

Technical Research (Last updated June 2010)

Key Themes: Sustainable Development and Energy Efficiency

Project No	Project Title	Partner/Contractor
07/3.1(a)	Sustainable Refurbishment of Buildings of Historic Interest	BRE
07/3.1(b)	Towards Zero Emission refurbishment	BRE
08/3.1(a)	Guidance on the assessment of large panel structure dwelling blocks to resist accidental loading	BRE
08/3.1(b)	Improved Drainage Provision for Sustainable Development	BRE
09/3.1(a)	Rethinking refurbishment - Victorian Terraces	BRE
09/3.1(b)	Rethinking Refurbishment - 60/70s housing	BRE
09/3.1(c)	Energy Payback for Renewable Energy Technologies	BRE
09/3.1(d)	Low Water use fittings/appliances- will customers find them acceptable?	BRE
09/3.1(e)	Security Glazing – Is it all it's cracked up to be?	BRE

PROJECT NUMBER 07/3.1(a)

PROJECT TITLE Sustainable Refurbishment of Buildings of Historic Interest

CLIENT Housing and Regeneration

BACKGROUND

It was decided to embark on a refurbishment project to demonstrate the need to refurbish the existing housing stock rather than to knock down and rebuild new housing or new developments on green land. The existing housing stock needs to be sustainably refurbished as a large percentage are more than 50 years old, a quarter of these homes are categorised as 'non-decent', and – in the midst of this housing shortage – around 800,000 are vacant. Most older homes need renovation to bring them into line with today's energy efficiency and other standards. Demolishing and replacing them is neither possible (60% of UK homes that will exist in 45 year's time have already been built), nor desirable – knocking down swathes of older housing is wasteful and can destroy communities and architectural heritage.

METHODOLOGY

A disused Victorian stable block will be turned into four exemplar refurbished dwellings that demonstrate the options and logic for different levels of refurbishment. The building will also incorporate a sympathetic extension, an education facility that showcases the latest refurbishment technologies and techniques, and a training centre that will provide top-up courses for traditional construction skills and crafts.

TIMETABLE

Start date June 2007
Finish December 2010.

PROGRESS REPORT

Through the DECC funding, Phase One of the project is nearing completion. We have installed many different types of insulation to demonstrate them in their varied applications, both internally and externally applied to the walls, and in the floors and roofs as well. We are also showcasing forms of heating; air source, flue save gas boilers, and solar thermal for hot water. Water saving devices have been fitted and all waste on site has been recorded to minimise the impact of the site works. LED lighting and building management systems will also reduce energy consumption, and we have installed the infrastructure to receive the Assisted Living Technology required for keeping people living in their homes longer, through old age and illness. The use of Phase Changing Materials in the presentation room will demonstrate passive cooling through introducing thermal mass into the room space. Representatives from DECC, CLG and BIS visited the site in early May 2010 and were very satisfied with the progress.

Stage two is the addition of a side access space providing a defined entrance and staircase for the whole building. Stage three is the addition of the double story height exhibition space including toilets and a shower for cyclists.

The target of bespoke BREEAM 'excellent' rating will be tested against reasonably affordable costs to achieve the target, but we recognise that we might have to settle for "very good".

We have also sourced sponsorship of three of the main areas, St Gobain are sponsoring and supply materials for Demonstration House B, the Assisted Living Technology Zone. CRH insulation are sponsoring and supplying materials for Demonstration Home C, the innovation Solution Zone, and BASF and its supply chain have taken on the Presentation Zone. We are in negotiation with a number of potential partners to complete the whole project.

The related initiatives and refurbishment projects continue nationally with the HMR Pathfinders, Local authorities and Housing Association, including a housing refurbishment training facility in Stoke on Trent, the Centre for Refurbishment Excellence (CoRE). This in turn has now lead to planning of similar facilities in Brazil, starting in Rio de Janeiro

[Back to Technical Research Programme](#)

PROJECT NUMBER 07/3.1(b)

PROJECT TITLE Towards Zero Emission Refurbishment

CLIENT Housing and Regeneration

BACKGROUND

The T-Zero project has been part funded by DTI, with matched funding from the project partners. The main objective is to reduce the life cycle impacts of housing through refurbishment.

