

Penguin

Non-Photoreal Rendering for Rhinoceros

Version 2.0

Basic Training Series

By Jørgen Holo



PENGUIN 2.0 - BASIC TRAINING SERIES

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TUTORIAL 1 - BASIC USE

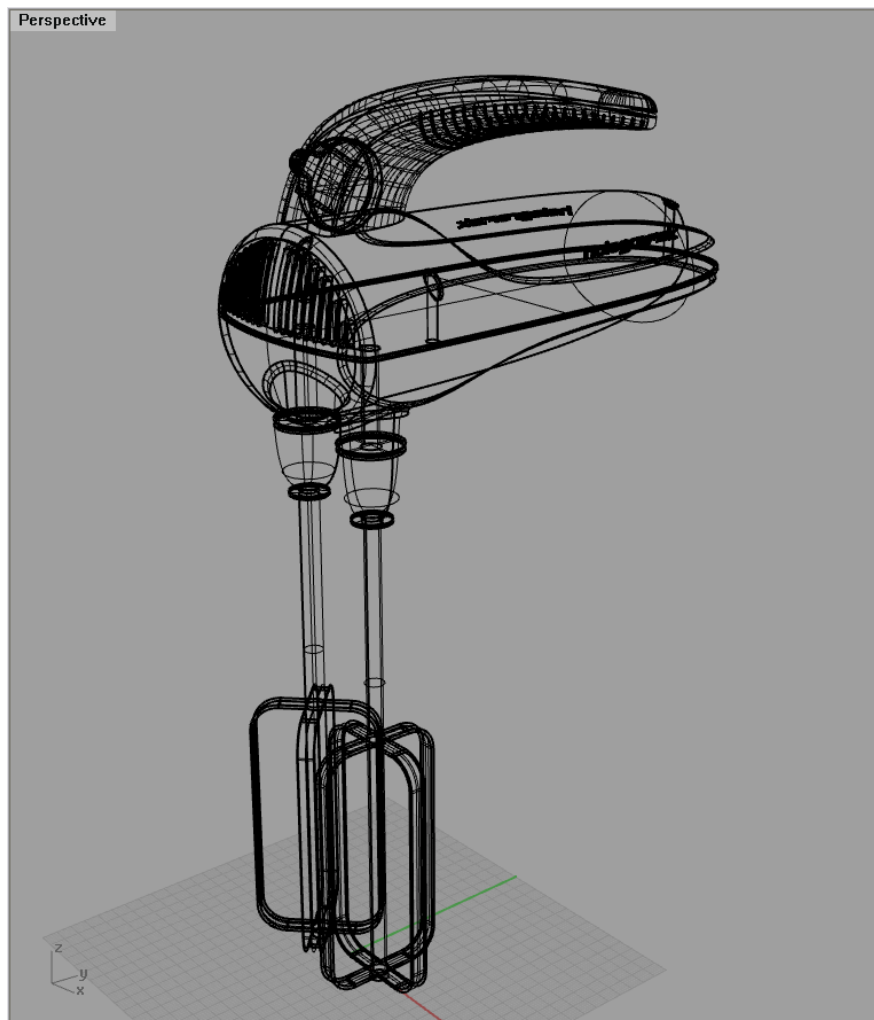
Features

This tutorial covers the basic use of Penguin 2.0 through the following topics:

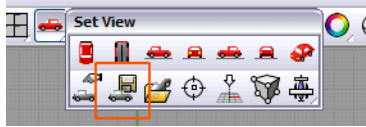
- Render with the standard Penguin shader
- High antialias
- Background color
- Cast shadows
- Ambient light
- Custom resolution
- Save to file

Steps

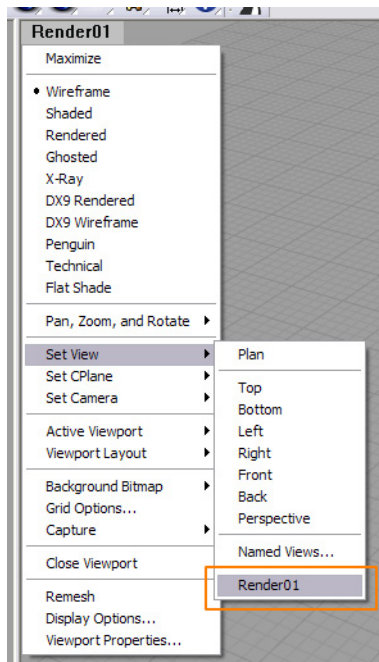
- 1 Open the **HandMixer.3dm** model in the *D:\Penguin 2\Tutorial\English* folder on the CD.





- 2 Start by saving the **Perspective** view so we can get back to the same camera position later on. To do so click the **Save Named View** icon in the **Set View** toolbar and type in **Render01** (do not use space in the name since Rhino considers space as enter!) and press **Enter**.

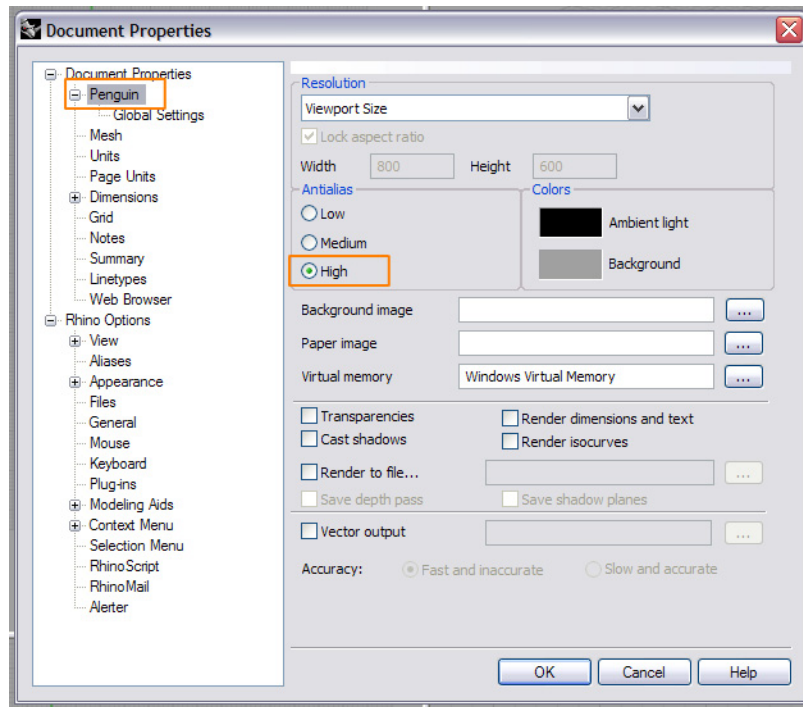


- 3 From now on you can bring back the original view by right-clicking any viewport title and navigate to **Set View** and choose **Render01**.



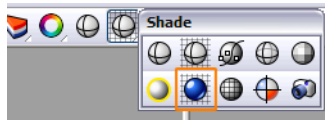
- 4 Do a test render by clicking on the Penguin icon  .
You can also use the Render icon if you set the current render to Penguin.

- 5 Notice that the rendered image does not have very clean object edges.
Open **Penguin Settings** by right-clicking on the Penguin icon , navigate to **Penguin**, and select **High** under **Antialias**.

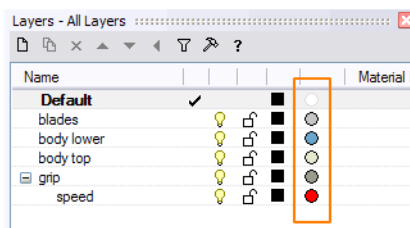


Do a new render to see the improved result.

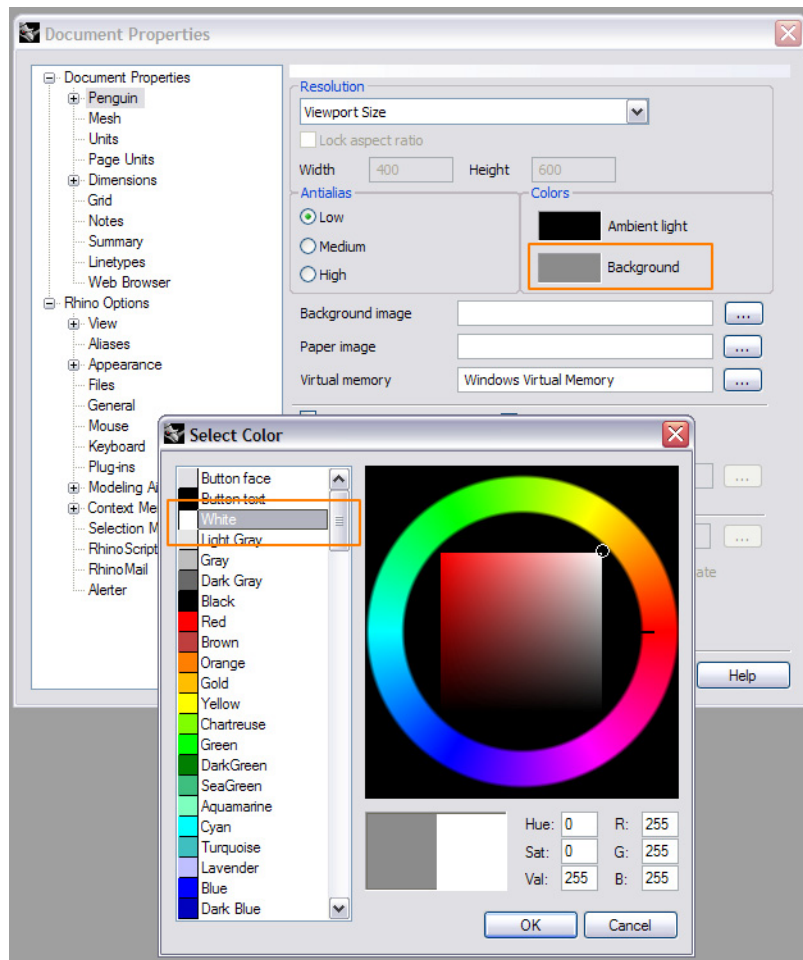
- 6 Make sure the **Render01** view is active and then assign **Rendered Viewport** to the view by clicking on the **Rendered Viewport** icon.



All objects are on separate layers and the default material setting for an object is "by layer". In this tutorial the object colors are assigned to the layers instead of to the individual objects. Change the object render colors by clicking on the circles to the right of the level names.

