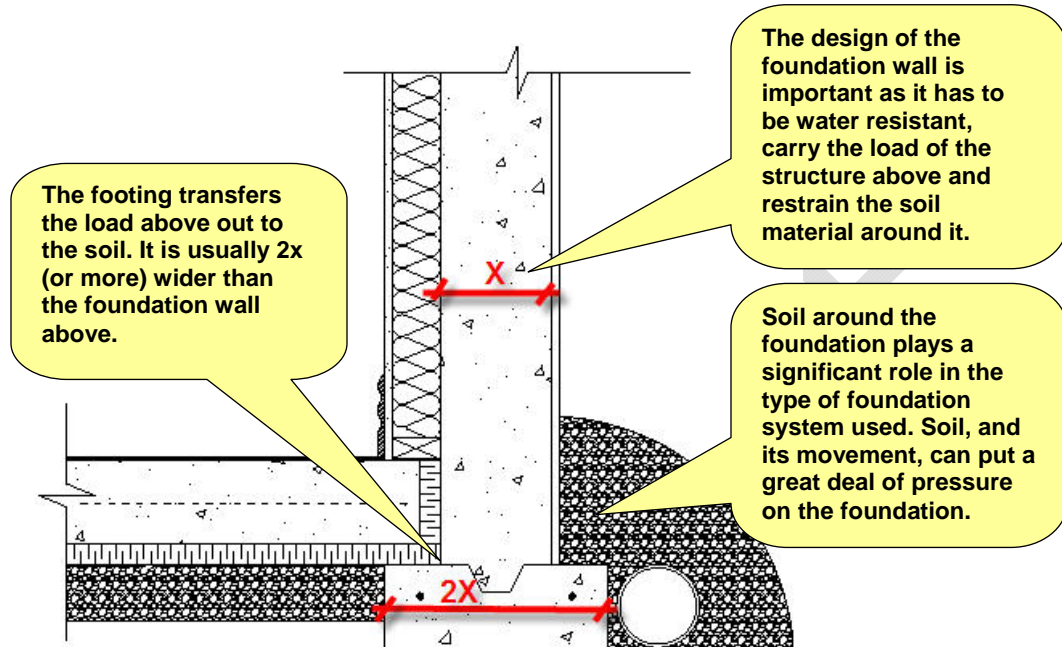
### Foundations

Foundations are the most integral part of the entire house construction. They carry loads from the house above, interact with the surrounding soil conditions and create a solid structure to build upon. Foundations can be constructed from a variety of materials, the most common being concrete and masonry block. Whatever material is used, it is vital that the foundation system be water resistant and of a strong durable material that can withstand the pressure of the subsequent loads from the house and the surrounding environment. Surrounding soil puts pressure on the walls and in settling

can cause severe damage to a foundation system. Houses can be supported on a Foundation wall system, a monolithic slab or on piers.

### Footings

Footings transfers the weight of a foundation wall and loads above to the soil below. It is, generally, 2 times wider than the foundation wall to spread out the load.



### Foundation Wall Systems

When using a foundation wall system there are four types of basements that can be created as a result: crawl space, standard, walkout and daylight.

In a Crawl Space situation the footings are placed just below the frost line, leaving the space below the ground floor too low to be usable.

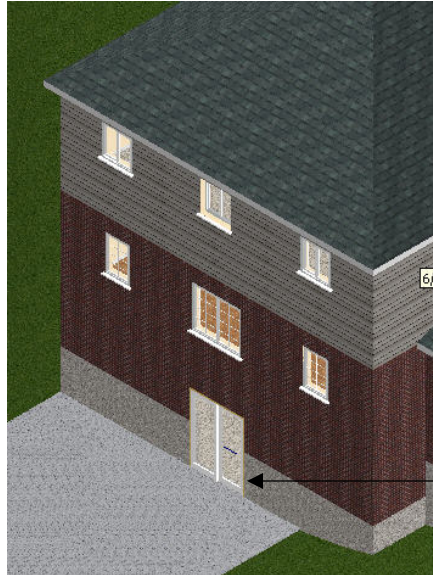
Standard basements have useable living space but are not accessible by the outside and most of the height of the basement walls are below grade.

Daylight basements have useable living space with one or more walls exposed, and are typically built on hillsides.



Daylight Basement with the foundation wall exposed.

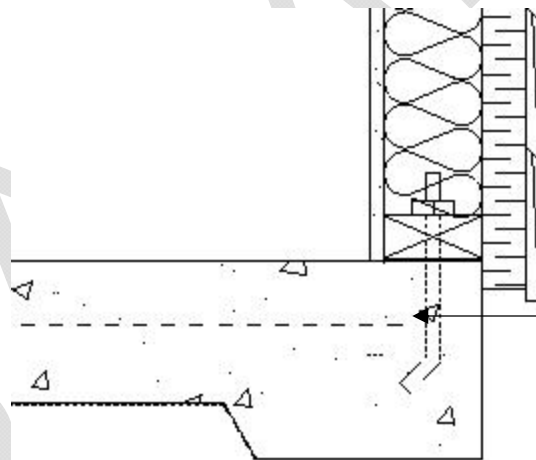
Walkout basements have useable living space and have access via an exterior door and staircase to the outside.



Walkout Basements have a door for access to the finished basement.

#### Monolithic Slabs

In warmer climates a full foundation system is not required as there is no frost line or it is insignificant. A concrete slab can be poured right on grade with a supporting footing beneath it. When the footings and slab are poured together it is called a monolithic slab.



Monolithic Slab

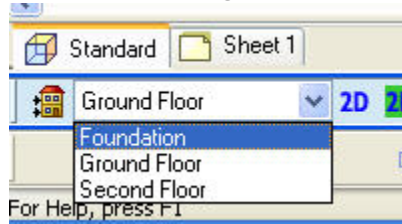
## Hands On Activity-Creating a Second Floor & Foundation

### For You to Try - This exercise requires the use of Cadsoft Envisioneer

Once you have created your ground floor exterior walls, you can easily add more levels to your design using the **Duplicate to Locations** tool to copy the ground floor walls to alternate locations.

1. **File>Open.**

2. Select the file created in chapter one.
3. Select **Edit>Select All**.
4. All of the walls will be selected. Right-click and select **Duplicate to Locations**, or select **Edit > Modify Elements > Duplicate to Locations**.
5. In the **Duplicate to Locations** dialog, select the Second Floor.
6. Click **OK**. The walls are copied, and you now have a new story.
7. Repeat the process and copy the walls to the Foundation location.
8. In the lower right of the screen, change the location to the Foundation location.



9. Click one of the interior walls, then Shift+click to select the remaining interior walls.
10. Right click and choose **Delete**.



**NOTE:** You will notice that you can still lightly see the ground floor walls above. When a particular location is current, elements on all other visible locations are dimmed. This makes it easier to insert and edit elements on the current location while being aware of the other locations above and below and their structural placement.

11. Select **Edit>Select All**.
12. All of the exterior walls on the Foundation location are selected, right click and select **Replace**.
13. In the **Catalog Access** dialog box, select the **Foundation Walls** group and in the **Walls** list below, select the **10" Concrete Wall** and click **OK**.
14. The walls on the Foundation location have now been replaced with concrete foundation walls.



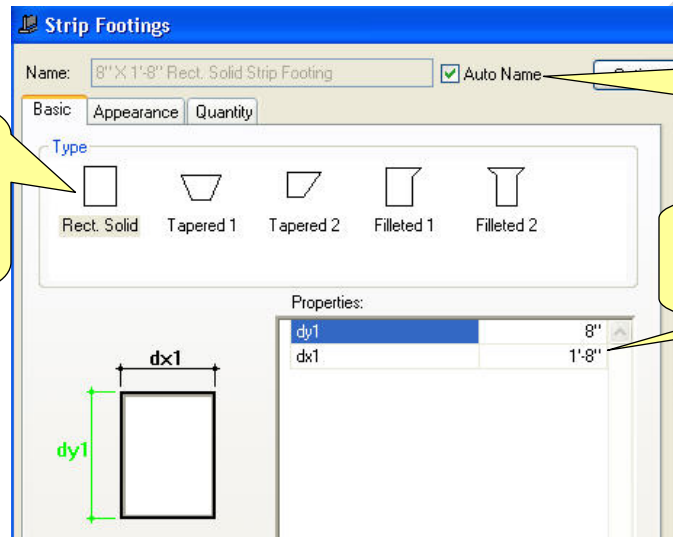
**TIP:** As an alternative to duplicating an entire location, once you have created your ground floor exterior walls, you can also draw the layout for the second floor or foundation just like you did to create the ground floor, using the dimmed locations as a guide.

