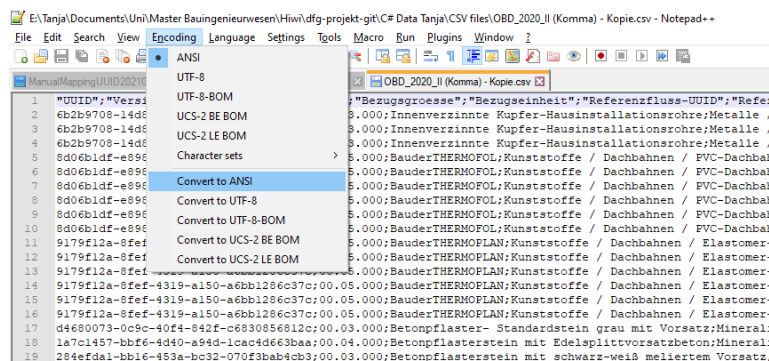


## Preparation of ÖkobauDat data for use in early planning phases

The CSV version of ÖkobauDat serves as the basis. The current version is designed for version 2020\_II. We define an "entry" as a line in the CSV file. This means that there is usually more than 1 entry for a material (one line per module).

Special feature: the csv version was edited and a line was added: Needle fleece A1-A3 (available online, but not included in csv version; added because it is essential)

Encoding: the ÖkobauDat is available in UTF-7 encoding by default and is also read in with this encoding. All other required manually created CSV files are in UTF-8 encoding by default. If, for any reason, an encoding needs to be changed, this can be done in the Notepad++ program, for example. To do this, open the file, select "convert to UTF-8" in the Encoding tab and save (see image below).



### 1. Filter empty entries

We define "empty" entries as all lines in the CSV file that have a value of less than  $10^{(-12)}$  in all indicators.

### 2. Sorting the entries in cost groups

Only KG300 entries are relevant in the context of this work. To obtain these, we use the following procedure:

- Filter out all entries with module B6 or category „Sonstige / Energieträger - Bereitstellung frei Verbraucher / Strom“(Other / energy sources - provision free consumer / electricity)
- Filter out all entries with module B7
- Filter out all entries for KG400 (category or name contains "Rohr"(pipe), category contains "Gebäudetechnik" (building technology), "Gussteile" (castings) or "Schmiedeteile"(Forgings). Capitalization is not important here
- Filter out all entries with modules that are not relevant for early planning phases (A4, A5, all Bs, C1 and C2)
- All remaining entries are assigned to KG300

Currently, only the entries (or more precisely their indices) for KG300 are exported again. However, it is also easy to extend the function to include all KG400 entries, for example.

### 3. Filter End-of-Life

The entries are copied and all generic entries for "End of Life" are filtered out of one of the copies. This list without End of Life is used further, the entries with End of Life are important for a later completion of the data records (see paragraph 10).

#### 4. Assignment of application area

All entries must be assigned to an application area (more precisely, in which layer types and cost groups they are applicable). There are two approaches to this:

- 1) Assignment according to the category (from the Ökobaudat)
- 2) Assignment according to the UUID

In principle, approach 1) is preferable as it is easier to realise. However, a corresponding assignment cannot be realised on the basis of every category. Therefore, all entries for which the category does not allow an assignment are assigned individually (based on the UUID). These assignments are recorded in the files "MappingKategorien-LayerType.csv" or "ManualMappingUUID.csv". Further entries can be added below in these files, but their structure (columns) cannot be changed (i.e. do not delete any columns or similar - hiding them is not a problem).

At this point, these "maps" are only read in. The assignment takes place in step 8.

#### 5. Filtering of unassignable entries in early planning phases

Entries that cannot be used in early planning phases according to the categorisation mentioned in 4) are filtered out.

#### 6. Automated data completion

The remaining entries are pre-processed so that they can be converted to OekobaudatEntries later on

##### i) Complete/finalise

- (a) For all entries with unit "null", the text of the application from the associated XML file is added to the reference flow name
- (b) For entries with unit "zero", an attempt is made to extract the unit from the reference flow name (incl. info from xml) (potentially error-prone, therefore the document "UnitCorrection.csv" is exported to enable a manual check). This step also includes a conversion from e.g. 1000 kg to 1 kg (the indicators are also scaled accordingly).

##### ii) Corrections

- (a) All entries with a unit not equal to "zero" are scaled to 1 unit (e.g. from 1000 kg to 1 kg) including scaling of the indicators
- (b) Entries that have a "wrong" unit (but not equal to zero) are attempted to be converted into the "correct" unit. This can be achieved, for example, by using stored densities, surface weights or similar (see below for information on "incorrect" and "correct" units). The indicators are scaled accordingly.