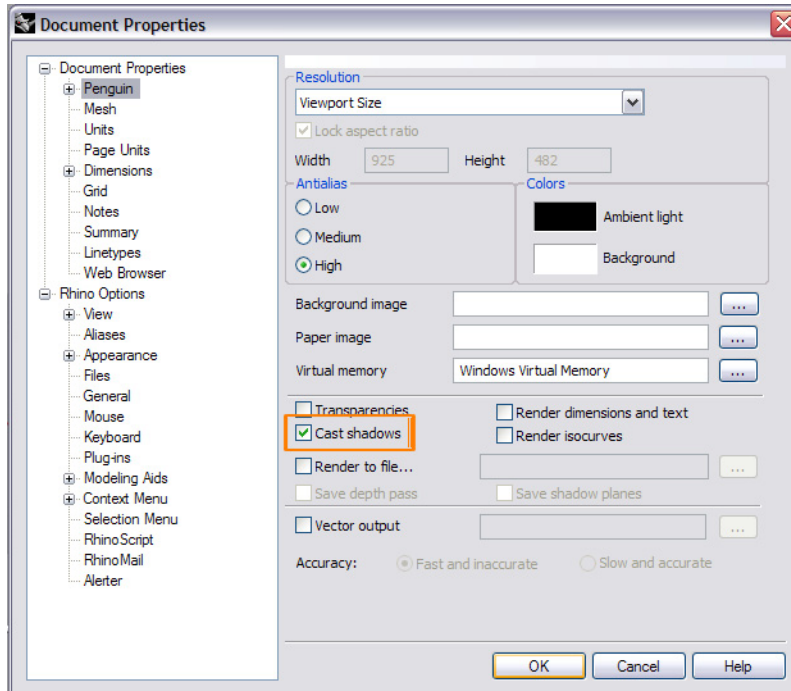


- 7 Do a test render and notice that the default background is gray. To set the **background color** to white open the **Properties** page and click on the gray rectangle next to **Background** under the **Colors** area.



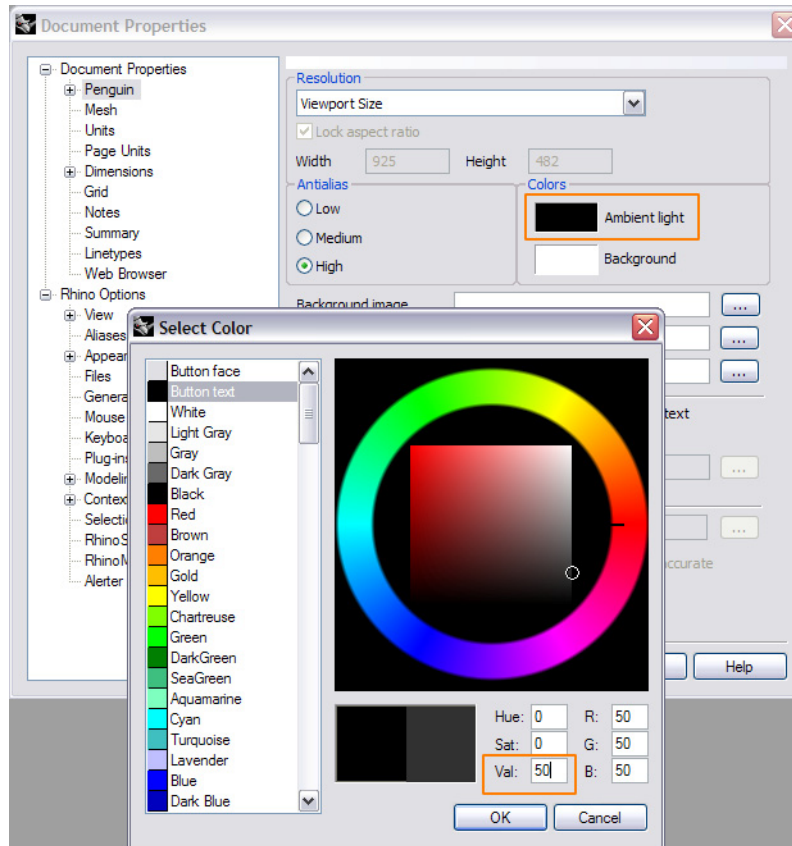
Now choose white from the color wheel or from the predefined color options to the left of the wheel.

- 8 Penguin 2.0 has another great feature: shadows. Notice that Penguin does not calculate shadows from the default light, so this is one of the reasons why a point light is already created in the scene. To turn on shadows, open **Penguin Settings** and check the **Cast shadows** box.



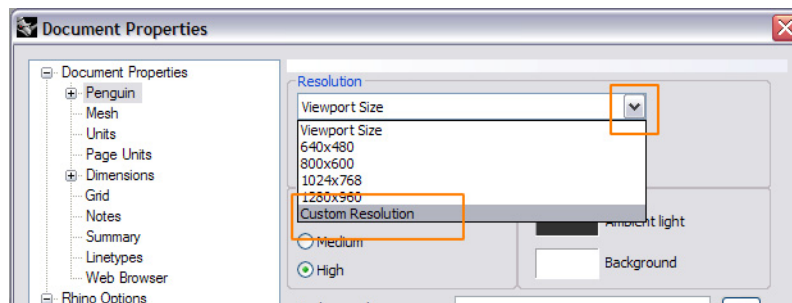
Do a new render and notice that the render time goes up by 7x on this complex model. Shadows are complex to calculate (so switching to **Low** antialias can be a smart move while testing out different settings).

- 9 Notice that the shadows are completely black since there is only one light in the scene. You could add a fill light (another point light that is positioned so it lights up the shadows) but this would result in new shadows and longer render times. So instead we adjust the **Ambient Light**. Open the **Penguin Settings** and click on the black rectangle next to **Ambient Light** under **Colors** and set the **Val** to **50** (or all of the RGB values to 50) to get slightly lighter shadows.

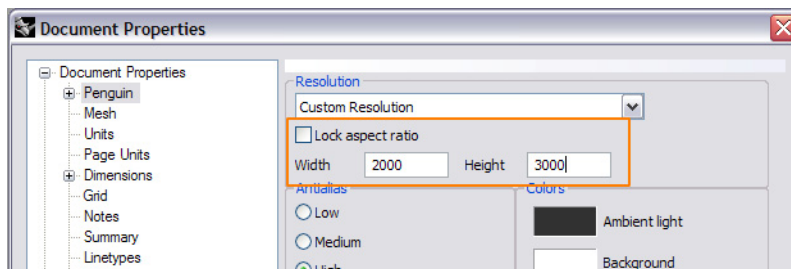


Ambient light is affecting all objects evenly without casting any shadows. And has almost no impact on render time.

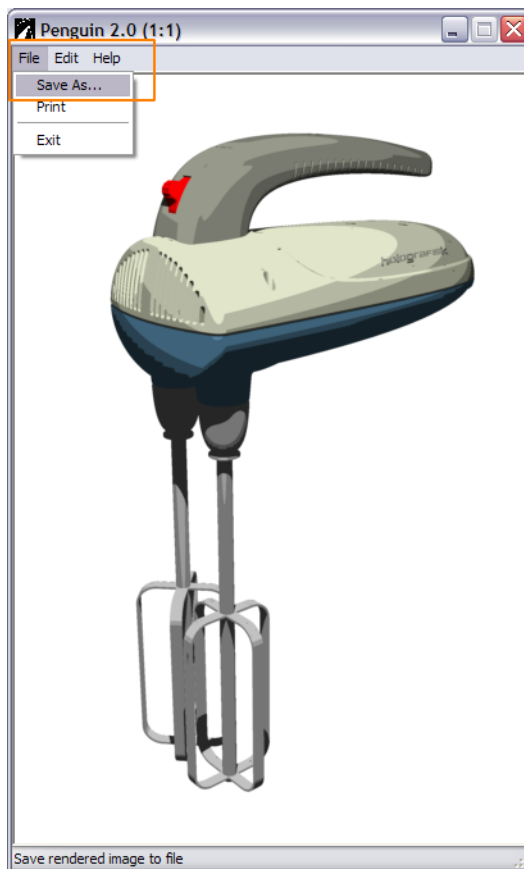
- 10 The rendered image is by default the same size and resolution as the view you render. To get a higher resolution you can either maximize the view by double clicking the viewport title so you get full screen, or you can set a **custom resolution**. To do this go to the **Penguin Settings** page and select **Custom Resolution** from the drop down menu.



Uncheck the **Lock aspect ratio** box if you want to type in a different aspect ratio than the view you want to render, and fill in your desired resolution.



- 11 Now that you have the desired result you can save the image by selecting **Save As...** from the **File** menu.



TUTORIAL 2 - INTERMEDIATE USE

Features

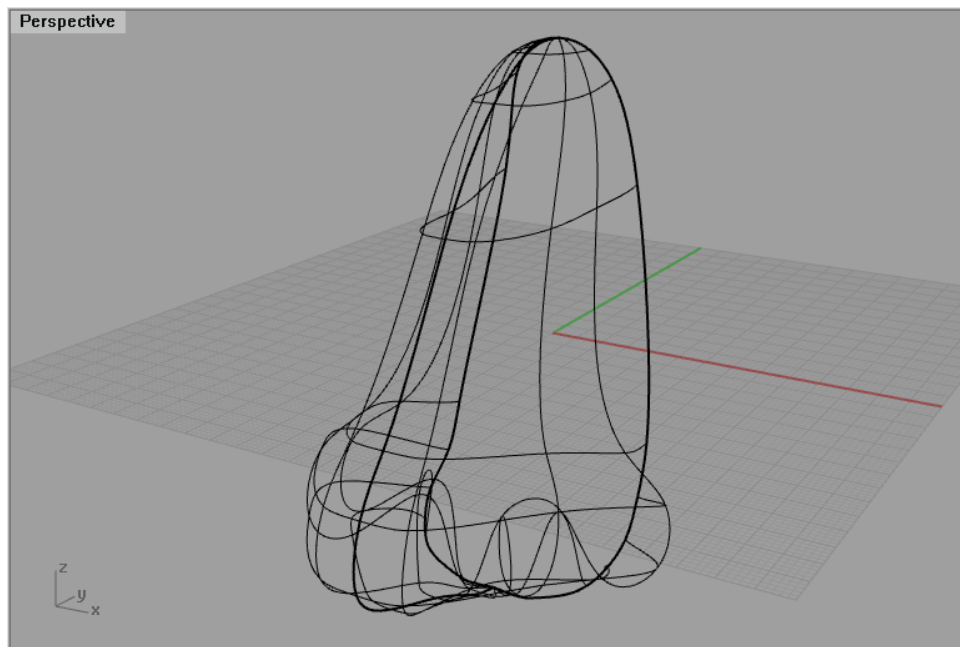
This tutorial covers Penguin 2.0 advanced features through the following topics:

- Custom shaders
- Real-time render
- Background image
- Ambient light
- Custom light
- Custom render resolution.

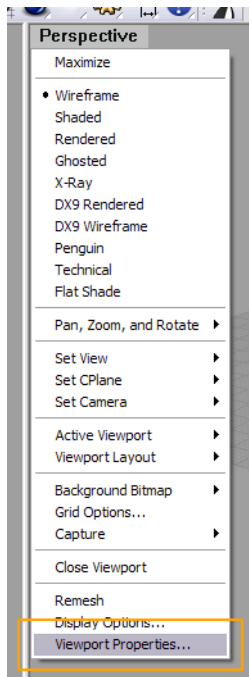
We are going to use Penguin to add an object on to a photo by matching the perspective to a background image and simulate the light.

