

SWA RETROFIT

Sarah Wigglesworth Architects
with
Qoda

A Holistic Design Approach to the Retrofit of Existing Buildings

BEST PRACTICE RETROFIT

Energy use in the UK's domestic building stock is responsible for 18% of our annual national emissions.¹

Of all the operational emissions that come from buildings in the UK, 69% come from energy use in the domestic stock which alone is responsible for 18% of our annual national emissions.¹

But retrofit isn't just about reducing carbon emissions. A best practice retrofit should reduce fuel bills and also improve health and wellbeing.

BEST PRACTICE RETROFIT

Sarah Wigglesworth Architects (SWA) in collaboration with Qoda adopt best practice retrofit principles aligned with LETI guidance. Our retrofit strategy is to

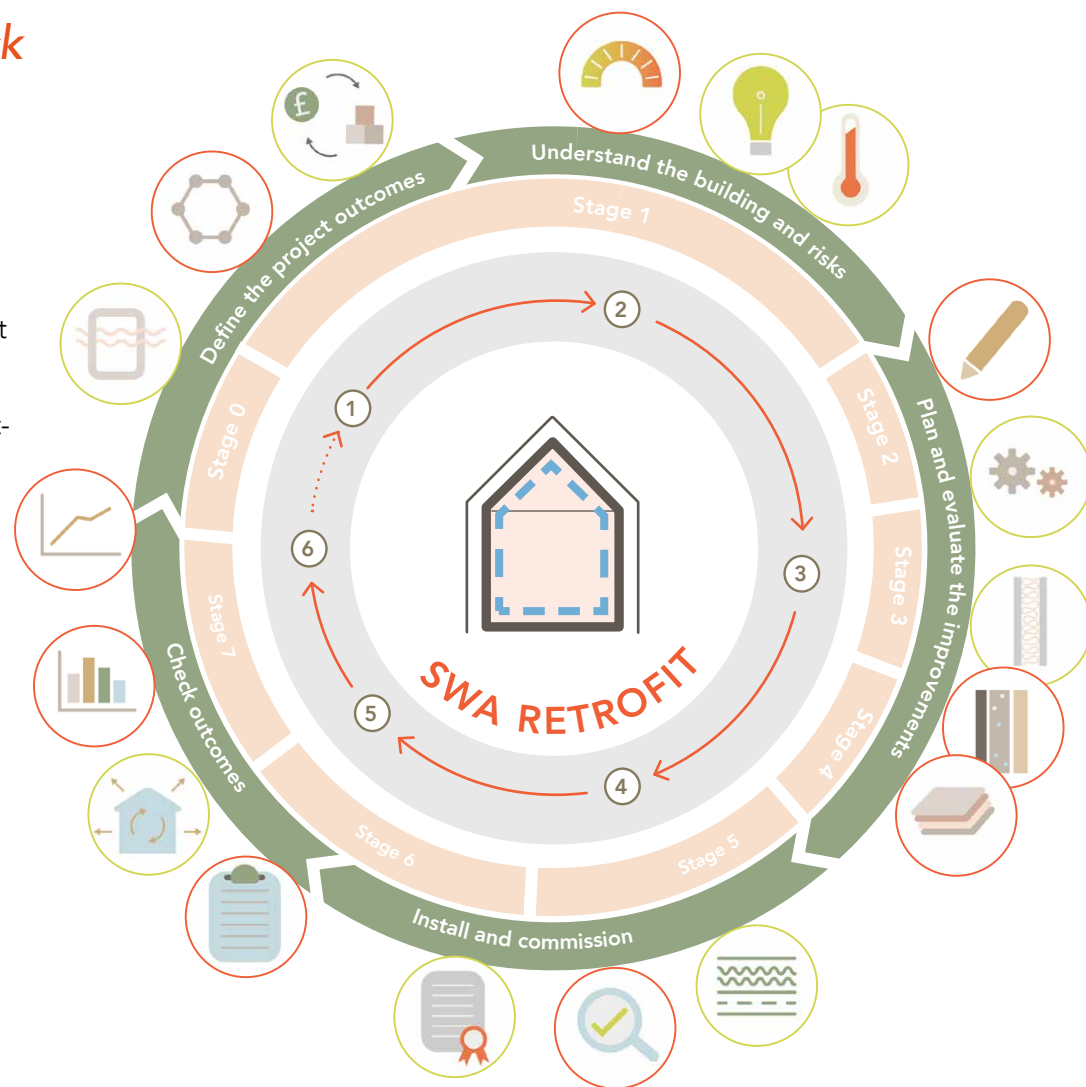
- Reduce energy consumption
- Prioritise occupant and building health
- Have a whole building Retrofit Plan
- Measure the performance
- Be ambitious and inventive
- Consider impact on embodied carbon as well as operational carbon

PROCUREMENT

SWA and Qoda offer a service through all RIBA design stages from analysis and feasibility designs to post occupancy evaluation.

Qoda and SWA work closely and jointly from project inception, through to implementing and evaluating the retrofit measures. We feed back lessons learnt into all new projects with the aim to create a trusted closed loop process.

¹ Source: The CCC, Net Zero – Technical Report [Online] Available from: <https://www.theccc.org.uk/publication/net-zero-technical-report/>



SWA Process Summary Diagram showing the key RIBA design stages.
(Based on LETI Retrofit Guide 2021 Process Diagram).

WHAT WE DELIVER

An integrated architectural and engineering approach to retrofit design

Sarah Wigglesworth Architects (SWA) in collaboration with Qoda offer a holistic 'whole house' approach to deep retrofit. We offer an integrated architectural and engineering approach to design, and procurement. We hold a shared ethos and track record setting ambitious targets to improve building performance and reduce carbon emissions. Our aim is to create improved sustainable places to live and work that have a low environmental impact.

We follow best practice guidance and meet industry retrofit standards such as AECB Building and Retrofit Standards, Passivhaus EnerPHit, LETI, BSI and PAS2035:2019.

UP-TO-DATE TECHNIQUES

As climate change focuses our attention on the mitigation strategies for the future we make sure we are informed about current ecological concepts, new products, techniques and materials. We are a member of UK Architects Declare to raise awareness of the climate and biodiversity emergencies and the urgent need for action amongst our clients and supply chains.

We support the re-use and refurbishment of existing buildings and believe in the construction industry making positive developments in carbon reduction and the retrofit sector.

