Madaster User Manual

General user guide of the Madaster Platform

Made for	Version	Date
Madaster User	10.12	22 September 2022

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Table of Contents

1 Getting started. 5
1.1 What is Madaster? 5
1.2 What is a Materials Passport? 5
1.3 How does it work? 5
1.4 What do you need? 6
1.5 Workflow Madaster Materials Passport 7
2 Workflow 8
2.1 Flexible folder structure 8
2.2 Type of folders 8
2.3 Users 9
2.4 Features 10
2.4.1 Performance dashboards and Benchmarking 11
2.4.2 Embodied Carbon Overview feature 11
2.4.3 Split building feature 12
2.4.4 Area register (private buildings only) 13
2.5 Types of files 14
2.6 Source files 14
2.7 IFC-source file manuals 14
2.8 General files 14
2.9 Data and information 15
2.10 Geometric data 15
2.11 Material Classification 15
2.11.1 Matching on own search criteria (global databases only) 15
2.11.2 Matching on Madaster material list & NAA.K.T. search criteria 16
2.11.3 Matching on EPEA Generic dataset 17
2.11.4 Import data from generic external database(s) 18
2.12 Standard Classification (NL/SfB) 19
2.13 Building process – renovation phases 19
2.14 Databases 20
2.15 Database properties 21
2.16 Users 21
2.16.1 Subscription management summary 21

2.17 Sharing databases with other accounts, folders, buildings 22
2.18 Sharing a database: rights 22
2.19 Sharing a database: account, folders, buildings 22
2.20 Share and use 23
2.21 IFC check (BIMCollab Zoom) 23
2.22 Upload source files 24
2.22.1 Upload settings 24
2.22.2 Replace existing IFC file (keep linked elements) 26
2.23 Enrichment process 26
2.23.1 Link elements 26
2.23.2 Unlink elements 27
2.23.3 Adjust elements (incl. bulk edit) 28
2.23.4 Adjust classification code per element (incl. bulk edit) 29
2.23.5 Adjust phasing per element (incl. bulk edit) 29
2.23.6 Adjust building number per element (split building function) 29
2.23.7 Adjust Reuse (Feedstock input & Output) 30
2.23.8 Adjust detachability per element (incl. bulk edit) 31
2.23.9 Include / exclude elements 31
2.23.10 Search function 32
2.24 Activate source files 33
2.24.1 Activate/Deactive/Delete multiple source files 33
2.25 3D model viewer 33
3 Materials passport 37
3.1 A Materials Passport 37
3.2 Owner label in Materials Passport 37
3.3 Generate & download a Materials Passport 38
4 Archiving & transferring buildings 40
4.1 Archive & transfer building dossier to existing account 40
4.2 Archive & transfer building dossier to new (private) account 41
5 Circularity 44
5.1 Circularity score 44
5.2 Circularity indicator 44
5.2.1 Feedstock input & Output 44
5.2.2 Detachability (index & quality score) 45

6 Financial 48
6.1 Financial value and residual value 48
7 Performance & benchmarking 49
7.1 Performance dashboards 49
8 System databases & suppliers 52
9 Administration 53
9.1 Classification methods 53

1 Getting started.

1.1 What is Madaster?

Madaster is the brand name of the Madaster Foundation. The aim of the Madaster Foundation is to keep materials available in all economic cycles, by registering these materials and thus facilitating their availability at the highest possible level. The Madaster Foundation wants to realize this goal by offering a digital platform in which the built environment can be fully documented. Madaster is an independent Platform that is accessible to everyone: individuals, companies, governments, and the scientific community. Madaster is the "land register of materials".

In our closed system, the earth, raw materials are limited and scarce. To keep materials available indefinitely, they need to be documented/registered in use. With the help of a Materials Passport, materials retain their identity, so that they are not lost anonymously, as waste. Madaster thus acts as a library of materials in the built environment: it links the material identity to the location and records this in a Materials Passport.

1.2 What is a Materials Passport?

A Materials Passport is based on the entered materials and products of a building or building section, as created from one or more source files. In this Materials Passport, the quantities of the materials used are made transparent within the so-called 'building framework'. The materials in the various layers of the building are shown based on the NL/SfB classification coding applied in the Netherlands, and these can be classified according to seven 'material families' or according to the NL/SfB table 3 categorization.

1.3 How does it work?

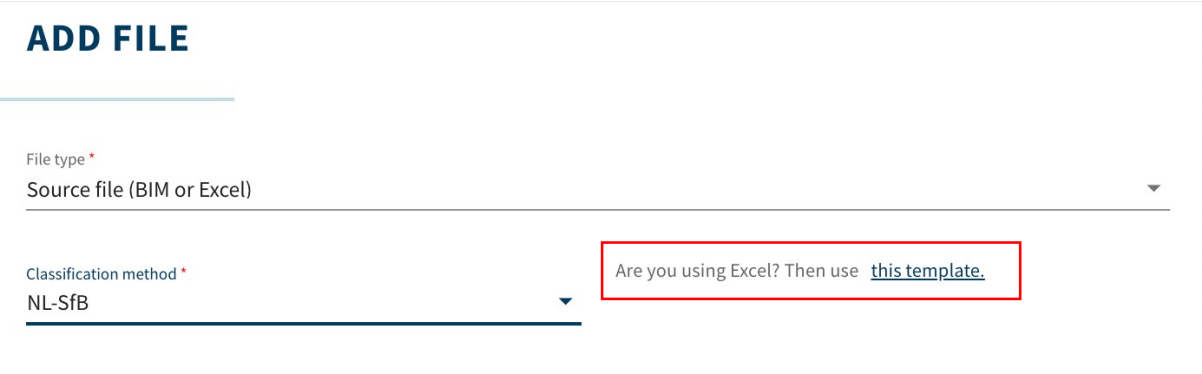
To register a new or existing building in Madaster, information (data) of this building is needed. The more extensive and complete this data is available (input), the more detailed and complete the report (output) is displayed in the Madaster Platform and specifically in the Materials Passport.

The Madaster Platform can process two types of source files:

1. IFC files (based on a 3D/BIM model).
2. a Madaster Excel template (if no 3D/BIM model of the building is available).

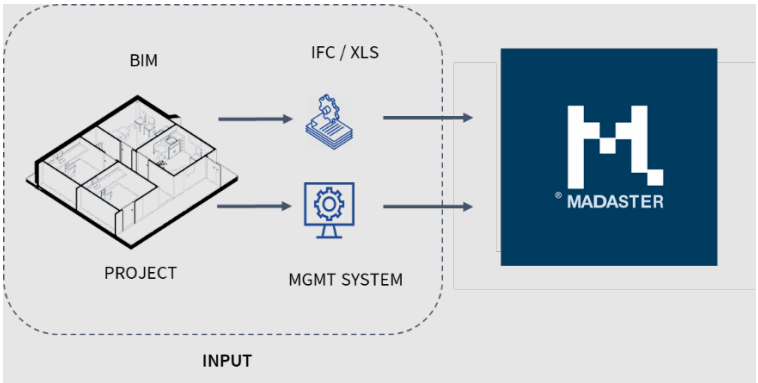
The various 3D CAD applications in which buildings are currently modelled digitally use their own file format but communicate with each other using the universal IFC file format. This IFC format can therefore be exported by all 3D CAD applications. For more information about the export possibilities of the 3D CAD application you are using, please contact your software supplier.

If a building is not modelled in 3D or certain elements are not worked out in the 3D model, an Excel template can be used in Madaster. The latest version of this template is always available in the Madaster Platform under: “Dossier” tab >> “Upload” button >> select classification method.



Picture: Download Madaster Excel template.

Based on this secondary source of information, a building can still be registered in Madaster (without a 3D/BIM model), where the materials and products used in the building are recorded in a Materials Passport.



Picture: Madaster input data (various options).

Madaster then categorizes and summarizes the information contained in the source files, so that for a building or for each building section it is possible to see where and how much of which material is in the building. Madaster does not calculate quantities itself; all geometric information and quantities are imported directly from the IFC model.

The quality (completeness) of the source files is validated by Madaster and displayed in the system after the source file has been read. All calculations within Madaster take place within these frameworks. Missing or incomplete information in the source files leads directly to inaccuracies of the result compared to 100% accuracy.

1.4 What do you need?

A Materials Passport is created based on the available information (data) that the user uploads into so-called 'source files' in the Madaster Platform. These source files (in IFC and/or Excel file format) are automatically validated for completeness when imported into Madaster in terms of material description, classification code and geometric data.

Madaster focuses on the use of IFC files as source files as they can be exported in 3D CAD applications such as Autodesk Revit, Archicad, etc. This usually happens in the design phase of a building or during its renovation. If this type of source file is not available (e.g., for an existing building), the Materials Passport can be created in Madaster based on an Excel template.

More information about collecting and preparing the required building information (source data) is described in the Manual 'Madaster Action plan Materials Passport' (see Step 2).

1.5 Workflow Madaster Materials Passport

You can get started with the Madaster Platform using the manual 'Madaster Action plan Materials Passport'. This manual describes these necessary process steps in more detail and refers to other specific Madaster documentation or reference works for additional information.

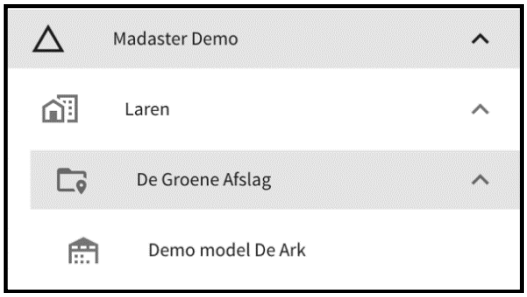
* You can register your Madaster account via the Madaster website.

2 Workflow

2.1 Flexible folder structure

The Madaster platform works from "Accounts" - usually the owner of the property or the primary, leading party in a particular phase (e.g., the architect in the design phase, the contractor in the execution phase, or a designated building manager in the use phase).

You can set up your account structure in Madaster as you wish. Within your account, "Folders" can be created containing buildings or other folders (e.g., a region, department, or subsidiary). A folder contains the "Buildings", the existing real estate properties, or projects or those under development. This structure is flexible and allows you to configure your Madaster environment according to your needs.

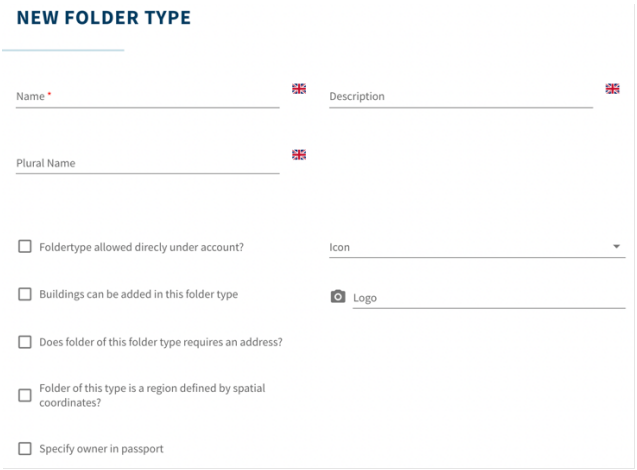


Picture: Madaster folder types (navigation).

"Users" can be assigned different roles in Madaster with specific management, write & read or read-only rights. These rights can be granted by an account manager to other users who have access to one or more folders, folders and/or buildings in the Madaster Platform.

2.2 Type of folders

In the "Type Folders" tab, different types of folders can be created. Think of the above examples of regions, subsidiaries, or another definition of your (desired) organizational structure.



Picture: Define Madaster folder types.

A few examples:

- A large construction company has several companies and subsidiaries. The projects for the different clients can now be organized per company/subsidiary.
- A nationally operating developer has divided his company into regions, with a department for "residential construction" and "non-residential construction" for each region. Various projects or area developments are underway in which the buildings are registered.
- An architectural firm wants to organize the projects per year and per sector (care, education, offices). Within the sectors there are projects with several buildings.

Each account is completely free to decide what the structure of leaflets will look like. By means of the different rights and roles of users, it is possible to determine per level who sees what and who can do what.

2.3 Users

On account level, different users can be invited with different roles and permissions. Madaster has three types of users:

- Administrator: the account holder who is the owner of one or more portfolios and the buildings located within them; the owner can also delete them and has all the features of the role Manager and Reader.
- Manager: a person who is enabled by an owner to manage his portfolios and buildings. In addition, the Manager has all the features of a Reader.
- Reader: a person who can upload (source) files, use information, and generate Material passports.

AVAILABLE ROLES AND RIGHTS AT THE ACCOUNT LEVEL:

Account level	Administrator	Manager & contributor to database	Manager	Reader
Creating and modifying folder types	Yes	No	No	No.
Creating folders	Yes	Yes	Yes	No
Creating database	Yes	No	No	No
Contributions to database created on account or shared with account with at least contribution rights	Yes	Yes	No	No

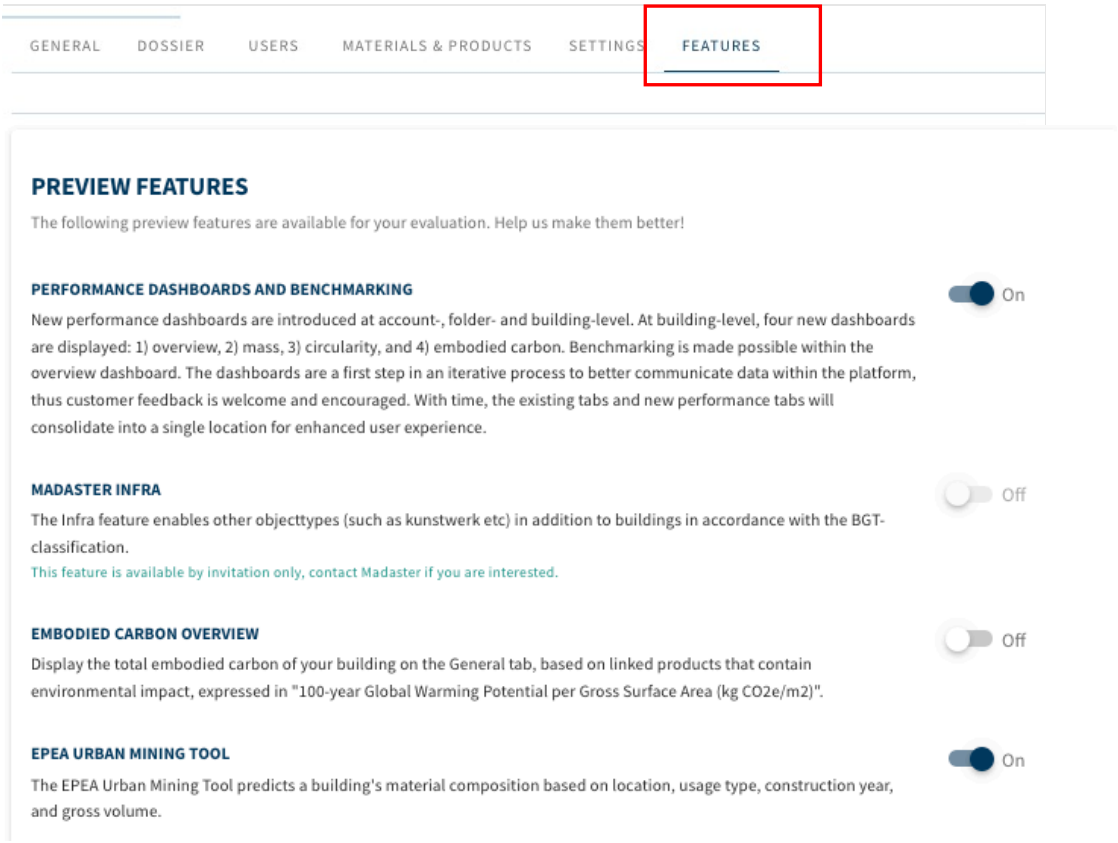
Picture: Available Madaster roles & rights (account level).

Folder level	Administrator	Manager & Contributer to database	Manager	Reader
Create folders and subfolders	Yes	No	No	No
View brochure and underlying buildings	Yes	Yes	Yes	Yes
Modify folder and underlying buildings	Yes	Yes	Yes	No
Delete folder and underlying buildings	Yes	No	No	No
Add building to a folder	Yes	Yes	Yes	No
Add and remove users	Yes	No	No	No
Add database (folder level)	Yes	No	No	No
Contribute to database created at folder level or shared with folder with at least contributions rights	Yes	Yes	No	No
Export Material Passport	Yes	Yes	Yes	No
Download Material Passport to PDF	Yes	Yes	Yes	No

Picture: Available Madaster roles & rights (folder level).