Steps

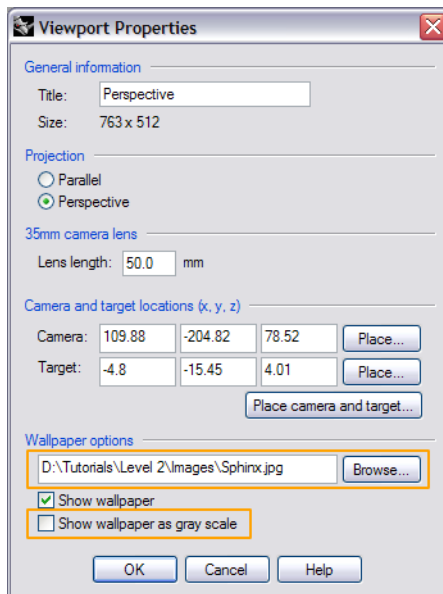
- 1 Open the **SphinxNose.3dm** model in the *D:\Penguin 2\Tutorial\English* folder on the CD.



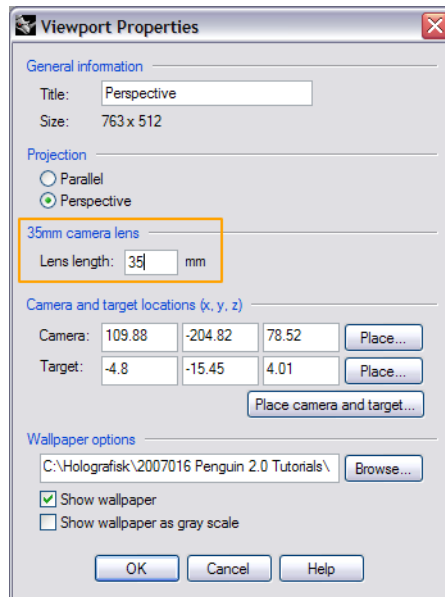
- 2 Add a background image to the perspective view by right-clicking the **Perspective** view title and click on **Viewport Properties**.



- 3 Click on **Browse...** and navigate to the **Sphinx.jpg** image in the *D:\Penguin 2\Tutorial\English* folder on the CD. Then uncheck the **Show wallpaper as grayscale** box.

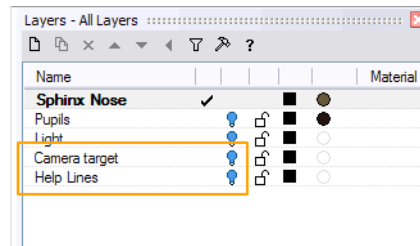


- 4 The **Sphinx.jpg** image was taken with a 18mm lens on a digital camera, which is equivalent to a 35mm lens on traditional cameras. We shall now match the perspective view to the zoom level of the camera lens used to take the picture by setting the Perspective **View Camera Lens** to **35**. Do this by right-clicking on the **Perspective** view title and click on **Viewport Properties**. Then manually type in **35** instead of 50 in the box.

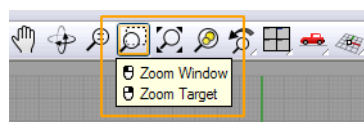


If you want to skip the camera matching then just go to step 8.

- 5 There are 4 layers that are turned off. Turn on **Camera Target** and **Help Lines** layers. These objects are created to make it easier to orient the object so it matches the image.

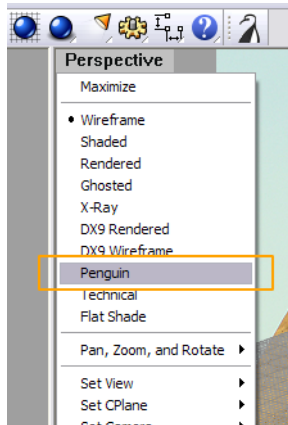


- 6 Notice that the single point is on the wireframe head's cheek. This point is approximately at the same place as the center (or focus point) of the background image. Make sure point osnap is on and right-click on **Zoom Window** icon to run **Zoom Target**.




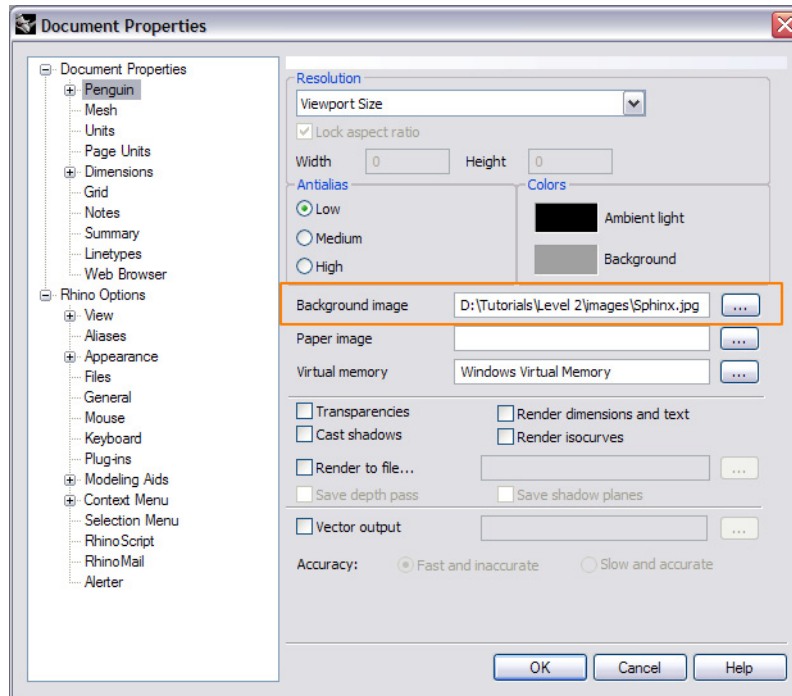
Select the point and drag a square that surrounds the head. Now the camera focus point is set to this point.

- 7 Rotate and zoom the viewport so the wireframe head and the nose matches the image.
- 8 To load the result of the image matching, right-click on the **Perspective** view, choose **Set view** and select **Sphinx**.
- 9 Penguin 2.0 has a great new real-time preview tool that can be applied to any viewport. So right-click the **Perspective** view and select **Penguin** to activate this.



Notice that the Penguin shader does not show the background image, so we have to toggle between Penguin shader and Wireframe or Rendered through this tutorial.

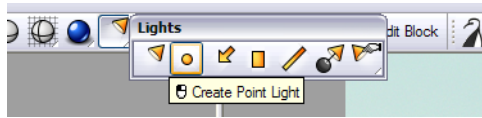
- 10 Do a test render and notice that the background image is not showing in the render! This is because Penguin uses it's own background setting, so we have to activate this setting as well. Open the **Penguin Settings** and click on  icon to the right of the **Background Image** settings and navigate to the **Sphinx.jpg** image in the *D:\Penguin 2\Tutorial\English* folder on the CD.



- 11 Click on the material tab for the **SphinxNose** layer to change the material, or select the nose and set the material for the object. Set the **RGB values** to 105, 90, 60 to get a sandy look.

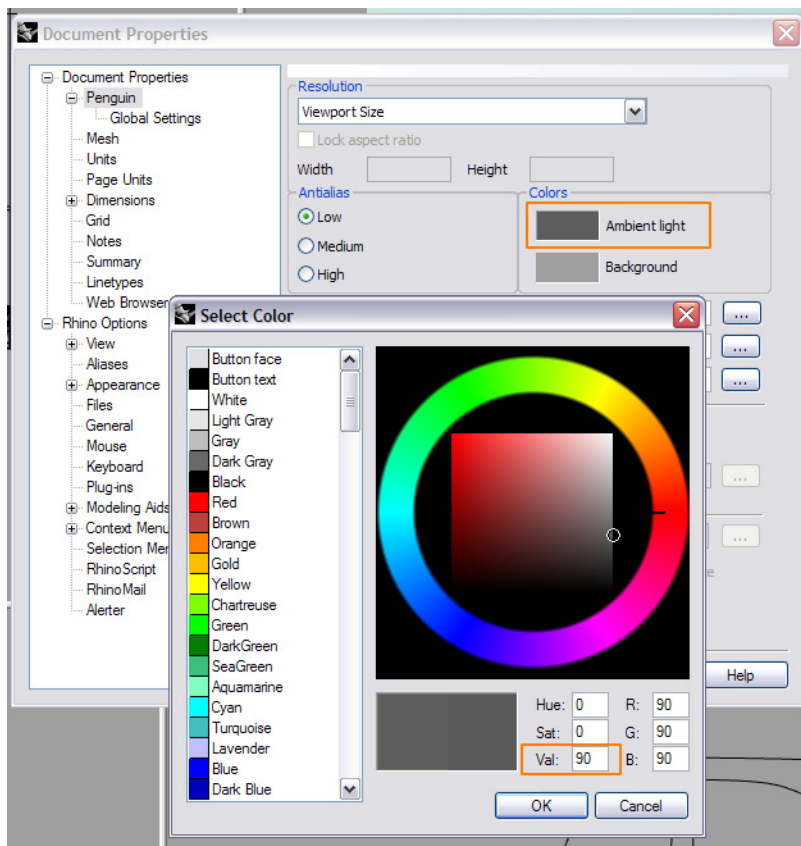


- 12 The default light is pretty good, but we want it to be a bit better so add a **Point Light** and position the light at x:315 y:220 z:300 (you can move the light to tweak the result by dragging it or using the move tool).

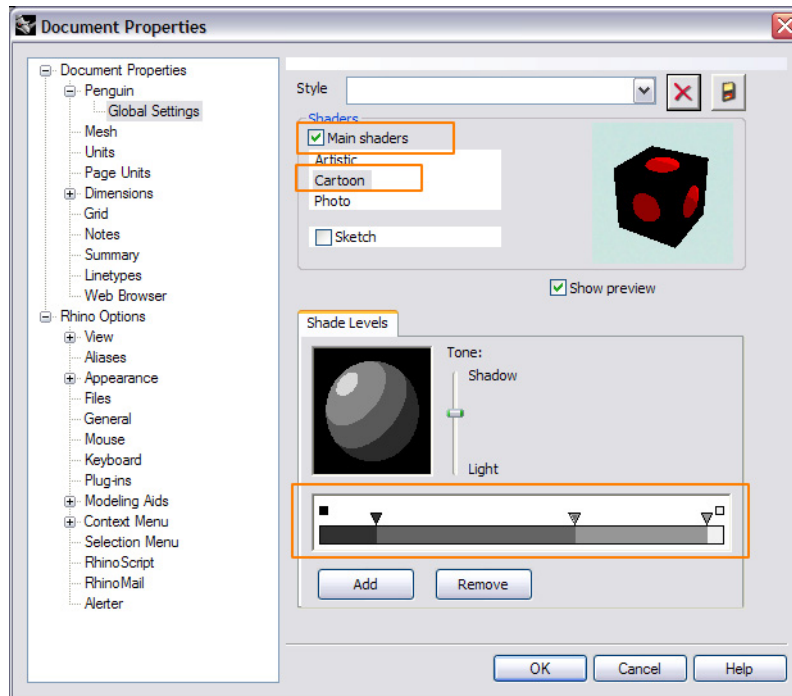


Point lights are the normal lights to use with Penguin.

