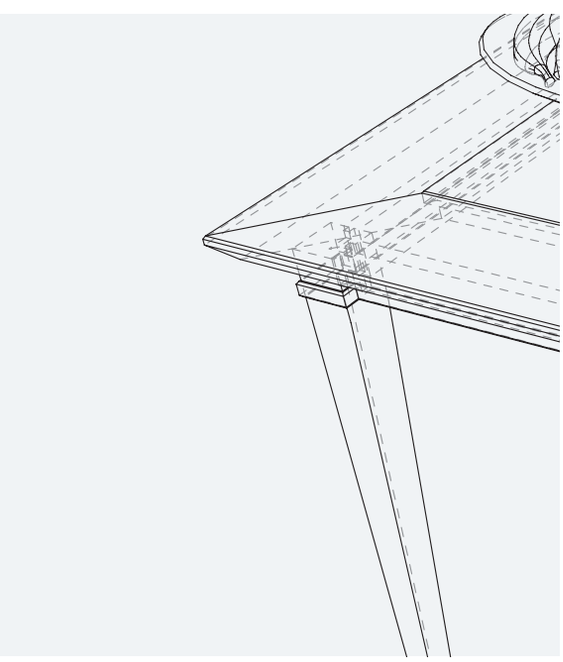
Vectorworks®
interiorcad®

Basic Course
Technical Drawing and 3D Design



extragroup

Table of Contents

Preface

This script is designed to give you an overview of „Vectorworks interiorcad"'s basic 2D and 3D drawing capabilities.

Today, Computer Aided Design (CAD) is one of the most important abilities a cabinetmaker must posses, especially during design and when creating workshop-ready drawings as well as customer-oriented visualizations.

This script introduces students to "Vectorworks interiorcad 2009", a professional CAD software. All exercises are explained with detailed step-by-step instructions. Working through this tutorial will help you make basic 2D and 3D computer aided drawing easy and comfortable.

This script was written in close cooperation with the Master Carpentry School in Munich and is employed there in introductory CAD classes.

Markus Höpler

Meisterschule für das Schreinerhandwerk München

Syllabus

In this class, you will...

- ...become familiar with the user interface and the basic elements of Vectorworks.
- ...learn about the most important Vectorworks preferences.
- ...learn how to handle tools and commands in the drawing and how to use the most important basic features of Vectorworks.
- ...use 2D tools to draw a hinge.
- ...learn to create and save a symbol.
- ...create a cross section of a cabinet's detail, including hatches and dimensions.
- ...create a 3D model of a table.
- ...create a plan layout of a table (Australian version only).

Requirements

- This script is based on "Vectorworks interiorcad 2009" including "Renderworks". This Vectorworks version includes the features of the versions "interiorcad" and "Architect" plus the "Renderworks" module. The educational versions for students and teachers also include these three modules.
- It is required that you have a standard installation of Vectorworks interiorcad on your computer.
- We recommend a screen resolution of 1280 x 1024 pixels or more.
- If possible, use a scroll wheel mouse.
- You should have basic knowledge of the operating system and know the names of the keys.

- This tutorial was made using the operating system "Microsoft Windows XP". You can work through the exercise on other operating systems, but in that case, dialogs and keyboard shortcuts may be different from those described here. This applies especially to the naming of the keys for the keyboard shortcuts on "MacOS". We recommend using the menu commands instead of keyboard shortcuts if in doubt.

1 Basics - Introduction

1.1 Preparations - Downloading the Template Files

For each exercise, you will need a template file. These template files have to be downloaded from our website and installed on your computer.

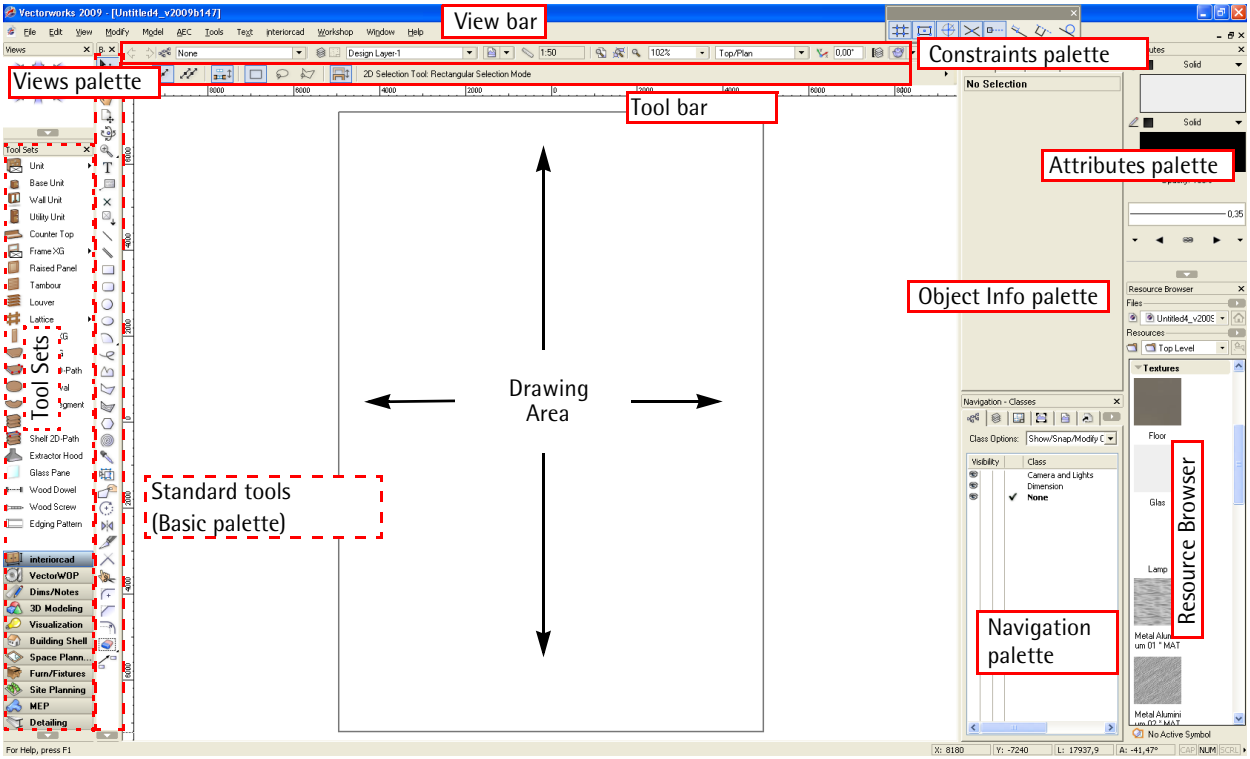
Download the installation file from the training area of our website (www.extragroup.de/learning) and save it to your desktop.

Double-click the file and follow the instructions in the dialog.

1.2 Vectorworks user interface

The arrangement of the screen is created by so-called workspaces. The workspace shown below is called **interiorcad**.

If your screen division looks different from this, you can choose **Tools > Workspaces > interiorcad.**.



The tool sets are grouped on the left. All frequently used 2D tools can be accessed from the Basic palette to the right of them. All other tools can be accessed from the Tool sets palette to the left by clicking the buttons on the lower left.

If you have trouble finding a button or palette during the course, simply refer to this page.

Tool Bar

Additional modes of a tool are selected on the tool bar. Many tools also need further specifications, for example chamfer width and height for the Chamfer tool. This settings dialog can be called from the Preferences mode of the Tool Bar.

Attributes Palette

The graphic attributes of the objects are adjusted in the Attributes palette. An object can be filled with a color, pattern, hatch, gradient, image, or not filled at all. Pen attributes, like pen color, line weight, line style etc. are adjusted here.

Resource Browser

In Vectorworks, resources means all symbols, symbol folders, hatch patterns, VectorScripts, script palettes, record formats, worksheets, gradient fills, textures, image fills, and backgrounds.

The resources used in a drawing are saved as part of the drawing file and managed in the Resource Browser. From the Resource Browser, you can also access the resources of all simultaneously opened files and all default and custom library resources.

The resources can be displayed as list or as thumbnails. It is possible to place symbols, allocate hatches, materials etc. via drag and drop from the Resource Browser.

Object Info palette

The Object Info palette is divided into the Panes Shape, Data, and Render. The drawing-relevant data of the active object can be seen and edited here. You can also link objects to record formats and assign a texture to them.

Views

The Views palette contains the most important 3D standard views.

View Bar

The View Bar has the most important zoom commands, such as Current Zoom, Fit to Objects, Fit to Page Area etc. which can be called by clicking the appropriate symbols.

In addition, any view of the drawing can be saved and then accessed at any time from the Saved Views menu.

Drawing Area

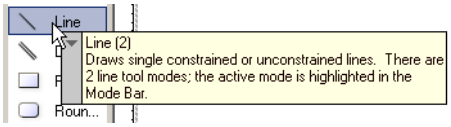
The drawing area corresponds to the size of the paper on which we are drawing. It is displayed as a rectangle with orientation lines in the standard interiorcad workspace. It can be edited

at any time. Of course, this paper can be larger than the size of the paper in your printer. In this case, your printer will print multiple pages. The frame is not printed. Only objects inside the frame will be printed.

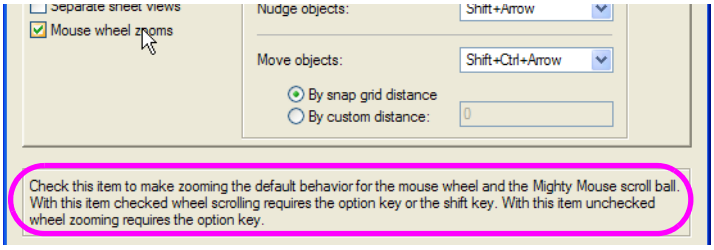
1.3 Help

In Vectorworks interiorcad you can access the complete **manual** in electronic form at any time. Select **Vectorworks Help** from the **Help** menu or press **F1** and choose the desired chapter.

Hover the mouse over a tool to get further help. A short help text will give you the name of the tool and, in most cases, refer you to the corresponding page of the manual. Click the little arrow, and the text will expand.



Many dialog windows display a short help text when you hover the mouse over a control element.



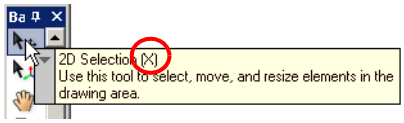
1.4 Keyboard Shortcuts

Generally, all commands and tools can be called either from the menu bar or by clicking the corresponding buttons in the tool palettes. However, you will notice that the most comfortable and fastest way to call a frequently used command or tool is using a keyboard shortcut.

When the shortcut is a combination of keys, e.g. Ctrl+C, you have to press the keys simultaneously, e.g. press C while holding down Ctrl.

The shortcuts can be seen in the menus behind the corresponding command (e.g. Ctrl+X).

In the palettes, the shortcut can be found in brackets.

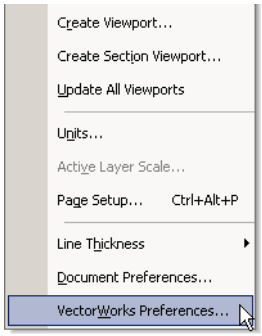


1.5 Vectorworks Preferences

To ensure continuous workflow for our exercises, we have to set some general preferences for the software and the document. Uniform software preferences are important to set up the same working environment on your computer as in this tutorial and to avoid confusion.

■ As a rule, the standard preferences described in this section are already set by default during standard installation. Please check the settings according to this section and set all options as shown. Each feature of the preferences dialog displays a short help text when you hover your mouse over it. Please refer to the Vectorworks help or the Vectorworks manual for more detailed explanations. ■

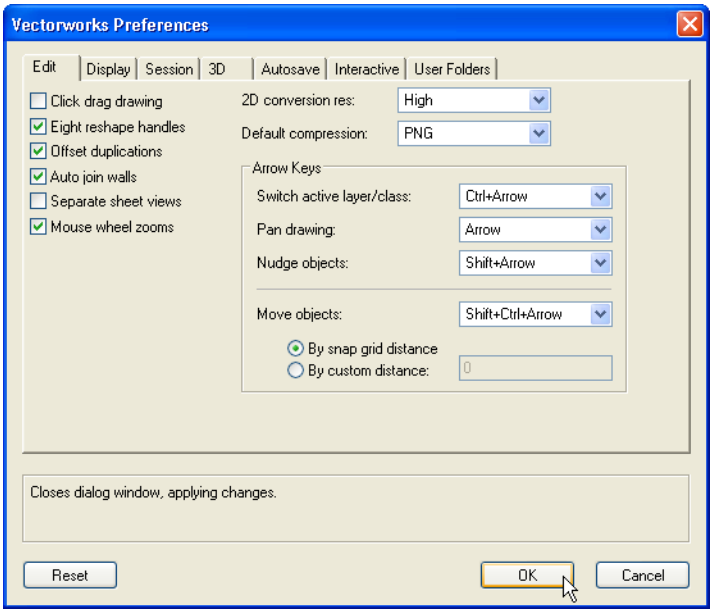
First, we set the software preferences. Right-click an empty space on the drawing and select **Vectorworks Preferences...**.from the contextual menu.



The Vectorworks Preferences dialog is divided into tabs: Edit, Display, Session, 3D, Autosave, User Folders.

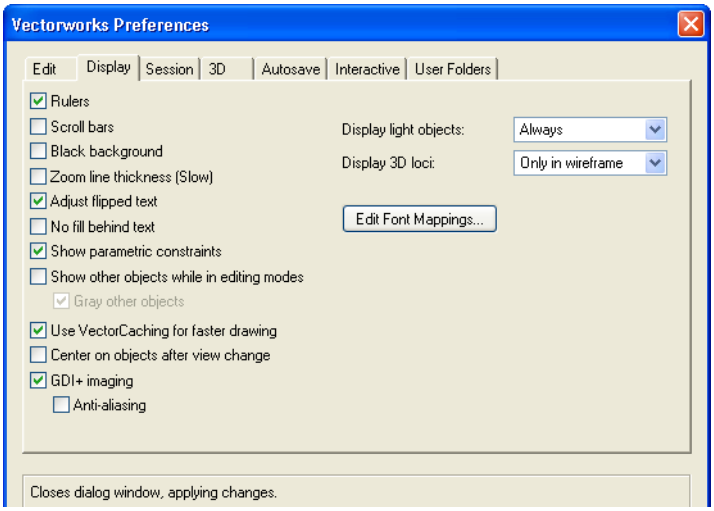
Edit tab

In this area, you can set preferences for Vectorworks' behaviour for drawing elements.

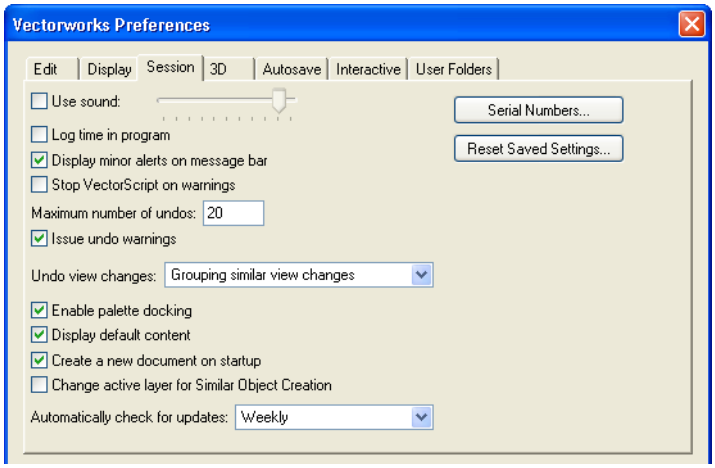


Display tab

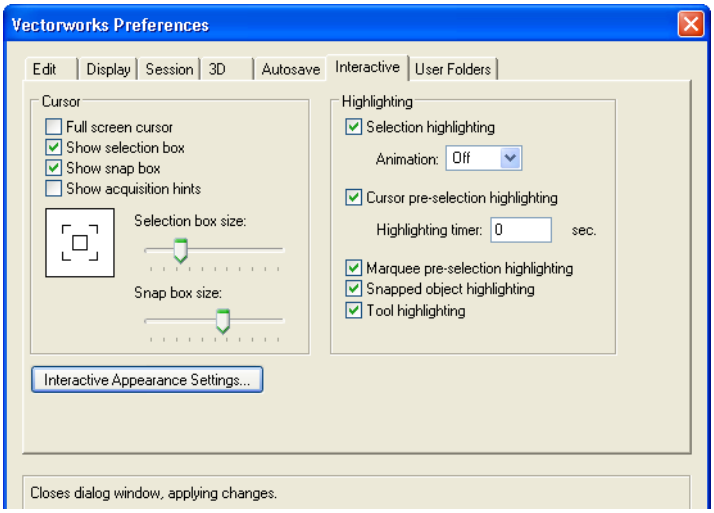
This tab offers settings for the Vectorworks interface.



Session tab



Interactive tab



2 Exercise 1: Handling Vectorworks

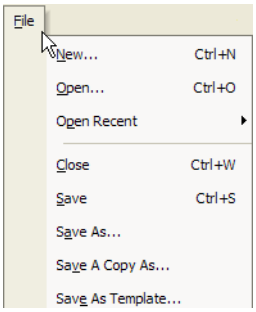
2.1 Preparing an Exercise

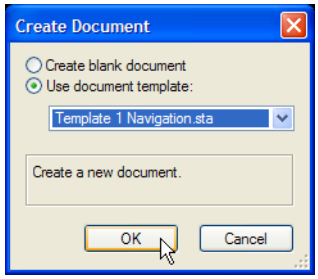
■ At the beginning of each exercise, a template file with all needed elements is opened and saved under a new name. Before doing that, scale, unit size (mm, cm...) and drawing size should be checked and edited if required. This step is explained here for the first exercise. For later exercises, the settings will only be listed shortly. ■

2.1.1 Opening the Template File

1 Before opening a template file, close all open files. Either use Ctrl+W or choose **File** > **Close**.

2 To open the template, choose **File** > **New**.





3 Click **Use document template**.

4 Choose the template **Template 1 Navigation.sta**.

5 Click **OK** to confirm.

Notes:

2.1.2 Document Settings

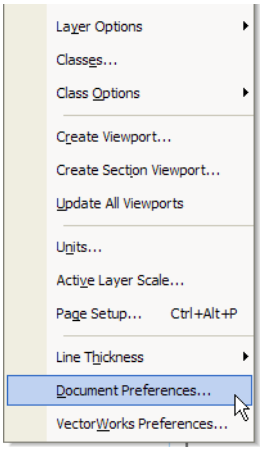
In addition to the global - not document-dependent - settings, there are also **document-specific** settings.

■ The settings are different for each exercise, so in this section, you will only get a short overview of possible settings for a file. The settings for the exercises are already made in the templates. ■

The Document Settings dialog can be accessed from the contextual menu.

1 Right-click an empty space on the drawing.

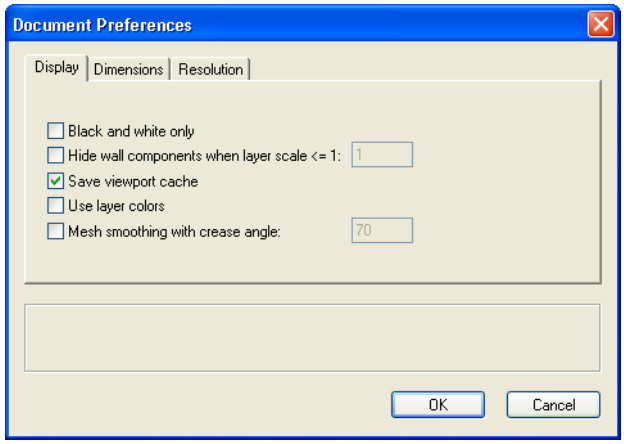
2 Select **Document Preferences...** from the contextual menu.



The **Document Preferences** dialog is divided into tabs: Display, Dimensions and Resolution.

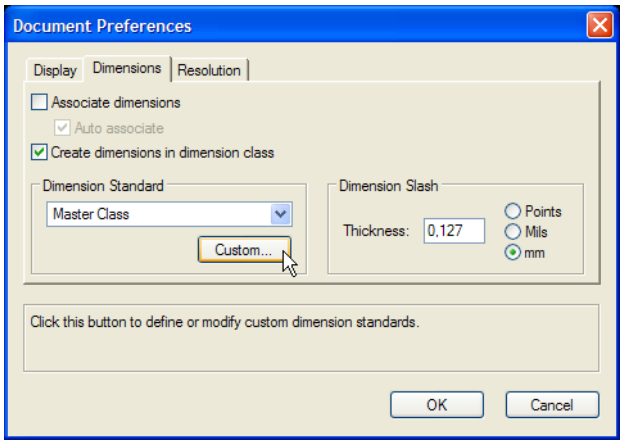
Display Tab

The settings on the Display tab define quality and speed of the screen display.

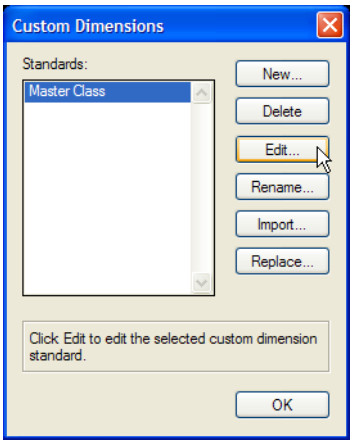


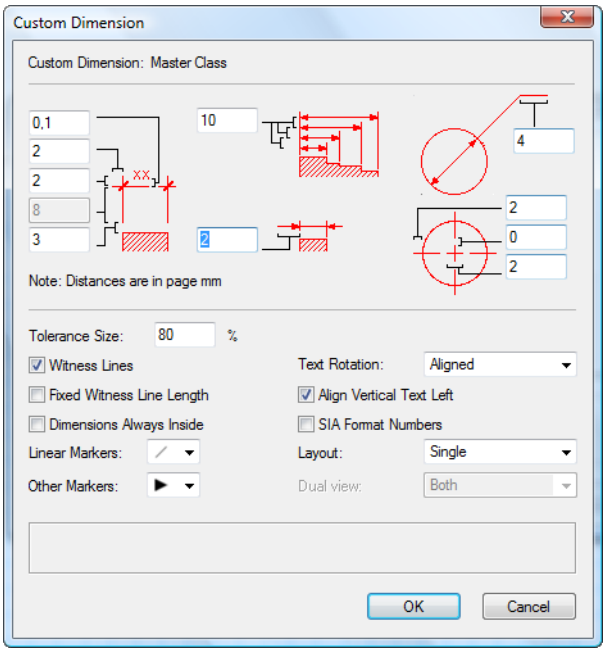
Dimensions Tab

In the Dimensions tab, dimensioning standards can be chosen or edited. Custom standards can be defined. Line thickness of the dimensions slashes can be defined and edited independently from the line thickness of the other dimensioning lines. If you want to edit the line thickness of the dimensioning lines globally via the class, you have to check the option Create dimensions in dimension class.



Click **Custom** to access the dialog **Custom Dimensions**. Click Edit to access the settings dialog.



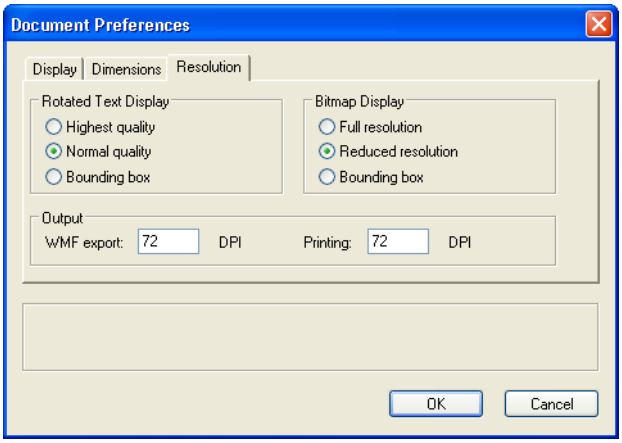


■ The format of the dimensioning numbers is not predefined by the dimensioning standard, but by the currently selected text attributes (Text menu). For example, if Helvetica 10 pt has been selected, dimensioning text will be written in this font and font size. This setting can be edited afterwards by selecting the text and editing the text attributes. ■

For our exercises, we use the dimensioning standard Master Class.

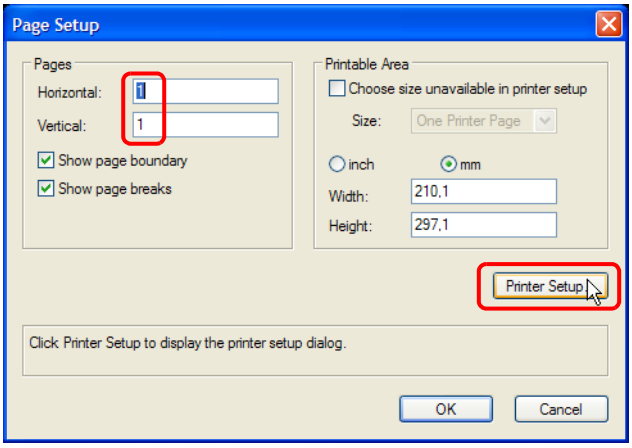
Resolution Tab

You can make settings for the display quality of different objects in Vectorworks in this tab.



2.1.3 Page Setup

The Page Setup dialog can also be accessed from the contextual menu. Right-click an empty space on the drawing and select **Page Setup...** from the contextual menu.



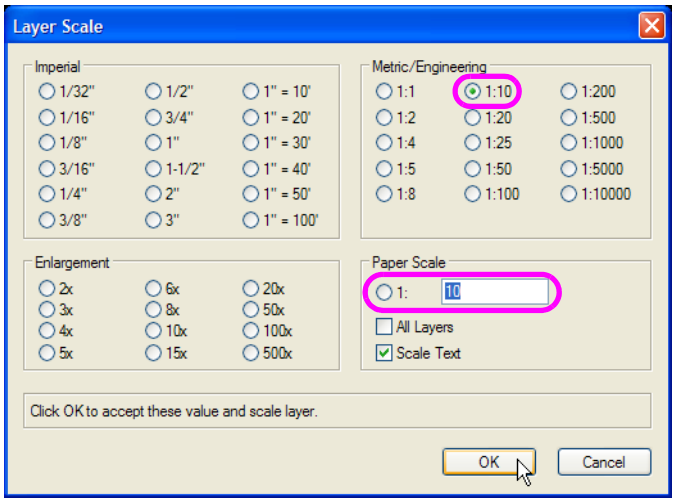
However, the Page Setup dialog does not determine the printer paper size and orientation. These setting are made in the printer's preferences.

We recommend you leave the size at One Printer Page and click Printer Setup to access the printer setup and edit the page size.

After selecting a printer and editing the page size and orientation, check the number in the Pages boxes. In horizontal and vertical directions, there should be one page each.

2.1.4 Defining the Layer Scale

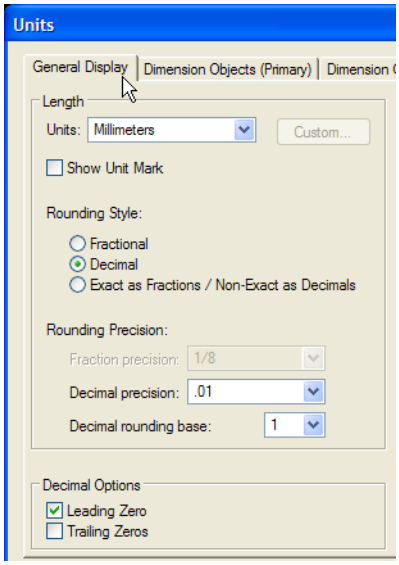
The Layer Scale dialog can also be accessed from the contextual menu. Right-click an empty space in the drawing and select **Active Layer Scale...**.

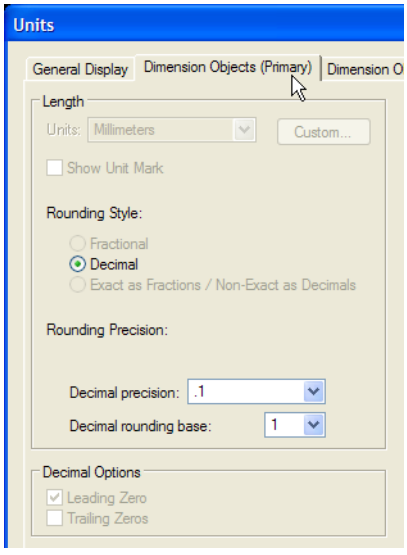


You can either select one of the scales or enter a custom value. The scale for the first exercise is **1:10**.

2.1.5 Defining Units

Select **Units...** from the contextual menu.





The screenshots show the recommended configuration for units in **Millimeters**. Check these settings briefly.

■ The units are already predefined in the document template for the exercises. Refer to the manuals for further details. ■

2.1.6 Save File As...

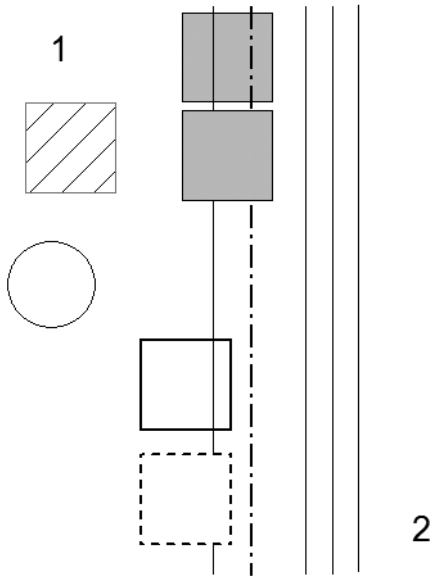
In the beginning, we opened a document template. To save our work, we save the document as Exercise #1 Navigation *SURNAME GIVEN NAME*..vwx .

Save your progress with the exercises regularly to prevent data loss by choosing **File** > **Save** or the keyboard shortcut **Ctrl+S**.

2.2 Carrying Out the Exercise

This exercise is designed to introduce you to Vectorworks controls before starting on the actual drawing exercises.

In the drawing of the template **Template 1 Navigation.sta** there are different sample objects:



2.2.1 Zooming

In addition to the Zoom tool and the Zoom Out tool, the most comfortable method of zooming is using the mouse wheel.

1 **Roll** the mouse wheel **up or down** to zoom in on or out of the drawing.

2 Before zooming in, place the **cursor** on a point in the drawing, for example one of the **numbers**, to zoom in on this point.

2.2.2 Panning with the Mouse Wheel

Another frequently used feature is moving a detail. With this tool, you can move the drawing on the screen.

1 To move the drawing, hold down the **mouse wheel**. The mouse cursor will be displayed as a hand symbol.

2 Move the drawing by moving the mouse.

3 Finally press **Ctrl+4** to display the complete drawing in the middle of the screen again.

2.2.3 Selecting Objects

There are several methods of selecting objects in the drawing for editing.

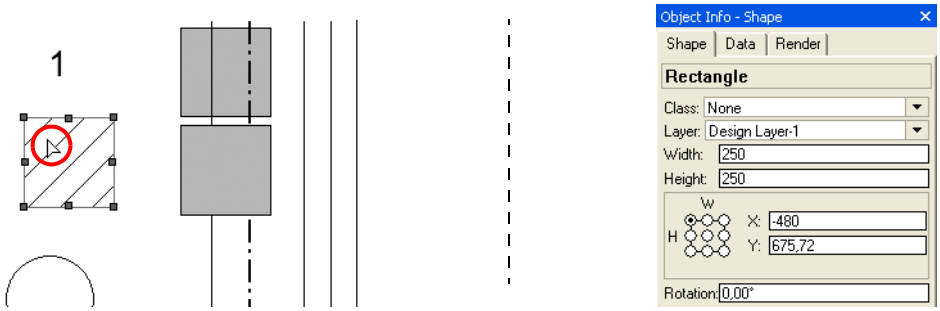
A Selecting an object by clicking

Press **X** to select the tool 2D Selection.

■ By pressing X, any active commands or tools are exited and the standard tool 2D Selection is called. Selection is the starting point for many commands and tools. ■

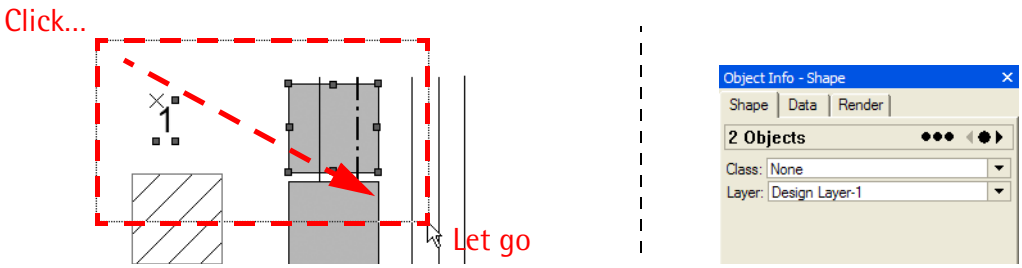
Click an object in the drawing.

When an object is selected, it is marked in orange. The **Object Info palette** shows further data and the dimensions of the object:



B Drawing a Selection Marquee

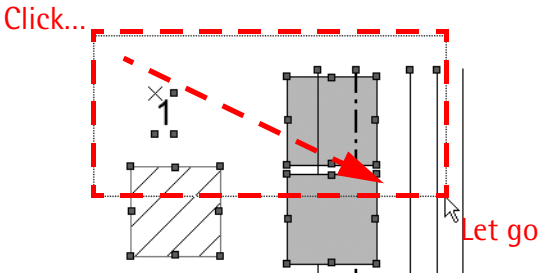
Only objects **inside** the selection marquee will be selected. You can draw a selection marquee by clicking the mouse and holding, drawing the mouse and then letting go of the mouse button.

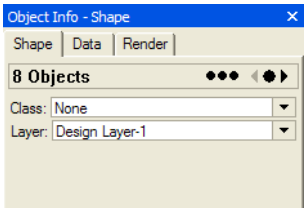


C Selection Marquee While Pressing the Alt Key

In addition to the objects inside the marquee, all objects **cut** by the marquee are also selected.

Draw a selection marquee over the same area as in A) while pressing Alt.





D Selecting Multiple Objects by Clicking

Select an object by clicking.

Then **hold** down **Shift** (⇧) and click further objects to add them to the selection.

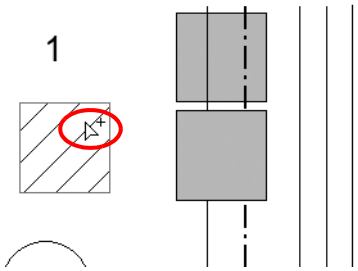
■ Make sure to hold down Shift (⇧), *NOT* Ctrl! Otherwise, a copy would be made of every clicked object (see below). ■

Notes:

2.2.4 Duplicating and Deleting Objects

1 Hover the cursor over an object and then press **Ctrl**.

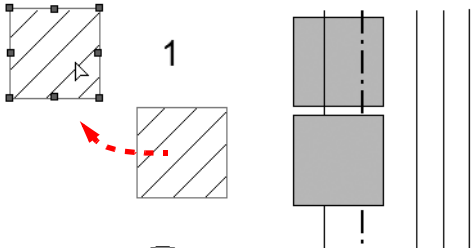
A little "plus" sign is displayed next to the cursor:



2 **Click** the object while pressing **Ctrl**.

You will see no immediate result in the drawing, but a copy of the object has just been made.

3 **Click on the copy and move** it while holding the mouse button. Now the original object appears under the copy.



In a similar way, a duplicate of any object can be extracted with the mouse.

4 Hover the mouse over an object and hold down **Ctrl** and the **left mouse button**.

5 Then move the mouse. When you let go of the mouse button after that, the duplicate is placed in the drawing.

To end the exercise, remove the duplicates by selecting them and pressing **Del**.

2.2.5 Undo and Redo

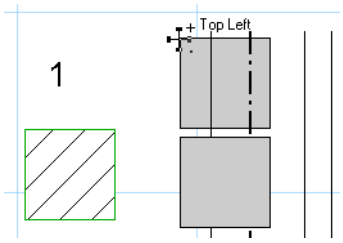
Every step can be undone by choosing **Edit** > **Undo** (or **Ctrl+Z**). If you have undone to many steps, you can redo them with choosing **Edit** > **Redo** (or **Ctrl+Y**).

