

### **Evaluation of bond using FRP rods with axisymmetric deformations**

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**Abstract:** This paper presents experimental results obtained with the direct pull-out test using machined and wrapped glass/vinylester, carbon/vinylester, and carbon/epoxy FRP rods with axisymmetric lugs. The typical results are given as nominal shear stress vs. free- and loaded-end slip. Experimental results obtained from strain probes used during the pull-out test are presented as shear stress vs. strain. Machined glass/vinylester FRP rods with embedded lengths including five and 10 lugs, and different lug widths and heights were studied. The failure mode consisted of the shearing off of the lugs without concrete damage. Four concrete mixtures with strengths ranging from 32 to 66.1 MPa were examined. Provided that enough confinement is used, it was found that the concrete strength has no noticeable effect on the shear strength and failure mode of FRP rods. Results showed that the FRP-concrete bond is controlled by the lug dimension and shear strength of the resin. The shear strength of the wrapped lugs is less than that of machined ones due to fiber orientation and weaker interfacial bond between the wrapped strands and rod surface.