- 13 To avoid black shadows set the **Ambient Light** to **90**, so open the **Penguin Settings**, click on the **Ambient Light** rectangle and type in the value.



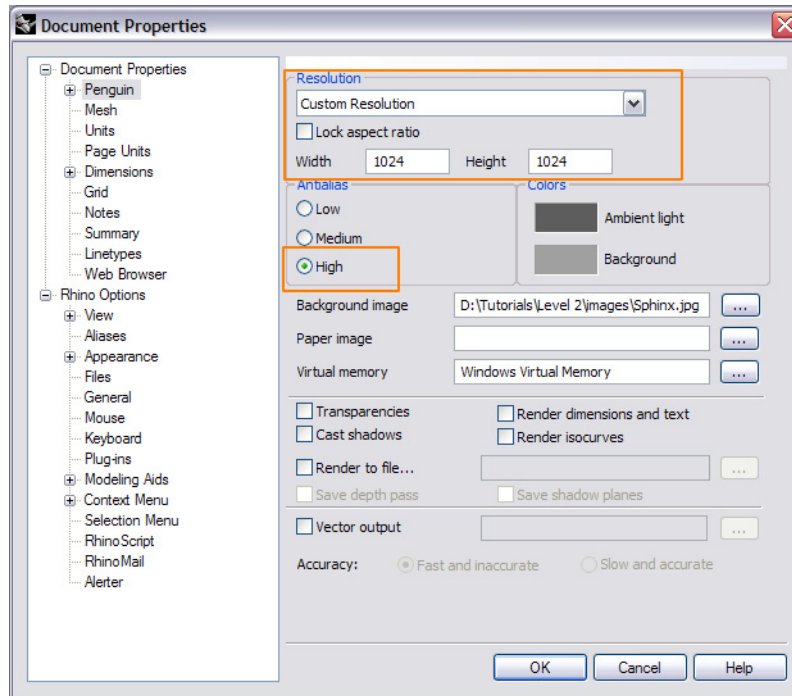
- 14 The default **shader** needs a bit of tweaking so open the **Penguin Settings** and navigate to **Global Settings**. Toggle on the **Main shaders** and choose **Cartoon**. This gives a clean shader with as many color steps as you want. Drag the small triangles up and down the slider to get your desired effect, and add and remove them by using the buttons below. Set the sliders to approximately 15%, 60% and 95% to get the result.



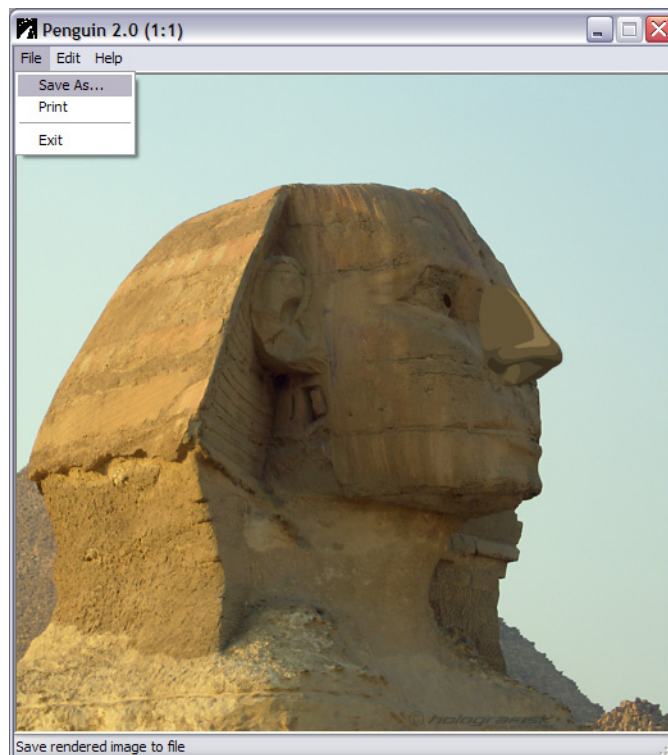
The style is saved within the file, but if you want to apply these settings to other files as well, then you have to save the settings. You can do this by clicking the disc icon on the top to the far right.

- 15 Open the **Penguin Settings** and set the render **Resolution** to **Custom Resolution**, turn off **Lock aspect ratio** and set the **Width** and **Height** resolution to 1024x1024. This is the same as the background image, you do not need to use the same settings as the background image. If you use a different aspect ratio, then the background color will be apparent to the sides or above and below the background image.

Set **Antialias** to **High** to get the best quality for the final render.



- 16 Render the image and save it by clicking on the **File** menu and selecting **Save As...**



TUTORIAL 3 – KITCHEN TIMER

Features

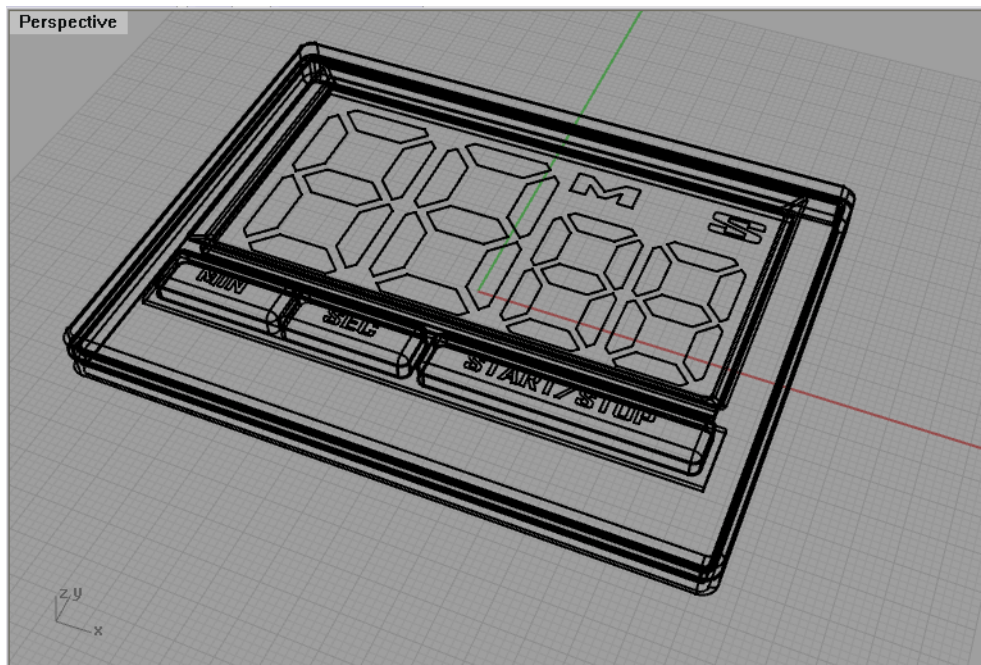
This tutorial covers the following advanced features of Penguin 2.0:

- Transparencies
- Hidden lines
- Dimensions
- Artistic watercolor render
- Custom object settings

We are going to make a shaded 2D drawing of a kitchen timer.

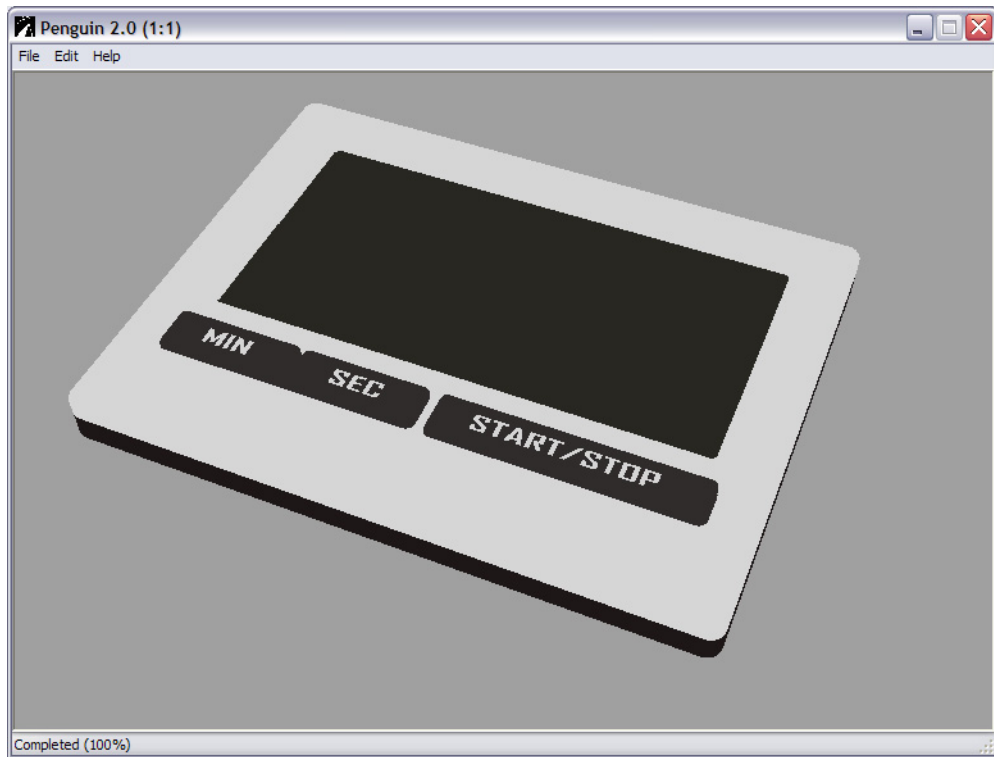
Steps

- 1 Open the **KitchenTimer.3dm** model in the *D:\Penguin 2\Tutorial\English* folder on the CD.