2.4 Features

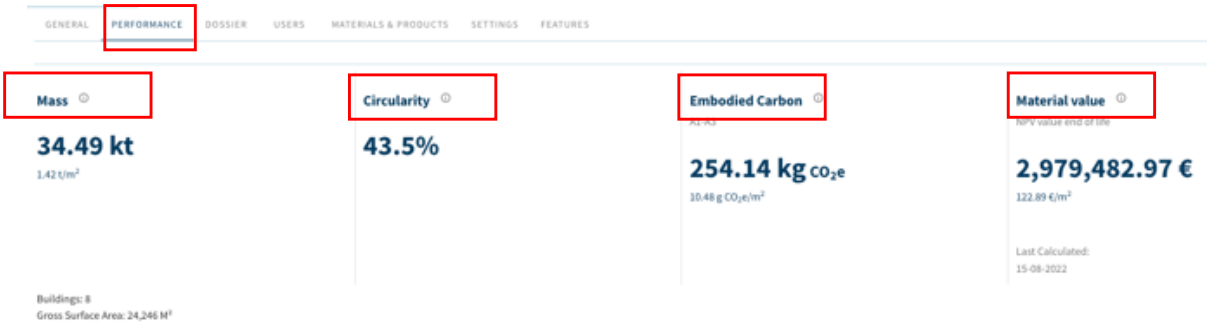
At a company account level, the Madaster user can activate, use and evaluate new (example) functions ('features'). These functions will be further developed based on user feedback. Features can be activated directly by the user or are available by invitation and/or subject to conditions.



Picture: Madaster features).

2.4.1 Performance dashboards and Benchmarking

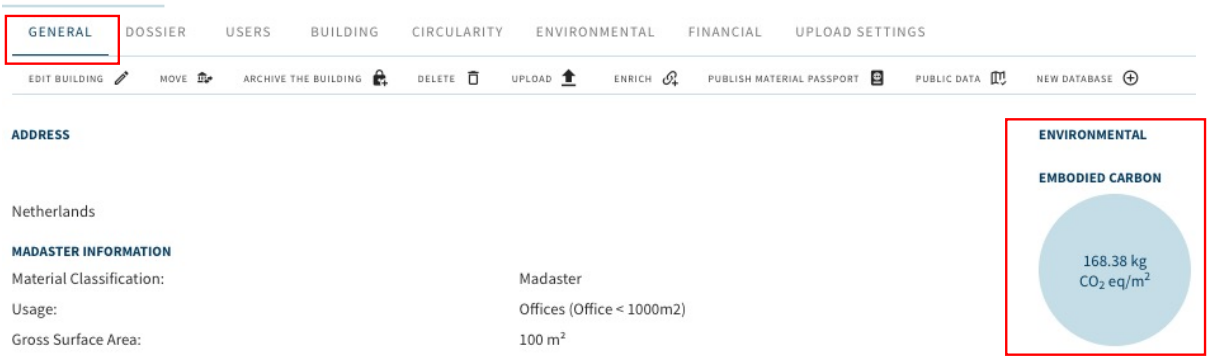
By activating the 'Performance dashboards and Benchmarking' feature, a "Performance" tab is displayed at account, folder and building level. Within the Performance tab, four dashboards are displayed: 1) Overview, 2) Mass, 3) Circularity, and 4) Embodied Carbon. Benchmarking settings can be defined in the Overview dashboard. Using the benchmark function, the building and its building layers (e.g., structure, skin, etc.) can be compared with all buildings in their own account or folder and can also be filtered for specific building types. The benchmark is against all buildings within the benchmark settings, including buildings for which a user does not have read rights. This feature is activated by default for all users in the Netherlands. For more detail, see chapter “Performance & Benchmarking” in this document.



Picture: Madaster Performance dashboard (account & folder level).

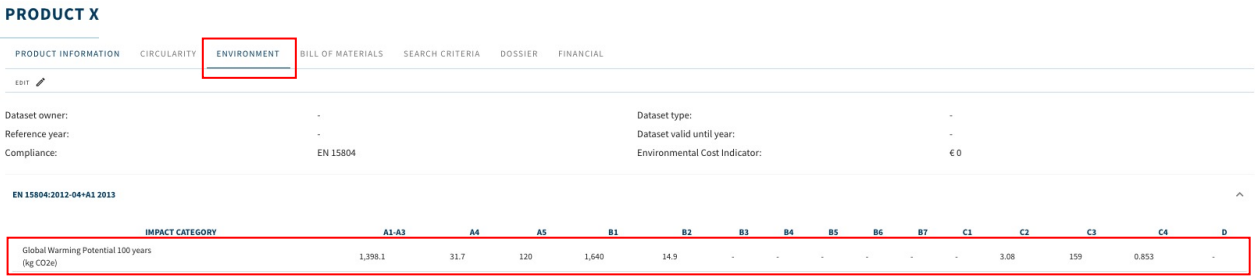
2.4.2 Embodied Carbon Overview feature

The 'Embodied Carbon Overview' feature can be activated directly by the user and offers Madaster users the opportunity to gain insight into the CO2 value per square meter of the building. This value is shown on the “General” tab of the building



Picture: Madaster Embodied Carbon Overview feature.

Prerequisite: one or more elements in the source file (IFC/Excel) are linked to a product in Madaster that contains environmental impact expressed in “Global Warming Potential 100 years (kg CO2e)”.

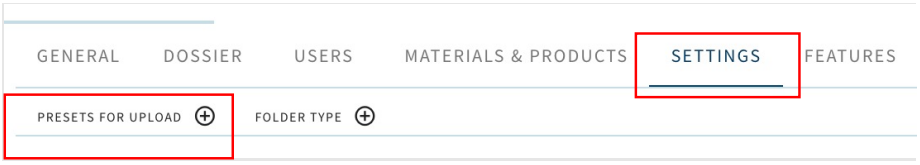


Picture: Product's environmental impact (Global Warming Potential)

2.4.3 Split building feature

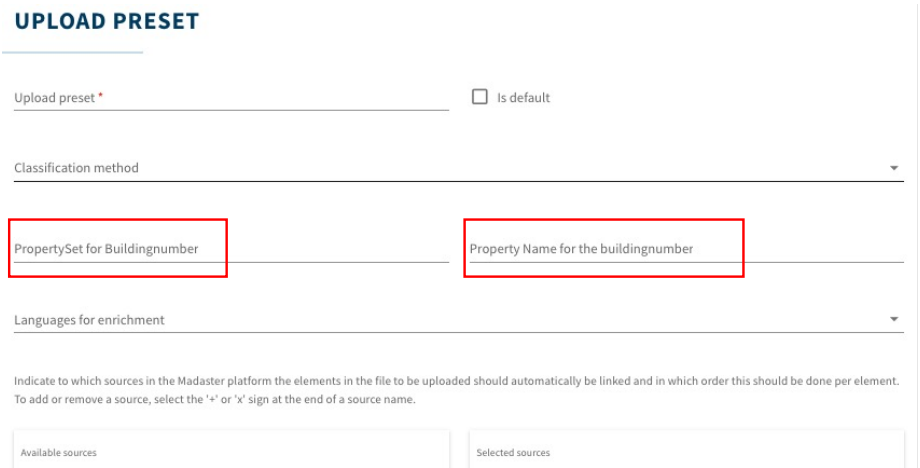
The 'Split buildings' preview function (available by invitation only) allows Madaster users to create individual building dossiers and passports based on a prepared IFC file with several buildings/homes. This makes it more efficient to split up (IFC) models per real estate object prior to being uploaded into Madaster.

To use this function, an individual building number must be available for each IFC element in the IFC file. The property set and property name for this building number are flexible. This and other settings (see section 2.2 for details) can be specified in Madaster at company account level as an upload setting.



Picture: Madaster presets for upload.

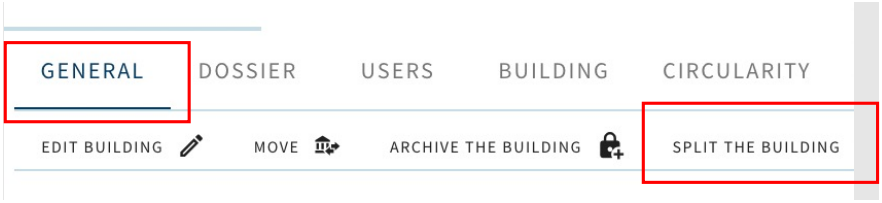
It can be defined by clicking on the 'Presets for upload' button.



Picture: Set Madaster upload settings.

When the data upload process in Madaster is completed, the user can manually link unlinked elements in the "Enrich" tab, adjust these elements (if desired) and consequently activate the

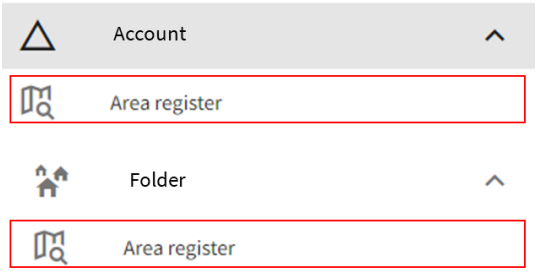
relevant IFC files. Subsequently, via the button 'Split the building' (on the building's 'General' tab), the user can automatically create individual building dossiers in Madaster (from a source file model with several buildings) on the basis of an assigned building number.



Picture: Split building function.

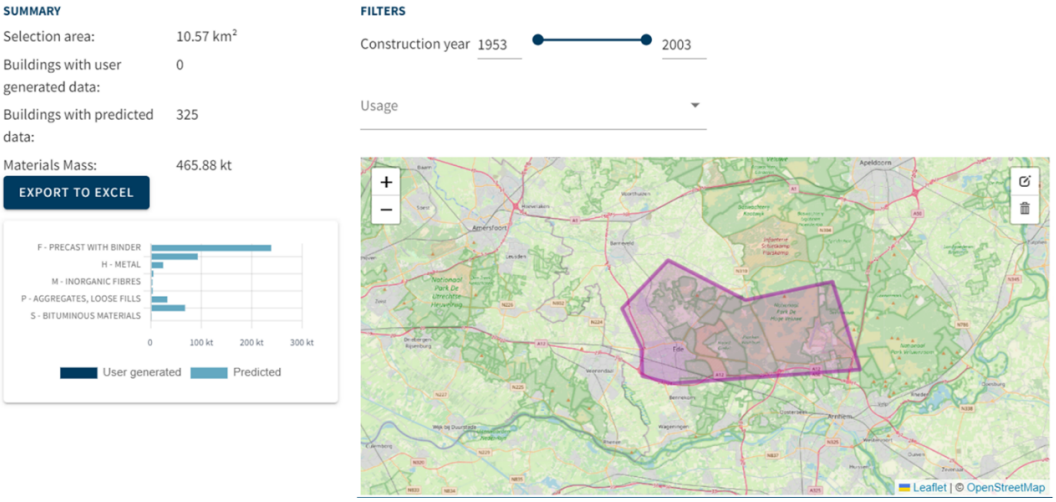
2.4.4 Area register (private buildings only)

The Area Register feature plots all buildings within an account or folder on a map for aggregated material mass reporting.



Picture: Area register feature.

Using the mapping interface, users can draw custom boundaries to report only on selected buildings. Buildings within the map can be filtered by construction year and usage. The aggregated material mass can be exported to excel and downloaded within the dossier.



Picture: Area register map.

2.5 Types of files

Within the Madaster Platform a distinction is made between two types of files, namely:

- **Source files:** the files with which the materials and products and the quantities of a building are delivered to be registered in Madaster. These include the IFC files and the Excel template of Madaster.
- **General files**: static files that contain information about the building and can be added to the building file in Madaster, but which cannot be used to serve as a source file.

2.6 Source files

The Madaster Platform primarily uses IFC files (4 or 2x3) of the buildings to provide insight into the quantities of materials used. As an alternative, Madaster offers an Excel template. This template is made available on the Madaster Platform.
The elements in these two types of source files should, as far as possible, include:

- **Geometric properties** (so-called 'base quantities') of the CAD objects; information about the quantities in volume and weight.
- A **material description**, on the basis of which the Madaster system can provide insight into the materials used in the building.
- A **classification coding** (in the Netherlands the NL/SfB code is common) on the basis of which the Madaster Platform can assign the elements to the building envelope in which the element is located (location).

Multiple source files can be uploaded in Madaster per building. For example, construction, installation, and architecture. You decide which file is made active. If multiple source files are active, they will be added together in the different tabs of Madaster (e.g., 'Building'-tab, 'Financial'). Attention: duplications can occur! This can be displayed in specialized 3D-viewers, such as Solibri, BIMColllab Zoom, etc. The latter functionality is not available in the Madaster system.

A source file can be made active or inactive at any time (depending on user rights).

2.7 IFC-source file manuals

- The manual "Madaster IFC guidelines" outlines the Madaster guidelines for setting up the BIM model and exporting the IFC file.
- The manual "Madaster BIM IFC import" describes in detail how to prepare an IFC file for processing within Madaster. It explains, among other things, how the geometric properties, classification coding, construction phase and material use is determined.
- The manual "Madaster BIM - IFC export" describes in more detail how to export an IFC file (from Archicad and Revit).

2.8 General files

This includes files that provide information about the building or its design, e.g., digital drawings of the building in 2D CAD formats (e.g. .dwg, .dxf), PDFs, photographs, and scans of building drawings (in JPG, PNG, TIFF formats).

2.9 Data and information

Because the Information Delivery Manual (IDM) is already widely used in the Netherlands, we recommend using it. For more information see the BIMloket. Here you will also find very extensive manuals to comply with the ILS with your specific BIM software. In the IFC check section, you can also see whether your files comply with the IDM standards. This manual discusses what is specifically required for Madaster. This is less extensive than the full IDM standard and is mainly focused on materials and NL/Sfb coding.

2.10 Geometric data

Madaster obtains all geometric data (e.g., volume, surface, length, weight) from the source files (IFC/Excel) that are uploaded by the user or from products that are available in its databases and that are linked to elements of a source file. This means that Madaster does not perform any calculations itself. Only the summation of the different quantities of the obtained information is used.

2.11 Material Classification

Madaster distinguishes six material categories and one that contains elements for which a material is unknown. In addition, it is possible to display the materials categorization on the “Building” tab based on the NL-SfB table 3 classification.

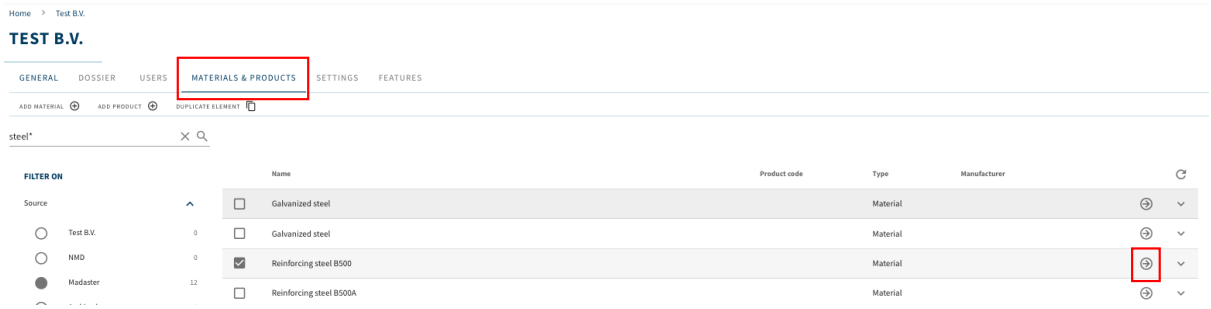
Picture: Material groups (“Building” tab).

Via the Materials & Products tab (in the left vertical navigation menu) you can view available materials and products from different data sources.

2.11.1 Matching on own search criteria (global databases only)

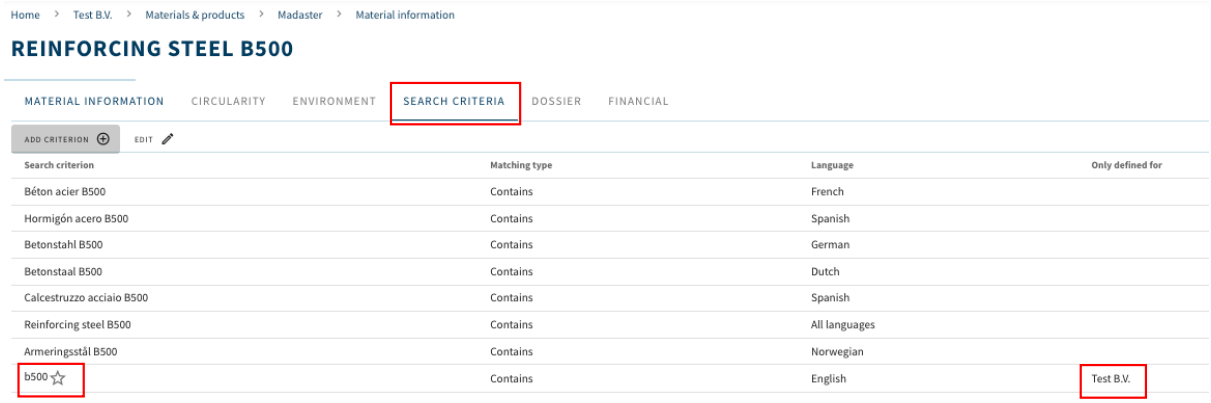
The Madaster platform allows users to add their own (account-specific) search criteria to materials/products from globally available databases (including the "Madaster" database). This improves the automated matching process and prevents users from having to duplicate materials/products in their own database before adding their own search criteria. This function is available at the Madaster account level (click on the company account name in the left vertical menu) under the section “Materials & products” and can only be used within globally available databases (including the “Madaster” database).

