# Finite Element Analysis of Structural Insulated Panel with OSB Skins against Windborne Debris Impacts

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## ABSTRACT

Oriented strand board (i.e. OSB) skin structural insulated panel (SIP) with expanded polystyrene (EPS) foam core is becoming more and more widely used as building envelope in the building industry. The structural insulated panel is considered as an efficient panel owing to the advantages of being environmentally sustainable, economical, easy to install and low thermal conductivity, etc. When building envelope is impacted by windborne debris during strong wind event, the debris might perforate the panel, resulting in dominant openings. The dominant openings might cause differential internal pressurization of building and result in building collapse. To investigate the impact resistance capacity, a series of laboratory tests on the SIP panels with OSB skins subjected to a 4kg timber projectile impact were conducted by using a pneumatic cannon system in a previous study. A brief of the experimental tests and results is described first in this paper. This paper then presents a numerical model developed to simulate windborne debris impact on the SIP panels by using commercial software LS-DYNA. The material models of OSB and EPS available in LS-DYNA are incorporated into the numerical model. The accuracy and reliability of the numerical model are validated by comparing the numerical and experimental results in terms of failure modes, penetrated depth of projectile, displacement and strain on the back skin measured in the tests. The validated numerical model can be utilized to conduct more numerical simulations to obtain vulnerability curves and fragility curves of the SIP panel against windborne debris impact.