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Dear Sir

EVIDENCE TO THE SWI COMMISSION

The Institute of Historic Building Conservation (IHBC) is the professional body for building conservation practitioners and historic environment experts working in England, Northern Ireland, Scotland and Wales, with connections to the Republic of Ireland. The Institute exists to establish, develop and maintain the highest standards of conservation practice, to support the effective protection and enhancement of the historic environment, and to promote heritage-led regeneration and access to the historic environment for all.

Thank you for inviting us to participate in this consultation.

Executive summary

The IHBC fully endorses the principle that traditionally constructed buildings can contribute to climate change targets if treated appropriately. However there are very serious issues regarding the appropriateness of SWI for traditional buildings.

The basis of the Review is totally misguided insofar as it seeks to expedite the delivery of Solid Wall Insulation on the current model and using current solutions and methods. This is both imprudent and premature in the light of already published DECC-supported research, and the major Solid Wall research currently being carried out by BRE for DECC. These show that the current approach is severely flawed in relation to traditionally constructed dwellings and other buildings, which make up at least 25% of the building stock. To accelerate delivery of demonstrably inappropriate measures for such buildings would be grossly irresponsible.

Flaws in the current approach include:

1) limited savings due to inappropriate methodologies, notably in relation to U-values, and many types of rebound effect.

2) technical risks: current techniques and standards devised for air-tight modern construction are inappropriate for structures in which the retention of a breathable fabric is key to their long-term survival.

3) very serious damage to historic assets and the wider heritage (both individual buildings and the street scene) arising from loss of historic character and fabric – which could all be for little gain and at great risk.

Our view is that it is also a massive error to consider SWI in isolation, rather than as one of a number of potential (and only practical where appropriate) ingredients of a "whole building" approach. The fundamental issue is that measures such as SWI intended to reduce carbon emissions may be promoting premature building decline and loss, and thus heavier carbon emissions than would have taken place if more appropriate action had been taken.

These issues are compounded by very long-standing failures, across all parts of the construction industry, to provide skills, training, techniques and materials appropriate to refurbishment and adaptation as opposed to new build.

A complete re-think is essential to halt avoidable current damage to buildings, and consequent waste of carbon and finance: firstly on inappropriate works, and then on remedial works to put them right.

In this context we commend the progress being made by CLG, DECC et al in relation to review of moisture standards and conventions, and reviews in prospect of SAP and rdSAP; however these are only the very first stages in what has to be an urgent, wide-ranging and radical review of building and retrofit standards, conventions and practice. New and appropriate standards and conventions, and the skills to deliver them in a "whole building" approach, need to be in place before any further large-scale roll-out of SWI for traditional buildings.

Most urgently, we call for the immediate publication of the Building Research Establishment's research on Unforeseen Consequences of Retrofit Measures (report supplied to DECC in 2014).

Traditional buildings – insufficiently recognised

All buildings dating from before 1919 are generally considered to be of traditional solid wall construction. On that basis, they make up at least 25% of the building stock (34% in Wales). However, and as BRE research for DECC has highlighted[1], a large proportion of buildings from 1919 to 1939 are also of solid wall construction.

IHBC is not aware of any overall assessment of the total number of buildings of solid wall construction: in our view such an assessment needs to be made urgently to enable properly informed and appropriate decisions to be made.

Good repair is vital

The first consideration should be to put the building in good condition including the walls. Walls can be 30% less energy efficient if damp (as cited in British Standard BS 7913:2013). Repair and maintenance should be seen as a vital part of energy conservation.

