Floor Insulation Programme for Castlehill Housing Association

Q-Bot has developed the first affordable and fully accredited solution for the retrofit of insulation to suspended timber floors. The result of this case study with Castlehill Housing Association shows that the measure reduces heat loss by **75%** through the floor and cold draughts by **22%** for the whole house. Compared with other options to upgrade energy efficiency Q-Bot is the most **cost-effective** solution available. The average cost was **£2,850** per install, with an improvement of **6 EPC points** per home, resulting in a cost of **£480 per EPC point** gained. All the customers were satisfied with the install and **8 out of 10** would recommend Q-Bot to their neighbours.

"I am much warmer and the house retains a lot more heat than it used to. I'm very satisfied with Q-Bot's underfloor insulation."

– Customer, Aberdeen

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Castlehill Housing Association

As part of a drive to improve energy efficiency and reduce fuel poverty, Castlehill Housing Association has worked with Q-Bot to install underfloor insulation across 6 properties in Scotland. This case study shows the impact on comfort and energy savings of the service.

The properties were mainly ground floor flats and semi-detached bungalows built between 1950 and 1980. The energy savings achieved by the upgrades were modelled in SAP using elemental U-values for the individual floors and the airtightness test results of each property. This enabled the energy improvements to be calculated against a range of scenarios with alternative retrofit measures. In addition, a pre and post installation questionnaire provided qualitative feedback from customers.

Impact

The installation of floor insulation significantly improved thermal comfort with fewer cold draughts and much more even temperatures within the house. The results show, on average, a **22%** improvement in airtightness and a **75%** reduction in the heat loss through the floor.

Q-Bot's solution for the insulation of suspended floors was shown to be the most **cost-effective** retrofit measure available. The average cost was **£2,850** per install, with an improvement of **6 EPC points** per home, resulting in a cost of **£480 per EPC point** gained. In addition, due to the innovative installation process, there was minimal disruption for the Housing Association's customers.

Fig 1. A happy customers.

Customer Feedback

100% of the occupants said they were '**Satisfied**', or '**Very Satisfied**' with the installation and **80%** scored Q-Bot 7 or higher on a survey of how likely would you recommend Q-Bot (where 1 stood for 'not at all' and 10 for 'highly recommend').

Q-Bot's non-disruptive approach has received praise from customers:

"The team was absolutely fantastic! I have no complaints about the installation process and there was no mess left in my house."

Customer, Aberdeen

Although too early to survey Castle Hill's customers on the resultant energy savings, some respondents have already noticed a great difference since Q-Bot insulated the floor. A thermal comfort survey will be undertaken early 2019 to collect feedback on the impact and change to homes.

"I am much warmer and the house retains a lot more heat than it used to. I'm very satisfied with Q-Bot's underfloor insulation."

Customer, Aberdeen

Summary

Key Outcomes from the Initial Pilot

Measurement	Floor heat loss (U-value)	Draughts (Air Permeability)*	Space Heating Requirement
Before (average)	0.79 W/m²K	9.3 m³/m².h @50Pa	8,410 kWh/yr
After (average)	0.20 W/m²K	7.2 m³/m².h @50Pa	6,670 kWh/yr
Reduction (average)	75%	23%	21%
EPC Points Improvement			6.0
Total Carbon Emissions Savings (over 42 years)			227,000 $kgCO_2e$

*An average was used when specific results were not available.

The EPC rating for **3** of the **6** properties was improved by one grade from band E to D. Residents could save an average **£96** per yer on their energy bills.

All **6** homes now comply with the Part L1A requirement for new build dwellings of <= **10 m³/ m².hr @50Pa** (there are no regulations covering airtightness in existing properties).

The U-value of the floor in all **6** homes now complies with the Part L1B requirement for upgrading retained thermal elements in existing dwellings of <= **0.25 W/m².K**.

Fig 2. A Castlehill property undergoing insulation.

Fig 3. Q-Bot team explaining the process to a customer.

