Explanation of the IFC import process

IFC Source files - Madaster platform

Versie 2020-1

Inhoudsopgave

Introduction

This document explains the processing process of IFC files within Madaster. It explains, among other things, how the geometric properties, classification coding, construction phase and material use is determined..

Classification

Within Madaster we try to trace the NL/Sfb classification structure for each element. The NL/Sfb classification is matched to a 4 or 2 digit code and derived from the following fields:

First of all the element references are searched for the type: IfcClassificationReference or IfcExternalReference. As soon as a property of this type is found the system will try to match the value of this property against the 2 digit and/or 4 digit NL/Sfb coding list.

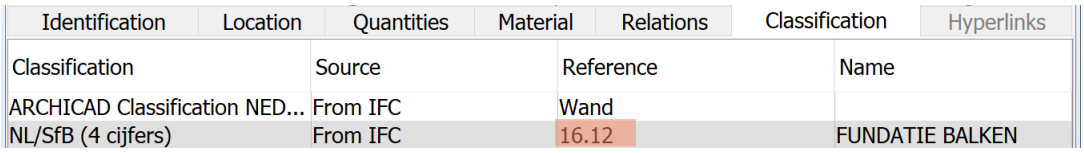


Fig: Example of 4-digit NL/Sfb coding on element.

Geometrical properties

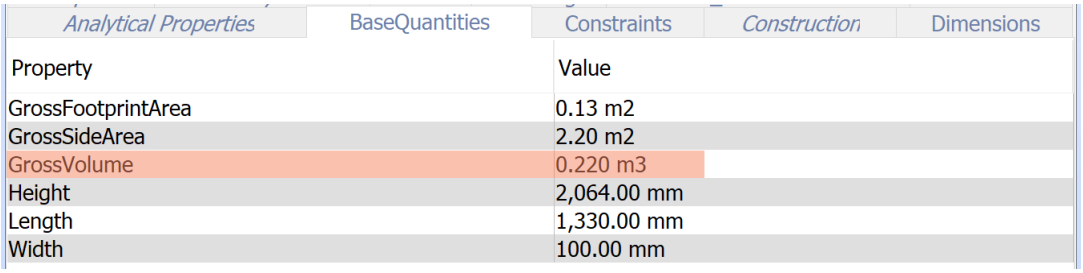
Volume

For each element the surface is first tried to read the IfcQuantityVolume with the name "NetVolume" from the collection of the type: IfcElementQuantity. If no value can be found for this, in all property sets of the element a property with the name "NetVolume" will be searched for.

When there are multiple property sets of type IfcElementQuantity or multiple properties with the name "NetVolume" then the first property is chosen. If no property with this naming can be found, then the same process is repeated for properties with the following naming and in the following order until a value can be found:

- NetVolume
- Volume
- GrossVolume

Depending on the material composition, in some scenarios the volume is calculated on the basis of the material thickness * the surface area. For more information see the chapter ‘Material’.



Analytical Properties	BaseQuantities	Constraints	Construction	Dimensions

Property	Value
GrossFootprintArea	0.13 m2
GrossSideArea	2.20 m2
GrossVolume	0.220 m3
Height	2,064.00 mm
Length	1,330.00 mm
Width	100.00 mm

Fig: Example of volume property within BaseQuantities propertyset.

Surface area

For each element, the IfcQuantityAreaproperty with the name "NetSideArea" is first tried from the collection of the type: IfcElementQuantity. If no value can be found in all property sets of the element a property with the name "NetSideArea" will be searched for.

When there are multiple property sets of type IfcElementQuantity or multiple properties named "NetSideArea" then the first property is chosen. If no property with this naming can be found then the same process is repeated for properties with the following naming and in the following order until a value can be found:

- NetSideArea
- GrossSideArea
- TotalSurfaceArea
- GrossSurfaceArea
- OuterSurfaceArea
- CrossSectionArea
- NetFootprintArea
- GrossFootprintArea
- GrossArea
- Area

Length

Voor elk element wordt voor de lengte eerst geprobeerd om de IfcQuantityLength property met de naam “Length” uit te lezen vanuit de collectie van het type: IfcElementQuantity. Indien hier geen waarde voor gevonden kan worden zal in alle property sets van het element gezocht worden naar een property met de naam: “Length”

Wanneer er meerdere propertysets van het type IfcElementQuantity of meerdere properties met de naam “Length” zijn dan wordt de eerste property gekozen.

