STRUCTURAL ADHESIVE BEHAVIOR

EXPERIMENTAL AND COMPUTATIONAL STUDY

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Abstract

Adhesive joints are being increasingly used in structural applications due to their unique characteristics and advantages. Many structural industries have seen the use of adhesive for joining load-bearing components as an excellent candidate for replacing the traditional joining methods such bolting and riveting, especially when they are dealing with Fiber Reinforced Polymers (FRP) materials. They have been attracted to use adhesives due to several reasons: their high strength, light weight, dimensional stability, high resistance to environmental degradation and ease of use. The traditional methods have gone a long way in creating appropriate technologies and gaining years' of design experience, this cannot be easily replaced. Switching from traditional joining methods to adhesives bonding in the civil infrastructure applications requires a large investment. It is crucial to understand bonded joint behavior and strength, and to be able to predict it for a given geometries and loads.

The objective of this research is to investigate the structural adhesive behavior by characterizing their mechanical properties. Furthermore, to build representative material model that can mimic their behavior and can be used in numerical models for computational studies. Quasi-static and dynamic experiments were performed on structural adhesive at different loading modes: tension and shear. Material model has been created and validated at coupon level and system level, under quasi-static and dynamic loadings. Comparison between experimental results and numerical results obtained from 3D finite element analysis showed very good correlation at different loading modes and rates.