Try out these functions by using the shortcuts.

2.2.6 Moving Objects With the Mouse

1 Move the mouse cursor next to a corner of the square. The cross-shaped Snap cursor (Move cursor) is displayed.

Snap cursor
(Move cursor)



2 **Hold** the **left mouse button** to grab the object at the corner vertex and move it.

3 Hover the mouse cursor over the Engage point of another object - e.g. the corner vertex of another square - and then let go of the mouse button.

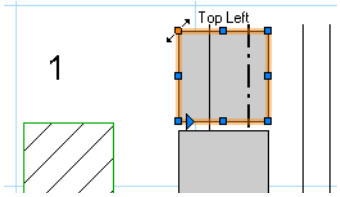
■ To **move objects in horizontal or vertical alignment**, hold down **Shift** while moving them. ■

2.2.7 Reshaping Objects With the Mouse

1 Select one of the squares by clicking it.

2 Point the cursor at the corner point of a square. The double-arrow-shaped Reshape cursor is displayed.

Reshape cursor



3 Click once to start transforming.

4 Now you can transform the object with the mouse, e.g by capturing other points and adapting it to other objects.

■ If you press **Shift** while transforming, the aspect ratio of rectangles will be kept. The cursor's behaviour can be adjusted on the Tool bar. ■

5 Click a second time to end transforming.

Notes:

_____

_____

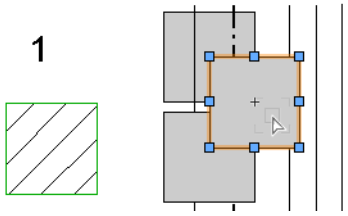
_____

2.2.8 Sending Objects

Objects can be behind or in front of other objects in the drawing. By default, they will be displayed according to the order in which they were drawn.

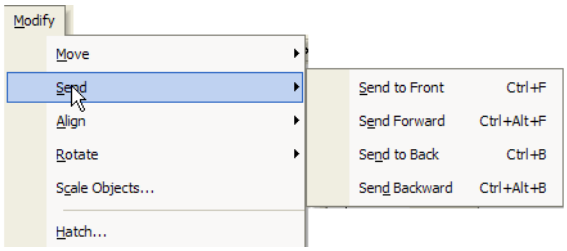
To illustrate this point, have a look at the gray squares. The upper square is behind the vertical lines, the lower one is in front of them.

1 Make a copy of the upper square while pressing Ctrl as described in chapter 2.2.4 and place it as shown below:

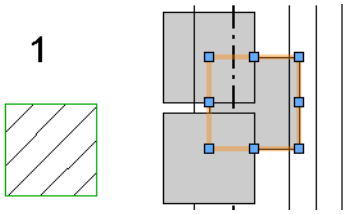


The copy was made after the other two squares and after the lines. It is therefore in front of all the other objects.

The order of the objects can be changed using the command Send. This command can be called either from the Modify menu or via the shortcuts displayed below.



2 Make sure that the copy you just made is still selected. Then send it to the back using **Ctrl+B**.



3 Press **Ctrl+F** to send it back to the front.

4 For better visibility of the next step, zoom in on the square as described in the previous chapter until it covers up all other objects.

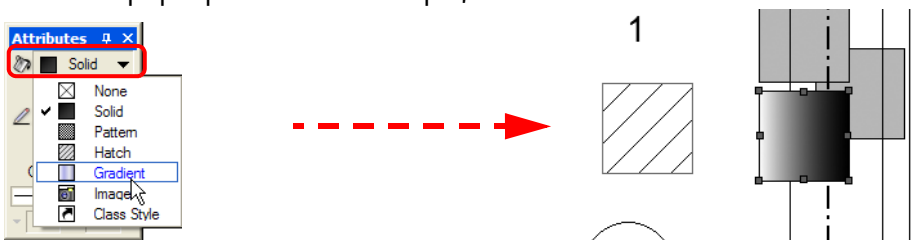
5 To send the square backward and forward step by step, use **Ctrl+Alt+B** and **Ctrl+Alt+F** respectively.

2.2.9 Attributes Palette

Object properties like color/fill style, line weight and line style are defined in the Attributes palette.

A Fill Style

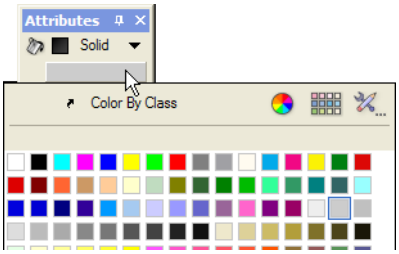
Select one of the gray squares. Then click the box next to the bucket symbol and choose a fill style from the pop-up menu for example, Gradient.



In addition to the **Gradient** fill style, there are **None** (the object will only show lines), **Solid** (opaque color inside the object), **Pattern**, **Hatches** (see the green-lined square on the left), **Image** and **Class style**.

B Solid Fill Color

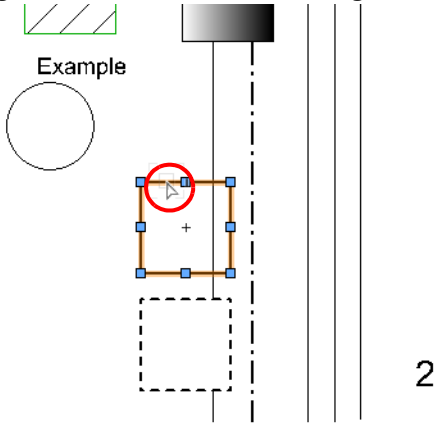
Select one of the gray squares. Then click the color selection box and choose a color.



C Objects With the None Fill Style

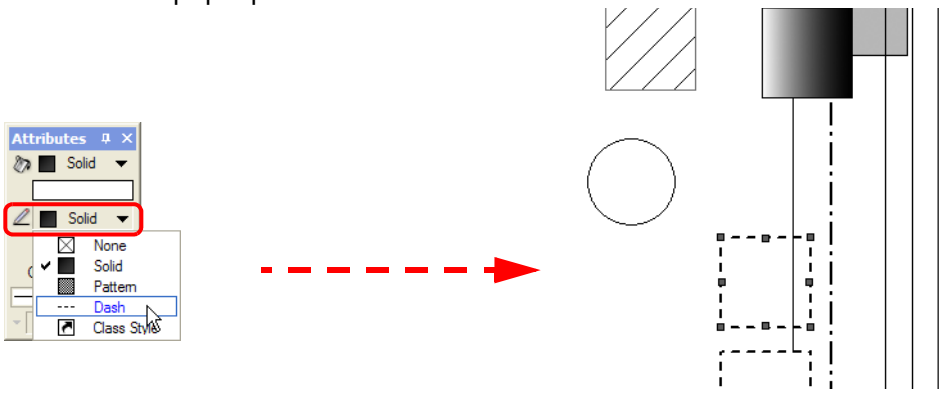
Objects with the None fill style do not have fills. They consist only of the lines. They can only be selected by clicking the lines.

One of the lower squares is such an object. If you click inside it, nothing will happen. Select it by **clicking the lines**, send it to the front by pressing Ctrl+F and move it over another object. The objects in the background remain visible through it.

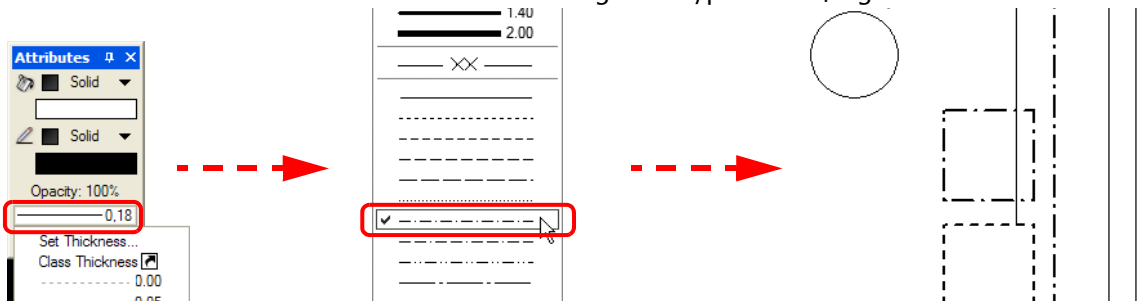


D Lines

Select any object. Then click the box next to the pen icon in the Attributes palette and choose Dash from the pop-up menu.

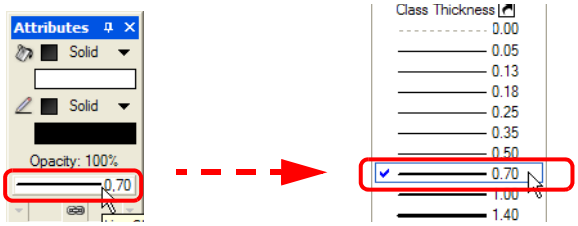


Then click the box for the line attributes and change the type of line, e.g. into a dash-dot line.



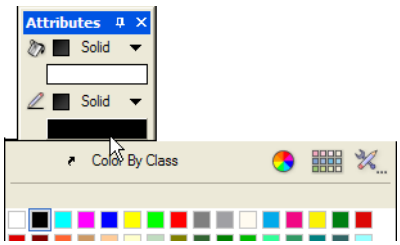
E Line Weight

You can also adjust line thickness in the pop-up menu shown above. For example, change the line thickness of the circle to .7 mm.



F Pen Color

Select any object. Then click the lower color selection box in the Attributes palette and choose a different color.



G Set Basic Attributes Preferences

The basic preferences of the attributes palette apply to all new objects. They can be adjusted as desired.

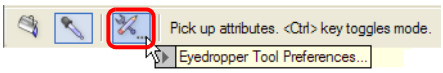
Make sure no objects are selected while you adjust the preferences. To apply the new preferences, click once on an **empty space** in the drawing.

H Copying Attributes

You can copy and paste attributes from one object to another.

Choose the **Copy Attributes** tool from the Basic palette. Now click one of the squares with the **Eyedropper** tool to copy its attributes. Then press **Ctrl** and paste the attributes onto other objects with the **paint bucket**.

You can choose which attributes to copy via the preferences dialog in the Tool bar.



■ We recommend you try out the features described above at will. Please refer to the manuals and the Vectorworks help for further information about specific points. ■

Notes:

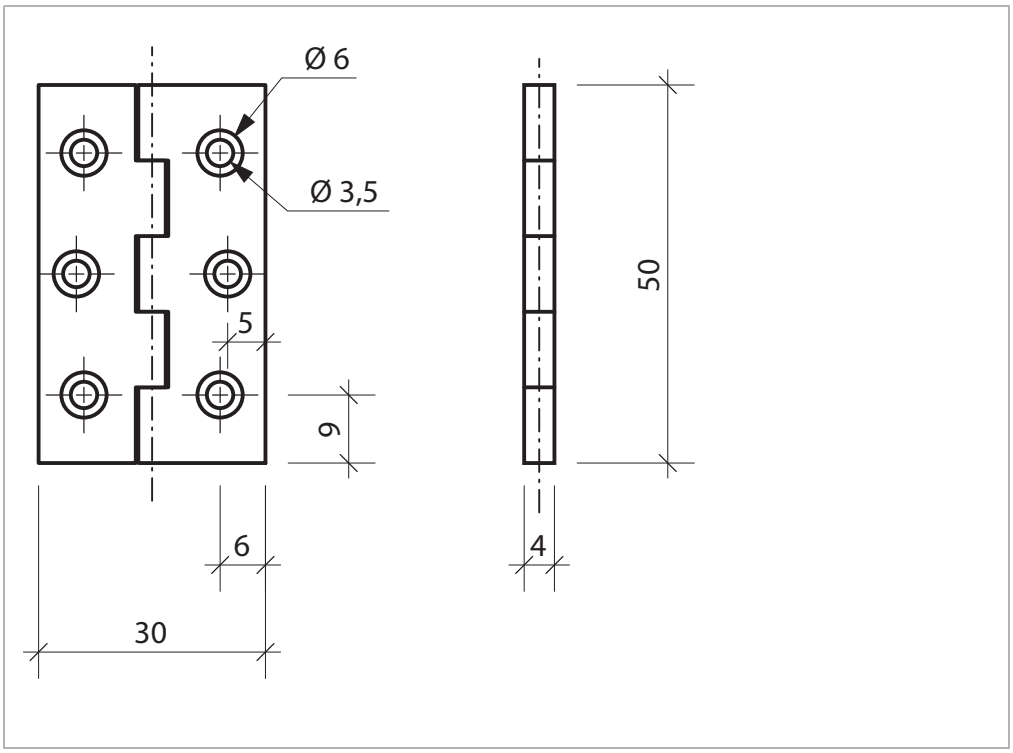
3 Exercise 2: Furniture Hinge- 2D Drawing

Open the template file **Template 2 Furniture Hinge.sta** and check the document preferences:

- Paper format *A4 landscape* (Printer format)
- Scale *1:1*
- Units in *mm*

Save the file as **Exercise #2 Furniture Hinge** *SURNAME GIVEN NAME*.**vwx**.

The object of the exercise is for you to create the following drawing:



Line Thicknesses:

- Object Edges: Solid line .5 mm
- Symmetry axes: Dash-dot line .25 mm
- Center marks of drillings: Solid line .18 mm
- (Dimensioning lines: preset at .13 mm in the class Dimensions)
- (Hidden edges (Symbol): Dash line .18 mm)

Fonts:

- box and heading: Arial 14 pt
- Dimensioning numbers: Arial 12 pt (see remark on page13)

In this chapter, you will learn about the following features and commands:

- Draw Rectangle via dialog box
- Editing objects via the Object Info palette
- Draw Circle via dialog box
- Move objects (Ctrl+M)
- The Mirror tool
- Use Duplicate Array (Ctrl+Shift+Alt+D) to move and duplicate objects
- The Center Mark tool
- The Trim tool
- The 2D Polygon tool
- The Constrained Linear Dimension tool
- The Radial Dimension tool
- The Text tool

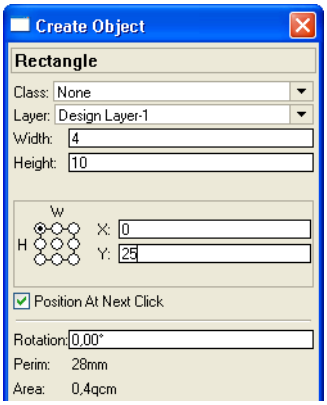
3.1 Front View

The first design step is drawing a front view of the hinge. We start with the middle part - the roll. After that, we add the sides and set the drillings with center marks.

3.1.1 Knuckle

1 **Double-click** the **Rectangle** tool in the Basic palette.

2 Enter edge lengths of **4** mm by **10** mm and click **OK** to confirm.



3 Place the rectangle in the approximate **middle** of the drawing.

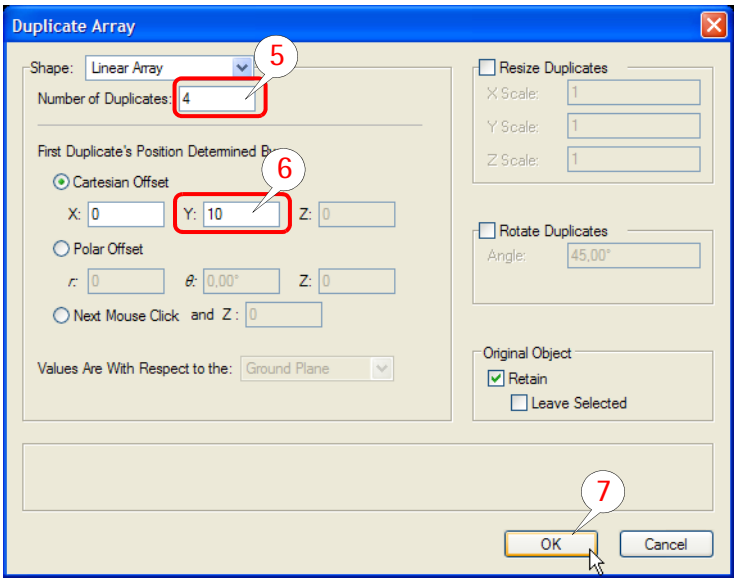
Now duplicate the rectangle **four** times.

4 Select Edit > Duplicate Array... or enter the keyboard shortcut **Ctrl+Shift+Alt+D**.

5 Set **4** copies in the Duplicate Array dialog.

6 Enter a Y offset of **10** mm.

7 Click **OK** to confirm.

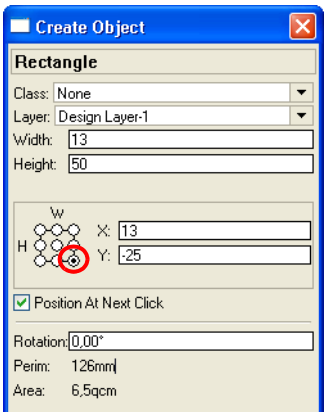


3.1.2 Sides

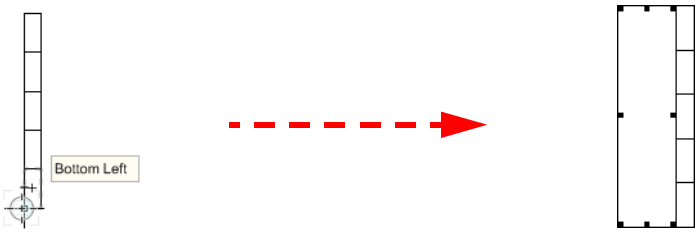
1 **Double-click** the **Rectangle** tool in the Basic palette.

2 Enter edge lengths of **13** mm by **50** mm.

3 Choose the **bottom right corner** as **insertion point** for the rectangle and click **OK** to confirm.



4 Place the rectangle as shown below.



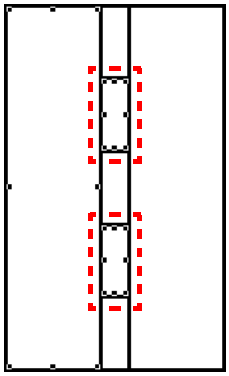
5 Draw another rectangle with the same edge lengths (**13** mm / **50** mm) on the right side. Make sure its **point of insertion** is the **bottom left corner**.

6 Press **X** to exit the Rectangle tool.

Notes:

3.1.3 Add Surface

1 Select the **large rectangle on the left** and the **two small rectangles indicated below**. To do so, press **Shift** while clicking the objects.

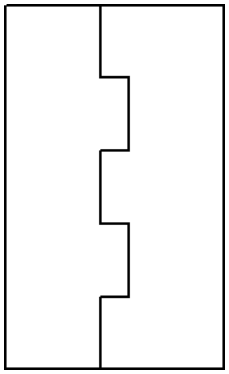


The Object Info palette should now show 3 Rectangles.

2 Now choose **Modify > Add Surface**.

3 Repeat steps 1 and 2 with the large rectangle on the right and the remaining **three small rectangles** to create the right side of the hinge.

Your drawing should now look like this:



There should be a narrow gap between the two parts of the hinge. To create it, we use the Object Info palette to reduce the Width (X) of each side by .2 mm. Make sure you select the correct point of modification.

4 Select the left half of the hinge and set the modification point in the **Object Info palette** to **bottom left**.

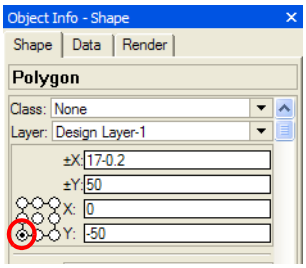
Notes:

_____

_____

_____

5 Then enter the arithmetic operation **-.2** after the value displayed in the **±x** box and press **Enter** to confirm.



6 Repeat with the **right half of the hinge**. Make sure that the point of modification is set to **bottom right** this time.

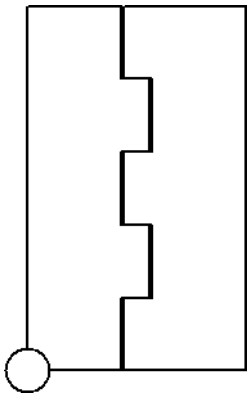
3.1.4 Drilling

Next we draw one of the drillings: two concentric circles and a center mark.

1 **Double-click** the **Circle** tool in the Basic palette.

2 Enter a **diameter** (!) of **6** mm in the Create Object dialog.

3 Click **OK** to confirm and place the circle by clicking the **bottom left** corner of the hinge (cue: Point).



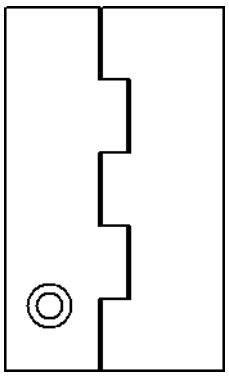
4 Make sure the circle is selected and press **Ctrl +M** to call Move.

5 Enter **6** mm in the **X Offset** box and **9** mm into the **Y Offset** box. Click **OK** to confirm.

The circle is now moved to the desired position, representing a through drilled hole.

6 Draw another circle with a **diameter** (!) of **3.5** mm and place it **concentric with** the other circle (cue: Center), representing a through drilled hole.

Your drawing should now look like this:

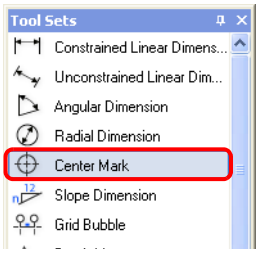


3.1.5 Center Marks for Drillings

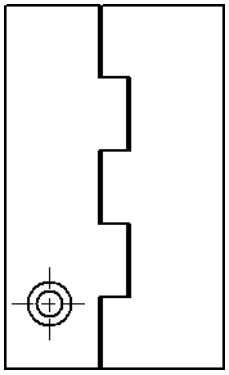
In the next step we draw the center marks for the drillings.

1 Change to the **Dims/Notes** tool set.

2 Select the **Center Mark** tool.



3 Then click the **large circle** in your drawing.



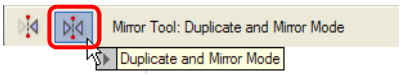
4 Select both circles and the center mark. Then choose **Modify** > **Group** or press **Ctrl+G**.

5 Make sure to save your drawing every now and then (**Ctrl+S**).

3.1.6 Duplicate Drilling

1 Select the group you just created (*Object Info palette*: Group). Then choose the **Mirror** tool from the Basic palette.

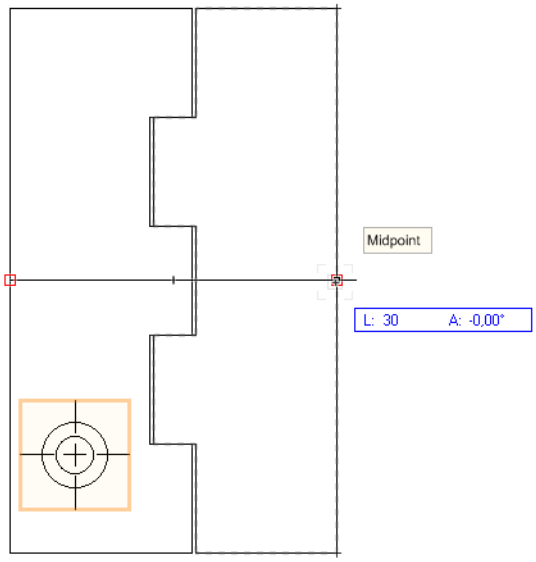
2 Select **Duplicate and Mirror Mode**.



Next we determine the mirror axis using SmartCursor cues.

3 Hover your mouse over the **middle** of the **left side of the hinge**. Click when Vectorworks shows that you are at the **Midpoint**.

4 Repeat step 3 on the right side.



5 Select one of the groups and make a **copy** by **moving** the elements while pressing **Ctrl**.

6 Move the copy to the center of the left outer edge (cue: Midpoint).

7 Press **Ctrl+M**. Enter an X offset of **5** mm and a Y offset of **0** mm. Click **OK** to confirm.

3.1.7 Symmetry axis

Now we need a symmetry axis for the whole hinge. We will also use it to mirror the three drillings to the right.

1 Click the **Line** tool and choose a **dash-dot line** .25 mm from the **Attributes palette**.

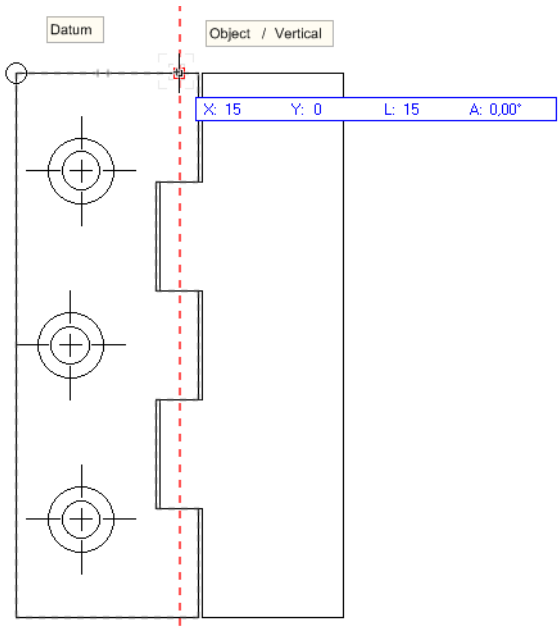
The hinge is 30 mm wide.

2 Hover your mouse over the top left corner of the hinge and create the Floating Datum **T** at this corner.

3 Press **Tab twice** and enter an X offset of **15** mm. Press **Enter** to confirm.

The mouse cursor is moved by the X offset and we can now set the initial point of our line at the top edge of the hinge.

4 Hover the mouse cursor over the intersection point of top edge and vertical help line and click when Vectorworks shows the cue **Object/Vertical**.



5 Draw a straight vertical line with the mouse cursor. Set the end point some millimeters below the bottom edge of the hinge.

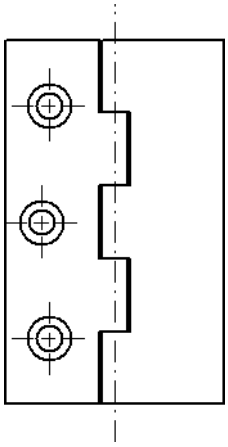
The line should also protrude some millimeters over the top edge of the hinge.

6 Press **X** to exit the line tool.

7 Hover the mouse cursor over the top modification point of the axis line. Click when the **Reshape cursor** (⤢) shows up.

8 Draw the line upwards a few millimeters. Set the new initial point with a second click.

The intermediate result should now look like this:



3.1.8 Mirroring Drillings

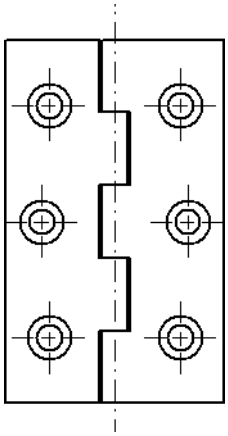
Finally, we mirror the three drillings to the right using the symmetry axis.

1 **Select** the **three groups** (Drillings with center marks) by clicking them while pressing **Shift**.

2 Choose the **Mirror** tool from the Basic palette. Select **Duplicate and Mirror Mode**.

3 Set the mirror axis between initial point and end point of the central axis.

Now the front view is finished:

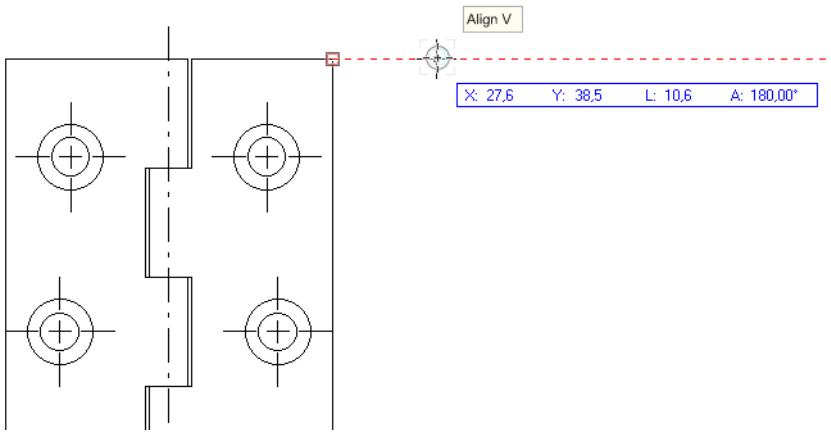


3.2 Side View

1 **Double-click** the **Rectangle** tool.

2 Enter dimensions for a rectangle with the edge lengths **4** mm / **50** mm. Choose the top left corner as insertion point.

3 To insert the rectangle, hover your mouse cursor first over the top right corner of the front view and then to the right. The cue **Align V** will show up. Insert the rectangle some centimeters next to the front view.



4 Press **X** to exit the rectangle tool.

3.2.1 Symmetry Axis

We copy the symmetry axis from the front view.

1 Select the symmetry axis in the front view.

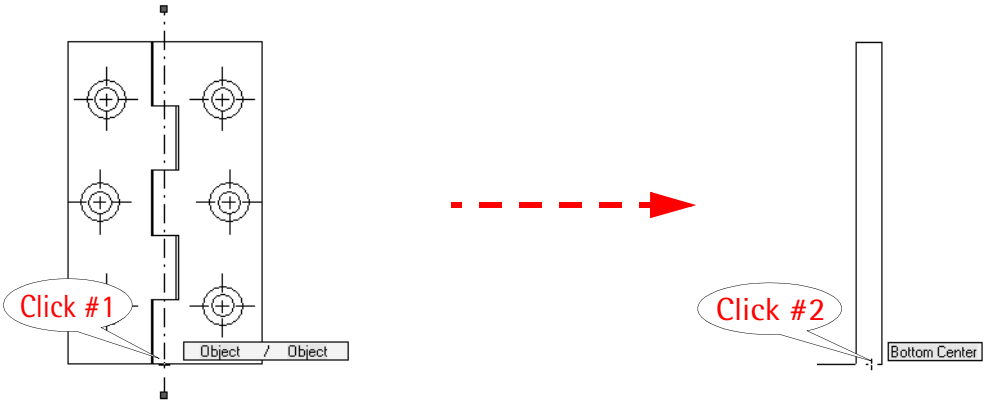
2 Press **Ctrl+C** to copy the symmetry axis and then **Ctrl+Alt+V** to paste it at the same place.

3 Choose the **Move by Points** tool from the **Basic** palette.

4 Select **Move Mode**.

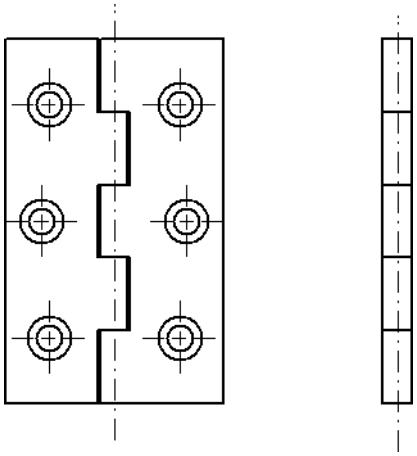
5 Hover the mouse over the intersection point of symmetry axis and bottom hinge edge (cue: **Object/Object**) and click (**Click #1**).

6 Place the end point of the vector on **Bottom Center or Lowercase** of the side view (**Click 2**).



7 Press **Ctrl+F** to send the duplicate to the front.

8 Draw the four missing lines. You can copy the initial points from the front view.



3.3 Dimensions and Text

In the last step, we add dimensions and text boxes to the drawing.

3.3.1 Dimensioning Distances

First set preferences for the text attributes.

1 Click an empty space in the drawing. Make sure no objects are selected.

2 Choose **Text** > **Format Text...**.

3 Set the font to **Arial** and size to **12 pt**. Click **OK** to confirm.

4 Choose the **Constrained Linear Dimension** tool from the **Dims/Notes** tool set.

5 Dimension as shown on page 37. To do so, determine start and end points of each distance to be dimensioned and then place the dimensioning line at a desired distance.

■ To achieve a more unified drawing, change the distance in the Object Info palette.. ■

6 Press **X** to exit dimensioning.

3.3.2 Dimensioning Circles

Before duplicating, we grouped two circles and a center mark into a drilling. One of these groups has to be dissolved so we can dimension it.

1 Select any group for dimensioning.

2 Press **Ctrl+U** or choose **Modify** > **Ungroup** to ungroup the objects.

3 Choose the **Radial Dimension** tool.

4 Choose **Exterior Radial Dimension Mode** and **Right-Hand Shoulder Mode** on the Tool bar.

5 Click the **outer edge** of the large circle with the crosshairs cursor.

6 Move the cursor to the top right and click to place the dimensions.

7 Repeat from step 3 for the small circle. Press **X** to exit dimensioning.

3.3.3 Text

Now we add a heading and a caption to the drawing.

1 Choose the **Text** T tool from the Basic palette.

2 Click above the drawing and enter FURNITURE HINGE ONI 30x50x4.

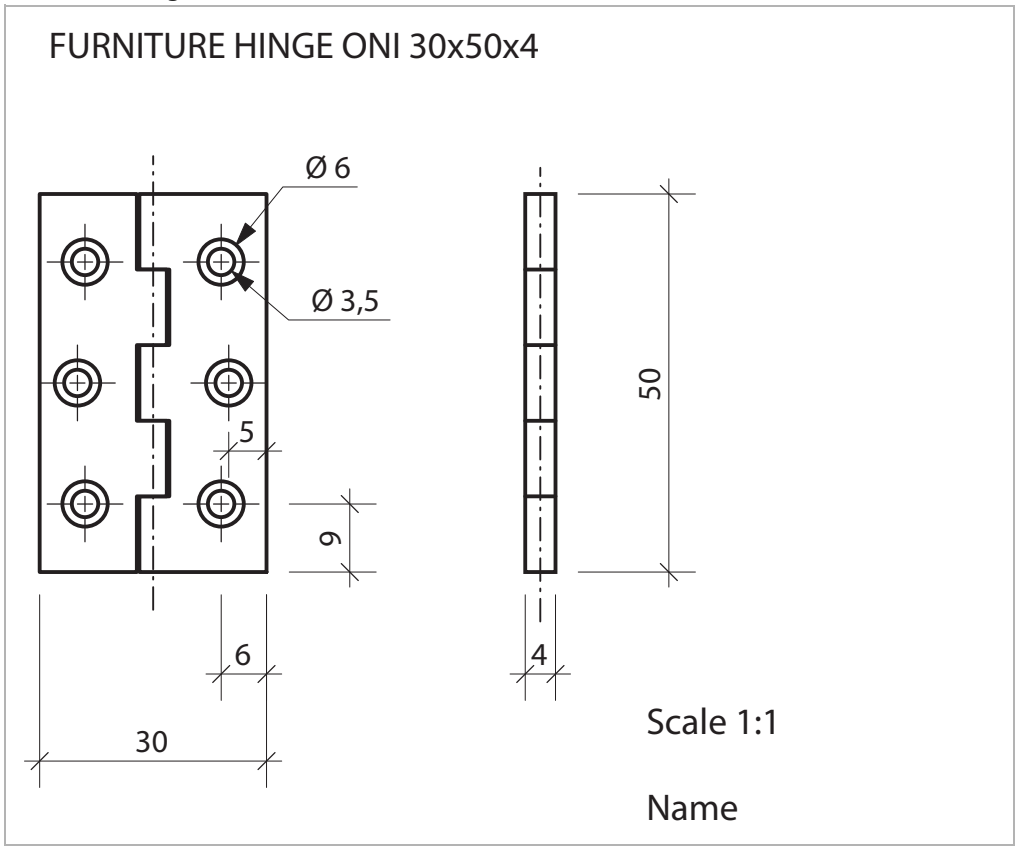
3 Press **Esc (!)** to exit the text tool.