Limited savings and inappropriate methodologies

A strong and growing body of research (SPAB, English Heritage, Historic Scotland, STBA et al) shows that current methodologies (including SAP and RdSAP) based on U-values underestimate the energy performance of traditional buildings. While this problem has

1 Major problems have been found in a study of retrofits of 1920-30s buildings, as noted in Colin King (BRE Wales) presentation at Ecobuild 2014 http://www.slideshare.net/BREGroup/colin-king-ecobuild-6-march-2014

been acknowledged to some extent by DECC through its "In-Use Factors", this nothing like enough: it is so significant that it calls into question the whole basis (in terms of EPCs) on which claims are made for carbon savings in traditional buildings. DECC-supported research by the UCL Energy Institute published in October 2014[2] suggests that standard UK solid-wall U-values may be inappropriate for energy certification or for evaluating the investment economics of solid-wall insulation. This research shows that real U-values of solid walls are underestimated to such an extent that up to 1/3 of all solid wall buildings should be given a higher EPC rating than calculations suggest.

Without the 'real' U-Value of the original building fabric the increased energy efficiency of the SWI cannot possibly be calculated, this means that the energy savings cannot be calculated. As stated above published data on U-Values is inaccurate and therefore payback calculations based on this data will be inaccurate and usually cite a better payback than that which is achieved. This means SWI investment decisions offer considerable risks. A database of U-Values for different types of walls and thicknesses should be developed based on real in situ U-Value tests of walls in existing buildings. The database would need to contain hundreds if not thousands of different types of walls with different types of masonry units, different types of mortar, different mortar/masonry ratios, different finishes, different categories of condition, different exposure zones and different thicknesses and then a means of bringing all this information together in a meaningful and efficient way needs to be developed.

Rebound effects

"Comfort-taking" and other rebound effects are well-documented.

Technical risks – a predictably flawed approach

Standard SWI solutions apply an impermeable coating to the wall. Whether EWI or IWI, this approach seals moisture in. However traditional buildings rely on a "breathing' wall in which moisture is absorbed and then evaporates; special consideration of all such buildings is well established in Building Regulations Parts L1B and L2B.

For decades IHBC members, and many building owners, have had difficult and costly experiences of rectifying the damage caused by impermeable coatings applied in the 1960s and 1970s.

We are horrified to see the same mistakes being made again, in the interests of reducing carbon emissions and with Government funding, when in all too many cases the predictable consequences are or will be trapped moisture leading to building failures, mould growth, and occupant health issues.

Issues already raised in Government-commissioned research

It is particularly puzzling that this review has been launched at the same time as the Building Research Establishment has been carrying out a major research project for DECC which highlights the issues for traditional buildings. While the majority of the research is as yet unpublished, the Literature Review "Solid wall heat losses and the potential for energy saving"[3] published by BRE and DECC on 19 January 2015 highlights potential unintended consequences of SWI as follows:

"The main unintended consequences identified from the review can be categorised into two areas: 1) the risk of overheating in buildings with SWI and 2) changes to the distribution of moisture in a building following an intervention. Both of these can have severe effects on occupants' health, as well as the building itself. The research

2 Solid-wall U-values: heat flux measurements compared with standard assumptions, Building Research & Information, 43:2, 238-252 http://www.tandfonline.com/doi/abs/10.1080/09613218.2014.967977#

3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396363/solid_wall_insulation_literature_review.pdf

suggests installing external rather than internal insulation can help to moderate the excesses of internal temperature swings. However, poor installation of either can lead to problems with water ingress, condensation, and mould growth. The majority of the unintended consequences observed, have been linked to shortfalls in the quality of the workmanship, as well as mistakes in the initial assessment of the buildings when assessing their suitability for the application of wall insulation."

Why has this Call for Evidence been issued now, given these very serious issues highlighted in already-published Government-commissioned research?

What is needed instead is "a thorough and extensive review", as the BRE Literature Review for DECC suggests, "of buildings that have been insulated with EWI,… to endeavour to identify causes of unintended consequences." The Review goes to note that:

"The current arguments are based on limitations in different numerical models (Glaser/Wufi). Although Wufi encompasses more parameters (wind-driven rain, water ingress, and local climate data) than Glaser, it is still a numerical model, with serious limitations on the materials and climate data bases within the tool. Much support is given to undertaking this type of modelling, but it is both costly and impractical on a mass roll-out of supported / funded insulation schemes.

