# Task 1 - Farnsworth House Exercise

**SketchUp Tutorial**

## Farnsworth House

**The Farnsworth House, designed and built in the International Style by architect Ludwig Mies van der Rohe for Dr. Edith Farnsworth from 1949-1951, is one of the world's most widely recognised and studied structures constructed in the 20th century. As one of the pinnacle works of Mies van der Rohe's style and philosophy, it remains an international pilgrimage site for thousands of architecture students and professionals annually.**

**The Farnsworth house is perhaps the fullest expression of modernist ideals that had begun in Europe and it marks a change in lifestyle and in architecture. Farnsworth house is the breakdown of architectural elements and is a meeting point between architectural drawings, technology and the creation of space. It is also an introduction to modern domestic life in its simplest form which led to a long series of houses embracing the modernist aesthetic style.**

## Required Files:

**FARNSWORTH HOUSE CAD.skp**

**Please note that the SketchUp base file (FARNSWORTH HOUSE CAD.skp) has the first step of loading the CAD file of the tutorial already complete for you.**

# Setting up the file

**NOTES**

Toolbars
Toolbars can be found by accessing the view-toolbars menu. Become familiar with what each of the toolbars are for. Keep them open and dock them in a suitable place so you can access them readily and quickly.

Window Palettes
Window palettes can be accessed by the window menu. These can be maximized, minimized and dragged around the screen by clicking the toolbar at the top of the relevant window. They can also be stacked as a group. You may not need every window open at once but for this tutorial you will need the following windows open:
**Entity info**
**Layers**
**Shadows**

Create a new file in Sketchup

Click - File – New
select the architectural – metric template.

Firstly delete the man standing at the corner of your axis; he will just get in the way. He has a name apparently and it's Sang.

Make sure you have all the **toolbars** available open

Make sure there is a tick next to the toolbars

If you wish to do so at this stage you can also stack all of the **window palettes** to the top right hand corner of the screen

# Importing the CAD file

We can import the CAD file to work as a base to our model. This can help us by creating snapping points to allow certain parts of our model align to. In this instance we will just import the plan, however it is perfectly feasible to import the elevations and sections if they are available.

Click- File – Import

Make sure you are looking for ACAD files by selecting them from the drop down menu, and also check your import units are millimetres by checking in the options tab

Locate the file ST_001_Farnsworth House_plan.dwg click open.

# Task 1 - Farnsworth House Exercise

## SketchUp Tutorial

**NOTES**

Selecting
Ctrl+A selects everything in the model or active group / component.

A single click will select a single line or face.

Double click to select one object and anything touching it.

Triple click will select one object and anything that is connected.

Groups / Components
Groups and components are two different entities. Whilst both groups and components isolate selected elements, components differ in that any changes you make to one will apply to all instances of the same component. Groups are individual.

As noted previously the CAD plan is best used as a reference, so we now need to set it up as a reference tool.

Select all of the imported CAD lines.

Make these a group by right clicking on the selected objects and selecting make group

Make a new layer by clicking the + sign within the layer dialogue, rename this layer CAD_import.

You will notice that the current layer is still layer 0 as this has the black dot in its circle within the layers dialogue.

Select all other layers in the dialogue and click the - button. When prompted select move objects to current layer.

Repeat this until all layers are removed and you are left with **Layer 0** and **CAD_Import.**
Layer 0 should still be the current layer.

We can now move the imported CAD lines onto the correct layer using the ‘entity info’ window.

Select the cad lines group and open the entity info window.