METHODOLOGY

The objective of reducing the life cycle impacts of housing through refurbishment will be achieved through:

- Showing refurbishment is a viable alternative to demolish and new build certain standards of environmental performance are met.
- Helping decision making by quickly identifying the best mix of refurbishment options to reduce environmental impacts; from the point of refurbishment through subsequent use/maintenance and eventual demolition.
- Collecting data and using case studies to ensure recommended approaches are viable within the context of other drivers such as whole life cost, maintenance and preservation of heritage buildings.
- Addressing overall impact, including material resource efficiency and other life cycle impacts, alongside the main environmental priorities in existing housing of energy efficiency and renewable energy production.

TIMETABLE

Start date June 2007

Finish date January 2010.

PROGRESS REPORT

This work has been completed. A website is now in operation <http://www.tzero.org.uk/>, where users can identify the best options for low environmental impact refurbishment.

[Back to Technical Research Programme](#)

PROJECT NUMBER	08/3.1(a)
PROJECT TITLE	Guidance on the assessment of large panel structure dwelling blocks to resist accidental loading
CLIENT	Communities and local government (CLG)

BACKGROUND

This project has been awarded based on a proposal prepared in response to a request from Communities and Local Government (CLG) Sustainable Building Division entitled: Guidance on the Assessment of large panel structures (LPS) dwelling blocks to resist accidental loading (contract reference BD2730). This project was commissioned in September 2008 under the CLG Structural Integrity Framework Programme.

The work aims to develop and use work recently completed on large panel buildings performance under accidental loading as part of a DTI Partner in Innovation (PiI) funded research programme. The PiI project collaborated with engineering consultants, industry, local authority and housing association partners working in the field of assessment, upgrading and maintaining of existing structures.

The PiI project developed:

- An outline historical summary of key events that have occurred within the UK with respect to large panel structures, including the partial collapse of Ronan Point in 1968 together with changes that have taken place in regulatory requirements with respect to LPS blocks following the Ronan Point enquiry.
- An overview of the risk environment that LPS blocks may be subjected to and a brief summary of the mechanisms associated with pipe and non-piped gas explosions.
- A summary of results of a series of limited number of gas explosions tests and full-scale static load tests undertaken on joint samples and more, recently complete buildings.
- Selected case studies of previous structural assessments of LPS blocks

There are in excess of 700 individual high-rise and over 1000 low- and medium-rise LPS blocks in the UK, a total of about 50,000 dwellings. Reviews of the structural assessment procedures of such structures undertaken by a number of different consultants over a period of three decades or so, highlighted inconsistencies, differing assumptions and approaches resulting in widely differing conclusions and recommended management strategies with the potential to compromise safe operation of such buildings. In some instances the outcome of the structural assessments had resulted in buildings being demolished.

Previous work on this topic highlighted the urgent need to develop unified guidance on the engineering assessment and studies on LPS block under accidental loading for current engineering practice.

METHODOLOGY

The aim of the work to be carried out under this project will be to revise existing regulatory and best practice guidance used for the structural assessment of large panel structures dwelling blocks under accidental loading. This work therefore introduces BRE's unique work/experience on full-scale load testing of LPS blocks and also aims to provide a unified approach to possible assessment strategies and suitable methodologies. The project brief is also to update current government guidance (Ministry of Housing and Local Government Circulars 62-68 and 71-68, produced shortly after the collapse of Ronan Point, 1968) to take account of approaches for accidental actions in the structural Eurocodes and risk management strategies more widely.

The final output of this project is to develop two complementary documents comprising:

- A set of normative, performance-based requirements in the style of an Approved Document
- Information handbook detailing the tasks and preferred methodologies available to engineers.

A focussed peer review by specialists in the field of engineering, insurance and risk management as well as consultation (completed as part of ADA consultation in 2009) with leading professional bodies such as the Institution of Structural Engineers, ASELB and SCOSS, is sought to ensure ready adoption of the guidance documents by the industry.

TIMETABLE

Start September 2008

Finished August 2009

PROGRESS REPORT

It has not been possible to progress this work as BRE is waiting for CLG.

