BIMBMS

Checker

To access the demo, an account *must* be requested at**:** https://demo.bimkeeper.com

The demo can be accessed at: https://demo.bimkeeper.com/demos/ifc-ids-checker

This demo-instance is only intended for use with this particular demo. The focus of the demo is on this subject only. This means the navigation shows only what the user might need. Some features might not work for this reason. The first demo (basics) can be checked for a broader perspective of all the features BIMBMS offers. For more detailed information, the BIMBMS manual can be referenced, or IRP can be contacted at: contact@bimkeeper.com.

Contents

1 Introduction

A new checking tool is built that can make analyses of IFC-files. It can check whether a model matches “information specifications”, but also present more general information. It can also be used to calculate some estimates, like volume, percentage of wall-openings/walls (often used for energy calculations).

The checking tool is very flexible. Own rule sets can be built for example. Please note that checks often depend on how the IFC is modeled (language, naming conventions, structure, used technical specifications).

There are two types of checks: general checks and technical specification checks.

Example of general checks: At least 10 toilets, 10 bathrooms, 10 kitchens can be expected if there are 10 apartments in a building. In some countries there are rules for the minimum size of a toilet room: for example, 1.6 m^2, or a living room 4.5 m^2. This is not likely to be found in the technical specs. When using the checking module this information can be extracted to easily interpret whether it is correct.

Technical specifications normally contain information on specific details desired to be modelled. Many clients demand IFCs to be modelled in accordance with specifications they use throughout the portfolio. Meaning every IFC needs to match a (large) number of criteria. For example, all doors should have measurements, a material definition, fire safety properties, etc. The IFC-based viewer of BIMBMS is already showing all this information, but this way it can’t be easily found out if any information is missing. This module offers a solution for that problem

At this moment, the results of checks are not saved online, although this will change in the future.

2 Manual

PLEASE NOTE: The IFC Models need to be re-converted with the latest version of the BIMkeeper converter to work with the BIMkeeper Model Checker.

2.1. Running a check

To open the “BIMkeeper Model Checker”, the model that needs to be checked should be opened. Once the model is loaded, the “Model Checking” button must be pressed and followed by the “Open checking configuration” button located in the viewer’s toolbar.

Once the “BIMkeeper Model Checker” is open a ruleset must be loaded.

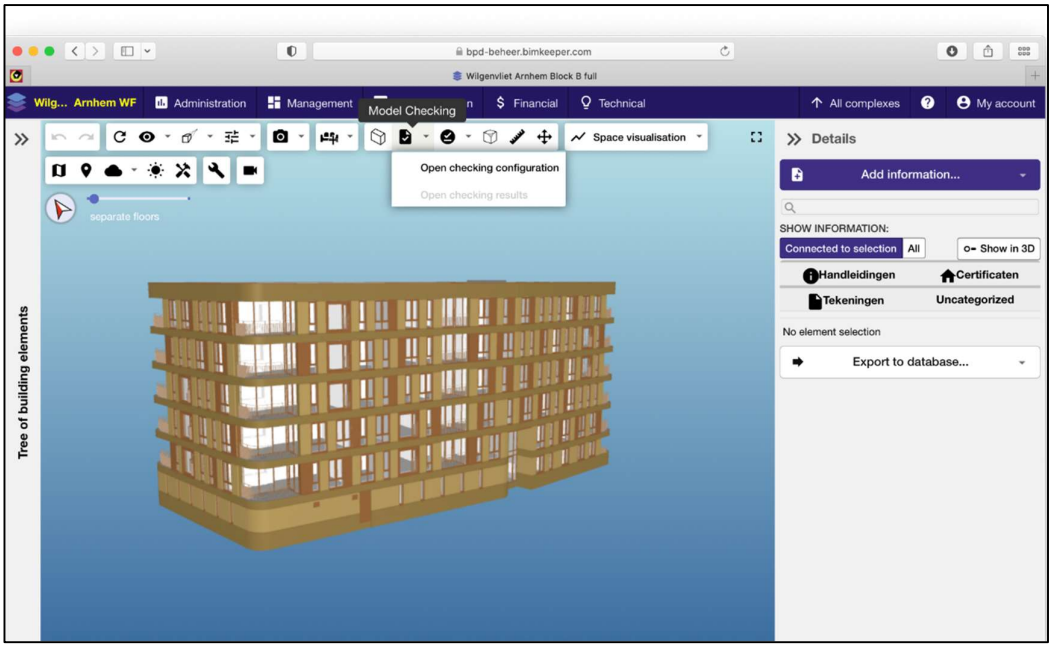

Figure 1: Pressing the icon button of Modelling checking will give the option to open the checking configuration.

The “Load ruleset…” button must be pressed to load or import a ruleset.

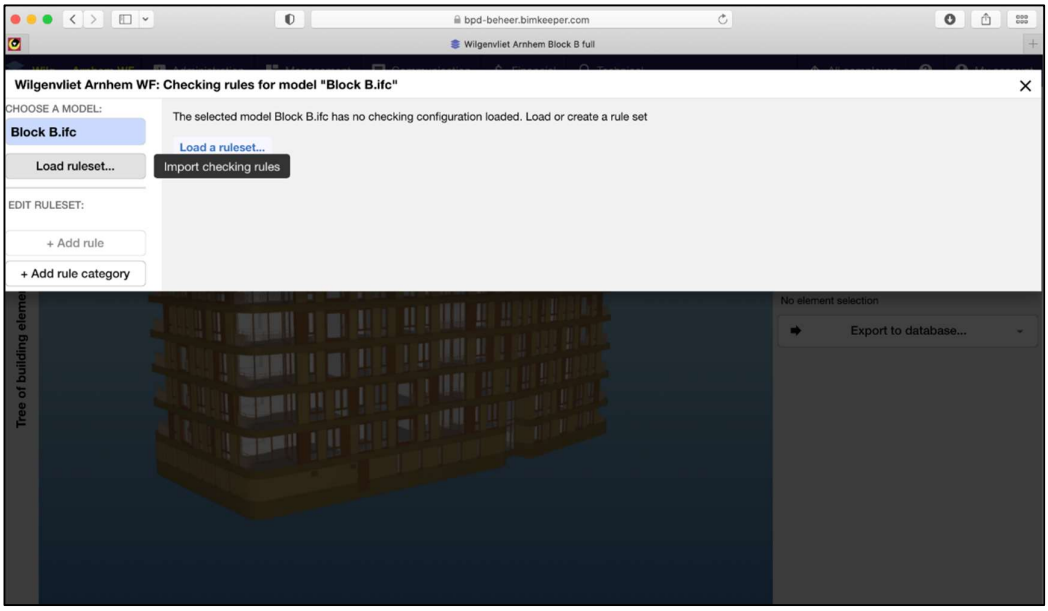

Figure 2: Load or import a ruleset

In the “Load or import a rule set” dialog, the dropdown box can be used to select the rule set that needs to be loaded. Then the “Load rule set” button needs to be pressed. Alternatively, a custom ruleset can be imported by pressing on the “Import from local file…” button.

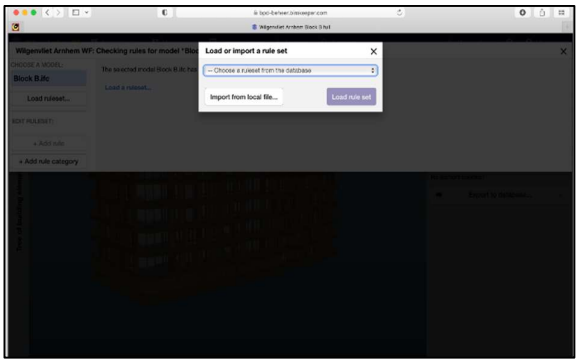

Figure 3: Pick a ruleset from a dropdown menu

Figure 4: Different kinds of rulesets

Next, the “Run checks” button needs to be pressed in the navigation bar to run the checks.

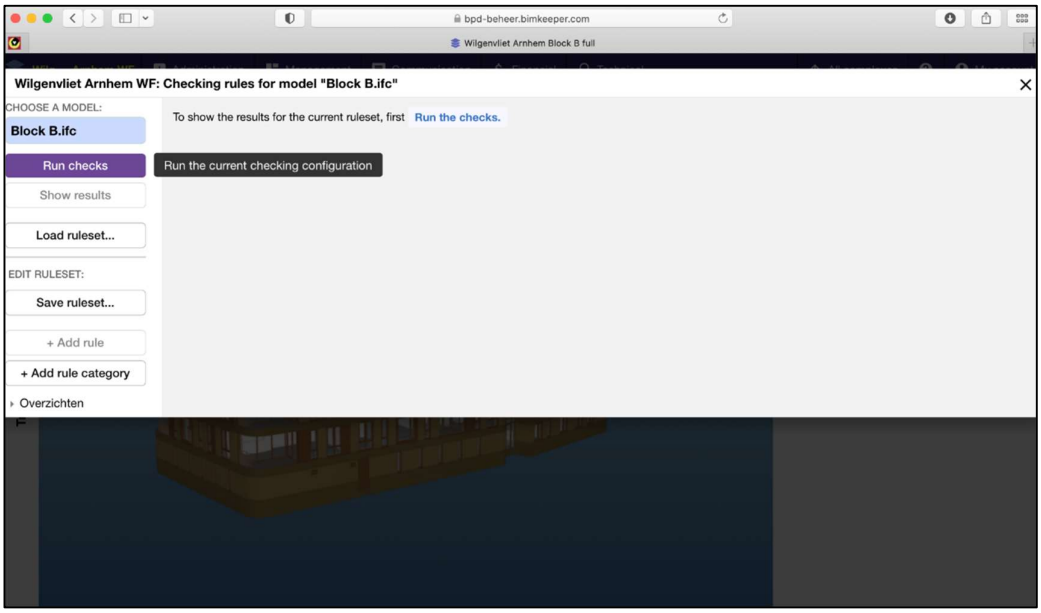

Figure 5: Running a check on the current configuration

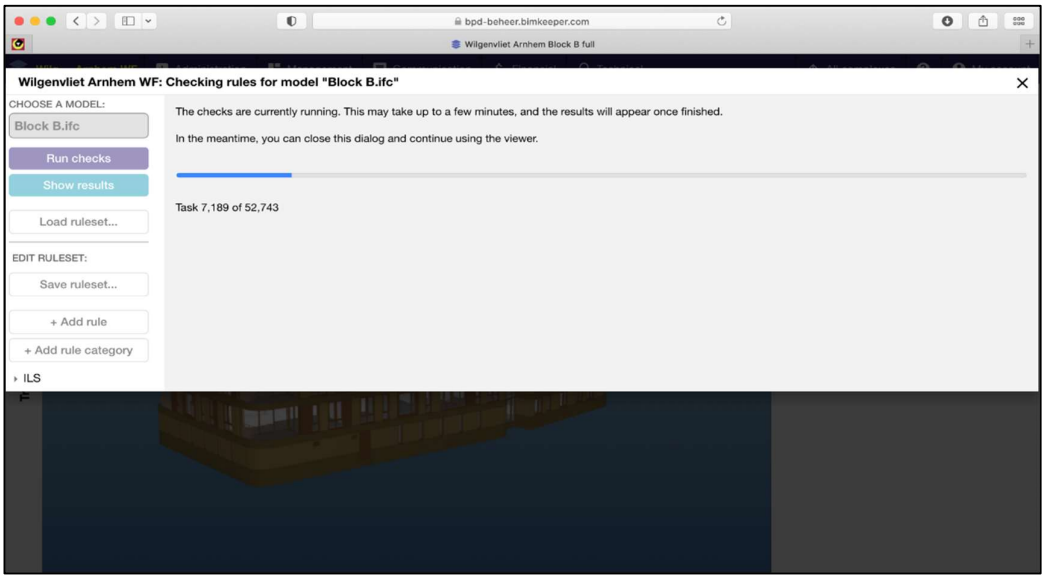

Figure 6: A check is being run

2.2. View checking results

The checking results can be viewed by ensuring the “BIMkeeper Model Checker” is opened and running selected checks.

When the “Show Result” button is pressed, the results can be viewed.

Figure 7: Show results

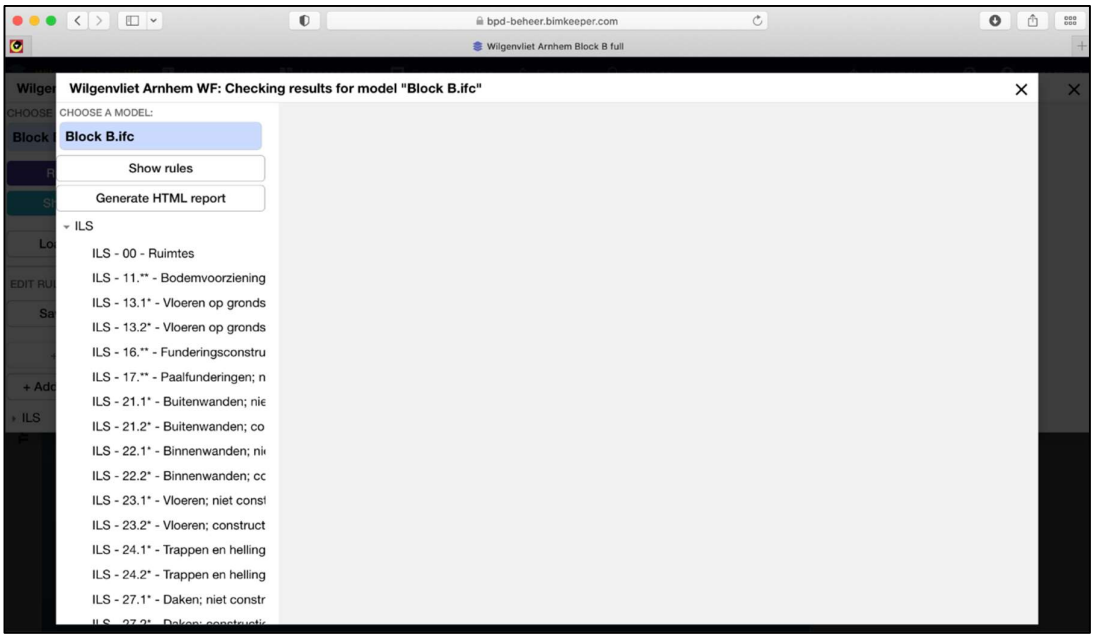

Figure 8: Results of checks

The results can be viewed by pressing on a rule and selecting a result category.

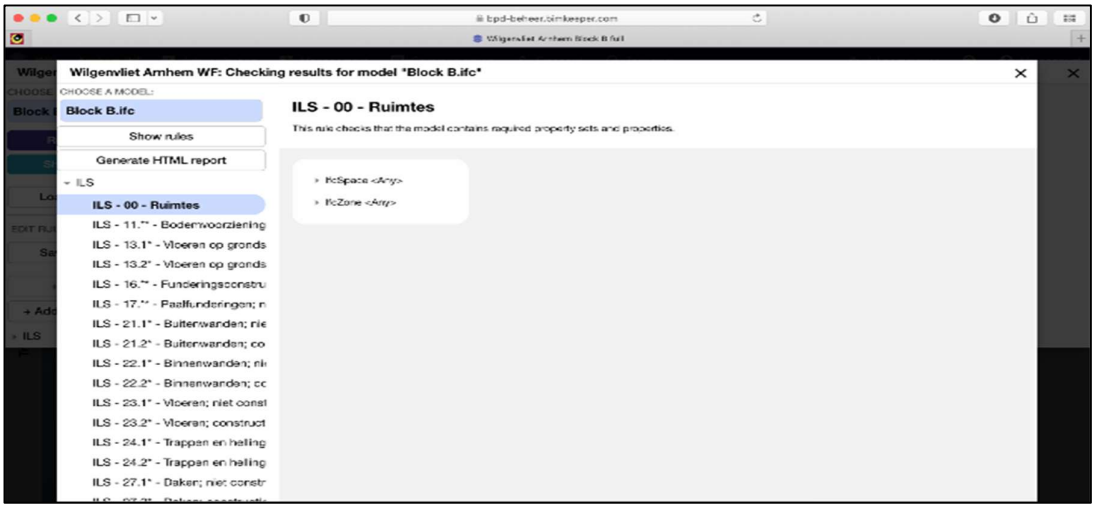

Figure 9: A rule and category is selected

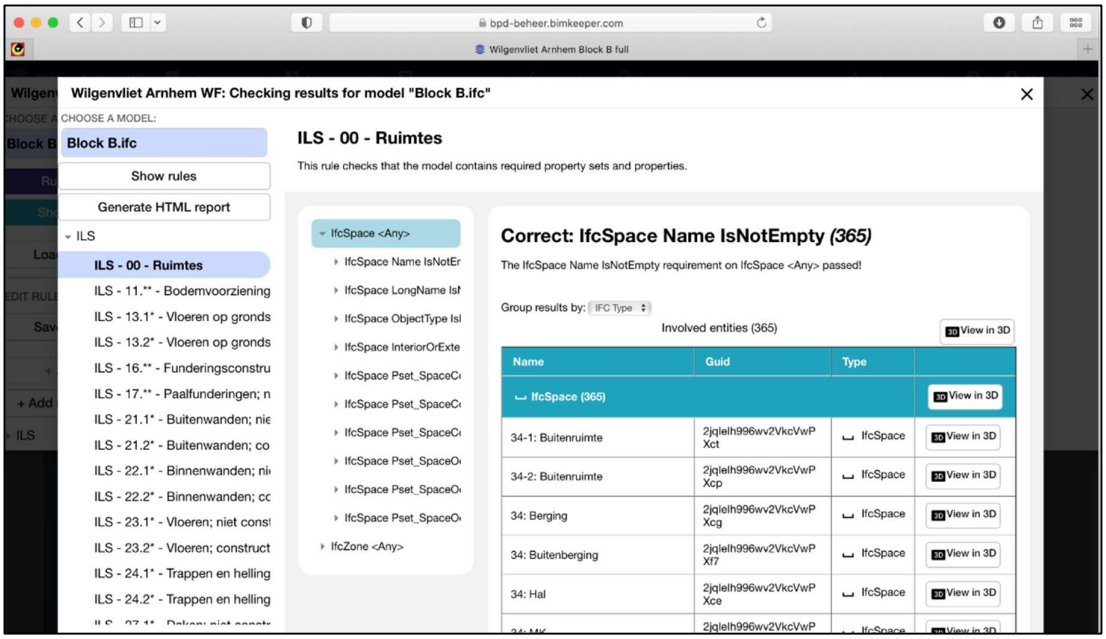

Figure 10: The results of a ruleset category

3 Scenario's

3.1. Bathrooms with a toilet and a sink

An example of a model check that can be performed is one where the application checks whether each bathroom has a toilet and a sink. After opening the model checker, a rule category should be added first by pressing on "+ Add rule category". Also, make sure that the correct model has been selected under "Choose a model" before proceeding.

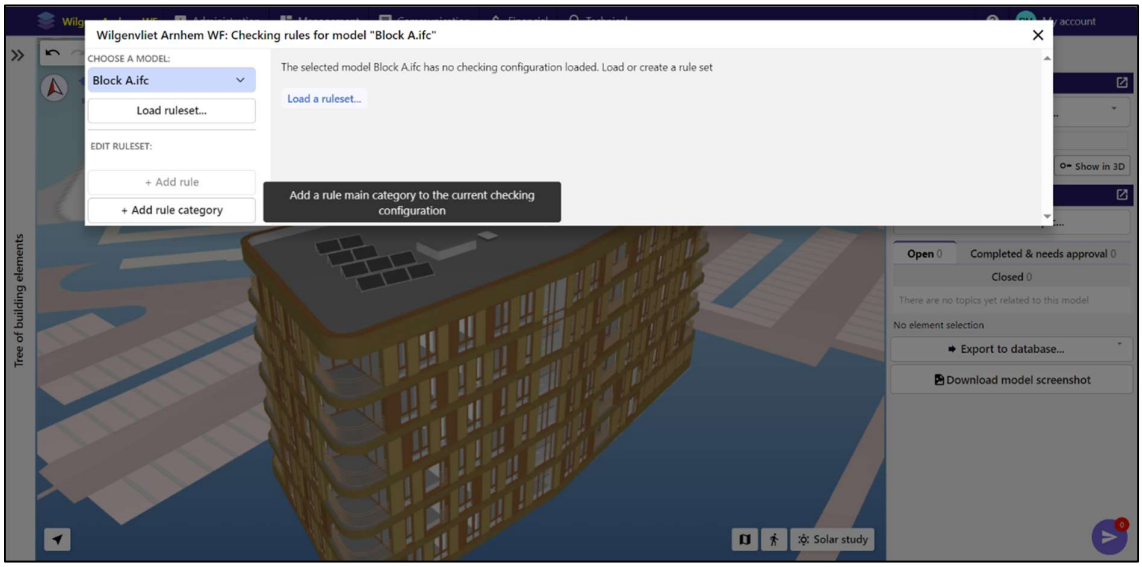

Figure 11: Pressing on "+ Add rule category" allows for a new category to be added

For this example, the category will be named "Overviews". After

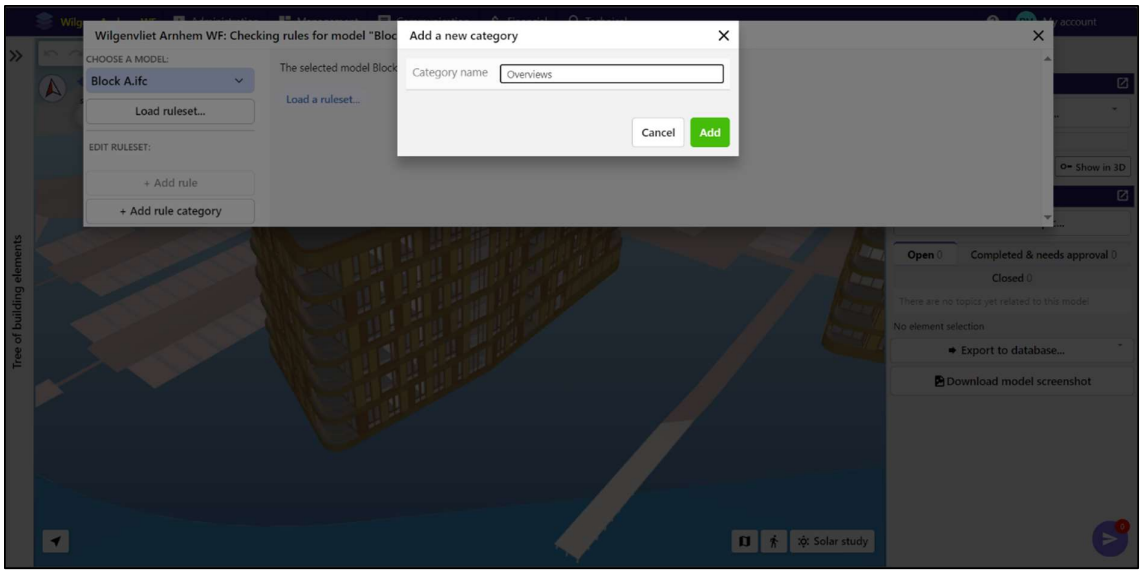

Figure 12: Naming a category and adding it

Now that the new category has been added, it can be selected by pressing on the category name, which is “Overviews” in this case. The new category can be found at the bottom left of the model checker screen.

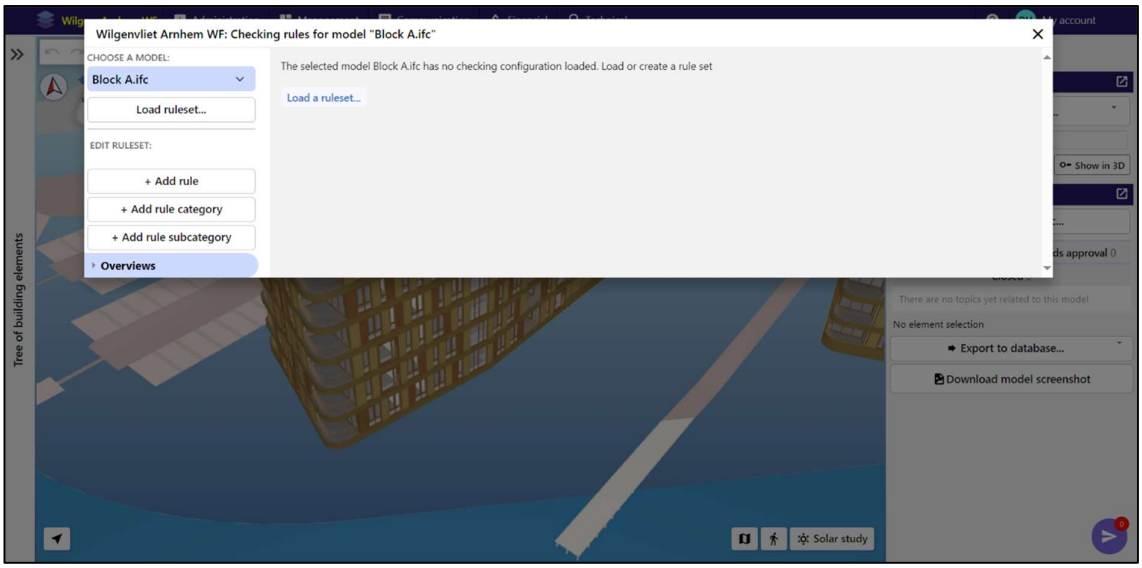

Figure 13: Selecting the newly created category

Now, a rule template needs to be selected. For this example, we can use the “Components Per Building” template. For this example, this template is chosen because the goal of this check is to find out whether every bathroom has a toilet and a sink. A bathroom can be considered a “space”, and the toilet and sink can be considered “components”.

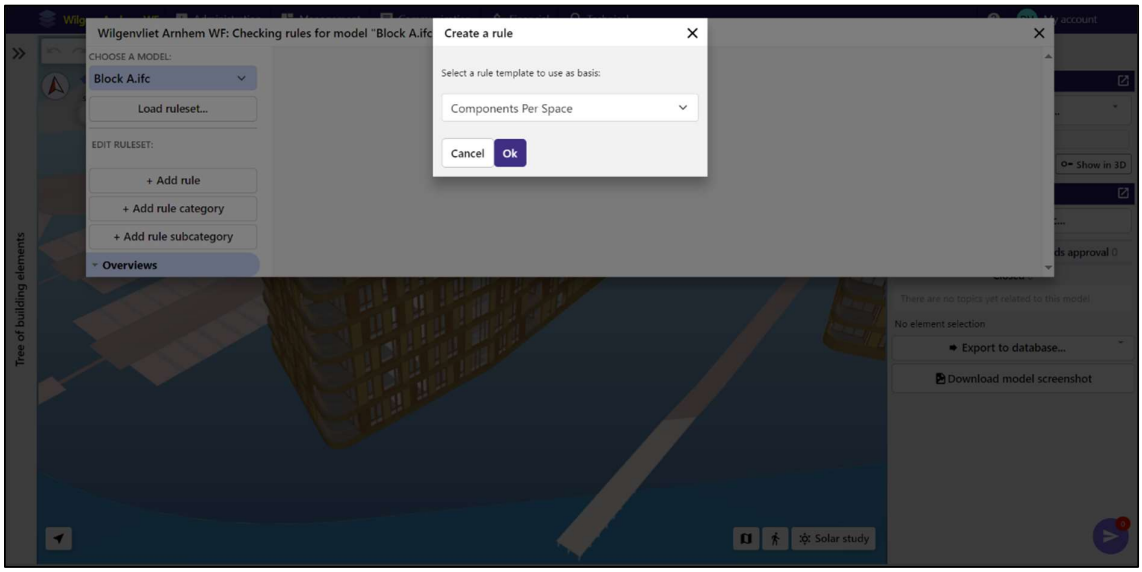

Figure 14: Selecting a rule template

After choosing the newly added “Components Per Space” rule template, it needs to be selected by pressing on it. In this case, it can be found under the “Overviews” category. After pressing on “Components Per Space”, the empty template is shown.

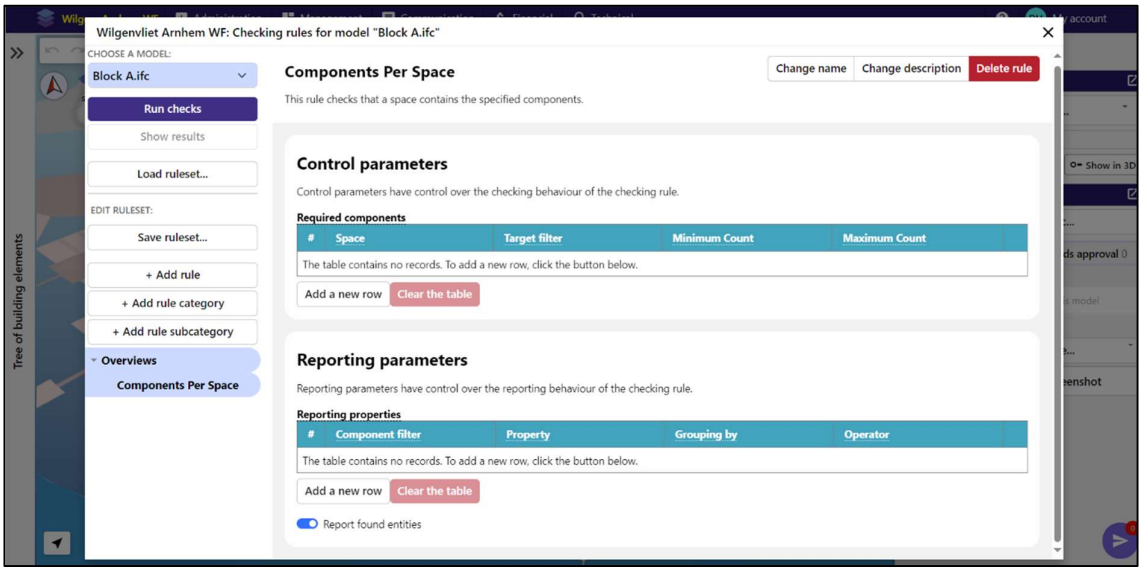

Figure 15: Overview of the empty "Components Per Space" rule template

If desired, the name and description of this rule can be changed by respectively pressing on “Change name” and “Change description”.

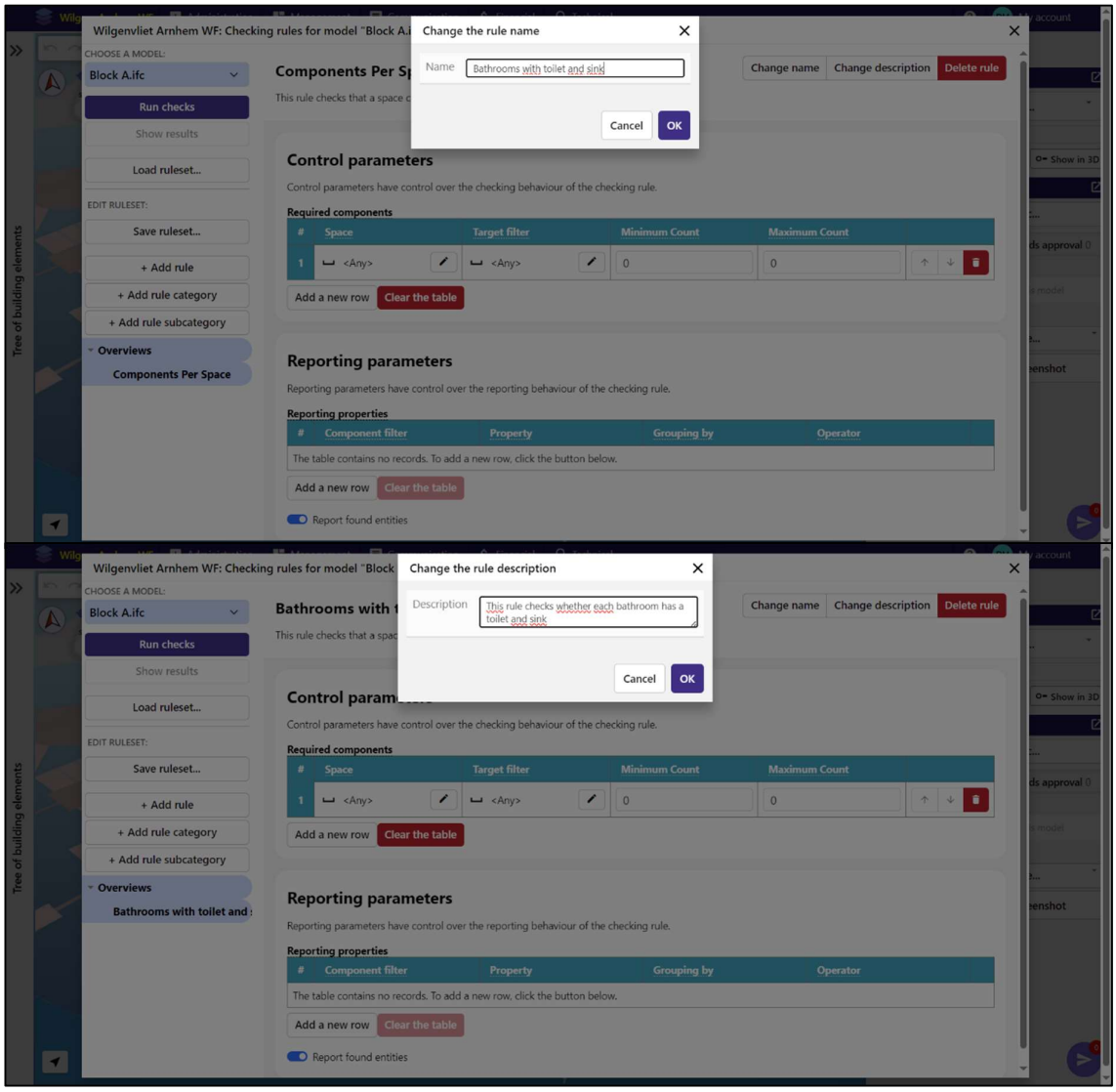

Figure 16: Changing the name and description of the rule

The next step is to specify the components that the model checker needs to look for, and how many of these components a space should have. This can be done in the “Control parameters” section. First, a new row needs to be added for every component that the model checker has to look for. Since the goal of this particular check is to check bathrooms for two separate components (toilets and sinks), two rows need to be added. This is done by pressing the “Add a new row” button twice.

