

Fire tests on single layer spherical aluminium alloy reticulated shells

Lei. Tao, Xiaonong. Guo*, Qiang. Zeng, Shaojun. Zhu

*Department of Structural Engineering, Tongji University
No.1239 Siping Road, Yangpu District, Shanghai, China
guo-xiao-nong@tongji.edu.cn

Abstract

Aluminium alloy reticulated shells are widely applied in public buildings, while they behave poorly under fire conditions due to the dramatically degraded mechanical properties of aluminium alloy at high temperatures. However, the relevant research at the level of the whole structure is insufficient.

In this paper, a series of fire tests on a 1/5 reducing-scale model of a single layer aluminium alloy reticulated shell were conducted to investigate the fire behavior of aluminium alloy shells.

Firstly, preliminary tests on combustion characteristics of two kinds of fire sources were carried out outdoors to validate the classical fire plumes model. Subsequently, based on the preliminary tests, eight nondestructive tests were performed to explore the space temperature field and the temperature rise of members in large space fire, taking into account the ventilation conditions and the positions and powers of fire sources. Finally, a destructive test with a fire source of ultrahigh power was implemented to discuss the temperature field, the temperature rise of members and the elasto-plastic stability bearing behaviour of aluminium alloy reticulated shells under local ultrahigh power fire.

This test research validates the temperature elevation model in large space fire, and can fill the gap of the fire behavior of aluminium alloy reticulated shells in large space fire.

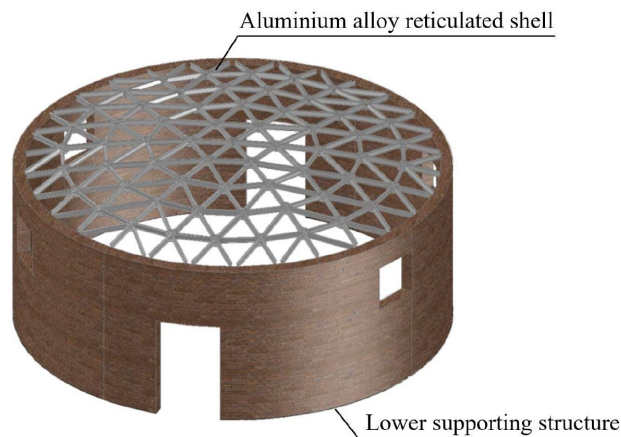


Figure 1: The reducing-scale experimental model.

References

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