80% of residents would recommend the service

The most cost-effective solution

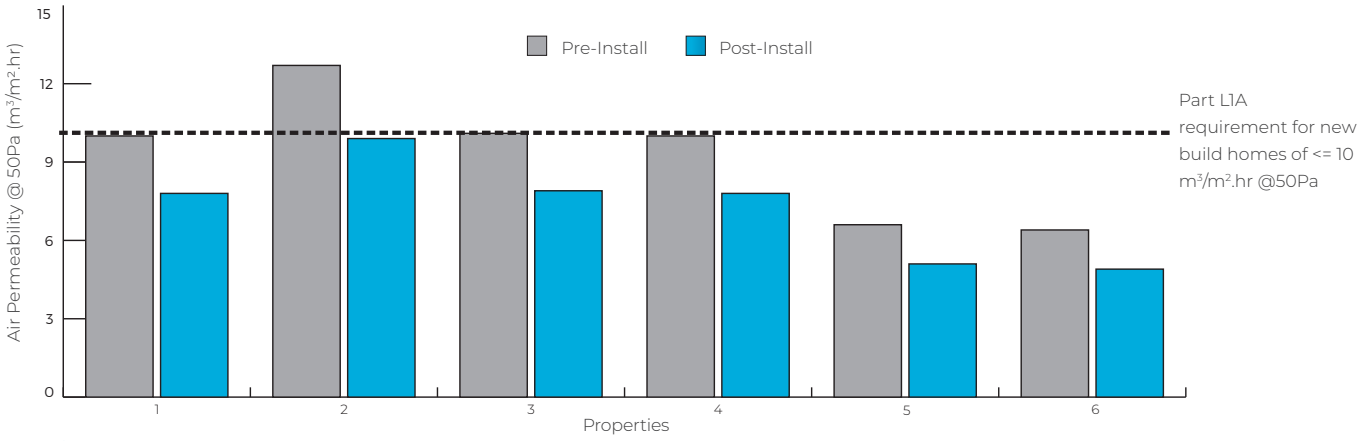
22% reduction in draughts

75% reduction in heat loss

Results

Reduction in Air-Permeability

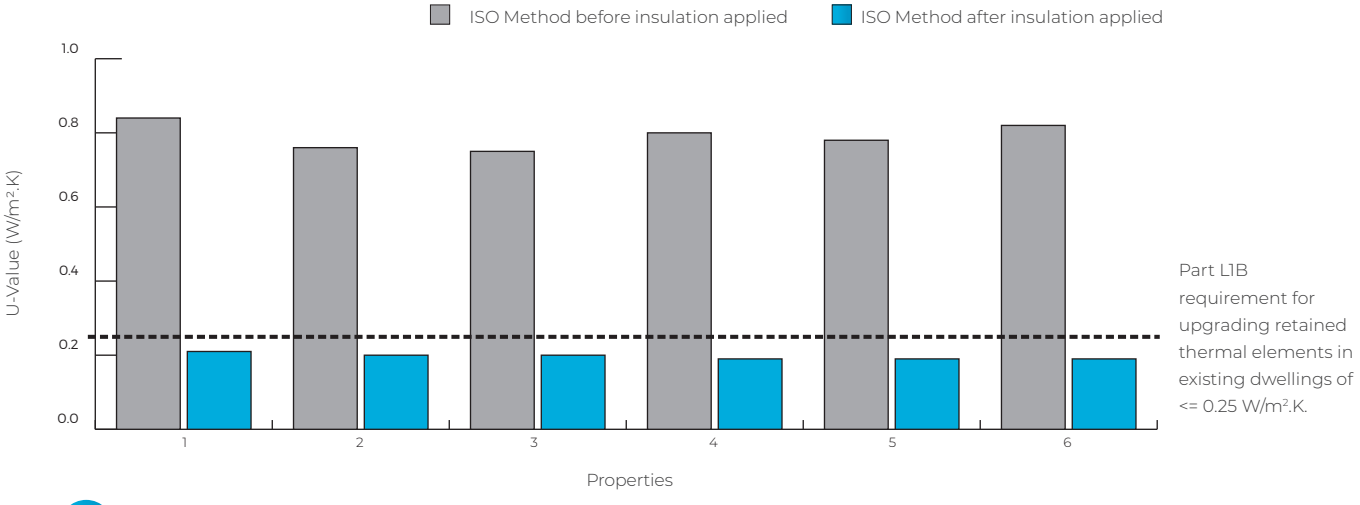
The air-permeability of the properties was tested according to the ATTMA Technical Standard to comply with BS EN 13829:2001. Of the 6 properties with air-permeability results, 3 did not have a pre-installation pressure test (mainly due to being 'too leaky' to pressurise). For these cases, a "pre-install" air permeability was estimated using the average improvement of the other properties. All the post-installation results were measured directly for each of the 6 properties, with an average post-installation test result of **7.2 m³/m².hr**. The before and after test results demonstrated an average **22%** improvement in airtightness.



