



Madaster Action Plan

Materials Passport

Process description to create a materials passport in the Madaster Platform

Voor
Madaster users

Door
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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 "building 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 building 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. building passport) in the Madaster Platform.
6. Transfer building file to property owner in the Madaster Platform (Enterprise licence holder)

These steps are further explained below.

Step 1: Determine the level of detail of the building passport to be drawn up.

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 building passport. It is therefore recommended to determine the purpose of the building passport before collecting data and to determine on the basis of this:

1. Which level of detail of the building passport is (ultimately) desired.
2. Which building shells ("building layers") must be incorporated in the building passport.
3. The level of detail of the requested building layers.

Ad. 1 1. Which level of detail of the building passport is (ultimately) desired?

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

At level 1, the building 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 located 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.

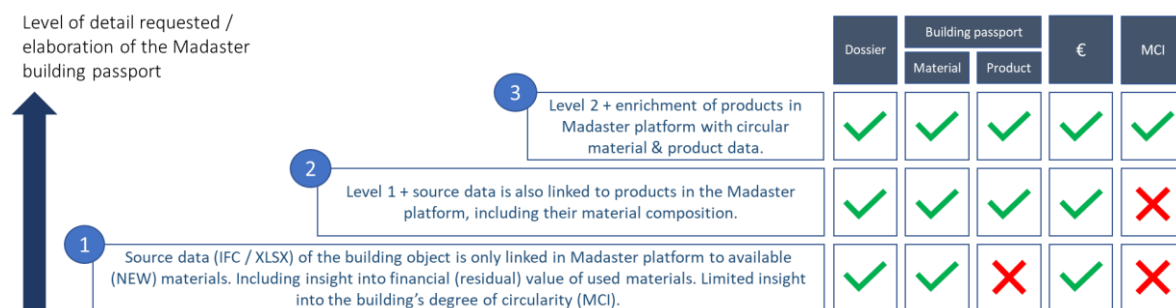
Level 1 contains the minimum guidelines that form the starting point and provide insight into the steps to be taken and the source information to be collected in order to initiate a basic building registration in Madaster (see section "Level 1 - Madaster source information").

At level 2, the purpose of the building 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. On the basis of this additional perspective, the building 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.

Despite the fact that 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 building 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 building passport in Madaster.



Picture 1: Elaboration levels of the Madaster building passport

Ad. 2 Which building shells ("layers") must be incorporated in the building passport?

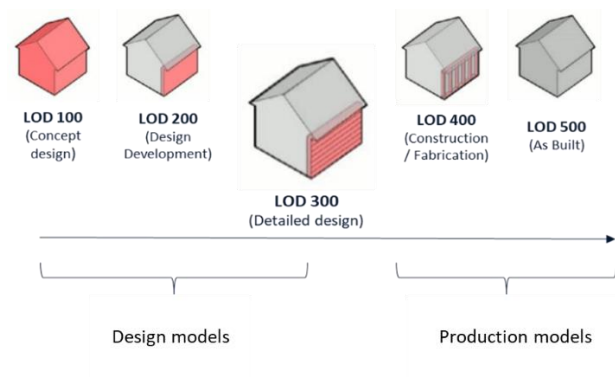
A building is composed of distinctive "shells" ("shearing layers") that each have their own function and lifespan. The materials and products used in the building are categorized in the Madaster platform and assigned (by means of a classification code; e.g. OmniClass table 21) to various building shells. In this way, the location of materials and products in the building also becomes clear. In addition to architectural and constructional elements, Madaster also has the option to classify technical services (installations), interior and elements in the vicinity of the building.



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

Ad. 3 3. The level of detail of the requested building layers?

A building can be modelled in different levels of detail. This is expressed in a standard, namely: Levels of Detail (LOD).



Picture 3: Levels of Detail

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 building passport in Madaster, design models should ideally be developed at a minimum LOD 300 level*. 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.

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

For more information refer to:

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

Step 2: Collect & prepare required building information (source data).