RETROFIT PLAN

The effective procurement of any retrofit project is a detailed retrofit plan. A unique plan for each project should

- ① Set out key building information, constraints, risks, and opportunities.
- ② Set out the key works proposed along with related strategies and details.
- ③ Set out the sequence of work.
- ④ Be appropriate in its level of detail and intervention for the project.
- ⑤ Include a plan for monitoring and reporting energy consumption.
- ⑥ Stay with the building.



Architectural Design



Energy Modelling



U-value Analysis



Thermal Bridging Analysis



Condensation Modelling



Overheating Modelling



Air Tightness Calculations and Evaluation



Fabric Specification and Installation Detailing



Energy Use Analysis



Embodied Carbon Calculations



On-site QA



Mechanical Services Design



Specification and Selection of Materials and Products



Advice on Internal Air Quality



Information for Planning and Construction



Certification Advice



Procurement Approaches



Handover Systems (Soft Landings)



Post-Occupancy Evaluation



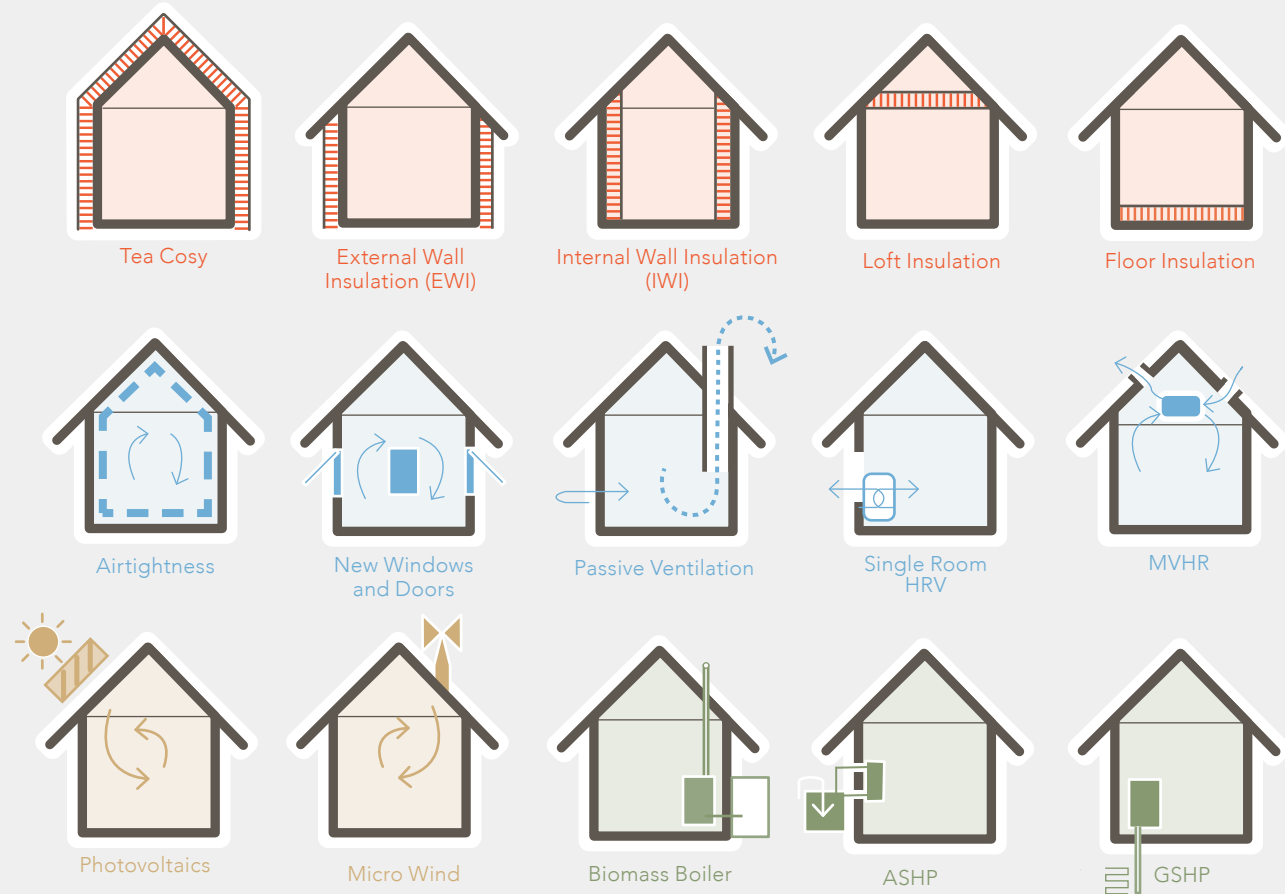
Analysis of Findings - Informing Future Projects

A WHOLE HOUSE APPROACH

We tailor the retrofit strategy to the building(s) typology and its social and environmental context. We refine the chosen measures to account for opportunities and constraints in the building's form, landscape, space, use and occupancy.

Single measure retrofit can lead to unintended consequences. We assess a multitude of retrofit measures and use analysis and building physics to find a balanced combination to provide economic phased solutions that can overcome project constraints such as programme, funding or maintaining building use.

To achieve longevity and comfort, the impact of all the proposed retrofit measures needs to be carefully considered as a whole, creating a successful harmony with the building's fabric, ventilation and heating design. The intended retrofit measures for each project is unique and considered holistically in a 'Whole House Retrofit Plan'.



WHO WE ARE

SARAH WIGGLESWORTH ARCHITECTS

Architect and Lead Designer
Principal Designer (CDM 2015)

Sarah Wigglesworth Architects (SWA) is an award-winning design practice specialising in ecological buildings. The practice works in the housing, educational, cultural and community sectors on both new build and retrofit projects. It produces sensuous, tactile and spatially rich environments that function well and are a pleasure to occupy. Collaborating closely with users and clients and working with materials in an innovative and imaginative way SWA delivers buildings that are loved by their users, are simple to use and are economical to run and maintain.

The practice is an expert in passive, low energy design and sustainability, and it works closely with its consultants to integrate low carbon initiatives from the very start of the design process. Every project presents unique challenges and SWA uses its judgment and past experience to find the most economical and environmentally conscious solutions.

SWA were awarded the 2021 AJ Retrofit Award (Highly Commended) for Stock Orchard Street.

QODA

Building Physics
Services Options Modeling

Qoda Net Zero Team is a team of building physics and building services experts, bringing together both design and practical experience. We provide expert technical advice for retrofit projects, delivering high performing comfortable homes.

