

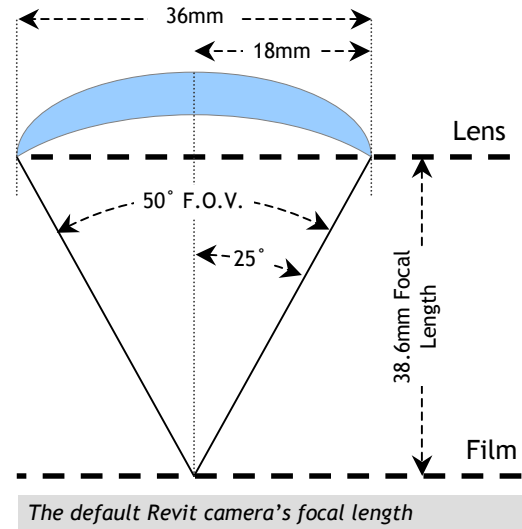
Setting up and Adjusting the Revit Camera

For rendering in Revit - particularly if you're going to be doing a photomontage - it's good to know how the cameras in Revit work, and how they can be very simply be adjusted.

Focal Length and Field of View

Standard 35mm film cameras have a variety of lenses that change the focal length, and thus the field of view (FOV). A 50mm lens on a 35mm camera yields an FOV of 46°, which is about what the human eye sees.

For a 35mm camera, the frames are usually 36mm wide x 24mm high - hence the 36mm dimension in the diagram at right. Keep in mind that the human eye sees a conical field of view - not rectangular like a camera. Because of this, the formula for 35mm film equivalence to the human eye is calculated on the diagonal frame dimension of 43.3mm. For the purpose of setting up the Revit cameras, the 36 x 24mm dimensions are more important.



Adding a Camera

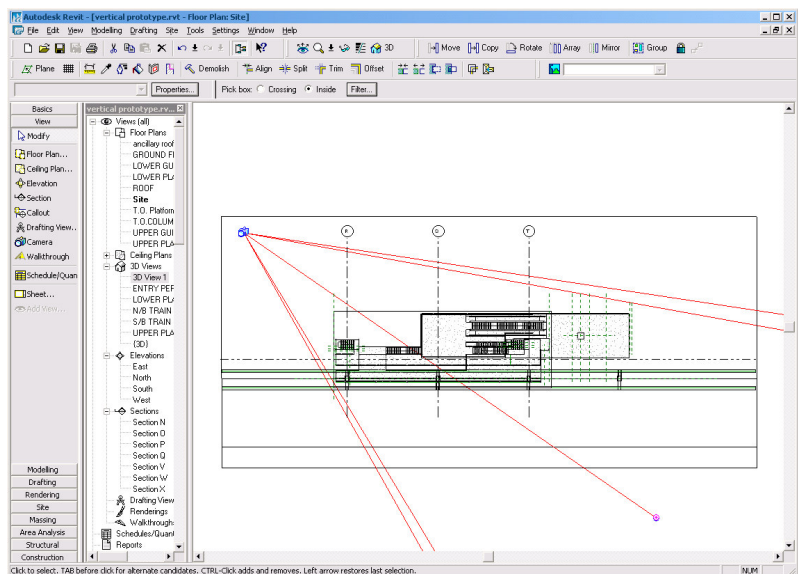
The Revit camera has, by default, a 50° FOV, slightly wider than our field of view. Revit cameras can have the field of view edited, effectively editing the focal length of the camera.

$$\text{Focal length} = 0.5 * \text{Film Dimension} / (\tan (\text{FOV} / 2))$$

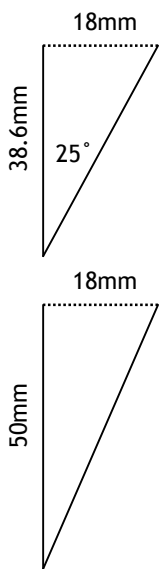
This equation is simple geometry... the focal length is simply 18mm divided by the tangent of 25°. Using the 36mm horizontal frame dimension, The Revit camera is thus equivalent to a 38.6mm focal length lens.

When a camera is added in Revit, the users "drags" a line representing the view depth and direction of the camera. To begin with, the camera views horizontally, but this can be edited. This image, if placed on a Revit sheet, would print 6" x 6" in size.

Once the view is created, clicking on the crop region around the perspective view will allow the user to change the proportions of the image, and effectively alter the FOV/focal length of the lens used for the image.



If you want to create an image to work with a photo taken with a certain lens, you should create a new 3D view so that you know you're starting with a 6" x 6" image and a 50° FOV.