15. Select **Insert>Footings>Strip Footings Attached to Walls**.
16. The catalog panel will update with Strip footing elements. Select the Rectangle Strip Footing group and in the Strip Footing list below, right click and select Add Element.

17. The Strip Footings dialog box appears. In this dialog box you can describe a new footing to add to the catalog. This will be a permanent addition to the catalog so future projects will have access to it as well.
18. In the Properties list, click in the edit box beside dy1 and type 8".
19. Edit the dx1 value to read 20".



**NOTE:** With the Auto Name feature checked at the top of the dialog box, the Name of the footing will update as you change the properties.



There are many different shapes of footings. Left click on the type that suits the construction project.

The Auto Name feature will create a name for the element based on the property values inserted.

Insert new values for the thickness and width of the footing.

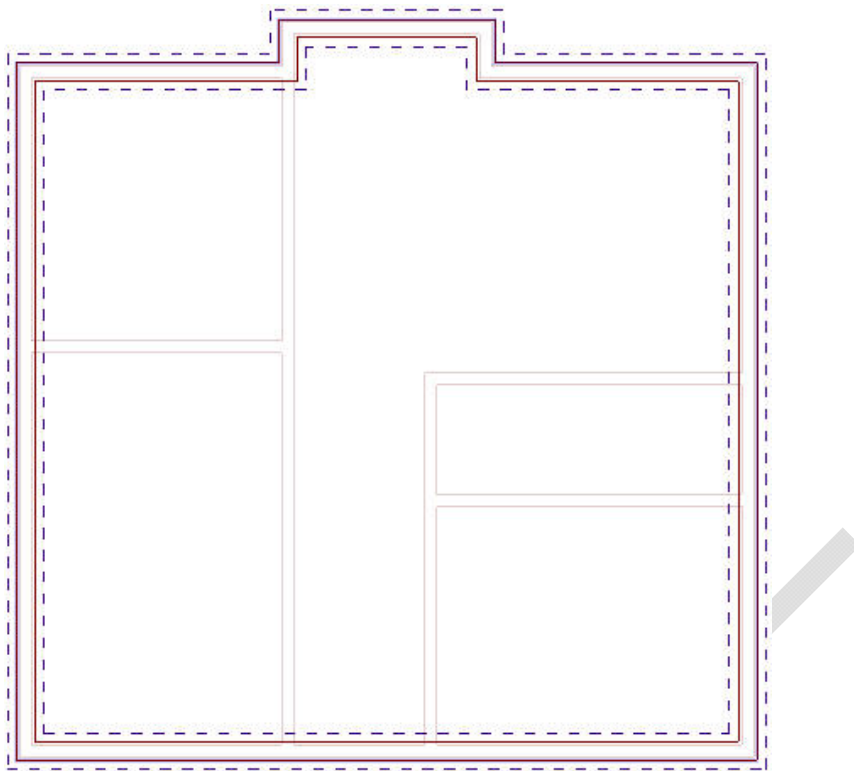
20. Click **OK** and the new strip footing will be added to the catalog.
  21. With the new footing selected move the cursor onto the drawing screen area and left click inside one of the foundation walls.
- A dashed footing will appear around the wall.
22. Repeat for all of the walls. Right click and choose **Finish**.



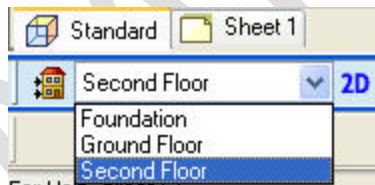
23. **File>Save**.



**NOTE:** An additional support system (beams and columns) will be created later in the book to support the floor above.

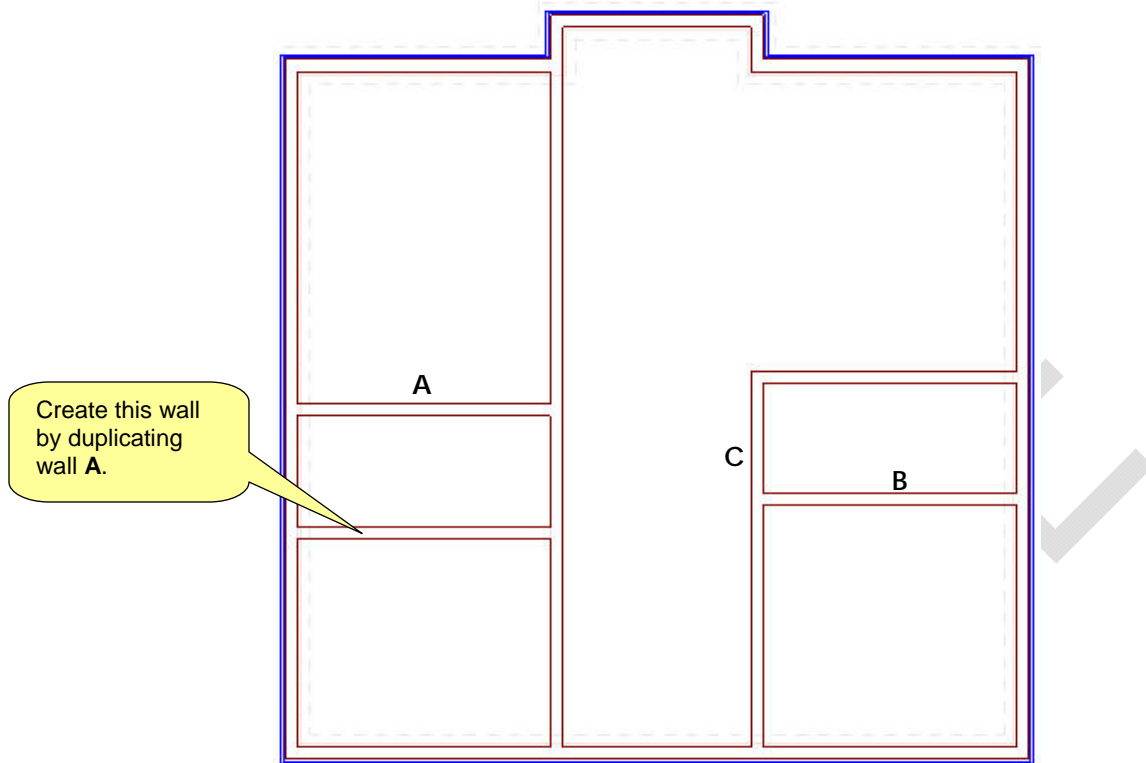


1. Switch the location to the Second Floor.



2. Referring to the diagram below, left click on wall **A**. Dimensions will appear in relation to the walls parallel to it.
3. Left click on the dimension above the room.
4. Type **14'** and click OK.

## Creating Walls by Duplicating



1. With that wall still highlighted, right click and select **Duplicate**.
2. Select a base point for the copy movement. Typically you would select one of the element's grips, but you can click anywhere in the drawing. The base point is simply a reference point used to define the move distance.
3. Moving your mouse downwards, drag a copy of the wall. When the onscreen dimensions read approximately 5' release the left mouse button.
4. Click on the onscreen dimension above the new wall.
5. Type **5'** and click OK.

The wall is now exactly 5' from the original wall.

6. Click on wall **B**, as depicted in the diagram above.

The wall will highlight and dimensions will appear to lock its position in relation to the parallel walls next to it.

7. Click on the dimension above wall **B**.
8. Type **2'6"** and click OK.
9. The wall moves closer to the wall above it.