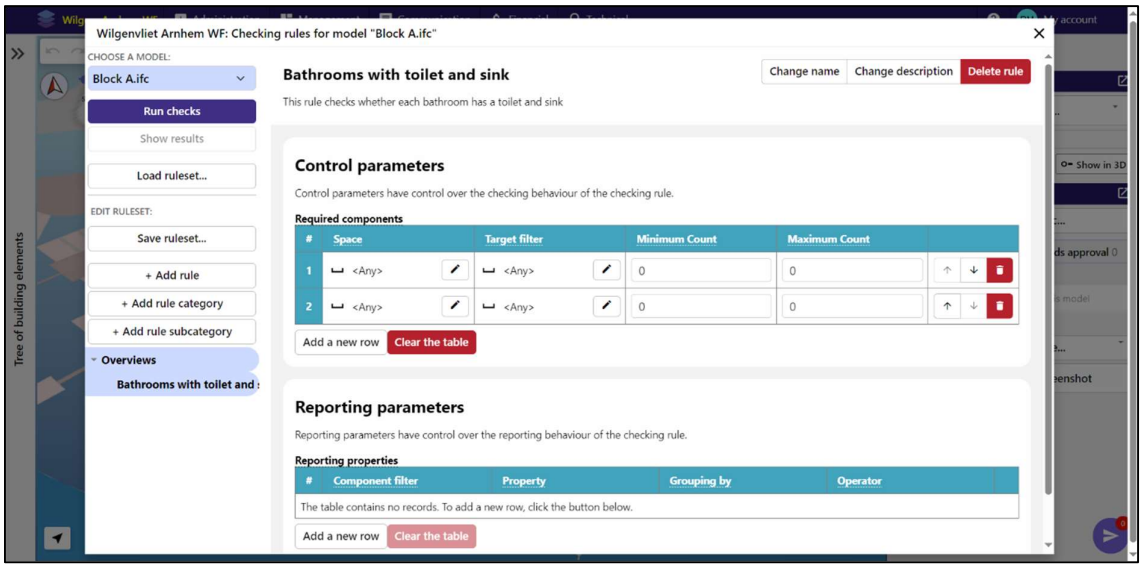

Figure 17: Adding rows in the "Required components" table

Now, both of these rows should be edited so that the model checker knows what to do. First of all, the spaces that need to be checked are bathrooms. In order to specify this, the left side of the table should be edited (“Space” column) by pressing on the edit button (“pencil” icon). In this particular IFC model, bathroom spaces are simply called “Toilet” which are part of the “LongName” attribute in this case, so the model checker needs to look at spaces that contain this name. This can be done for both rows in the table.

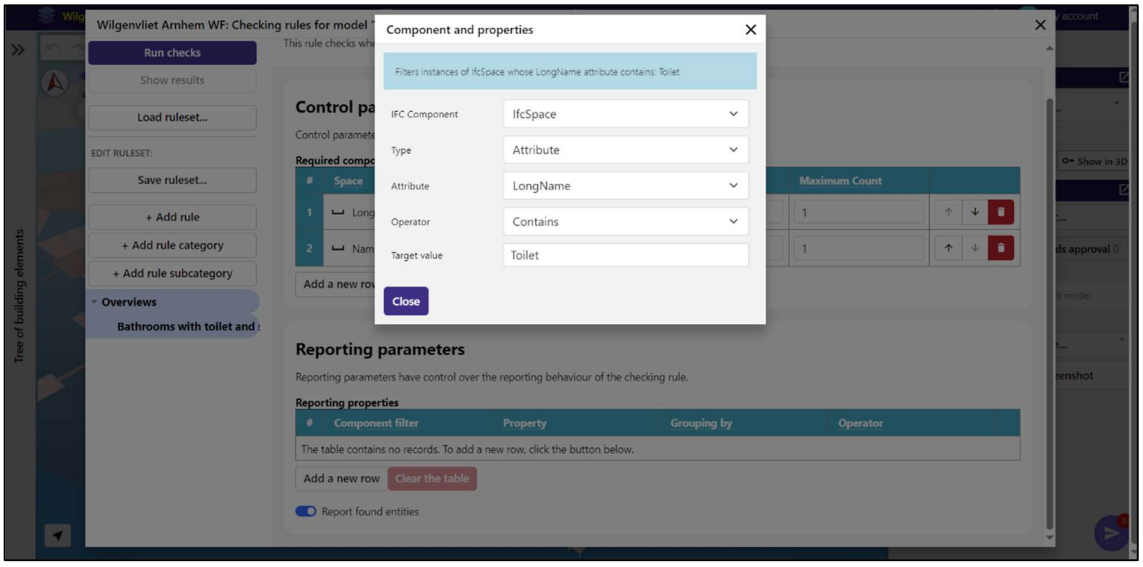

Figure 18: Specifying the spaces that needs to be included during the check

Now, the table looks like this:

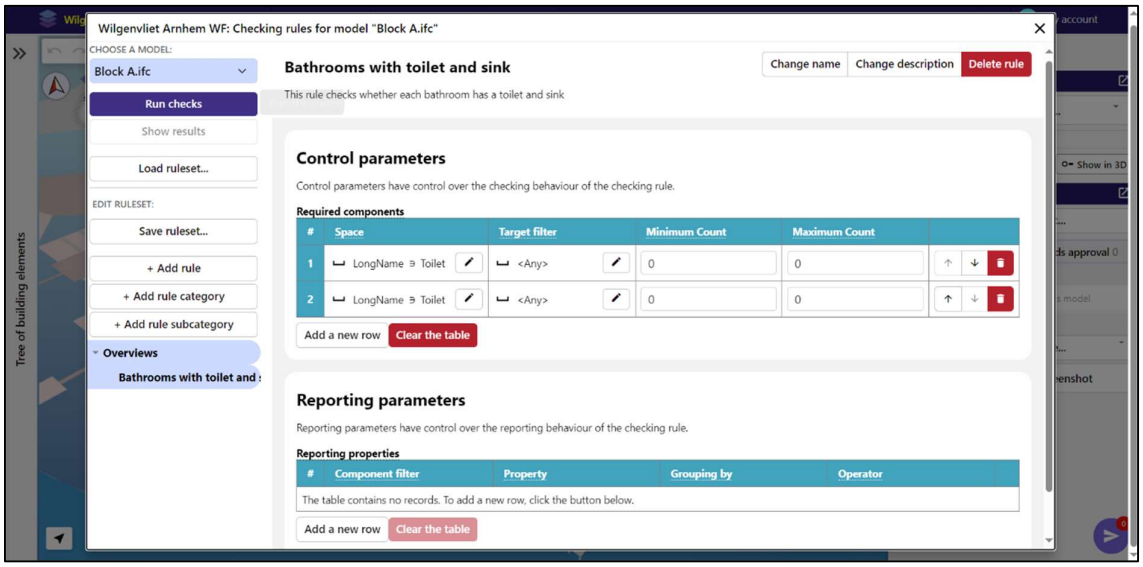

Figure 19: Overview of the "Required components" table after editing the values in the "Space" column

The next step would be to specify the components to check for (toilet and sink). This is done by pressing the edit button in the “Target filter” column. In this particular model, the toilets and sinks are respectively called “Toilet” and “Hoekfontein” (Dutch for “corner sink”), and belong to the “FlowTerminal” class.

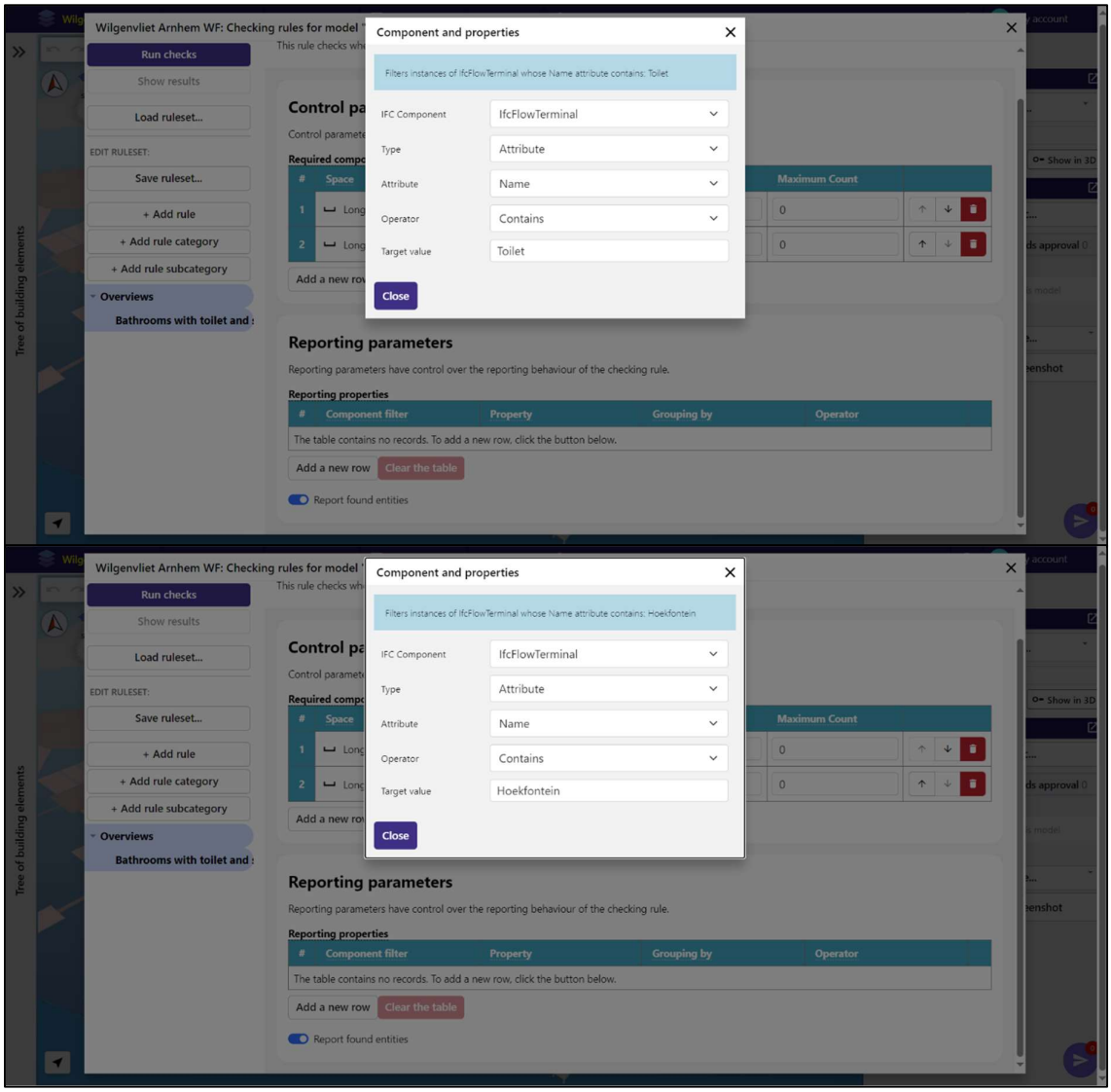

Figure 20: Specifying the components that the model checker needs to look for

Now that the target filters have been added, the table looks like this:

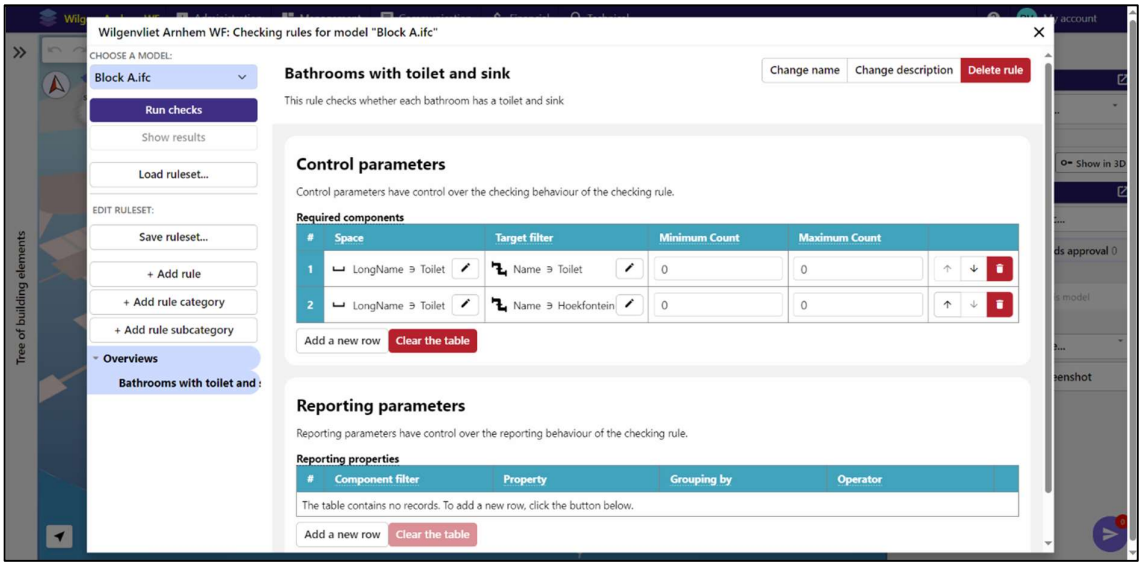

Figure 21: Overview of the "Required components" table after editing the values in the "Target filter" column

The last thing that needs to be done within the “Control parameters” section is specifying the minimum and maximum count for each respective component. In this case, the minimum count will be set to 1, since the goal is to find out whether each bathroom has at least 1 toilet and sink.

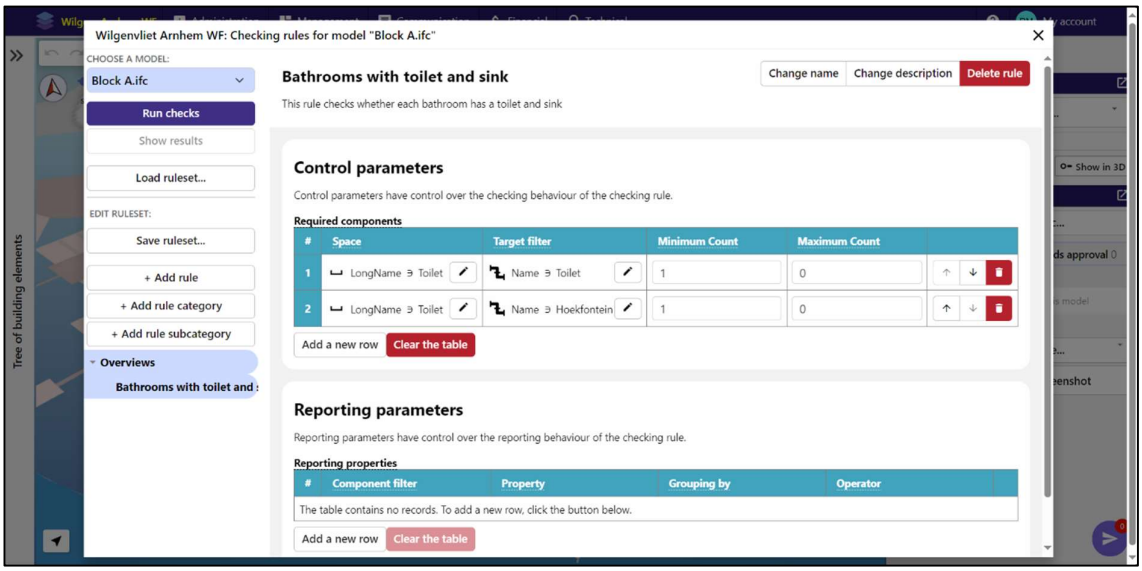

Figure 22: Overview of the "Required components" table after setting the minimum count to 1

Now, the “Reporting parameters” need to be added to specify how the results are reported. In this case, the results should show for both components (toilet and sink) how many there are per space. Therefore, two rows need to be added by pressing on the “Add a new row” button twice, but this time under the “Reporting properties” table.

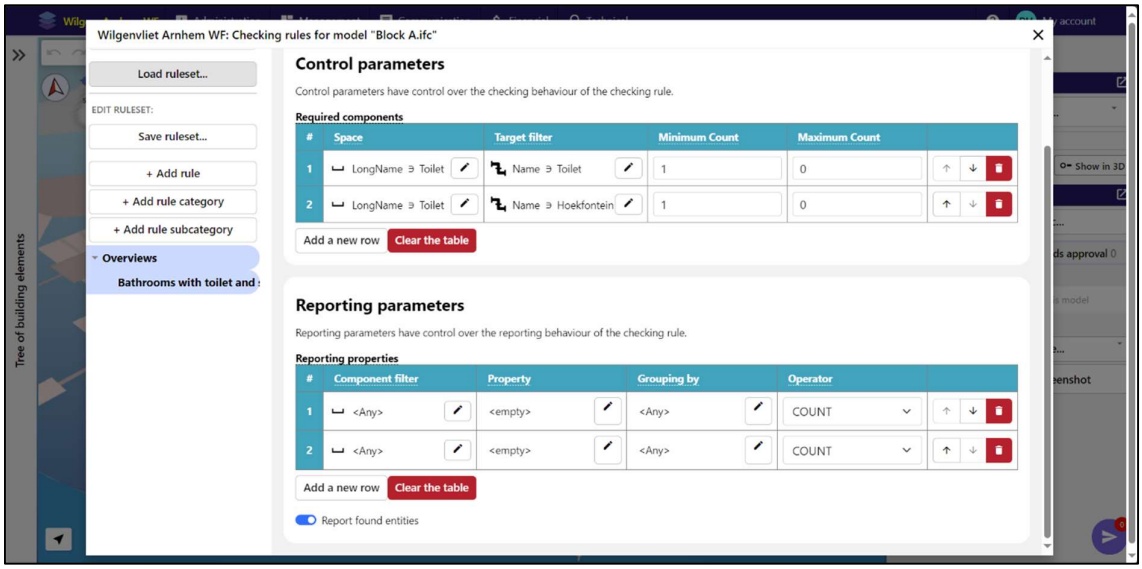

Figure 23: Overview of the "Reporting properties" table after adding two rows

Both the toilets and sinks need to be included in the results. Therefore, both are added by editing the values in the “Component filter” column.

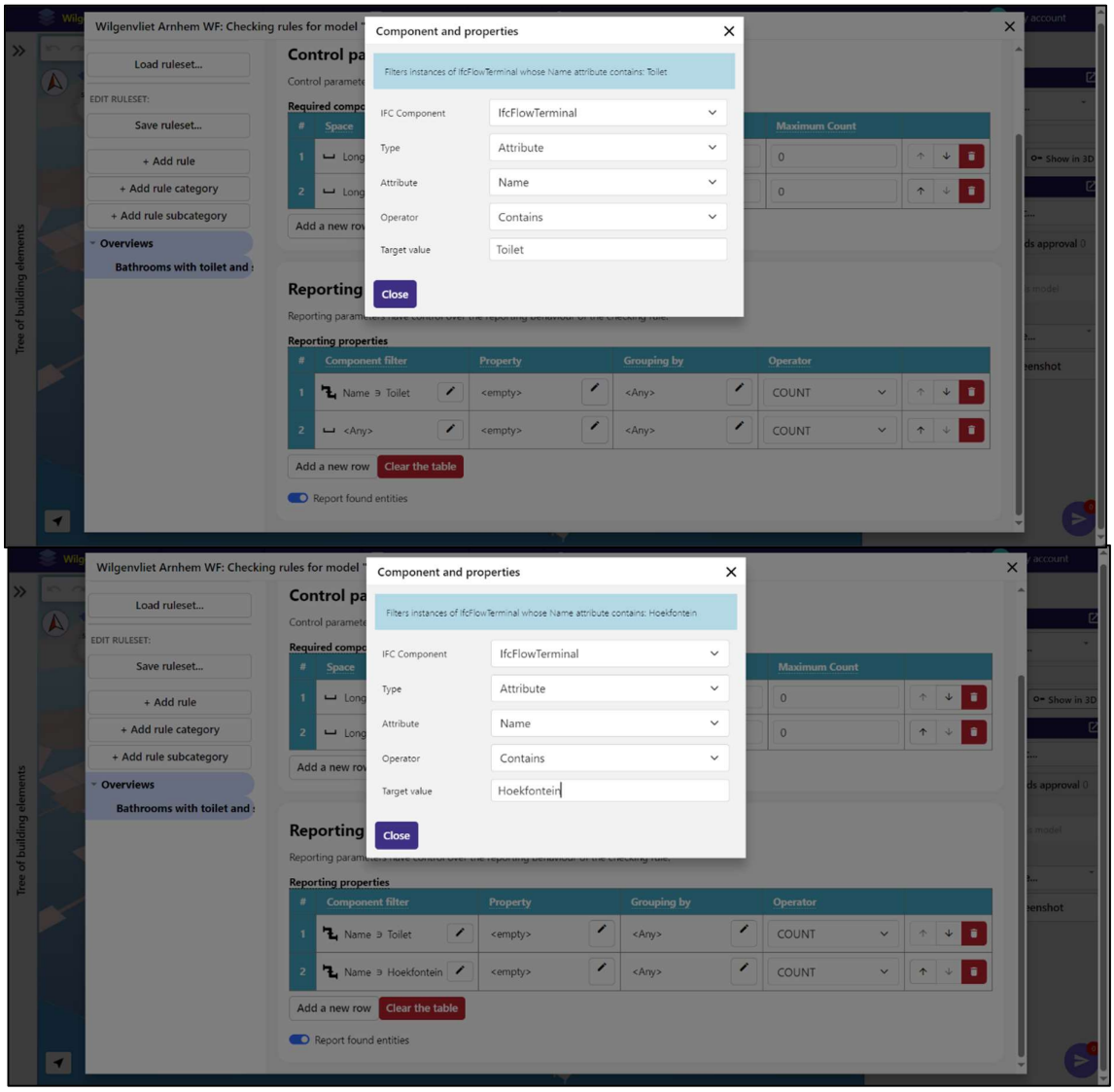

Figure 24: Specifying the components that need to be reported in the results

The values in the “Property” column can be left empty, because specific properties of a toilet or sink component are not relevant for this check. Next, the “Grouping by” values need to be edited so that the results are shown per space (bathroom). In order to do this, “Relationship” needs to be selected, followed by “Space”.

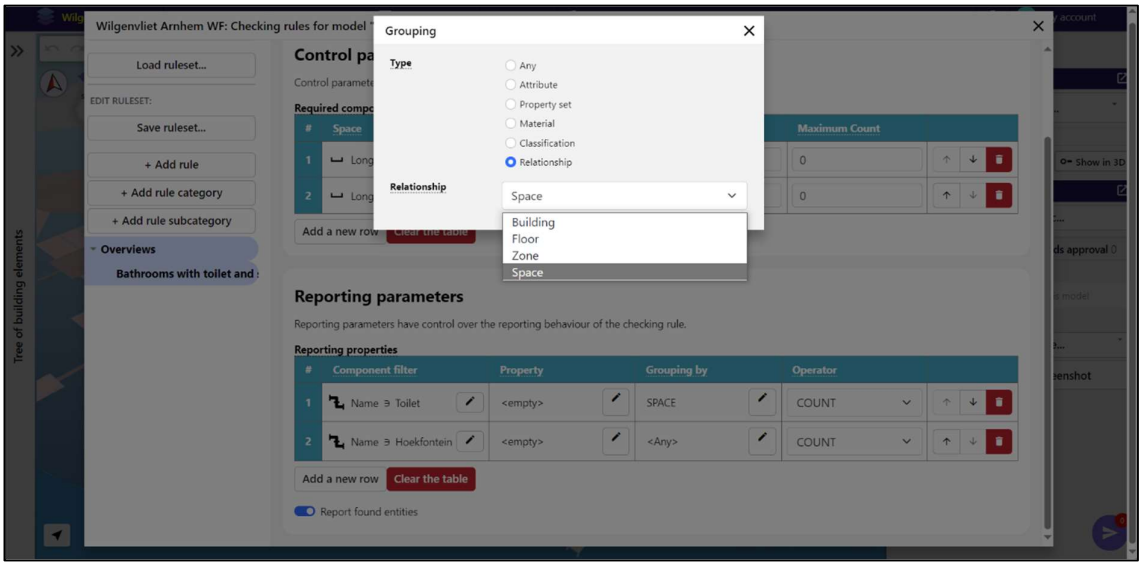

Figure 25: Editing the "Grouping by" values

Lastly, the “Operator” values can be left on “COUNT” for this example, so that the results show the amount of toilets and sinks per bathroom.

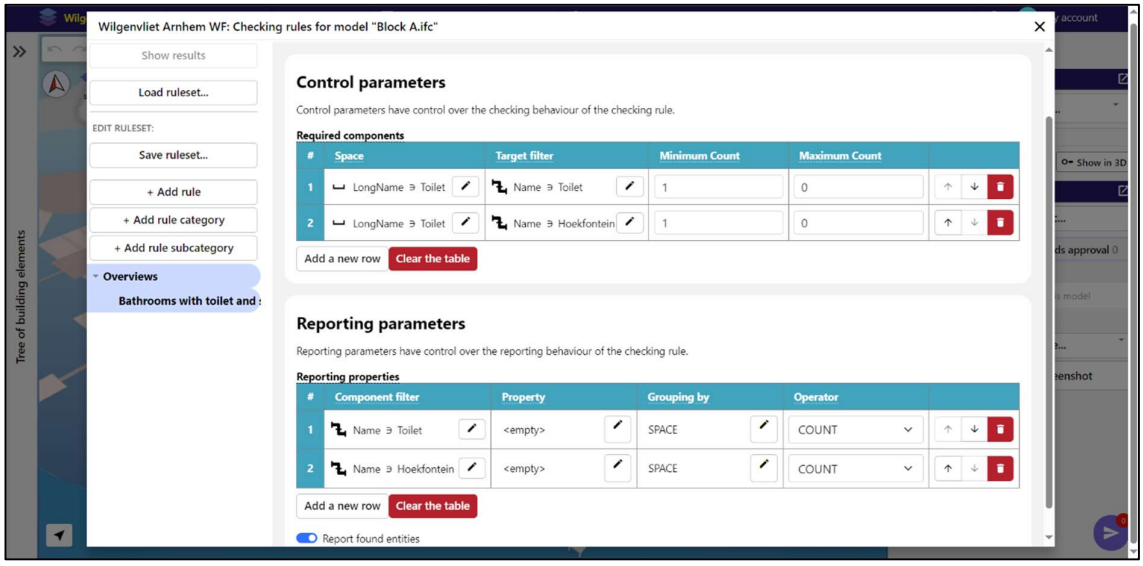

Figure 26: Overview of the "Reporting properties" table after setting the "Grouping by" value to "SPACE" and leaving the "Operator" value on "COUNT"

If everything is filled in correctly, the blue “Run checks” button can be pressed at the top left of the model checker screen. After which the results are shown.

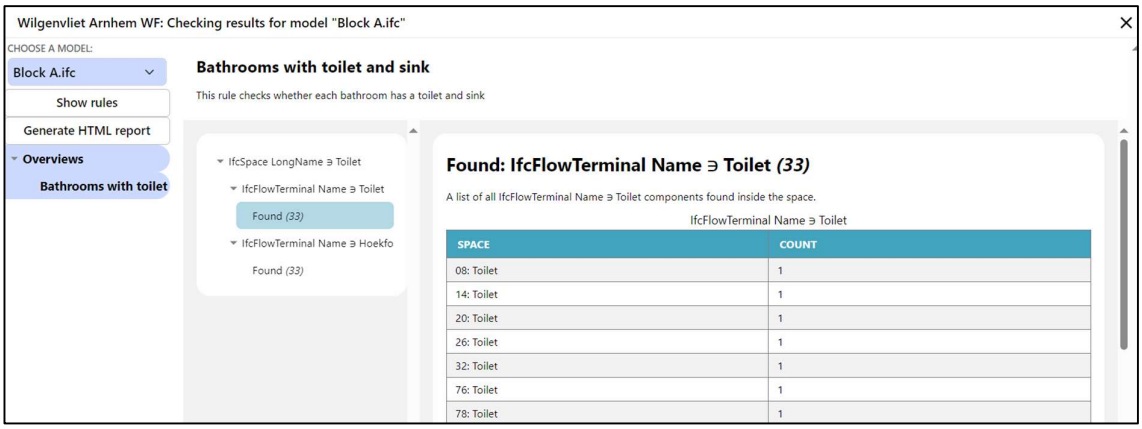

Figure 27: Results of the configurated check

3.2. Spaces per zone

An overview of the spaces per apartment within a complex can be created. Such an overview can be achieved by using the “Components per Building” checking constraint.

With the “BIMkeeper Model Checker” opened the “Add rule category” button must be pressed.

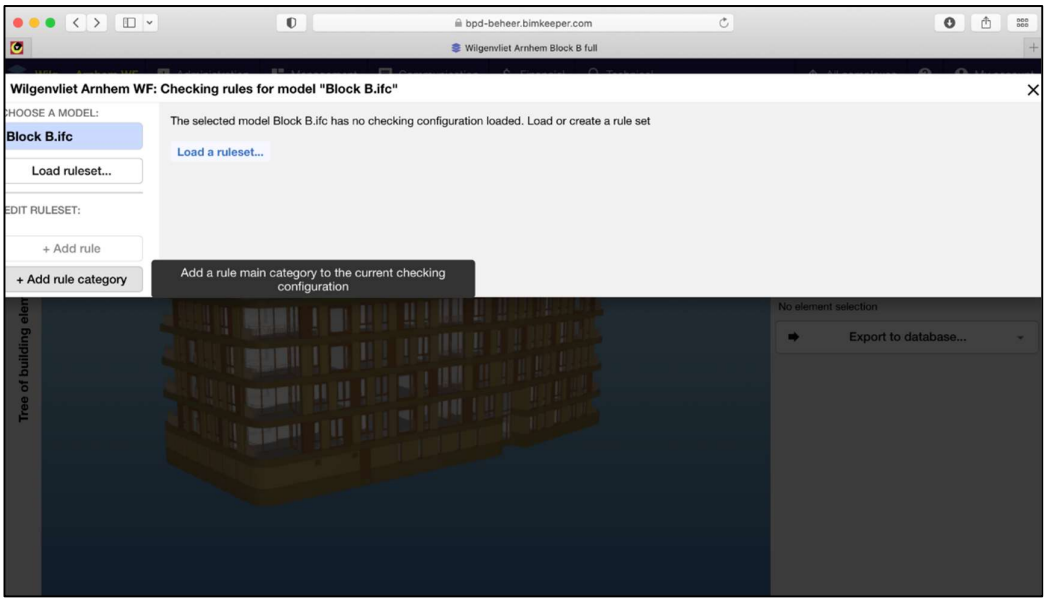

Figure 28: Pressing "Add rule category" allows for a new category to be created

In this example the category is named “Overviews”.

