Technology Strategy Board
Driving Innovation

Retrofit for the Future

Project final report

Cover note

This report was prepared by the collaborative project team for this Retrofit for the Future project, to provide fuller context on their experiences and the particulars of their retrofit's specification, construction and occupation.

The authors were encouraged to include honest, transparent and constructive comment, garnered from multiple perspectives across their team. All views are taken to be an accurate account from the time.

There may have been further modifications to the property after this report was produced. It is therefore possible that a small minority of statements will no longer be valid.

Although minor modifications have been made to this report by the Technology Strategy Board, these were only to ensure the privacy of individuals, including the residents, and compliance with the Data Protection Act.

This report may contain links to other websites, such as for project partners or the retrofit project. The Technology Strategy Board is not responsible for the content of those websites.

This report has already proven to be a valuable source of information for the technical and cost analysis reports published by the Technology Strategy Board which are available at: www.retrofitanalysis.org

Retrofit for the Future Project Final Report

Project number: ZA644T
Property number(s): TSB018, TSB019, TSB020, TSB021

Authors: Bramall Construction/ Keepmoat

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Technology Strategy Board
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SBRI
Government challenges.
Ideas from business.
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Final Report

Project information

- **ZA reference number:** ZA644T
- **Location of property:** WF2, Wakefield
- **Lead participant details:** Bramall Construction/ Keepmoat, Callflex Business Park, Golden Smithies Lane, Wath Upon Dearne, Rotherham S63 7ER
- **Date report issued:** 30 May 2012

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1. Project details and directory

4 Properties:
TSB018
TSB019
TSB020
TSB021

Fig 1: TSB018&TSB019 pre-retrofit

Fig 2: TSB020&TSB021 pre-retrofit

Role	Organisation	Contact Details
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Housing Provider: Wakefield and District Housing (WDH)	Wakefield and District Housing (WDH)	Address: Merefield House, Whistler Drive, Castleford WF10 5HX Tel: 01977 724431 Website: www.wdh.co.uk
Architect	URBED	Address: 10 Little Lever Street, Manchester, M1 1HR Tel: 0161 200 5500 Website: www.urbed.coop
Engineer	AECOM	Address: 2 City Walk, Leeds, LS11 9AR Tel 0113 391628
QS		See QS details for Main Contractor
Main contractor	Bramall Construction / Keepmoat	As above
Sub-contractor – electric	SEC	Address: Unit 4, Astley Way Ind Estate, Swillington, Leeds LS26 8XT Tel: 01132 765151 Website:www.ssecontracting.com
Sub-contractor - heating	V&T	Address: V&T (Plumbing & Heating Services) Ltd., Whaley Road, Barugh, Barnsley, S75 1HT

		Tel: 01226 243708
PV installer	Bramall Construction / Keepmoat	As above
Supplier - Windows	Metroglaze	Address: Block J, Normanton complex, Altofts road, Normanton WF6 2XA Tel: 01924 307871
Supplier – Doors		Address: Manse Masterdor Ltd, Halfpenny Lane, Knaresborough, HG5 0SL, United Kingdom Tel: 01423 866868 Website:www.masterdor.co.uk
Supplier – PV's	Beco	Becosolar Limited, Tempsford Hall, Sandy, Bedfordshire, SG19 2BD United Kingdom Tel: 01767 640111
Supplier – Solar Thermal Tubes	Navitron	Navitron Ltd., 2 Lands End Way, Oakham, Rutland. LE15 6RB Tel: 01572 725512 www.navitron.org.uk
Supplier - Insulation	Spacetherm Aerogel	A.Proctor Group Ltd, The Haugh, Blairgowrie, Scotland PH10 7ER Tel: 01250 872261 www.spacetherm.com
Supplier - Insulation	Knauf	www.knaufinsulation.co.uk
Supplier – Insulation + external render	Alumasc phenolic insulation system	Address: Ecotherm, Southgate Business Centre, 32 Gilly gate, Pontefract, WF8 1PQ Tel: 01977 781594
Supplier – Insulation + external render	Udireco	Address: Unger Diffutherm, Blankenburgstrabe, 81 Chemnitz, Germany 09114 Tel: +49 371815640
Supplier - Heating	Greenshop Solar Ltd	Address: Greenshop Solar Ltd, Bisley, Stroud, Gloucestershire GL6 7BX Tel: 01452 772030
Supplier – Heat Recovery + Heat Pump	NIBE	Address: NIBE Energy Systems Ltd, Unit 3C Broom Business Park, Bridge Way, Chesterfield S41 9QG Tel: 0845 0951200
Supplier – Heat Recovery Nuaire	Nuaire	Address: Nuaire Group, Western Industrial Estate, Caerphilly, CF83 1NA,United Kingdom Tel: 08705 121400 www.nuaire.co.uk
Supplier – Hot Water Storage	Consolar Tank via Greenshop Solar	Address: Greenshop Solar Ltd, Bisley, Stroud, Gloucestershire GL6 7BX

