



## Floor Insulation Programme for Hexagon 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 Hexagon Housing Association shows that the measure reduces heat loss by **76%** through the floor and cold draughts by **23%** 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 **£2,460** per install, with an improvement of **2.83 EPC points** per home, resulting in a cost of **£870 per EPC point** gained. All of the customers were satisfied with the install and **8 out of 10** would recommend Q-Bot to their neighbours.

*"I've already noticed a great difference, my house is a lot warmer and retains the heat much better. I'm very happy with Q-Bot's installation."*

– Customer, SW London



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# Hexagon Housing Association

As part of a drive to improve energy efficiency and reduce fuel poverty, Hexagon Housing Association has worked with Q-Bot to install underfloor insulation across 7 properties in London. This case study shows the impact on comfort and energy savings of the service.

The properties were mainly ground floor flats, built before 1919 with different sizes and states of repair and disrepair. 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 **23%** improvement in airtightness and a **76%** 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 **£2,460** per install, with an improvement of **2.83 EPC points** per home, resulting in a cost of **£870 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 customer.

## Customer Feedback

**100%** of the occupants said they were '**Satisfied**', or '**Very Satisfied**' with the installation process. **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 brilliant, very clean and tidy. They explained to me in detail each step of the process and I am very pleased with the end result."*



Customer, SW London

Although too early to survey Hexagon'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've already noticed a great difference, my house is a lot warmer and retains the heat much better. I'm very happy with Q-Bot's installation."*



Customer, SW London



# Summary

## Key Outcomes from the Initial Pilot

Measurement	Floor heat loss (U-value)	Draughts (Air Permeability)*	Space Heating Requirement
Before (average)	0.80 W/m <sup>2</sup> K	11.5 m <sup>3</sup> /m <sup>2</sup> .h @50Pa	14,480 kWh/yr
After (average)	0.19 W/m <sup>2</sup> K	8.8 m <sup>3</sup> /m <sup>2</sup> .h @50Pa	12,790 kWh/yr
Reduction (average)	76%	23%	12%
EPC Points Improvement			2.83
Total Carbon Emissions Savings (over 42 years)			107,000 kgCO <sub>2</sub> e

\*An average was used when specific results were not available. Of the 7 properties, 3 did not achieve pre-install airtightness results due to poor weather. 4 full SAP assessments were possible with measured airtightness, showing an average EPC points improvement of 3.25.

**6** homes now comply with the Part L1A requirement for new build dwellings of **<= 10 m<sup>3</sup>/ m<sup>2</sup>.hr @50Pa** (there are no regulations covering airtightness in existing properties).

The U-value of the floor in all **7** homes following installation of floor the insulation complies with the Part L1B requirement for upgrading retained thermal elements in existing dwellings of **<= 0.25 W/m<sup>2</sup>.K**.

*"The pilot scheme had minimal disruption over 2/3 day installation period, and was very customer focused. The installers/engineers were clearly very committed to the process. The residents appreciated having this innovative process explained to them and watching the work on the laptop as it took place."*

Rumana Khair  
Stock Improvement Manager - Hexagon Housing

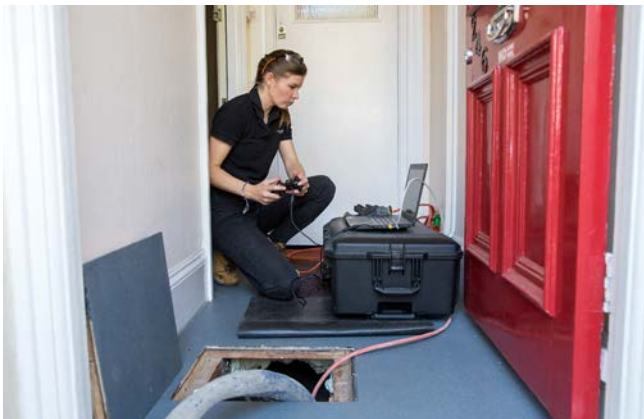
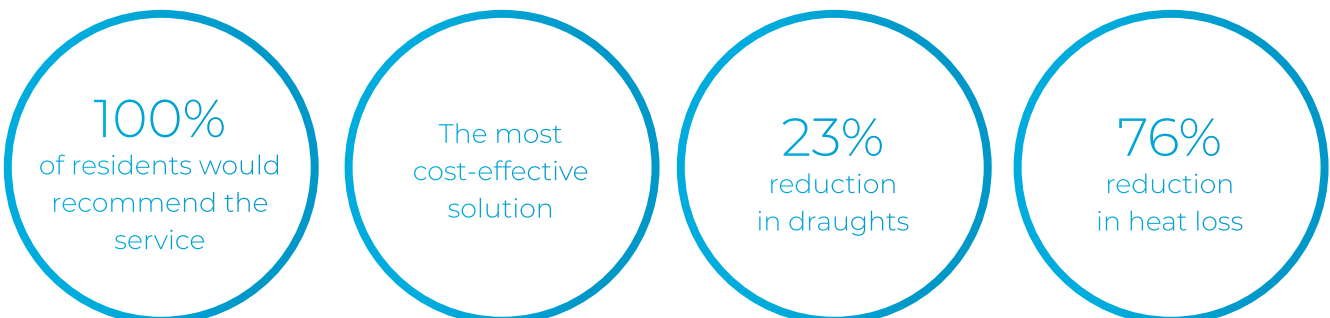


