CAD PROJEKT K&A

Operation manual

Basic Rendering

CAD Kitchens 8.0, CAD Decor 4.0, CAD Decor PRO 4.0

www.en.cadprojekt.com.pl

INTRODUCTION

The manual describes how to work with the Basic Render module. It can be found in each of our programs.

We hope that you will find working with our software both pleasant and productive.

CAD Projekt K&A Team

The manual provides instructions and keyboard shortcuts for the previous 32-bit version of the program environment. The program now runs in a 64-bit environment. The commands and keyboard shortcuts may have changed as a result. Additionally, the program's interface has been updated.

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Visualization – Basic Rendering

1. Introductory remarks

The quality, contrast, and depth of the displayed image when the lights are switched on depend on the performance of the renderer or imaging. Therefore, it is crucial to choose the right lighting appearance to achieve the desired result. The rendering module offers solutions that can help designers achieve excellent visualization effects with minimal effort. Our software incorporates the latest developments in 3D computer graphics, including the **Ambient Occlusion** global shading method and a specialised technique for texturing irregularities in objects - **Bump mapping**, even at the basic rendering level.

Note: In CAD Decor PRO version 3.0, the 'Depth of focus' function has been relocated from the Basic Renderer Functions panel to the 'Scene' tab, specifically under the 'Camera' sub-tab .Additionally, the Bump mapping function can now be found in the 'Material Properties' panel

2. Basic renderer functions

Some of the basic renderer functions are located in the **"Radiosity"** sub-tab, under the **"Render"** left menu (Illustration 1). Controlling the appearance of the visualized scene involves deselecting and selecting individual features and setting feature values using sliders. The available options are shown in the following table.

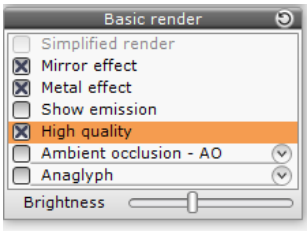

Illustration 1 Basic renderer functions panel

Function	Description
Simplified render	- feature available in the **"Basic Render"** panel in the left menu; - a more economical version of the renderer in terms of memory consumption; - useful on computers with less processing power; - faster time to get the final effect; - worse appearance of shadows (less realistic, sharper, "angular"); - less pronounced convexity mapping effect.
Mirror effect	- function available in the **"Basic render"** panel in the left menu; - when lit, displays vertical reflections on the objects given them.
Metal effect	- function available in the "Basic Render" panel in the left menu; - when the lights are on, displays general reflections on the objects given them.
Show emission	- function available in the "Basic Render" panel in the left menu; - the assigned property of the basic emission is displayed as an apparent glow, which includes a glow and glow effect around the objects to which it is assigned, such as light bloom or a glow effect.).
Hight quality	- function available in the "Basic Render" panel in the left menu; - if your computer has sufficient power, using this feature can improve the quality of the effects.; - this function improves the quality of rendered shadows in the project, giving them a more realistic softness and shape that reflects the actual distribution of light and dark. It also enhances the display of multiple reflections in mirrors.
Ambient Occlusion (AO)	- function available in the "Basic Render" panel in the left menu; - the ambient occlusion method involves estimating the extent to which a portion of an object's surface is exposed to diffuse light in the room); - Is responsible for natural chiaroscuro, gives objects a realistic look; - its operation can be adjusted using sliders: - "AO Range" slider - sets the range of shadows obtained by turning on global shading (moving it to the left decreases its range, and to the right - increases it);

