

BIMXplorer

v1.4.3 BETA

**NOTE: VR-mode is currently only supported
on NVIDIA graphics cards!!**

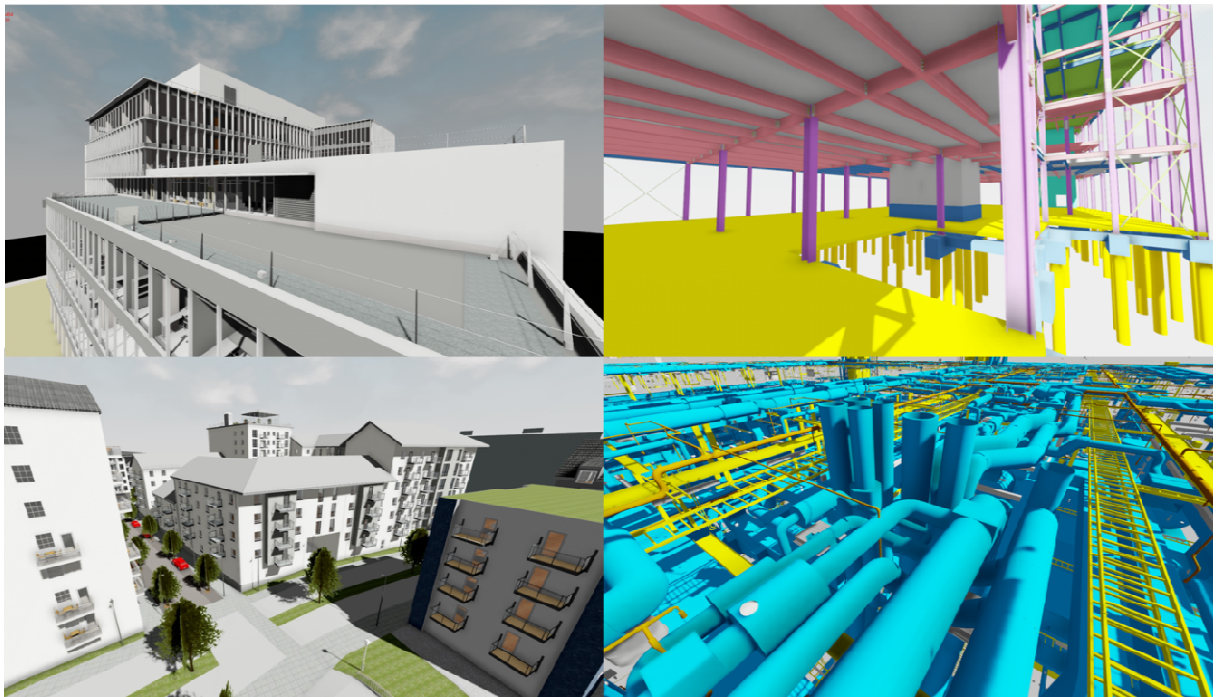


Table of Contents

1	Introduction.....	3
2	Setup.....	3
3	Trial period and activation	4
4	Use BIMXplorer with Revit	4
5	A little bit on navigation and interaction	5
6	Save/Open File	6
7	Collision detection.....	6
8	Materials, shadows and links	6
9	Use the “Standalone viewer”	7
9.1	IFC Import options.....	8
10	Color-coding different links.....	8
11	Fixing “broken” IFC geometry	9
12	Display object properties	10
13	Using BIMXplorer with a VR headset	11
13.1	Using BIMXplorer with HTC Vive	11
13.1.1	SteamVR Settings	12
13.1.2	Navigation – Fly Mode.....	12
13.1.3	Tools Palette	12
13.1.4	Navigation – Teleport Mode	13
13.1.5	Labels in VR - General.....	14
13.1.6	Measure distance	15
13.1.7	Measure perpendicular distance.....	15
13.1.8	Select and display object properties	16
13.1.9	Hide and show links/layers.....	17
13.1.10	Section plane	17
13.1.11	Hide and show objects	19
13.1.12	Screenshots	20
13.2	Using the Oculus Rift with Oculus Touch:	20
13.3	Using the Oculus Rift without Oculus Touch:.....	21

1 Introduction

BIMXplorer is a plugin for **Autodesk Revit (2016, 2017 and 2018)** as well as a standalone viewer application that can import **IFC-files** or load previously saved **.grx-files** (BIMXplorer's proprietary file format). BIMXplorer makes it possible to "walk around" in a BIM similar to a 3D game, either in a regular desktop mode or using the Oculus Rift or HTC Vive HMD.

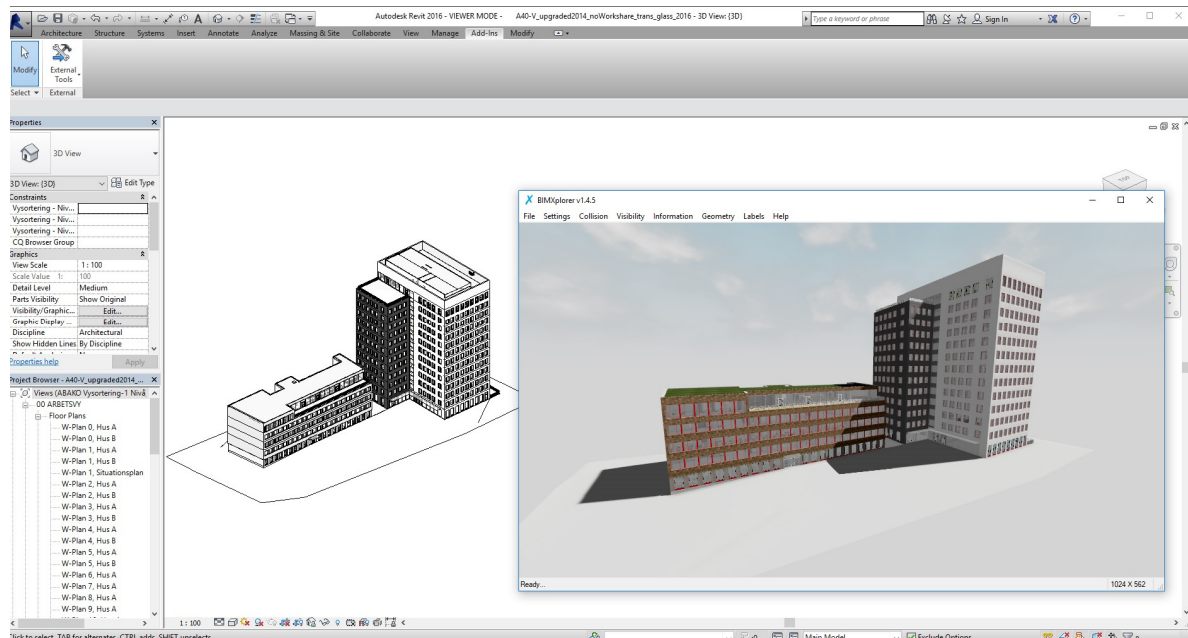


Figure 1: BIMXplorer interface.

The first part of this guide will explain how to install and use the BIMXplorer Revit addin and the standalone viewer **WITHOUT** Oculus Rift or HTC Vive. The last part will explain how to use BIMXplorer together with Oculus Rift and HTC Vive.

2 Setup

Unzip the downloaded file into a temp dir. Make sure Revit is not running. Run setup.exe. This will install both the Revit addin as well as the standalone viewer.

FYI the software will install into "C:\ProgramData\VIZCODE\BIMXplorer v1.4.5" and the addin will be added to "C:\ProgramData\Autodesk\Revit\Addins\2016", "... \2017", and "... \2018".

BIMXplorer is targeting **OpenGL 4.5** but has a fallback for OpenGL 4.3 and OpenGL 2.1 (however, the fallback versions has no Oculus or Vive support and has limited graphics quality). In case of any problems, make sure that the latest graphics drivers are installed.