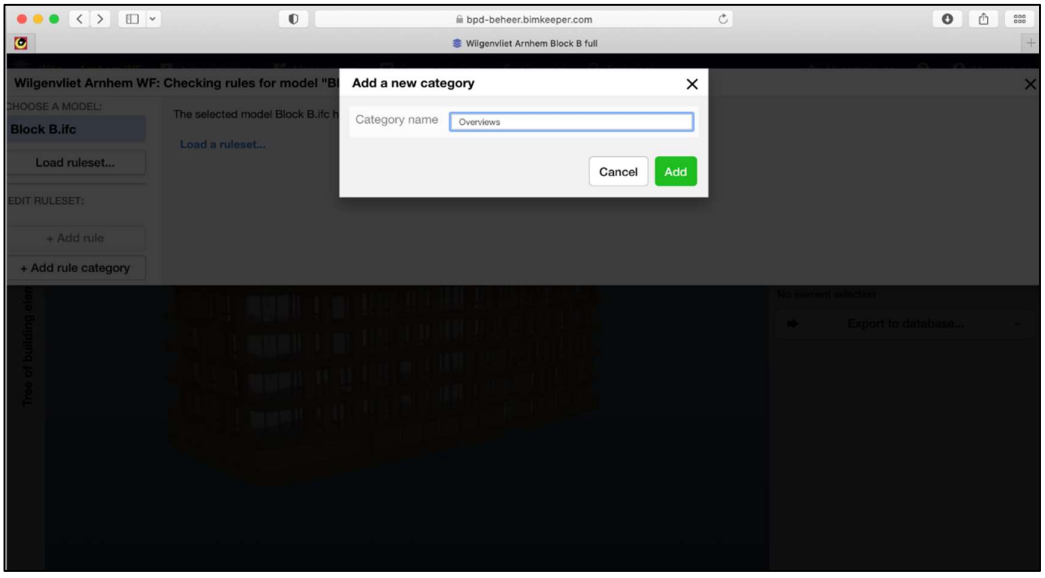

Figure 29: Naming a category and adding it

The “Overviews” category needs to be selected and the “Add rule” button needs to be pressed.

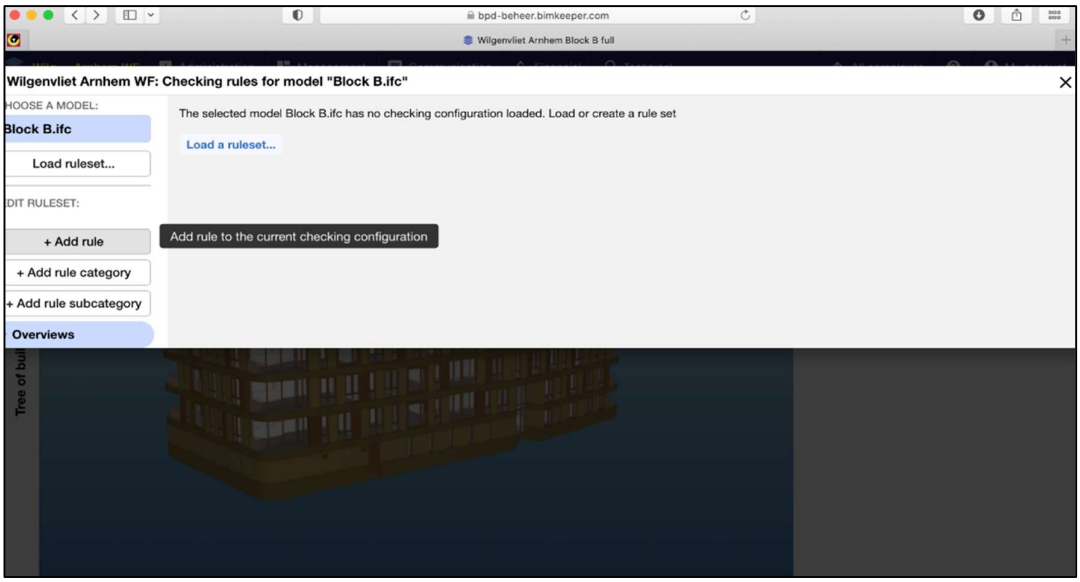

Figure 30: Add a rule to a category

Components per Building under Component instances needs to be selected. Afterwards the rule needs to be selected.

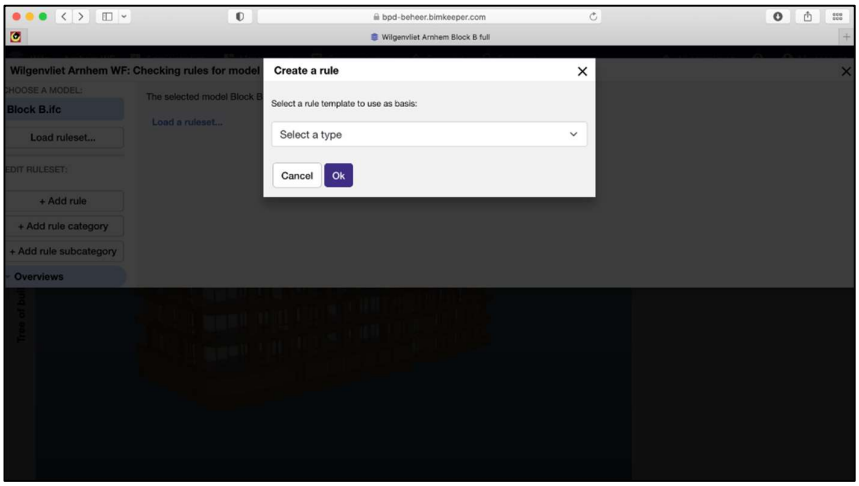

Figure 31: A rule template needs to be selected from the dropdown

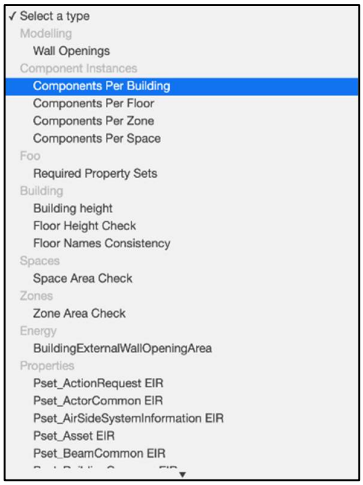

Figure 32: Different rule templates are available

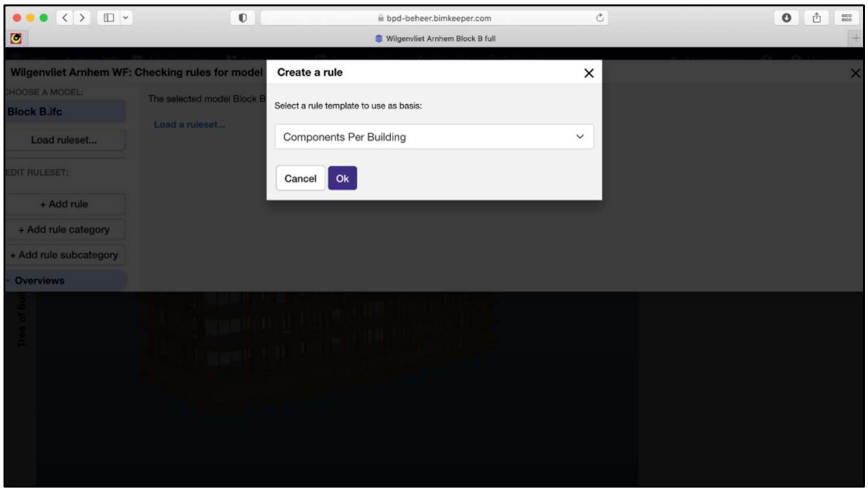

Figure 33: Components Per Building template is selected

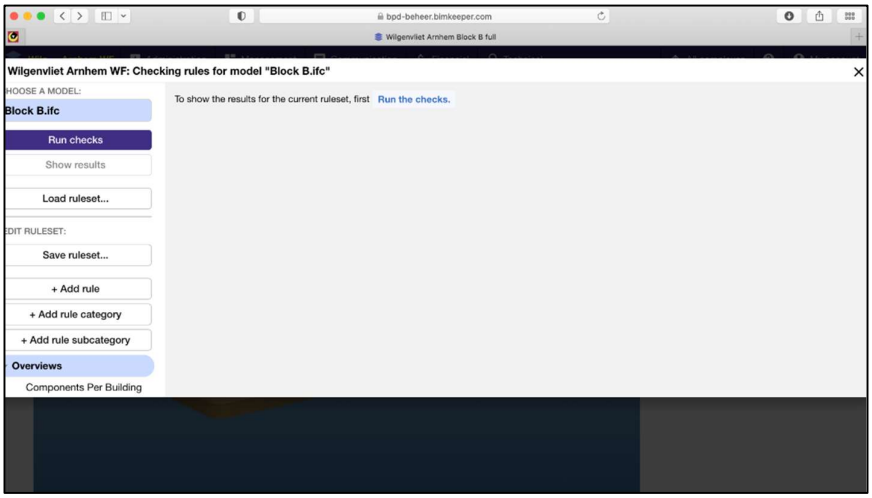

Figure 34: The rule is added to the "Overviews" category

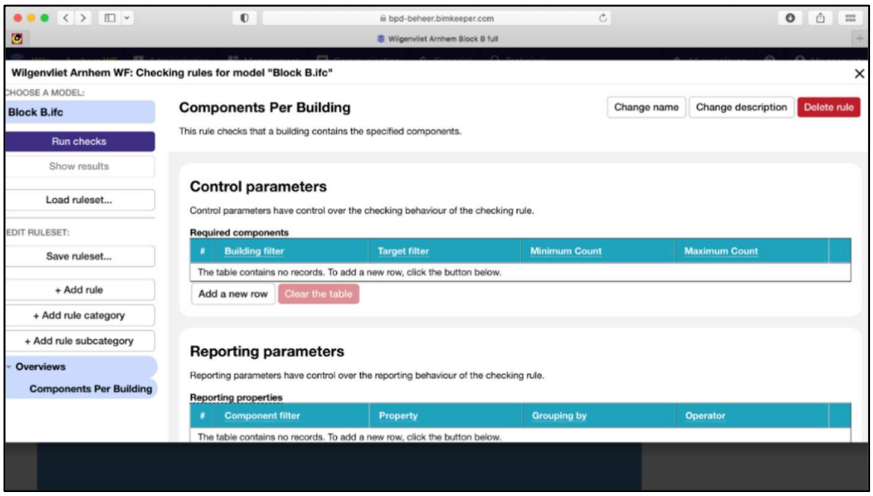

Figure 35: The rule is selected

The rule is renamed to “Space per unit overview” for clarification, by pressing the “Change name” button.

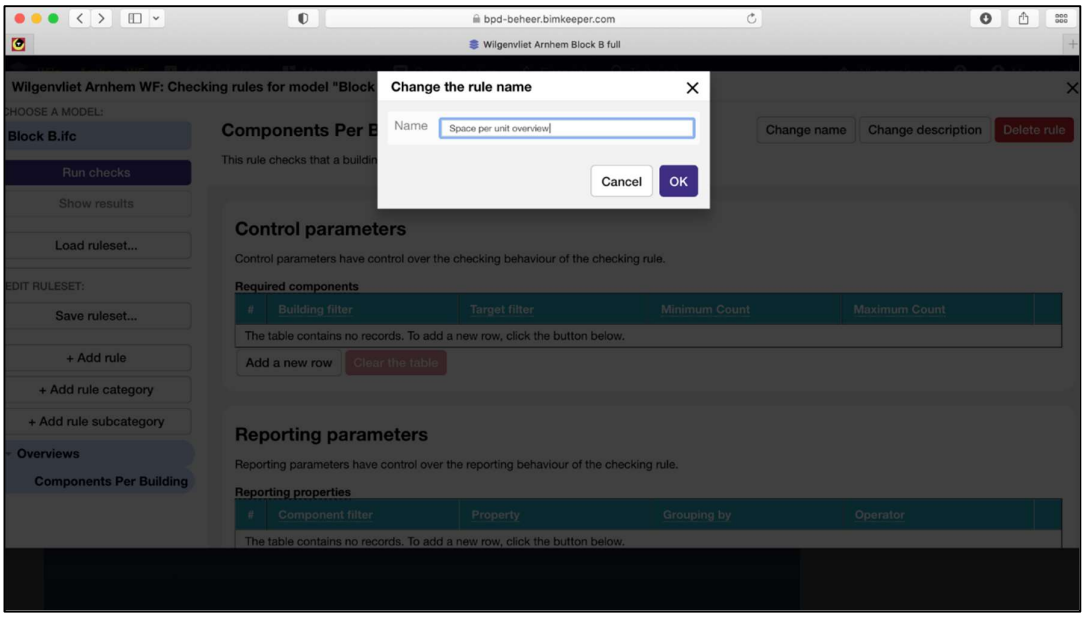

Figure 36: The rule is renamed to "Space per unit overview"

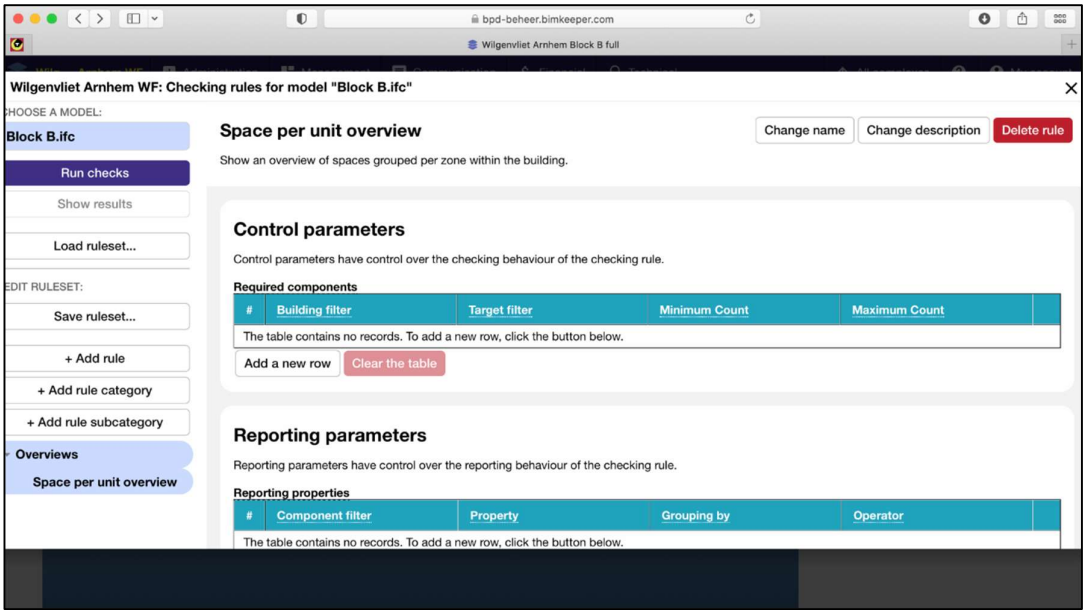

Figure 37: The rule is now added to the “Overviews” category and the details can be viewed by selecting it

The description can be changed to “Show an overview of spaces grouped per zone within the building” for clarification, by pressing the “Change description” button.

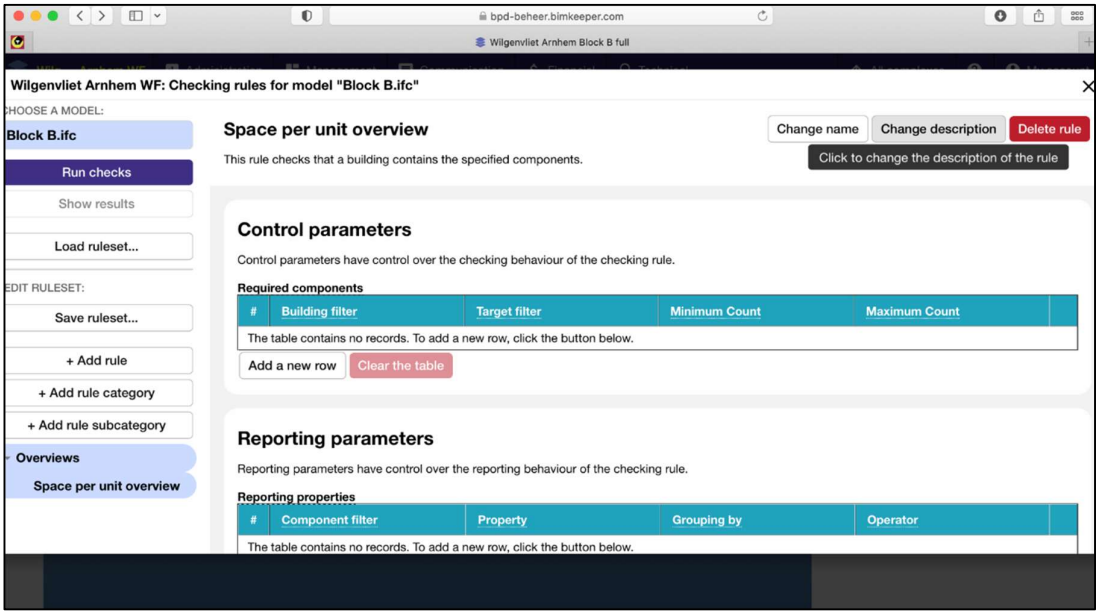

Figure 38: The "Change description" button is pressed to change the description of the rule

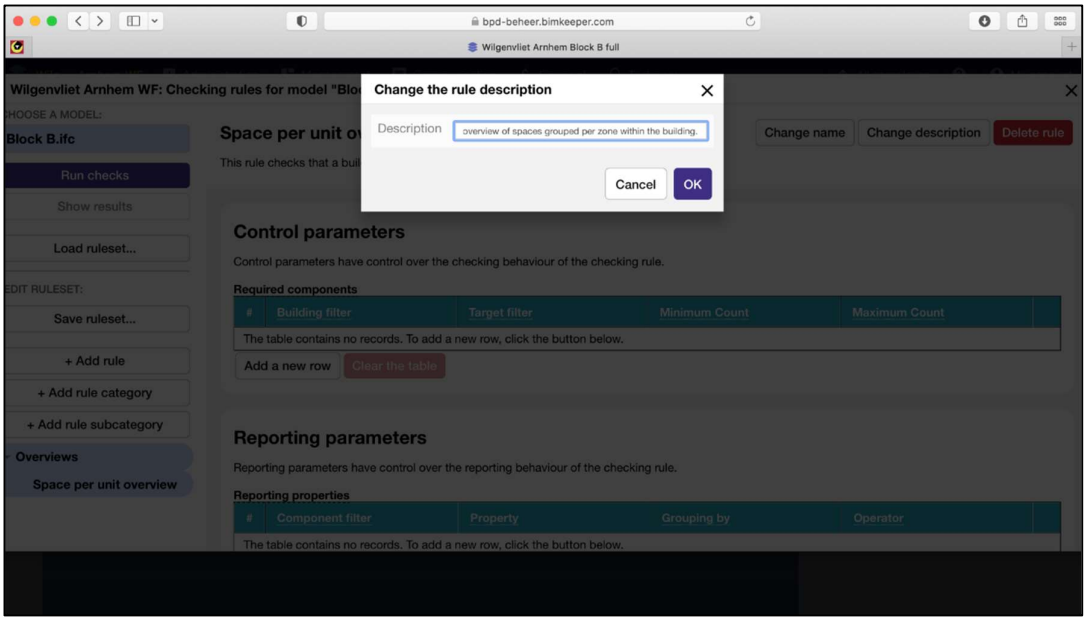

Figure 39: The description is changed

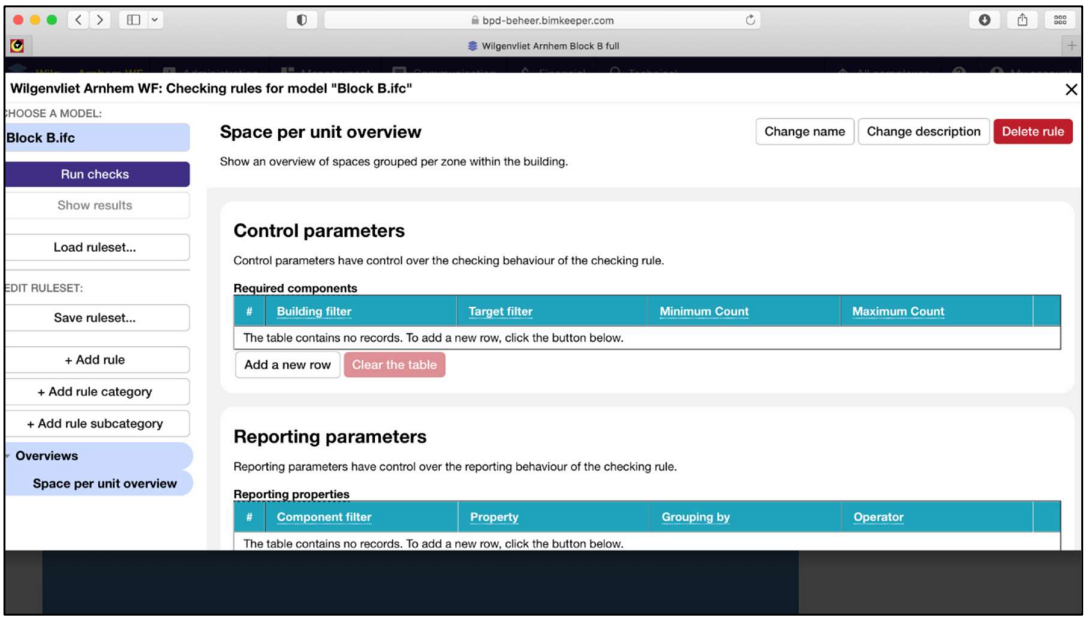

Figure 40: The description can be viewed under the rule page

In the “Control parameters” section the “Required components” table can be found.
By pressing the “Add a new row” button underneath the table, a new row with component filters can be added.

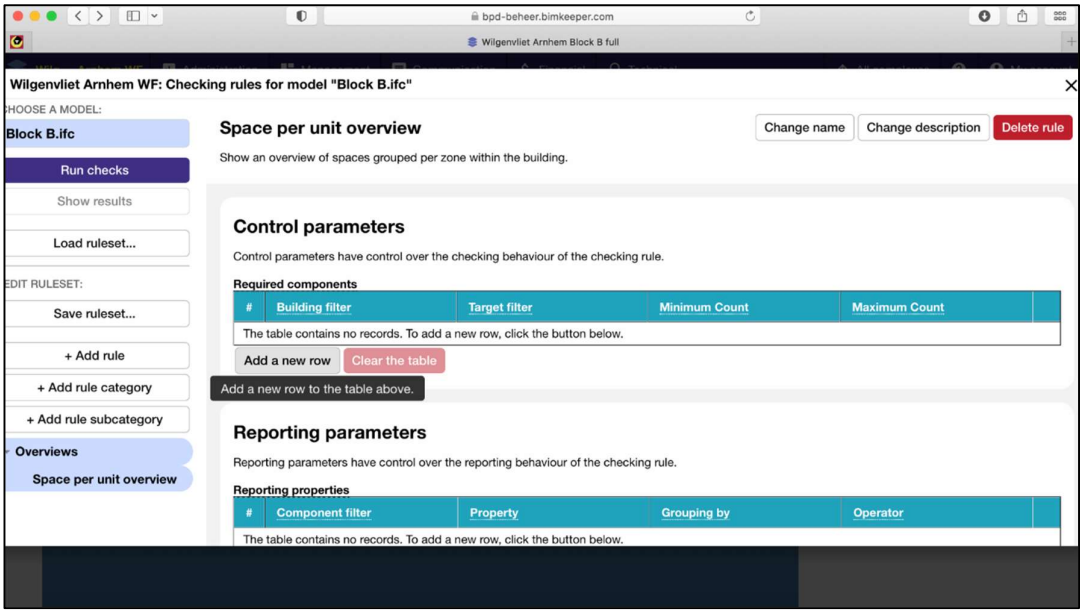

Figure 41: Pressing the "Add a new row" button adds component filters

In the new row, there are four columns: Building Filter, Target Filter, Minimum Count and Maximum Count. For this example, the Building Filter, Minimum Count and Maximum Count columns are not used.

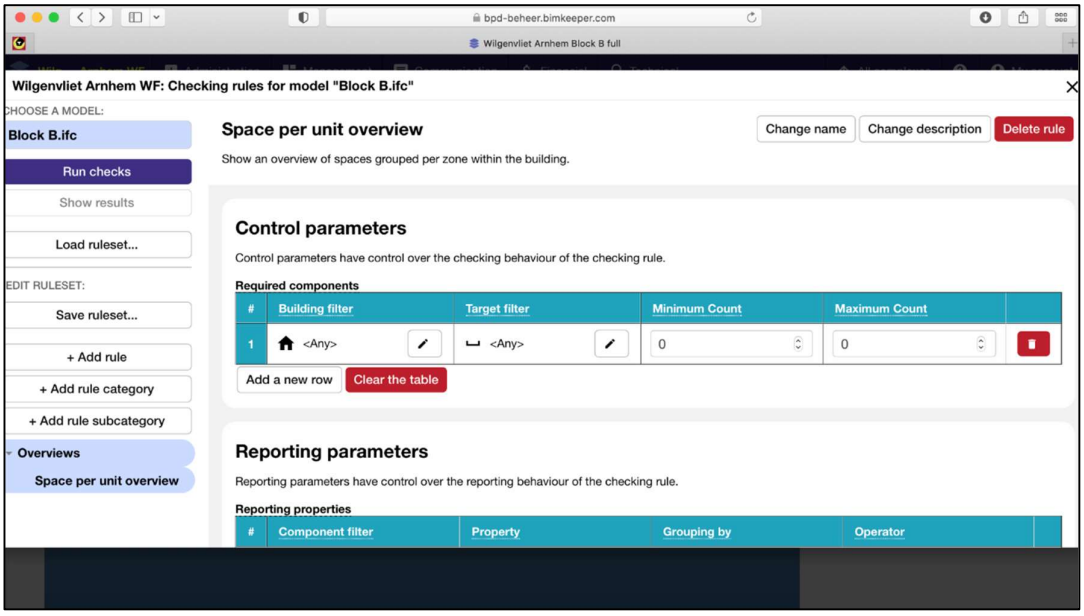

Figure 42: Component filters are added as a row

The pencil icon in the “Target Filter” column of the new row is pressed to change the filter options.

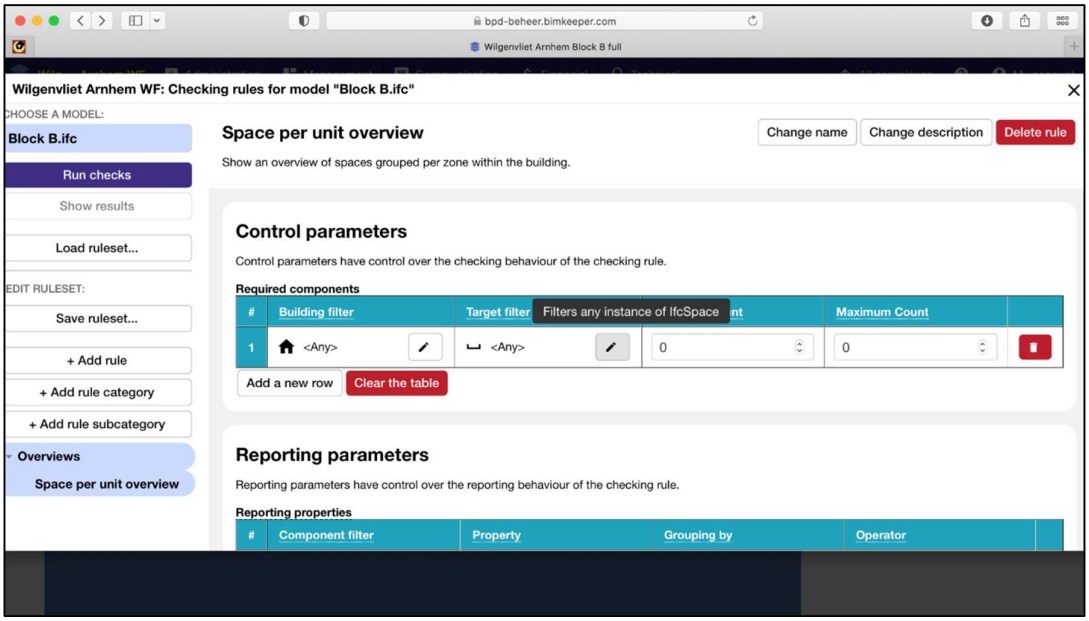

Figure 43: Opening filter options by pressing the pencil icon

The “IFC Component” needs to be “IfcSpace”, and “Type” should be set to “Any”.

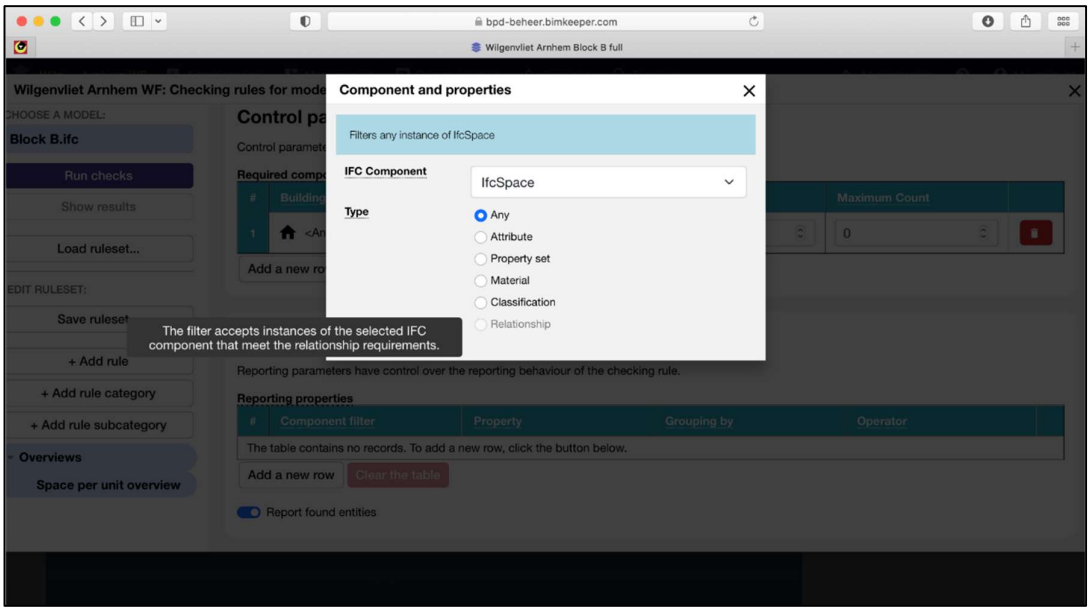

Figure 44: Options need to be set to "ifcSpace" and "Any"

With this new rule a check can, be performed.

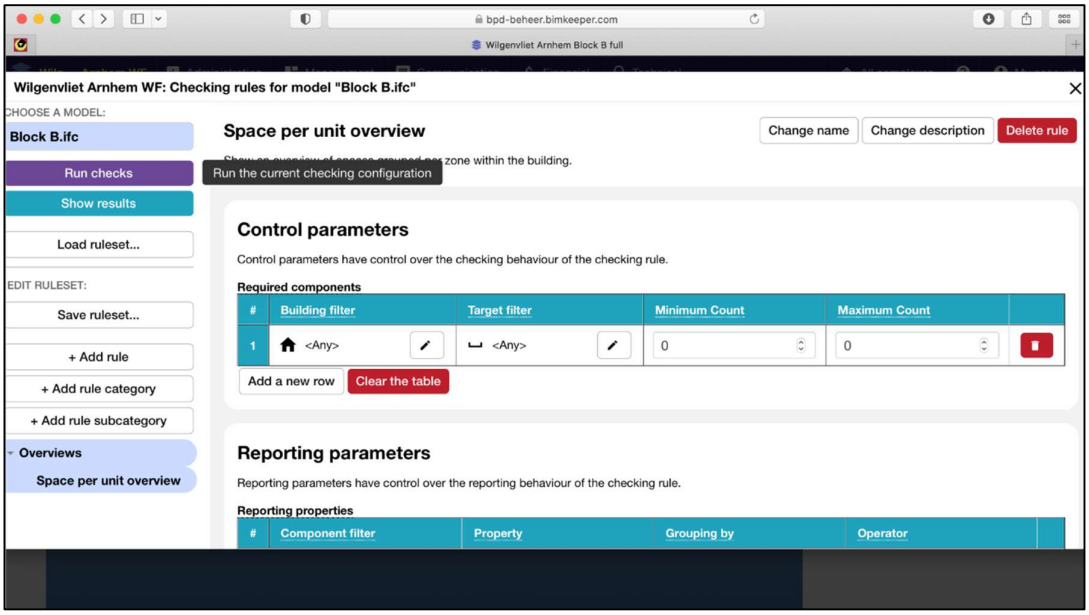

Figure 45: The check is performed with the new configuration

This check results in a list displaying all the spaces in the model, but they are ungrouped. The “Group results by” function can be used to group by zone.

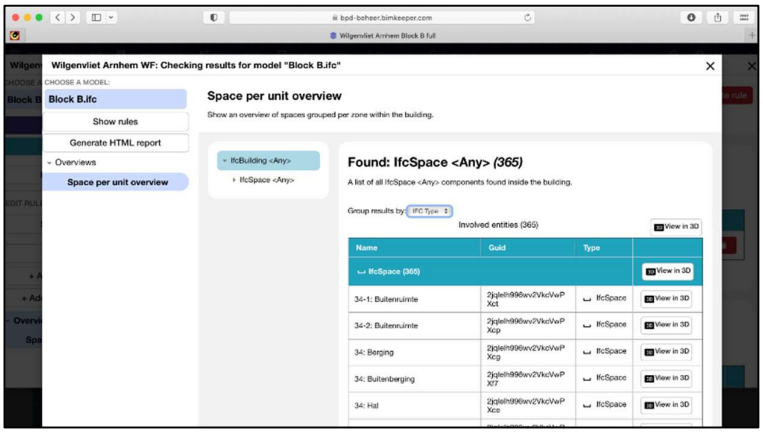

Figure 46: The "Group results by" functionality is used

Figure 47: "Zone" is picked as a category to group

This shows results per zone. This is not the preferred outcome; therefore a few reporting parameters must be changed within the rules by pressing the “Show rules” button.

