



Madaster Action Plan

Process description to create a materials passport in the Madaster Platform

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Madaster Switzerland

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Madaster action plan for materials passport

This document describes the necessary process steps that lead to the delivery of a materials passport in the Madaster platform (hereinafter referred to as "material passport"). In addition, for more detailed information, various sections of this document refer to pre-existing Madaster documentation as needed.

In general, the following steps are distinguished:

1. Determine the level of detail of the material passport to be drawn up.
2. Collection and preparation of the required building information (source data).
3. Uploading the source data into the Madaster Platform.
4. Checking and enriching the source data in the Madaster Platform.
5. Complete building dossier (incl. material passport) in the Madaster Platform.
6. Transfer building dossier to property owner in the Madaster Platform (Enterprise licence holder)

These steps are further explained in the following chapters.

Step 1- Determine level of detail of the material passport

To register a new or existing building in Madaster, information (data) is required from this building. The more extensive this data is available (input), the more detailed the report (output) is shown in the Madaster platform and specifically in the material passport. It is therefore recommended to determine the purpose of the material passport before collecting data and to determine based on:

- A. Which level of detail of the material passport is (ultimately) desired?
- B. Which building shells ("building layers") must be incorporated in the material passport?
- C. The level of detail of the requested building layers.

A. Which level of detail of the material passport is (ultimately) desired?

A material passport in Madaster can be roughly elaborated on three levels, with the higher level always building on the directly underlying level (see Picture 1). There is always the option to stop at a specific level and then move on to the next level later. These three levels are briefly explained below.

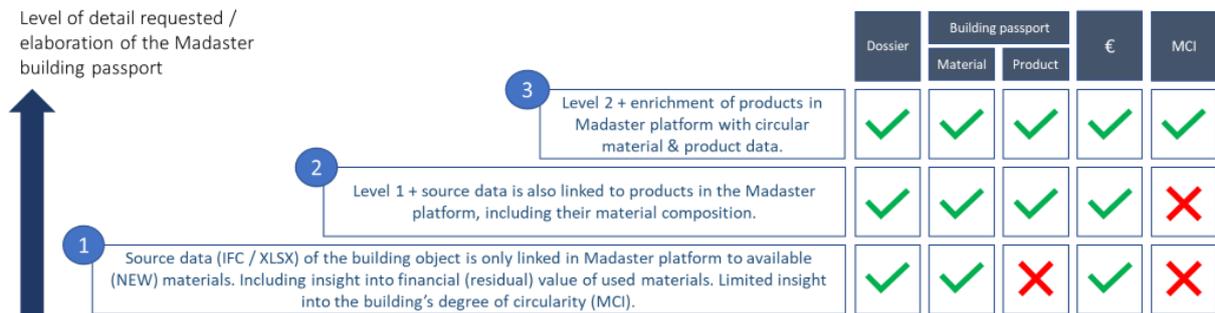
At level 1, the material passport aims to reflect the materials used in a building and as such provides insight into the quantities of materials used, where these materials are in the building and what their financial (residual) value is. At this level, no insight is obtained into the products used in the building and their underlying circular properties (including the degree of reuse, recycling, detachability, etc.). As a result, insufficient insight can be given at this level into the circularity score (Madaster Circularity Index) of the building.

Level 1 contains the minimum guidelines that form the starting point and provide insight into the steps to be taken and the source information to be collected to initiate a basic building registration in Madaster (see section "Level 1 (basic)").

At level 2, the purpose of the material passport is, in addition to providing insight into the materials used and quantities thereof, also to provide insight into products (including their material composition), which are incorporated in the building and their location (building layer) in the building. In Madaster a distinction is made between four different types of products: volume, surface, length & pieces products. Based on this additional perspective, the material passport makes it clearer which products have been used in the building (including numbers) and, in contrast to materials, these can potentially be "reused" at a higher level.

Even though the product basis is formed at level 2, still insufficient insight is obtained at this level into the degree of circularity of the building, because the circular properties of the materials and products used are still largely lacking.