Editing the Default Revit Camera

To the left is a triangle that represents the focal length settings for the default Revit camera, but looking at only half of the FOV so we can use triangles to determine how to set the Revit camera for other focal lengths. As it turns out, we don't need to know the FOV angle of the other lenses - just having their focal lengths is enough. So here, the total field of view is 50° and the frame size is 36mm.

To the left is the triangle that deals with a 50mm lens - the frame size is still 36mm, so half of that is still 18mm. As you can guess, the FOV of this lens is smaller.

Simply, to set the size of the Revit image, divide the image size by the focal length of the lens used in the photo into which the Revit rendering will be inserted, and multiply by 38.6 - so for a 50mm lens, you would multiply the image size by 38.6 and divide by 50. Given the Revit image's default size of 6", this would be:

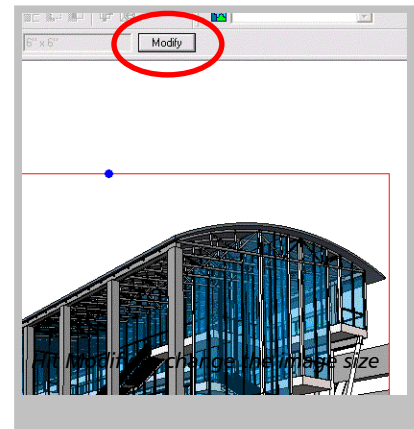
$$6 * 38.6 / 50 = 4.63''$$

So the image needs to be resized to 4.63" wide. Given the 24 x 36 (2:3) proportions of a regular film camera frame, one dimension of the Revit image needs to be 2/3 of this value, or $4.63 * 2/3 = 3.06''$

So, given an initial Revit image size of 6", for any lens:

$$\text{Adjusted Size} = 6'' * 38.6 / \text{Focal Length of Lens}$$

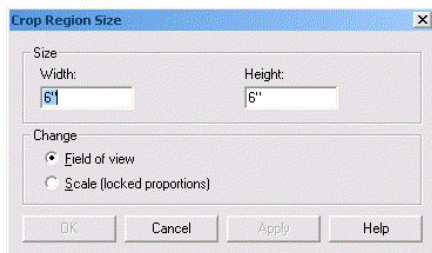
With the crop region selected, hit the Modify button as shown to modify the dimensions of the image. Note that you can edit the FOV/focal length or keep the same FOV/focal length and enlarge the plotted size of the image.



So here's how to resize the Revit camera for a 35mm lens:

$$\text{Adjusted Size} = 6 * 38.6 / 35 = 6.62''$$

The short side of the frame should be $6.62'' * 2/3 = 4.37''$. In the Crop Region Size dialog box, choose **Field of View**, and depending on the orientation of the photo, enter 6.62" and 4.37" into the width and height fields. Hit OK.

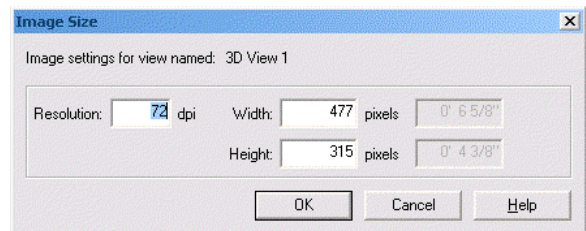


If you need to plot the image in Revit and need the image to be a different size for plotting, re-enter the Crop Region Size dialog box and choose **Scale (locked proportions)**. Enter the plot height or width you need; the other dimension will be automatically adjusted for you. Once you've done this, however, changing the image for a different focal length will be difficult since you're no longer working with the original FOV and image size, unless you remember what lens this image is supposed to be mimicking and can do the math to get to the new lens requirements for height and width.

The final step is moving and panning the Revit camera into the approximate position from which the photo was taken in real life. Since images can vary somewhat between cameras with the same focal length, a number of manipulations may be required before the Revit camera matches the appearance of the real life image.

Finally, you will want to set the resolution of the Revit image. The best idea is to have the resolution of the Revit rendering about the same as the photo, though you may want more or less resolution based on the size of the final image. Values of 150 to 300 dpi are a good range to work with. So if you have a 8" wide photo into which you want to import a Revit rendering, you'll want to render the view at somewhere between 1200 and 2400 pixels wide.

Go to the View Properties of the view and hit the Edit button beside Render Image Size, which will bring up the dialog box shown at right. Enter the number of pixels required, or plug in a resolution value.



Once you've completed the rendering, you can export the image to a JPG file for importing into Photoshop. Note that only at the end of the rendering process is the export option available - if you go to another view and return to this view, you will not be able to export the JPG unless you re-render the model.

If you have further questions about rendering or setting up Revit for your photomontage efforts, please contact Wes Macaulay at Pacific Alliance Technologies at (604) 676-6000 ext. 114 or by e-mail at wm@pat.ca