Width

For each element the IfcQuantityLength property with the name "Width" is first tried from the collection of the type: IfcElementQuantity. If you can't find a value for this, all property sets of the element will search for a property with the name "Width".

When there are multiple property sets of type IfcElementQuantity or multiple properties with the name "Width" the first property is chosen.

Height

For each element the IfcQuantityLength property with the name "Height" is first tried from the collection of the type: IfcElementQuantity. If no value can be found in all property sets of the element a property with the name "Height" will be searched for.

When there are multiple property sets of type IfcElementQuantity or multiple properties with the name "Height" the first property will be selected.

Depth

For each element the IfcQuantityLength property with the name "Depth" is first tried from the collection of the type: IfcElementQuantity. If no value can be found in all property sets of the element a property with the name "Depth" will be searched for.

When there are multiple property sets of type IfcElementQuantity or multiple properties with the name "Depth" the first property will be chosen.

Weight

For each element the length is first tried to read out the IfcQuantityWeight property from the collection of the type: IfcElementQuantity.

When there are multiple property sets of type IfcElementQuantity or multiple properties of type "IfcQuantityWeight" the first property is chosen.

Material

For each element, the material is collected via the IfcMaterialSelect relationship. And depending on the characterization of the related material property, different scenarios are handled for the following characterizations:

IfcMaterialLayerSetUsage

If the material property is of the type IfcMaterialLayerSetUsage then an attempt will be made to retrieve IIfcMaterialLayerSet. And this will check if this list contains multiple elements and if the thickness (Thickness) property is filled in. If this is the case and the value of the property Thickness is greater than 0 mm then the element is split up in the number of materials the layerset knows about.

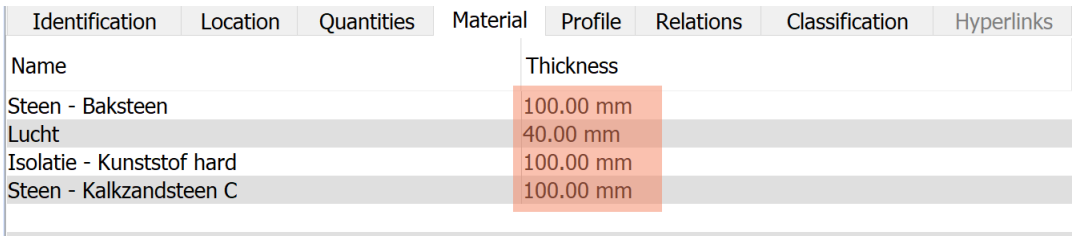


Fig Example of a material specification with layerSet

The volume of these materials is then calculated as follows:

Volume = Surface * Thickness of layer

If the property Thickness is 0 or not filled. Then multiple materials are specified on the element and the volume remains from the volume proportions as specified above.

For the naming of the material the "Name" field of the property is used.

IfcMaterialLayerSet

If the material property is of the type IfcMaterialLayerSet it will be checked if the list contains multiple layers. And if the thickness (Thickness) property is filled in. If this is the case and the value of the property Thickness is greater than 0 mm then the element is split up in the number of materials the layerset knows.

The volume of these materials is then calculated as follows:

Volume = Surface * Thickness of layer

If the property Thickness is 0 or not filled. Then multiple materials are specified on the element and the volume remains from the volume proportions as specified above.

For the naming of the material the "Name" field of the property is used.

IfcMaterialList

If the material property is of the type IfcMaterialList, multiple materials are specified on the element and the volume remains from the volume proportions specified above.For the naming of the material the "Name" field of the property is used.

IfcMaterial

If the material is property of the type "IfcMaterial" then the property is taken from the Name field of the property.

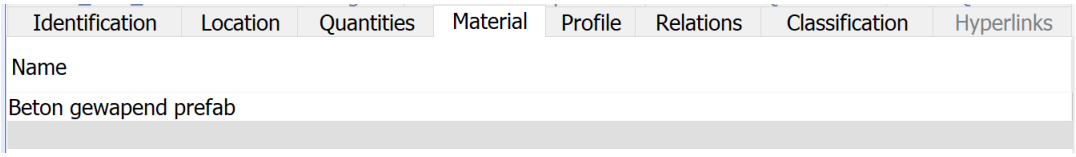


Fig: Example material specification without layerset.