At level 3, the purpose of the material passport is to obtain insight into the circularity score of the building to be registered (in addition to the display of materials and products used). This is done by enriching the materials and products with circular data. This is the most detailed and comprehensive version of the material passport in Madaster.



Picture 1: Elaboration levels of the Madaster material passport

B. Which building shells ("building layers") must be incorporated in the material passport?

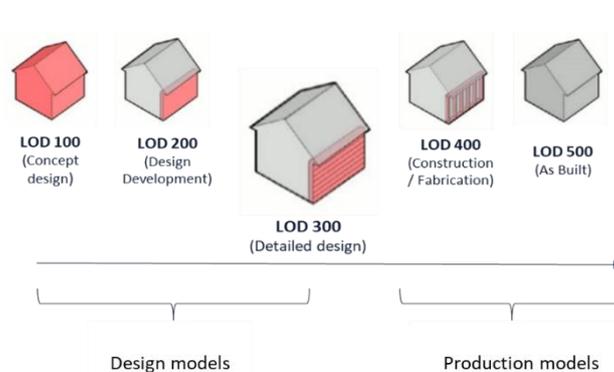
A building is composed of distinctive "layers" ("shearing layers") that each have their own function and lifespan. The materials and products used in the building are categorized in the Madaster platform and assigned (by means of a classification code, e.g., EBKP-H) to various building layers. Hence, the location of materials and products in the building also becomes evident. In addition to architectural and constructional elements, Madaster also has the option to classify technical services (installations), interior and elements in the surroundings of the building.



Picture 2: Building layers in Madaster (model of Steward Brand)

C. The level of detail of the requested building layers.

A building can be modelled in different levels of detail (LOD).



Picture 3: Levels of Detail (LOD)

During a BIM process a distinction can be made between “design” models (elaborated by architectural, construction and installation consultants) and “production” models (elaborated by installers and suppliers). Many parts of the building are elaborated during the construction phase in both the design and production model. However, not all parts are developed by a supplier. It is therefore recommended to choose early in the process for which parts what model will be used. For a solid material passport in Madaster, design models should ideally be developed at a minimum LOD 300 level¹. To avoid duplication in the Madaster platform, it is not recommended to eventually activate a design and production model in Madaster for the same building components. Production models often contain specific information and often better represent the actual built situation. It is therefore preferable to eventually use as many production models as possible.

For more information refer to:

- [Madaster Circularity Indicator explained](#) – how is the degree of circularity in Madaster calculated?

¹ Objects are materialized and accurate in terms of quantities, dimensions, shape, location and orientation. Non-geometric information can be linked to objects.

Step 2- Collect & prepare required building (source) data

The Madaster platform can handle two types of source data; namely:

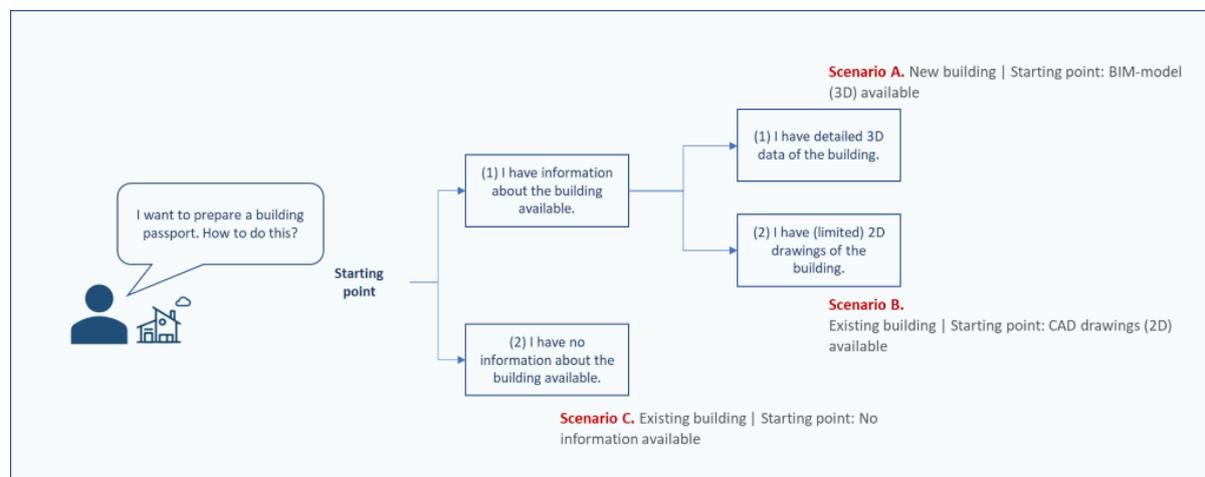
- (1) an IFC file (based on a 3D / BIM model)
- (2) a Madaster Excel template (if no 3D / BIM model of the building is available)

