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BOOK OF ABSTRACTS

**MECHANICS
OF COMPOSITE MATERIALS**

**JUNE 2 - 6, 2014
RIGA, LATVIA**



**INSTITUTE OF POLYMER MECHANICS
UNIVERSITY OF LATVIA**

**EIGHTEENTH INTERNATIONAL CONFERENCE
MECHANICS OF COMPOSITE MATERIALS**

**Devoted to the 50 Anniversary of the Institute of Polymer Mechanics
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OPTIMIZATION OF HYBRID JOINTS FOR IMPROVING THEIR RELIABILITY

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The high strength-to-weight ratio of fiber reinforced composite material makes them extremely attractive as a building material for civil engineering applications.

Bolted connections, which are the most practical connections for civil applications, not only sever the reinforcing fibers, caused by drilling bolt holes and thus reduce the overall strength of the composite, but also introduce high stress concentrations which promote fracture.

Adhesively bonded joints are alternatives to mechanical joints in engineering applications and provide many advantages over conventional mechanical fasteners. However, significant disadvantage of these joints is the high stress concentrations at the ends of connections and low fracture toughness of the adhesives.

To improve the reliability of adhesively bonded joints, the additional mechanical fastening is generally used. One of the interesting mechanical fastening of composites is the use of needlelike connection. It is known [1] that for fiber reinforced composites reducing the diameter of bolt holes reduces or eliminates the effect of severed fibers, what may in some cases to maintain the original strength of composite material.

The purpose of this work is to investigate of the hybrid joints: a adhesively-needle connection. Needle steel rods of diameter 1 mm were used in this study, as well as fiberglass reinforced plastic (FGRP) with thickness of 1.6 mm with and layup $[0^\circ/90^\circ/0^\circ]_s$. Strength of the joints was determined on the specimens with lap joints in accordance with ASTM D 1002.

It was established experimentally that if FGRP strips connected with needles diameter of 1 mm and the distance between them is greater than 4–5 diameters, they do not decrease the strength of the strips with drilling hole and they not failed due to bearing strain. Comparison of strength for the samples with the adhesively bonded and hybrid bonded joints showed that strength of the hybrid bonded joints approximately 30% higher.

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