On computers with **NVIDIA** cards, right click on the desktop and launch the **NVIDIA Control Panel**. Go to **Manage 3D settings**. Make sure **Vertical sync** is **Application Controlled**, turn **Threaded optimization ON**, and set "**Power management mode**" to "**Prefer maximum performance**".

On computers with integrated AND NVIDIA graphics card, make sure NVIDIA processor is chosen as "Preferred graphics processor".

3 Trial period and activation

When BIMXplorer is installed for the first time on a computer it will begin a 30-day trial period. Every time you start BIMXplorer it will display the License Dialog until you activate it, either with a unique Activation Code (for Node-Locked license) or user/password (for Floating license). Go to www.bimxplorer.com or contact license@bimxplorer.com to get information on how to purchase a Node-Locked or Floating license. Unless the Trial Period has ended you can start BIMXplorer in Trial Mode by clicking “Trial Run”.

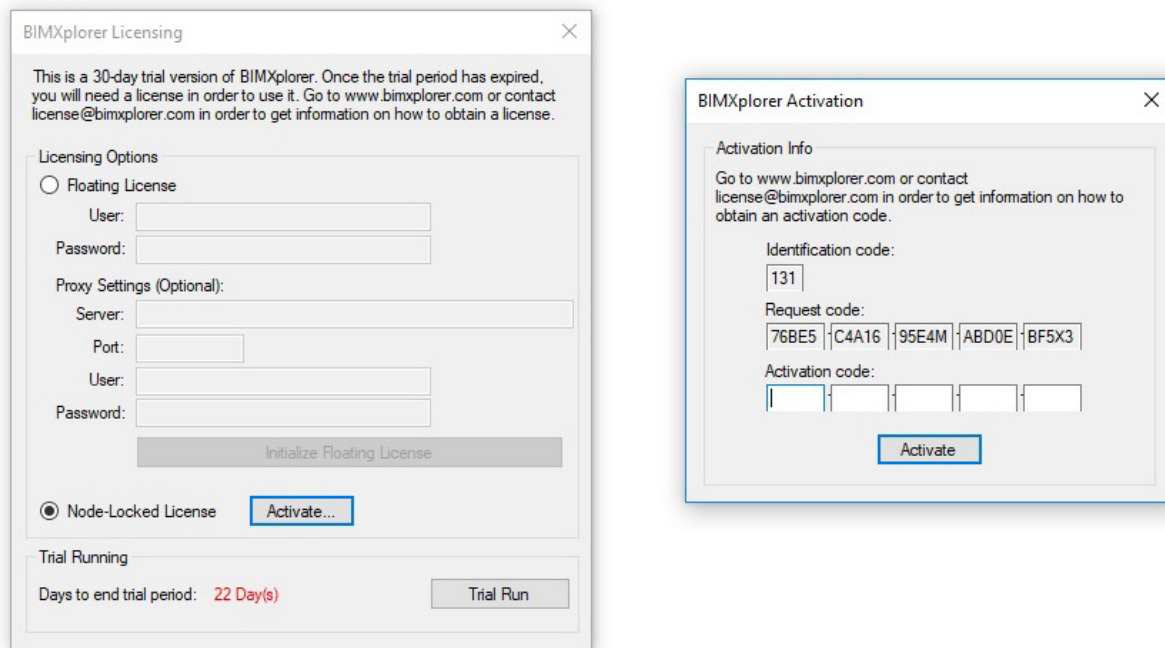


Figure 2: For a floating license, select “Floating license” and enter user/password. For a Node-Locked license, select “Node-Locked License” and click “Activate...”. This will display the Identification and Request Code. Upon receiving the “Activation Code”, enter it and click “Activate”.

4 Use BIMXplorer with Revit

Note: BIMXplorer is not yet “signed” with Autodesk Revit 2017 or 2018. When starting Revit 2017 (or 2018) for the first time after you install BIMXplorer you will be prompted with a dialog similar to the following (but with different version number):

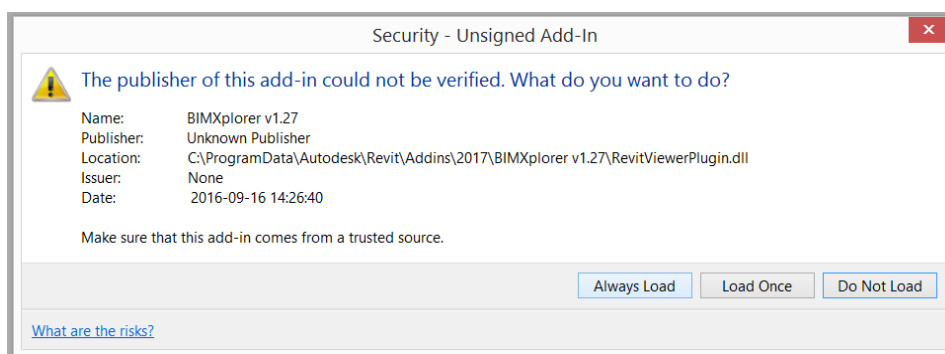


Figure 3: The “Unsigned Add-In” Dialog in Revit 2017 (similar in Revit 2018).

Just click “**Always Load**”.

After install, start Revit (2016, 2017 or 2018) and load or create a model (perhaps use either the “basic” or the “advanced” Revit sample project for the first time in order to just give it a slow start). Go to the **default 3D-view** and under the **Add-Ins** tab choose:

External Tools->BIMXplorer v1.4.5.

A new window will open and the addin will extract the model from Revit (the addin extracts the geometry that is currently visible so you can isolate or hide objects if you only want certain parts to be shown in the viewer).

Sometimes the Revit window will put itself *above* the plugin window so you have to minimize it, or select the plugin window (BIMXplorer) from the Windows taskbar.

After the model has been loaded (progress bar done) the default camera position might not be placed so that you see the model. Press the [spacebar] in order to place the camera so that all of model is visible (i.e. zoom all). Hold [Shift] and press [spacebar] in order to place the camera in the middle of the model

5 A little bit on navigation and interaction

Right Mouse Click: Activate/Deactivate MouseLook

Move Mouse: Look around (when MouseLook is ACTIVE)

w,a,s,d : w=Forward, a=Left, s=Back, d=Right (When MouseLook is ACTIVE)

q,e: Move camera up/down (when collision detection is NOT active, see below)

Shift + w,a,s,d : Move faster

Left Mouse Click: Select object (when MouseLook is NOT active)

Esc: Un-select any selected object

h: Hide selected object

u: Unhide all (show all)

F8: Toggle fullscreen

Space: Place camera so that all of model is visible (Zoom all)

Shift + Space: Place camera in center of model

F4: Toggle Rendering statistics (frame time)

If there are cameras defined in the Revit model, these will now be located at the buttons [1-9] (i.e. press 1 to get to the location defined by the “first” camera). If you hold down [shift] while pressing the camera number you will “animate” from you current position to the chosen camera position.

v: Add current viewpoint (accessible from the button [1-9])

In the **Camera Settings Dialog** (Settings->Camera Settings...) it is possible to change **speed**, **speed multiplier** (how much faster it goes when shift is pressed) as well as “**eye height**” (when collision detection is active).

6 Save/Open File

When the model has been loaded in BIMXplorer you can choose **File->Save File** in order to save a binary file (*.grx) that can be opened in the standalone viewer. That is, without having Revit installed, you can start the standalone BIMXplorer (should be a shortcut on the desktop) and then choose **File->Open File** in order to load a previously saved file (*.grx).