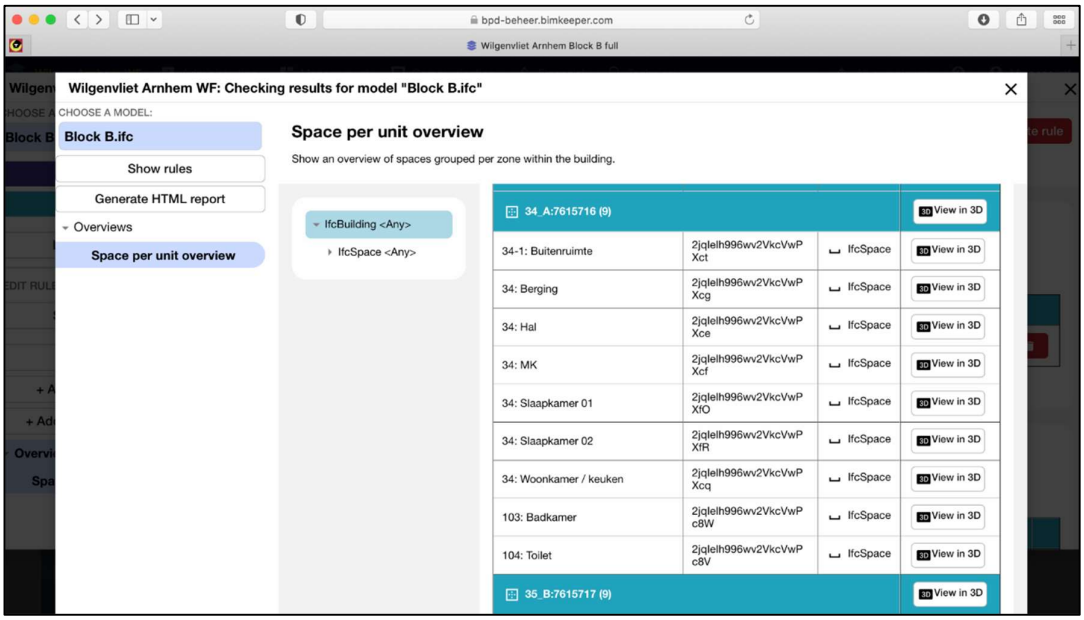

Figure 48: The overview shows the spaces grouped by zone

To change the reporting rules, use the “Reporting properties” under the “Reporting parameters”.

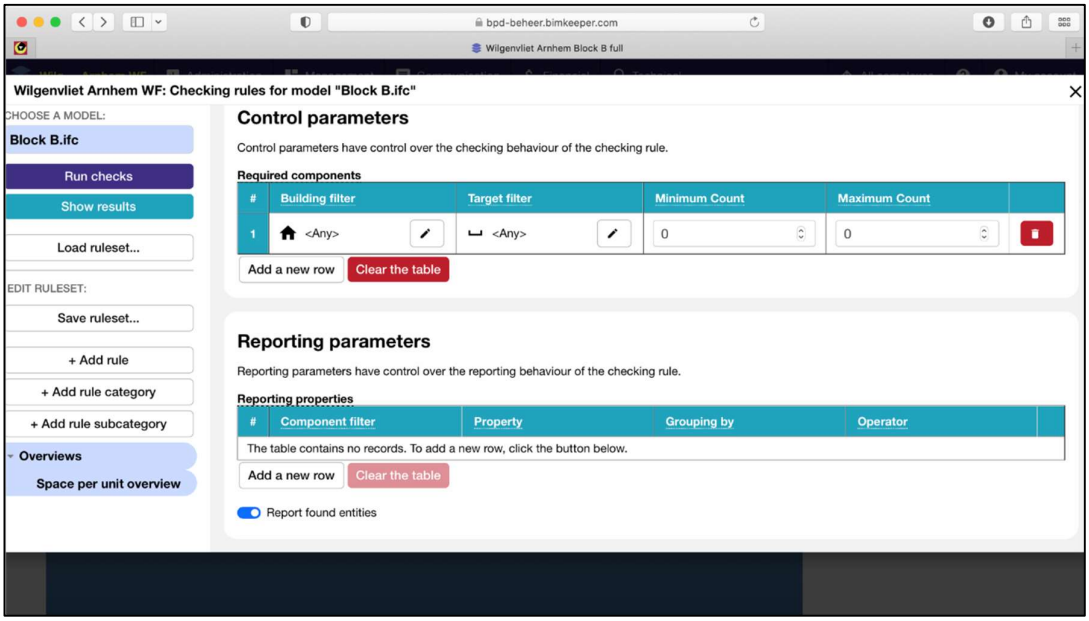

Figure 49: Checking rules can be changed. In this case the "Reporting parameters"

The “Add a new row” button needs to be pressed under the reporting properties table.
In the “new row”, there are four columns: Component Filter, Property, Grouping By and Operator.

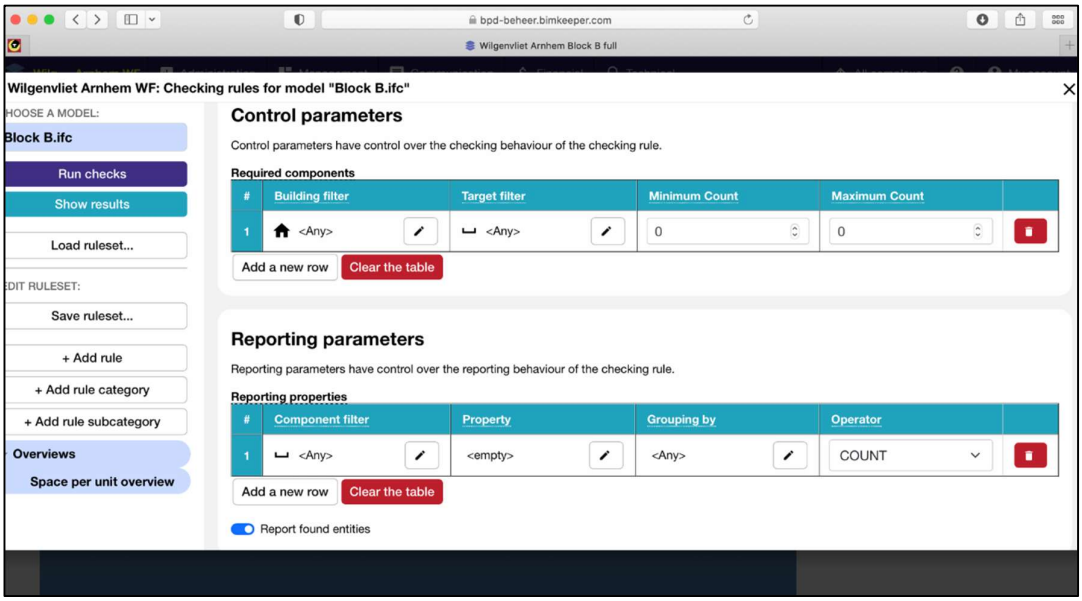

Figure 50: Four "Reporting parameters" are available to be configured inside the checking rules

Here the number of spaces per zone is shown.
The “Component filter” needs to be configured to accept any “IfcSpace”.
The “Property” column doesn’t need configuration for the count.

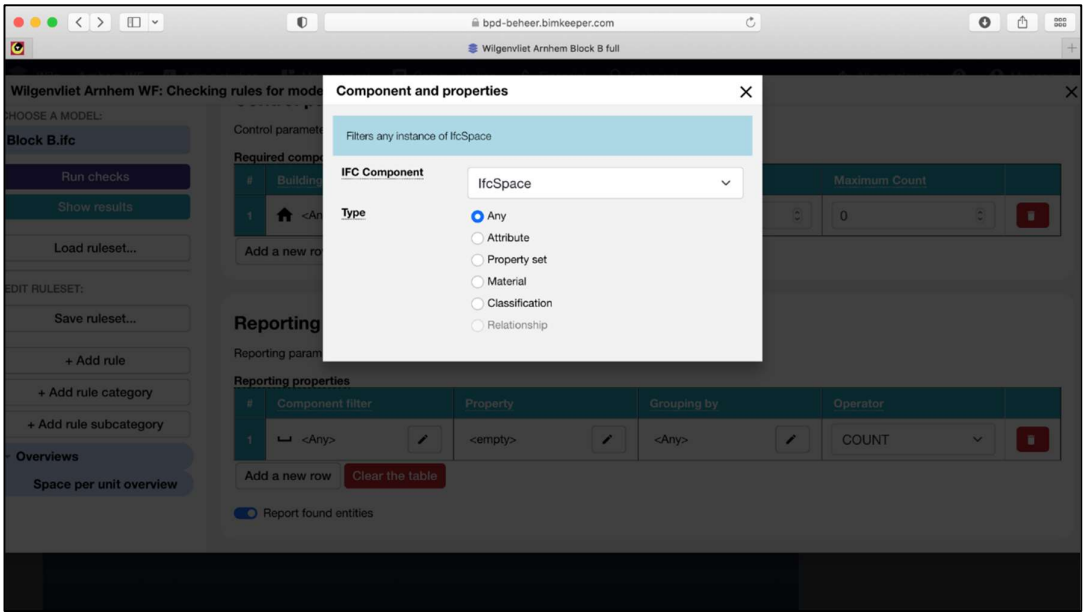

Figure 51: Component filter is configured to any "ifcSpace"

On the “Grouping” column the type needs to be set to “Relationship” and “Relationship” needs to be set to “Zone” afterwards.

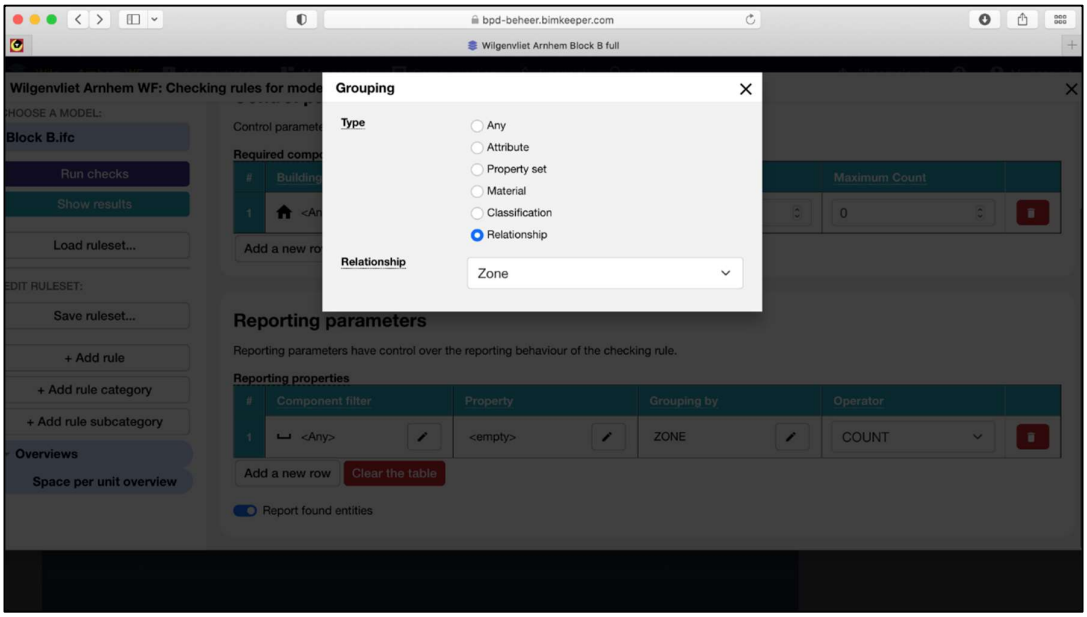

Figure 52: Grouping filter is configured to "Relationship" and it is filtered to "Zone"

Finally, the “Operator” column needs to be set to “COUNT”.

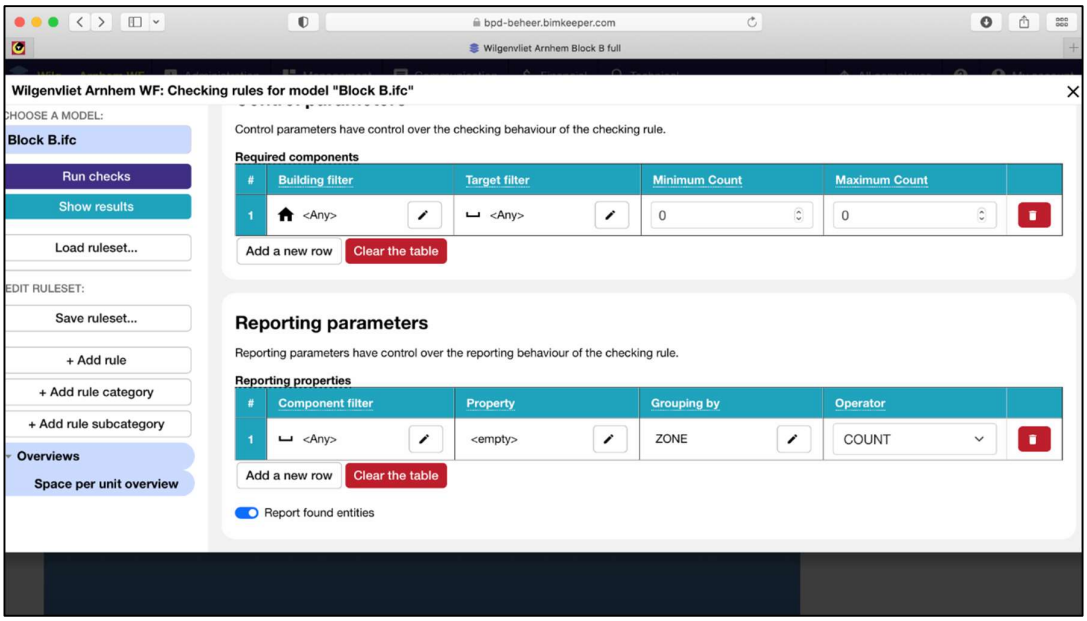

Figure 53: Operator filter is configured to "COUNT"

When the checks are run again, an overview is shown in the report with several spaces per zone.

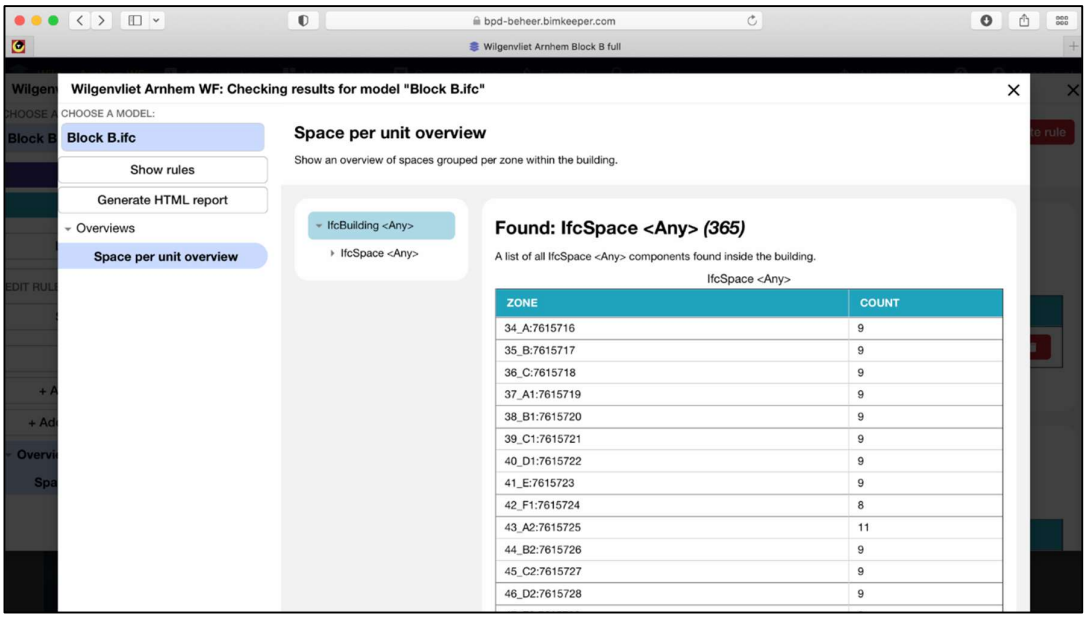

Figure 54: Overview of several spaces per zone

The “space numbers” and “space names” are added to the overview.
To add the “space numbers”, a new row to the reporting parameter needs to be added. The new row needs to be configured as follows:

The “Component filter” column needs to be configured to accept any space.

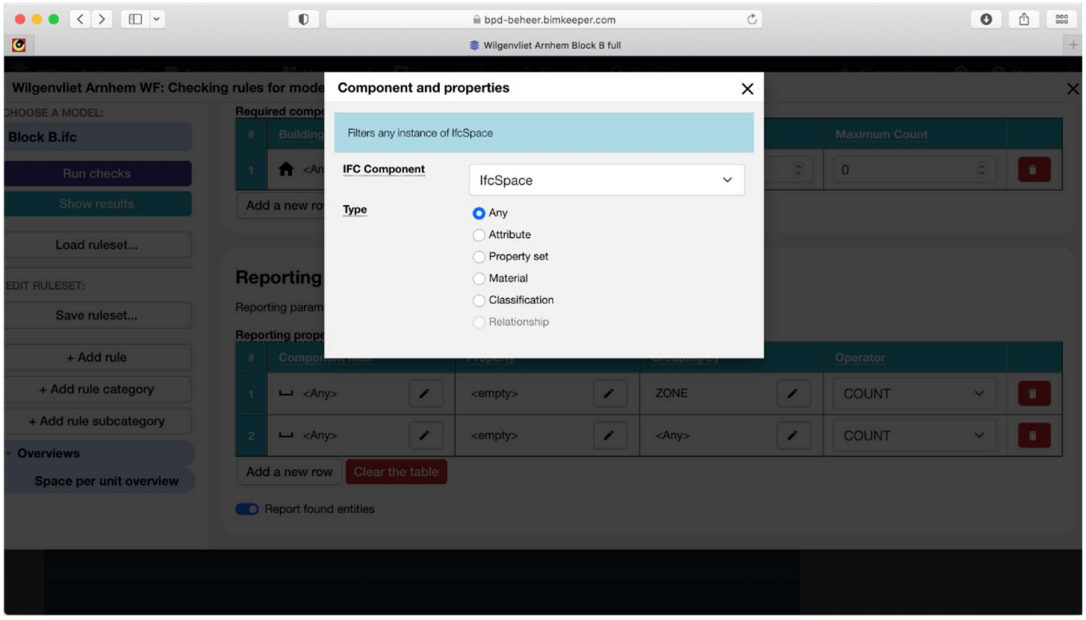

Figure 55: "Component filter" is set to accept any space

The “Property column” needs to be configured as Type: “Attribute” and “Name” needs to be picked as “Attribute”.

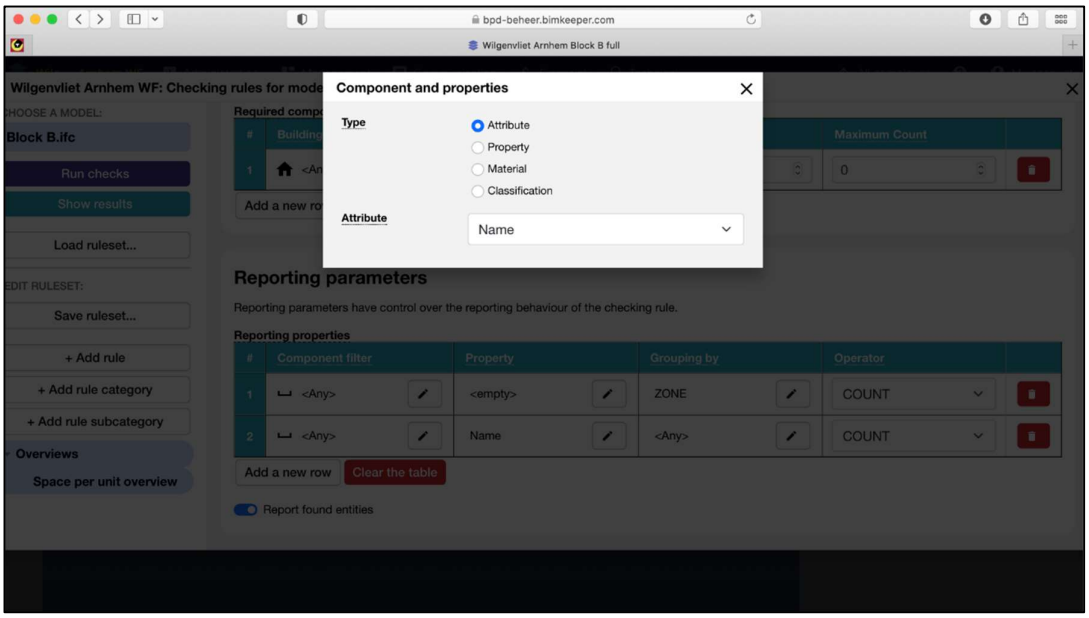

Figure 56: "Property" column is configured as Type: "Attribute" with “Name” indication

The “Grouping by” column needs to be configured as Type: “Relationship” and “Zone” needs to be picked as “Relationship”.

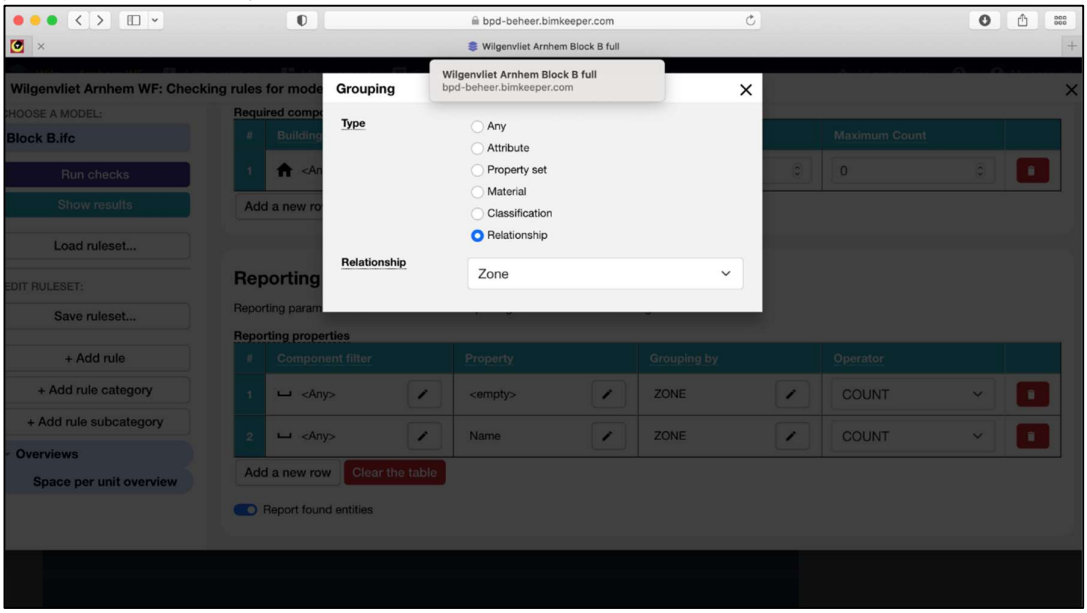

Figure 57: "Grouping by" column is configured as Type: "Relationship" with "Zone" indication

The “Operator” column needs to be configured as “List”.

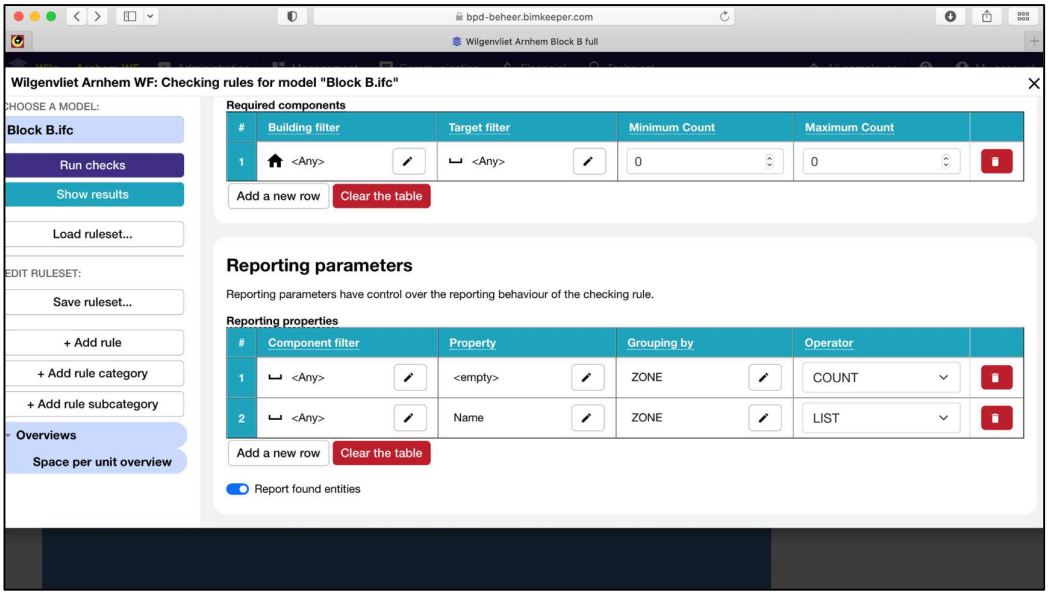

Figure 58: "Operator" column is configured as "List"

Next, the “space name” need to be added to the report. The “add a new row” button needs to be pressed below the table, and configured as follows:

The “Component filter” column needs to be configured to accept any “IfcSpace”.

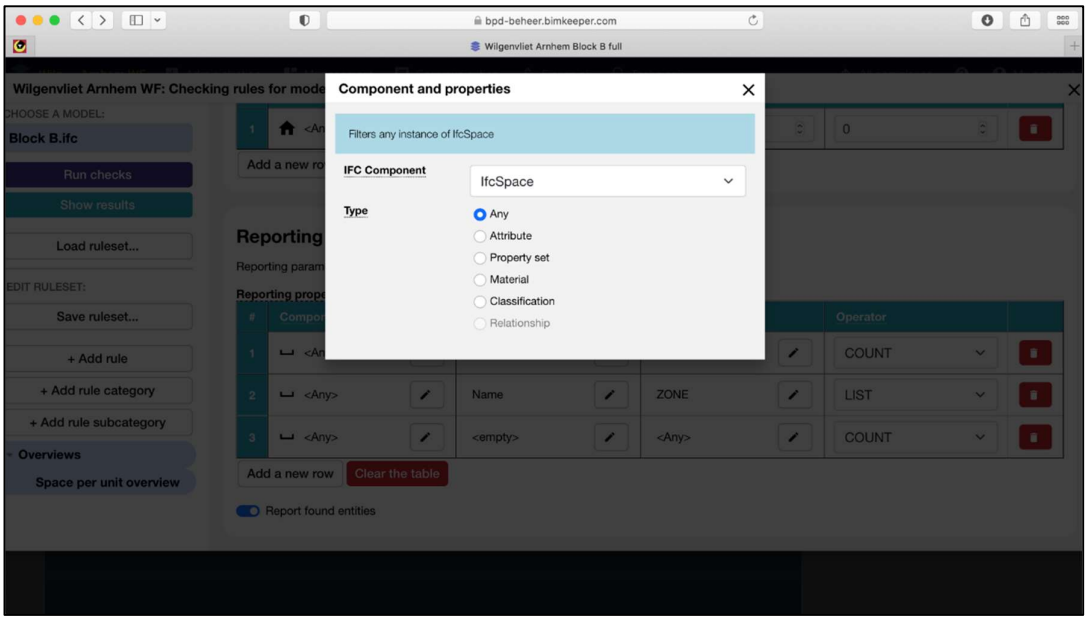

Figure 59: The new row is configured with spaces Type: "Any"

The “Property” column needs to be configured as Type: “Attribute” and “LongName” should be picked as Attribute.

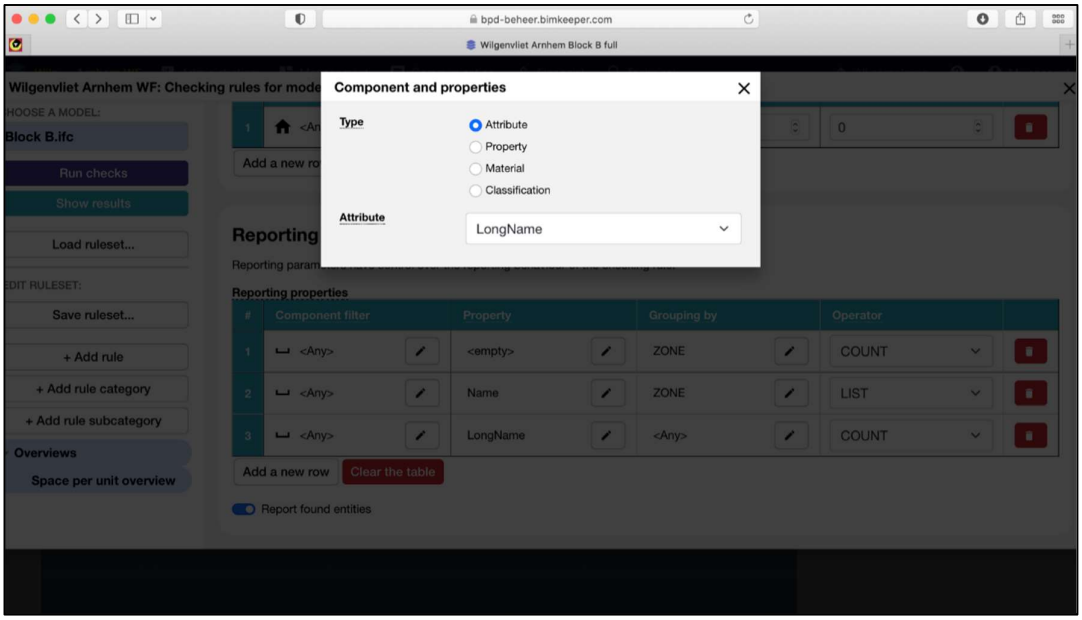

Figure 60: "Property" column is configured as Type: "Attribute" with “LongName" indication

The “Grouping by” column needs to be configured as Type: “Relationship” and “Zone” needs to be picked as Relationship.

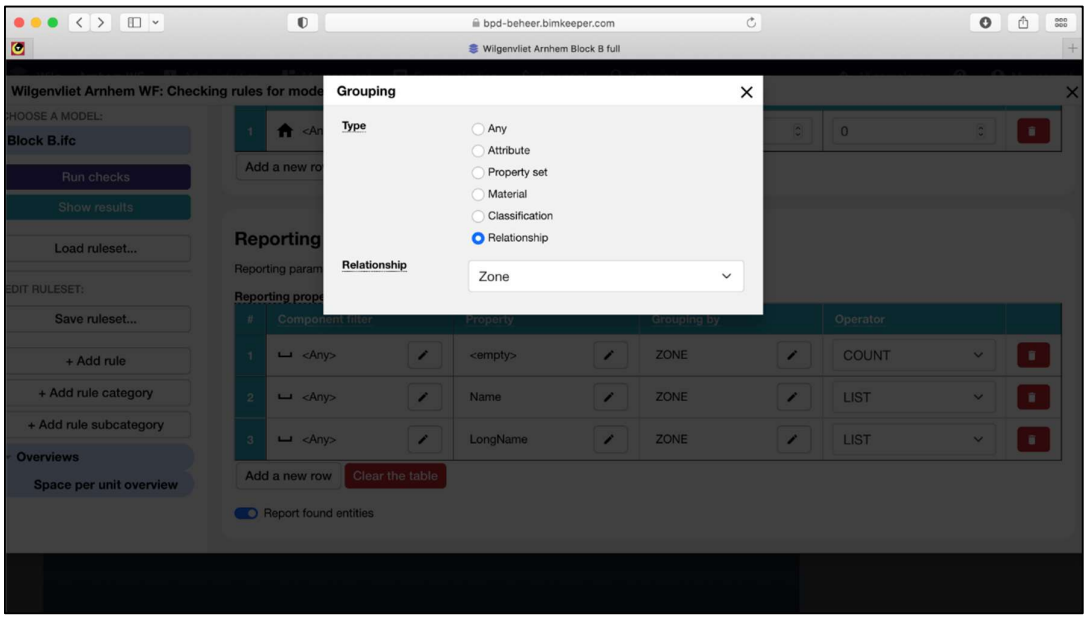

Figure 61: "Grouping by" column configured as Type: "Relationship" with "Zone" indication

The “Operator” column needs to be configured as “List”.

