# Madaster IFC-import process explained

Technical description of the processing of IFC files within the Madaster platform

| Intended for | By | Date |
|---|---|---|
| Madaster Switzerland | Madaster | 03. December 2021 |

# Table of Content

## DISCLAIMER

This document and its contents have been compiled with the greatest possible care. Nevertheless, it cannot be ruled out that certain information is outdated, incomplete or otherwise incorrect. Madaster is not liable for any damage of any nature whatsoever arising from any use / consultation of this document and its contents and / or from the information obtained through this document, including but not exhaustive also information obtained through references mentioned in this document. and / or hyperlinks.

# Introduction

This document explains the processing of IFC files within Madaster and as such provides insight how IFC files should be prepared for optimal use in the Madaster platform. In this guide, it is explained how the geometric properties, classification coding, construction phasing and material parameters are retrieved.

# Classification

<u>Note</u>: The Madaster platform supports the Dutch (NL/SfB), the Swiss (EBKP-H), and international OmniClass table 21classification code.

First of all, all references of the element are searched for the type: IfcClassificationReference or IfcExternalReference.

- **EBKP-H** classification code

When a property of this type is found, the system tries to match the value of this property against the 4-digit EBKP-H coding list.

| Identification | Location | Quantities | Material | Relations | Classification | Hyperlinks |
|---|---|---|---|---|---|---|
| Classification | | Source | | Reference | | Name |
| ARCHICAD Classification NED... | | From IFC | | Wand | | |
| NL/SfB (4 cijfers) | | From IFC | | 16.12 | | FUNDATIE BALKEN |

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

- **OmniClass table 21** classification code

When a property of this type is found, the system tries to match the value of this property against the 6 digit and / or 8 / 10-digit OmniClass table 21 coding list.

| Identification | Location | Quantities | Material | Profile | Relations | Classification | Hyperlinks | BaseQuantities | BaseQuantities_Ec |
|---|---|---|---|---|---|---|---|---|---|
| Classification | | | Source | | | | Reference | | |
| Omniclass Classification | | | From IFC | | | | 21-02 10 | | |

**Fig:** Fig: Example of a 6-digit OmniClass coding on an element

# Geometrical Properties

## Volume

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

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

- NetVolume
- Volume
- GrossVolume

Depending on the material composition, the volume is calculated in some scenarios by multiplying the material thickness by the material surface. For more information see section "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 property set.

## Surface area

For each element, the area first tries to read the IfcQuantityAreaproperty named "NetSideArea" from the collection of type: IfcElementQuantity. If no value can be found for this, all property sets of the element will be searched for a property with the name: "NetSideArea".

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

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

## Length

For each element, for the length, it first tries to read the IfcQuantityLength property named "Length" from the collection of type: IfcElementQuantity. If no value can be found for this, all property sets of the element will be searched for a property with the name: "Length".

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

## Width

For each element, for the length, it first tries to read the IfcQuantityLength property named "Width" from the collection of type: IfcElementQuantity. If no value can be found for this, all property sets of the element will be searched for a property with the name: "Width".

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

## Height

For each element, the length first tries to read the IfcQuantityLength property named "Height" from the collection of type: IfcElementQuantity. If no value can be found for this, all property sets of the element will be searched for a property with the name: "Height".

If there are multiple property sets of the type IfcElementQuantity or multiple properties with the name "Height", the first property is chosen.

## Depth

For each element, for the length, it first tries to read the IfcQuantityLength property named "Depth" from the collection of type: IfcElementQuantity. If no value can be found for this, all property sets of the element will be searched for a property with the name: "Depth".

If there are multiple property sets of the type IfcElementQuantity or multiple properties with the name "Depth", the first property is chosen.

## Weight

For each element, for the length, it first tries to read the IfcQuantityWeight property from the collection of type: IfcElementQuantity.

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

# Material

For each element, the material is retrieved 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 type IfcMaterialLayerSetUsage then an attempt is made to get IIfcMaterialLayerSet. And here it is checked whether this list contains multiple elements and whether the thickness (Thickness) property has been entered. If this is the case and the value of the property Thickness is greater than 0 mm, the element is split into the number of materials that the layerset knows.

| Identification | Location | Quantities | Material | Profile | Relations | Classification | Hyperlinks |
|---|---|---|---|---|---|---|---|
| Name | | | Thickness | | | | |
| Steen - Baksteen | | | 100.00 mm | | | | |
| Lucht | | | 40.00 mm | | | | |
| Isolatie - Kunststof hard | | | 100.00 mm | | | | |
| Steen - Kalkzandsteen C | | | 100.00 mm | | | | |

**Fig:** Example of a material specification with layerSet

The volume of these materials is then calculated as follows:

Volume = Area * 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. The **Name** field of the property is used for naming the material.