Search the desired material or product and click on the arrow icon.



Picture: Add own search criteria (global database).

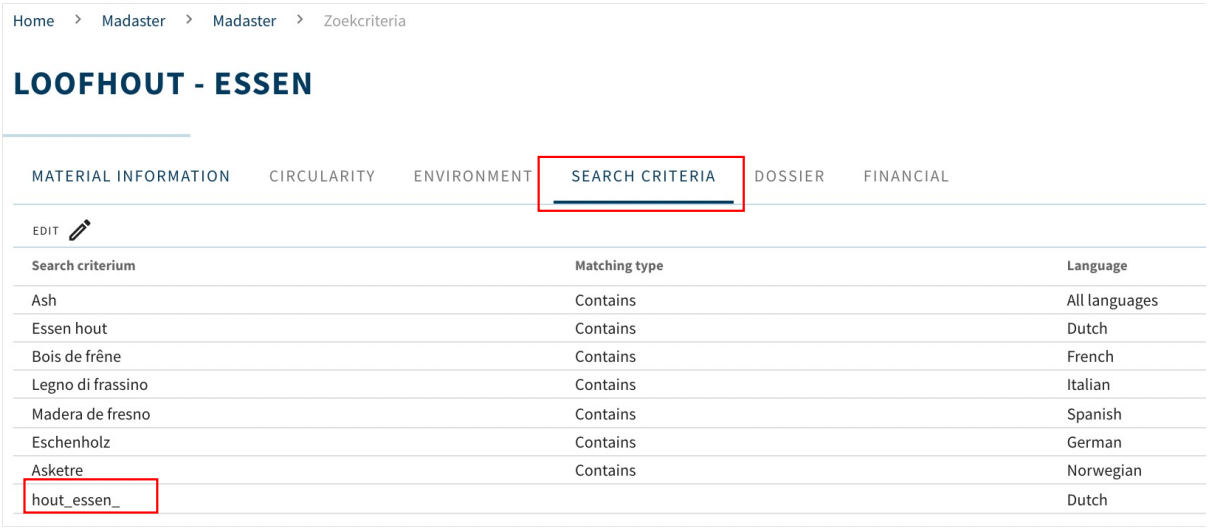
The characteristics of the material or product are shown. Then click on the 'Search criteria' tab and on the 'Add criterion' button. Enter one or more 'own' (account specific) search criteria here. These own criteria can be distinguished by the star icon.



Picture: Add own search criteria (global database).

2.11.2 Matching on Madaster material list & NAA.K.T. search criteria

If the “Madaster” database is used, the “Madaster Materials List” can be used when preparing source files (IFC/Excel) (column B of this list contains the exact English search criteria). The materials in the “Madaster” database also contain the NAA.K.T material naming (Dutch abbreviation for name attribute, application) as search criteria. As a result, in a source file (IFC/Excel) an element containing a NAA.K.T material name will be automatically recognized and linked to a corresponding material in the “Madaster” database.

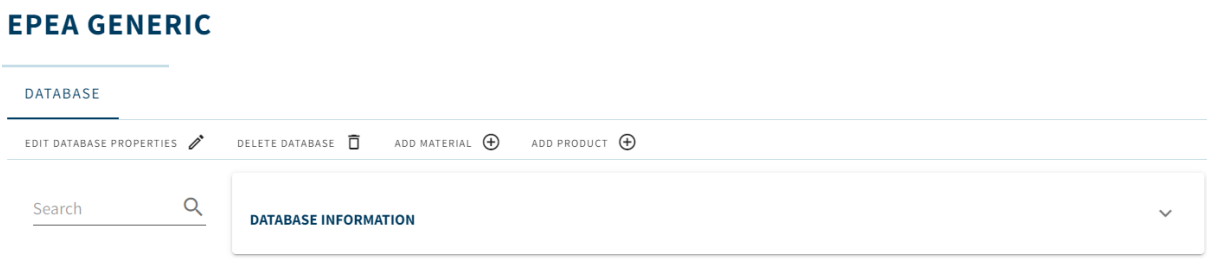


Picture: Material (example search criteria).

If desired add your own materials and products to a database (on account, folder type or building level). By adding search criteria to your material/product the Madaster Platform can link these automatically to elements in the source file(s). For more details refer to Madaster manual "Add Products".

2.11.3 Matching on EPEA Generic dataset

The new EPEA Generic database enables country-specific, full-building circularity and environmental calculations, even when specific manufacturer products have not yet been selected. The database, which contains over 180 generic materials and products, is verified by EPEA and sourced through a combination of EPDs and other scientific and public literature. The database will be periodically maintained to include the most up to date information and expanded to include more materials and products.



Picture: EPEA Generic dataset.

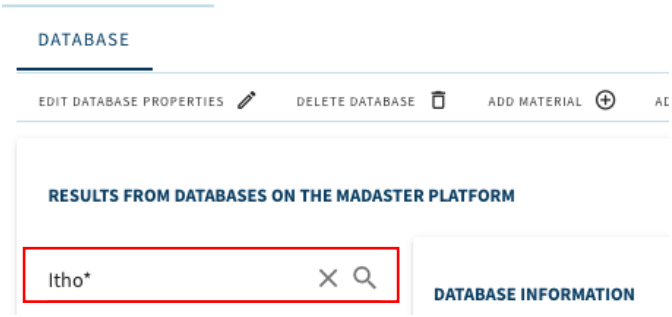
The Data is intellectual property of EPEA and may only be used within the Madaster platform. The data may not be exported, copied, or removed from the platform or be used for other purposes than calculations within Madaster. Any other use of the data violates EPEA's creator rights and EPEA will pursue any contravention legally. EPEA assumes no responsibility or legal liability concerning the Data's accuracy, reliability, completeness, timeliness, or usefulness.

2.11.4 Import data from generic external database(s)

Users can manually import materials and products from generic external databases (e.g., 2BA) to a shadow database in Madaster, if no automatic linking has taken place by GTIN (EAN) or article code. Adding account-specific search criteria to the imported materials/products, enables automatic linking to these materials/products in the future.

Picture: Madaster generic database(s)

Search for the material/product in the generic external databases (e.g., 2BA).

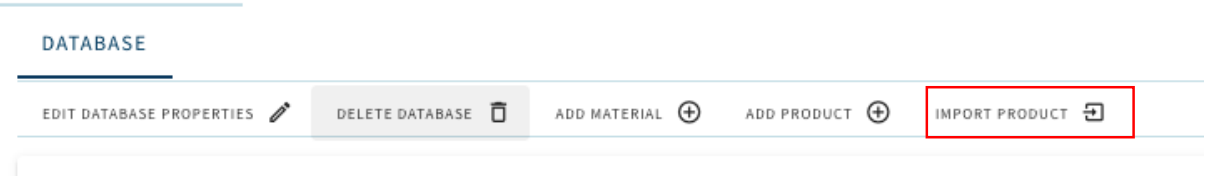


Picture: Madaster generic database(s) – search function.

The search results found from the external database are displayed at the bottom of the page. Then select the material to be imported to the Madaster shadow database.

Picture: Madaster generic database(s) – results.

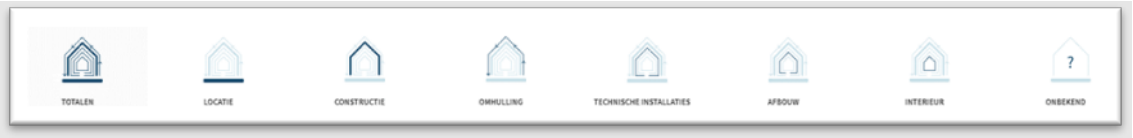
Then click on the “Import product” button at the top of the submenu. The product is now imported from the external database and is available in the Madaster shadow database.



Picture: Madaster generic database(s) – import product.

2.12 Standard Classification (NL/SfB)

In the construction sector, the NL/SfB code indicates the building section in which a building section or material is located. This coding is given to objects in the IFC file. This allows Madaster to categorize the materials. In this way it is made clear how many materials are located where in the building. Preferably use the NL/SfB code with 4 digits. Madaster then assigns these to the building envelope (e.g., Construction, Enclosure, etc.).



Picture: Classification (building layers).

In addition to the NL-SfB classification, the Madaster Platform also supports the: NL/SfB table 1 (NL-SFB V201912), the international OmniClass (table 21) and its own “shearing layers” classification. The content of these classification methods can be viewed in the Madaster Platform under “Administration” (in the left vertical navigation drawer).

2.13 Building process – renovation phases

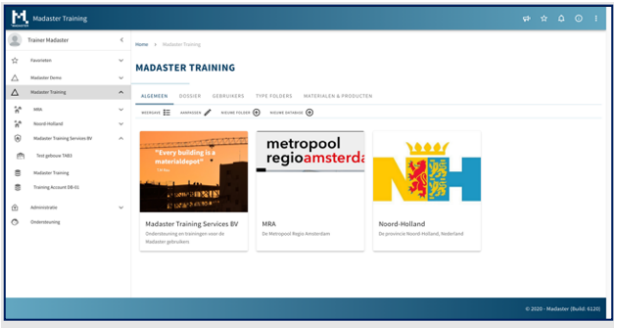
Many building projects consist of the renovation of existing buildings. Part of an existing building is demolished; a shell remains and is built in and attached with new materials. This construction phase (Current-Demolition-Casco-New-Final) is supported by Madaster from the information that can be provided in a source file (IFC and/or Excel template).

Picture: Building process (renovation phases).

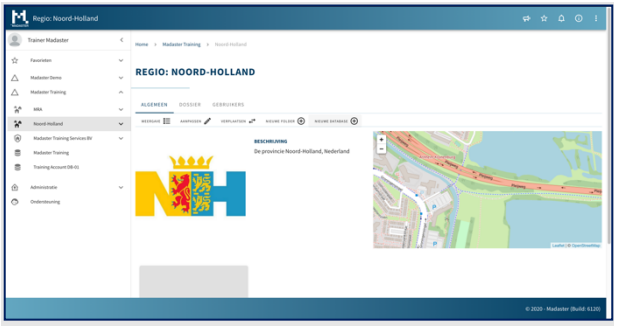
This tab will be displayed as the “Building phase” is marked as: ‘Existing’, ‘Renovation’ or ‘Demolition’.

2.14 Databases

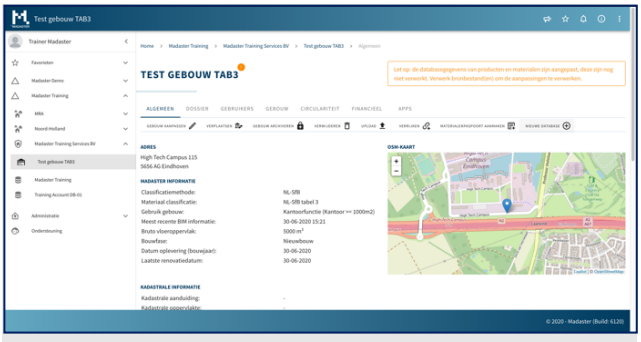
In Madaster it is possible to create and use multiple databases at different levels (e.g., project, portfolio and/or building level) within one's own account. A created database can be found in the navigation drawer on the left-hand side of the screen. The images below show several levels on which a new database can be created in the platform.



Picture: Database creation at account level.

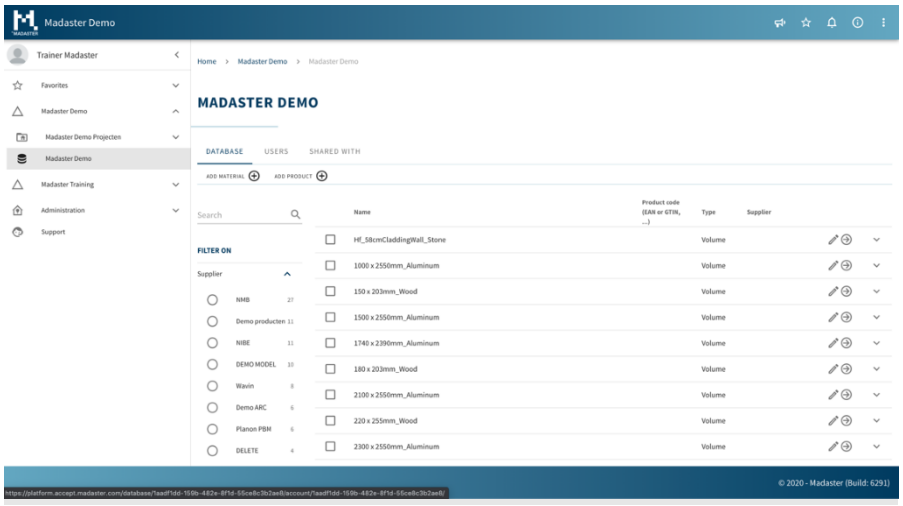


Picture: Database creation at folder level.



Picture: Database creation at building level.

It is also possible to create multiple databases at a level (folder or building). These databases are always visible in the navigation drawer on account, (sub)folder or building level.



Picture: View/find created databases.

2.15 Database properties

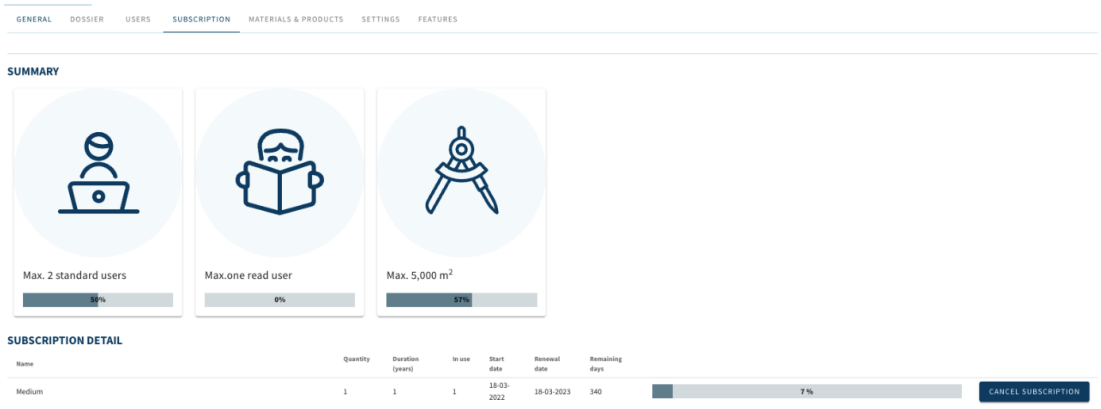
A database has minimal properties: a name and the possibility to use this database as a standard selected database when uploading a source file. If a database is shared, several properties are added, which relate to the use of the (shared) database.

2.16 Users

Just as with accounts, folders and buildings, databases can also be used by several people or by another IT system using an API token. Users can now be invited and receive rights as administrator or contributor. The latter role can only create or modify materials and products in the platform.

2.16.1 Subscription management summary

Private individuals (residentials) and business admin users have access to a (preview) summary of their current subscription. This makes it clear to these user groups which type of Madaster subscription they have and to what extent it is currently being used (based on number of users, square meters GFA, etc.). In addition, it is possible to cancel their subscription directly via the platform.



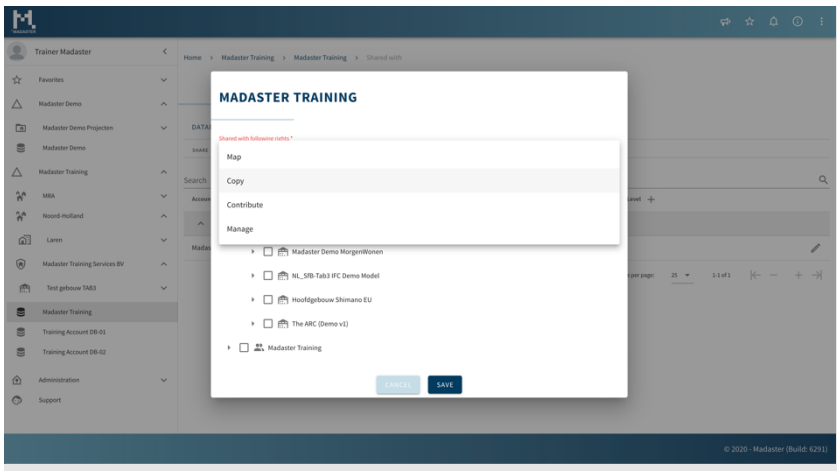
Picture: Subscription mgt. summary.