Qoda is a consultancy that uses low energy design to transform uncomfortable and wasteful buildings into comfortable habitable spaces. Using Passivhaus principles we help our clients achieve low energy and low cost homes while improving their comfort and longevity.

The Qoda Net Zero Team designed and delivered the UK's first Passivhaus retrofit projects at Lena Gardens and Princedale Road, with the Lena Gardens project winning the 2013 CIBSE Energy Efficiency Project of the Year.



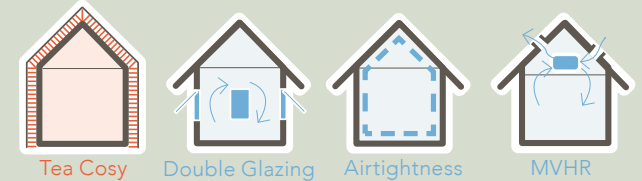
Image: 9/10 Stock Orchard Street, retrofit completed in collaboration with Qoda.



RETROFIT CASE STUDIES

Social Housing Decarbonisation - Warwick

PAS2035:2019



Project location Warwick
Date 2022
Value: £2.9m
Funding: Government Department for Business, Energy & Industrial Strategy (BEIS)
Collaborators Oxford Brookes University, Warwick District Council.
Depth of Retrofit / Standards PAS2035:2019

Summary
SWA led a multidisciplinary team awarded £1.3m of BEIS funding to transform and de-carbonise 50 socially rented homes in Warwick, meeting the new PAS 2035 standard. Retrofit interventions will improve the thermal comfort and energy efficiency of three different house typologies inclusive of existing semi-detached houses and bungalows across Lillington, Leamington Spa and Warwick, reducing lifetime carbon running costs and



Aerial View showing a variety of building typologies under retrofit assessment.

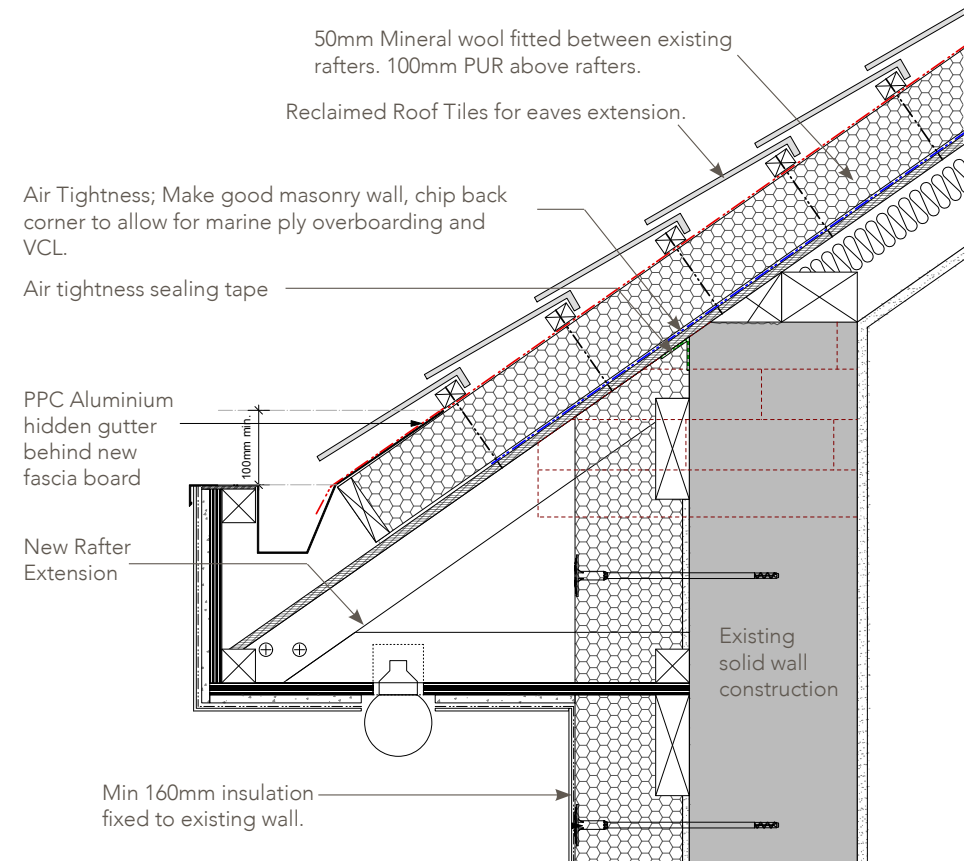
preventing the release of embodied carbon in the existing buildings. The £2.9m pilot project is being undertaken in collaboration with Oxford Brookes University and the housing team at Warwick DC promoting economies of scale in retrofit schemes.

The Proposal

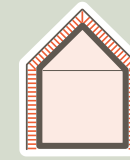
The proposals were designed through extensive consultation with local communities. Resident satisfaction will be monitored during and after the build, in order to feed into national learning around the potential of Social Housing Decarbonisation.

The project is a critical step for tackling fuel poverty in social housing; we developed innovative methods for selecting the pilot properties with local and national representation, providing solutions for a cross-section of lifestyles and income levels. The project can be extended locally and to private homeowners, demonstrating the potential and value of design-led decarbonisation of both social and owner-occupied housing.

A pilot project for tackling fuel poverty in social housing.



Proposed WIP EWI and extended eaves detail to address cold bridging and air tightness



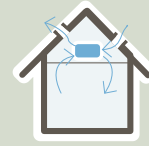
Tea Cosy



Double Glazing



Airtightness



MVHR

Lowering space heating demand by 47%.

(128kWh/m².pa to 65kWh/m².pa)

Qoda Net Zero provided retrofit coordination, building physics modelling and led on many of the innovation areas required for the BEIS funded research project.

With SWA, Qoda developed a fabric first design strategy for all new build social housing in order to work towards zero carbon for both new and existing building stock. This was based on modelling of archetype homes to evaluate the carbon emissions and energy bills for different details specifications.



