Building Insulation and Dry Lining Products Market Report

UK

9th edition

AMA Research

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AMA Research Ltd
5 Howick Place, London, SW1P 1WG United Kingdom

Telephone: +44(0) 1242 235724
Email: sales@amaresearch.co.uk
Website: www.amaresearch.co.uk

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AMA Research Ltd, 5 Howick Place, London, SW1P 1WG

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1.1 Background

AMA Research Ltd is a specialist publisher of market reports and provider of marketing research and consultancy services, specialising in ad-hoc and commissioned research projects in the UK building and construction industry. Full details of our range of services are contained in the information pages at the end of this report or on our website at www.amaresearch.co.uk.

This 8th edition of the **UK Building Insulation Products Market** reviews the market for insulation products used in buildings for thermal, acoustic and fire protection applications. The main structural applications covered are; roofing, external walls, floors and building services/HVAC.

The main applications for structural thermal products are primarily lofts (cold roofs), pitched (warm) roofs, flat roofs, cavity walls, internal solid walls, ground floors and underfloor heating systems. Acoustic insulation products are mainly used on party walls, intermediate floors and partitioning. HVAC and pipework insulation is used on heating and air-conditioning ductwork, hot and cold water pipework and process pipework and storage tanks used in industrial applications.

This report provides an analysis of recent market performance and forecasts to 2023. The analysis is both qualitative and quantitative, with indications of key trends and views on the future prospects for the market.

1.2 Sources of Information

While there are basic Government statistics at an overall construction industry level, there are very few 'officially recognised' statistics at individual market, product or sector level. Some sectors of the construction industry or trade associations produce basic market statistics but, in general, there is very little published data which identifies market size, product mix, sector application mix, supply and distribution structures and shares etc.

The insulation market is typical in terms of lack of availability of robust market data. As a result, information in this report has been collated from a wide range of sources and includes both primary and secondary research data. Secondary data sources include government statistics, company accounts, Internet, trade magazines, etc, whilst a range of interviews with suppliers, distributors and others has also contributed to the development of this report. Key sources include:-

- **Department of Business, Energy and Industrial Strategy** (BEIS) - Statistics on ECO, Housing Energy Efficiency, Energy Prices.
- **Department for Communities and Local Government -** English House Condition Survey 2017/18, Housebuilding statistics tables.
- **Scottish Government** – Scottish House Condition Survey.
- **Rockwool A/S, Knauf Insulation, SIG Group, Kingspan Group** – annual reports.

Market calculations are based on AMA's assessment of these information sources, together with data and research in related markets, which has been collated over the last 30 years. Data in the report is often sourced as 'AMA Research/Trade Estimates', which reflects the fact that assessments are

estimates only and are based on a range of sources and our interpretation of data and key market influences, and we are happy to discuss our findings with the reader.

Finally, forecasts of market developments are provided and these are also based on our interpretation of the wide range of factors influencing the market. Forecasting in the current climate is very difficult, but AMA assess the key positive and negative factors impacting on the market and then develop 5-year forecasts of trends.

1.3 Glossary

Listed below are acronyms and other references used widely throughout the report:

CERT – Carbon Emissions Reductions Target.

CESP – Community Energy Savings Programme.

EEC – Energy Efficiency Commitment.

ECO – Energy Companies Obligation.

EPS – Expanded Polystyrene.

EWI – External Wall Insulation

HVAC – Heating, Ventilation and Air Conditioning.

NIA – National Insulation Association

PIR – Polyisocyanurate (foam).

PUR – Polyurethane (foam).

RMI – Repairs, Maintenance and Improvements.

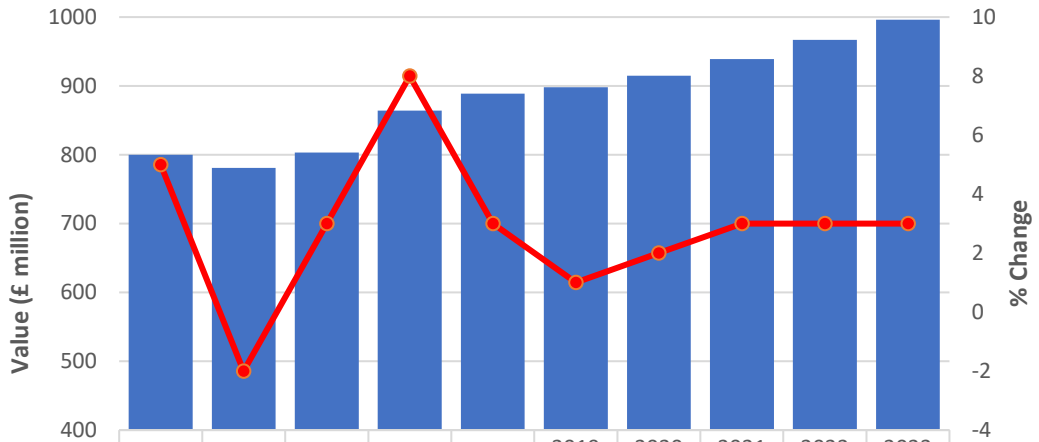
XPS – Extruded Polystyrene.

2. SUMMARY

2.1 Market Background

- In 2015 the market for building insulation products experienced a downturn, driven by a significant fall in government-subsidised retrofitted installation activity, which had been a large end use sector. The Green Deal was scrapped that year, and reduced funding to deliver the Energy Company Obligation (ECO) resulted in far lower levels of domestic installation activity compared to under previous government initiatives such as CERT and CESP, which ended in 2012.
- The decline in the retrofit market has been offset through strong growth in demand for insulation products from rapidly increasing levels of new housebuilding, a growing market for home extensions and a strong non-residential new build sector, particularly in 2017, which saw the total market value increase by around 8%. Growth continued in 2018 as non-residential construction output and housebuilding levels continued to rise, although at a lower rate, taking market value to around **£889 million**.
- The following chart illustrates the market movements in recent years.

Chart 1: UK Building Insulation Market by Value £m 2014-2023



	2014	2015	2016	2017	2018	2019 Est	2020 Fcst	2021 Fcst	2022 Fcst	2023 Fcst
Size £m	800	781	803	864	889	898	915	939	967	996
% Change	5	-2	3	8	3	1	2	3	3	3

Source: AMA Research/Trade Estimates

- The chart indicates the decline and recovery of the market in the most recent years and the forecast for steady growth over the next few years. This is in contrast to the previous years when the market was more volatile, with market forces disrupted by a number of different Government initiatives.

- Key market influences include Building Regulations and energy prices. The Building Regulations Part L 2013 were updated with an aim of reducing carbon emissions by a further 6% on top of the 2010 standard for new domestic buildings, and by 9% for new non-residential buildings.
- Industrial energy costs have increased sharply since 2016, and in the longer-term are forecast to rise further, which is likely to result in higher end-product prices for insulation products. This is likely to be exacerbated by the ongoing weakness of sterling, leading to increased import prices for many materials.
- PUR/PIR products now have the largest market share of insulation products, accounting for around 41% by value in 2018. The market value of mineral wool products has fallen due to the fall in demand for such products under Government-subsidised retrofit programmes, but they still account for 30% of the total market in the UK.
- By end-use sector, the dramatic fall in demand through reduced ECO funding means that the most important market is no longer domestic retrofit, which now accounts for around 28% by area installed.
- The non-residential market has a share of around 34%, mainly flat roofs and site-built metal cladding and roofing systems.
- The 38% share for new housebuilding is higher than in recent years, boosted by strong growth in completions in 2017.
- Within the retrofit market sector, the key areas of demand by application remains cavity walls and lofts. The **overall market** had just over 16 million m² of insulation products installed in 2018, compared to 43 million m² in 2014. More than half of this was cavity wall insulation.
- Lofts accounted for around 36%, while the share held by solid walls was just 10%, although this is higher than under previous schemes, and is now a priority area for the current ECO.
- The two largest UK manufacturers of insulation products are **Kingspan Group** and **Knauf Insulation**, the former experiencing growing market share primarily due to the strong performance of all four insulation companies in the group, at the expense of some other key suppliers.
- Other key suppliers are **Saint Gobain Construction Products** (Celotex and Isover), **Xtratherm, Rockwool UK**, **Recticel Insulation,** the **Kay-Metzeler EPS** division of Vita Cellular Foam, **Jablite**, **Promat** and **Superglass Insulation**.
- The key supply route for insulation products are the specialist (interiors) distributors, the key companies being **SIG Group** subsidiaries, **Encon Insulation**, **CCF** (Travis Perkins) and **Minster Insulation** (Saint Gobain). Builders merchants account for approximately 19% of the market, the remainder being split between direct sales to installers, direct sales to external wall insulation systems companies, converters and a small share via DIY stores.
- The installation market is polarised between a small number of national companies and many regional and local independent firms. The leading contractors typically provide other energy efficiency services as well as insulation work. The largest are **Miller Pattison, Instagroup**, **Dyson Energy Services, Lawtech** and **A & M Energy Solutions**.

- The decline of the retrofit market caused turnover to fall for most installers, and a number of large installers have gone into liquidation in recent years including **Carillion Energy Services** (which went under with the rest of Carillion in 2018) and **Viscount Environmental. BillSaveUK**, which was created through the management buyout of the insulation arm of the Mark Group (which went into liquidation in 2015) made a loss each year until it was acquired by the roofing contractor Avonside in August 2019.

2.2 Market Prospects

- The market value of insulation products is likely to show modest growth over the next few years, following a fairly subdued market in 2019 and total market value is forecast to be around £996 million by 2023.
- These trends are driven by lower levels of volume demand from the retrofitting sector, alongside a number of other factors:
    - A slight decline in output for some key non-residential construction sectors.
    - Positive growth in new housebuilding levels as progress towards government targets is made.
    - No forecast increases in Government funding for new schemes to support retrofitted installation, despite the potential to better insulate millions of existing dwellings.
    - Reduced levels of consumer and investor confidence resulting from the uncertain impacts of the Brexit process.
    - Evidence suggests that homeowners are reluctant to implement insulation-based energy saving measures without a strong financial incentive, especially for solid walled properties, which are generally the most expensive to insulate.
- There remains massive potential for retrofitted insulation to Britain's existing housing stock, with an estimated ~7.75 million uninsulated dwellings with solid walls, ~5.8 million with lofts that are easy to fill and ~4.0 million with uninsulated cavity walls.
- In addition, there is also a substantial area of non-residential flat roofs that have no or inadequate insulation.
- Gas and electricity prices will also have some impact on the market, with rising prices likely to stimulate some demand for relatively inexpensive insulation in the domestic market i.e. loft and cavity wall insulation.
- Oil and gas prices are forecast to increase significantly in the longer-term, which will inevitably result in higher energy prices for both households and non-residential consumers, however, not before being lower, on average, in 2020 than in 2019 due to rising global oil inventories.
- In the housebuilding sector, the strong growth of offsite construction methods will have an impact on the insulation sector in terms of the types of materials used rather than the volumes installed. Although a range of materials are suitable for insulating prefabricated panels, it may be likely that housebuilders will favour products that provide the same u-values with a thinner profile of insulation and maximise usable internal space.

- The commercial sector tends to be less dependent on Government-funded initiatives, unless the schemes offer substantial support. Investment in this sector is more likely if there are clear cost savings that can be made over a reasonable period of years, although the evidence available suggests that payback periods for investment in insulation of building fabric are over 20 years in length.
- The ongoing weakness of the pound will also have an impact with imported prices rising on both finished products and components or chemicals. This may lead to some market value growth alongside volume increases.

3. UK BUILDING INSULATION PRODUCTS MARKET

3.1 Definition

The focus of this report is on products used for the thermal, acoustic and fire protection insulation of building fabric, typically supplied either through merchants or direct to installers.

Building fabric insulation products are used for cavity walls, solid walls, lofts (between the rafters), pitched roofs, flat roofs, ground floors, timber frame buildings and site-erected cladding systems. The main materials used are:

- **Glass Wool** – blown wool, rolls, slabs, quilts and batts plus lamellas, blankets, wired mats, boards insulated flexible ductwork and snap-on sections for pipes.
- **Stone** and **Slag Wool** – blown wool, rolls, slabs, quilts and batts plus tubes, wraps and clip-on pipe sections.
- **Polyurethane (PU/PUR)** and **Polyisocyanurate** (**PIR**) rigid boards.
- **Expanded Polystyrene (EPS)** – blown beads and rigid boards.
- **Extruded Polystyrene (XPS)** – rigid boards.
- **Phenolic Foam** - rigid foam boards and pre-insulated ductwork.

Niche products include; **calcium silicate** boards, **expanded polyethylene** (EPE) flexible sheets, **multi-foil** sheets, **cellulose, sheep wool, cork** and **nitrile rubber** tubes and sheets.

Not covered in this report are:

- **Technical** insulation products including; HVAC ductwork & pipework, tanks & vessels, chimneys & exhausts, boilers & ovens, process equipment, marine & offshore installations, high-temperature pipework in petro-chemical plants, power generation plant and equipment etc.
- **OEM market** including the manufacture of pre-fabricated panels with insulated cores of steel, aluminium, oriented strand board or precast concrete. Also, sound-proof partitions with glasswool cores and pre-insulated plasterboard.
- **Draught-proofing** products e.g. taping for windows and doors.

3.2 Market Size and Recent Trends

3.2.1 Insulation Market Size

This section provides a broad overview of recent market performance, with the following sub-sections containing more detailed explanations. As illustrated in the table below, the market in 2018 is estimated to be worth around **£889 million.**

Table 2: UK Building Insulation Products Market by Value (£ million MSP) 2014 to 2023

Year	Value (£m MSP)	Change (%)
2014	800	+ 5
2015	781	- 2
2016	803	+ 3
2017	864	+ 8
2018	889	+ 3
2019 Est	898	+ 1
2020 Fcst	916	+ 2
2021 Fcst	939	+ 3
2022 Fcst	967	+ 3
2023 Fcst	996	+ 3

Source: AMA Research - analysis of market and trade sources.

The value of the market declined in 2013, primarily due to the end of the CERT and CESP programmes at the end of 2012, and the introduction of the Green Deal and the Energy Company Obligation (ECO) in 2013 (discussed in more detail in section 4.3.1). These changes prompted a sharp fall in the total number of retrofitted insulation measures, which was only partially offset by modestly rising levels of new house building and an improving non-residential market at that time. The market improved in 2014, as the Green Deal and ECO schemes gained some momentum, and the number of new housing starts continued to rise.

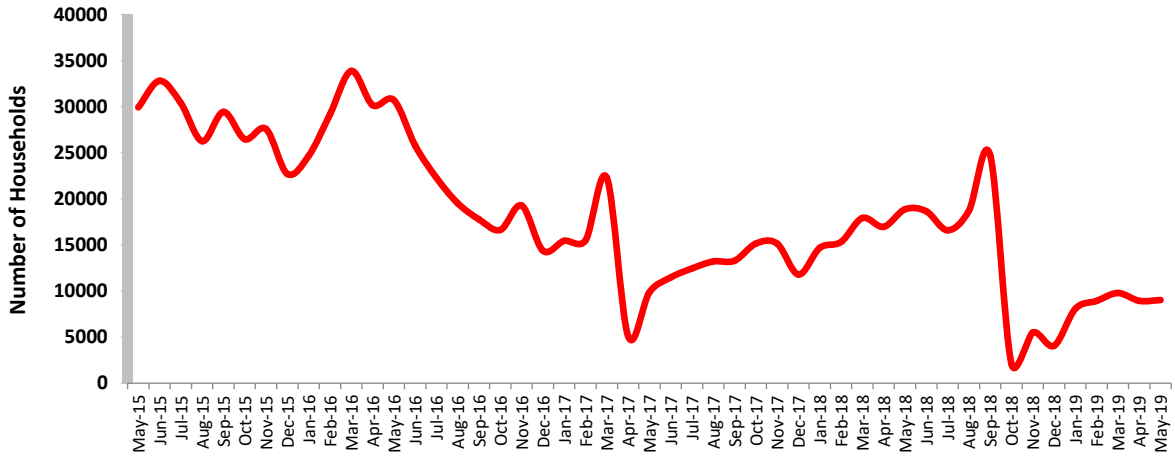
In the summer of 2015, the Government scrapped the Green Deal due to extremely low take-up. In June 2017, it was announced that the Green Deal Finance Company has relaunched under private ownership, providing finance for households to improve the energy efficiency of a building through a number of providers and installers, in much the same way as the previous company. However, as of May 2019, only 70 households had installed measures using Green Deal Finance Plans since the relaunch, a negligible impact on the market.

Reductions in funding to implement measures under ECO have also impacted on the retrofit market for building insulation. Chart 7 shows that the number of households having measures installed under Government funded frameworks has fallen significantly in recent years, from over 30,000 a month in mid-2015 to just over 9,000 in May 2019, although there have been peaks and troughs in that period. From a peak of around 171,000 in the first quarter of 2014, the total number of insulation measures installed under ECO had fallen to just under 22,000 by the first quarter of 2019, a fall of 87%.

This sharp decline of the retrofit market has been largely offset by the accelerated rates of new housebuilding and growth in non-residential construction, but overall market value fell slightly in 2015, before recovering in 2016. 2017 was a particularly strong year both for new housebuilding and

commercial construction, boosting market value by an estimated 8%, and growth continued in 2018, albeit at a slower rate.

Chart 3: Households with Measures Installed Through ECO /Green Deal, By Month 2015 To 2019

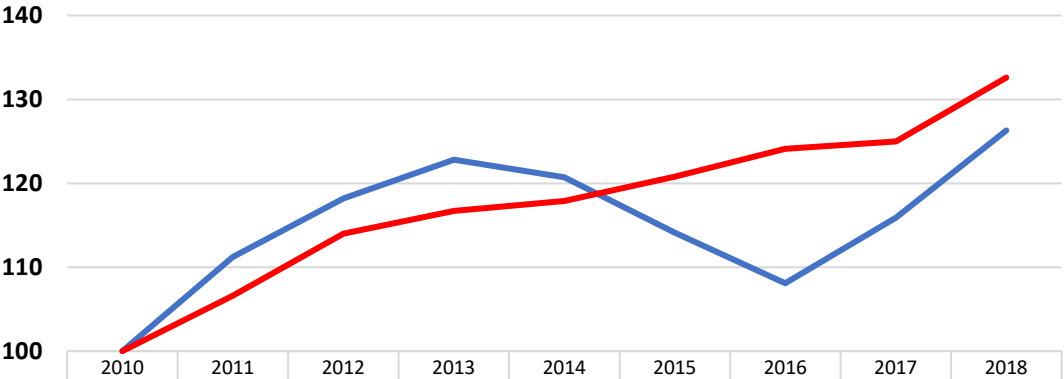


Source: BEIS Household Energy Efficiency Statistics.

Other key factors pushing up growth in market values include the impact of both raw material and energy costs on end product prices. In particular, prices for rigid foam boards are ultimately underpinned by global prices for crude oil.

The following chart suggests that average prices for insulation products have consistently increased since 2010, while average industrial energy costs have started to increase sharply in 2017 and 2018, having fallen from 2013 to 2016; changes that reflect the change in oil prices over the last few years.

Chart 4: UK Indices for Overall Average Annual Energy Prices for Industry (excluding Climate Change Levy) and Average Annual Insulation Product Prices (2010 = 100) 2010 to 2018



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Energy Prices	100	111.2	118.2	122.8	120.7	114.1	108.1	115.9	126.3
Insulation Product Prices	100	106.6	114	116.7	117.9	120.8	124.1	125	132.6

Source: BEIS Quarterly Energy Prices March 2019 and Monthly Statistics of Building Materials and Components adapted by AMA Research

3.2.2 Insulation Market Prospects

Table 7 shows our forecast for the market value of insulation products up to 2023 and indicates that growth will gradually slow over the next few years, following a fairly flat market for 2019, driven by a flat retrofitting market funded through ECO and a slight decline in output for key non-residential sectors. Total market value is forecast to be around £996 million by 2023.

Although the non-residential and new house building sectors are forecast to continue to show reasonable growth over the next five years, the forecast for the residential RMI sector is less positive. Growth in this sector over the last decade or so has been driven by Government funded initiatives to subsidise the retrofitting of insulation, and by the growth in home extensions, but ECO funding has been reduced from previous levels and will remain flat over the next few years, and the home extensions market has slowed in the last year, suggesting that growth will be more limited than in the new build sector.

In terms of potential for the retrofitted insulation product market, there are still millions of dwellings either with no or inadequate insulation, particularly those with solid walls constructed before 1920. BEIS publish regular estimates of the number of dwellings that lack adequate insulation, and their headline estimates for December 2018 are as follows:

- Dwellings with solid walls ~7.75 million.
- Dwellings with lofts that are easy to fill ~ 5.8 million.
- Dwellings with cavity walls ~4.0 million.

It is likely that there also remains a substantial number of non-residential flat roofs that have no or inadequate insulation.

However, while there is still considerable potential for retrofit work in insulating lofts and cavity walls, the lack of financial incentives following reductions in funding for ECO is likely to have a continued impact on future demand. This is likely to translate into negligible growth in this area of the market, depending on the future direction of government policy in this area.