Fig 2. A Hexagon property undergoing the installation of underfloor insulation.



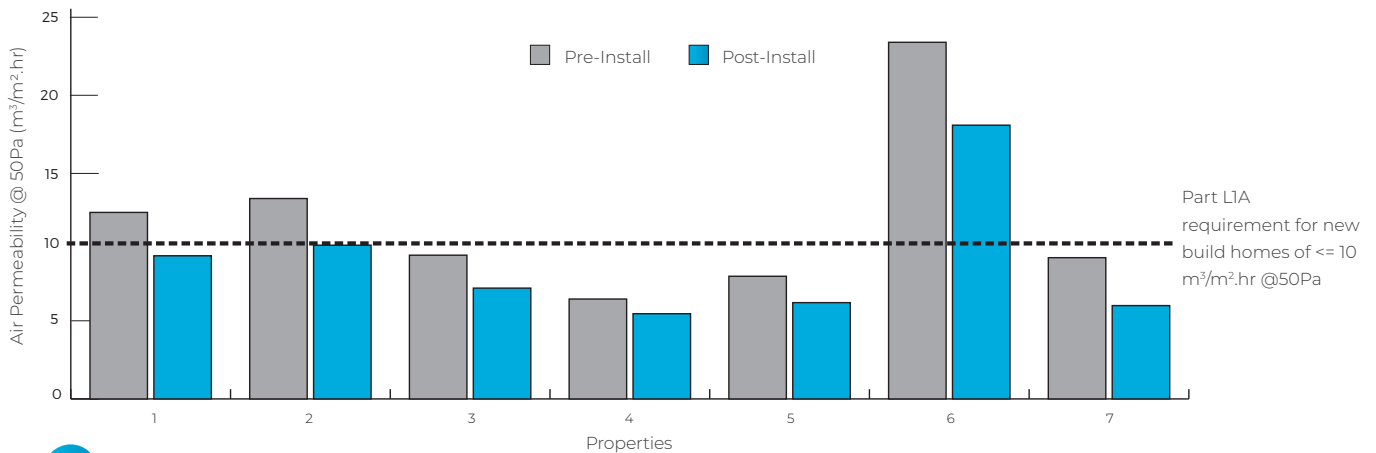
Fig 3. Q-Bot team explaining the process to a customer.