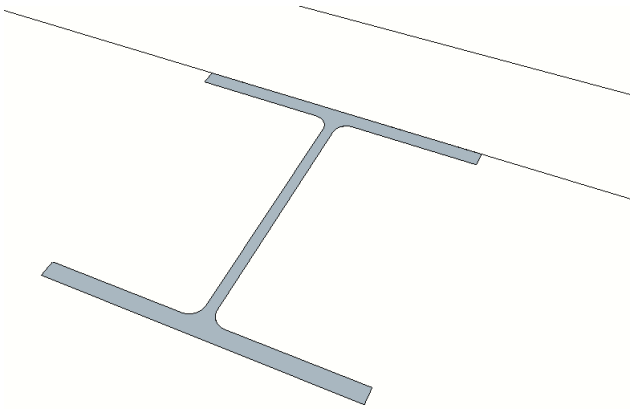
Using the drop down box select the layer you wish to move the CAD group into.

In this case you only have one option.
The CAD lines can now be switched on and off by clicking the ‘visible’ check box within the layers window

# Building the structure

Using the middle wheel of your mouse zoom and orbit into one of the columns on the cad plan. Alternatively you can use the **navigation buttons**.

Trace the shape of one of the columns until you have created a **face**, which should appear blue face up



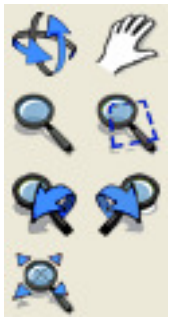
As there are more instances of this column we need to make it a component

Triple click on the face to select it and all touching lines, right click and select make component

**NOTES**

Toolbars

Toolbars can be found by accessing the view-toolbars menu. Become familiar with what each of the toolbars are for. Keep them open and dock them in a suitable place so you can access them readily and quickly.



Navigation Buttons

The navigation buttons allow you pan and zoom around the model. These buttons can be used **during** another command, for example move, without losing the selected objects.

Faces

When Sketchup creates a face it actually creates two faces, a front side, white and a back side blue. It is good practice to only have front sides showing as this will assist when exporting to various other programs. To flip a face right click it and select reverse **faces.**

# Task 1 - Farnsworth House Exercise

## SketchUp Tutorial

**NOTES**

Move / Copy (M)
Each tool may have a number of uses. For example the copy command is accessed using the move tool. Pressing Ctrl will toggle between move and copy. The indication of a small plus sign indicates that you are in copy or move mode.
Some commands like pan and orbit are available to use whilst in the middle of an action. For example if you are moving an object and press space bar you can pan around the model, clicking the move button will continue your moving action.

Push/Pull (P)
To push or pull click once to begin and second click to finish.
Exact distances can be typed into Sketchup when pushing or pulling after you have done you first click

Place a copy of the column component to each of the column locations using the **move** button.

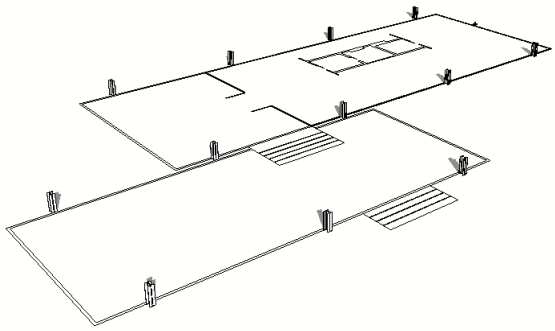
Using the common endpoints snap ensure they all line up with the CAD plan

When you have a cad column at each of the required locations you now need to give the columns some height.

Double click one of the columns to begin editing

Use the **push**/**pull** tool to pull the column to a height of 825mm.

All columns should now be at a height of 825mm.



# Task 1 - Farnsworth House Exercise

## SketchUp Tutorial

**NOTES**

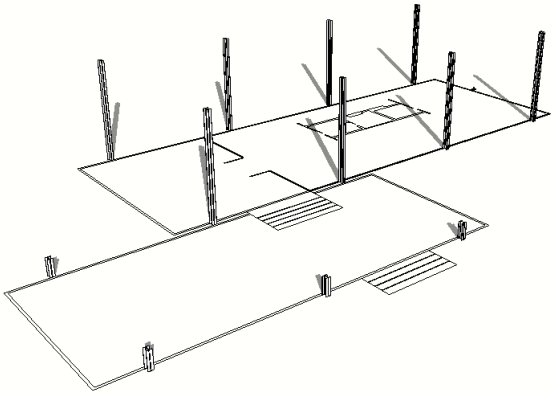
Select
Selecting can be done by dragging a window across the items, or by individually clicking the desired objects. To add to a selection use the CTRL key. Pressing it you will see the + sign appear. To remove items from a selection press CTRL & SHIFT, a – should appear.

