Madaster IFC-import process explained

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

Intended for	**By**	**Date**
Madaster users	Madaster	

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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.

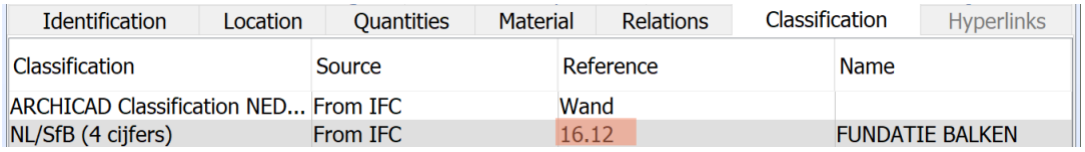
Classification

Note: The Madaster platform supports the local Dutch classification code (NL/SfB) and international OmniClass table 21 classification code.

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

- **NL/SFB** classification code

When a property of this type is found, the system tries to match the value of this property against the 2-digit and / or 4-digit NL/SfB 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

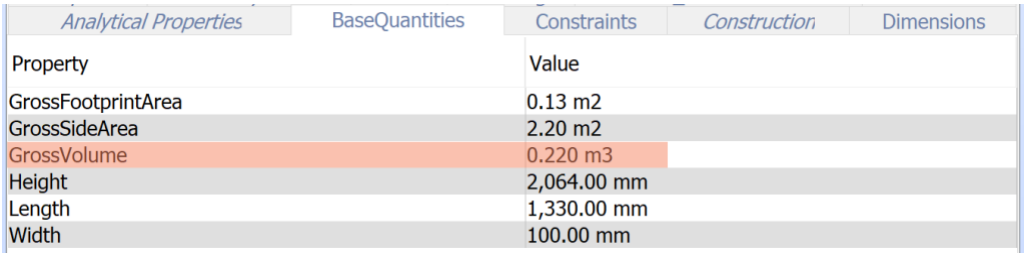
Volume

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.

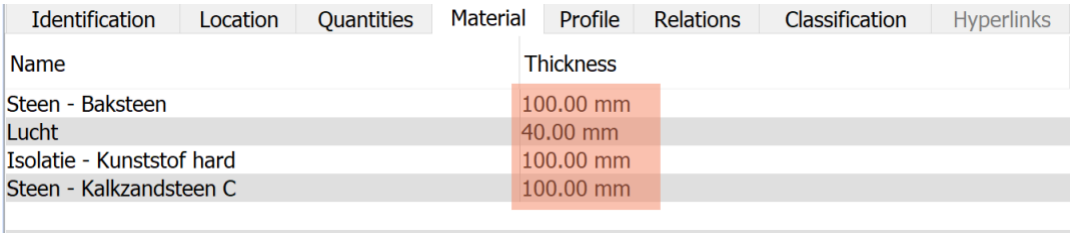


Fig: Example of a material specification with layerSet

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.

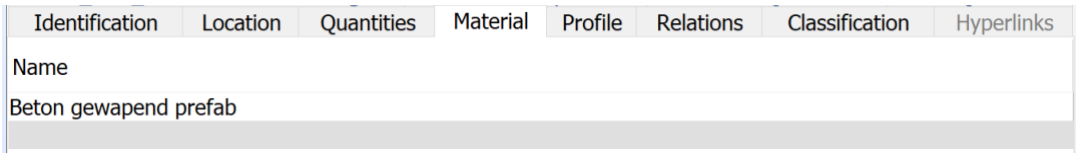


Fig: Example material specification without file set.

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

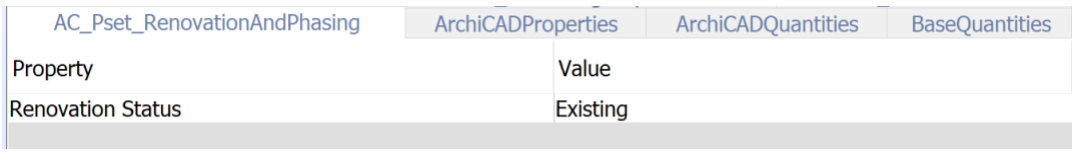


Fig: Example of phase in Archicad CAD-application

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

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

IFC 2x3:

IFC 4x0

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.

