PILKINGTON

2nd March 2009

Jeff Haber
W&W Glass Systems LLC
Nanuet, NJ

Dear Jeff,

Re : Tempered Glass Usage in Structural Facades – Risk Assessment Notes

This letter is issued to assist in the preparation of risk assessment documentation which might be required when considering the use of appropriate glass materials for structural glass facades. In particular, the following text deals with glass breakage arising from Nickel Sulphide inclusions which might be present in the glazing material:

(1) Breakage of tempered glass attributable to Nickel Sulphide (NiS) occurs in product supplied by all glass manufacturers. This is not a new phenomenon and is well documented in the public domain. The potential for the presence of NiS is inherent in the manufacturing process of all basic glass products used in construction and when the glass is tempered these foreign particles introduce a risk of breakage in service, since they can disturb the high built-in stresses induced during the tempering process.
Despite observance of all appropriate practices applicable to the commercial manufacture of tempered glass, the risk of NiS cannot to our knowledge under current technology be totally eliminated. For this reason many manufacturers of tempered glass employ a 'heat soaking' process to reduce the risks of breakage in service.

(2) All tempered glass incorporated into the Pilkington Planar™ system is subject to a heat soak regime in which the glass temperature is elevated to 290^0C +/- 10^0C for a period of 8 hours in a calibrated heat soak oven. The original German DIN 18516-4 standard specified a heat soaking regime in which the air temperature in the oven was maintained at 290^0C +/- 10^0C for 8 hours. The new BS EN 14179-1 standard specifies a heat soaking regime in which the glass temperature is maintained at 290^0C +/- 10^0C for 2 hours. BS EN 14179-1 also contains the following statement (para 3.2):

"The risk of spontaneous breakage of heat soaked thermally toughened soda lime silicate safety glass, on a statistical basis, due to the presence of critical nickel sulphide inclusions, is no more than one breakage per 400 tonnes of heat soaked thermally toughened soda lime silicate safety glass."

The commentary above is provided to demonstrate that Pilkington apply a more rigorous heat soak regime than both the DIN and BSEN standards when manufacturing the Planar™ system. It can therefore be taken that the overall risk of a spontaneous breakage in the tempered component of a Planar™ panel (on a statistical basis) will be a minimum 1 per 400 tonnes of tempered glass supplied (although it should be noted that this can

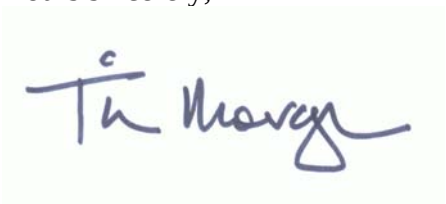
vary if one particular commercial contract is taken in isolation due to the small number of glass panels involved when compared to a full year of manufacture).

(3) It should be noted that the statistical probability of a glass breakage due to a critical Nickel Sulphide inclusion is far smaller than the actual possibility of failure due to impact and edge damage (e.g. caused during installation, handling and vandalism etc). As a result, it is important that the failure mechanisms of glass products are evaluated even if all measures have been taken by the manufacturer to minimize the risk of NiS related failures. In the case of single tempered Planar™ panels, a broken glass in a vertical application would generally be expected to remain in place in the façade although the risk of glass falling from the opening will increase with time and adverse weather conditions.

(4) Since NiS is an inherent characteristic of tempered glass, it should be noted that any breakage of a panel in service due to this phenomenon would be in line with a project specification which calls up tempered glass or a product which requires the use of tempered glass such as Pilkington Planar™. However, I can also confirm that under normal circumstances, as a gesture of goodwill and without accepting liability to do so, Pilkington Architectural would provide a replacement glass panel and pay reasonable costs of reglazing in the event that NiS was demonstrated to have caused the failure of a panel. Such a gesture would be made during the warranty period for the product despite the warranty not actually covering a breakage resulting from the presence of NiS for the reasons explained above.

I trust that this information is of use and would be willing to answer further specific questions as required on a project by project basis.

Yours sincerely,



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