These source files (IFC and Excel) are automatically validated upon import into Madaster for completeness in terms of material description, classification code and geometric data.

Building information (source data) must then be collected and processed in response to the desired level of detail of the material passport to be delivered (see step 1). Below the requirement of data per level (1, 2 & 3) is explained.

Level 1 (basic): Representation of the materials used in a building in terms of quantities, location and their financial (residual-)value.

The scenarios A, B & C below are your starting point in collecting the required building information. Each provides insight into the necessary and desired source data and how to prepare them for use in the Madaster Platform. Regardless of the selected scenario, a material passport can already be generated at level 1 in Madaster.



Picture 4: Starting point scenarios

Scenario A. New building| BIM-model (3D) available

Necessary source data:

1. An IFC file (based on a 3D model) of the architectural, construction and technical services of the building modelled at a minimum LOD 300 level.
2. This IFC file complies with the [BIM Basic IDM](#) and each element contains the following information:
 - a. Material description: provides insight into the materials used in the building
 - b. Classification coding: provides insight into the location of used materials / products in the building
 - c. Geometric properties: provides insight into quantities of materials / products used in the building
3. This IFC file contains elements whose material description (see 2a) is as much as possible automatically validated with and linked to the available databases on Madaster. This can be accomplished by including the [exact material description of the Madaster database](#) in the material description of each element in the IFC file.

IFC files can be checked regarding the minimum guidelines (BIM Basic IDM) using so-called “IFC checkers” such as Solibri and / or BIM-Collab Zoom. The latter (free) application also features “Madaster smart views”, which make it easy to visually validate the parameters of Madaster and / or the BIM Basic ILS before uploading the source file into Madaster. These IFC checkers can also be used to check for duplications in the available models.

For more information refer to:

- [Madaster IFC import process](#) – how to correctly prepare the IFC file?
- [Madaster IFC export manual](#) – how to correctly export the IFC file from a CAD application?
- [Madaster BIM requirements](#) – what BIM guidelines to take into consideration?
- [BIMCollab Zoom application](#) – how to check the quality / completeness of the IFC file?

Scenario B. Existing building | CAD drawings (2D) available

Necessary source data:

1. 2D drawings of (parts of) the structure, skin and space plan of the building.
2. Based on this, a 3D model can be created² for the structure, skin and space plan of the building at a minimum LOD 300 level that meets the BIM Basic IDM standard (whereby each element ideally contains a material allocation, classification code and geometric data). This model should eventually be exported to IFC file format.
3. This IFC file contains elements whose material description is as much as possible automatically validated with and linked to the available databases on Madaster. This can be accomplished by including the [exact material description of the Madaster database](#) in the material description of each element in the IFC file.

Desired source data:

- A filled in Madaster Excel Template (“Material Import Template.xlsx”) to register the used materials and products from the other building shells (surroundings, services, interior) of which information on the drawings is incomplete³.
- This Madaster Excel template contains elements whose material description is as much as possible automatically validated with and linked to the available databases on Madaster. This can be accomplished by including the [exact material description of the Madaster database](#) in the material description of each element in the Madaster Excel template.