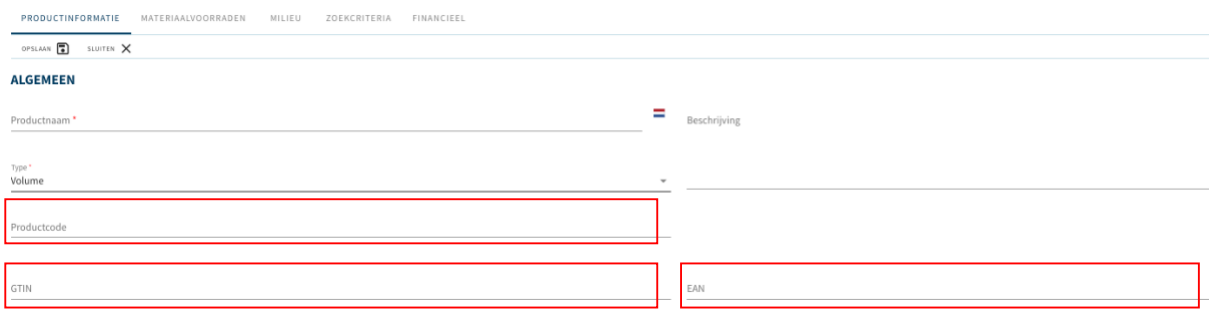


Fig: Example of matching on product code, GTIN & EAN

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):

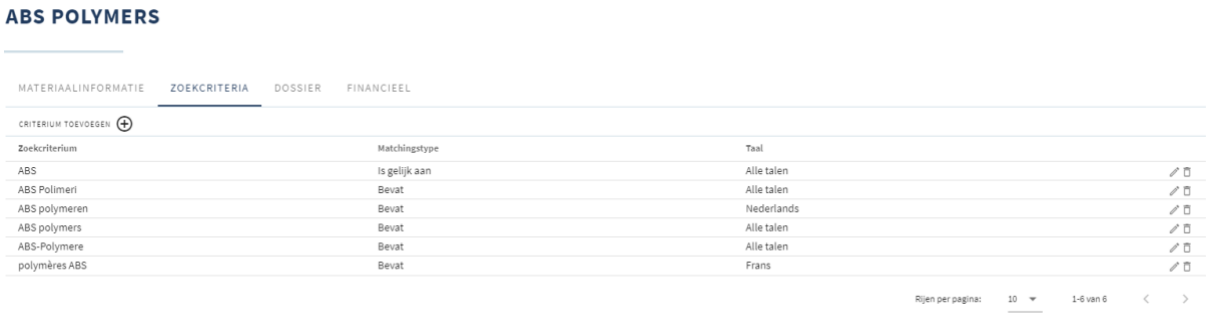


Fig: Example of search criteria in material/product in Madaster

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.

Propertyset = Pset_Madaster

PropertyName	PropertyType	Madaster Element	Descriptiom
MaterialOrProductId	IfcText	MadasterId	Unique identifier of a material or product within a Madaster database.
externaldatabaseId	IfcText	externaldatabaseId	Unique identifier of a material or product in an externalDatabase also connected to Madaster.
GTIN	IfcText	GTIN	
ArticleNumberGLN	IfcText	ArticleNumberGLN	The articleNumber|GLN combination.
MaterialOrProductName	IfcText	MaterialName	When filled, madaster will use this material/product name to map to search criterias (Overrides the Material information explained before)
Volume	IfcVolumeMeasure	Volume	
Area	IfcAreaMeasure	Area	
Length	IfcLengthMeasure	Length	
Width	IfcLengthMeasure	Width	
Height	IfcLengthMeasure	Height	
Depth	IfcLengthMeasure	Depth	
Weight	IfcMassMeasure		Not used yet
Classification	IfcText	Classification	Code of the used classificaiton method.
Phase	IfcText	Phase	