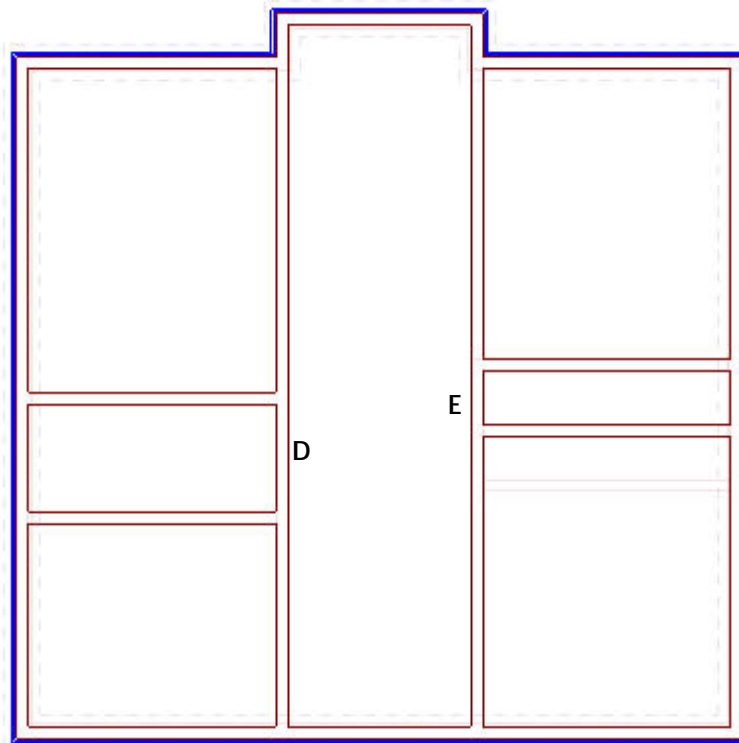
### Lengthening and Shortening Walls

1. Click on the Wall marked **C** in the previous diagram.

- The wall highlights and grips will appear. The grips define the middle and endpoints of the wall.
- Move your cursor towards the grip on the top end of the wall. As you hover your cursor over the endpoint, the cursor will change to indicate it is ready to stretch the wall.





- Hold down the left mouse button.
- Stretch the wall up to the exterior walls above and release the mouse button.

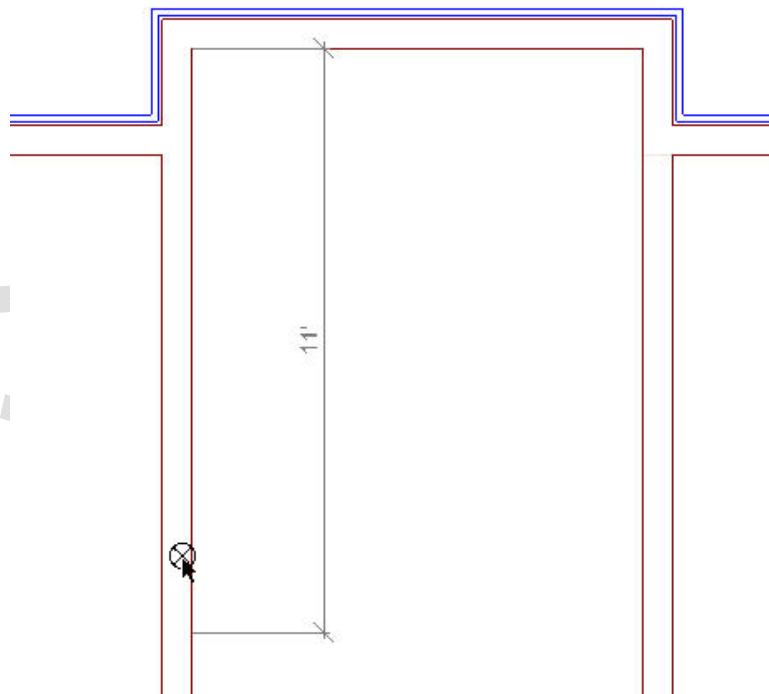


- Referring to the diagram above, select the wall marked **D**.
- Right click and choose **Duplicate**.
- Holding down the left mouse button, drag a copy of the wall to the left. Release the mouse button when it is approximately 4' away to create the new wall.
- Left click on the onscreen dimension to the left of the new wall.
- Type **7'** and click OK.
- Click on the wall labeled **E** in the previous diagram.
- Right click and choose **Duplicate**.

13. Holding down the left mouse button, drag a copy of the wall to the right. Release the mouse button when it is approximately 5' away to create the new wall.
14. Left click on the onscreen dimension to the left of the new wall.
15. Type **5'6"** and click OK.

### Creating Walls Using the Insertion Offset Option

1. Select **Insert > Walls**, or click the Walls button on the Building toolbar. 
2. In the catalog panel, select the **2x6 Wood Framed Wall** element in the **Interior Walls** category.
3. Move your cursor onto the drawing screen area and right click and select **Enter Insertion Offset**.
4. Type **11'** and click OK.
5. Place your cursor along the interior wall as indicated in the diagram below. When the 11' dimension is in place left click to start drawing the wall from that position.
6. Move the cursor to the right and left click in the opposite interior wall.
7. Right click and choose **Finish**.
8. **File > Save**. 



## Doors

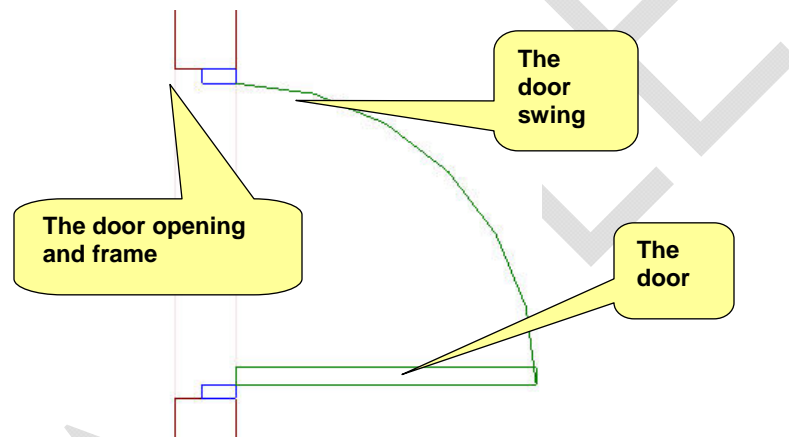
Simply stated,

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### Depicting a Door in a Floor Plan

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When depicting a door on a floor plan you show the door and the swing that it will take from its open to close position and the framed opening that it makes in the wall. This allows the person viewing the floor plan to visualize the size of opening, the direction of the door swing and any obstructions that may affect the door when it is opening.



### Hands on Activity - Inserting Doors

The Envisioneer catalog contains a wide variety of doors for you to insert, including hinged, bi-fold, pocket, sliding glass and garage doors. You can point and click to insert a door anywhere inside a wall, automatically center the door in the wall, or offset the door a specific distance from the end of the wall.

Doors are inserted at floor level. You can raise or lower a door after you have inserted it if you need to.

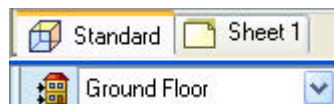
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#### For You to Try- This exercise requires the use of Cadsoft Envisioneer

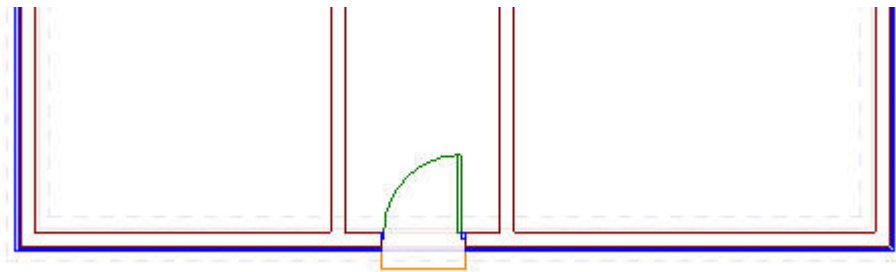
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In this exercise we will insert doors using the point-and-click method, *Center on Wall* option, and *Insertion Offset* option.

1. **File>Open.**
2. Select the file created earlier in the manual.
3. Ensure the current location is the Ground Floor.