7 Collision detection

There is no collision by default. However, once a model is loaded you can choose **Collision->Generate Collision Meshes (Everything)** in order to activate the collision functionality. When these meshes are generated, you can press “c” and then you will have gravity and collision. You can then only “enter” through doors. Also, you need to have something under “your feet” or you will just fall down. Press “c” again if you want to disable collision and gravity.

It’s also possible to *only* generate collision meshes for **Floors and Stairs** or **Floors, Stairs and Topography**. For large and complex models this is usually preferred because it is much faster to generate.

At the Collision menu it is also possible to clear all collision meshes in the scene or Add/Remove collision mesh for the selected object.

The time taken to calculate collision meshes will vary depending on model complexity. For instance, the “Revit basic sample” project as well as the “advanced sample” project will take around 5 seconds (using the “Everything” alternative). Also, regarding collision detection there are basically two types of collision meshes – triangular meshes and convex meshes. The triangular meshes are used for the majority of objects, such as walls, slabs, roofs, topography and stairs. However, for objects of the type “Furniture” a convex mesh will be generated (this is a much more efficient representation in terms of creation and real-time performance). This works well in most of the cases, but for furniture objects that are very non-convex the “collision volume” becomes very different from the actual geometry. Also, no collision mesh is currently generated for railing objects.

If collision meshes are generated before the file is saved (*.grx), two additional files are also saved (one .cma and one .cms file with the same name as the *.grx file) that contains the collision meshes. When you later open the *.grx file (in standalone mode) the collision meshes are imported as well (unless you choose to delete the files) so you don’t have to do a new “collision mesh generation step”, just press “c” to activate it.

8 Materials, shadows and links

There is (basic) support for most of the Revit materials (i.e. color or diffuse texture, tint color, as well as transparency and simple cubemap reflections). The lighting used by default is fairly simple, but can be enhanced with **Sun Shadows** (see Figure 4).

You can enable/disable shadows under **Settings->Shadow Settings...**

If your model has linked files you can control the visibility of these with **Visibility->Links Visibility**. Check or uncheck to hide/show links.



Figure 4: Shadows off (top) as well as on (bottom).

9 Use the “Standalone viewer”

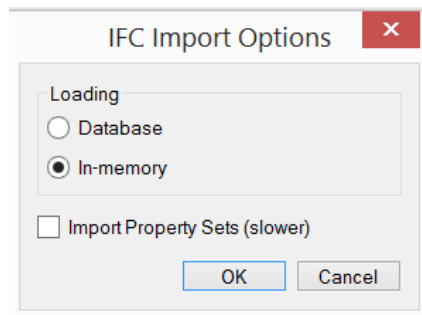
Start **BIMXplorer v1.4.5** (either from the Start menu or from the shortcut on the desktop). Choose **File->Open File** to load a previously saved .grx-file or **File->Import IFC** to import an **IFC 2x3** file. It is also possible to import **3ds** files exported from SketchUp. Navigation and interaction is the same as for the Revit plugin (see above). For .grx files and IFC-files you can also choose **(Import And) Append (IFC)** or **(Import And) Append (IFC) as Link**.

Append will add the model to the current scene; *Append as Link* will add the model to the current scene and also make it possible to hide/show sub-models under **Visibility->Links Visibility...**

In summary, Import And Append IFC as Link will make it possible to load several different IFC-files, each one representing a different discipline (i.e. Architectural, Structural, HVAC, etc.). The visibility of each discipline can then be controlled individually (Visibility->Links Visibility...)

9.1 IFC Import options

Upon selecting an IFC-file (using any of the Import IFC alternatives), the following dialog will show:



For normal IFC-files, **choose In-memory**. The Database alternative is mainly if we have very large IFC-files exceeding the computer's internal memory. If you also want to extract the Property Sets for all objects in the scene, check "Import Property Sets". It is optional because it might lead to a slower import process.

10 Color-coding different links

If you have links in the Revit file or if you import several IFC-files using **File->Import and Append IFC As Link** you can override the default color of the objects in a certain link. Go to **Visibility->Links Visibility...** and select any link and right-click and chose **Override Color...** to select a color for all the objects in that link. This is useful during design review session to separate objects by discipline.

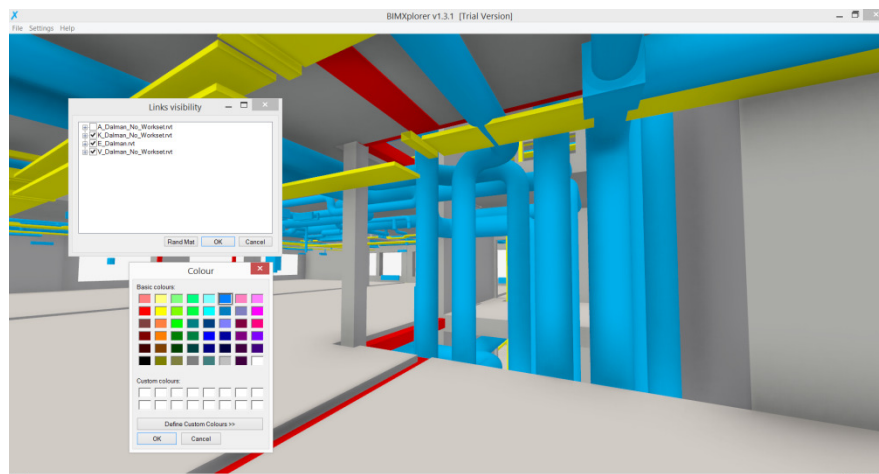


Figure 5: Overriding the object color in links.

11 Fixing “broken” IFC geometry

In some cases the IFC-geometry can have “flipped faces” as illustrated in Figure 6.

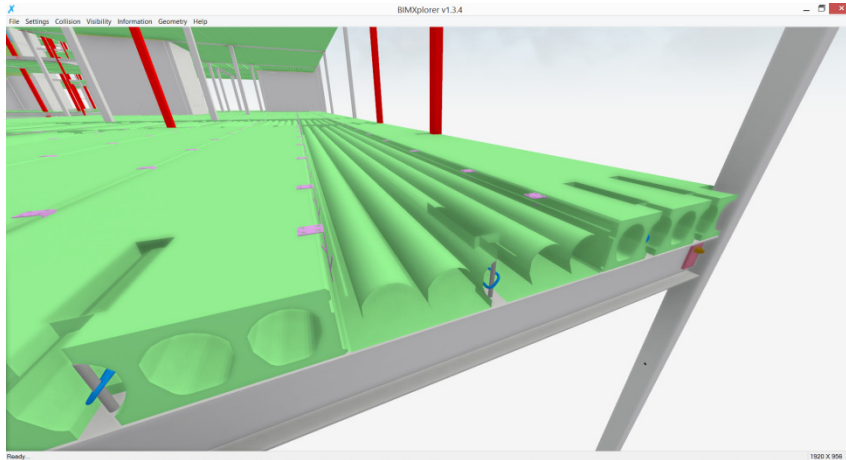


Figure 6: IFC object with “broken” geometry.

To fix this, select the object and choose **Geometry->Fix Normals On Selected Objects (for IFC geometry)**. The result is shown in Figure 7.

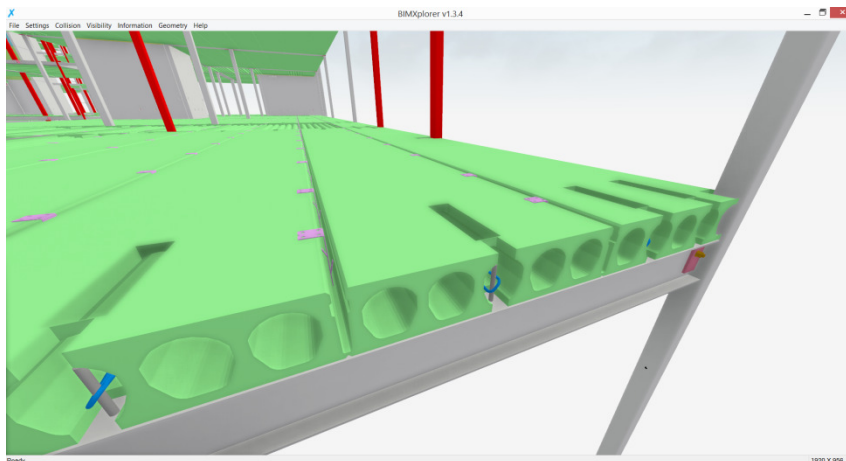


Figure 7: IFC object after correcting the geometry.