For more information refer to:

- [Madaster IFC import process](#) – how to correctly prepare the IFC file?
- [Madaster IFC export manual](#) – how to correctly export the IFC file from a CAD application?
- [Madaster BIM requirements](#) – what BIM guidelines to take into consideration?

² Activity can be performed by an affiliated Madaster Service Partner.

³ A material inventory in the building may need to be performed by an affiliated Madaster Service Partner to obtain this source information.

Scenario C. Existing building | No information available

Necessary source data:

1. A filled in Madaster Excel Template (available on the Madaster Platform) to register the used materials and products of the building shells (site, structure, skin, space plan, services and interior) as completely and in detail as possible ⁴.
- This Madaster Excel template contains elements whose material description is as much as possible automatically validated with and linked to the available databases on Madaster. This can be accomplished by including the [exact material description of the Madaster database](#) in the material description of each element in the Madaster Excel template.

⁴ A material inventory in the building may need to be performed by an affiliated Madaster Service Partner to obtain this source information.

Level 2 (builds upon Level 1): insight into products (incl. their material composition) that have been used in the building and their location (building layer).

Please note: this section is only relevant if in *Step 1- (Determine level of detail of the material passport)* it has been decided to elaborate the material passport for the building at level 2 or 3.

For a more accurate material passport (and ultimately higher level of product reuse), it is recommended to link as many elements of the source file as possible to a product in Madaster. As a condition, the product to be linked exists in one of the available databases on Madaster.

Despite the fact that more and more data of building products is becoming available in databases on Madaster, it is possible that products used in the respective building are not yet available. To link these elements from the source file with products in Madaster, the Madaster platform offers the user the opportunity to add products themselves, including the material composition. In this way, in addition to the data sets available to every user, an "account specific" product library is also built in the Madaster platform. This library can be used again when registering each successive building in Madaster.

Necessary source data:

- Overview of products used in the building, including material composition and ratio (expressed in percentage of volume).

Level 3 (builds upon Level 2): Display of the degree of circularity of the building to be registered.

Please note: this section is only relevant if in *Step 1- (Determine level of detail of the material passport)* it has been decided to elaborate the material passport for the building at level 3.

At the highest and most detailed elaboration level within Madaster, insight is also gained into the degree of circularity of the building to be registered, using the Madaster Circularity Indicator (MCI⁵). This is expressed on the platform, under the "Circularity" tab, by a percentage between 0% (non-circular) and 100% (fully circular). This insight is mainly achieved by enriching the modelled products on Madaster, as described in the previous paragraph ("Level 2 - Madaster products"), with circular data in the areas of:

- **Use of raw materials** (in the Construction phase) whereby the ratio between “new” and “recycled, reused or rapidly renewable” materials is demonstrated. Objective: use 100% non-virgin materials
- **Expected lifespan** (in the Use phase) whereby the expected lifespan of the products that are used are compared with the average lifespan of comparable products. Objective: use > 100%
- **Expected waste scenario** (in the End-of-life phase) in which the relationship between “waste” and “reuse or recycling” of materials and products that are released during the renovation or demolition of a building is demonstrated. Objective: 100% of reusable materials

When collecting this circular data, suppliers and manufacturers will also have to be consulted to the extent of their products contain recycled materials, and what the specific waste scenario is for the material and / or product concerned. Ideally, this data should be substantiated.

Necessary source data:

- Account specific product library is created in the Madaster platform
- Overview of products used in the building, including materials used in construction, the expected lifespan (in years) and the expected waste scenario

For more information refer to:

- [Madaster Circularity Indicator explained](#) – how is the degree of circularity in Madaster calculated?

⁵ The Madaster CI for buildings is based on the Material Circularity Indicator of the Ellen MacArthur Foundation and adapted to function in the Madaster Platform.