4. Select **Insert > Doors**, or click the Doors button on the Building toolbar.
5. In the catalog panel, select the **Entry** group and then the **36" Steel Door**.
6. In the drawing screen area, right click and select **Center on Wall**.
7. Move your cursor onto the middle of the front exterior wall in the stud portion of the wall. The door swing will be illustrated swinging inside as depicted in the diagram below.

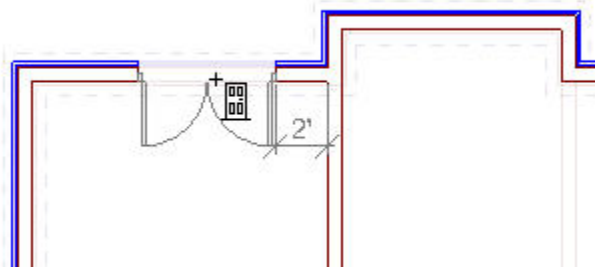


8. Left click to center the door in the wall.
9. In the catalog panel, select the **French Doors** group and the **60" Double French Door** element.
10. Move your cursor onto the drawing screen area, right click and select **Enter Insertion Offset**.



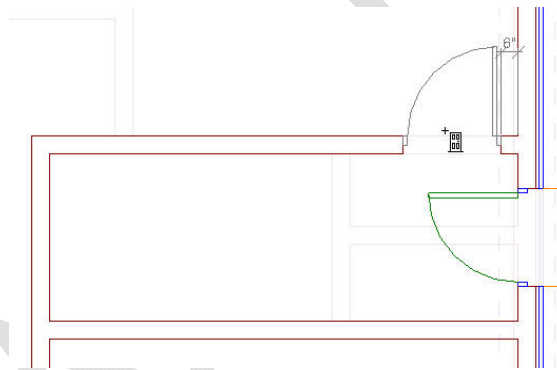
**NOTE:** If you want to install the door a specific distance from the end of a wall, door or window use the Enter Insertion Offset tool. When activated, as you move your cursor close to a wall a dimension will appear along the wall with the distance you specify. When it is in the correct position, left click to install the door. It will install exactly that distance away from the corner.

11. Type **2'** and click OK.
12. Move your cursor onto the rear exterior wall in the Dining Room close to the interior wall between the Dining Room and Kitchen. Left click when the 2' dimension places the door exactly 2' from the wall.



13. In the Catalog Panel, select the **30" French Door**.
14. Move your cursor onto the drawing screen area, right click and choose **Center on wall**.

15. Place your cursor in the interior wall between the Office and the Front Hall. Left click to center it in the wall with the swing facing into the room.
16. In the Catalog Panel, select the 32" 9-Lite Steel Door.
17. Move your cursor onto the drawing screen area, right click and choose **Center on wall**.
18. Place your cursor in the right exterior wall entering into the Mudroom. Left click to center the door in that wall.
19. Choose the **Hinged** group and **the 32" Hinged Door** in the door list below.
20. In the drawing screen area, right click and select **Enter Insertion Offset**.
21. Type **6"** and click OK.
22. Move your cursor along the top interior wall of the Mudroom close the right exterior wall. Left click when the 6" dimension appears from the exterior wall.

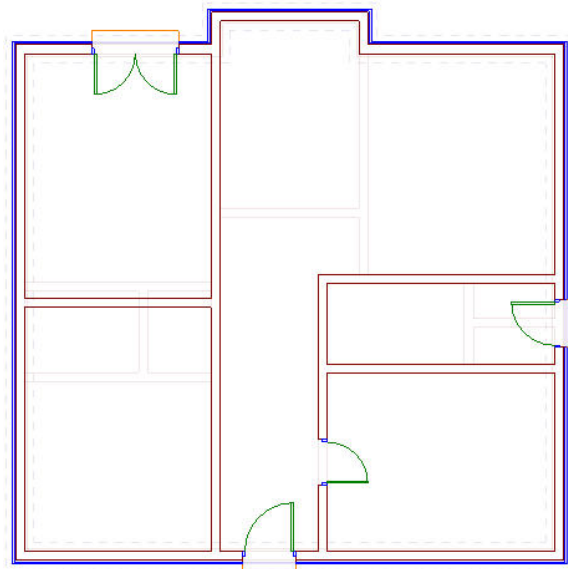


23. Right click and choose **Finish**.

24. **File>Save**.



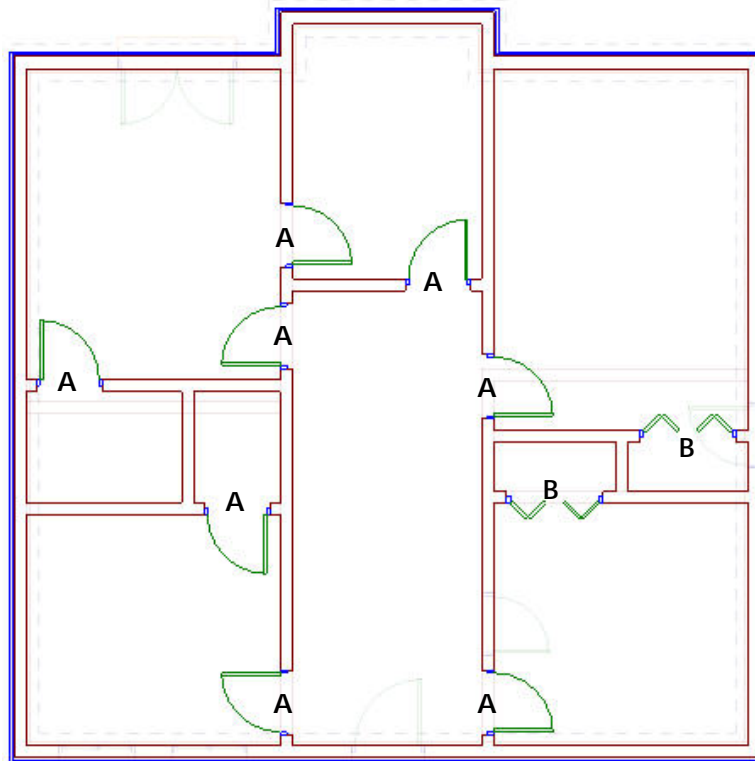
Your model on the Ground Floor should now appear as the following diagram.



25. Continue on by inserting doors on the second floor plan, following the diagram and chart below.

Remember to use the **Center on wall** and **Enter Insertion Offset** tools to place the doors.

A	Hinged	32" Hinged Door
B	Bi-Fold	32" Bi-Fold Door



### Flipping Door Swings

Some of the doors inserted with the door opening facing a wall. We can easily flip the swing of doors.

1. Click on the front entry door to select it.
2. Right-click and select **Flip Swing**. The swing flips automatically.
3. Flip any door swings as needed to match the diagram above.

### Flipping Door Openings

Some of the bi-fold closet doors may need to be flipped around so that they open out instead of in.

1. Click on a door that needs to be flipped.
2. Right-click and select **Flip Opening**. The door flips automatically.
3. Repeat for any other doors that need to be flipped.
4. Select **File > Save**.



## Windows

Simply stated,

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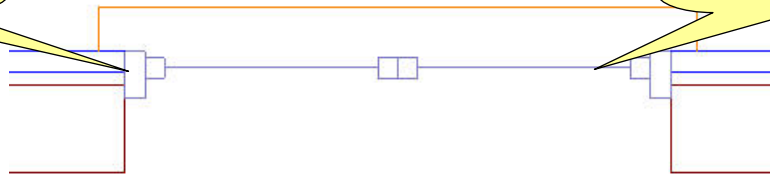
### Depicting Windows in a Floor Plan

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When showing a window in a floor plan you show the size of the frame and the location of the glass and its orientation in the wall.

This line represents the frame of the window.

This line represents the glass in the window.



## Hands on Activity - Inserting Windows

The Envisioneer catalog contains a wide variety of windows for you to insert, including fixed, casement, double casement, hopper, awning, sliding, double-hung, single-hung, bay, bow and louvered windows.

You can point and click to insert a window anywhere in a wall, automatically center the window on the wall, or offset the window a specific distance from the end of the wall.



Windows are inserted at the Head Height defined for the building location (See the Introduction to Envisioneer section) you insert the window on. You can raise or lower a window after you have inserted it if you need to.