		Tel: 01452 772030
Supplier – Solar Thermal		www.solaruk.net
Supplier- Monitoring kit	Orsis	Address: 10 Cardale Park, Beckwith Head, Harrogate, North Yorkshire HG3 1RY Tel: 01423 530700 www.orsis.co.uk
Sub-contractor – monitoring installation in accordance with TSB requirements.	Energy Saving Trust	Energy Saving Trust England, 21 Dartmouth Street, London, SW1H 9BP Tel: 020 7222 0101 www.energysavingtrust.org.uk

2. Introduction

Bramall Construction were made aware of the TSB competition through our marketing department who had seen information about the project in the trade press. Our sustainability manager thought that it would be a great opportunity to enter a social housing refurbishment project into the competition, as raising the eco performance of the UK's existing social housing stock and reducing carbon emissions is one of the key issues facing social landlords.

Bramall Construction then approached the sustainability manager for one of our key clients, Wakefield and District Housing (WDH), who were keen to get involved to ascertain a successful and cost effective strategy for retrofitting WDH's existing 32,000 housing stock. The project was designed to trial different technologies to find a realistic and replicable solution which could be implemented within the social housing sector. It was also a key driver for our client to ensure that this solution was cost effective; thus the initial bid was based upon a scheme consisting of four properties.

3. Occupants

Four families were involved in the project; the four families were the same before the retrofit and after:

TSB018 – the tenants at TSB018 had lived in the property approx. 17 years prior to the retrofit. The tenants remained in the property whilst the retrofit took place.

Age band	Number before retrofit	Number after retrofit
Under 5 years	0	0
5-16 years	0	0
17-21 years	1	1
22-50 years	1	1
51-65 years	0	0
Over 65 years	0	0
Please state if (yes/no):	**Before retrofit**	**After retrofit**
Married couple / partners	No	No
Couple / partners with children	No	No
Any disabled persons	No	No

TSB019 - the tenants at TSB019 had lived in the property approx. 16 years prior to the retrofit. The tenants remained in the property whilst the retrofit took place.

Age band	Number before retrofit	Number after retrofit
Under 5 years	0	0
5-16 years	0	0
17-21 years	2	2
22-50 years	1	1
51-65 years	0	0
Over 65 years	0	0
Please state if (yes/no):	**Before retrofit**	**After retrofit**
Married couple / partners	No	No
Couple / partners with children	No	No
Any disabled persons	No	No

TSB020 - the tenants at TSB020 had lived in the property approx. 15 years prior to the retrofit. The tenants were decanted to another property within the same area for the duration of the retrofit.

Age band	Number before retrofit	Number after retrofit
Under 5 years	0	1
5-16 years	0	0
17-21 years	2	3
22-50 years	2	2
51-65 years	0	0
Over 65 years	0	0
Please state if (yes/no):	Before retrofit	After retrofit
Married couple / partners	Yes	Yes
Couple / partners with children	Yes	Yes
Any disabled persons	No	No

TSB021 - the tenants at TSB021 had lived in the property approx. 1 year prior to the retrofit. The tenants arranged their own alternative accommodation (at a parents' house) for the duration of the retrofit.