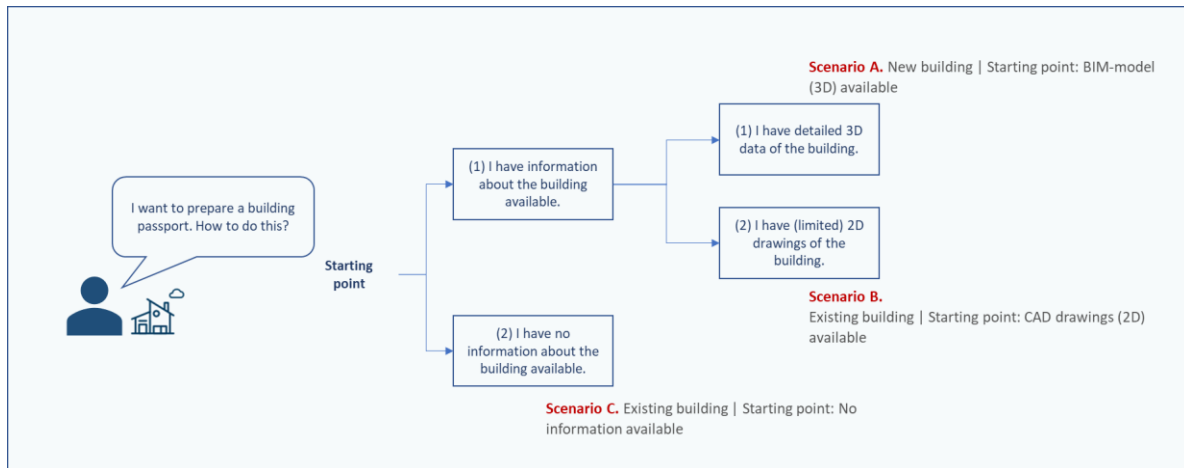
The Madaster platform can handle two types of source data **: namely: (1) an IFC file (based on a 3D / BIM model) and (2) a Madaster Excel template (if no 3D / BIM model of the building is available). These source files (IFC and Excel) are automatically validated upon import into Madaster for completeness in terms of: material description, classification code and geometric data.

** Data of the building in terms of applied materials / products, classification codes and geometric properties on the basis of which the Madaster platform can provide insight into a building passport, financial (residual) value and circular value.

Building information (source data) must then be collected and processed in response to the desired level of detail of the building passport to be delivered (see step 1). Below is explained per level (1, 2 & 3), whereby the higher level always builds on the directly underlying level, which data is required and desired.

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 and each provide 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 be generated at least at level 1 in Madaster.



Picture 4: Starting point building scenarios

Scenario A. New building | Starting point: 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 applies to the [BIM Basic IDM](#), ideally 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 materials list in the Madaster database. 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 with regard to 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.

Desired source data:

- Building (engineering) specification information: provides insight into the materials and products used.

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?
- [BIM Collab Zoom application](#) – how to check the quality / completeness of the IFC file?

Scenario B. Existing building | Starting point: 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 created* 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 materials list in the Madaster database. 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.

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

Desired source data:

- Building (engineering) specification information: provides insight into the materials and products used.
- A filled in Madaster Excel Template (“Material Import Template.xlsx”) to register the used materials and products from the other building shells (site, services, interior) of which information on the drawings is incomplete **.
- This Madaster Excel template contains elements whose material description is as much as possible automatically validated with and linked to the available materials list in the Madaster database. 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.

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

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?

Scenario C. Existing building | Starting point: no information available

Necessary source data:

1. A filled in Madaster Excel Template ("Material Import Template.xlsx") 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 **.
2. This Madaster Excel template contains elements whose material description is as much as possible automatically validated with and linked to the available materials list in the Madaster database. 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.

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

Desired source data:

- Building (engineering) specification information: provides insight into the materials and products used.

Level 2 (in addition to 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 ("Determining the level of the building passport") it has been decided to elaborate the building passport for the building at level 2 or level 3.

For a more accurate building 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 must be available in the Madaster database.

Despite the fact that more and more data of construction products is becoming available in the Madaster database, it is possible that products used in the relevant building are not yet included in the Madaster database. In order 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 generic data set available to every user, an "account specific" product library is also built directly 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).

Desired source data:

- Building (engineering) specification information: provides insight into the materials and products used.

For more information refer to:

- Madaster manual [How to add products](#) – how to add products in Madaster.

Level 3 (in addition to 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 ("Determining the level of the building passport") it has been decided to elaborate the building 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 (MCI*). This is expressed on the "Circularity" tab in the Madaster platform in a percentage between 0% (non-circular) and 100% (fully circular). This insight is mainly achieved by enriching the products presented in 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 is assumed between "new" and "recycled, reused or rapidly renewable" raw materials. 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 is assumed between "waste" and "reuse or recycling" of materials and products that are released during the renovation or demolition of a building. 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.