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### For You to Try- This exercise requires the use of Cadsoft Envisioneer

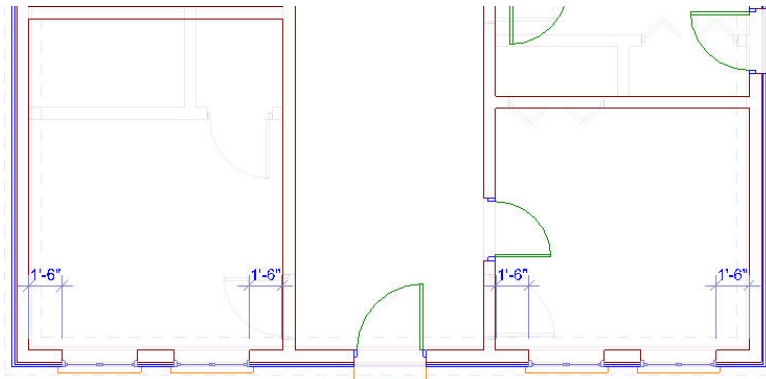
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In this exercise we will insert windows using the point-and-click method, *Center on Wall* option, and *Insertion Offset* option.

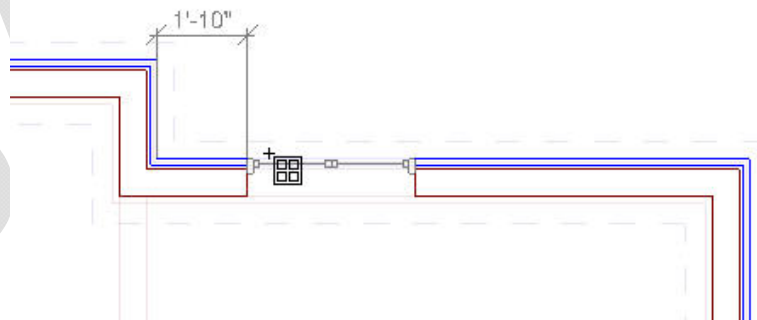
1. **File>Open**.
2. Select the file created earlier in the manual.



3. Select **Insert > Windows**, or click the Windows button on the Building toolbar.
4. In the catalog panel, select the **Double Casement** category, then select the **4'-9" X 4' Double Casement Window**.
5. In the drawing area, right-click and select **Enter Insertion Offset**.
6. Type **1'6"** and click OK.
7. Insert the 4 front windows 1'6" away from each of the corners as shown in the diagram below.

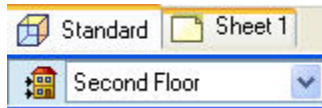


8. In the catalog panel select the **3'5x3' Double Casement** window from the **Double Casement** category.
9. In the drawing screen area, right click and select **Enter Insertion Offset**.
10. Type **1'10"** and click OK.
11. Insert the window along the rear exterior wall as shown in the diagram below.



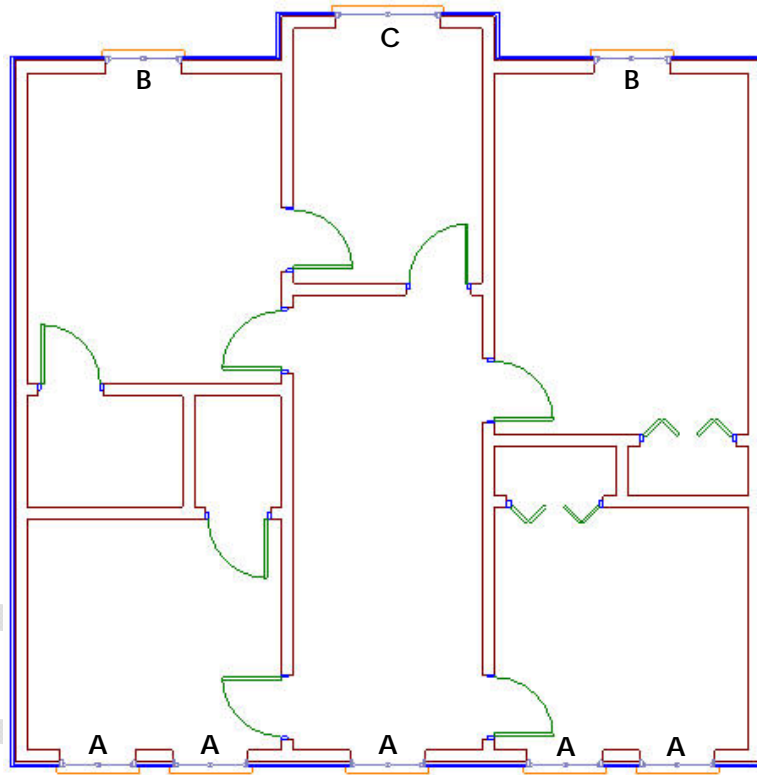
12. In the Catalog panel select the **Bay** window group and the **6'-10" X 5'-6" Bay Window (2' Side Windows)**.
13. Move the cursor onto the drawing screen area and right click and select **Center on Wall**.
14. Center the window in the rear window as shown in the diagram below.

- In the lower left hand corner of the screen, switch locations to the second floor.



- Using the diagram and chart below, insert the second floor windows.

<b>A</b>	Double Casement	3'-5" X 4'-5" Double Casement Window	Insertion offset of 1'6".
<b>B</b>	Double Casement	3'-5" X 4'-5" Double Casement Window	Center on Wall
<b>C</b>	Double Casement	3'-5" X 3' Double Casement Window	Center on Wall



- Right click and choose **Finish**.



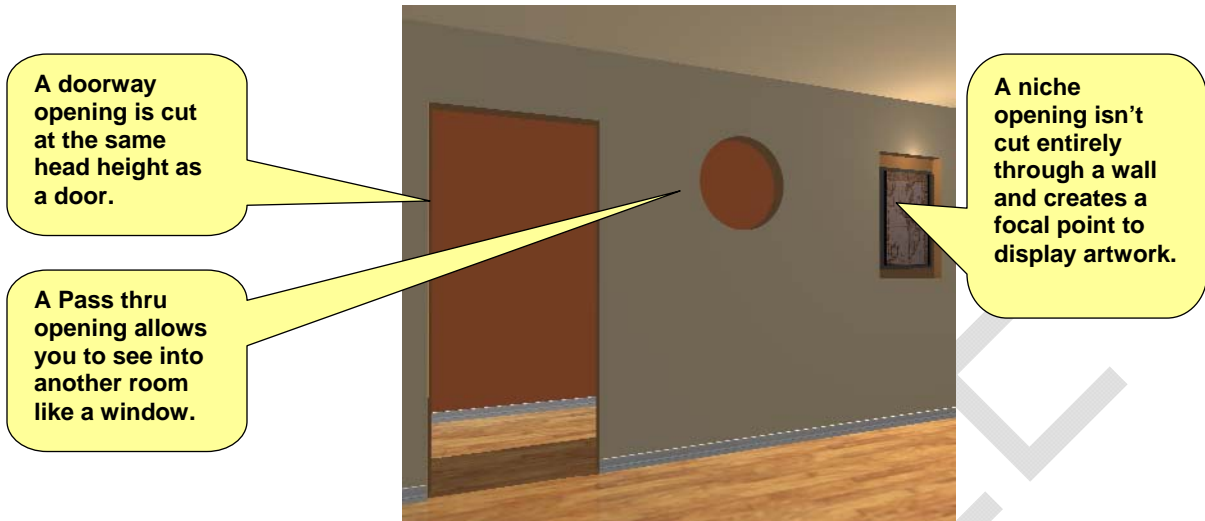
- File > Save**.

## Openings

An opening is a cutout in a wall of a specific shape, width and height. The opening can be used as a doorway, a smaller pass through or an art niche where the opening isn't cut entirely through the wall.

The opening will not have a door or window hung in the space. It is just a clear opening cut in a wall.