The eight columns surrounding the upper part of the house need to be longer, but we want to leave the rest of the columns at the height they are. To do this we need to isolate the eight longer columns.

**Select** the eight columns.
Right click on one of them.
Click make unique
Pull the top of the column up a further 4655mm

You should now have the eight columns in place and all at the correct heights.

Make a new layer called *columns*
Select all columns and move to correct layer.



# Building the slabs

NOTES

Rectangle (R)
Click once to begin drawing a rectangle, second click to stop. Exact dimensions of a rectangle or square can be input after the first click. A coma should separate the length and breadth. When dragging your rectangle the appearance of a dashed line indicates you are drawing a square or rectangle with golden ratio proportions.

Move (M)
Using the arrow keys can isolate the direction you want to move. During a move command pressing up will snap to the blue axis so the object will only move vertically.

Offset (O)_
To offset click once to begin and second click to finish. Exact distances can be typed into Sketchup when pushing or pulling after you have done you first click

Using the **rectangle** tool, and the CAD plan as guide, draw a rectangle to cover the terrace.
Pull this up 435mm.
Make a group.

**Move** the terrace into place so the top lines through with the top of the lower columns.

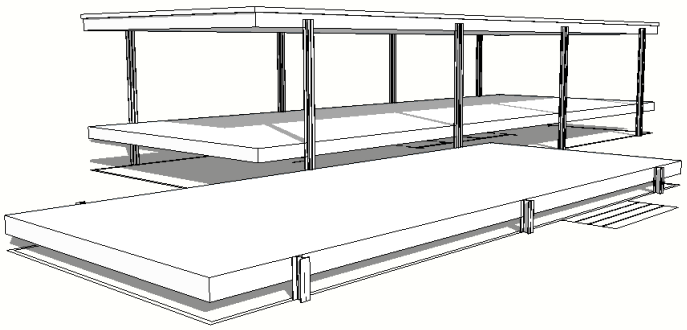
Draw a new rectangle to cover the floor.
Pull this up 435mm.
Make a group.
Move vertically 1210mm.
Copy the floor vertically 4010mm to form the roof.

Draw a new rectangle, the same size, over the roof slab.
Select the four edges to the rectangle.

Using the **offset** command, offset the four selected edges 60mm and then delete the original edges.

Pull this rectangle vertically up 150mm.
Make a group.

Make 3 new layers called *terrace, floor* and *roof.*
Select all slabs and move to correct layer.



# Adding the stairs

NOTES

Tape measure (G)
The tape measure can be used to measure distances but is also very useful for adding in construction lines. CTRL toggles between measuring and adding guides. Guides can be added by clicking between two snaps points. Clicking on an existing line within the drawing adds a guide parallel to the original line.

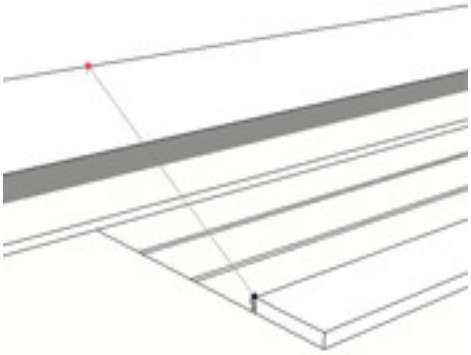
Guides can be deleted from the Edit menu

**/ ? & x ?**
After completing a copy command before doing anything else, typing in / ? or x ? (? Being any number greater than 1) tells Sketchup to either divide the copy command by the required number or add in extra instances or multiplies the original copy x number of times. This is a very useful tool for creating multiple items, say on a grid.

draw a rectangle over the bottom tread of the stair.
pull it up 70mm.
make this a component.

