SECTION 226(1)(A) OF THE TOWN AND COUNTRY PLANNING ACT 1990

AND THE ACQUISITION OF LAND ACT 1981

THE BASILDON BOROUGH COUNCIL

(FRYERNS AND CRAYLANDS) (PHASE NORTH)

COMPULSORY PURCHASE ORDER 2020

PUBLIC INQUIRY 29 JUNE 2021

REBUTTAL PROOF OF EVIDENCE OF LUKE RILEY OF

ON BEHALF OF SWAN HOUSING ASSOCIATION

PLANNING INSPECTORATE AND PLANNING CASEWORK UNIT REFERENCE: APP/PCU/CPOP/V1505/3258817

1. INTRODUCTION

1.1 The rebuttal proof of evidence has been prepared following a review of Mr Howe's outline statement dated 10 June 2021.

1.2 In this rebuttal proof of evidence, I have sought to provide a response to points on which the Inspector may find it helpful to have a written response in advance of the inquiry. If I have not responded to or made reference to other points in Mr Howe's outline statement, it is not because I have accepted those points. This rebuttal proof of evidence should be read in conjunction with Mr Sullivan's rebuttal proof of evidence.

2. RESPONSE TO MR HOWE'S EVIDENCE

2.1 I set out below the issues raised by Mr Howe in italics and my response below:

The development doesn't make any sense:

105 properties demolished with only 96 being built - resulting in the net loss of 9 homes despite masses of unused space on the Estate.

105 three bedroom properties demolished with only 56 being built - resulting in the net loss of 49 three bedroom homes.

2.2 The objection focuses purely on the outcomes of one phase of a multi-phase development. This does not reflect the wider benefits of the whole redevelopment, nor the needs-led approach to determining housing mix and the way this is balanced with delivering a viable scheme.

2.3 When the masterplan was developed and consulted on with both stakeholders and the local community the priority was for the maisonettes to be demolished and the principle of simpler and more legible streetscapes to be followed through. We also reviewed the mix of housing with Basildon Council to ensure that it reflected, where possible, the needs of the local community. At the same time, the viability of the scheme had to be considered while ensuring the way Phase North joins up with the existing estate (including Phase 1 which was completed in 2015). Therefore, the following outcomes were proposed:

2.3.1 Less demolition was proposed with the central focus being on the continued demolition of the maisonette blocks.

2.3.2 Only 14 houses are due for demolition in Phase North and this was only to improve connectivity across the estate, including linking Phase North to the completed Phase 1 (Britten Avenue). The same principle is followed through for the future phase, Phase South.

2.3.3 Parking has always been reported as an issue for local residents in terms of unsafe parking courtyards and garages. Basildon Council has already demolished the garages because of the local concerns around vandalism and anti-social behaviour.

2.3.4 The detailed consent for Phase North has responded to the parking requirements and where possible parking for the new homes is on plot.

2.3.5 In working with Basildon Council, Swan were advised that there was a need for some ground floor wheelchair flats, which were accommodated where possible. Therefore, Phase North has a small block of 8 flats for social rent, with 2 wheelchair flats on the ground floor. The same principle has been followed in the outline consent for Phase South and for the small block of 9 flats being constructed as part of Phase West (with 1 wheelchair flat on the ground floor).

2.3.6 In addition, Basildon Council have advised that there is a strong requirement for 2 bed houses for social rent, which again is reflected in the agreed tenure mix (12no 2 bed houses and 3no 3 bed houses for social rent).

2.3.7 As the plans were developed and market housing needs were considered it was clear that more houses are required than flats, as reflected in the local market, and a mix of sizes are proposed for this phase.

2.4 Therefore, the final proposed mix does deliver a net loss when viewed in isolation. However, when the masterplan as a whole is considered then it is clear that there is a significant increase being delivered – See CD7.10 and paragraphs 2.2-2.3 of Mr Sullivan's rebuttal proof of evidence. It is worth noting, though, that the revised masterplan that was submitted for planning approval in 2016 was also responding to the economic circumstances at the time and the level of demolition was reduced compared to the original 2006 planning permission. Viability was a key consideration at the time, while maintaining the regeneration objectives for the local community and stakeholders wherever possible. The approach taken by Swan, Basildon Council and Homes England has been recognised as one of the case studies in the Estate Regeneration Strategy (Case Study number 3) (page 87 of CD3.2) as an example of how cross subsidy can work when part of the delivery of the whole regeneration programme.

A far better option is to renovate, refurbish & regenerate the existing housing and build on the surplus land increasing the housing stock.

2.5 Simply building on the surplus land (Phase West) would not bring the benefits required for the existing Craylands Estate and the local community as a whole. The task for the partnership is to respond to the challenges identified by the residents living and working in this part of Basildon. Simply increasing housing supply on its own would not tackle the physical design issues of the existing Radburn design of the estate, and the proposals developed are a direct response to these challenges wherever possible.

The costs of demolishing are far greater than renovating, refurbishing & regenerating the existing housing stock. I estimate about £500,000 per block for renovations making an overall cost of £3.5 million. The costs of demolition are many times greater when considering the following expenses; the planning process, surveys & surveyors legal costs, buyouts of 31 homeowners, compensation/disturbance payments/buying & selling legal fees/stamp duty & legal support of 31 homeowners, relocating 74 council tenants, maintaining and paying the bills of all the vacant properties for many years, the Public Inquiry and finally the actual demolitions.

2.6 It is acknowledged demolition and rebuild is an expensive process, especially when demolition is next to existing homes that are to be retained and when significant amount of asbestos needs to be appropriately removed. However, simply refurbishing the existing properties does not generate either the income required or the wider social benefits in the case of the Craylands Estate.

2.7 The Facility Architects & Consultants undertook a pre-retrofit field survey on the existing maisonette blocks in 2014 (Appendix R1) on behalf of Basildon Council. Issues such as cold, low ceiling spaces, rising damp, condensation and movement cracks within the property were identified. The overall report also included a specific structural engineer’s report who was briefed to consider a proposal to increase the thermal efficiency of the blocks and eliminate damp and draught problems. The structural engineer identifies obvious areas of damp and long term water ingress, crack in load bearing gable walls due to failed foundations and evidence of subsidence.

2.8 Clearly the parties (Basildon Council, Homes England and Swan) agreed that the best way forward was to continue with the redevelopment to ensure that the maisonette blocks owned by the Council were demolished. This was the basis of resident and stakeholder consultation that led to the submission of a revised masterplan in 2016.

It is Government policy to discourage demolition unless absolutely necessary due to the environmental impact. Large industrial and heavily polluting machinery will be transported on to the Estate in preparation for demolition, knocking down the buildings will release tonnes of CO2 into the atmosphere, large polluting lorries will go on to the site to collect the rubble, the polluting lorries will transport the material to a disposal location and finally very polluting industrial machinery will crush all what has been demolished.

2.9 With appropriate measures in place, demolition impacts can be adequately minimised and controlled. Construction Management plans have to be approved by the local council and these focus on minimising environmental impacts in terms of construction activity and waste. At the same time, Swan is using offsite modular construction using CLT (Cross Laminated Timber) for the new homes. The factory is in Basildon and only 1.5 miles from this site. This brings additional benefits in terms of a shorter distance travelled for the completed modules and generally more sustainable than traditional construction approaches.

The improvements to the layout of the Estate through demolitions have been greatly exaggerated. Only pockets of the Estate will be demolished, therefore only certain areas of the Estate will have an improved layout. The majority of the Estate's layout will be untouched. Given the masses of spare space on the Estate the layout can be improved without any demolitions occurring.

2.10 The approach taken here has been to focus on the demolition of the maisonette blocks, minimise the demolition of houses, while at the same time providing a more joined up place where possible. The starting point for design was to identify the areas that need improvement and seek to deliver improvements (see DAS CD 5.7, Section 8 of Mr Sullivan's proof and his rebuttal proof of evidence). The masterplan as a whole has been developed to respond wherever possible to the concerns and issues raised by local residents and local stakeholders. This is shown by how responses have been made to linking up the roads, having clearer pedestrian routes, having a central focus for play areas, improved landscaping and the delivery of community infrastructure (shops and a new community centre).

3. STATEMENT OF TRUTH

3.1 I declare that the evidence set out in this proof for the inquiry is true and follows accepted good practice. The opinions expressed are my own and are formed from professional judgements based on my experience.