# Results

## Reduction in Air-Permeability

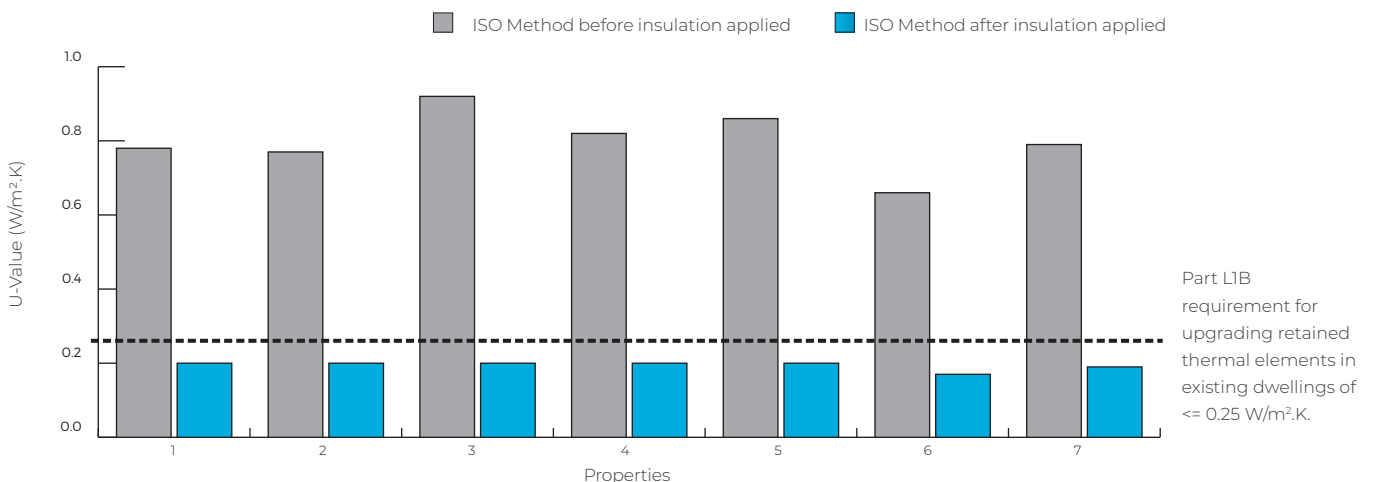
The air-permeability of the properties was tested according to the ATTMA Technical Standard to comply with BS EN 13829:2001. Of the 7 properties with air-permeability results, 3 did not have a pre-installation pressure test (mainly due to being 'too leaky' to pressurise). For these cases, a "pre-install" air permeability was estimated using the average improvement of the other properties. All the post-installation results were measured directly for each of the 7 properties, with the average of post-installation test results of **8.8 m<sup>3</sup>/m<sup>2</sup>.hr**. The before and after test results demonstrated an average **23%** improvement in airtightness.



86% of homes meet the building regulations air permeability for new builds.

## Improved Floor U-Values

The floor 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, **0.80 W/m<sup>2</sup>.K**. The post-installation U-values were, on average, **0.19 W/m<sup>2</sup>.K**, which constitutes a **76%** improvement, and meets the Part L1B requirements for elemental U-values of floors in existing buildings.



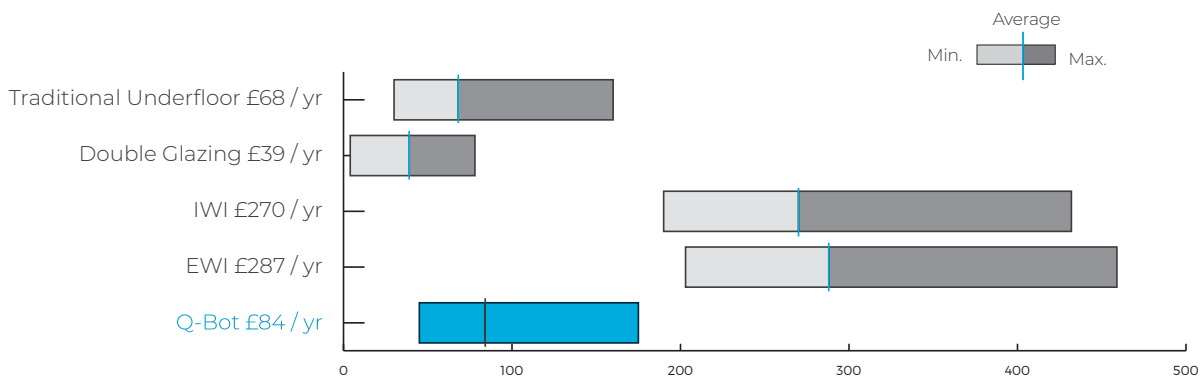
Every home now meets the requirement of Part L Building Regulations for upgrades to existing buildings.

## 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 **£870 per EPC point**. It also produced an average annual energy saving of **£84**, with properties saving up to **£176** per year. The average EPC improvement across the range of properties was **2.83** points.