Although at an early stage in this project, there are already indications that the areas of weakness in the EWI process could be categorised into three main causes of unintended consequences: the initial assessment of buildings, systematic problems, and factors relating to occupancy. There is already a growing list of these that need to be considered, and ranking these by risk and effect will help focus the minds of the people involved in making the decision whether to insulate or not.

The literature examined as part of this review points to several factors which can lead to the unintended problems often observed. These factors include:

- Inadequate assessment of the condition of the building before improvement is considered,
- The limitations in assessing realistic climatic conditions,
- Incorrect installation methods being used.

All of these factors have the potential for considerable risk in the implementation of large-scale external wall insulation projects such as the Green Deal or ECO, and in particular when external or internal insulation is applied to walls that are of solid construction. Many factors are influential in this early deterioration but poor detailing on junctions and penetrations in buildings appear to be major factors."

Unintended consequences: "the risks are too high to continue as normal"[4]

In the absence of the full published BRE research, Colin King's Ecobuild 2014 presentation of interim findings clearly shows the urgent need for change, identifying up to 74 unintended consequences of retrofit works, and serious flaws at all stages of the process.

It is vital that these issues are addressed before any large scale roll-out of SWI.

The need to understand moisture in buildings - and for new standards

Wall insulation should not be applied to damp walls, but it often is and sometimes this may be due to a lack of a proper damp investigation process. We need to see robust

4 ibid

methods of understanding dampness put in place that does not automatically delegate responsibility onto damp proofing contractors.

One cannot possibly understand whether interstitial condensation is being caused with the installation of SWI unless the U-Value of the existing structure is known and modelling with dynamic software takes place. In almost all cases the U-Value is not known. The U-Value can be estimated but published data contained within software is acknowledged to be inaccurate especially where traditional solid walls are concerned, and this equates to about one third of all UK buildings.

IHBC calls for urgent publication of the Moisture Guidance prepared for DECC and CLG by the Sustainable Traditional Buildings Alliance.

The need for a "whole-building" approach, with location- and building-specific solutions

"One size fits all" solutions are totally inappropriate for traditional buildings. A "whole-building" approach is vital.

Choices need to be made on the basis of what is best for the particular building construction, and taking into account Building Regulation guidance in relation to UK Exposure Zones. In exposure zone 4 (Wales, the west country, western parts of Lancashire, Cumbria and about a third of Scotland) it recommends that cavity wall insulation should not be installed unless there is a rain screen (i.e. water proof cladding). This same information should be used to inform choices on SWI. This means that one needs to think about the weather protection of EWI and the huge risks involved with IWI in situations where there could be penetrating dampness.

It is vital that SWI installation does not repeat the well-documented problems with inappropriately-specified Cavity Wall Insulation. These were the subject of a Westminster Hall debate on Compensation for victims of badly-installed cavity wall insulation on 3 February 2015.[5]

Safeguards? Building Regulations special consideration vs approved inspectors

The need for special consideration of traditional "breathable" buildings has been set out in the Building Regulations since 2002 (Parts L1B and L2B, paras 3.8-3.14). Inexcusably, these safeguards have been ignored in the Green Deal and ECO, with the exception of one cautionary paragraph in the Green Deal Code of Practice. The current focus on SWI in the Green Deal Home Improvement Fund shows no awareness whatever of the risks and potential problems.

The efficacy of the Part L safeguards is already severely undermined by the use of Approved Inspectors rather than Local Authority Building Control with their direct access to specialist advice from conservation officers (where available – their numbers and potential for advice severely limited by staffing cuts).

Further promotion of self-certification would be disastrous for traditional buildings, in the absence of corresponding development of the required skills, knowledge and appropriate accreditation.

