ON FIRE DEVELOPMENT IN DOUBLE DECKER BUSES

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I read with some interest the article in the current International Journal on Engineering Performance-Based Fires Codes on fires in double decker buses [1] and have the following points to add.

Flashover is referred to in the paper. When a vehicle, be it a small car or a larger vehicle such as a bus or commercial truck, ignites peak heat release rates are well in excess of those required for flashover. A passenger car will have a peak heat release rate of typically 8 MW, whereas flashover requires about 1 MW. If however the vehicle is out of doors there is nothing to flash over *to*, so flashover is expected only if the vehicle is in a garage or workshop. The matter of flashover in double decker buses was addressed a couple of years ago in an examination of the circumstances of a fire at a London bus garage [2] in which several buses were destroyed.

It was not known at the time that [2] was written whether the buses destroyed were under cover or out of doors. It was suggested however that close proximity of buses to each other might in effect have created an enclosure. In such an enclosure a stage would have been reached where rates of heat release by the burning bus and of heat transfer from the entire group of affected buses to the surroundings were tangential to each other. That would have caused a large and sudden rise in heat-release rate, identifiable with flashover. There is another possibility. The behaviour might have been simple propagation without the discontinuity which characterises flashover. If so the fact that hot gases released encountered obstacles in the form of the adjacent buses would have had the effect of raising the turbulence of the gases and hence the rapidity of the propagation.

There is scope for relating these ideas to the results in [1]. In particular, flashover in [1] appears to be on the basis that a small fire within the bus, perhaps involving a piece of upholstery, can cause flashover to the entire bus interior. The alternative, explained above, is that a burning bus itself exceeding 1 MW or so in heat release rate will cause flashover to an enclosure in which it is parked. In [1] a $1/10^{th}$ scale model of a bus is used. One might have hoped that some scaling of heat release rates would have been attempted. A full-size bus will on burning attain a maximum heat release rate well in excess of 10 MW. Can the maximum heat release rate of the scale model be adjusted so as to correlate with this? There has been one previous attempt [3] to burn model vehicles and scale up the results to full-size ones full results from which will be submitted in due course.

Finally, more information on the thermocouples is needed if a reader of [1] is to have full confidence in the temperature histories presented. In particular response times and possible radiation errors should be considered.

REFERENCES

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3. J.C. Jones, T. Noonan, M. Riordan, “Combined photographic and gravimetric evidence of the destructive potential of fire”, Journal of Fire Sciences, Vol. 23, pp. 189-192 (2005).