

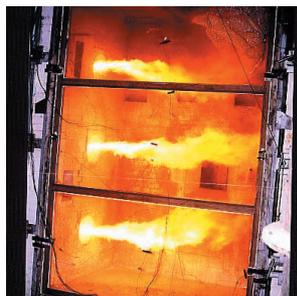
FIRE GLAZINGS TECHNOLOGY



Pyrostop glazing at Düsseldorf Airport

Although glass is not combustible, monolithic panes of sodium silicate glass are not an effective barrier to the propagation of fire. The traditional way of enhancing the fire resistance of glass is a wire mesh. In a fire, wired glass still cracks like annealed glass would do. In contrast to normal glass, however, the fragments are kept together by the wire mesh, thus protecting the unexposed side from flames, smoke and combustion gases. This product is called Pilkington Pyroshield™, today's most widely used fire resistant product. Wired glass was designed to prevent the fire spreading. When glazed in an appropriate frame, it encloses flames, smoke and hazardous gases. It also offers some resistance against accidental human impact.

In the mid-1970s Pilkington developed Pilkington Pyrostop™, an advanced glazing without wires. Pyrostop not only blocks the spread of fire but also remains cool on the side away from the fire. The secret is an intumescent interlayer which forms a heat-opaque barrier. When a fire starts, the radiant heat is entirely absorbed by the interlayers, which contain water and therefore are not transparent to IR-radiation. When the interlayer reaches the reaction temperature,



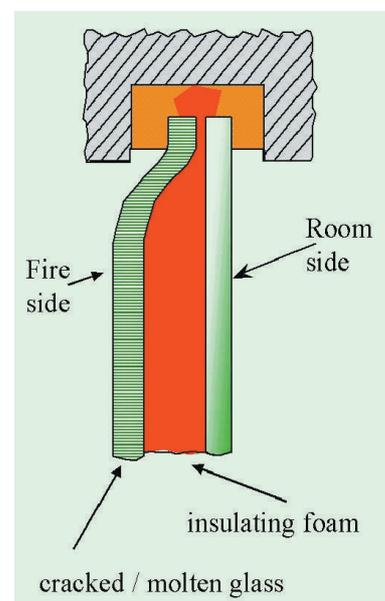
Fire test

the residual water in the interlayers evaporates thus consuming a major part of the energy released by the fire. Simultaneously, the interlayer expands generating a thick, tough and viscous foam, keeping all glass pieces facing the fire in position. During this reaction, the foam is in fact transformed into foam glass forming a rigid sandwich structure consisting of glass and foam glass that still provides full protection when all sheets of the laminate have cracked. Over time, the temperature gradient through the glass structure can easily reach 500°C or more. The advantage of Pyrostop is evident: while the retention of flames offers protection against the primary fire, radiant heat could still cause secondary fires to develop on the other side of the glazing. Moreover, radiant heat is a danger to people. Depending on the intensity of the radiation, the exposure for only a few seconds causes unbearable pain, severe injury or death.

Pyrostop began life as a multi-layer sandwich of glass and sodium silicate layers, batch made and set in a steel frame. The number of layers varied depending on the fire regulation to be met. Three to five such intumescent layers would meet architectural specifications in most applications, but an oil rig or tanker, might require as many as ten. Pyrostop can provide fire protection for as long as 120 minutes, affording both radiant heat insulation and protection against smoke and flame penetration. Development continues to meet ever-tightening fire regulations.

In 1987, Pilkington developed Pilkington Pyrodur™ which is also a laminated glass based on similar technology. Pyrodur offers a compromise between integrity only and full thermal insulation in case of fire by limiting the level of radiant heat transmitted through the glazing. Pyrodur typically comprises one or two intumescent layers.

In 2001, another new product, Pilkington Pyrodur Plus™, was introduced into the UK market. In this, the fire resistant interlayer was modified to add impact safety while maintaining its excellent fire resistant properties. The product is cuttable on normal cutting tables.



Pyrostop and Pyrodur are produced at Gelsenkirchen in Germany. In 1994 Pilkington commissioned a major investment in a fully automated plant as part of the drive to cut manufacturing costs. In 2001, the capacity of the Gelsenkirchen plant was further expanded. Careful factory production control procedures including checks of raw materials, control of process parameters and testing of the final product are put in place in order to secure a consistent and reliable product performance. Pyrostop is produced in stock sizes centrally and cut to the customer end size in de-centralised processing centres in Europe, North America and Asia. Other functions like solar control, thermal insulation, sound reduction and security can be added by combining Pyrostop and Pyrodur with double glazings, coatings and polymer interlayers.



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