Building Regulations Approved Document L1A

The current Approved Document L 1, for England came into effect in 2013. The guidance given in this document gives clear advice on the measures which may be taken to meet the requirement. Different requirements apply in other parts of the UK.

INTRODUCTION

Precast concrete floors, whether they are beam and block or hollowcore floors, can be used within a dwelling to meet the requirements of Part L1A of the Building Regulations.

Compliance with Part L1A of the Building Regulations is in two parts. The first part is to limit heat gains and losses and the second part is to provide energy efficient heating / cooling systems.

This datasheet aims to explain what is required to demonstrate that a precast concrete solution meets the first requirement in terms of limiting heat losses from the building. Heat losses from a building are split into two categories, which are:

- heat loss through an element, e.g., a wall or floor - referred to as the U-value, and
- heat loss through a junction between elements (thermal bridge) - referred to as the psi-value.

It should be noted that the two heat loss mechanisms are linked in that the heat loss from the building will take the path of least resistance. So, for example, improving the U-value of the floor can have a negative effect on the psi-value of an associated junction.

The U-values and psi-values of the respective elements and junctions and the data relating to the heating / cooling system are used within the Standard Assessment Procedure (SAP) software to determine the dwelling emission rate (DER), which is a measure of how much energy is used to maintain a comfortable internal environment within the dwelling. Overall compliance with Part L1A will be met if the DER is less than the Target Emission Rate (TER).

The SAP assessment software is a sophisticated tool and allows the assessor to make various changes to meet the TER. For example, if loft insulation were increased in thickness by, say, 50mm this may negate the need to have a lower wall U-value. What the SAP assessment demonstrates is that the psi-value is as important as the U-value.

U-VALUES

In accordance with Table 2 of Part L1A (see Table 1 overleaf) the maximum allowable floor U-value is 0.25W/m^{2}K. However, most designers will set a maximum target U-value of around 0.2W/m^{2}K.

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A floor U-value of 0.1W/m^{2}K, or less, can be achieved with a beam and block floor depending on:

- the type of beam;
- the spacing of the beams,
- the type of insulation, and
- the thickness of the insulation.

Table 1 – Limiting fabric values
(extract taken from Table 2 of Part L1A)

Element	Area-weighted average U-value
Roof	0.20 W/m^{2}K
Wall	0.30 W/m^{2}K
Floor	0.25 W/m^{2}K
Party wall	0.20 W/m^{2}K
Swimming pool basin	0.25 W/m^{2}K
Windows, roof windows, glazed roof-lights, curtain walling and pedestrian doors	2.00 W/m^{2}K
Air permeability	10 m^3/hr.m^2 at 50 Pa

The alternative to a SAP assessment is to adopt the standard Model Designs which are presented in Table 4 of Part L1A. The theory behind this is that by adopting the model designs the dwelling will meet the TER. However, there is a penalty associated with this approach, which is that the maximum U-values are now much tighter as demonstrated below; the maximum U-value for the floor has been lowered from 0.25W/m^{2}K to 0.13W/m^{2}K by adopting the model designs.

Table 2 – Summary of concurrent notional dwelling specification
(extract taken from Table 4 of Part L1A)

Element or System	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area
External walls (including opaque elements of curtain walls)	0.18 W/m^{2}K
Party walls	0.0 W/m^{2}K
Floor	0.13 W/m^{2}K
Roof	0.13 W/m^{2}K
Windows, roof windows, glazed roof-lights and glazed doors	1.4 W/m^{2}K (whole window U-value)
	g-value = 0.63
Opaque doors	1.0 W/m^{2}K
Semi-glazed doors	1.2 W/m^{2}K
Airtightness	5.0 m^3/hr.m^2
Linear thermal transmittance	Standardised psi values – see SAP 2012 Appendix R, except use of y = 0.05W/m^{2}K if the default value of y = 0.15W/m^{2}K is used in the actual dwelling

At quote stage the manufacturer of the system will provide a U-value based on the information available, which could be used for the SAP assessment. However, it should be noted that the actual U-value of the floor is subject to the final construction issue of the drawings, which may have variations that have resulted in the U-value changing. The psi-value of the floor to wall junction can also be provided at quote stage but is subject to the same caveat.

PSI-VALUES

As the psi-value is a function of the floor U-value it is very dependent on the floor type being used. If the floor to wall details are not fully specified at the time of undertaking the SAP assessment, then default values can be used, which are listed in Table K1 of the SAP document (see Table 4). The default value for an intermediate floor is 0.074W/mK and for a ground floor it is 0.16W/mK.

Table 3 presents the results from various psi-values modelled by the PFF. These include:

- intermediate beam and block floors with various specifications of infill blocks and various cavity wall specifications;
- intermediate 150mm deep and 200mm deep hollowcore floors, and
- beam and insulated infill block floors at ground floor.

The table clearly demonstrates the advantages of each type of system over the default values.

Table 3 – Summary of psi-values for different floor/wall combinations

Location	**Floor type**	**Construction Specification**	**psi-value (W/mK)**
Ground floor	Beam and block	Aerated blocks used in the floor and wall	0.053 parallel 0.052 perpendicular
Ground floor	Beam and insulated block	L shape EPS blocks 300mm thick aerated concrete inner leaf block	0.060 parallel 0.083 perpendicular
Ground floor	Beam and insulated block	T shape EPS blocks 225mm thick aerated concrete inner leaf block	0.048 parallel 0.055 perpendicular
Intermediate	Beam and block	Dense aggregate floor blocks, 50mm PIR cavity wall insulation with aerated concrete inner leaf blocks	0.015 parallel 0.011 perpendicular
Intermediate	Beam and block	Dense aggregate floor blocks, 100mm PIR cavity wall insulation with aerated concrete inner leaf blocks	0.005 parallel 0.003 perpendicular
Intermediate	150mm hollowcore	50mm PIR cavity wall insulation aerated concrete inner leaf blocks	0.014 parallel 0.014 perpendicular
Intermediate	200mm hollowcore	50mm PIR cavity wall insulation aerated concrete inner leaf blocks	0.013 parallel 0.015 perpendicular

Notes:

Ground floors have a high psi-value due to the higher temperature difference between the two airspaces above and below the floor.

Table 4 – Values of psi for different types of junction conforming with accredited details (extract taken from Table K1 of SAP document)

	Junction detail	**psi-value (W/mK)**
Junctions with an external wall	Steel lintel with perforated steel base plate	0.50
	Other lintels (including other steel lintels)	0.30
	Sill	0.04
	Jamb	0.05
	Ground floor	0.16
	Intermediate floor within a dwelling	0.07
	Intermediate floor between dwellings (in blocks of flats)	0.07
	Balcony within a dwelling [2]	0.00
	Balcony between dwellings [1, 2]	0.02
	Eaves (insulation at ceiling level)	0.06
	Eaves (insulation at rafter level)	0.04
	Gable (insulation at ceiling level)	0.24
	Gable (insulation at rafter level)	0.04
	Flat roof	0.04
	Flat roof with parapet	0.28
	Corner (normal)	0.09
	Corner (inverted – internal area greater then external area)	-0.09
	Part wall between dwellings [1]	0.06
Junctions with a party wall [1]	Ground floor	0.08
	Intermediate floor within a dwelling	0.00
	Intermediate floor between dwellings (in blocks of flats)	0.00
	Roof (insulation at ceiling level)	0.12
	Roof (insulation at rafter level)	0.02

Notes:

1. Value of psi is applied to each dwelling

2. This is an externally supported balcony (the balcony slab is not a continuation of the floor slab) where the wall insulation is continuous and not bridged by the balcony slab.