Signed………………………………………………

LUKE RILEY

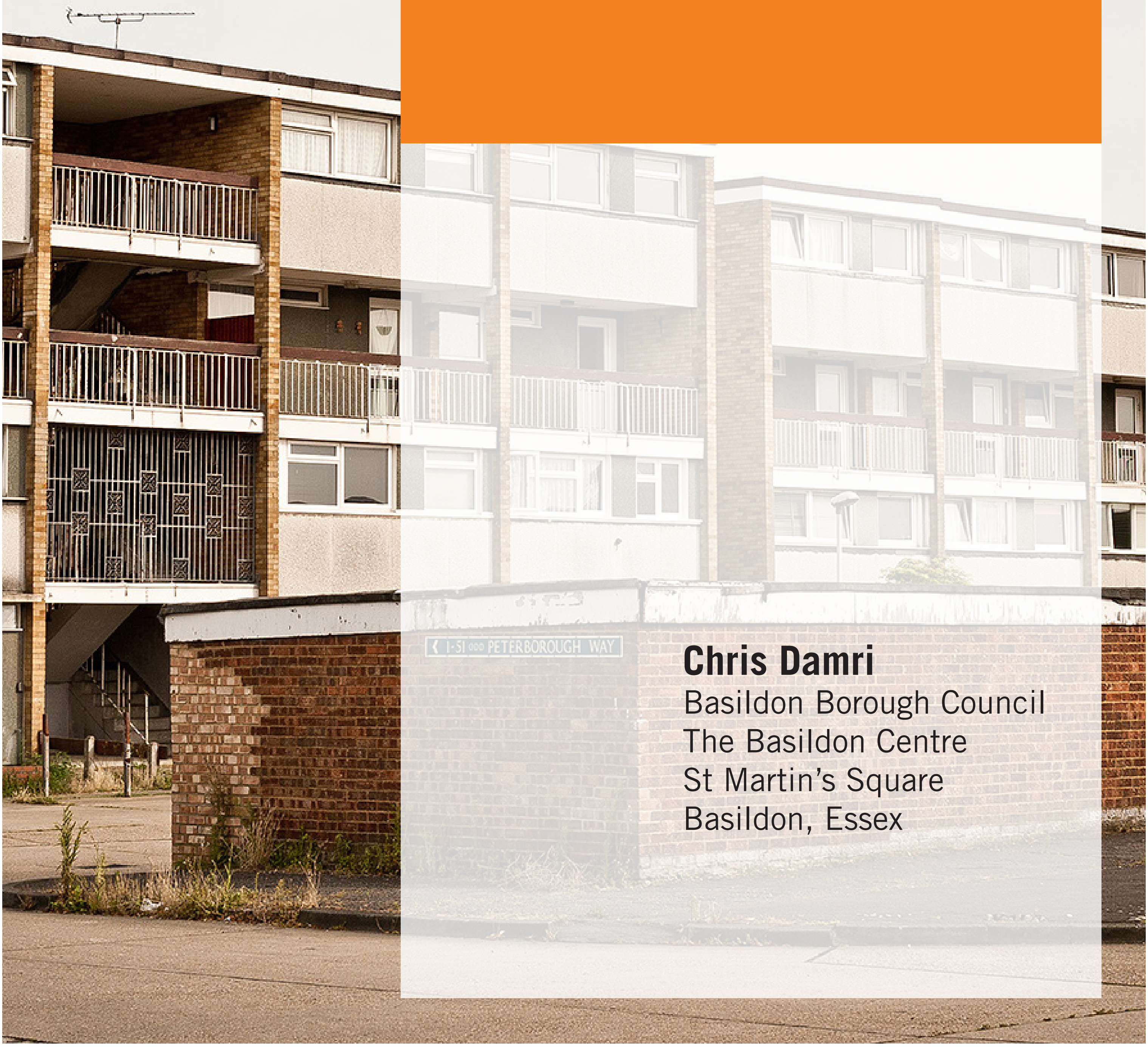
PROJECT DIRECTOR AT SWAN HOUSING ASSOCIATION

22 June 2021

R1

Craylands Estate Retrofit Strategy – The Facility architects + consultants (2014)

the facility
architects + consultants



Chris Damri
Basildon Borough Council
The Basildon Centre
St Martin's Square
Basildon, Essex

OVERVIEW

At the core of the Craylands redevelopment project is the need to create a sustainable, thriving and vibrant community where people want to live and become actively involved in the management of their neighbourhood, now and in the future.

The estate, built in the late 1960s and early 1970s, has a mixture of property types, including blocks of flats of non-traditional construction, being cross walled maisonettes with reinforced concrete floors and flat roofs.

Some of the blocks have been subject to instability, and have been shored up externally using structural steel work, and the estate has generally suffered from a lack of investment and will be subject to regeneration based on a phased approach.

However, it is difficult for BBC to regenerate the blocks containing leaseholders, because of the cost of buying back the leases.

This report looks to assess the viability of refurbishing those blocks affected.

Following the initial findings of the site visit, a data analysis is held based on the 3 Archetypes that were identified. Since housing types 2 and 3 are similar in terms of construction, materiality, age and fabrication but differ in flat floor area, the latter will be used instead as the bigger internal area the greater fabric heat losses.

4 consecutive scenarios are set to assess the most energy and cost effective refurbishment. They are sorted into 4 groups.
The scenarios are:

1. **Basic Retrofit** - Options which are more affordable and feasible to carry out. Includes Solar Thermal

2. **Enhanced Retrofoit & Green roof** – Roof insulation with aesthetical advantages and upgraded retrofit. Adds Photvoltaics

3. **EnerPhit Retrofit** – Options which approximate as near as possible the Passivhaus Standards

4. **New floor addition** – Roof extension to use the revenue generated to offset the refurbishment of the entire blocks

The scenarios are assessed in terms of the cost, disruption, feasibility and funding eligibility.

A more analytical cost analysis and full instrusive structural survey will be essential in case of project realization.

CREATE BUILDING BASELINE

The case study properties are ate 1960s and early 1970s construction, owned by Basildon Borough Council. They are cavity wall constructions and more than 70% have shallow pitched roofs with small loft spaces which may be difficult to access for insulating purposes. The rest have flat concrete roofs. Generally the properties are fitted with double glazing openings but some single glazing remains. Open fans and window vents are also common.

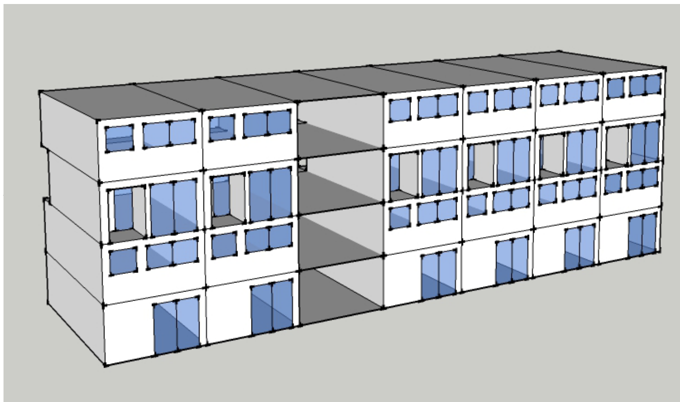
The Facility Architects & Consultants undertook a pre-retrofit field survey in which issues such as cold, low ceiling spaces, rising damp, condensation and movement cracks within the property were identified.

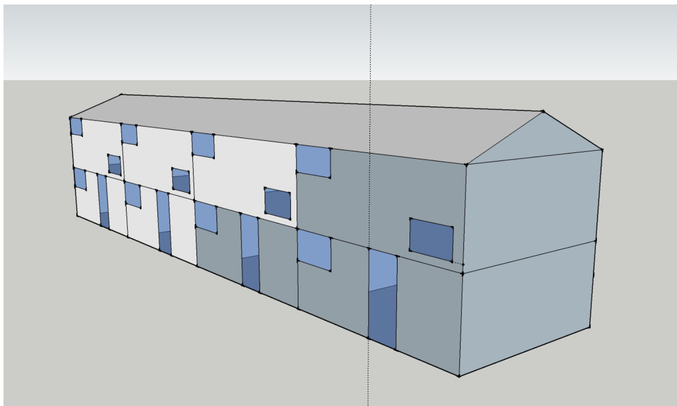
Archetype 1

4-storey block of flats/maisonettes with centralised external staircase and flat roof makes up around 30% of the housing stock in Craylands Estate. The dwelling used as the first base case scenario includes 12 2-storey flats/ maisonettes. Since it was built around 1970's, it is assumed that the wall construction includes: brick external leaf/ 50 mm cavity/ dense block internal leaf/ light weight plaster.

Archetype 2

2-storey terraced block of flats/maisonettes with 3 bedrooms and shallow pitched roof makes up around 70% of the current housing stock of the site. The dwelling used as the second base case scenario includes 4 2-storey flats/ maisonettes. Since it was built around 1970's, it is assumed that the wall construction includes: brick external leaf/ 50 mm cavity/ dense block internal leaf/ light weight plaster.





The Retrofit scenarios that are identified in this report respond to these specific findings, including external wall insulation, roof insulation, new double glazed windows, efficient gas boiler, photovoltaic panels and solar thermal panels.

The existing construction elements of the building stock (wall, roof, ground floor, windows) are presented in the following tables in relation to their U-values[1].

1 A U-value is a measure of heat loss in a building element such as a wall, floor or roof. It can also be referred to as an 'overall heat transfer co-efficient' and measures how well parts of a building transfer heat. This means that the higher the U-value the worse the thermal performance of the building envelope. A low U-value usually indicates high levels of insulation.

