Questions and answers after the event

Tenement Flat Carbon Reduction Shopping List
Held at Glasgow Caledonian University on 8 February 2011

Speakers:
Douglas Jack, Holmes Partnership
Jeremy Cockroft, Energy Systems Research Unit, Department of Mechanical Engineering, University of Strathclyde Glasgow

Roger Curtis, Head of Technical Research, Historic Scotland, was in the audience and contributed to the discussion after the presentations.

Message from the architect Andrew Rodger:

Another very interesting presentation. There were, like last week, many thoughts brewing as discussion proceeded at the end but the interjections which I felt I could make risked being too long winded for that forum and I wondered if it might be possible to leave the door open for written questions of the speakers, say, for the rest of the day? Perhaps by eMail?

To illustrate my point, I was tempted to question the assertion that having ventilation gaps between the lining plaster and the external stonework was/is to prevent rot in the joists. Assuming the building is well maintained and there are no leaks on the wall or wall head then the soaking and drying processes of the stone wall will inevitably mean that the water content of the stone will vary but within manageable limits. In my experience, rotten joists are common but invariably because of either poor design or poor maintenance and I can confirm that the ventilation gap does nothing to prevent this rotting occurring, though it does succeed in hiding the problem for a while, as Roger Curtis mentioned.

I believe that the ventilation gap does serve a purpose in that it helps prevent the saturation of vulnerable materials, as a result of normal release of moisture from saturated stone or, probably more importantly, it helps to prevent the accumulation of moisture deposited on the cold stone through condensation of vapour which has migrated through traditional lime plasters and, indeed, gaps in the linings.

One thing which was not mentioned was the difficulty of addressing measures specific to any one flat when they are surrounded by party walls/floors/ceilings and the frequent breaches of this ventilation gap which happen (as Douglas confessed) do serve to limit the fire protection between floors and a "breeze" blowing in the space means that if fire does breach the lining it quickly spreads upwards within this cavity. Another good reason for not having it.

I think Roger's tests of Warmcel (I presume) are a good way to address this problem, insofar as the product is inert and does not appeal to vermin, is fire resisting and does not contribute to the spread of moisture at expected levels. There are problems with using it in existing buildings, as we found on a few projects around 1990-1991. These problems all related to the need to have a skilled operative installing the product and that will have cost implications. The main issues were to do with slump or settlement after a period of time and of getting the material into difficult to reach voids. There was also some loss of the blown cellulose from the bottom of cavities, even when this was deemed to have been considered. Because it was so problematic and relied on a specialist subcontractor we tended to use it only in new build construction where it was blown into the open framework from the outside (sheathing on the inside), made possible by moistening the cellulose. It dried like a kind

of papier maché froth and we could see it was fixed in place before we covered it over. By blowing it into the frame depth from the outside, with sheathing on the inside, we were able to use the plywood as a vapour check and to prevent the Warmcel putting pressure on the plasterboard. The plasterboard was added to battens which formed a service void, so the contractor was not tempted to burst the vapour check to fit pipes and wires. The last project where we used Warmcel dry and fed from the inside did result in a slight quilting effect on the plasterboard.

The wall insulation seems to be the main benefit to this tenement model and could be the most cost effective in most flats, given the Baxi was deemed an anomaly. We have lately been using Kingspan K18 on 25mm strapping to insulate stone walls. This is typically reducing the cavity by more than 60% while giving a very satisfactory level of insulation at more or less the same depth of lining. We have found that skirtings are difficult to remove without splitting, so this does add to the costs. The price of replacing decorative cornices has risen so much over the last ten years we would like to find a way to ensure the survival of the installed cornices. On the assumption that one would be trying to work with just the lengths on the outside wall(s) we are currently trying to keep the cornice in position, treat the framing timbers, dooks and grounds against fungal decay and insulate between the timbers which are cut level with the bottom of the cornice bottom moulding. The picture rail is more complicated as it either makes the insulation more difficult or it requires a pretend rail to be fitted or a complicated reinstatement. Aerogel/SpaceTherm, though expensive, can be used to fit in thin gaps to help avoid cold bridges at inward projections. The 25mm strapping will presumably slow the rate of air flow through the gap, assuming there is a solum and attic to connect to and I expect this could be further slowed if the strapping was applied horizontally with hit and miss gaps. I do question the merits of encouraging a through flow of air from the solum into the attic however. It seems to me only likely to cause trouble in a heated dwelling. Furthermore, in an attic which is insulated as a warm roof, the way to ensure this moist air is delivered to the cold side of the insulation is not always clear or easy to achieve, especially with the skills available to carry out the work.

We very often use Tri Iso Super 10 though, these days, because of infighting in the insulation world, we are no longer allowed to use it in walls (other than a percentage of the loft walls). We used to use TriIso in its early forms in the walls of new build houses and it worked extremely well, in situations where we were aiming for very high levels of insulation. I was thinking today that it would probably be the perfect solution to this problem in the model flat. Insofar as it is a compressible composite membrane which can be fixed to ?25mm strapping and then have ?25mm strapping laid over the top, before sheeting. Building Control will not allow it, which is a great shame, as it is very affordable per insulating benefit per depth. Actis' claims used to be that TI9 was the equivalent of about 200mm of Rockwool. This has been called into doubt but Actis have few friends in the industry. Most insulation manufacturers say that it does not stand up in the simulated "hot box" tests. TRADA have done real life evaluation and found it performed as claimed if installed correctly. I still use it in lofts but would have no hesitation in using it on my own house, in the walls as well as the roof.