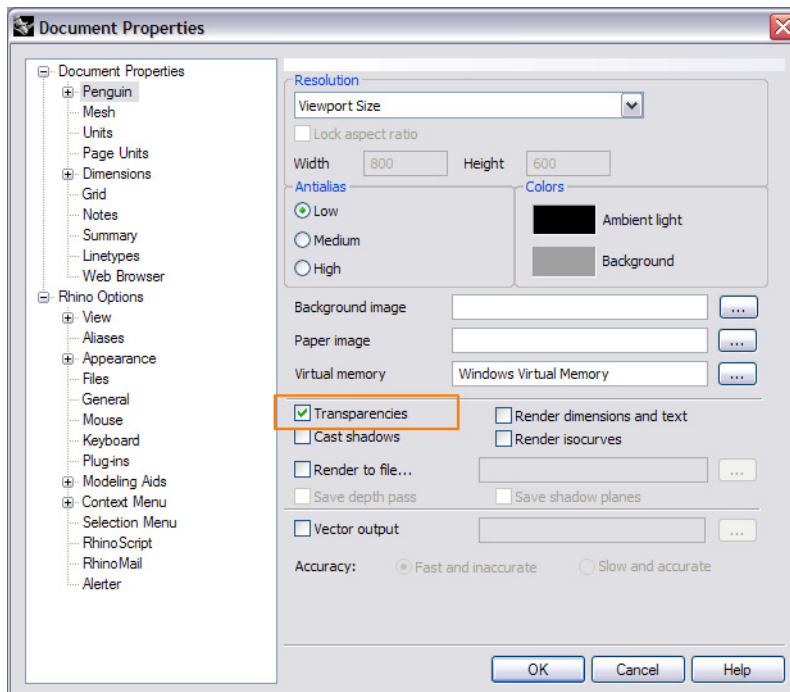


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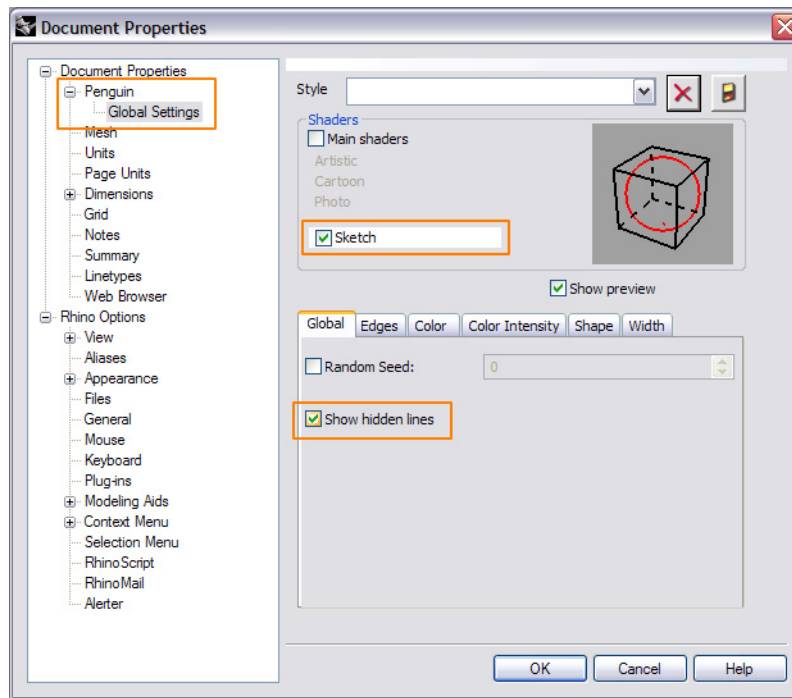
- 2 Do a test render and notice that the transparent glass is rendered opaque. Also notice that the objects are rendered without any shading due to this file's default setup.



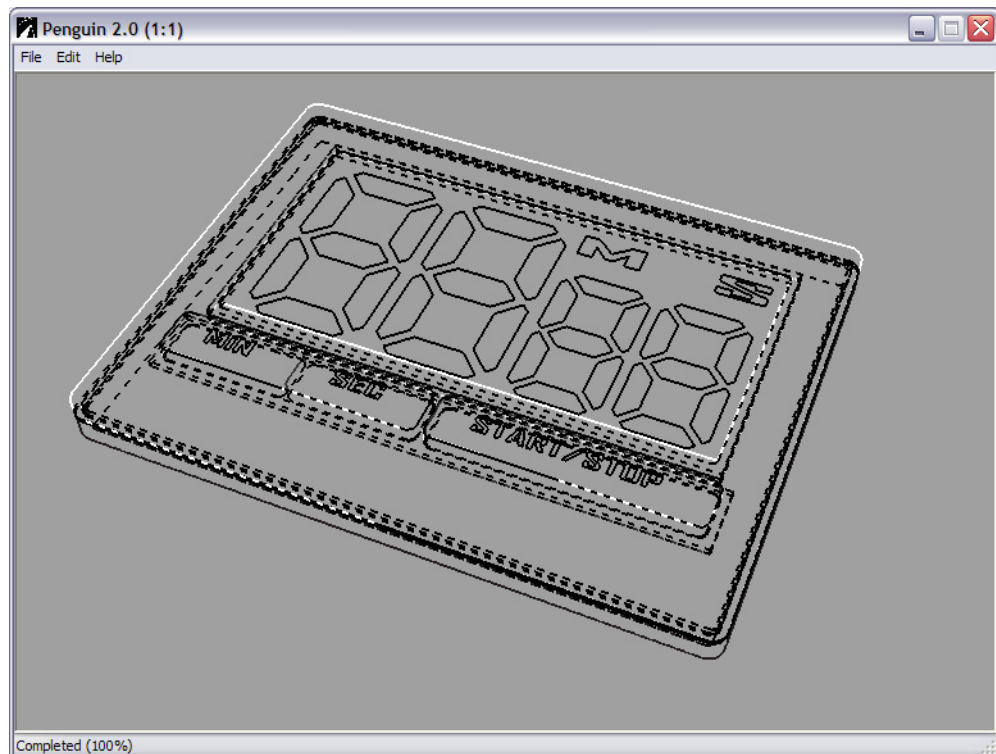
- 3 Open the **Penguin Settings** and turn on **Transparencies**, and do a new render to see the effect if you like.



- 4 Go to the **Global Settings** and turn on **Sketch**, which enables the edge render in Penguin. More settings appear underneath, so turn on **Show hidden lines** as well. Notice that the preview updates automatically.

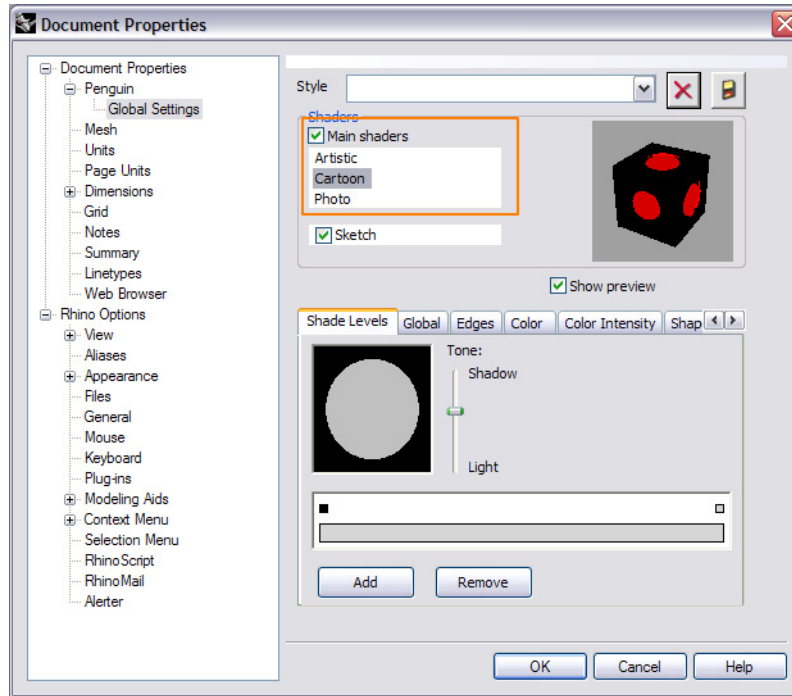


- 5 Render the scene and notice that the objects are no longer shaded because Penguin now uses the new settings instead of the default settings.



Also notice that the white lines are appearing both in front of and behind the black lines. This is a limitation of Penguin that has to do with its tolerances. Setting the antialias higher will not affect this.

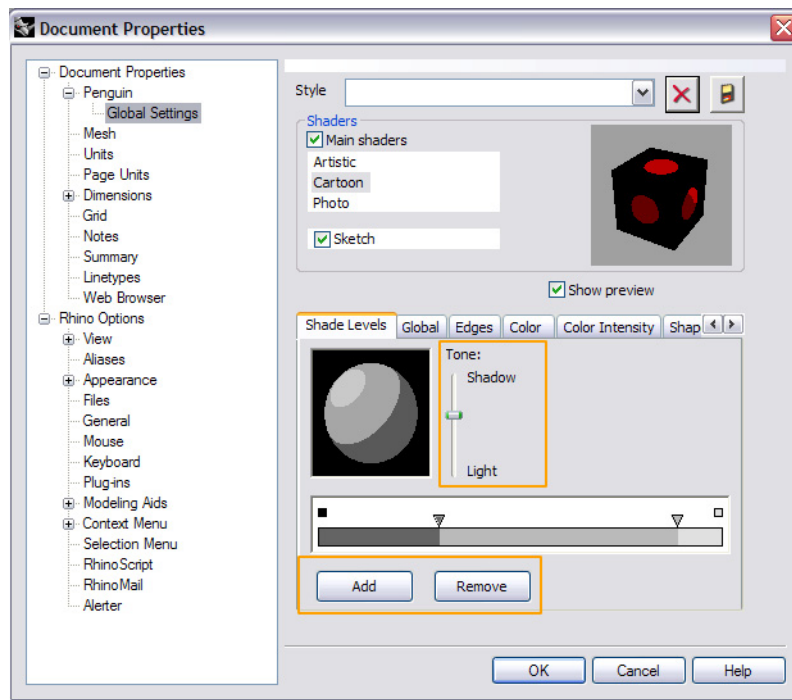
- 6 Turn on the shading again by going to the **Global Settings** and turn on **Main shaders** and choose **Cartoon**.



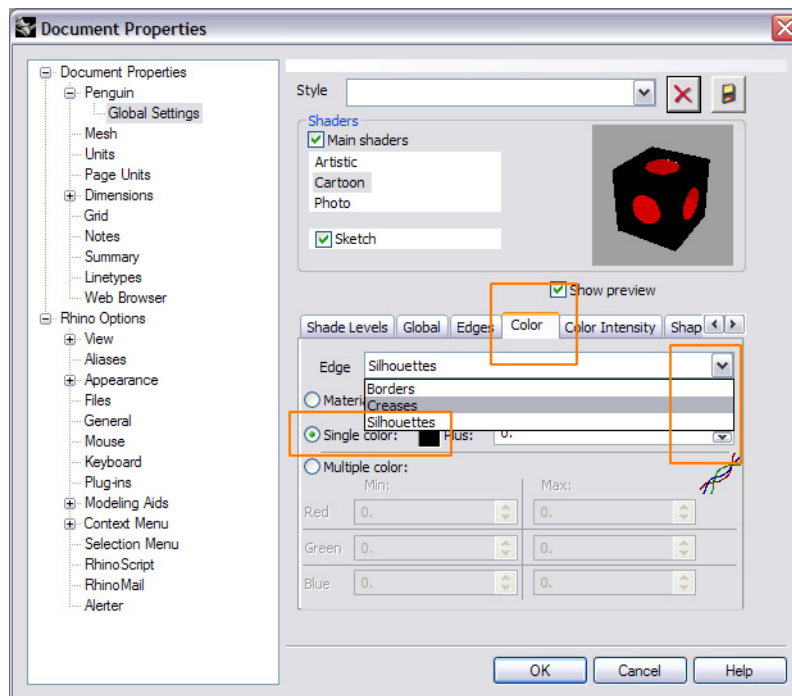
- 7 This shader has now only one plain color, so add some more color nodes by clicking the **Add** button, and adjust the **Tone** for each color node by dragging the slider up and down between **Shadow** and **Light**. The position of the color nodes affects how much of the object that renders with each tone setting.

