Hello Jon,

Re. FIRE PERFORMANCE OF CELOTEX RIGID FOAM INSULATION BOARDS

As I think I explained when we last spoke - we have been waiting for an internal meeting to take place between NHBC Standards & Technical and our Building Control Department to review and discuss fire performance issues affecting rigid foam board insulation products. This includes Celotex insulation board in relation to BRE Fire Test report 295369 and the supporting information that you have sent to Standards & Technical.

We have now had an opportunity to discuss the fire risk issue affecting buildings >18m high where design and specification of external walls may include proposals for insulation board products that are not fully resistant to combustion.

For a number of our registered high-rise residential building projects NHBC has received reports and information in relation to fire resistance of insulation products including what is reported from the testing for fire performance under both BR135 and BS8414 requirements. Our understanding, from information received to date, is that the indicated performance does not always determine that fire risk has been fully dealt with in building envelope designs where the specification of cladding, insulation and backing wall materials is significantly different from the façade build-up that has been tested for fire resistance.

When you attended our initial meetings to discuss the type testing that NHBC normally accepts as proof of performance in relation to wall cladding and insulation board products - I took time to explain that any test specimen would need to represent, as much as practically possible, the typical construction build-up used for external facades. In terms of fire resistance these were wall types built to form the external envelopes of typical Steel or Concrete framed building with light gauge steel infill stud walling. I recommended that any construction submitted for testing should include substrate build-up and a rainscreen cladding envelope that would be typically found on multi-storey building facades.

In reading the test description given in BRE Report 295369 – the fire performance was achieved using 100mm Celotex fixed onto 12mm thick Magnesium Oxide sheathing board supported by a light steel framed infill wall system. The external cladding installation was 12mm thick Marley Eternit Natura Board. These cladding boards, as installed onto your test rig, were very large format panels, set out in landscape orientation and butt-jointed along horizontal edges. The only ‘rainscreen’ ventilation gaps were located along the shorter vertical edges. The wall firestopping was constructed with Lamatherm continuous non-expanding vertical fire breaks and Lamatherm intumescent expanding fire breaks horizontally at each floor level.

From the BRE fire test report we are able to see how the key elements, as constructed for this test, have performed in terms of both temperature measurements and overall reaction to fire. I can summarise the performance as follows:

i. **In terms of temperature measurements** – we can see that the maximum threshold temperatures at level 2 were not exceeded. This key performance criterion is accepted as relating to elevated temperature within the specified wall envelope build-up as described above.

ii. **In terms of reaction to fire** – the test showed how the fire affected mechanical behaviour in relation to fire spread where the building envelope continued burning as both the Eternit rainscreen system and Celotex insulation layer continued to burn over time. This critical behaviour in fire performance directly relates to fire load and potential fire growth within key building envelope components. Additionally, a partial minor, collapse of the rainscreen cladding occurred over an area within level-1 of the facade.
At our previous meetings I took care when explaining the limitations in testing fire performance of any wall type where the key details were not representative of typical actual facade systems – this included some constructive feedback on your initial prototype drawings. However, when we finally saw that the actual test had included some very large format thick cladding boards and unusual detailing - the immediate comment was that this test installation was not sufficiently representative of typical rainscreen designs normally found on high-rise residential buildings. Whilst this arrangement was resistant to early temperature rise within upper storey levels – the overall fire behaviour indicated that the facade had only limited fire resistance and continued to burn extensively in excess of 30 minutes.

However, in looking more positively at the data contained in BRE report 295369 I would have the following comment:

- The information in this report is potentially very useful to a fire engineer i.e. it can provide the required input for a suitably fire engineered facade assessment wherever the building envelope design and specification may include these particular key wall elements for high rise elevations.

From a technical standpoint it appears, from this BR135 test prototype, that the wall build-up contained three key layers which gave the following performance in fire:

a) The only fully non-combustible element in the wall layer build-up was 12mm thick MgO board.

b) Partial fire resistance the Marley Eternit cladding product was directly related to its thickness (in this case 12mm) plus the format, layout and gapping of these cladding panels.

c) Fire will affect the 100mm Celotex insulation board as it was shown to be partially combustible as burning continued. The fire lasted significantly over 30 minutes and continued for a period of 60 minutes when the test was called to a halt and all flames were finally extinguished.

In terms of NHBC acceptance our technical view is that the fire performance of Celotex insulation shows limitations in the actual fire resistance relying heavily on a specific and unusual facade construction type including thickness and layout of key parts of the cladding system to provide partial fire resistance. It should be considered whether a qualified Fire Engineer will assess the external envelope design for buildings with wall elevations over 18 metres. This is particularly relevant wherever the use of rigid foam board insulation products, such as the one manufactured by Celotex, are being considered for building envelopes. We would be interested in your views and experience on fire engineered facades in relation to the use of Celotex insulation.

There is a need for better understanding on how insulated building envelopes actually behave during fires and how the combination of materials will influence fire performance within the whole building envelope system. The product information sheets and literature provided by manufacturers are not always sufficiently clear on this aspect of design.

We will continue our efforts towards reaching an agreed view on what the performance reported from these fire tests truly represent in terms of Building Regulations Approved Doc. B2 – Sect. 12. This is likely to involve further discussion within NHBC and may possibly include further discussion within the Building Control Alliance within which NHBC also participate.

Best Regards

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