



## Floor Insulation Programme for Camden Council

Q-Bot has developed the first affordable and fully accredited solution for the retrofit of insulation to suspended timber floors. This case study with Camden Council shows the measure reduces heat loss by **77%**, cold draughts by **32%** and is the most **cost-effective** solution available, after loft insulation. The average cost was **£2,050** per install, with an improvement of **3.7 EPC points** per home, resulting in a cost of **£550 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 I'm saving £20 per month on bills. I love Q-Bot, it has made a massive difference. There are now no draughts."*

– Customer, NW London



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 698607.

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# Camden Council

As part of a drive to improve energy efficiency and reduce fuel poverty, Camden Council has worked with Q-Bot to install underfloor insulation across 48 properties in London. This case study shows the impact on comfort and energy savings of the service.

The properties include a wide range of all housing types, different ages and sizes. 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 **32%** improvement in airtightness and a **77%** 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, after loft insulation. The average cost was **£2,050** per install, with an improvement of **3.7 EPC points** per home, resulting in a cost of **£550 per EPC point** gained. In addition, due to the innovative installation process, there was minimal disruption for the Camden Council's customers.



Fig 1. A happy customer in Camden.

## Customer Feedback

Of Camden Council's occupants who were surveyed, **100%** said they were '**Satisfied**', or '**Very Satisfied**' with the communication of the installation and **84%** 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 recommended').

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

*"The team was polite at all times. It was a pleasure having them in my home. Highly Recommended."*



Customer, NW London

**2/3** of respondents have noticed a significant reduction in energy bills of between **£140** and **£240** per year:

*"I am much warmer, and I'm saving £20 per month on bills. I love Q-Bot, it has made a massive difference. There are now no draughts."*



Customer, NW London

# Summary

## Key Outcomes from the Pilot

Measurement	Floor heat loss (U-value)	Draughts (Air Permeability)*	Space Heating Requirement
Before (average)	0.84 W/m <sup>2</sup> K	15.8 m <sup>3</sup> /m <sup>2</sup> .h @50Pa	16,700 kWh/yr
After (average)	0.19 W/m <sup>2</sup> K	10.8 m <sup>3</sup> /m <sup>2</sup> .h @50Pa	14,500 kWh/yr
Reduction (average)	77%	32%	13%
EPC Points Improvement			3.72
Total Carbon Emissions Savings (all 48 homes, over 42 years)			926,000 kgCO <sub>2</sub> e

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



The average air permeability of **48** homes is now **10.8 m<sup>3</sup>/m<sup>2</sup>.hr @50Pa**, **16** properties 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).

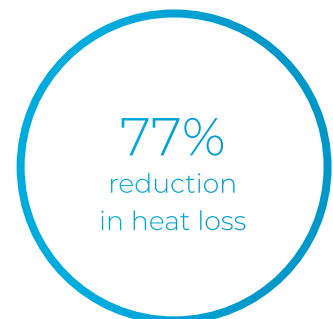
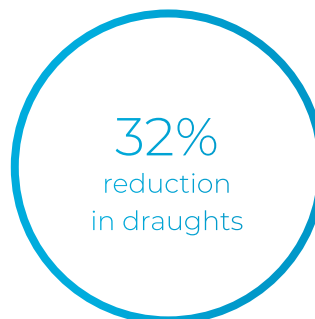
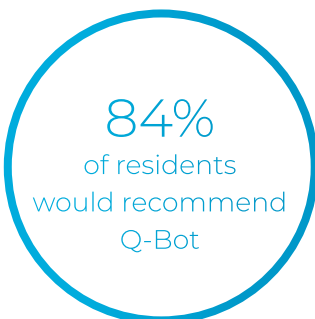
The U-value of the floor in **48** homes now complies with the Part L1B requirement for upgrading retained thermal elements in existing dwellings of **<= 0.25 W/m<sup>2</sup>.K**.



Fig 2. A typical converted flat in a period property.



Fig 3. Cllr Patricia Callaghan visiting Q-Bot on site.



