

Fire performance of uPVC window frames

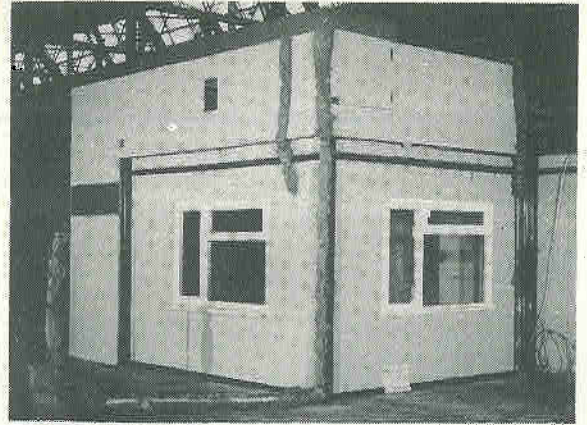
Unplasticised polyvinyl chloride (uPVC) window frames are increasingly popular in the UK, mainly as replacements for existing wooden frames. They have several attractive features, for example, resistance to rot and easy maintenance, and it is envisaged that their popularity will continue to increase.

The UK Building Regulations do not specify fire performance standards for window units but because uPVC has very different physical and chemical properties to wood or metals, concern has been voiced about the possible performance of these frames when exposed to fire. It has been suggested that early failure of the window may accelerate the rate of growth of accidental fires. Particular concern has been expressed about the behaviour of uPVC polymer when exposed to the heat of slowly developing fires. There have been suggestions that it might soften allowing the whole window unit to be displaced posing an additional hazard to fire fighters.

A programme of experimental work at FRS sponsored by the British Plastics Window Group of the British Plastics Federation was designed to compare the performance of uPVC window frames with that of traditional wooden window frames. Two types of uPVC window frames were tested. The performance of each was compared with that of traditional wooden ones in two types of fire in a life-size enclosure at the Cardington Laboratory. The two types of fire were: ● large fuel load non-ventilation controlled fire ● medium fuel load ventilation controlled fire.

Measurements were made of the concentration of oxygen, carbon dioxide, carbon monoxide and hydrogen chloride in preselected locations. Temperatures were measured at several locations inside and outside the room; they were also measured at the fixed window panes and frames for all windows.

Finally determinations were made of the obscuration by smoke and the heat flux in front of the windows.



The FRS window frame test rig

The tests have shown that glass panes cracked and were displaced after attaining temperatures in the region of 250-400°C. The time and mode of failure of glass panes varied in a random manner. However, once the first pane was displaced the increased ventilation changed the mode of combustion and the remaining panes of glass failed. When all the panes were displaced, the uPVC window frames failed gradually by displacement of hung frames and horizontal members, but much of the frame remained in situ. The wooden frames on the other hand continued to burn even after the fuel was exhausted although the woodwork remained in position.

Smoke obscuration levels depended on the quantity of fuel, a larger fuel load producing more smoke. The 'Threshold Limiting Values' (TLV) of carbon monoxide and hydrogen chloride were 50 ppm and 5 ppm respectively indicating that carbon monoxide produced in these tests is at least as hazardous as hydrogen chloride.

The tests described above indicate that the uPVC window frames do not pose an unacceptable risk and would not accelerate the development of accidental fire.

For further information contact

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A 6½ minute video on this subject 'Fire performance of uPVC window frames' can be purchased from the Publications Sales Office, Garston, Watford, Herts, WD2 7JR. Price £20.00 + £3.00 VAT.

bre Building Research Establishment

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