Compared to an average of around 160,000 installation jobs a month throughout 2012 (across all types of retrofitted insulation), there were only around 32,000 per month in 2013. Although there was an increase to around 47,000 per month in 2014, there was a steady decline in installations from around 25,000 a month in mid-2015, to around 10,000 a month by the start of 2017. The first three quarters of 2018 saw an increase to an average closer to 15,000 a month, as the latest Energy Companies Obligation (ECO3) came into effect, which includes a specific target to insulate at least 17,000 solid-walled homes a year.

The available evidence strongly suggests that homeowners are reluctant to implement insulation-based energy saving measures without a strong financial incentive, particularly in the case of solid wall insulation, which is by far the most expensive type of insulation to install. Despite recent gas and electricity price increases in the UK, statistics taking ECO-funded installations suggest that these have had a negligible impact on the retrofit market, even for relatively inexpensive insulation measures in the domestic market i.e. loft and cavity wall insulation.

It is therefore likely that unless there are financial incentives to householders, all the indications are that demand will continue to be constrained in the domestic retrofit sector, and that any significant growth in the domestic sector will come through new house building.

The commercial sector tends to be less dependent on Government-funded initiatives, unless the schemes offer substantial support. Investment in this sector is more likely if there are clear cost savings that can be made over a reasonable period of years.

The issue of fire-retardancy has had a much higher profile in the building industry since the Grenfell Tower fire, though particularly the cladding sector rather than insulation. Although the Hackitt Review has recommended a number of changes to the regulation of high-rise buildings, there have been no changes to the technical requirements of building regulations regarding fire retardancy. However, some manufacturers have called into question the fitness for purpose of fire testing and certification procedures relating to insulated cladding systems.

Certain types of insulation are known to be more flammable than others, so it may be that the attraction of these types is reduced in favour of other types. Whether there will be a material impact on the market mixes remains to be seen, but it seems unlikely that it will affect the overall market size.

3.3 Key Market Influences

3.3.1 EU/Government Initiatives

The Green Deal and The Energy Companies Obligation (ECO)

Overview

In 2011, the Government introduced the Energy Act which included the provision for a new '**Green Deal'** and a new **Energy Company Obligation (ECO)** to replace the Carbon Emissions Reduction

Target (CERT) and the Community Energy Saving Programme (CESP), both of which expired in December 2012. The Green Deal was designed to finance the installation of a broad range of measures, products and systems including those that generate energy as well as those that have energy efficiency properties.

Underpinning the delivery of the Green Deal is the **ECO (Energy Company Obligation)**, which came into effect in October 2012. ECO was designed to fit within the Green Deal framework and provide support, in the domestic sector, where Green Deal finance alone was not enough. The ECO, a subsidy from energy suppliers, is extra help for those most in need and for those measures that do not meet the Golden Rule, which is "***The expected financial savings must be equal to or greater than the costs attached to the energy bill"***.

Under this scheme, the big energy suppliers are legally obliged to provide exactly the kind of extra support that is needed to make sure that hard to treat homes, and the lowest income and vulnerable households, can benefit from the new arrangements.

ECO is used to provide insulation and heating measures to low-income and vulnerable households and insulation measures to local communities. The current obligation period, known as ECO3 began in Autumn 2018 and will run until March 2022. Gas and electricity suppliers with more than 250,000 customers are automatically required to deliver ECO. More energy suppliers will be obliged to join the scheme, with all suppliers with more than 150,000 customers required to become involved by 2020.

ECO3 consists of just one obligation:

- **Home Heating Cost Reduction Obligation (HHCRO)** - under this obligation (also referred to as 'Affordable Warmth'), suppliers must promote measures which improve the ability of low income and vulnerable households to heat their homes. This includes actions that result in heating savings, such as the replacement or repair of a boiler.

The overall target for ECO3 has been increased by 7% to £8.235bn lifetime bill savings. Within the current obligation period, total funding is around £640 million per annum, down from around £800 million per annum under ECO2.

Energy efficiency measures that can be installed under ECO include insulation, heating and connections to district heating systems (new and upgrades). Insulation measures include internal and external wall insulation systems, with solid walls remaining a key area of focus, with a target of insulating 17,000 solid walled homes per year.

According to latest statistics, the ECO had (by the end of March 2019) delivered almost 1.7 million insulation measures (see Table 10), by contrast Green Deal finance never got going, with less than 6,000 insulation measures delivered before it was scrapped in July 2015.

Table 5: Total Insulation Measures delivered under ECO – up to March 2019

Measure (Quantity)	Total
Cavity Wall Insulation	880,326
Loft Insulation	584,625
Other Insulation	17,612
Solid Wall Insulation	179,113
Total Insulation Measures	1,661,676

Source: AMA Research - adapted from BEIS Household Energy Efficiency statistics

Since the scrapping of the Green Deal, businesses only have access to the following existing energy scheme targeted at the non-residential sector:

- **Climate Change Agreements**, which are voluntary agreements made by UK industry and the Environment Agency to reduce energy use and carbon dioxide (CO2) emissions. In return, operators receive a discount on the Climate Change Levy (CCL), a tax added to electricity and fuel bills. The scheme is due to run until March 2023.

The Government also introduced the **Energy Savings Opportunity Scheme (ESOS)** in 2014, to implement Article 8 (4 to 6) of the EU Energy Efficiency Directive (2012/27/EU). ESOS is a mandatory energy assessment scheme for large UK undertakings and their corporate groups. It mainly affects businesses but can also apply to not-for-profit bodies and any other non-public sector undertakings that are large enough to meet the qualification criteria. Large undertakings are defined as:

- Any UK company that either employs 250 or more people, or has an annual turnover in excess of 50 million euros and an annual balance sheet total in excess of 43 million euros; or
- An overseas company with a UK registered establishment which has 250 or more UK employees (paying income tax in the UK).

Organisations that qualify for ESOS (those fully covered by ISO 50001 are exempt) have to carry out an ESOS assessment to inform what needs to be done to comply with the ESOS regulations. An ESOS compliant energy audit must analyse the participant's energy consumption and energy efficiency and must identify energy saving opportunities.

However, guidance states that energy saving opportunities should be reasonably practicable and cost effective to implement and there is no regulatory requirement for participants to implement any energy saving opportunities identified.

To date, there have been over 7,100 energy assessments carried out under the scheme, although there are no statistics about any measures implemented.

In March 2016, the Government decided to close the **Carbon Reduction Commitment Energy Efficiency Scheme** following the 2018-19 compliance year, with the aim of streamlining the business energy tax landscape by replacing it with an increase in the Climate Change Levy. The CRC was designed to incentivise energy efficiency and cut emissions in large energy users in the public and

private sectors across the UK, together responsible for around 10% of the UK's greenhouse gas emissions. Participants included supermarkets, water companies, banks, local authorities and all central government departments.

3.3.2 The Building Regulations Part L 2013

The Energy Performance of Buildings Directive (EPBD) is the key legislative driver to reduction in greenhouse gases in the long term. Under the UK climate change programme, a commitment has been made to reduce carbon emissions and this is largely to be achieved through amendments to Building Regulations as well as increased legislation and energy schemes. In the new build sector in particular, building regulations will be the main tool for reducing emissions.

The following chart outlines the amendments to building regulations and those sectors impacted by this change:

Table 6: Building Regulation Amendments Impacting on the Building Insulation Market

Building Regulation Part L 2013 (with 2016 amendments)	Sectors Impacted	Date
Part L1a	New dwellings	April 2014
Part L1b	Existing dwellings	October 2010
Part L2a	New non-residential	April 2014
Part L2b	Existing non-residential	October 2010
Part E 2003	All residential & schools	2003

Source: DCLG/AMA Research

Effective from April 2016, the amendments to the Approved Documents of Part L reflect alterations to the regulations, primarily the withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012. The 2016 amendments contained **no technical changes**.

Part L1a and Part L2a of the Building Regulations contain an aim of reducing carbon emissions by a further 6% on top of the 2010 standard for new domestic buildings, and by 9% for new non-residential buildings.

For **new domestic** buildings, the 2013 regulations require compliance with a defined target for carbon emissions, the Target Emission Rate (TER). The 2013 regulations also introduced an emphasis on the basic fabric of buildings, with new dwellings now also having to meet a Target Fabric Energy Efficiency (TFEE).

For L1A 2013, the highest permissible U-values (the worst acceptable level of performance) for individual building elements are the same as in the 2010 regulations, although designing to these values is unlikely to result in compliance and the building specification will need to be considerably better.

The 2013 regulations contain a 'notional building specification', a recipe approach that will ensure compliance if all standards are met, these are shown in Table 12 below.

For new **non-residential** construction, the target reduction in CO2 emissions is 9% across the building mix. The focus is similar to new domestic buildings, but the regulations define a range of notional buildings that take into account whether buildings are unlit, side lit, or top lit, and whether mechanical heating and cooling is specified.

U-value requirements for existing buildings are also unchanged from Part L 2010.

Table 7: Building Regulations Part L 2013 Notional Building Specification vs Limiting U-Values by Insulation Application

Application	Notional building	Limiting U-Values
L1a (Domestic)		
Floor	0.13	0.25
Exterior Wall	0.18	0.30
Flat Roof	0.13	0.20
Pitched roof/sloped ceilings	0.13	0.20
Pitched roof/flat ceilings	0.13	0.20
L2a (Non-residential)		
Floor	0.22	0.25
Exterior Wall	0.26	0.35
Flat Roof	0.18	0.25
Pitched roof/sloped ceilings	0.18	0.25
Pitched roof/flat ceilings	0.18	0.25

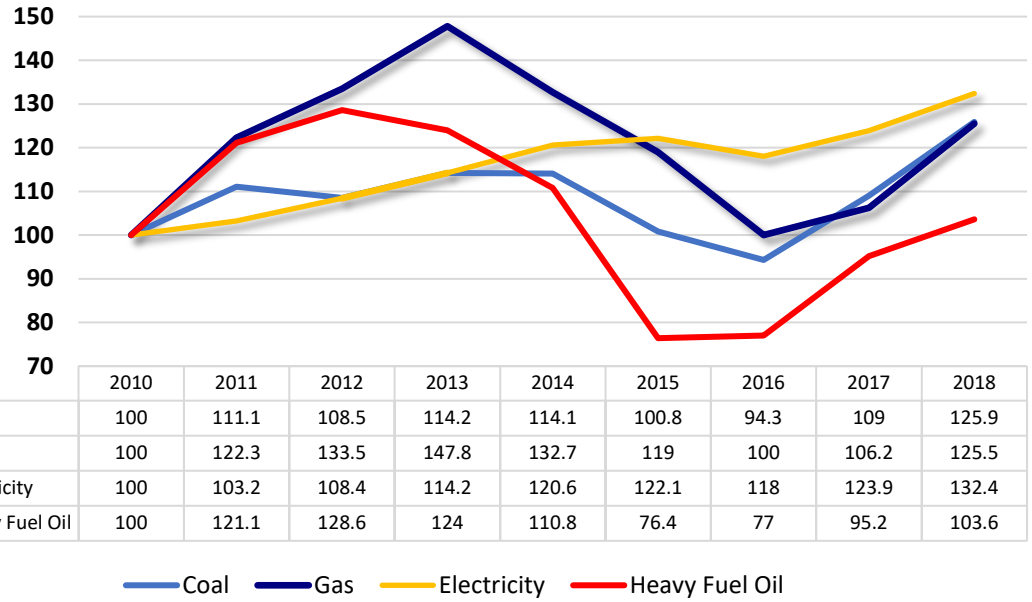
Source: DCLG (data applies to England only)

In 2018, amendments were made to the Domestic Building Services Compliance Guide, which introduced revised standards for when gas-fired and oil-fired boilers are installed or replaced in existing dwellings. It is expected that the UK Government will also soon launch a consultation on a revised version of Part L of the Building Regulations, which is expected to be implemented in 2020. Trade sources indicate that the legislation could be revised to address specific issues arising from the regulations as they currently stand, such as overheating in homes, energy performance gaps and a focus on air tightness that has led to poor indoor air quality.

3.3.3 Energy Prices

Heavy fuel oil prices typically follow crude oil prices, and these fell from their high point in 2012, and gas prices also fell between 2013 and 2016. Recent changes are illustrated in the chart below, and show that prices of all fuels have increased sharply since 2016.

Chart 8: UK Fuel Price Indices for The Industrial Sector in Current Terms (excluding the Climate Change Levy) 2010 = 100, 2010 to 2018



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Coal	100	111.1	108.5	114.2	114.1	100.8	94.3	109	125.9
Gas	100	122.3	133.5	147.8	132.7	119	100	106.2	125.5
Electricity	100	103.2	108.4	114.2	120.6	122.1	118	123.9	132.4
Heavy Fuel Oil	100	121.1	128.6	124	110.8	76.4	77	95.2	103.6

Source: BEIS Quarterly Energy Prices March 2019

The UK is becoming increasingly dependent on gas imports, which exposes the country to increased risk of energy price increases, and BEIS forecasts both oil and gas prices to rise in the medium (3-4 years) to longer term (+5 years), following relative stability in the short-term (1-2 years). With domestic energy prices likely to increase over the next few years, homeowners are likely to be enthusiastic about implementing lower-cost passive energy efficiency measures, such as increasing their levels of loft insulation. However, the reduced level of funding available through the current ECO3 scheme mean that financial support for such measures is less widely available, although it is particularly aimed at low income households.

The impact of energy price rises on the manufacturing costs of insulation products varies, depending on the types of raw materials used. Stone wool products typically require more energy to make than glass wool insulation, which in turn demands more direct energy input than the production of rigid foam boards.

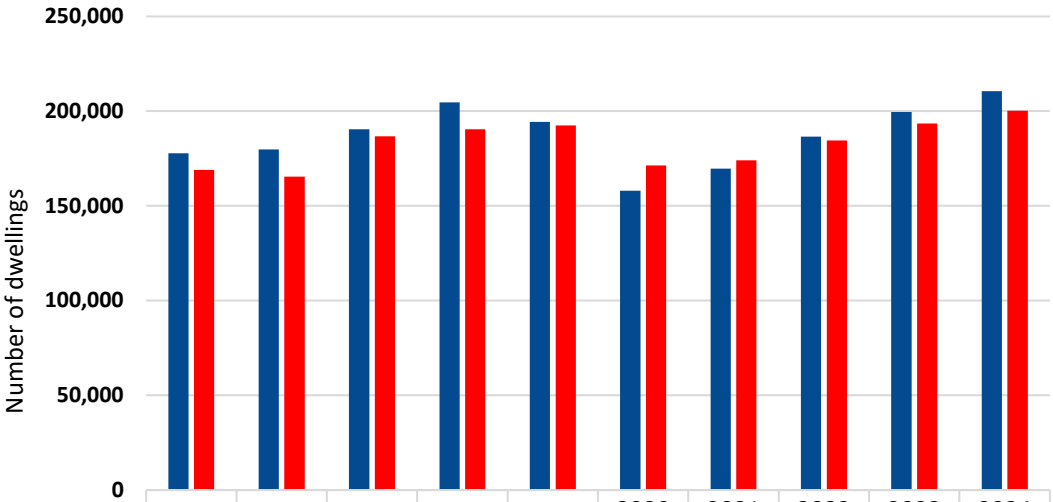
3.3.4 Housebuilding and Construction

Over the last decade or so, demand for insulation products in the residential sector was largely driven by the domestic retrofit sector market, with new build housing typically accounting for just 20% of demand for insulation products.

However, annual house building output levels have grown strongly in recent years, while the market for domestic retrofitting of insulation has contracted significantly due to the scrapping of the Green Deal and reduced funding under the current ECO scheme compared to under the previous CERT/CESP schemes.

The chart below shows the level of housing completions from 2012 for both the private and public sectors, with forecasts to 2023:

Chart 9: House Building Starts and Completions (UK) by Number of Dwellings 2015 to 2024



	2015	2016	2017	2018	2019	2020 est	2021 Fcst	2022 Fcst	2023 Fcst	2024 Fcst
Starts	177,800	179,800	190,400	204,700	194,300	158,000	169,600	186,500	199,600	210,600
Completions	168,900	165,400	186,800	190,400	192,500	171,300	174,000	184,500	193,500	200,200

Source: MHCLG/AMA Research Ltd

The table illustrates the consistent growth in house building levels in recent years. The 165,000 new dwellings started in 2014 was almost 50% higher than the low point reached in 2009. The period from 2015 to 2017 saw consistent growth of 5-6% annually in the number of starts, before slowing to 1% in 2018. Figures for the first quarter of 2019 (England, Wales and Northern Ireland only) are lower than in 2018 (~7% decrease), suggesting a weakening of the market.

The level of completions is estimated to increase by 4% in 2019, following a 2% increase in 2018. Rates of growth of around 3% are forecast for completions between 2021 and 2023. This indicates a volume of around 226,300 by 2023.

Affordability and mortgage availability issues are likely to see annual growth rates for housing starts levelling at around 4% with volume in 2023 currently forecast to be 227,400. The current imbalance between the level of demand for and actual supply of new housing stock is likely to be a significant characteristic of the new housing market into the medium-term and beyond.

In the first half of 2019, the above-mentioned factors were less resilient than during the same period in 2018, indicating a more cautious approach is being applied by housebuilders – in response to particular concerns about earnings and job security.

Similar issues have affected consumer confidence and spending and there is anecdotal evidence within the housing market that buyers may be deferring purchases until there is greater clarity on job security and wage growth.

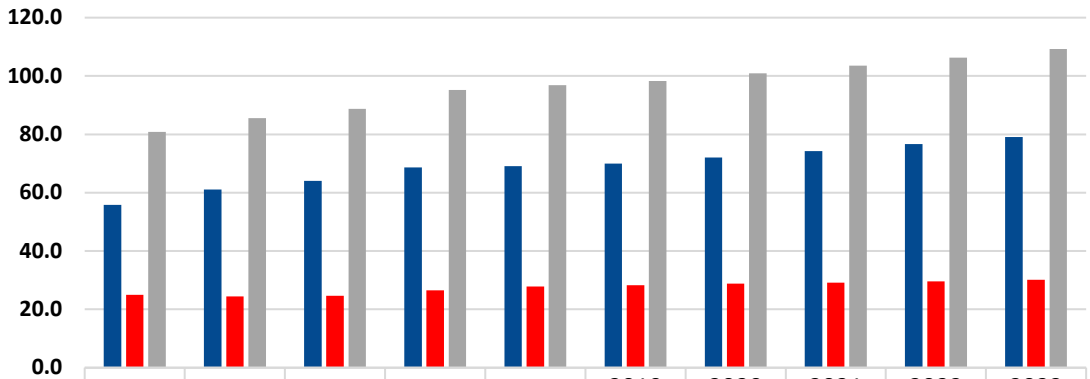
Government policy is still in place to increase new housing supply, with various programmes either having been announced or being expanded in recent years including Build to Rent, Affordable Homes and New Garden Cities programmes.

The private sector will continue to play a dominant role in total housing output, while the public sector is undergoing changes to the way in which housing developments are actually delivered. A number of housing associations and Registered Social Landlords (RSL's) have now set up essentially "private" sector divisions to carry out the building works needed, while some local authorities have set up "direct build" divisions.

3.3.5 Non-residential Construction

The performance of the insulation market is influenced by the level of new work and RMI output in the non-residential construction sectors. The following chart indicates the levels of activity in construction in terms of contractor output from 2014 to 2023:

Chart 10: Non-Residential Construction Output (Great Britain) New Work & RMI – Current Prices (£bn) 2014 -2023



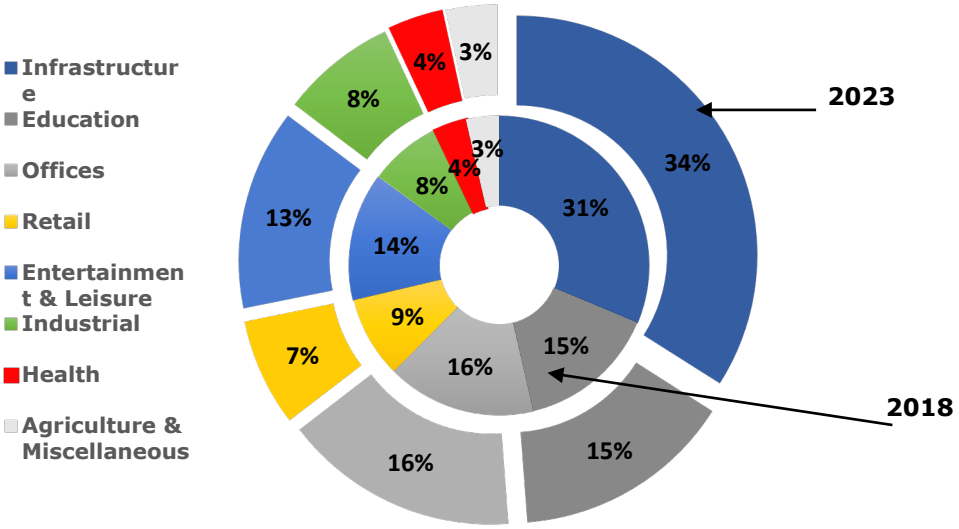
	2014	2015	2016	2017	2018	2019 Est	2020 Fcst	2021 Fcst	2022 Fcst	2023 Fcst
New	55.8	61.1	64	68.7	69.1	70.0	72.1	74.3	76.7	79.1
RMI	25.0	24.4	24.7	26.5	27.8	28.3	28.8	29.2	29.6	30.1
Total	80.8	85.5	88.7	95.2	96.9	98.3	100.9	103.5	106.3	109.2

Source: ONS/AMA Research

The medium-term outlook for the non-residential sector is for only marginal improvement in 2019, followed by annual growth rates of 2-3% to 2023 when output value is forecast to be around £109.2bn. The recent slowing of new orders in key sub-sectors, such as private commercial is the key driver for this relatively modest forecast, which has also been influenced by the cautious outlook of some organisations who have postponed business investment and expansion plans until confidence levels begin to improve.