4 Choose a font size from the Object Info palette.

5 Add a caption stating the scale and your name in the same way.

6 Adjust line thicknesses in the Attributes palette.

7 Save the drawing.



Notes:

_____

_____

_____

3.4 2D Symbol

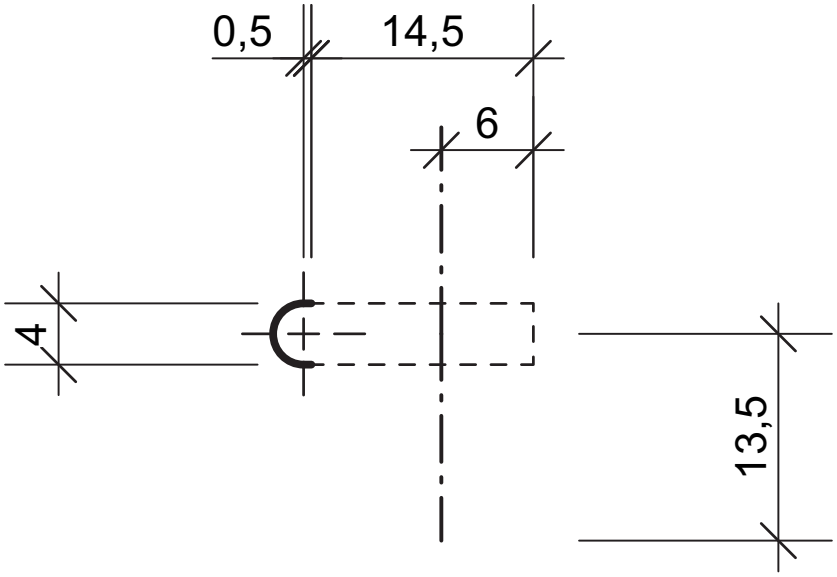
In this short exercise, we will create a symbol from the hinge, that is then used in the following exercise.

3.4.1 About Symbols

By using symbols, frequently used elements can be saved and placed in the drawing as often as desired. It is also possible to insert symbols from other drawings into the current drawing. The selected symbol is then automatically transferred to the current document's resources. Symbols also update themselves: If you make changes to one symbol, they will be transferred to all other instances of that symbol.

3.4.2 Drawing symbol content

The symbol is to be used in cross-section drawings. It shows the built-in hinge.



■ Since you already know most of the tools used here, the drawing of the symbol is not described at length. ■

1 Draw a **Circle** (Solid line .5 mm) with a diameter of **4** mm and a **center mark** (Solid line .18 mm).

2 **Select** the Trim tool in the Basic palette.

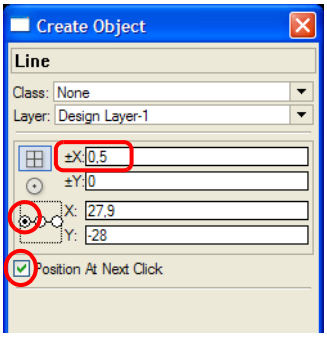
3 Now **click** the **edges** (!) of the **top right** and **bottom right** circle segments to remove them.

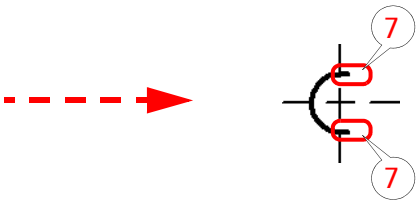
4 Press **X** to exit the tool.

5 **Zoom in** on the half-circle as close as possible.

Add two lines of .5 mm length (solid line .5 mm) to the top and bottom of the half-circle to represent the extensions of the sides.

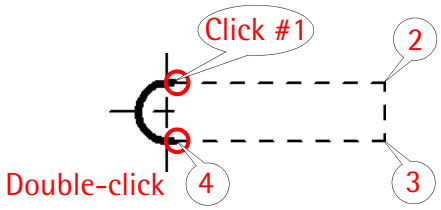
6 Double-click the **Line** tool and enter **.5** mm into the **±x** box. Set the **insertion point at the left** and click **OK** to confirm.





7 Select the **Polygon** tool from the Basic palette.

8 Draw a 14.5 mm by 4 mm rectangular polygon (dash line .18 mm) (**Clicks #1** to **3** and **Double-click #4**).



9 Set the polygon's **fill style** to **none** in the Attributes palette!

10 Finally use the **Line** tool to draw **two axis lines** with a length of 13.5 mm (Dash-dot-line, .25 mm). The lines should have an offset of 6 mm from the right edge (see illustration on page 38)

Notes:

_____

_____

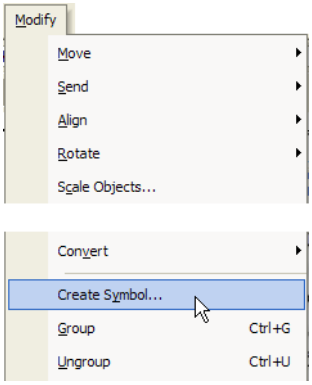
_____

_____

3.4.3 Creating a Symbol

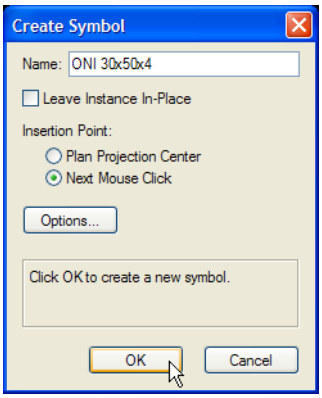
1 **Select** all objects to be included in the symbol (7 objects).

2 Choose **Modify** > **Create Symbol...**.

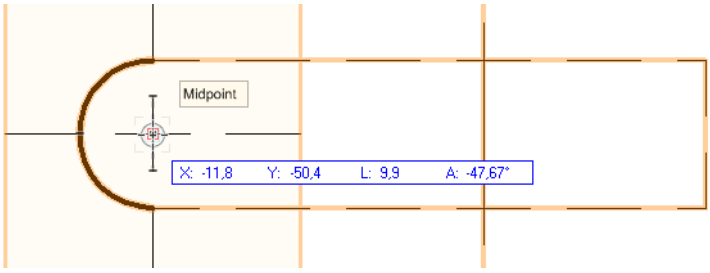


3 Enter **ONI 30x50x4** in the Name box of the Create Symbol dialog.

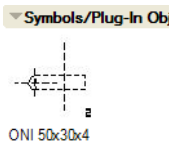
4 Choose **Next click** as Insertion Point of the symbol. Click **OK** to confirm.



5 The cursor becomes a crosshairs. Click the knuckle of the roll to turn it into the **insertion point**.



The objects are removed from the drawing. The new symbol is displayed in the Resource Browser.



You can now save your work.

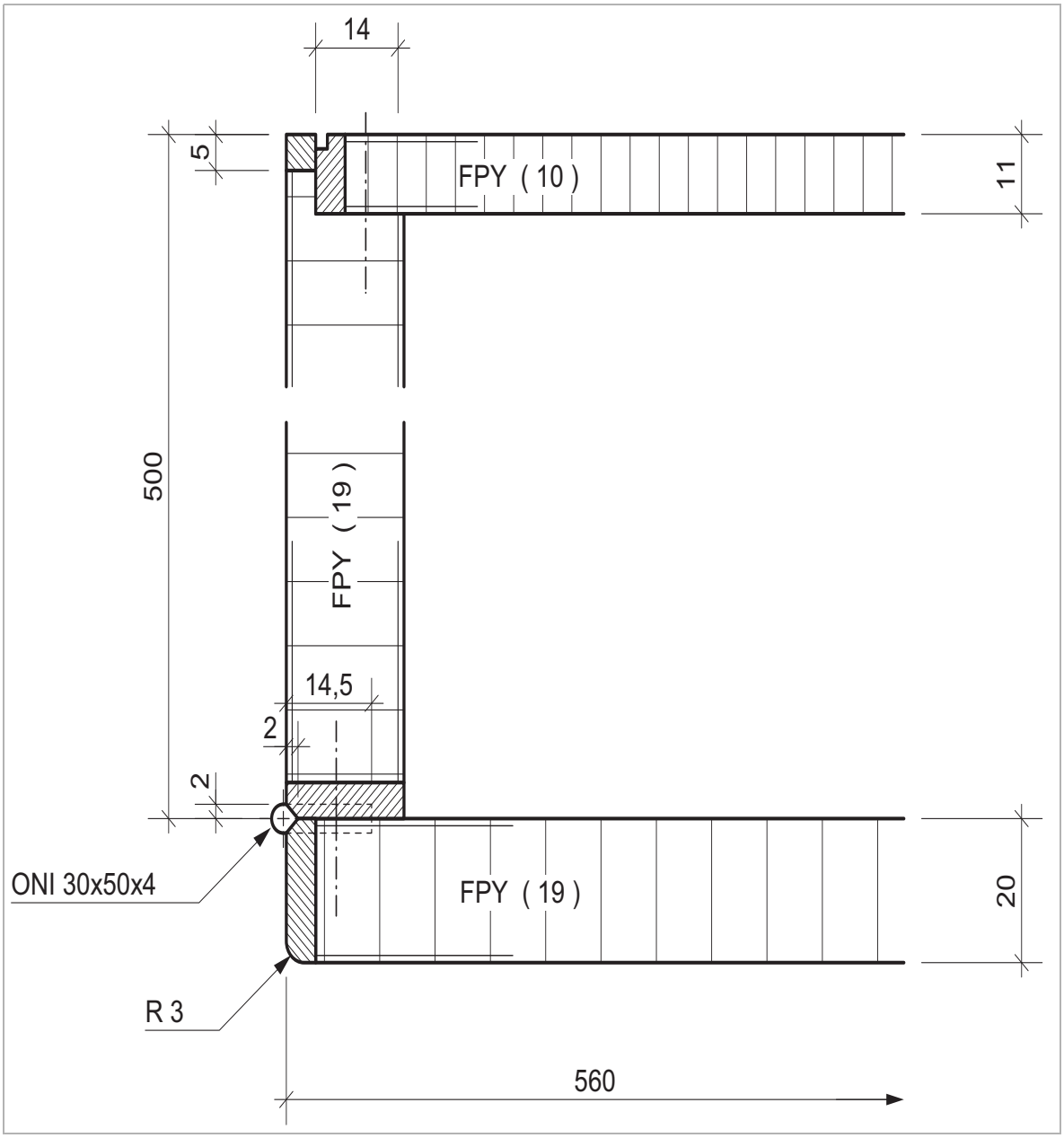
4 Exercise 3: Detailed Cross Section – Hatches and Classes

Open the template **Template 3 Detailed Cross Section.sta** and check the document preferences:

- Paper format *A4 Portrait* (Printer format)
- Scale *1:1*
- Units in *mm*

Save the document as **Exercise #3 Detailed Cross Section** *SURNAME GIVEN NAME*.**vwx**

The goal of this exercise is to create the following horizontal cross section of a cabinet:



Line Thicknesses:

- Object edges: Solid line .5 mm
- Hidden edges: Dash line .18 mm
- Veneer lines: Solid line .18 mm
- Axes: Dash-dot line .25 mm
- (Dimensioning lines: preset at .13 mm in the class Dimensions)

Fonts:

- Heading: Arial 18 pt
- Dimensions and other text: Arial 12 pt

In this chapter, you will learn about the following features and commands:

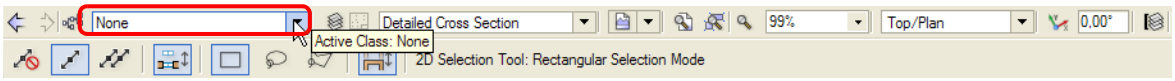
- The Fillet tool
- The Chamfer tool
- Creating and editing hatches
- 2D Reshape
- The Clip tool
- Using symbols
- The Double Line tool

4.1 Creating a Basic Design

4.1.1 Drawing Surfaces

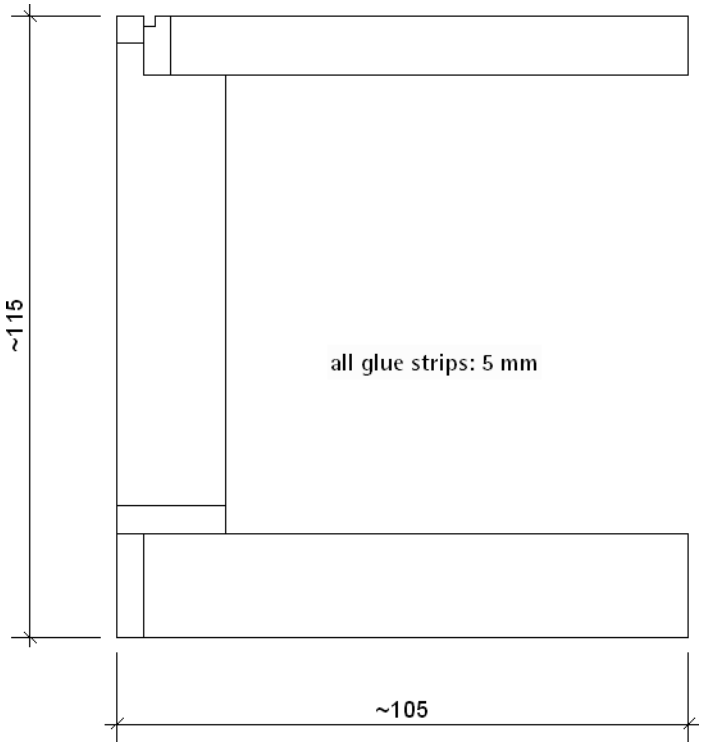
We first draw the parts of the cabinet as surfaces. Since we are already familiar with the tools used to do this - Rectangle and the Add Surface command - the steps for this section are only briefly described.

1 Before starting the drawing, make sure that **None** is the **active class**. Change the setting via the View Bar if required.



■ New objects are always assigned to the active class. A unified assignment is practical before starting a new drawing. ■

2 Create the following drawing - without dimensions and text - using the Rectangle tool and Add Surface.



Please refer to the illustration on page 41 for dimensions. Where dimensions are missing, create appropriate dimensions.

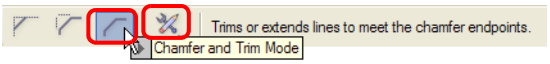
■ The dimensions in the illustration are only a guideline for the approximate size of the drawing, not for the outer dimensions of the cabinet. ■

4.1.2 Chamfer

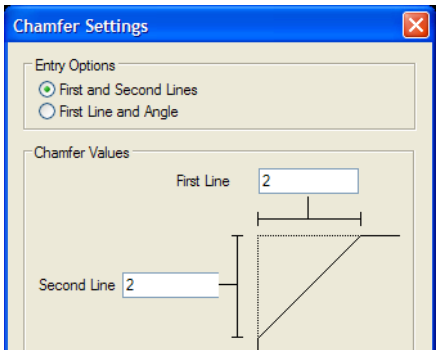
The gap between door and cabinet side should be V-shaped. We chamfer both edges.

1 Select the **Chamfer** tool from the Basic palette.

2 Select the **third** mode on the Tool bar, then click **Chamfer Preferences...** on the Tool bar.

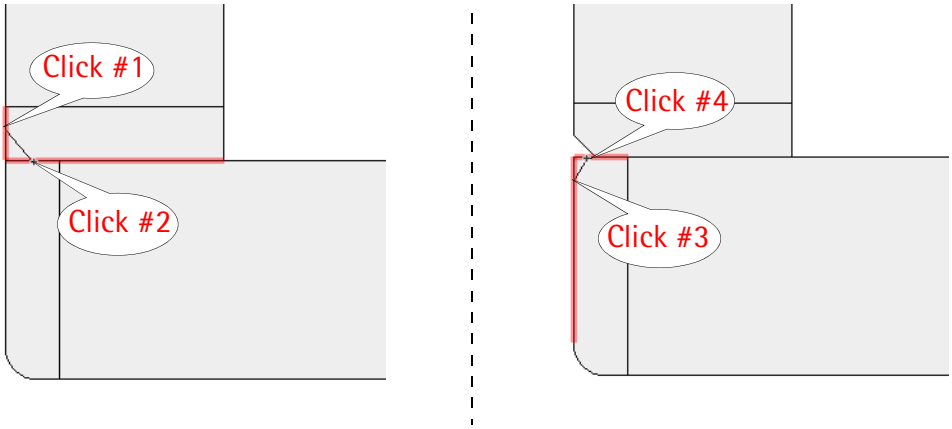


3 Choose the option **First and Second Lines** in the Preferences dialog. Enter a value of **2** mm for both lines and click **OK** to confirm.



4 Click the edges to be chamfered like you did for the fillet - first the side of the cabinet (**Clicks #1** and **2**), then the door (**Clicks #3** and **4**).

■ First chamfer the cabinet side edge strip. When chamfering the door, make sure to place click 4 on the left part of the line, within the V-shaped gap. Otherwise, the line of the top edge strip will be taken into account in chamfering and there will only be a short line. ■



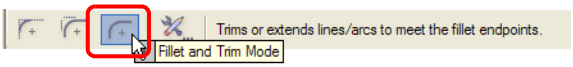
5 Press **X** to exit the tool.

4.1.3 Fillet

The drawing on page 41 shows that the door's outer edge has a fillet.

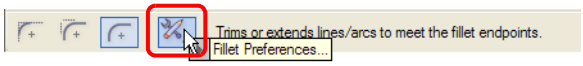
1 Click the **Fillet** tool in the **Basic** palette.

2 Choose the third option, **Fillet and Trim Mode**, in the Tool bar.

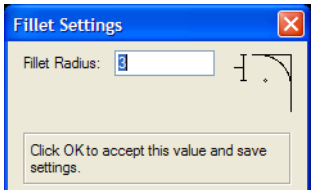


Before we start filleting, we adjust the tool's settings.

3 Click **Fillet Preferences...** in the Tool bar.



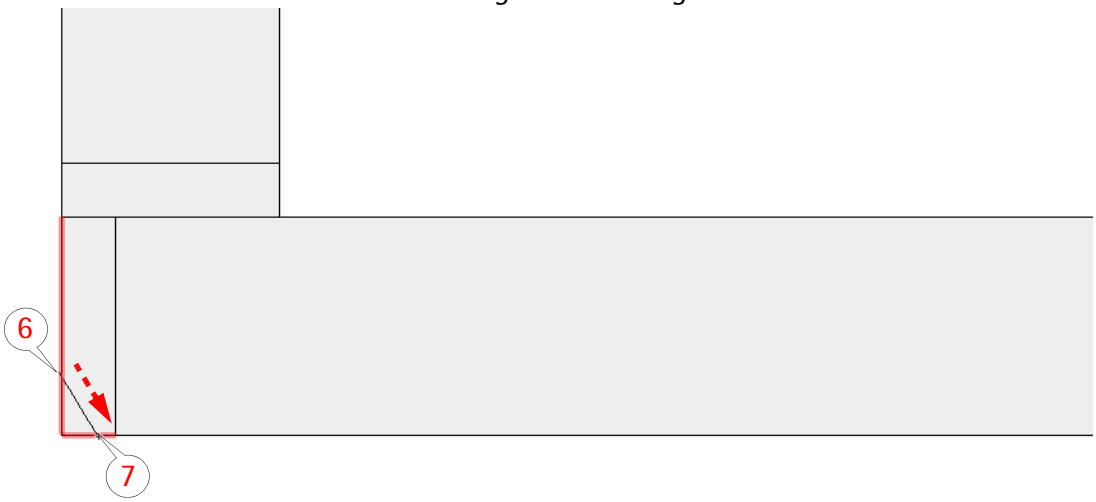
4 Enter a radius of **3** mm in the Settings dialog and click **OK** to confirm.



5 **Zoom** in on the bottom left corner of the drawing.

6 Hover the mouse cursor over one of the edges of the filleted corner. **Click** when the cursor is displayed as a little cross.

7 Then hover the mouse over the second edge and **click** again.



8 Press **X** to exit the tool.

As you can now see in the Object Info palette, filleting turns the rectangle into a polyline consisting of four lines and one arc.

4.2 Assigning Hatches

In this step, the surfaces of the cut parts will be filled with hatches. There are several methods of assigning a hatch.

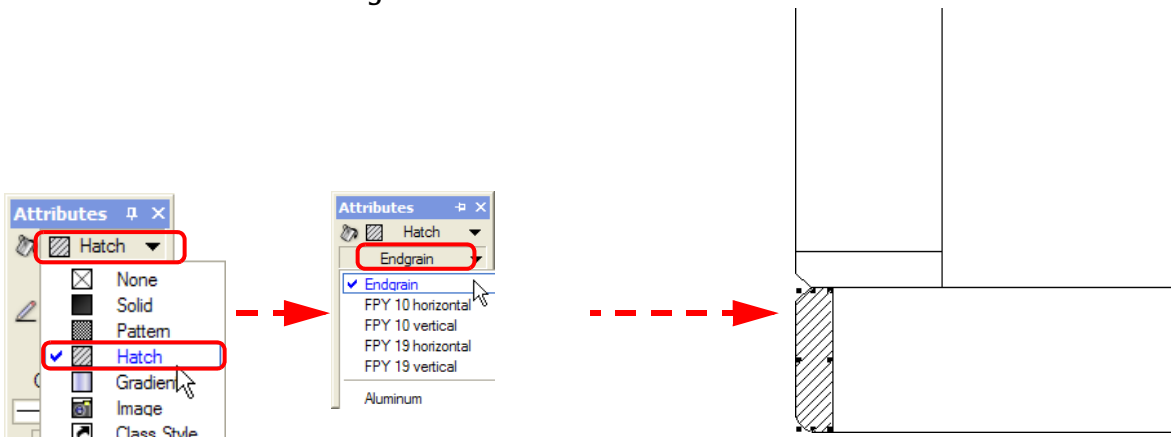
4.2.1 Manually Assigning a Hatch

You have already seen this way of assigning attributes in the chapter Attributes Palette from page 22. The attributes of an object are assigned directly in the Attributes palette.

1 Select the filleted glue strip at the front corner of the cabinet.

2 Click the box next to the bucket symbol in the Attributes palette and choose the **Fill Style Hatch**.

3 Then select the hatch **Endgrain** from the list.

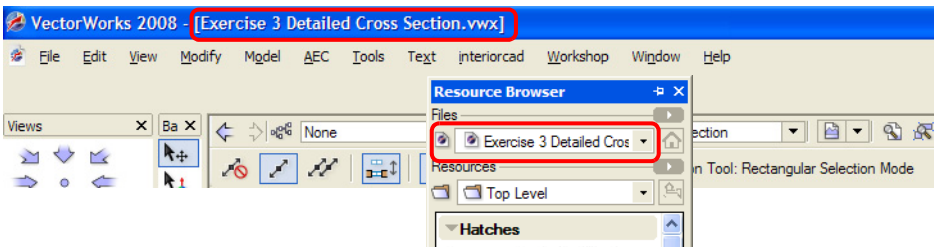


Notes:

4.2.2 Assigning a Hatch via the Resource Browser

Hatches can be selected and assigned to an object in the Resource Browser.

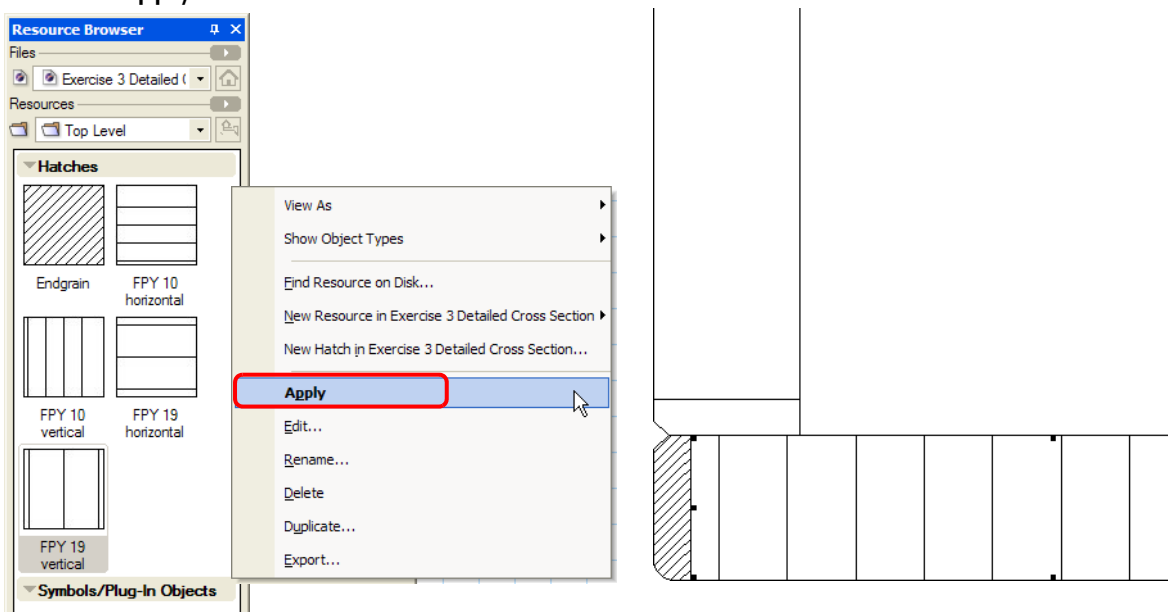
1 Make sure that the current drawing's resources are displayed in the Resource Browser. (The current drawing in the illustration is called Exercise 3 Detailed Cross-Section.vwx.



2 Select the rectangle next to the already hatched glue strip (door board).

3 Then **right-click** the hatch **FP 19 vertical** in the Resource Browser.

4 Select **Apply** from the contextual menu.



■ You can also double-click the hatch in the list or drag and drop it onto the object. ■

Notes:

_____

_____

_____

_____

_____

4.2.3 Assigning Attributes via Classes

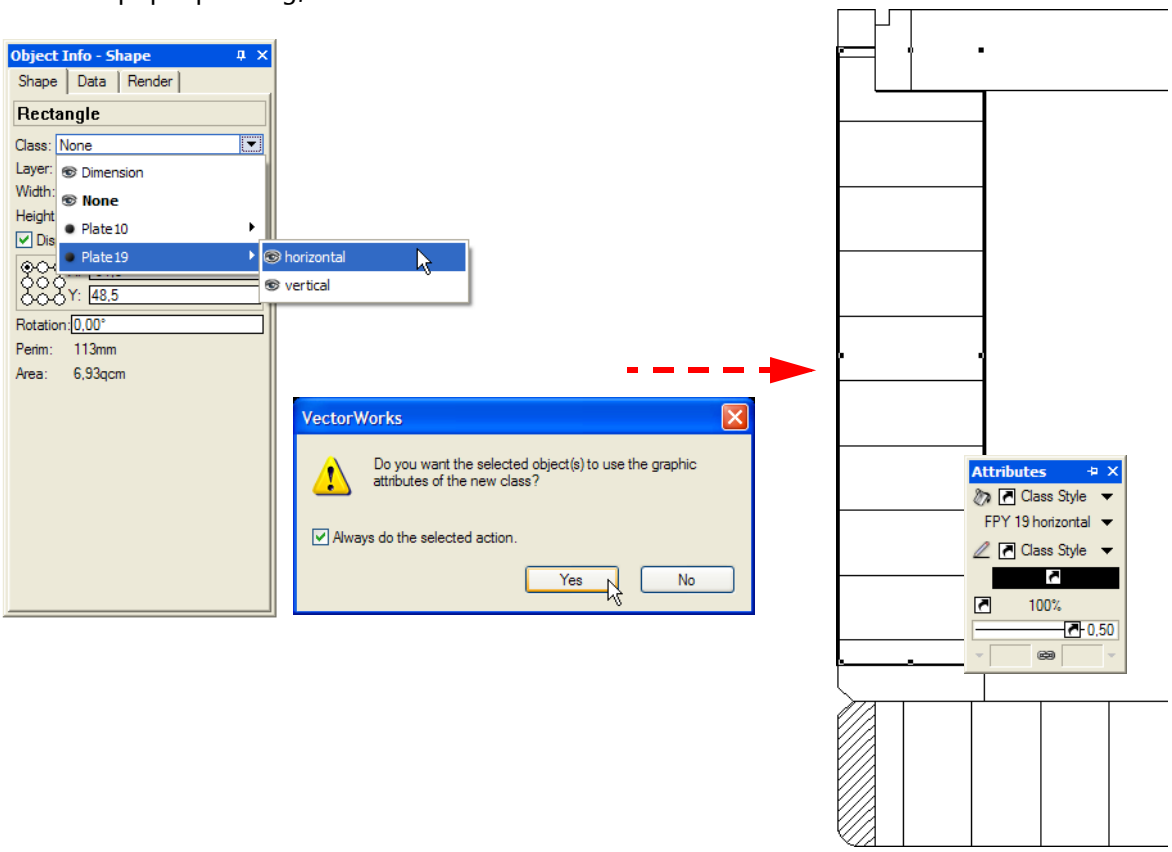
Assigning attributes via classes is extremely comfortable. If an object is assigned to a class, the class attributes (line type and thickness etc.) are automatically assigned to the object.

1 Select the board on the **left cabinet side**.

This board is to have a horizontal hatch.

2 Set this object's class as **Plate 19** > **horizontal** in the **Object Info palette**.

3 In the pop-up dialog, check the box and click Yes to confirm.



The class attributes are assigned to the object.: the hatch FPY 19 horizontal and the line attributes Solid line .5 mm. These settings also show up in the Attributes palette.

■ If an attribute is defined by the assigned class, a small arrow will indicate this. This corresponds to the settings Class Style for fill and line style and Class Thickness for line attributes. ■

4 Assign the **back** to the class **Plate 10** > **vertical.**

5 The already hatched board of the **door** is also assigned to the class **Plate 19** > **vertical**.

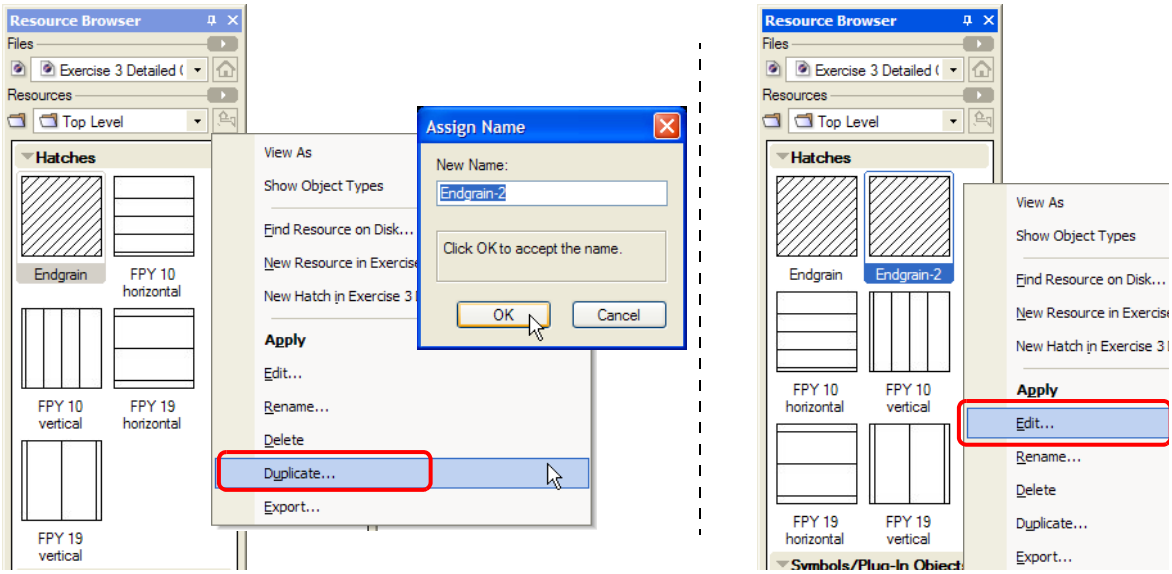
4.2.4 Creating a Hatch

For the glue strips we need a second Endgrain hatch, but the lines have to be rotated.

1 **Right-click** the hatch **Endgrain** in the Resource Browser and select Duplicate... from the contextual menu.

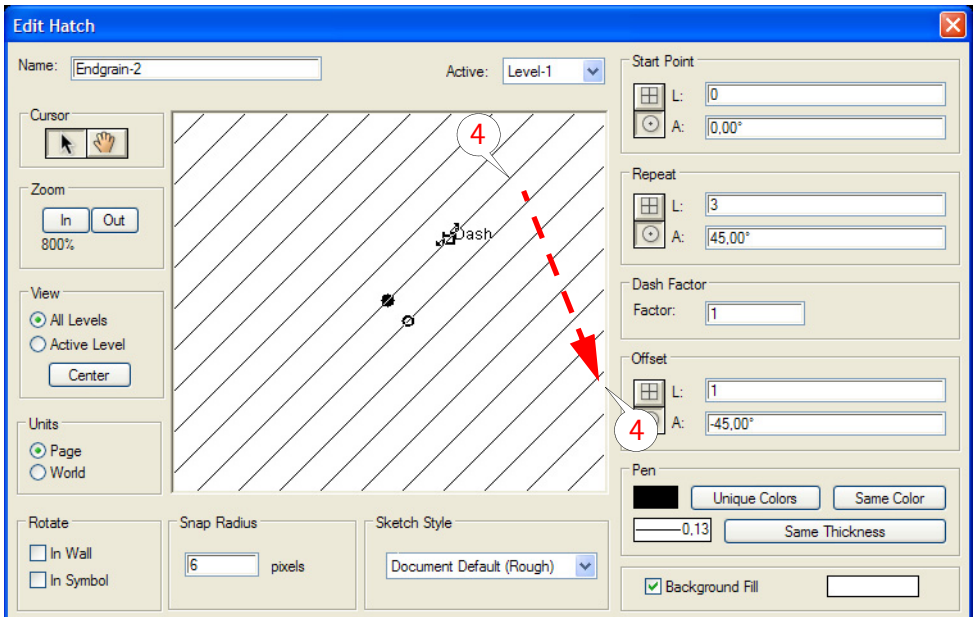
2 Name the duplicate **Endgrain-2** and click **OK** to confirm.

3 **Right-click** the hatch **Endgrain-2** and select **Edit...** from the contextual menu.



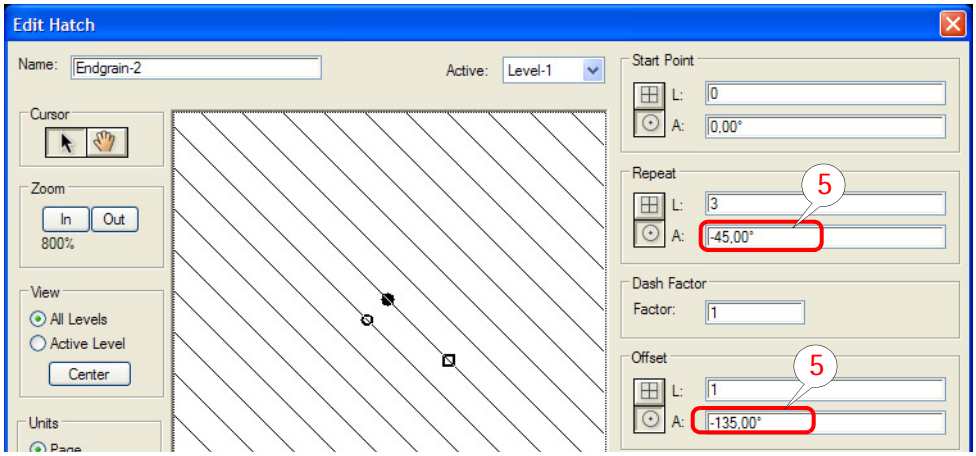
The dialog Edit Hatch opens.

4 Hover the mouse over the **little square** (Dash) and **drag** it to the **right and down** to change the direction of the dashes.