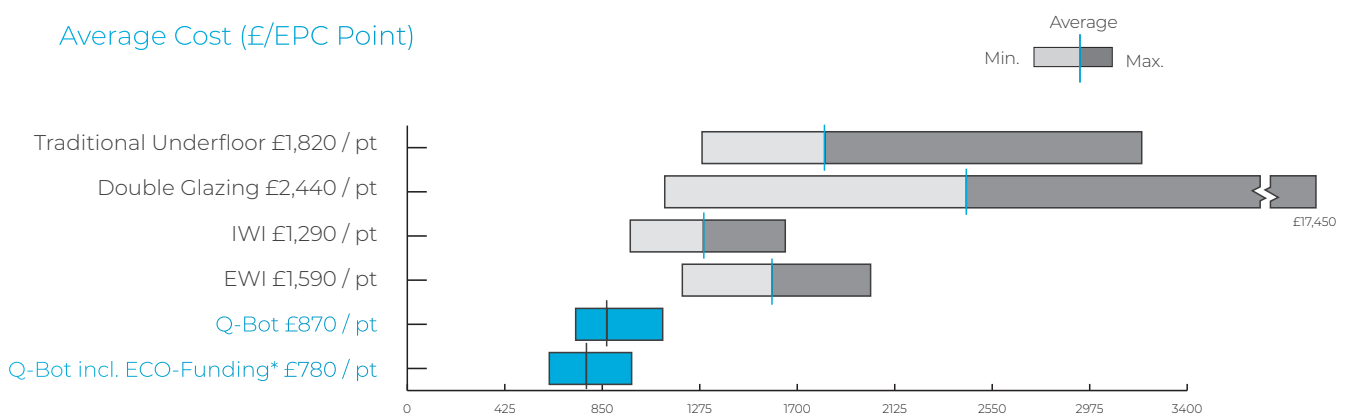
The average sales price for the installs was **£2,460** per property based on a minimum volume per year.

### Average Annual Energy Savings (£ saved per year)



Significant energy savings with limited disruption.

### 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 three bedroom flat in South-East London was insulated as part of the pilot. The property is a ground floor flat built before 1920 with no wall insulation and has **103m<sup>2</sup>** of suspended timber floor. **125mm** of insulation was installed between the joists and **25mm** below the joists. This has resulted in an annual energy saving of **£176**, an EPC points improvement of **4.84**, and a carbon emission reduction of **31,900 kgCO<sub>2</sub>e** over the 42 years lifespan of the insulation.



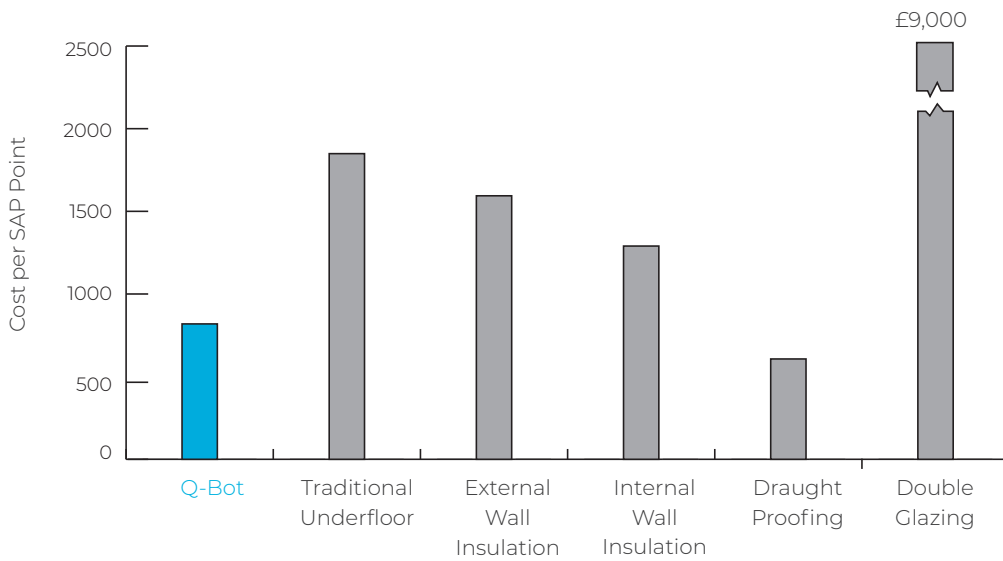
Fig 4. A ground floor flat

## Property Details

Suspended floor area ..... 103m<sup>2</sup>  
 Area Insulated: ..... 103m<sup>2</sup>  
 External wall area: ..... 125m<sup>2</sup>  
 Window area: ..... 10.6m<sup>2</sup>

The price of the install was **£3,960**.

