Project name:	Determination of the dynamic and limit load capacity of a single sided fillet weld of AISI 304 steel
Description:	Stainless steels are increasingly being used as construction materials due to their high corrosion resistance combined with good mechanical properties. This makes stainless steels a desirable material for building sustainable structures in environments with aggressive media, such as near the sea. Welding is the main method of joining different structural elements made of steel. However, welds are often the main cause of fatigue failures. Fillet welds are commonly used to manufacture steel structures from sheet metal components. Stress concentrations that occur at the edge and root of a fillet weld are common locations for fatigue cracks. Poor accessibility or even inaccessibility inevitably leads to fillet welds being welded on only one side of the sheet metal instead of both sides. Sometimes fillet welding is only performed on one side to improve productivity and reduce production time. The fatigue behaviour of welded butt and fillet welds in austenitic and duplex stainless steels has been studied in detail. Fillet welds have been investigated on transverse joints of plates with load-bearing and non-load-bearing double-sided welds, whereby the research was mainly carried out experimentally, while the fatigue behaviour of a transverse load-bearing single-sided fillet weld on a T-joint of two stainless steel plates was only insufficiently investigated. This will be the subject of research in this project, and in addition to the experimental work, a numerical investigation of the fatigue behaviour will be carried out. A classical tensile test and a constant amplitude fatigue test will be performed experimentally on previously prepared specimens of 4 mm thick plates. The plates are made of AISI 304 austenitic steel and welded using the MAG welding process. The tests will be carried out on an INSTRON 1255 multi-purpose servo-hydraulic testing machine with computerised control and data acquisition for dynamic and static tests, with a working capacity of up to 250 kN at a loading frequency of 30 Hz, using a stress ratio of R=0.1. The expected result of the experimental research is the determination of the S-N curve of the considered joint. Numerical research will be conducted using a commercial finite element analysis programme. The numerical modelling and simulation of the fatigue behaviour of the joint under consideration is carried out with the task of determining the location of crack initiation, the critical crack length and the ultimate load for different crack lengths and making a comparison with the experimental research results.
Webpage:	https://www.croris.hr/projekti/projekt/12262
Source of finances:	Ministry of Science, Education and Youth
Beneficiary:	University of Slavonski Brod
Partners:	University of Maribor
Project budget:	2.000,00 EUR
Duration:	2 years
Location:	Slavonski Brod, Maribor

Target groups:	University of Slavonski Brod, Sveučilište u Mariboru, Researchers in Materials Science and Fracture Mechanics, Broader Scientific Community, Manufacturers of Stainless Steel Components
Objectives:	• Experimental investigation of fatigue behavior in transversely loaded single-sided fillet welds on a T-joint of two AISI 304 stainless steel plates. • Determination of the S-N curve and fatigue strength required for fatigue analysis of the considered joint. • Numerical investigation of fatigue behavior in the analyzed single-sided fillet weld on a T-joint of two plates using the finite element method (FEM). • Numerical determination of critical crack length as a function of applied load magnitude. • Numerical determination of limit loads for different simulated crack lengths in the single-sided fillet weld.