The non-residential construction market is comprised of a number of key sub-sectors with new work value share for 2018 and estimates for 2023 illustrated in the following chart:

Chart 11: Non-Residential Construction Output New Work Analysis by Sector 2018 and 2023 - % by Value GB



Source: ONS/AMA Research Ltd

The chart indicates that infrastructure is the largest sub-sector for non-residential new work in 2016 and is expected to gain share by 2023. Other key sectors include education and offices.

While most sectors are forecast to lose a small share of the total market in this time as a result of the strong growth in infrastructure output (usually less than 0.5%), the retail sector is forecast to experience a larger loss of share, from almost 9% of output to just over 7%.

The prospects for the retail sector into the medium-term have become less positive due to the downward trend in new orders since 2016. A further significant decline in 2018 suggests that construction output levels will remain subdued into the short-medium term, and output is forecast to fall by around 8% between 2018 and 2020 and will then increase by 1-2% per annum to reach around £5.7bn in 2023.

The planning pipeline does have a number of larger projects contained within it, many of which are contained within some larger-scale mixed use redevelopments of urban centres. Key to future prospects for the retail sector remains that of consumer confidence and spending, particularly on non-essentials. Recent results from the British Retail Consortium suggested the worst level of retail sales on record for June and July 2019 while consumer spending continues to shift online.

While education is likely to have lost share slightly, the outlook into the medium-term is for growth of around 13% currently forecast from 2018-23, with output reaching around £11.7bn at the end of the period. The university sector is currently the main driver of education construction projects, although the sector remains under pressure in terms of student numbers and also increased tuition fees.

In the offices sector, output forecasts for 2019-23 have been revised downwards, with an estimated 3-4% decline in 2019 followed by annual growth rates of around 2-5% to 2023 when output is forecast to be around £12.5bn. This more subdued forecast is down to slowing and some volatility in new orders since 2017 and less positive output in 2018 as a result. Whilst some uncertainty in the sector has been ascribed to the Brexit process there are a number of factors at work which will influence future output levels, one of the most important being the financing of new build schemes, with some institutional investors and pension funds shifting their focus in recent years towards sectors of the housebuilding market such as *Affordable Housing* and *Build to Rent*.

Entertainment & leisure is forecast to see good overall growth to 2023, when output from new work is forecast to be around £10.7bn. Following growth of around 15% in 2018, annual growth rates are currently forecast to fall back to around 1-2% in 2019 and followed by annual growth rates of 2-3% from 2020 to 2023. Frequency of use is a key driver of refurbishment activities in sub-sectors such as hotels, gyms, sports clubs, swimming pools, pubs and restaurants with an underlying level of such activities likely to underpin RMI to 2023.

Construction output in the health sector is currently forecast to stabilise at around £2.2bn in 2019-20 following two years of significant decline. This will then be followed by annual growth rates of around 2-4% to 2023 when health sector output is forecast to be around £2.8bn. Although there is a reasonable planning pipeline for the health sector, projects are polarised between a small number of high value projects (often for provision of new facilities) and a large number of much smaller projects concentrating on much smaller extensions and/or refurbishments.

3.3.6 Underfloor Heating Market

UFH systems can be incorporated into many different floor constructions. Although different materials possess different thermal properties, thinner, lightweight flooring finishes (e.g. timber and laminates) do not absorb much heat, which results in rapid heat transference.

In contrast, denser flooring systems (e.g. stone and ceramic tiles) take longer to warm up and transfer heat, although they tend to remain warm for longer periods. This usually results in a more stable temperature profile, which is especially suitable for dwellings and buildings with a relatively constant demand for heat.

Water-based UFH systems have traditionally been most suitable for the new build sector, where pipes can be incorporated at an early stage. However, product innovation has led to the introduction of more versatile water-based systems for use within the retrofit market, which can be laid over existing flooring. This is likely to stimulate demand for water-based systems within the domestic sector.

The main types of floor construction are screed, concrete or solid floors and ‘dry’ systems, a sector which includes suspended or batten construction floors and floating flooring. Screed floor systems remain popular with wet-based UFH systems, especially in new-build or extensions.

The UFH market is likely to benefit from the growing use of pre-cast concrete flooring, which can be manufactured to high standards and then installed immediately on-site. Besides offering benefits such as durability, insulation and high acoustic performance, some pre-cast concrete units are now being supplied with UFH pipework already cast into the concrete. This allows developers to offer UFH

at residential applications without the need for additional screeding or costly overlay heating systems.

The introduction of more stringent environmental legislation and regulations has had a significant impact upon growth of UFH in the housing sector. With the focus being upon energy efficiency in the home, improved insulation, thermal and acoustic performance have all created ideal conditions for installation of UFH and the reduction of energy running costs within homes. A higher SAP rating may be obtained by properties with UFH, depending upon insulation.

Building Regulations stipulate that insulation is required below all systems to prevent downward heat transmission; BS EN 1264 stipulates that any downward heat loss does not exceed ten watts per square metre. **BS EN 13163** and **BS EN 826** cover thermal insulation.

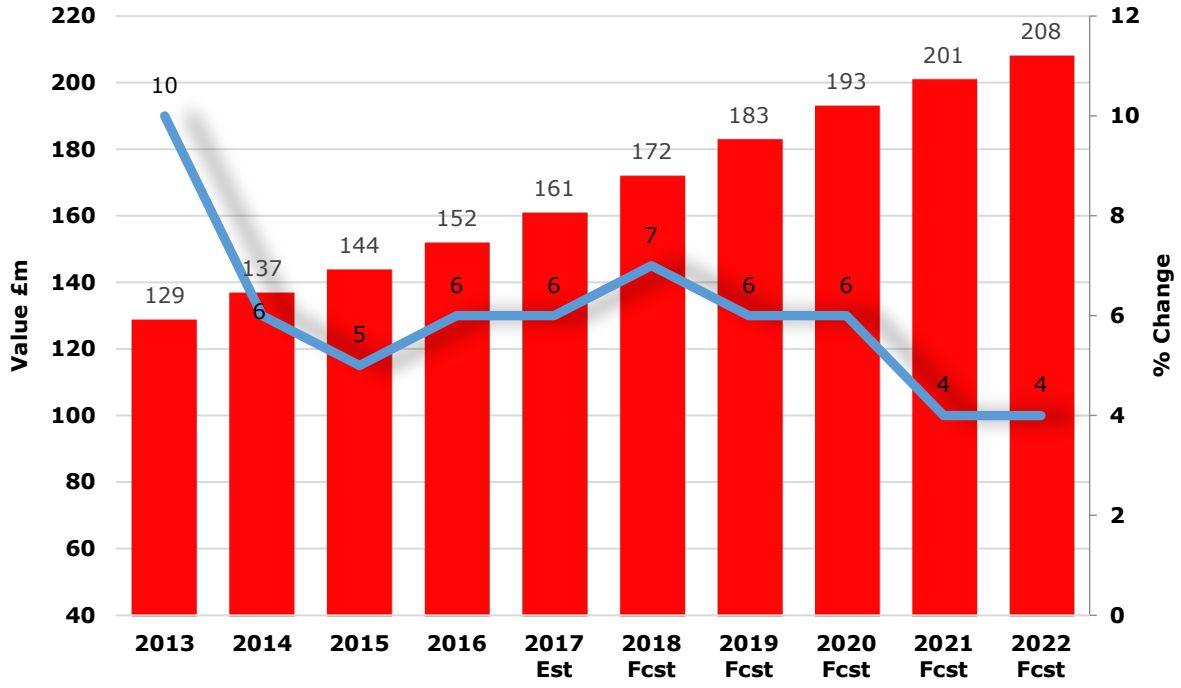
The costs of underfloor heating can vary dramatically, depending upon the type of heating selected and the floor structure, and whether it is a new build or retrofit project. A wide variation in prices exists within the market, a trend which has accelerated following the increased penetration of online sales channels.

Other related products include thermal insulation boards to reduce heat up times, as well as overlays to provide floating subfloors for different floor coverings. Insulation boards are used to ensure optimum heat-up times. They represent a low-cost solution for new homes and extensions where a new concrete screed is being poured.

Water-based systems are particularly suitable for new build construction where UFH forms part of the original building fabric. However, its appeal within the domestic retrofit market is also increasing, together with improved insulation of properties and increased knowledge of its benefits. The emergence of easy to install, low profile overlay systems which avoid significantly raising the height of the floor have also stimulated demand.

The following chart illustrates the size of the underfloor heating market in terms of value since 2013, with forecasts provided up to 2022:

Chart 12: UK Underfloor Heating Market by Value (£m MSP) 2013-2022



Source: AMA Research / Trade Estimates

- The sector has performed well over the last few years, driven by good levels of commercial and domestic construction, and RMI activity. Market value has increased by almost 25% since 2013.
- Recent growth at the consumer level can also be attributed to rising energy prices and concerns over fuel bills, as well as a desire to make homes more energy efficient on environmental grounds. Additionally, UFH is now seen as a more affordable mainstream heating option.
- Long-term energy costs remain a concern, with consumers and businesses alike seeking alternative, lost-cost solutions. **Energy efficiency** is also likely to remain high on the agenda in both the domestic and non-domestic sectors.
- Housebuilding activity is expected to continue at a steady pace, with demand for new and affordable housing likely to remain a major political issue. Government measures such as Help to Buy and expanding the variety of tenures available for those on lower incomes are likely to place increasing pressure on the UK's housing stock.
- In the **private commercial sector**, energy efficiency remains a key topic. Demand is expected in sectors such as offices, entertainment/leisure and infrastructure, both new build and RMI. These areas, along with industrial warehousing, represent potential applications for UFH, with some systems used for both heating and cooling spaces.

- Overall, prospects for UFH remain positive driven by concerns over volatile energy bills, ongoing running costs of systems and maximising comfort. There is also a trend towards products which are easy to use and maintain. Penetration of UFH is therefore likely to continue, as it is perceived as less of a luxury product, across a range of building types.

4. PRODUCT MIX

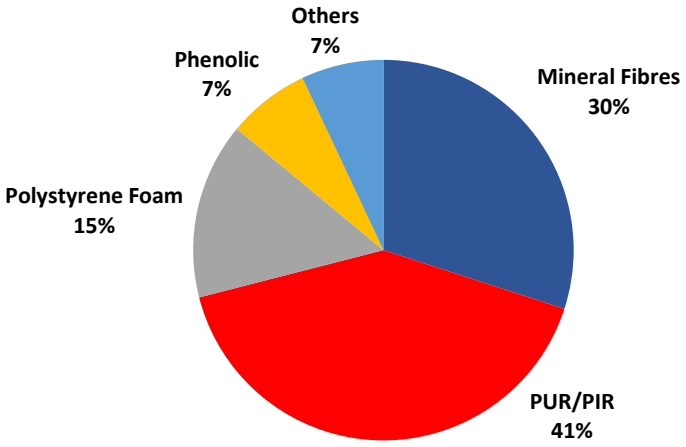
4.1 Overview of Building Insulation Products

The insulation products market consists of a large number of products made from a variety of materials. The majority of products are based upon the following material groups:

- Glass wool – blown and rolls, slabs, batts.
- Stone wool - blown and rolls, slabs, batts.
- Expanded polystyrene (EPS) – blown beads, rigid boards.
- Extruded polystyrene (XPS) – rigid boards.
- Polyurethane (PU/PUR) - rigid boards.
- Polyisocyanurate (PIR) – rigid boards.
- Phenolic – rigid boards.
- Expanded polyethylene (EPE) – flexible sheets.
- Multi-foil sheeting.
- Cellulose – loose & blown.

The following chart shows our estimates of the mix for the insulation products market in 2018:

Chart 13: Mix of Building Insulation Products by Material % By Value – Polystyrene, Phenolic, Mineral, PUR etc. - 2018



Source: AMA Research Ltd

Polyurethane (PUR) and Polyisocyanurate (PIR) foam boards have become more widely specified on applications such as partial fill cavity walls (newbuild) and 'warm roofs' (mainly loft conversions) due to a combination of thin profiles balanced by high thermal performance and ease of handling on site. Arguably, the largest building market for PIR boards is flat roofing where they have the dominant market share.

Mineral fibre products include glasswool and stone or slag wool and are among the most commonly used insulation material on the market. With regards to building insulation, key areas of use of glass wool are lofts and site-built metal cladding systems. The most important areas of demand for stone wool products are acoustic insulation and fire protection. Both types of material are also used as technical insulation.

Polystyrene foam insulation comprises EPS and XPS boards, blocks and sprayed foam. Although versatile, demand for ESP boards has been losing share to PIR boards. However, demand for sprayed foam has grown on RMI applications such as loft and garage conversions. EPS blocks have niche applications in areas such as insulated beam and block flooring. The main area of demand for XPS boards is inverted flat roofs, whereby the insulation layer lies on top of the other elements. XPS boards are arguably the most robust insulation product available, able to withstand high compression.

Phenolic foam boards are widely used on technical and industrial applications but less so for building fabric.

'Other' insulation products make up the remaining 7% of the market. These include foil sheets, nitrile rubber sheets for acoustic insulation and cellulose (mostly used on DIY loft jobs).

4.2 Building Insulation Products

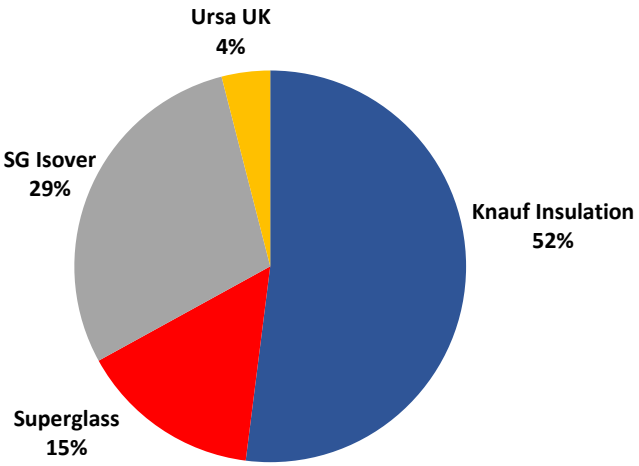
4.2.1 Glass Wool

Glass wool insulation products are mostly used for domestic applications i.e. blown wool and batts for cavity walls and rolls for lofts, between the rafters. Other applications include HVAC and pipework, partitions and party walls, timber framed buildings and twin-skin profiled steel wall cladding assembled on-site. The material has good sustainability due to being made from a high level of recycled glass and producing almost no waste on-site, making it a relatively low cost product.

In the past, Government-funded incentives for retrofitted insulation were the key drivers in rising demand for glass wool, but the significant reduction in funding under the current ECO arrangements has seen overall market share fall further.

The principal suppliers of glass wool products are **Knauf Insulation**, **Saint Gobain Isover** and **Superglass Insulation**. A fourth company **URSA UK**, supplies the UK market with products manufactured in Europe.

Chart 14: UK Suppliers of Glass Wool Estimated Market Shares, 2018



Source AMA Research Ltd

The chart illustrates the strength of the market leaders, particularly Knauf having over 50% market share.

4.2.2 Stone Wool

Stone wool insulation products, made from molten diabase rock, are typically more expensive than glass wool, largely due to production processes requiring greater energy usage. As such they are used to a lesser degree on domestic applications.

The key advantages of stone wool are that it is virtually non-combustible, has low compression values and high sound resistance properties. Superior fire-retardancy makes stone wool very desirable for occupied commercial buildings and also high temperature applications, in particular the petro-chemical and utilities industries. It is also often the material of choice in areas prone to consistent high noise levels e.g. near motorways, airports and factories. Low compression values also make it well suited to applications, e.g. flat roofs that are heavily ballasted and/or support a lot of foot traffic.

Stone wool is also used for non-building applications including cold rooms, refrigerated containers, ships and offshore facilities.

The two principal suppliers in the UK, both of which have manufacturing plants in the UK, are **Rockwool** and **Knauf Insulation.**

4.2.3 Polyurethane (PUR)/Polyisocyanurate (PIR) Foam

PUR/PIR is a highly versatile form of insulation, supplied in several formats including as an insulation core with metal composite panels, within OSB Structural Insulated Panels (SIPs), as rigid foam insulation boards and as sprayed foam.

Key building applications for rigid foam boards include pitched (warm) roofs, flat roofs, partial fill cavity walls, and ground floors. Sprayed foam is mainly used for insulation of existing building elements needing repairs/retrospective insulation such as; leaking roofs, perished/missing roof felts,

around old leadwork, perished pointing, loft conversions (between rafters) and the internal faces of metal wall and roof cladding.

PUR/PIR foam is also the most widely used insulating material for the manufacture of metal faced sandwich panels, insulated precast concrete panels and SIPS. However, because the focus of this report is on insulation products, typically supplied through merchants or direct to contractors and not to OEMs, these composite products fall outside its scope.

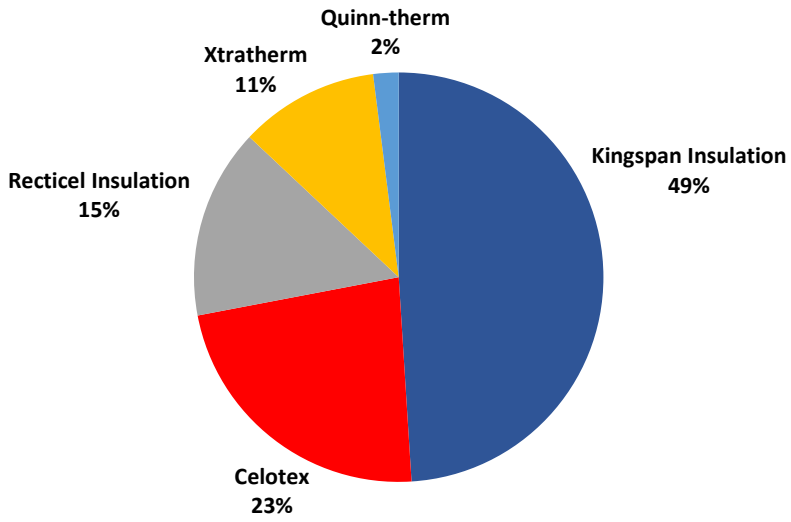
Overall and on specific areas of use such as flat roofs, PUR/PIR boards have dominant market share due to a combination of factors:

- **Thinner profiles and lighter weights** of PIR boards, relative to mineral wool equivalents, meet the requirements of Part L at key U-values. This, along with easer installation, has favoured their use for warm pitched roofs over mineral wool alternatives.
- **Low compression values** and high enough densities for use on standard warm, flat roofs to support ballast and foot traffic.
- Most PIR boards have **better insulating capacities at given thicknesses** (i.e. lower lambda values) than EPS boards and mineral wool alternatives.
- **Ease of handling on site** as they are lightweight, easy to cut to falls and do not give off noxious fumes or dangerous particles when being cut.
- Available with a wide range of facings making them versatile.
- High resistance to moisture ingress and so do not support the growth of fungi.

However, PUR/PIR boards are more expensive than mineral wool products per square metre of coverage. Many domestic insulation purchases are driven by price, especially since the decline of the government subsidy driven retrofit market. Market conditions are likely to favour lower priced mineral wool products until PIR board prices become comparable.

As shown below, the market leader in supply of rigid PUR/PIR boards is **Kingspan Insulation** followed by **Celotex**, **Xtratherm**, **Recticel Insulation** and **Quinn-therm. Kingspan Group** has seen its share of this market increase, while **Celotex's** and **Xtratherm's** have fallen slightly.

Chart 15: UK Suppliers of PUR/PIR Boards Estimated Market Shares, 2018



Source: AMA Research

4.2.4 Expanded and Extruded Polystyrene Foam (EPS and XPS)

As an insulation material, EPS is typically supplied to market as rigid boards, blown beads for cavity walls and blocks. Foam is also supplied to manufacturers of SIPS and thermal wall boards. Rigid board EPS is used for pitched roofs, ground floors, partially filled cavity wall insulation and insulated rendering systems. EPS blocks are used as substitutes for concrete blocks in beam & block flooring.

XPS boards can be used for the same applications but in practice the main area of demand is for inverted flat roofing and ground floors, due to their high resistance to compression.

Demand for EPS and XPS has been impacted by competition from other products, and has seen its overall share of the insulation product market fall in recent years.

The main suppliers of EPS boards are **Cellecta, Kay-Metzeler** (Vita Cellular Foams), **Springvale** (part of the Kingspan Group), **Jablite** and **Xtratherm.** Smaller suppliers include **Thermal Economics** and **NMC UK.**

The biggest supplier of XPS boards is **Cellecta**.