CLG have requested that the group contributes to the revision of Approved Document A. A major part of their response is with AD A3, which covers disproportionate collapse. Special consideration is being given to what is required for old buildings.

If this does not occur then the work will be made into a new BRE publication and an existing BRE digest will be updated.

[Back to Technical Research Programme](#)

PROJECT NUMBER 08/3.1(b)

PROJECT TITLE Improved Drainage Provision for Sustainable
Development

CLIENT: Housing and Regeneration.

BACKGROUND

There are a number of areas where improvements in the current provision of drainage for housing developments of all sizes could be made:

- Simple design and construction guidance for soakaways (guide)
- Providing drainage and ground treatment for building at the same time (research, guidance)
- Building soakaways that can be repaired and maintained (research, construction and repair guidance)
- SUDS for small developments (guide)

This would enable NHBC, through their builders, to ensure that developments have as little impact as possible on the local water regime.

METHODOLOGY

Review current design guides for drainage and look for ways to develop and improve them with the help of LA's. Gaps in current guidance will be identified as will processes for the integration of design guidance.

The identification of barriers to changes being made with a view to confirm regulatory acceptability; contacting of LA's, NHBC, building control and EA contacts will be necessary. Potential solutions will be developed where possible and a workshop will be arranged and hosted at the BRE for interested parties.

TIMETABLE

Start date: September 2007
End date: 2009.

PROGRESS REPORT

After a lengthy revision process this report has now been approved. It is currently with the publisher who are having to re-draft many of the diagrams. The report should be published in the next 2 months.

[Back to Technical Research Programme](#)

PROJECT NUMBER 09/3.1(a)
PROJECT TITLE Rethinking refurbishment - Victorian Terraces.
CLIENT Housing and Regeneration

BACKGROUND

The BRE team is transforming a disused Victorian table block into three energy efficient homes fit for 21st century living. Sited next to BRE's Innovation Park at Watford, the finished building will house an Information & Training Centre where visitors will be able to learn about best practice refurbishment including the latest processes, materials and technological advances. Traditional crafts and skills will be taught in the Centre's workshops.

As part of the project, the team is working in partnership with the Housing Market Renewal Pathfinders and The Prince's Foundation for the Built Environment on nine other refurbishment projects – back-to-backs, terraced houses, a £50K refurbishment design competition, Victorian Villas etc. This means that the data and guidance that emerges can be applied to different housing scenarios and budgets.

Renovation has an important role to play in reducing carbon emissions and our aim is to provide the information, guidance and tools that are needed to improve housing refurbishment standards nationally.

METHODOLOGY

The properties are being tested before and after to gather vital data on how to specify the products that will be the best fit for the building, achieve high levels of energy efficiency, provide thermal comfort for the resident, and deal with issues such as climate change and assisted living. The testing will include infra red thermography, air tightness, acoustic and energy consumption, and others as appropriate. The data gathered, and the specifications drawn up can then be rolled out on similar stock. The Victorian properties are considered the hardest to treat and form the bulk of the least energy efficient properties, so by establishing clear guidance on a sustainable approach to refurbishment we can set standards for the industry and inform specifiers, contractors and home owners alike.

There is also an opportunity for remodelling properties to reflect the needs of the local community, which may include reducing large houses into smaller units or knocking two into one to provide large family homes, depending on the needs of that area.

CONTRACTOR

BRE

TIMETABLE

Completion spring 2010.

PROGRESS REPORT

Works to the stable block Phase 1 are due for completion in June 2010.

The pre works testing has been carried out to all of the properties. The Sheffield Ecoterrace has been completed and the case study has been completed by BRE on

behalf of, and funded by the Energy Saving Trust. It should be published in June 2010. The project reached an A rating for the energy performance certificate.

The works to a Calderdale stone faced back to back are now complete, with after-testing having recently been carried out, and reports are being prepared. The East Lancashire property is to be subjected to further conservation submissions by the client, so is on hold until these are completed. In addition to the original properties, a further twenty solid wall properties have been brought into the programme in Redbridge in London and another in Halifax. We are looking at homes in Luton, Derbyshire and Northamptonshire to increase our data on different property types.