EXISTING BUILDING ELEMENTS

Existing wall

Material (inside to outside)	Thickness (mm)
Plaster- light weight	13
Concrete- dense block	75
Cavity	50
Brick- exposed	110
U-value (W/m²K)	**1.55**

Existing Roof - Archetype 1

Material (inside to outside)	Thickness (mm)
Plasterboard	25
Cavity	110
Plasterboard	25
EPDM membrane	5
U-value (W/m²K)	**1.52**

Existing Roof - Archetype 2

Material (inside to outside)	Thickness (mm)
Plasterboard	25
Cavity	110
Plasterboard	25
Cavity	1000
Ceiling tiles	10
U-value (W/m²K)	**1.04**

Existing windows

Material (inside to outside)	Thickness (mm)
Single pane	5
U-value (W/m²K)	**4.8**

Single pane	4
Air gap	20
Single pane	4
U-value (W/m²K)	**2.7**

Existing ground floor

Material (inside to outside)	Thickness (mm)
Vinyl covering	2
Floor screed	38
Concrete slab	100
EPDM membrane	5
Hardcore compacted	120
U-value (W/m²K)	**1.42**

1) Basic Retrofit

Recommended measures	Indicative cost (Price per unit)	Typical savings per year	Green Deal Finance	Rating after improvement
Increase loft insulation to 270 mm	£100 - £300	£73	✓	E47
Hot water cylinder thermostat	£500	£145	✓	D55
Low energy lighting	£50	£45		D60
New condensing boiler	£1,500 - £3,500	£408	✓	C72
Solar water heating	£4,800	£32	✓	C73
Replace windows with double glazing	£2,500 - £6,500	£54	✓	C75
External or internal solid wall insulation	£5,500 - £14,500	£393	✓	B81

External wall insulation

Effective, economical and can be installed from the outside of the dwelling to improve aes-thetic. External weathering surface should be also applied. The timber stud structure is protected and thermal bridges are minimized.

Roof/ loft insulation

Sprey/Injected PUR Foam insulation

Pros: Relatively easy to install, economical and maintenance-free, water repellent, fireproof, excel-lent thermal and acoustic characteristics.

Cons: Requires making good to ceiling when applied to flat roof.

Overview

Pros:
Lowest capital cost intervention
Least disruption to residents
No need to decant residents
Quickest install time
Improves building aesthetics
Will increase building life-span

Cons:
Some redecoration required
Least Carbon savings from three options
Lowest level of energy savings
Will not attract as much funding as other options
May not greatly increase value of dwellings

Ground floor insulation

According to current Building Regulations, the floor should achieve a U-value of 0.25 W/m^2K or less, if possible. The U-value is a measure of how quickly heat will travel through the floor. To achieve this standard it is normally needed at least 70mm of high-performance foam insulation, or 150mm of mineral wool, but this will vary depending on floor type, shape and size.

Expanded Polystyrene (EPS)

Pros: Low cost, breathable, good acoustic performance

Cons: if exposed to persistently high levels of humidity sufficient moisture may be absorbed to cause decay or damage.

Material Cost: Alsecco EPS Insulation Boards- PS 15 SE 50 - c. £4.58/m^2

Due to the low ceiling height, it is difficult to integrate an additional layer of insulation on the ground floor. An alternative option to the existing ground floor could be the installation of insulated carpet instead of the vinyl covering that reduces heat losses and improves the energy performance.

Boiler

High efficiency gas combi boiler

Pros: Green Deal funding
Cost: £2300 (average in total exc. VAT)/ flat

Also consider community heating via Biomas or CHP

Photovoltaic Panels (PVs)

Use of the sun energy to produce electricity for domestic use and grid supply. While the Feed In Tariff rate is less good than it used to be, solar panels are also getting cheaper and well-designed systems still deliver good returns.

Pros: Funding Schemes available (ex FITs Scheme)
Cons: Planning permission required
Cost: £6700 (average domestic solar PV system of 3,5kWp in circa 28 m^2 area in total exc. VAT)

Solar Thermal

Use of the sun energy to provide domestic hot water passively.

Pros: Funding Schemes available (ex. RHI Scheme)
Cons: Often requires boiler replacement and less often replacement of HT radiators to LT radiators

Bulb replacement

We assume that we have approximately 25 bulbs per flat and 30 per massionette.

Basic Retrofit notional cost per unit/dwelling*

*Assumed that 80% of lofts will require pumped PUR insulation (£900 per dwelling)

£19,250 per dwelling

2) Enhanced Retrofit Green Roof

Another option of insulating the roof is green roofs. It is presented as a separate strategy as specific measures should be taken into account. There are two types of green roof, the intensive and the extensive green roofs. The intensive green roof has a layer of substrate at least 20cm thick which supports a range of trees, flowers, shrubs and vegetation. Depending on what types of plants you choose, an intensive roof will require regular maintenance, as with any garden. Extensive green roofs are a more popular option as they are easier to install, maintain and aren't excessively heavy (20mm to 200mm), so are suitable for more types of roof. Green roofs are suitable for almost any type of building be it a house, office, garage or shed.

Extensive green roof

Pros: Good thermal and acoustic insulation, improved air quality in urban areas, provide fire resistance, increase the lifespan of the roof and encourage wildlife , self-sufficient. Extra funding available.
Cost: £60- £100/ m^2

Archetype 1: 224 m^2 x £60 = £13440 (flat roof)
Archetype 2: 130 m^2 x £60 = £7800 (pitched roof)

Photovoltaics

Photovoltaic cells are created using layers of semi-conducting material that convert light into electrical power. The most common material used in the cells is silicon, which is laid and enclosed within glass or plastic casing. A PV solar electricity system can help to cut the average household electricity bill by up to 40 per cent.
Pros: Generates zero carbon energy. Attaracts FITs. Attracts third party funding. Reduces energy bills.
Cons: Difficult to integrate with green roof. Detailed design may scale back PV, or ruleout green roof.

Enhanced Retrofit notional cost per unit/ dwelling*

*Includes more expensive and better performing insulation, air tightness improvements, new doors

£31,850 per dwelling

Overview

Pros:
Less disruption to residents
May not need to decant residents
Improves building aesthetics
Improves biodiversity
Benefit from FITs
Attracts more funding options
Will increase building life-span
Will marginally increase value of dwellings

Cons:
High capital cost
Some redecoration required
Will not attract as much funding as EnePHit
May require maintenance

Solar panels facts and figures (per dwelling)

	4kw	3kw	2kw
Average cost to install	£6,000	£4,625	£3,250
Electricity generated	3604 kWh	2703 kWh	1802 kWh
Annual feed-in tariff	£636	£479	£320
Annual bill savings	£252	£189	£121
Total annual income and savings	£890	£668	£445
Lifetime profit	£11,814	£8,735	£5,657
Payback time	6 years	6.5 years	7 years
Return on investment	14.8%	14.4%	13.7%

3) Passivhaus Retrofit

A passive house is an energy-efficient building with all year-round comfort and good indoor environmental conditions without the use of significant active space heating or cooling systems. The space heat requirement is reduced by means of passive measures to the point at which there is no longer any need for a conventional space heating system; the air supply system essentially suffices to distribute the remaining space heat requirement.

A passive house provides a very high level of thermal comfort and whole-house even temperature. The concept is based on minimising heat losses and maximising solar heat gains, thus enabling the use of simple building services.

The Passivhaus Standard is a specific construction standard for buildings which results in good comfort conditions during winter and summer, without traditional space heating systems and without active cooling. The primary focus in building to the Passivhaus Standard is directed towards creating a thermally efficient envelope which makes the optimum use of free heat gains in order to minimise space heating requirement. Structural airtightness (reduction of air infiltration) and minimal thermal bridging are essential. A whole-house mechanical heat recovery ventilation system (MHRV) is used to supply controlled amounts of fresh air to the house. The incoming fresh air is pre-heated, via a heat exchanger, by the outgoing warm stale air. If additional heat is required, a small efficient back-up system (using a renewable energy source, for example) can be used to boost the temperature of the fresh air supplied to the house.

In order to maintain high comfort levels in any building, heat losses must be replaced by heat gains. Heat losses occur through the building fabric due to transmission through poorly insulated walls, floor, ceiling and glazing as well as from uncontrolled cold air infiltration through leaky construction and poorly fitted windows and doors. In a passive house, the heat losses are reduced dramatically (through better insulation and airtight detailing) so that internal gains and passive solar gain contribute a relatively high proportion of the total need. As a result of this, a smaller space heating system is therefore required compared to that needed in a conventional poorly performing dwelling.

The EnerPHit StandardEnerPHit

It is difficult to meet the requirements of PassivHaus for a new build but when retrofitting an existing property this is even more difficult as the orientation and many fabric components have already been provided, with many areas being difficult to retrospectively make cold bridge free. Though it is possible in many circumstances it is not financially viable, for this reason a retro fit standard for existing homes is being developed, the EnerPHit.