DetachabilityConnectionType	IfcText	DetachabilityConnectionType	See list of possible values in Detachability 1
DetachabilityConnectionTypeDetail	IfcText	DetachabilityConnectionTypeDetail	See list of possible values In Detachability 1
DetachabilityAccessibility	IfcText	DetachabilityAccessibility	See list of possible values in Detachability 2
DetachabilityIntersection	IfcText	DetachabilityIntersection	See list of possible values in Detachability 3
DetachabilityProductEdge	IfcText	DetachabilityProductEdge	See list of possible values in Detachability 4

Detachability

1. Property **Detachability*ConnectionType*** and **Detachability*ConnectionTypeDetail*** are used to indicate the type of connection

Detachability*ConnectionType*		**Detachability*ConnectionTypeDetail***	
Mogelijke waarde	***Uitleg***	***Mogelijke waarde***	***uitleg***
DryConnection	Dry Connection	Unknown	
DryConnection	Dry Connection	None	None
DryConnection	Dry Connection	Click	Click connection
DryConnection	Dry Connection	Velcro	Velcro connection
DryConnection	Dry Connection	Magnetic	Magnetic connection
AddedConnectionConnection	Connection with added elements	Unknown	
AddedConnectionConnection	Connection with added elements	BoltAndNut	Bolt and Nut connection
AddedConnectionConnection	Connection with added elements	Spring	Spring connection
AddedConnectionConnection	Connection with added elements	Corner	Corner joints
AddedConnectionConnection	Connection with added elements	Screw	Screw joints
DirectConnection	Direct integral connection	Unknown	
DirectConnection	Direct integral connection	Peg	Peg
DirectConnection	Direct integral connection	Nail	Nailing
SoftChemicalConnection	Soft chemical compound	Unknown	
SoftChemicalConnection	Soft chemical compound	Sealant	Sealant
SoftChemicalConnection	Soft chemical compound	Foam	Foam joint (PUR)

HardChemicalConnection	Hard chemical compound	Unknown	
HardChemicalConnection	Hard chemical compound	Glue	Adhesive bonding
HardChemicalConnection	Hard chemical compound	LandFill	Landfill connection
HardChemicalConnection	Hard chemical compound	Weld	Weld joint
HardChemicalConnection	Hard chemical compound	Concrete	Cementitious bond
HardChemicalConnection	Hard chemical compound	ChemicalAnchor	Chemische anchors

2. Property ***DetachabilityAccessibility***

Mogelijke waarde	Uitleg
Accessible	Freely accessible without additional actions
PartialNoDamage	Accessible with additional actions that do not cause damage
PartialWithRepairableDamage	Accessible with additional operations with fully repairable damage
PartialWithDamage	Accessible with additional operations with partially repairable damage
NotAccessible	Not accessible - irreparable damage to the product or surrounding products

3. Property ***DetachabilityIntersection***.

Mogelijke waarde	Uitleg
None	No intersections - modular zoning of products or elements from different layers
Incidental	Occasional intersections of products or elements from different layers
Complete	Full integration of products or elements from different layers

4. Property ***DetachabilityProductEdge***

Mogelijke waarde	Uitleg
Open	Open, geen belemmering voor het (tussentijds) uitnemen van producten of elementen
Overlapping	Overlapping, gedeeltelijke belemmering voor het (tussentijds) uitnemen van producten of elementen
Closed	Gesloten, volledige belemmering voor het (tussentijds) uitnemen van producten of elementen

Madaster Support

The Madaster Service desk can be reached by phone during office hours (+31 85 060 1242).
You can always ask your questions via service@madaster.com.

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.