

## EFEKAT TRENJA NA VIJČANIM VEZAMA KOD ALUMINIJSKIH KONSTRUKCIJA

### **Sažetak:**

*U ovom radu je prikazano eksperimentalno određivanje koeficijenta trenja i njegov efekat na ponašanje vijčanih spojeva na aluminijumskim konstrukcijama. Vijčani spojevi su ostvareni upotrebom prednapregnutih visokovrijednih vijaka od karbonskog čelika. Upotrebene dimenzije vijaka su M12, M16, M20 i M22, klase čvrstoće 10.9. Da bi se ispitalo ponašanje spojeva, ispitivanjem se odredio koeficijent trenja za tri vrste obrade tarnih površina. Obrade tarnih površina su takve da predstavljaju uobičajenu praksu na našem tržištu. Upotrebjeni su spojevi bez površinske obrade, sa površinskom obradom čeličnom četkom te površinskom obradom plastificiranjem. Sila klizanja pri kojoj se određivao koeficijent trenja je definisana propisom i očitava se pri klizanju spoja od 0,15 mm. Mjerni instrumenti su postavljeni tako da mjere proklizavanje oba vijčana spoja neovisno jedan o drugom. Svi spojevi su modelirani i u softveru ANSYS te se pokazalo da se uspješno mogu analizirati i predvidjeti ponašanja spojeva i pomoću MKE. Eksperimentalna istraživanja su sprovedena na Institutu za materijale i konstrukcije pri Građevinskom fakultetu Univerziteta u Sarajevu, te na Institutu za zavarivanje Tuzla.*

**Ključne riječi:** vijčana veza, prednapregnuti vijci, koeficijent trenja, sila klizanja, Ansys, modeliranje MKE, tarne površine, obrada površine

## FRICION EFFECT OF BOLTED CONNECTIONS IN ALUMINUM STRUCTURES

### **Abstract:**

*This paper presents the experimentally determined coefficient of friction and its effect on the behavior of bolted connections on aluminum structures. Bolted connections are made using pre-stressed high value carbon steel bolts. The dimensions of the bolts used are M12, M16, M20 and M22, strength class 10.9. In order to examine the behavior of the joints, the coefficient of friction was determined by testing for three types of treatment of friction surfaces. Treatments of friction surfaces are such that they represent a common practice in our market. Joints without surface treatment, with surface treatment with a steel brush and surface treatment with plasticization were used. The sliding force at which the coefficient of friction was determined is defined by the regulation and is read when the joint slips by 0.15 mm. The measuring instruments are set to measure the slippage of both bolted joints independently of each other. All joints were modeled in the ANSYS software, and it was shown that joint behavior can be successfully analyzed and predicted using FEM. Experimental research was conducted at the Institute for Materials and Structures at the Faculty of Civil Engineering of the University of Sarajevo, and at the Institute for Welding, Tuzla.*

**Keywords:** bolted connection, prestressed bolts, friction coefficient, sliding force, Ansys, FEM modeling, friction surfaces, surface preparation