100% of homes meet the building regulations air permeability for new builds.

Improved Floor U-Values

The U-values for both pre- and post-installation conditions, were calculated using actual measurements of the floors, vents, perimeter walls and physical site conditions (in accordance with ISO 13370:2007). The pre-installation U-values for the floors were, on average, **0.79 W/m²K**. The post-installation U-values were, on average, **0.19 W/m²K**, which constitutes a **75%** improvement, and meets the Part L1B requirements for elemental U-values of floors in existing buildings.



Every home now meets the requirement of Part L Building Regulations for upgrades to existing buildings.

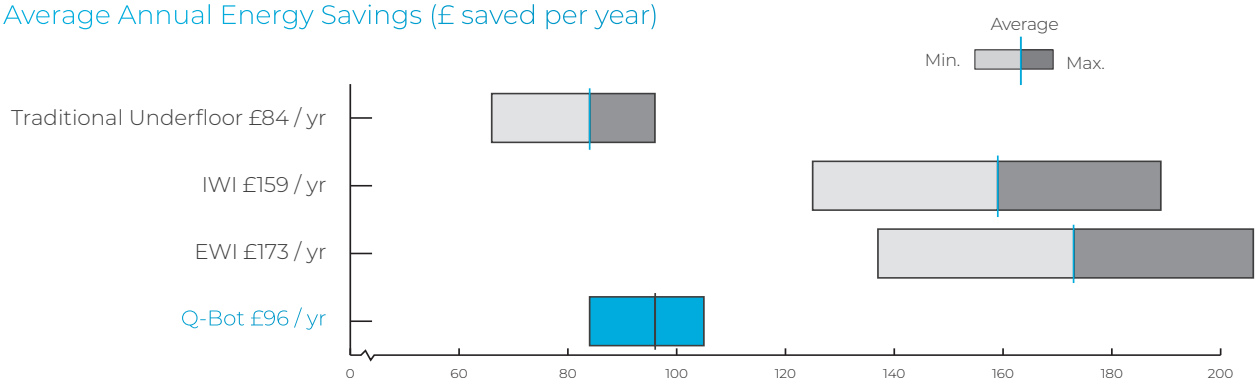
Energy Savings and Cost Effectiveness

The comparison of annual energy savings of Q-Bot's floor insulation with a range of standard retrofit measures was calculated using SAP. Q-Bot's solution was shown to provide the most cost-effective measure at an average cost of **£480 per EPC point**. It also produced an average annual energy saving of **£96**, with properties saving up to **£104** per year. The average EPC improvement across the range of properties was **6 points**.

The average sales price for the installs was **£2,850** per property based on a minimum volume per year.