	- "AO Intensity" slider - affects the intensity of the shadows (moving to the left gives soft shadows, while moving to the right gives crisp and darker ones).
Anaglyph	- function available in the "Basic Render" panel in the left menu; - allows you to create anaglyph images (which give the impression of *three-dimensional images* when viewed through red-cyan glasses); two options can be adjusted to achieve the optimal effect: - "**Separation**" slider - is responsible for adjusting the view to the viewer's eye span (the narrower the monitor, the bigger it should be); - "**Convergence**" slider - allows you to determine the distance at which the eye axes converge; set it on the object on which you want to focus the viewer's gaze (it will have the smallest red and turquoise "ghosts"); when setting it, you can use the "Center selected" option, available under the right mouse button after selecting the object - the convergence will automatically set on the object indicated as the canter of the view.
Brightness	- function available in the "Basic Render" panel in the left menu; - determines the brightness level of the entire scene; - allows you to control the level of overall contrast.
Depth of focus	- function in the "Scene Settings" panel on the right menu, under the "Camera" tab; - allows you to achieve blurring of the image in the foreground or background; - you can use the "Autofocus" option or independently control the degree of out-of-focus (the "Blur" slider) and the distance of the maximum focus point (the "Distance" slider”).
Bump mapping	- function available in the "Material properties" panel in the right menu; - a specialized texturing technique that causes a three-dimensional impression of textures with uneven surfaces (e.g., patterned wallpaper, structured plaster, bricks, ceramic tiles with convex decorations, etc.); - you can control the expressiveness of indentations and convexities and reverse the effect (convex fragments will then become concave and vice versa).
Emissions	- function available in the "Material properties" panel in the right menu; - using it will brighten the edited object and, while using the " **Show emission** " option from the left menu, described above, also display a glow around it, so that it will appear to glow with intense light (in the color of the object texture); - this effect can be given to any object in the scene.
Stereo picture	- function available in the **"Save Visualization"** window (under the **"Save Visualization as…"** icon).in the top menu); - as a result of using this option, illustrations are created that can be viewed in special stereoscopic 3D glasses, giving the impression of three-dimensionality; - we describe it in detail in section 8 of this chapter.
Post-process filter and gradient	- functions available in the **"Advanced"** tab in the **"Save Visualization"** window (under the **"Save Visualization as…"** icon).in the top menu); - allow you to create interesting images based on visualization illustrations; - example applications are presented in section 9 of this manual.
Creating 3D illustrations and animations	- the visualization can be saved as regular, stereo or anaglyph images in JPG or PNG formats, as well as 3DE presentations read by the Export 3D module and the CAD Share-it mobile application (for more on this topic, see the manual titled Project Presentation); - there are many resolutions to choose from - from 1024 x 768 all the way up to 5760 x 3240; - to save a visualization, select **[F12]** or the **"Save visualisation"** icon; - you can add an author mark (logo or text) to the illustration and 3DE presentation.
Export 3D 	- the module allows you to save visualizations as 3DE animations, also playable by the CAD Share-it application; - it can be sent to the client along with the saved 3DE files so that they can take a virtual visit to the designed interior; - for more information, see the manual titled Design Presentation.
AVI video recording	- AVI-format videos are created in the "Presentation" tab on the left menu, based on a self-recorded track (for more information on this topic, see the manual titled Project Presentation;.

	- the angle and speed of the camera should be set before recording in the **"Scene"** tab→**"Camera"** (these can be changed during recording - this requires using **pause**, going to the **"Scene"** tab and changing the camera settings, then returning to the **"Presentation"** tab and resuming recording); - there is a range of resolutions (up to 4K) and different frame rates to choose from; - after recording the video, turn on the lights, select the **"Save to AVI file"** button and choose the appropriate codec; - the result is a video in which the camera moves freely in space at varying speeds and changes at will; - you can use an interesting effect of displaying the video in the movie - to do this, place the AVI file in the project just like a texture (drag and drop); - CAD Decor PRO users can also record spherical videos in which the camera can be rotated 360°during playback (this requires that the **„Spherical Panorama"** option be checked first when rendering using the **Path tracing** algorithm.).
CAD Galeria	- a standard module for presenting illustrations and AVI videos; - For more information on this topic, see the manual titled Project Presentation.
Mobile presentation in CAD Share-it	- 3DE presentations are read by the CAD Share-it mobile application, which brings the designs directly to the customers' pockets; - users of CAD Decor PRO with an active Service Package have free access to the CAD Share-it app on BASIC and PRO accounts; - more information on this subject in the manual titled Presentation of the project.

3. Ambient occlusion

The use of the Ambient occlusion (global shading) algorithm improves the appearance of the scene with a soft chiaroscuro effect, mainly at the junction of walls and ceiling, which adds depth to the image (Illustration 3). The extent and intensity of the global shading can be freely adjusted with the sliders, shown opposite, as can the overall brightening of the scene (the **"Brightness"** slider at the bottom of the panel) (Illustration 2), allowing you to set the contrast and intensity of the chiaroscuro according to your preferences.