Skills and Competency issues

Many of the failings noted in current research arise from poor or inappropriate design, specification or execution.[6] These failings are the (entirely predictable) result of a "perfect storm" combination of:

5 http://www.parliament.uk/business/news/2015/february/westminster-hall-debates-3-february-2015/

6 External Wall insulation in Traditional Buildings, English Heritage 2014 https://content.historicengland.org.uk/images-books/publications/external-wall-insulation-traditional-buildings/external-wall-insulation-in-traditional-buildings.pdf/

a) the application of single products / methods / "solutions" without considering how these relate to or interact with the particular characteristics of the building, and in the absence of a "whole-building" approach and the skills needed to deliver this.

b) the near-total overlooking of traditional building needs and issues in DECC initiatives (while new National Occupational Standards for Older Traditional and Vulnerable Buildings were consulted on in 2013, they have only been approved in Scotland and Wales, not England) and

c) the construction industry's very long-standing focus on training for new building work, not on refurbishment, adaptation and repairs. IHBC has repeatedly raised this issue in consultation responses, but to no significant effect.[7]

At the most basic level, everything should commence with understanding the construction and condition of a building along with its environment. There should be a robust standard practice that details how to go about assessing, surveying, inspecting all types of buildings. This should be undertaken before decisions are taken to provide SWI. This will no doubt require those involved to be trained to the required competency levels.

Carbon and financial costs of works – and subsequent remedial works

Since Government first tried to improve energy efficiency in existing buildings through Part L in 2002, the approach has been fundamentally flawed because it has only considered energy performance "in use", ignoring embodied energy, the carbon cost of installed measures, or the carbon emissions arising from disposal.

IHBC considers that a "whole life" approach is essential to effectively meeting the carbon challenges we face, rather than wasting carbon (and finance) on inappropriate measures. In this context inappropriate SWI installations can only be described as "carbon villains": they waste carbon in damaging the fabric of the building, their installation costs carbon, their subsequent removal costs carbon, and the required remedial works may cost far more carbon than might have been needed for a more appropriate intervention in the first place.

Furthermore, SWI may not be the best option even in purely financial terms. The National Trust's 2014 CROHM study (by Parity Projects, report submitted as supporting document to National Trust submission on the Private Rented Sector Regulations) of its 5000+rental properties showed that upgrading to EPC 'D' and 'E' with SWI as part of a "whole building" package of interventions would cost approximately 50% more than equivalent improvement in a package not using SWI.

Consideration also has to be given to the use (or misuse) of public funds in financing and promoting inappropriate solutions. It would therefore be prudent to take forward publication of the BRE Solid Wall research with a thorough audit of SWI schemes already carried out.

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7 IHBC Responses to: PAS 2030 25/10/11
http://ihbc.org.uk/consultations/docs/PDF/PAS2030revised_response.pdf
CITB ConstructionSkills Strategy 31/10/11 http://ihbc.org.uk/consultations/docs/PDF/Skills-Strategy Consultation1-Questions-web%20IHBC%20Final.pdf
All-Party Parliamentary Group for Excellence in Built Environment – Sustainable Construction and the Green Deal 7/1/13 http://ihbc.org.uk/consultations/docs/PDF/appgebe/Memorandum%20final.pdf
Consultation questionnaire on Green Deal National Occupational Standards 28/3/13
http://ihbc.org.uk/consultations/docs/PDF/IHBC%20OTVQuestionnaireMarch2013Revised.pdf
All-Party Parliamentary Green Deal Group Green Deal Investigation and Survey 18/11/13
http://ihbc.org.uk/consultations/docs/PDF/GreenDeal.pdf
DECC consultation on In-use Factors 5/11/14
http://ihbc.org.uk/consultations/docs/PDF/DECC's%20Review%20of%20In%20Use%20Factors%20response.pdf
Future Challenges in Energy Policy 15/12/14
http://ihbc.org.uk/consultations/docs/PDF/ClimateChange.pdf

Heritage issues

For all the reasons noted above, inappropriate solid wall insulation can be severely damaging to the fabric of historic buildings.

Solid wall insulation, whether external or internal, also unavoidably masks[8] the surfaces and features which give character to historic buildings and townscapes.

For an example of SWI applied to undesignated heritage asset in Reading, irreversibly damaging the whole terrace see Photograph 1 in Appendix 2.