Image: Post-Retrofit. Proposed material changes



Image: Pre-Retrofit - Existing Site Photograph



Visualisation: Proposed material changes to street-scape

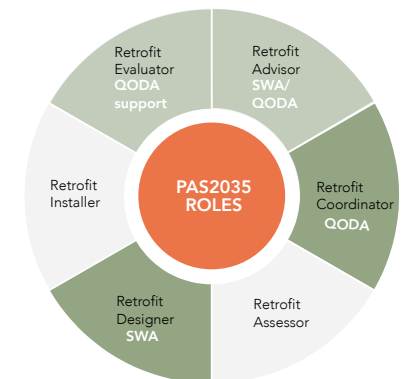
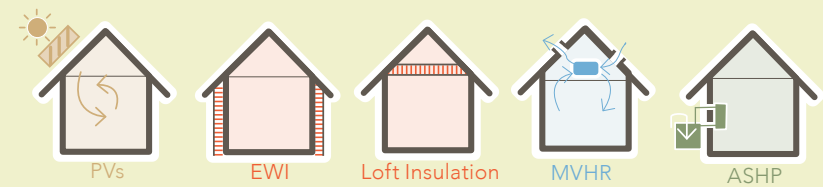


Diagram: SWA & Qoda roles under PAS 2035

Pilot Project for Family Accommodation EnerPHit

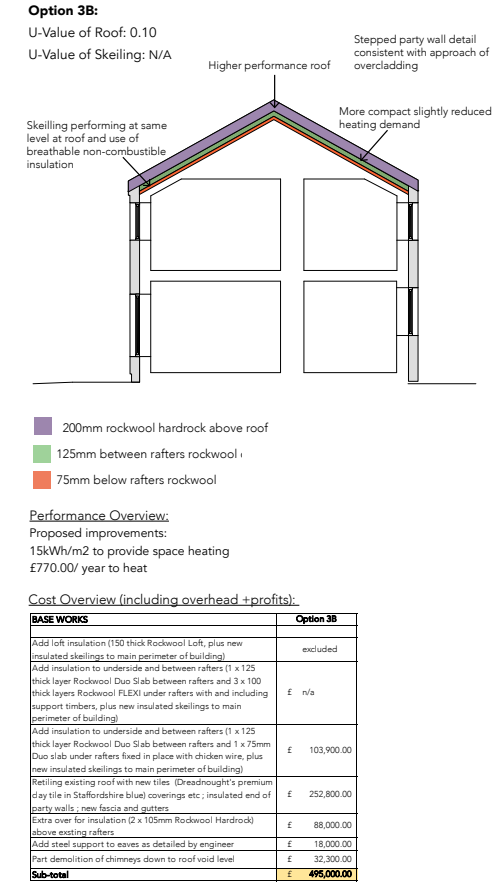
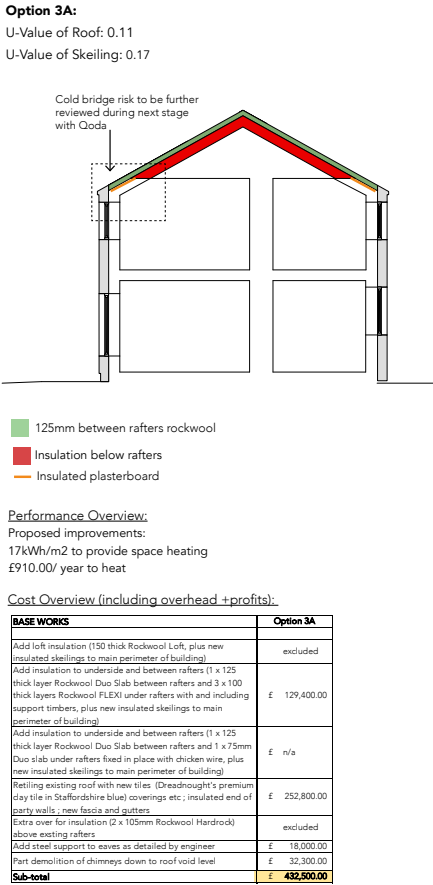
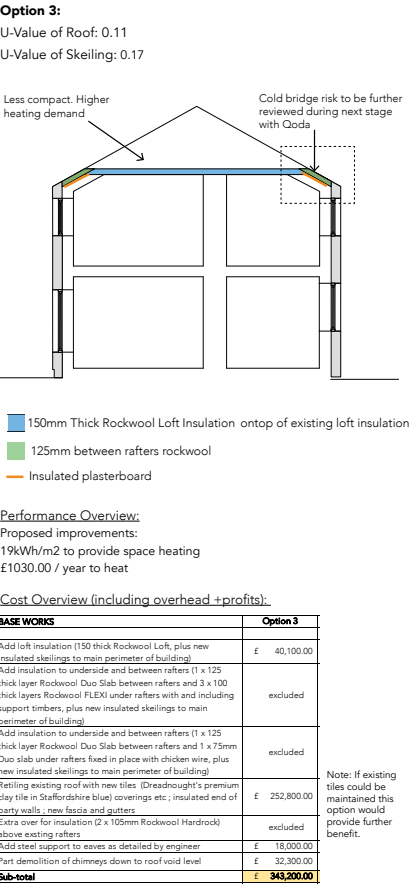


Project location Confidential
Date 2022
Value: tbc
Depth of Retrofit / Standards Passivhaus
EnerPHit & PAS2035. Following Technical
Bulletins on EVCPs and Renewable Energies.

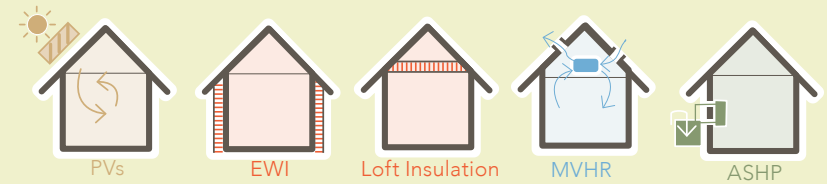
**'Pilot project to achieve >92% Net Zero Carbon
In Use Energy Performance'**

Summary
The aim of this pilot project is to demonstrate that accommodation can be deep retrofitted to achieve 'Nearly' Net Zero Carbon In Use Energy Performance, with a holistic strategy which can be applied across similar house types. The measures will have long term benefits for the occupants including wellbeing, significantly reduced energy bills, protection from future energy price rises, and importantly wider benefits for the environment in line with central government carbon emission reduction targets.

The Target
The design strategy targets >92% Net Zero Carbon (NZC) In Use Energy Performance. The 100% target is considered at every level however caveated with applying a common sense approach of what is 'practical' to achieve at a 'reasonable level of affordability'. The breakdown of design and retrofit options alongside high level construction costs and anticipated annual running costs are reviewed and agreed with the client's Delivery Accommodation Team.



