

BREAKING GLASS

Rare though it may be, the prospect of glass spontaneously shattering – and ways of avoiding it – should still be considered. **Tony Whitehead** looks through the issue

Bang! There goes another one. It is an exceptional, almost incredible occurrence, but the fact is that panes of toughened glass can shatter spontaneously weeks, months or even years after they were installed.

The phenomenon is caused by an impurity in the glass known as a nickel sulphide inclusion and is, fortunately, a rare event. Frustratingly though, it is pretty much impossible to say exactly how rare.

"It is a very awkward problem to analyse," explains Robert Davies, technical manager at partitioning supplier Optima Products. "If a pane breaks, it could be because of poor installation – the edges of toughened glass require particular care – or it could be because an impact has weakened the glass."

Spontaneous breakage is also a marvellous excuse for clumsy operatives, he adds, so without conducting an expensive technical analysis of every breakage, the

cause of cracks often remains a mystery.

Does it matter? Davies thinks so. "We only have anecdotal evidence, but we are concerned the incidence may be on the rise," he says. "And these breaks can be expensive, sometimes dangerous."

He cites a recent Optima commercial contract in London. "We have had six failed panes. They are in people-free areas, so we have to suspect the breakages are spontaneous and due to inclusions. It is a problem because obviously the client wants to know when the glass will stop breaking and we can't tell them."

It should be emphasised that six shattered panes in one contract do not give an indication of the overall incidence of spontaneous breakages – they tend to occur in groups as a result of contamination of a batch of glass.

However, Optima is sufficiently concerned that it is now



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recommending the use of heat-soaked toughened (HST), rather than standard toughened glass, to all its clients.

"HST is more expensive, but much less likely to spontaneously fail," explains Davies. "If the client wants standard toughened glass, then we are happy to provide it. However, we now advocate heat-soaked glass and

automatically include it in our estimates."

But why should clients pay extra when ordinary class 1 toughened glass is accepted as a safety glass by the Building Regulations and is BSI- and EN-certified as such?

Davies emphasises Optima does not consider non-heat-soaked glass to be a bad product; he simply wants to stimulate debate.



SPONTANEOUS BREAKAGE: THE FACTS

Toughened glass is created by rapidly cooling it after it is cut to size, to set up a tension on the skin or surface of the glass, which gives it its impact resistance.

But rapid cooling can cause a problem if nickel sulphide (NiS) is present. The NiS particle may be unable to change back to its low-temperature molecular structure quickly enough. If so, it will change back later – increasing in size and causing the glass to shatter.

One estimate puts the incidence at one inclusion for every four tonnes of toughened glass produced (enough to make 160 1m² 10mm panes) though far from every inclusion causes a breakage.

Heat-soaked toughened (HST) glass goes through a secondary process in which it is kept at a higher temperature for longer and as a result most inclusions that might cause a breakage do so during this process. Because of the cost of heating glass for longer, and the breakages that result, the price of HST glass can be around 15% (about £20/m²) more expensive than standard toughened glass. On the other hand, it is around 100 times less likely to fail.

BRITISH AND EUROPEAN STANDARDS AND BUILDING REGULATIONS

The use of toughened and/or laminated glass is covered in the Building Regulations by Approved Documents K and N. Building Regulations at present do not consider the risk of spontaneous breakage. According to the Department of Communities and Local Government, there are no plans to revise the existing Approved Document N until, at the earliest, 2013.

■ Thermally toughened soda lime silicate safety glass (known more commonly as Class A or standard toughened safety glass) is covered by BS EN 12150-1:2000.

■ Heat-soaked thermally toughened soda lime silicate safety glass is covered by the standard BS EN 14179-1:2005.

■ In both the above instances, glass should be marked "Class 1" (toughened) and be stamped with the relevant EN number.

■ Laminated glass, meanwhile, is covered by BS EN 14449.

It is the view of the BSI committee, which considers issues concerning glass, that the incidence of spontaneous breakages has decreased considerably over the past 40 years.

"If a pane spontaneously breaks, what will be the cost of replacing it? Are you going to have to demount an entire partition system to do so?"

"Safety glass shatters into small fragments, so there is no risk of large, sharp pieces cutting somebody. However, clumps of small fragments can still fall and cause injury, especially from a height. And if the glass is guarding a drop, you will be left with a dangerous gap if the pane breaks."

Chris Hughes, architect with designer BDP, agrees. "If you're toughening glass you are doing so for a reason: to guard or protect. Or you're using it in an area where if a pane were to fail it would render the building unusable.

So you want to go for HST to minimise the likelihood of that ever happening."

Most glazing contracts put out by BDP now come back with HST as standard, he says. "At BDP for some years now, the practice has been to use HST because there have been issues with standard toughened glass."

There are other options. Most specifiers will consider laminated glass in roof areas to guard against falling glass, and toughened laminated glass in areas that protect a drop. But while non-toughened laminated glass is cheaper than HST, toughened laminated is not.

Chris Thomason, divisional head of European Glass Installations,

points out: "A key reason for choosing heat-soaked is price and programme – it is quicker and cheaper to produce HST than a toughened laminate product."

So should anyone ever specify ordinary toughened glass? Absolutely, says Pilkington technical advisory service manager Garry Smith.

He stresses that when toughened glass breaks, inclusions in the glass are the least likely cause and that in many applications the risk of breakage due to an inclusion is so small that it does not warrant the additional cost of heat soaking.

"Pilkington's recommendations for heat soaking are where the glass is to be used in a safety-

critical location, such as a barrier or as overhead glazing. Otherwise it's mainly an economic argument as to whether you bother. For example, are you going to require scaffolding to replace the glass.

"For general toughened glass applications, heat soaking Pilkington glass is not our recommendation."

So is it worth specifying HST? The answer is maybe, after considering your supplier, the safety implications and the costs of replacement.

In other words, as Davies puts it: "Be aware of the issues."

■ Since contributing to this article, Robert Davies has been involved in a serious car accident. We wish him a speedy recovery.