COLD BRIDGING

We increasingly discover that the effects of a cold bridge and importance of avoidance are often not recognised and more worryingly, frequently ignored.

This is an actual example of a project on which we were instructed to act. It is the worst case to date of cold bridging that we have encountered.

The issue was initially identified by us during a review of the subcontractor's drawings before the works began and thus could have easily been avoided.

A cold bridge has two detrimental effects. The first is to reduce the thermal efficiency of the building envelope, and the second to increase the risk of condensation.

In this particular case, we were informed by the Architect and sub-contractor that such a cold bridge had little if any impact upon the building integrity. As the worst example of a cold bridge that we have ever encountered, we chose to have a different opinion and advised our client accordingly. After the Main Contractor sought the advice of the sheet manufacturer and another Roofing Consultant, our view that is now accepted as being correct.

The Building

An Architect had designed a relatively small building with an attractive cantilevered bull nosed parapet. This building consisted of a steel portal frame building, with the main portal stanchions continuing past the eaves line. At the top of the stanchion a stub rafter was attached to provide support for the overhanging feature and bull nose.

We will not state the use of the building as this could identify it. It is not our intention to embarrass any party connected. Suffice it to say, that the intended occupants will be using some very sophisticated computer equipment and any condensation or water ingress could prove an expensive intrusion, possibly to the prevention of the unit operating until new specialist equipment is supplied and installed. (by all accounts not a cheap cost if loss of operations are also encountered)

An extract of the subcontractor's detail is included on page 3.

The Building Regulations

The Building regulations applicable at the time of construction are PART L 2006

Within the approved document reference is specifically made to the calculation of $\mathbf{f}$ and $\boldsymbol{\psi}$ values.
f value is the value given to the risk of condensation and mould growth
Ψ value is given to the value of thermal conductivity of a detail.

There are limiting values for the f factor, which can be found within the technical paper No 17 contained on the MCRMA's web site (http://www.mcrma.co.uk/technical/t17.htm). This is referenced, albeit indirectly by clause 69a ii of ADL2A 2006.

Below we have copied the chart contained within the above documents showing the minimum values permitted as defined by BS5250

Humidity Class	Building Type / use	Minimum f value
1	Storage Areas	0.3
2	Offices, Shops	0.5
3	Dwellings with Low Occupancy	0.65
4	Dwellings with High Occupancy, sports halls, kitchens, canteens: Buildings heated with unflued gas heaters	0.8
5	Special buildings e.g Laundry, brewery, swimming pools	0.9

Interestingly, we were informed by the Main Contractor (and others) that they have never come across this before !

Design

If you observe the sketch on the next page, we would draw your attention to the following points :-

a) The sub contractor has proposed closing off the parapet void by using a steel sheet laid across two proprietary cold rolled galvanised steel rails.