INSERT TEXT AND PICTURES HERE

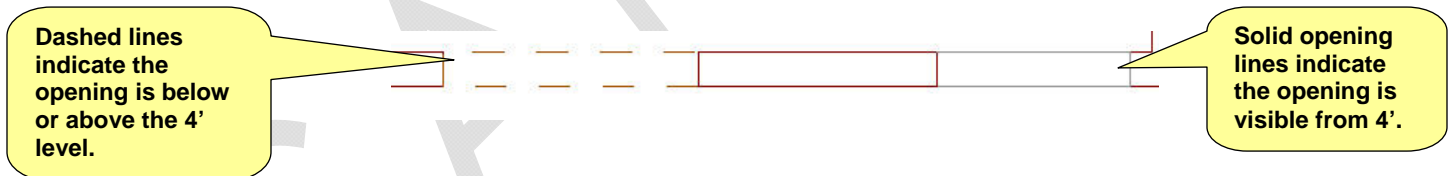


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### Depicting an Opening on a Floor Plan

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The general rule is that an architectural floor plan is visualized as being cut at approx. 4 feet from the ground, so you draw it as if you are viewing the plan from 4 feet up. Anything you wouldn't see at that level, you would show dashed in. Use small dashes for items hidden below and longer dashes for items above. So if the wall opening is cut 4' above the floor and isn't a full opening show it as a dashed line. If it is a full height opening show it as continuous.



### Hands on Activity - Inserting Openings


When inserting an opening in Envisioneer, you can either use the on-screen dimensions to position the opening in the wall, use the *Center on Wall* option to automatically center the opening on the wall, or use the *Insertion Offset* option to offset the opening a specific distance from the end of a wall.

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### For You to Try- This exercise requires the use of Cadsoft Envisioneer

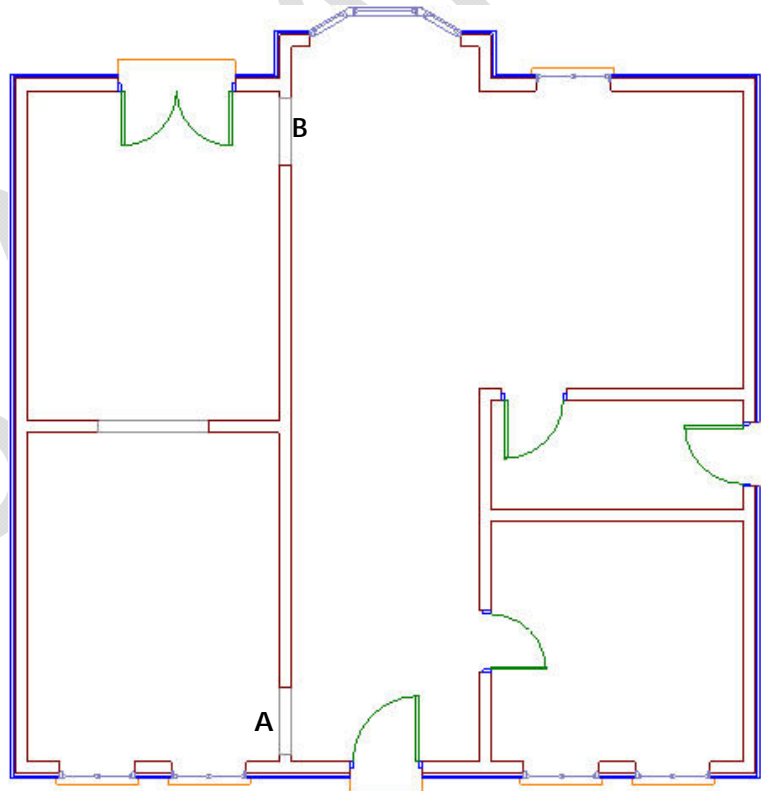
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In this exercise we will insert openings using the *Center on Wall* option, and *Insertion Offset* option.

1. **File>Open.**
2. Select the file created earlier in the manual.
3. Select **Insert > Openings**, or click the Openings button on the 

Building toolbar.

4. Select the **Rectangular (Doorways)** group and the **5' X 6'-8" Rectangular Opening** element.
5. Move the cursor onto the drawing screen area and right click and select **Center on Wall**.
6. Place the cursor in the wall between the Dining Room and Living Room. It will find the center of the wall. Left click to insert it.
7. Right click and select **Enter Insertion Offset**.
8. Type **2"** and click OK.
9. Place the cursor in the wall between the Living Room and Front Hall , as depicted by Opening A in the diagram below. Left click when the dimensional guide is 2" from the bottom of the interior wall.
10. Move your cursor up to the top end of this same wall where it meets the rear exterior wall. Opening B in the diagram below. Left click to insert it 2" away from the top corner.
11. Right click and choose **Finish**.
12. **File > Save**.



## Stairs

INSERT TEXT AND PICTURES HERE

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### Depicting Stairs on a Floor Plan

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INSERT TEXT

### Hands on Activity - Inserting Stairs

When inserting a set of stairs in Envisioneer, you can do so with a single mouse click. If you place the staircase near a wall, the staircase will automatically snap to the wall. Once you have inserted a staircase, you can edit its size, style and geometry.

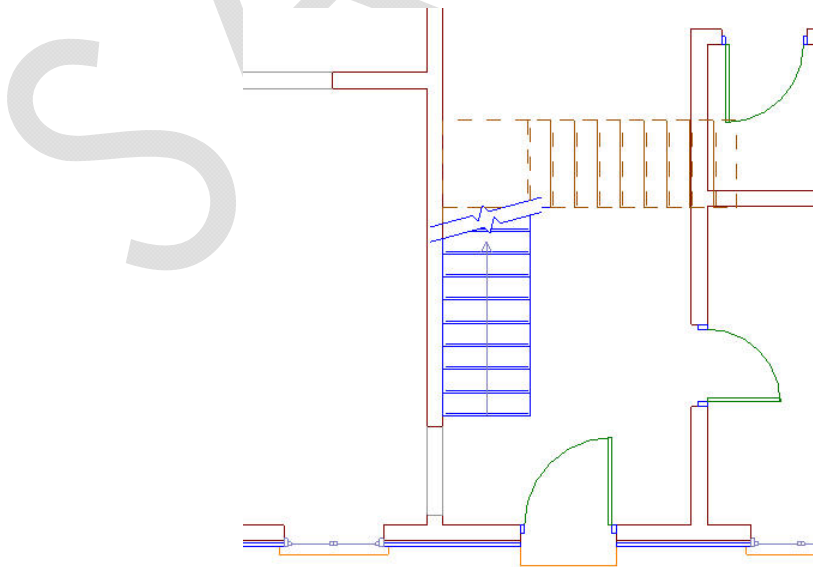
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### For You to Try- This exercise requires the use of Cadsoft Envisioneer

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In this exercise we will insert a set of stairs on the Ground floor leading to the Second floor.

1. **File>Open.**
2. Select the Ground floor location, where you want to insert the base of the staircase.
3. Select **Insert > Stairs/Ramps**, or click the Stairs/Ramps button on the Building toolbar.
4. In the catalog, select the **L - Shaped Stairs** group and the **3' Wide L-Shaped Right Stairs, Notched Stringer** staircase.
5. Position the staircase just above the front hall opening leading to the Living Room and click to insert it.





TIP: You may need to turn off collision to place the stair inside the front hall. The stair, when first inserted, will be longer than the hall and therefore collide with the adjacent walls. By turning off collision Envisioneer will overlook this and you can then adjust the settings of the stairs to fit.

6. Right-click and select **Finish**.
7. Left click on the inserted stair to select it.
8. Right click and select Properties.
9. Click on the **Riser Maximum** edit box.