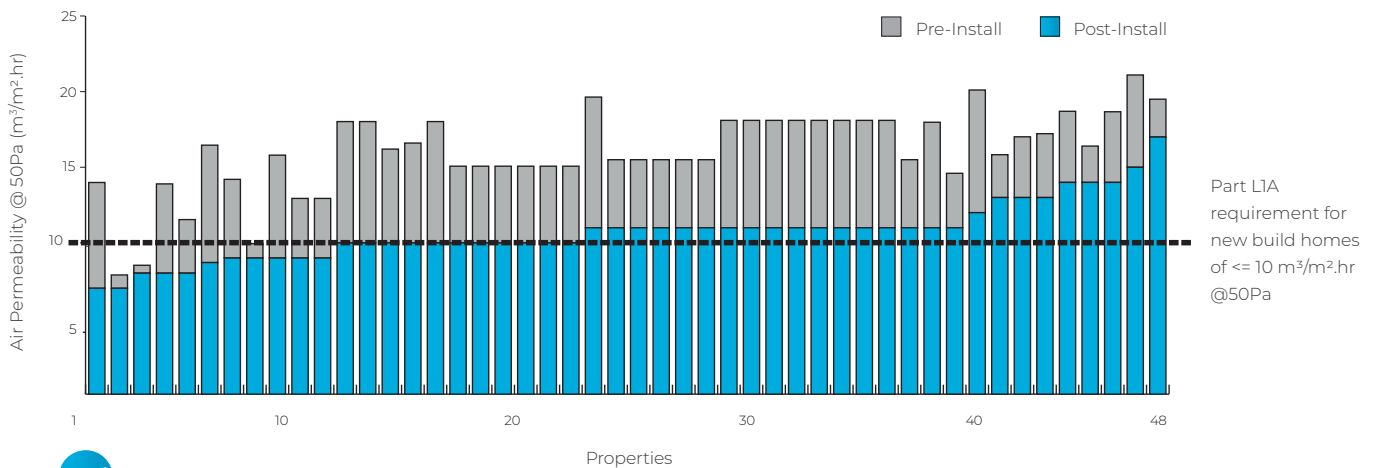
*"What's not to like about Q-Bot, it's safe, it's non-disruptive, it makes people's houses warmer and can save bills."*

Cllr Patricia Callaghan, Camden Council.

# Results

## Reduction in Air-Permeability

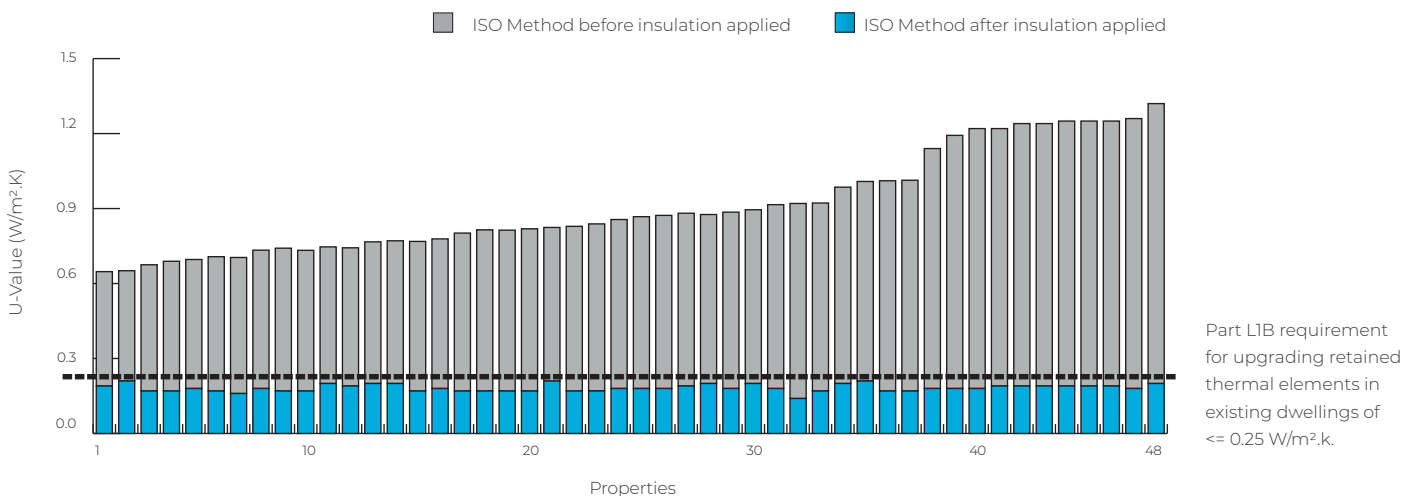
The air-permeability of the properties was tested according to the ATTMA Technical Standard to comply with BS EN 13829:2001. Of the 48 properties with air-permeability results, 15 did not have a pre-installation pressure test (mainly due to being 'too leaky' to pressurise). For these cases, a "pre-install" air permeability was estimated using the average improvement of the other properties. All the post-installation results were measured directly for each of the 48 properties, with an average post-installation test result of **10.8 m<sup>3</sup>/m<sup>2</sup>.hr**. The before and after test results demonstrated an average **32%** improvement in airtightness.