2.17 Sharing databases with other accounts, folders, buildings

A database can be shared with multiple accounts, folders or buildings. This makes it possible, for example, for a company to set up your own database and then make these materials and products available to another user working under a different account.

2.18 Sharing a database: rights

When sharing a database, it is necessary to determine the rights with which the users -of the account/folder/building with which you share it- can use the materials and/or products.



Picture: sharing databases (rights).

A database can be shared with four different rights, properties:

Map – elements can be linked to the materials and products in this database.

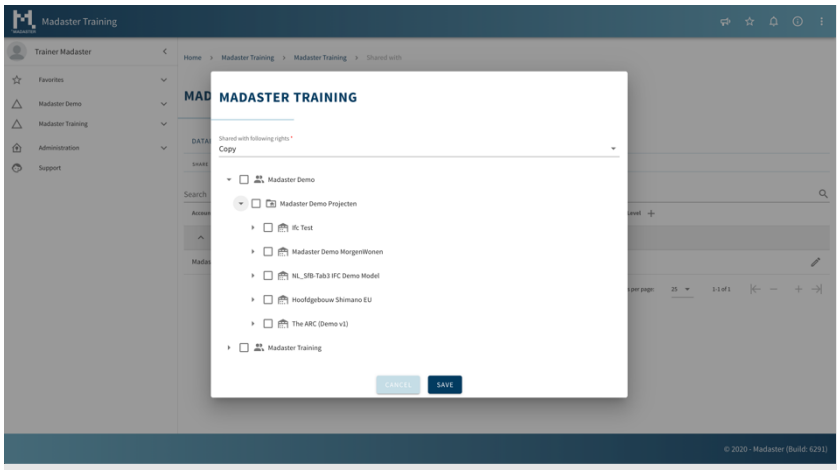
Copy – the materials and products from this database can be copied.

Contribute – new materials and products can be entered into this database by the users with whom this database is shared.

Manage – the database can be managed by the users with the rights, on the account/folder/building with which this database is shared.

2.19 Sharing a database: account, folders, buildings

A database can be shared with multiple accounts, folders or buildings. This makes it possible to create a central database that supports multiple folders and buildings or specific databases for certain types of buildings. After sharing a database, you get the choice to determine which accounts, folders, buildings have access to the shared database.



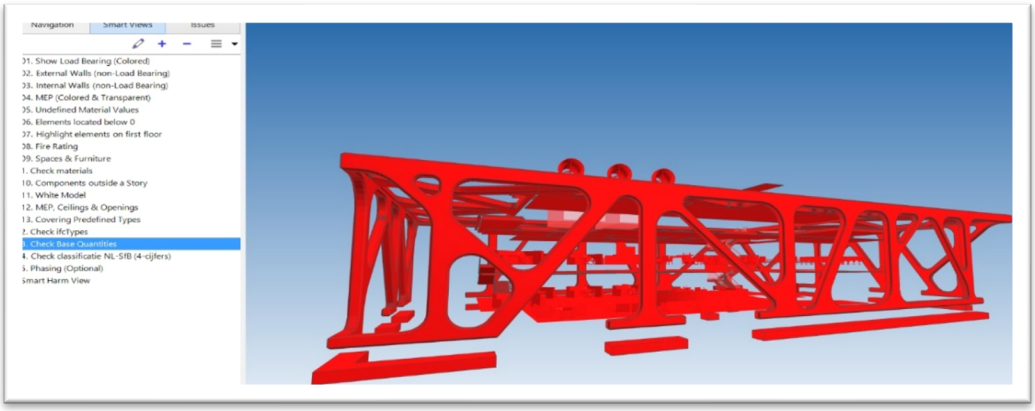
Picture: A database can be shared with other account(s), and/or one or more folders and/or buildings.

2.20 Share and use

The materials and products in a shared database are "synchronized": it is the same database, accessible from multiple accounts, folders and/or buildings. Changes and additions made by one user are also available to all other users of this database.

2.21 IFC check (BIMCollab Zoom)

Before reading an IFC file into the Madaster system, you can perform a validation to determine whether the basic settings, such as materials and NL/SFB classification, are correct and complete. For this purpose, a Madaster smart view is available, which can be used with the free version of the "view" program BIMCollab Zoom. This public viewer and the Madaster smart view can be downloaded here.



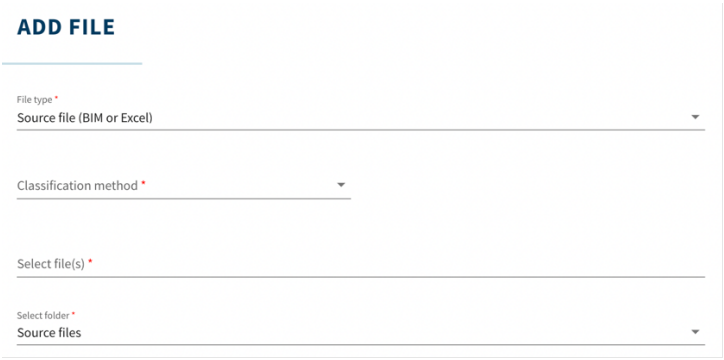
Picture: IFC checker (BIMCollab Zoom).

After loading your IFC model in BIMCollab Zoom, you can load the Madaster smart views under smart views. Now several pre-programmed views are loaded with which you can quickly scan elements that are missing a NL/SFB coding or do not yet have a material allocation. After this check

and any adjustments in Archicad, Revit, etc. the IFC models can be uploaded into the Madaster Platform.

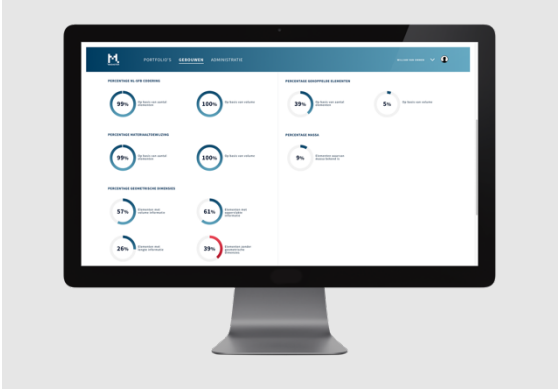
2.22 Upload source files

The Madaster platform can handle two types of source files: an IFC file (based on a 3D / BIM model) and a Madaster Excel template (if no 3D / BIM model is available). In the tab "Dossier", within the relevant building in the Madaster platform, one or more source files can be added (at the same time) consisting of, for example, construction, technical services and architecture.



Picture: Upload files (Dossier tab).

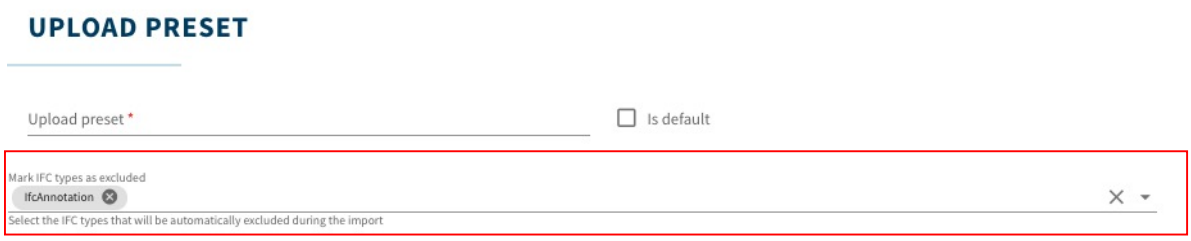
For more details about the upload process, please refer to Step 4 “Uploading the source data into Madaster” in the manual “Madaster Action Plan Materials Passport”.



Picture: Upload results source files (Dossier tab).

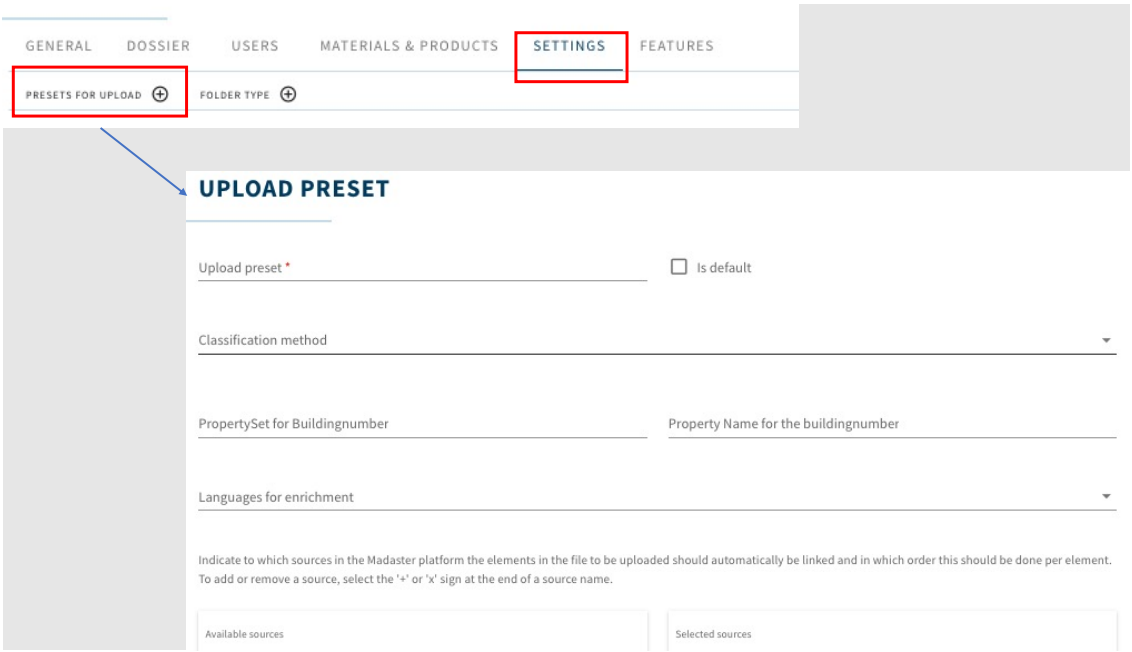
2.22.1 Upload settings

On different levels (account, folder type & building) within the Madaster platform, default upload preferences can be set and selected regarding classification method, language(s) for enrichment, selection of source files (incl. priority) and property settings for building numbers (for 'split building' feature) and building phase. There is also the option to automatically exclude IFC types during the source file upload. The latter prevents unnecessary manual work while enriching elements in Madaster.



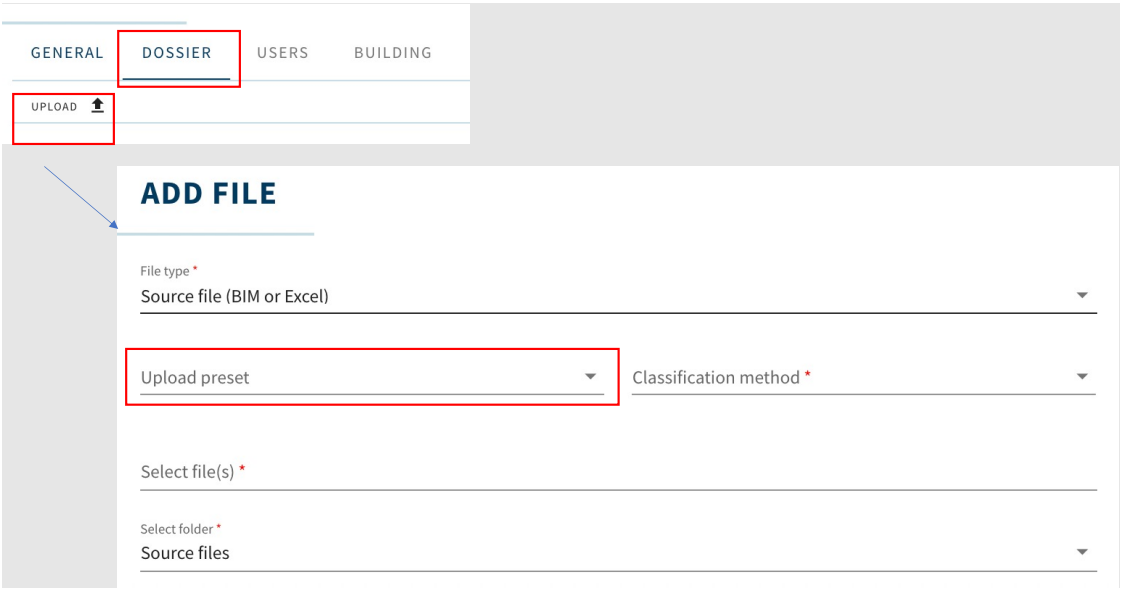
Picture: Upload settings (exclude IFC types during upload).

Upload settings created at a higher level in the navigation tree (e.g., account, folder type, building) are made available by default at the lower levels as well, but this inheritance can also be broken at a lower level.



Picture: Define Madaster upload settings.

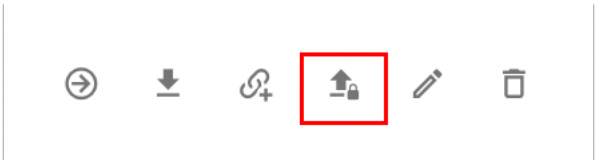
The upload setting is then selected in the building's "Dossier" tab.



Picture: Select Madaster upload preset.

2.22.2 Replace existing IFC file (keep linked elements)

It is also possible to replace an existing IFC file, of which elements have already been automatically or manually linked, with a new version of the IFC file while retaining the linked elements. Instead of the usual IFC upload procedure, this function starts via the upload icon (in Dossier tab) located behind the IFC file to be replaced.



Picture: Upload new version of source file (while retaining linked elements).

Subsequently, the regular upload process steps must be followed (as described at the beginning of this chapter). The system then processes the new IFC file and, if a unique element occurs again and was linked in the previous IFC file, will maintain this relationship. Ultimately, only 1 version of the IFC file can be activated in the building dossier. By activating the most recent version, the system will automatically deactivate the former (replaced) version.

2.23 Enrichment process

2.23.1 Link elements

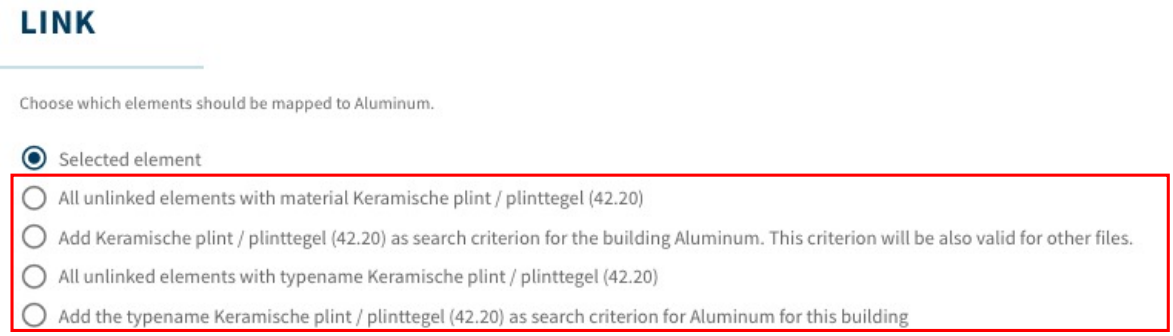
It is recommended to link as many elements as possible or at least link elements with the most volume to a material or product in Madaster. Unlinked elements can be linked manually by the user. This can be done in the “Enrich” tab (click on the source file (IFC/Excel) in the dossier) or directly via the “Building” or “Building process” tab by clicking on the pie charts (see paragraph ‘Adjust elements’).

If desired, use the search function or the predefined filters on the left side of this screen to select IFC elements. After selecting one or more elements, the user clicks on the 'Link' button (paperclip icon).

Picture: Linked elements (Enrich tab).

Then select the material/product from the available databases and subsequently click on the 'link' button. In addition to the selected elements, the platform allows users several options for linking elements of a source file, namely:

- All unlinked elements with the same material description
- Add material name as search criteria for material to be linked.
- All unlinked elements with the same Type Name.
- Add Type Name as search criteria for material to be linked.



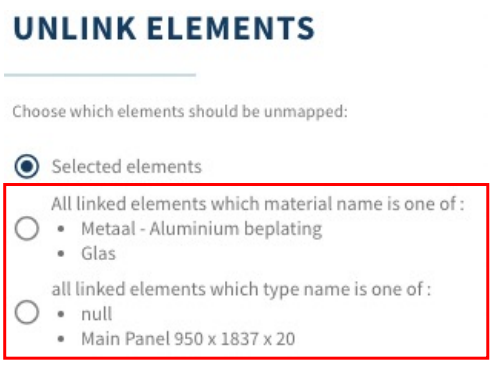
Picture: Linked elements.