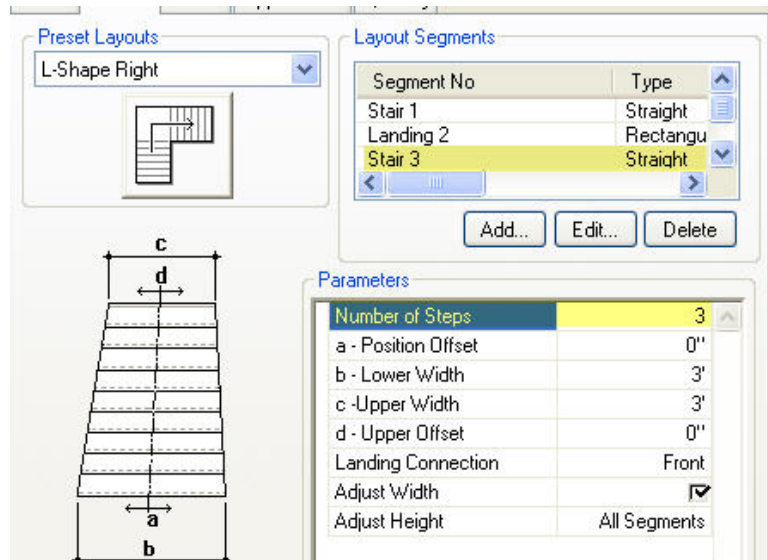
The Riser Maximum value is determined by your local building codes. It dictates the maximum height of a riser in a set of stairs. The Riser Height option can not exceed the value set here. If the Overall Height divided by the Total steps exceeds the Riser maximum the Total steps will be adjusted.

Properties:	
a - Overall Height	9'
Total Steps	14
b - Riser Height	7 11/16''
c - Tread Run	9 1/2''
Riser Maximum	8''
Show Riser	<input checked="" type="checkbox"/>

10. Type **8''**.
11. Click on the Total Steps edit box. Type **14**.

The Riser Height will adjust to accommodate the 14 stairs in a 9' height.

12. Click on the Layout tab.
13. In the Layout Segments area, click on Stair 3, change the Number of Steps value to **3**.



14. Click **OK**.
15. **File > Save**.

The stair will adjust to the new parameters set.

## Floors

Typically in residential construction floors that sit above grade are constructed using a floor joist system. This framework will act like a platform and span the house from one exterior wall to the other.

Floor Joist

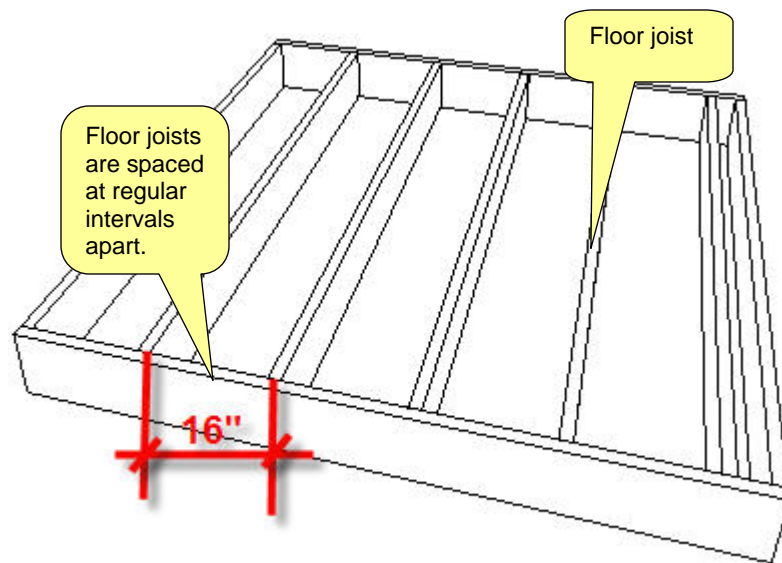
Manufactured Floor Joists

Floor Slabs

Rim Joist

Floor Sheathing

Finish Floor Material



## Hands on Activity - Inserting Floors

The Envisioneer catalog contains an extensive selection of framing members in various sizes and shapes that will aid you in creating a floor structure.

When you create an enclosed room in Envisioneer it will automatically place a finished floor in the room. The floor will hug the perimeter of the room and every room in the model will have a separate floor. For presentation purposes this is perfect as you want to be able to quickly design and show a client their home with finish floor materials. For structural layouts another flooring system will have to be used that will match the floor joist layout and not the individual room layout.

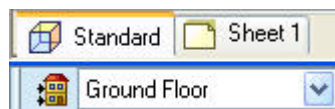
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### For You to Try- This exercise requires the use of Cadsoft Envisioneer

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In this exercise we will remove the automatic floor and replace it with a new floor that will match the structural floor system for the house.

1. **File>Open.**
2. Select the file created in chapter one and click **OK.**
3. Ensure the **Ground Floor** is the current floor location.

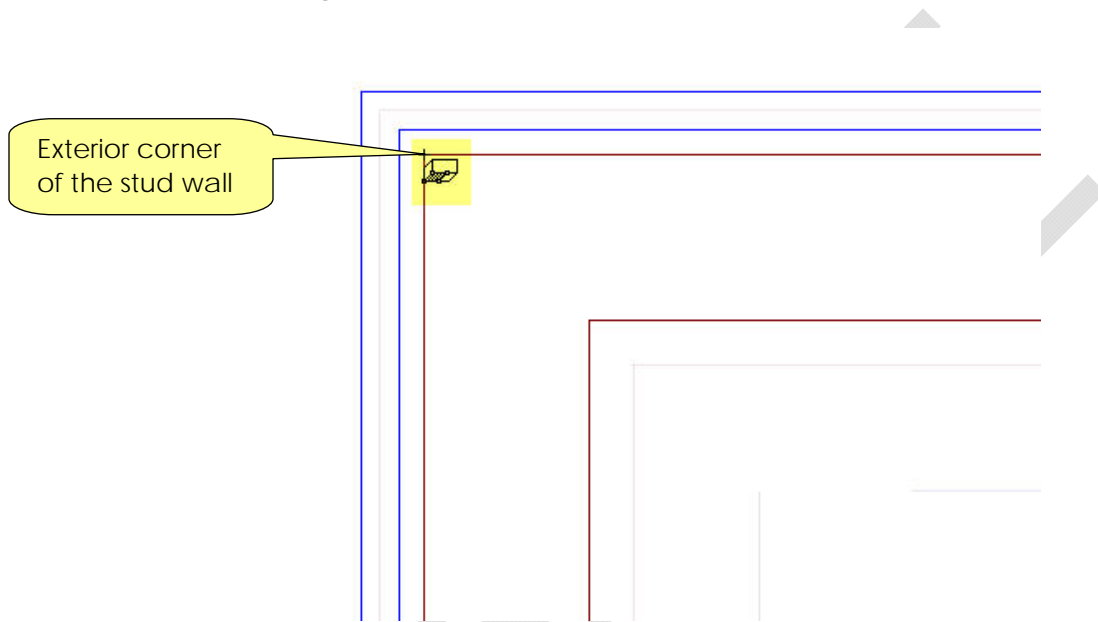


4. Select **View>2D Designers View.**

In this view you can see the finish materials for the floor plan. The flooring materials become apparent for each room.

5. Left click in the middle of the Mudroom to select the floor in that area. The edge will highlight green. The edge will hug the perimeter of the room.
6. Right click and select **Delete.**

7. The floor is removed. Repeat for each room on the Ground floor.
8. Select **Insert> Floor>Floor by Picking Points**.
9. The Catalog panel to the right will update with your options.
10. Select the **Wood Flooring** Group and the **Hardwood Floor 1** in the Floors list below.
11. Left click in the upper left corner of the exterior stud wall line as depicted in the diagram below.



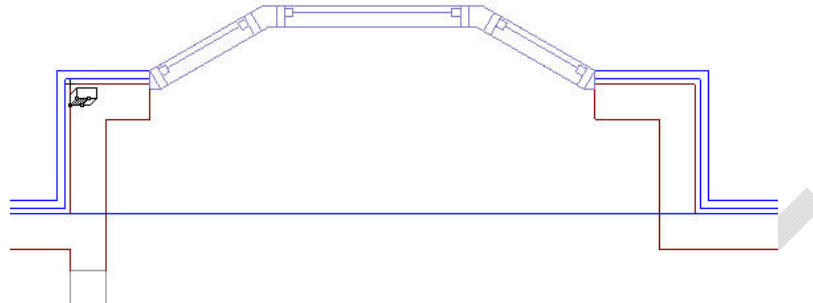
12. Moving the cursor to the right (the 0° direction) type **33'7"** and press Enter.
13. Move the cursor down (270°) and type **15'9"** and press Enter.
14. Move the cursor to the left (180°) and type **33'7"** and press Enter.
15. Right click and choose **Finish**.

The floor is inserted. Now we will make a copy of for the area at the front of the house that also requires a floor system.