Using the **tape measure** draw a construction line from the back corner of the stair tread to the upper edge of the terrace.

The tape measure should snap to a point where the construction line remains perpendicular to the edge of the slab, this is indicated by the snap turning red. If this doesn't happen automatically hover the tape measure over the stair edge for a few seconds and try again.



Copy the stair tread component from and to the end points of the construction line.

Type in / **3** and press enter.

If done correctly Sketchup should add in the remaining number of treads.

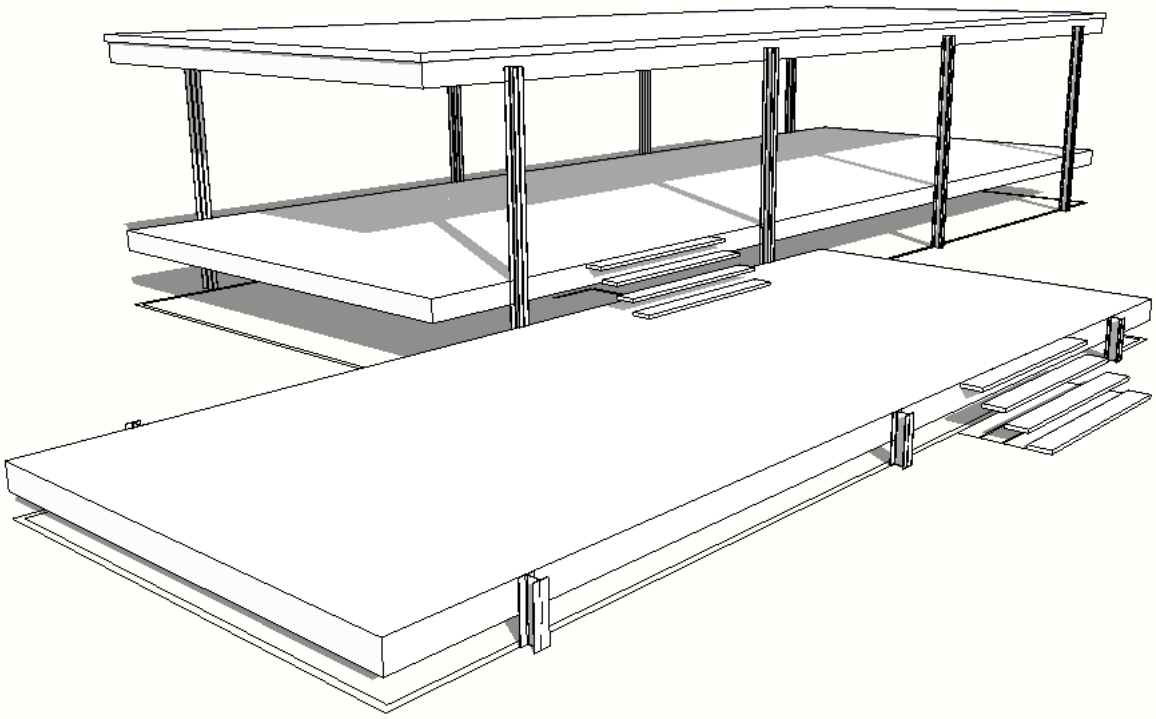
Select all the treads.
Make a component.

Copy the lower stairs up to the upper deck using the same method.

Make a new layer called *stairs*.
Select both sets of stairs and move to the correct layer.

# Task 1 - Farnsworth House Exercise

**SketchUp Tutorial**



# Adding the windows

**NOTES**

Mirror
Although there is no mirror button in Sketchup, mirroring can be done by flipping the object along a specified axis. Select the object you wish to mirror. Right click on it and select 'flip along'. Then select the axis you wish to flip the object.