5 Enter an angle of **-45°** in the Repeat area and one of**-135°** in the Offset area.

6 Click **OK** to confirm.

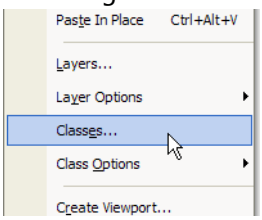


■ If you draw a freehand pattern of lines into a rectangle, you can turn this pattern into a hatch by **interiorcad > Hatch**. Please refer to the manual for further information about this command and the Edit Hatch dialog. ■

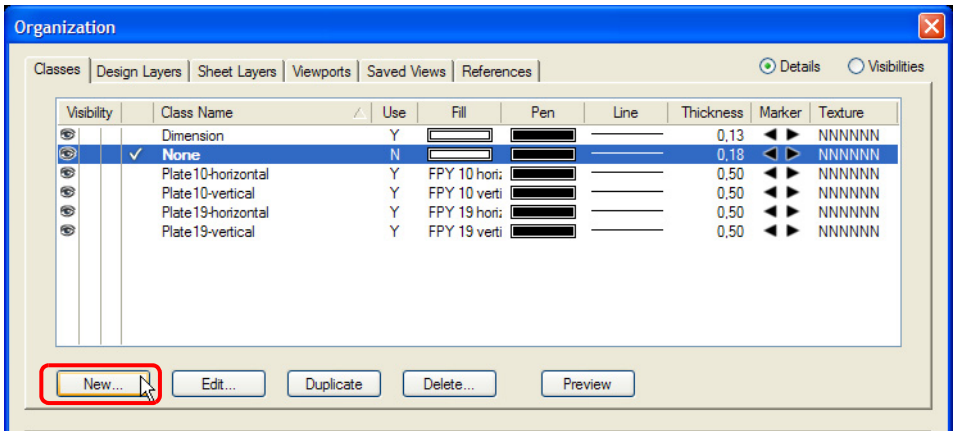
4.2.5 Creating a New Class and Defining Class Attributes

We now create two more classes so that we can use classes to define the attributes of the edge strips.

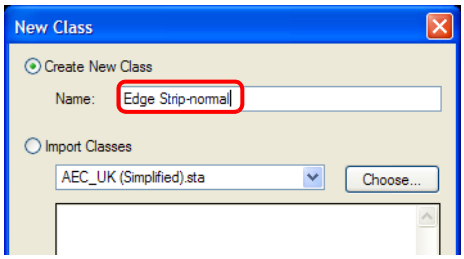
1 **Right-click** an empty space in the drawing and select **Classes...** from the contextual menu.



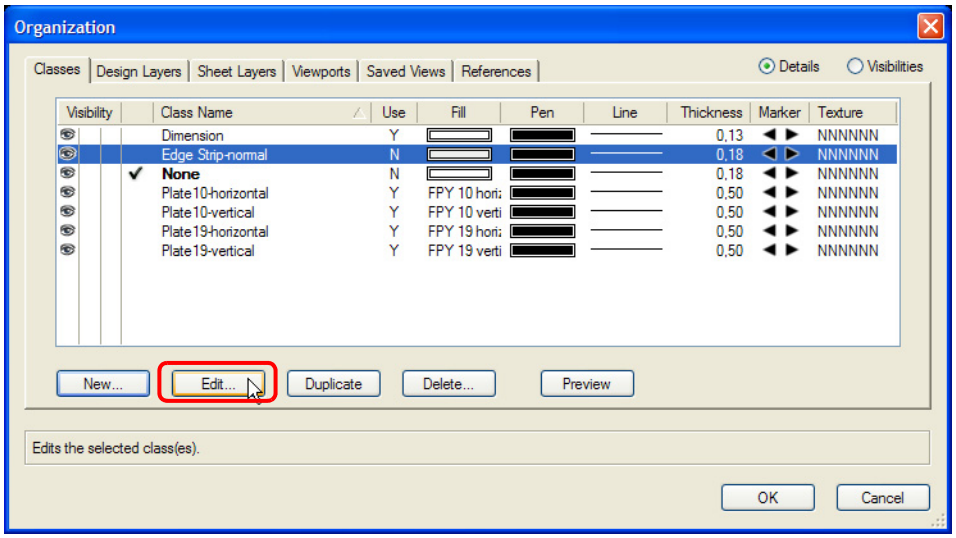
2 Click the button **New...** in the Classes tab.



3 Name the new class **Edge Strip-normal** and click **OK** to confirm.



4 Now click **Edit...**.

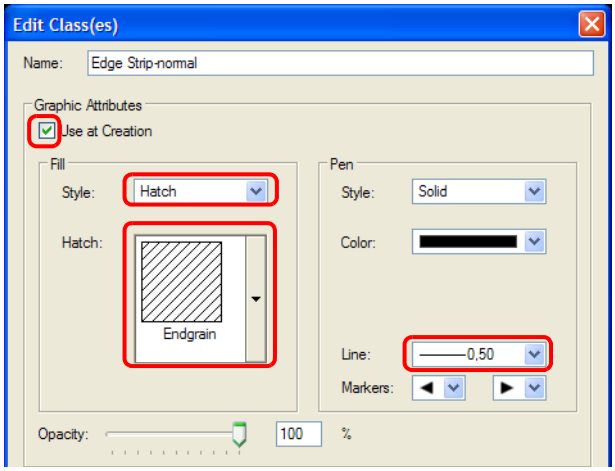


The Edit Class(es) dialog opens. We can adjust the class attributes here.

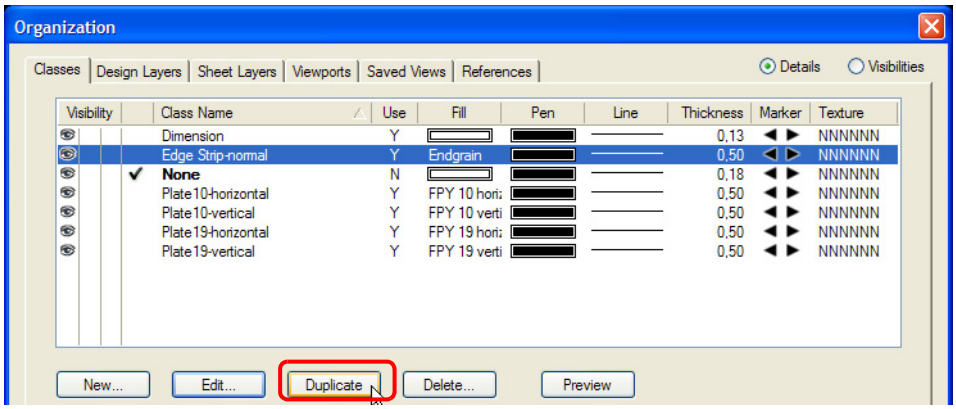
5 Check **Use at Creation**.

6 Select the **hatch** Endgrain.

7 The lines should be set to **Solid .5 mm**. Click **OK** to confirm.



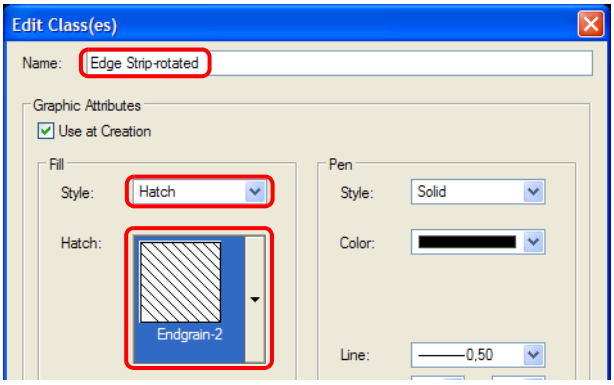
8 Click **Duplicate** to duplicate the class Edge strip-normal.



9 **Double-click** the class Edge strip-normal-2 to edit it.

10 Change the name to Edge strip-rotated.

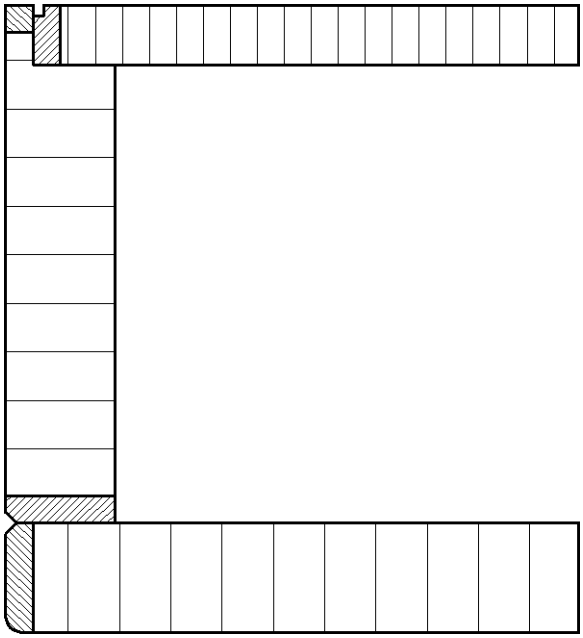
11 Set the **hatch** for this class to Endgrain-2.



12 Close all open dialogs by clicking **OK**.

13 Then assign the edge strip to the two new classes.

The result should look something like this:



Notes:

4.3 Clipping and Breaking Surfaces

4.3.1 Clipping Surfaces

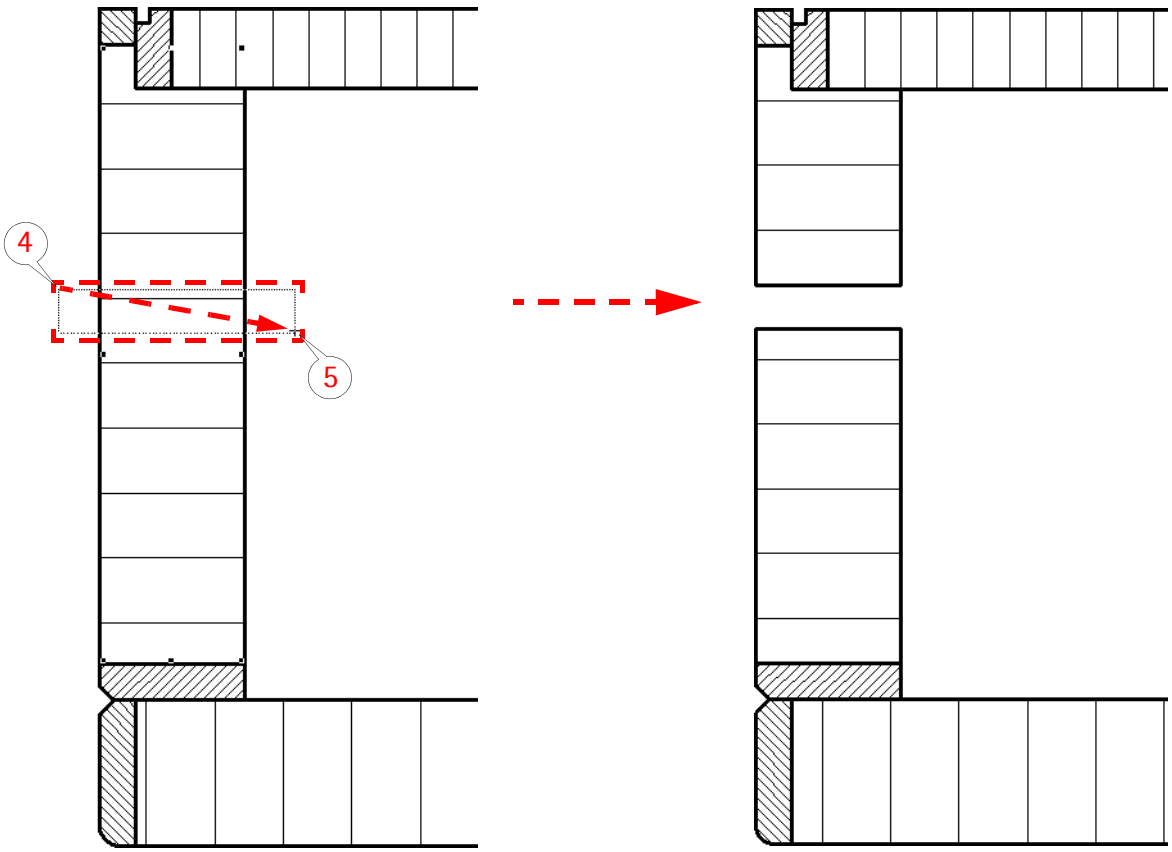
You can easily create breaks/openings in cross-section drawings with the Clip tool from the Basic palette. In the next step, we will use this tool to make an opening in the left side of the cabinet.

1 **Select** the board on the left side.

2 **Select** the Clip tool from the Basic palette.

3 **Click** outside of the board to define the **initial point** of the opening.

4 Draw a rectangle and **click** again to define the **end point** of the opening.



4.4 Hide or Show Edges

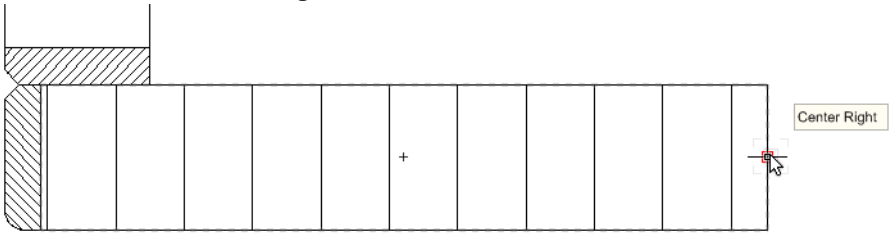
The horizontal cross-section only shows the left side of the cabinet, so we want to hide the edges of the door and back on the right side and the lines around the clipping we just created.

1 Select the board at the front and choose **Modify > Convert > Convert to Polygons**.

2 Select the **2D Reshape** tool from the Basic palette.

3 Select Hide or Show Edges Mode in the Tool bar.

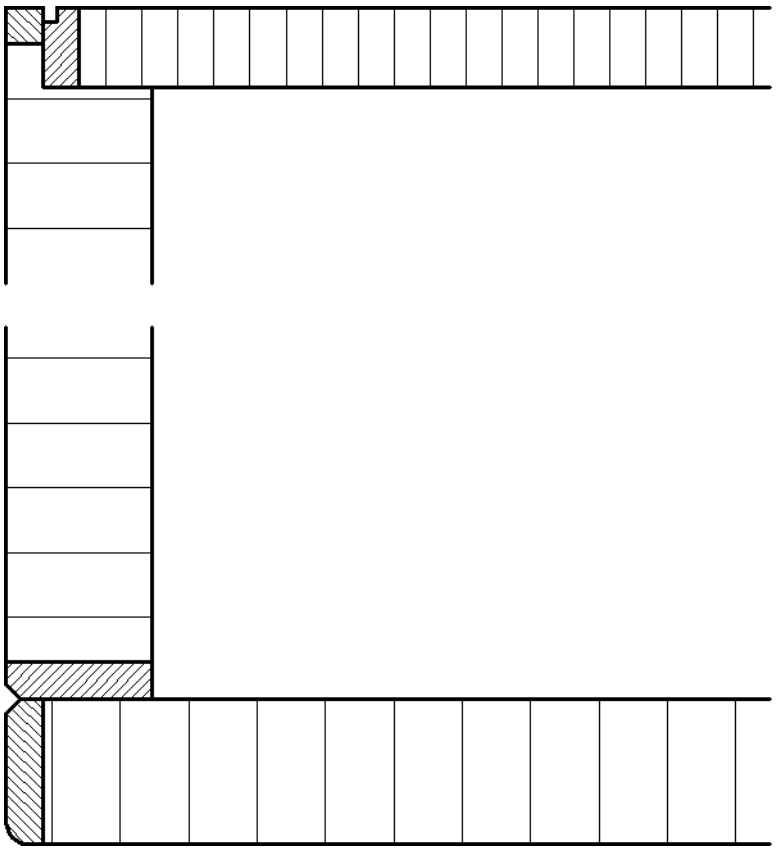
4 Click the center of one of the edges to be hidden.



5 Do the same for the back and the two parts of the cabinet side.

6 Press **X** to exit the tool.

The result should look like this:



Notes:

_____

_____

4.5 Completing the drawing

You know most of the remaining steps for the completion of our drawing from the previous exercises. We put in the prepared hinge and add veneer lines. Then we will dimension the drawing and add text.

4.5.1 Insert Symbol

1 Make sure that the current drawing's resources are displayed in the Resource Browser.

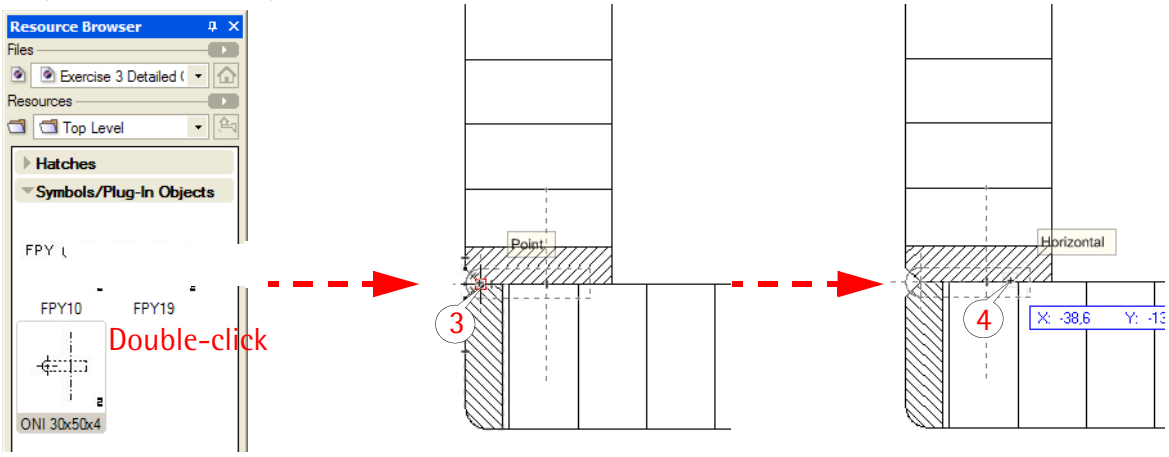
2 **Double-click** the symbol **ONI 30x50x4** in the Symbols/Objects area of the Resource Browser.

Around the mouse cursor (insertion point), the symbol's outline is displayed in dashed lines.

3 **Click** on the inner corner of the V-shaped gap between door and side to place the insertion point.

You can now determine the insertion angle of the symbol with the mouse.

4 Drag the cursor a little to the right, onto the front edge of the cabinet and insert the symbol horizontally with a second **click**.



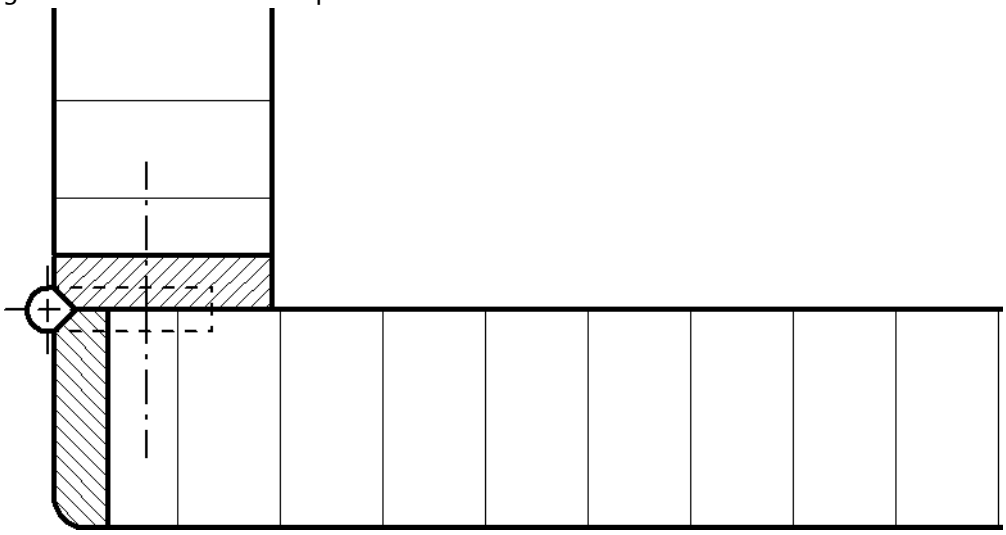
5 Press **X** to end insertion.

The pivot point of the hinge should be .5 mm outside of the cabinet.

6 Press **Ctrl+M** to call Move.

7 In the pop-up dialog, enter an **X Offset** of **-2.5** mm and a **Y** Offset of **0** mm and click **OK** to confirm.

The hinge is now at the desired position.

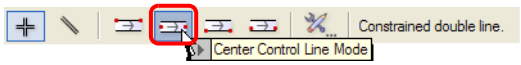


4.5.2 Adding Veneer Lines

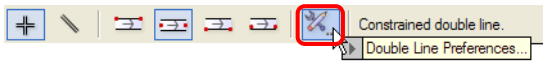
The tool Double Line from the Basic palette is a comfortable way of drawing veneer lines. As an example, we now add veneer lines to the door.

1 **Click** the **Double Line** tool in the **Basic** palette.

2 Select **Center Control Line Mode** on the Tool bar.



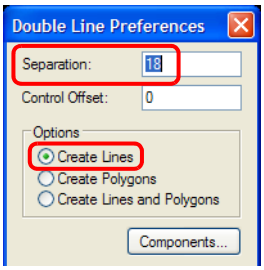
3 Then click **Double Line Preferences**.



The door consists of a veneered 19 mm chipboard. The door's cross-section was therefore drawn 20 mm wide. The veneer lines should be 1 mm from the chipboard's edge.

4 Enter **18** mm in the box Separation.

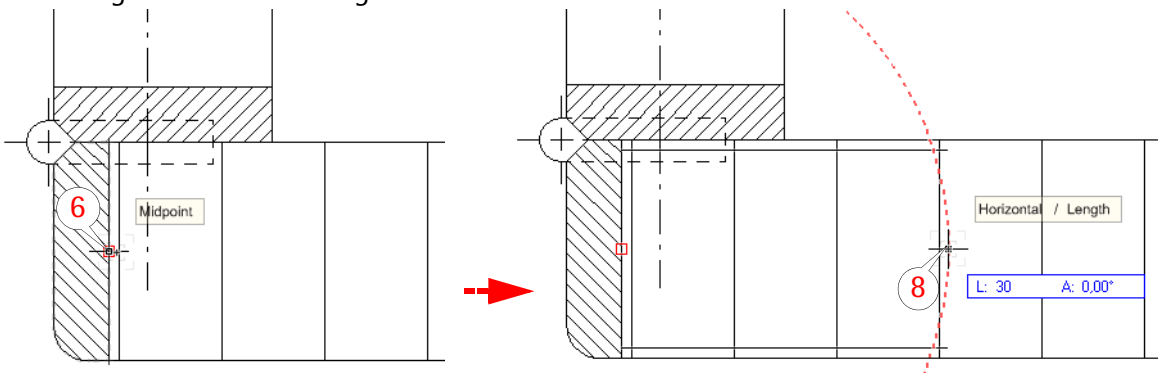
5 Select the option **Create Lines** and click **OK** to confirm.



6 Hover the cursor onto the center of the left board edge. **Click** when the **Center** is displayed.

7 Move the cursor to the right to **draw** the **double line**. Press Tab once to display the length, twice to enter a length.

8 **Click** again to **end** drawing.



9 Draw veneer lines for the other boards in the same way.

For the veneer lines at the back edge of the side, do the following: Make a quick copy of the lines at the front edge, drag those duplicates upwards and adjust the length of the lines with the Reshape cursor (chapter 2.2.7).

■ Save frequently used edgings (edge strip, veneer lines, text etc.) as symbols. Since you can always customize the insertion angle, one symbol per board thickness is sufficient: it can be used as front/back or left/right edge. ■

4.5.3 Dimensions and Overwriting Measurements

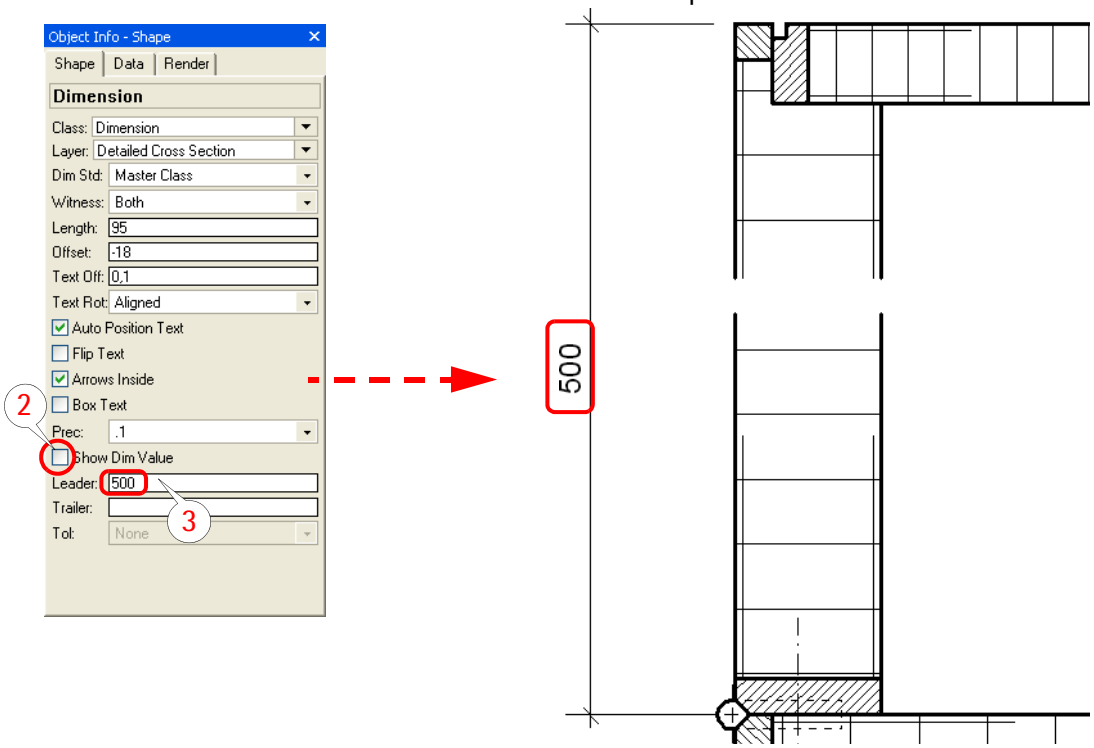
Create dimensions as described in chapter 3.3.1 with the **Constrained Linear Dimension** tool from the Dims/Notes tool set.

The complete dimensions in horizontal and vertical direction, like cabinet depth and width, are of special interest to us. Here, the true dimensions from the drawing have to be overwritten with the desired dimensions of the cabinet.

1 First create linear dimensions.

2 Then **uncheck** the option **Show Dim Value** in the Object Info palette.

3 Then enter the **desired dimension** in the **Leader** box and press Enter to confirm.

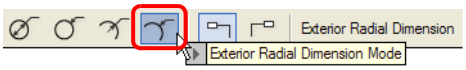


Notes:

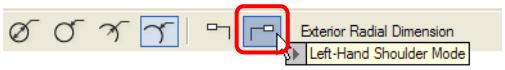
4.5.4 Radial Dimensions

1 Select the **Radial Dimension** tool.

2 Select **Exterior Radial Dimension Mode** on the Tool bar .



3 Additionally, select **Left-Hand Shoulder Mode**.



4 **Click the radius** at the door edge.

5 Then drag the mouse cursor to the left at an angle of 45° and click again to create the dimension.

6 Press **X** to exit dimensioning.

4.5.5 Labeling

We create the heading and the name field using the **Text** tool from the Basic palette.

■ Please note that the Text tool is exited by pressing **Esc**, not by pressing X. (!) ■

For **board labeling**, we first create one of the labelings with the Text tool. Then we **duplicate** it and **rotate** the text using **Ctrl+L**.

The **hinge labeling** is created using the **General Notes** tool from the Dims/Notes tool set. Please refer to the manuals to find a detailed description of this tool.

Finally, we save the finished drawing.

Notes:

5 Exercise 4: Kitchen Table- 3D Drawing

Open the template **Template 4 Table.sta** and check the document preferences:

- Paper format *A4 Landscape* (Printer format)
- Scale *1:20*
- Units in *mm*

Save the document as **Exercise #4 Table** *SURNAME GIVEN NAME*.**vwx**.

The goal of the exercise is creating the table shown below as 3D model.

The result of the exercise is used as a basis of a plan layout in the next chapter. All views, cross-sections and detailed drawings are derived from it.

In this chapter, you will learn about the following features and commands:

- Creating an Extrude... (Ctrl+E)
- Using the Views palette to toggle between different views of a 3D drawing
- Move 3D...
- Align/Distribute 3D...
- Creating a Multiple Extrude...
- The Protrusion/Cutout tool
- Mirroring three-dimensional objects with the 2D Mirror tool
- The Chamfer Edge tool
- Defining a Working Plane
- Creating and modifying an Extrude along path...

5.1 Tabletop

The template already contains a rectangular floor board (*Extrude*) that serves as a visual reference in 3D space.

5.1.1 Create Extrude

1 Press **Ctrl+5** and **Ctrl+4** to make sure that the drawing is displayed in Top/Plan view and Fit to Page Area.

2 **Double-click** the **Rectangle** tool from the Basic palette.

3 Enter edge lengths of **1500** mm x **800** mm and select the **central insertion point**.

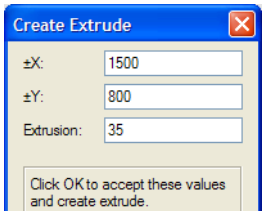
4 Make sure that the option **Next Click** is checked.

5 Click **OK** to confirm and place the rectangle approximately in the **middle of the drawing**.

The rectangle is still a 2D element. To orient it in 3D space, we create an extrude.

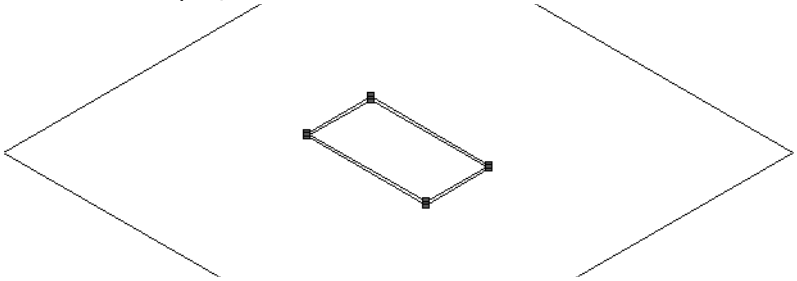
6 Select the rectangle and select **Model > Extrude...**

7 Enter the tabletop's thickness of **35** mm into the **Extrusion** box and click **OK** to confirm.



8 Select Right Isometric Standard View from the Views palette or from the Current View menu in the View bar.

The intermediate result is displayed in 3D.

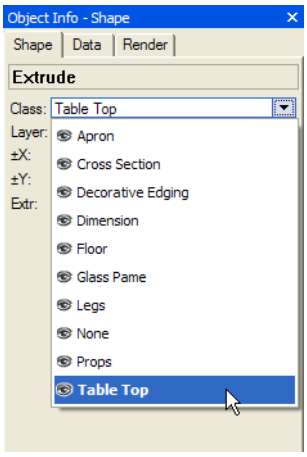


■ All 3D objects created from 2D objects in Top/Plan view are inserted on the design layer (z=0). ■

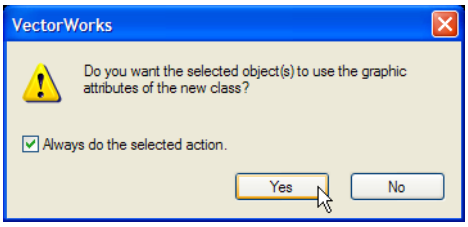
5.1.2 Assign Class

At the end of this class, the table will be displayed in rendered mode. Additionally, cross-sections and views of the table are to be created. To this end, the single parts have to be assigned textures and hatches.

1 For the tabletop (*extrude*), choose the entry **Table Top** from the Class box in the Object Info palette.



2 In the pop-up dialog, check the box and click Yes to confirm.



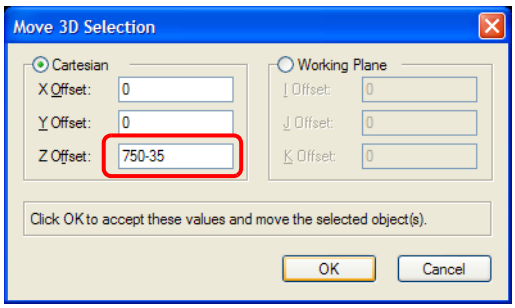
The extrude is now assigned to the class Table Top..

5.1.3 3D Move

Now we move the tabletop to the desired height.

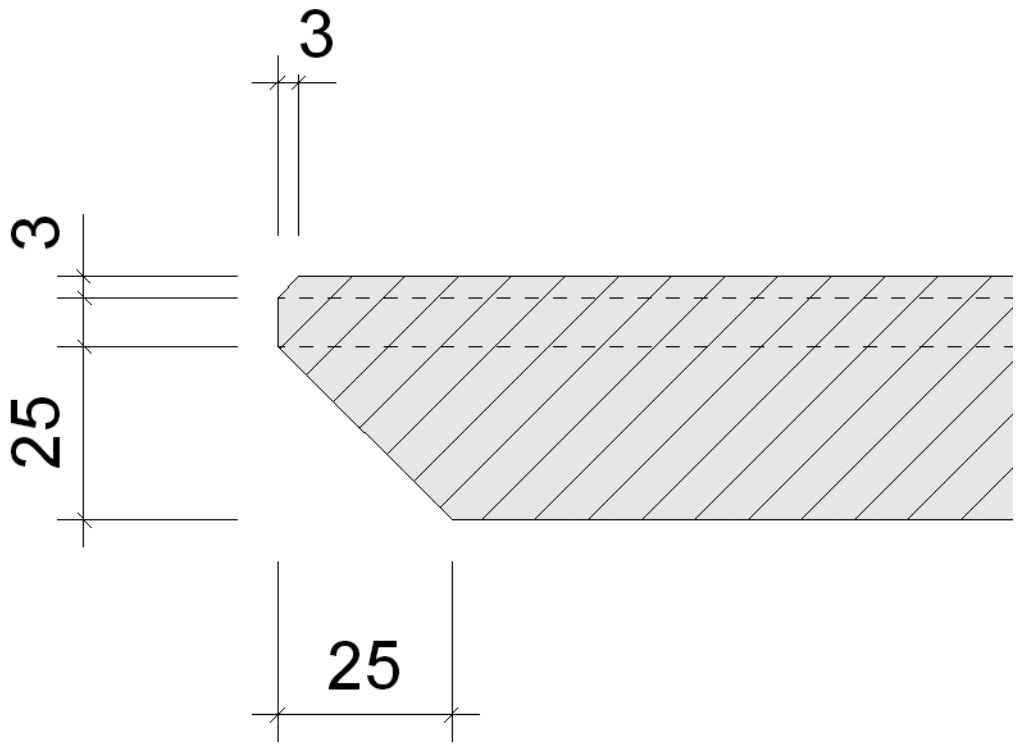
1 Press **Ctrl+Alt+M** to call **Move 3D...**.

2 Enter **750-35** mm into the **Z Offset** box and click **OK** to confirm.



5.1.4 Chamfering the Tabletop

In this step, we will add two chamfers to the tabletop. The tabletop's cross-section is to look like this:

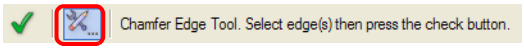


Chamfering the Bottom Edge

1 Select the **Chamfer Edge** tool from the **3D Modelling** tool set.

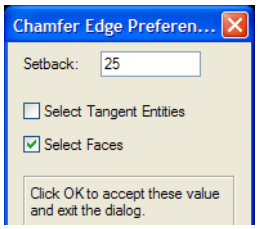
Before we start chamfering, we adjust the tool's settings.

2 Click the button **Chamfer Edge Preferences...** in the Tool bar.



3 The lower chamfer is to have a value of **25** mm. Enter that value into the **Setback** box.

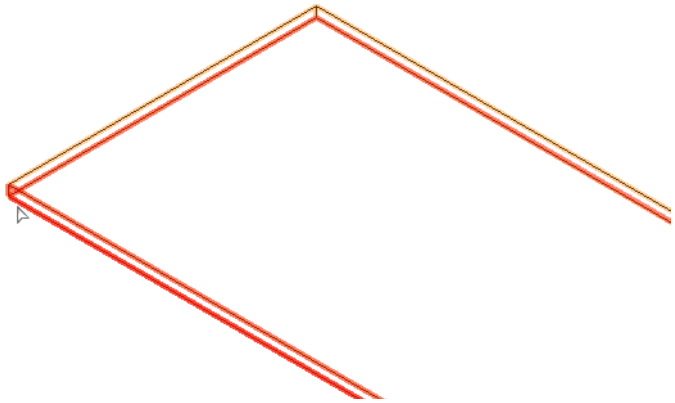
4 Check the **Select Faces** box and click **OK** to confirm.