The energy requirement of a house retrofitted to the EnerPHit Standard is:

Annual space heating requirement of 25 kWh/(m2a) treated floor area;
The upper limit for total primary energy demand for space and water heating, ventilation, electricity for fans and pumps, household appliances, and lighting not exceeding 120 kWh/(m2a), regardless of energy source; and
The frequency of Excessive internal temperature (> 25 °C) should be limited to ≤ 10 % recommended ≤ 5 %
Additionally, the air-leakage test results must not exceed 1.0 air changes per hour (ac/hr) using 50 Pascal over-pressurisation and under-pressurisation testing.

The energy requirement of a house retrofitted to the EnerPHit Standard is:

> Annual space heating requirement of 25 kWh/(m2a) treated floor area

> The upper limit for total primary energy demand for space and water heating, ventilation, electricity for fans and pumps, household appliances, and lighting not exceeding 120 kWh/(m2a), regardless of energy source

> The frequency of Excessive internal temperature (> 25 °C) should be limited to ≤ 10 % recommended ≤ 5 %

> Air-leakage test results must not exceed 1.0 air changes per hour (ac/hr) using 50 Pascal over-pressurisation and under-pressurisation testing.

Overview

Pros:
Extremely energy efficient
High comfort and indoor air quality levels
Very low fuel bills
Improves building aesthetics
Improves biodiversity
Benefit from FITs / RHI
Attracts more funding options
Will increase building life-span
Will increase value of dwellings

Cons:
Very high capital cost
Major redecoration required
Residents will likely need decanting

Passivhaus Retrofit

It is a house that has an excellent thermal performance and exceptional airtightness with mechanical ventilation. The Passivhaus standard is a comprehensive low energy standard intended primarily for new buildings. Therefore, this retrofit scenario aims to approximate as near as possible these requirements. The following energy performance targets define the standard and must be met in order for certification to be achieved.

PassivHaus Standard

Component	U-value (W/m²K)
Wall	≤ 0.15
Windows	≤ 0.80
Roof	≤ 0.15
Floor	≤ 0.15

Energy performance targets and air changes per hour

Specific Heating Demand	≤ 25 kWh/m². yr
Specific Cooling Demand	≤ 25 kWh/m². yr
Specific Heating Load	≤ 10 W/m²
Specific Primary Energy Demand	≤ 120 kWh/m² yr
Air Changes Per Hour	≤ 1.0 @ n50

In order to approximate the Passivhaus U-values, the existing building fabric has to be insulated more. The following table indicate the thickness of the insulation that is required.

Scenario 2- PassivHaus (wall)

Material (inside to outside)	Thickness (mm)
Plaster- light weight	13
Concrete- dense block	75
Cavity	50
Brick- exposed	110
Insulation- EPS	200
Plaster- dense	20
U-value (W/m²K)	**0.16**

Scenario 2- PassivHaus- Triple glazed windows

Material (inside to outside)	Thickness (mm)
Single pane (low E, En = 0.05)	4
Argon gap	12
Single pane- clear glass	4
Argon gap	12
Single pane (low E, En = 0.05)	4
U-value (W/m²K)	**0.8**

Scenario 2- Archetype 1- PassivHaus (roof)

Material (inside to outside)	Thickness (mm)
Plasterboard	25
Cavity	110
Plasterboard	25
Insulation- mineral wool	200
EPDM membrane	5
U-value (W/m²K)	**0.17**

Scenario 2- Archetype 2- PassivHaus (roof)

Material (inside to outside)	Thickness (mm)
Plasterboard	25
Cavity	110
Plasterboard	25
Cavity	1000
Insulation- mineral wool	200
Plywood	25
EPDM membrane	5
Ceiling tiles	10
U-value (W/m²K)	**0.15**

Guideleines for cost-optimal EnerPhit retrofit

Climate zone	Regions	Building envelope				Building services					Example buildigs
		Exterior wall insulation with λ value of ca. 0.035 W/(m·K)	Glazing	Window frame	Shading	Heating installation	Cooling strategy	Ventilation concept	Domestic hot water system	Renewables	
Cool temperate	Great Britain, Northern Ireland, Outer Hebrides, Isles of Orkney, Isles of Shetland	23 cm	Triple insulated glazing	Insulated, phB class or better	Roof overhang, exterior shading device	Supply air heating is possible	Night ventilation	With heat recovery and frost protection	Boiler or compact unit (ventilation, dhw boiler, heating/cooling in one unit)	Photovoltaic solar panels as much as possible	Example project 1849

Component	Specification*	Average cost (£/m²)**
Windows	Double	£261
	Triple	£567
Internal wall insulation	Rigid	£123
	Natural	£368
	Hi-tech	£359
External wall insulation	Rigid	£161
	Natural	£150
Floor insulation	Rigid	£65
	Natural	£94
	Hi-tech	£130
Roof insulation	Rigid	£82
	Natural	£30
	Loose-fill	£14
Mechanical Ventilation with Heat Recovery (MVHR)	System + ancillary works	£6,117 per system
Low/ Zero Carbon (LZC) technologies	Air Source Heat Pump (ASHP)	£1,310 per kW
	Biomass	£1,742 per kW
	Ground Source Heat Pump (GSHP)	£2,893 per kW
	PV	£5,627 per kW_p
	Solar thermal	£1,739 per m^2

Overview

Pros:
Creates additional homes for Basildon
Generates income from property sales/lease
Improves building aesthetics/efficiency
Attracts more funding options
Will increase building life-span

Cons:
Very high capital cost (but good ROI)
Residents will likely need decanting

4) New Floor Addition

New top roof extension for more space needs and use of the revenue generated from these to offset the refurbishment of the entire blocks. When converting an existing roof space into a room or rooms the provisions for escape need to be considered throughout the full extent of the escape route. There should be suitable means of access to the building by a new lift shaft and lift and the extension of the existing external staircase. Planning permission is required to ensure that the new construction complies with the current Building Regulations for fire protection.

Initially, it is proposed for the flat roof properties due to easier installation. This could add between three and four flats per block. Any strategy should be followed by a structural survey to ensure feasibility levels.

Archetype 1

> Brick cross wall construction is generally seen as suitable for our modular builds. No loads would transfer to the front and rear elevations, but instead be spread across party walls.
> Modules will be landed traversely, rather than front to back.
> A full decant of each block will be required. Therefore no crash deck required.
> A lift shaft and new lift will be required to accommodate the additional floor
> There may be a requirement to spread loads at the party walls. This could be in the form of spreader beams, or a transfer deck. This would be subject to the type and imposed load of the new modules. We would look to design a light weight structure for these particular blocks.
> New modules will meet all current regulations and required code, where required.
> Access and logistics seem to be manageable
> Site construction time 4-6 weeks per block (for landing modules, finishing units off, connecting to extended services, external waterproofing and external finishing).
> Services can either be provided by extending the existing supplies through the lower properties, or providing a new riser to provide completely new supplies.
> All the above is subject to the usual caveats, exclusions, clarifications, etc. We would recommend a full investigative structural analysis of the blocks. We can assist with this if required.

Archetype 2 and 3

> Brick cross wall construction is generally seen as suitable for our modular builds. No loads would transfer to the front and rear elevations, but instead be spread across party walls.
> Modules will be landed traversely, rather than front to back.
> A full decant of each house will be required. This decant may need to extend to a full terrace for health and safety, structural enabling and economic reasons. No crash deck required.
> There may be a requirement to spread loads at the party walls. This could be in the form of spreader beams, or a transfer deck. This would be subject to the type and imposed load of the new modules. We would look to design a light weight structure for these particular houses.
> Structural strengthening and significant enabling works will be required to the houses, in order to support an on-roof structure. These could prove uneconomical, especially when considering the gains potentially on offer.
> It is not clear whether the extension proposed to the house types, is to create a new and independent dwelling, or whether it is to extend the existing house by adding more rooms. Access will be a consideration for each option, with the former requiring a complete new external staircase.
> New modules will meet all current regulations and required code, where required.
> Access and logistics seem to be manageable, but may prove problematic where there is limited vehicular access to the front and rear of some roads.
> Site construction time 3 weeks per house (for landing modules, finishing units off, connecting to extended services, external waterproofing and external finishing).
> Services can either be provided by extending the existing supplies through the lower property, or providing a new riser to provide completely new supplies.
> All the above is subject to the usual caveats, exclusions, clarifications, etc. We would recommend a full investigative structural analysis of the blocks. We can assist with this if required.

Enemetric Volumetric steel construction

Pros: Quicker construction, various layouts, environmentally friendly material, funding schemes available (CSH),
Cons: New lift and stair extension, planning permission, structural strength required
Cost: £790 - £1070/m^2
Archetype 1: 224 x 790 = £177000
Archetype 2: 120 x 790 = £95000
Lift addition: £45000 - £65000

Extra floor - cost per unit/dwelling*

*Based on total cost per block divided by number of units in same block

£17,500 - £22,000 per dwelling (cost for additional floors only, retrofit costs must be factored too)

The Green Deal

The Green Deal helps people pay part of the cost of energy-efficiency improvements to their houses through savings on their energy bills. The improvements include insulation (solid wall, cavity wall and roof insulation), heating, draught-proofing, double glazing, renewable energy (solar panels, heat pumps etc.). It is a financing mechanism that was launched in January 2013 and applies to both domestic and non-domestic buildings.