You will see if you look at the CAD drawing that the windows are fixed to the columns by small L shaped brackets. Begin building the windows by making these brackets.

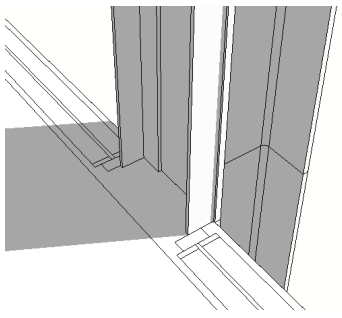
Trace the shape of one of the brackets to create a face.
Pull the face up to meet the bottom of the roof slab.
Push the bottom of the bracket to the top of the floor slab.
Make component.

Make a new layer called *bracket*
Move the bracket to the correct layer.

Now that we have one bracket drawn we need to mirror it to form the other side. It may be useful a this stage to move the CAD plan up to the top of the floor slab.

Copy the bracket (CTRL+C)
Paste the bracket (CTRL+V) roughly into position.
**Mirror** the bracket along the red axis.
Move the bracket into the correct position.

Select both brackets and make a component
Move the component to the correct layer.



Copy the bracket component to each location along one side of the floor using the CAD plan as a guide.

Select each instance of the bracket component.
Copy the bracket (CTRL+C)
Paste the bracket (CTRL+V) roughly into position.
**Mirror** the bracket along the green axis.
Move the bracket into the correct position.

You should now have a double bracket at 6 of the columns to which we can fix the window frames.

# Task 1 - Farnsworth House Exercise

## SketchUp Tutorial

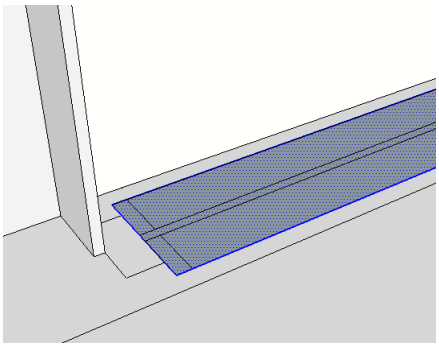
**NOTES**

Push / Pull
If you want to push or pull a face but retain a copy of the original face press CTRL. The small + sign indicates you are in duplicate mode.

When pushing a shape through a wall Sketchup will automatically snap to the back face and erase the hole.

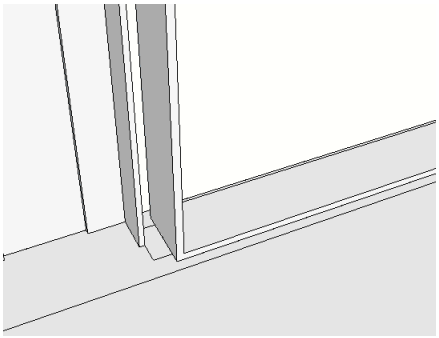
We now need to draw in the window frames. We will do this by drawing a single window frame and placing multiple copies around the building

Using the CAD plan as a guide create a face to cover one window



Pull the face up to the top of the underside of the roof slab.
Select the four edges of the outer face of the window.
Offset these lines inwards 10mm.
**Push** the new inner face through the window to line through with the back face.

Sketchup should erase the back face and leave you with a window frame.