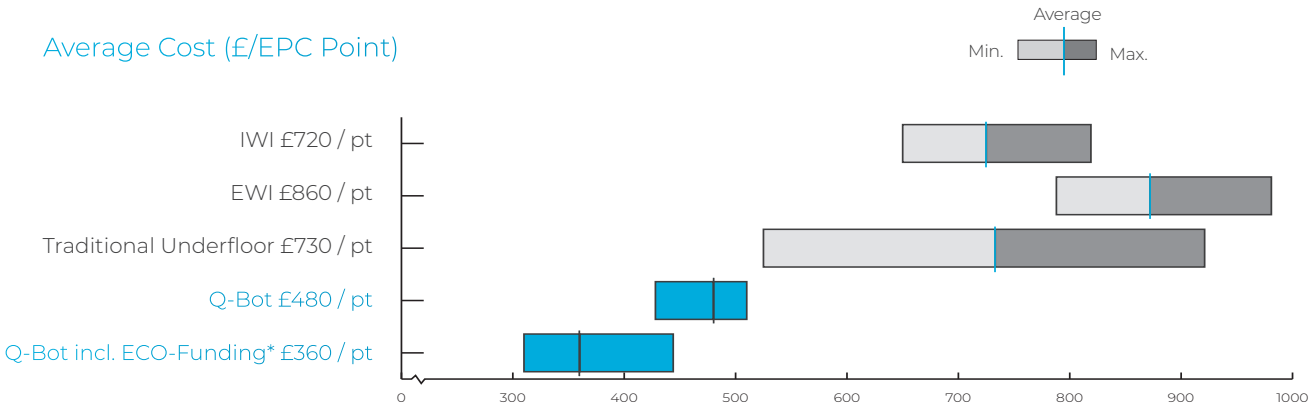
None of the properties were connected to the national gas grid. All properties already had loft insulation or a dwelling above and had cavity wall construction. These properties also had double glazed windows. The results shown represent an upgrade of the existing retrofit measure, explaining a high cost per EPC point. These properties also had a 100% efficient boiler, which explains a lower energy saving than usually achieved.

Average Annual Energy Savings (£ saved per year)



Significant energy savings without the disruption of major works.

Average Cost (£/EPC Point)



* Value calculated as at August 2018, subject to change due to new regulations.
Assumptions based on a large volume programme.

Q-Bot is the cheapest option per EPC point.

Example
Ground Floor Flat

A one bedroom one storey flat in Aberdeen, Scotland was insulated as part of the pilot. The property was a ground floor flat built between 1950 and 1980 with cavity wall construction and had **50m²** of suspended timber floor. **120mm** of insulation was installed between the joists and **25mm** below the joists. This resulted in an annual energy saving of **£104,** an EPC points improvement of **6.6**, and a carbon emission reduction of **41,200 kgCO_2e** over the 42 years lifespan of the insulation.

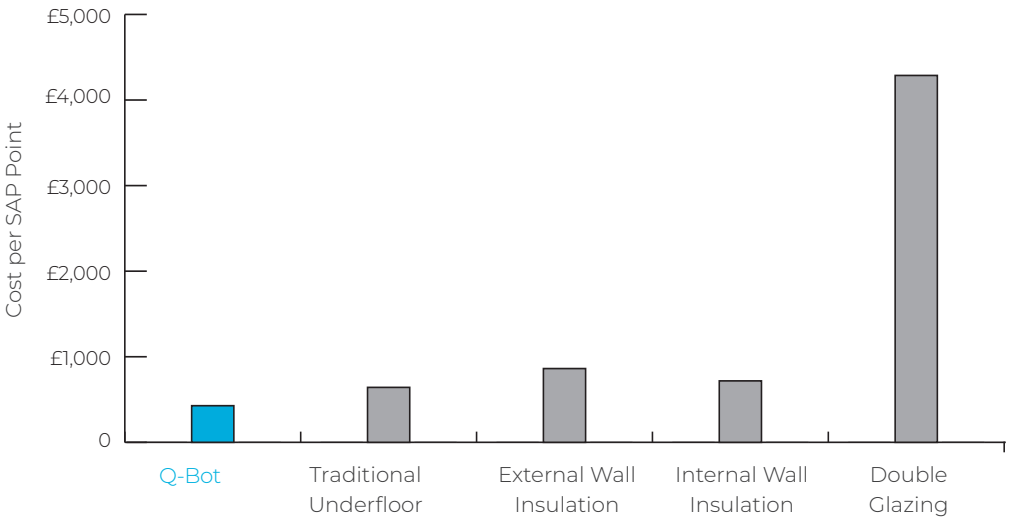
Fig 4. Ground Floor Flat in Aberdeen.