The selected elements are then linked by the Madaster system. A maximum of 500 elements can be linked to a material/product in Madaster at the same time. For more details about the enrich process, please refer to Step 5 “Check & enrich source data in Madaster” in the manual “Madaster Action Plan Materials Passport”.

2.23.2 Unlink elements

Like the functionality to link elements, it is also possible to manually unlink elements. In addition to one or more selected elements, a user can also unlink:

- All linked elements with the same material description
- All linked elements with the same type (ifcTypeName)



Picture: Unlink elements.

2.23.3 Adjust elements (incl. bulk edit)

In addition to linking materials and products in Madaster, a user also has the option to adjust elements in the Madaster platform. This takes place in the “Enrich” tab via the 'Edit' button (pen icon) or directly via the “Building” or “Building process” tab by clicking on the pie charts.

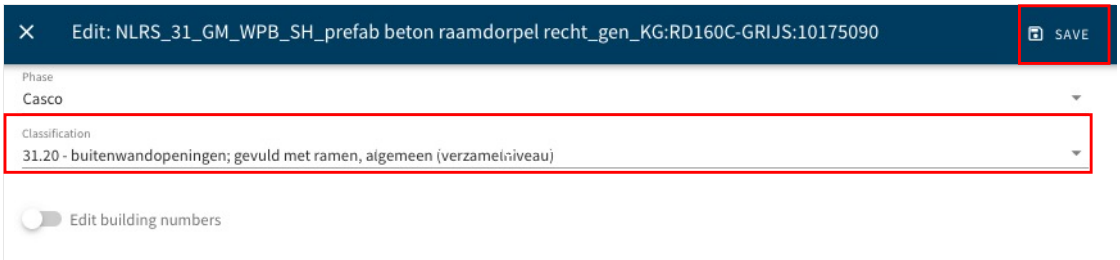
Picture: Adjust elements (Enrich tab).

Picture: Adjust elements (Building & Building process tab)).

2.23.4 Adjust classification code per element (incl. bulk edit)

Picture: Adjust elements (Enrich tab).

Subsequently, it's possible to adjust the classification code of one or more elements (material and product) at the same time (bulk).

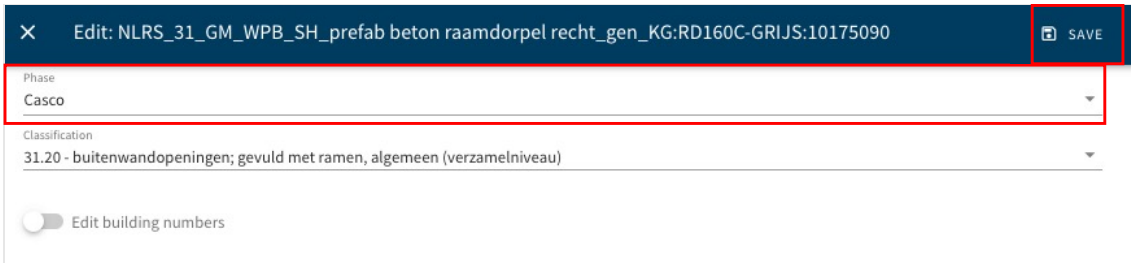


Picture: Adjust classification code of element (Enrich tab).

Click this field and then select the desired classification code from the defined list. Finally, click on the 'Save' button to save the changes.

2.23.5 Adjust phasing per element (incl. bulk edit)

Subsequently, it's possible to adjust the phase (e.g., demolition, casco, new materials) of one or more elements (material and product) at the same time (bulk).



Picture: Adjust phase of element (Enrich tab).

Click this field and then select the desired classification code from the defined list. Finally, click on the 'Save' button to save the changes.

2.23.6 Adjust building number per element (split building function)

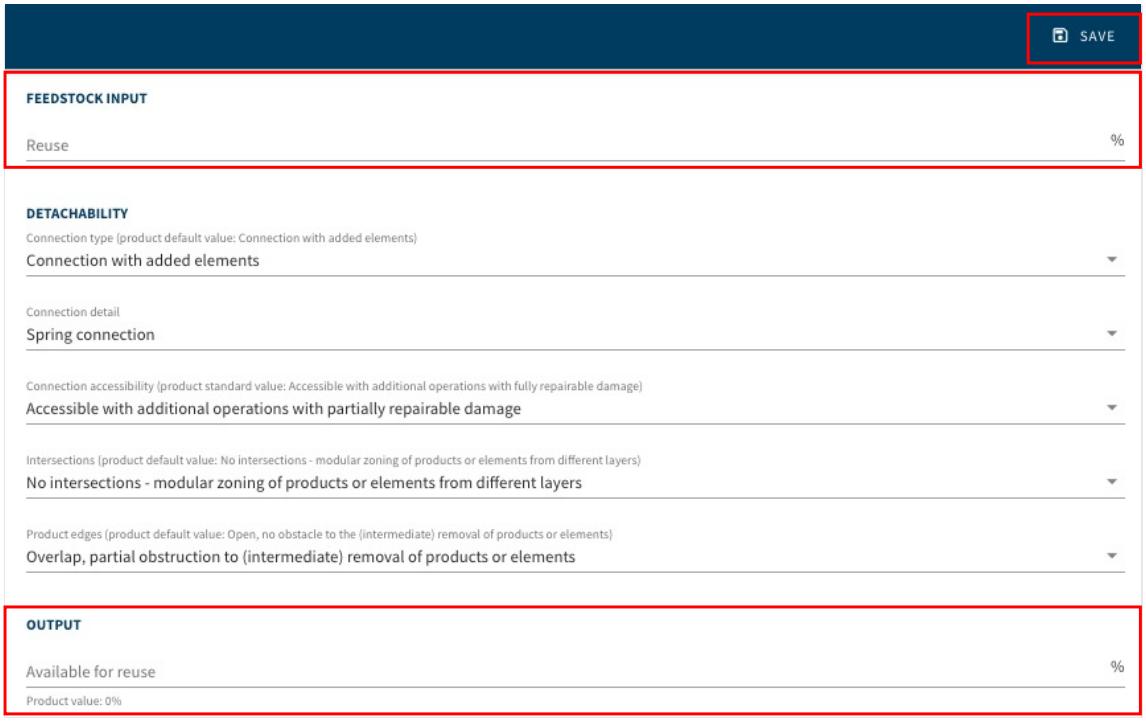
Subsequently, it is possible to adjust the (degree of) building number allocation of one or more elements (material and product) at the same time (bulk).

Picture: Adjust building number of element (Enrich tab).

To do this, activate the function 'Edit building numbers' and then allocate the desired ratio (%) to the available building numbers. Finally, click on the 'Save' button to save the changes.

2.23.7 Adjust Reuse (Feedstock input & Output)

Subsequently, it is possible to adjust the degree of reuse in the construction phase (Feedstock input) and at the end-of-life phase (output) of one or more elements (product only) at the same time (bulk).

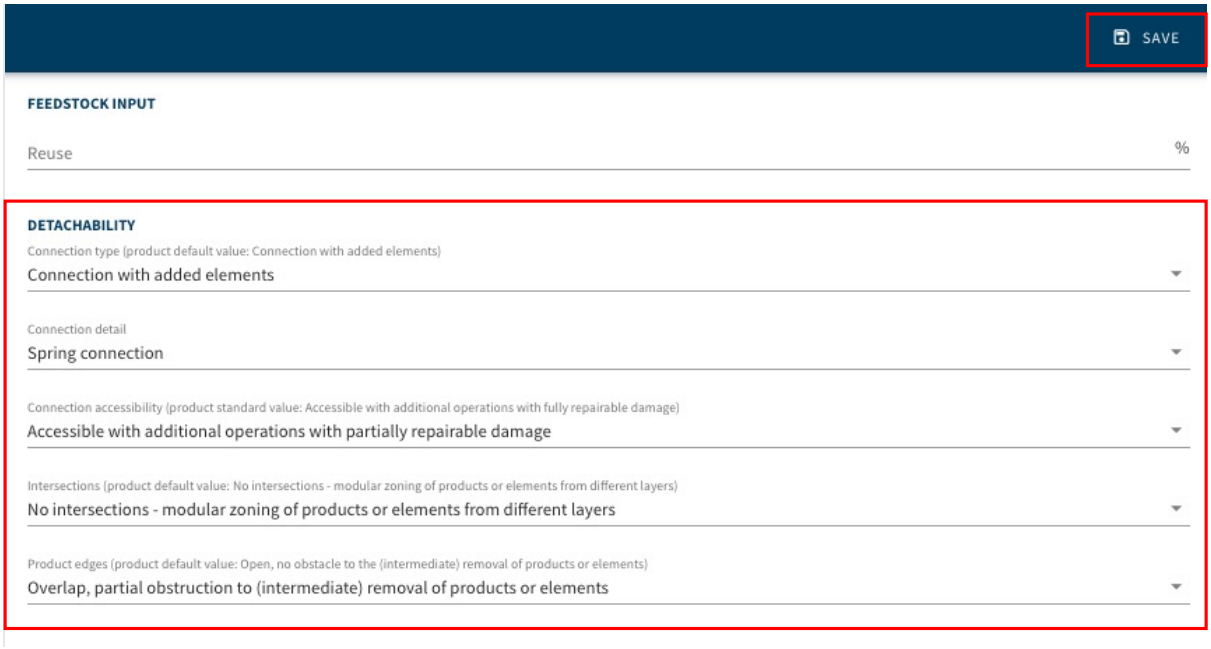


Picture: Adjust Reuse (Enrich tab).

If desired, complete the fields 'Feedstock input Reuse' (in %) and 'Output available for reuse' (in %). Finally, click on the 'Save' button to save the changes.

2.23.8 Adjust detachability per element (incl. bulk edit)

Subsequently, it is possible to adjust the detachability parameters of one or more elements (product only) at the same time (bulk).



Picture: Adjust Detachability (Enrich tab).

Adjust the desired detachability parameters. Clicking the 'Save' button will save the adjusted parameters. Detachability parameters cannot be edited when the selected building elements are matched to different products.

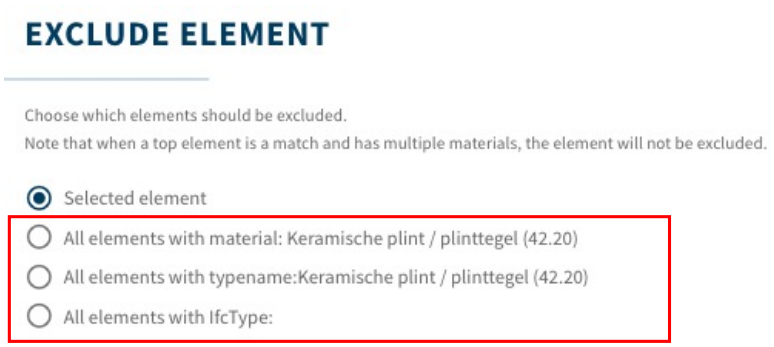
2.23.9 Include / exclude elements

In addition to linking and/or adjusting elements, a user also has the option to include or exclude elements from a source file in the Madaster platform. This too takes place in the “Enrich” tab.

Picture: Include / exclude elements (Enrich tab).

The exclusion of elements can also be done directly via the “Building” or “Building Process” tab by clicking on the pie charts (see section “Element customization”).

Excluded elements are not included in the calculation and display of the various insights (regarding material overview, financial display, etc.) in the other Madaster tabs. Besides selected elements, the platform offers users to include and exclude elements of a source file, if they contain the same material description, type name or the same ifcType.



Picture: Include & exclude element(s)

2.23.10Search function

The "Enrich" tab also contains a search function that enables the user to search for / find source file elements based on their material description (in column 'materials').

Picture: Search function (Enrich tab).

The following search characters can be used in a query string to improve the precision of a match:

- Wild card search character = *****
  - Search prefix = **alpha*** >> returns search results "**alphanumeric**" or "**alphabetical**".
  - Search suffix = ***numeric** >> returns search result "**alphanumeric**".
  - Search infix = **non*al** >> returns search results "**nonnumerical**" and "**nonsensical**".

- Boolean operator's characters

Boolean operators can be embedded in a query string to improve the precision of a match. The full syntax supports text operators in addition to character operators. Always specify text Boolean operators (AND, OR, NOT) in all capitals.

AND: specifies terms that a match must contain.

- Search = **wood AND stone** (with spaces)
- Search = **wood+stone** (without spaces)
- Search = **wood&stone** (without spaces)

For these search examples, the query will look for elements with a material description containing both "**wood**" and "**stone**".

OR: finds a match when either term is found.

- Search = **wood OR stone** (with spaces)
- Search = **wood|stone** (without spaces)

For these search examples, the query will return match on elements with a material description containing either "**wood**" or "**stone**" or both.

NOT: returns matches that exclude the term.

- Search = **wood NOT birch** (with spaces)
- Search = **wood!birch** (without spaces)

For these search examples, the query will return match on elements with a material description that have the "**wood**" term but not "**birch**".

2.24 Activate source files

After enriching (as many) elements, a source file in Madaster can be made 'active' (in the 'Results' tab). This ensures that the results of the source file are also shown in the 'Building' tab, 'Building process' tab, etc. Based on this, it becomes clear (per building layer) how complete the source data of the building is. A source file can be made active or inactive at any time (depending on user rights). The goal is to get 100% completeness before a source file is activated in the system.

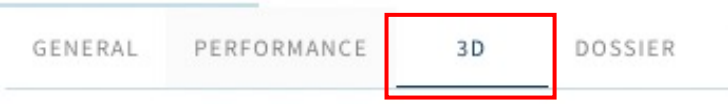
2.24.1 Activate/Deactive/Delete multiple source files

In the building's "Dossier" tab, a Madaster user can activate, deactivate, or delete multiple source files simultaneously. To use this function, first select the tick boxes of the appropriate source files. Subsequently, click the activate, deactivate, or delete button in the menu that becomes available.

Picture: Activate/deactivate/delete multiple source files simultaneously.

2.25 3D model viewer

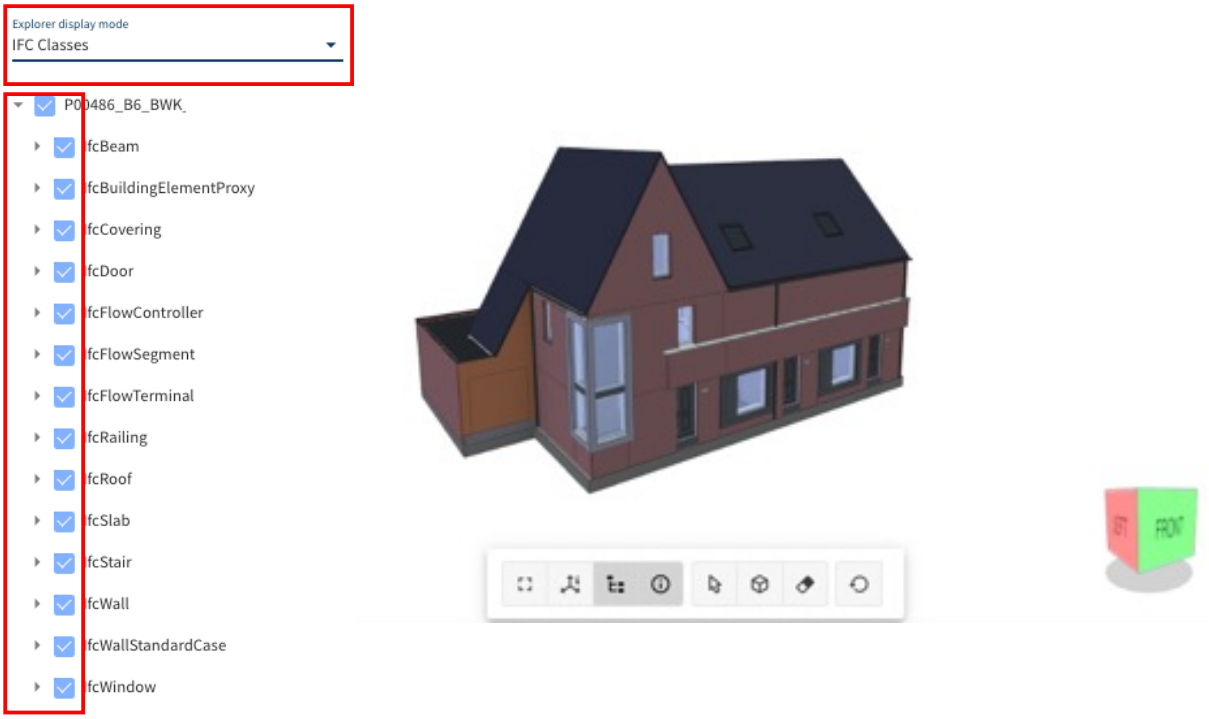
The Madaster platform includes a "3D" tab, which includes an advanced 3D viewer (available for all buildings with active IFC source files). In addition to the ability to display multiple IFC files in one 3D view (view), this 3D viewer has improved performance when processing large files, including filtering, rotating, and properties of individual objects. displayed.