[Back to Technical Research Programme](#)

PROJECT NUMBER 09/3.1(b)
PROJECT TITLE Rethinking Refurbishment - 60/70s housing.
CLIENT Housing and Regeneration

BACKGROUND

As an expansion on the programme that originally was designed to address Victorian housing The BRE team has extend the scope to cover a number of other key property types, system housing, 1930s and 1950s properties, and properties built in the 1960s and 1970s. Each era marks a boom in housing and has both its own merits and problems with regard to energy efficiency

Through the interest in the stable Block Project, various partners have joined BRE in seeking clearer guidance on how to sustainably refurbish their stock. In addition to the Pathfinder agencies, Local Authorities have joined the rethinking refurbishment programme. Huntingdonshire District Council are one such partner. They have a predominance of properties built between 1960 and the early 1970s to deal with the overflow of population from London. Their stock consist of mainly semi detached properties built with cavity walls, some on the gas network but some are not.

METHODOLOGY

The properties are being tested before and after to gather vital data on how to specify the products that will be the best fit for the building, achieve high levels of energy efficiency, provide thermal comfort for the resident, and deal with issues such as climate change and assisted living. The testing will include infra red thermography, air tightness, acoustic and energy consumption, and others as appropriate. The data gathered, and the specifications drawn up can then be rolled out on similar stock.

Cavity wall properties are considered easier to treat and in theory should be better performing but this is not always the case. We also need to look at the fact that many of the properties in this area are subject to potential flooding so the refurbishment solutions must take into account such issues.

CONTRACTOR

BRE

TIMETABLE

Commenced, completion June 2010.

PROGRESS REPORT

The preferred contractor has been chosen through open tender, and works are under way. We will be arranging a site visit to monitor the use of innovative materials. The property in St Neots will focus on a pragmatic approach to sustainable refurbishment, retaining as much of the existing fabric while bringing it up to and beyond building regulations for the least outlay. We are also concentrating on climate change measures, both in flooding and overheating. In the property in St Ives we are looking at an enhanced specification of high levels of insulation, air source heat pump and

renewables, solar thermal and PV. This property will also benefit from the consequential improvements of extensions being added.

In addition to the solid wall properties and cavity wall properties, we have expanded to include timber frames houses, system houses and park homes so that we are covering as many key construction types in the UK.

[Back to Technical Research Programme](#)

PROJECT NUMBER 09/3.1(c)
PROJECT TITLE Energy Payback for Renewable Energy Technologies
CLIENT BRE Trust

BACKGROUND

Renewable energy technologies capture ambient energy and convert it to electricity and heat. The source of energy is consequently free of cost and also carbon free in operation. As with all technologies the manufacture of the hardware itself nevertheless consumes energy. The energy/carbon payback time is the time that elapses while the energy generated/carbon saved recoups the energy/carbon spent prior to installation (primarily manufacture).

This project will provide recommendations to the BRE Trust concerning where there remains a need for such information to be determined.

METHODOLOGY

The notion of energy and carbon payback has received some attention already and there have been some studies already carried out. Where this is the case they have produced variable results over a significant range. Such studies have typically assessed the energy consumed/carbon emitted during manufacture, operation and the energy subsequently usefully harnessed.

The information will be compiled through the team's already existing knowledge, through web searches and through discussion with personal contacts.

The methods used in each of the assembled studies will be reviewed to determine how comprehensive each study was. The basis of the studies is of particular importance, issues including:

- what generalised assumptions were made
- is there a dependence on manufacturer's performance claims?
- What climatic assumptions are made?

CONTRACTOR

BRE

TIMETABLE

Compilation of existing energy payback information under way.

PROGRESS REPORT

This work has been completed and a report submitted to the BRE Trust. NIHE has received a copy. A related report, also prepared by BRE has been published by the NHBC Foundation

<http://www.nhbcfoundation.org/LinkClick.aspx?fileticket=UzYVWRQW%2fTY%3d&tabid=339&mid=774&language=en-GB>

[Back to Technical Research Programme](#)

PROJECT NUMBER	09/3.1(d)
PROJECT TITLE	Low Water use fittings/appliances- will customers find them acceptable?
CLIENT	BRE Trust

BACKGROUND

Low water use fittings and appliances are being increasingly specified and with the introduction of the Code for Sustainable Homes this is likely to increase. However there is a question over whether all of these fittings and fittings will be acceptable to customers, because if they are not then they are likely to be replaced with those that use more water.