Eligibility: Households, businesses

https://www.gov.uk/green-deal-energy-saving-measures/overview

Energy Companies Obligation, ECO

ECO is an energy-efficiency programme that was introduced in UK at the beginning of 2013. It works along with the government's Green Deal to help people install energy- saving measures to their homes. It places legal obligations to larger energy suppliers to deliver energy improvements for further support of the domestic sector and to reduce carbon emissions.

Eligibility: Low income vulnerable households, homes in low income areas, houses that may not benefit from the Green Deal

https://www.ofgem.gov.uk/environmental-programmes/energy-companies-obligation-eco

Feed in Tariff, FiT

FiT scheme is a financial incentive to encourage uptake of renewable electricity-generating technologies. By introducing domestic technologies (PVs, domestic wind turbines, micro combined heat and power etc.), people can generate their own electricity (for own use) and supply the grid, saving money on the electricity bill. It was launched in April 2010.

Eligibility: Households, landlords, businesses, organizations, schools etc.

http://www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Feed-In-Tariffs-scheme-FITs

Renewable Heat Incentive, RHI

RHI is a UK Government scheme that pays participants that generate and use renewable energy to heat their buildings. By increasing the generation of heat from green energy sources (instead of fossil fuels) the RHI helps the UK to reduce greenhouse emissions and meet the targets for mitigating the effects of climate change.

Eligibility: Industry, businesses, public sector (November 2011), households (Spring 2014)

http://www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Renewable-Heat-Incentive-RHI

Additional funding to be explored once options are narrowed

Public Works Loan Board (PWLB)/"Prudential Borrowing" The PWLB is a loan facility available to local authorities provided they can satisfy government "prudential borrowing" requirements in which they have to demonstrate that the loan will be used for an investment which is self financing, eg borrowing to finance renewables projects in which a local authority receives FiT payments. Typical PWLB interest rates to local authorities are around 4–4.5% over 25 years, below the rates of return they can receive from FiTs, thereby fulfilling the requirement for these projects to be self financing. Examples of the use of PWLB funding include the Birmingham Energy Savers programme (see Case Study on page 10). Since PWLB capital is raised nationally by Government through public borrowing, it may be subject to constraints in the future.

Third party funding from the private sector including banks and risk capital investors, which provides local authorities and housing organisations with the capital to invest in installations, from which they then generate FiT or Green Deal payments to repay the third party funding. Third party funding can take a variety of forms, including roof rentals, shared equity and partnership schemes. See Section 4.3 for further information.

European sources of funding for low carbon housing retrofit projects includes funding from the European Investment Bank (EIB), the New European Commission Energy Efficiency Fund (EEEF), European Local ENergy Assistance (ELENA) and the European Regional

Large-scale retrofit funding models

Local authorities and housing associations, working with energy suppliers, investors, other businesses and the community sector are developing large-scale housing retrofit programmes covering hundreds of properties. These large-scale programmes are using a combination of funding, including Green Deal finance, FiT, RHI, ECO, Local Authority "prudential borrowing", European funding and third party/capital market investments.

Five alternative models for funding large-scale FiT based programmes are outlined below:

> third-party FiT Scheme – "rent a roof"/roof leases/"PV for free"
> shared equity FiT Scheme
> partnership FiT Scheme>
> self-financing by building owners
> funding via a special purpose vehicle.

The suitability of these models varies according to the amount that housing organisations are required to invest, the amount of debt and risk that they wish to take on, the degree of control they have over projects and how much money they could make.

Third-party FiT Scheme – "Rent a roof"/roof leases/"PV for free"

The current use of this model, which involves financing and ownership by a third party, is based on revenues from FiT but could also make use of RHI in the future. Examples include third-party FiT schemes and involve the use of capital raised by the third party to fund solar PV installations.

The third party company is granted the lease of roof space or land (housing, business premises, schools etc), for the installation and maintenance of FiT qualifying installations. All investment, installation and maintenance is provided by the third party (or their installation subcontractor) who in turn receives the FiT revenue. The third party takes all of the FiT revenue, which provides them with a return on investment (at least 10%, depending on the scale of the scheme). The third party also maintains the solar PV installation throughout its 25 year life, at the end of which ownership is transferred to the housing organisation. The building owner receives rental income (eg roof rent) and benefits from some free electricity.

The main advantage of this type of scheme for the housing organisation is that the solar PV installations are provided at no cost to the housing organisation, and its residents benefit from reduced energy bills and some free electricity for 25 years.

However, there is a strong tendency for the third party to "cherry pick" the most favourably oriented, unshaded roofs with easy access; if the housing organisation wishes to include other, less financially attractive roofs in the scheme, in order to distribute the benefits of the FiT more widely among its residents, then it must make separate arrangements for those roofs, with no option of cross subsidy. The other disadvantage is that the housing organisation loses control of some of its assets (the roofs of its houses) for 25 years, after which it is left with the potential liability of worn-out solar PV systems.

Shared equity FiT scheme

Shared equity FiT schemes take at least two forms. The housing organisation may be able to invest its own capital in the scheme and thus take a share of the FiT income as well as being paid "roof rent". The share of the FiT income depends on the level of investment but the return on capital can be as much as 7%. Most housing organisations' finance officers would consider this a very attractive return on investment, which could be financed by borrowing from financial institutions or by raising a bond. Alternatively, the housing organisation may not invest any capital but forgo roof rent in return for a small share of the FiT income or negotiate an appropriate balance of the two.

The advantage of a shared equity FiT scheme is that the housing organisation can obtain an attractive return on investment, which can then be used to fund other activity, including other low carbon housing retrofit measures. The disadvantages are essentially the same as those of third party schemes: "cherry picking" and loss of control of the housing assets.

Partnership FiT scheme

A partnership FiT scheme is essentially a joint venture involving a housing organisation and a supplier and/or installer of solar PV systems. Both parties invest capital to fund the installation costs, the housing organisation provides the roofs, the partner installs and maintains the solar PV systems and the FiT income is shared on an agreed basis that reflects the investment made by each party.

The advantage of this type of scheme is that it is "self-contained": there are no external investors seeking a return. The partner can provide the technical expertise, accredited products and accredited installers that the housing organisation does not have. The housing organisation makes roofs available, liaises with the residents and maintains control of its assets (subject to some obligations to its partner) and can include a wide range of dwellings in the scheme rather than cherry picking only the most financially attractive roofs. The partner has a vested interest in providing sound, well-designed and well-specified solar PV installations that will maximise the FiT income from each roof.

The disadvantage of partnership FiT schemes is the need to find a reliable, trusted partner with appropriate technical expertise, accredited products and installers, and capacity. Therefore, this option is more suited to housing organisations with relatively small, local stocks, although larger organisations with stock in several areas might enter into separate partnerships in different areas. Economies of scale are more difficult to achieve than they are in third party or shared equity schemes, in which many housing organisations may participate.

Self-financing by building owners

In a self-financed scheme, the housing organisation is the sole investor (although it may raise funding from a financial institution or via a bond), and the work of designing, specifying, installing and metering the solar PV installations is given to a specialist contractor. This option suits housing organisations with access to capital, some in-house technical expertise and large housing stocks that provide economies of scale in both purchasing and installing PV panels.

The main advantage of a scheme of this type is that there are no other investors, so all of the FiT revenue is taken by the housing organisation, which can use it to fund other activities. The housing organisation also retains complete control of its assets and can choose which roofs to include. The disadvantages are the need for detailed in-house engagement with the technicalities of the scheme and the need to select and appoint a reliable contractor with the capability and capacity to design and install the solar PV systems. For large schemes, selection of the contractor would be subject to the statutory European competition, the Official Journal of the European Union (OJEU) procedure.

Funding via a special purpose vehicle (SPV)

This approach involves a housing organisation or group of organisations establishing a special purpose vehicle (SPV) to invest in generation assets and energy improvements. The SPV provides a means of attracting bank and investor finance from the capital markets. Examples of schemes being developed include Phase 3 of Birmingham Energy Savers, Project “Viridis” in Liverpool and plans for large-scale housing retrofit in Greater Manchester.

This approach provides “off balance sheet” funding that ring-fences risk and liabilities, reduces balance sheet debt and equity investment and minimises security requirements. It also enables refinancing once the scheme is up and running, whereby funders (eg a local authority or housing association) could sell their stake in an SPV to other investors once it is up and running, thereby freeing up their borrowing capacity to fund further waves of retrofit activity.