## IfcMaterialLayerSet

If the material property is of type IfcMaterialLayerSet, then it is checked whether the list contains multiple layers. And whether the thickness (Thickness) property has been entered. If this is the case and the value of the property Thickness is greater than 0 mm, the element is split into the number of materials that the layerset knows.

The volume of these materials is then calculated as follows:

Volume = Area * 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. The **Name** field of the property is used for naming the material.

## IfcMaterialList

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

## IfcMaterial

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

| Identification | Location | Quantities | Material | Profile | Relations | Classification | Hyperlinks |
|---|---|---|---|---|---|---|---|
| Name | | | | | | | |
| Beton gewapend prefab | | | | | | | |

**Fig:** Example material specification without file set.

# Building Phase

For each element, the build stage is taken from the property with one of the following naming conventions (this is case sensitive):
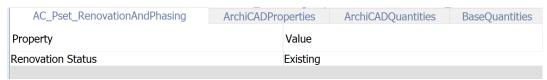
- Phase Created
- Renovation Status
- Phase

| AC_Pset_RenovationAndPhasing | ArchiCADProperties | ArchiCADQuantities | BaseQuantities |
|---|---|---|---|
| Property | Value | | |
| Renovation Status | Existing | | |

**Fig:** Example of phase in Archicad CAD-application

| Graphics | Identity Data | Other | Phasing | Pset_WallCommon | Structural |
|---|---|---|---|---|---|
| Property | | | Value | | |
| Phase Created | | | Nieuw | | |

**Fig:** Example of phase in Revit CAD-application

Then the values from these properties are matched as follows:
- Demolition
  - o Demolition
  - o To be demolished
- New
  - o New
- Casco
  - o casco
  - o existing

The matching is performed on the entire sentence / word and is not case sensitive. If no matching has taken place with the above categories, the element will be mapped to Casco.

The construction phase current and final are calculated using the above phase according to the following calculation:
- Existing = Demolition + Casco
- Final = Casco + New

# Matching of Elements

## On product code, GTIN code and/or EAN code

If an IFC file contains one or more elements, where a product code, GTIN code or EAN code is included in the material name [IfcMaterialSelect], then a match will be made against this code. If an exact match is found, it will be used with priority over the matching on material and / or product name.

As soon as the materials per element are known, they will be automatically matched during the data upload in Madaster against (linked to) materials and products that are known within Madaster database (s). This can be found in the Madaster Navigation drawer under "System databases & suppliers". If available, account specific databases can also be selected in this import process.

## On material name and/or product name

As soon as the materials per element are known, they will be automatically matched during the data upload in Madaster against (linked to) materials and products that are known within Madaster database (s). This can be found in the Madaster Navigation drawer under "Databases & suppliers". If available, account specific databases can also be selected in this import process.
Each material and / or product can be provided with search criteria (per language):

When importing an IFC file, the materials of each element are matched against these search criteria (s). This involves checking whether the material of an element matches one of the search criteria at product / material level in the selected languages.

Search criteria on product / material level can be configured in several ways:
- Contains the search criterion
- Equals the search criterion
- Starts with the search criterion
- Ends with the search criterion

And runs sequentially as long as no match is found:

- 1- against the "Equals" criteria
- 2- Against the "Starts with" criteria
- 3- Against the "Contains" criteria contained
- 4- Against the "Ends with" criteria

If multiple matches are found in step 2, 3 or 4, the longest match (largest number of matching characters) will be used.

When multiple materials are specified on an IFC element without a thickness (Thickness). Then these elements are skipped in terms of matching because it is then not possible to relate the element to 1 material and / or product.

If no products and / or materials are linked, they can be manually linked to the element via the enrichment screen in Madaster. Any new materials and / or products can also be created here.

# Madaster Property Set

If a property set with the name: Pset_Madaster is present on an IFC element. And within this dataset the properties below have been entered, then the values of the properties will be used within Madaster. And the above properties are ignored.

The following fields are recognized within the Madaster property set:
- MaterialOrProductId
  - Identifier of the material of product in Madaster
- MaterialOrProductName
  - Name of the material Madaster uses for the mapping.

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

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 EBKP-H can be entered here
  - For example, the OmniClass-Table 21 can be entered here
- Phase             (property type: IfcText)
  - Building phase

# Madaster Support

The Madaster Service desk can be reached by phone during office hours (+41 44 500 44 46).
You can always ask your questions via service@madaster.ch.

When logged in the Madaster environment you can always consult the available support documentation online. Every page in the Madaster platform contains a "help" button on the right side. This provides information about the page concerned and available functions at all times.

This information and additional guides and explanations on the use and development of the Madaster platform can also be found directly at the following link.