For files with many “broken” objects you can choose **Geometry->Fix Normals On All Objects (for IFC geometry)** in order to process all objects in the file.

12 Display object properties

Information->Selection Info will display the *Properties Dialog*. Selecting an object will show its properties in the dialog, as shown in Figure 8.

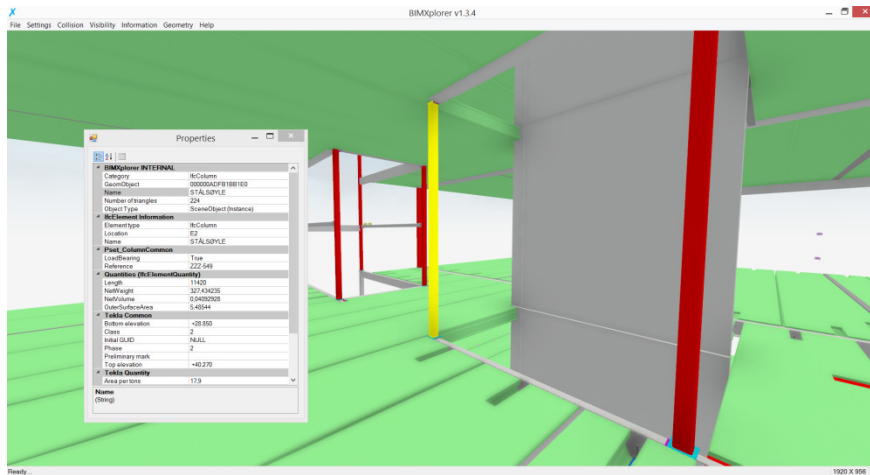


Figure 8: Displaying object properties (Property Sets).

13 Using BIMXplorer with a VR headset

BIMXplorer has support for both Oculus Rift and HTC Vive. However, before using BIMXplorer with either one of these systems you will first need to setup each system properly (i.e. install the Oculus Software or Steam VR and also follow the setup guides regarding tracker positioning, calibration, room setup, etc.).

As soon as a headset is correctly setup and connected, BIMXplorer will always start in VR-mode (even from within Revit).

13.1 Using BIMXplorer with HTC Vive

If the Vive is connected when BIMXplorer is started (either as standalone or as a Revit plugin) it will automatically enter “VR mode”. The menu system (i.e. file loading and settings) is functional as before but the navigation interface is different. See figure below for general interaction interface:

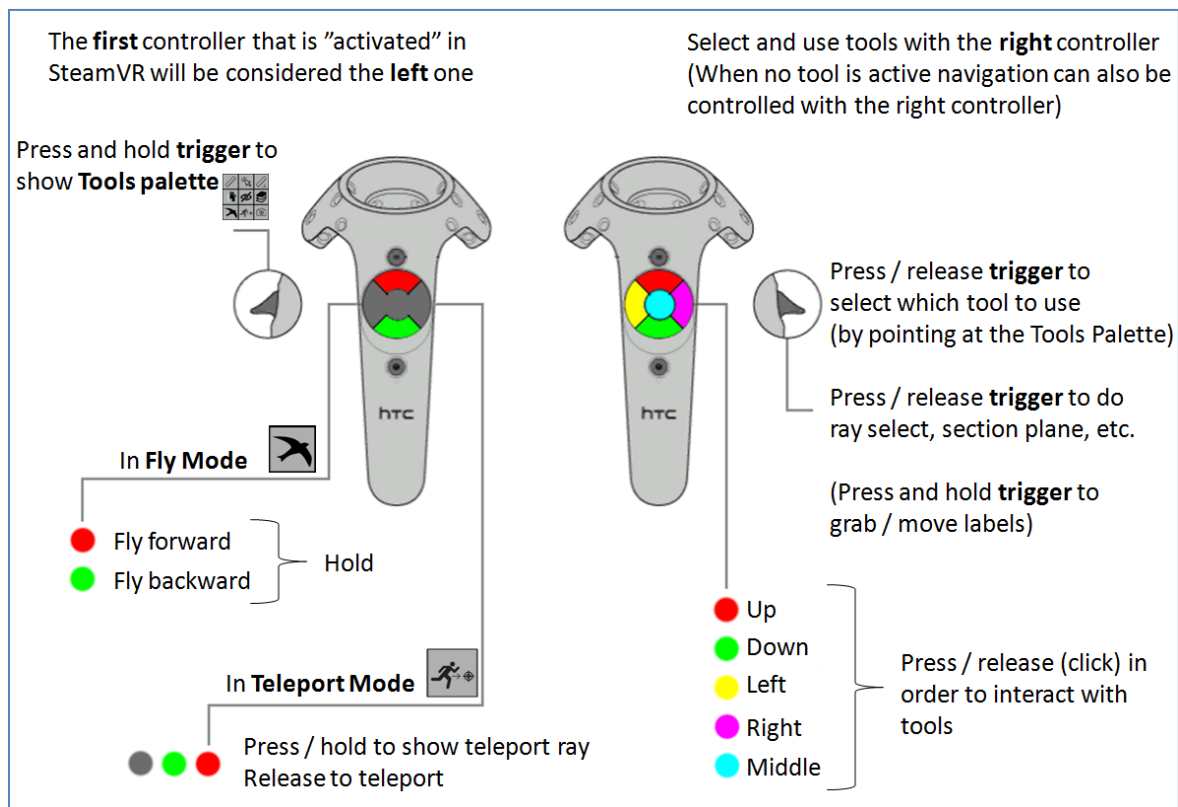


Figure 9: General interaction interface with the Vive controllers.

13.1.1 SteamVR Settings

Make sure “Allow asynchronous reprojection” and “Allow interleaved reprojection” is checked. Also, use “Manual Override” in Video/Supersampling settings and set to 100%.

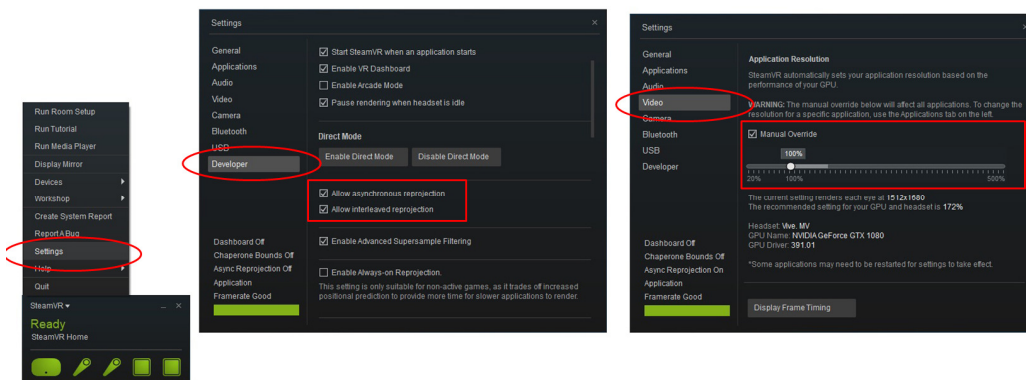


Figure 10: SteamVR settings for BIMXplorer.