16. Left click on the floor edge to select it.
17. Right click and choose **Duplicate**.
18. Holding down the left mouse button drag a copy of the floor system down (270°) as you are dragging the floor type **15'9"** and press Enter.

This will make a copy of the floor so the lower edge of the first floor is abutting the upper edge of the new floor. Now we need to install one last piece of flooring at the rear breakfast nook.

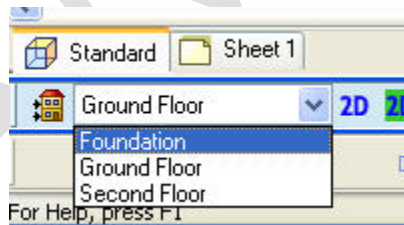
19. Select the **Wood Flooring** Group and the **Hardwood Floor 1** in the Floors list below.
20. Left click in the upper left corner of the exterior stud wall line as depicted in the diagram below.



21. Moving the cursor to the right (the 0° direction) type **9'7"** and press Enter.
22. Move the cursor down (270°) and type **2'** and press Enter.
23. Move the cursor to the left (180°) and type **9'7"** and press Enter.
24. Right click and choose **Finish**.
25. Repeat the process on the second floor location as well.

#### Inserting a concrete slab in the Basement

1. Change the floor location to the Foundation.



2. Select **View>2D Designer's View**.

The finish materials are displayed.

3. Left click on the inserted floor.

4. Right click and choose **Delete**.

5. Select **Insert>Floors>Floors by Perimeter**.

6. In the Catalog Panel, select the Slabs group and the **4" Concrete Floor** element.

7. Left click inside the perimeter of the home.

The floor slab is inserted.



8. Right click and choose **Finish**.
9. **File > Save**.

## Ceilings

INSERT CEILING TEXT HERE

### Hands on Activity – Ceilings

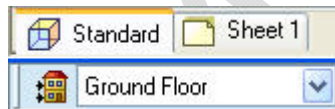
When you use the ceiling command in Envisioneer, it has the option to place a ceiling in each room separately (Ceiling by Room), following the exterior perimeter walls (Ceiling by Perimeter) or place the ceiling using free form points (Ceiling by Picking Points). In this exercise will insert a ceiling in each room and then cut a hole in the ceiling to accommodate the stairs.


---

#### For You to Try- This exercise requires the use of Cadsoft Envisioneer

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1. **File >Open**.
2. Select the file that you have created previously using this text. Click OK.
3. Set the current location to Ground Floor.



4. Select **Insert > Ceilings > Ceiling by Room**, or activate the Ceilings flyout on the Building toolbar and select Ceiling by Room. 
5. In the catalog panel, select the **1/2" Drywall Ceiling** in the **Standard** category.
6. Click inside the rear left room in the house. A ceiling is automatically inserted in the room.
7. Continue inserting ceilings in each room, then right-click and select **Finish**.

## Roofs

INSERT ROOF TEXT HERE

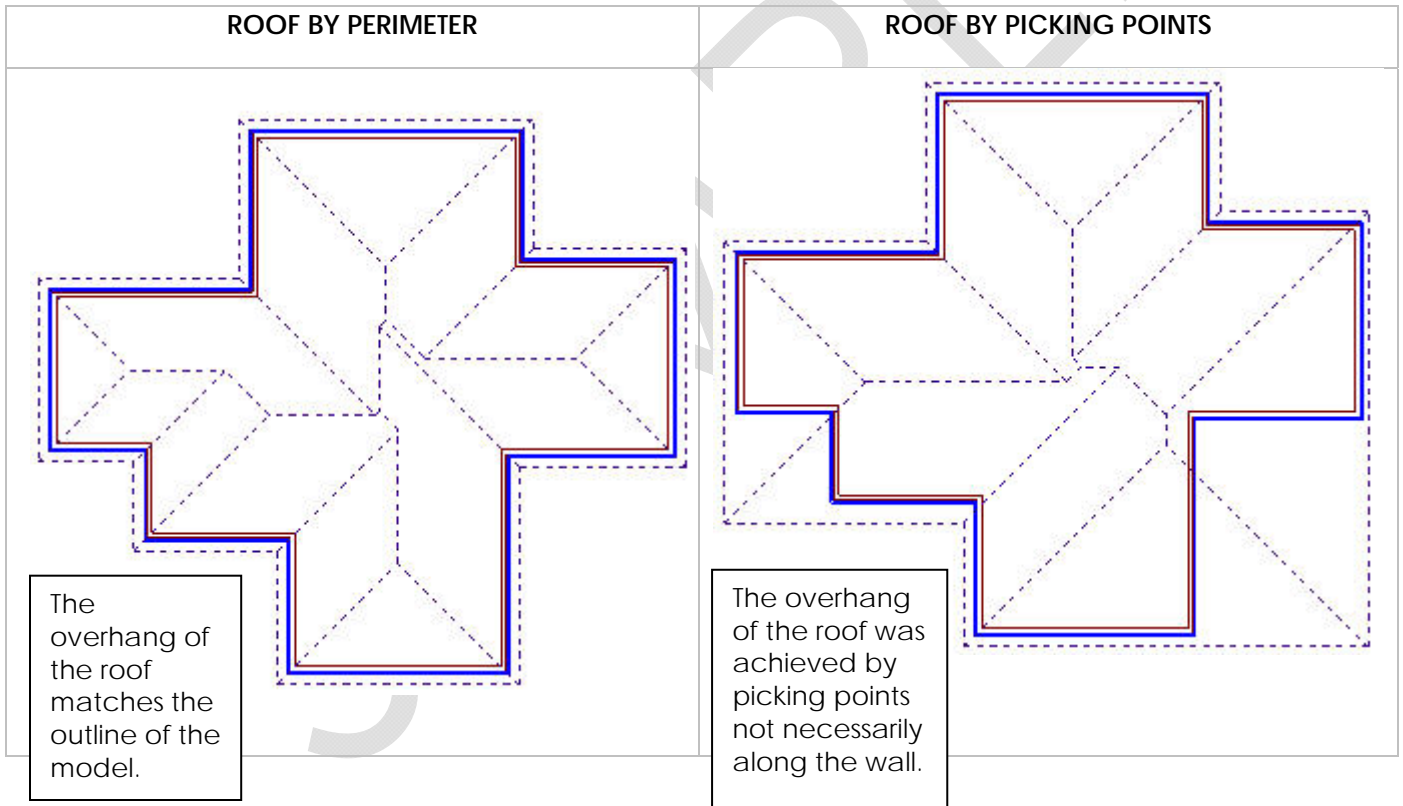
### Hands on Activity - Roofs

Envisioneer offers two insertion methods for roofs: Roof by Perimeter and Roof by Picking Points.

When you use the Roof by Perimeter tool it will look at all of the perimeter walls and automatically place a roof structure over them. The walls and the roof become a cohesive unit that move and interact together.

When you use the Roof by Picking Points option to insert a roof, you are freely picking points to define each roof corner. There is no tie between the roof and any walls that may be beneath it.

Each option for inserting a roof has their strengths and flexibility and before you insert a roof you should determine where the roof structure will lie in accordance with the walls and therefore which method of roof insertion will best suit your needs.



### Hands on Activity – Roof by Perimeter

When you use the Roof by Perimeter tool it will look at all of the perimeter walls and place a roof structure over them.

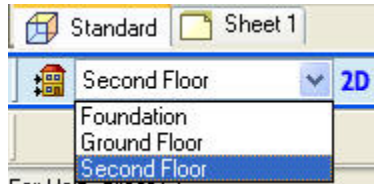
Your walls therefore need to be in place and in a continuous formation.


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**For You to Try- This exercise requires the use of Cadsoft Envisioneer**

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1. **File >Open.**
2. Select the file that you have created previously using this text. Click OK.
3. Ensure the Building Location is set to the Second Floor.



4. Select **Insert > Roofs > Roof by Perimeter**, or click the Roofs button on the Building toolbar and select Roof by Perimeter. 
5. In the catalog, select the **4/12 Pitch Hip Roof, Asphalt Shingles** from the **Hip** category.
6. Click anywhere inside the model. The roof is inserted automatically.