Ground Contact Constructions

The Apache Constructions Database has been enhanced to assist with calculating U-values of constructions (floors and walls) that are in contact with the ground. Using the current model geometry to identify surfaces that are below or in contact with the ground plane (at level \( z = 0 \)) Constructions can then be modified to give an accurate U-value calculation.

In CDB select the menu option:
Tools >> Ground-contact Floorplans.

Here the Floorplan parameters are defined and Characteristic Dimension is calculated for the building. Click the “Update building from geometry” button to automatically add Levels for each storey with a floor touching or below ground (Z=0) in the building.

**Floorplan** – the floorplan at a particular ground or sub-ground level is the polygon formed from the intersection of the building with a horizontal at that level. Characteristic Dimension is calculated for any particular level as \( 2 \times \frac{A_f}{P_f} \)

Where

\( A_f \) is Floorplan Area at that level

\( P_f \) is Floorplan Perimeter at that level
Options to manually override these values are provided to allow user to add/delete levels and edit the Depth, Floorplan Area and Floorplan exposed perimeter values for any level. This gives the user control over the Characteristic dimension for buildings with unusual geometry.

When Floorplans have been defined the Ground-contact Constructions can be modified. In CDB open any Ground-contact/Exposed Floor or External Wall.

The option to define the construction as Ground-contact is available, tick this and click the U-value adjustment button to input further parameters that will be used in the calculation of the U-value adjustment.

The U-value adjustment can be calculated using the EN-ISO 13370 method or F-factor.
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**EN-ISO method**

EN-ISO 13370 method takes as input ground conductivity, Floorplan characteristic dimension, wall thickness and insulation details and depth below ground level.

**F-Factor**

F-factor method takes as input the Floorplan characteristic dimension and an F-factor.

Both methods rely on the Level being chosen so that the correct parameters (Characteristic Dimension etc) are used.

When the parameters are defined tick the “Apply adjustment” checkbox then Save and Exit to apply the U-value adjustment to the construction in the form of additional layers in the Construction Layers (identifiable as the U-value correction layer).
## Ground Contact Constructions

[Image of a construction diagram]

### Construction layers (outside to inside)

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness (m)</th>
<th>Conductivity (W/mK)</th>
<th>Density (kg/m³)</th>
<th>Specific Heat Capacity (kJ/kgK)</th>
<th>Resistance (m²K/W)</th>
<th>Vapour Resistance (Gm/s/m²K)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-value correction layer</td>
<td>0.150</td>
<td>0.0500</td>
<td>550.0</td>
<td>100,000</td>
<td>0.000</td>
<td></td>
<td>Insulating Materials</td>
</tr>
<tr>
<td>LONDON CLAY</td>
<td>0.750</td>
<td>1.4100</td>
<td>1800.0</td>
<td>1000.0</td>
<td></td>
<td></td>
<td>Sands, Stones and Soils</td>
</tr>
<tr>
<td>BRICKWORK (OUTER LEAF)</td>
<td>0.250</td>
<td>0.8400</td>
<td>1700.0</td>
<td>800.0</td>
<td></td>
<td></td>
<td>Brick &amp; Blockwork</td>
</tr>
<tr>
<td>CAST CONCRETE</td>
<td>0.100</td>
<td>1.1000</td>
<td>2000.0</td>
<td>1000.0</td>
<td></td>
<td></td>
<td>Concretes</td>
</tr>
<tr>
<td>DENSE EPS SLAB INSULATION - LIKE STYROFOAM</td>
<td>0.050</td>
<td>0.0250</td>
<td>30.0</td>
<td>1400.0</td>
<td></td>
<td></td>
<td>Insulating Materials</td>
</tr>
<tr>
<td>CHIPBOARD</td>
<td>0.035</td>
<td>0.1500</td>
<td>600.0</td>
<td>2003.0</td>
<td></td>
<td></td>
<td>Timber</td>
</tr>
<tr>
<td>CHIPBOARD CRUST</td>
<td>0.025</td>
<td>0.6000</td>
<td>100.0</td>
<td>1820.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Construction thickness**: 1.3545 m

**Total R-value**: 6.5104 m²K/W

**U-value (W/m²K)**: 0.1404 W/m²K

**U-value method**: EN 13706