Process Sketch Showing Roof Insulation Options for Client Review - Complete with assessment of performance and operational and build costs

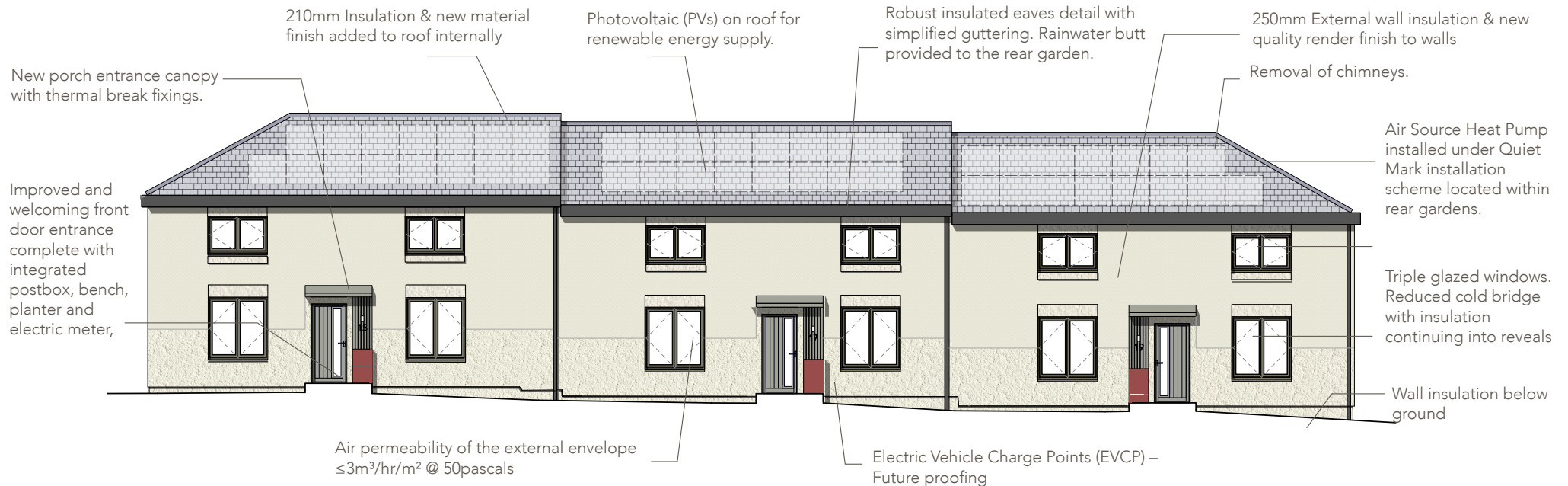


SWA with Qoda ensure design elements are fully considered as a whole house strategy to ensure that unintended consequences, for example issues with moisture, rising or penetrating damp, poor ventilation, over heating or lack of heating and potential damage to the building fabric are avoided.

Building Physics

The design is a holistic approach of both M&E and building fabric improvements, and adopts a fabric first improvement strategy. Changes to one element of works may affect another, therefore Qoda use recognised software to calculate effects of retrofit measures and to assist in avoiding common retrofit problems.

Qoda use a building physics assessment to demonstrate in use compliance based on the building specific criteria including location, orientation, materials, thermal bridging, air tightness, ventilation, heating, and occupancy avoiding a reliance on SAP assessments which often lead to 'the performance gap'.



Proposed Building Elevation - highlighting EWI and other key retrofit design measures

Connexus Warmer Homes EnerPHit



Project location Shropshire and Hereford
Date 2020
Value: £2.7m
Funding: European regional
Development Fund (ERDF)
Collaborators Connexus Warmer Homes
Housing Association.
Depth of Retrofit / Standards EnerPHit

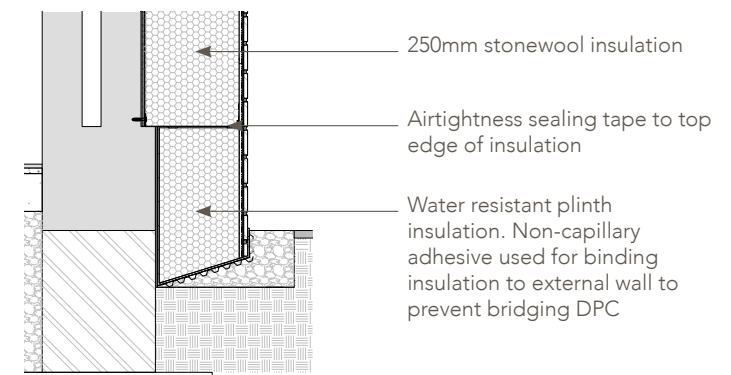
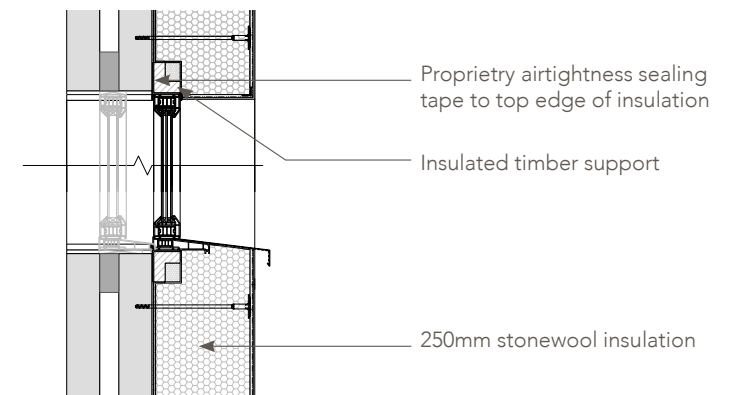
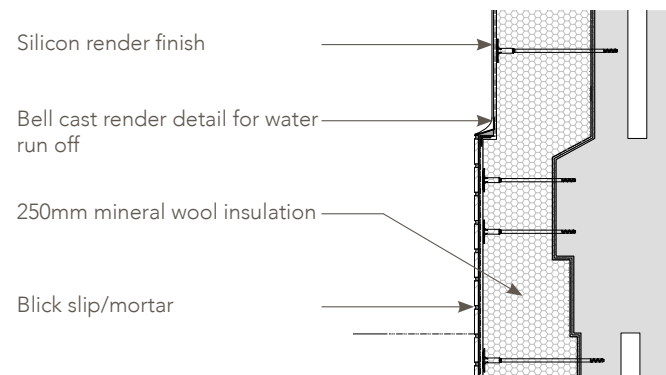
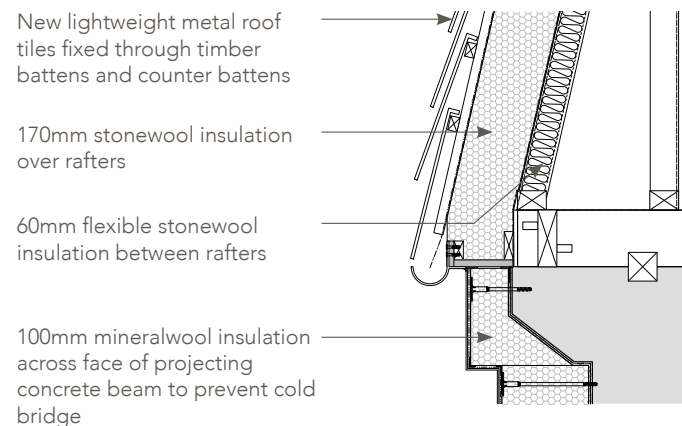
Summary