Age band	Number before retrofit	Number after retrofit
Under 5 years	0	0
5-16 years	2	2
17-21 years	0	0
22-50 years	2	2
51-65 years	0	0
Over 65 years	0	0
Please state if (yes/no):	Before retrofit	After retrofit
Married couple / partners	Yes	Yes
Couple / partners with children	Yes	Yes
Any disabled persons	No	No

4. Dates

Event TSB018&TSB019	Date
Project start date (when was the first proposal discussed or agreed)	19.1.2010
Planning application submitted (if appropriate)	n/a
Planning permission granted (if appropriate)	n/a
Building Regulations application submitted (if appropriate)	n/a
Building Regulations approval granted (if appropriate)	n/a
Contract for work let / signed	9/02/2009
Occupants moved out (state if they remained or property was empty)	Remained
Start on site	1/06/2010
Completion of retrofit	27/8/2010
Occupants moved in	n/a
Monitoring system commissioned and operating properly	3/3/11
Building defects corrected	3/9/10
Building services and controls operating correctly	17/9/10
Other key dates? (please add more lines as necessary)	n/a

Event TSB020&TSB021	Date
Project start date (when was the first proposal discussed or agreed)	19.1.2010
Planning application submitted (if appropriate)	n/a
Planning permission granted (if appropriate)	n/a
Building Regulations application submitted (if appropriate)	n/a
Building Regulations approval granted (if appropriate)	n/a
Contract for work let / signed	9/02/2009
Occupants moved out (state if they remained or property was empty)	30.6.10
Start on site	1.7.10
Completion of retrofit	17.12.10
Occupants moved in	22.12.10
Monitoring system commissioned and operating properly	3/3/11
Building defects corrected	14.1.11
Building services and controls operating correctly	28.1.11
Numerous discussions between Bramall Construction, design team, client, installers and tenant.	
CM Met TSB020 with tenant due to bills issue etc. 16.2.11	16/2/11

5. Pre-retrofit property

The four properties selected for the project are 2 pairs of traditionally constructed 1945 – 1965's post war 3 bedroom semi-detached properties, located on two different roads in WF2, Wakefield, and managed by Wakefield and District Housing (WDH). This style of property was chosen at it is the most common house type in the UK, and our client WDH have over 15,000 semi-detached properties within their housing stock portfolio.

Fig 3: TSB018&TSB019

Fig 4: TSB020&TSB021

The properties have cavity construction to the ground and first floors with brick finish. The cavities were already filled as part of the decent homes programme. All four properties have solid floors.

No monitoring took place in the properties prior to the retrofit.

Selection of the properties was based on choosing two pairs of semi-detached properties on the same estate. The properties selected are on different roads, which allowed a comparison between two properties with gas (TSB018 and TSB019) and two properties without gas (TSB020 and TSB021).

WDH were also very keen to ensure that the tenants were suitable candidates to be involved in such a ground-breaking programme. It was felt that the tenants needed to buy-in to the whole ethos of the project in order for it to be successful. Therefore WDH visited each of the families involved to discuss the potential scheme; from this process two original properties were dropped and replaced with TSB020 and TSB021.

6. Design

The retrofit originally proposed was designed to prioritise improvement of the fabric of the properties and to reduce heat loss before addressing more costly renewable technologies, such as photovoltaic, solar thermal and mechanical heat recovery, in order to keep costs down to a minimum.