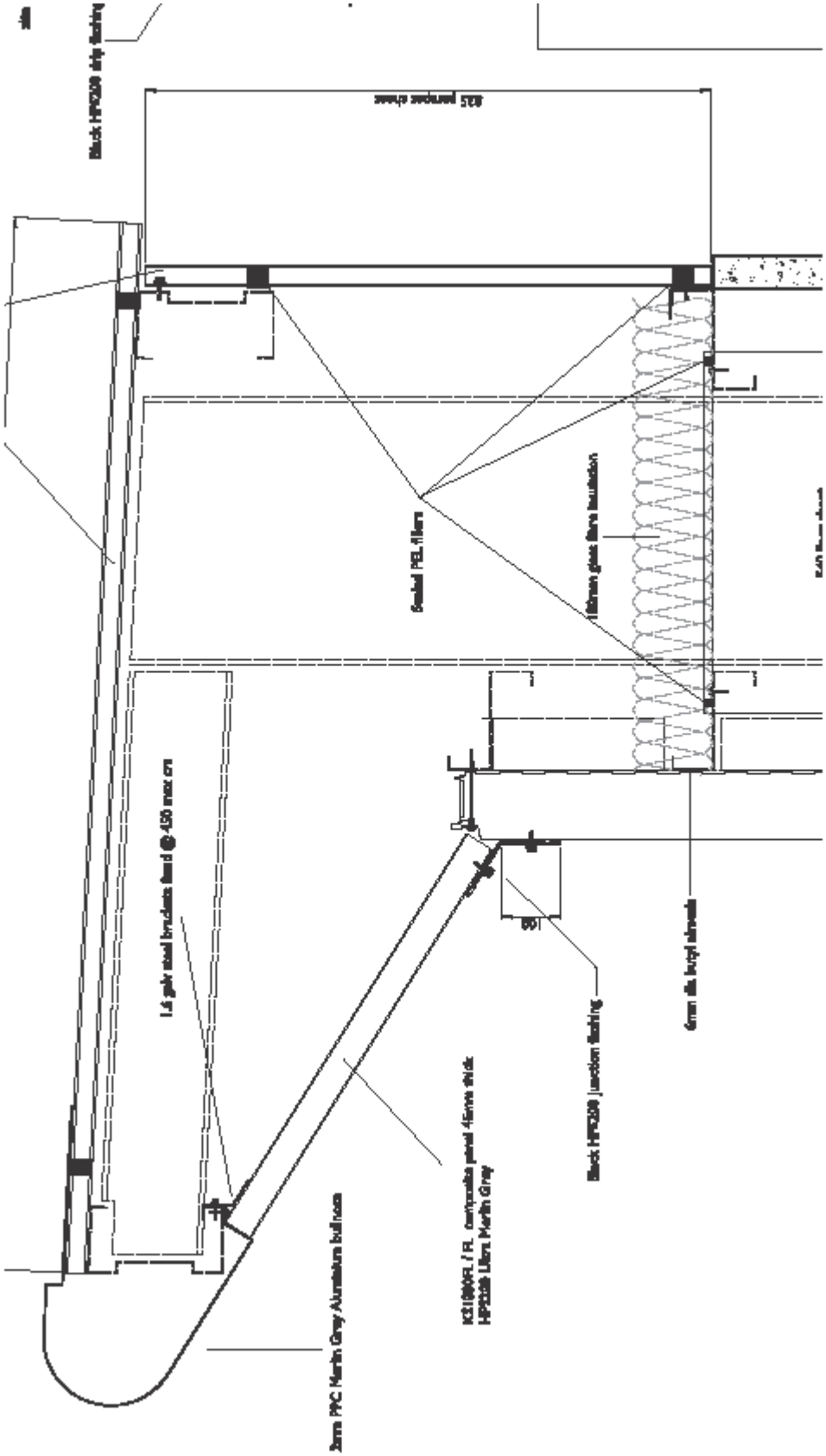
b) The Main stanchion (457 UB) penetrates from the warm interior of the building into the un-insulated void of the parapet. This will form a serious cold bridge into the building.

c) The parapet perimeter is not fully sealed. Although foam fillers have been indicated at various points, these are vented and not fully sealed; Thus they will not stop cold air penetrating the void. It should also be remembered that the various cold rolled steel members are usually fabricated as standard components and will contain holes that are unused and there will also be gaps at section joints. These holes and gaps will permit further free flow of air and those supporting the closure lining will allow condensation within the void to drip into the building and allow warm air to leak from within the building into the void.

d) A further cold bridge occurs with the rail adjacent to the gutter. You will observe that the external vertical parapet sheet here is single skin and in direct contact with the rail. The underside face of the rail is exposed within the heated area of the building.

e) Other than the sloping fascia, all other faces of the parapet are single skin.

f) There are issues with non fragility of the top sheet and the sheet closing the cavity. However, this is outside the scope of this study.



EXTRACT OF SUB CONTRACTOR'S DETAIL

Our Concern

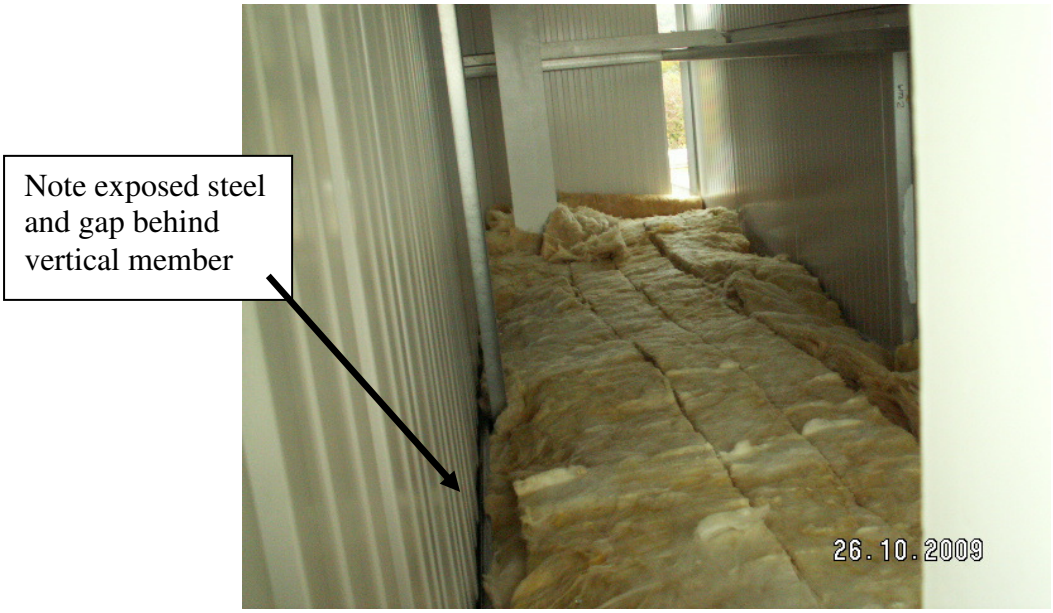
Our concern was that condensation was inevitably going to occur here due to the cold bridges. Furthermore, continual condensation within the parapet void would cause the insulation quilt to become compressed and less thermally efficient, thus increasing the risk further.