4.2.5 Other

Phenolic foam boards have a high strength to density ratio that make them well suited to applications where it is important to limit profile thickness such as internal walls and insulated render systems. The other key property is a high level of heat and fire resistance making it one of the most widely specified materials for ducting and pipework insulation. Although mainly supplied as thin rigid foam board, phenolic foam is also used in factory engineered composite panels. **Kingspan Insulation** and **Xtratherm** are the only UK suppliers of phenolic boards.

Foamed glass, made from crushed glass and carbon, is vapour impermeable, has high dimensional stability and excellent compressive strength and fire-resistant properties. As such it is well suited for

uses where there is heavy ballast or foot traffic. Foamed glass is typically the most expensive insulation material and so tends only to be specified on applications requiring the highest level of compression performance and where thermal conductivity is of secondary importance. **Pittsburgh Corning UK** (now part of **Owens Corning**) is the primary supplier to the UK market, with some European manufactured brands such as *Geocell* and *Technopor* also available on the UK market.

Cellulose insulation, made from recycled newspaper, is mainly used in DIY loft and timber frame applications. **CIUR UK** (formerly **Excel Industries**) is the key supplier in this market, its range of insulation products marketed under its *Warmcel* brand. European-manufactured brands, such as *Thermofloc*, are also available in the UK.

Foil based insulation comes in three main formats: multi foils, rigid polyethylene bubble sheets with a foil layer and flexible polyethylene bubble sheets with one or two foil layers. Areas of application include garden rooms, conservatory roofs, barns & barn conversions, re-roofing churches & church conversions, re-roofing other historic buildings, roof upgrades for schools and non-building uses e.g. live-aboard boats and caravans.

These products are typically not used on high volume housing developments, reflecting their higher price, but drivers of demand include warm pitched roof insulation, the key use being loft conversions, housing extensions, topping up existing roof insulation and non-residential refurbishment.

Cork insulation is a natural, renewable source of insulation which is mainly used in flat roofs due to its lightweight nature.

Sheep's wool tends to be relatively expensive and must be treated before use but is breathable and is therefore good for timber framed properties. **Thermafleece** and **Sheep Wool Insulation Ltd** are among the leading suppliers.

Hemp insulation is made from plant fibres and often used on external walls of timber and steel framed buildings as well as being used in all internal applications in both new build and retrofit buildings. This insulation is good at moisture regulation and has seen growth in share as environmental concerns increase. However, hemp is relatively expensive and remains a niche sector. Suppliers include **Thermafleece** and **John Cotton Nonwovens Ltd** (for brands such as **B&Q**).

Flexible Latex is mostly used in retrofit applications, particularly on internal solid walls, with social housing refurbishment a significant end user.

4.3 Pre-fabricated/Offsite and Composite Products

In addition to traditional building insulation products such as mineral wools rolls, batts and rigid foam boards, there has been an increase in the use of pre-fabricated components incorporating insulation. However, as these products incorporate added value, like-for-like comparisons with standard insulation products are not possible.

The table below lists the main types of pre-fabricated products that have insulation fitted in the factory. However, with the exception of metal composite panels, these products only account for a small share of the total insulation market.

Table 16: Main Pre-fabricated Building Products Incorporating Insulation

Product Type	Key Applications	Main Materials
Insulated plasterboard	Internal walls – offices, retail	PIR, Phenolic, XPS
Metal composite panels	Industrial walls & roofs	PIR, PUR
Modular building systems	Living accommodation	Foam
OSB structural insulated panels	Social housing newbuild	EPS, PUR
Unitised curtain wall	Office newbuild	Mineral wool

Source: AMA Research/Trade Estimates

Steel composite panels are arguably the largest of these in terms of area installed, the key uses being food warehouses, retail 'sheds', business park offices, schools and airport buildings.

Roof cladding represents the largest part of the metal composite panel market, being twice the size of the external wall composite metal panel market. The main insulation used in these products are PUR and PIR, although mineral wool is also used, particularly within external wall panels.

Insulated wall linings and partitions can be used as an alternative to insulated render systems for solid walls. In the new build sector, the majority of systems used include rigid thermal board, which is plasterboard attached to rigid foam insulation board. Flexible latex sheets are more widely used in the domestic retrofit market. In recent years, there has been a growing trend of 'improve not move' in the residential market, with greater numbers of home extensions and loft conversions being built, resulting in greater use of thermal boards. Specialist sound resistant boards with mineral wool core insulation are also available for use in applications such as party walls. Housing new build and office, retail and health markets remain the key end use markets for these products.

Modular building systems are largely dominated by steel cabins, accommodation units and other hire units. This sector has seen strong growth across a number of sectors, including health, education, hotels, prisons and student accommodation. However, it is in the new build housing sector where modular building has shown strongest growth in recent years. In 2018, the use of off-site modular products in housing i.e. softwood open & closed panel timber frames, structural insulated panels (SIPS) and cross laminated timber (CLT) panels accounted for around 18% of total UK housing completions, with steel framed modular housing systems accounting for a further 5%. A number of leading housebuilders are now using offsite building systems

Forecasts for increasing annual growth rates for 2019 -2023 are based on strong indications of increasing demand for, and the supply of, steel, CLT, timber frame and SIPS volumetric housing systems. Among the main market drivers are:

- An ongoing decline in the numbers of skilled tradesmen and professionals which means that to meet the government's ambitions of 300,000 new homes a year, alternative methods of newbuild delivery are needed.

- In response to this problem, government agency Housing England is offering direct support and provision of funding for off-site housing through the Accelerated Construction Programme.
- Major housing association development programmes, driven by the need to accelerate build times to increase the annual level of affordable housing completions, have so far not matched government targets of 55,000. Many of the largest associations have also declared that off-site construction will make a significant contribution towards this.
- Also in response for the need to solve the housing crisis – mainly in the UK's major cities - the Build to Rent (BTR) sector is set to grow. To achieve early occupancy and to generate early revenue earning for investors, large-scale developments featuring high degrees of design standardisation are being built using off-site methods.

Annual growth rates for this sector are expected to accelerate into double digits by 2021, resulting in a forecast market value of £940 million by 2023.

In terms of the materials used for insulation in offsite construction, several different types of material are suitable for insulating timber frames. However, within SIPs the main insulation materials used are polyurethane (PUR) or expanded polystyrene (EPS).

Structural Insulated Panel (SIP) building systems tend to use expanded or extruded polystyrene core insulation sandwiched between two oriented strand boards (OSB) or plywood. These boards function as an 'I' Section beam with the core acting as a web and the outer sheets as flanges. SIPs are used in a wide range of applications including commercial, education and domestic – including social housing and apartments of up to 4 storeys.

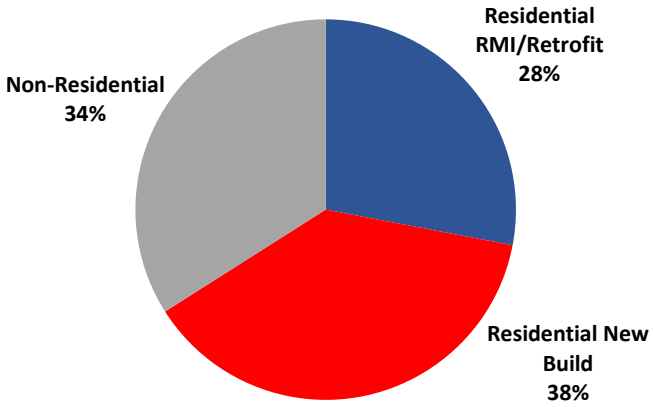
SIPs are also used in non-structural applications such as infill for panels for over-cladding in order to save time on site. SIPs are competitively priced compared to alternative construction methods and offer high insulation levels. The main suppliers of SIPs include **Kingspan Insulation** and **SIPs Industries**.

5. MARKET MIX BY END-USE SECTORS

5.1 Overview

The wide range of individual applications for insulation **products** makes the calculation of end user market shares difficult. The following chart shows our estimates by volume in 2016. Because pre-fabricated panels etc with insulated cores are excluded, the total area of buildings insulated in the non-residential sector is effectively under-represented.

Chart 17: UK Market Share - Insulation Products by Volume by End Use Sector, 2018



Source: AMA Research/Trade Estimates

The **residential sector** accounts for around two thirds of demand for insulation products used and of this, around 60% of domestic insulation was installed in new build properties. **New build** properties, which are subject to stricter government legislation, tend to require more insulation per property, and the recent increase in rates of house building has seen this sector gain significant share.

The **residential RMI and retrofit** sector, by comparison, has continued to decline in recent years, impacted by further reductions in funding through ECO which are now a fraction of the funding committed to previous programmes, generating much lower levels of demand for retrofitting insulation in domestic properties. This sector accounts for an estimated 28% of demand, down from around 40% in 2014.

There are factors that have helped maintain demand in the RMI sector, such as the recovery of the housing market and the increase in the number of home extensions in recent years. All homes being sold in the UK require an Energy Performance Certificate (EPC), and some sellers may have decided to improve existing properties to add value in preparation of selling. The home extensions market has grown strongly in recent years but has stalled in the last year, with around 214,000 householder planning permissions granted in 2018, of which around 102,500 were single or double storey extensions.

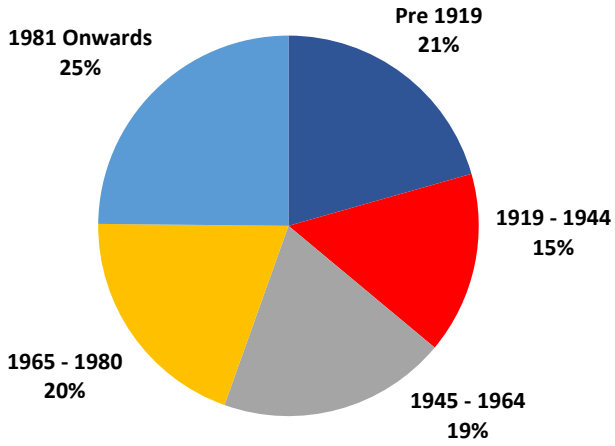
The **non-residential market** accounts for an estimated 34% of demand for insulation products by volume (down from 36% in 2016), supported by use of high levels of high-quality insulation in the public sector, particularly within health and education, where long term efficiencies are an important consideration during design. However, unlike dwellings, energy efficiency can sometimes be achieved using passive non-insulation measures such as installing hollowcore flooring, concrete walls and triple–glazed curtain wall, designing for 'daylighting' etc.

5.2 Domestic RMI/Retrofit

5.2.1 Housing Stock

There are approximately **28 million** dwellings in Great Britain, the estimated breakdown of age shown in the chart below. This provides a broad indication of the volume of houses built with cavity walls and of those with solid walls. As the first cavity walls only appeared in the 1930's, the 5.7 million properties built before 1919 all have solid walls. However, Building Regulations did not stipulate cavity wall construction until 1982.

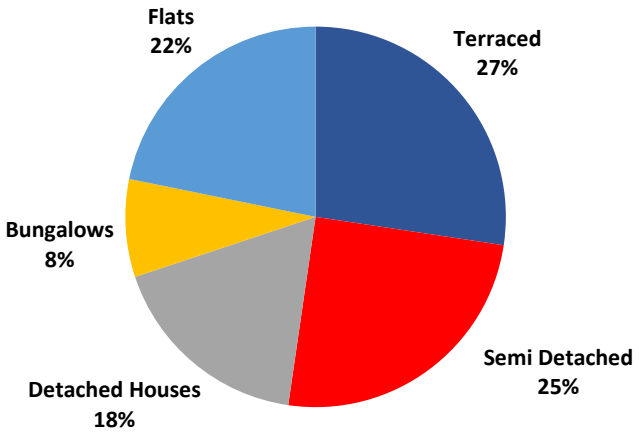
Chart 18: GB Dwelling Stock by Age Band (%)



Source: English House Condition Survey 2017/18, Scottish House Condition Survey 2017 adapted by AMA Research

In terms of property types, terraced housing accounts for over a quarter of the total number of dwellings, an indication of the high level of concentration of Great Britain's population in the larger towns and cities. However, recent housebuilding trends have seen a shift towards semi-detached and detached houses, which have seen their share of total dwellings increase.

Chart 19: GB Dwelling Stock by Type of Property (% of Dwellings)



Source: English House Condition Survey 2017/18, Scottish House Condition Survey 2017 adapted AMA Research

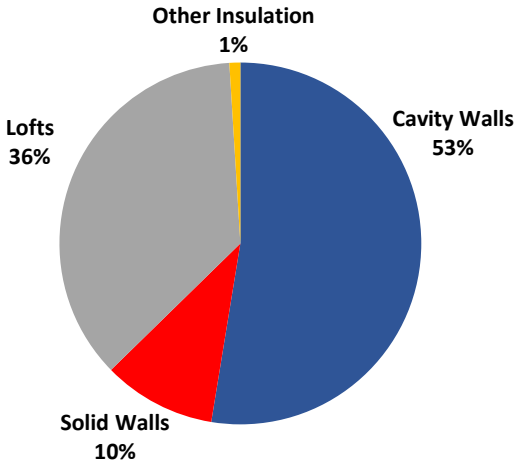
5.2.2 Recent Market Trends

The term 'retrofit' refers primarily to the installation of insulation in existing properties, often under recent granted-aided schemes such as the Green Deal and ECO. RMI (repair, maintenance and improvements) mainly refers to work that includes insulation installation as part of a wider project such as loft conversions, extensions and refurbishment.

Over the course of the ECO programme – between January 2013 and March 2019 using the latest statistics available – over 1.66 million insulation measures/jobs were carried out. **Insulation measures** accounted for around two thirds of all measures implemented under the programme. **Cavity walls** accounted for over half of all insulation measures installed (53%), but this number of installation jobs was a fraction of those achieved under CERT, and has fallen further in recent years.

The number of **solid wall installations** (just under 179,000 through ECO) is much higher than those achieved under CERT (around 59,000), and accounts for 11% of all insulation measures achieved.

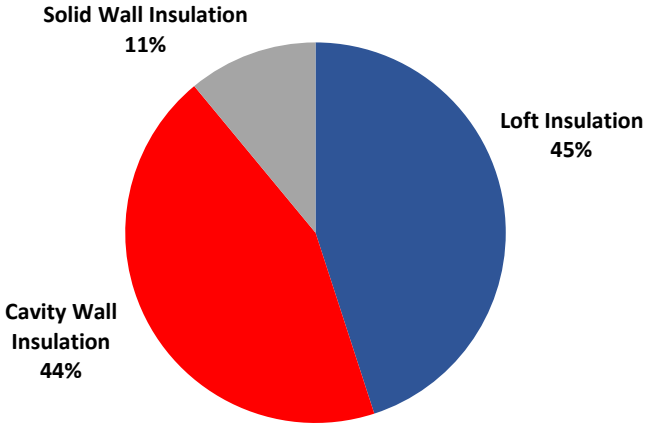
Chart 20: Total Numbers of Insulation Measures Delivered Under ECO by Type (Lofts, Solid Walls, etc). Total 1,662k Installations 2019



Source: BEIS Household Energy Efficiency Statistics July 2019, adapted by AMA Research.

As indicated in the chart below, in 2018 it is estimated that just over **16 million m²** of insulation products were installed, compared to 43 million m² in 2014. Almost 90% of which was loft and cavity wall insulation (fairly evenly split between the two types). As well as the **11 million m²** installed through ECO measures, this total includes an estimated **5 million m²** of insulation (loft) installed by DIYers.

Chart 21: UK GB Retrofit Insulation Market by Application by Area Installed 2018. Installed Volume = ~16 million m²



Source: AMA Research estimates based on ECO data

By value, the shares for both cavity walls and solid walls are much higher due to the relatively lower costs of 'cold roof' loft insulation.

5.2.3 Domestic Retrofit Market Prospects for Insulation Products

In contrast to the CERT/CESP era, when grant-funded measures were largely targeted at low-cost cavity wall and loft insulation measures, the focus has shifted under the current ECO towards solid walls and hard-to-fill cavity walls.

Table 22: GB Potential for Insulation Measures in Existing Properties as of December 2018

	No. dwellings in GB - million	% with insulation	% of dwellings not insulated but easy to treat	Max potential no. of measures - million
Cavity walls	19.9	70.0	20	3.98
Solid wall	8.5	9.0	91	7.75
Lofts	24.5	66.0	23	5.76

Source: BEIS – Household Energy Efficiency National Statistics, Annual Report, March 2019 adapted by AMA Research

In the furthest right-hand column in the above table are listed estimated maximum numbers of dwellings without insulation that would be easy to treat. In terms of cavity walls, BEIS estimate that there are 3.98 million dwellings that are not insulated but are easy to treat, although there are a further 1.31 million that are not insulated, but are hard to treat.

Up to 40% of dwellings with solid walls are located in city and other urban central areas, many of these being fuel poor/low income households living in blocks of flats or terraced housing. Although the ECO programme has seen an increase in the number of solid walled dwellings being insulated, just 9% of the stock is currently insulated, leaving an estimated potential of 7.75 million properties to be insulated. The relatively high cost of solid wall insulation remains a significant barrier to low income households being able to insulate solid wall homes, without sufficient funding through government-subsidised programmes.

5.3 Housebuilding

5.3.1 Profile of Housebuilding

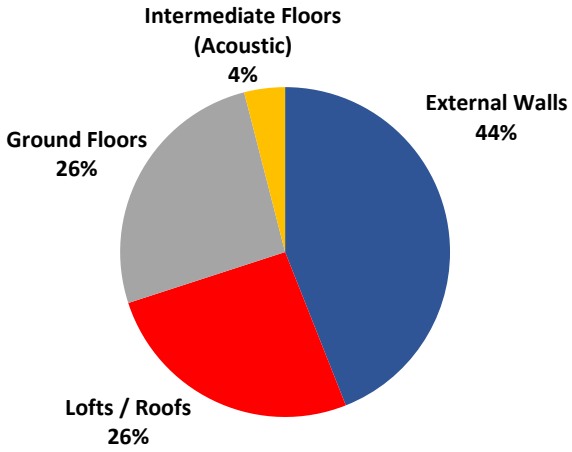
Since 2014, there has been a year on year increase in the number of new dwellings started, up from 165,200 to 192,000 in 2018 (an increase of around 17%). Data for the first quarter of 2019 (for England, Wales and Northern Ireland only) suggests a decrease of around 7% in rates of new building compared to the first quarter of 2018.

5.3.2 Recent Market Trends

Based on the mix of flats and house completion data from MHCLG's housebuilding live tables and average areas for the main structural elements (i.e. walls, lofts etc.), it is estimated that some **44-46 million m²** of thermal and acoustic insulation was installed in **new dwellings** in 2018.

These estimates make certain assumptions on factors such as the breakdown of flats by numbers of storeys and the housebuilding mix by type e.g. detached or terraced. It is also assumed that acoustic insulation is used for intermediate flooring in flats but not houses.

Chart 23: UK New Housebuilding Market for Insulation by Area Installed by Application - Ground, Lofts, External, Intermediate.



Source: AMA Research/Trade Estimates

In recent years there has been a shift in the mix of new build dwellings, with an increasing proportion of new builds being houses - 80% of the total in 2018, up from 75% in 2016. This change in the mix between flats and houses has resulted in a falling market share for acoustic insulation on intermediate floors between dwellings. Conversely, the shift back towards houses – and larger houses in particular – has also resulted in increased demand for ground floor insulation.

It is difficult to determine how much insulation is used in ground floor construction. While mineral wool batts and rigid foam boards are used, beam and block floor systems, with polystyrene blocks used instead of concrete, are becoming more widely used.

5.3.3 Housebuilding Market Prospects for Insulation Products

Two of the key factors expected to stimulate demand for increased volumes and/or higher specification of insulation products are the carbon savings requirements set out in the building regulations (a consultation on revisions to Part L is currently in place and due to close in January 2020). Other drivers include the Government's changes to planning regulations to relax the restrictions for homeowners and businesses, the latter concerning change of use.

The latter policy has already contributed to the increased level of new house building observed, and forecasts suggest that the number of new housing starts will continue to increase year on year, to around 227,000 by 2023.

5.4 Non-Residential Buildings

5.4.1 Non-Residential Building Stock

According to latest statistics, there are over 2.3 million non-residential buildings in Great Britain, which according to BEIS statistics, accounted for around 18% of the country's CO2 emissions in 2018.

5.4.2 Market Trends

The non-residential market for insulation products is very hard to quantify due to factors such as the lack of robust statistics, the lack of standardisation in building types and the wide range of approaches available for improving energy efficiency other than through insulation. Moreover, demand for insulation products is limited to relatively few applications, the main ones being:

- Flat roofs.
- Site built metal wall cladding.
- Standing seam roofs.
- HVAC systems - ductwork and pipework in large buildings.
- Site built cladding and rainscreen systems.

In many applications, insulation is incorporated within pre-fabricated components e.g. composite metal panels, precast concrete panels, modular building systems, modular flooring and roof units. Within the context of this report, these do not qualify as insulation **products**, being supplied direct and not through merchants or distributors.

It is difficult to accurately determine trends in demand for insulation in this market because the sector is highly fragmented and developments are usually bespoke and non-standard.