Basildon Craylands - High Level ROI Analysis (per block)

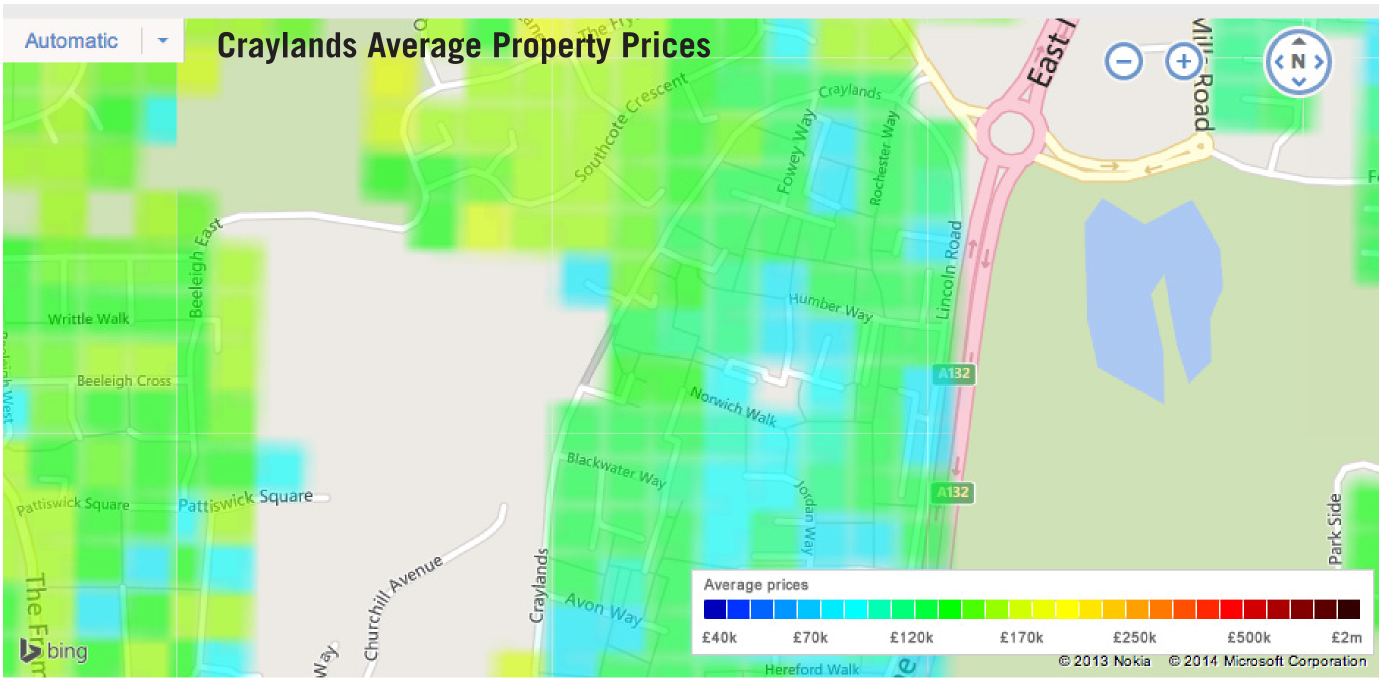
Average Price SS14 6HF	
1 bed flat	£105,000
2 bed flat	£125,000
3 bed flat	£150,000

Notional Dwellings	
Architype 1	13
Architype 2	8

RF-B	19250
RF-E	31850
RF-EP	61850

	1 bed flat*	2 bed flat*	3 bed flat*	Extra Floor (cost)	Retrofit Works**	Sale revenue	Potential ROI	Addiotanal Funding
RETROFIT BASIC								
Architype 1	1	0	3	£234,000	£200,200	£555,000	£120,800	£30,000 - £205,000
Architype 2	0	3	0	£169,000	£123,200	£375,000	£82,800	£22,000 - £178,000
RETROFIT ENHANCED								
Architype 1	1	0	3	£234,000	£331,240	£555,000	-£10,240	£30,000 - £275,000
Architype 2	0	3	0	£169,000	£203,840	£375,000	£2,160	£22,000 - £220,000
ENERPHIT RETROFIT								
Architype 1	1	0	3	£234,000	£643,240	£650,000	-£227,240	£30,000 - £393,000
Architype 2	0	3	0	£169,000	£395,840	£425,000	-£139,840	£22,000 - £328,000

*Extra units added



Traffic and predestrian integration

Public urban gardens

Parking, street furniture and planting

Structural Engineering Report

Engineer:

Marco Bonelli BSc CEng MICE

Site:

Craylands Estate, Basildon Essex -
Peterborough Way: Flat
Lincoln Road: Maisonette

Project Brief

The Craylands regeneration scheme is designed to increase the properties' thermal efficiency and eliminate damp and draught problems, but also to modernise the look of the estate and to improve their appearance.

Property Archetypes

Archetype 1

Type - 1970's four storey housing blocks (Maisonettes or flats being over two storeys). With centralised external staircase.
Streets applied
• Peterborough Way, Lincoln Road, Craylands
Construction –
• Non-traditional form of Crosswall construction
• Brick party walls between flats/maisonettes
• Primary timber stud construction to the front/ rear and wooden joist flooring
• Flat roof
• Single/double glazed upvc windows
• 3rd storey circulation balcony to the front to access to entrance doors to upper floor flats/ maisonettes
• External finish of painted cement render

Archetype 2

Type - 1970's two storey terraced housing blocks (2 bedroom maisonettes/flats).
Streets Applied
• Hereford Walk, Southwark Path, Rochester Way and Chichester Close
Construction –
• Non-traditional form of Crosswall construction
• Brick party walls between flats/maisonettes
• Primary timber stud construction to the front/ rear and wooden joist flooring
• Single/double glazed upvc windows

Structural Engineering Report

- Low pitched gable roof
- Circulation balconies to the front for access to flats/ maisonettes on the third storey
- External finish single skin brickwork at ground floor elevation and clay hung tiles at second floor elevation. Some may have horizontal timber cladding at second floor or have a cement render finish

Archetype 3

Type - 1970's two storey terraced housing blocks (3 bedroom maisonettes/flats)
Streets Applied
- The Lichfields

Construction –
- Non-traditional form of construction
- Brick party walls between flats/maisonettes
- Primary timber stud construction to the front/ rear and wooden joist flooring
- Single/double glazed upvc windows
- Low pitched gable roof
- Circulation balconies to the front for access to flats/ maisonettes on the third storey
- External finish timber cladding/ painted cement render at ground floor elevation and painted cement render or clay hung tiles at second floor elevation. Some may have horizontal timber cladding at second floor or have a cement render finish
- Low ceiling heights

Summary:

Even though there are three Archetypes in total, each housing type are all similar in terms of form of construction, materiality, age and fabrication and therefore flats/maisonettes will have a similar structural limitations.

Crosswall Construction

Crosswall Construction ~ this is a form of construction where load bearing walls are placed at right angles to the lateral axis of the building, the front and rear walls being essentially non-load bearing cladding. Crosswall construction is suitable for buildings up to 5 storeys high where the floors are similar and where internal separating or party walls are required such as in blocks of flats or maisonettes. The intermediate floors span longitudinally between the crosswalls providing the necessary lateral restraint and if both walls and floors are of cast insitu reinforced concrete the series of boxes so formed is sometimes called box frame construction. Great care must be taken in both design and construction to ensure that the junctions between the non-load bearing claddings and the crosswalls are weathertight. Where pitched roof is employed with the ridge parallel to the lateral axis an edge beam has been provides as a seating for the trussed or common rafters and to transmit the roof loads to the crosswalls.

Structural Engineering Report

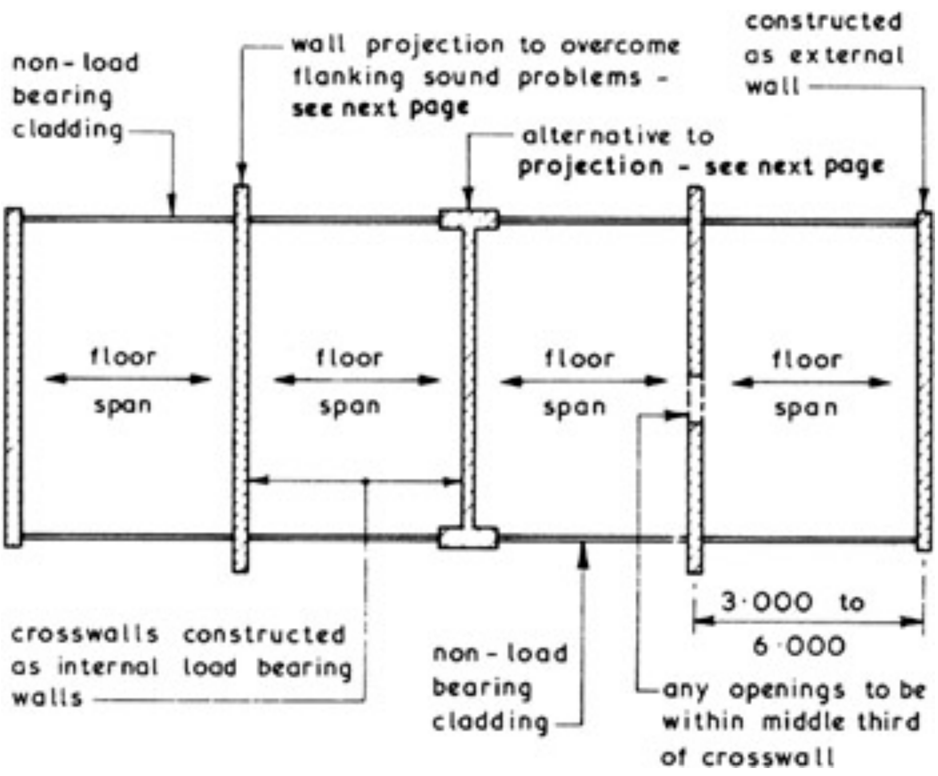
Survey Findings

A structural survey exposed areas of the timber frame that were in need of replacement and the obvious cause of the damp within the properties. The crosswall construction of brick cavity gable walls, metal and timber framework with front and rear timber studwork in-fill panels and cladding also suffered poor thermal performance.