Such symptoms were likely to be confused as being a gutter or roof leak.

It is not inconceivable that the sub-contractor would be repeatedly called back to site to rectify a leak, causing disruption by way of loss of use of the property to the occupants. Furthermore there is also the possibly of damage to their electronic equipment.

In Reality

a) The contractor used 2 layers of 180mm quilt instead of one over the horizontal sheet. However, this did not protect the sheet underneath. The quilt was not well laid and in several locations left areas of the rail below exposed. Furthermore, the quilt was not wrapped around components such as sag bars leaving further areas of exposed single skin steel in this area.



b) Our concerns regarding this issue was raised during our review of the Sub-contractor's drawings and raised within that report. The Contracting parties chose to ignore our comments, suggesting that such matters were not an issue as they had used "Robust details".
Suffice to say, the design of this parapet is somewhat unique and by no stretch of the imagination or definition of such a phrase do we consider it as a robust detail.

c) Our subsequent reports following inspections of works in progress has maintained our concern regarding this issue. After much correspondence, and involvement of a manufacturer and another consultant employed by the Main Contractor, our view point appears now to be taken seriously.

However, this has now left the project in a precarious state. Firstly some serious rectification works are now required. Delivery of the correct or replacement materials may not be effected until after the contract completion date, and the application of Liquidated and Ascertained Damages are a distinct possibility.

d) The Sub-contractor is defending their position by stating that they have followed the details issued by the Architect. The Architect is maintaining that his drawings are correct by virtue that, based on the drawings, Building Regulation approval was granted.

We will leave these arguments to others to decide on this, however, our opinion is that both parties are in the wrong. Regulation approval does not negate the responsibility of those concerned to comply with building regulations.

e) It should also be noted that several other issues were found to be defective within the construction, but these are outside the scope of this study subject. Suffice to say, the technical ability of this sub-contractor appears somewhat less than adequate.
(These included, inter alia, aluminium in direct contact with galvanised steel & no expansion joint between aluminium flashings)

In Summary

The Architect's View :

i) Maintains that this is not a problem as the Approved Inspector has approved his details.
ii) Has relied upon robust details
iii) Produced a SBEM calculation to substantiate compliance.

Comment The Architect's detail of this was in single line format. No construction details were indicated. This is not a Robust detail (and that is probably the wrong terminology anyway)
The SBEM Calculation was submitted in a format that could not be audited, and was based on "As designed" not "as Built"

An f factor calculation undertaken via ourselves shows a figure of 0.36. This building is at best Humidity Class 2, thus requiring a factor of 0.5. Hence this is a major issue.

The Roofing Contractor

i) Basically "hid" behind the statement that they had copied the Architect's details
ii) Tried to justify their detail by production of a manufacturer's U value calculation, which specifically ignored cold bridging

Comment The Roofing Company's technical knowledge was very poor as demonstrated by several other very basic construction errors. One has to ask, where will the design responsibility lay should this go legal ? Their lack of understanding is further confirmed by the fact that they thought a U value calculation based on ignoring the main ingredient of the issue would resolve this.

Main Contractor

i) In fairness the M/C is somewhat a "piggy in the middle", but did have the sense to seek opinion from the manufacturer and another consultant. When their opinion agreed with mine, The M/C did try and drive this issue forward.

Comment This is a reasonable action in our view, The M/C then consulted the Approved Inspector…….

Approved Inspector

i) Amazingly the Approved Inspector has stated (in writing) that f factors are not required for Building Regulations!

Comment So the MCRMA's Technical paper 17, and some pages of ADL2 are wrong then ?

CONCLUSION

Though this is probably the worst case we have witnessed so far, this type of situation is not uncommon in our experience. It is our belief that the large majority of the industry do not fully understand Part L and hence unable to administer or audit it properly. Including those that are specifically employed to do exactly that.

With further changes due this year, we fear that such requirements will be further ignored Not only is this making a mockery of the Government's Carbon emissions policy and sound bites, but it ridicules Building Regulations and their enforcement .