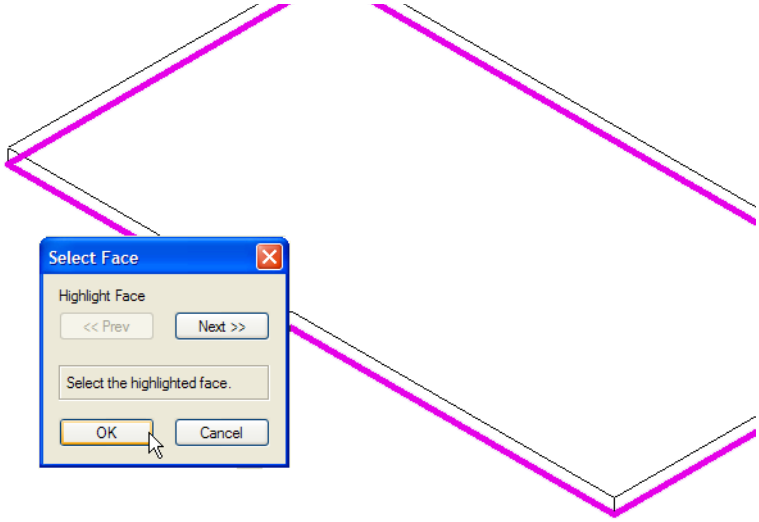
■ Select Faces makes sure that when you click an edge, all neighbouring edges are selected as well. This way, you don't have to select the edges individually. ■

5 **Zoom** in on one of the table corners.

6 Click one of the **edges** at the **bottom of the board**.



7 The **Highlight Face** dialog opens. Make sure that the **bottom edges are marked in red**. Otherwise, click Next >> to toggle between selections.



After clicking **OK**, the edges will remain red.

8 Since we do not want to add other edges to the selection, we complete the operation by pressing **Enter** or clicking the green check mark button in the Tool bar.

The edge is chamfered. The **Currently selected object type** in the Object Info palette changes from *Extrude* to *Chamfer*.

Notes:

_____

_____

_____

_____

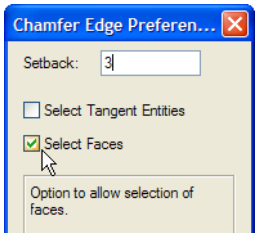
Chamfering Top Edge

We operate in a similar way to chamfer the top edge of the table.

Chamfer Edge should still be active.

1 Click the **Chamfer Edge Preferences** button in the **Tool bar**.

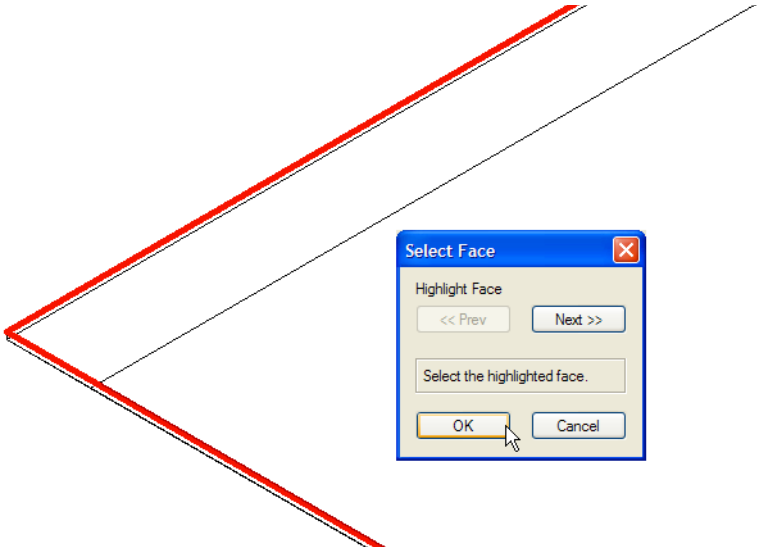
2 The top chamfer is to have a value of **3** mm. Énter this value into the **Setback** box and click **OK** to confirm.



3 Now click one of the top **table top edges**.

4 In the Select Face dialog, make sure that the desired top edges are marked in red and click **OK** to confirm.

■ If the wrong face is selected and the Select Face dialog does not appear, exit the selection with Esc and start over. Zoom in on one of the table corners and click on a different top edge. TIP: Do not click on the middle of an edge, but a bit further in the direction of the desired face. This way, Vectorworks can determine which face adjoining the selected edge should be selected. ■



5 Press **Enter** or click the green check mark button on the Tool bar to complete the operation.

6 Select **Front** from the Views palette.

5.1.5 Create Cut Out

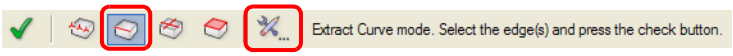
In the next step, we will create a rectangular cut out in the tabletop. Later, a glass pane will be inserted into it.

1 Select **Left Isometric** from the **Views** palette.

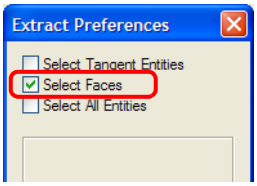
2 Press **Ctrl+Alt+4** to fit the zoom factor to the page area.

3 Select the **Extract** tool from the **3D Modelling** tool set.

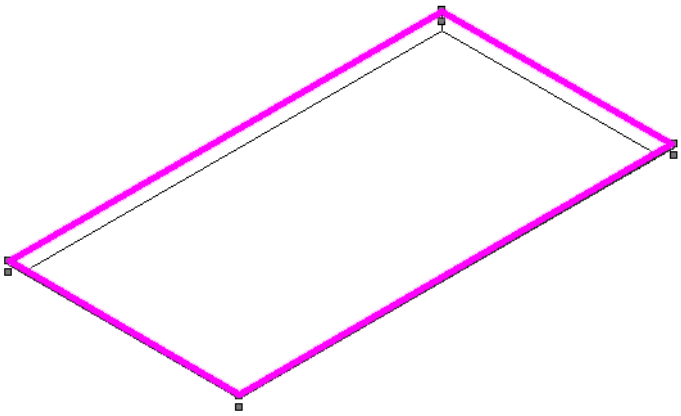
4 Select **Extract Curve Mode** and click **Extract Preferences...**.



5 Check the **Select Faces** box and click **OK** to confirm.



6 Click one of the top edges of the tabletop so the top surface of the board is marked in red.



7 Press **Enter** to extract the edges.

The extracted NURBS curves are grouped by default. We will now ungroup them and then join the individual edges into **one** NURBS curve.

1 Press **Ctrl+U** to ungroup.

The Object Info palette shows **4 NURBS Curves**.

2 Choose **Modify** > **Compose**. The four objects are combined into one NURBS curve.

We will now offset a parallel of this NURBS curve to the inside of the tabletop.

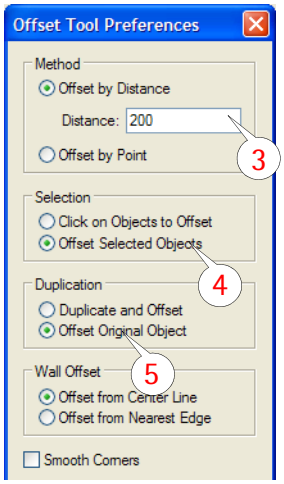
1 Select the **Offset** tool from the **Basic** palette.

2 Select **Offset Preferences...** from the Tool bar.

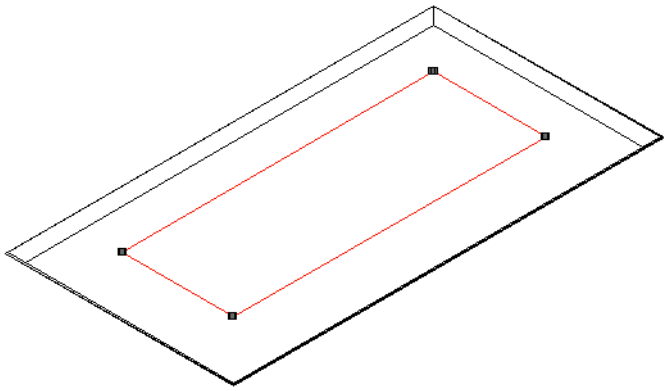
3 Set the **Distance** to **200** mm.

4 The offset duplicate is to run parallel to the **Selected Objects**.

5 In the **Duplicate** area, select **Offset Original Object**.

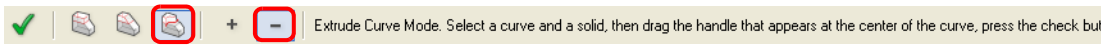


6 Click **OK** to confirm. Then click into the top surface of the tabletop to determine the direction for the offset.

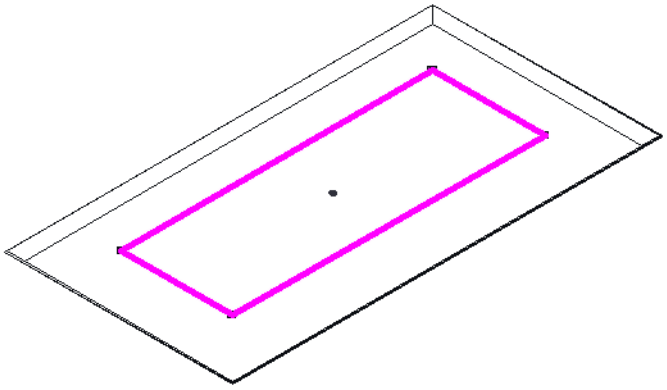


7 Select the **Protrusion/Cutout** tool from the **3D Modelling** tool set.

8 Select **Extrude Curve mode** and **Subtract**.

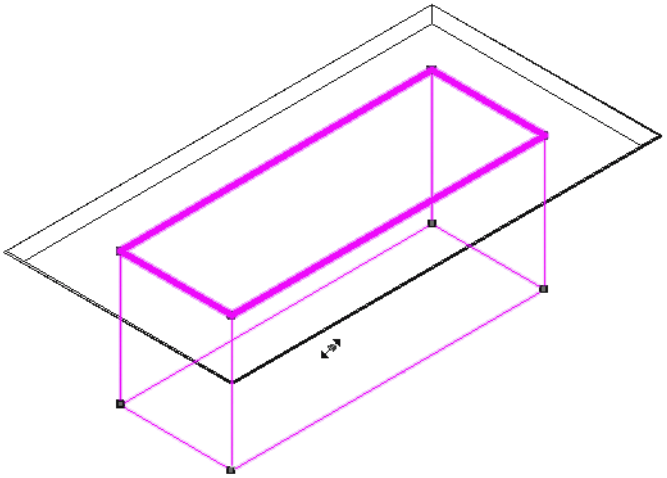


9 Now click first the NURBS curve and then any edge of the tabletop.



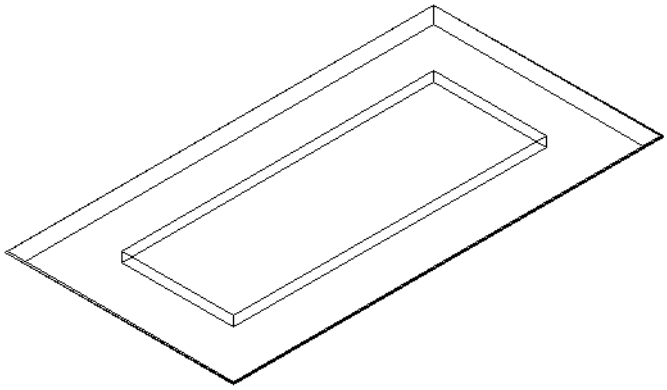
10 Move the cursor over the green modification point in the middle of the NURBS curve.

11 Drag the point down through the tabletop.



12 Complete the operation by pressing **Enter** or clicking the green check mark button in the Tool bar.

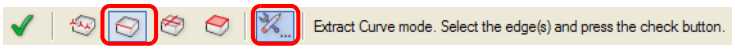
The result should look like this:



5.1.6 Insert Rabbet for Glass Pane

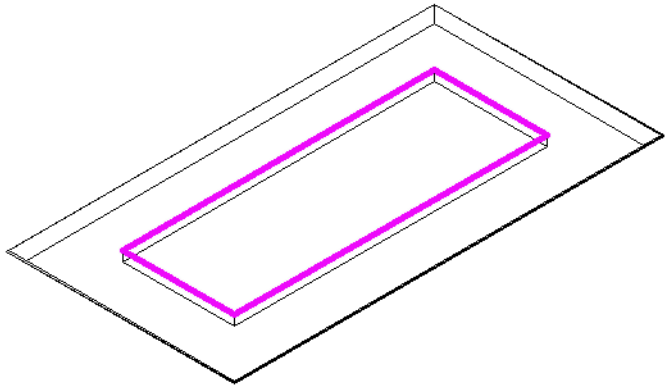
Select the **Extract** tool from the 3D Modelling tool set.

13 Select **Extract Curve Mode** and then click **Extract Preferences...**



14 **Uncheck Select Faces** and click **OK** to confirm.

15 Press **Shift** while selecting the four top inner edges of the object.



16 Press **Enter**.

17 A group is created. Press **Ctrl+U** to ungroup it.

18 Choose **Modify** > **Compose**. The four NURBS curves are composed into one curve.

Now we have to create a profile for the extrude along path.

1 Double-click the **Rectangle** tool from the Basic palette.

2 In the dialog, enter **24** mm for both **Width** and **Height**.

3 Exit the dialog and place the rectangle anywhere in the drawing.

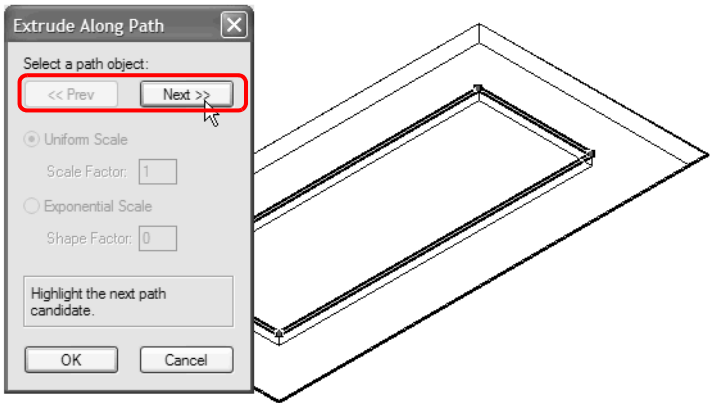
4 Press **X** to exit the tool.

5 Press **Shift** and select the rectangle and the NURBS curve.

6 Choose **Model** > **Extrude Along Path...**.

■ In chapter 5.5 we will deal with extrudes along paths in much more detail. You will find more detailed descriptions for creating, editing, and functioning of extrudes along paths. ■

The NURBS curve is now displayed in red. If it isn't, use << Prev or Next >> to toggle the selection.

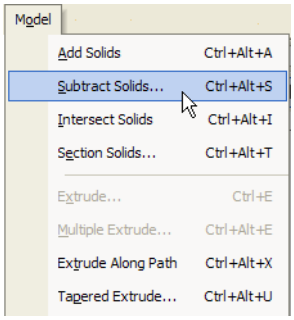


7 Click **OK** to confirm.

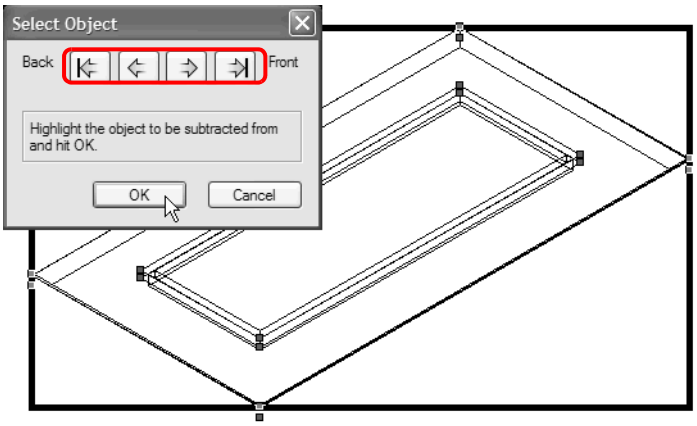
The seam for the glass pane is created by subutracting the extrude along path from the tabletop.

1 **Select** the **extrude along path** and the **tabletop**.

2 Choose **Model** > **Subtract Solids...**



3 Make sure that the red frame is displayed as shown below. Otherwise change the frame via the arrow buttons. Click **OK** to confirm.



5.1.7 Miter

The tabletop is assembled as a mitered frame, so we will cut the object twice diagonally.

1 Press **Ctrl+5** to change to Top/Plan view.

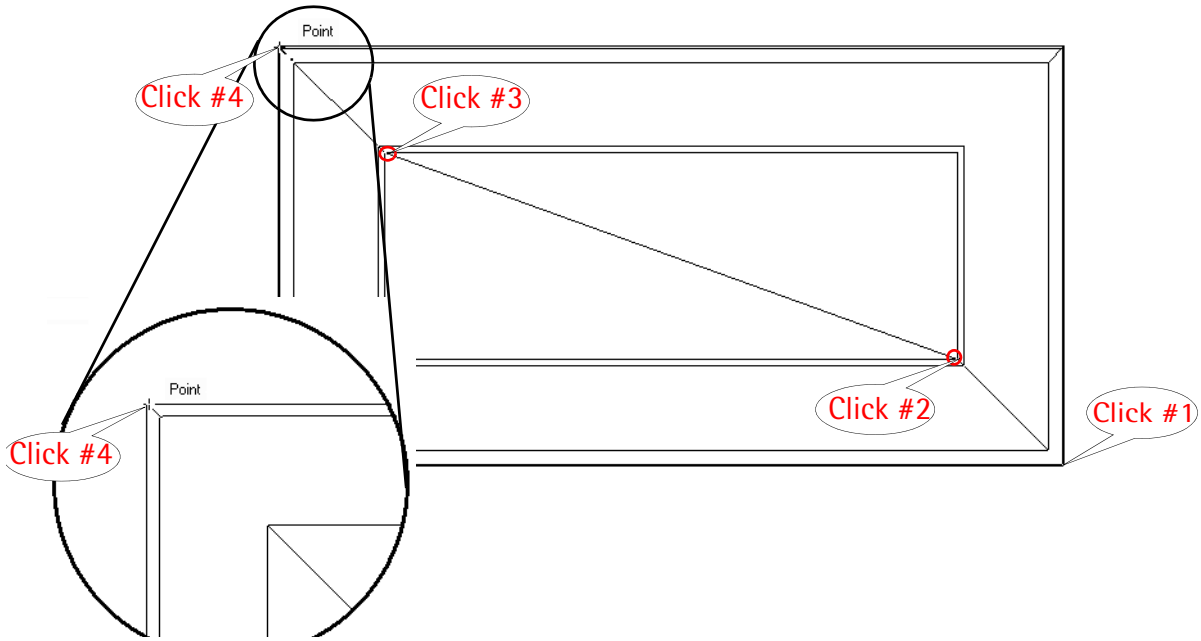
2 Select the 2D **Polygon** tool from the **Basic** palette.

3 Use the mouse wheel to zoom in on the bottom right outer corner of the tabletop and start the polygon at the outermost corner (**Click #1**).

4 Zoom in on the bottom right inner corner and place the second point of the polygon (**Click #2**).

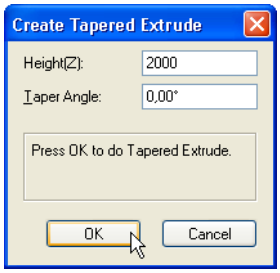
5 Place the third point on the top left inner corner (**Click #3**).

6 **Double-click** the top left outer corner to complete the polygon (**Click #4**).

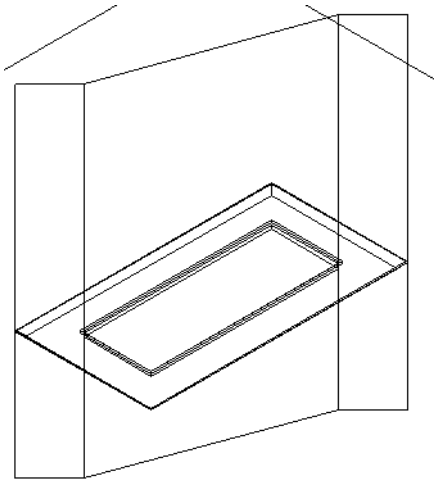


7 Press **Ctrl+Alt+N** to transform the polygon to a **NURBS curve**.

8 Press **Ctrl+Alt+U** to create a Tapered Extrude from the polygon with **Z=2000mm** Taper Angle = **0 degrees**.

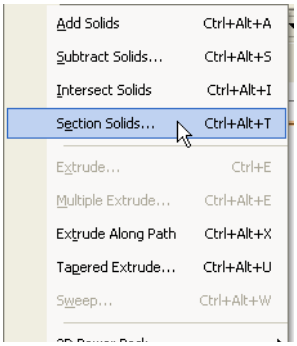


9 Change to the view **Left Isometric** by selecting it in the Current View menu of the View Bar or by choosing **View** > **Standard Views** > **Left Isometric**.. .

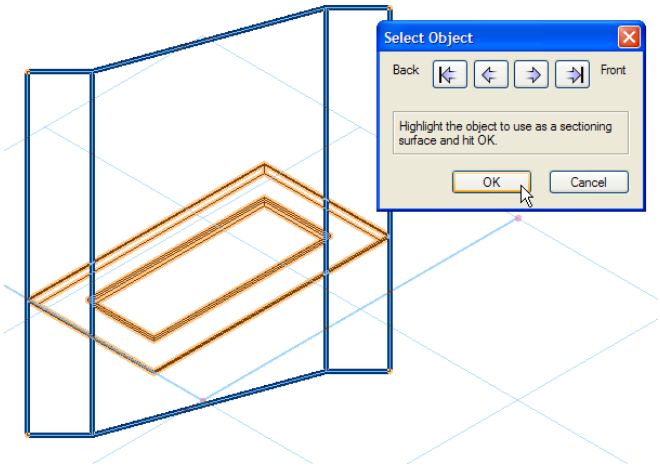


10 Select the extrude and the tabletop.

11 Choose **Model** > **Section Solids...**.



12 Make sure that the extrude is marked in blue as shown below.



13 Click **OK** to confirm.

14 Press **Ctrl+5** to return to **Top/Plan** view.

15 Make sure that the remaining intersection extrude is selected.

16 Select the **Split** tool from the Basic palette.

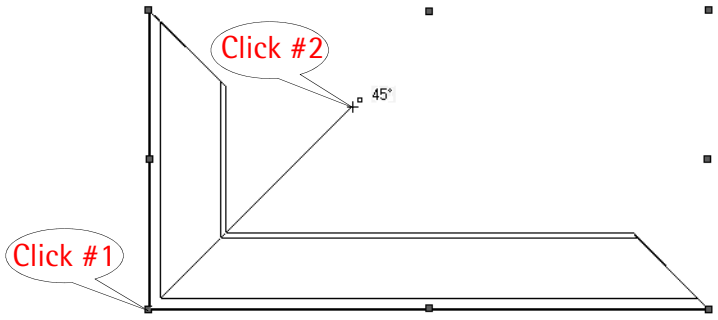
17 Choose **Split by Line** from the Tool bar.

18 Click the bottom left outer corner of the cut tabletop (**Click #1**).

19 **Press Alt** while cutting so that only the selected object is cut.

■ Pressing Alt makes sure that the tool is only applied to the selected objects (here: the piece of the tabletop). Otherwise we would be cutting the floorboard below the table as well. ■

20 Drag the mouse cursor to the right and up and click again when the cue **45°** is displayed (**Click #2**).



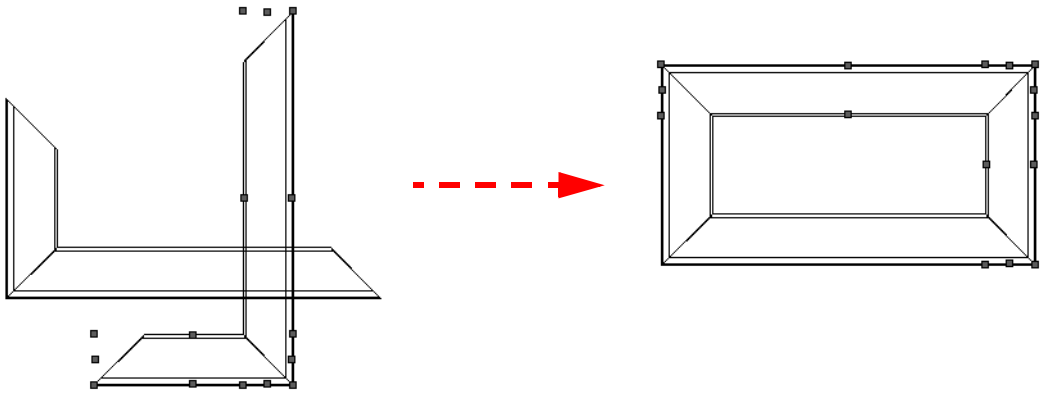
21 Press **Ctrl+C** to copy both objects to the clipboard.

22 Press **Ctrl+Alt+V** to call Paste In Place.

Now we have congruent copies of both objects, we rotate one of these copies by 180°.

23 To do so, press **Ctrl+L twice**.

■ Ctrl+L calls Rotate Left 90°. You can also access this command from the contextual menu (right-click) or by choosing Modify > Rotate. ■



5.1.8 Adjusting the Grain

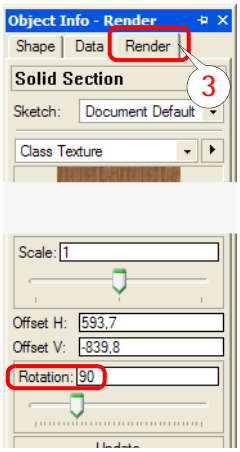
1 To check your progress, choose **View** > **Rendering** > **Fast Renderworks** or select **Fast Renderworks** in the Render Modes list in the View bar.

The grain of the two long frame segments needs to be adjusted.

2 **Select** one of the two long **segments**.

3 Change to the **Render** tab in the Object Info palette.

4 Set the Rotation to 90°.



5 Set the Rotation of the opposing segment to 90° as well.

6 Change back to the **Shape** tab on the Object Info palette and press **Ctrl+5** to change back to Top/Plan view.

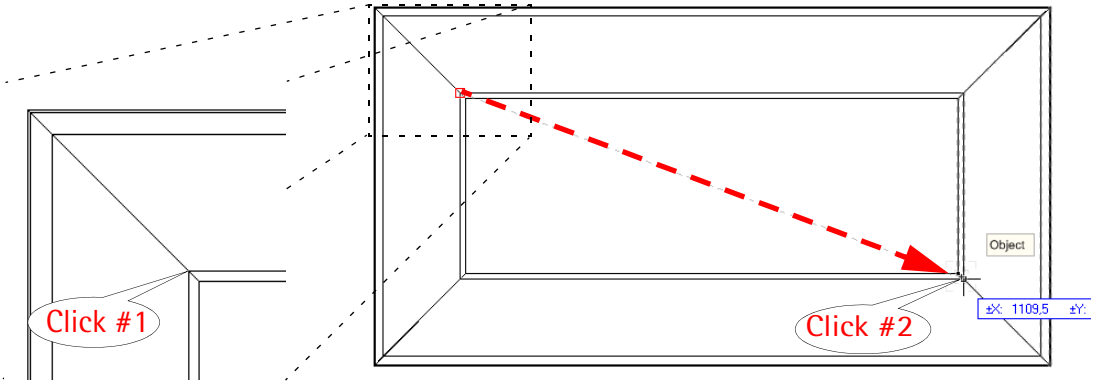
5.1.9 Insert Glass Pane

In the next step, we create the glass pane.

1 Exit the active tool by pressing **X** and click an empty space in the drawing to deselect all objects.

2 Select the **Rectangle** tool.

3 Draw a rectangle from the top left to the bottom right corner of the seam to define the dimensions of the glass pane (**Click #1-2**).



4 Press **Ctrl+E** and give the rectangle a height of **12** mm.

5 Assign the extrude to the class **Glass Pane** via the Object Info palette.

6 Change to **Left Isometric** view.

The extrude is placed on the design layer (z=0). Next we will move the glass pane to the desired height.

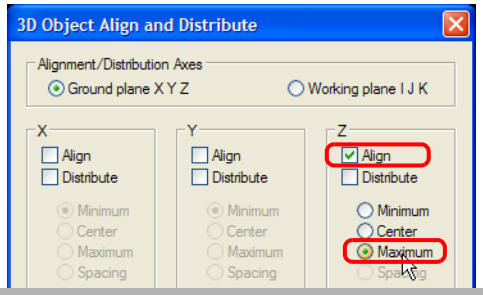
1 Select the glass pane and any element of the tabletop.

2 Right-click an edge of the active objects.

3 Select **Align/Distribute 3D...** from the contextual menu.

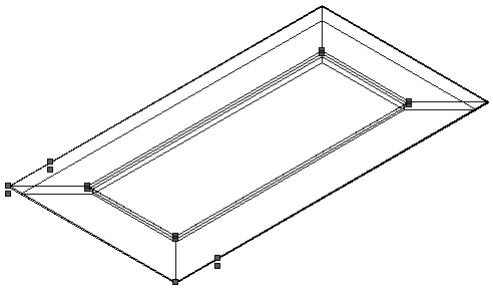
4 Check the option **Distribute** in the z area.

5 Change the setting to Maximum.



■ If you choose Maximum, the top edges of the selected objects are level with each other. If you choose Minimum, the bottom edges are level with each other. ■

Click **OK** to confirm. The glass pane is moved to the height of the tabletop.

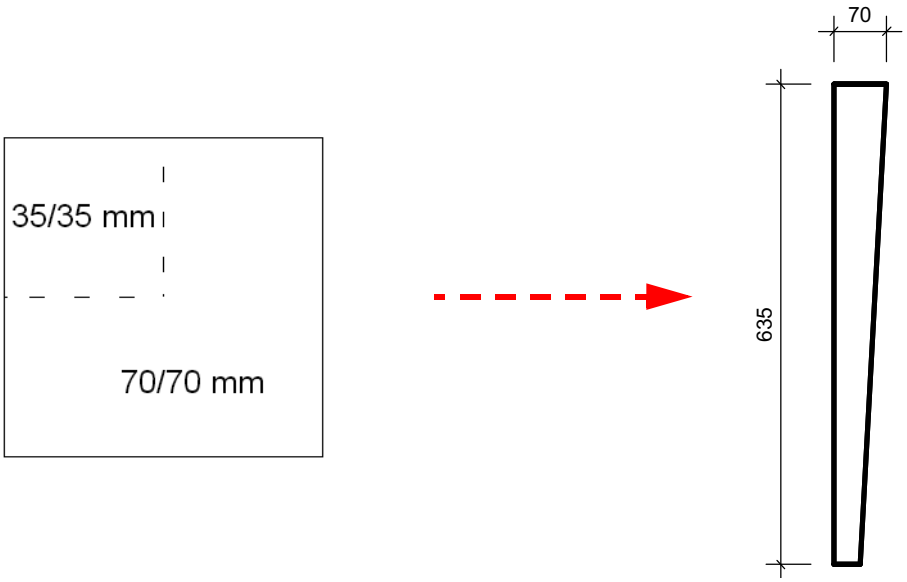


5.2 Table Leg

In the next step, we create one of the table legs. At the top, in the apron area, the leg is straight. Below, the inner surfaces taper.

The lower tapered part is created with the volume operation **Multiple Extrude**. The basic geometry consists of two squares.

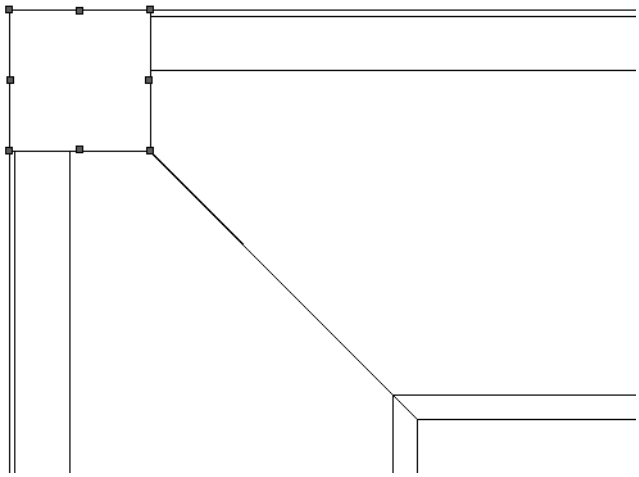
■ The command Multiple Extrude creates a 3D object from selected two-dimensional objects. The 2D surface at the front/top is moved at a certain distance at a 90° angle to the screen and the corner points are connected with each other. It works like pitching a tent. ■



5.2.1 Draw Basic Geometry

1 Change to **Top/Plan** view.

2 Draw a **rectangle** with edge lengths **70** mm x **70** mm (*Double-click* the *Rectangle* tool) and place it in the **top left corner of the tabletop**.



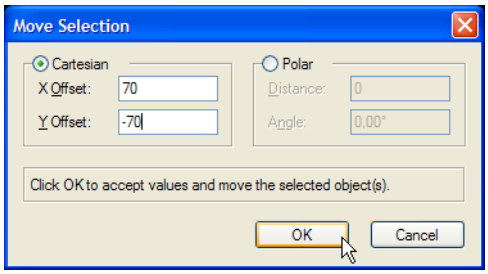
■ At this point, we can illustrate the difference between 2D elements and 3D elements especially well. Change back to Left Isometric. The little rectangle will remain in its position. Since it is a 2D element, it is not oriented in 3D space. Now change back to **Top/Plan** view so we can continue the exercise. ■

3 Zoom in on the left corner of the table and make sure that the square you just created is selected.

4 Press **Ctrl+M** to call **Move**.

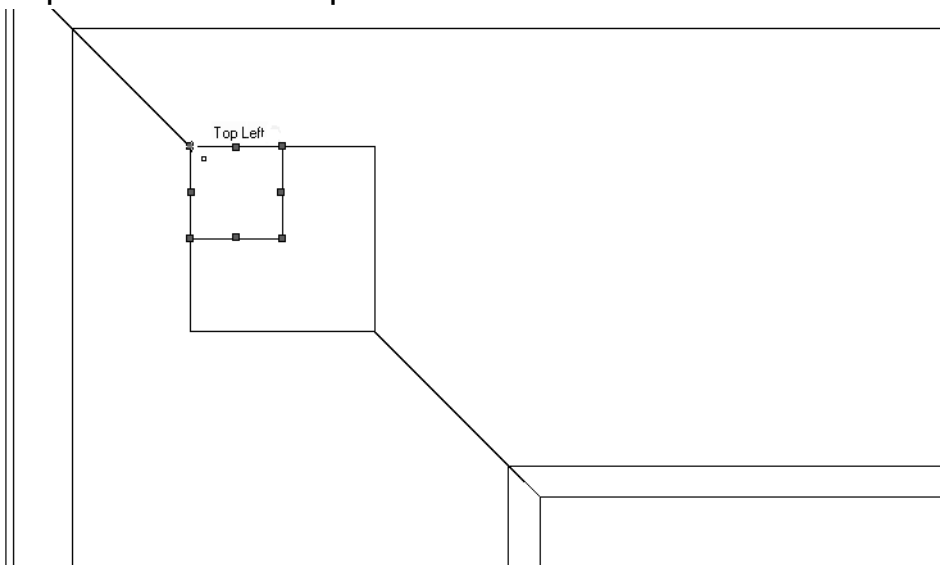
5 Enter the coordinate values for moving in the dialog box: x = **70** mm (move 70 mm to the right) and y = **-70** mm (move 70 mm down).

6 Click **OK** to confirm.



The square is moved off from the inner edge by 70 mm in both directions.

7 Draw a **rectangle** with edges **35** mm x **35** mm (*Double-click* the *Rectangle* tool) and place it at the **top left corner of the square drawn before**.



5.2.2 Create Multiple Extrude

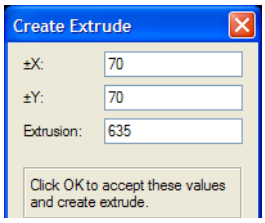
A multiple extrude is always created by moving the surface at the top/front forward at a 90° angle to the screen. The small square was created before the large square, so it is at the front. But we want the table leg to be in the other direction, so we move the small square to the back.