Picture: Madaster 3D tab.

Using the display mode (navigation panel on the left), the geometry can be organized and filtered for any active source IFC file in the following ways:

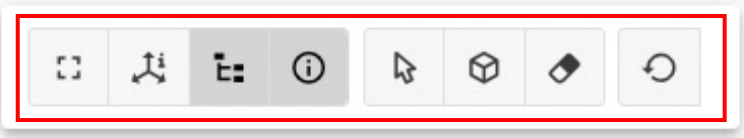
- **IFC structure**: IFC elements are grouped by IFC class.
- **Storeys**: IFC elements are grouped by floor and then by IFC element classes per floor.
- **IFC classes**: IFC elements are grouped by IFC class.



Picture: Madaster 3D viewer (display mode).

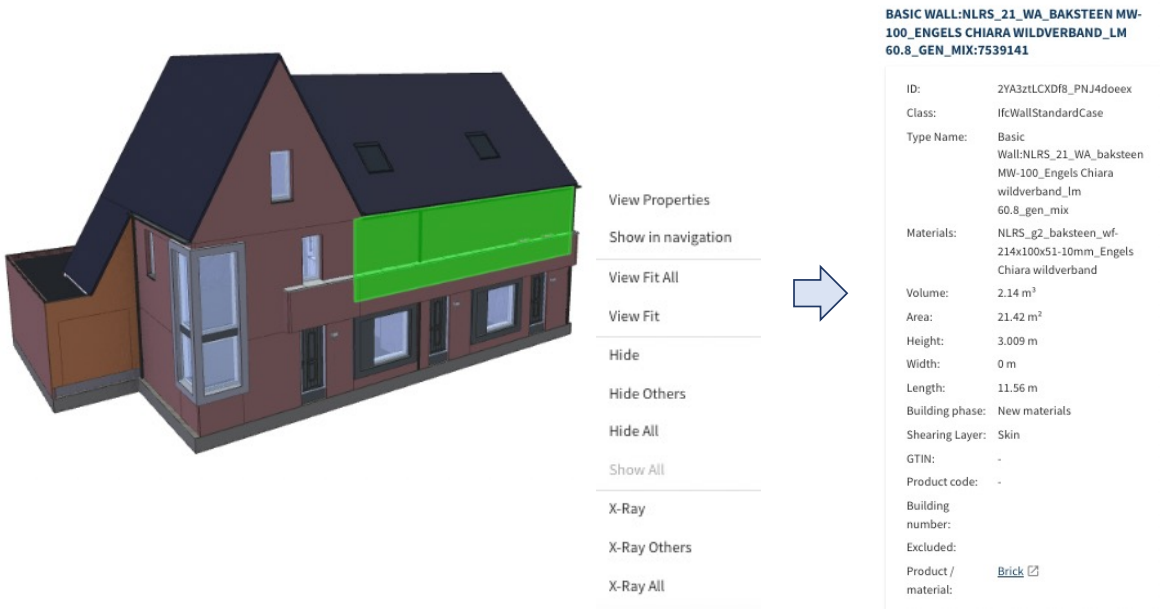
Any source IFC file, story, and IFC class can be expanded in this way until unique IFC elements appear in the hierarchy. This (unique) user selection is immediately visible in the 3D model (in the middle of the tab).

Using the toolbar (below the 3D) the model can be displayed in full screen and navigation and property windows can be shown and hidden. Elements can be selected to view their properties, viewed in X-Ray or hidden. Finally, the model geometry can be returned to the original default view.



Picture: Madaster 3D viewer (toolbar).

Finally, use can be made of the so-called 'Context menu'. By right-clicking in the 3D model or in the left navigation pane displays, a context menu appears. IFC source files, floors, IFC classes and unique IFC elements can be isolated, hidden, shown, or viewed in X-Ray.

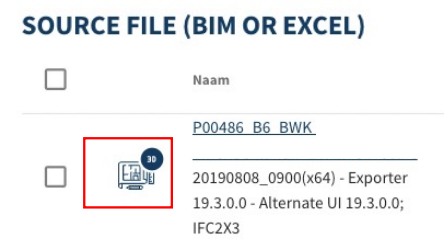


Picture: Madaster 3D viewer (context menu).

For a selected IFC element (on the right of the screen), the following properties are displayed:

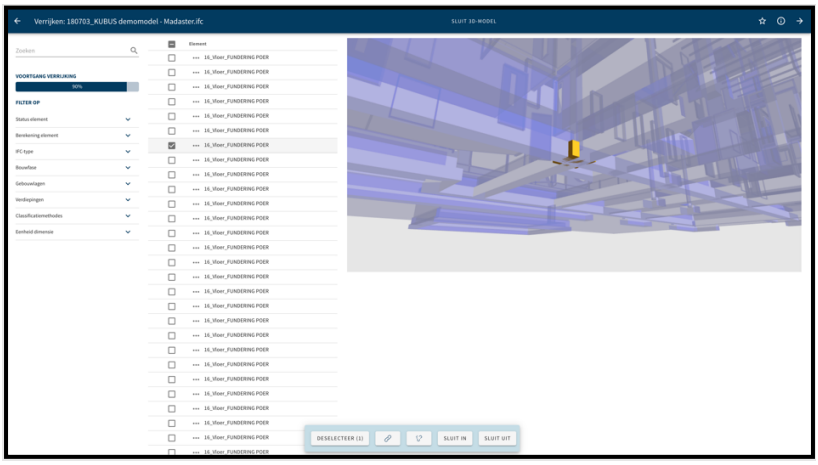
- IFC Element Name: name of IFC element.
- Global Unique Identifier: unique reference of an IFC element.
- Class: IFC element class.
- Type name: IFC element type.
- Materials: material assigned to IFC element within the Madaster Platform.
- Volume: volume of IFC element.
- Height: height of IFC element.
- Width: width of IFC element.
- Length: length of IFC element.
- Excluded: whether an IFC element is excluded from construction calculations.

After uploading an IFC source file, this 3D viewer is also fully available in the 'Dossier' tab, where a 3D model can be displayed and edited per IFC file. Available IFC files that can be displayed by the new 3D viewer are displayed with a new icon.



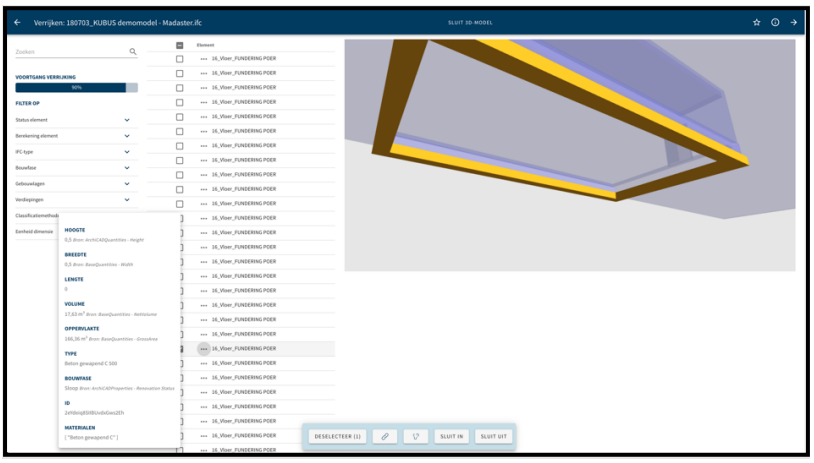
Picture: Madaster 3D viewer (3D icon).

Also after selecting one or more elements in the Enrich tab, elements can be displayed in 3D, in the screen itself. Because of this, it is also possible to use the functionalities of the "candy bar" (the menu in light blue color at the bottom of this screen).



Picture: Selecting elements (Madaster 3D viewer).

After selecting one/multiple elements in the 3D, these elements are also selected in the list. This makes it possible to use the functionalities of the "candy bar", after information about the element in question via the "three dots" (visible before the name of the document).



Picture: Selecting elements in viewer: possibility to connect/disconnect.

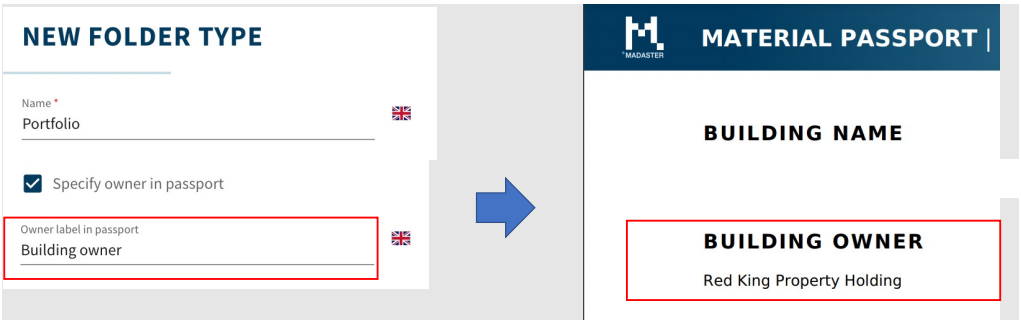
3 Materials passport

3.1 A Materials Passport

A Building Materials Passport displays the building's information as shown in the 'building tab' on the Madaster Platform. The Materials Passport consists of the selected source files uploaded into the Madaster Platform of which the user has indicated to use the results with the building information.

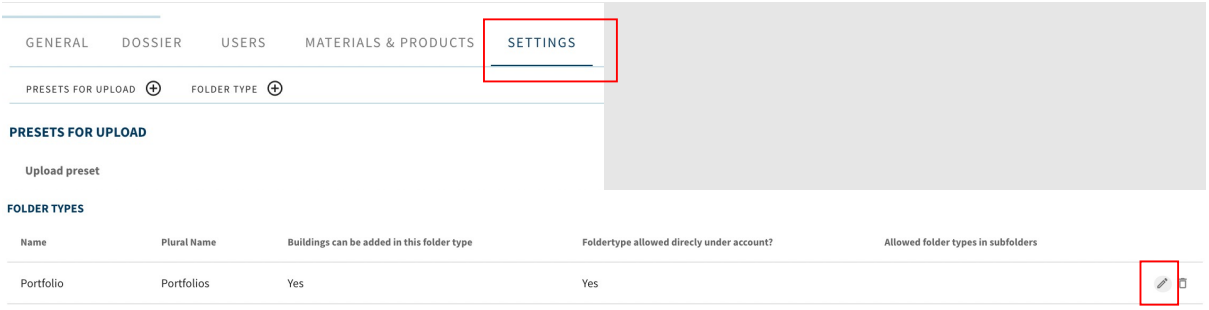
3.2 Owner label in Materials Passport

In Madaster it is possible for Administrator users to add and define a text label on a folder type (portfolio, region, etc.). The label and the entered value are then shown on the front page and General page of the material passport (PDF & Excel file).



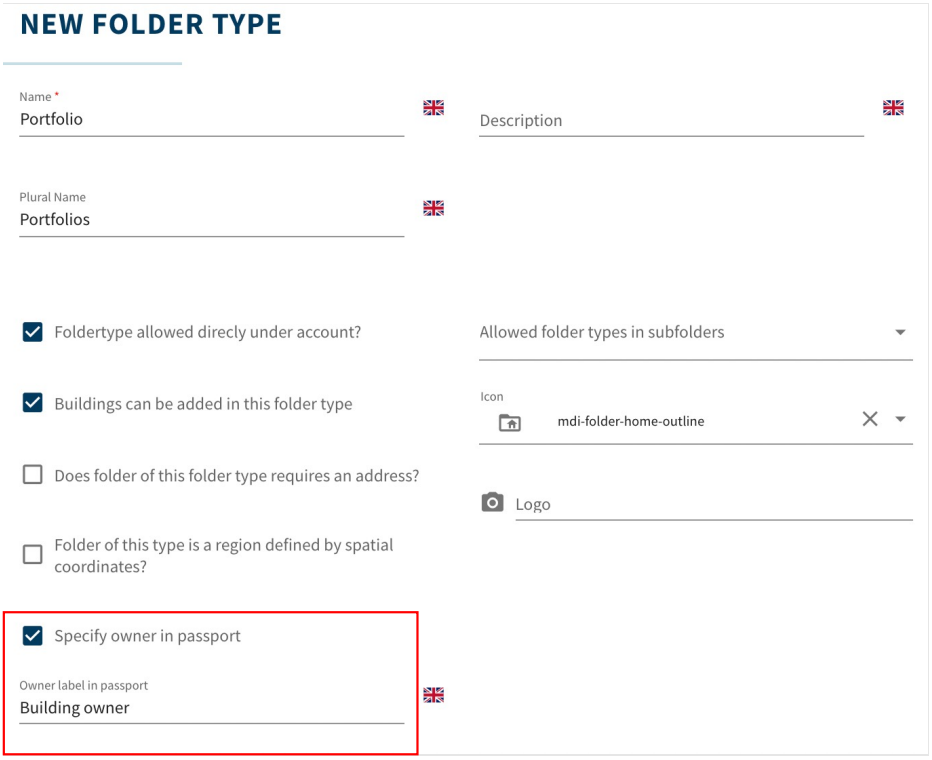
Picture: Result Owner label.

To define a text label by folder type, go to 'Settings' at company account level. Then select the folder type (see section 2.1.1 for more details) and click on the 'Edit' button (pen icon) behind the relevant folder type.



Picture: Adjust folder type (owner label).

Then select the option 'Specify owner in Passport' and define the label, as it should be displayed in the material passport.



Picture: Define folder type (owner label).

Subsequently, in the left (vertical) navigation structure of Madaster the user can click on the folder type (portfolio, etc.) that is adjusted in the previous step. Then click the ‘Edit’ button (on the “General” tab of the folder type. Subsequently, insert the owner's name in the previously defined label and click on the 'save' button.

Picture: Insert owner label.

All material passports created in this specific folder type will have this owner label on the front page and General page.

3.3 Generate & download a Materials Passport

Go to the tab "General" in the building. By clicking on the "Create Materials Passport" button, the user can create a Materials Passport based on the active source files. This Materials Passport will be

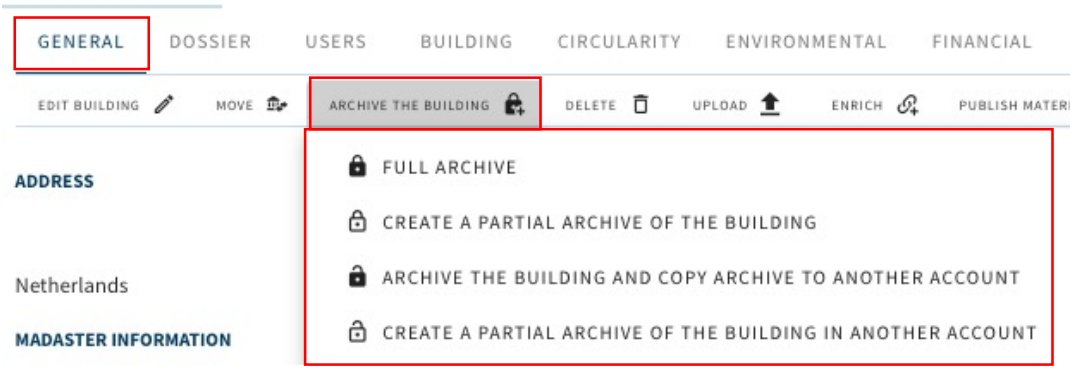
created in a PDF and Excel format and saved directly in the 'Dossier' tab, under the 'Passports' folder. Each time a new Materials Passport is generated it will be added as a new file. The previous Materials Passports will remain available and accessible. By clicking on the download icon, the Materials Passport file will be downloaded to your computer.

4 Archiving & transferring buildings

4.1 Archive & transfer building dossier to existing account

To preserve a fixed, certain state of a building or to transfer a building to another Madaster account, the "archive a building" functionality is available. This functionality is available on the "General" tab of a building. By archiving a building, the platform creates a collection of files of a building, with the active source files at its core. The archive is given a Version Name and a Version ID when it is created (entered by the user).

A distinction is made between four different archiving functions:



Picture: Archive & transfer building dossier.

- **Full archive** – the entire archive is created and kept in the original account, including a database with all materials and products used (in the initial building). The fully archived building dossier can then be transferred to another Madaster account, where it can be edited again.

- **Partial archive** – Only items from non-globally available databases are included in the archive. Items from validated databases and globally available manufacturer databases are not copied to the building archive database.