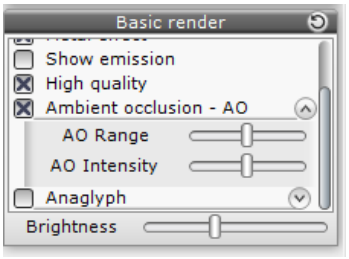

Illustration 2 Ambient occlusion option in the "Basic Render" panel in the left menu (under the "Render" tab)

Illustration 3 Left: scene without global shading, right: with global shading (visible shadows at the junction of walls and ceiling)

4. Depth of focus

The "**Depth of focus**" function allows you to get a blurry image in the foreground or background to give the impression of depth in a scene (Illustration 5). When enabled, the **"Autofocus"** mode is active by default, in which you just need to set the view with respect to the marker (the red square visible in the scene, which can optionally be turned off with the eye icon:), indicating the point of greatest focus (the distance will automatically set to the indicated object). With the **"Autofocus"** function disabled, you can set the distance of the point of greatest focus from the camera (the **"Distance"** slider) and the degree of out-of-focus (the **"Blur"** slider) yourself.

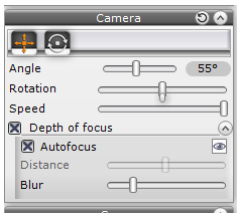

Illustration 4 "Depth of focus" function in the "Camera" panel, under "Scene settings" in the right menu

Illustration 5 Left: depth of field in the background; right: depth of field in the foreground

Owners of the Render PRO module can display the depth of field along with the effects of the Advanced Render algorithm. To do this with the Radiosity renderer, first perform Radiosity calculations. Once finished, select 'Depth of field' and turn on the lights using [F1] or the ;;Show lights' icon. To display depth of field along with the Ray tracing effect, ensure that the 'Depth of focus' option is checked before selecting the START button in the Ray tracing panel. Similarly, for Path tracing rendering, enable depth of field before starting the rendering process as selecting it while the algorithm is running will reset the calculation.

Note: To avoid high memory load, do not use the 'Depth of focus' function simultaneously with the 'Anaglyph' function. However, it is possible to obtain an anaglyph image with depth of field by saving the visualization illustration in the 'Save visualization' window under the Save visualisation as...” icon. In the save window for visualizations, you can choose the 'Anaglyph image' option for a scene with pre-set depth, and the image will render correctly.

5. Bump mapping

Thanks to a special texturing technique - bump mapping, the surfaces of materials, structured paints and claddings gain the impression of three-dimensionality (Illustration 7). The program recognizes the lighter and darker parts of the texture and creates the illusion that they are indentations or highlights (depending on the option selected: **"Bump effect"** or **"Reversed effect"**). When you turn on the lights in the design, you can clearly see which textures are smooth and which have three-dimensional patterns. Even when using the **"Simplified Renderer"** function, the most economical from the point of view of memory consumption and imaging time, which comes at the expense of the appearance of the scene, the effect is still clearly visible (although devoid of additional shading, which gives the impression of flattening).

The bump mapping function becomes available in the right menu after editing the object on which the effect is to be visible by double-clicking on it with the left mouse button. The extent of the bump mapping can be determined using the slider in two ways - by changing its extent by left-clicking on any point, or by right-clicking on a percentage value and typing a new one from the keyboard (the selection should be confirmed with the **[Enter]** key).

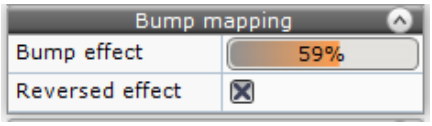

Illustration 6 – "Bump Mapping" panel in the "Material Properties" tab on the right menu

Illustration 7 Left: texture without relief mapping; right: with mapping

To clearly show the effect of mapping the bulge on the wall, it is recommended to place a halogen nearby and illuminate the surface vertically from above.

6. Emission

In the program there are two types of illumination, which can be assigned to selected objects or surfaces in the **"Material Properties"** tab in the right menu (Illustration 8):

- apparent emission (**"Glow"**), which is the impression of glowing an object with intense light in the color of its texture (does not affect the lighting distribution in the scene);
- advanced emission (**"Emission"**), which is the real emission of light of any color into the environment (affects the lighting distribution in the scene).

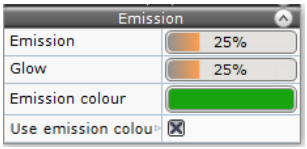

Illustration 8 "Emission" panel in the "Material properties" tab in the right menu

The action of glow, which we also call apparent or basic emission, is to maximally brighten the object to which it is assigned. The effect is to give the impression of an object glowing and to imitate its emitting a glow, which, however, has no real effect on the distribution of lighting in the scene. This effect can be used at the basic level of rendering, for giving the impression of illumination of, for example, halogens, and also in advanced rendering as an additional effect for objects with given **"Emission"**, which causes the actual emission of light into the surroundings.