13.1.2 Navigation - Fly Mode

This is the default navigation mode when you enter VR-mode. Pressing “Up” on the “touchpad” on any of the two controllers will take you forward **in the direction you look**, and “Down” backward. Pressing “Up” on **both** controllers at the same time will make you go faster. Same for “Down”. If you have collision meshes generated, you can press “c” on the keyboard to activate gravity and collision detection. It is also possible to navigate using “Teleport mode” (see 13.2.4).

13.1.3 Tools Palette

Assuming the left controller was the first one you “activated”, this will be your **MenuController**. The right one will be your **ToolsController**.

With no tool active when you start (you’re in navigation mode when you start), pressing the trigger on the right controller will display a “ray-pointer”. During design review sessions, for instance, you can use this ray-pointer to guide other people that are looking at the same model on the computer screen.

When pressing the trigger on the left controller a “tools-palette” will show up. Using the ray from the right controller, you can now select a tool or navigation mode. Similar to a mouse-click, your “click” in VR will happen when you RELEASE the trigger.

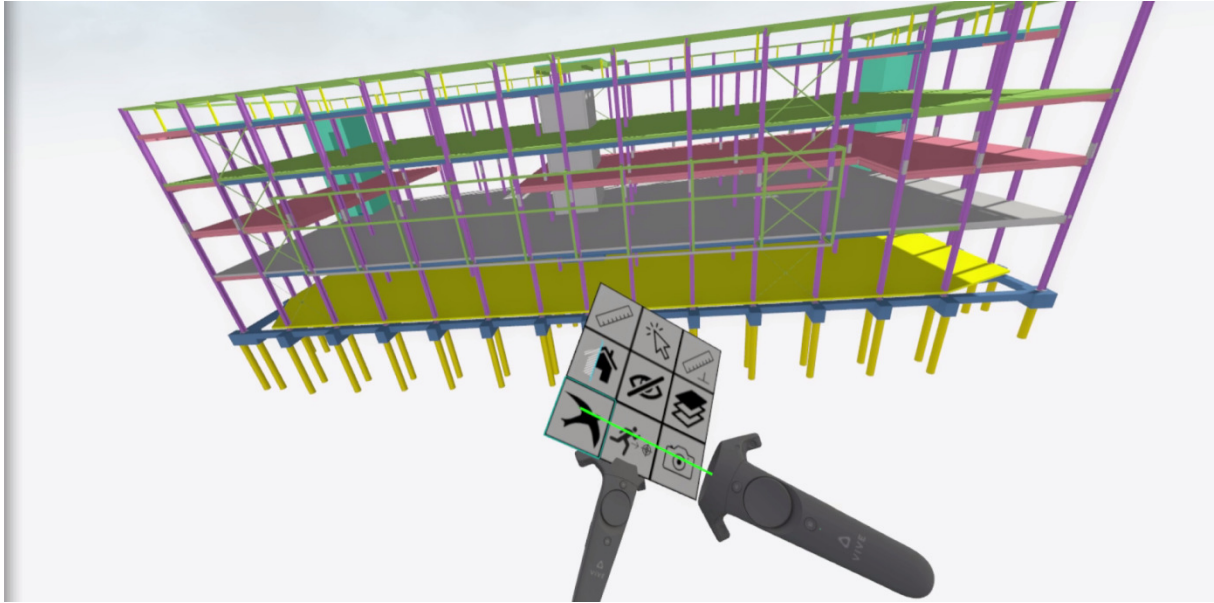


Figure 11: Press left trigger to show the Tools Palette. Press/release right trigger to select tool or navigation mode.

13.1.4 Navigation - Teleport Mode



Figure 12: Activate teleport mode.

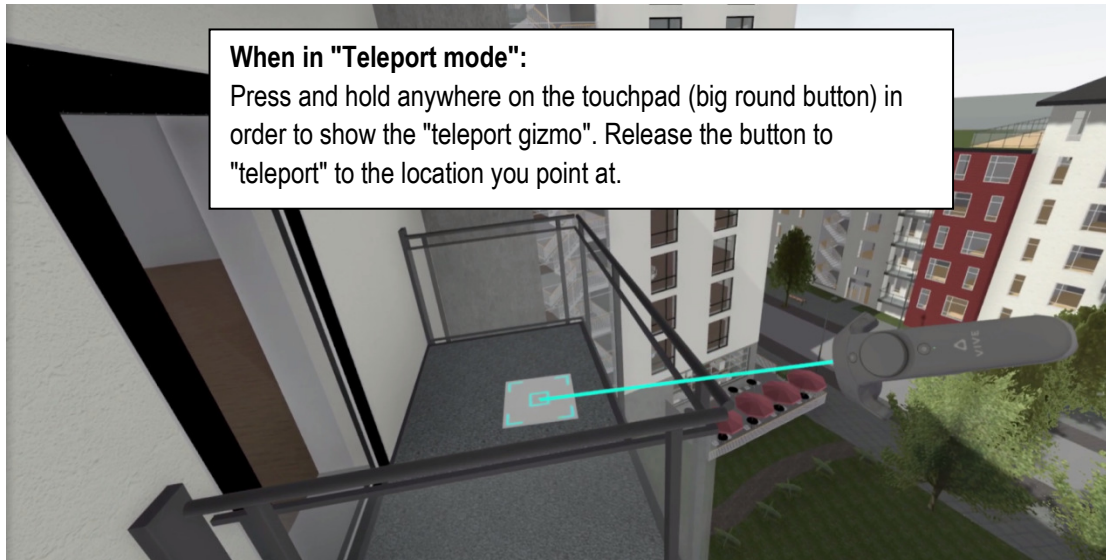


Figure 13: Use teleport mode.

13.1.5 Labels in VR - General

BIMXplorer v1.4.5 introduces the concept of 3D labels, where you can take measurements and extract properties and define an "information view" directly in VR (Figure 14).

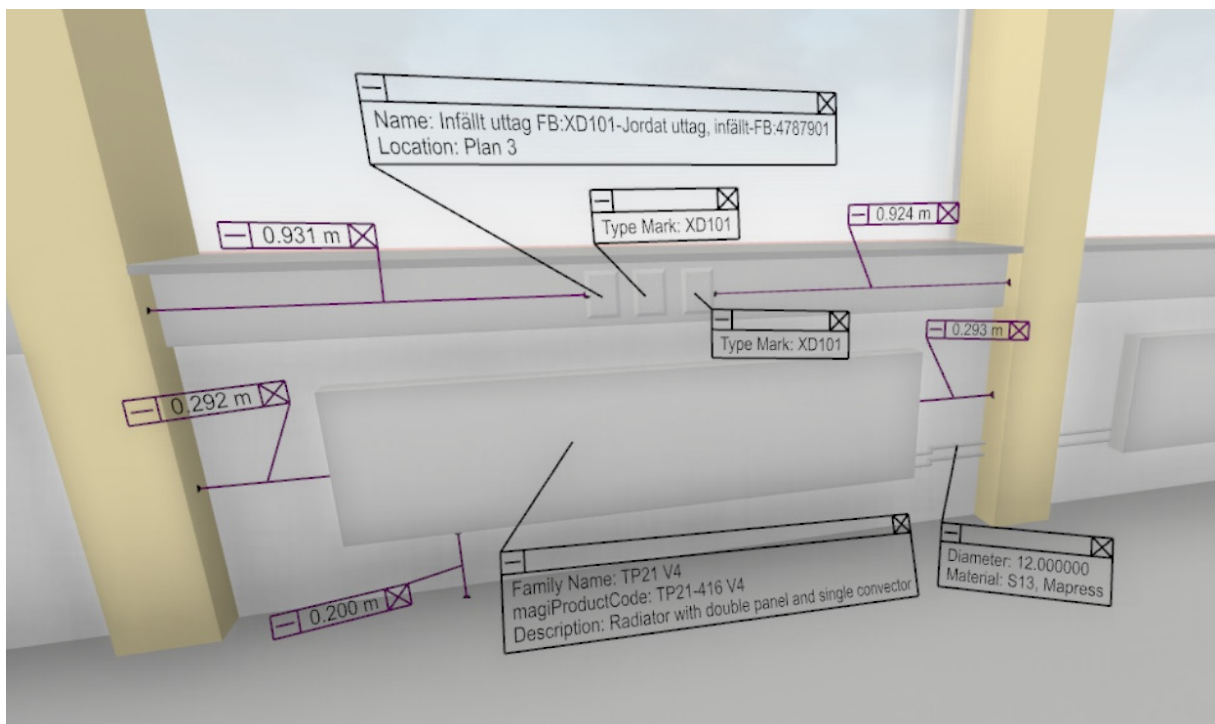
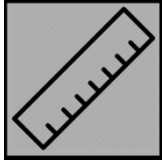


Figure 14: 3D labels containing object properties and measurements created and arranged directly in VR-mode.