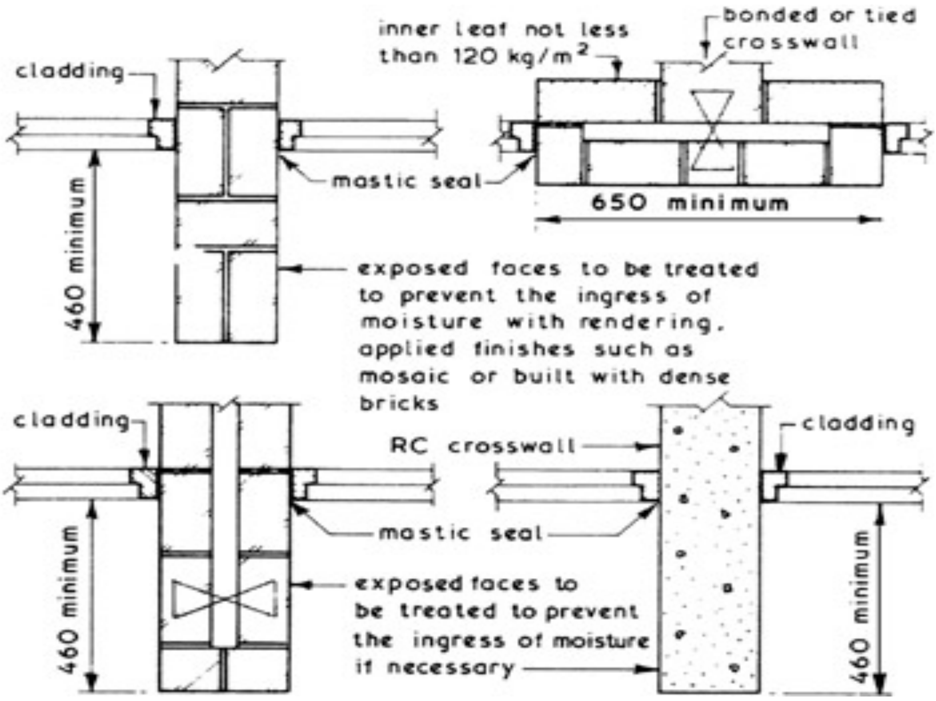
If the external facade were stripped from the building it would became clear there had been ongoing water ingress over many years, rotting much of the timber frame in many.

It is recommended that the existing facade in-fill panel sections are removed to the front and rear elevations with new timbers installed where necessary. A new exterior grade 18mm sheathing board was then fixed to act as the new substrate for the External Wall Insulation system.

A EWI system should be of a 60mm thick Phenolic insulation board, attached to the sheathing board by specifically tailored fixings to ensure a strong fastening and prevent failure of the system in future.



Structural Engineering Report



Cracks were identified in load bearing gable/flank walls. Horizontal floors were deemed sound. An investigation of the footings revealed that the wall cracks were due to settling foundations as opposed to inappropriate/failed foundations, requiring only remedial repairs as opposed to underpinning.

For all the structural wall cracks shown deemed as in need of repair, it is recommended that the application of Helifix stitching bars be applied according to the following procedure:

INSTALLATION PROCEDURES

1. Rake out or cut slots into the horizontal mortar beds, a minimum of 500mm either side of the crack, to the specified depth.

2. Clean out slots with blow pump and apply HeliPrimer WB or flush with water.

3. Using the CS Pointing Gun Kit, inject a bead of HeliBond to the back of the slot.

4. Using a finger trowel, or similar, push the HeliBar into the grout to obtain good coverage.

5. Insert a further bead of HeliBond over the exposed HeliBar, finishing 10-15mm from the face, and 'iron' into the slot using a finger trowel.

6. Repoint the mortar bed and make good.

7. Make good the vertical crack with an epoxy-based weatherproof filler. e.g. CrackBond TE.

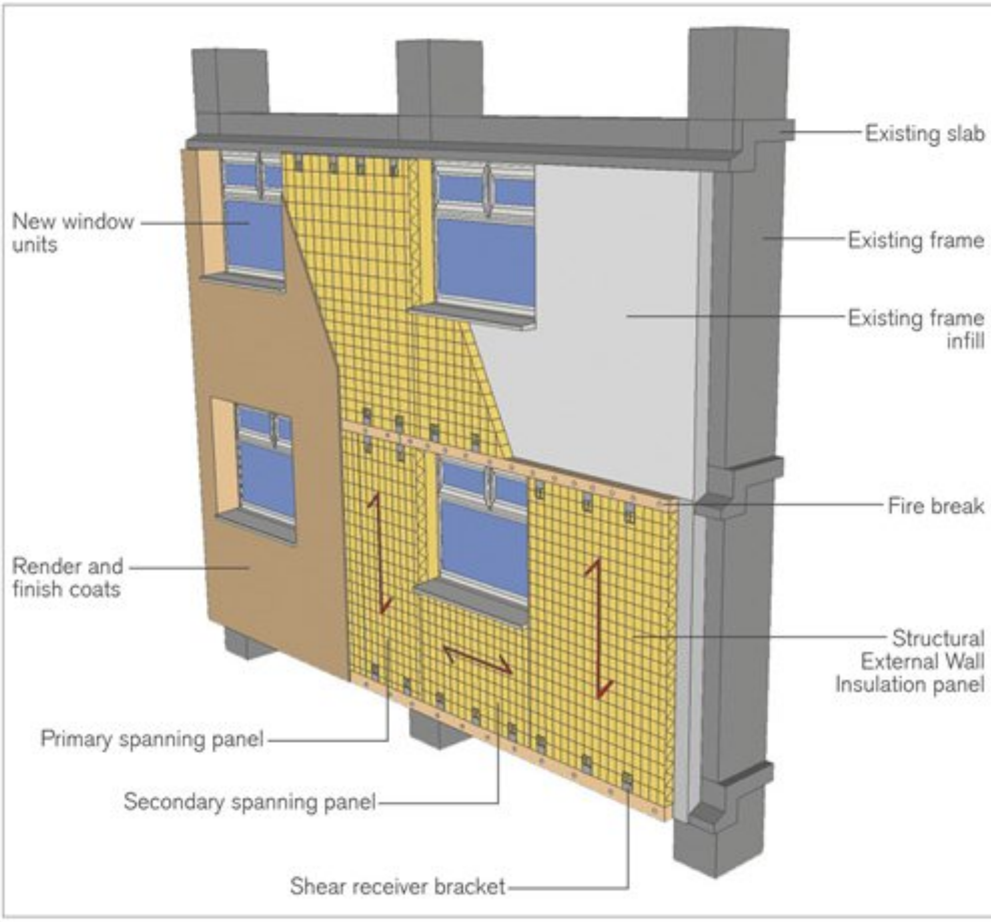
HELIFIX STRESS FREE STRUCTURAL SOLUTIONS

Structural Engineering Report

However, other blocks on the Craylands Estate clearly have subsidence issues that will require more extensive remediation. Although not surveyed, some of the blocks in the Craylands Estate have had load-bearing walls shored up with structural steel. Three basic strategies potentially could be employed to remediate these structural issues.

1) Underpin foundations
2) Structural EWI
3) Additional floors added with steel frame load transfer

When works are rolled out across all properties, a full invasive structural survey is recommended for all properties that will have major retrofit works carried out.