The **"Glow"** function is closely related to **"Emission"** - a change in the level of actual emission causes an automatic analogous change in the intensity of the backlight, allowing the user to effortlessly achieve the optimal appearance of light sources.

To give an object a basic emission effect, select it by double-clicking the left mouse button. This will activate the **"Material Properties"** tab in the right menu, including, among other things, the **"Emission"** panel, which includes the **"Glow"** slider (as well as the **"Emission"** slider and the **"Emission Color"** and **"Use Emission Color"** functions, allowing you to select any shade of emitted light).

Setting the **"Glow"** slider to the right (100%) causes the object to be maximally brightened, making it appear to glow with intense light (Illustration 9). To intensify this effect, in the **"Basic Render"** panel, check the **"Show emission"** function - this will add a special Light bloom effect - that is, an imitation of a glow around the object. As a result, an object with a given backlight will look as if it emits an intense light of its own (however, it will not actually have any effect on the distribution of lighting in the scene).

The program also has the ability to give objects real light emission, measured in watts per square meter, which causes objects to actually emit light into the environment and have a real effect on the appearance of the entire room. The light emitted by objects with assigned emission can be of any color. This function is available under the slider **"Emission."** (Illustration 8). It is detailed description can be found in the Separate Instructions on Advanced Level Rendering.

The following illustrations (Illustration 9) compare the operation of glow and emission. A detailed description of the settings shown in each illustration can be found below.

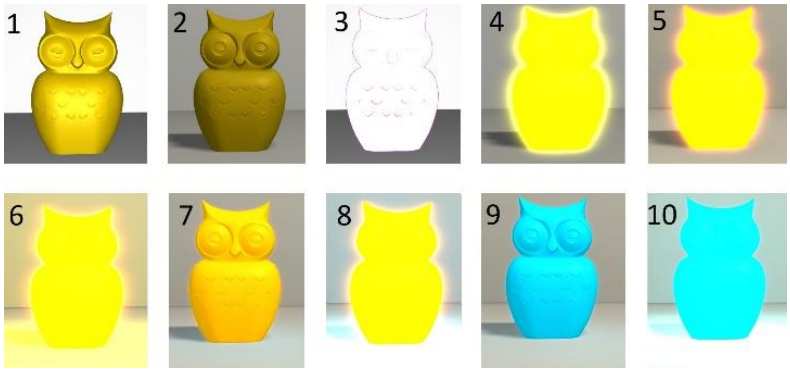

Illustration 9 - The same object with different backlight and emission settings, in different lighting (direct or global only)

1 - object without glow and emission, view before lights on;
2 – Object without glow and emission, view after lighting (direct illumination);
3 – The object with the given glow (100%), before the lights (maximally brightened);
4 – object with given glow (100%), after lighting (glow has texture color) (direct lighting);
5 – The object with glow(without emission) when **Radiosity** is turned on (global illumination - no effect of glow on light distribution in the scene);
6 - object with glow and emission (the emitted light was given a yellow color) after turning on **Radiosity** (global illumination -visible effect of emission on light distribution in the scene);
7 – object with 70% glow and 10% emission when the lights are on (direct illumination);
8 – object with 100% glow and with 100% emission (global illumination; the color of the object remained yellow, while the emitted light was given a blue hue - visible effect of emission on the distribution of light in the scene);
9 – object with 70% glow n and 10% emission when the lights are on (direct light; object color changed to blue);
10 – Object with 100% glow and 10% emission (global illumination; both the object and the emitted light were given the color blue; visible effect of emission on the distribution of illumination in the scene).

7. Anaglyph

With the creation of anaglyphic images, it is possible to obtain images that evoke a three-dimensional impression when viewed through special red and blue glasses. These images are created by superimposing two images, taken with a slight offset, corresponding to the views for the right and left eye, encoded in opposite colors (red and turquoise). The effect can be obtained by enabling the **"Anaglyph"** option in the **"Basic Render"** panel (Illustration 10), as well as in the **"Save visualization"** window, which opens with the icon **"Save visualization as..."**, selecting the save mode **"Anaglyph picture"** (Illustration 11).