Add two extra nodes and position them as in the image to get the same render result as the final image in this tutorial. Notice that the brightest node is not white, this is done to make more of the objects color apparent since the highlight will now have the objects color as well.

If you want to remove a node, then just select its triangle and click on the **Remove** button.

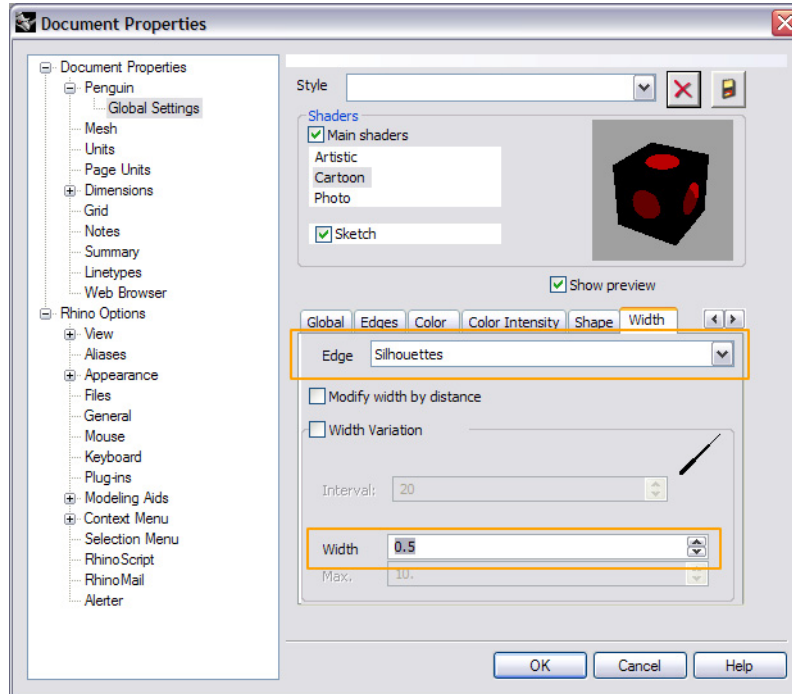


- 8 To make Penguin render all edges in black go to the Penguin **Global Settings** and click on the **Color** tab, then select **Single color** and use the black color for **Borders**, **Creases** and **Silhouettes**.

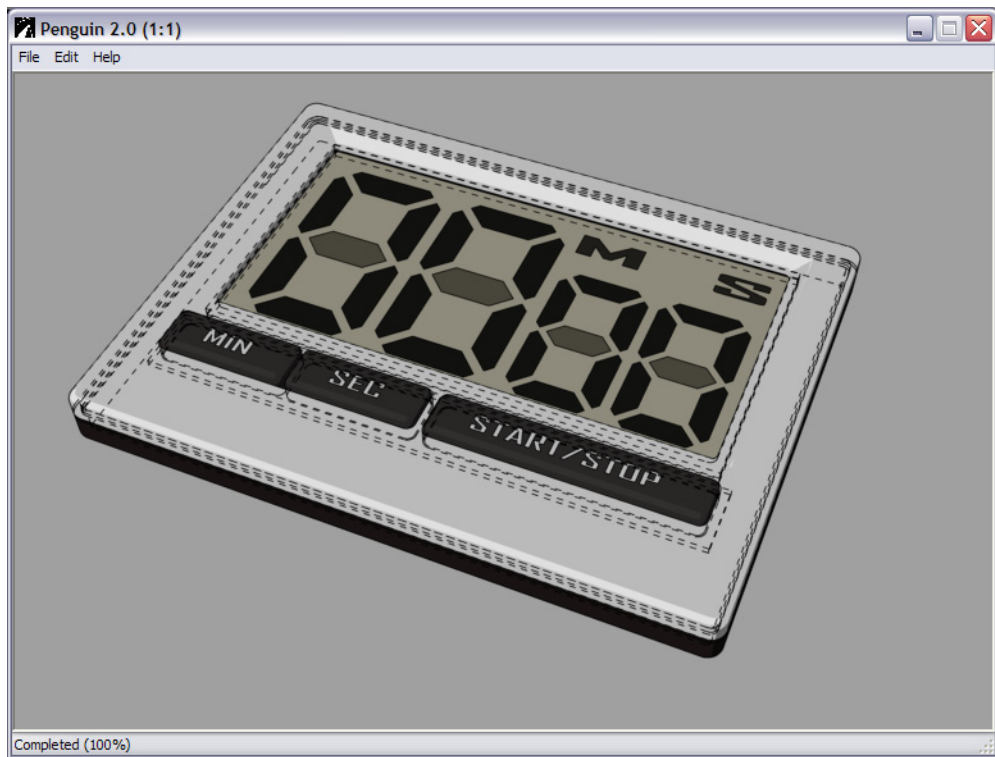


- 9 The default line thickness is 1.5 which can be too thick when rendering lower resolution images since the value is in pixels. So since we are rendering the default viewport resolution we need to set the setting down to 0.5 which gives a really good look when rendering with **Antialias** set to **High**.

Make sure you set all three values to 0.5, type them in, or use the small arrow icons to change the value.

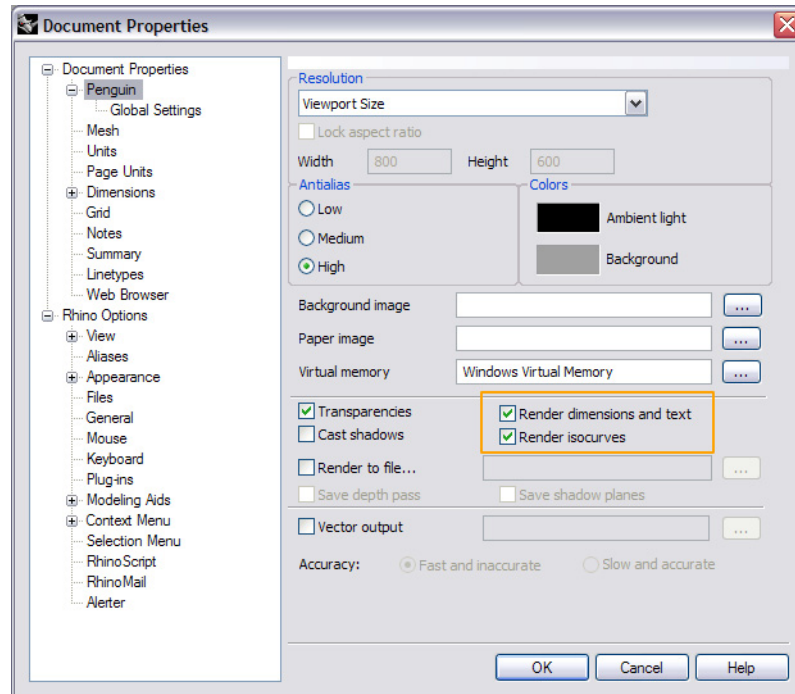


10 Set **Antialias** to **High** and do a render to see the effect.

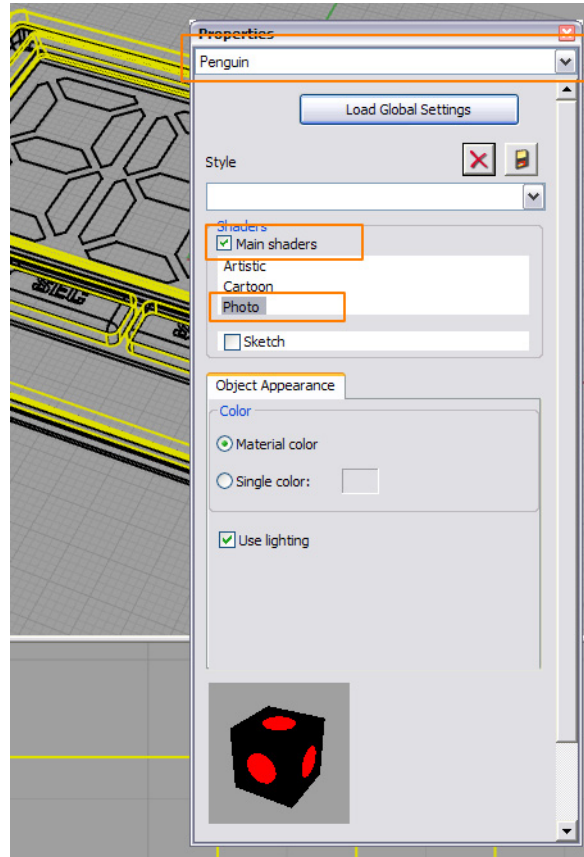


As you can see we have nice and thin borders and hidden lines, but we lack the lines that define the actual shape of the objects.

- 11 Penguin can render the isocurves also, and you might have noticed that the objects do not show the internal isocurves, this is because they are turned off on a per object basis. This is done so the final image will look better. So turn on the **Render isocurves** and the **Render dimensions and text**, turn on the dimensions layer and do the final render.



- 12 Every object in the scene can have custom **Penguin Settings**, so to add a bit more life to the top cover, select it and change its shader to **Photo**. The Photo shader renders the object with an OpenGL render so it looks similar to the Rendered display mode of the viewports.