22 homes now comply with the building regulations for air permeability threshold for new builds.

## Improved 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, **0.84 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 **77%** improvement, and meets the Part L1B requirements for elemental U-values of floors in existing buildings.



100% of homes now meet the requirements for Part L Building Regulations for upgrades to existing buildings.

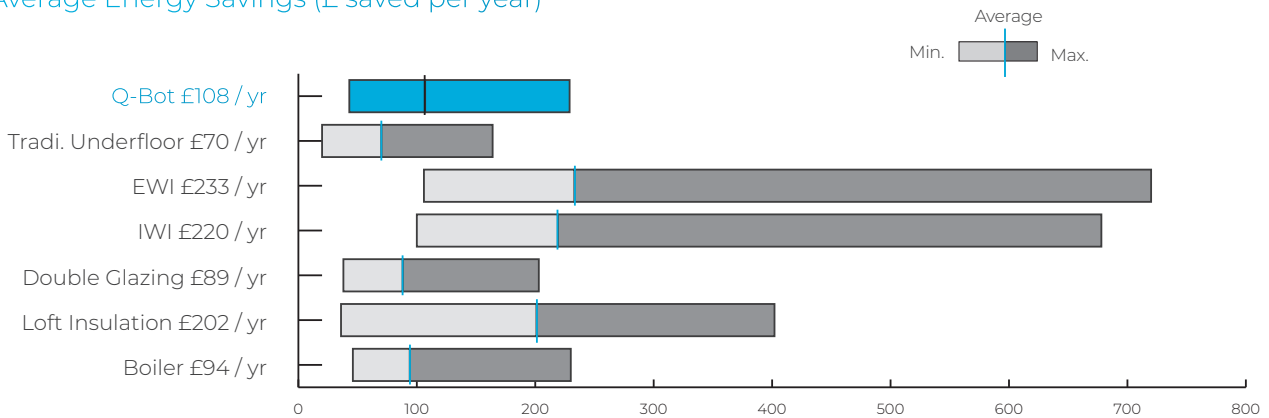
## Energy Savings and Cost Effectiveness

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, after loft insulation, at an average cost of **£550 per EPC point**. It also produced an average annual energy saving of **£108**, with properties saving up to **£229** per year. The average EPC improvement across the range of properties was **3.7** points.

The average sales price for the installs was **£2,050** per property based on a minimum volume per year.