##### iii) Further corrections

All entries that are still in the wrong unit are run through the following steps. These are not applied to all entries, as this could increase the potential for errors

- (a) Conversion factors such as density etc are tried to be extracted from the reference flow name
- (b) Another attempt is made to obtain the correct unit using the conversion factors

As „correct“ unit are defined:

- m3

- sqm for entries with categories containing the following keywords: „Rahmen“(frames), „Füllungen“(fillings), „Türen und Tore“(doors and gates) , „Beschichtung“(coating), „Dachbahnen“(roofing membranes), „Wärmedämmverbundsystem“(thermal insulation composite system), „Folien und Vliese“(foils and fleeces)
- square meters for the following categories (flooring and cladding)
  - Wood / wooden floors / cork
  - Wood / wooden floors / parquet
  - Wood / wood-based materials / laminated veneer lumber
  - Wood / solid wood / glulam panels
  - Composites / system components / ceilings
  - Plastics / floor coverings / rubber/rubber floor coverings
  - Plastics / floor coverings / linoleum floor coverings
  - Plastics / floor coverings / PVC floor coverings
  - Plastics / floor coverings / textile floor coverings
  - Metals / aluminium / aluminium sheets
  - Metals / lead / lead sheets
  - Metals / Stainless steel / Stainless steel sheets
  - Metals / steel and iron / steel sheets
  - Metals / Zinc / Zinc sheets
  - Mineral building materials / stones and elements / roof tiles
  - Mineral building materials / bricks and elements / fibre cement
  - Mineral building materials / bricks and elements / artificial stone
  - Mineral building materials / bricks and elements / slate
  - Mineral building materials / bricks and blocks / tiles and slabs

## 7. Manual data completion

Some data records cannot be converted into a correct unit and thus into usable data records using the methods described in paragraph 6. They must therefore be reprocessed manually. In "ManualDataCompletion.csv", these data records have been supplemented or revised with additional information. In each case, the changes made and the data on which they were based are stored.

## 8. All entries with the „correct“ unit are converted to “OekobaDatEntries”

Up to this point, each line of the ecobaDat is treated as an entry (referred to in the programme as "SingleModEntry" (entry with a single module)). Now these individual entries are to be summarised. This means that all entries with the same UUID (but different modules) are combined into one unit (called "OekobaDatEntry"). This contains, among other things, all general information and the indicators for modules A1-A3, C3, C4 and D (if available).

In order to obtain entries that can only be used in the further course, only entries that are in the correct unit are converted (see definition above). All entries that cannot be converted are exported in the "NotConvertedEntries.csv" file. It should be ensured that all entries can be converted via steps 6 and 7 and that this list is empty. However, it will certainly not be possible to convert entries, especially if the ÖkobaDat is changed/updated..

During the conversion, it is also ensured that all entries that are summarised are in the same unit. If this is not the case, the programme is stopped and an error is displayed.

## 9. Assignment of OekobaDatEntries - KG3xx und LayerTypes

The assignments created in step 4 (by category and UUID) are now used to assign each OekobaDatEntry its corresponding KG3xx and LayerTypes. All OekobaDatEntries that are not

covered by the mappings created are exported to the "ManualMapping.csv" file. It should be ensured that this file is empty. If this is not the case, categories or UUIDs must be added to the original mapping files.

#### 10. Adding the thermal conductivity

The thermal conductivity for each category is stored in the "ThermalConductivity.csv" file. This is added to each OekobaudatEntry in this step. If a category is not stored, an error is displayed. If changes are made to the eco-build data, this file will probably have to be adapted (this should be evident from the error).

#### 11. Completing the general information of the Oekobaudat entries through conversions

If two of density, basis weight and thickness are available, the third can be derived by conversions;

Relation: Density = weight per unit area/thickness

#### 12. Completing the eco-building data entries using the eLCA

The eLCA (building material configuration) contains further information on many data records in the eco-building data. For this purpose, a check is made for each OekobaudatEntry as to whether a corresponding entry is stored in the eLCA. If so, the system checks whether an entry exists for C3, C4 and/or D in the OekobaudatEntry and, if not, whether it can be completed by the entry in the eLCA (important: it must be ensured that the units also match and that entries are converted if necessary). The „service life“ is also taken from the eLCA.

For some datasets, there is no information on C3 or C4 either in the eLCA or in the dataset. As the presence of one of these modules is a necessary prerequisite for their use, the eLCA was supplemented manually (information from Patricia). This is indicated in the "Modified" column. The manual addition currently also requires that some values are deliberately set to "0". To indicate this, "**Null entry**" must be entered in the corresponding place in the "UUID" column.

Important: there should be no **names** with ";" in the eLCA, as these are recognised as new cells within the programme (the individual csv cells are normally separated by semicolons). In the current version, this is the case for „Parkettlack (Grundierung Holz; wasserverdünnt)“ (“Parquet lacquer (wood primer; wall-diluted)“ (ID 15143). The semicolon was therefore manually converted to a comma. Problems do not usually occur with semicolons, it is only possible that values from the eLCA (such as the density here) cannot be recognised and therefore cannot be transferred. The only exception is the last column. Semicolons are used here by default, but these are taken into account in the code. However, the corresponding implementation also means that **no column may be added at the end!**

#### 13. Completing the service life entries manually

The entries for service life from the eLCA have two restrictions: in some cases, only a value of "0" is stored and the maximum service life is 50 years. Both do not correspond to reality and must be completed. This is done by manually adding the information for the affected data records in CSV files, which are then read out in the programme and lead to an adjustment of the data. Data records that are still incomplete are exported to CSVs and must be checked manually!

#### 14. Einträge für Luft hinzufügen

Two data records are added manually to OekobaudatEntries in order to be able to take air into account in the superstructures. These are called "moving air" and "static air layer". The following

are stored for both: Name as above, Service Life Time 120 years, all indicators for all modules 0, reference unit "1 m3", layertype according to name.

The thermal conductivities are also 0.0 and 0.33 for "moving air" and "static air" respectively. (Average of lambda for 2.5 to 10 cm air thickness from

<https://www.ingenieure.immo/wiki/baustoffe/luftschichten/> in accordance with the DIN EN ISO 6946 standard)