The key features of the work to the four properties were:

- Rendered external wood fibre insulation; allowing a flat covering of uneven surfaces whilst increasing the thermal (and acoustic) mass and allowing better moisture control in the building fabric.
- Loft top-up insulation using recycled newsprint, with ceiling rafters built up to ensure the use of the loft for storage does not damage the effectiveness of the insulation.
- Triple glazed windows; one in UPVC, the other in timber to assess the relative performance in near identical solutions.
- New doors with design U-values of 0.8W/m2K; again, one in UPVC, the other in timber to assess the relative performances.
- Floor insulation – Perimeter external floor insulation of foamed glass, carried down to the top of the footings on all four properties, and new floating timber floors on top of floor slabs in two properties (TSB020 and TSB021).
- Buffer spaces to the TSB020 and TSB021, between the old coal store and the side door. Created to allow relatively free access for pets without having to leave doors open all day.
- New A++ rated appliances, low flush toilets, click taps and shower flow restrictors.
- Power display monitors – real-time usage display of heat and power.
- Low carbon heat and power – focusing on solar thermal and photovoltaic arrays together with novel ventilation and heat recovery solutions.
- Solar electric – the pair of properties with less floor insulation (TSB018 and TSB019) will have substantial photovoltaic installations to offset the greater emissions.
- Solar thermal – one property (TSB021) to have an evacuated tube solar thermal installation connected to an integrated exhaust air heat pump, whole house ventilation recovery unit and solar hot water tank. This will be compared to its neighbour (TSB020), which will have an evacuated tube install and a stratifying solar thermal store in its outhouse supplying 85% of hot water and 25% of much reduced space heating. Electric immersion will provide the remainder.
- Ventilation – to reduce summer overheating, one property will have a passive stack ventilation using the chimney stack; others will have a temperature activated loft hatch and permanently open vent into the chimney.
- Two of the properties will be fitted with MVHR units to maximise use of internal gains, one system integrated (as per above).

The proposals for the retrofit did change, as did two of the properties - as it was deemed by the landlord that the tenants in two of the properties originally selected were less than enthusiastic about the green agenda. Therefore, two of the original property selections were replaced with the TSB020 and TSB021.

The key changes to the retrofit design, as built were;

- MVHR unit which was finally used was the Nibe 410P rather than the Drexel & Weiss; this was due to the cost of the Drexel & Weiss unit, together with extremely long lead in times.
- The two heating systems designed for TSB020 and TSB021 were swapped from one property to another, due to the size of the coalhouses and buffer spaces created, for accommodation of the systems.
- Triple glazed windows and doors were used in all four properties, due to cost and the client's maintenance policy.
- The intended wood fibre insulation was replaced on two of the properties (TSB018 and TSB019) with 100mm phenolic board insulation and Alumasc render system. This was to provide an opportunity to compare the performance of two systems, offer different solutions to the same problems, and reduce the costs; a major consideration in completing the four properties on the budget of £150,000.

7. Construction

Procurement: The project was negotiated with WDH to be carried out in the four selected properties alongside their 'decent homes' programme.
Contract Type: PPC 2000
Contract Structure: Bramall Construction were the main contractor, using direct labour for most trades plus specialist sub-contractors to carry out specific elements of the work.
Sub-Contractors: The following sub-contractors were involved in the project.

Sub-Contractor	**Element of works**
V+T	Heating and Plumbing
SEC	Electrical
SLK (now Ecotherm)	Insulated Render System
Metroglaze	Windows

Specialist Installers: The specialist heating systems in TSB020 and TSB021; the Nibe fighter MVHR unit in TSB021, and the Solar tubes with Consolar thermal store were both installed by V+T.

The Phenolic insulation and render, and the rendering onto the Udireco insulation on TSB020 and TSB021 were done by SLK (Now Ecotherm).

Specialist Equipment Suppliers:

Equipment	**Procured:**
Nibe Fighter 410P MVHR Unit	Through principal contractor buying department
Consolar Thermal Store	Through principal contractor buying department
Photo Voltaic Panels + Inverters	Through principal contractor buying department
Nuaire Heat Recovery System	Through electrical sub-contractor
Passivent	Through principal contractor buying department

Site supervision: The project was run alongside a decent homes refurbishment programme, and as such the project was managed by a site manager who was running the refurbishment programme on the same estate. A site supervisor was responsible for the works in the four properties which formed the retrofit project.

