UNDERFLOOR INSULATION

Underfloor insulation is an option to be considered as part of retrofit works. Here, Associate Partner and PAS 2035 Retrofit Coordinator Will Gregory looks at the options available and what needs to be considered, particularly under PAS 2035.

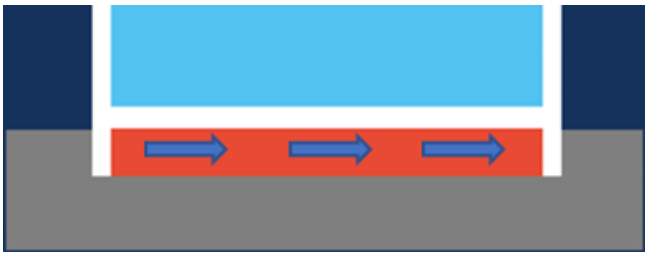
What do we mean by underfloor insulation?

When referring to retrofitting to underfloor insulation, we mean installing it to the floor which forms the thermal envelope of the building. In this instance it is the floor which is directly above the red section on the house graphic below. It doesn't include the intermediary floors or the loft/ceiling line.

When insulating the floor, we would be looking to achieve a U-value of 0.25 or better to comply with Part L building regulations. This can usually be achieved by installing a standard performing insulation such as mineral wool to a depth of 150mm or a high-performance foam insulation to a depth of 50- 70mm.

What's the impact of retrofitting this measure and why would we want to do it?

The two main floor types that the majority of domestic properties will have are either suspended floor or solid floor. Heat is lost between both. The graphics belowindicate cold draughts running though a floor void in a suspended floor where heat is lost and heat being lost through a solid floor via conduction.



Suspended floor

Retrofitting underfloor insulation will help reduce the heat loss through both solid and suspended floors which in turn would reduce energy bills and help alleviate fuel poverty. With the current cost of living crisis, any measures that contribute to this would likely be more appealing to residents.

On suspended floors, underfloor insulation will reduce draughts in living spaces by improving the airtightness of the floor structure.

One key point, particularly looking at Social Housing Decarbonisation Fund (SHDF) funding, is that installing underfloor insulation to an uninsulated floor will likely improve the SAP score and subsequent EPC rating.

	Upgrades			Results	
				EPC rating	Space heating demand kWh/m²/yr
				(SAP score)	SAP (PHPP) values
	Existing			D (64)	148.1 (162.9)
Fabric First Approach	1. Top up roof insulation to 400mm			D (65)	142.2 (156.4)
	2. Replace existing cavity fill insulation			C (70)	118.7 (130.6)
	3. 150mm EWI			C (73)	102.7 (113)
	4. Double glazing			C (73)	99.4 (109.4)
	5. Air tightness measures			C (76)	87.5 (96.2)
	6. Thermal Bridging calculations			B (81)	61.3 (67.5)
HVAC	7. Ventilation	Upgrades		CMEV	MVHR
		Results	EPC rating	B (81)	B (82)
			Energy demand kWh/m²/yr	59.1 (65)	49.1 (54)
	8. Low Carbon Heat Source	Upgrades		ASHP	ASHP
		Results	EPC rating	B (81)	B (82)
			Energy demand kWh/m²/yr	57.5 (63.2)	48 (52.8)
Further Fabric	9. Floor Insulation	Upgrades		Floor insulation	Floor insulation
		Results	EPC rating	B (85)	B (86)
			Energy demand kWh/m²/yr	41.4 (45.6)	31.2 (34.3)
Renewable Technology	10. Photovoltaics	Upgrades		PV	PV
		Results	EPC rating	A (92)	A (93)
			kWp	2.2	2.0
			Energy demand kWh/m²/yr	41.4 (45.6)	31.2 (34.3)

Extract from Baily Garner Retrofit Toolkit showing improvement options on a semi detached 1930s dwelling

To give an example of the impact of underfloor insulation on the EPC rating, we have extracted this table from an improvement option of a semi detached 1930s dwelling which has an uninsulated suspended timber floor. While this improvement option does include a fabric first approach, underfloor insulation has been pushed further on down the list of improvement options due to the installation challenges it poses. At this point, introducing the measure provides four additional SAP points and a reduction in space heat demand of 17 kWh/m2/yr. At this point in the improvement option, the property is already a B and therefore the EPC doesn't increase any further. However, if we change the order of the improvement

Solid floor

options and introduce it as the first measure on this property, seven SAP points are gained, taking the property from an EPC of D to C and reducing the space heat demand by 23 kwh/m2/yr.