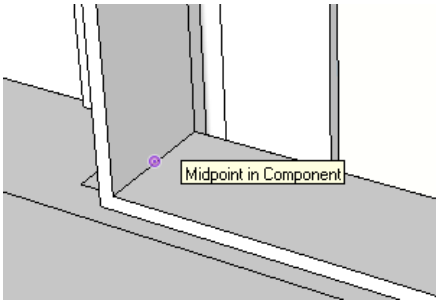
# Task 1 - Farnsworth House Exercise

## SketchUp Tutorial

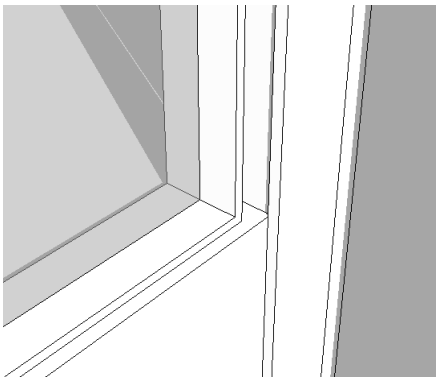
**NOTES**

Snaps
Sketchup will snap to common points in a model. These could be end points or midpoints. Lines can also be inferred by hovering the mouse over the respected area.
For example if you wish to snap to the center of a circle hover the cursor over perimeter of the circle for a few seconds before moving in to the center.

Draw a rectangle from the bottom left to the upper right midpoint on the inner edge of the frame




This should draw in a pane of glass. You can paint this a transparent material to give the effect of glass.



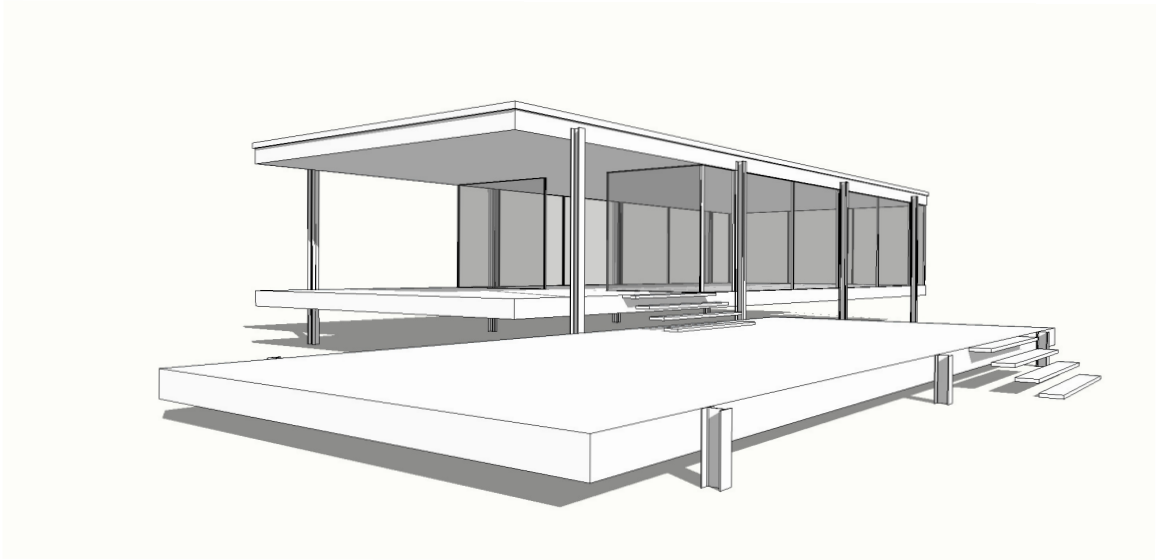
Select all elements of the window.
Make component.
Create new layer called *window*.
Move window to correct layer.

Duplicate these windows along the front and back of the building.

Draw in the remaining smaller windows and the windows along the sides using the same technique.
Fill in the gaps between the windows and at the corners by tracing the shapes and pulling them to meet the roof slab. **Remember to place them on the correct layer.**

# Task 1 - Farnsworth House Exercise

**SketchUp Tutorial**



# Core

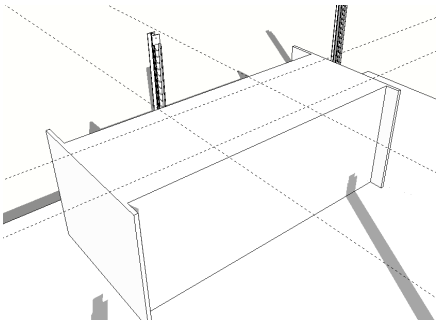
**NOTES**

Layers
Layers can be switched on and off by checking the tick box under the visible category.

