UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Eyes in the Top of Your Head?

Thermally-toughened glass is the most popular glass typology used for cladding buildings. Relatively recently, the industry has accepted that small nickel sulphide (NiS) inclusions within the glass body can cause spontaneous breakage, introducing a potentially deleterious situation to those in the drop zone. To address the risk of failure, various mitigation techniques have been developed, however to date, no code of practice or standard has mandated that this failure risk be alleviated from buildings. Consequently, buildings are still being designed with an inherent risk of glass failure that could cause harm or death to people.

This research investigates the contributing factors that lead to a NiS inclusion failure and the subsequent kinetic pathways that could result in an endangerment to life.
The research also questions the current methods of risk assessment, specific to NiS related failure, and inquires if they are robust enough to manage the safety of those who interface with buildings.

The research methodology comprises a mix of methods. Firstly, a quantitative questionnaire targeting façade professionals was used to gain an understanding of the industry's experience with NiS and the way in which risk is managed. Secondly, a qualitative desktop study of the available research within the subject area was carried out, identifying statistical source data and classifying the mode of failure and post-failure events that could lead to a potential injury or death. The results of the questionnaire showed that the overwhelming majority of the façade community have experienced NiS failure. The questionnaire also highlighted that the majority of the façade community believe that there is a need for an improvement to the regulation and for a standardised method for risk measurement to be made available.

The desktop study of available literature on the topic of NiS breakage suggested a multitude of factors that contribute to an NiS failure which could result in an injury or death. This research offers a documented outline of the contributing factors that lead to an NiS failure and the post-breakage events that follow, accompanied by a compilation of the available referenced literature and statistics.

The findings have the potential to catalyse the development of a mathematical risk model based on empirical data and probability that could be used by industry professionals, legislative bodies and insurance organisations to govern the exposure to risk that our buildings' façades impose on the public.

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November 2015