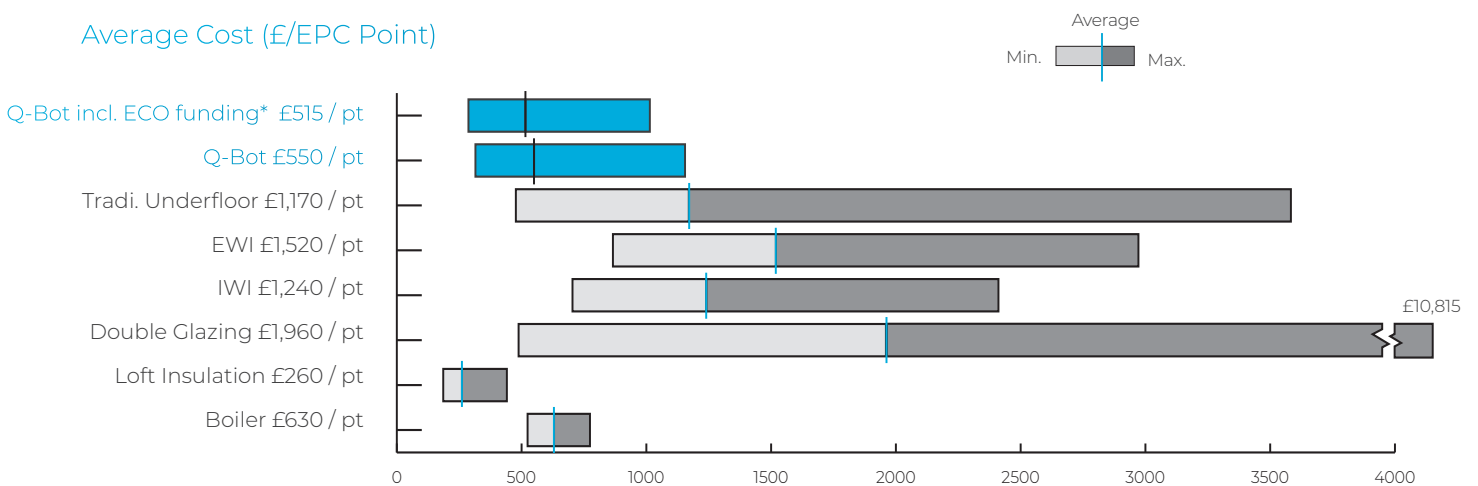
In many hard to treat properties, the loft has already been insulated and the boiler replaced with a more efficient model, meaning Q-Bot is often the most cost-effective practical option available, at roughly half the cost of solid wall insulation.

### Average 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 after loft insulation.

# Example Terraced Ground Floor Flat



A one bedroom, ground floor flat, in Northwest London was insulated as part of the pilot. The flat was built pre-1920 with solid wall construction and had **40m<sup>2</sup>** of suspended timber floor. **150mm** of insulation was installed between the joists and **25mm** below the joists. This resulted in an EPC points improvement of **2.8**, and a carbon emissions reduction of **14,200 kg CO<sub>2</sub>e** over the 42 year lifespan of the insulation.



Fig 4. Terraced ground floor flat.

## Property Details

Suspended floor area .....40m<sup>2</sup>  
 Area Insulated: .....36m<sup>2</sup>  
 External wall area: ..... 65m<sup>2</sup>  
 Window area: ..... 10m<sup>2</sup>

The price of the install was **£2,160**.

KPI	Before	After
EPC Rating	D 54.6	D 57.4
Annual Heating Cost	£950	£870
Annual CO <sub>2</sub> e	4,100 kgCO <sub>2</sub> e/yr	3,700 kgCO <sub>2</sub> e/yr
Air Permeability	14.3 m <sup>3</sup> /m <sup>2</sup> .h@50Pa	9.1 m <sup>3</sup> /m <sup>2</sup> .h@50Pa
Floor U-Value	0.82 W/m <sup>2</sup> .K	0.17 W/m <sup>2</sup> .K

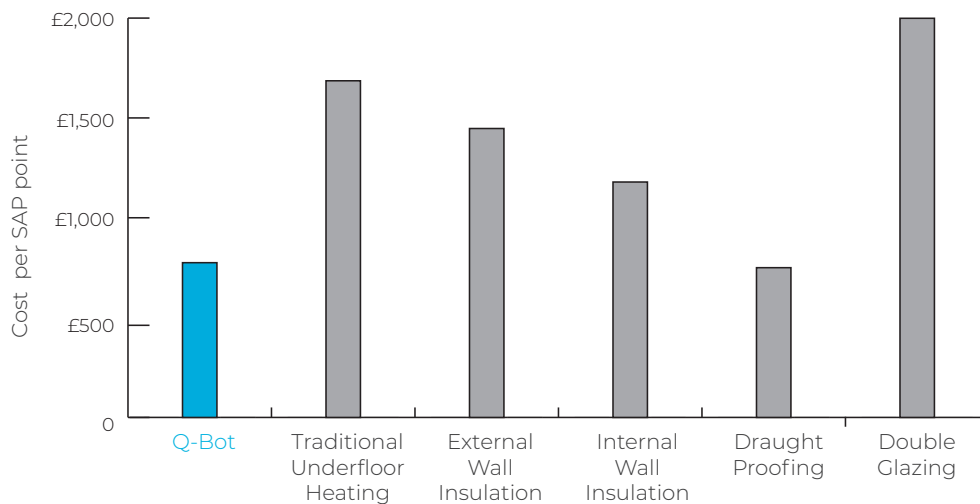


Fig 5. Before the installation.