Qoda and SWA have come together to deliver a detailed design package for the step-by-step retrofit of 132 homes in Shropshire and Hereford. The Connexus Warmer Homes project is partially funded by the ERDF to deliver innovative and future-proofed homes for the housing association. The project brought together the latest thinking in building physics and technical architecture for retrofit, to produce airtight and thermal bridge free designs, as well as considering the client's requirement for the use of non-combustible materials.

The project groups the buildings into 3 main typologies. This allows an economic review of all 132 Connexus homes for the best practice retrofit measures. Included in these typologies are a variety of wall constructions including cavity brick walls and solid wall construction.

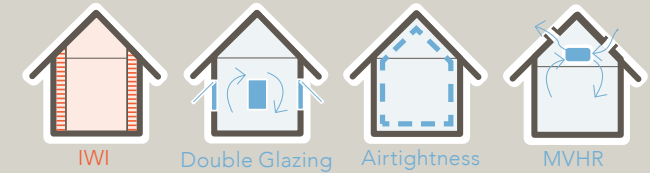
'Innovative 'tea-cosy' retrofit avoids tenants having to move out during works'

Tea Cosy Retrofit Tender Details - Eaves Detail, Window Detail, Ground Interface and EWI typical fixing detail.



Barnsbury Street

Retrofit of Listed Buildings in a Conservation Area



Project location Islington, London

Date 2022

Listing: Grade II

Collaborators Barnsbury Housing Association (BHA), Islington Planning Authority. Heritage Consultants.

Depth of Retrofit / Standards Traditional Building Retrofit, Individual Ownership / Tenancies.

Summary

SWA led the design development of a 'whole house strategy' for energy performance improvements to 40

apartments within Grade II listed buildings on Barnsbury Street in Islington.

SWA coordinated a materially sensitive approach to restoring and improving the existing flats, based upon the PHPP modelling, thermal imaging and air-permeability testing completed by Qoda. The housing stock was evaluated in both SAP and PHPP modelling programmes to understand the impact on energy efficiency rating, the opportunities for retrofit and the path to zero carbon.

'a 30 year phased strategy for 300 homes - directing the path to Zero Carbon'

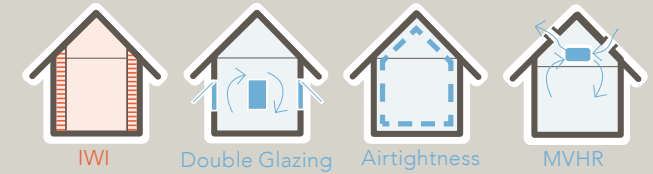
Assessment scheme showing ownership along Barnsbury Street



PILOT PROJECT



Image: location and organisation of Grade II listed flats under ownership - Pilot project highlighted

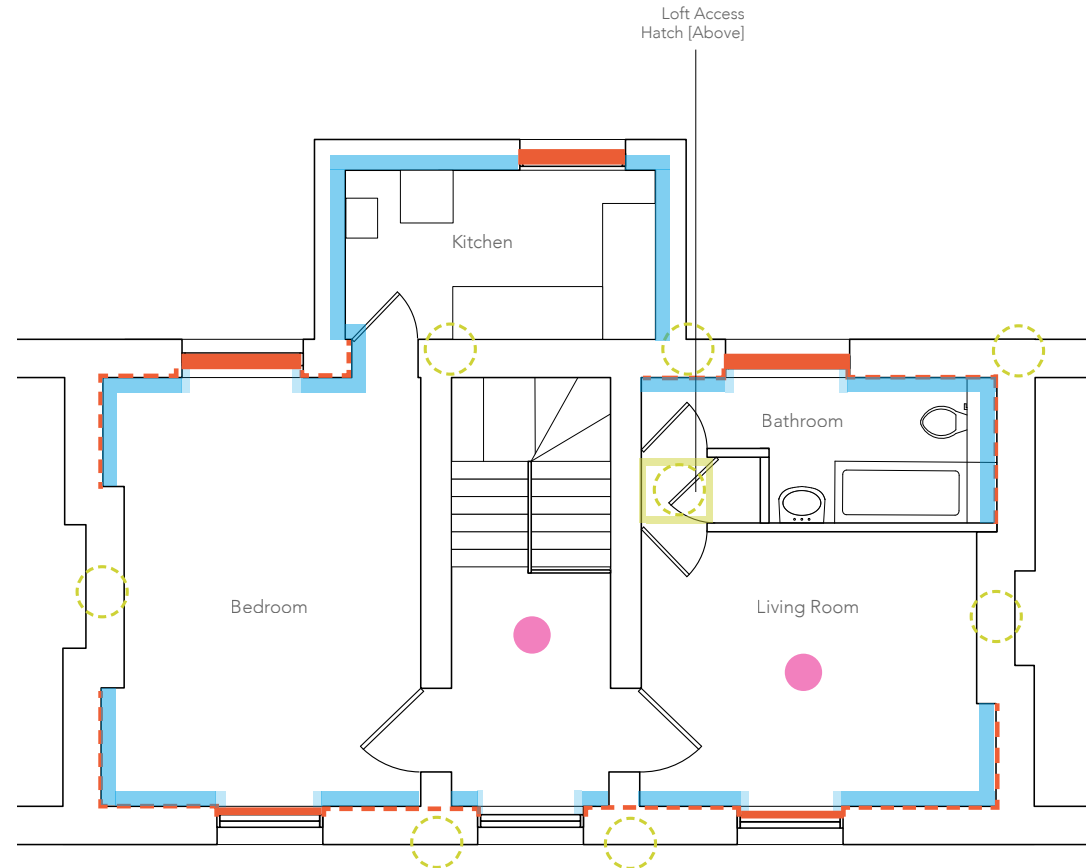


Phased Strategy

As a pilot project for their 300-home portfolio, we assisted BHA to develop a phased strategy of ambitious, sensitive and replicable work across a 30 year period. The project is located in the Barnsbury Conservation Area and SWA have led early engagement with the Local Planning Authority (Islington) with the input of a Heritage Consultant to ensure retrofit measures are suitable and work harmoniously with the traditional building fabric.

