BLUESTAR ARCHITECTURAL GLASS

Technical Document

Heat Soak Testing for Architectural Glass

Introduction

This Blue Star Architectural Glass Technical Document aims to provide valuable information regarding the practice of heat soak testing for architectural glass. Heat soak testing is a critical process employed to reduce or eliminate the risk of spontaneous glass breakage, primarily attributed to nickel sulfide (NiS) inclusions. The document discusses the significance of heat-treated glass, the causes of spontaneous breakage, the principles and procedures of heat soak testing, and important considerations when specifying heat-treated glass.

Heat-Treated Glass in Architectural Applications

Heat-treated glass, often referred to as "thermally toughened glass," is an essential component in architectural glazing applications.

It offers increased strength and resistance to thermal stress, wind loads, and snow loads, reducing the potential for breakage. Depending on the specific requirements and safety considerations, various types of heat-treated glass can be chosen, including heat-strengthened glass, fully tempered glass, or laminated heat-strengthened glass.

Standards

Currently, there is no North American standard for heat soak testing, and companies in North America typically follow the European standard (BS EN 14179-1). Blue Star Architectural Glass recommends using the 2016 version of the standard or newer for conducting heat soak testing.

Spontaneous Glass Breakage

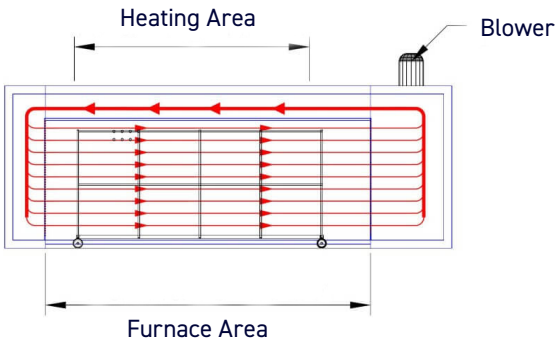
Spontaneous glass breakage is a phenomenon that occurs without any apparent external force or thermal stress. One of the key contributors to this issue is nickel sulfide (NiS) inclusions, which are tiny impurities that form within the glass during the manufacturing process. When fully tempered glass is subjected to certain conditions, these NiS inclusions can undergo a phase change, leading to glass breakage.

Understanding NiS Inclusions

NiS inclusions are extremely small and can be challenging to detect. They result from the combination of nickel-rich particulates with sulfur in the glass batch materials. While they exist in most float glass, their potential for causing spontaneous breakage is quite rare.

Heat Soak Testing

Heat soak testing is a widely accepted practice to mitigate the risk of spontaneous breakage due to NiS inclusions. This process involves subjecting fully tempered glass to elevated temperatures for a specified duration. The primary objective is to induce any potential inclusions to break during the test, reducing the likelihood of future spontaneous breakage in the field.



Key Parameters of Heat Soak Testing

Temperature: A typical heat soak process elevates the glass temperature to at least 482°F (250°C) for a minimum of two hours, following the guidelines set in reference standard BS EN 14179-1:2016.

Objective: The primary aim of heat soak testing is to ensure that any glass lites with inclusions break during the process, reducing the risk of spontaneous breakage in the future.

Limitations and Considerations

It's essential to recognize that while heat soak testing is a valuable tool, it does not guarantee a 100% elimination of potential spontaneous breakage due to inclusions. The outcome can only be expressed statistically, indicating a reduction in the predicted probability of breakage. Several factors, including stone occurrence, stoichiometry, inclusion location, and the efficacy of the test procedure, influence the results.

Benefits of Heat Soak Testing

Reduced Risk: Heat soak testing significantly reduces the risk of spontaneous breakage, making glass safer for architectural applications.

Compliance: It aligns with industry standards and codes, ensuring compliance with safety requirements.

Enhanced Assurance: Glass that has undergone heat soak testing may come provides additional assurance to building owners.

Potential Unintended Consequences

While heat soak testing offers numerous benefits, it's essential to be aware of potential unintended consequences:

- **Stable Stones:** Stones that would have remained stable in the field can initiate phase transformation during the heat soak test, potentially causing breakage later.

Recommendations

When specifying heat-treated glass and considering heat soak testing, the following factors should be taken into account:

- **Use of Heat-Strengthened Glass:** Heat-strengthened glass is a suitable alternative to tempered glass when safety glazing is not required.
- **Laminated Heat-Strengthened Glass:** For applications necessitating safety glazing, consider laminated heat-strengthened glass.
- **Verification of Test Procedures:** Confirm adherence to the BS EN 14179-1:2016 heat soak temperatures and timeframes.

Conclusion

Heat soak testing is a valuable practice in ensuring the safety and reliability of architectural glass. While it may not eliminate all potential risks of spontaneous breakage, it significantly reduces the likelihood, making it an essential consideration when specifying heat-treated glass for architectural applications. Proper adherence to standards and quality assurance measures is crucial to achieving the desired results and ensuring the long-term performance of architectural glass.

For additional information or assistance, please contact the Blue Star Architectural Glass Technical Services department.