Claims have been made (not least by the former Energy Minister Greg Barker) that it is possible to reproduce the appearance of traditional brickwork through using slips; IHBC has sought evidence to substantiate such claims and none has been provided. We have seen no examples which are even remotely convincing (see Appendix 1(a)), and no assessment of the cost implications.

The consequence (individual and cumulative) is severe damage to our heritage, designated and undesignated, and to what makes our country special.

Such damage is only justified if an irrefutable case can be made that it is essential, beneficial, and there is no alternative means of achieving the same benefits without damage. No such case can be made.

Risk management (or lack of it)

Almost all the issues we have raised in this submission are the direct consequence of inadequate assessment and management of risks, many of which are well-known but have been ignored. To continue with such an approach in the face of strong and ever-growing evidence to the contrary would be imprudent in the extreme. Instead, lessons need to be learned from past mistakes.

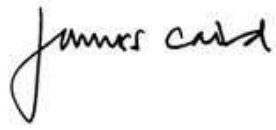
Consideration needs to be given not only to the direct costs but also to liability aspects.

Conclusion

A wide-ranging and radical re-think of SWI, and retrofit generally, for traditional buildings has to be carried out before any further carbon and public money are wasted on inappropriate and damaging measures. The longer the present situation continues, the higher the carbon and financial cost.

We hope these comments are helpful and we are available to give oral evidence if required.

Yours faithfully



James Caird

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8 see photos in English Heritage's "external wall insulation in traditional buildings", ibid.

APPENDIX 1

Some examples from IHBC members

Professional experiences:

a) "attributed to IHBC member that specialises in the assessment of condition of residential historic structures"

"On a practical note, my many inspections of old houses, including many Listed, has seen a significant increase in the use of modern materials for solid wall insulation and the almost consequential increase in condensation levels inside such houses. I would agree entirely that this can be down to how the house is occupied, but many problems were seen in 2013 / 2014 following the very wet weather conditions of the previous year, where empty houses became particularly saturated, but use of cement mortars & renders outside and Kingspan etc. inside, allowed moisture to be retained within the respective structures. I also have many examples of cold bridging, especially around door and window reveals; to walls where insulation has been missed; and mould developing between materials such as Kingspan and the solid walls behind, where no allowance has been made for ventilation. I have also seen circumstances where a material designed for one location, has used in another i.e. very often workmanship or the lack of understanding of the material AND the house to which the insulation was added, has created significant damp & condensation problems. In essence, adequate training is the key as much as the material used.

My personal conclusion is that modern block insulation such as Kingspan is entirely inappropriate unless its installation is very carefully thought through. I have therefore had a tendency to advise the use of materials such as woodwool fibre board (PROVIDED all dampness has been removed), or Calsitherm or cork in such locations, but with the reminder to insulate all surfaces as well as window reveals. As an aside, I have also seen some instances where cavity wall insulation has been installed in "hard to treat" houses, only to create damp patches at various points inside!

What with this and the use of cementitious materials and retrospective damp courses, I am being kept extremely busy commenting on damp issues, where the retrospective DPCs have not worked!"

(b) Another IHBC member's professional experience of many buildings and problems:

"Manchester – Edwardian town-house. Solid brick wall – 9" built with lime. Suffered extensive damp problems at rear of house. Kitchen was stripped out, plaster falling off rear wall, skirtings rotted, door frame and door rotted. Even the concrete floor slab was damp where it touched the wall. I drilled carbide samples from the wall a metre up it, and extracted mud – it tested over 20% total moisture content. Realised that cement render to rear was actually EWI. It was Kingspan fitted in a steel frame, with about 15mm gap between wall and Kingspan, with a rendered coating over cement board screwed to the steel frame. Closed at the bottom, finished about 9" above ground. A thermo-hygrometer probe pushed into the gap between Kingspan and wall recorded 110% RH at 12 degrees C. The entire lower half of the wall was saturated – amazingly the occupants said their bedroom upstairs was warmer than it had been – the wall upstairs was dry. The EWI was removed, the wall dried out, and the kitchen has now been plastered in lime, and is dry.