Step 3- Add material/product in Madaster (optional)

In this step, an inventory is made which materials and products are used in the building. Madaster offers its users to link elements to a “material” or “product”. For a more accurate material passport, it is wise to link as many elements as possible to product. It is therefore advisable to determine in advance which elements will be linked to a product and which to material. As a rule of thumb, it can be stated that materials ‘in bulk’ also remains material (e.g., "concrete"); the remaining is presented as a product, even if this consists entirely of one material.

The Madaster database, which is available for all users, contains an overview of materials that can be linked automatically or manually with elements from source files (IFC/Excel). These materials are defined as 100% new ("virgin") materials, with no recycled content (100% virgin, 0% recycled content) and with a very pessimistic waste scenario (100% incineration or landfill). This materials list can be used if the material passport is developed at level 1 (see Level 1).

If a material or product does not appear in the Madaster database and to achieve a solid circularity score (MCI) in Madaster (elaboration of the material passport at level 3), it is necessary for the user to add materials and/or products in the platform. For these purposes, it will also have to be investigated among suppliers to what extent recycled parts are used, and what the specific waste scenario is of the material concerned (ideally this information is supported by a “Product sheet” or “EPD” of the product).

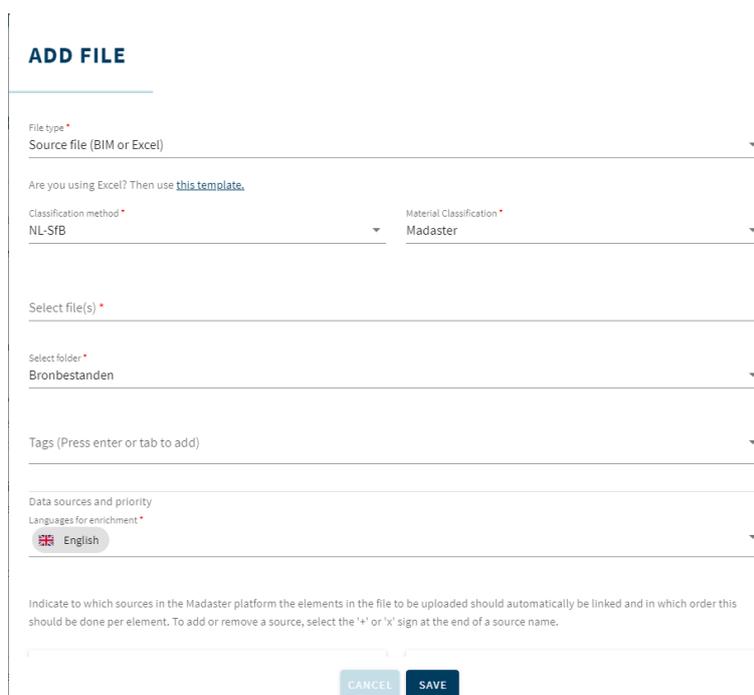
With this approach, an "account'specific" database is built up on the Madaster account, which can then be used again when registering each successive building in Madaster. If desired, this database can be shared with other Madaster users and accounts, so that the materials and products from this database are also available for buildings in other accounts, folders or buildings.

For more information refer to:

- [Madaster Circularity Indicator explained](#) – how is the degree of circularity in Madaster calculated?

Step 4- Uploading the source data into Madaster

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 space plan.



ADD FILE

File type *
Source file (BIM or Excel)

Are you using Excel? Then use [this template](#).

Classification method *
NL-SFB

Material Classification *
Madaster

Select file(s) *

Select folder *
Bronbestanden

Tags (Press enter or tab to add)

Data sources and priority
Languages for enrichment *
English

Indicate to which sources in the Madaster platform the elements in the file to be uploaded should automatically be linked and in which order this should be done per element. To add or remove a source, select the '+' or 'x' sign at the end of a source name.