Role of architect / design team: During the work the design team had a watching brief, and were called in to assist as and when required. A number of design team meetings were held prior to, during, and after the works.

Reflecting on the project, the following bullet points highlight the lessons learnt.

Once committed to being involved, the tenants were keen to get started as soon as possible, as they had already been waiting for the decent homes work to commence. The pressure was on to give the tenants a start date and stick to it. As a result, the final heating design for two of the properties was not completed until the work on the property had begun – it is felt that the design and consultation had an adverse effect on the installation period of the heating sub-contractor, which would have been better if the heating design had been finalised prior to starting works. This also had an impact on ordering of specific materials; as, due to the short amount of notice given regarding final design, the heating sub-contractor suffered delays in sourcing and getting materials delivered, which in turn impacted the programme.

Using none-UK based suppliers also created difficulties in obtaining information and technical guidance, which were needed due to the technology and this was the first time sub-contractors had installed these new technologies in some cases.

- There is no such thing as a standard occupant;
- Tenants require simple user controls and manuals for what can be complicated technology;
- Early retrofits require a full design service, things should not be left to inexperienced subcontractors until standard approaches are developed;
- Building physics is much more critical at these levels of insulation;
- The supply chain needs developing;
- Methodologies to deal with unforeseen costs need to be developed;
- 80% of targets can be achieved without eco-bling – i.e. expensive technologies; the better performing properties within the project used simpler and cheaper technologies;

Timescales for completion did go overtime, due to the reasons mentioned above.

Since completing one of the properties, the heating system has been replaced with a standard gas system boiler due to excessive running costs. The Consolar tank stored 500 litres of water; therefore, when the emersion kicked in to heat the tank (either when the solar was not heating the water sufficiently or weekly to prevent legionnaires) it was heating 500 litres of water.

The reasons for changing the heating system were a combination of tenant lifestyle and an ‘over engineered’ system for a domestic property. After just under a year monitoring her bills the tenant was at the end of her tether with the system, and threatened her landlord with legal action if they did not replace the system. Since installing the gas system boiler which continues to work alongside a reduced number of solar tubes, the tenant is delighted with the results; her bills have reduced to lower than before the retrofit project began, an estimated three times less than they had allegedly been during the use of the Consolar store. With hindsight, tenant lifestyle, and occupancy have had an impact on the success of this system; more consultation with the tenant prior to selection may have resulted in a more positive approach to the project in this case.
The less complicated technologies used at TSB018 and TSB019 worked very well, with excellent energy savings from day one.

- Simpler / established technologies have worked very well on this scheme.
- A tight pre-commencement period in hindsight caused issues during the construction phase; this was due to pressure from the tenant and client to get the project underway.
- A decision was made to use one of our standard domestic sub-contractors, instead of a more specialist installer to fit some of the more challenging technologies such as the Nibe MVHR unit. There were initially quite a few problems with this system which have since been resolved, and the installation of the other technologies on the scheme was fairly straightforward and no other installation problems were experienced.
- Due to the thickness of the wood fibre insulation the windows had to be extended out onto bespoke heavy duty frames, which were troublesome to install.
- Digging the insulation trench around the properties went well, as there were few services to move, and doing this external work caused less disruption than the digging up of internal floors.
- It is felt that the system installed at TSB020 was ‘over-designed’ and has not performed as projected.
- The technology used in TSB021 – the Nibe Unit - has been accepted with open arms by the tenant, who fortunately has a technical understanding of the equipment and is keen to embrace the green agenda. It is felt, however, that this technology would be beyond the understanding of most other tenants.
- On reflection, timescales for completion inevitably went overtime and the work took longer to complete than expected.

8. Commissioning and Occupancy

In TSB018 and TSB019, the technologies were quite straightforward and the tenants remained in the properties for the duration of the works. There were no issues in respect of these installations, due to using tried and tested technologies. The tenants in these two properties are delighted with the results as they use their heating less than before and are making significant savings on their gas bills.