Objects can be coloured by layer using the additional options button at the top left of the layers window. This is useful for ensuring your objects are placed correctly on the correct layer.

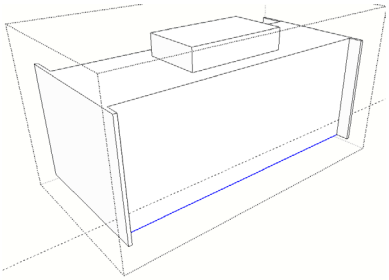
Modeling the interior should be a straightforward exercise using the commands already used throughout the modeling process.

Switch off the roof and windows layer.
Trace the outside edges of the internal core.
Pull the face up 3000mm
Draw 4 guides on the top of your internal core, 500mm from the sides and 2450mm from the edges.



Draw a rectangle picking up the points where the guides intersect.
Switch on roof layer
Pull the face up to meet the underside of the roof.

Copy the base line of the front wall vertically up 500mm.
Push the new lower face back 300mm



Select all core objects.
Make group.
Create a new layer named *core.*
Move objects to correct layer.
Delete guides.

# Doors

**NOTES**

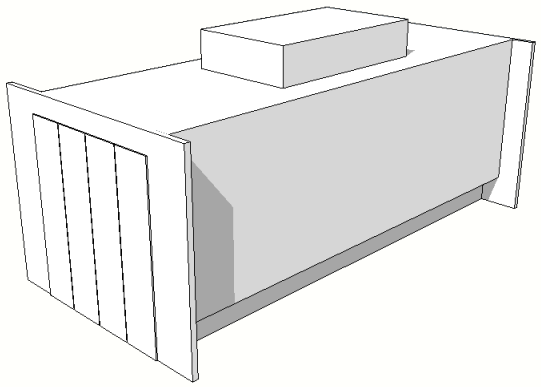
Axis
Objects or lines can be constrained to move only in one direction. Whilst mid command you will see a red, green or blue dashed line appear. Holding shift while one of these lines appears will lock the object to move only in the chosen direction.

The cursor keys can also lock direction.

Draw a face on one end of the core 2700mm high x 600mm wide.
Pull the face out 20mm.
Make component.
Copy along the green axis 610mm.
Type **x 3.**
Select all four panels.
Make component
Create a new layer called door.
Move door to correct layer.

Position the door component into the correct position so it is sitting centrally in the core end. You can do this by moving vertically and on the green axis so that the door snaps to the base of the core and to the mid point of the end wall.

Copy the door to the opposite core end.



# Furnishing

NOTES

Rotate
When the rotate tool is selected a protractor appears. The protractor snaps to either the red, green or blue axis depending on what object the cursor is placed over, default is blue. You can lock the axis to your preferred axis by holding the SHIFT button.

Click one sets the center of the rotation, click two sets the reference angle, and click three sets the new angle.

Copies can be made whilst rotating by pressing the Ctrl button after the first or second click. The + sign appears when you are in copy mode.

**x ?** and / **?** also works after the completion of a copy rotate command.

Scale
When the scale tool is selected the objects to be selected become surround by a series of grips. These grips change the way the object will scale, whether uniformly or not.

Pressing shift will center the scale on the center point of the object.

Exact scale amounts can be entered after the first click.