1 Select the **small square** and press **Ctrl+B** to send it to the back.

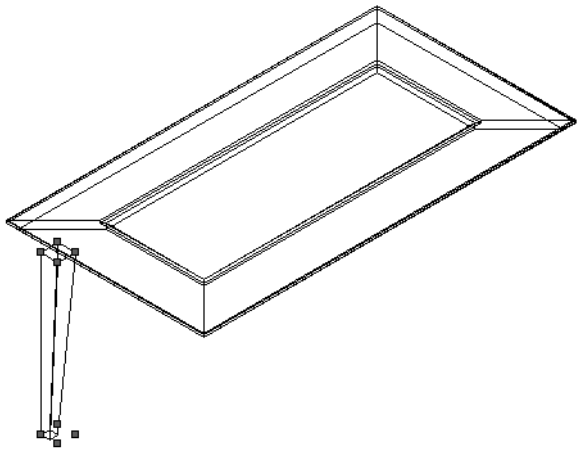
2 Select the large square in addition (press **Shift** during selection).

3 Select **Model** > **Multiple Extrude...**

4 Enter a height of **635** mm in the **Extrusion** box and click **OK** to confirm.



Look at the result in **Left Isometric** view.



Notes:

_____

_____

_____

_____

_____

_____

5.2.3 Protrusion/Cutout

In the next step, we will create the upper, straight part of the table leg. To do so, we use the Protrusion/Cutout tool to draw the upper part of the leg up and enter the desired height.

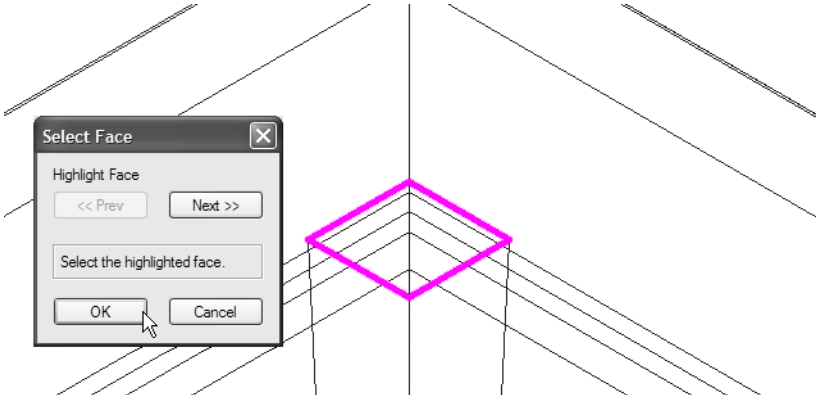
1 Zoom in on the extrude.

2 Select the **Protrusion/Cutout** tool from the **3D Modelling** tool set.

3 Select **Extrude Face Mode** and **Add**.

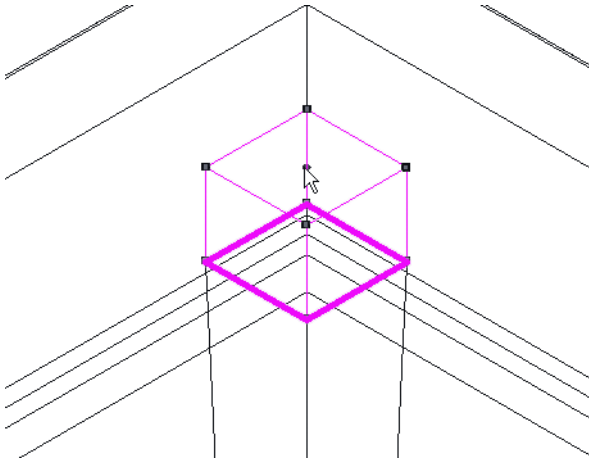
4 Now click one of the **edges** of the upper surface of the leg to select it as modification surface.

5 If Select Faces opens, check that the top surface is marked red. Otherwise, toggle the selection by clicking Next >>. Click **OK** to confirm.

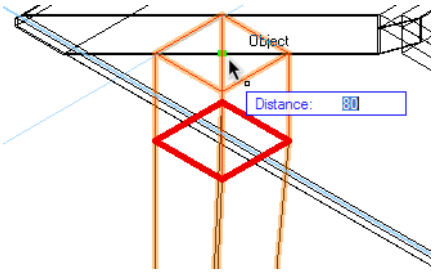


The surface is marked red and a green modification point is displayed in its center.

6 Grab the upper surface at this point and **drag** it **upwards**.



7 We want the straight part of the leg to be **80** mm high. Press **Tab** twice and enter the value. Press **Enter** to confirm.



The red preview cuboid is adjusted accordingly.

8 Complete the operation by clicking the green check mark button in the Tool bar or pressing **Enter**.

9 Press **X** to exit the tool.

5.2.4 Creating a Symbol

In the last step, we create a symbol from the table leg. This way, the table legs can be easily replaced by other legs (see chapter 5.4.13).

1 Press **Ctrl+5** to change to **Top/Plan** view.

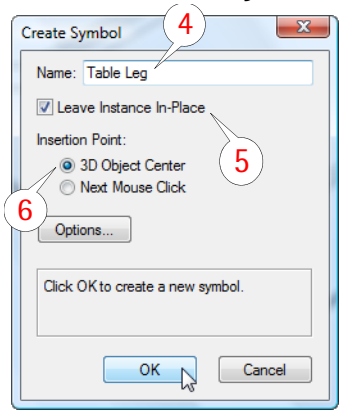
2 Make sure the table leg is selected (*Object Info palette:* Solid Addition).

3 Select **Modify** > **Create Symbol...**.

4 Name the symbol **Table Leg**.

5 Check **Leave Instance In-Place**.

6 Make sure that **Insertion Point** is set to **Plan Projection Center** and click **OK** to confirm.



7 In the following dialog (Move) you don't have to make any changes. Simply click **OK** to confirm.

5.2.5 Duplicate Table Leg

The first table leg is now finished so we can place copies of it at the other corners of the table.

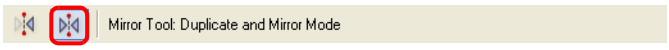
1 Change to **Top/Plan view (Ctrl+5)**.

2 Zoom in on the left side of the table.

3 Make sure the table leg is active (*Object Info palette*: 3D Symbol).

4 Select the **Mirror** tool from the **Basic** palette.

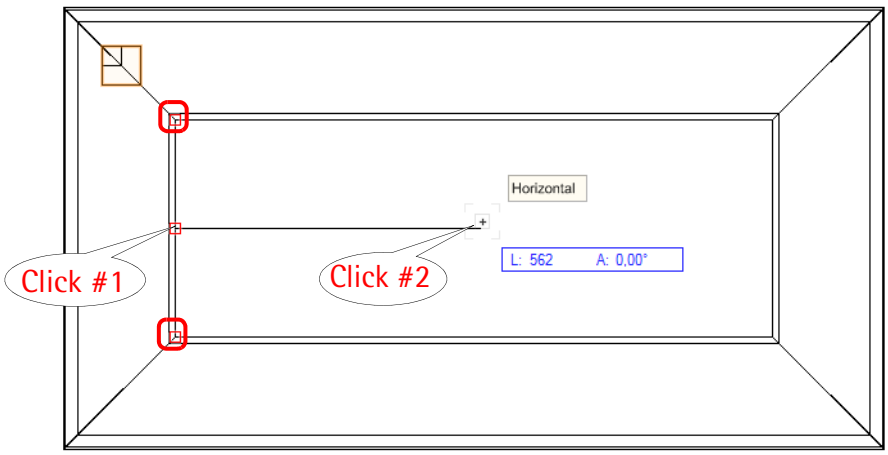
5 Make sure that **Duplicate and Mirror Mode** is selected.



Next we define the mirror axis with a guiding line.

6 Hover the cursor over both corners of the inner edge of the short frame segment. Click in the center when the cue **Midpoint** is displayed (**Click #1**). Make sure to select the bottom edge and not an edge of the rabbet.

7 Then move the mouse to the right and click when the cue Horizontal is displayed (**Click #2**).



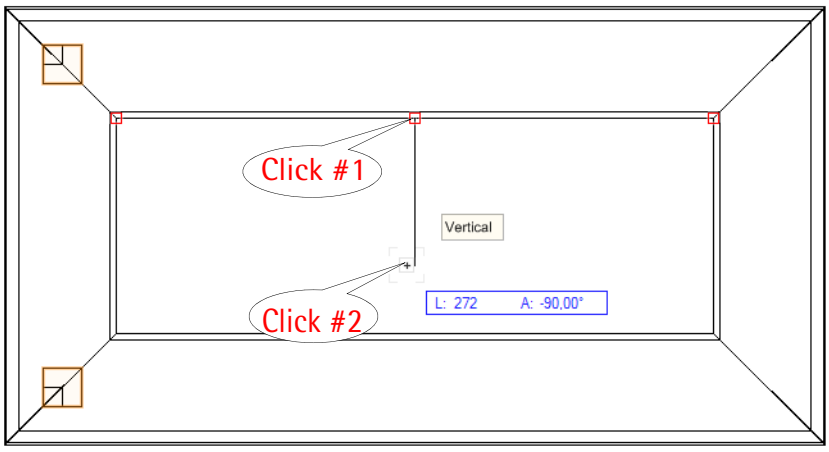
The third and fourth legs are also placed by mirroring.

1 Press **X** to exit the Mirror tool.

2 Now select both table legs (Press **Shift** during selection).

3 Again select the **Mirror** tool from the Basic palette.

4 Draw the mirror axis along the **midpoint** of the long frame segment on top (**Clicks #1 and 2**). Make sure to select the bottom edges.



Notes:

5.3 Apron

5.3.1 Draw Basic Geometry

In the next step we create the left apron as an extrude.

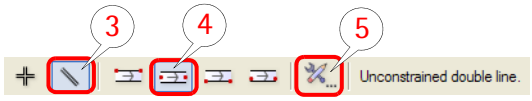
1 Change to **Top/Plan** view and zoom in on the left side of the table.

2 Select the **Double Line** tool from the **Basic** palette.

3 Select **Unconstrained Double Line Mode** on the Tool bar.

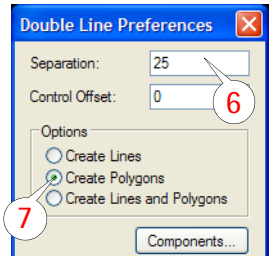
4 Make sure that **Center Control Line Mode** is active.

5 Click **Double Line Preferences...**.



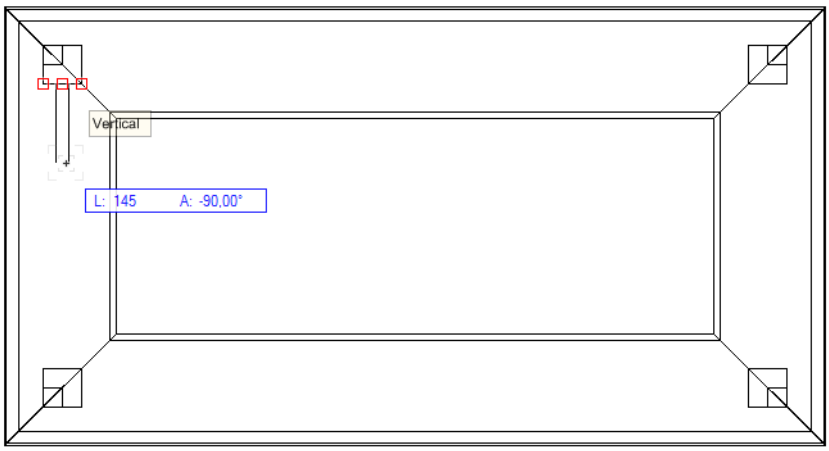
6 Enter **25** mm in the **Separation** box.

7 Check **Create Polygons**.



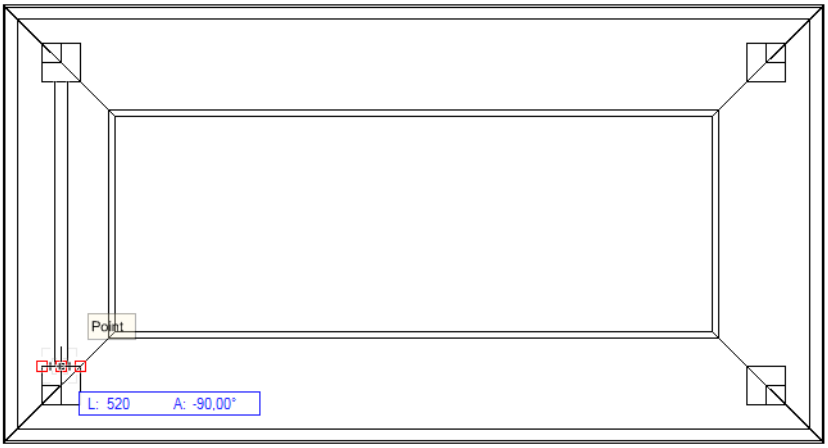
We want the double line to begin at the inner edge of the top left table leg.

8 Hover the mouse cursor over both corners of this edge and start the double line by clicking in the center when the cue **Midpoint** is displayed.



9 Drag the cursor down vertically and hover the mouse cursor over a corner of the opposing table leg.

10 Click again in the center of the edge when the cue **Vertical / Align V** is displayed.

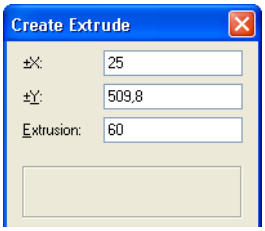


11 Press **X** to exit the tool.

5.3.2 Create Extrude

1 Make sure that the polygon you just created is active. Choose **Model** > **Extrude...**.

2 Enter a height of **60** mm in the **Extrusion** box and click **OK** to confirm.



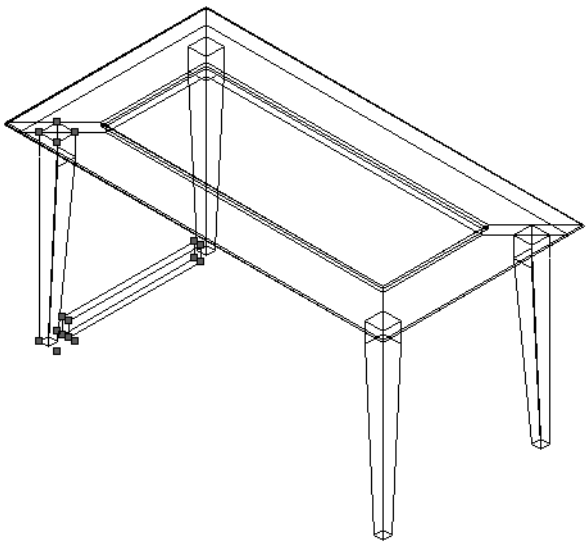
Notes:

5.3.3 Align Apron

As we already know, all new extrudes are placed on the design layer by default - at z=0. In the next step, we move the extrude to the desired position.

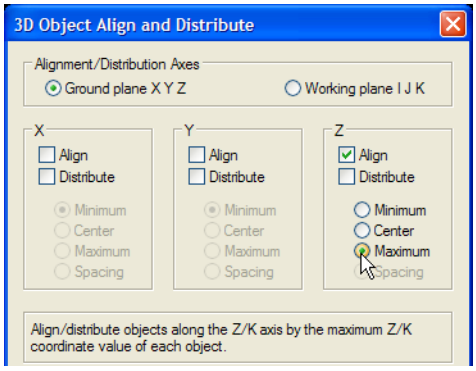
1 Change to **Right Isometric** view.

2 Press **Shift** and select the extrude and the front left table leg.



3 **Right-click** the edge of the extrude and select **Align/Distribute 3D ...** from the contextual menu.

4 Make settings as shown below.



■ By selecting Maximum, the **top surfaces** of the table leg and the apron are aligned level with each other. ■

5 After clicking **OK** the extrude is aligned with the top edge of the table leg.

5.3.4 Create long apron

The first long apron is created by mirroring the short apron at 45 degrees and adjusting the length.

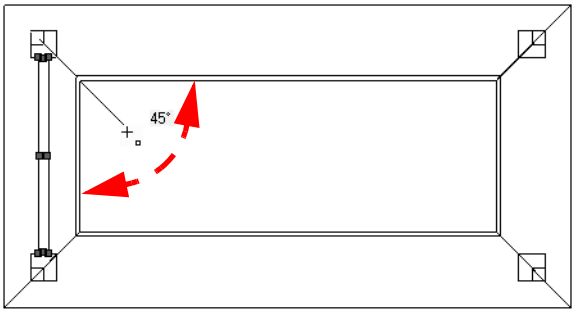
1 Change to **Top/Plan** view.

2 Only the apron should be selected.

3 Then select the **Mirror** tool from the **Basic** palette and select **Duplicate and Mirror Mode**.

4 The starting point of the mirror axis is the **top left** table corner.

5 Draw the mouse cursor to the **right and down** after this first click and click again when the cue **45°** is displayed.



6 Press **X** to exit the tool.

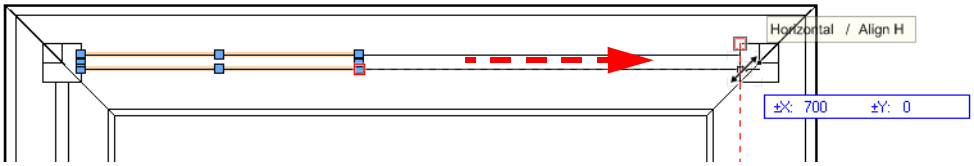
We will now adjust the length of the apron with the mouse.

7 Zoom in on the right end of the mirrored apron.

8 Then hover the mouse cursor over the **center modification point** of the right side of the apron. Click when the Reshape cursor is displayed.

9 Zoom out of the drawing and then in on the right table leg.

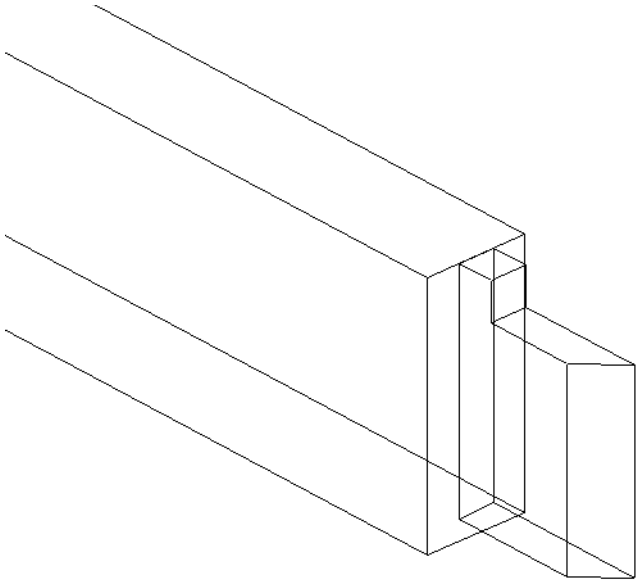
10 Hover the mouse over the inner edge of the right table leg. Click when the cue Object is displayed.



5.4 Tenon

In the next step we add a tenon to the aprons.

The tenon is to look like this.

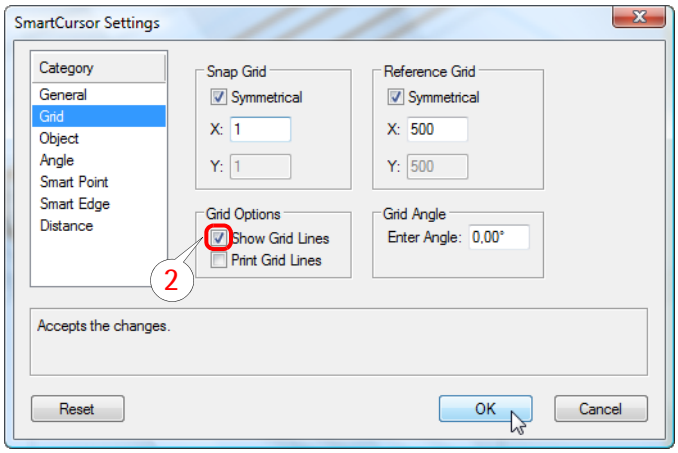


5.4.1 Set Grid

To create the tenon, we will use a layer. We need to display the grid so the layer is displayed on the drawing.

1 Double-Click **Snap to Grid** in the Palette **Constraints.**

2 Make sure that **Show Grid Lines** is checked and click **OK** to confirm.



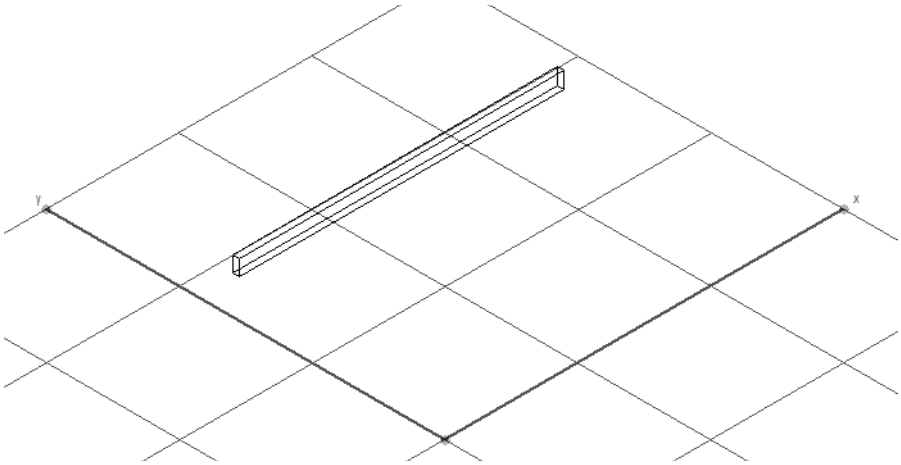
We will now work inside the apron group. This way, only the apron will be displayed - all other parts are hidden.

1 **Select** the **long apron** at the **top**.

2 Press **Ctrl+G** to group the apron (*Object Info palette*: Group).

3 **Double-click** an edge of the apron to get inside the group.

4 Change to **Left Isometric** view.



5.4.2 Set Working Plane

Now we draw the tenon's basic form onto the narrow side of the apron. To do that, we define a working plane first.

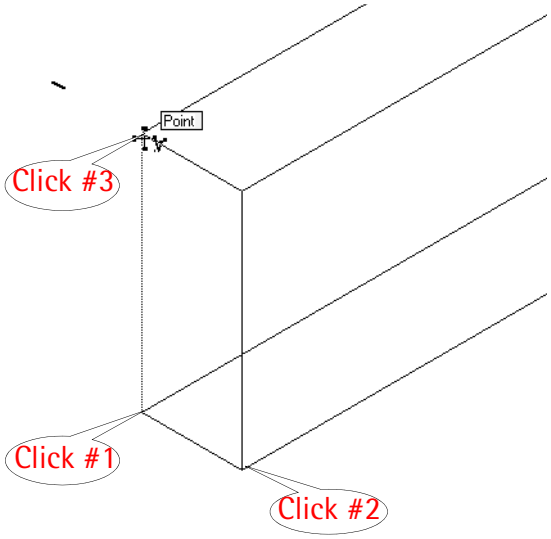
1 Zoom in on the left narrow side of the apron.

2 Select the **Set Working Plane** tool from the **3D Modelling** palette.

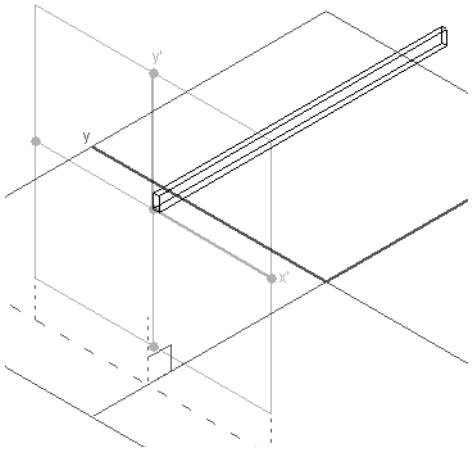
3 Hover the cursor over the bottom left corner of the narrow side. Click when the cue **Point** is displayed (**Click #1**).

4 Click the bottom right corner to define the direction of the X axis of the working plane (**Click #2**).

5 Then click on the top left corner (**Click #3**) to define the Y axis.



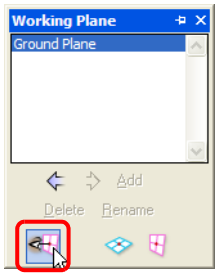
The working plane is marked in magenta in the drawing.



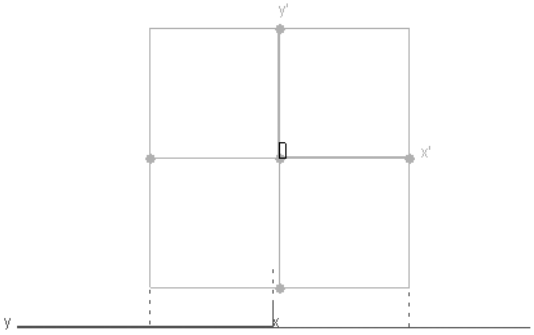
■ Working planes are organized in the **Working Planes** palette. New working planes are added to this palette. ■

We want to view the working plane from above so we can draw the tenon. We adjust this view via a button on the Working Planes palette! Do not use the Standard Views used previously (Standard Views list in the View bar), since they refer to the ground plane, not the working plane.

1 Click the **bottom left button** on the **Working Planes** palette.



Now we are looking at the working plane from the front.

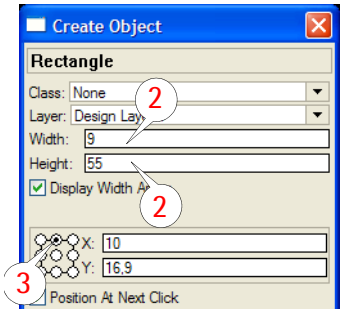


5.4.3 Create Tenon

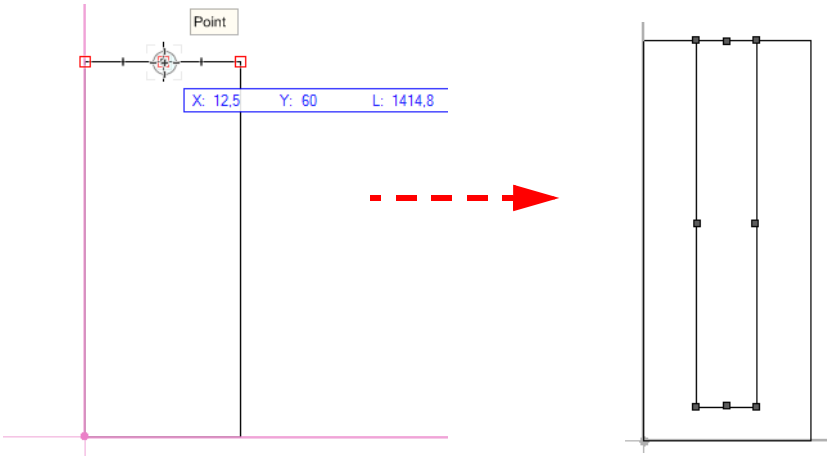
1 **Double-click** the **Rectangle** tool.

2 Enter **9** and **55** mm respectively in the **±x** and **±y** boxes.

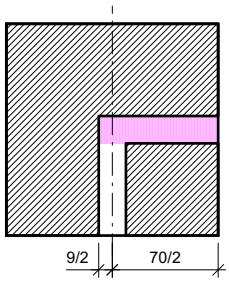
3 Set the insertion point to **Top Center** and click **OK** to confirm.



4 Move the mouse cursor to the top edge of the apron. Click when the cue **Midpoint** is displayed.

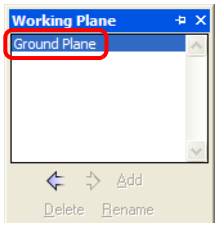


5 Press **Ctrl+E** to create an extrude from the rectangle with a height of **70/2+9/2** mm.

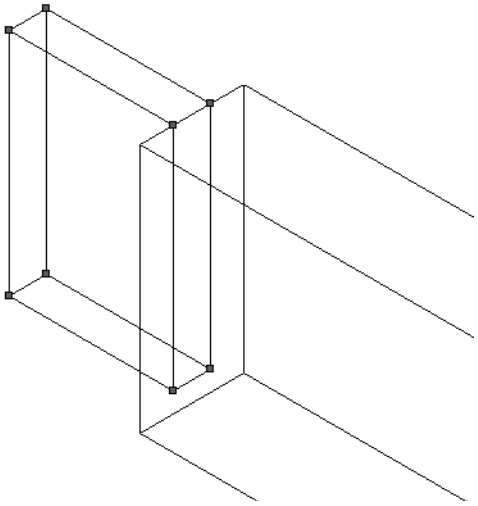


6 Change to **Right Isometric** and press **Ctrl+4** to fit to page area.

7 We can now return to the ground plane. **Double-click Ground Plane** in the Working Planes palette.



8 Zoom in on the tenon.

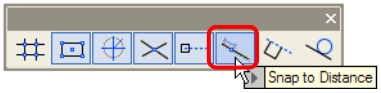


5.4.4 Drawing a 3D Polygon

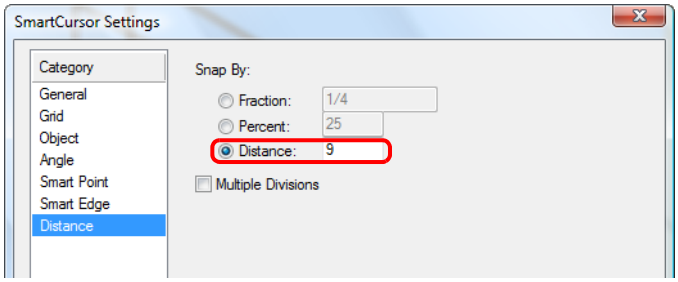
In the next steps, we want to work with the surface of the tenon. We first draw a 3D polygon onto the top surface at a distance of 9 mm from the apron.

One setting has to be made before.

1 Double-click Snap to Distance in the Constraints palette.



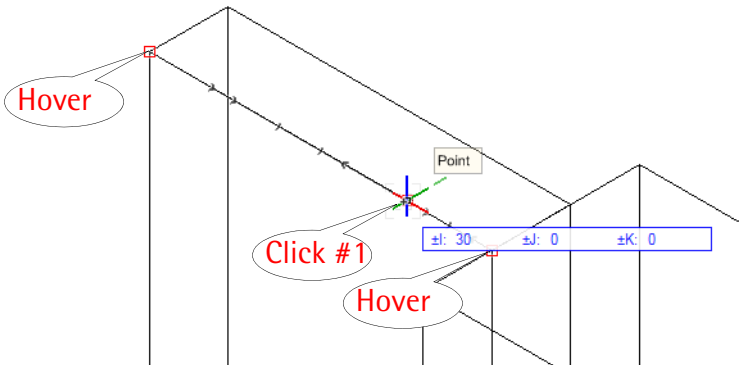
2 Select Distance and enter 9 mm.



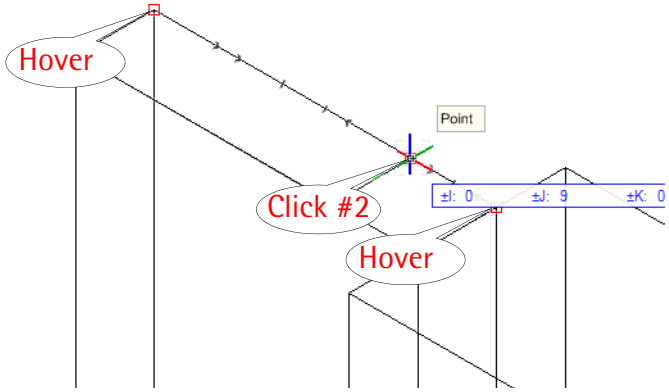
■ This setting makes sure that a part of the line is captured on each edge at a distance of 9 mm from the corners. ■

3 Click **OK** to exit the dialog and select the **Polygon 3D** tool from the **3D Modelling** tool set.

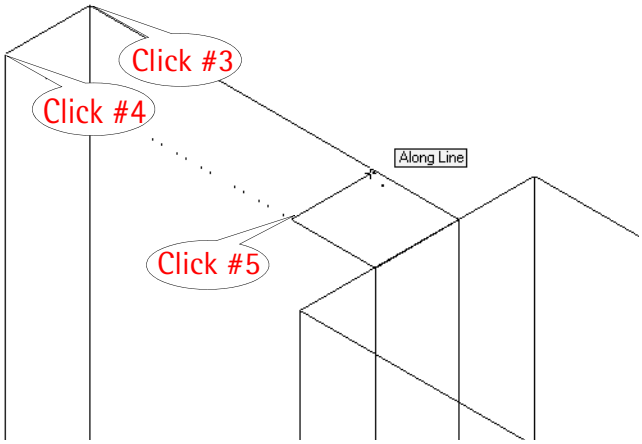
4 Start the polygon as shown below: Hover the mouse cursor over both corners of the edge and click when the cue **Along Line** is displayed (**Click #1**).



5 Hover the mouse cursor over both corners of the opposite edge and click when the cue Along Line is displayed (**Click #2**).



6 Now click once on the left rear corner (**Click #3**), once on the left front corner (**Click #4**) and return to and click on the starting point (**Click #5**).



7 Press **Ctrl+Alt+N** to convert the Polygon to a NURBS-Curve.

8 Click Snap to Distance in the Tool bar again to switch off the mode.

5.4.5 Protrusion/Cutout

In the next step, we will use the **Protrusion/Cutout** tool. Since we need a NURBS curve as basic form, we first convert the 3D polygon.

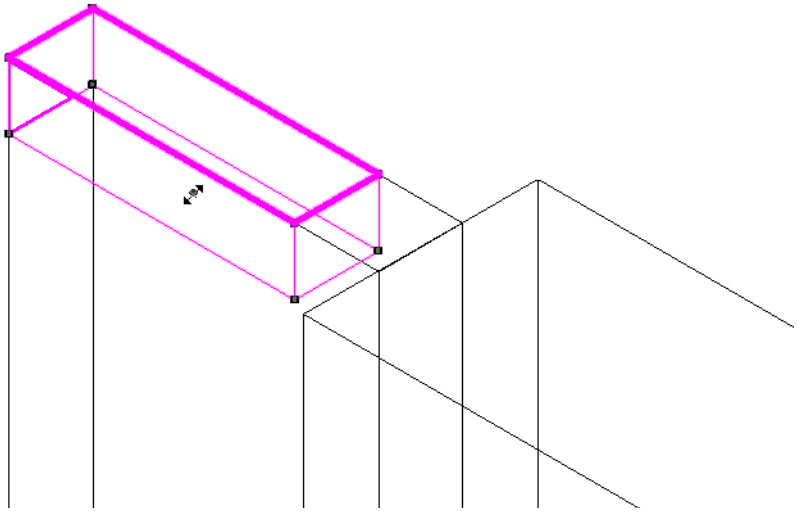
1 Select the **NURBS Curve** tool from the **3D Modeling** tool set (shortcut: Shift+7).

2 Select the **Protrusion/Cutout** tool from the **3D Modeling** tool set.

3 Select **Extrude Curve Mode** and **Subtract**.

4 **Click** first the **NURBS curve** and then the **tenon**.

5 Move the cursor to the **green modification point** and **drag** it **down**.



6 Press Tab and enter the value 9mm. Press Enter to confirm.

7 **Confirm** by clicking the **green check mark button** in the Tool bar.

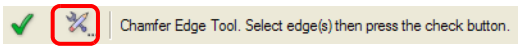
8 If necessary delete the NURBS-Curve.

5.4.6 Chamfering the Tenon

In the next step, we will chamfer the front edge of the tenon.

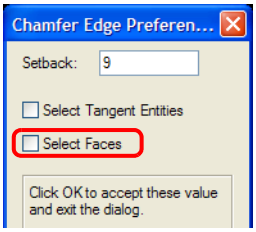
1 Select the **Chamfer Edge** tool from the **3D Modeling** tool set.

