

U-values, the Building Regulations and underfloor heating



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Insulation is required below all underfloor heating systems to stop downward heat transmission.

The Building Regulations also stipulate the need for better-insulated buildings and a reduction in building heating requirements.

• U-Values and the Building Regulations

Recent changes to the Building Regulations have reduced the required U-value for floors from 0.45 to 0.25W/m²K.

The formula for calculation of a ground floor U-value is given in CIBSE Guide A3 and is very complicated.

A simplified method of calculating the U-value of an uninsulated floor has been described in BRE Information Paper IP 3/90.

This simplified formula can be used for all types of ground floor, including ground bearing, suspended concrete and suspended timber floors.

It can also be used with relative ease for irregularly shaped floor plans, not just simple rectangular shapes.

• IP 3/90 formula

$$U = 0.05 + 1.65(P/A) - 0.6(P/A)^2$$

Where:

U = U-value of the uninsulated floor (W/m²K).

P = Length of the exposed perimeter (m).

A = Area of the floor (m²)

• Note

The measurement of the perimeter and area should be to the inside surface of the perimeter walls that enclose the heated space. Unheated spaces, such as garages and porches, should be excluded. The perimeter should not include walls between adjacent heated areas such as semi-detached or terraced properties.

• U-values of uninsulated ground floor

The formula yields the following values for different perimeter to area ratios.

Perimeter/Area ratio = 0.10, 0.1253, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70

Uninsulated U-value = 0.21, 0.25, 0.36, 0.50, 0.62, 0.73, 0.83, 0.92

The above figures show that only floor plans with P/A ratios less than 0.1253 will meet the new Building Regulations without additional insulation.

Using the figures above we can calculate the effective thermal resistance of the uninsulated floor (m²K/W) (which is the reciprocal of the U-Value).

In order to meet the new Building Regulations for a U-value no greater than 0.25 we must therefore increase the thermal resistance to at least 4.0 by adding insulation.



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Knowing the additional component thermal resistance that the insulation must provide we can then calculate the required thickness of insulation from the thermal conductivity of the material.

The table can then be expanded to give guidelines as to what thickness of each type of insulation is required to bring the floor U-value under 0.25. The figures are available at <http://www.warmafloor.co.uk/knowledge-center/catagories/insulation.asp>