However, anecdotal evidence suggests that while insulation demand has historically been limited to newbuild, other energy efficiency initiatives such as Climate Change Agreements and the Carbon Reduction Commitment Energy Efficiency Scheme, suggest an increasing amount of refurbishment activity, i.e. improved insulation in existing office or retail buildings for example.

5.4.3 Non-Residential Buildings Market Prospects for Insulation Products

The focus of government efforts to drive up improved energy efficiency performance has been on the domestic sector, as evidenced by the range of initiatives from Warm Homes, Decent Homes, EEC, CERT & CESP, The Green Deal and the ongoing Energy Companies Obligation.

The Green Deal was arguably the first major initiative that aims to tackle poor energy performance across the non-residential sector. Businesses were able to apply for funding from the Green Deal (with no upper cap on how much they could apply for), but the scheme was scrapped due to its negligible impact, and the overwhelming majority of energy efficiency measures installed were through ECO, which was aimed at the domestic sector.

The main schemes to date aimed at the non-residential sector have been Climate Change Agreements, the Energy Savings Opportunity Scheme (ESOS) and the Carbon Reduction Commitment Energy Efficiency Scheme (a scheme that is now closed), but these have been mandatory initiatives focusing on larger and/or energy intensive users while not addressing SMEs.

The vast majority of carbon emissions in the non-residential sector come from existing buildings, as the net increase due to the addition of new floorspace is typically less than 0.5% a year. Findings from the Building Energy Efficiency Survey (BEES), published by BEIS in November 2016, remain the most up to date detailed understanding of how energy is used across the non-residential building stock in England and Wales.

The survey investigated how energy use can be reduced and sought to understand the barriers and facilitators of reducing energy use. It found that in terms of improving the energy efficiency of non-residential building fabric (in which improved insulation would play a significant role), a potential £295m could be saved annually in energy costs, but that the investment cost of doing so would be in the region of £6.4 billion.

This payback period of around 21 years from the initial investment for improving the building fabric was far longer than for all other means of improving energy efficiency, such as lighting (4 years), HVAC systems (10 years) and hot water systems (also around 10 years).

The survey found that the most commonly perceived barriers to energy efficiency were:

- low capital availability;
- investment costs;
- hidden costs;
- intervention-related risks;
- external risks, and
- interventions not being sufficiently profitable.

Another issue has been the issue of disparate ownership and the large amount of rented accommodation where the owner is not responsible for the energy bills, which often results in nothing being done.

While improved insulation measures are low-cost options for some businesses, e.g. SMEs operating out of residential-type premises, for owners/occupiers in larger buildings they are generally less feasible. In larger buildings, the most important insulation elements typically form part of an external wall system that also includes a sub-frame, drylining, sheathing and cladding. Insulation elements cannot simply be removed and replaced, while new over-cladding and rainscreen systems are costly options.

Similarly, non-residential flat roofing systems comprise several elements including decking, waterproof membranes, vapour barriers and ballast. Improving the energy performance therefore usually requires complete replacement of the roof. Therefore, lower cost and easier to implement options are non-insulation measures.

These issues, in the ongoing context of no stringent government policy or support are likely to result in ongoing constraints to the potential for improving the insulation of existing non-residential buildings.

6. APPLICATIONS

6.1 Introduction

Building insulation products are primarily for thermal and acoustic while the main use for technical insulation is for fire-retardant/high-temperature applications. Thermal insulation products are mostly used for the following applications:

- **Domestic pitched roofs/lofts.**
- **Flat roofs.**
- **Cavity walls.**
- **Domestic walls without cavities – e.g. solid walls, timber frame with timber studs, lath & plaster.**
- **Cladding & standing seam roofing systems.**
- **Ground floors.**

6.2 Lofts/Pitched Roofs

6.2.1 Profile of Dwellings with Lofts

Of the circa 27.5 million dwellings in GB, an estimated **3.6 million** (13%) **do not** have lofts. Most of these are blocks of flats with flat roofs though also included are bungalows with dorma rooms and also houses with loft conversions. Therefore, some **24.5 million** properties do have lofts. Latest statistics estimate that around **13.8 million** of these properties, around half of the total, are insulated to a depth of at least 150mm.

The National Insulation Association (NIA) recommends depths of 270mm for glasswool, 250mm for stone wool or 220mm for cellulose between the joists. However, since ceiling joists are typically only 100-150mm deep, fitting this amount of material would make it impossible to secure floor boards on top of the joists. While statistics are not collated for this level of insulation – the English Housing Survey for 2017 estimated that 9 million dwellings had at least 200mm of loft insulation, around 38% of the total.

Historic data has shown that a minority of dwellings with lofts have **uninsulated** lofts (around 405,000 in 2017), with the vast majority being owner-occupied. Over a quarter of these were rented properties, suggesting that landlords may be less motivated to insulate lofts as tenants pay the utilities bills.

6.2.2 Recent Trends in Loft Insulation

Retrofit

With the massive decline in Government subsidised installations, the retrofit market for loft insulation has shrunk way below that of new housebuilding, accounting for less than 40% of demand. For 2018, it is estimated that ~**7 million m²** of loft insulation was installed under both ECO and independent DIY measures, a huge decline compared to the 98 million m² installed in 2012 under the last year of CERT.

Table 24: GB Retrofit Market for Loft Insulation Products 2011 - 2018

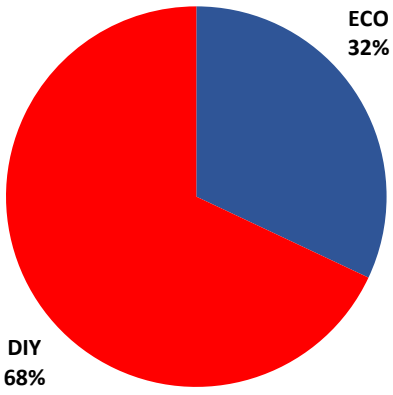
Year	Million m²	% change
2011	71	+29
2012	98	+38
2013	13	-87
2014	16	+23
2015	11	-31
2016	9	-18
2017	**7**	-19
2018	**7**	+3
Total	**232**	

Source: AMA Research estimates based on CERT, CESP, Green Deal and ECO data

Aside from the decline in loft insulation installed through Government-supported programmes, we estimate that the market for DIY loft insulation has remained fairly constant since 2013, albeit at a lower level than up to 2012, as DIY installations could still be subsidised under CERT.

Compared to an estimated 27 million m² installed in 2012 (from the total of 98m m^2), there was an estimated 5 million m² installed through DIY measures in 2018, accounting for around two thirds of loft area installed.

Chart 25: UK Retrofit Loft Market for Insulation by Type of Measures by Area Installed 2018 - Population ~7 million m²

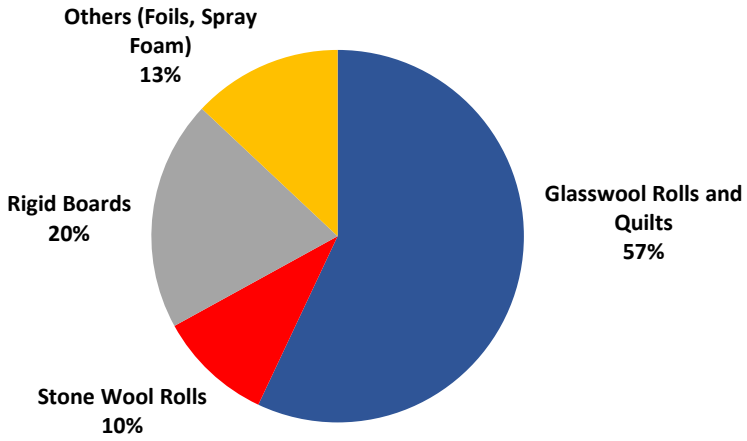


Source: AMA Research estimates based on ECO data

As illustrated below, most loft insulation activity has tended to focus on the lower-cost installation of glass wool rolls and quilts between the ceiling joists (known in the trade as 'cold roofs'). Stone wool

products are typically both relatively more expensive and due to higher density, heavier and more difficult to install for DIYers.

Chart 26: UK Retrofit Loft Market for Insulation by Material by Volume 2018 - Population ~7 million m²



Source: AMA Research estimates based on trade estimates

Demand drivers for different kinds of loft insulation products include levels of house moving, property prices, increased difficulties for first time buyers in obtaining mortgages and perceptions about extra rooms giving added value – with a loft conversion typically adding around 10% to property value.

Recent relaxation of planning laws and the extension of permitted development rights have made it easier for homeowners to carry out loft conversions and extensions without having to obtain permission from their local planning authorities, and the market for home extensions (both single and double storey) has been rising in recent years, although 2018 has seen a decline in the number of planning permissions in response to increasing economic uncertainty.

In new build town houses there is also greater added value in providing rooms in loft space as opposed to storage uses. This has resulted in the shift towards 'warm roofs' where insulation is placed between the rafters.

The increase in loft conversions and warm roof construction has tended to favour the use of rigid foam boards, foils and spray foam, as their thin profiles and high thermal properties mean less insulation depth is required to meet thermal regulations, while making the fitting of both insulation and plasterboard much easier than if using mineral wool products. Therefore, there has been an increase in demand and market share for these products for use in lofts, at the expense of glass wool products, demand for which has been impacted by the decline in volumes of loft insulation installed through ECO.

New Build

It is estimated that the recent GB housebuilding market for loft insulation in 2016, was around **11.6 million m²**, as illustrated below. We estimate that there was a 40% increase in volume installed in 2018 compared to 2016, as the number of new houses completed rose strongly.

Table 27: GB Housebuilding Market for Loft Insulation Products 2011 to 2018

Year	Million m²	%change
2011	5.3	+ 10
2012	5.6	+ 5
2013	5.3	- 6
2014	6.1	+ 16
2015	8.2	+ 34
2016	8.0	- 2
2017	11.3	+37
2018	11.6	+3

Source: AMA Research estimates based on MHCLG Tables for Housebuilding

The data in the above table has been calculated using the mix in housing completions by number of bedrooms in England and applying the average loft areas to each category. So, for example, a 2-bedroom detached house typically has a loft area of 50 m². Flats have been excluded as they mostly either have flat roofs or low pitches that make them unsuitable for insulating in this manner. The totals for England have then been extrapolated for GB.

The strong increase in demand from 2016 to 2017 was driven by increased levels of housebuilding (completions of new houses were up by 17% in this time), and particularly a strong increase in the number of 3 and 4-bedroom houses being built, which on average require 10% and 50% more loft insulation respectively than a 2-bedroom house. The number of completions was up by a further 6% in 2018.

6.2.3 Market Prospects for Loft Insulation

At the end of December 2016, BEIS estimated that there were still around 8.06 million lofts without adequate insulation. Of these, an estimated **5.76 million** are easy to treat. The remaining 2.3 million are classified as hard to treat, or unfillable, which can occur in properties with a flat roof or in properties where the roof has a very shallow pitch which makes the loft space inaccessible.

Table 28: Summary of Loft Insulation Levels in GB at December 2018

	'000 dwellings	%
Insulated	16,189	66
Uncertain	286	1
Remaining potential	8,061	33
Easy to treat	5,760	23
Hard to treat	2,288	9
With a loft	**24,536**	**100**

Source: BEIS Household Energy Efficiency Statistics adapted by AMA Research

As mentioned already, the DIY market is a significant one in terms of loft insulation, as it is both relatively easy and inexpensive work to carry out. For example, fitting glasswool rolls to a depth of 270mm in an uninsulated, 55m² loft of a 3-bedroom detached house would cost a DIYer around £330. A typical 100mm roll is ~£2.30/m² and a 170mm roll is ~£3.70/m².

The energy savings from installing loft insulation mean that the costs are typically repaid in around 2 years. For all but the poorest households, loft insulation is a highly affordable way of reducing heat loss at limited cost. BEIS forecast longer-term increases in the wholesale prices of oil, gas and coal, which will put upward pressure on domestic gas and electricity prices, and provide an ongoing incentive for homeowners to insulate their roofs at their own cost.

Typically, homeowners have tended to fund structural alterations to their property against their property's equity. In recent years, mortgage interest rates have remained low, suggesting that lenders are likely to continue supporting homeowners' financial requirements for extensions and loft conversions. Latest data suggests that this market is currently stalling after being buoyant in recent years, with approximately 75,300 applications for single storey extensions granted in 2018, plus a further 27,500 double storey extensions approved.

6.3 Flat Roofs

6.3.1 Profile of Buildings with Flat Roofs

Unlike domestic walls and roofs, there is limited data on the market for flat roofs, mainly because most are on non-residential buildings, for which there are no robust statistics on the numbers of buildings and types and areas of roof structures.

In the residential sector, flat roofs are almost always found on blocks of flats over 5 storeys, but, depending on the ages of buildings and locations, are not uncommon on low-rise blocks. Flats under 5 storeys often have low pitched roofs or a combination of both pitched and flat elements. Most purpose-built blocks of flats, however, with 6+ storeys typically have flat roofs.

The table below provides a summary breakdown of the stock of flats in the UK, with details for England and Scotland.

Table 29: Stock of Flats in UK, England and Scotland 2017/18 – Total, Privately Owned and Social Housing

Stock – '000 dwellings	England*	Scotland**	Wales	NI	UK
Total housing stock	23,950	2,464	1,430	790	28,634
Total flats	4,863	895	114	85	5,957
Flats as % of total	20%	36%	8%	11%	21%
Privately owned flats	3,031	-	-	-	-
Social Housing	1,833	-	-	-	-
Converted	946	-	-	-	-
Purpose built (high rise) 6+ storeys	496	-	-	-	-
Purpose built (low rise) <6 storeys	3,421	-	-	-	-

Sources *English Housing Survey 2017-2018, ** Housing Statistics for Scotland 2017 – Scottish Government

While flats account for around 20% of total dwellings in England, in Scotland they take a 36% share. However, there are relatively few high-rise, flat roofed blocks in Scotland, these mainly being limited to public sector housing in the less affluent parts of the major cities and towns, most of which were built in the 1960s and 1970s. The overwhelming majority of privately owned flats are low-rise, pitched roof buildings.

6.3.2 Recent Trends in Flat Roof Insulation

Of the estimated 34 million m^2 of flat roof waterproofing membranes installed in 2018, around 44-56% was estimated to be on new buildings, both dwellings and non-residential. Assuming insulation was also installed around the same time this would equate to around 15-19 million m^2. A small proportion of new non-dwellings will not have needed roofing insulation, hence the estimate is slightly lower than 35%. With a relatively small proportion of refurbishment and RMI incorporating new insulation, plus the insulation installed in new build, it **suggests a total of around 16-20million m^2**, up from 15-17 million m^2 in 2016.

The main driver behind a possible increase in demand for insulation on flat roofs is the stipulated 9% improvement in carbon emission reductions on new non-dwellings, compared to the requirements set out in the 2010 edition of the Building Regulations. However, as there are no significant relevant changes in parts 1B and 2B there are no new regulatory drivers for improving insulation on existing buildings presently.

All buildings with either heating and/or refrigeration systems are required by Part L of the Building Regulations to have thermal insulation. Non-accommodation and other buildings not needing temperature control such as garages do not need insulation.

The main insulation materials used for flat roof insulation are:

- Polyisocyanurate (PIR).
- Stone wool slabs and boards.

- Extruded polystyrene (XPS).
- Foamed glass.
- Expanded polystyrene (EPS).

Polyisocyanurate (PIR) boards have almost become standard in the specification of warm flat roof insulation due to their appealing properties; thinner profiles, low mass, wide range of facings and resistance to moisture ingress.

Polyurethane (PUR) boards are now not widely used in these flat roofing insulation applications.

Stone wool insulation's key properties include fire-resistance – making it well suited for use on high temperature applications and superior sound resistance which make it ideal for buildings in noisy environments. It can be used with most waterproofing materials although mechanically fixed SPMs are best suited as stonewool slabs can easily be fixed through the membrane to the decking.

Extruded polystyrene (XPS) boards are used on inverted flat roofs as their high compression properties means they can tolerate heavy ballast, plant, roof gardens and other heavy loadings. Their relative thickness, compared to PIR board, does not make them well suited for standard warm roofs or refurbishment applications where space between the decking and waterproofing layer is restricted.

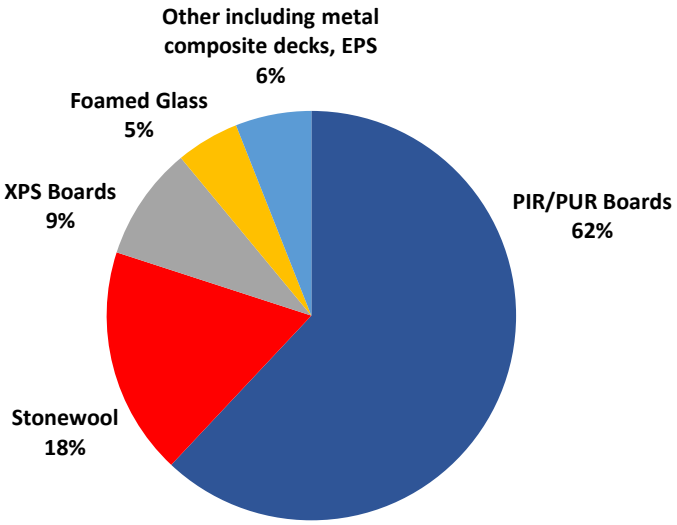
Foamed glass structural properties make it suitable for use as insulation on standard warm flat roofs with traffic, whereas other insulation products may be compressed resulting in an uneven surface and reduced insulation performance. One of the main drivers for using foamed glass insulation has been the requirement of high energy efficiency standards in construction. However, foamed glass insulation is typically the most expensive insulation material, and used mainly where highest levels of compression performance are required.

In common with the volume data, there are no reliable estimates as to the value of the flat roof insulation market. Taking into account the higher average values going into the non-residential sectors and the increased values generally for insulation products, we estimate that the value of the market at **manufacturers selling prices** was around **£200m** in **2018**.

As shown in the chart below, **PIR/PUR** boards are the most widely used insulation product for flat roofing, accounting for just over **60% of area installed**. This is partly due to the relatively large volume of products available from several major insulation suppliers, resulting in highly competitive sales prices. In recent years, there has been a steady increase in demand for PIR boards, underpinned by growing popularity of warm roof construction and a corresponding decline in cold roof systems.

Stonewool accounts for an estimated 18% of installed area with XPS accounting for a further 9% and foamed glass around 5%. It needs emphasising that there is neither robust trade nor government data on the flat roofing market and that share estimates need to be viewed as broad indications of market position.

Chart 30: UK Flat Roof Market for Insulation by Product Type (PIR, Stonewool, XPS etc) by Area Installed, 2018



Source: AMA Research based on trade estimates

6.3.3 Market Prospects for Flat Roof Insulation

Over the medium term, 3 – 4 years to 2023, it is forecast that demand for flat roofing – and associated insulation - will continue to decline slightly year on year, the key driver being the impact of the 'Brexit' process on investor confidence across the commercial & industrial newbuild sector. 'Brexit' is also exacerbating the skills shortage among trades and professionals in the construction industry, as a substantial number of workers from EU countries may well leave the UK. The roofing trade is one of the worst affected.0

There are, however, several factors that could sustain some demand for flat roofing systems in the commercial & industrial market; e.g. the need to increase retail distribution centre capacity in order to meet the shift in supply chain demands predominantly led by online shopping and increasing consumer expectations of convenience; growth in the Build-to-Rent apartment block sector and growing demand for 'green roofs'.

In urban areas, factors likely to drive up demand for 'green' roofs include; increasing concerns about rainfall run-off, pollution & air quality and lack of private outdoor space. In rural areas the main driver, to date, has been planning requirements demanding that buildings merge in with surrounding areas.

In the public sector, there is potential for increased demand for flat roofing waterproofing systems, driven by the need to refurbish buildings from the 1950s-1970s, when demolition and newbuild is the more expensive and less desirable option.

In the education sector, key to potential growth will continue to be the Conservative Government's commitment to capital spending through programmes (subject to the pending outcome of the

forthcoming December 2019 UK general election) including Priority Schools Building Programme, Free Schools and Academies as well as the creation of University Technical Colleges.

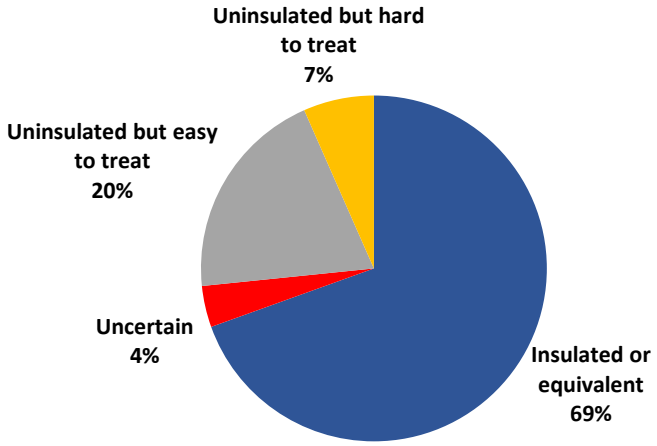
In the universities sector, demand for construction has been driven by long-term campus re-development programmes. Following the removal of the cap on student numbers in 2015 and the increase in the maximum level of tuition fees that can be charged, universities are having to be more competitive with their services and are investing more in student accommodation, teaching facilities, sports and arts facilities etc.