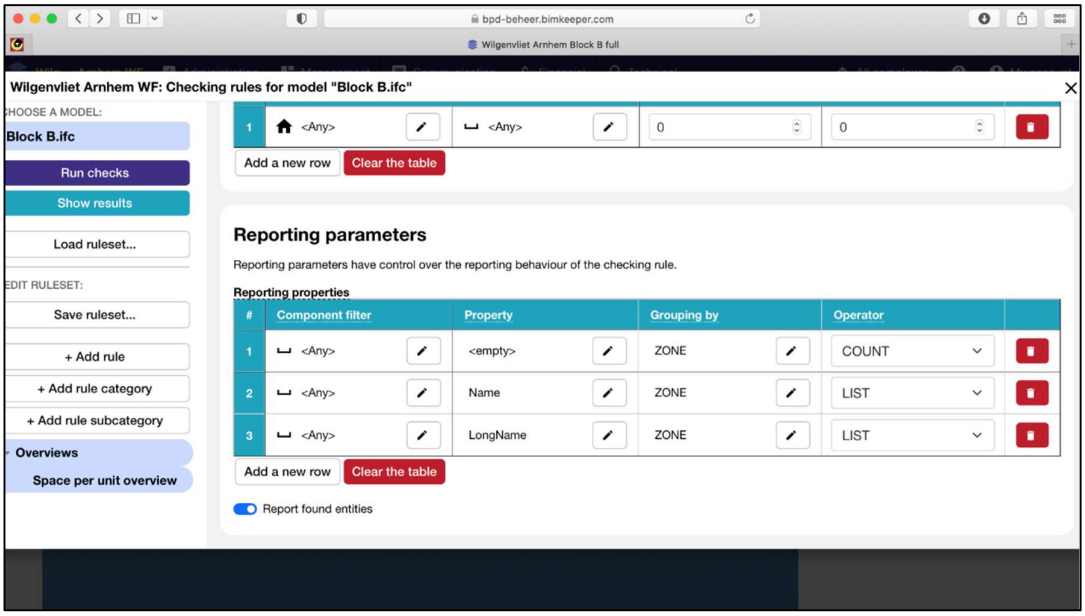

Figure 62: "Operator" column configured as "List"

The checks need to be run again.

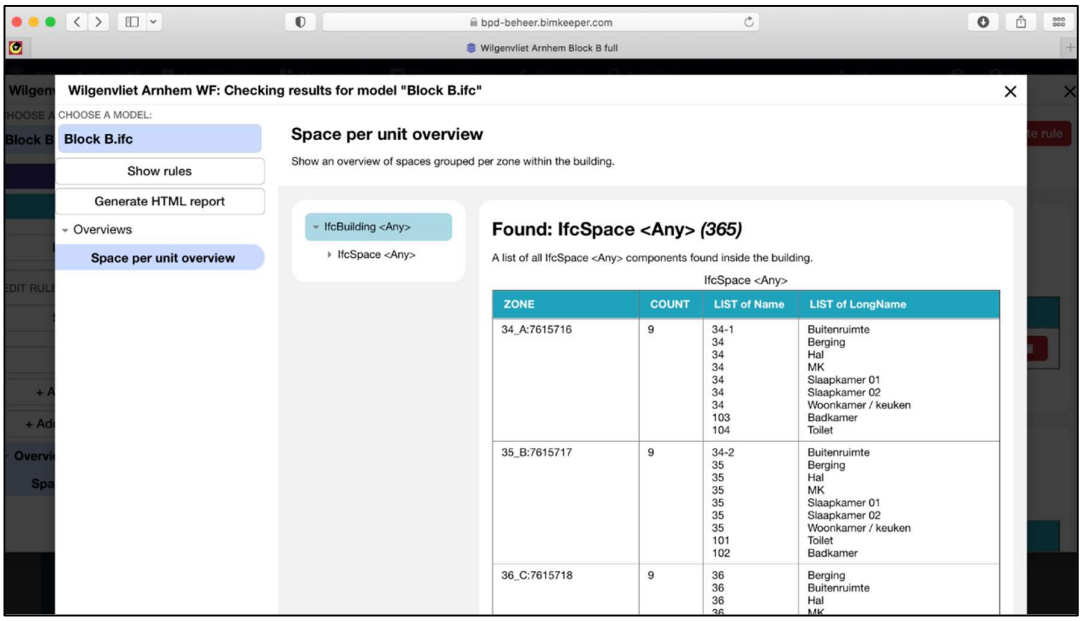

Figure 63: The checks are run again

Now there is an overview of spaces per zone. The reporting properties can be configured to show any property of the space. The floor area per space, and a sum of the total space floor area per zone can be shown as well. According to the Employer's Information Requirements (EIR) of the model used in this manual, the area of a space is in the "Area" property of the "Dimensions" property set within an "IfcSpace".

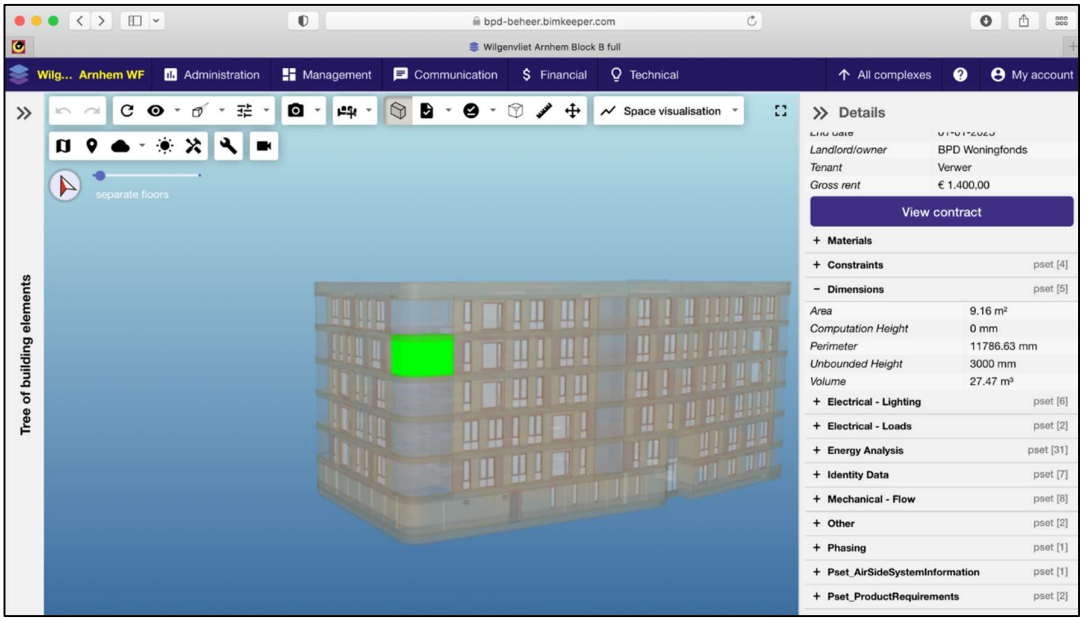

Figure 64: The "Dimensions" property set of the IfcSpace

To list the area per space, click the "add a new row" button, and configure it as follows: Configure the "Component filter" column to accept any space.

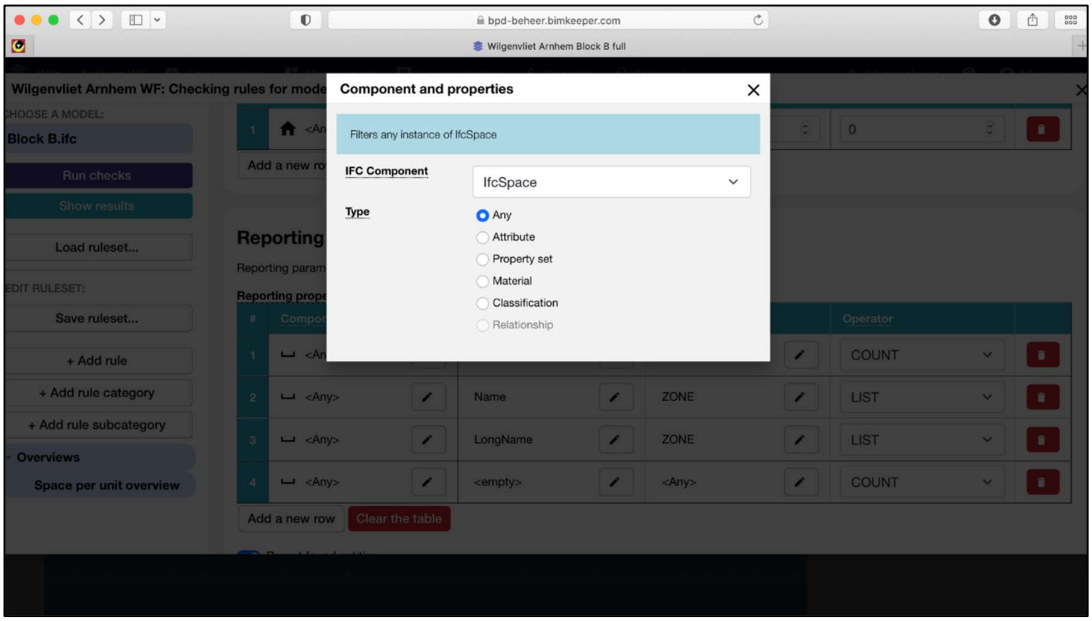

Figure 65: "Component filter" column is configured to accept any space

The “Property” column needs to be configured as Type: “Property” with Property set name: “Dimensions” and Property name: “Area”.

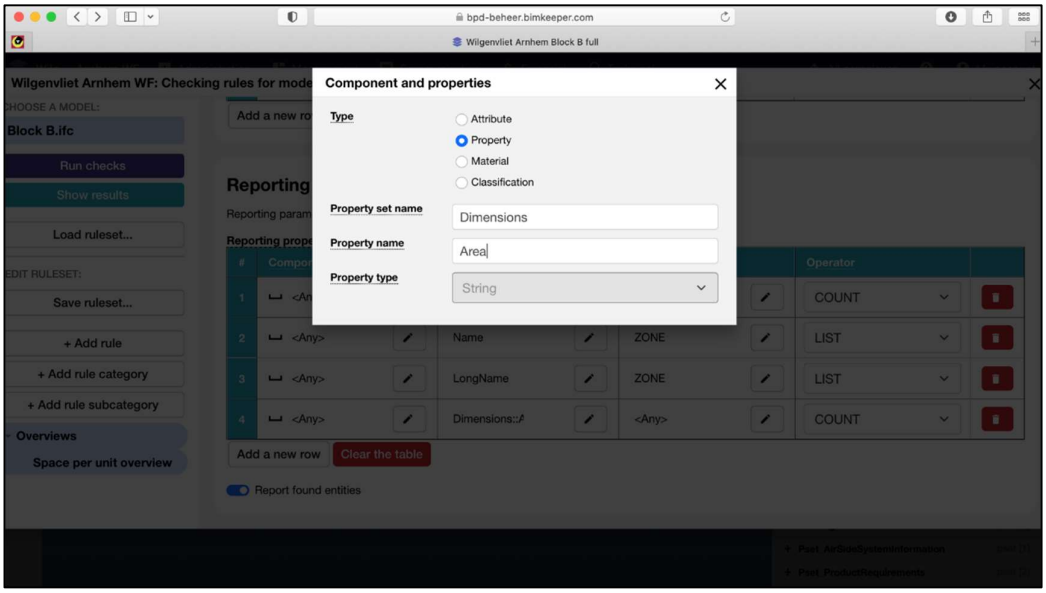

Figure 66: "Property" column is configured with Type: "Property" with a set name "Dimensions" and property name: "Area"

The “Grouping by” column needs to be configured as Type: “Relationship” and “Zone” needs to be picked as Relationship.

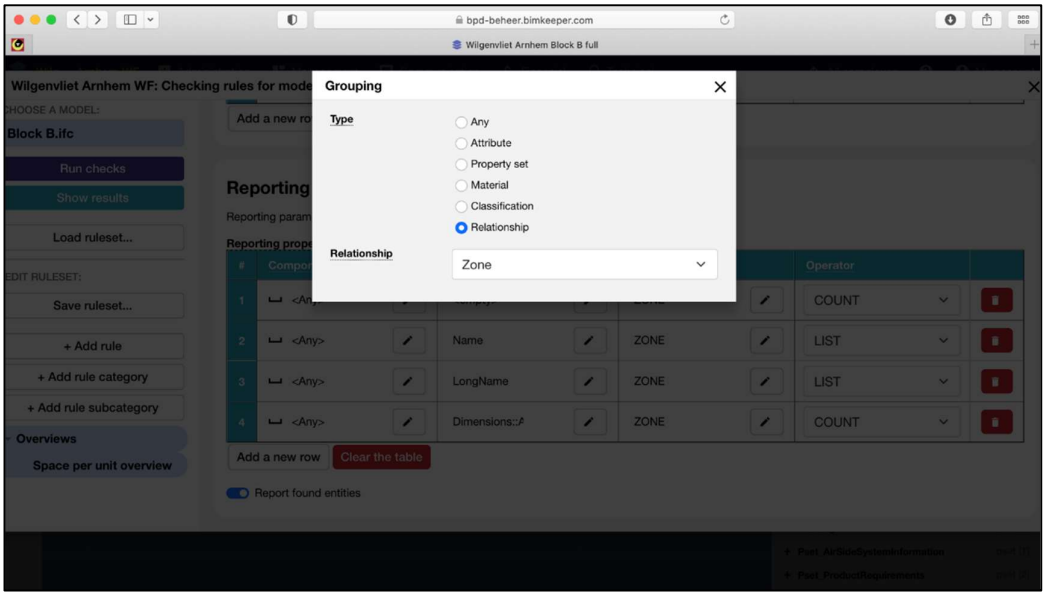

Figure 67: "Grouping by" column configured as Type: "Relationship" with "Zone" indication

The “Operator” column needs to be configured as “List”.

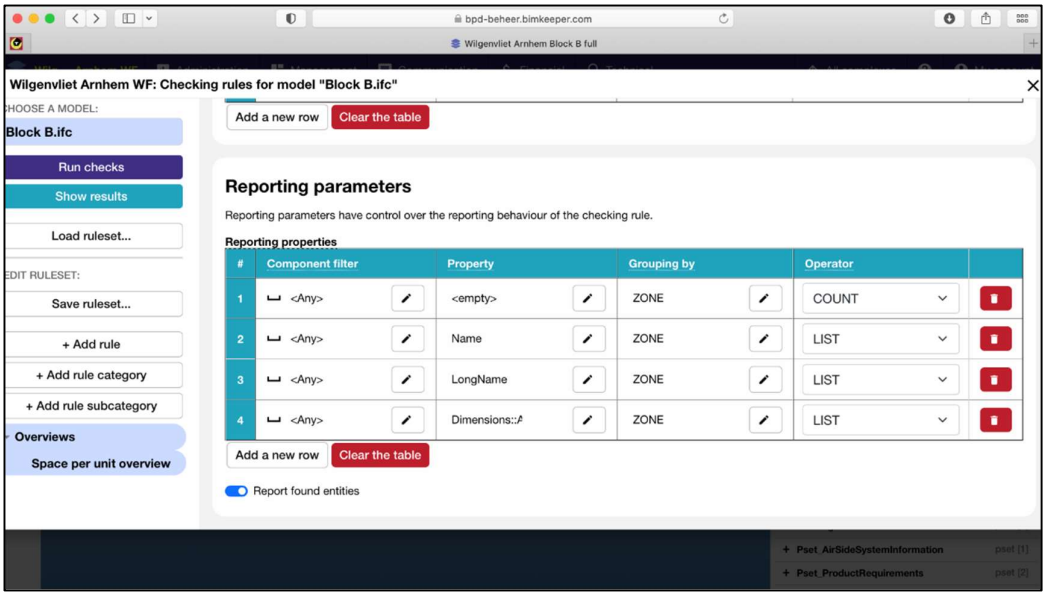

Figure 68: "Operator" column configured as "List"

To show the sum of space areas per zone, the “add a new row” button needs to be pressed and the new row needs to be configured as follows:
The “Component filter” column needs to be configured to accept any IfcSpace.

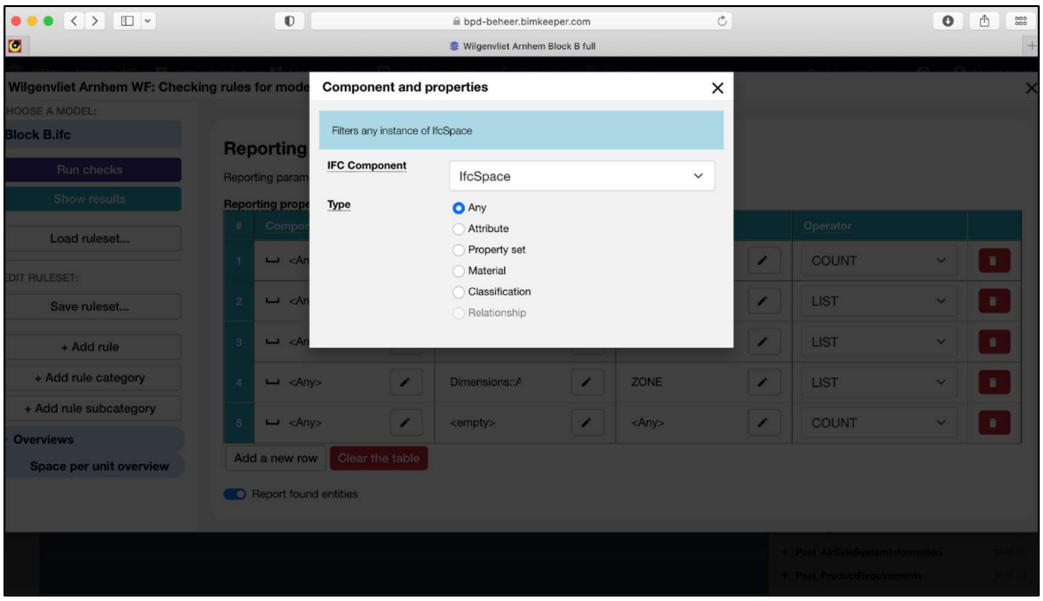

Figure 69: "Component filter" is configured to accept any ifcSpace

The “Property” column needs to be configured as Type: “Property” with Property set name: “Dimensions” and Property name: “Area”.

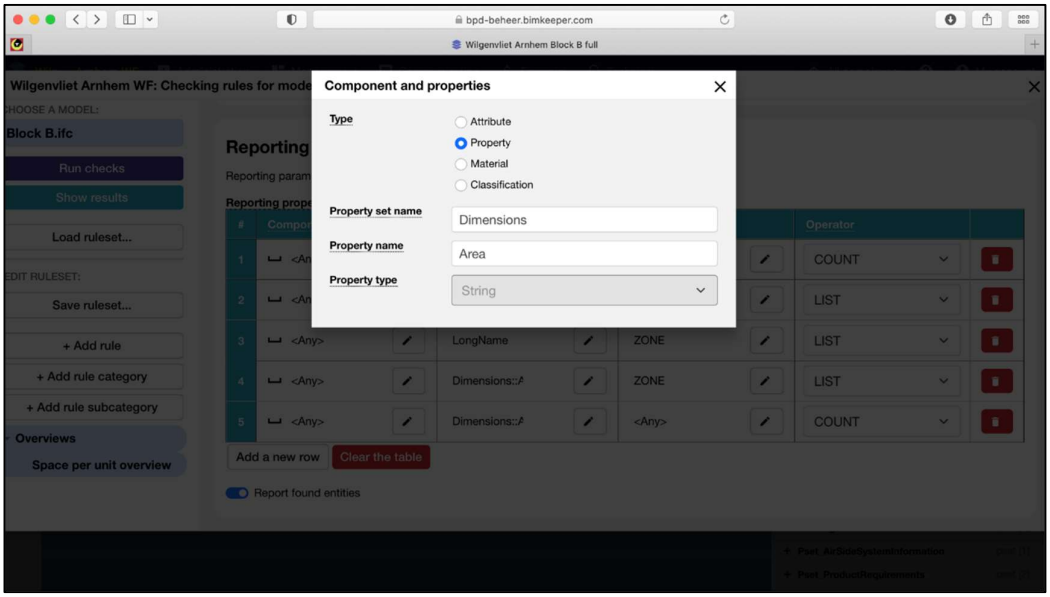

Figure 70: "Property" column is configured with Type: "Property" with a set name "Dimensions" and property name: "Area"

The “Grouping by” column needs to be configured as Type: “Relationship” and “Zone” needs to be picked as Relationship

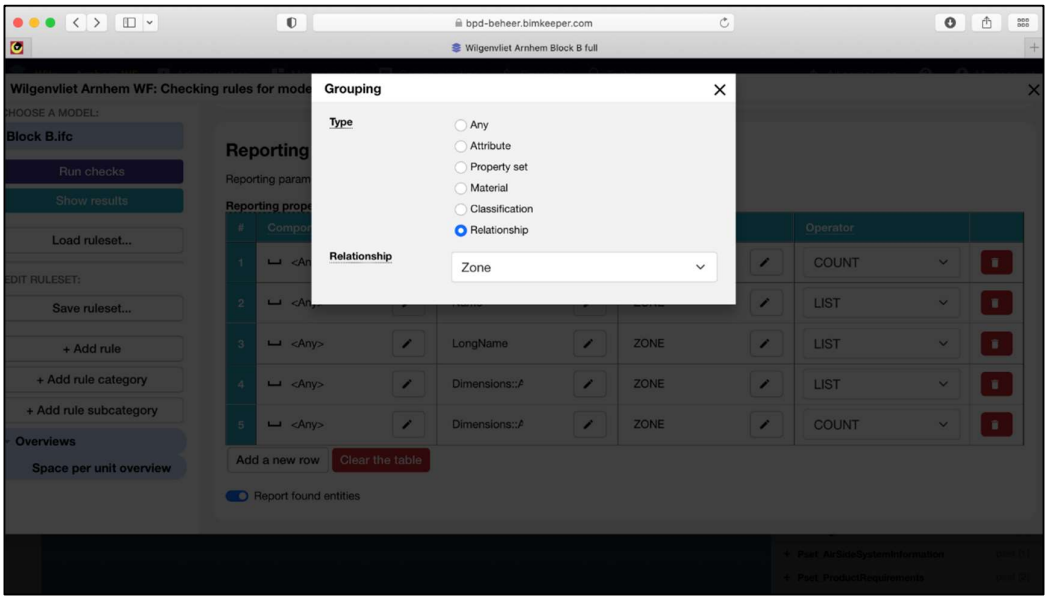

Figure 71: "Grouping by" column configured as Type: "Relationship" with "Zone" indication

The “Operator” column needs to be configured as “Sum”.

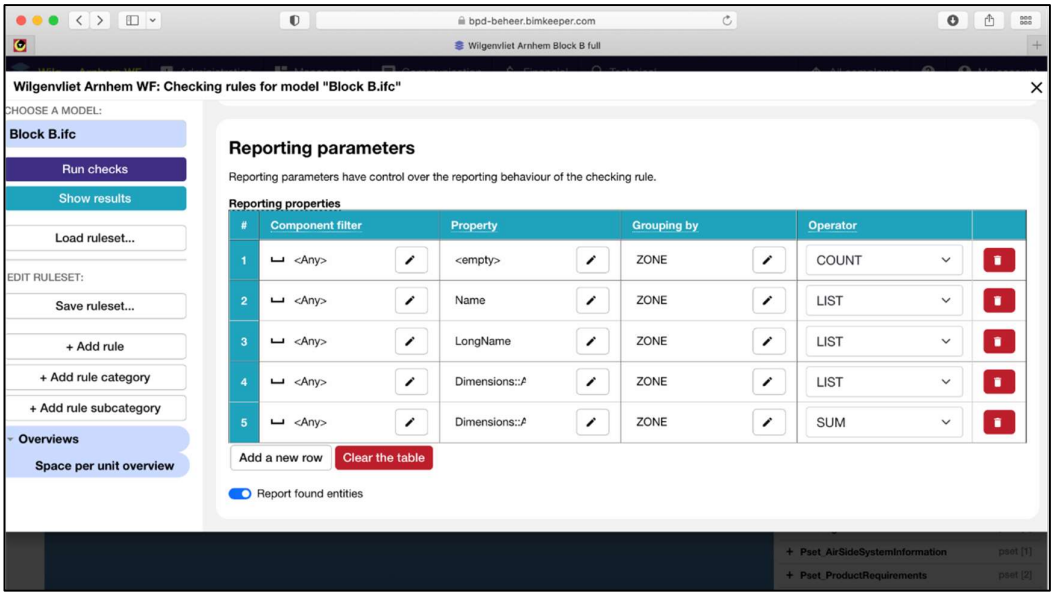

Figure 72: "Operator" column configured as "Sum”

The checks are run again to get an overview with the area dimensions.

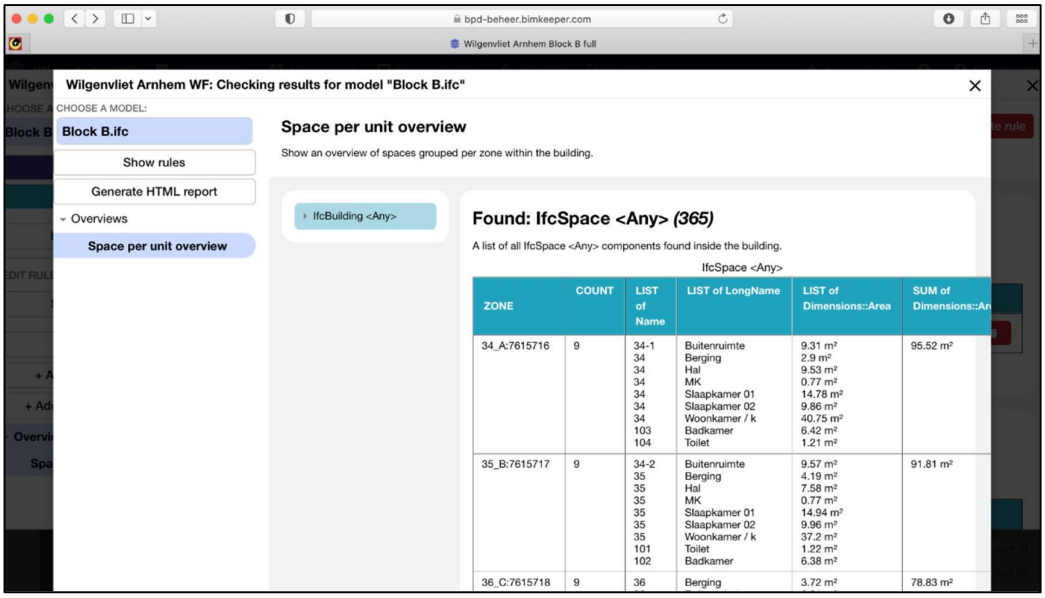

Figure 73: The checks are run again

3.3. External Walls Are Marked As External

If the NL/SfB classification is used within the model and all walls classified with “21” will be checked, the property should be set to: “*Pset_WallCommon.IsExternal = true”.*

The model that needs to be checked must be opened and afterwards the “checking configuration” needs to be opened.

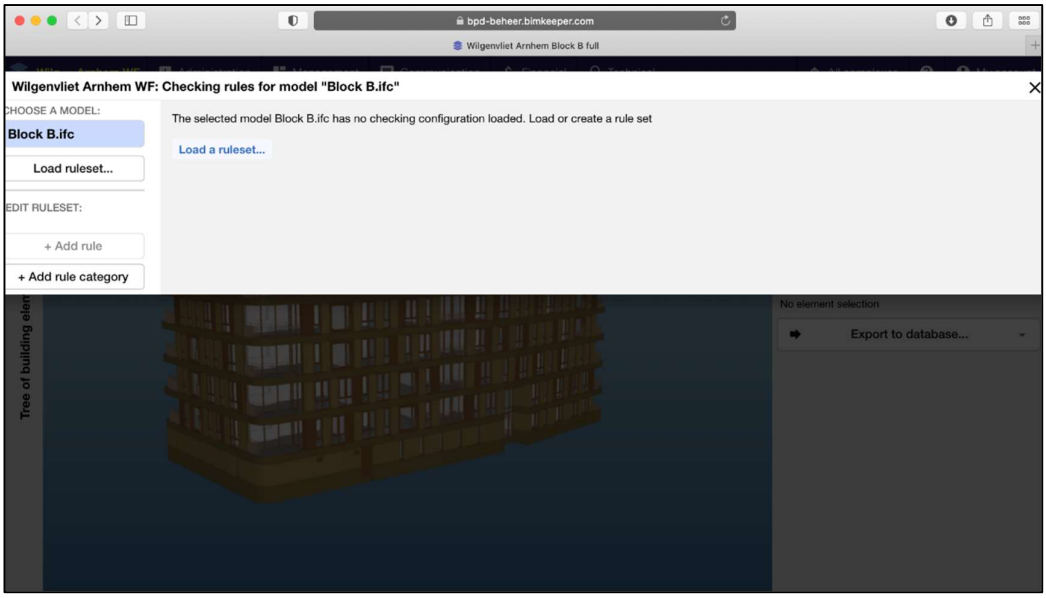

Figure 74: The "checking configuration" of the model is opened

The “Add a rule category” button needs to be pressed to add a new category. For this scenario the category is named: “*External Wall Requirements”*.

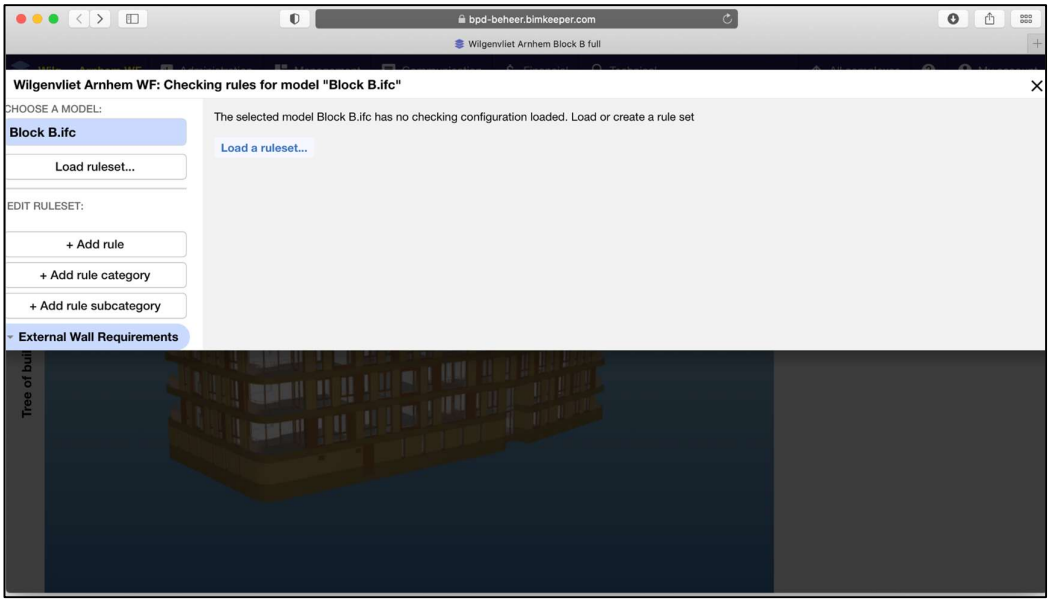

Figure 75: The category "External Wall Requirements" is added to the checking

The “External Wall Requirements” category needs to be pressed, and the “Add rule” button needs to be pressed afterwards.

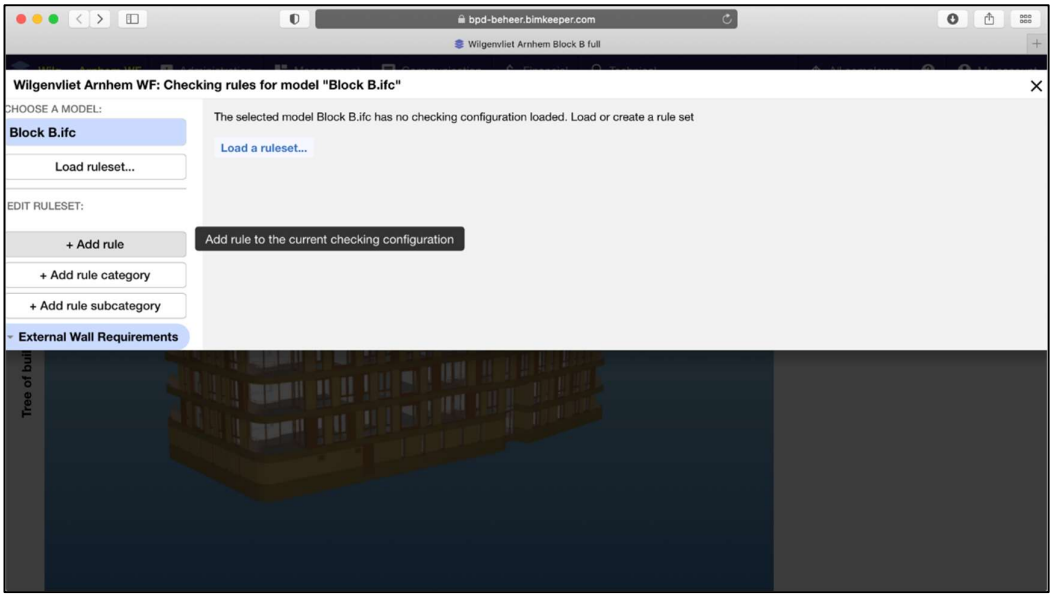

Figure 76: The "External Wall Requirements" category is selected, and a new rule is added

The “Required Property Sets” rule needs to be selected.