In TSB020 and TSB021, the issues encountered were as follows:

- Due to extreme weather conditions at the point of practical completion (December 2010) there were major running issues with the Nibe 410p fighter. This resulted in high running costs as the tenant had to use electrical heaters to kick-start the heat recovery process. This situation was finally rectified in January 2011 after visits from the Nibe engineer, who resolved the issue and balanced the system.
- As part of the design in TSB020 it was decided to remove the existing gas supply in order to find technologies that could be used on properties off the gas network. Installed technologies would be used to run the heating and hot water, and it was projected that there would be savings to the tenant in respect of fuel bills, due to this and the super insulation installed. However, the electric boiler back-up for the Consolar thermal store proved to be a mistake as running costs are no better than before. The use of a gas back-up would have been a much more cost effective solution in respect of running costs.

9. Costs

Item Stage>	Design stage		Post-construction		Comments
	Materials	Labour	Material	Labour	
Management and administration		£6000		£24,633	Site management and set-up costs were covered by a Decent Homes Refurbishment site running concurrently with the retrofit project; an additional supervisor was employed for the duration of the retrofit project.
Design		£30,386.95		£8,200	
Construction overall					
- Prelims					No prelims as these were charged to existing site.
- Fabric measures			£30,098	£71,380	
- Building services (conventional)					
- Low /zero carbon technologies			£45,223	£23,261	
- Consequential costs					Costs that we have had to pay out as a result of proposed solutions not working, and issues on site: works are costing up to 8k
Occupant temporary housing			£2400		WDH decanted 1 property to alternative accommodation: approx. cost £89 per week for approx. 27 weeks

Monitoring equipment				£9,800	
Monitoring and reporting service				£2,000	

Consequential costs which were unexpected are as follows:

- One of the tenants moved in with their parents for the duration of the improvement works and rent of their home was deferred during the works. Although the cost of alternative accommodation was saved by the client, the tenant's cats were accommodated at a cattery for the full duration of the work: this was a consequential cost which was unexpected.
- Re-decorating TSB020 and TSB021 completely due to finishing just before Christmas and delays to programme – incurring construction cost.
- Reimbursement for electricity in TSB021, as it was felt that excessive electricity costs were incurred by the tenant as the Nibe was not commissioned correctly, and the tenant had to use plug in electric heaters to boost the air temperature and ensure the MVHR system kept running through a very cold period over Christmas 2009.
- Returning to replace the heating and hot water system at TSB020 with a standard gas combi boiler, due to tenant dissatisfaction with the system and excessive running costs occurred by the occupant.

10. Wash-up Meeting

Visits took place following the retrofit works to the four properties involved to gain feedback about the works, and ensure the residents were happy with the works and understood how to use the technologies. Numerous post-completion meetings took place as detailed earlier, to discuss design, installation and performance issues experienced within the properties. These have now ceased, although there is still an issue at TSB020 with running costs for the tenant; so much so that our client is considering the removal of the electric back-up boiler, and replacing this with a gas system boiler.

Feedback from designers, architects, construction delivery team and sub-contractors has been given via email; a summary of the feedback is provided in section 7 above.

11. Doing it again

1. Definitely do again – the team would definitely recommend (subject to available funding) the design solution employed at TSB018 and TSB019. The reasons for this are: ease of installation; tried and tested technologies; cost; replicability on a large scale; ease of use for the tenant – minimal lifestyle change required; reduction in fuel bills (i.e. tangible benefits to the tenant);

2. Definitely not do again – Be really wary of what you tell the tenants prior to the work regarding estimated savings they can make on their bills. The team would not recommend the use of an electric boiler as back up to the solar thermal.

3. Reduction of costs – We would recommend installing the Alumasc phenolic rendered system rather than the Udireco wood fibre due to high actual material costs and transport (from Germany). We would aim to design in an alternative to the Nibe MVHR unit as this was considered too expensive to be replicated on a large scale within the social housing market. We also don't consider the Nibe to be user friendly.