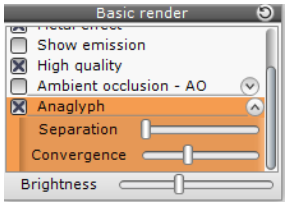

Illustration 10 The "Anaglyph" option in the basic renderer function panel under the "Render" tab in the left menu

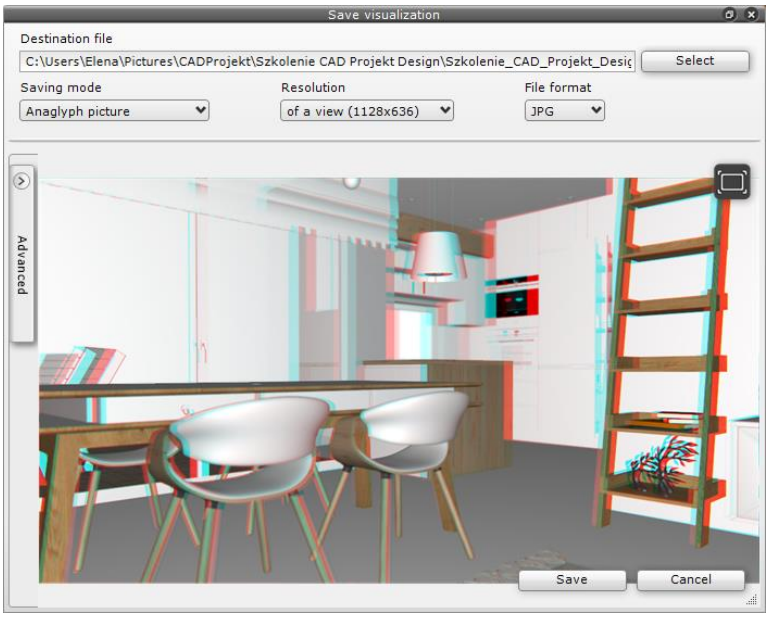

Illustration 11 Anaglyphic image - convergence set on a chair

The effect depends on the settings of the **"Separation"** and "**Convergence**" sliders in the **"Basic Render"** panel in the **"Render"** tab in the left menu. The former is responsible for matching the view to the viewer's eye span, and the latter is responsible for the distance at which the viewer's eye axes should converge. The convergence should be set on the object on which you want to focus the viewer's eyes (it will have the smallest turquoise and red "ghosts" - in the illustration on the next page this object is a chair) (Illustration 11). The function of creating anaglyph images is available both in standard rendering and in the Render PRO module, after **Radiosity** and **Ray tracing** calculations.

Please note that the parameters of visualizations saved as 'Stereo Images' are also determined by the settings of the 'Separation' and 'Convergence' sliders.

8. 3D effect -stereo picture

Stereo images (a.k.a. stereo pairs) are two flat images showing an object or scene from slightly different angles (one corresponds to the image seen by the left eye and the other to the right eye). These images can be viewed using instruments with two lenses, through which each eye sees only one of the stereopara images (such as stereoscopic 3D glasses). They then give the impression of three-dimensionality; they allow one to see the depth of the scene and the mutual position of objects in space. To use this effect, select the save illustration mode **"Stereo picture"** in the **"Save visualization"** under the icon **"Save visualization as..."** in the top menu. You will then get a stereoscopic image, consisting of two images of the same scene, taken from different viewpoints.

The default setting for stereo image pairs in our software is the "top-down" (one below the other) position, since this is the mode in which most viewing devices operate. We also offer the possibility to save stereo images in **"Stereo side by side"** mode and two independent files for the left and right eyes (option **"Separated stereo"**), as some devices require this solution. These options are available in the **"Advanced"** panel in the **"Save visualisation"** window (Illustration 12).

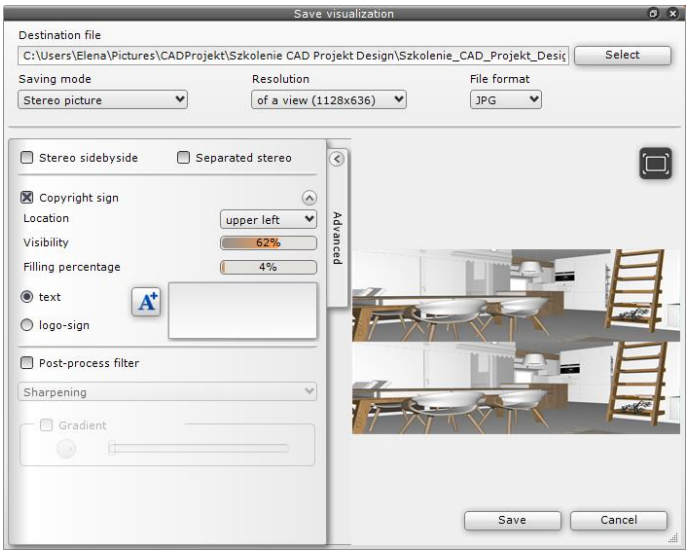

Illustration 12 Side by side stereo image

The illustrations on the next page show stereo images in "top-down" and "sidebyside" modes(Illustration 13).