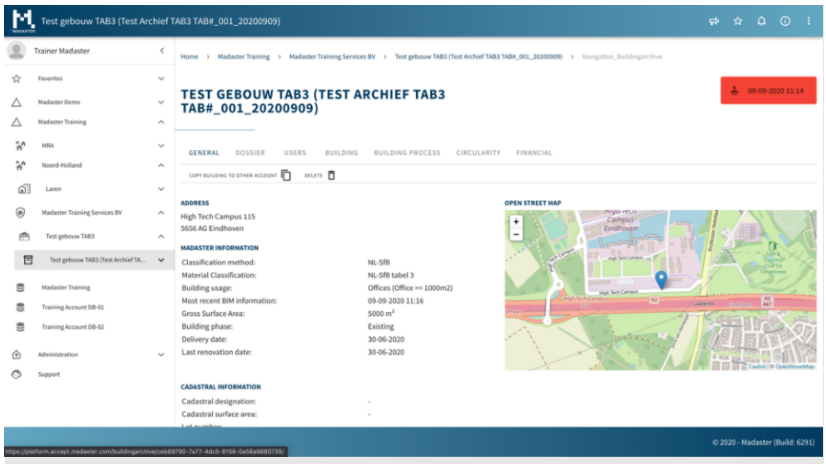
To transfer an archived building file, click on the “Transfer building to other account” button (on the “General” tab) and then select the Madaster account of the recipient (client or end customer). Note: This receiving account must give prior permission for the transfer of the archive.

- **Full archive + transfer to another account** – the entire archive is created and transferred directly to another account without being kept in the original account. The transferred building can be edited under the new account and contains a database with all (in the initial building) applied materials and products.

- **Partial archive of building in another account** – the partial archive is created and transferred directly to another account without being kept in the original account. The transferred building can be edited under the new account and contains a database containing only the materials and products applied (in the initial building) from non-globally available databases.

General (static) documents made available from the “Dossier” tab are also added to the building archive. Finally, a new materials passport is generated. The archived building will be timestamped and, with the “Full archive” and “Partial archive” options, will also remain available as a separate archive in the navigation drawer on the left side of the screen.

For more details about the archiving process, please refer to Step 7 “Archive building” and to Step 8 “Transfer Building Archive” in the manual “Madaster Action Plan Materials Passport”.



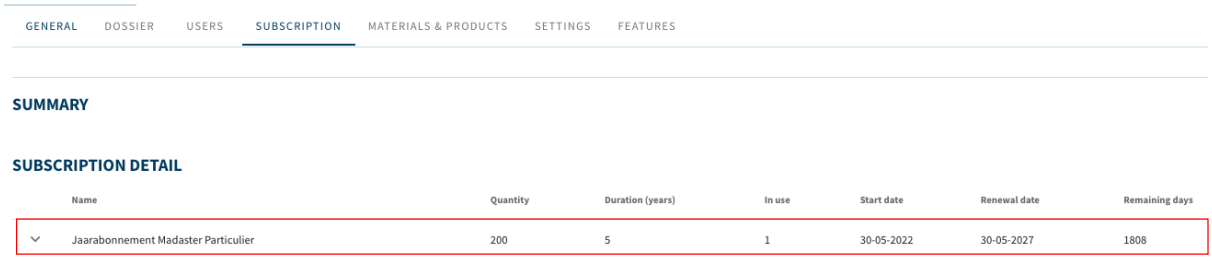
Picture: Archive building (General tab).

4.2 Archive & transfer building dossier to new (private) account

Note: this function is currently only available in The Netherlands.

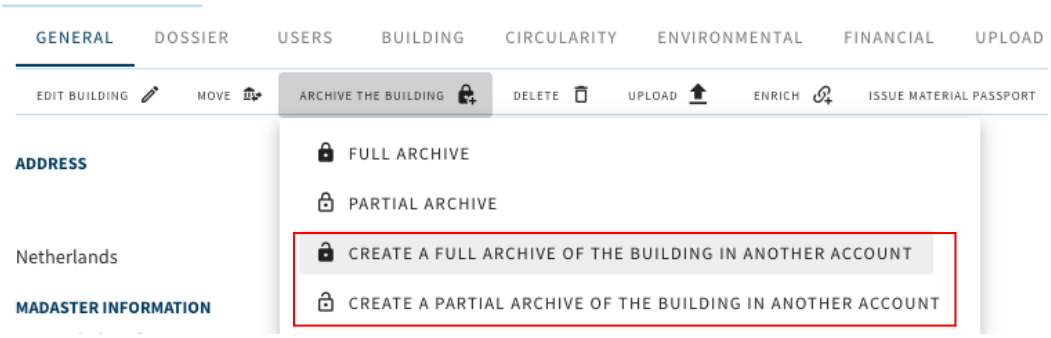
In addition to transferring a building dossier to another existing account, it is now also possible to transfer a building dossier to a new account (to be created) in the Madaster platform. As a condition for this, a credit must be topped up in advance on the Madaster company account of the transferring party. Please contact your Madaster contact person for this.

When transferring the building dossier to a new account, this subscription credit will automatically decrease. The remaining subscription credit is always visible via the subscription information. In the future, this feature will be extended to business subscriptions.



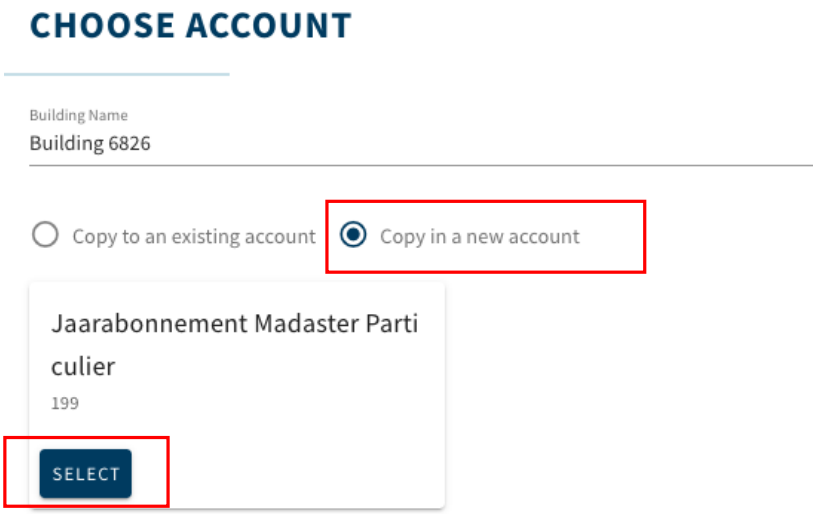
Picture: Subscription credit.

Before a new private account can be created, the building file to be transferred must be archived.



Picture: Archive & transfer building dossier (to new account).

In the “Choose account” screen, then select the option “Copy in a new account” and then click the “Select” button.



Picture: Archive & transfer building dossier (copy in new account).

Then enter the name and email address of the recipient of the new (private) Madaster account to be created. Finally, a short accompanying text must be entered. Finally, click on the “Copy” button.

Picture: Archive & transfer building dossier (copy in new account).

The new account is now created in Madaster. The recipient of the new account will receive an email, including the added accompanying text, with a link. By clicking on this link, a short registration process is started, giving the new user access to his/her personal Madaster account containing access to the transferred building dossier.

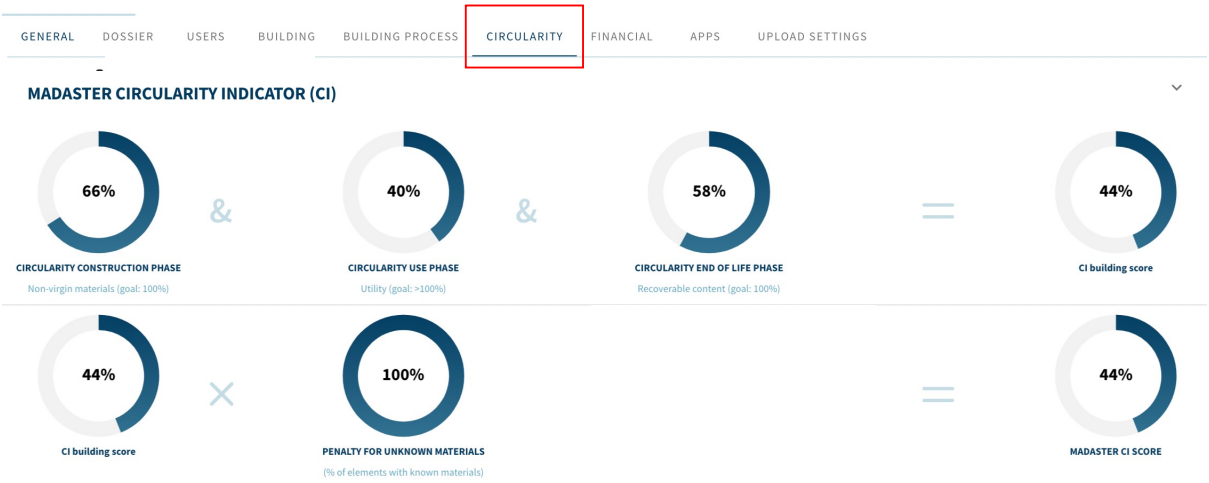
5 Circularity

5.1 Circularity score

The value of the data stored in the Madaster Platform increases as the value of the products and materials in the building is better preserved. The Madaster Circularity Indicator has been developed to gain an idea of how a building score in the field of circular construction. This Madaster CI gives an indication of the degree of circularity of the building. A fully circular building achieves a score of 100%.

More information and details, including the applied methodology, is described in the reference work "Madaster Circularity Indicator explained".

5.2 Circularity indicator

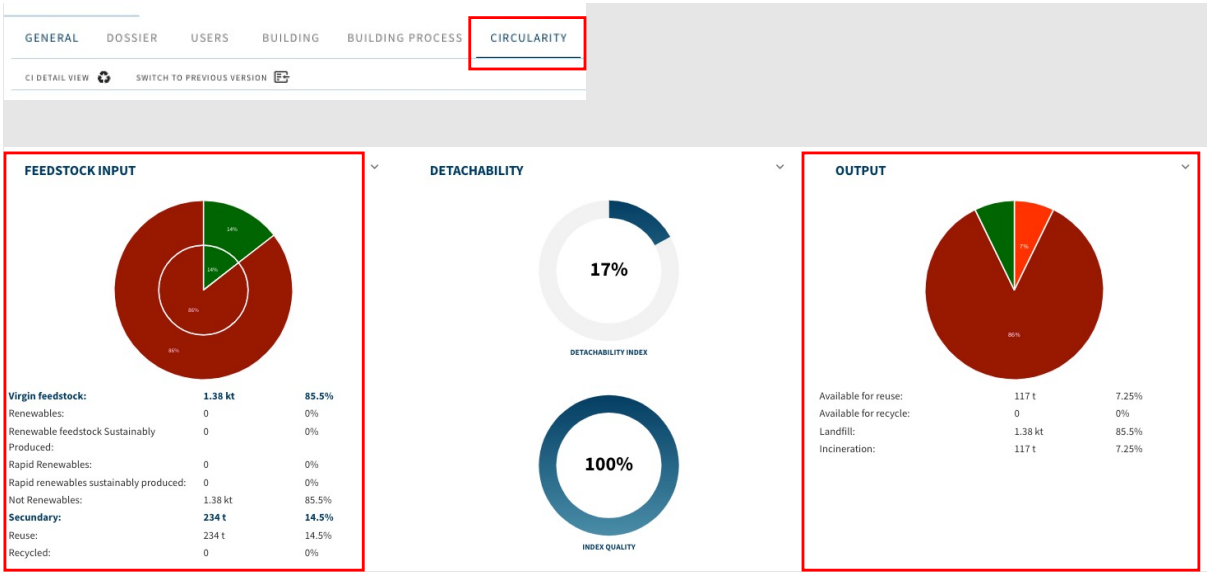


Picture: Madaster Circularity Indicator score

Note: It is no longer possible for users to switch between the different Circularity versions (v1 & v2). From now on, the "Circularity" tab and the more detailed "Circularity overview" only contain the most comprehensive version (v2), including feedstock input and output flows, detachability, etc.

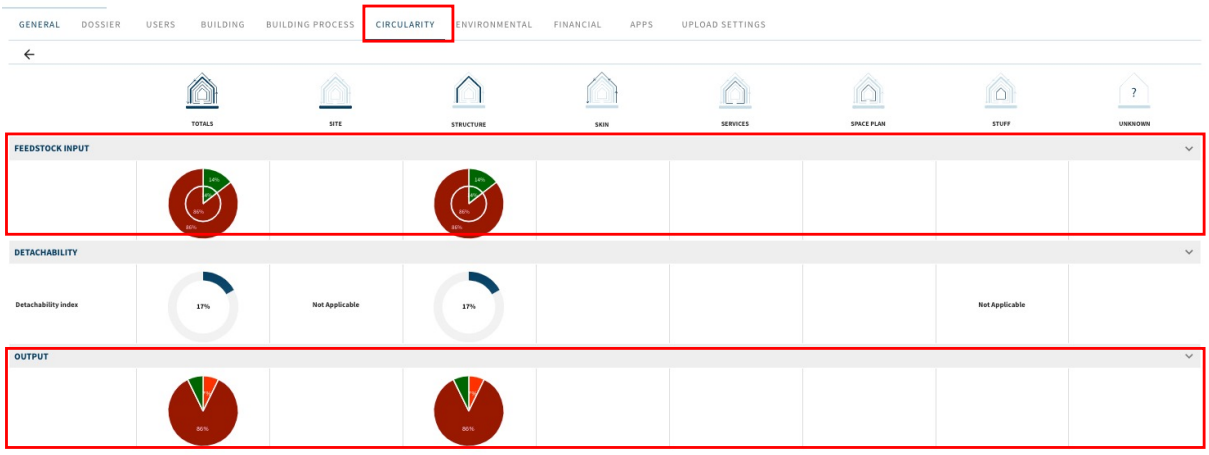
5.2.1 Feedstock input & Output

By matching elements from a source file with materials/products in a Madaster dataset, the Madaster platform can provide insight into the "feedstock input" flow and "Output" flow of materials. The feedstock input flow indicates the amount (in weight) and ratio (in %) of primary (virgin) and secondary (reused/recycled) materials used in the building's construction phase. The output flow shows the amount (in weight) and ratio (in %) of materials released at the building's end of life stage, categorized according to materials available for reuse, recycling, landfill and incineration.



Picture: Feedstock input & Output flow (building level).

By clicking the (feedstock input or output flow) pie chart on the building's Circularity tab, a more detailed view is displayed, in which these indicators are visible per building layer (e.g., Structure, Skin, etc.). Even more specs are displayed when the user expands the feedstock input and/or output rows in this view (via the menu on the right-hand side).



Picture: Feedstock input & Output flow (building layer level).

5.2.2 Detachability (index & quality score)

Madaster offers users the option, in addition to the building's circularity level, to also display the degree of detachability on building and building layer level. As such, it should indicate how detachable a building (shell) is and the products contained within it.

This detachability indication in Madaster is based on the revised (2.0) version of the uniform measurement method for detachability, as described in the report 'Circular Buildings – a measurement method for detachability 2.0'. This methodology has been developed and tested by a consortium of Alba Concepts, Dutch Green Building Council, etc. on behalf of the Dutch Ministry of the Interior and the Transition Agenda Circular Building Economy.

The following detachability factors are considered:

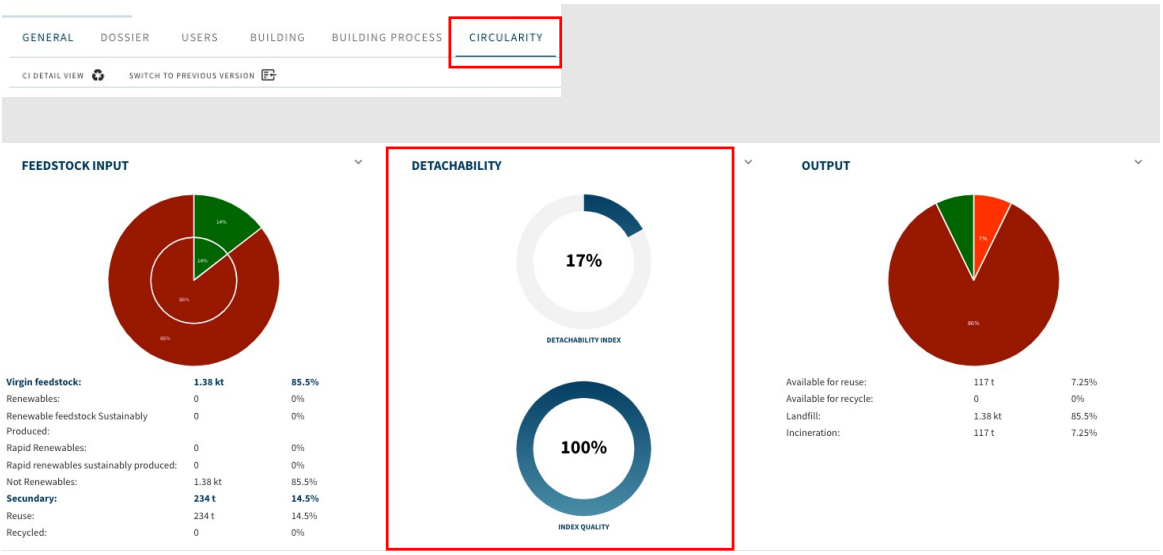
- **Connection type**: where dry connections are being preferred over connections with added elements and direct, integral connections taking precedence over soft and hard chemical ones.