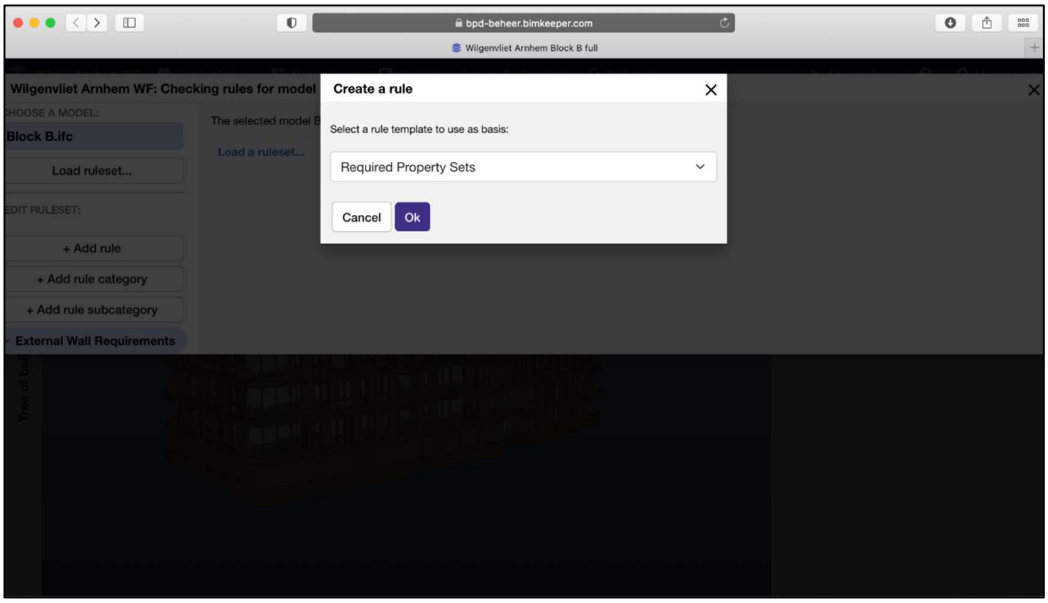

Figure 77: The "Required Property Sets" rule is selected

A new “Property sets” rule is added to the “Control parameters”.

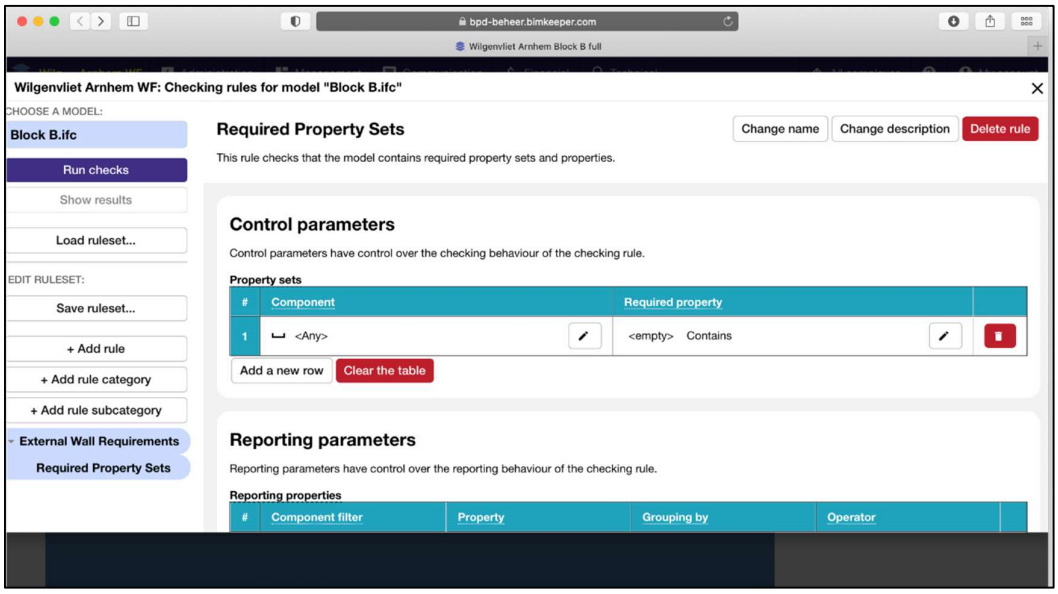

Figure 78: "Property sets" rule is added to "Control parameters"

The “Component” column needs to be configured as IFC Component “IfcWall”, type “Classification”, operator “Starts With” and target value “21”. This looks for IfcWall elements with the classification that starts with 21.

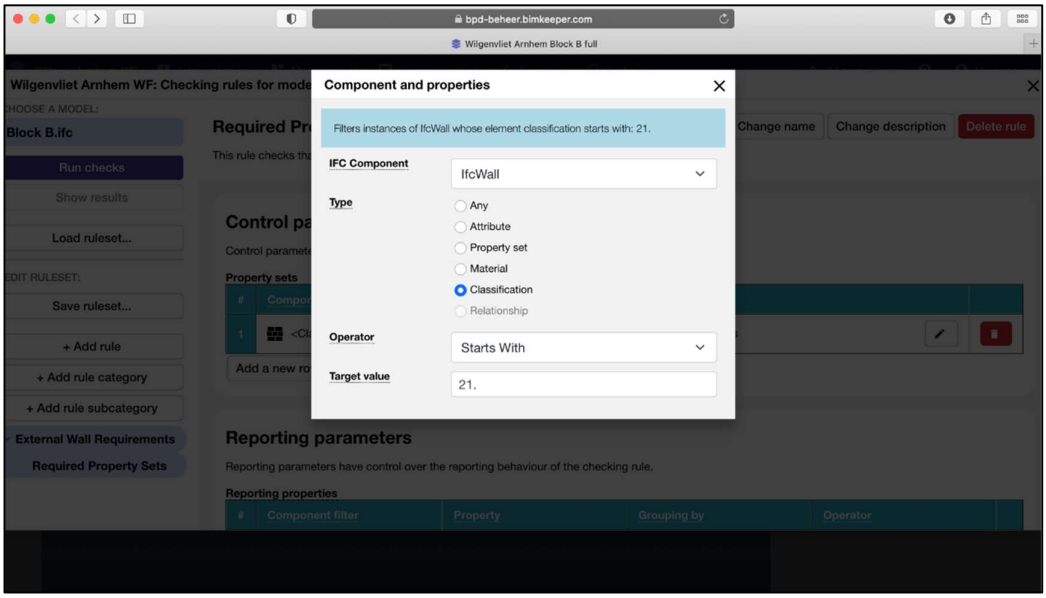

Figure 79: "Component" column is configured

The “property” column needs to be configured as type “Property”, property set name as “Pset_WallCommon”, property name as “IsExternal”, property type “Boolean”, operator as “Equals” and set the target value to “True”.

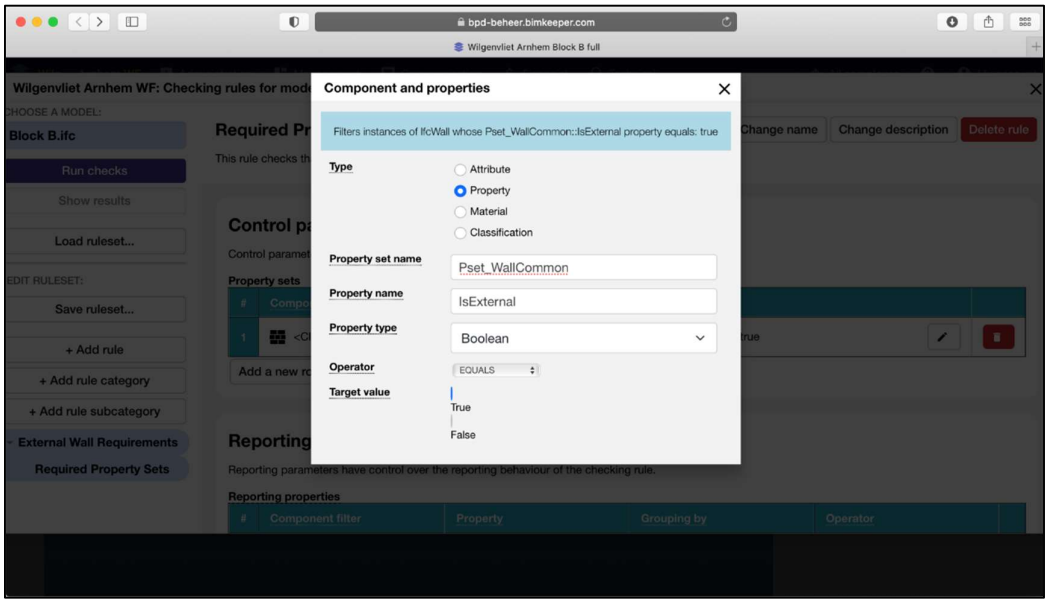

Figure 80: "Property" column is configured

When the checks are run, it reports there are 1521 walls found with the classification 21. In this model, all those walls have the Pset_WallCommon.IsExternal = true property.

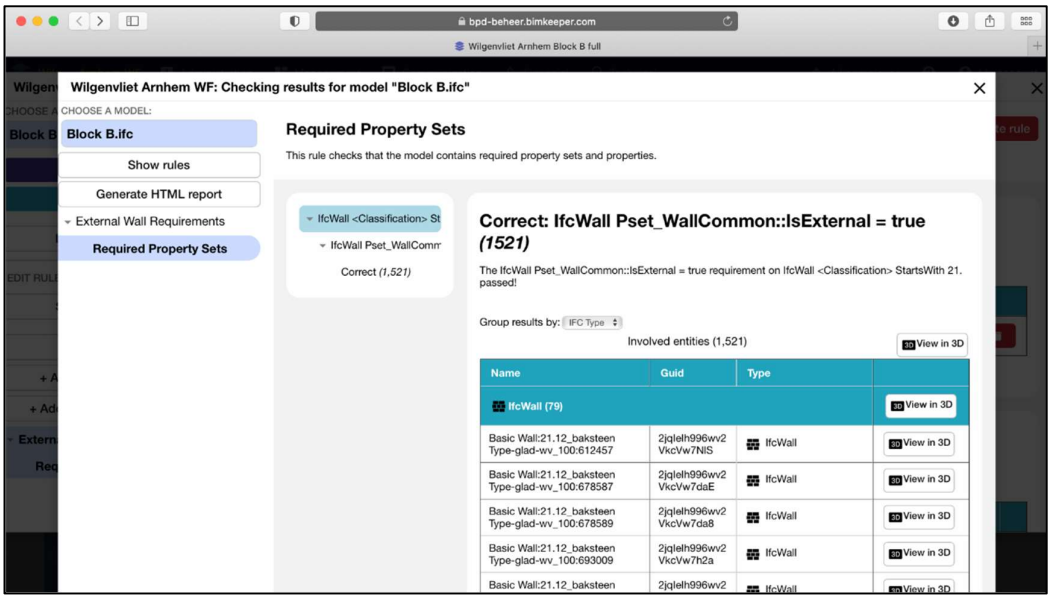

Figure 81: Checks on the walls are performed. The number of walls with classification 21 are shown

4 Checking rules

4.1. Components per Building

The “Components per building” checking rule checks for the presence of the selected target components within the building.

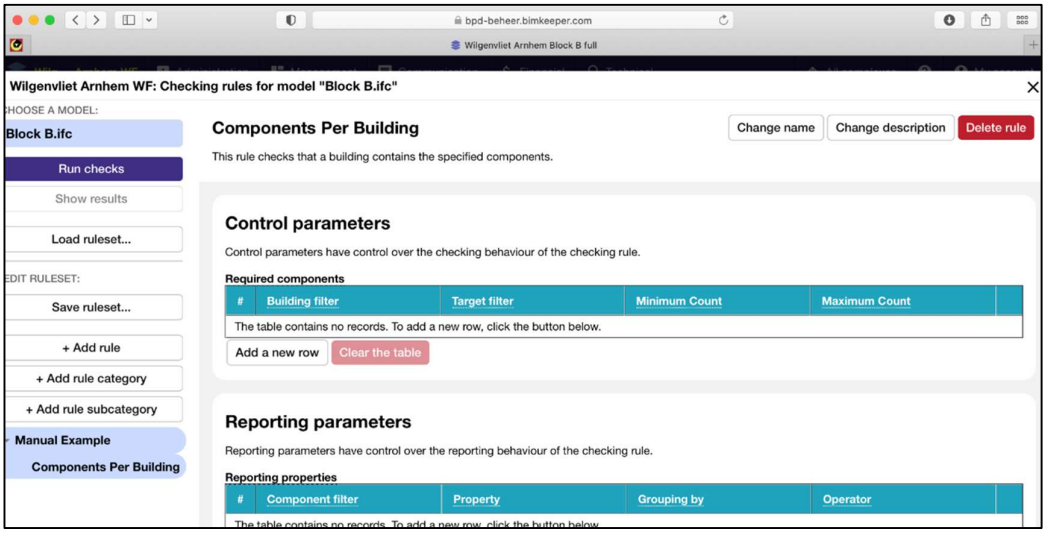

Figure 82: “Components per Building” overview

4.1.1. Control parameters

Required components

The “Components per Building” check has a “Required components” control parameter. This is used to search for target filters within the building filter, which include an optional minimum and maximum count.

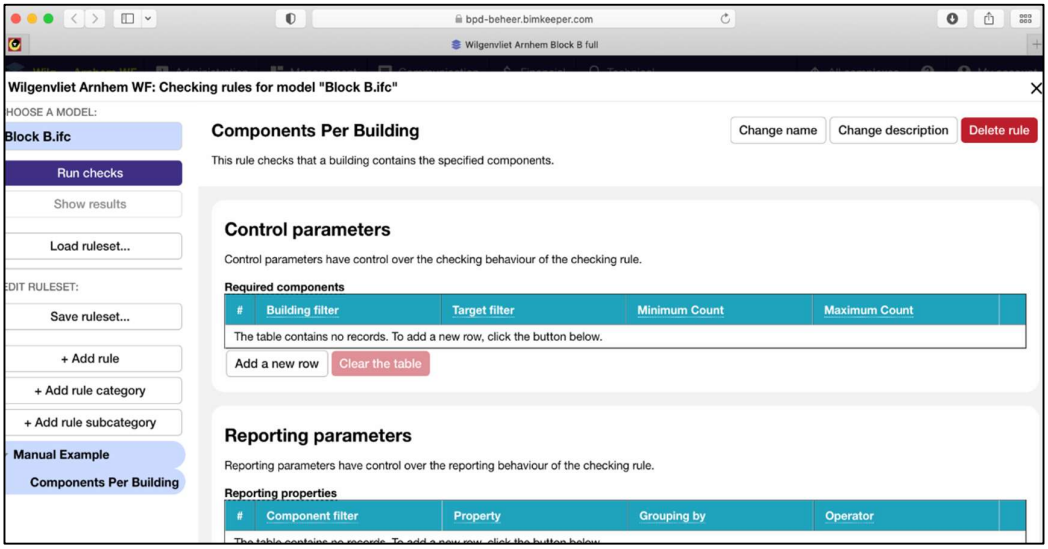

Figure 83: “Required components” table under “Control parameters”

Building filter

This filter is used for searching specific instances within the configured building.

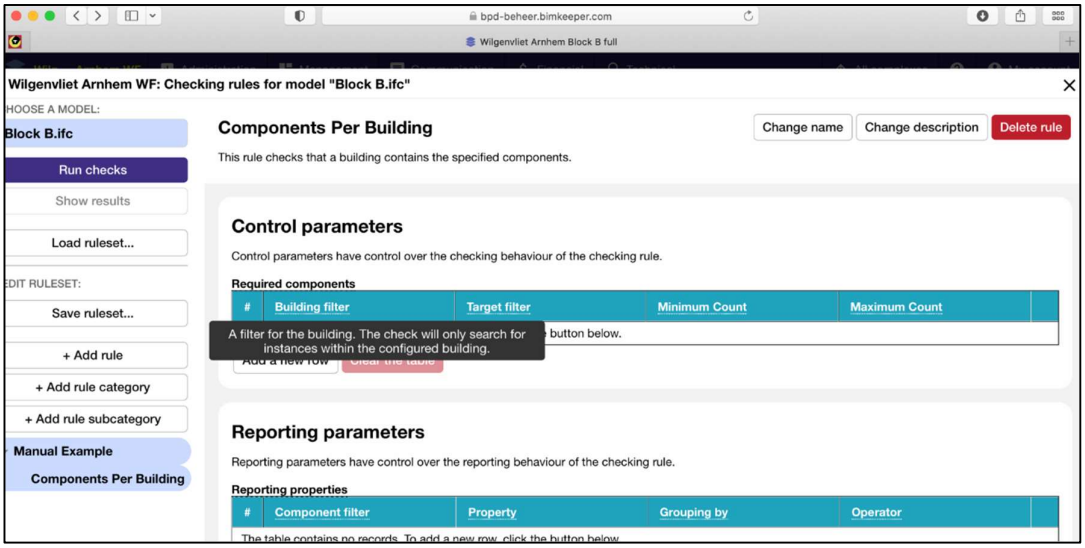

Figure 84: Description when hovering over the "Building filter" field name

Target filter

This filter is used for searching instances based on the specified target. Any IFC component or attribute can be used for filtering.

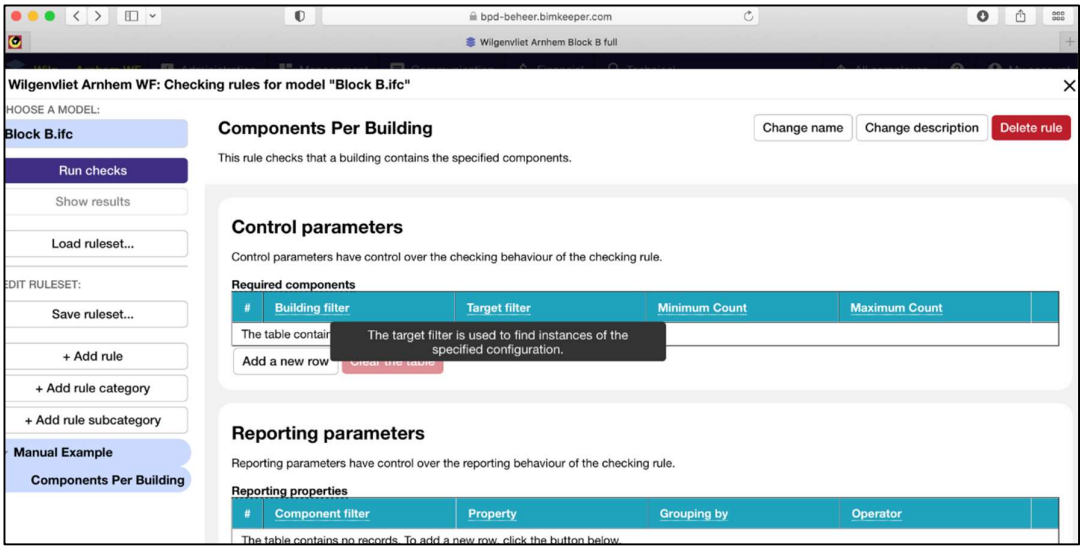

Figure 85: Description when hovering over the "Target filter" field name

Minimum count

The “Minimum count” value is optional and ignored when set to zero. If there are fewer components found, the check will report it as an issue.

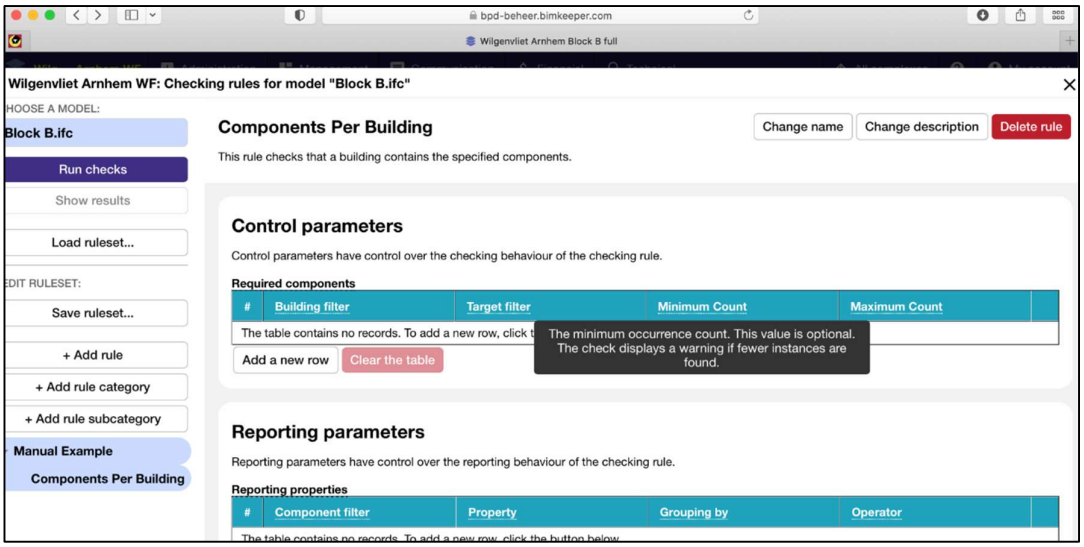

Figure 86: Description when hovering over the "Minimum count" field name

Maximum count

The “Maximum count” value is optional and ignored when set to zero. If there are more components found, the check will report it as an issue.

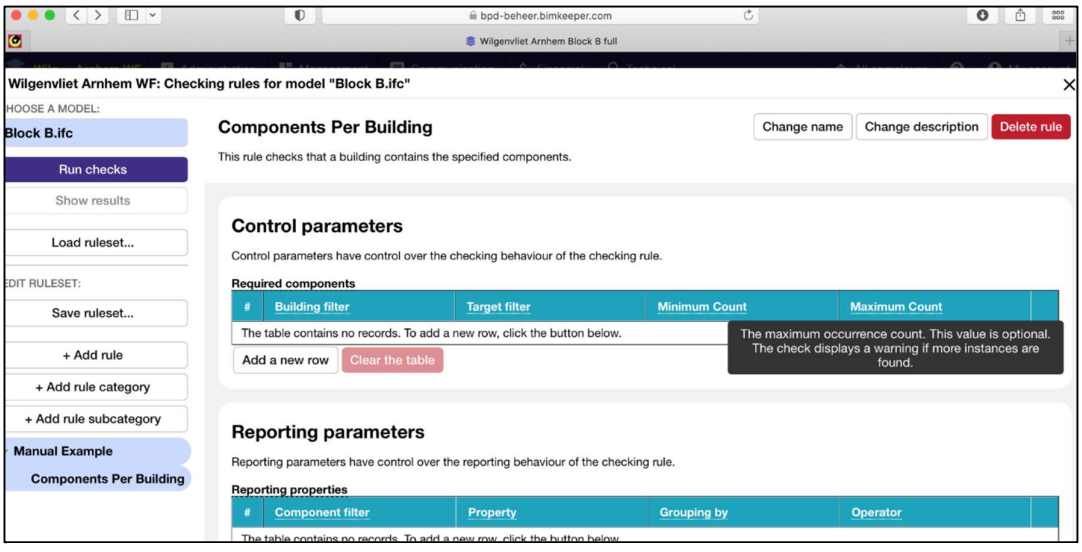

Figure 87:Description when hovering over the “Maximum count” field name

4.1.2. Reporting parameters

Reporting properties

The “Components per Building” check has a “Reporting properties” parameter. This is used to add extra properties to the report.

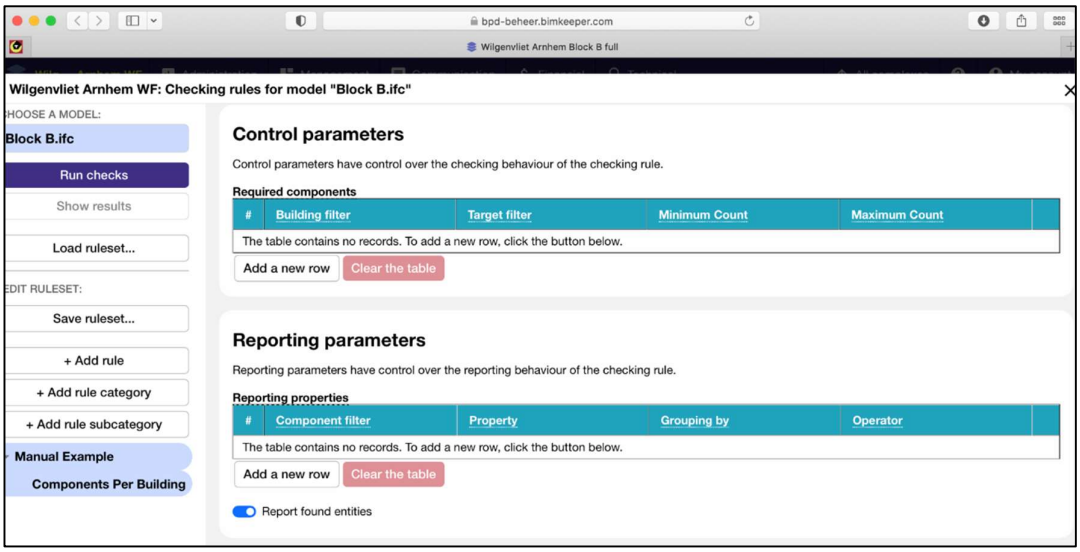

Figure 88:“Reporting properties” table under “Reporting parameters”

Report found entities

The “Report found entities” parameter is used to indicate whether to report entities that are found. Turning this property off will not list any components that are found, but will only show when the components are not found in the model, or when the minimum and/or maximum count of the “Required components” control parameter is exceeded.

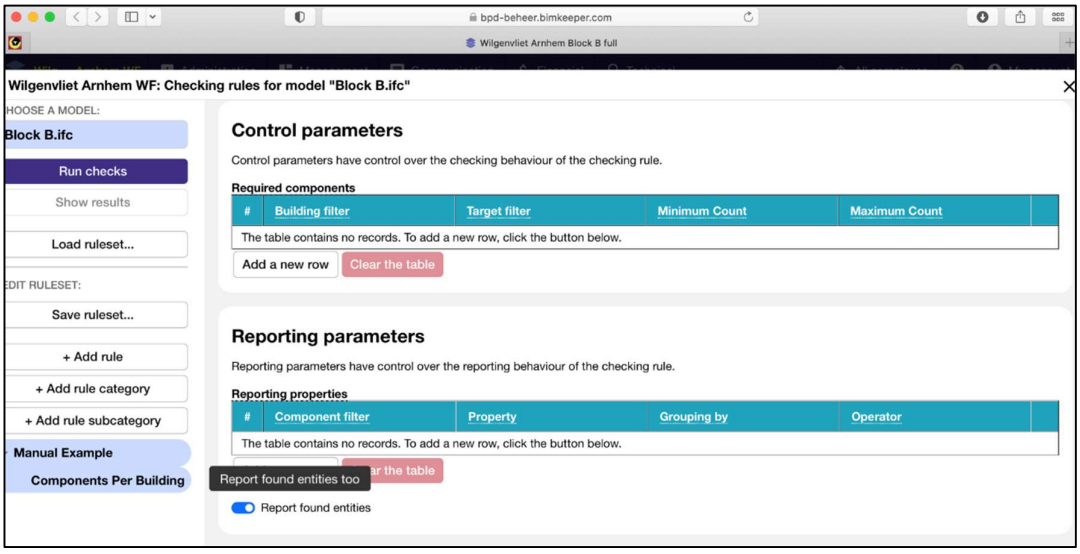

Figure 89: Description when hovering over the "Report found entities" button

4.2. Components per Floor

The “Components per Floor” checking rule checks for the presence of the selected target components within a specific floor of the building.

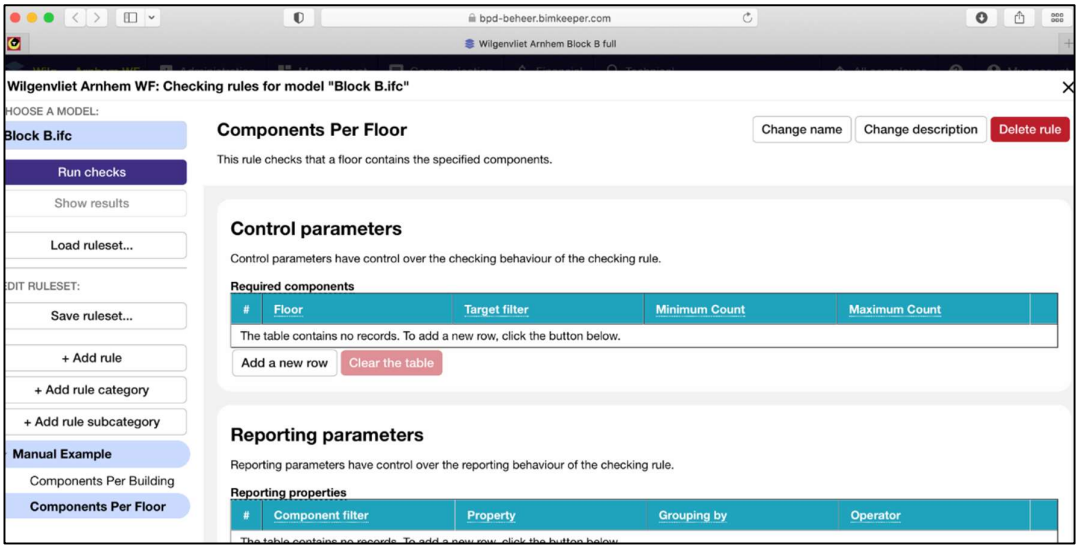

Figure 90: "Components per Floor" overview

4.2.1. Control parameters

Floor filter

This filter is used for searching instances within the specified floor.

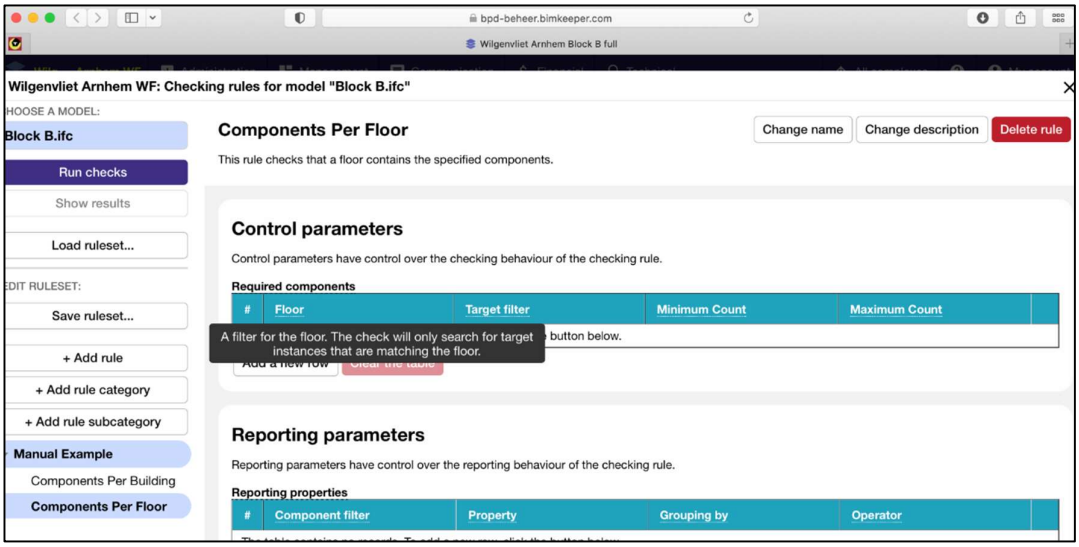

Figure 91: Description when hovering over the “Floor filter” field name

Target filter

The “Target filter” is used in a similar way to how it is described in chapter 4.1.1.

Minimum count and maximum count

The “Minimum count” and “Maximum count” values are used in a similar way to how they are described in chapter 4.1.1.

4.3. Components per Zone

The “Components per Zone” checking rule checks for the presence of the selected target components within a zone.