Reduces draughts by  
**36%**



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



# Example

## Three Storey Semi-detached House



A three storey semi-detached house in Northwest London, was insulated as part of the pilot. The house was built pre-1920 with solid wall construction and had **63m<sup>2</sup>** of suspended timber floor. **125 mm** of insulation was installed between the joists and **25mm** below the joists. This has resulted in an improved EPC rating, from band E to D, and a carbon emissions reduction of **38,000 kgCO<sub>2</sub>e** over the 42 year lifespan of the insulation.



Fig 7. Semi-detached house.

### Property Details

Suspended floor area ..... 63m<sup>2</sup>  
 Area Insulated: ..... 57m<sup>2</sup>  
 External wall area: ..... 211m<sup>2</sup>  
 Window area: ..... 32m<sup>2</sup>

KPI	Before	After
EPC Rating	E 54.3	D 57.6
Annual Heating Cost	£2,400	£2,200
Annual CO <sub>2</sub> e	10,600 kgCO <sub>2</sub> e/yr	9,700 kgCO <sub>2</sub> e/yr
Air Permeability	16.5 m <sup>3</sup> /m <sup>2</sup> .h@50Pa	8.7 m <sup>3</sup> /m <sup>2</sup> .h@50Pa
Floor U-Value	0.90 W/m <sup>2</sup> .K	0.20 W/m <sup>2</sup> .K

The price of the install was **£2,760**.

Pays back the initial investment in 14 years.



Fig 8. Before the installation.

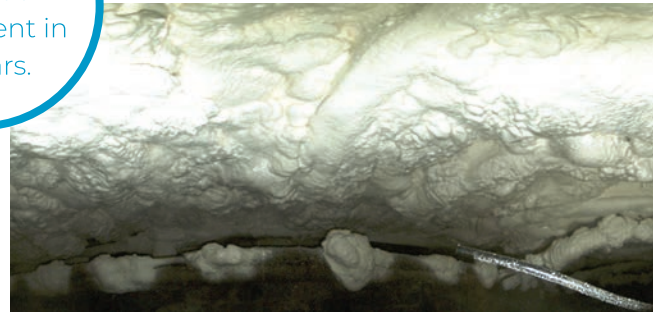
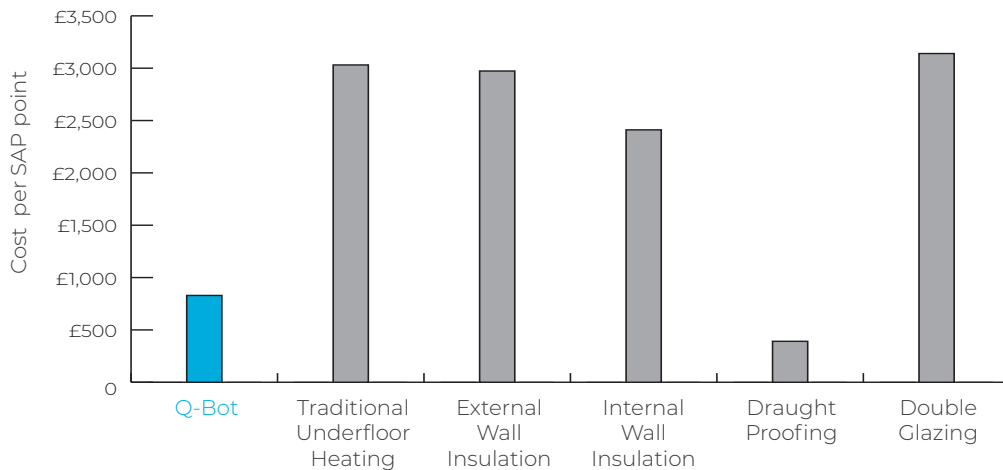


Fig 9. After the installation, showing the insulation now applied.





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

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 698607.