13.1.6 Measure distance



With this tool active you will get a new panel on the right controller displaying your currently measured distance. Press/release the trigger on the right controller to select two points in the scene. A dark yellow “distance ray” will be rendered together with a “label” displaying the distance. Select two other points in order to make a new measurement (the previous one will then disappear). Press/release the “middle” button on the touchpad in order to make the distance permanent (it will then turn red). As long as you haven’t made the distance permanent, you can “aim” at any of the distance points and a blue dot will appear. When the blue dot is shown you can press/hold the trigger to grab the point. Release the trigger in order to place it at its new location.

Move/fold/delete “labels”:

- As long as you have any of the tools that create labels active (distance, perpendicular distance, or select) you can move/fold/delete any of the labels in the scene.
- When you “aim” at the “label”, a blue dot will display. When the dot is shown you can press and hold the trigger to grab the label. Release the trigger again in order to place the “label”.
- “Aim” at the “minus sign” and press/release the trigger in order to fold the label. Do the same in order to expand it.
- “Aim” at the “cross sign” and press/release the trigger in order to delete the label.

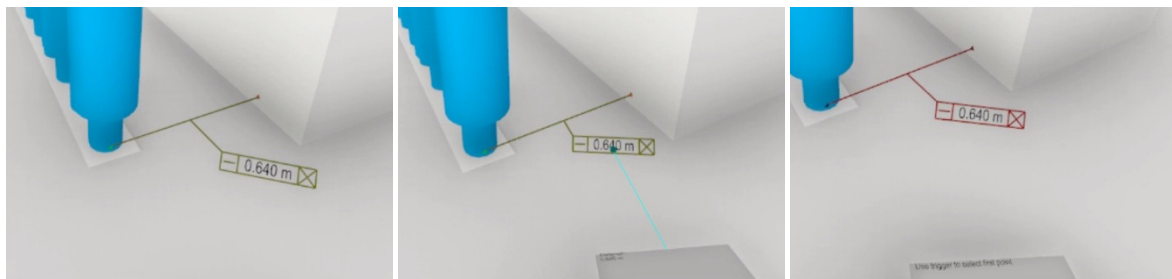
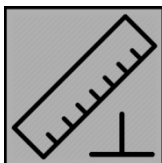


Figure 15: Measure distance (left), move label (middle), and make distance/label permanent (right).

When you are “in a tool” you can still navigate forward/back with the left controller

To “exit” from a tool, select either another tool on the “Tools Palette” or the “bird” or “teleport” icon to enter “navigation-only mode”.

13.1.7 Measure perpendicular distance



This tool is similar as the Measure Distance Tool, but you only select one point. Based on the orientation of the surface you hit (the normal of the surface), a new ray will be constructed.

This ray is perpendicular to the surface and will extend until it hits some other surface in the 3D-model. The length of the ray will be displayed on the panel and on the label. Press/release the “middle” button on the touchpad to make the distance permanent (it will then turn purple). This tool is useful for measuring the width of corridors or a distance from the floor to the ceiling.

Similar as for the Measure Distance Tool, you can move/fold/delete the label.

13.1.8 Select and display object properties



With this tool you can select any object in the 3D-model by pressing/releasing the trigger and display all of its “property sets” on the panel and on a label. If an object has more than one property sets, you can cycle through them by pressing/releasing left/right on the right controller. Use up/down to navigate in the list. Press/release the middle button to “transfer” the property to the label. The text will then get a cyan color on the panel. Press/release the middle button again to remove the property from the label (the text on the panel will then turn black again). The system will remember which properties you recently selected and automatically place them on the label for the next object you select.

Similar as for the Measure Distance and Measure Perpendicular Distance Tools, you can move/fold/delete the label.

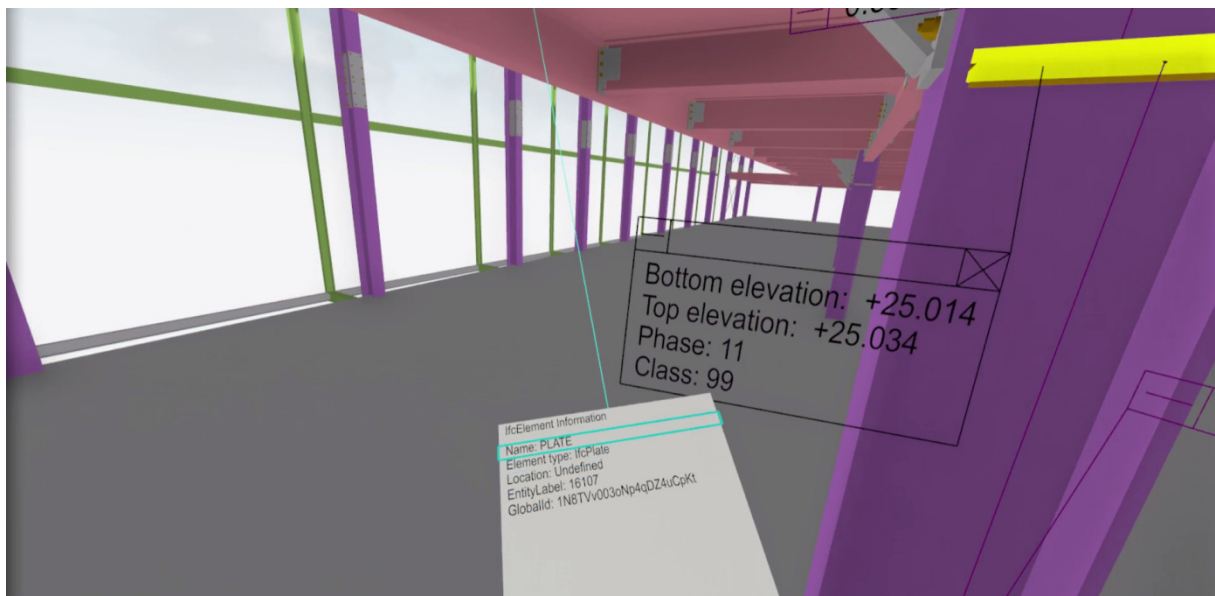


Figure 16: Select an object and display its properties.

13.1.9 Hide and show links/layers



Similar as with the Select Tool you will get a list on the right panel with all the different links/layers in the model. If there are more links than can fit on a single panel, you can cycle through them by pressing/releasing left/right on the right controller. Use up/down to navigate in the list. Press/release the middle button to hide or show the link (cyan text = visible, black text = hidden).