Lincolnshire farmhouse – solid brick wall 9" built with lime. Soft Lincolnshire brick, early Victorian. Clients had damp wall to house downstairs and problems with damp in wardrobes upstairs. Dining room ceiling had partially collapsed through water dribbling onto it. Clients had wall re-pointed, roof stripped back and replaced, plumbing tested – and still the water came. I demolished the wardrobes in the bedroom above the dining

room, and found the entire wall had been fitted with IWI – approx. 30mm Kingspan sheets which were bonded to the wall with blobs of adhesive. Condensation was pouring down the back of the Kingspan into the ceiling of the room below. Stripped the Kingspan off the wall, which dried out immediately, and ceiling and timbers replaced – house is now dry and warm again.

Bristol town-house – Georgian. Solid brick – 9" built with lime. 5 storey. Had major problems with damp walls upstairs - entire house (£1m plus value) scaffolded, roof stripped, valleys pulled out and re-leaded, and still water poured down the walls. Thermo-hygrometer readings showed high RH in the upper rooms where water was staining walls. Took plasterboard off sloping ceiling and upper walls to reveal Kingspan 50mm boards, dripping wet with condensation, which was pouring down the walls. Kingspan removed, walls now dry.

Barn in Southampton area - £1.5 million – timber framed, with brick base. RH inside building no more than 60% - water running down underside of roof and walls. Roof and walls had been lined with Kingspan to comply with building regs 5 years ago when the barn was renovated. Pulled Kingspan out and found water running down it. Now in process of removing all Kingspan and replacing with sheepwool.

Farmhouse in Shropshire – Georgian brickwork 18" thick, built with lime mortar. Steel frame lined – 50mm steel stud, with fibreglass insulation batts in steel frame, plasterboard over it. Fibreglass is sopping wet. Has now been removed by pulling it out from underneath, walls dried out.

Summary:

Kingspan appears to be the worst problem – we are finding more and more instances of major damp problems resulting from condensation running down Kingspan. It is not being diagnosed very often – people don't realise it is there half the time.

Cavity wall insulation:

We are seeing almost too many cases to report – In my opinion, the reason is very simple – lack of diagnosis. Most people when faced with a damp problem look up the local damp wall – who promptly diagnoses rising damp and injects and re-plasters the house. We are only seeing the tip of the iceberg – we get to see the intelligent people, who have thought long and hard, and researched possible causes of their damp problem. The vast majority of people with damp issues from cavity insulation failure call the damp man – and it is not diagnosed properly. I'm of the opinion that for every case we diagnose, there are another 100 or more that are not being diagnosed."

Householder experiences:

c) An IHBC member's personal experience (2012 report of her mother's house):

"My Mum's Edwardian terrace house has recently had a council-led thermal upgrading system applied, this was approx. Two years ago, she has since had internal damp problems that were never there before, to the point where plaster is disintegrating from off of internal walls. She has spoken to other neighbours and they are also having similar problems, she is in the process of putting a list of problems together and emailing them to her local council, however she has highlighted her problems to the council and they are not willing to accept that this is a problem caused by this system. The exterior aesthetics of the scheme is very distasteful also." See Photograph 2 in Appendix 2 and also Photograph 3 which shows the interior situation.

(2015 update) The query never got resolved with the council, we tried but they just seemed to fob us off. So we gave in.

Having asked them numerous questions about the SWI products they put on my Mum's house, with regards to breathability and the build up itself. The answers we were getting suggested that they didn't really understand the products themselves and the risks and likely impacts the SWI would have upon the house.

My Mum has reported that it does keep her house warmer, however she still has issues with plaster disintegrating off of internal walls."

d) Another IHBC member's personal experience:

"I was considering possible EWI for my 1938 semi-detached (brick, solid walls). The company acting for the Council scheme were keen to come and visit. I asked if the material would be "breathable"; the call taker did not know, but promised me the managing director would get back to me with an answer. 3 months later I am still waiting."

APPENDIX 2: PHOTOGRAPHS

PHOTOGRAPH 1

PHOTOGRAPHS 2 & 3 (interior)