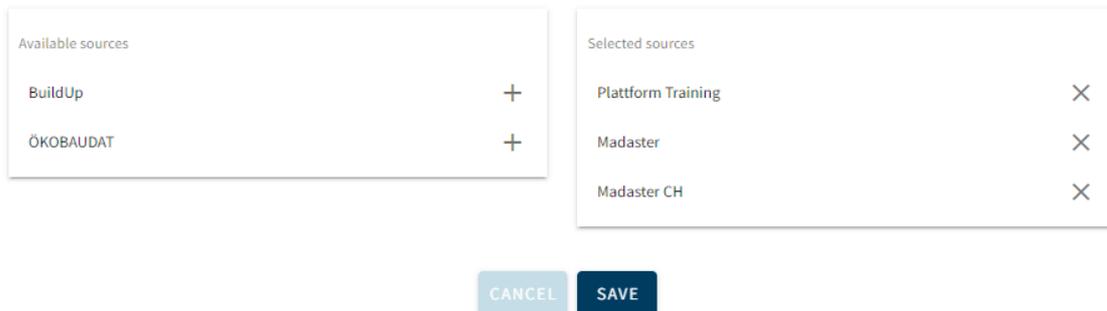
CANCEL SAVE

Picture 5: Upload source file (IFC/Excel) in Madaster

During the import process in Madaster, source files are automatically validated for completeness in terms of: (1) material description, (2) classification code and (3) geometric data. In addition, based on the material description, the platform will attempt to link each element in the uploaded source file to a corresponding material or product registered in the databases selected by upload. If the material description of an element is recognized, the Madaster system will automatically link the element. If no automatic linking takes place, it is possible to manually link the element at a later stage in Madaster (see *Step 1- Check & enrich source data in Madaster*). Alternatively, the source file requires modification first and a new version of the IFC file is uploaded and processed in Madaster.

To make this automated matching process as effective as possible, prior to processing the source files, a selection can be made, and priority given to relevant data sources in the Madaster platform. The selected sources are used during the automated matching process.

Indicate to which sources in the Madaster platform the elements in the file to be uploaded should automatically be linked and in which order this should be done per element. To add or remove a source, select the '+' or 'x' sign at the end of a source name.



Picture 6: Select and prioritise databases on Madaster

The first database selection will be the primary source for any material and product linkages. If no match found, the system will proceed to search through the second database selected and so forth. It is advised to choose the “account specific“ products library (in this example “Plattform Training”) first, if materials and / or products are added manually to Madaster (in the case of working on “Level 2” or “Level 3”). Users of Archicad (Material Catalog materials) or Revit can choose to select these specific sources if they know that the naming corresponds to the IFC export.

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 process, this function is started via the upload icon marked in Picture 7.



Picture 7: Replace existing source file (keep 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. By activating the most recent version, the system will automatically deactivate the former (replaced) version.

For more information refer to:

- [BIMCollab Zoom application](#) – how to check the quality / completeness of the IFC file?
- [Madaster User Manual](#) – how is the Madaster Platform working?

Step 5- Check & enrich source data in Madaster

After one or more source files have been fully processed in Madaster, the system provides insight into:

1. “Quality of the source file”:
 - Percentage of elements that contain a material description.
 - Percentage of elements that contain a classification code (e.g., EBKP-H or OmniClass) and are therefore assigned in Madaster to the correct building layer (skin, space plan, etc.)
 - Percentage of elements that contain geometric information.
2. “Quality of the matching process”: percentage of elements automatically linked to a material or product in the Madaster database (based on the selected data sources).