4. Improvement of the design process – There is a high level of reliance on the expertise of consultants when considering new and ground breaking technologies; this can result in consultants wanting to promote technologies which are in line with their own green agenda, but which are not necessarily in line with the clients and tenants' end needs.

5. Improvement of the construction process – When using known industry standard technologies, the team are comfortable with managing the process. When using pioneering technologies, the site team required more input and support from specialists who have experience of this. If this was to be done again, much more communication and preparation between designers and installers would be encouraged to take place.

6. Improvement of the commissioning and occupancy process - The controls for the heating in TSB020 are not considered to be user friendly and, in hindsight, a more simple heating control system would be considered. User guides, which were simplified to try and help the tenants, were still difficult to understand due to the technology of the two heating systems. The Nibe system installed in TSB021 is also technical and not thought to be user friendly either, but the tenant of this property is very pro-active and enthusiastic about the environment; taking a strong interest in the project both prior to and during the works, and having a thorough knowledge of the Nibe system and how it works.

If delivering a larger programme of retrofits, costs could be reduced significantly and through lessons learnt, and a more streamlined project could be delivered over a much shorter period on site. For simplicity and ease of use, the more simple approach used in TSB018 and TSB019 would be used as opposed to the more intense technologies employed in TSB020 and TSB021. Efficiency gains could be made in respect of time taken per property; this would be reduced in a rolling programme of properties, and increased efficiency could be gained on purchasing of materials and continuation for sub-contractors etc.

Key to making the replication on a grander scale successful would be to ensure that a full design is in place upfront; simple user friendly technologies; experienced sub-contractors, and a readily available and easily accessible supply chain.

12. Business Benefits

The project has allowed us to up-skill our knowledge of the various technologies available within the retrofit and sustainability market, and has given us a feel to what the best methods are; something that will be reinforced by other projects within the wider Retrofit for the Future project.

Keepmoat are currently heavily involved in CESP (Community Energy Saving Programme) schemes and are anticipating the arrival of the government ECO policy and RHI (Renewable Heat Incentive).

Involvement with the Retrofit for the Future scheme has allowed us to engage with numerous clients, and give those clients the confidence in our experience.
Due to the economic downturn it is almost impossible to estimate the impact of this retrofit scheme on our business going forward; no doubt if the economy had been buoyant we would feel that that there were definite advantages from being involved with the scheme, in terms of obtaining additional work in future.

13. Additional Information

Since completing the work in TSB020, the tenant has complained of excessive electric bills, and about the house not getting warm despite these high bills. This property is on a pre-payment meter for electric. There was also an issue with the heating system control panel which was installed in the property – the control was not easy to use for the average user, and predicted changes in outside temperature and regulated itself accordingly. The tenant has found the system very complicated to operate, and it tends to take a considerable amount of time to heat the house back up to 21degrees once the temperature has dropped below this.

The electric and hot water usage in this property has been monitored over the last year since installation. Several factors have affected the usage including an additional occupant, and a new baby. After monitoring, and taking into account the tenant's lifestyle and financial situation, the landlord has reluctantly agreed to replace the solar thermal with a gas system boiler, and smaller hot water tank. Some of the original solar thermal installation still feeds into this system.

From the tenant's perspective, this is a much more user friendly system; she can heat the house as and when she wants, and reports that it now warms up very quickly, meaning that she only needs to have her heating on for short periods. Although fitted recently (December 2011) the tenant has reported significant savings on her bills (both prior to retrofit and after the installation of the solar thermal) since the new system boiler has been fitted. It is believed that the cost of heating the 500 litre Consolar electrically was pushing the tenant's bills higher than average rather than being more energy efficient. Although the tank was fed by solar thermal tubes on the roof, the electric emersion inside the boiler was firing up, which took 11kw, thus costing the tenant significantly when demands on hot water and central heating required the electric emersion to kick in.

Before and after photographs:

Fig 5: TSB018 and TSB019

Fig 6: TSB020 and TSB021