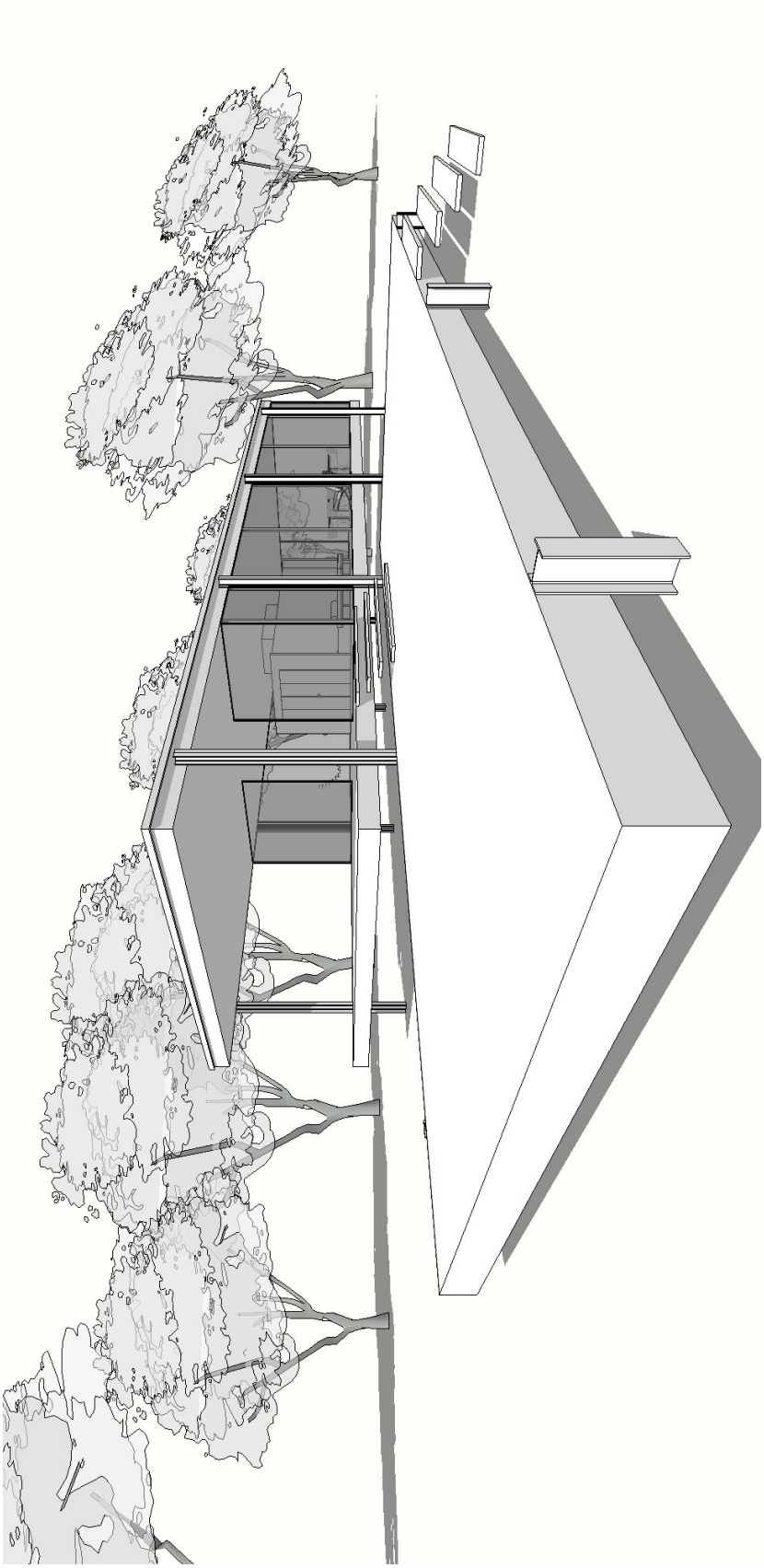
A number of relevant components are available in the project file. These can be inserted and placed within the model. Move and **rotate** them into a suitable position. Some of the components may not be at the correct **scale**.

Open the components palette under the window menu.
Click on the details button to the right of the palette.
Select *open a local collection*.
Browse to find the *components* folder in the project file.
Click on the desired component.
Place in model.
Move to desired layer.

Done!

# Task 1 - Farnsworth House Exercise

**SketchUp Tutorial**



HALLIDAY FRASER MUNRO