

Experimental studies on tear failure of PVC coated fabric

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Abstract

The tearing performance of a kind of PVC coated polyester fiber fabric commonly used in membrane structure was experimentally studied in detail. Uniaxial tearing tests including single tongue, double tongue and trapezoid-shaped methods were carried out and the failure mechanism and main characteristics of them were analyzed. The results show that the tearing mechanism of the tongue tests which include single tongue and double tongue methods is complex and there are many invalid specimens, therefore, it is unreasonable to test the tearing resistance of the PVC coated polyester fiber fabric with them. On the other hand, the tearing mode of trapezoid-shaped test is simple and closer to the plane stress state of fabric tearing in actual structure, and the test results are relatively stable, therefore, it is worth recommending. Uniaxial and biaxial central tearing methods were used to test the effects of the slit length, slit angle and stress ratio on the tear strength and tear failure modes of this fabric material. The similarities and differences between uniaxial and biaxial central tearing were compared. The strain distribution and displacement field of the membrane surface were measured by non-contact digital speckle correlation method, and the strain distribution curve on the crack section was fitted. The results show that all the above factors have significant effects on the tear strength and crack propagation mode of this material. During the whole process of central tearing methods, the maximum strain on the membrane surface almost always concentrates in the del zone at the crack tip. This paper provides a reference for the study of tear resistance of building membrane materials.

Keywords: Uniaxial tearing test, uniaxial and biaxial central tearing methods, crack propagation, strain distribution and displacement field.

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