Bouwfase

For each element, the construction phase is taken out of the property with one of the following names (it is case sensitive):

- Phase Created
- Renovation Status
- Phase

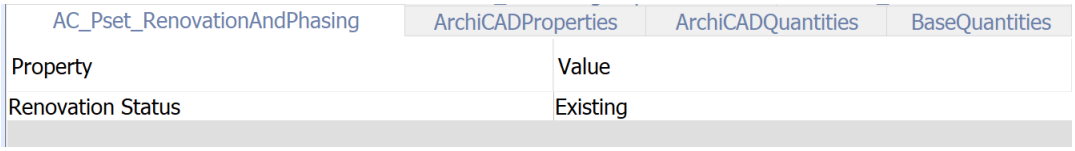


Fig: Example of phasing within Archicad

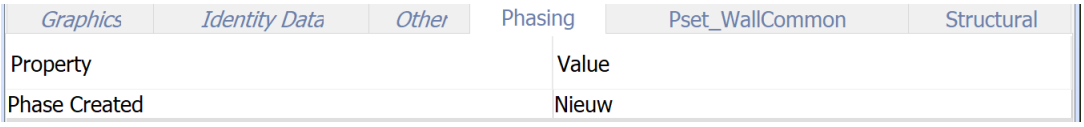


Fig: Example of phasing within Revit

Next, the values from these properties are matched as follows:

- Demolition
    - Demolition
    - To be demolished
    - Sloop
- New
    - Nieuw
    - New
- Existing
    - casco
    - existing
    - bestaand

Matching is performed on the entire sentence/word and is not case sensitive. If there is no matching with the above categories then the element will be mapped to Casco.

The current and final construction phase shall be calculated on the basis of the above phase according to the following calculation:

- Existing = Demolish + Casco
- Result = Casco + New

Matching

As soon as the materials for each element are known they will be matched against the materials and products known within the Madaster database. These can be found in the Materials & Products overview under the Administration tab.

Each material and/or product can be provided with search criteria:

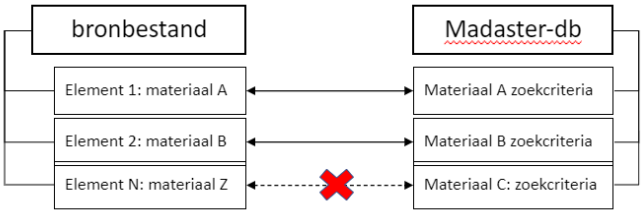


Figure: Matching of element (from source file) to added product in Madaster database (draft view).

When importing an IFC file, the materials of each element are matched against these search criteria(s). It checks whether the material of an element matches one of the search criteria at product/material level..

A search criteria can be set up in different ways:

- Contains the search criterion
- Equals the search criterion
- Starts with the search criterion
- Ends with the search criterion

If multiple matches are found, the largest match (largest number of matching characters) will be used.

If the material of an element matches one of the search criteria at product / material level, the Madaster system will automatically link the element. If no automatic linking takes place, the user can manually link the element in Madaster (in sub step “Enrich”).

When several materials are specified on an IFC element without a thickness (Thickness). These elements are then skipped in terms of matching because it is then not possible to relate the element to one material and/or product.

If no products and/or materials are linked then they can be linked to the element itself via the enrichment screen of the file. Here you can also create new materials and/or products.

Matching op EAN/G-TIN

Indien op een product de productcode is gevuld:

Then the material on the element will also be matched against this code and if an exact match is found it will be used above the previous matches..

Madaster Propertyset

If a property set with the name: Pset_Madaster is present on an IFC element. And within this dataset the properties below are filled in then the values of the properties are used within Madaster. And the above properties are ignored.

Within the Madaster property set the following fields are recognized:

- MaterialOrProductId
  Identifier of the material or product within Madaster
- MaterialOrProductName
  Name of Material that Madaster uses for mapping.

In terms of matching, the Id property of the Material and/or Product always takes precedence over the Name property.

The other fields are:

- Volume (property type: IfcVolumeMeasure)
- Area (property type: IfcAreaMeasure)
- Length (property type: IfcLengthMeasure)
- Width (property type: IfcLengthMeasure)
- Height (property type: IfcLengthMeasure)
- Depth (property type: IfcLengthMeasure)
- Weight (property type: IfcMassMeasure)
- Classification (property type: IfcText)
  For example, the NL/SfB-Table1 can be set here.
- Phase (property type: IfcText)
  Construction phase