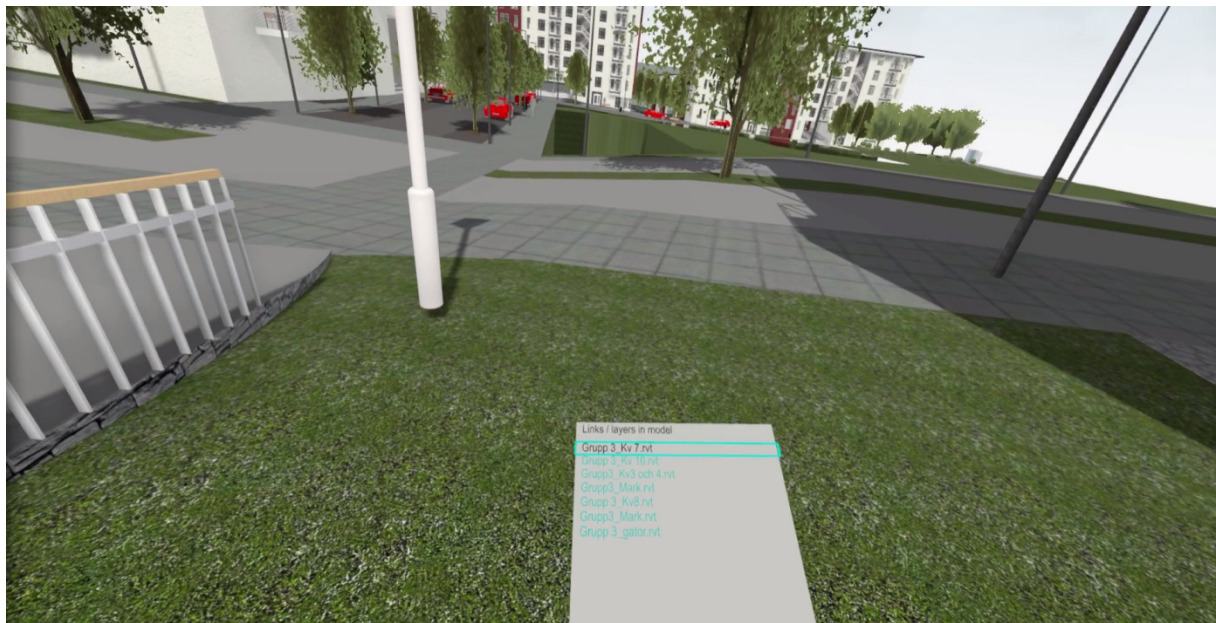


Figure 17: Use up/down and left/right in order to select which link to hide/show. Use middle-click to toggle visibility.

13.1.10 Section plane



With this tool you can define a section plane in order to “cut through the building” (Figure 18). Selecting this tool will bring up six different settings on the panel on the right controller. Use Up/down on the right controller in order to select which setting to modify (Figure 19).

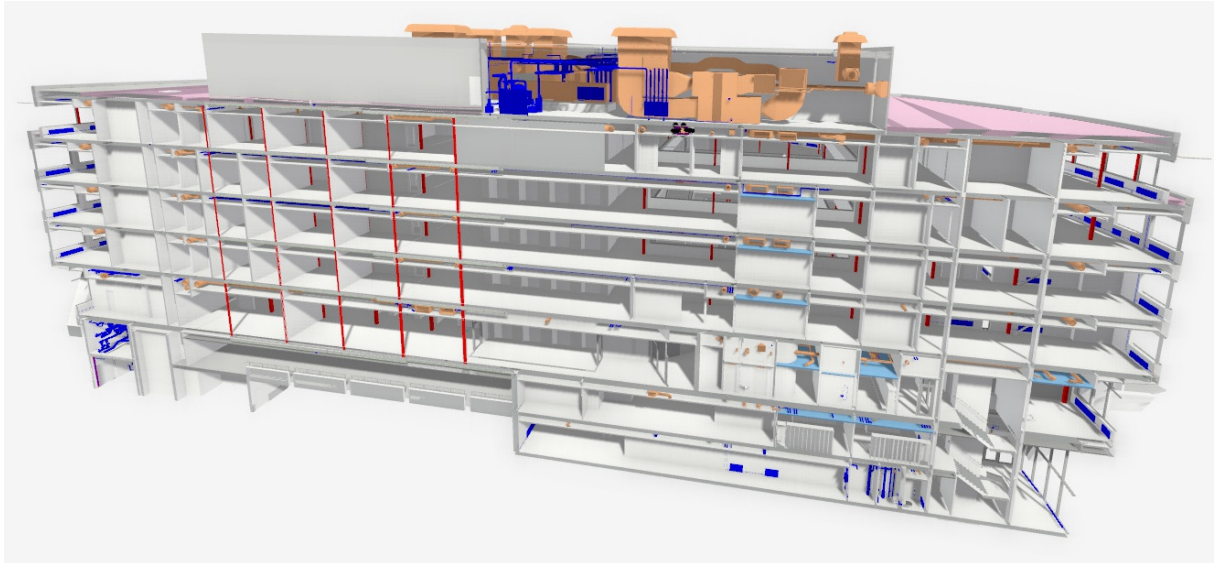


Figure 18: Example of using a section plane in VR.

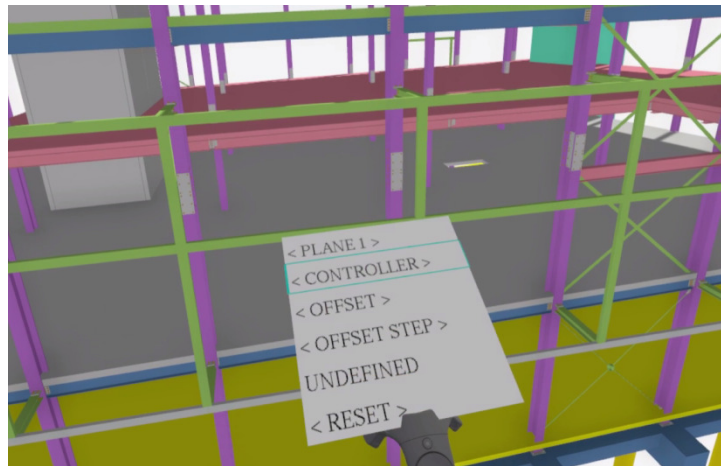


Figure 19: Use up/down in order to select which setting to modify.

The different settings are explained below:

First line: Currently unused.

Second line: Click left/right on the right controller to select three different modes for defining the section plane:

- **CONTROLLER:** Will let you define the section plane by pressing/holding the trigger and moving the controller. The plane will align with the panel. Release the trigger in order to freeze the plane (See Figure 20).
- **RAY FRONT:** Define the plane by selecting a geometric face in the model (press/release the right trigger). The plane will align with the selected geometry, and everything on the front-side of the face will be cut away.
- **RAY BACK:** Define the plane by selecting a geometric face in the model (press/release the right trigger). The plane will align with the selected geometry, and everything on the back-side of the face will be cut away.

Third line: Plane offset – use left/right (click) in order to offset the plane.

Fourth Line: Currently unused.

Fifth line: When a plane has been defined, use left/right (click) in order to toggle the plane active/inactive.

Sixth line: Use left/right (click) in order to reset (remove) the plane.

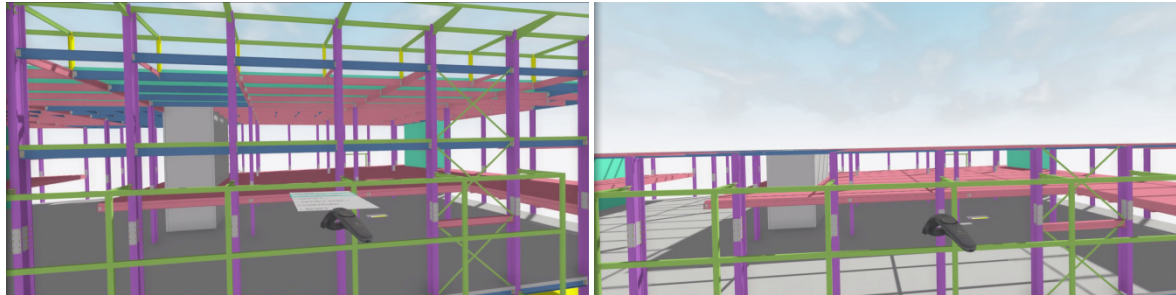


Figure 20: Define section plane using the controller. Press/release the trigger in order to make the section plane align with the panel on the controller.