I believe Historic Scotland have been involved in some tests where they have ventilated cavities into the room. That is to allow air to go behind the plastered linings at floor level and re-emerge at ceiling level and I have a vague recollection of something like this being done at Methven Castle. Obviously it would not work if it connected across a party floor. Nor if it conveyed moist air to a place where it can condense. I would be interested to know where these experiments led and what were the findings.

As you see, I have nattered on about just wall linings for far too long and that was only a tiny part of what Douglas was wanting to talk about. I think the principle of taking a typical scenario, developing

methods of measuring to yield information which could be applied to any typical tenement and helping people to help themselves is a great idea.

In situations like the model tenement in Glasgow it would appear that there are significant benefits to adopting a strategy which deals with the whole building, rather than individual apartments. Although that is not what this exercise aimed to address, if there are to be incentives of government-led initiatives, a system of co-operating arrangements might help to ease the problems and reduce costs.

Answers from Douglas Jack, Jeremy Cockroft and Roger Curtis:

DJ: Andrew, thank you for your contribution. It is good to hear from someone who is busy actually installing these things.

A discussion with Roger Curtis afterwards set me thinking about skirtings and cornices and your email has encouraged this. If we were to treat the ventilation gap behind the skirtings and cornices independently with say aerogel, or even just stuffed mineral wool, and then apply composite board as tight to the stone as possible between the two features, we would have minimised the cold bridging and hopefully the board thickness would not come out beyond the cornice/skirting depths. The crucial internal appearance and floor area issues would have been preserved. The board thickness could be specified after the original plaster and lath had been removed and once an assessment of available depth could be made.

RC: We are trialling alternative methods – the blown materials – that do not require removal of existing linings. Appreciate that there are issues with technique and quality control, but nothing that has been an issue up to now. This approach keeps costs down and disruption to a minimum.

DJ: ...I see you have used Kingspan K18 and other products which are not breathable. The breathability lobby sounds good, but I have found no hard and fast evidence to support it. The vapour will pass easily through the breathable layer and possibly condense on the stone. The advantage we are told, is that it can then evaporate back in to the room, but does it not need a breeze of fresh air or some other group of conditions to make it do this? If a non permeable board is used then the amount of vapour getting through to the stone is much less and could be dealt with by the residual ventilation??? If you know of any evidence one way or the other I would be grateful to hear it.
(Obviously using traditional construction techniques because it is an historic building is a separate and, in some cases I think, justifiable argument.) I was aware that the measures I looked at in the research were going to be so expensive that I tried to avoid any additional costs or complications. In addition, using the Kingspan type boards means that Joe Bloggs Ltd Joiner and Builder at the corner of the street can install it. More complicated products will require more specialised contractors and add another hurdle to residents wishing to undertake improvements.

RC: In places where there are no existing linings we are trialling board materials direct onto the stone face – essentially making a solid wall of varying density – but permiable. We will see how the humidity behaves.

DJ: ....We had a project where an independent consultant was called in to comment on a foil-bubble wrap insulation, and reported against its ability to perform - we simply do not use these products any more for that reason, although I consider they may be useful in the right locations.

RC: One of our staff used a multifoil foil insulation in her attic (on the rafters) and had a lot of moisture problems so we are cautious of it.

JC: Dear all, very interesting discussion. Just a couple of points:

I think the Baxi Bermuda type of appliance is quite widespread (I had >one in a flat exactly like that in the Hyndland flat). Very convenient because they were designed to fit into the fireplace recess and often the plumbing was already there for gravity hot water. The carbon reduction will anyway be obtained by replacement of any 20/30 year old boiler.

RG: I detect that this living flame fire is a more modern thing than the baxi, but still hoovers the gas.....

JC: My understanding of the joist end problem is:

1. As you take measures to draught proof and insulate the property, the temperatures and absolute humidity (and dew point) within the property rise....

RG: Agree - the principle of all our approaches is that with a vapour permeable inside surface (plaster and paint of the right kind), and outside (stone) these concentrations are mitigated somewhat.

JC: ...2. When you insulate the walls, the residual inter-floor internal wall surfaces will be at lower temperatures, so become even more significant cold bridges, and permeation of internal air around these areas will likely result in condensation.

RG: Our take on it is that the masonry inside surface being a softer natural material (stone and lime) that these condensation risks are not what they would be if a harder surface. Monitoring of such faces, as is going on at present, will clarify this.

JC: ...3. Over the years the air space between joist end and wall gets filled up with sand and debris (I, and I think Douglas, have observed), so there is a potential direct wicking path from the stone to the wood.

RG: Up to a point - in certain areas, but again, this is assuming that the inside face of the masonry is damp or wet. In my experience this only happens when things are not as they should be - normally outside.

JC: ... So it is a perfect triple-whammy, but at least we have some possibility to control item one at source. In my opinion, removal of wet air as it is produced should significantly alleviate the risk, for example humidity controlled dc fans in kitchens, bathrooms, en-suites etc. But I think some controlled experimentation (and 2-d modelling!) would be desirable to assess the remaining risk. Douglas, maybe this is our next project?!!

RG: We can model all we like, but I hope to demonstrate in urban and reasonably exposed conditions certain approaches - of which blown materials (suitably controlled) are the present focus. I will get interim results in April/May, so can discuss further then.