6.4 Cavity Walls

6.4.1 Profile of Dwellings with Cavity Walls

BEIS estimates that there are ~**19.9 million** dwellings in Great Britain that have cavity walls. As of December 2018, approximately **13.8 million** homes, or 70%, have insulated cavity walls or equivalent. However, as illustrated in the chart below, still 27% of dwellings have no insulation in the cavity walls. This equates to around **5.3 million dwellings.**

Chart 31: Dwellings in GB with Cavity Walls % December 2018 - 19.8 million Dwellings with Cavity Walls



Source: BEIS – Household Energy Efficiency Statistics

Based on data from the most recent English and Scottish house condition surveys, it is estimated that around 83% of homes with uninsulated cavity walls are privately owned.

Hard-to–fill or unfillable cavities are those that are either more difficult and/or more expensive to fill than standard cavities. There are several types including:

- Narrow cavities in masonry walls less than 50mm wide.
- Pre-fabricated concrete constructions systems with cavities.
- Metal frame construction systems with cavities.
- Uneven cavities formed in walls built using natural stone outer leaves and block/brick inner leaves.

- Timber frame buildings that have both uninsulated studwork cavities and masonry cavities.
- Standard cavities that present problems e.g. they are too high, form part of blocks of flats, are exposed to severe wind-driven rain, have faults in outer walls needing remediation before insulating. Some walls are of a mixed type e.g. have partial cladding - such as vertical tiling - that cannot be drilled into for the purpose of blowing wool or EPS beads.

There are also solid walls and walls of lath and plaster, which are discussed in sub-section 7.5.

6.4.2 Recent Trends in Domestic Cavity Wall Insulation

Retrofit

Quantifying the market size and trends for CWI is made difficult mainly by the fact cavity wall areas range from 60 m² for a mid-terrace house to over 140 m² for detached housing with 4+ bedrooms and also because ECO data does not provide breakdowns of measures by property type. However, based on data on the mix of housing stock in England and Scotland, we estimate the average cavity wall area to be 75 m².

Taking these caveats into account, under ECO some **7 million m²** were installed in 2018. Not included are any estimates for measures taken independently of ECO but these are likely to have been few. The volume for 2018 is around a third of what was installed in 2014, and a fraction of the **48 million m²** installed in the last year of CERT in 2012.

Table 32: GB Retrofit Market for Cavity Insulation Products, 2011 - 2018

Year	Million m²	% change
2011	39	+22
2012	48	+23
2013	15	-69
2014	22	+47
2015	11	-50
2016	8	-40
2017	6	-24
2018	7	+16
Total	**155**	

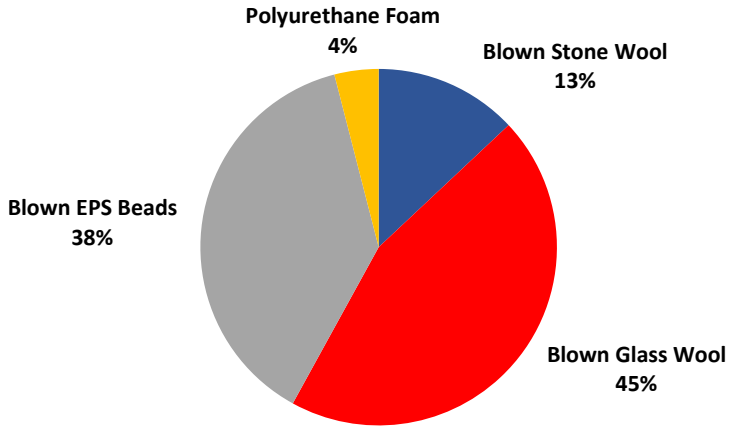
Source: AMA Research estimates based on CERT, CESP, Green Deal and ECO data

With around 870,000 CWI measures delivered under ECO, we estimate that **around 79 million m²** of insulation had been installed between the start of 2013 and the end of 2018.

Cavity wall insulation is available in several formats with blown mineral wool being the most commonly used in the retrofit market, whereby the insulation is injected into the cavity through mortar joints. The use of EPS beads has also been increasing steadily in recent years, while a minority of installers now use Polyurethane Foam.

As indicated below, blown glass wool remains the most popular choice of material due to its relatively lower cost.

Chart 33: UK Retrofit Cavity Wall Insulation Market by Material by Volume, 2018



Source: AMA Research based on trade estimates

6.4.3 Market Prospects for Domestic Cavity Wall Insulation

As indicated in the table below, there were around **5.3 million** dwellings with unfilled cavity walls in Great Britain at December 2018. However, more than 1.3 million have been identified as hard to fill. These include dwellings with timber frame walls comprising studwork cavities and masonry cavities. In this wall type the studwork cavity contains insulation but the masonry cavity does not contain insulation. Another large sub-group is that of concrete-framed, purpose-built flats.

The other main sub-group of hard to treat walls are houses with outer walls that need remediation work before they can be insulated. The additional cost of such work may be an off-putting issue for homeowners, particularly as ECO does not have cover the costs for doing so.

Table 34: Summary of Cavity Wall Insulation Levels in GB at December 2018, Insulated, Uncertain, Easy to Treat etc.

	'000 dwellings	**%**
Insulated or equivalent	13,821	70
Uncertain	769	4
Uninsulated	5,293	27
Easy to treat	*3,980*	*20*
Hard to treat or unfillable	*1,313*	*7*
With cavity walls	19,883	100

Source: BEIS – Household Energy Efficiency Statistics

Uninsulated but easy to fill cavity walls account for 75% of the 5.3 million dwellings without cavity wall insulation or around 3.98 million in total.

At the time of writing, prospects for the cavity wall insulation sector are mixed, despite the potential millions of homes remaining in Britain that could feasibly be insulated. The reduced level of funding and installations under ECO will continue to suppress the retrofit market in the short-term, and there is uncertainty regarding the longer-term future existence of ECO beyond 2022. However, further growth will be likely from the newbuild sector, with the number of housing completions currently forecast to increase at 3-4% per annum through to 2023.

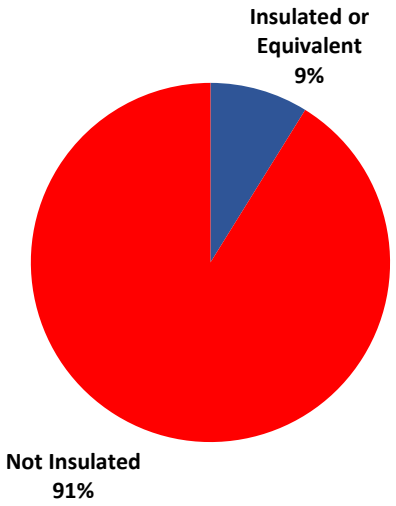
The National Insulation Association estimates that the average cost of having cavity wall insulation installed ranges from £330 for a flat to £725 for a detached house, making it approximately 50% more expensive to install than loft insulation. With estimated annual savings on energy bills of £315 for a detached house, the payback time for investing in cavity wall insulation is typically 3 to 4 years.

6.5 Domestic Walls Without Cavities

6.5.1 Profile of Dwellings Without Cavity Walls

As illustrated below, the vast majority of the circa 8.5 million dwellings in Great Britain without cavity walls have no wall insulation. The shift of focus under the Green Deal/ECO towards solid wall insulation measures has seen the number of insulated properties rise by around 5% in the last two years to around 752,000, but 91% remain uninsulated.

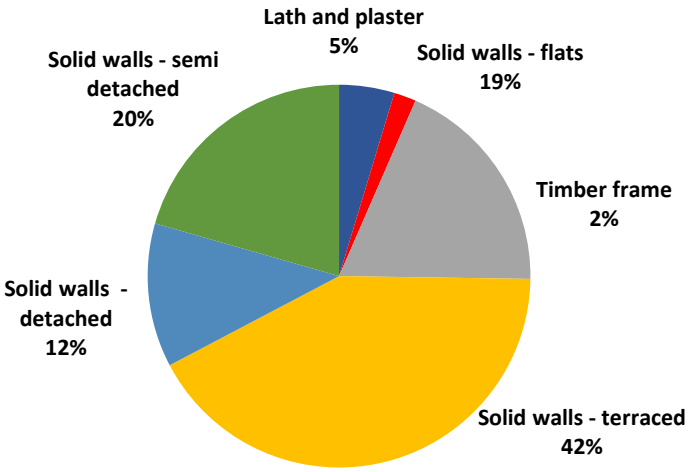
Chart 35: % GB Dwellings with and without Cavity Wall Insulation as at December 2018 - Circa 8.5 million dwellings without cavity walls



Source: BEIS – Household Energy Efficiency Statistics

The chart below provides a historic summary of the split between the main types of external wall construction, with solid walls the most widely built.

Chart 36: 8.5m Dwellings in GB Without Cavity Walls - % by Type of Wall Construction, Solid Detached, Solid Semi, Solid Terraced, Lath/Plaster etc

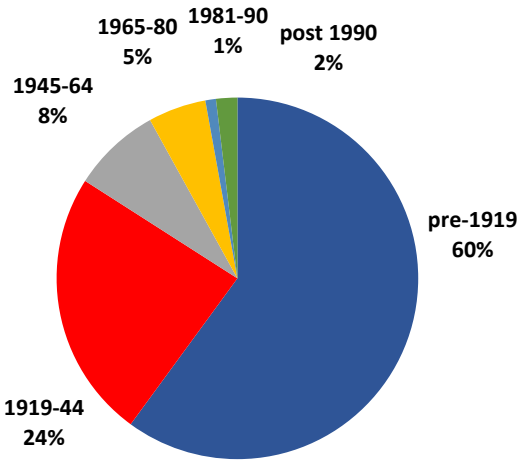


Source: AMA Research adapted from DECC report Review of The Number of Cavity Walls in Britain May 2012

Of the ~8.5 million dwellings with solid walls, ~40-45% are terraced houses, mostly located in large cities, particularly across the North of England. Around 20% of solid wall housing is flats, including both converted units as well as purpose built. A similar number of semi-detached homes also have solid walls, most of these having been built during the early part of the 20th century and mainly located in the suburbs. The remaining lath and plaster built houses are mainly found in Scotland.

As shown in the chart below, over 80% of dwellings with solid walls were built before 1944. Of all homes built before 1920, around 85% have solid walls.

Chart 37: GB 8.5m Dwellings Without Cavity Walls by Date Range by %



Source: AMA Research adapted from English and Scottish house condition surveys

Based on data from past editions of the English Housing Survey, compared to houses with cavity walls, a much higher proportion of dwellings with solid walls are located in urban centres, as illustrated below. This is largely explained by the fact that most medium-high rise blocks of flats, built with solid walls, are in situated in inner city areas.

Table 38: England – Proportions of Solid Walled Dwellings vs Cavity Walled Dwellings by Broad Location

Location	Cavity Wall	Solid Wall
City & Other Urban Centres	13.3%	37.0%
Suburbs	69.3%	45.5%
Rural	17.3%	17.5%
Number of Dwellings	16.4 million	6.9 million

Source: AMA Research adapted from English Housing Survey

Having a higher proportion of solid walled dwellings (particularly blocks of flats), in urban centres, coincides with high levels of deprivation and households in fuel poverty in urban centres.

6.5.2 Recent Trends in Domestic Solid Wall Insulation

External wall insulation (also known as insulated render) systems typically comprise a plain rigid foam or stone wool insulation layer fixed to building exteriors with layers of reinforcing measure and weather proofing with various decorative finishes, including wood and stone, on the top layer. The insulation layers are typically supplied by insulation product manufacturers to the external wall systems companies, which in turn supply their networks of approved contractors.

Under ECO, a total of just over 176,000 solid wall insulation measures have been carried out (from January 2013 to December 2018).

The table below provides estimated trends in demand for solid wall insulation. These have been calculated by annualising CESP/CERT and Green Deal/ECO data on measures undertaken and applying an average area of wall covered. The assumption is that most social housing properties are a mix of flats, semi-detached and terraced housing. Average external wall areas of flats are 70-90 m^2 and 95 m^2 for semi-detached homes while those for terraced units range from 60 m^2 (mid terrace) to 95 m^2 (end terrace). Therefore, we have taken 80 m^2 as a broad average for the calculations.

Table 39: GB Retrofit (Green Deal & ECO) Market for Solid Wall Insulation 2011 - 2018

Year	Million m²	% change
2011	1.5	+15
2012	6.5	+333
2013	3.2	-51
2014	4.7	+47
2015	2.6	-45
2016	2.4	-8
2017	1.6	-33
2018	1.8	+13
Total	**24.3**	

Source: AMA Research estimates based on CERT/CESP/Green Deal/ECO data

The massive increase in area installed in 2012 was primarily due to the acceleration in the number of external wall insulation measures carried out under CESP, although levels of installation have been far lower each year since. 2015 and 2017 saw further significant falls in the area installed to just 1.6 million m² in 2017, although this increased by 13% to 1.8 million m² in 2018, with solid walls being a particular area of focus under the current ECO.

The non-residential sector is not accounted for in the above table. Typically, however, social housing refurbishment has tended to be the largest end use market.

6.5.3 Market Prospects for Solid Wall Insulation

Although ECO continues to generate demand for solid wall insulation systems in recent years, latest estimates suggest that **the potential market is circa 7.75 million dwellings.**

With an estimated **2.5 million** solid wall dwellings located in lower income urban centres, the ECO remains a key tool in delivering solid wall insulation measures to low-income/fuel-poor households.

The NIA estimates that installation costs for solid wall insulation, for a typical semi-detached house, are around £13,000 for external walls and around £7,400 for internal walls. The NIA estimates that a semi-detached house could make an annual saving of £260 from being insulated. Using the lower estimate of £7,400 for an internal wall installation, the payback period will be around 28 years, several times longer than for either loft or cavity wall insulation.

A 2017 study by BEIS sought to identify current trends in installations, barriers to uptake and future innovations that could increase the number of installations being undertaken. The study found that the main barriers to installation are the cost and disruption of work, loss of internal space, changed appearance, low awareness of the options for wall insulation, and uncertainty about energy savings. The study also found that innovations in insulation techniques for solid walls have been undermined by a lack of demand, levels of which are unlikely to change significantly as evidence suggests that most homeowners will act to reduce energy use if the action they need to take is in line with the

benefits. The balance of costs against benefits for solid wall insulation suggests a significant increase in uptake is unlikely without Government subsidy, meaning that measures installed with support from ECO will continue to be the key driver of the retrofit market, funding for which will not increase in the short-term.

The UK government's relaxation of planning rules removed one of the barriers to increasing take up of solid wall insulation systems. Technical guidance on ***Permitted Development for Householders*** states that the installation of solid wall insulation '*constitutes an improvement rather than an enlargement or extension to the dwelling house' and is not caught by key provisions there*.' These changes mean that householders wishing to, can invest in external solid wall insulation without planning applications, except in the case of listed buildings in Conservation Areas. However, this development in isolation has not led to a significant increase in take up, and as already referred to, other significant barriers remain in place to deter homeowners from investing in solid wall insulation.

6.6 Other Applications

6.6.1 Ground Floor Thermal Insulation

With flooring, thermal insulation is mostly used at ground level, while acoustic insulation is typically used for intermediate floors, particularly in blocks of flats. Unlike lofts and walls, there have been no government backed initiatives at increasing the uptake of retrofitted floor insulation as floors are not a key source of heat loss. Therefore, demand for floor insulation is mostly limited to new housebuilding and also other types of new 'key worker' residences e.g. care and nursing homes, student accommodation, MoD accommodation etc.

All new housing and other full-time accommodation are required to have some form of ground floor insulation, although the type of insulation used is largely dependent on the construction of the floor. Traditional methods of floor construction include concrete ground bearing slabs, suspended concrete, beam and block and suspended timber flooring. If insulation is laid below the slab or screed layer then insulation with high compression properties will need to be used, such as stone wool, rigid polystyrene or rigid phenolic insulation.

As non-residential new build is a complex area of use, it is difficult to quantify the market. Based on MHCLG housebuilding data, it is estimated demand on new housing is currently within the range **11-13 million m²** annually**.** Demand for non-housing applications is currently likely to be less than this owing to falling levels of newbuild towards refurbishment and increasing RMI in sectors such as education and healthcare.

6.6.2 Acoustic Insulation

Acoustic insulation is mostly used internally for intermediate floors in flats and other shared residences, party walls and partitions in offices, hospitals and schools. The main materials used for this purpose are mineral wools. Stone wool is mostly used on flat roofs on buildings located in noisy areas such as under flight paths.

A key driver for acoustic insulation remains building regulations, specifically part E, which specifies the sound insulation values required in buildings. Whilst in the early to mid-part of the last decade, acoustic insulation saw growth in demand driven by the high level of construction of apartments,

house builders have reverted back towards building houses, with houses consistently gaining market share in recent years, which could see the requirement for acoustic insulation falling.

Based on MHCLG housebuilding data, it is estimated that demand for acoustic insulation for intermediate floors in flats is **1.5 -2 million m²**. Taking this as a reference point, a similar proportion is probably used on non-residential applications.

6.6.3 Site Built Metal Cladding and Roofing Systems

This section includes mineral insulation products supplied to site for use as insulation cores in twin-skin, metal wall cladding systems and standing seams roofs. Not included are metal composite panels with insulating foam incorporated at the point of manufacture.

Within the UK market for metal wall and roof cladding systems, around 70-80% of installations are newbuild, with overcladding and replacements accounting for the balance.

Industrial newbuild and major refurbishment typically accounts for **60-70%** of demand for both metal wall cladding and roofing. More recent positive trends in the warehousing and advanced manufacturing sector offers some opportunities for insulation in cladding and roofing systems.

In terms of product type, composite panels have gradually been taking share from built-up systems, due to a combination of factors:

- General trend towards prefabrication and requirements for faster installation times.
- Better thermal performance due to reduced risks of 'cold bridging'.

The Grenfell Tower fire in 2017 could have a significant impact on the cladding market. A possible ban on the use of combustible materials on buildings over 18 metres tall may well depress demand for cladding systems comprising rigid polymer insulation while benefitting those classified as A1 under Euroclass definitions e.g. stone and glass wool, concrete and fibre cement. The Hackitt Review, published in 2018, found that 'the current regulatory system for ensuring fire safety in high-rise and complex buildings is not fit for purpose.' The key reasons cited for this were:

- Current **regulations and guidance are too complex and unclear**. This can lead to confusion and misinterpretation in their application to high-rise and complex buildings.
- **Clarity of roles and responsibilities is poor**. Even where there are requirements for key activities to take place across design, construction and maintenance, it is not always clear who has responsibility for making it happen.
- Despite many who demonstrate good practice, the **means of assessing and ensuring the competency of key people throughout the system is inadequate**. There is often no differentiation in competency requirements for those working on high-rise and complex buildings.
- **Compliance, enforcement and sanctions processes are too weak**. What is being designed is not what is being built and there is a lack of robust change control. The lack of meaningful sanctions does not drive the right behaviours.
- The route for **residents to escalate concerns is unclear and inadequate**.
- The system of **product testing, marketing and quality assurance is not clear**.

Hackitt's final report proposed a new regulatory framework to address all of the identified weaknesses and place a stronger focus on creating and maintaining safe buildings. The proposed new framework will focus initially on multi-occupancy, higher risk residential buildings (HRRBs) that are 10 storeys or more in height, and is designed to:

- **Create a more simple and effective mechanism for driving building safety** – setting out a clear set of responsibilities for duty holders across a building's life cycle.
- **Provide stronger oversight of duty holders** with incentives for the right behaviours, and effective sanctions for poor performance. More rigorous oversight of duty holders will be created through the creation of a new **Joint Competent Authority (JCA),** comprising Local Authority Building Standards, fire and rescue authorities and the Health and Safety Executive.
- **Reassert the role of residents** – giving residents a voice in the system through providing reassurance and recourse for residents of all tenures by providing greater transparency of information on building safety, greater involvement in decision-making, and a no-risk route for residents to escalate concerns on fire safety where necessary, through an independent statutory body.

Hackitt explicitly stated that the review would not recommend detailed changes to technical requirements, as this was outside the scope and competence of the team conducting the review.

7. SUPPLIERS

7.1 Manufacturers & Suppliers Market Shares

The building & technical insulation products industry is reasonably fragmented, comprising a number of distinct sub-sectors. Some of the larger manufacturers and suppliers operate across several of these, while smaller companies tend to focus on just one or two.

The table below illustrates our estimate of overall market shares of the major suppliers of building and technical insulation in the UK. Several of the larger companies manufacture or supply products outside the scope of this report. The market shares should therefore be regarded as indicative.

Table 40: UK Total Market Shares by Value

Company	% Share
Kingspan Group (Kingspan Insulation, EcoTherm, Kingspan Tarec and Springvale Insulation)	28
Knauf Insulation	15
Saint Gobain Construction Products (Celotex & Isover)	13
Rockwool	11
Xtratherm	7
Recticel Insulation	6
Kay-Metzeler EPS (div of Vita Cellular Foam)	4
Jablite	3
Superglass Insulation	3
Promat UK	2
Others include Celecta, Armacell, Paroc, CIUR, URSA UK, Web Dynamics, Thermal Economics.	8
Total	100

Source: AMA Research/Trade Estimates

The three largest manufacturers have remained the same for several years - Kingspan, Knauf and Saint Gobain – and their market share has increased in the last two years, accounting for an estimated 59% of the UK building & technical insulation products market, compared to 54% two years ago. This has been due to Kingspan – the largest supplier – increasing its market share, with strong turnover growth across the four insulation companies in the Group. Some other significant suppliers have seen a fall in market share, including Xtratherm, Promat and Jablite.