13.1.11 Hide and show objects



With this tool you can select/deselect multiple objects using the trigger on the right controller. Use up/down on the touchpad to choose what to do. Use middle-click to execute. Note: “Isolate selected” is currently NOT implemented.

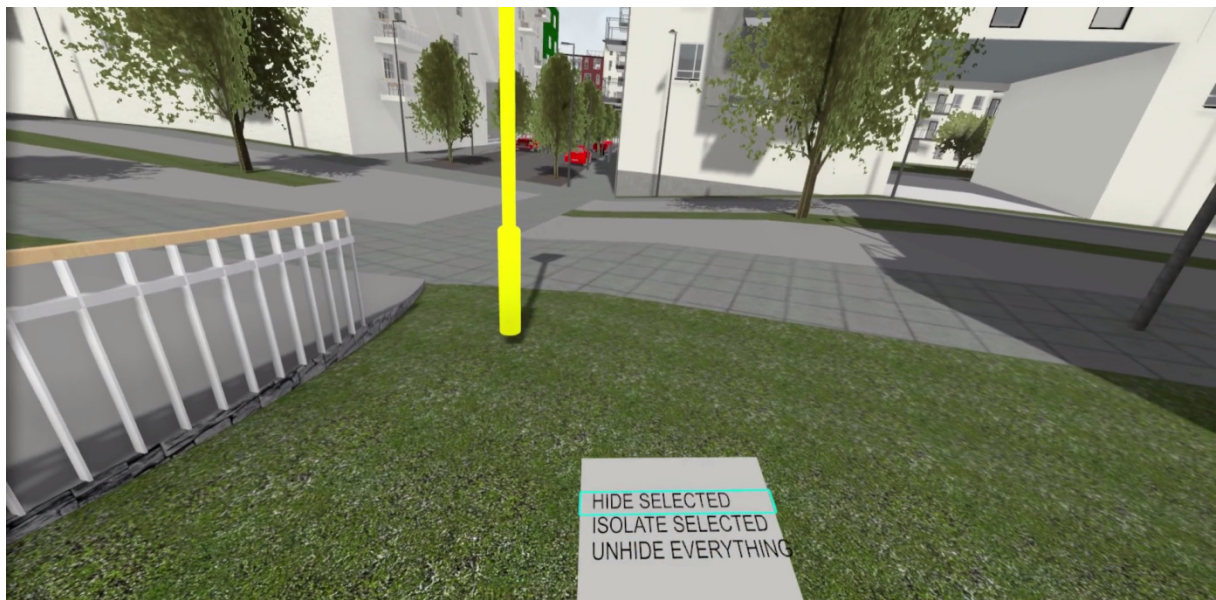
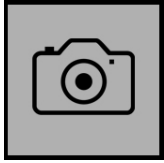


Figure 21: Hide/unhide selected objects. Use up/down click in order to navigate in the list of options. Use middle-click to execute.

13.1.12 Screenshots



With this tool you can create a screenshot/snapshot of the current view. Press/release the trigger on the right controller to take a screenshot (the screen will blink once). The image will be saved in a screenshot-folder at the same location where your loaded model is stored. If you are doing this from the Revit addin, the screenshot will be saved in the current users Documents folder in a subfolder named BIMXplorer\screenshot.

13.2 Using the Oculus Rift with Oculus Touch:

Note: As BIMXplorer is not “signed” with Oculus it is required to tell Oculus to allow “Unknown Sources”. **Start the Oculus software and go to Settings->General and enable Unknown Sources.**

If the Oculus is connected when BIMXplorer is started (either as standalone or as a Revit plugin) it will automatically enter “Oculus mode”. The menu system (i.e. file loading and settings) is functional as before but the navigation interface is different.

With the Oculus Touch controllers we are using the same general interaction interface as with the HTC Vive (See section XX.Y). See figure below for the mapping of buttons according to the Vive interface. Middle-click is executed by pressing/releasing the joystick. **NOTE: BIMXplorer v1.4.5 now has native support for Oculus Touch and you NO longer need to have SteamVR installed!**

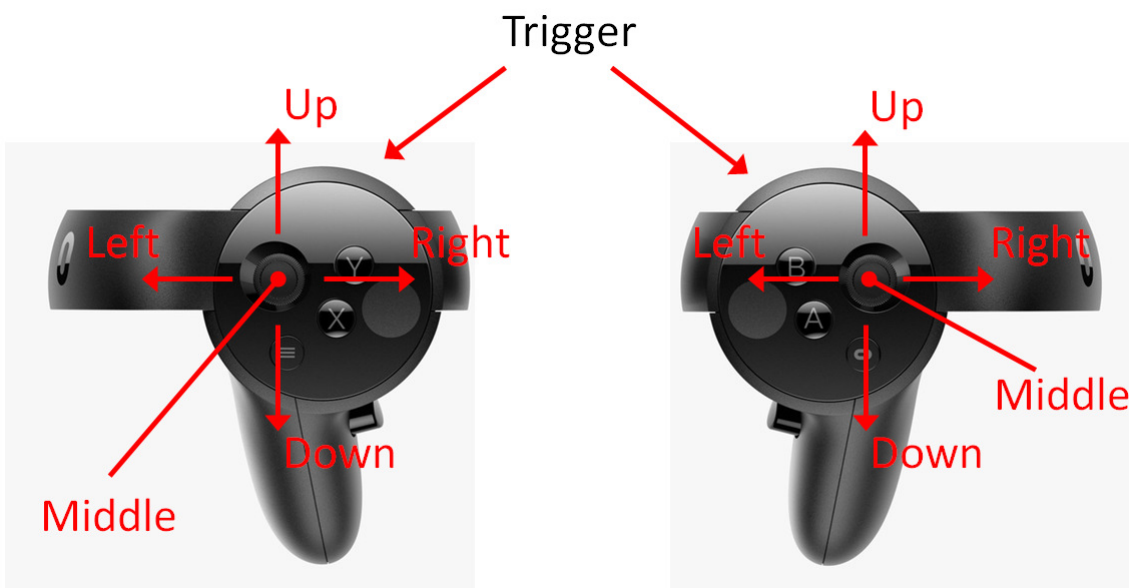


Figure 22: Oculus Touch controllers button mapping and trigger.

13.3 Using the Oculus Rift without Oculus Touch:

Note: As BIMXplorer is not “signed” with Oculus it is required to tell Oculus to allow “Unknown Sources”. **Start the Oculus software and go to Settings->General and enable Unknown Sources.**

If the Oculus is connected when BIMXplorer is started (either as standalone or as a Revit plugin) it will automatically enter “Oculus mode”. The menu system (i.e. file loading and settings) is functional as before but the navigation interface is different.

To control movement we are using the **Oculus Remote** (Figure 23). “Up” will take you forward **in the direction you look**, and “Down” backward. Right and Left will increase/decrease the navigation speed. If collision meshes are generated, you can press “c” on the keyboard to activate gravity and collision. The “eye-height” is taken from the Oculus Settings (changing the “Eye height” parameter in BIMXplorer has no effect in “Oculus Mode”). To calibrate the Oculus eye height, go to **Settings->Devices->Sensor->Reset Default View.**



Figure 23: The Oculus Rift navigation interface.