Internal insulation materials, airtightness and insulative improvements to windows and window reveals were all considered and evaluated with product and aesthetics sensitive to the heritage building.

The pilot project will be used to set the parameters for future phased works across the Housing Association's properties.

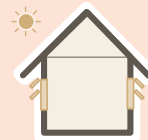


- Proposed Internal Wall Insulation
- Proposed Sensitive Internal Wall Insulation designed and itergrated with internal historic detailing
- Cold Bridge to be mitigated
- Improved Air-Tightness
- Retained Windows with Draft Proofing
- New Double Glazed Windows
- New Air Intake Required for MVHR improved ventilation system

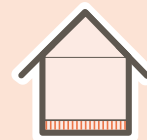
Plan - Pilot Project - Individual Upper Flat Retrofit

Stock Orchard Street

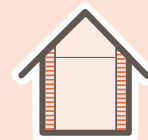
Live / Work Retrofit



Solar Shading



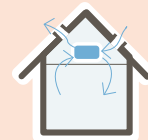
Undercroft
Insulation



IWI



Airtightness



MVHR



New Doors /
Windows / Roof Lights

Project location Islington, London
Date 2019
Value: Undisclosed
Collaborators Qoda Building Physics
Depth of Retrofit / Standards Key Fabric
Retrofit.

Summary

SWA were developer, project manager and architect for this inner London live/work infill scheme completed in 2000. The back land site, tucked into the end of a cul-de-sac, was formerly occupied by a working forge and is the unpromising host to this innovative development.



Photo: Stock Orchard Street in Context

The retrofit project was completed in 2019 with the main aim to reduce CO₂ emissions and improve the comfort of its users. The project has won highly commended for a 2021 Architect's Journal Retrofit Award.

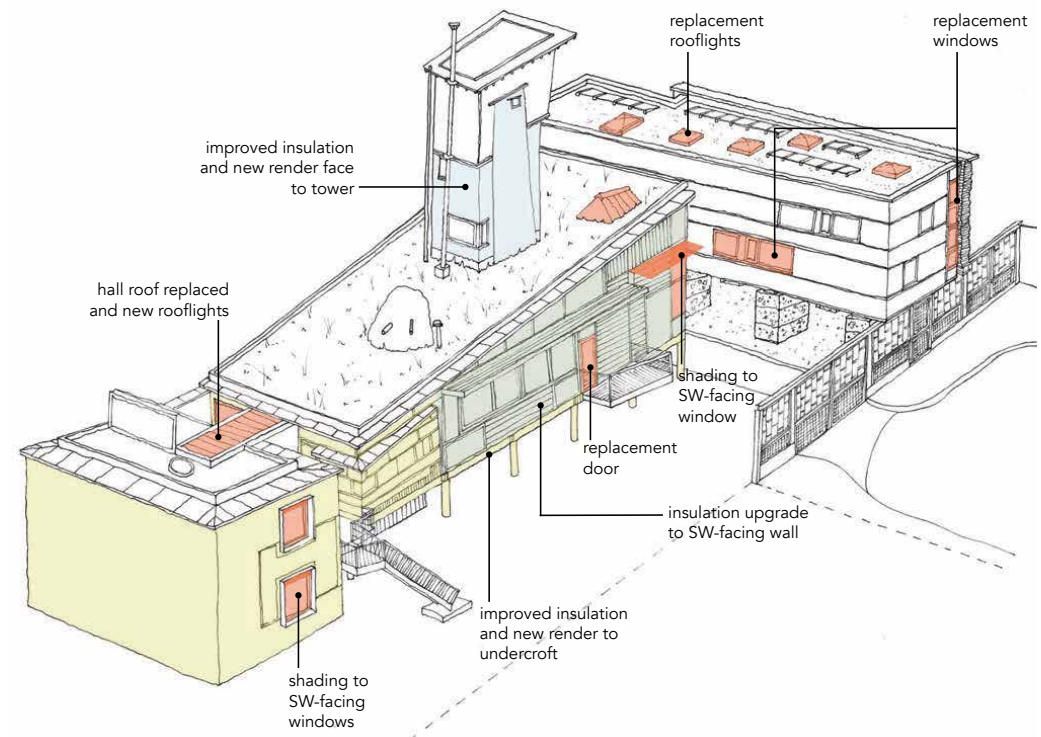
Project Information

At the time of initial design, the buildings were cutting edge green exemplars, whose design well exceeded the 1996 Building Regulations then current. In the fullness of time the buildings performed a little better than average. 20 years after their completion, the green movement had evolved and

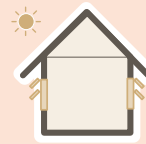
techniques of analysis had improved, while the evidence of climate change made green design responses more urgent than ever. With a wealth of knowledge about the pleasures and pitfalls of living and working there, we gathered scientific data to measure the building's performance 20 years on.

In 2016 SWA appointed QODA to undertake a thorough assessment of how the building was performing in terms of comfort and energy demand. This enabled SWA to benchmark the resulting data against current energy standards and assess the benefits post retrofit against trusted data.

