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Subject: UpDate Modelling
Date: 14 November 2017 06:19:46

Hi [REDACTED]

I was in meetings all of yesterday. Following the last report/comment on cladding and insulation replacement at QEUH update on the modelling as follows.

QEUH

The quantitative analysis of fire growth and development in a room at QEUH spreading to the cladding has been carried out using CFD modelling and fire engineering formulae. The analysis of the outcomes is not complete, and as I had indicated, may require some further modelling to close off with further variation of input parameters/assumptions. However the outcomes to date are not unexpected:

To generate the conditions that could cause glazing failure and fire spread from room of origin in the timescales below four key assumptions:

- a. sprinkler system does not operate
- b. furnishings are not fire retardant
- c. fixtures and furnishings can support a fire size of 4MW – 16MW
- d. no first aid fire fighting or fire brigade intervention (ie detection and alarm failure and no planned initial response and/or no fire service intervention in the period)
- e. failure of glazing is assumed at 300DegC to provide the necessary ventilation to support combustion to, and after, flashover (ie glazing is modelled as failing before flashover). As noted in the Interim Report predicting the failure of glazing in practice is problematic however the 300 DegC assumption is necessary to provide ventilation. *'Glazed windows would require to be subjected to localised direct flame impingement from fire in a room before failure; the inner pane of the double glazed unit would fail first (glass fails in fire due to stresses created in a material that is not a good conductor of heat, impurities and constraints caused by differential expansion)..... The evidence is that failure is typically partial failure of glazing.'*

Estimated Fire Spread Timeline:

- Estimated minimum time to flashover in room of origin 10 minutes from ignition in room of origin
- Estimated minimum time to potential cladding ignition 13 minutes from ignition in room of origin

The estimated minimum times require a fuel load to support a fire size that is unrealistic and the full failure of the glazing, necessary for ventilation and flame spread out of the room of origin is problematic.

We are reviewing the input assumptions and the outcomes to:

- i) determine if alternative/less severe conditions in terms of fire size (and hence fire load requirement) in the room of origin could generate the conditions for fire growth/spread
- ii) provide an estimate of the time to failure if glazing in a room above the room of origin which could lead to re-entry, the data could indicate it taking an hour (still with all assumptions regarding the protection measures to 'fail') for flashover in the upper room.

Summary

In summary, at this stage, the modelling estimates a time to cladding ignition of 13 minutes or more but given the fuel load and glazing failure/ventilation assumptions/conditions alone this is considered unlikely. The timescales for growth and spread would also in practice be impacted on by protection/intervention measures.

RIE

The model for RIE is under construction and runs will start when complete on Thursday. The initial model runs will complete early next week. It is assumed that the outcomes will be similar to QEUH outcomes although the basis for the assumptions will differ.

The analysis of QEUH will be complete this week.



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