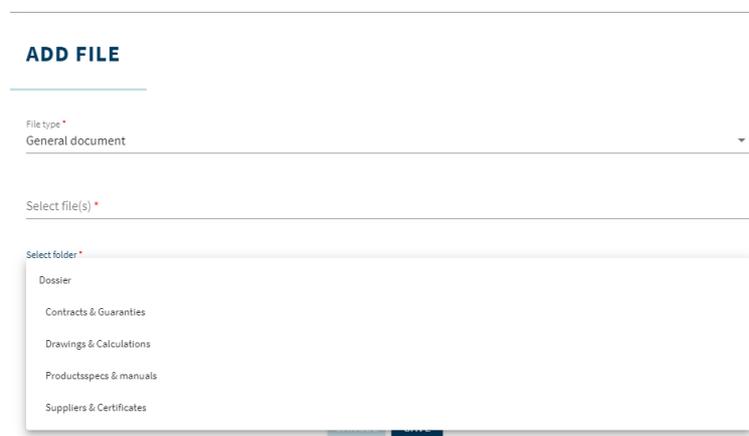
Subsequently, in the sub-step "Enrich" in Madaster, it can be checked which material or product is linked to an element from the source file. In Madaster it is only possible to manually establish or adjust a link between element and material or product. There is no possibility in Madaster to manually enrich elements with a classification code or geometric data that is incomplete or missing. This latter data can only be added by uploading a modified source file (IFC or Excel) in Madaster.

Finally, a source file can be made 'active' in Madaster. This ensures that the results of the source file are shown in the "Building" tab in Madaster. Based on this, it becomes clear (per shearing layer) how complete the uploaded 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.

Step 6- Complete building dossier in Madaster

When the designated source file on Madaster is complete and all elements of it are automatically or manually linked to a material or product of a database, the final design and / or production models (structure, façade, technical installations, etc.) of the building can be switched active on Madaster. The active source record is the most recent version of the material passport ("Building" tab) and is also the basis of the financial (residual-)value ("Financial" tab) and the circularity value ("Circularity" tab) of the building. So if several source files are active on Madaster, they are added together. This can lead to duplications, which should be avoided.

In addition to activating the source files for the specific building, the total building dossier can be enriched with available building documents (for example: drawings, certificates, contracts, photos, etc.) can be added in the "Dossier" tab.



Picture 8: Add general documents

In conclusion, based on the active source files and the added information, a material passport (in PDF & Excel) of the building can be generated (tab "General"). This material passport is automatically filed in the "Dossier" tab.

Step 7- Archive building

As soon as the building dossier is complete and no further adjustments are made to it, it can be stored in Madaster at a specific point in time in a so-called "final state" (archived status). In this way, an "image" is taken of the building registration and the building is assigned a time stamp and separate archive database in Madaster.



Picture 9: Archive building

Before the building is archived in the platform, the user must assign his own version name and ID to the building.

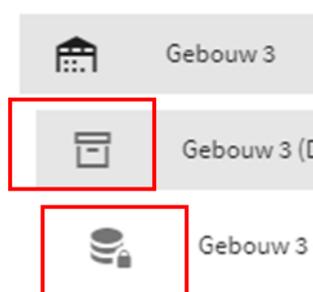
ARCHIVE THE BUILDING

Version Name *

Version Identifier

Picture 10: Archive building (Version name & ID)

The Madaster platform then creates the building archive consisting of a collection of active source files, linked materials & products, and available general building documents. Finally, a new material passport is generated from the archived building.

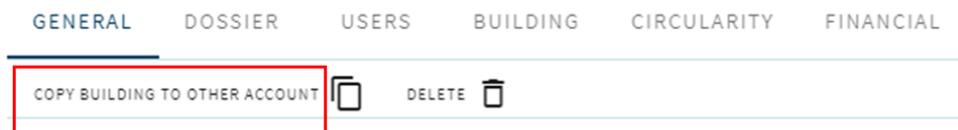


Picture 11: Archived building

Step 8- Transfer building archive

After the building (including material passport) has been archived, it can be transferred on Madaster to the account of the building owner or developer. Prior to this, the building owner receiving the archived building must have an active account on the Madaster platform and should grant the transferring party (Madaster Enterprise licence holder) access to their account.

After receiving the access right, the Enterprise licence holder who transfers the archived building can transfer the archived building to the shared location (folder) of the building owner account under the "General" tab of the archived building (see Figure 11) via the "transfer building to other account" button. A copy of the archived building remains available in the Enterprise licence holder's account..



Picture 12: Transfer building archive