It should be noted that this does not take into account insulated/panels and pre-insulated OSM systems. Kingspan Group is also the largest manufacturer of both metal composite panels and OSM systems.

7.2 Profiles of Major Insulation Manufacturers

The following section highlights some of the main building insulation manufacturers but excludes manufacturers and suppliers of building products that incorporate insulation material such as insulated render systems and corporate panels.

Kingspan Group's insulation boards business in the UK comprises Kingspan Insulation Ltd, Kingspan Industrial Insulation Ltd (formerly Kingspan Tarec Industrial Insulation Ltd), Springvale Insulation Ltd and Ecotherm Insulation (UK).

Kingspan Insulation, the original company, manufactures and supplies insulation products for both domestic and non-residential applications. Products include the *Kooltherm* brand of rigid phenolic boards, PIR boards under the *Therma* brand, rigid XPS boards under the *GreenGuard* brand, and rigid vacuum insulation panels under the *OPTIM-R* brand. In the UK, insulation boards are manufactured at Leominster in Herefordshire and at Leeds in West Yorkshire. For the year ending December 2018, turnover was £205.3m, decreasing for the first time since 2013.

Kingspan Industrial Insulation manufacture insulation solutions for a range of applications such as HVAC, petrochemical and refrigeration, with products including pipe insulation, insulated pipe support inserts, fire-sleeves and slab insulation. Turnover was just over £15.2m in the year to December 2018, up from £13.8m in 2017.

Springvale Insulation has been part of the Kingspan Group since 2011, when it was acquired along with the rest of CRH Group's European insulation division. From its two UK manufacturing plants, at Glossop in Derbyshire and Newcastle-Upon-Tyne, Springvale manufactures and supplies EPS insulation products for floors (through its *Beamshield* and *Floorshield* brands), walls (*Ecobead*) and roofs (*Roofshield, Hydroshield*). For the year ending June 2018, turnover was around £33.6m, up from £25.5m in 2016.

EcoTherm Insulation UK operates two plants in Essex and Holland (for supply to the UK), manufacturing PIR rigid boards for roofing, lofts, cavity walls and floors for the domestic and non-residential sectors. For the year ending December 2018, turnover was around £63.2m, down from £65.4m in 2017.

Knauf Insulation, part of the **Knauf Group**, operates in the UK out of three production sites, making glass wool at St Helen's in Merseyside and Cwmbran in North Wales and stone wool at Queensferry in North Wales. In 2017, the company sold its XPS manufacturing plant in Hartlepool to **Ravatherm UK** (now trading as **Polyfoam XPS Ltd**), part of the Ravago Group, a global service provider to the plastic, rubber and building industries employing 4,500 people.

Although a key supplier of thermal, fire protection and acoustic products for the residential market, Knauf is also a key supplier of products for commercial and industrial applications.

A comprehensive range of glass wool and rock wool building thermal, acoustic and pipe insulation products are manufactured and supplied under the *Earthwool* brand. Rock wool products are marketed under the *Rocksilk* brand which include slabs for external wall insulation (EWI) systems, along with the following specialist branded products:

- *Thermo-teK* – for HVAC ductwork.

- *Fire-teK* – for fire protection of ductwork and structural steel.
- *Power-teK* – for industrial applications.
- *Urbanscape* – for green roof and wall systems.

The company also produces non-combustible blowing wool for a range of applications under the *Supafil* brand.

For the year ending December 2017, turnover grew slightly to £172.8m, up from £161.3m in 2017.

Saint Gobain UK's Construction Products division comprises three businesses manufacturing or supplying insulation products. These include; **Isover** (SGI - glass wool insulation products), **Ecophon** (mineral fibre ceiling tiles) and **Celotex** (PIR rigid foam boards).

Celotex operates out of factories near Ipswich and Goole where it manufactures PIR boards for domestic and non-residential use. Commercial and industrial products are supplied for flat roofs, partitions, concrete floors, stud-framed walls and external wall insulation.

SGI manufactures and supplies glasswool insulation for the building and technical markets. In addition to products for cavity walls and lofts, non-residential insulation for buildings includes rolls for metal cladding systems, rolls and slabs for sound and thermal insulation in partitions, modular buildings and fire protection for ductwork. Technical insulation products include; pipe sections, slabs and rolls for ductwork, pre-insulated ductwork.

Xtratherm UK manufacture and supply rigid PIR boards (*Thin-R, CavityTherm* and *Xtroliner)*, phenolic foam boards (*Safe-R)* XPS and EPS (*Warm-R*) and structural insulated panels (*UniSIPS*) for both domestic and non-residential walls, floors and roofing. The company now has factories in Derbyshire, County Meath in Ireland and a third facility in Belgium. Turnover has been falling consecutively in recent years, from around £106.14m in 2014 to £74.6m in 2018.

Rockwool UK, with a factory at Bridgend in South Wales employing 400 people, manufactures stone and slag wool insulation products for thermal, fire protection, and acoustic applications. The core market for Rockwool is construction, particularly renovation but products are also used by customers in the horticultural, marine and offshore sectors.

Rockwool's product range is broadly split between building and technical uses including thermal, acoustic and fire protection insulation. Building applications are wide ranging including; cavity walls, ground floors, flat roofs, external walls, ductwork, fire barriers, metal roofing & cladding systems, lofts, cavity closers and facade systems. Technical insulation products are primarily used in the process, marine, offshore and downstream petro-chemical industries to protect pipes and vessels and other equipment exposed to high temperatures.

Turnover has risen year on year, up from £83.8m in 2014 to £153.3m in 2018.

Recticel Insulation Products is part of Recticel UK, ultimately owned by the International Recticel Group, which has its head offices in Belgium. In the UK Recticel has 5 factories manufacturing and converting rigid foam and flexible foam for various end-use applications including furniture fillings, crash barriers, clothing, mattresses and insulation. Insulation accounts for around 18% of the group's turnover. The factory at Stoke-on-Trent manufactures and supplies rigid PIR boards under the *Eurothane* and *Eurofloor* brands for floors, ceilings and lofts, *Eurowall* for walls, *Powerdeck* for flat

roofs and *L-Ments* for pitched roofs, across the domestic and industrial sectors. Total turnover for Recticel UK exceeded £133.8m in 2017, up from £105.6m in 2015.

Vita Cellular Foams (VCF) is the largest subsidiary of **British Vita Group**, accounting for 52% of group turnover. VCF operates in two key markets - comfort applications such as furniture and bedding and technical applications such as automotive, aviation and industrial and construction. Insulation products are manufactured by the **Kay-Metzeler** EPS division, which include thermal insulation boards for ground floor, cavity wall, internal floor and pitched roof applications under the *Kay-Cel Plus* and *Kay-Cel Super Plus* brands. Turnover for the company as a whole was over £147.5m in 2018 up from £138.7m in 2017.

Promat UK is a subsidiary of Promat International, itself a part of the pan-European Etex Group. Promat is a leading UK manufacturer and supplier for passive fire protection and high temperature insulation products, having completed a major factory development expanding its capacity at its Heywood site in Lancashire in late 2017. The company also operates a separate site at Carlton in Nottinghamshire for spray production.

Most of the company's products are for non-residential use including buildings and petro-chemical plants. Fire protection products are also supplied for marine & offshore installations and tunnels. Key products for buildings applications are: *Supalux* and *Masterboard*, (calcium silicate boards for fire-resistant uses), *Durasteel* (composite boards of fibre reinforced cement bonded to punched steel sheets) and *CAFCO* (spray products to upgrade fire protection performance). Turnover fell to £17.4m in 2018, down from £19.2m in 2017.

Jablite, is the UK's leading manufacturer and supplier of EPS products to the building and civil engineering markets. Previously an autonomous subsidiary of the Synbra Group, the company's management bought the company in 2015. Turnover grew to £29.5m in 2018, up from £24.3m in 2017. Insulation products include rigid boards for thermal insulation for use in roofs, ground floors and walls, supplied under the *Jablite, Jabfloor* and *Jabfill* brands. Among products supplied for non-residential applications are: boards for cold store floors, solid and suspended floor systems, timber wall panels, warm deck and inverted flat roofs and external walls. In mid-2018, Jablite announced a partnership with the national insulation installer Miller Pattison, to be the sole supplier of Supabead, Miller Pattison's own-brand cavity wall insulation.

Superglass Insulation is part of the **TechnoNICOL Group** and manufactures a broad range of thermal and acoustic glass wool insulation products. Although the housing market is core to the company's activities, Superglass also offers several products for non-residential applications e.g. cladding mats for built-up metal panel systems and acoustic slabs/rolls for partitions/internal walls. The company recorded turnover growth of 39% in 2018, increasing from £23.6m in 2017 to £32.9m in 2018, as a result of increased sales and rising prices. The company is also currently investing £37m in doubling the production capacity of its Stirling plant.

Armacell UK, part of the global Armacell Group, manufactures a range of engineered foam products including technical insulation for heating and plumbing, HVAC, acoustic, refrigeration, process, transport, solar and marine applications. Armacell claims to be the world leader in the supply of flexible technical insulation material, mostly under the *ARMAFLEX* range. Other brands include

Tubolit thermoplastic pipe insulation and *Armasound* acoustic insulation. Turnover for the year to December 2017 increased to just over £15.2m, up from £14.4m in 2016.

Thermal Economics supplies thermal and acoustic insulation for new build and conversions in domestic, commercial and office applications, supplying house builders and modular building sectors. Thermal insulation products include *Alreflex* foil insulated rigid EPS boards for cavity walls, micro-perforated insulating membranes for ground floors (*Floortherm* and *TE Ground Floor Insulation*) and its *Raftertherm* boards for pitched roofs. Turnover for the year to October 2018 was estimated to be just over £20m, up from £18.6m in 2016.

Cellecta is one of the UK's largest producers of environmentally friendly high performance thermal and acoustic insulation products for residential, education, commercial and industrial uses. Thermal insulation products include XPS and EPS and acoustic insulation includes EPE and PU products. Turnover in the year to December 2018 was around £20m, up from £19.2m in 2017.

Ravago Building Solutions (part of the **Ravago Group**) claims to be the largest producer of XPS in Europe, following its acquisition in 2018 of seven XPS production plants from **DowDuPontInc**. In the UK, the company operates from its base in King's Lynn, Norfolk, and also incorporates the XPS plant of Ravatherm UK, which is part of Ravago Building Solutions. In the UK, its XPS product range includes brands such as *XENERGY* roofing products, *PERIMATE* wall and *FLOORMATE* flooring insulation.

CIUR specialises in the production of cellulose fibres for a broad range of applications including horse bedding, artificial snow, products for agriculture as well as an insulation range for lofts, roofs, walls and floors through its *Warmcel* ® and Climatizer Plus ® brands of cellulose insulation. These products are manufactured and sold through CIUR (UK) from its base in South Wales.

Pittsburgh Corning UK – now part of Owens Corning **-** is the UK's principal supplier of foamed glass insulation (*Foamglas* ®). Made from cellular glass, *Foamglas*® is a premium, high-impact product primarily used for building envelopes, flat roofs, standing seam roofs and car park decking. Turnover for 2018 was estimated to be around £6m.

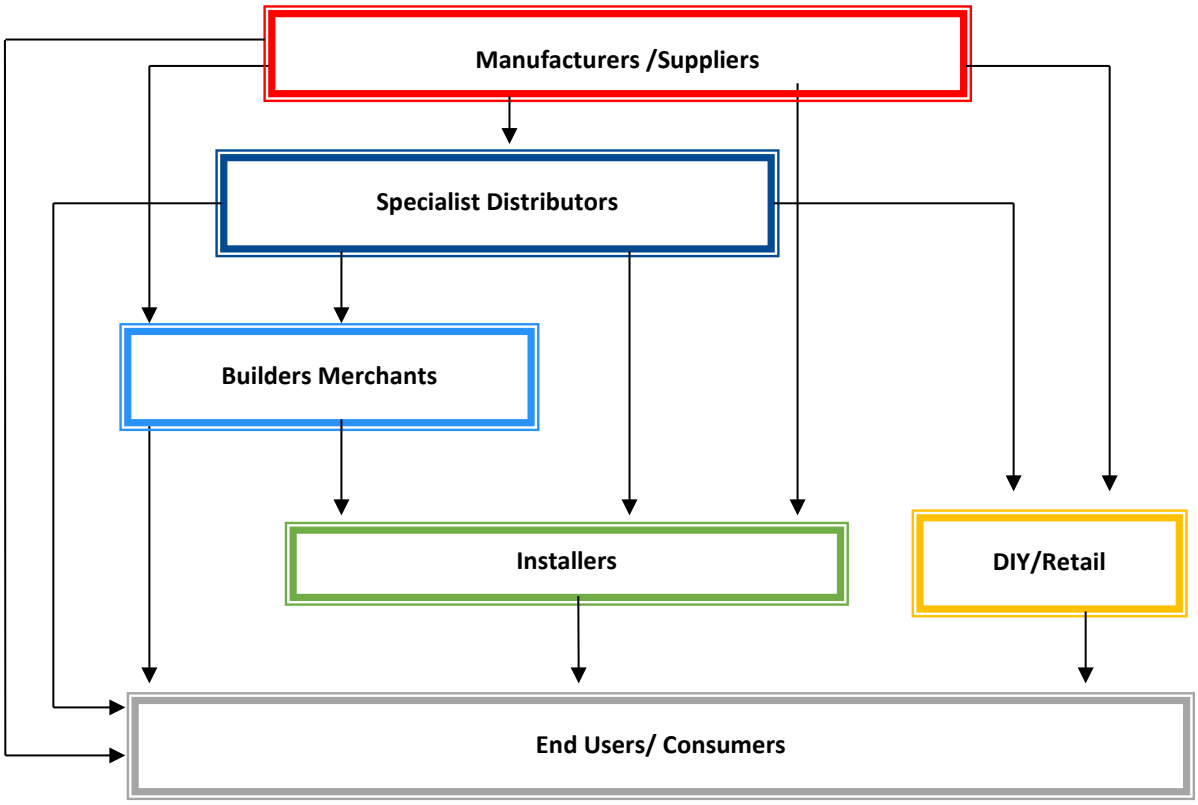
Other suppliers of insulation product include **Euroform Products** (foil and natural insulation), **International Petroleum Products** (foil insulation through *Alumaflex*, PIR through *Ballytherm* and sheep's wool insulation, through *Black Mountain*), **NMC UK** (rubber and polyurethane foams), **Novostrat** (polyethylene foam and foil), **Web Dynamics** (foil). TLX Insulation is part of Web Dynamics Ltd which designs and makes thin, high performance insulation at a production facility at Blackrod, Lancashire.

8. DISTRIBUTION

8.1 Overview

The distribution network of building insulation products is complex due to the large number of manufacturers and suppliers and variety of trade and retail channels available to the industry. The following chart illustrates a simplified model of the distribution channels for building and structural insulation products in the UK:

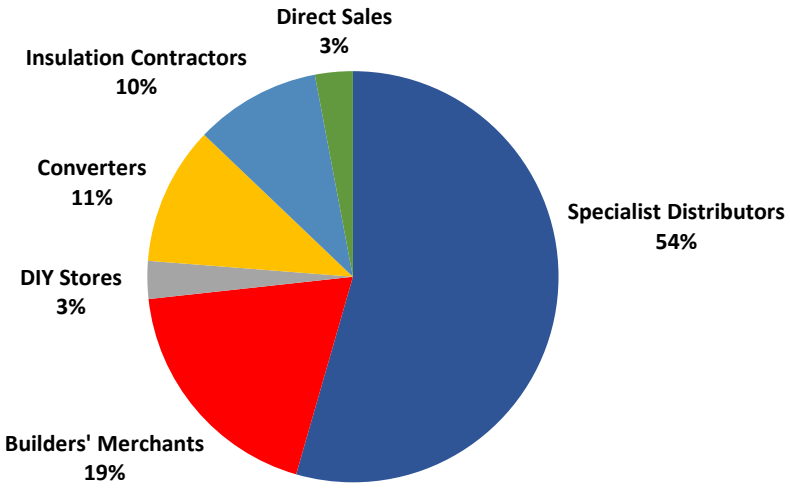
Chart 41: Major Distribution Channels for Building Insulation Products



Source: AMA Research

Specialist distributors supply to registered installers, of which there are just over 50 operating on national and regional scales. The specialist distributors have a key role in distribution, supplying to smaller merchants and retailers as well as installers and end users. However, this makes estimating channel shares difficult as including this type of intermediary supply role can result in double counting. The following chart shows estimated shares by key distribution channels for building insulation products.

Chart 42: Building Insulation Products Distribution – Estimated % Shares by Value



Source AMA Research Ltd

Specialist distributors remain the largest channel, and this is unlikely to change in the near future. These specialists, as mentioned previously, supply a number of other channels, namely:

- **The national and larger regional installers** - these are registered with the systems designers.
- **Industrial services contractors** - these operate on the larger HVAC & pipework insulation contracts within the industrial sectors and on the larger projects within the commercial and public non-housing markets.
- **Specialist cladding/façade, roofing and flooring contractors** – these use large volumes of insulation products on the larger new housing schemes and other major newbuild developments.
- **Regional and independent distributors** as well as the smaller merchants.

Direct sales occur in the market but are a small but increasing part of sales .

8.2 Distributor Profiles

SIG plc is a multi-national company supplying insulation, interiors, roofing and specialist construction products to customers in the UK, France, Benelux and central Europe. Key markets include building, engineering, process, petro-chemical, offshore, marine and manufacturing industries. The insulation and interiors specialist distribution arm accounted for 60% of total group turnover in 2018.

Within the UK, SIG is the largest distributor of insulation products with turnover of around £2.7 billion, supplying materials ranging from loft insulation rolls through to high-specification products for the petro-chemical industry. The company supplies insulation products through 265 trading sites, with its many UK subsidiaries including: **Ainsworth Group**, **Clyde Insulation, CMS Danskin** (acoustic

insulation), **Euroform Products, IMS** (high temperature insulation), **Mayplas**, **Macgregor & Moir** (high temperature insulation), **SIG Technical Insulation, SIG Insulation** and **Warren Bestobell.**

Encon Insulation, part of the Encon Group, is a leading independent building products distributor with turnover of around £248m in 2018. Encon offers a complete range of thermal, acoustic and fire insulation from all major manufacturers as well as ceilings, drywall, partitioning and fire protection products. Key end use markets include industry, such as HVAC and power generation, building, interior systems and roofing and cladding. Encon has 22 branches throughout the UK and products can be delivered to store or site.

CCF is part of the Travis Perkins group of companies and is a leading distributor of interior building products to the construction industry. Products supplied include insulation, drywall, ceilings, external envelope, fire protection, flooring, partitioning and tools/accessories. CCF operates 42 branches, a number of which are specialist insulation branches. Insulation products include mineral wool, acoustic and rigid board insulation for roofs, floors and walls as well as accessories. The company offers all main brands.

Minster Insulation is a specialist insulation distribution subsidiary within Saint Gobain Building Distribution Ltd operating a nationwide network of 20 branches. Minster Insulation also supplies fire protection, protective clothing, dry lining and partitions, roofing and cladding products. The company stock most of the main brands.

FGF is an independent distributor with 3 branches in Birmingham, Bristol and Manchester supplying insulation for high temperature and general industrial and commercial use. Products include building, cladding, roofing and fire protection products from all major brands.

There are also a large number of smaller, regional enterprises operating in the distribution of building insulation. Builders' merchants and smaller independent distributors tend to supply glasswool, rigid foam board and multi-foil products. Medium to small specialist insulation installers are a key customer group to these distributors, as well as general builders, for use in small or medium housing projects, both new build and refurbished, as well as new build non-residential work.

Among the biggest suppliers of insulation products are the leading national builders' merchants: **Jewson** (Minster Insulation), **Travis Perkins** (CCF), **Grafton** (Buildbase) and **Encon**. Traditionally, insulation has been a strong sector for merchants, although largely dependent on the domestic market.

Direct sales by manufacturers to end users are seen particularly in blowing wools and beads, which are typically sold direct to installers of site-assembled metal cladding and manufacturers of modular building systems. This is one of area that is expected to grow in line with the growing use of modular and off-site housebuilding techniques. Converters typically source glass and stone wool fibres direct, in order to fabricate composite insulation products such as mineral wool rolls or quilts with foil or laminate. Products are then supplied to installers and OEMs etc. Such companies include ***Mayplas, Siderise*** and ***MDL Insulations***.

8.3 Installers

This section reviews some of the main contractors installing thermal insulation products into buildings. The installers market, although less turbulent than in the Green Deal era, has continued to experience some difficulties in recent years as levels of demand for retrofitted insulation have continued to be constrained by the reduced funding of ECO, which has had a massive impact on even some of the largest installers.