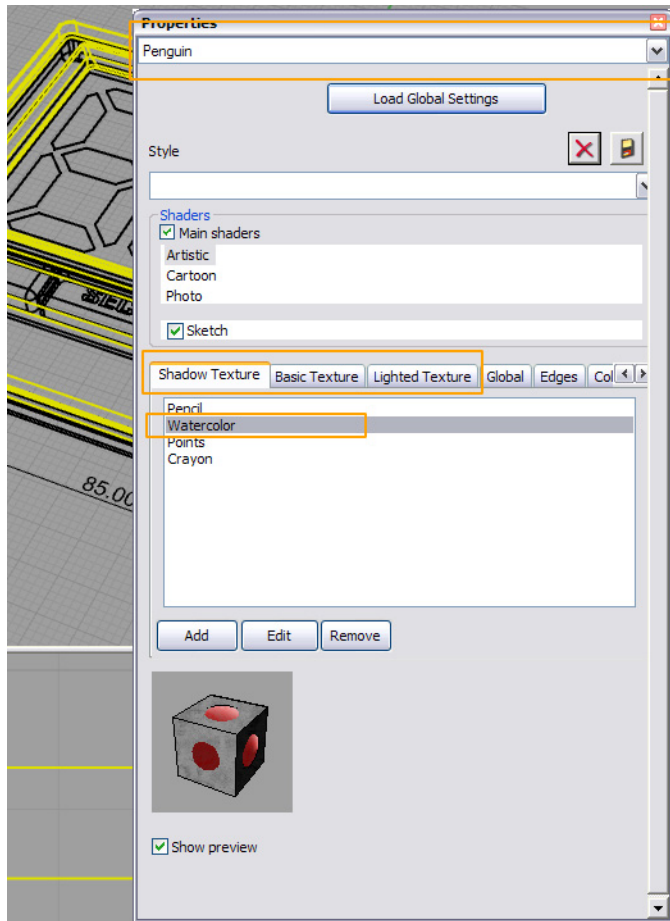


Note that the Photo shader supports transparencies and shadows, but not texture or bump maps.

Do a test render to see the effect.

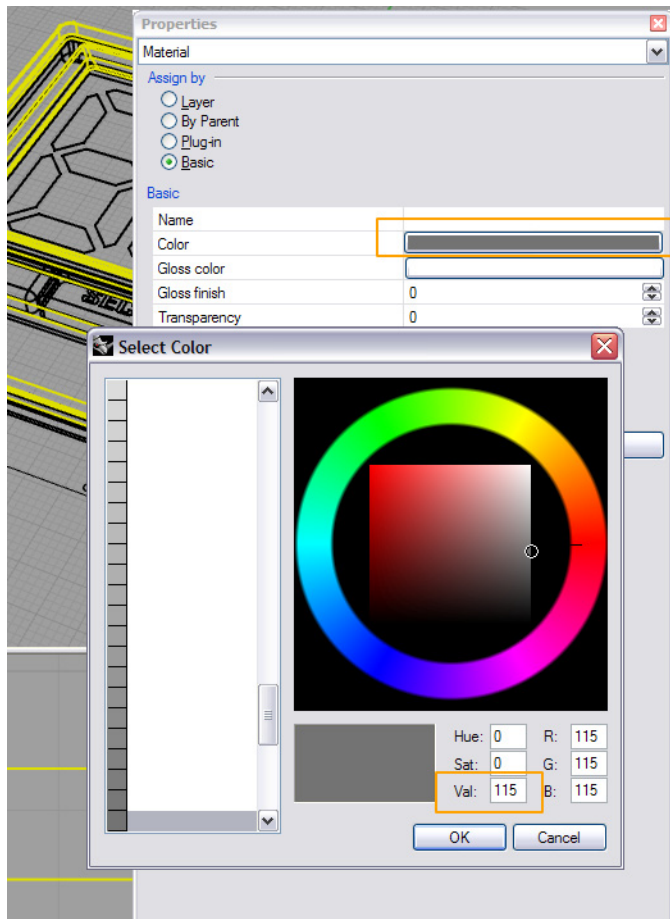
- 13 Select the top cover once more and now change its shader to **Artistic** in the **Object properties – Penguin Settings**.

Make sure you set all the texture settings to **Watercolor**, **Shadow Texture**, **Basic Texture** and **Lighted Texture**.

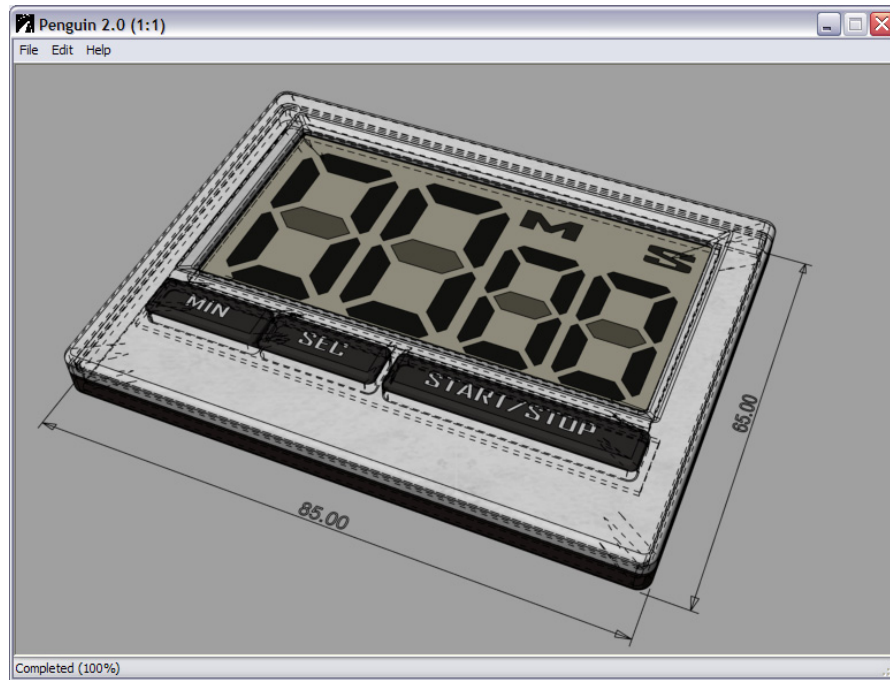


You can set these values independently if you want, but do not mix **Points** with other settings. Points uses a different render style that needs to be assigned to all three textures to work properly.

- 14 This setting makes the cover render much lighter, so we have to set the object color **Value** to **115**.



15 The final render:



TUTORIAL 4 - RENDER TO FILE

Features

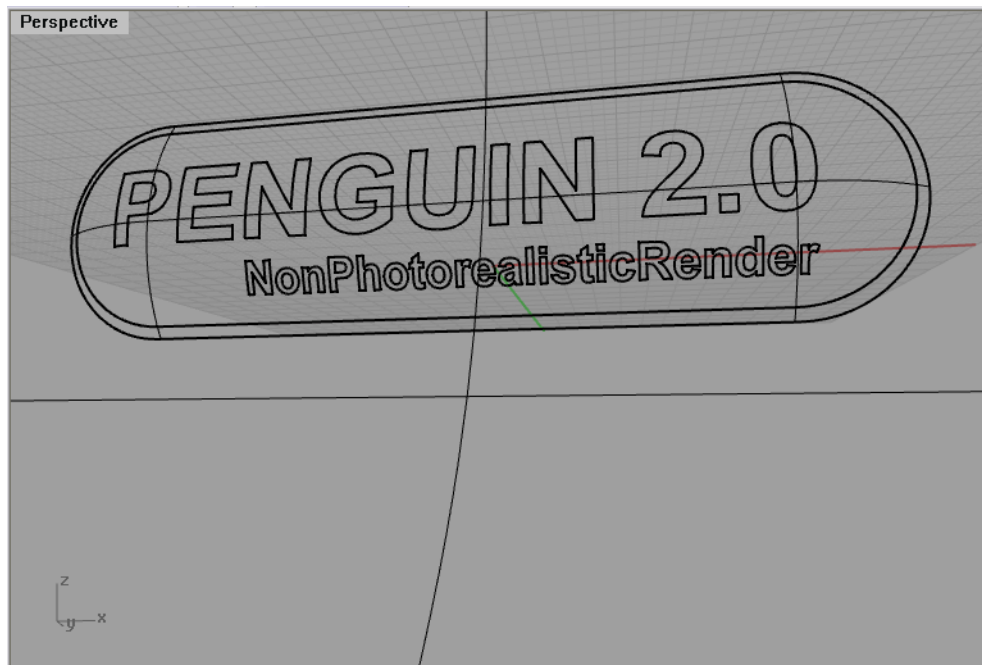
This tutorial covers the following Penguin 2.0 advanced features:

- Penguin shader
- Mesh settings
- Render to file
- Vector output

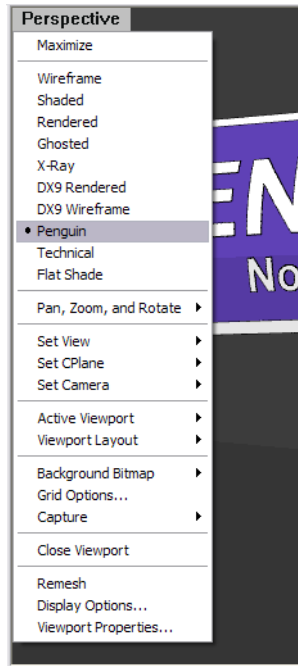
We are going to make a PDF file of a shaded logo.

Steps

- 1 Open the **VectorLogo.3dm** model in the *D:\Penguin 2\Tutorial\English* folder on the CD.



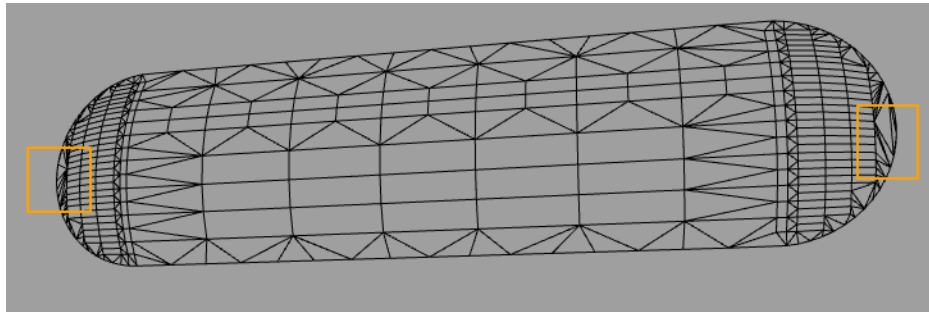
- 2 Set the shading mode of the **Perspective** view to Penguin by right-clicking the **Perspective** view and selecting **Penguin**.



- 3 Notice the two black vertical lines on the blue part. These are a result of bad meshing.

