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Thanks to James Service at Sills van Bohemen Architects
LCAQuick is a life cycle assessment tool that calculates the environmental impacts of a building throughout its life cycle. Materials used in the building contribute to these environmental impacts. LCAQuick can use the ArchiCAD building information model (BIM) to obtain material quantities needed for the calculation.

**LOD for LCAQuick**

The level of development or LOD required from ArchiCAD for LCAQuick varies depending on the elements modelled between approximately LOD 200 and LOD 350.


Some examples:

- LOD 200 would apply to a reinforced masonry wall with no coatings (LCAQuick includes the steel reinforcing).

  *ArchiCAD element required > Wall > Structure > Basic or composite / Building material.*
LOD 350 would apply for a wall assembly – for example, fibre-cement cladding, cavity battens, insulation, CLT, strapping battens, plasterboard.

**ArchiCAD element required > Wall > Structure > Composite or complex profile > Building material.**

The method of calculating the constituent layers is similar to the calculations for thermal performance where each element in each layer needs to be accounted for.

Refer LCAQuick sheet 1b Unit Converters.
LCAQuick uses codes to uniquely identify materials. These codes (and two other parameters) need to be added to the BIM elements’ metadata.

Within ArchiCAD, there are a number of ways to assign the three required parameters for LCAQuick to the BIM. The approach taken in this document uses ArchiCAD’s building materials attribute, which is described by Graphisoft as:

“super attribute”, a combination of multiple attributes having defined properties. Building Materials are defined globally, in the Building Materials dialog box, then applied to Construction Elements in their own Settings dialog boxes, or used as components of Composite Structures and Complex Profiles. Editing the Building Material attribute makes changes throughout the model.

The benefit of this approach is that it is top-down. An ArchiCAD BIM at an early stage of developed design can, with just the addition of some classification attributes and some schedules, generate sufficient data for LCAQuick.
The three parameters LCAQuick requires are:

1. LCAQuick material code
2. LCAQuick material name/description
3. LCAQuick unit quantity requirement.

Building materials have only a few properties that are user editable. You need to use all of these to add the three parameters above. Copy and paste these properties from LCAQuick sheet 1a For Ref - Material Codes. You will need to add these three parameters to each building material to be calculated in your project.

The third parameter (LCAQuick unit quantity requirement) has four options:
- Volume dependent [LCIA/m3].
- Area dependent [LCIA/m2].
- Area dependent, to derive volume [m3/m2].
- Number of items dependent [LCIA/item].

It is best to use ArchiCAD construction elements for those elements that are to be scheduled and calculated by LCAQuick. Try wherever possible to model using walls, columns, beams and slabs rather than objects for building elements. If the model includes complex geometries, use of complex profiles, shells and morphs is preferred.
Schedules for LCAQuick

Interactive schedules in ArchiCAD allow for the display of quantities and other parameters. They also allow for the editing of model data within the schedules themselves. The interactive nature of schedules is invaluable when auditing and editing the model information.

Interactive schedules are used to format the data that is transferred into three LCAQuick input columns: 1c INPUT - Material Quant., 1c INPUT - Window Mat. Quant., 1c INPUT - Mat. Quant.

WASHING.

For LCAQuick, these two types of interactive schedules are useful:

- **Components schedule**
  This lists the components of elements – for example, the individual materials in a wall assembly composite. This is used to generate material schedules.
Elements schedule

This lists the characteristics of individual components – for example, the area of window frame for the window schedule or the areas of different zones.

If you are unfamiliar with creating schedules in ArchiCAD, the online help menu has extensive documentation on this topic.

https://helpcenter.graphisoft.com/user-guide-chapter/85111/
Building materials schedule

The building materials schedule contains the most information for use in LCAQuick and typically requires the most auditing to ensure that the information is correct.

It is suggested to create two schedules for this: one that is used for auditing the BIM (Detailed) and one that is used for exporting the data to LCAQuick (Export).

Criteria are used in schedules to ensure that only the required elements are scheduled. All criteria need to be customised based on your project and office BIM standards. You may not need all or any of the criteria illustrated here. It is best to start with no criteria or a very small set and add to these selectively to include only elements that are required.
The criteria

The criteria for the detailed and export schedules needs to be identical. Therefore it is best to create the detailed one first and duplicate this once everything is working correctly. In the example shown, three criteria types are employed.

1. Element type: This filters out objects and focuses on the elements used in the BIM required for LCAQuick.
2. Home storey: This filters out other elements located outside this storey range. Elements not required in the schedule may include template parts, working models, hot-linked modules or discarded options located on other storeys.
3. Layer: This filters out layers containing elements that are not part of LCAQuick calculations. It also filters out hidden and other non-building elements.
Views

It is worthwhile setting up a plan view and a 3D view in the view map using the same filtering criteria as in the schedule as this will help speed up the creation of the filters and the auditing of the model.

1. Element type
2. Home storey
3. Layer
At the top of the interactive schedule are two buttons: Select on Floor Plan and Select in 3D. These allow you to quickly go to drawing windows and identify elements from the schedule. It is always best to visually check the correct materials have been used to model the elements.
Editing data

**Trust, but verify!**

Once elements that require building material reassignment have been identified, the interactive functionality of the schedule makes it easy to edit the BIM to make corrections.
Exporting data

The export building materials schedule should be formatted to easily cut and paste data straight into the LCAQuick spreadsheet. This can be achieved by adding custom text fields in the schedule as spacer columns to align with the unused parameters in LCAQuick.

![Image of spreadsheet with custom text fields highlighted]

Export building materials schedule settings
Windows schedule

The windows schedule needs to calculate both the frame area and the glazing area. In the example shown, these parameters are daylight area and total area (i.e. subtract the glazing from the total area to get the frame area).
Additional parameters are available for library parts such as doors and windows. In this example, the exterior joinery is modelled with Cadimage windows. These additional parameters are available from the Add Fields... drop-down menu.
Browse to locate the required parameters. Use the drop-down menu at the top and select **Folder View (used Objects only)** as this will reduce the search dramatically.

Some further editing and calculation of the data in a spreadsheet application will be necessary before taking it into LCAQuick. This is because a window is not modelled in ArchiCAD exactly as it will be formed in construction. This is especially the case with aluminium windows with their complex extruded profiles. After the schedules are populated and exported to a spreadsheet, the window frame surface area will need to be multiplied by a multiplier to get the actual volume of aluminium used.

One way to calculate that multiplier is to take the cross-sectional area of the aluminium profile(s), multiply it by 4,000 mm (for the volume of a 4 m long section of aluminum) and divide it by the frame surface area from a 1 m x 1 m ArchiCAD window.

Alternatively, LCAQuick features a tool that can be used to build up schedules for windows and doors. It is located in the **INPUT - Window Door Builder** sheet.
Washing schedule

Both the materials schedule and windows schedule are used to generate area data for the washing schedule.

The external wall, roof and floor faces can be extracted from the building materials schedule.

The external surfaces for the window frames and glass are extracted from the windows schedule.

Detailed building materials schedule settings

Windows schedule
Area schedules

Area schedules derived from zones will also be required for LCAQuick. Use the different zone construction methods to create zones for the interior NLF and GFA calculations, then set up a zone area schedule as shown here.
Export

Schedules are exported as Excel workbooks (.xlsx) (File > Save as...). They can also be exported as PDF and tabbed text as well as other formats.

It is best to export these to a folder and then make a copy to another folder for further calculations to avoid the files being overwritten when they are exported again.

The exporting of schedules can be automated using the publisher.