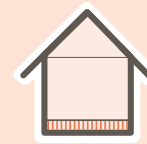
CO₂ emissions have been reduced by 62%



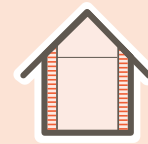
Sketch: Improvement Measures



Solar Shading



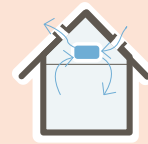
Undercroft
Insulation



IWI



Airtightness



MVHR



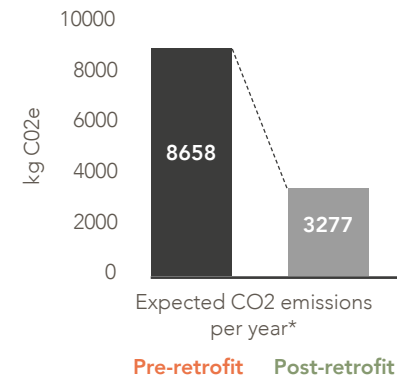
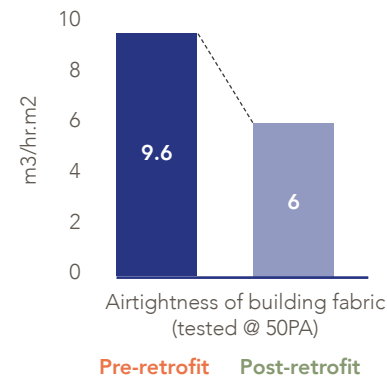
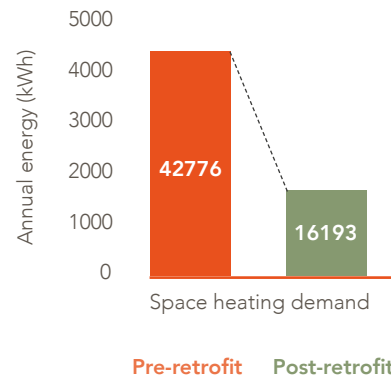
New Doors /
Windows / Roof Lights

QODA's assessment methodology included thermal imaging, airtightness tests, measuring u-values of the building fabric, analysis of energy demand using Passivhaus software, as well as an analysis of energy bill data.

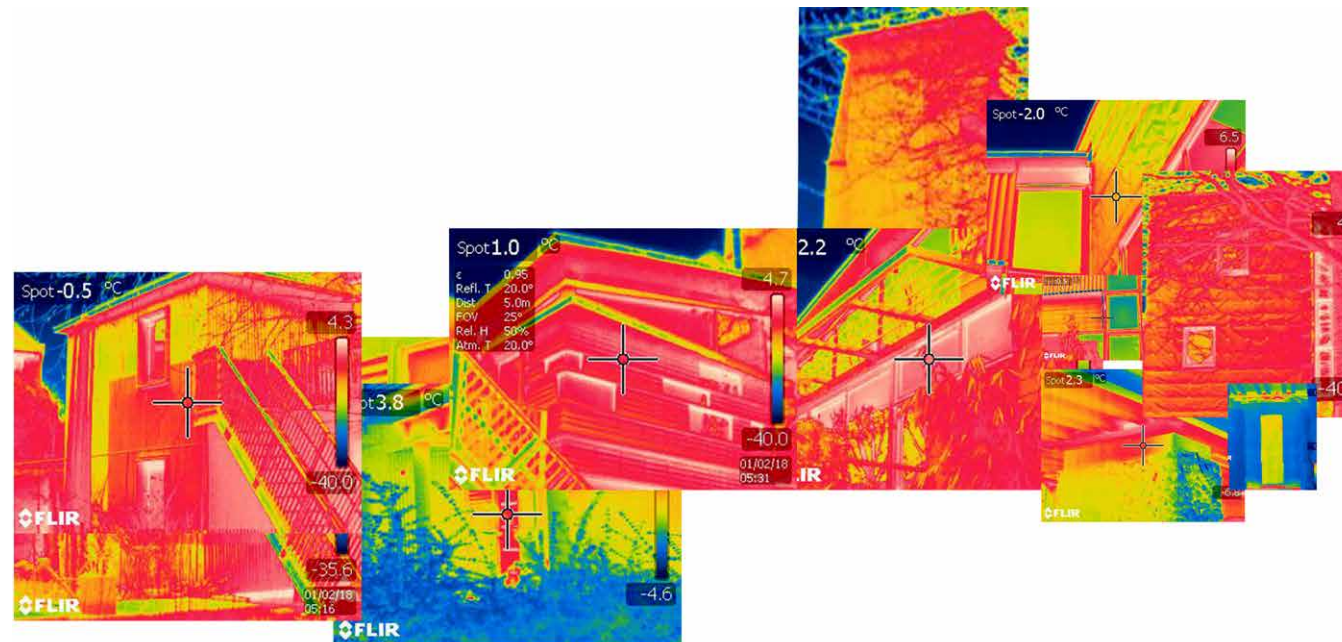
This research highlighted key elements of the building fabric that could be improved. The project focused on the retrofit measure that have the most significant impact on reducing energy consumption of the building and enhancing user comfort for the years to come. These included:

- Improved airtightness around all junctions of the fabric
- Reduced thermal bridging
- Improved quality of ventilation
- Improved solar control
- Improved artificial lighting.

On completion the retrofit led to improvements in u-values, airtightness and significant carbon reductions of 62%



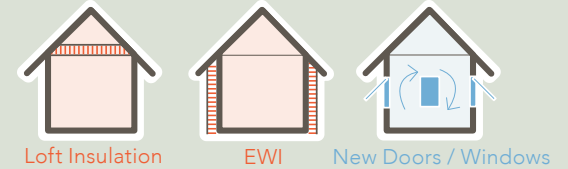
Pre and Post Retrofit Data Comparison



Thermal imaging produced as part of the pre-retrofit analysis.

Deborah House Studios

Artist Studios



Project location Hackney, London
Date Completed 2015
Value: £838,000
Collaborators Space
Depth of Retrofit / Standards Watertightness
and Improved Energy Savings

Summary

Appointed by Space, England's largest provider of affordable creative workspace, we were tasked with giving a new lease of life to these studios in Hackney. A former warehouse converted in the 1980s, the building suffered from leaks, heat loss, security breaches and a crumbling façade.

The renovation has stabilised the building's deterioration, improved thermal efficiency and weather protection, delivered additional artists' studios in an all-new green roof extension and transformed the building's image with an embossed metallic skin.

Over the course of the project, we demonstrated how a significant overlap between environmental and artists' needs, could also bring substantial cost benefits. With cost-effective improvements, Space has been able to provide a comfortable, sustainable and long-lasting building for its tenants.

"We selected SWA for their intelligent approach to providing affordable solutions."

Anna Harding, Chief Executive, Space



Elevation - Pre- Retrofit



Elevation - Post- Retrofit

Sarah Wigglesworth Architects

10 Stock Orchard Street
London
N7 9RW

tel: 020 7607 9200
email: mail@swarch.co.uk



ARCHITECTS!
CLIMATE
ACTION
NETWORK



TRUSTMARK
Government Endorsed Quality