2 Click **Chamfer Edge Preferences...** in the Tool bar.

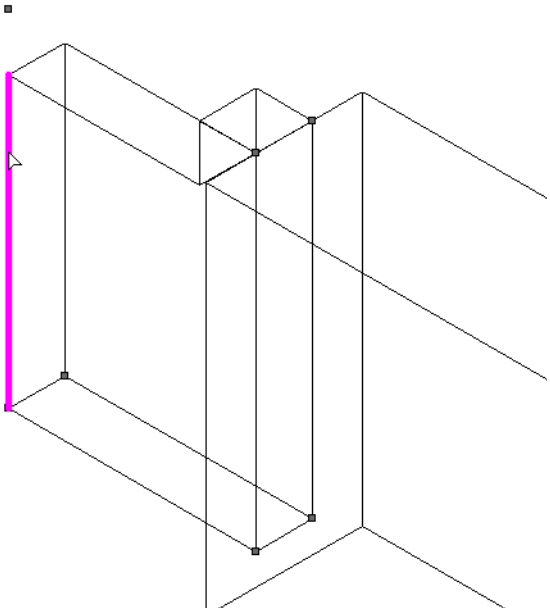


3 Enter a **Setback** of **9** mm.

4 Make sure that the option **Select Faces** is **unchecked** and click **OK** to confirm.



5 Now **click** the **vertical edge** shown below.



6 **Complete** the operation by clicking the **green check mark button** in the Tool bar.

7 Press **X** to exit the tool.

8 Click **Exit Group** in the Tool bar to return to the main drawing.

9 Press **Ctrl+U** to ungroup it.

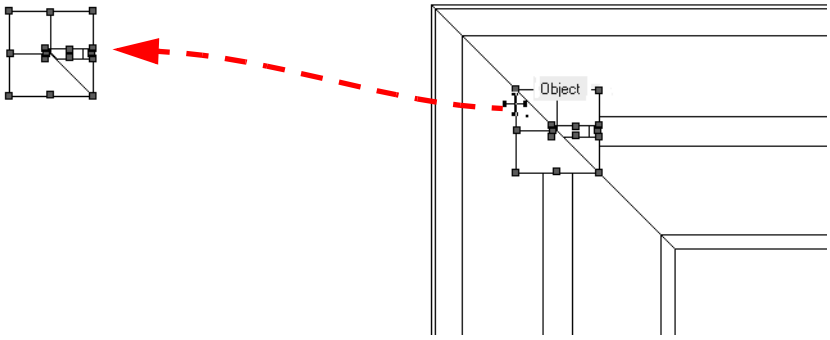
10 Press **Ctrl+5** to return to **Top/Plan** view.

5.4.7 Subtract Solids

In the next step, we mirror the tenon at an angle of 45° and then delete the tenon's volume from the table leg.

1 **Click** an **empty space** in the drawing and **select** the **tenon** and the **top left table leg symbol** (*Object Info palette*: 2 Objects).

2 Press **Ctrl** and **drag duplicates** of both objects to the left onto a free space in the drawing. (You can find a detailed description of this feature in chapter 2.2.4.)



3 **Zoom** in on the duplicates.

4 **Click** an **empty space** in the drawing again and **select** the **tenon** only.

5 Select the **Mirror** tool from the **Basic** palette. Make sure that **Duplicate and Mirror Mode** is active.

6 **Click** the **top left** corner of the duplicate table leg (cue **Point**).

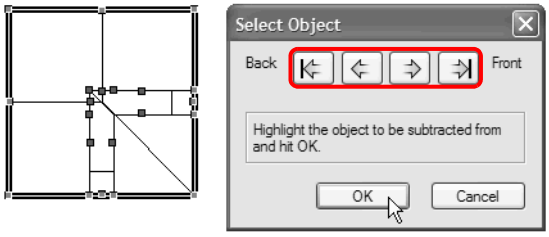
7 Move the cursor to the **bottom right** corner of the leg and **click** again (cue **Point**).

8 Press **X** to exit mirroring.

9 **Select** both tenons and the table leg (*Object Info palette*: 3 Objects).

10 Choose **Model** > **Subtract Solids.....** (shortcut **Ctrl+Alt+S**)

11 Use the arrow buttons to make sure that the table leg is marked in black.



12 Click **OK** to confirm.

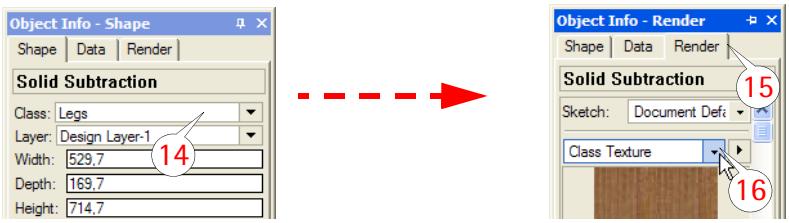
Now we assign a class to the table leg.

13 **Select** the table leg (*Object Info palette*: Solid Subtraction).

14 Choose **Legs** from the **Class** box in the **Object Info palette**.

15 Change to the Render tab.

16 Select Class Texture and change back to the Shape tab.



5.4.8 Create Symbol

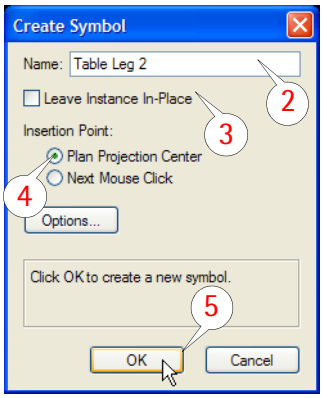
We will now convert the changed table leg into a symbol and replace the other legs with it.

1 Choose **Modify** > **Create Symbol...**

2 Name the symbol **Table leg**.

3 Uncheck **Leave Instance In-Place**.

4 Select **Plan Projection Center**.



5 Confirm this dialog and the following dialog by clicking **OK**.

The new table leg is added to the Resource Browser of the current document. We will need it again in chapter 5.4.13.

5.4.9 Mirroring the Tenon

In the nest step, we add tenons to the other ends of the aprons.

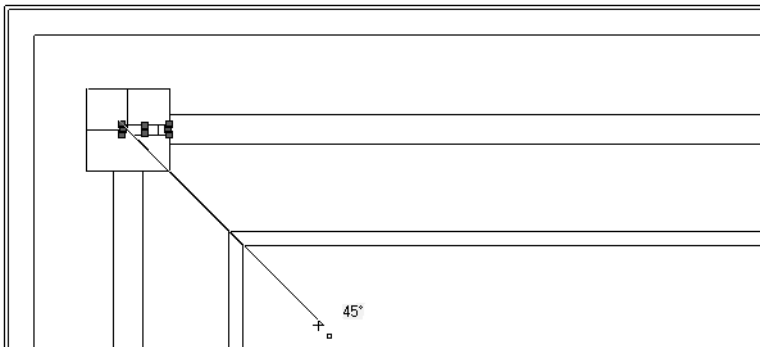
1 Adjust the zoom factor so that you can see the whole table.

2 Select the tenon created in chapter 5.4.3.

3 Select the **Mirror** tool from the **Basic** palette. Make sure that **Duplicate and Mirror Mode** is active.

4 **Click** the **top left** corner of the table (cue **Point**).

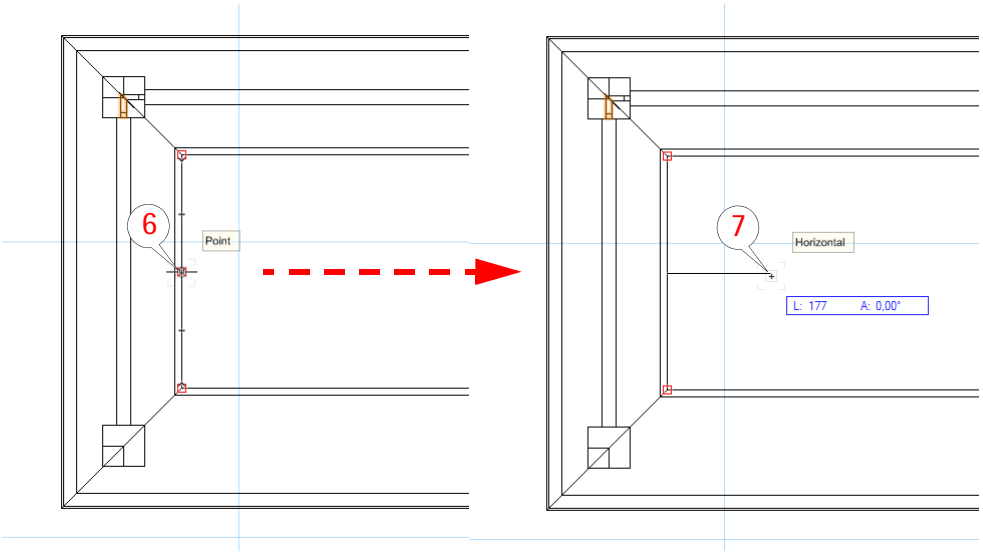
5 Move the cursor **to the right and down** and **click** when the cue **45°** is displayed.



We can now mirror the tenon onto the other side of the short apron.

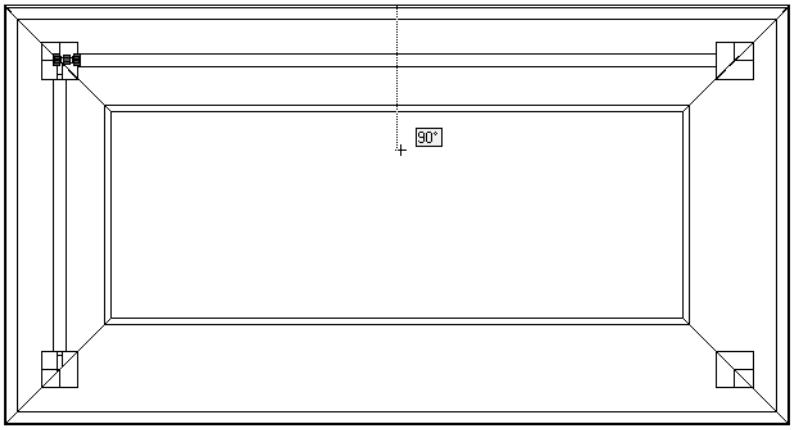
6 Start the mirror axis in the **center** of the **short table edge**. Hover the mouse cursor over both edges and click in the center when the cue **Midpoint** appears.

7 Move the mouse to the right and click when the cue **Horizontal** is displayed.



8 Press **X** to change to the 2D selection tool.

9 **Select** the **tenon** belonging to the long apron.



10 Select the **Mirror** tool again.

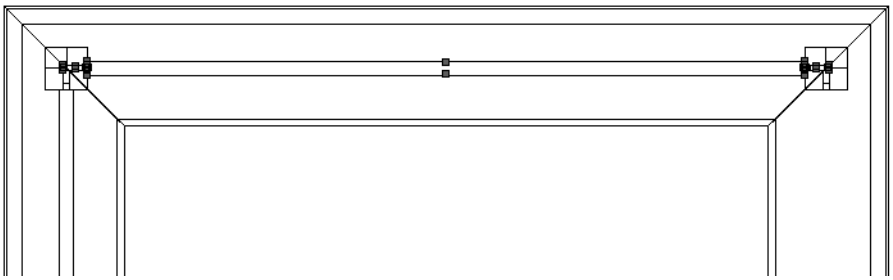
11 The mirror axis goes straight down at a **90°** angle from the **center** of the **long table edge**. Remember to hover the mouse cursor over the corners of the edge, so that the Midpoint is displayed.

12 Press **X** to exit the tool.

5.4.10 Joining tenons and aprons

Now we can join the tenons and the aprons into a complete object.

1 Press **Shift** and **select** the long apron and the two tenons to the left and right of it (*Object Info palette*: 3 Objects).



2 Choose **Model** > **Add Solids** (shortcut **Ctrl+Alt+A**).

The Object Info palette will display Solid Addition.

3 In the same way, join the **short apron** and the **corresponding tenons** into a **solid addition**.

Notes:

_____

_____

_____

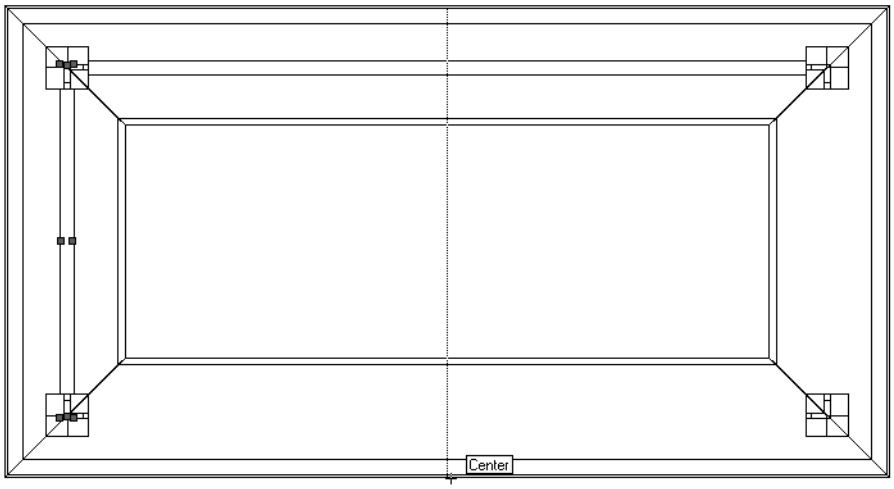
5.4.11 Mirror aprons

The missing aprons can be created through mirroring.

1 **Select** the short apron.

2 Select the **Mirror** tool.

3 Mirror the short apron to the right. The mirror axis runs **vertically** between the **center points** of the long table edges.



4 Press **X** to exit the tool.

5 **Select** the long apron.

6 Select the **Mirror** tool again and mirror the apron down along a horizontal mirror axis.

5.4.12 Assign Class

Finally,we assign a class to the four aprons.

1 Press **X** to change to the 2D Selection tool.

2 **Select** the four aprons.

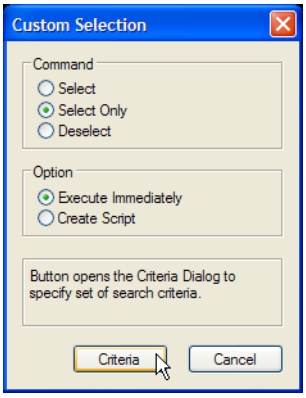
3 Assign the Apron class Apron via the **Object Info palette** (!).

5.4.13 Replace Table Legs

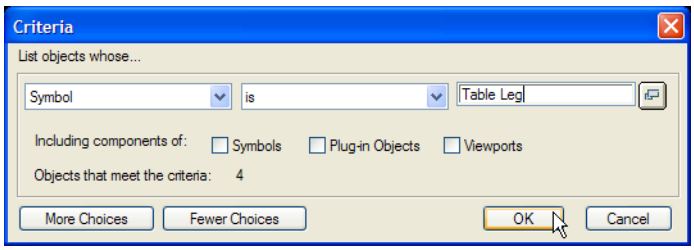
Finally, we replace the original table legs with the symbols created in chapter 5.4.8.

1 Choose **Tools** > **Custom Selection**.

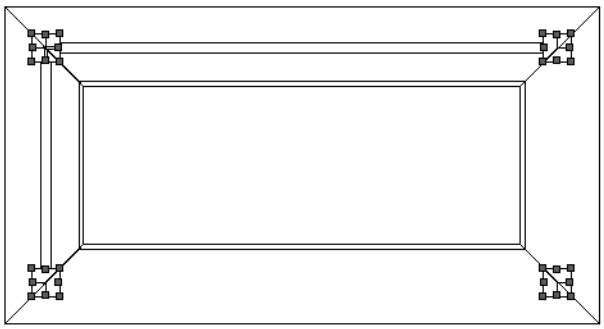
2 Make sure that the options **Select Only** and **Execute Immediately** are checked and click Criteria to proceed.



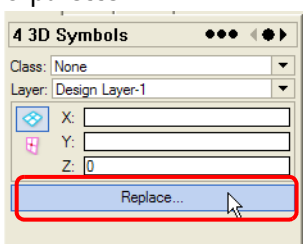
3 Select **Symbol** is **Table Leg** as shown. Vectorworks interiorcad shows that four objects melt the criteria. Click OK to finish the selection.



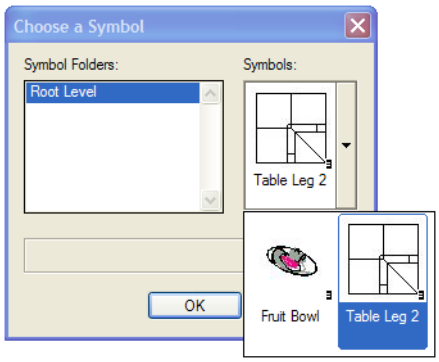
4 3D Symbols are marked in the drawing.



4 Click Replace... in the Object Info palette.

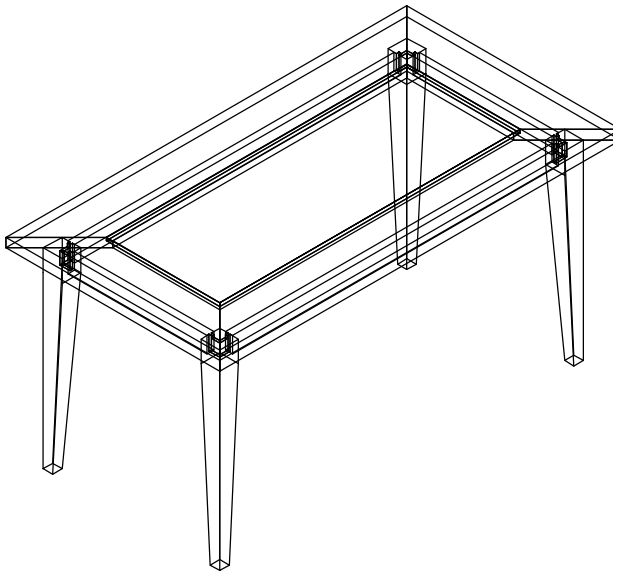


5 Choose the symbol Table Leg2 and click Replace to confirm.



6 Press X to exit the tool.

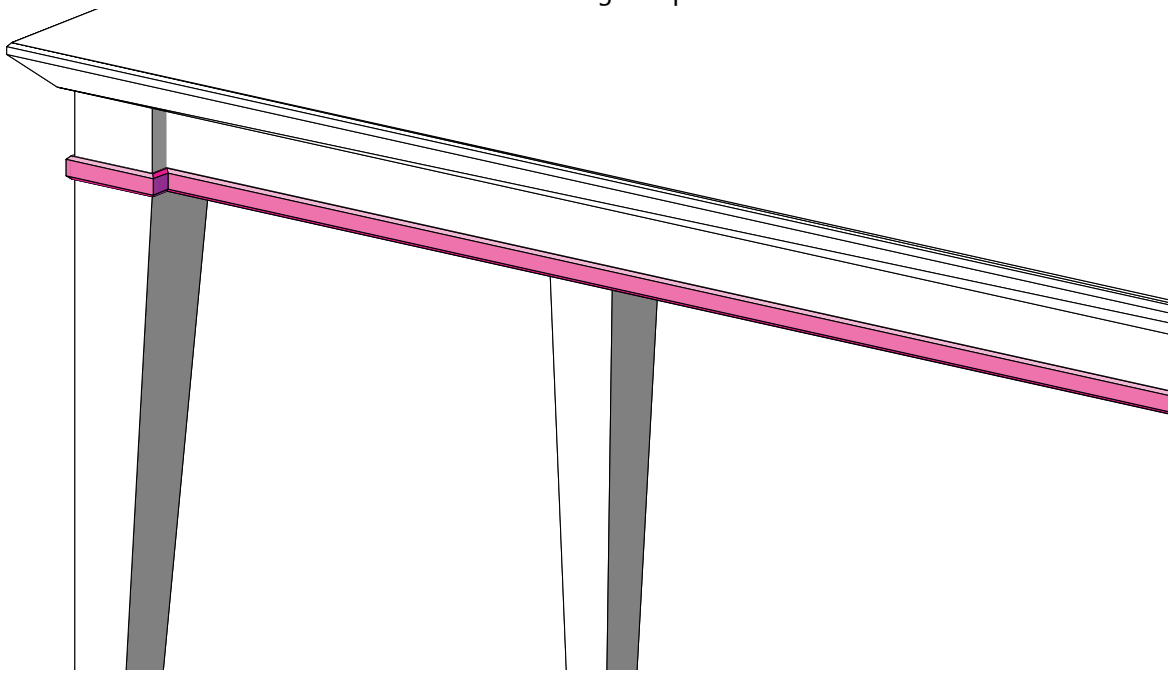
You can display the result now in Left Isometric view.



Notes:

5.5 Decorative Edging

In the last step, we will add a decorative edging to the bottom edge of the apron. This edging is created as an extrude along path. Such an extrude consists of a path (polyline etc.) and a two-dimensional cross-section which runs along the path.



We will create the edging in the following way: We duplicate the table frame and use a drawing tool to trace the contour in form of a cut surface to get the path. Then we draw the cross-section of the edging and create the extrude along the path.

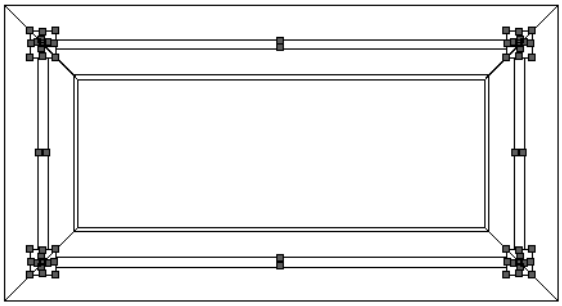
Notes:

5.5.1 Create Path

We want to create a closed and continuous contour with the cut surface tool. So we first create a copy of the table frame and join the individual 3D objects before making the cut. After creating the path, we paste in the four individual aprons and legs.

1 Press **Ctrl+5** to change to **Top/Plan** view.

2 **Select** the **aprons** and the **table legs** (*Object Info palette:* 8 Objects).



3 Press **Ctrl+C** to copy the selected objects to the clipboard.

■ Make sure not to use the clipboard for anything else until the end of this chapter. Otherwise,the saved objects will be lost. ■

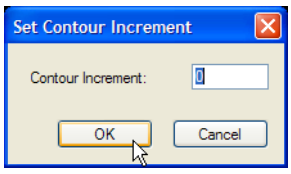
5 Join the parts by choosing **Model** > **Add Solids** (shortcut **Ctrl+Alt+A**).

6 Change to **Front** view.

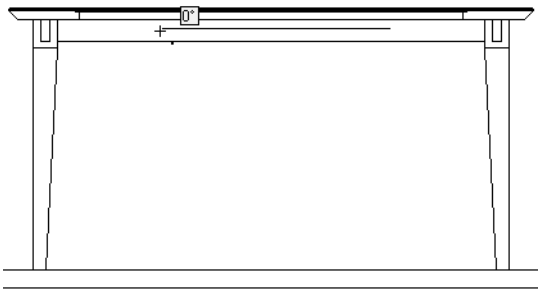
7 Select the **Create Contours** tool from the **3D Modeling** tool set.

8 Select **Contour Settings** on the Tool bar.

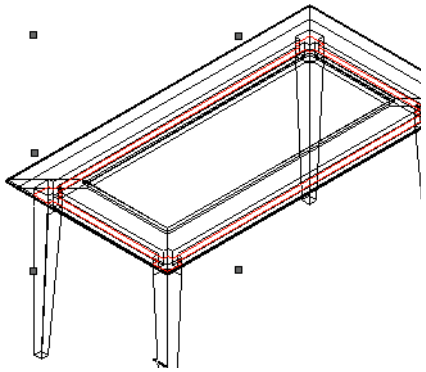
9 Enter a **Contour Increment** of **0** mm.



10 Now draw a horizontal line (cue: 0°) **inside** the apron (not along the object edge).



11 Press **X** to exit and change to **Left Isometric** view.

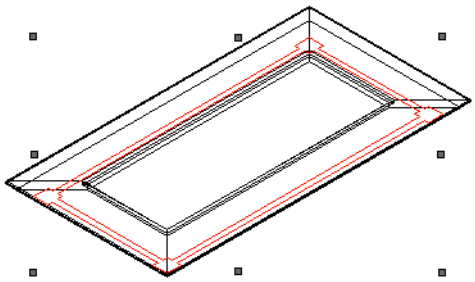


The elements joined before (frame) are not needed anymore.

1 Select the addition solid by clicking a apron (*Object Info palette*: Solid Addition).

2 Press **Del** to delete it.

Two contours marked in red remain in addition to the tabletop, but we only need the outer line as a path.

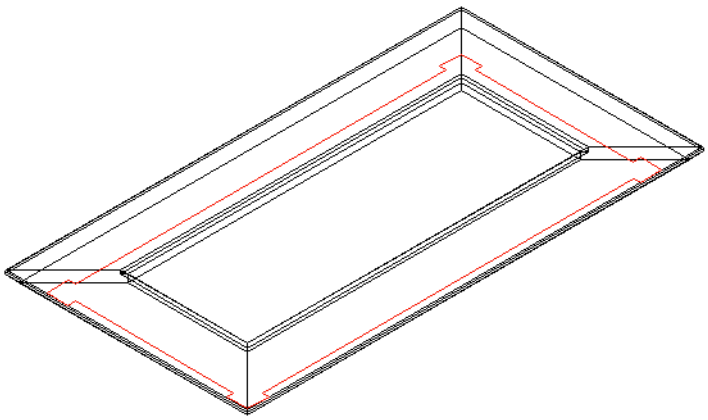


3 CLick one of the red contours.

4 The contours were grouped by default.

5 Press **Ctrl+U** to ungroup them and choose **Modify > Compose to get two NURBS curves**.

6 Now select only the **inner** red curve and press **Del** to delete it.



The creation of the path is now competed. We can now paste in the duplicate of the frame.

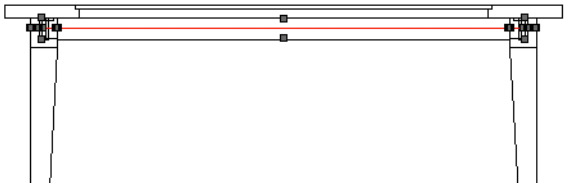
7 Choose **Edit > Paste In Place** (shortcut: Ctrl+Alt+V).

5.5.2 Move Path

We want the path to run along the bottom edge of the apron. So we have to move it up to the appropriate height.

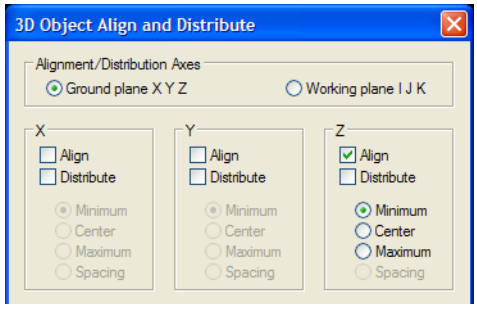
1 Change to **Front** view and click an empty space on the drawing.

2 Select the red path and one of the long aprons.



3 Right-click an edge of the apron and select **Align/Distribute 3D** from the contextual menu.

4 Adjust settings as shown and click **OK** to confirm.



The path is now aligned along the Z axis along the bottom edge ("Minimum") of the apron.

5.5.3 Check Direction

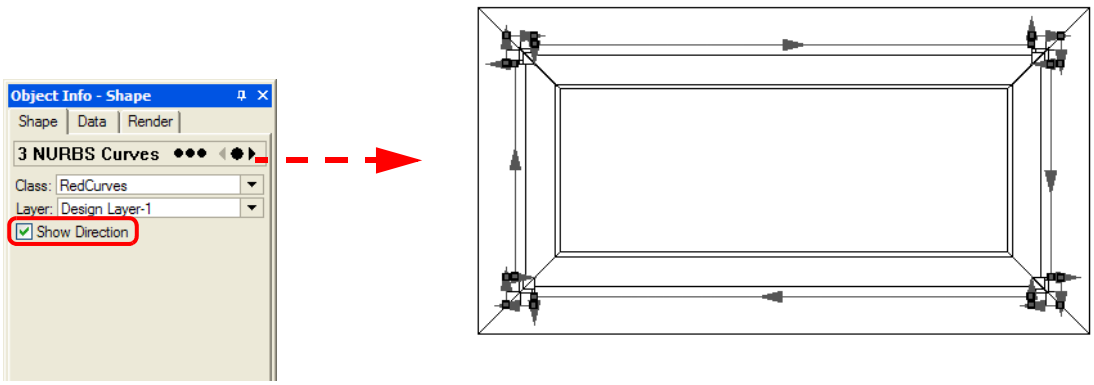
Before we can create the extrude along path, we should check the direction of the path. This is important for the later location of the profile relative to the path

1 Click the red path within the area of a table leg.

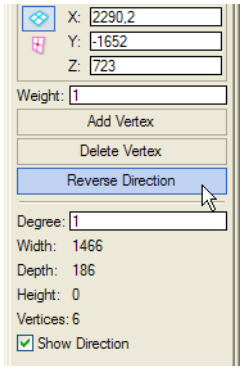
2 Change to **Top/Plan** view.

3 Press **Ctrl+F** to send the red path to the front.

4 Check Show direction in the Object Info palette.



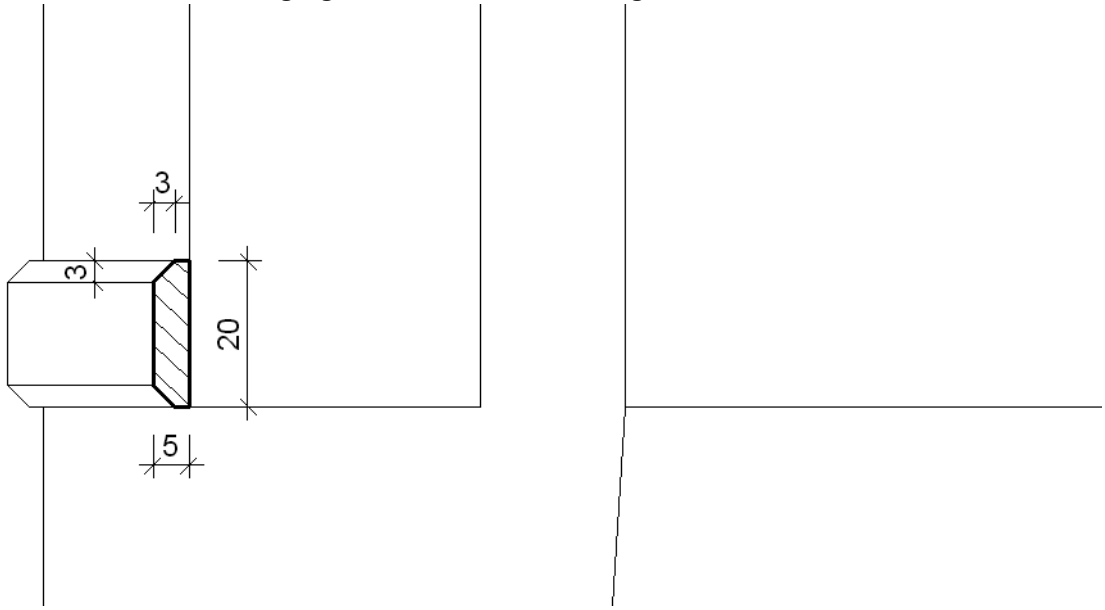
The direction of the curve can be changed via the Reverse Direction button in the Object Info palette.



5.5.4 Create Profile

The path is now located at the desired position and we can create the cross-section.

The cross-section of the edging is to have the following dimensions.



1 **Double-click** the **Rectangle** tool.

2 Create a rectangle with **edge lengths** of **5** mm / **20** mm and place the rectangle on a free space in the drawing.

3 Select the **Chamfer** . tool.

4 Make sure that **Chamfer and Trim Mode** is active.

5 Select **Chamfer Preferences** and enter **3** mm in both boxes.

6 **Chamfer** the rectangle on the **top left** and **bottom left corner**.

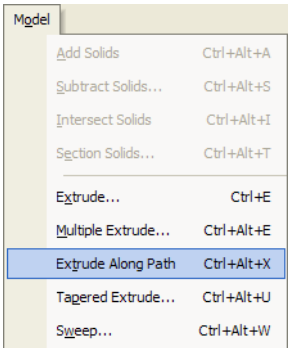
7 Press **X** to exit the tool.

5.5.5 Create Extrude Along Path

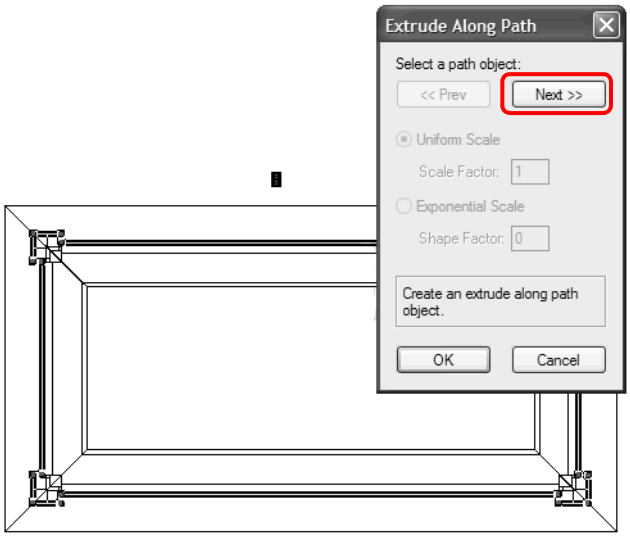
The individual elements of the extrude are now finished.

1 Press **Shift** while selecting the **Path** and the **cross-section**.

2 Choose **Model** > **Extrude Along Path....**



3 Use the pop-up dialog to make sure that the path is marked in black.



4 Click **OK** to confirm.

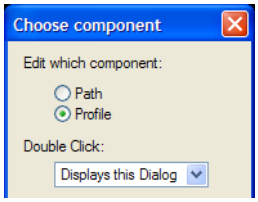
5 Change to **Front** view and zoom in on the edging.

5.5.6 Move Profile

The edging is not yet level with the bottom edge of the apron. it is too far down and too far inside. In the next step, we move the profile to the appropriate position relative to the path.

1 **Double-click** the **edge** of the edging.

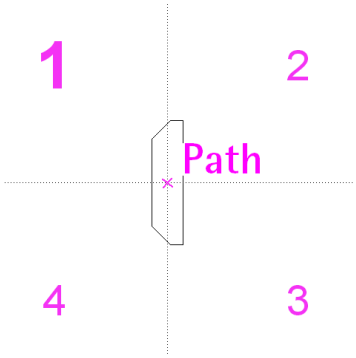
2 Select the option **Profile** in the pop-up dialog and click **OK** to start the operation.



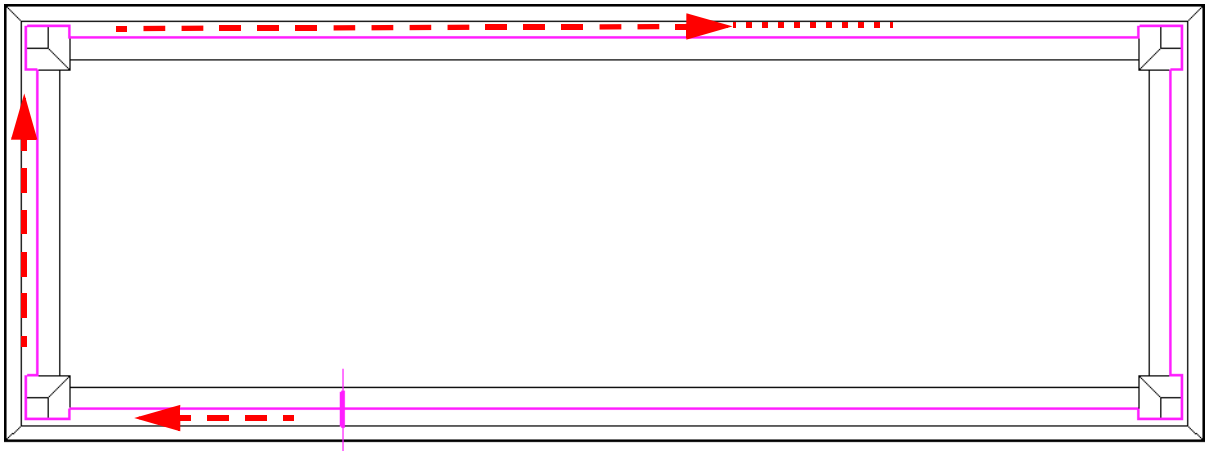
The two-dimensional cross-section geometry of the extrude is now displayed in the drawing.