Illustration 13 Left: upside-down stereo image; Right: sidebyside stereo image"

9. Post-process filter and gradient

In the **"Advanced"** drop-down panel (Illustration 14) in the **"Save Visualization"** window (under the icon "**Save visualization as...**") there are post-process filters: **"Sharpening"**, **"Sketch"**, **"Watercolour"**, **"Crayon"**, **"Soft Crayon"**, **"Oil"** and**" Oil paint van Gogh"**. They allow you to create diverse illustrations. They can be combined with other effects, and you can still add a tonal transition effect after applying the filter. To do this, select the **"Gradient"** option (Illustration 14). The user then gains access to a slider that controls the focus of the transition and to options for selecting the position of the transition ("knob" and icons; corners and edges of the illustration are available). The following are examples of the use of filters and tonal transitions (Illustration 15 – Illustration 17).

Illustration 14 Post-process filter options and go in the "Advanced" tab of the "Save Visualization as…" window

Illustration 17 Left: "Oil van Gogh" filter, plain image; Right: "Crayon" filter, plain image

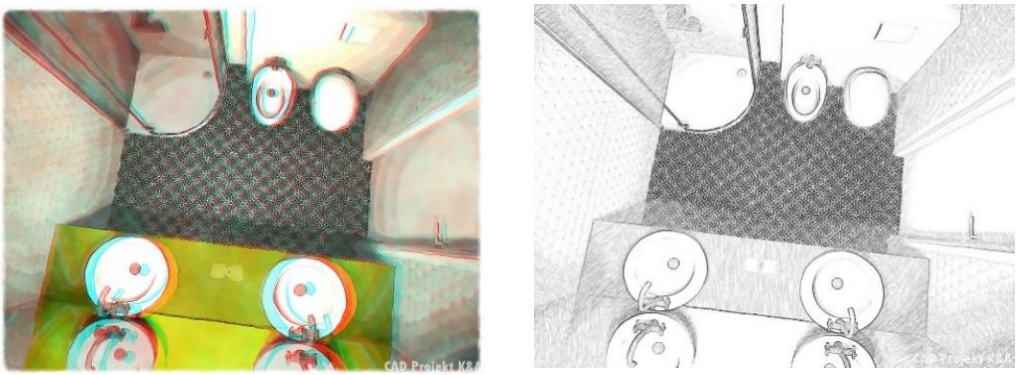

Illustration 16 Left: "Watercolor" filter, anaglyph image ; Right: "Watercolor" filter, plain image

Illustration 15 Left: transition from corner, "Crayon" filter; Right: blurred transition from right, "Sketch" filter"

Additional information

1. Instructional videos

- Playlist, Visualization | Render"

2. Shortcuts and commands

The document compares keyboard shortcuts in the .4CAD and visualization environments and lists the most frequently used commands in versions up to 3.Xi/7.X and version 4.X/8.X (both 34 and 64 bit versions of the environment). Find the document at: https://www.cadprojekt.com.pl/zasoby/pdf/opisy-techniczne/shortcuts-4-0-8-0-eng.pdf

This document provides an overview of keyboard shortcuts and commonly used commands in the .4CAD environment for visualization. The shortcuts and commands can be issued using either the mouse or keyboard. It can be accessed at: https://www.cadprojekt.com.pl/zasoby/pdf/opisy-techniczne/shortcuts-4-0-8-0-64bit-eng.pdf

In the above list, LPM and RMB stand for left and right mouse buttons, respectively. A command notation with a + sign (e.g. [Ctrl] + [Z]) indicates that both keys should be pressed simultaneously, while a notation with a >> symbol (e.g. [E] >> [Enter] or [Space]) means that you should first type E and then press [Enter] or the space bar.

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Contact form

We would like to inform you that we provide training in the use of our programs. For more information, please visit our website: https://www.en.cadprojekt.com.pl/trainings/

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