* 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.

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.

Desired source data:

- Building (engineering) specification information: provides insight into the materials and products used.

For more information refer to:

- Madaster manual [How to add products](#) – how to add products in Madaster.
- [Madaster Circularity Indicator explained](#) – how is the degree of circularity in Madaster calculated?

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 building 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 building passport is developed at level 1 (see paragraph 1.1).

If a material or product does not appear in the Madaster database and in order to achieve a solid circularity score (MCI) in Madaster (elaboration of the building passport at level 3), it is necessary for the user to add materials and/or products in the platform. For this 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 "own" 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 manual [How to add products](#) – how to add products in Madaster.
- [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 architecture.



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 Madaster database. 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 5 "Checking & enriching source

data”). Alternatively, the source file requires modification first and a new version of the IFC file is uploaded and processed in Madaster.

In order 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.



Picture 6: Select and prioritise datasets in Madaster

It is important to first select only the source “Madaster”, possibly supplemented with the 'account specific' products library (in this example “Madaster Demo”), if materials and / or products are created in Madaster (in the case of 'Level 2' or 'Level 3'). The "Madaster" database only contains materials (as they appear in the NMD). 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. The other data sources should only be used for specific purposes.

For more information refer to:

- [BIM Collab Zoom application](#) – how to check the quality / completeness of the IFC file?

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. NL-SfB or OmniClass table 21) (and are therefore assigned in Madaster to the correct building layer (site, structure, 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 (in the 'confirm' sub-step). This ensures that the results of the source file are shown in the "Building" tab in Madaster. Based on this, it becomes clear (per building 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

If the intended set of source files is complete in Madaster and all elements thereof are automatically or manually linked to a material or product in the Madaster database, the final design and / or production models (construction, architectural, technical services, etc.) of the building can be made active in Madaster. The active source data set is the most recent version of the building passport ('Building' & 'Building process' tab) and is also the basis of the financial (residual) value ('Financial' tab) and circular value ('Circularity' tab) of the building in Madaster. Therefore, if multiple source files are active in Madaster, they will be added together. This can lead to duplication, which should be avoided.

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



Picture 7: Add / archive general documents in Madaster

In conclusion, based on the final set of active source data files and the added information, a (version of the) building passport of the building can be generated (in PDF & Excel) on the Madaster tab 'General'. This building passport is automatically filed in the "Dossier" tab under the "Passports" folder.

Step 7: Archive building

As soon as the building file 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, a "image" is taken of the building registration and the building is assigned a time stamp and separate archive database in Madaster.

GEBOUW 3



Picture 8: Archive building

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

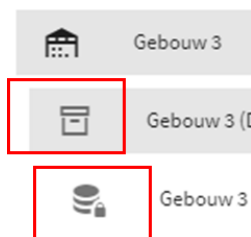
ARCHIVE THE BUILDING

Version Name *

Version Identifier

Picture 9: 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 building passport is generated from the archived building.

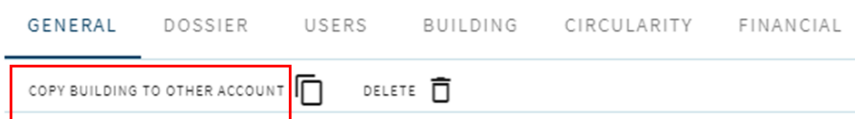


Picture 10: Archive building (Version name & ID)

Step 8: Transfer building archive

After the building file (including building passport) has been archived, it can be transferred in Madaster to the account of the building owner or client. Prior to this, the building owner, to whom the archived building file is transferred must have an active account in the Madaster platform and should grant the transferring party (Madaster Enterprise licence holder) access in Madaster to transfer the archived building to a specific location (folder) in its account.

Once this is done, the Enterprise licence holder transferring the archived building can click on the "Copy building to other account" button on the "General" tab of the archived building (see Figure 11) and then the specified location (folder) of the building owner. This will transfer the building to Madaster. A copy of the archived building will remain available in the Enterprise licence holder's account.



Picture 11: Transfer building archive

Madaster support

The Madaster Service desk can be reached by telephone during office hours (+31 85 060 1242).

In your Madaster environment you can always consult the available support documentation online. Each page in the Madaster platform contains an "I" button on the right side (mid-screen). At all times this provides information about the relevant page and available functions.

This manual and other support documents and reference documents of the Madaster platform can also be found directly at the following [link](#).