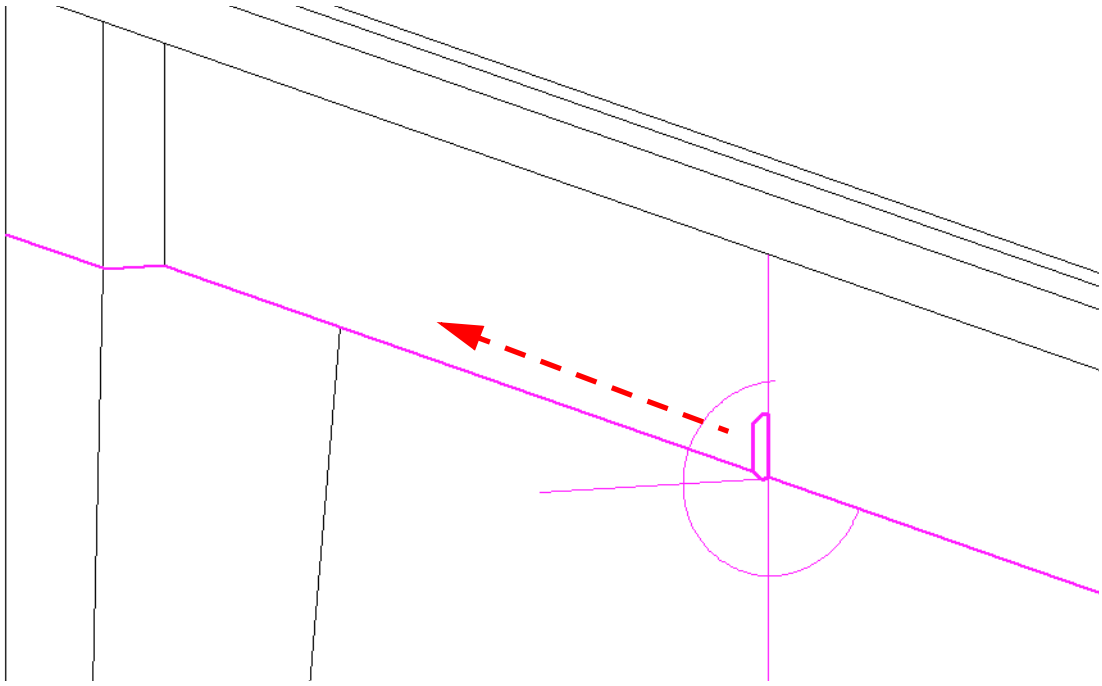
Using the coordinate axes, we can determine at which position the cross-section of the edging is to be placed so that the edging runs along the outer edge of the apron.

■ The visualisazation of the cross-section is divided into four quadrants. The center of the profile is set at the intersection of the axes (zero point). The path runs through this point.■



■ The extrude along path is circumscribed in the direction in which it was drawn. Our path runs clockwise (chapter 5.5.3), so the cross-section of the border has to be placed in the top left quadrant (1). ■

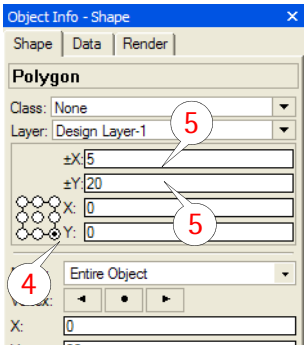




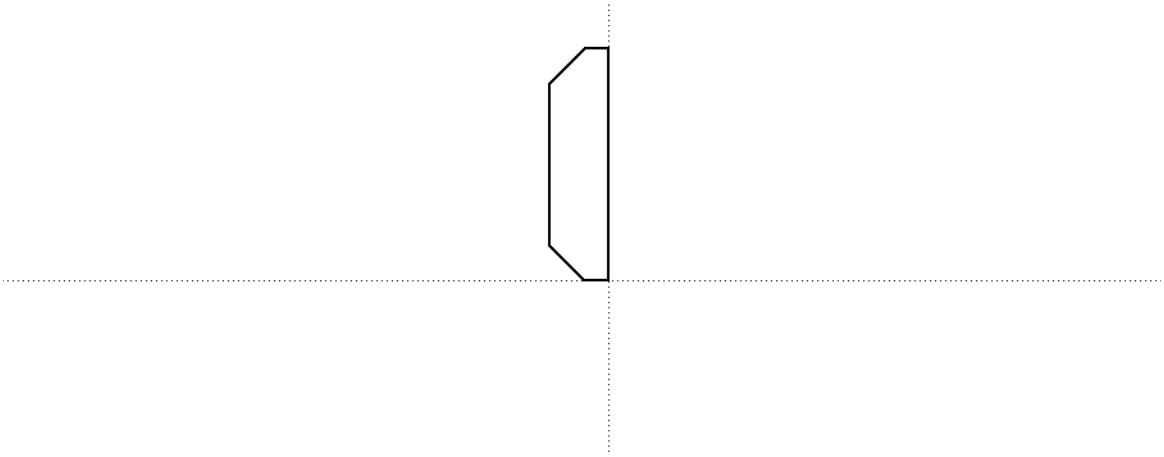
3 **Select** the profile.

4 Change the insertion point to **bottom right**.

5 Then set the values for **x** and **y** to **0**. This moves the profile so that the bottom right corner is at the insertation point.

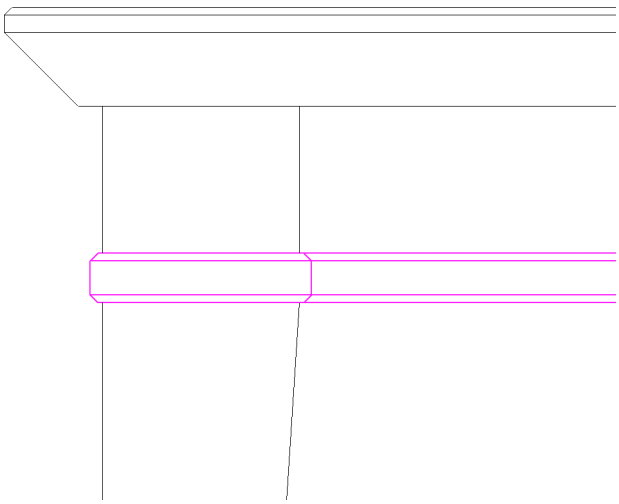


The result should look like this:



6 Click **Exit Profile** to exit the tool and return to the drawing.

The extrude is created again with the changed cross-section.



7 Finally, assign the extrude to the class **Decorative Edging** on the Object Info palette.

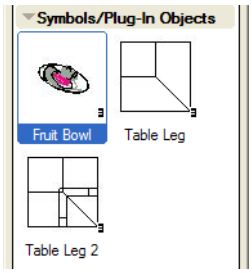
The table is finished now.

5.5.7 Add Resources

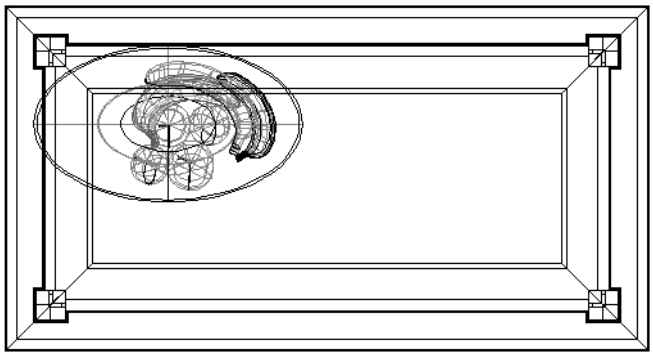
For the rendering, we add some props to the drawing.

1 Press **Ctrl+5** to return to Top/Plan view.

2 Double-click the **Fruit Bowl** symbol in the Resource Browser.



3 Place the fruit bowl on the tabletop.



You can now get a complete impression by changing to **Right Isometric** view and pressing **Ctrl+4**. Then select Wireframe from the Rendering menu.

6 Plan layout

In this exercise, we will learn how to create a plan layout. This chapter is designed to give you some introductory prerequisites on the topic.

The basis of our plan is the 3D model created in the previous exercise. From that, we will derive views, a rendering, and a cross-section and then distribute those on one layout plane with a Plan layout.

Open the template file **Template 5 Plan layout.sta** (Template #5 Plan layout) and save it as **Exercise #5 Plan layout** *SURNAME GIVEN NAME*.**vwx**.

6.1 Views Layout

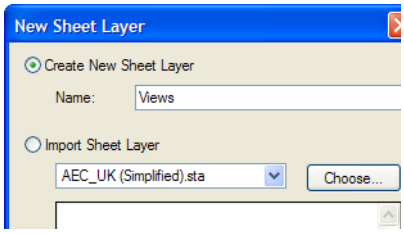
6.1.1 Create Layout

1 **Right-click** an **empty space** in the drawing and select **Layers...** from the contextual menu.

2 In the Organization dialog, change to the **Sheet Layers** tab.

3 Click **New**.

4 Name the sheet layer **Views** and click **OK** to confirm.

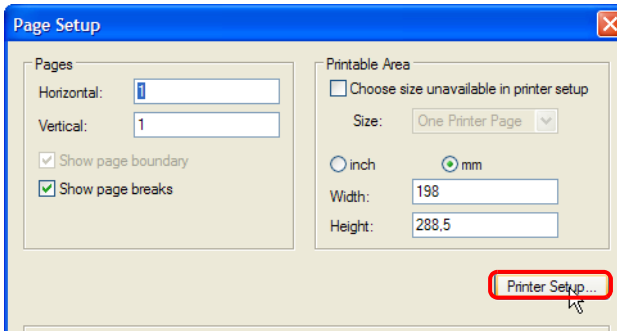


5 Click **OK** to exit the dialog.

The new sheet layer is displayed automatically.

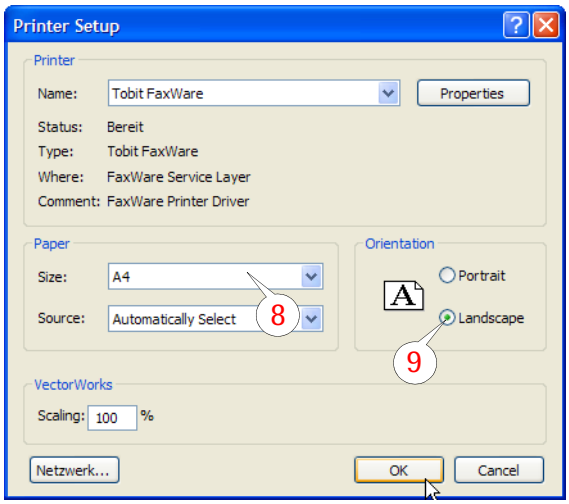
6 **Right-click** an **empty space** in the drawing and select **Page Setup...** from the contextual menu.

7 Click **Printer Setup...** in the Page Setup dialog.



8 Set **Paper Size** to **A4**.

9 Set **Orientation** to **Landscape**.

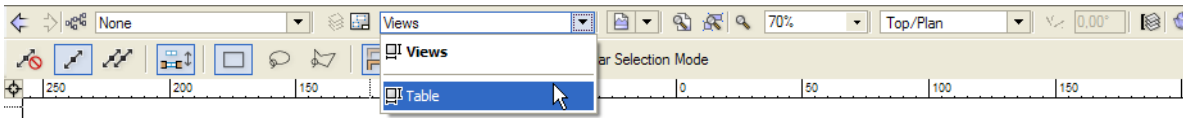


10 Confirm all open dialogs by clicking **OK**.

11 Press Ctrl+4 to see the whole layout area.

6.1.2 Create Viewport

1 Change to the design layer table via the View bar.



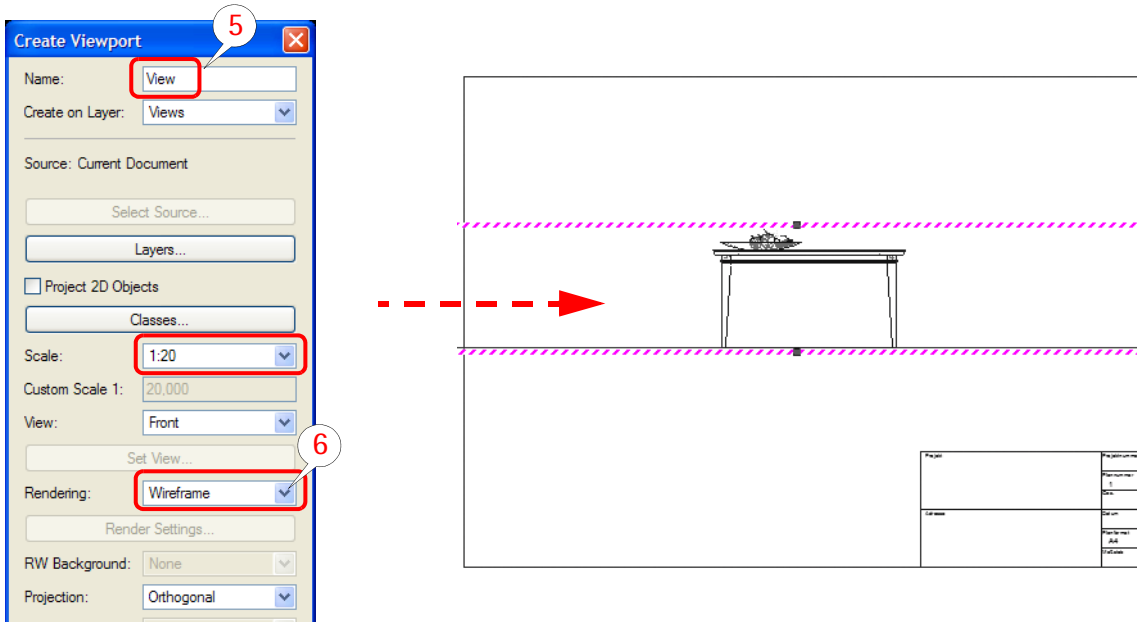
2 Then change to **Front View** (Views palette).

3 Choose **View > Create Viewport...**.

4 Name the viewport **View**.

5 Set Rendering to **Wireframe**.

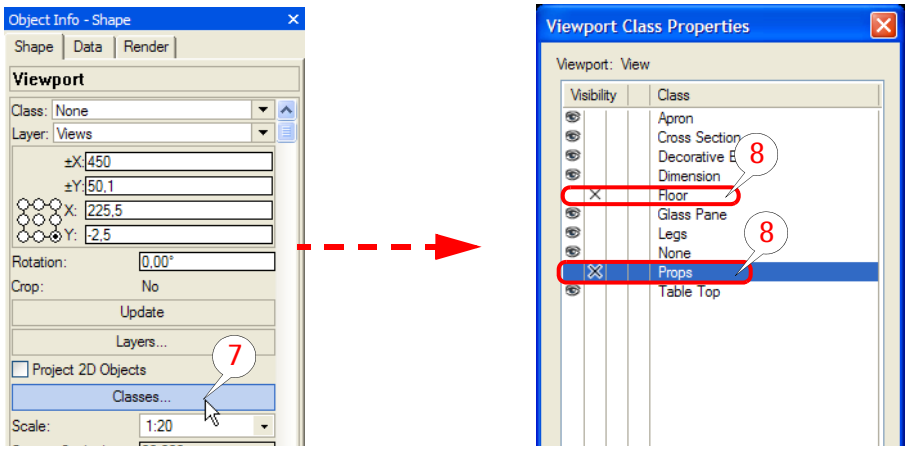
6 Adjust all other settings as shown below. Click **OK** to confirm.



The viewport is placed on the selected sheet layer. But now the floor covers up most of the viewport. We also want to hide the fruit bowl. Since the floor is assigned to the class Floor and the fruit bowl to Props (see chapter 5), we can hide the classes so these objects will not be visible in the viewport.

7 Click the **Classes...** button in the Object Info palette.

8 Change the visibility of the classes Floor and Staffage to Invisible and click OK to confirm.

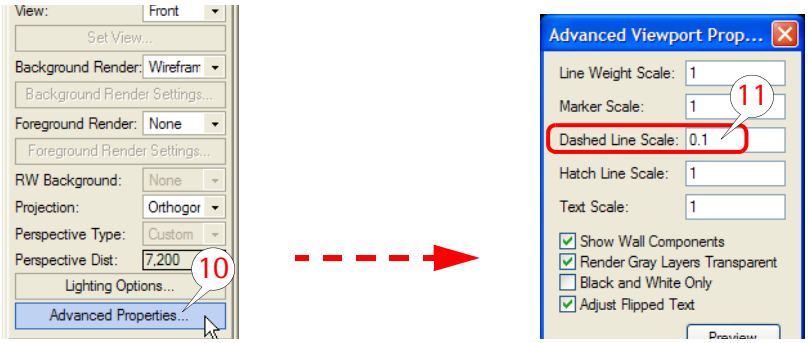


9 Now **move** the viewport to the top left corner of the drawing.

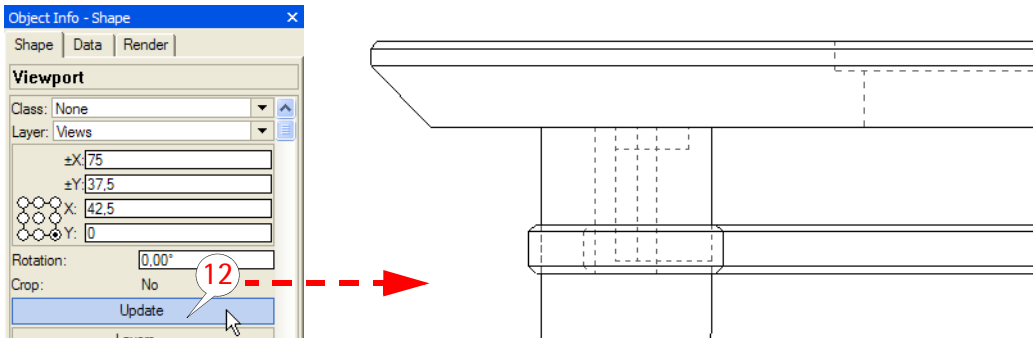
We selected the rendering Wireframe (Dashed Hidden Line) for the viewport, so the hidden edges in the viewport will be displayed in dashed lines. One further setting is necessary for this.

10 Click **Advanced Properties...** in the Object Info palette.

11 Set Dashed Line Scale to **0.1** and click **OK** to confirm.



12 To finalize, click Update in the Object Info palette.

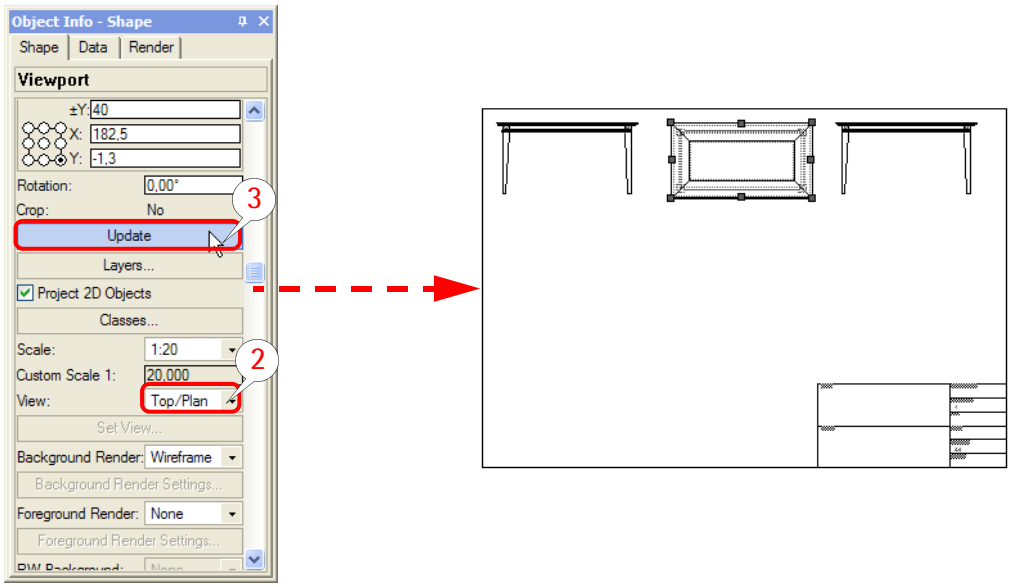


6.1.3 Create and Adjust Further Viewports

1 Press Ctrl and create two duplicates (see Chapter 2.2.4) of the viewports. Place them to the right of the front view.

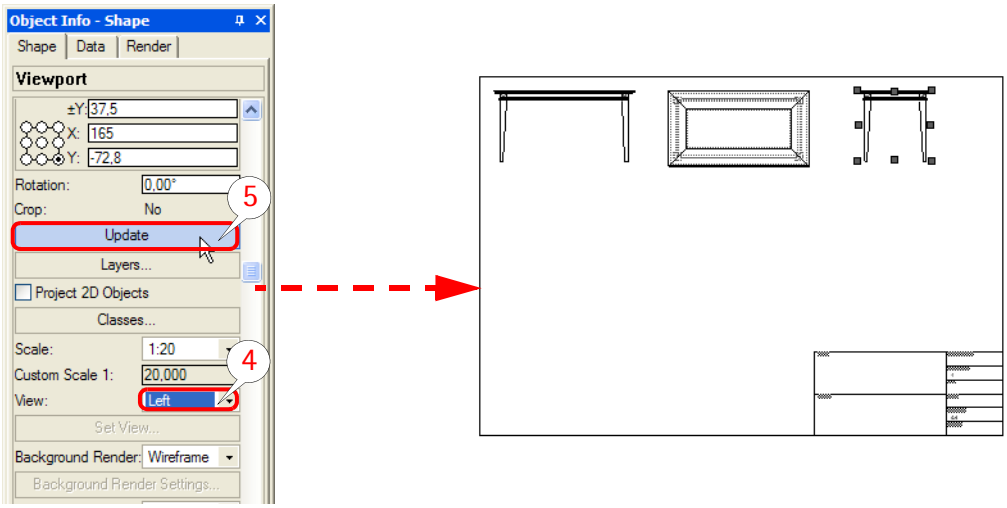
2 Select the viewport in the middle. Change the View setting to Top/Plan in the Object Info palette.

3 Click Update to apply the setting.



4 Now select the viewport on the right and change the View setting to Left in the Object Info palette.

5 Click Update to apply the settings.



6.1.4 Viewport Rendering

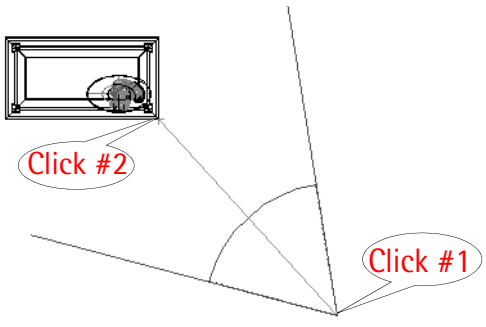
In the next step, we create a rendered viewport. For this, we do not use a standard view, but a custom perspective.

1 Return to the design layer Table via the View bar.

2 Press **Ctrl+5** to return to **Top/Plan** view.

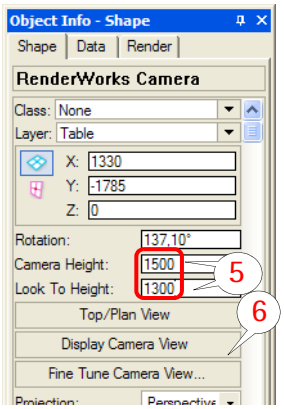
3 Select **Renderworks Camera** from the Visualization tool set.

4 Click #1 defines the camera's viewpoint, click #2 defines the view direction. Set click #2 into the area indicated below.

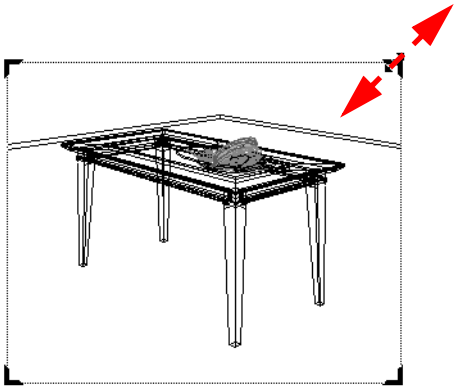


5 Enter a camera height of **1500** mm and a look to height of **1300** mm.

6 Then click Display Camera View in the Object Info palette.



7 Move the corners to display the desired section.



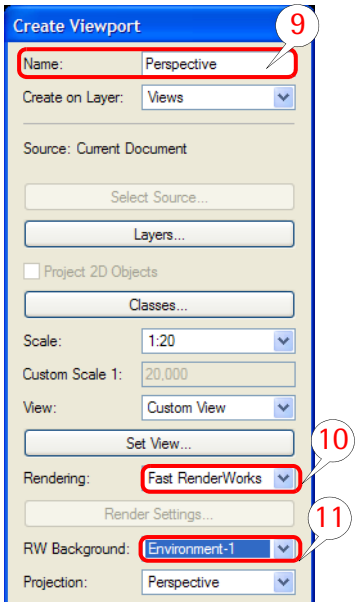
8 Choose **View** > **Create Viewport...**.

9 Name the viewport **Perspective**.

10 Set Rendering to Custom **Renderworks**.

11 Set RW Background to **Environment-1**.

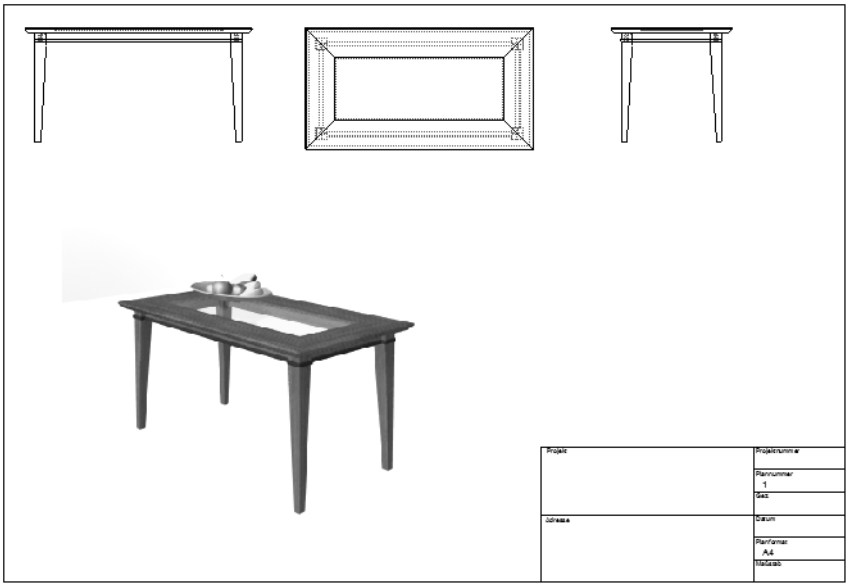
12 Make all other settings as shown below and click **OK** to confirm.



13 Move the viewport to the bottom left area of the drawing.

14 Choose **View** > **Update all Viewports**.

Our first plan layout is finished now.



6.1.5 Layout "Section"

6.1.6 Create Sheet Layer and Insert Plan layout

1 As described in chapter 6.1.1, create a sheet layer named **Vertical Cross-section**.

2 Set **Paper format** to **A4** and **Orientation** to **Landscape**.

6.1.7 Create Cross-section

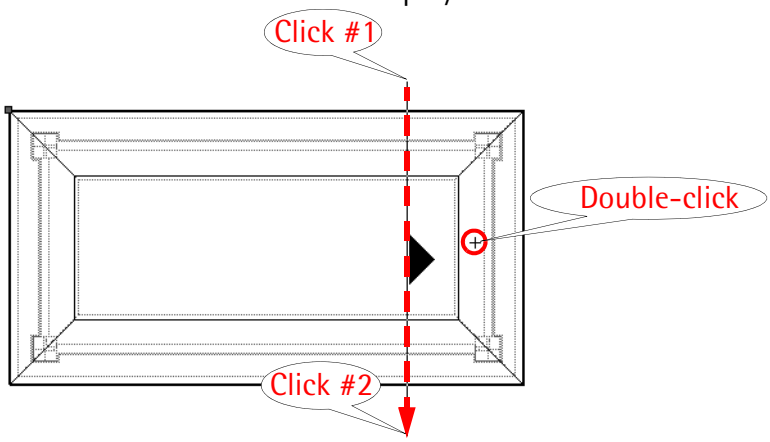
1 Change to the layer **Views** via the View bar.

2 Select **Top/Plan view**.

3 Choose **View** > **Create Section Viewport...**.

4 Define the section axis as shown below.

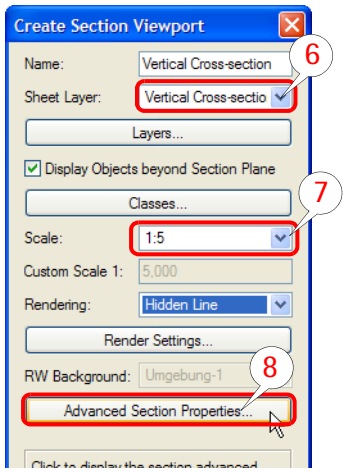
5 Double-click the side of the section to be displayed.



6 The cross-section is to be displayed on the sheet layer Vertical Cross-Section.

7 Set the scale to **1:5**.

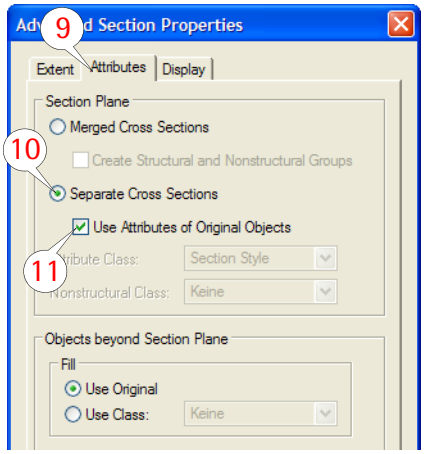
8 Then click **Advanced Section Properties...**



9 Change to the **Attributes** tab.

10 Check Separate Cross Sections.

11 Check **Use Attribute of Original Objects**.



12 Click **OK** to confirm all open dialogs.

The section viewport is placed on the sheet layer Vertical Cross-Section.

13 Move the section viewport to the left area of the drawing.

Notes:

_____

_____

_____

_____

_____

_____

_____

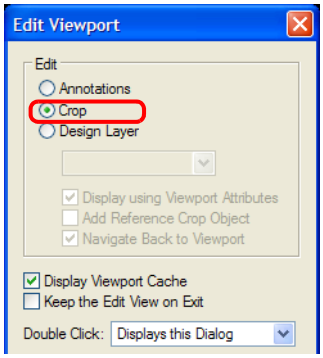
6.1.8 Crop Viewport

In the next step, we will create a blow-up view of a cropped area of the vertical cross-section.

1 Press **Ctrl to make a copy** of the section and move it to the right side of the page.

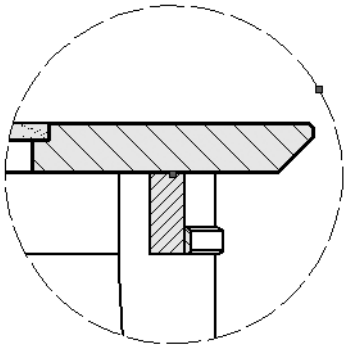
2 **Double-click** the copy.

3 Select **Crop** from the Edit Viewport dialog adn click **OK** to confirm.



The viewport is displayed for editing.

4 Use the Circle tool to draw a circle around the **top right corner** of the table.



A preview of the detail is displayed. You can move the circle and change its size; or even delete it and draw another shape to crop the detail.

5 Click **Exit Crop** in the **Tool bar** to return to the sheet layer.

6 Adjust the viewport's **scale** to **1:2** in the Object Info palette and click **Update**.

7 Move the cropped viewport above the text box.

Notes:

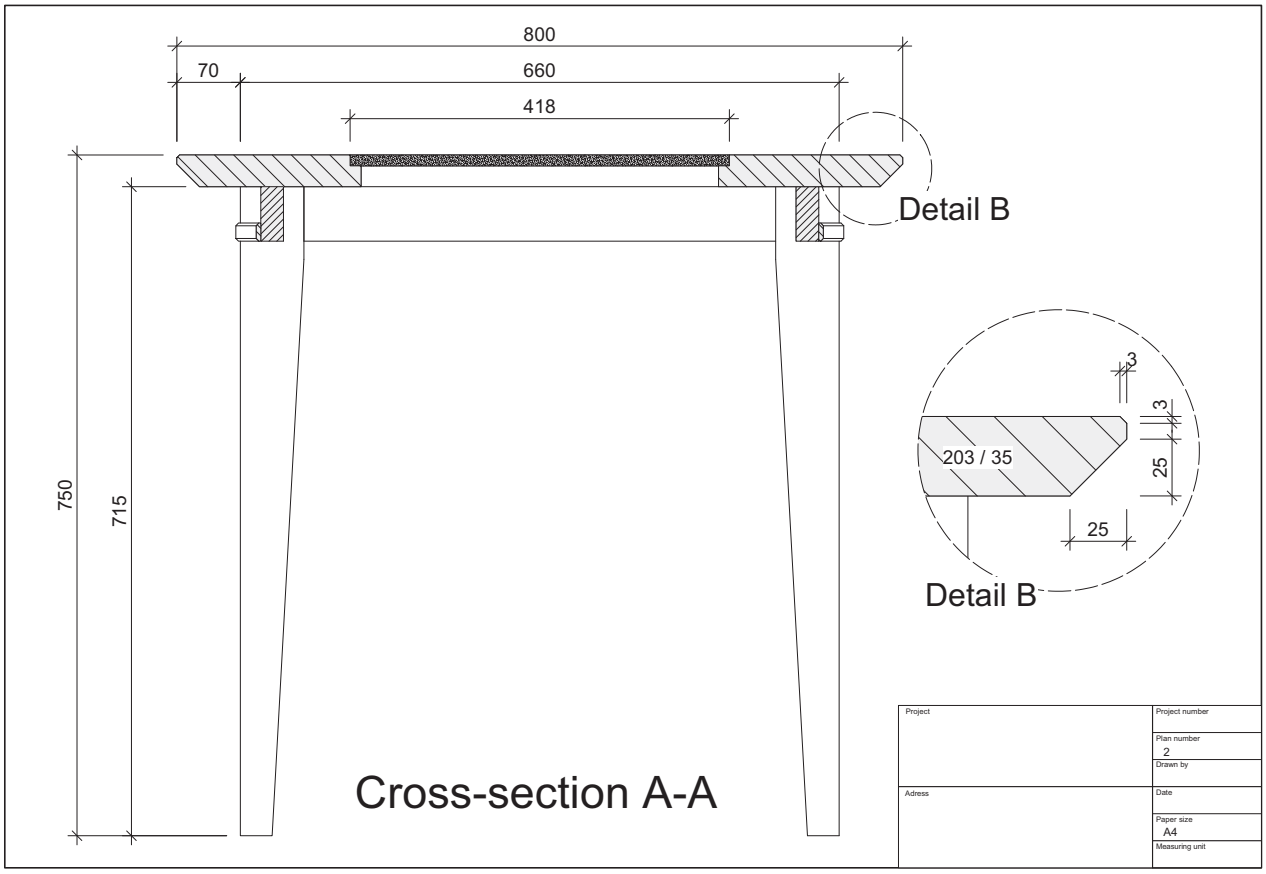
6.1.9 Add Annotations

1 **Double-click** the **vertical cross-section.** Select **Annotations** in the dialog.

2 Add **dimensions** and **text**.

3 Click **Exit Viewport Annotation** in the **Tool bar** to accept the annotations.

Add annotations to the detailed section in the same way and save the final result.



Notes:

_____

_____

_____

_____

_____

_____