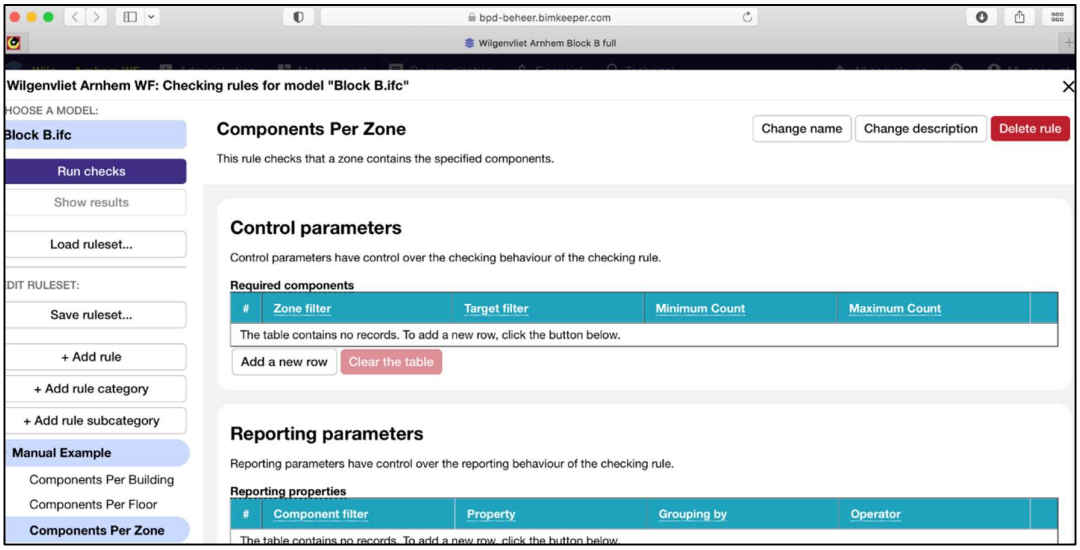

Figure 92: "Components per Zone" overview

4.3.1. Control parameters

Required components

Zone filter

This filter is used for searching instances within the specified zone.

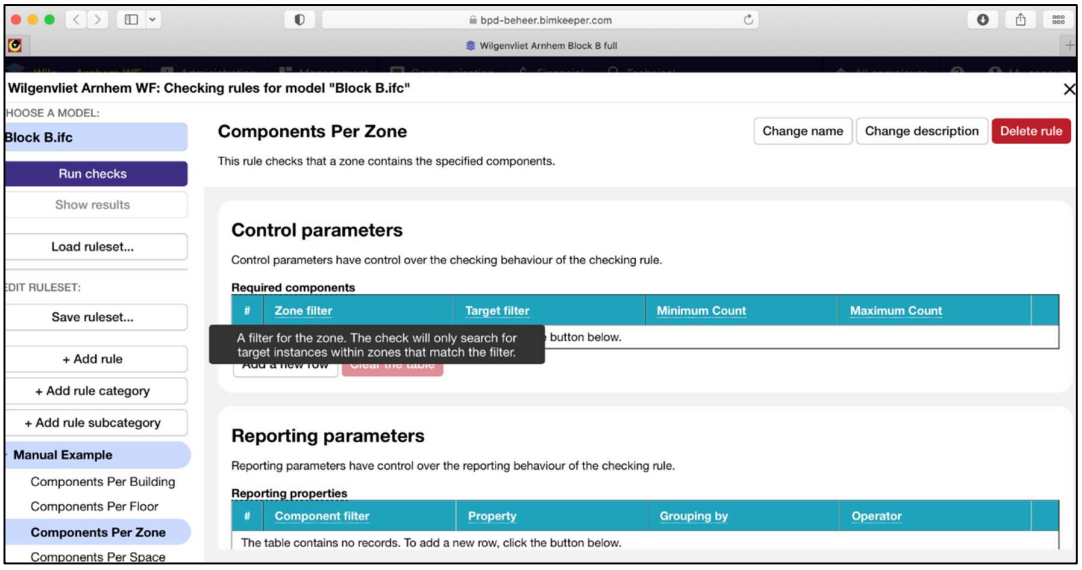

Figure 93: Description when hovering over the “Zone filter” field name

Target filter

The “Target filter” is used in a similar way to how it is described in chapter 4.1.1.

Minimum count and maximum count

The “Minimum count” and “Maximum count” values are used in a similar way to how they are described in chapter 4.1.1.

4.4. Components per Space

The “Components per Space” checking rule checks for the presence of the selected target components within a space.

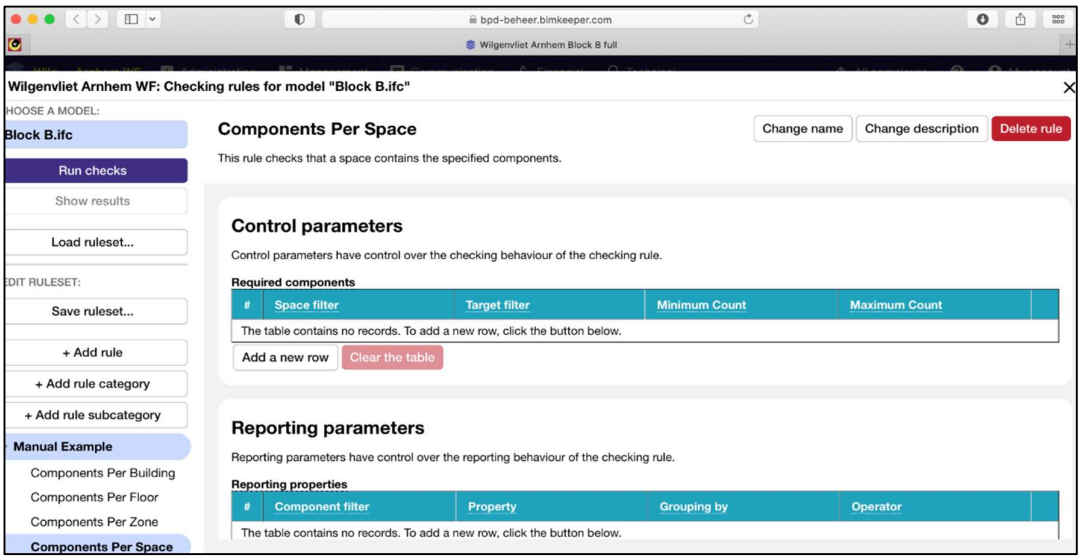

Figure 94: “Components per Space” overview

4.4.1. Control parameters

Required components

Space filter

This filter is used for searching instances within the specified space.

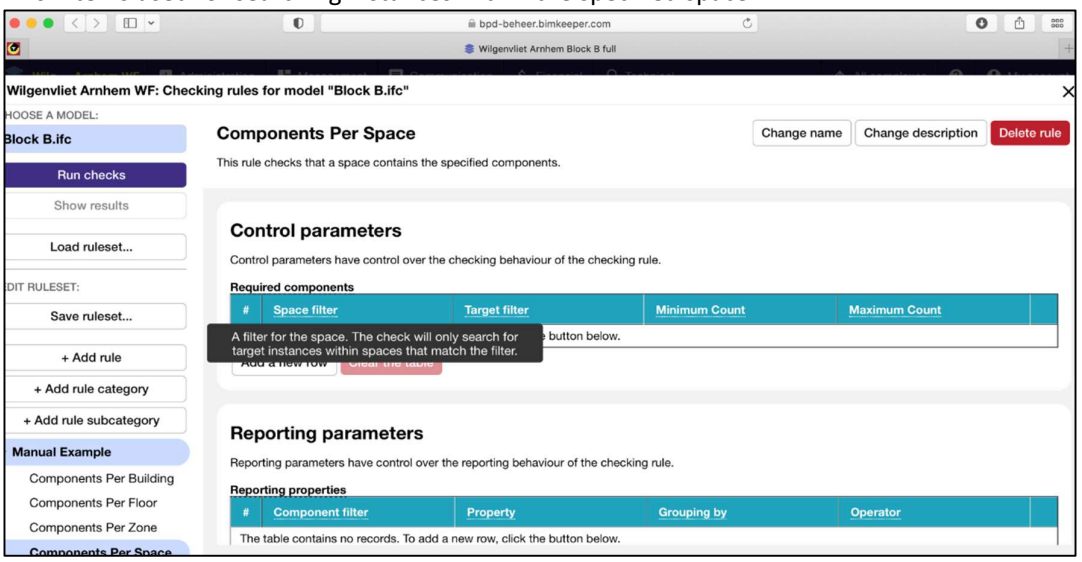

Figure 95: Description when hovering over the “Space filter” field name

Target filter

The “Target filter” is used in a similar way to how it is described in chapter 4.1.1.

Minimum count and maximum count

The “Minimum count” and “Maximum count” values are used in a similar way to how they are described in chapter 4.1.1.

4.5. Required Property Sets

The “Required Property Sets” check is used to check whether the selected component has the required property.

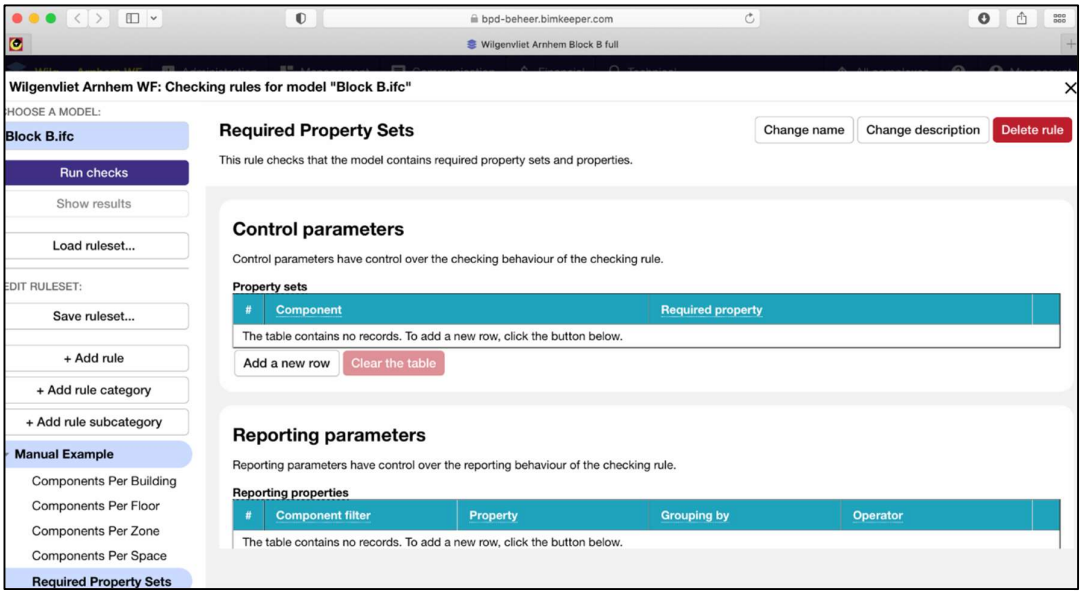

Figure 96: "Required Property Sets" overview

4.5.1. Control parameters

Property sets

The “Property sets” control parameters searches for the required properties within the selected components. For example, this can be used to check whether every IfcSpace has a name and number. Another example would be to see if every external wall has the property “Pset_WallCommon.IsExternal” set to a value of “true”.

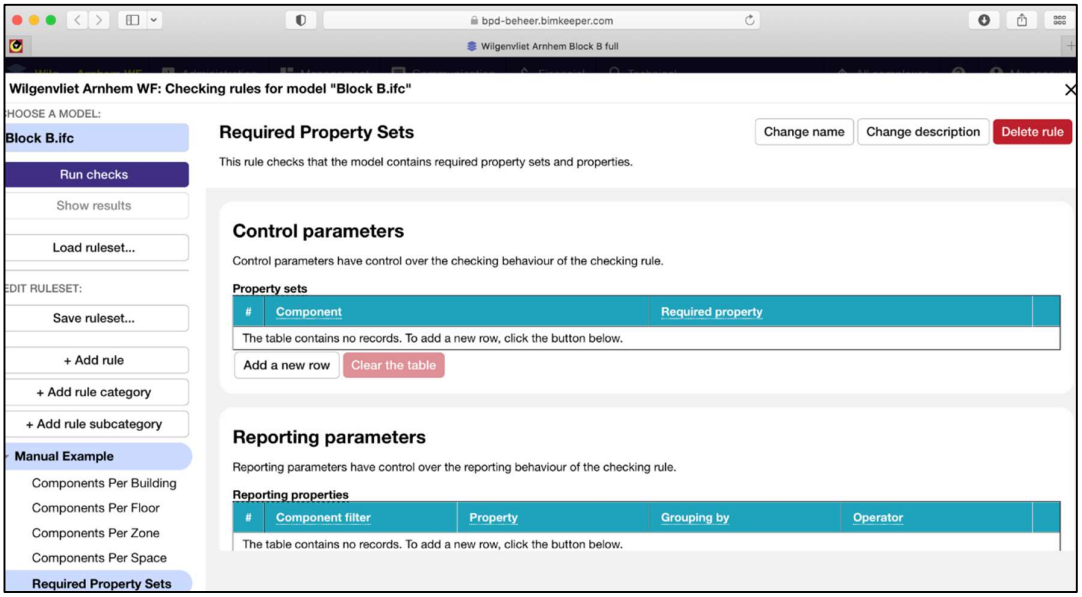

Figure 97: "Property sets" table under "Control parameters"

Component

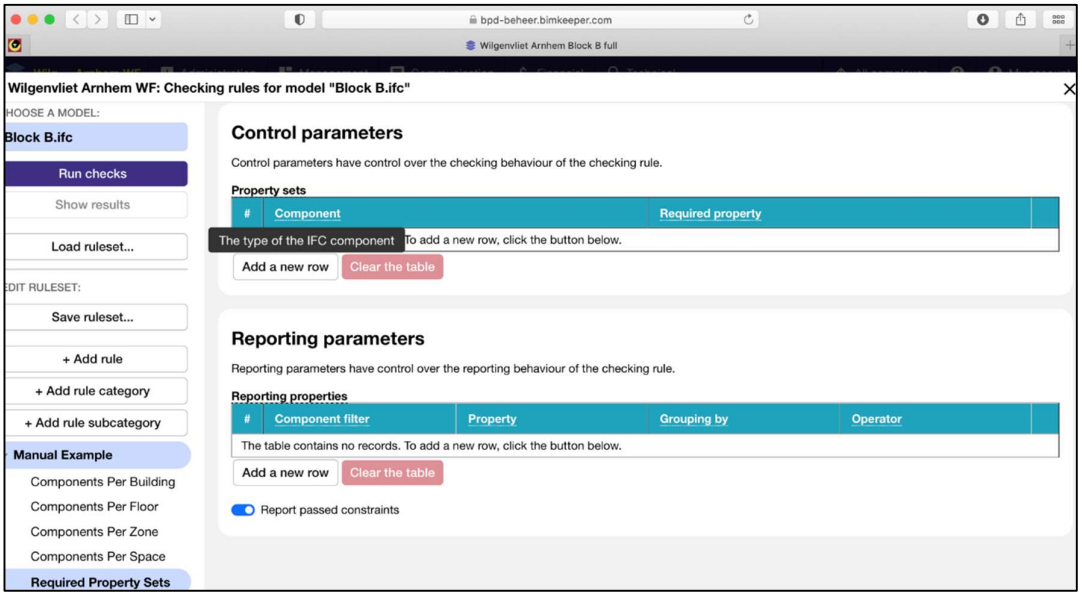

Figure 98: Description when hovering over the "Component" field name

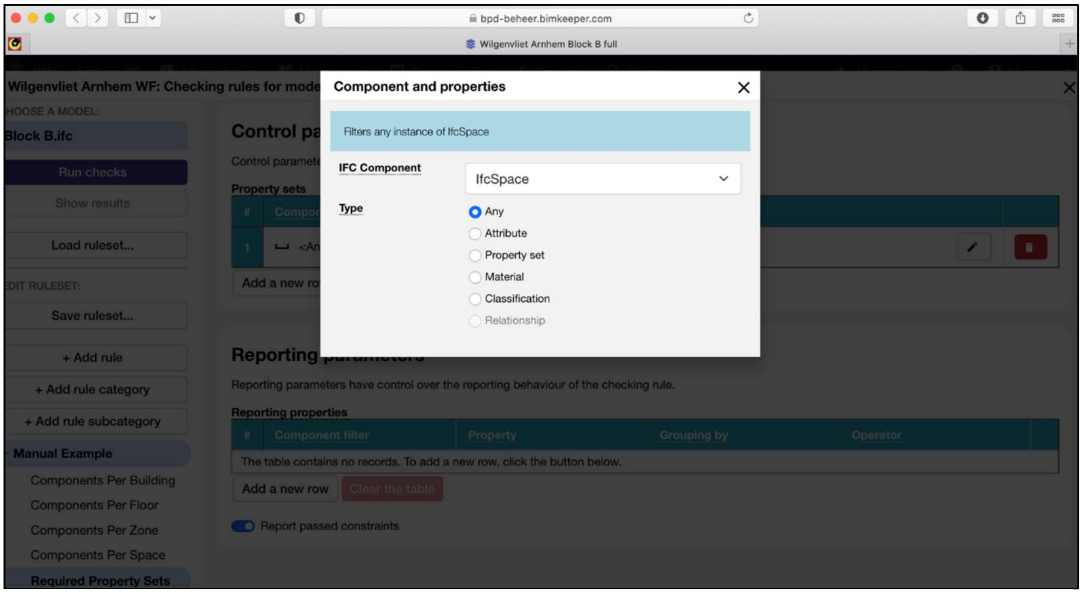

Figure 99: Menu for selecting the IFC-component type. Here, the filter type is set to "Any"

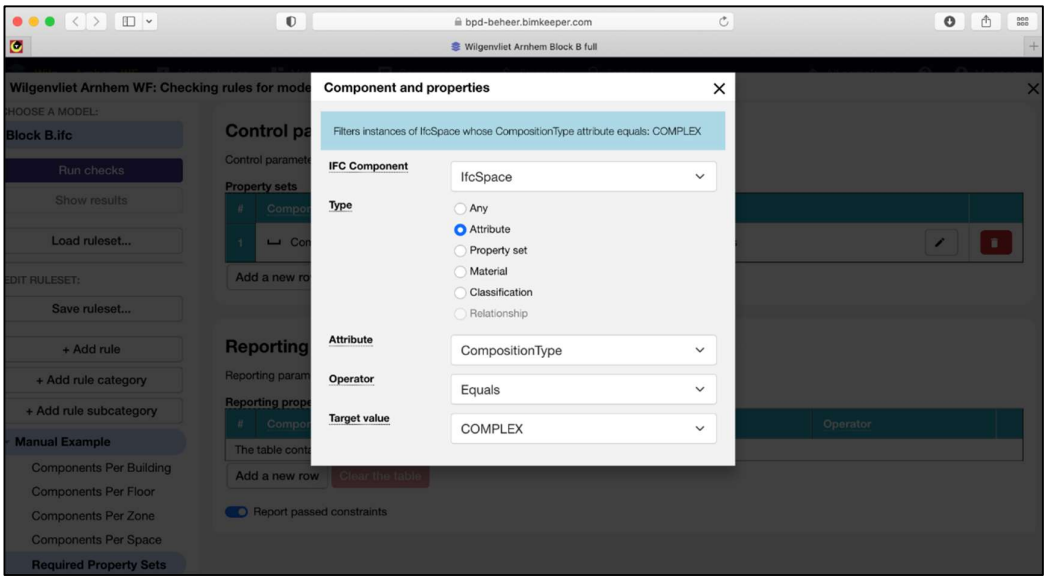

Figure 100: Menu for selecting the IFC-component type. Here, the filter type is set to "Attribute"

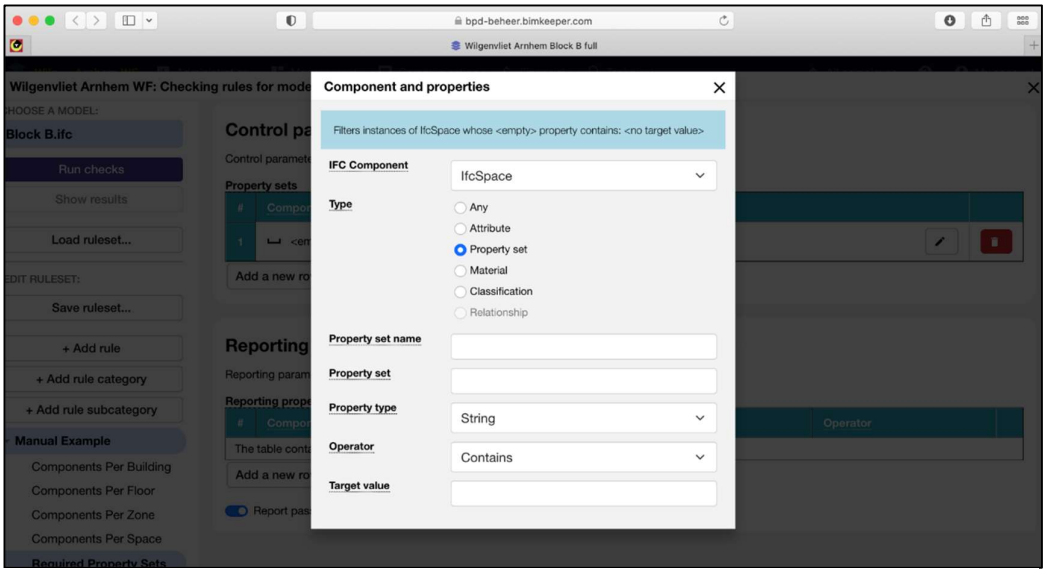

Figure 101: Menu for selecting the IFC-component type. Here, the filter type is set to "Property set"

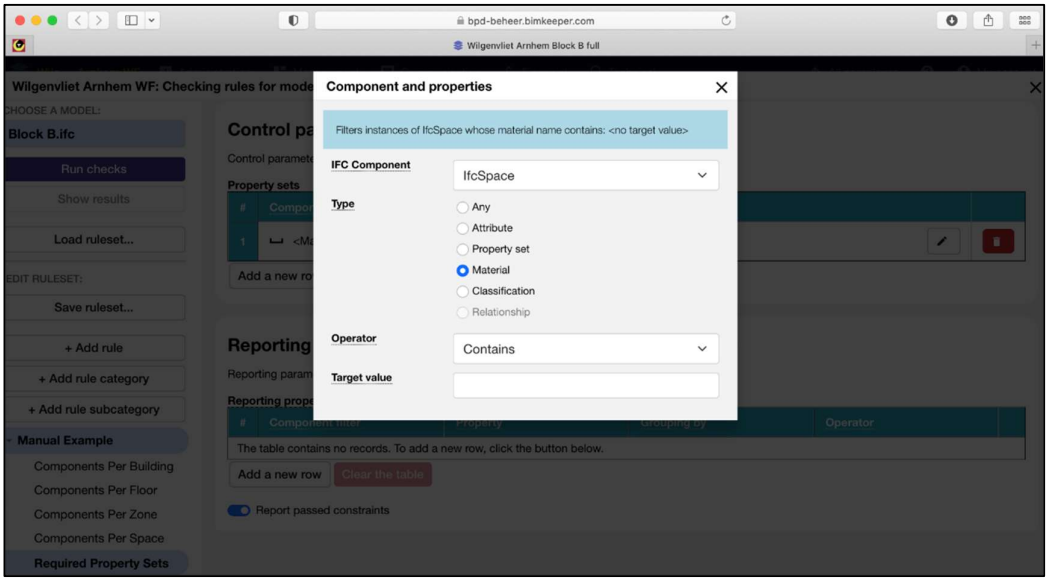

Figure 102: Menu for selecting the IFC-component type. Here, the filter type is set to "Material"

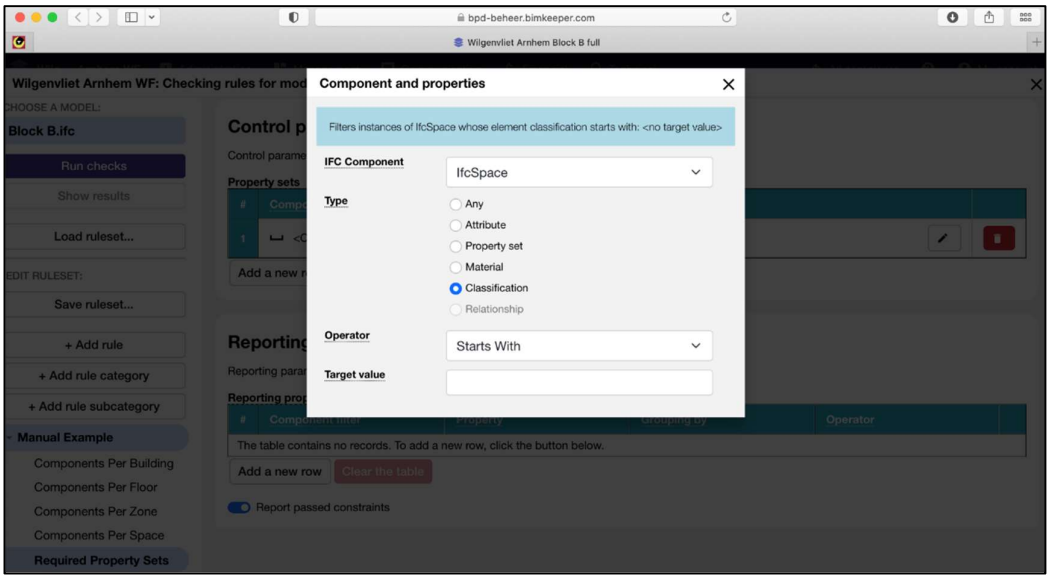

Figure 103: Menu for selecting the IFC-component type. Here, the filter type is set to "Classification"

Required property

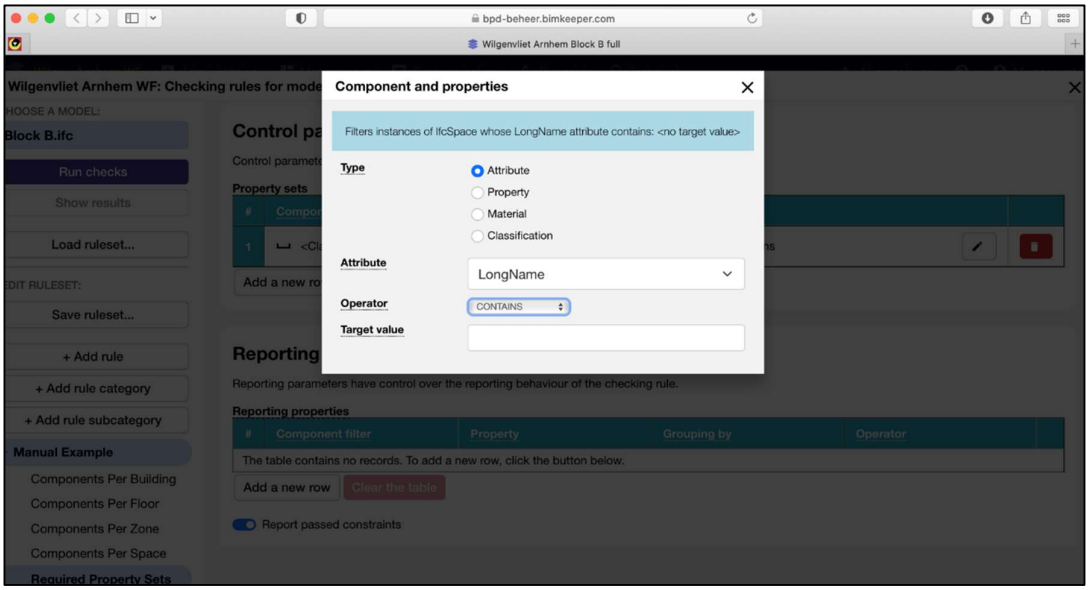

Figure 104: Menu for selecting the required property. Here, the filter type is set to "Attribute"

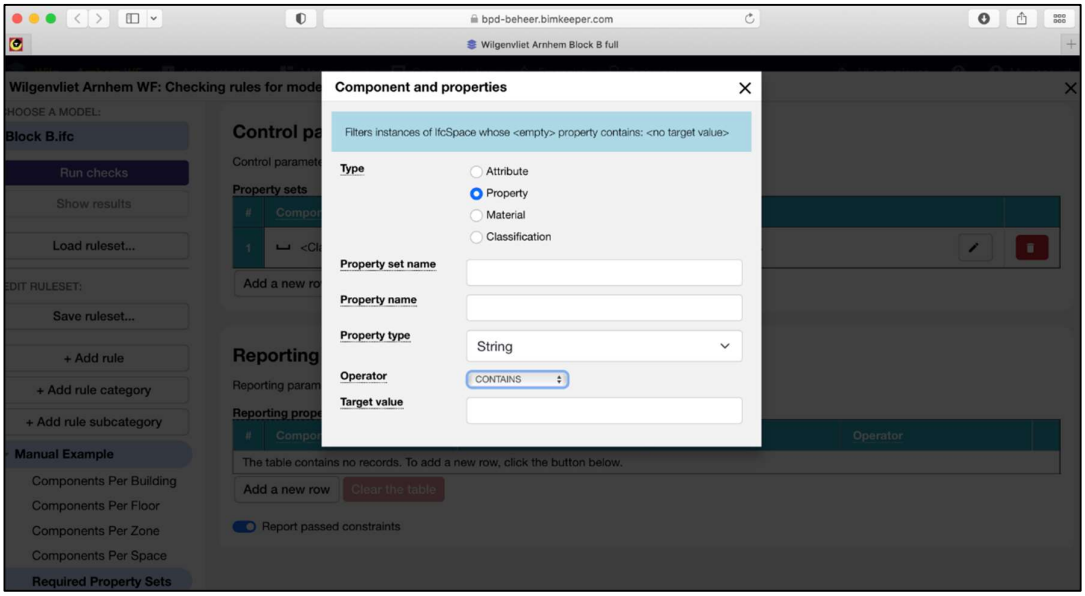

Figure 105: Menu for selecting the required property. Here, the filter type is set to "Property"

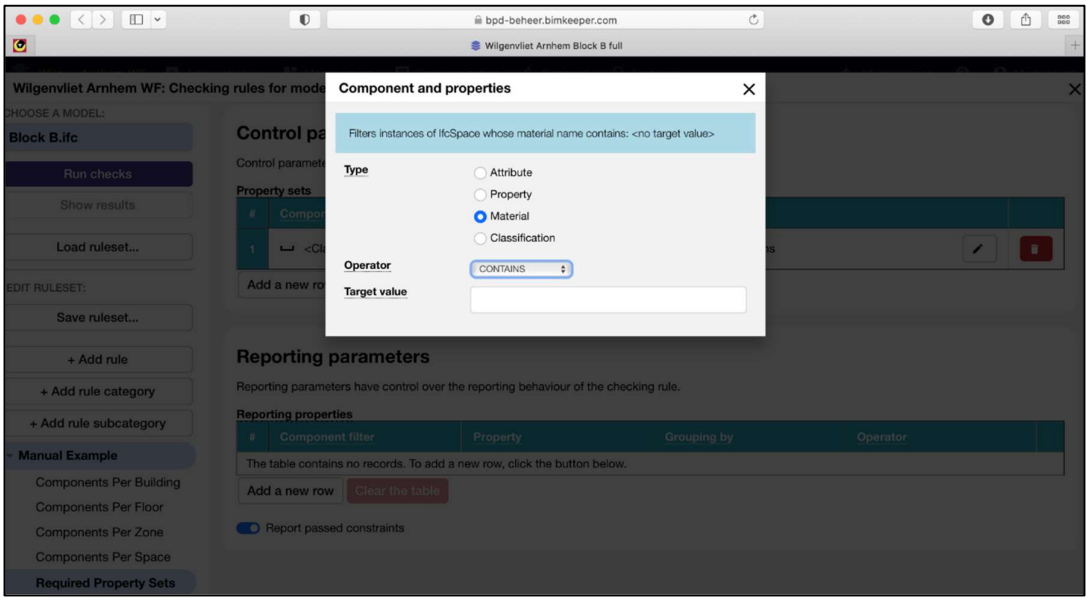

Figure 106: Menu for selecting the required property. Here, the filter type is set to "Material"

4.5.2. Reporting parameters

Report passed constraints

Indicates whether to report IFC elements that meet the requirements.