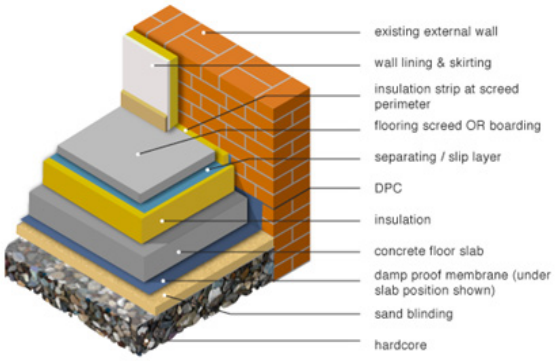
Options and considerations

It's important to understand the floor type before selecting an appropriate method. Determining whether it is a solid or suspended floor will govern the options available along with bringing to the fore the specific challenges.

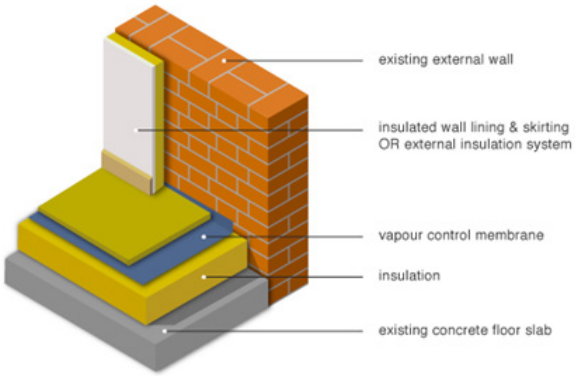
Solid floors option 1 - Excavate and relay with insulation

If you have a solid floor, one method would be to excavate the floor completely and relay the floor build-up including insulation with a build-up similar to the diagram above. The insulation in a build-up like this would likely be a rigid insulation foam.

As the image shows, this is a highly disruptive piece of work which would more than likely require a decant. The works are expensive in themselves but also require the replacement of floor coverings and potentially fixtures and fittings such as kitchens and bathrooms. These associated costs increase the overall expense even further.



Solid floors option 2 - Lay insulation on top of existing



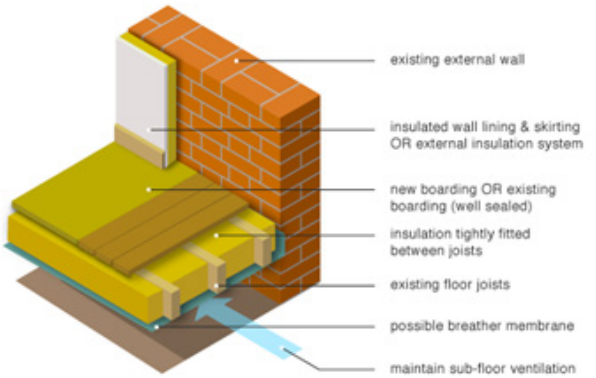
Continuing with solid floors, an alternative method of insulating could be to lay insulation on top of the existing floor structure. This would involve removing existing floor coverings, preparing the existing surface, and laying a rigid insulation board before installing new floor coverings on top.

These works are still fairly intrusive and may still require a decant or a phased approach for it to be manageable for residents. The method also comes with various associated works such as the adjustment of door heights and thresholds, skirtings, radiators and electrical fittings. The ceiling heights of properties is also reduced. Often high-performance insulation such as aerogel, which can be installed with a thin depth, is used to reduce the impact. However, this can increase the cost of insulation further.

Suspended Timber Floors option 1 – Remove floorboards, insulate and reboard

With suspended floors, understanding the depth of the floor void initially will be key. If the floor void is large and accessible by a cellar then insulation may be able to be installed from below. In the majority of properties this is not necessarily available and therefore one option could be to strip the floor covering and floor boards and lay insulation in netting in between the joists. New floorboards would then be installed on top with floor coverings in addition too.

In a similar theme to solid walls, this is a highly disruptive method and again a decant of the property may be required. It can also be expensive with associated costs of floor coverings and fixtured and fittings also required.



Suspended Timber Floors option 2 – Sprayed insulation system

Another, newer option to the market for suspended floors is a sprayed insulation system. Insulation is applied by a small robot which is dropped into the floor void. A closed cell foam insulation is then sprayed onto the underside of the floorboards to a depth of 120mm. The robot accesses the floor void through a small opening in between joists or to the external wall. If this option is viable then the disruption inside of the property is much less than other options. The companies that offer this service carry out onsite investigations in advance to determine the viability. Properties with extensive services running in the void or debris may not be suitable along with properties with too shallow of a floor void.

There is some skepticism around introducing a man-made foam material onto a natural structure, however the companies who offer this have test material available to confirm that moisture is still allowed to escape through the timber and insulation.