In that particularly turbulent period, a number of national installers went into liquidation, including Domestic and General Insulation, the **Mark Group** (the insulation arm of the company was bought out by its management and went on to trade as **BillSaveUK**, making a loss each year until it was acquired by the roofing contractor Avonside in August 2019) and **Viscount Environmental**. **Carillion Energy Services**, one of the largest national contractors went under with the rest of Carillion when it collapsed in early 2018, and had also experienced a huge drop in turnover since the end of CERT.

The largest of the remaining national contractors are **Instagroup, Dyson Energy Services, Everwarm, A & M Energy Solutions, Lawtech** and **Miller Pattison,** several of whom have experienced falling turnover in recent years.

The **Everwarm Group** offers energy saving advice and services to the domestic and commercial sectors and large-scale private or social landlords. The company specialises in energy saving solutions including heating, insulation and micro-generation, while it also offers services in repair and maintenance, refurbishment, electrical services (including electrical vehicle charging), and renewables. Company turnover for the year to September 2018 was £55.3m, down from £60.2m the previous year.

Lawtech, based in Rochester, Kent, claims to be one of the UK's leading external wall insulation contractors, employing 60 staff. It had an 18-month turnover in the year to September 2018 of around £21.5m, down from £26.7m in 2016 but up from £17m in 2017.

Miller Pattison is owned by the boiler and central heating provider **Help-Link UK Ltd**. The firm operates nationwide through a network of 11 depots, providing cavity wall, loft and external wall insulation as well as other boiler, central heating and electrical services. A key operator in the ECO retrofit market, the company had achieved several years' strong growth in turnover during the EEC and CERT periods. However, turnover for the year to March 2018 was £10.8m, down from around £56m in 2012, reflecting the fall in demand as ECO replaced CERT. The company has reduced its activities and cost base in line with the reduction in ECO funding, but made a loss of £238k in the year to March 2018. While the company remains active at the point of writing, Miller Pattison entered administration on the 23rd August 2019.

InstaGroup operates on a national basis, supplying and installing a wide range of insulation products through the Snug Network, a nationwide organisation of InstaGroup approved and nationally accredited installers. The company's focus is on the residential retrofit market, installing its own brands of cavity wall and loft (*InstaFibre*), solid wall (*InstaClad* - external, *InstaLine* - internal) insulation and also acoustic solutions (*Instacoustic)*. Group turnover for the year to June 2018 was just £20.4m, slightly up from £20.1m in 2017 but down from £25.9m in 2016.

Dyson Energy Services is a national company which installs insulation, heating solutions and renewable technologies. The company started in loft insulation installation but expanded to more than 400 employees across 9 sites. The company's insulation services cover cavity wall, solid wall and loft insulation. The declining subsidised retrofit market has caused difficulties for the company, which now employs less than 200 people compared to nearly 400 in 2013. Turnover for the fifteen months to March 2018 was around £12.7m, less than half of its 2014 level, and the company has been in a Company Voluntary Arrangement since 2017.

A & M Energy Solutions is a family business providing energy efficiency services to homeowners, local authorities, RSLs and other commercial customers. The company operates out of 10 locations across the UK and employs around 200 people, with services encompassing internal insulation, external wall insulation, fire barriers and draught proofing. Company turnover for the year to June 2018 was around £23.2m, down from a high of £46.1m in 2013.

The next rank of companies mainly includes larger regional contractors with annual turnovers within the range of £5m-15m. These include; **ThermaBead, AC Whyte & Co**, **Inbuild Solutions** (formerly **Essex Insulation)** and **Gill Insulation** (commercial and industrial sectors only).

APPENDICES

APPENDIX A: Economic Environment

A.1 Overview and Outlook

In 2020 Covid-19 delivered the deepest GDP contraction since 1709 with a fall of 9%. While output contracted by 25% between March and April, it recovered strongly by 19% up to July. Since then the recovery has slowed, with a further 4% recovered up to the end of October. The second UK-wide lockdown in November failed to produce a double-dip recession but activity flatlined in Q4.

The construction industry experienced a strong 2019, even with political uncertainty over the second half of the year. Output was a record £176bn. In 2020, as Covid-19 hit the construction industry contracted by 47% over March and April as movement restrictions resulted in the closure of construction sites. It then recovered by 48% over May to July and returned to pre-Covid-19 levels between September and November. However, it finished 2020 weakly in December, falling by 12%. Overall, in 2020 construction output fell by 12%: a much smaller amount than expected earlier in the year.

The industry has demonstrated it is able to operate successfully through successive lockdowns. The main areas that will hold the industry back are uncertainty in the economically-sensitive sectors and a lack of ambition from the government's "build back better" strategy.

In summary, the short-to-medium term economic outlook includes:

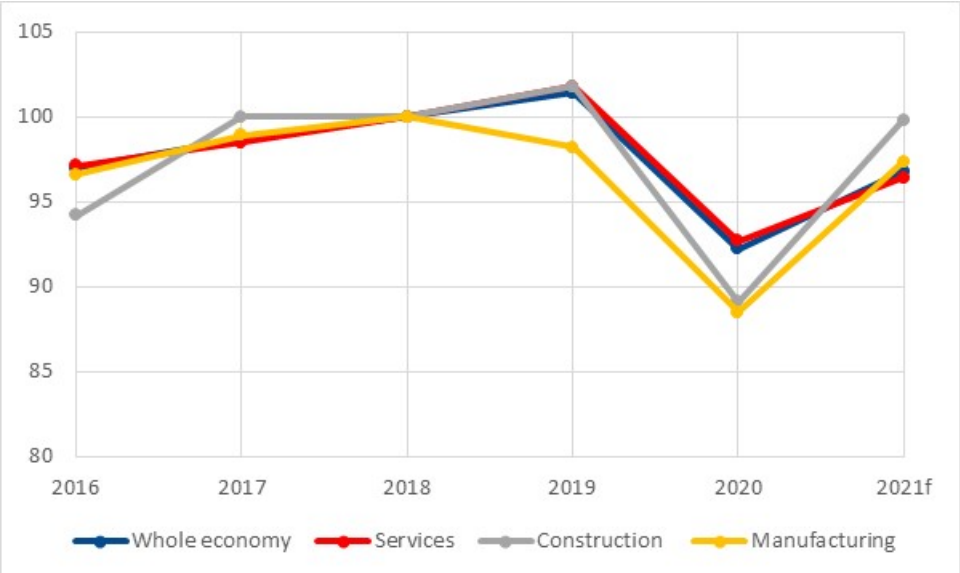
- GDP change of -9% for 2020 and +5% for 2021.
- The construction sector contracted significantly in 2020 by 12%. The recovery over the summer has lessened the impact in 2020 but we anticipate continued uncertainty over the near term as the as the economy recovers from the Covid-19 pandemic.
- The Infrastructure, Education and Healthcare sectors remain a source of growth from 2021 due to Government promises to boost spending.

A.2 GDP

- Brexit and political uncertainty held back the UK economy in 2019. A decade of growth-impairing austerity has left the economy structurally weak, with high consumer and business debt and low public and private investment.
- The December election result and the UK's withdrawal bill gaining accession failed to produce a bounce in GDP, with output in December 2019 to February 2020 flat.
- GDP in April 2020 contracted by a record 25% between March and April as the UK hit the bottom of the Covid-19 trough. The economy then rebounded strongly (by 19% up to July) as movement restrictions were relaxed and infection rates remained low. Since then however the recovery has slowed, with only a further 4% recovered up to the end October.
- The second UK-wide lockdown in November failed to produce a double-dip recession but activity flatlined in Q4.
- The UK's GDP growth rate for 2019 was 1.0%, falling from 2.3% in 2015. GDP in 2020 fell by 9%, the worst year since 1709.

- Meanwhile a thin Brexit deal was sealed that avoided a disastrous cliff edge. The deal is the largest imposition of trade barriers and red tape in memory. Trade appears to have been immediately impacted, with import and export difficulties, especially in Northern Ireland. The scale of these difficulties, as well as impacts on inflation and labour supply will be revealed in official data over the next few months.
- The Brexit agreement leaves many issues unresolved. What we are likely to end up with is a continuous re-evaluation of trade agreements with the EU, with damaging uncertainty and additional regulatory barriers with few obvious benefits.
- Maintaining government support through Covid-19 is also a key factor. Without ongoing support measures the scale of unemployment and business failure would be very significantly higher. As the economy recovers support will be withdrawn; unemployment will trend higher as this occurs.
- The Covid-19 recession will undoubtedly be value-destructive. Forecast GDP is currently:
  - 2020: -9%
  - 2021: +5%
  - 2022: +5%
- One significant upside is the UK's pace of vaccination. There are hopes of a loosening of restrictions in the spring. However, it is a high-risk strategy: everything is now riding on the effectiveness of the vaccine and the level of immunity that arises. A vaccine resistant infectious strain will set recovery back significantly.
- Increasing company insolvencies and labour market redundancies, plus high debt levels among consumers, firms and government are likely to act as a drag on growth. The Covid-19 crisis will therefore cause a loss in productive capacity in the economy.
- All major sectors of the economy are contracted over 2020. The chart below outlines sector-level GDP.

Chart A1: GVA Chained Volume Measures, 2016-2021, Key Constituent Elements

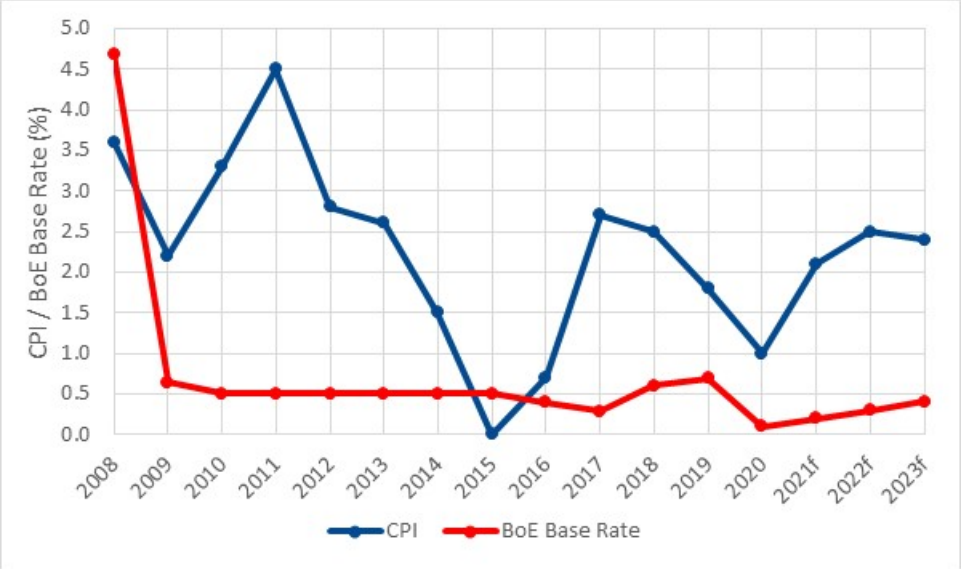


Source: ONS / AMA Research

A.3 Inflation & Interest Rates

- The Bank of England made two emergency interventions to the Base Rate in March, cutting it from 0.75% to its lowest rate ever of 0.1%. The Bank has stated it will not countenance negative rates. It has however greatly increased its Quantitative Easing programme to further artificially lower borrowing costs.
- CPI inflation averaged 1.8% in 2019 and fell to 1.0% in 2020. Inflation is expected to increase over 2021 as the inflationary effects of Brexit are felt and overseas demand picks up. The following graph shows historical and forecast CPI inflation and the Bank of England base rate.

Chart A2: CPI Inflation and Bank of England Base Rate, 2008-2023



Source: ONS / Bank of England / AMA Research

- The Bank of England is expected to maintain ultra-low base rates for the medium-term, only increasing the base rate conservatively as the economic situation improves. High levels of debt among governments, businesses and households will necessitate an interest rate policy at ultra-low levels for the foreseeable future.

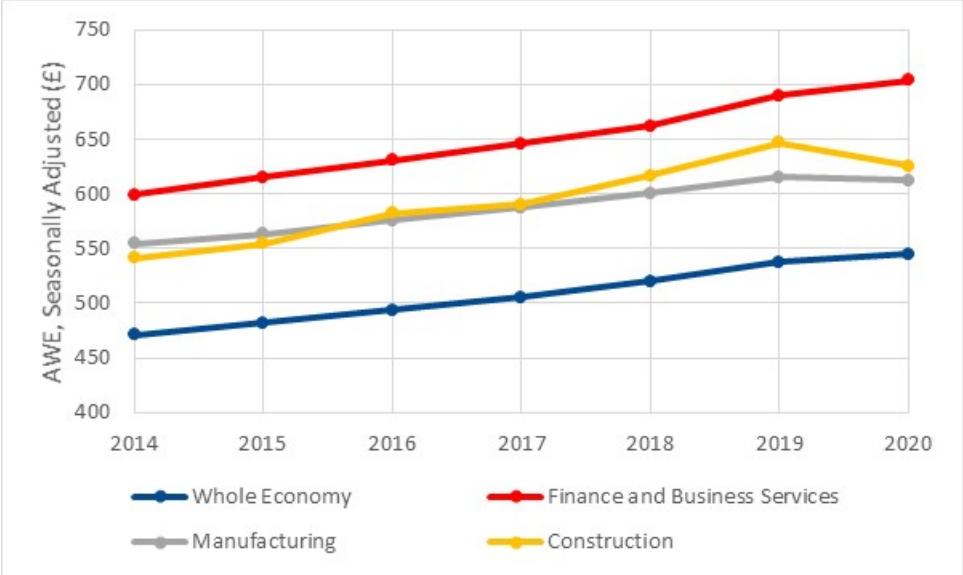
A.4 Employment & Wages

- Employment was at a high at the end of 2019 with a total number of 32.8m people employed. Over the initial lockdown the unemployment rate remained low at 3.9%, as the government furlough scheme effectively delayed companies laying off staff.
- ONS data for September showed that redundancies increased to record levels. Unemployment increased to 5.1% over October-December.
- Without government support the unemployment level would be much higher. There are concerns that the current measure significantly underestimates the level of unemployment.

The scale of future increases will be largely dependent on how quickly government support is withdrawn.

- The Brexit deal throws up new barriers to the free flow of labour. Construction workers are not included in the government's new regulations; there is a risk of labour supply issues becoming more pronounced over 2021, especially in the South East.
- The following graph displays average weekly earnings by sector and for the whole economy from 2014 to 2019. Average weekly earnings are expected to fall in 2020, with construction the most impacted due to the scale of site closures over lockdown.

Chart A3: Average Weekly Earnings Data – GB - Total Pay – 2014-2019 (Seasonally adjusted)

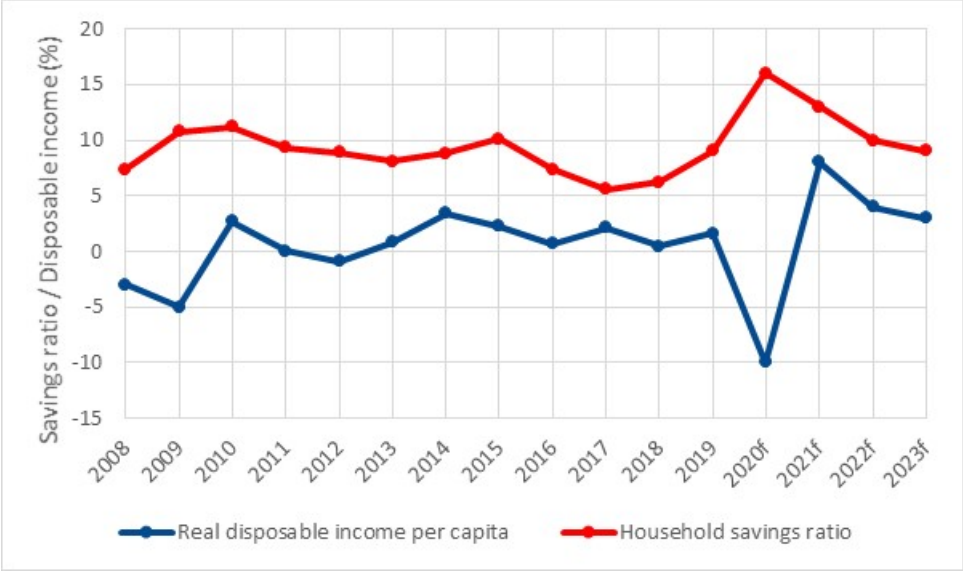


Source: ONS / AMA Research

A.5 Household Consumption

- Real disposable income was growing by around 1.0-1.5% per annum over the last year, due to slightly stronger wage growth and inflation remaining subdued as noted above.
- However, before the Covid-19 crisis household finances remained tight, reflecting low real disposable income growth. To mitigate this households have recently been running down savings and taking on debt to boost consumption as low interest rates discourage saving. This has had the result of boosting GDP and masking the underperformance of other sectors.
- Before the Covid-19 crisis, it appeared that households had started to repair their finances, or at least take debt on at a slower rate, as the savings rate has increased to 6.5% in 2019 from a low of ~5% in 2017.
- The following chart shows the annual growth in disposable income per capita and the savings ratio from 2008 to 2023.

Chart A4: DI per capita & Savings Ratio at Current Prices 2008-2023



Source: ONS / AMA Research

- The pandemic has caused very large shifts in the data for 2020 due to the government support measures which has seen income support. This has led to falls in income for furloughed workers, resulting in large income falls. At the same time the savings ratio has increased significantly as people have not been able to spend their income. Growth should resume from 2021.
- The savings ratio is anticipated to continue to grow at a faster rate than previously as citizens respond to the experience of the crisis in a risk-averse fashion by building up their savings.

A.6 Sterling

- In mid-2016, the Brexit vote resulted in a sharp fall in Sterling – over 12.5% against the Dollar and around 10% against the Euro. Sterling remained weak against both the Euro and the Dollar during 2017 and 2018.
- Until mid-August 2019, Sterling again fell against other currencies as markets priced in the impact of Brexit to the UK economy. Over the remainder of 2019 the Pound strengthened from £1.20 per $ and £1.06 per € to £1.33 and £1.20 respectively. The Pound experienced a significant appreciation as the General Election delivered some certainty and the markets' favoured outcome.

Chart A5: Exchange Rate Fluctuations 2015-2019, Sterling to the Dollar and the Euro, Spot Rates

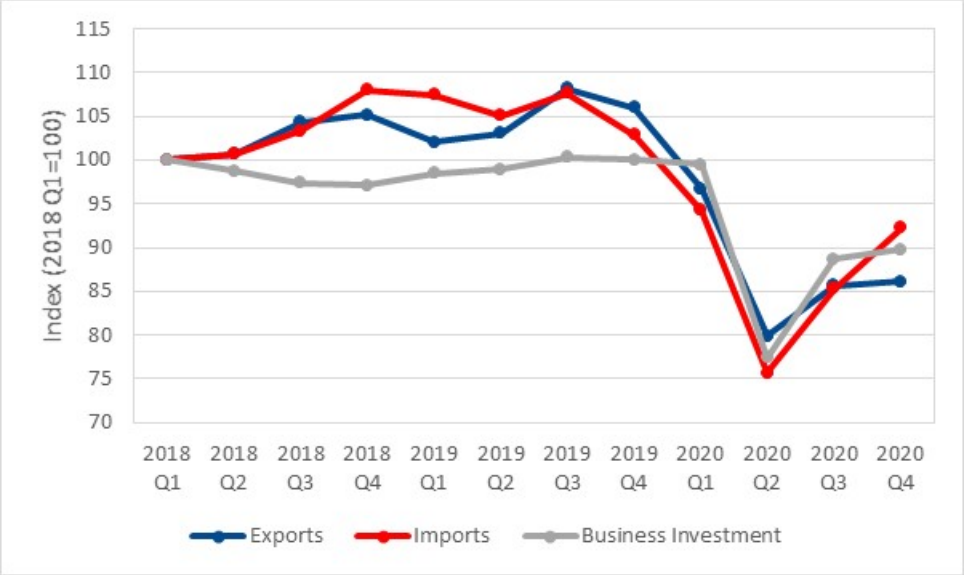
Source: ONS / OFX.com / AMA Research

- Since slumping to a severe low in March 2020 due to the severity of the UK's Covid-19 crisis compared to other nations, the pound has recovered somewhat, especially against the dollar which has fallen due to the faster pace of the UK's vaccine rollout. The Euro has strengthened since the EU agreed a rescue package in July.
- Over the medium term, Sterling is likely to remain relatively weak compared to historical standards. Much will depend on how quickly the relative countries are able to recover from the Covid-19 pandemic.

A.7 Trade & Business Investment

- Both trade and business investment have suffered as result of the uncertainty from Brexit, Covid-19. The pandemic saw trade fall by close to 30%, and business investment 25%.
- Since then they have recovered somewhat. Imports have increased by 20% as firms rushed to restock inventories and stockpile before a possible no-deal Brexit. Meanwhile exports have only increased by 8%. With largely anecdotal evidence suggesting trade has been significantly impacted by the new Brexit barriers, official data for the start 2021 will soon be published.
- Business investment increased by 15% over H2 2020 but remains very weak.

Chart A6: Trade & Business Investment, 2019-2020



Source: ONS / OFX.com / AMA Research