METHODOLOGY

This research is broken down into the following milestones:

1. Literature survey
2. Telephone survey of manufacturers, suppliers and installers
3. Design and production of test rig
4. Recruitment of focus group
5. Testing fittings on members of the public (this initial study will concentrate on taps)
6. Write BRE Report and produce Information Paper

TIMETABLE

The project is expected to conclude in the Autumn of 2009 with a submission of a BRE Report to BRE HIS press for publication.

PROGRESS REPORT

- A literature survey of the state of current knowledge has been completed.
- A test rig has been designed and built for testing responses of the public to performing simple everyday tasks at low water flow rates
- The test rig was used in an experiment involving over 300 members of the public attending the BRE exhibition Insite09
- Results of the experiment have been analysed
- A focus group study of attitudes of 9 members of the public to low water flow rates has been carried out, including a short experiment with the water test rig
- A telephone survey of water fittings manufacturers and installers has been conducted and the results analysed.
- The final report has is due for the for submission to the publisher by the end of March, but this has been delayed due to personal circumstances
- Negotiations are underway with the NHBC Foundation for funding to carry out further research into standards for low water use fittings in homes.

[Back to Technical Research Programme](#)

PROJECT NUMBER 09/3.1(e)

PROJECT TITLE Security Glazing – Is it all it’s cracked up to be?

CLIENT BRE Trust

BACKGROUND

This project coincides with a spate of burglaries in the West End of London which involve “smash and grab” attacks of expensive goods such as jewelry and designer clothing from window displays involving breaking the windows and taking the goods. In one incident earlier this year thieves managed to escape with half a million pounds worth of jewelry from a Cartier store in Sloane Square by breaking holes in the glass frontage.

This project will confirm whether current methods by which security glazing is specified results in provision of appropriate security to building occupants and if it does not, to identify more effective methods by which the performance of security glass may be specified to ensure that it provides performance consistent with that of the walls, windows, doors and other building elements in which the glass is used.

METHODOLOGY

1. Market study
 - a. Confirm current practices regarding specifying security glass by conducting a survey of current guidance, including current glazing performance standards and design based specifications e.g. thickness of laminated glass
 - b. Review of published UK crime statistics and a survey of specifiers, police and other stakeholders to determine methods burglars currently use to overcome glazing
2. Performance testing
 - a. Source glazing materials identified in stage 1 as being those complying with specifications typically used or which may provide resistance to attack to those currently specified
 - b. Test the glazing materials in accordance with the principles of manual attack standards used to evaluate building elements including those in which the glazing may be used. This is to determine whether there is any correlation between the manual attack performance achieved using the current specification tools with the manual attack performance expected of building elements in which glazing is installed, for example, doors, windows and curtain walling.
3. Publish guidance and develop CPD/seminar training for architects, consultants and other specifiers as well as police and others advising on selection of effective security measures.

TIMETABLE

PROGRESS REPORT

Stage 1 is complete. The review of crime statistics identified that attacks involving breaking glass are only second to those involving levering elements such as door leaves and window openings.

However the study of guidance available found that the published advice in protecting properties against crime contained inconstant advice on the glazing to use. That is the advice ranged from using materials such as wired glass or upgrading from single panes to double glazing, through to fitting laminated glass or polycarbonate. Furthermore a review of standards showed a disparity between the performance expected of the glass compared to the frame/elements in which the glass is fitted. Leading examples are PAS21 (doorsets) and BS7950 (windows); standards commonly recommended by the Police for use in residential and lower risk commercial applications.

Stage 2 has been further delayed by the massive increase in security work having to be done by the department. The BRE Trust are applying pressure to get the project back on course.

The resultant guide to specification should be published in 2010, but no date has yet been established.

[Back to Technical Research Programme](#)