
Heat Soaking Testing of Tempered Glass for Architectural Glass Applications

Introduction

Fully tempered (FT) glass used in architectural applications may break spontaneously for a variety of reasons, including, but not limited to, unperceivable imperfections or inclusions in the glass substrate. Most inclusions are stable, but some inclusions, most notably nickel sulfide, may cause a spontaneous break if it is located in the tension region. The purpose of a heat soak test is to reduce the risk of a spontaneous break by influencing the inclusion to break the glass during the test. It is important to remember a heat soak test may reduce the risk, but will not eliminate the potential of a spontaneous break due to an inclusion.

Glass Type

Heat soak testing may be done on any fully tempered architectural glass including, but not limited to, clear, tinted, low-iron, patterned and low-E coated glass. Reference ASTM C1036 and C1376 for more information on glass types and properties.

The Effect of Heat Soak Testing on the Temper of Glass

There is currently no North American standard for heat soak testing. Some companies in North America perform heat soak testing in accordance with EN 14179-1 Heat soaked thermally toughened soda lime silicate safety glass. This standard has specific instructions for the heat soak testing. When the heat soak test is performed as specified, there should be very little to no effect on the surface compression of the tempered glass.

Statistical Heat Soak vs. 100% Heat Soak

There have been two basic approaches taken with the heat soak testing. The first is to heat soak each lite required for the project. A second approach is a statistical approach. Statistical heat soak testing involves the selection of a statistically significant number of glass panels to be tested, as opposed to 100% of the glass. It is important to recognize that there is no consensus on the statistical procedures used with this approach. EN 14179-1 requires all lites to be heat soaked.

Heat Soak Testing In-line vs. Off-line

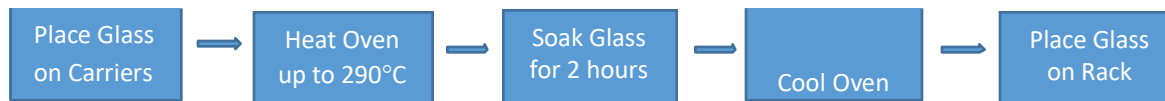
The most widely used method of heat soak testing tempered glass is an off-line process (reference EN14179-1). The goal of heat soak testing is to subject the fully tempered glass to an additional heating step to accelerate glass breakage caused by harmful inclusions in the glass. The breakage occurs during the heat soak test, thus potentially reducing future glass breakage in the field. The off-line process is a batch process in which fully tempered glass is heat soak tested in a separate oven at some time after the tempering process.

Off-Line Process

Step 1: Tempering Process



Step 2: Off-Line Heat Soak Process



According to ISO/TC 160/SC 1, the oven must be heated so that the glass temperature itself reaches 260o C +/- 10o.

In-Line Process

There is work underway to develop a standard for an in-line heat soak test, but it has not yet been published.

Effect on Post-Temperable Coatings

The temperatures that the glass is subjected to during heat soak testing are low compared to the temperatures used for heat-treating. However, the coated glass supplier should be contacted for specific guidance concerning the coated product being heat soak tested.

Effect on Iridescence

When the EN14179-1 heat soak procedure is followed, the glass is allowed to cool to ambient conditions without the assistance of fans or blowers. There should be no effect on iridescence. Reference EN14179-1 for more information.

Cost Implications

To evaluate the cost-benefit of heat-soak testing, the project design professional should consider all factors in the analysis including, but not limited to, the volume of tempered glass, the glass construction, the consequences of glass breakage within the glazing system, etc. Heat-strengthened glass should be utilized whenever possible where heat treated glass is being considered, and the use of tempered glass should be limited to comply with building codes, meet design loads, and minimize thermal stress breakage where required.

Additional Considerations

Specifying heat-soaked tempered glass will extend the processing time. Proper planning and coordination with the glass fabricator is recommended to ensure the glass installation remains on schedule.

Reference

BS EN 14179-1: Glass in Building - Heat soaked thermally toughened soda lime silicate safety glass

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