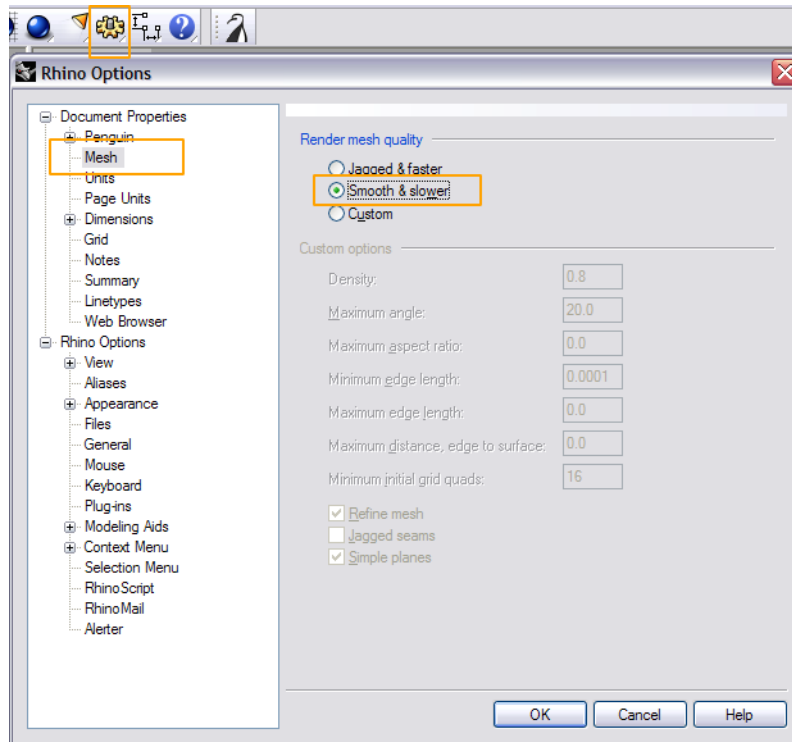


Note:



Notice how the mesh is going into one point in the troubled area. The image shows the **extractrendermesh** of the object which was done only to show why these lines appear. You do not need to extract the mesh.

- 4 Set the render mesh to **Smooth & slower** by clicking on the settings icon on the top menu and navigate to **Mesh**.



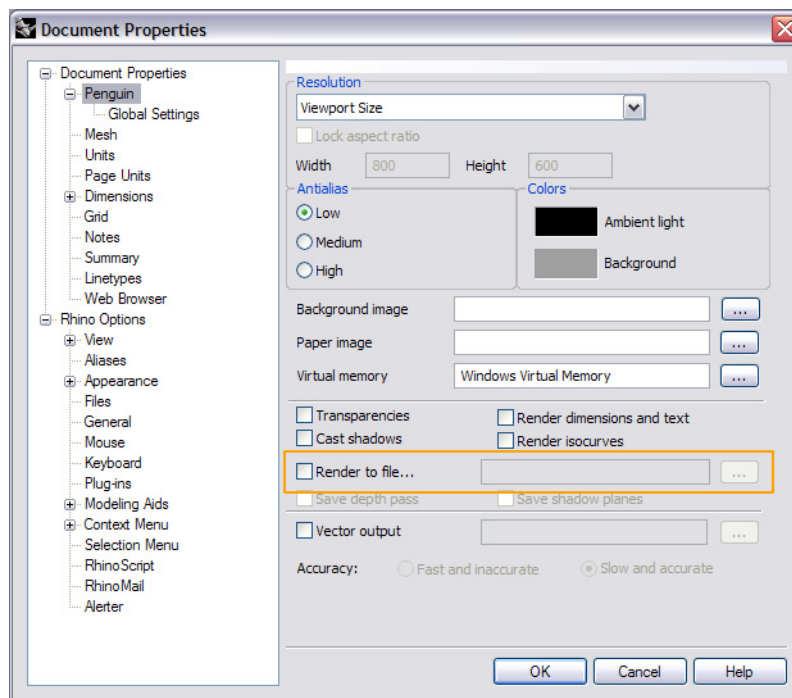
Penguin uses Rhino's mesh settings, just as the shaded viewport modes do, so the mesh you see in the viewport is what Penguin will calculate. You can of course use custom mesh settings if you like, but using **Smooth & slower** is enough for this tutorial.

- 5 **Note:**

Using the Penguin shader can distort the other shaders for that viewport due to a minor bug in the Rhino/Penguin communication which results in wireframe redraw of the objects regardless of which other shader you use.

To fix this do as follows:

- 1) Select all objects.
 - 2) Make sure the correct viewport is selected.
 - 3) Type in **SetObjectDisplayMode** command.
 - 4) Click on **Mode=Wireframe** and then on **UseView**.
- 6 The file has already a light inserted and the shader is adjusted to get the desired light and shade effect. Feel free to adjust them and the colors and see the realtime update in the viewport.
- 7 New in Penguin 2.0 is that it can render directly to file.
 Open the **Penguin Settings** and click on **Render to file**. Select a destination in the popup window, type in a name for the file and select PNG as file format from the pull-down menu.
 Avoid using JPEG if you want to use the image in production since Penguin compresses the image too hard.



- 8 Notice that when the **Render to file** is active then the **Save depth pass** alternative becomes visible. If activated Penguin renders an additional file containing the z-buffer value of the viewport to an extra file with **"_depth"** added to the file name.

This is the result:

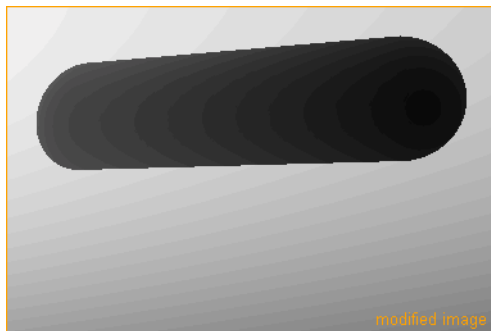


VectorLogo.png



VectorLogo_depth.png

It can be difficult to see but the image above contains all the depth information of the perspective viewport, so to get a better impression of the information it contains take a look at the level-adjusted image below:

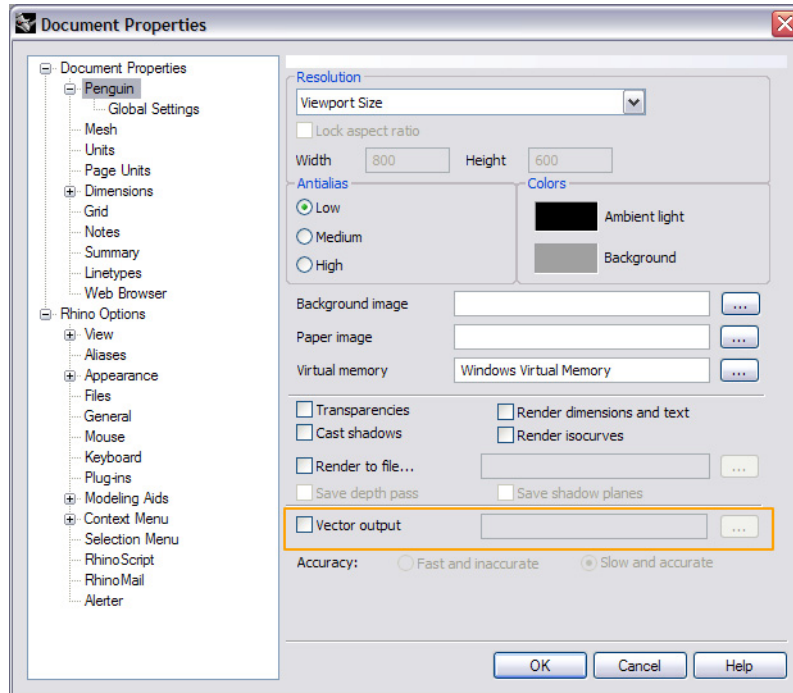


Also if **Cast shadows** and **Render to file** are activated in the options, then the **Save shadows planes** becomes visible. That makes Penguin render a separate black and white image of just the shadows with "**_shadow**" added to the file name. The reasons for using these options are if you want to post edit the images in Photoshop.

- 9 Penguin 2.0 can also save to **Vector output** but note that vector output does not support shadows. Also it has a limitation on the amount of polygons it can handle due to the increased RAM (memory) usage in creating the file, so setting the mesh density as low as possible is crucial for the render speed and the ability to handle the scene you want to render.

As a default format we recommend using PDF since it can be opened in all operating systems and in most vector programs like Illustrator and also in most image editing software such as Photoshop.

Open the **Penguin Settings** and check the **Vector output** box to make Penguin render to a file. Select a destination in the popup window, type in a name for the file and select PDF as file format from the pull-down menu.



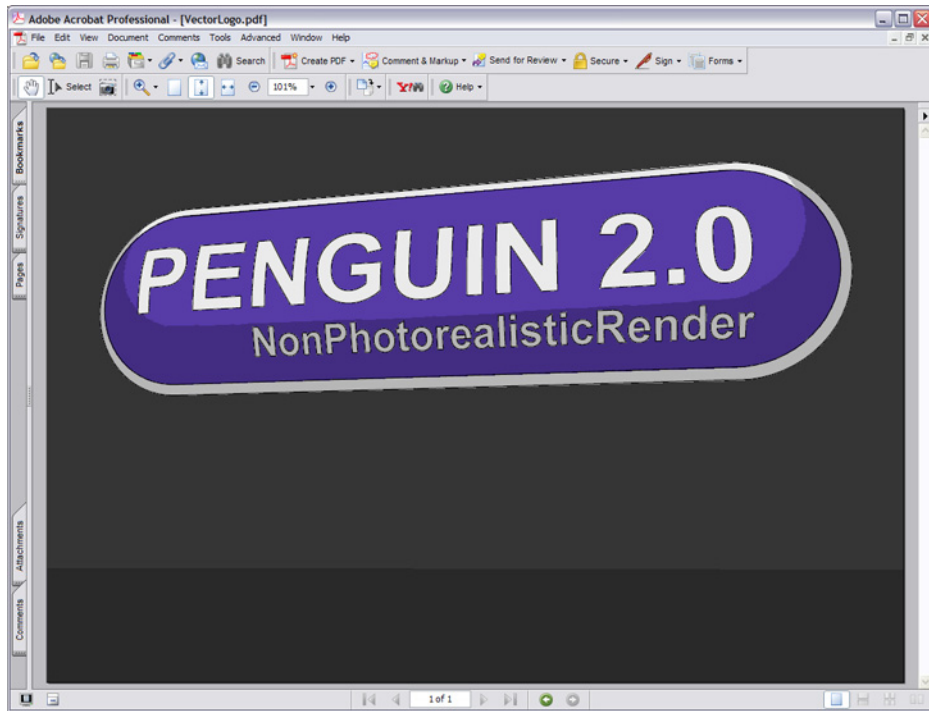
The vector output mode ignores the **Antialias** settings, but it has its own **Accuracy** settings that can be found under the vector output and becomes active once a destination is selected. Default is **Slow and accurate** which should be used in most situations.

Penguin uses a lot of memory and quite some time when rendering to vector output so setting the render mesh too high will cause a out of memory situation which results in an empty render file. If this happens, set the mesh settings lower and/or set the **Accuracy** to **Fast and inaccurate**.

- 10 Now click on the Penguin render icon and wait until it is done calculating. Now you can open **My computer** and navigate to the destination you chose and open the PDF.

If you do not have a PDF viewer installed then go to www.acrobat.com and download and install the newest version. It is free.

11 The PDF output:



Note that Penguin makes lots of small elements when rendering to vector, and elements of identical color are not combined. This can be done later on in Illustrator if desired. These amounts of elements can make the preview in Acrobat appear with lots of small lines, but if you zoom in on the image they disappear. It is an Acrobat artifact only.

Also note that the PDF file size can be quite large because of the high amount of elements. For this tutorial the output file is 2.5MB.