Considerations under PAS 2035

When looking at PAS2035, underfloor insulation is a recognised retrofit measure. It is listed as having a technical risk of 3 which in the PAS2035 risk assessments means that the project will follow risk path B as a minimum. This is important to understand from the outset as the risk path of a project determines different obligations.

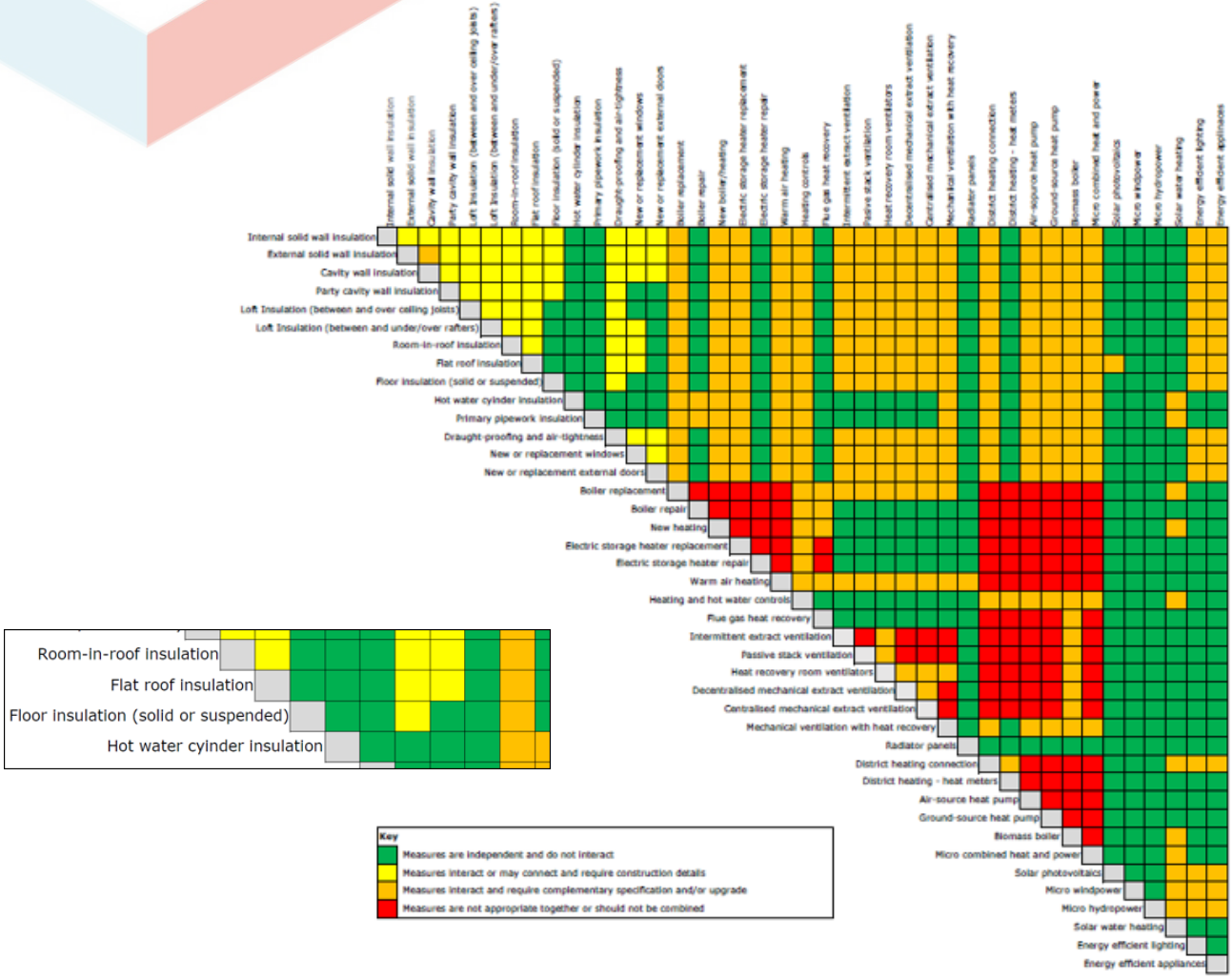
In a retrofit environment, it is likely that other measures may be introduced with underfloor insulation. The risk interaction matrix shown overleaf is a good tool you can use to understand the level of detail required between measures and what needs to be considered for each.

BAILY GARNER

BSI PAS 2030 Steering Group
BSI Retrofit Standards Task Group

RETROFIT MEASURES INTERACTION MATRIX

Version D, 20 November 2016



How we can help

At Baily Garner we have a team of retrofit experts including PAS2035 Retrofit Coordinators who can assist

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