Structural Engineering Report

Additional Modular Floor

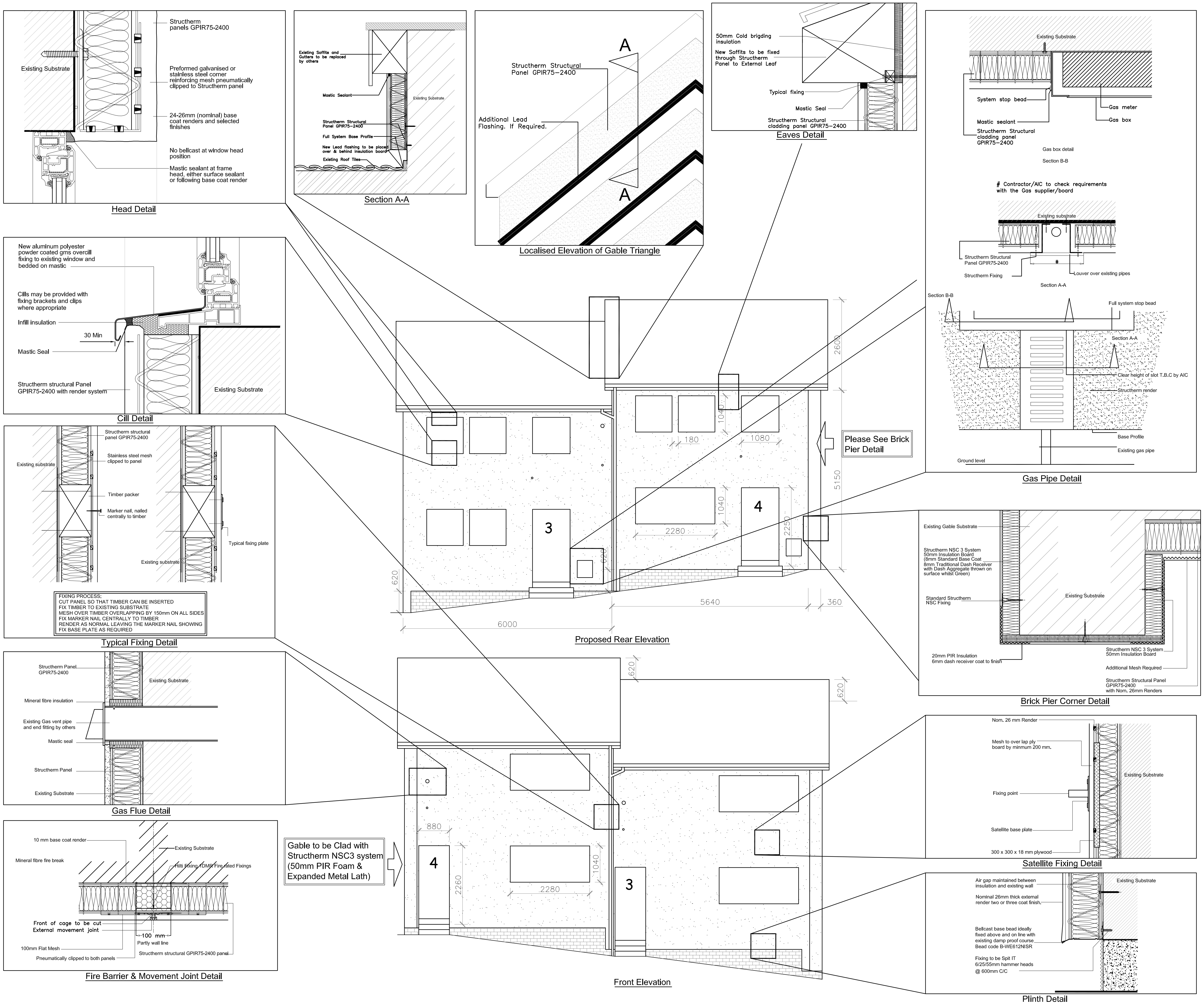
Archetype 1

- Brick cross wall construction is suitable for volumentric builds. No loads would transfer to the front and rear elevations, but instead be spread across party walls.
- Modules should be landed traversely, rather than front to back.
- A lift shaft and new lift will be required to accommodate the additional floor
- There may be a requirement to spread loads at the party walls. This could be in the form of spreader beams, or a transfer deck. This would be subject to the type and imposed load of the new modules.
- A full investigative structural analysis of the blocks is recommended

Archetype 2 and 3

Brick cross wall construction is suitable for volumentric builds. No loads would transfer to the front and rear elevations, but instead be spread across party walls.

- Modules should be landed traversely, rather than front to back.
- There may be a requirement to spread loads at the party walls. This could be in the form of spreader beams, or a transfer deck. This would be subject to the type and imposed load of the new modules. We would look to design a light weight structure for these particular houses.
- Structural strengthening and significant enabling works will be required to the houses, in order to support an on-roof structure


Structherm panels GPIR75-2400
Existing Substrate
Preformed galvanised or stainless steel corner reinforcing mesh pneumatically clipped to Structherm panel
24-26mm (nominal) base coat renders and selected finishes
No bellcast at window head position
Mastic sealant at frame head, either surface sealant or following base coat render
Head Detail
Existing Soffits and Gutters to be replaced by others
Mastic Sealant
Existing Substrate
Structherm Structural Panel GPIR75-2400
Full System Base Profile
New Lead flashing to be placed over & behind insulation board
Existing Roof Tiles
Section A-A
Structherm Structural Panel GPIR75-2400
Additional Lead Flashing. If Required.
A
A
Localised Elevation of Gable Triangle
50mm Cold brigding insulation
New Soffits to be fixed through Structherm Panel to External Leaf
Typical fixing
Mastic Seal
Structherm Structural cladding panel GPIR75-2400
Eaves Detail
Existing Substrate
System stop bead
Mastic sealant
Structherm Structural cladding panel GPIR75-2400
Gas meter
Gas box
Gas box detail
Section B-B
Contractor/AIC to check requirements with the Gas supplier/board
Existing substrate
Structherm Structural Panel GPIR75-2400
Structherm Fixing
Louver over existing pipes
Section A-A
Section B-B
Full system stop bead
Section A-A
Clear height of slot T.B.C by AIC
Structherm render
Base Profile
Existing gas pipe
Ground level
Gas Pipe Detail
New aluminum polyester powder coated gms overcill fixing to existing window and bedded on mastic
Cills may be provided with fixing brackets and clips where appropriate
Infill insulation
30 Min
Mastic Seal
Structherm structural Panel GPIR75-2400 with render system
Existing Substrate
Cill Detail
Structherm structural panel GPIR75-2400
Stainless steel mesh clipped to panel
Existing substrate
Timber packer
Marker nail, nailed centrally to timber
Typical fixing plate
Existing substrate
FIXING PROCESS;
CUT PANEL SO THAT TIMBER CAN BE INSERTED
FIX TIMBER TO EXISTING SUBSTRATE
MESH OVER TIMBER OVERLAPPING BY 150mm ON ALL SIDES
FIX MARKER NAIL CENTRALLY TO TIMBER
RENDER AS NORMAL LEAVING THE MARKER NAIL SHOWING
FIX BASE PLATE AS REQUIRED
Typical Fixing Detail
2600
1040
180
1080
Please See Brick Pier Detail
5150
1040
2280
4
3
2250
620
620
5640
360
6000
Proposed Rear Elevation
Existing Gable Substrate
Structherm NSC 3 System 50mm Insulation Board (8mm Standard Base Coat 8mm Traditional Dash Receiver with Dash Aggregate thrown on surface whilst Green)
Standard Structherm NSC Fixing
Existing Substrate
20mm PIR Insulation 6mm dash receiver coat to finish
Structherm NSC 3 System 50mm Insulation Board
Additional Mesh Required
Structherm Structural Panel GPIR75-2400 with Nom, 26mm Renders
Brick Pier Corner Detail
Structherm Panel GPIR75-2400
Existing Substrate
Mineral fibre insulation
Existing Gas vent pipe and end fitting by others
Mastic seal
Structherm Panel
Existing Substrate
Gas Flue Detail
620
620
Nom. 26 mm Render
Mesh to over lap ply board by minmum 200 mm.
Existing Substrate
Fixing point
Satellite base plate
300 x 300 x 18 mm plywood
Satellite Fixing Detail
10 mm base coat render
Existing Substrate
Mineral fibre fire break
Hilti Fixing, 7DMR Fire rated Fixings
Front of cage to be cut External movement joint
100 mm
Partly wall line
100mm Flat Mesh
Pneumatically clipped to both panels
Structherm structural GPIR75-2400 panel
Fire Barrier & Movement Joint Detail
Gable to be Clad with Structherm NSC3 system (50mm PIR Foam & Expanded Metal Lath)
880
4
2260
1040
2280
3
Front Elevation
Air gap maintained between insulation and existing wall
Existing Substrate
Nominal 26mm thick external render two or three coat finish.
Bellcast base bead ideally fixed above and on line with existing damp proof course. Bead code B-WE612NISR
Fixing to be Spit IT 6/25/55mm hammer heads @ 600mm C/C
Plinth Detail

FURTHER INFORMATION

British Standards Institution 2011, Code of Practice for control of condensation in buildings BS 5250, London: British Standards Institution

Department for Energy & Climate Change
www.decc.gov.uk

Energy Saving Trust
www.energysavingtrust.org.uk

Passivhaus
http://www.passivhaus.org.uk/

Enemetric
http://www.enemetric.co.uk/

Planning Portal
http://www.planningportal.gov.uk/