Property Details

Suspended floor area.....50m²
Area Insulated: 49m²
External wall area: 68.6m²
Window area: 6.6m²

The price of the install was **£2,830**.

KPI	Before	After	Improvement
EPC Score	E 52.67	D 59.28	6.6
Annual Heat Cost	£744	£640	£104
Annual CO_2e	5,280 kgCO_2e/yr	4,300 kgCO_2e/yr	980 kgCO_2e/yr
Air Permeability	10.0 m³/m².h@50Pa	7.8 m³/m².h@50Pa	22%
Floor U-Value	0.84 W/m².K	0.21 W/m².K	75%



EPC points improvement of 6.6

Fig 5. Before the installation.

Fig 6. After the installation, showing the insulation now applied.

Example
Semi-Detached Bungalow

Fig 7. A semi-detached bungalow in Aberdeen.

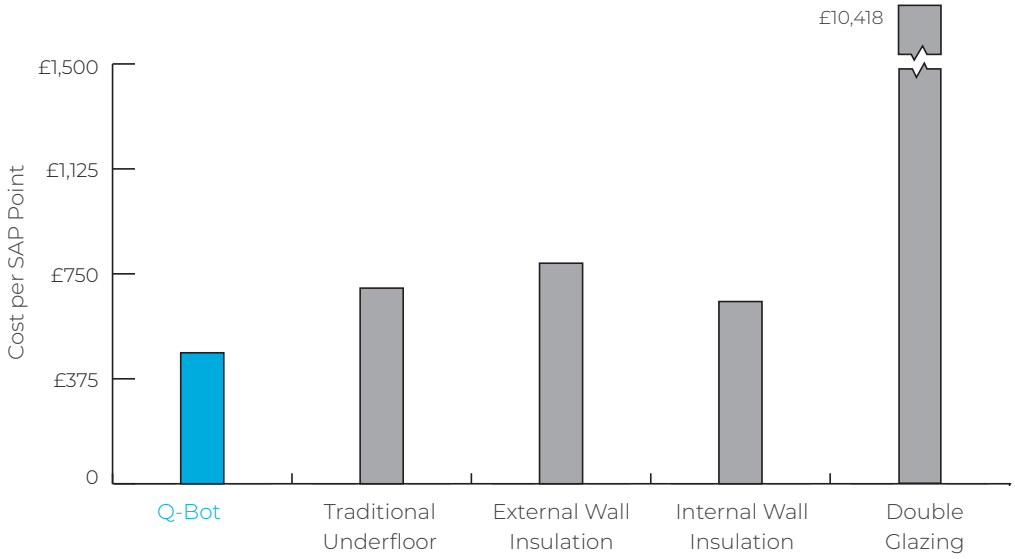
A one bedroom one storey bungalow in Aberdeen, Scotland was insulated as part of the pilot. The property was a semi-detached bungalow built between 1950 and 1980 with cavity wall construction and had **51m²** of suspended timber floor. **130mm** of insulation was installed between the joists and **25mm** below the joists. This resulted in annual energy saving of **£104**, an EPC points improvement of **6.4**, and a carbon emissions reduction of **41,300 kgCO_2e** over the 42 years lifespan of the insulation.

Property Details

Suspended floor area 51m²
Area Insulated: 51m²
External wall area: 53.3m²
Window area: 12m²

KPI	Before	After	Improvement
EPC Score	E 55.32	D 59.28	6.4
Annual Heat Cost	£733	£629	£104
Annual CO_2e	5,700 kgCO_2e/yr	4,720 kgCO_2e/yr	985 kgCO_2e/yr
Air Permeability	6.4 m³/m².h@50Pa	4.9 m³/m².h@50Pa	23%
Floor U-Value	0.82 W/m².K	0.19 W/m².K	77%

The price of the install was **£2,970**.



Annual Energy Saving of £104

Fig 8. Before the installation.

Fig 9. After the installation, showing the insulation now applied.

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