- **Accessibility of the connection**: how easily you can (physically) reach the connecting elements and to what extent this causes damage to nearby objects.

- **Intersections:** indicates the extent to which products overlap or are integrated with each other. The higher the integration, the more actions required to disassemble an element at the end of its life.

- **Product edges inclusion**: assessment of how products are placed in a composition and whether it is open or closed. A 'locked up' product can only be dismantled in the reverse order of construction.

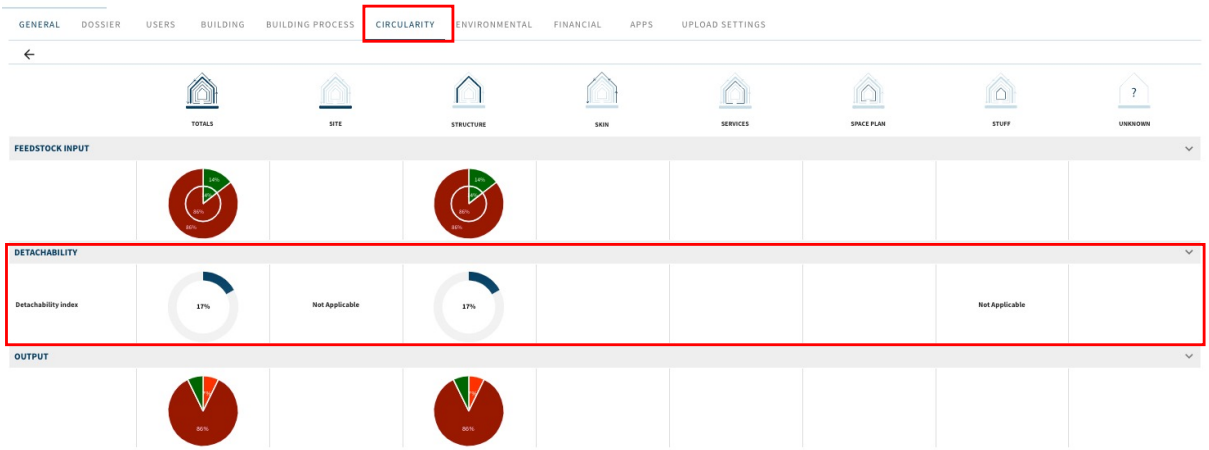
The building's detachability index (in %) is displayed on the Madaster "Circularity" tab when the "CI V2" feature is active. This index is the sum of the number of individual elements within the building, which are linked to a product in Madaster, that (1) has the a forementioned four detachability factors filled in (or taken over from the IFC element) and (2) where the shadow costs per product unit are available (in the product's "Environment" tab).



Picture: Detachability index (building level).

The “Index Quality” shows the ratio (in %) of the number of products for which a releasability index has been calculated compared to the total number of elements linked to a product on the Madaster platform.

By clicking on the detachability pie charts, a detail view per building layer is displayed (excluding Site and Stuff). Even more specs are displayed when the user expands the detachability row in this view (via the menu on the right-hand side).



Picture: Detachability index (building layer level).

6 Financial

6.1 Financial value and residual value

In addition to documenting the materials in a building, Madaster wants to link a financial value to the documented materials. The rationale behind this, is that if you really want to stimulate the circular economy, there must be a financial trigger attached to it. Therefore, the residual value of materials is calculated in the “Financial” tab. This data can be used to make circular propositions in the market and to determine more precisely what the final value is based on material value as an absolute minimum value. The more detachable and with sustainable materials are built, the higher the residual value. The financial module is therefore a driver for the circular economy and translates circularity into money.

The Financial module shows what the residual value of a building is at the end of the various lifetimes of products expressed in terms of material value. In addition, it shows the financial material value at this moment (current value) and the predicted development in the future.

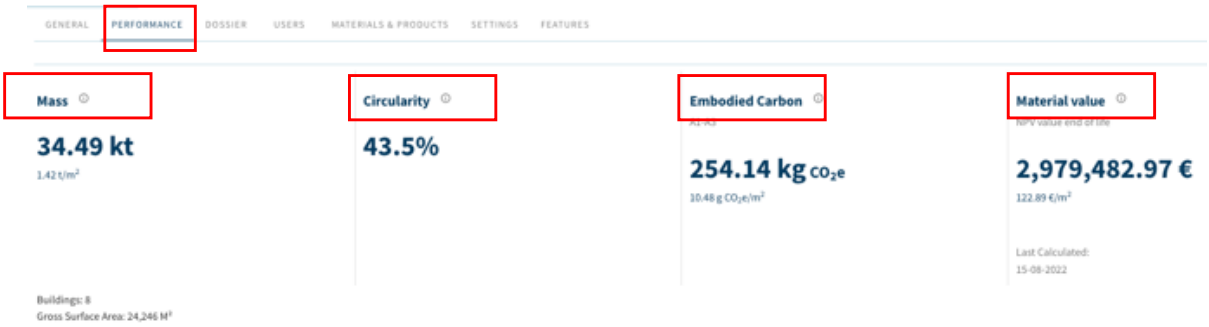
More information and details, including the applied methodology, is described in the reference work “Explanation Madaster Financial Model”.

7 Performance & benchmarking

7.1 Performance dashboards

When this feature is activated in Madaster, a new “Performance” tab is shown at account, folder and building level. At both the account and folder level (the latter is only available to business customers), the 'Performance' tab contains the following totals:

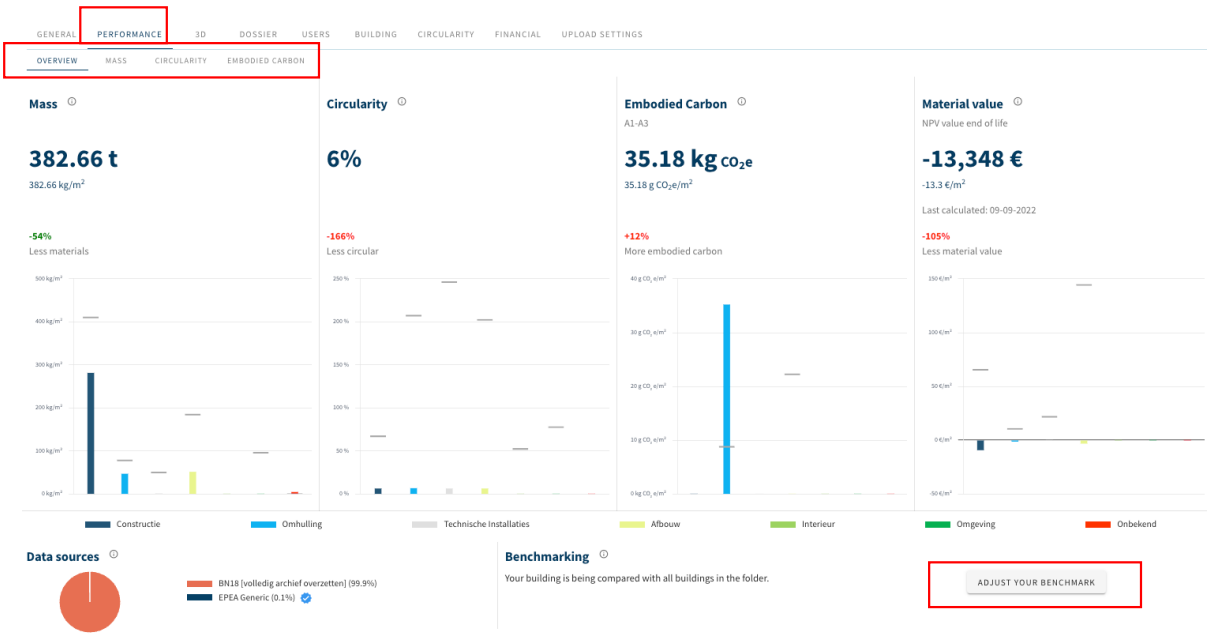
- **Mass**: total mass of the materials, as well as the intensity of the materials used per m2.
- **Circularity**: measures the Madaster Circularity Indicator (MCI), which is based on the degree of non-virgin materials used during construction, their utility, and their potential for reuse & recycling at end of use. The MCI applies a penalty for unknown materials.
- **Embodied Carbon**: measures the equivalent CO2 emissions released during the production (A1-A3), installation (A4-A5), use (B1-B5), and disassembly (C1-C4) of a building. Since production data (A1-A3) is most commonly accessible, it is used to establish comparisons across shearing layers and different buildings. The embodied carbon intensity is also shown per m2.
- **Material Value**; measures the future monetary value of materials at their end of life, accounting for the costs of disassembly, transportation, and processing for re-sale. The material value is also shown per m2.



Picture: Madaster Performance dashboard (account & folder level).

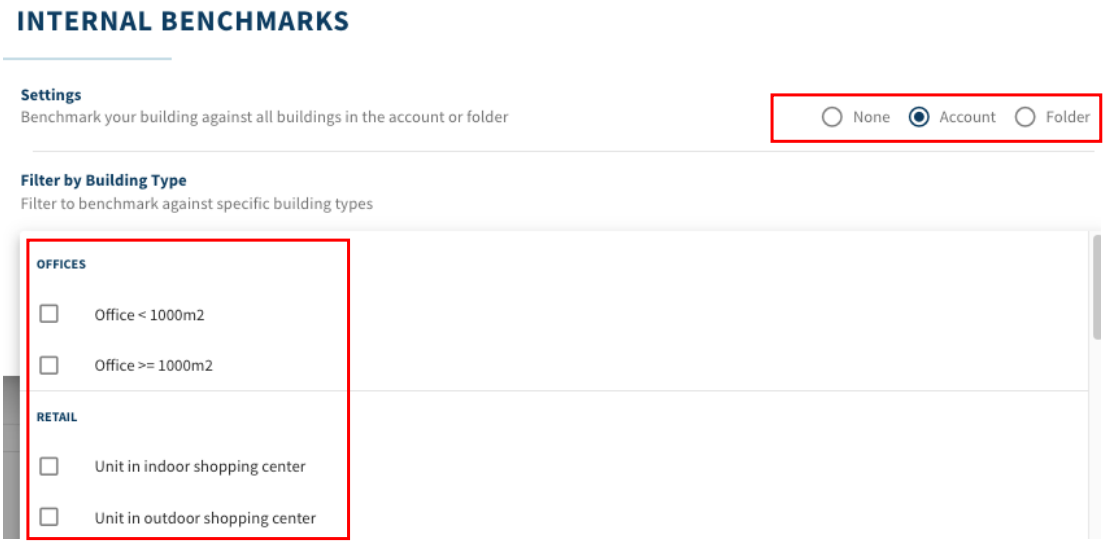
Four dashboards are shown at the building level for business users:

1. **Overview**: provides summary insights for the building and the building layers regarding mass, circularity, embodied carbon, and material value. The building can also be compared against a user-defined benchmark.
2. **Mass**: measures the total mass of the materials displayed per building layer and/or material families. In addition, the intensity of the materials used per m2 is shown.
3. **Circularity**: measures the Madaster Circularity Indicator (MCI), which is based on the degree of non-virgin materials used during construction (feedstock input), their lifetime and their potential for reuse and recycling at the end of use (feedstock output). The MCI applies a correction for unknown materials. The 'Detachability' provides insight into the extent to which materials and products can be disassembled without being damaged.
4. **Embodied Carbon**: measures the equivalent CO2 emissions released during the production (A1-A3), installation (A4-A5), use (B1-B5) and dismantling (C1-C4) of a building. Because production data (A1-A3) is the most accessible, it is used to establish comparisons between building layers and different buildings. In addition, the embodied carbon intensity is shown per m2.



Picture: Madaster Performance dashboard (building level).

Using the benchmark function (bottom right of the tab), the building and its building layers (e.g. structure, skin, etc.) can be compared with all buildings in their own account or folder and can also be filtered for specific building types. The benchmark is against all buildings within the benchmark settings, including buildings for which a user does not have read rights.

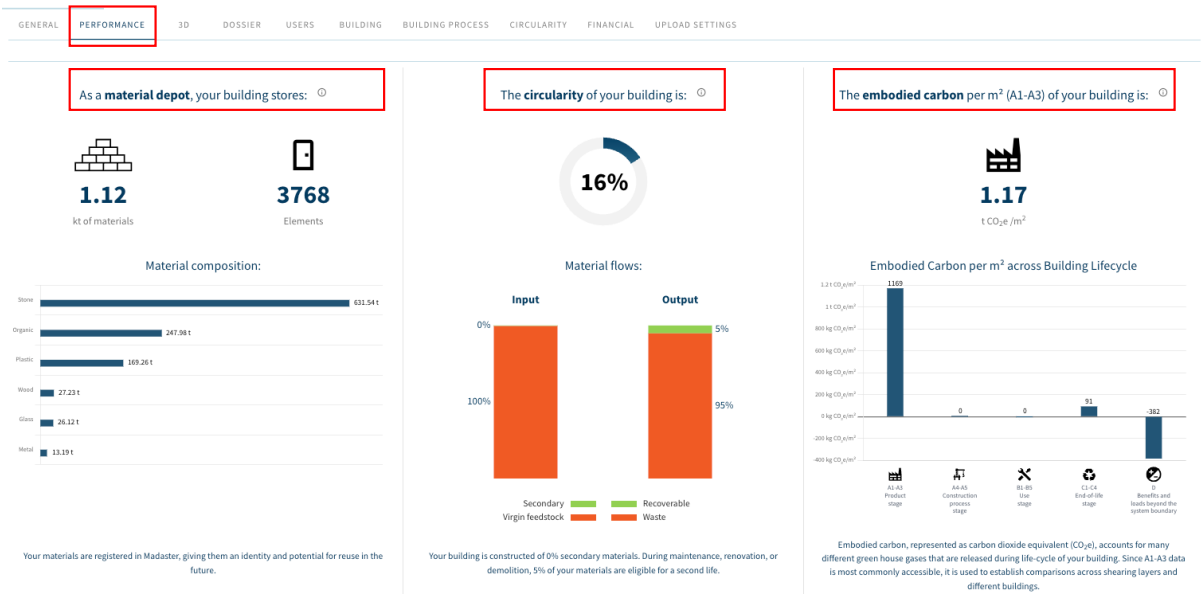


Picture: Performance dashboard (benchmarking).

For private (residential) users, one new simplified dashboard is shown at the building level with the following indicators:

- **Material quantity and composition**: insight into the total mass of the materials displayed per material families.

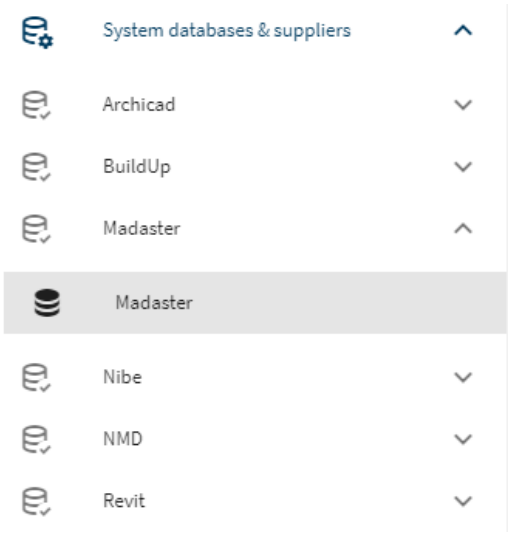
- **Circularity**: representation of the Madaster Circularity Indicator (MCI), which is based on the degree of non-virgin materials used during construction (feedstock input), their lifetime and their potential for reuse and recycling at the end of use (feedstock output). The MCI uses a correction for unknown materials.
- **Embodied Carbon**: measures the equivalent CO2 emissions released over the entire life cycle of the building (from production (A1-A3) to the environmental benefits and costs outside the system boundary (D)).



Picture: Performance dashboard (private/residential user).

8 System databases & suppliers

Here you will find the databases of materials and products, which are platform-wide available for the Madaster users according to their country.



Picture: System databases & suppliers (left vertical navigation).

9 Administration

Administration is the place where you find Information about:

9.1 Classification methods

A detailed overview of the classification structures (e.g., NL-SfB, eBKP and Omniclass) that are known for countries within Madaster. Per classification, a view of all codes and their mapping to the shearing layers of Brand is available.