KPI	Before	After
EPC Score	D 60.21	D 65.05
Annual Heat Cost	£1,154	£979
Annual CO <sub>2</sub> e	4,990 kgCO <sub>2</sub> e/yr	4,230 kgCO <sub>2</sub> e/yr
Air Permeability	9.2 m <sup>3</sup> /m <sup>2</sup> .h@50Pa	7.1 m <sup>3</sup> /m <sup>2</sup> .h@50Pa
Floor U-Value	0.92 W/m <sup>2</sup> .K	0.20 W/m <sup>2</sup> .K



Annual energy saving of **£176**



Fig 5. Before the installation.



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

# Example

## Ground Floor Flat



A two bedroom two storey flat in South-East London was insulated as part of the pilot. The property is a ground floor flat built before 1920 with no wall insulation and has **42m<sup>2</sup>** of suspended timber floor. **140mm** of insulation was installed between the joists and **25mm** below the joists. This has resulted in annual energy saving of **£90**, and a carbon emissions reduction of **16,200 kgCO<sub>2</sub>e** over the 42 years lifespan of the insulation.



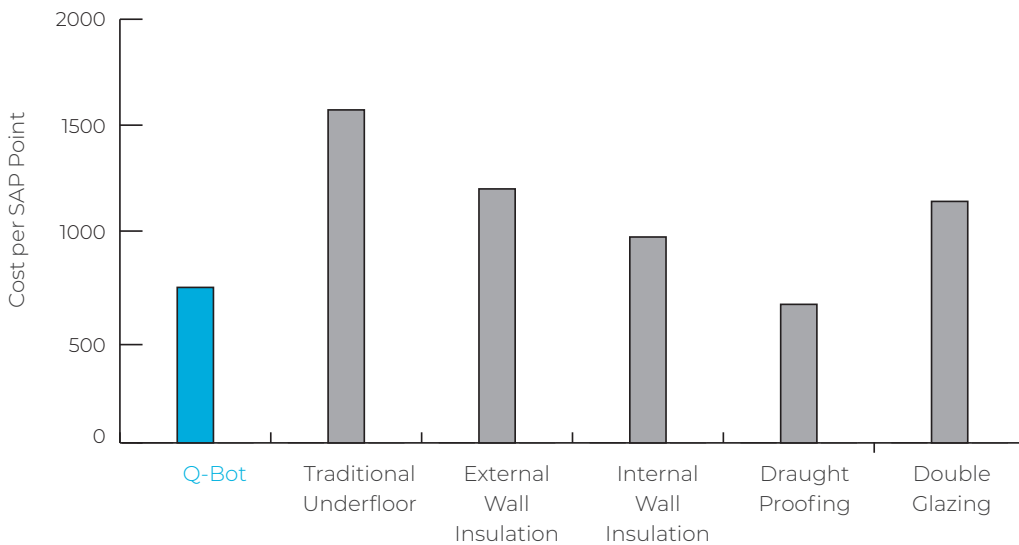
Fig 7. A ground floor flat in converted house.

### Property Details

Suspended floor area.....42m<sup>2</sup>  
 Area Insulated: .....42m<sup>2</sup>  
 External wall area: ..... 72.6m<sup>2</sup>  
 Window area: ..... 11m<sup>2</sup>

The price of the install was **£2,720**.

KPI	Before	After
EPC Score	D 56.22	D 59.92
Annual Heat Cost	£774	£684
Annual CO <sub>2</sub> e	3,340 kgCO <sub>2</sub> e/yr	2,960 kgCO <sub>2</sub> e/yr
Air Permeability	9.1 m <sup>3</sup> /m <sup>2</sup> .h@50Pa	6.0 m <sup>3</sup> /m <sup>2</sup> .h@50Pa
Floor U-Value	0.79 W/m <sup>2</sup> .K	0.19 W/m <sup>2</sup> .K



EPC points improvement of **3.7**



Fig 8. Before the installation.



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



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**Date:**

1<sup>st</sup> of October 2018

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