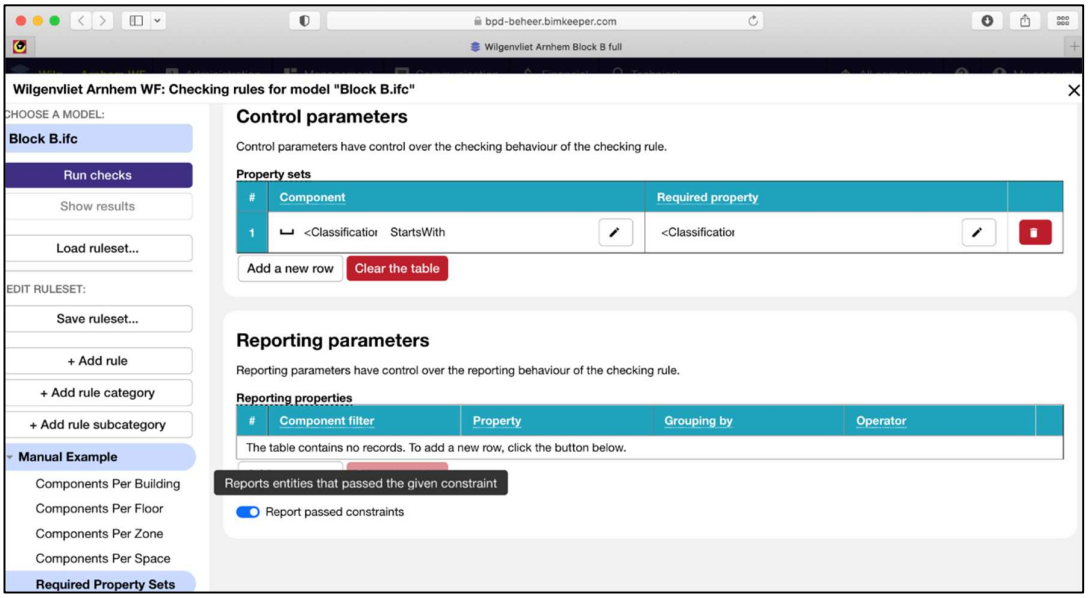

Figure 107: Description when hovering over the "Report passed constraints" button

4.6. Space Area

The “Space Area” check, checks whether the specified spaces are within the space area bounds.

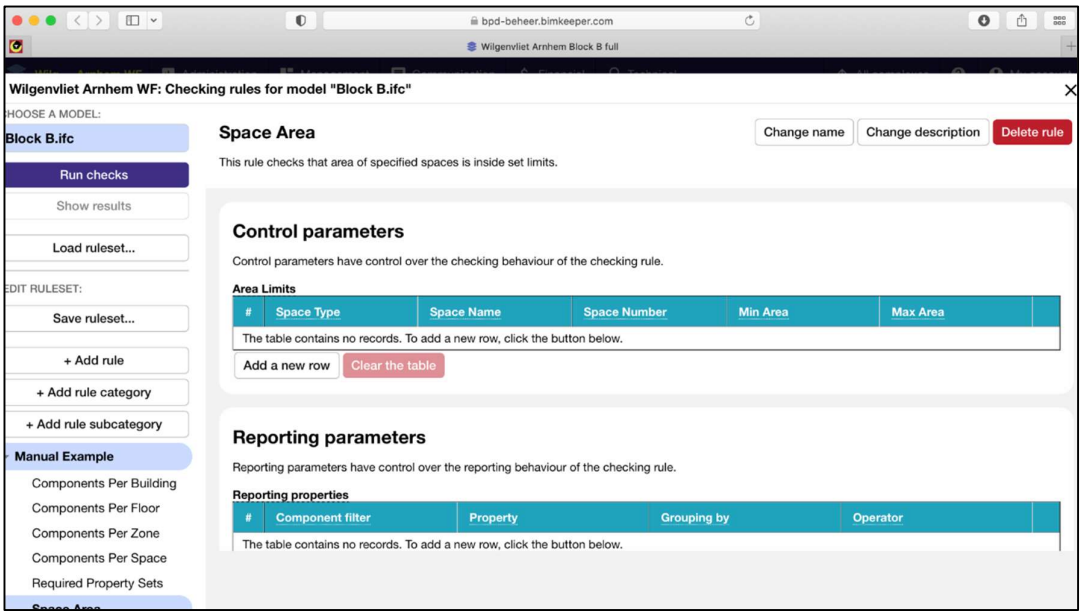

Figure 108: "Space Area" overview

4.6.1. Control parameters

Area Limits

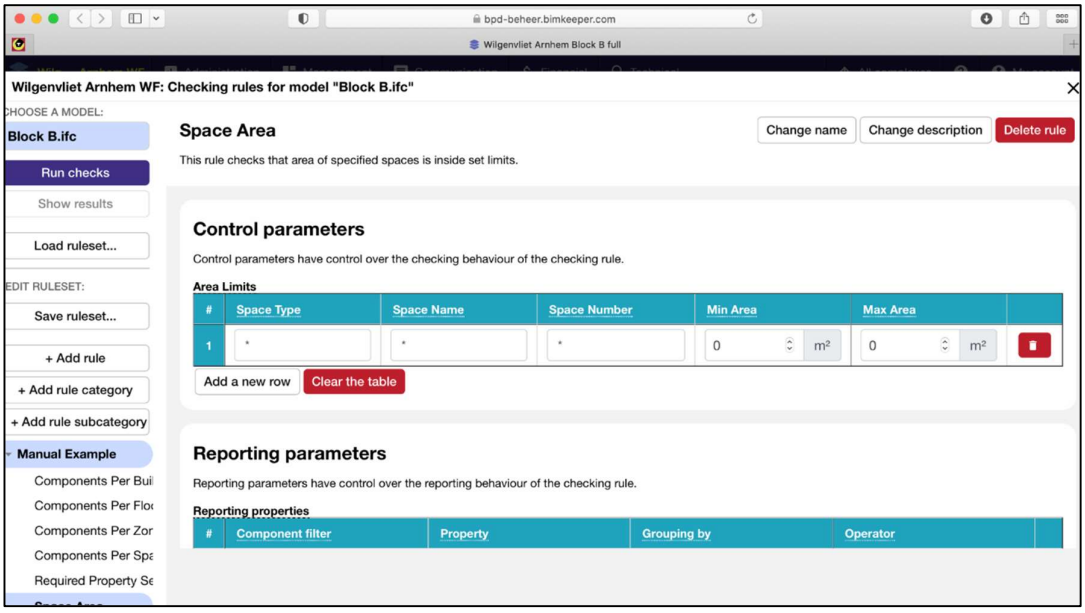

Figure 109: "Area Limits" table under “Control parameters”

Space Type

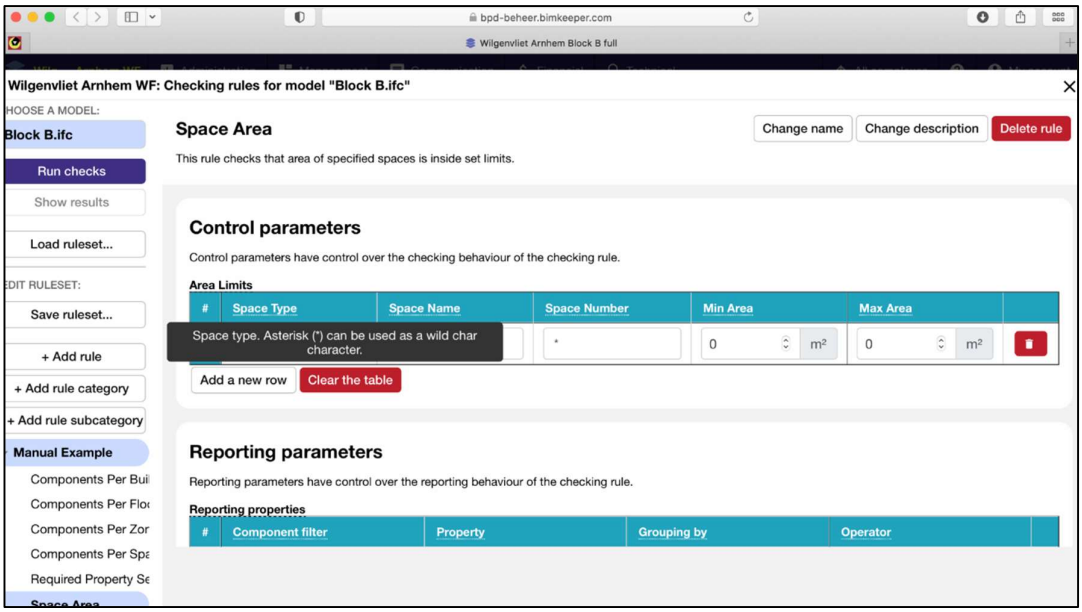

Figure 110: Description when hovering over the "Space Type" field name

Space Name

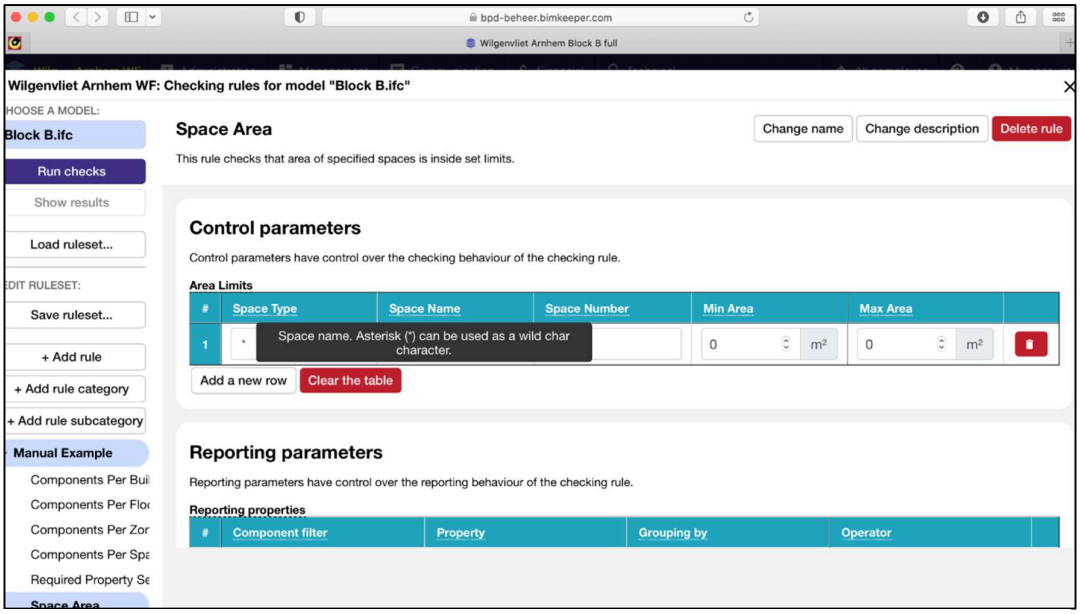

Figure 111: Description when hovering over the "Space Name" field name

Space Number

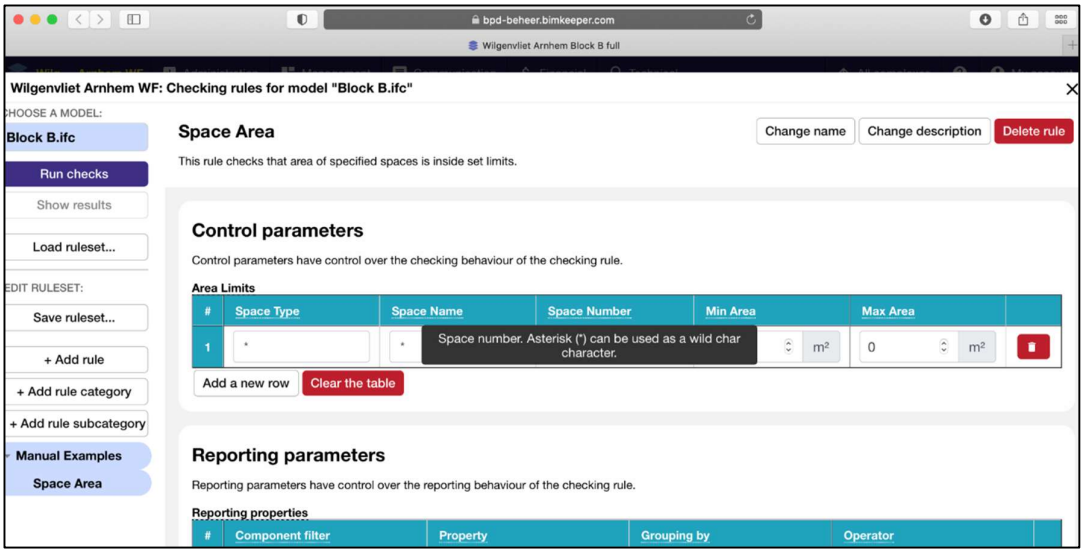

Figure 112: Description when hovering over the "Space Number" field name

Min Area

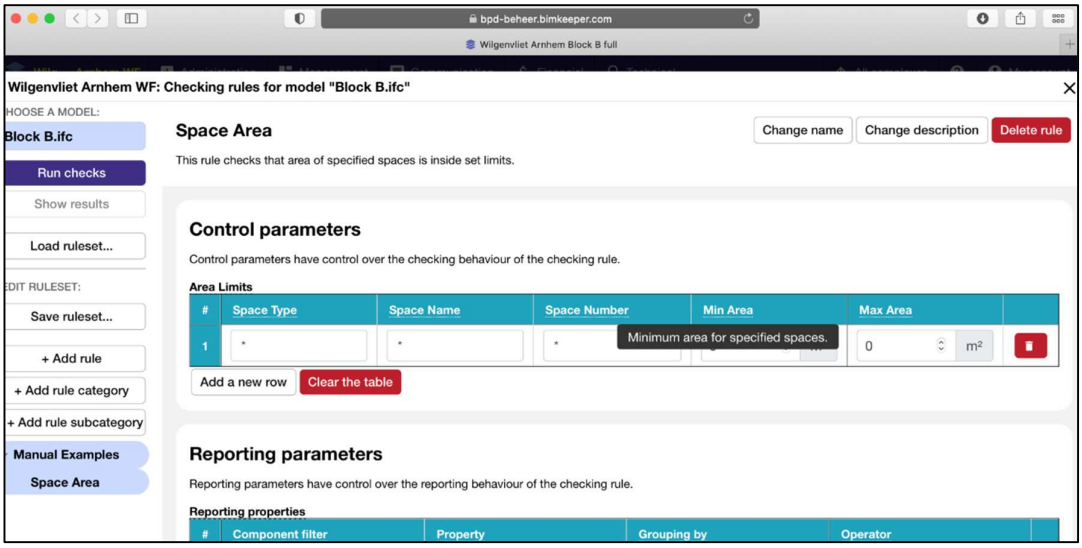

Figure 113: Description when hovering over the "Min Area" field name

Max Area

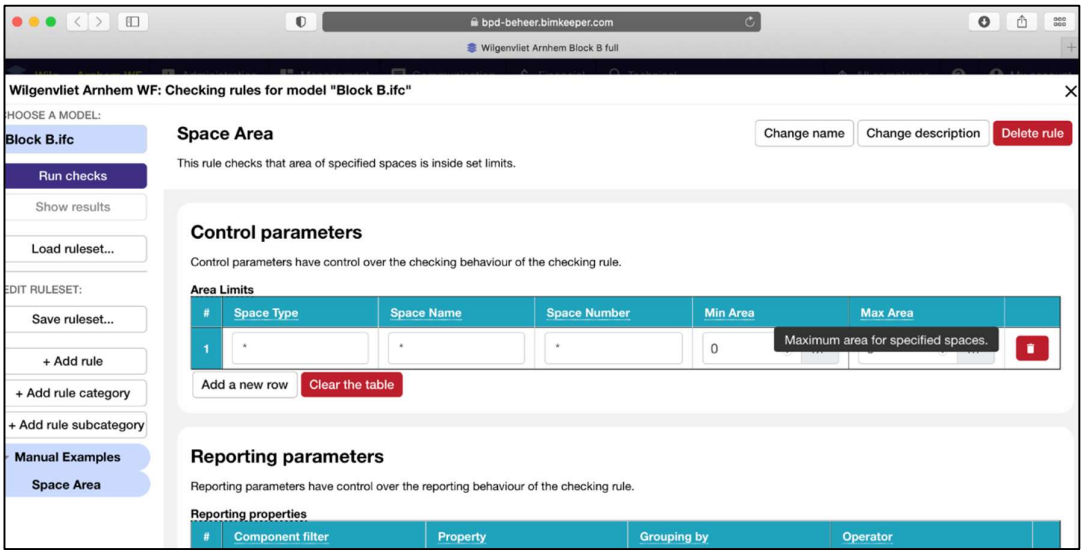

Figure 114: Description when hovering over the "Max Area" field name

4.6.2. Reporting Parameters

Report found entities

This setting indicates whether to report spaces found in the “Area Limits” table. This setting is switched on by default.

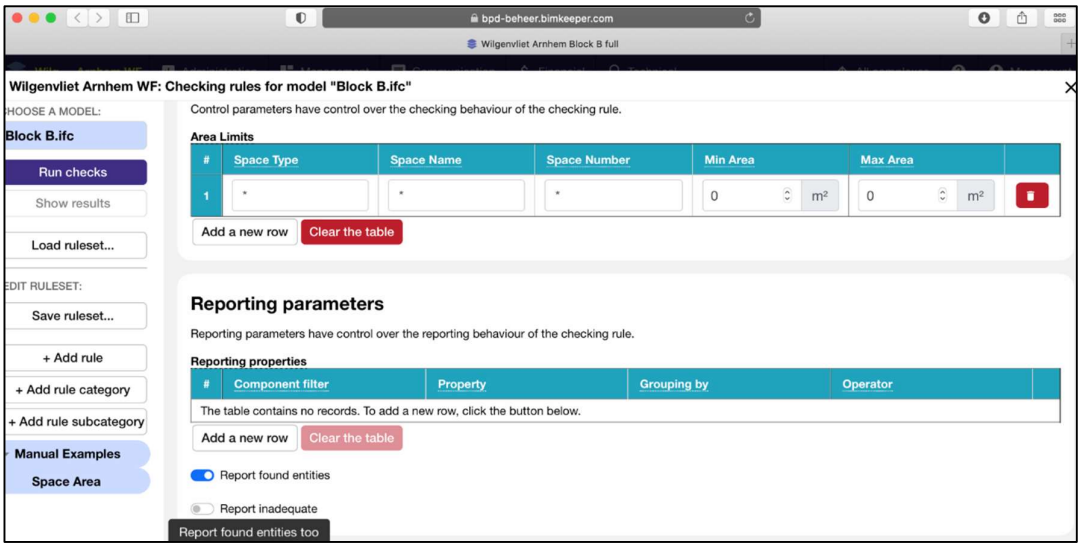

Figure 115: Description when hovering over the "Report found entities" button

Report inadequate

This setting indicates whether to report spaces that are not found in the “Area Limits” table. This setting switched off by default.

This is an advanced setting when one “Space Area” check is used for all spaces in the IFC. By enabling “Report inadequate”, the check shows which spaces are not configured.

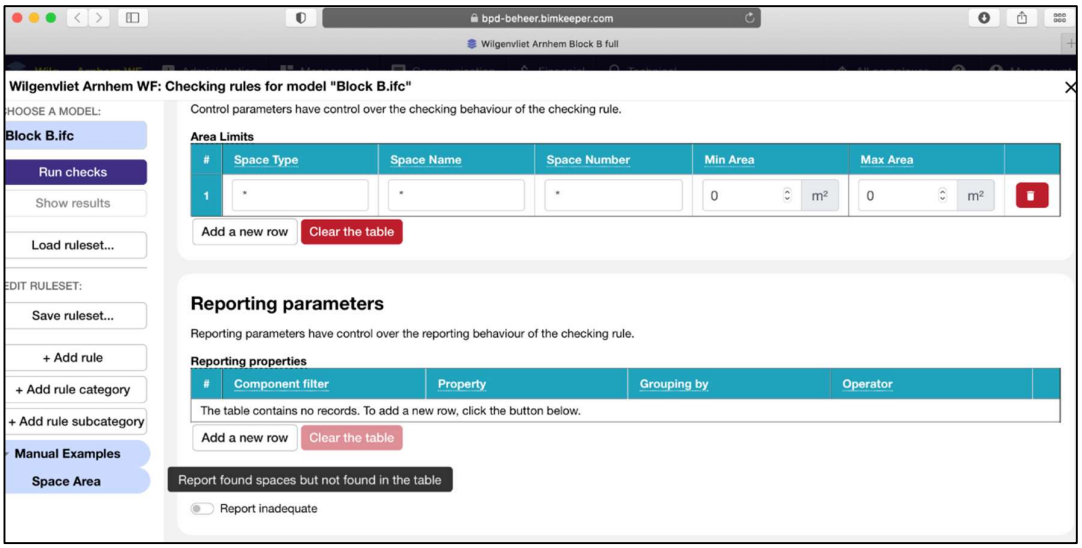

Figure 116: Description when hovering over the "Report inadequate" button

4.7. Floor Height Check

The “Floor Height Check” is used to check whether the floors in the building meet the height requirements.

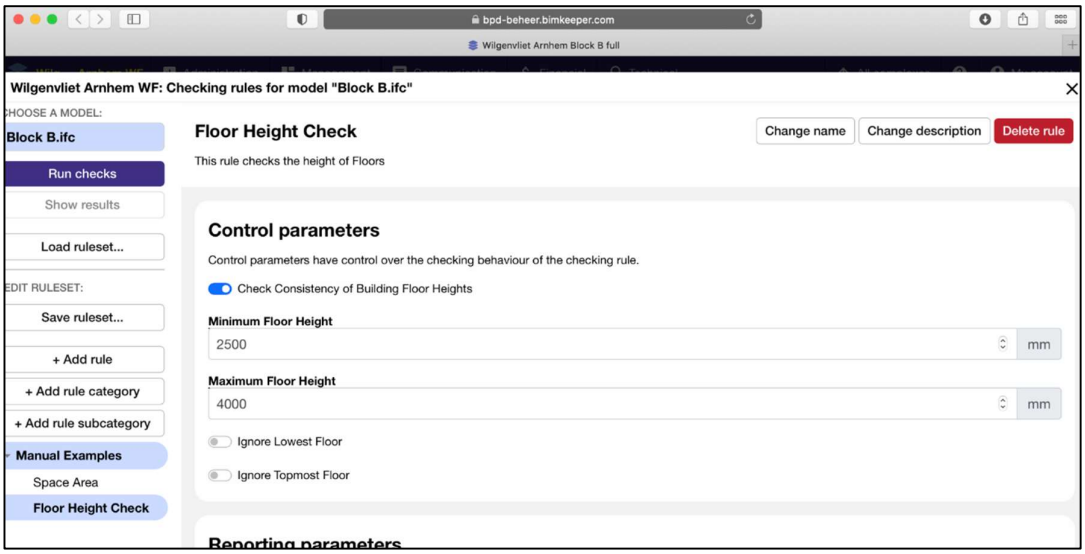

Figure 117: "Floor Height Check" overview

4.7.1. Control Parameters

Check Consistency of building floor heights

When this setting is enabled, it checks whether all floors in the building are the same height.

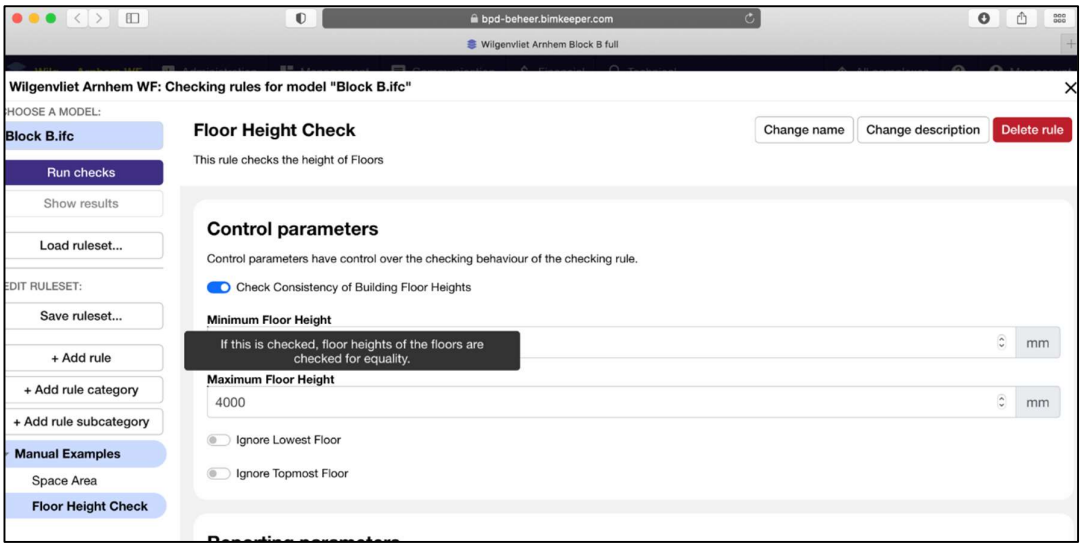

Figure 118: Description when hovering over the "Check Consistency of Building Floor Heights" button

Minimum floor height

The minimum height of the floor, in millimeters.

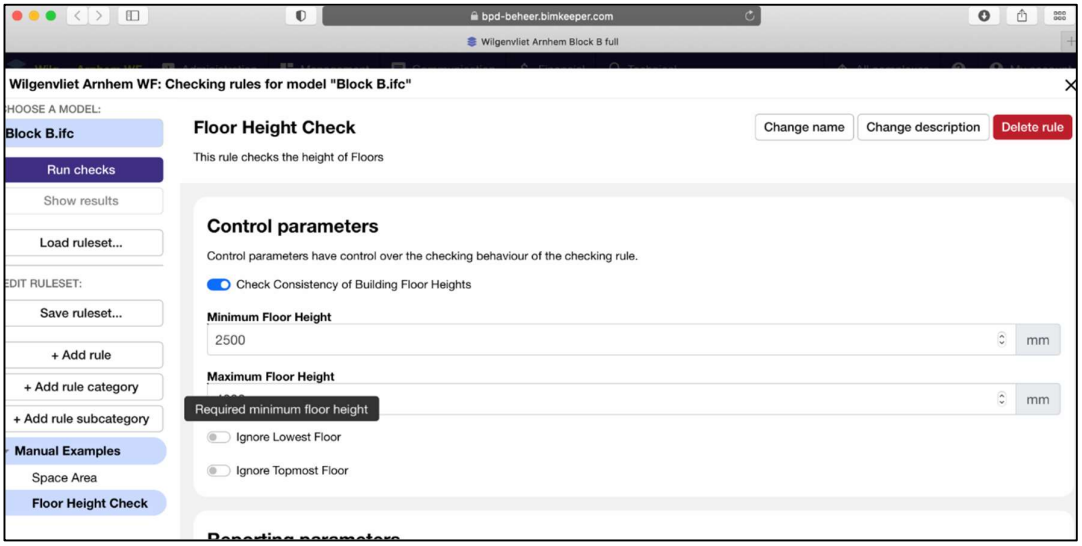

Figure 119: Description when hovering over the "Minimum Floor Height" field

Maximum floor height

The maximum height of the floor, in millimeters.

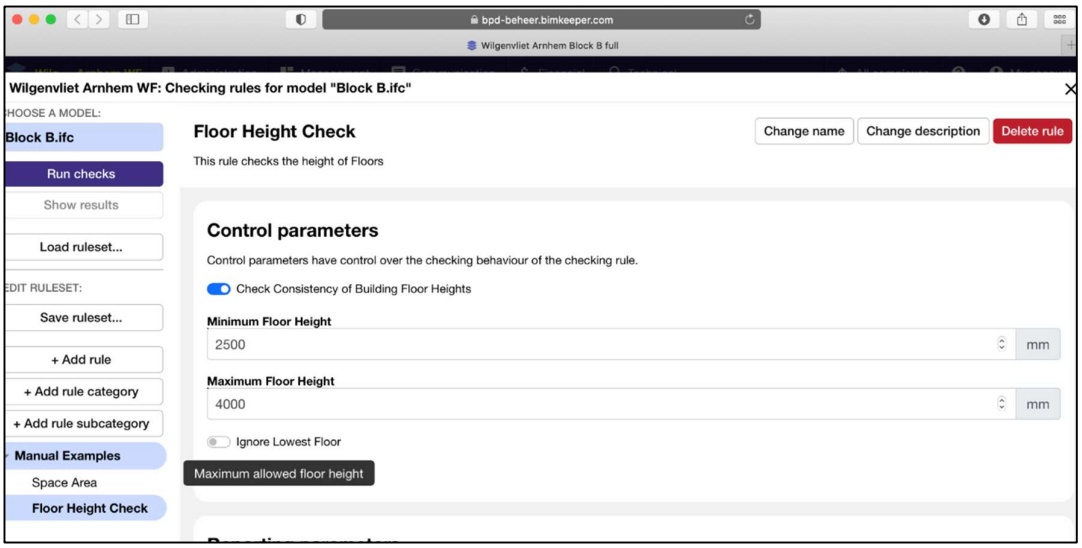

Figure 120: Description when hovering over the "Maximum Floor Height" field

Ignore Lowest Floor

In most models the lowest floor in the building consists of a foundation that has a different height and thus does not meet the set requirements. If this situation applies to the model, this setting can be enabled to ignore the lowest floor.

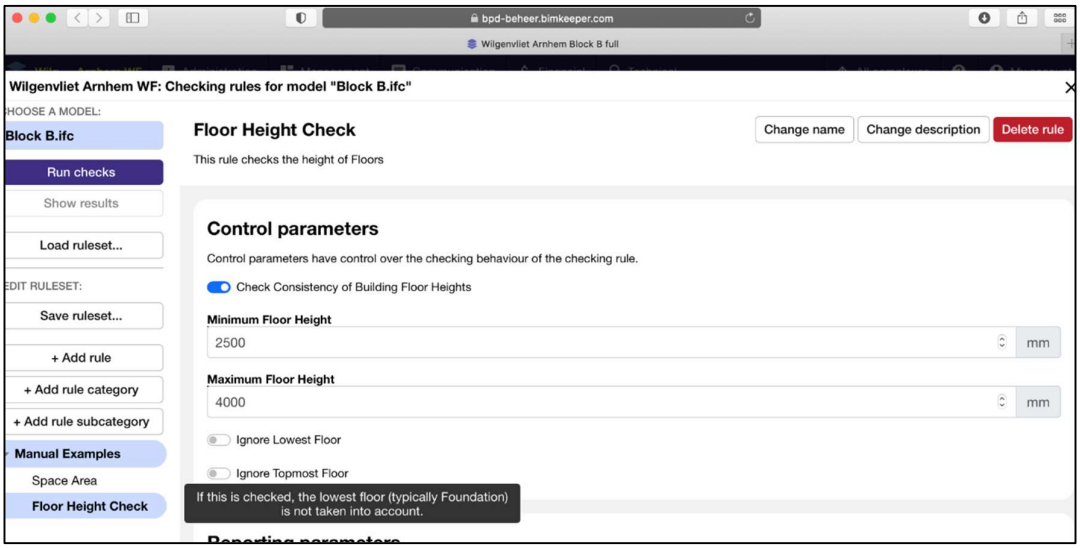

Figure 121: Description when hovering over the "Ignore Lowest Floor" button

Ignore topmost floor

When this setting is enabled, the topmost floor is ignored. Roofs are usually a separate building floor, and often have heights that don't meet the set requirements.

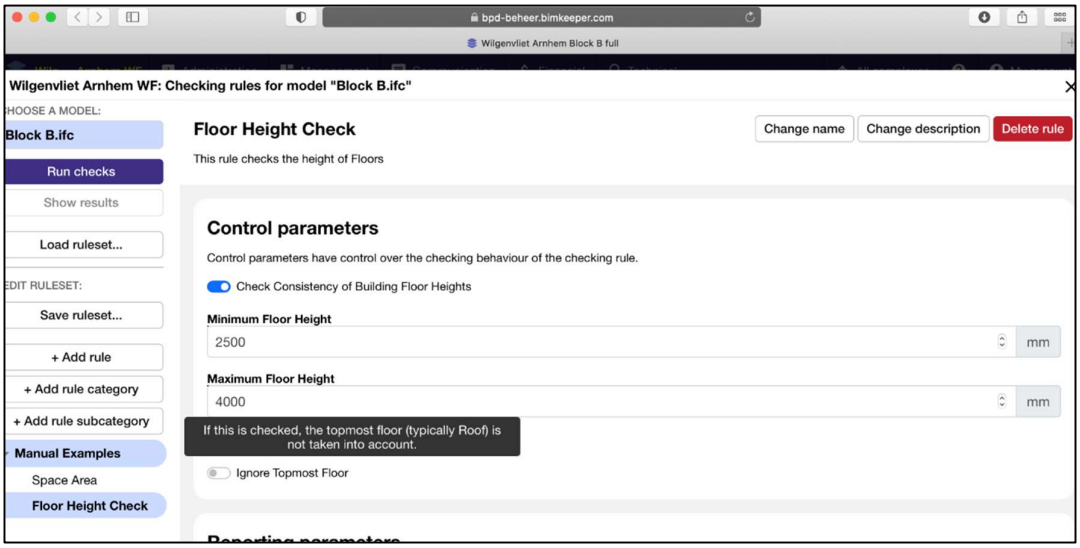

Figure 122: Description when hovering over the "Ignore Topmost Floor" button

End of manual

For other inquiries, please contact IRP at contact@irp.nl