

Evaluation of the failure mechanism of the t-stub connection with pre-tensioned bolts

Mohammad Amjadi, Ali Akbar Alishahi*

**Department of civil engineering, Roudehen Branch, Islamic Azad University,
Roudehen, Iran**

***corresponding Author**

Abstract

T-stub connection, considered as bolted connection and commonly semi-rigid connection, is under the pre-stressed tension, the applied force in the bolts during the tension loading dependent on the geometry of the connection consisting of several parameters like tension stiffness of bolt, flexural stiffness of the section flange, the erecting position of bolt, the geometric dimension of section, the pre-tension ratio and so on. In this study, the ratio and the change of the force applied in the pre-stressed high strength bolts during the tensile loading of the T-stub connection and also the sensitivity analysis of the applied force in the pre-stressed high strength bolts towards the change in the T-stub connection geometry is considered which is a valuable step in designing the bolted connection with pre-stressed high strength bolts more safely and economically and leads to the accurate study of this subject.

At first by selecting one experimental sample of bolted connection of T-stub, it is simulated in finite element software of Abaqus in order to determine the verification of the software and the used modeling way in this study. And also the structural elements, loading, material and the type of used analysis in the test are introduced. Besides, 52 controlled samples of T-stub connection with execution and design constraints are determined in order to assess a series of data by changing the geometric configuration and material strength of the T-stub connection components.

Finally, performing nonlinear analysis in Abaqus finite element software and determining the limit state function of maximum tensile force of the bolts based on the random variables such as bolt diameter, the thickness and the width of the section flange, the thickness and the width of the section web in two performance levels of yielding and the rupturing of the web plate, the reliability is analyzed using the Monte Carlo method. The results have shown that the thickness of the web plate and the bolt diameter in two performance levels have the most effect on the tensile force applied to the pre-stressed high-strength bolts during tensile loading.

Key Words:

High Strength Bolt, Pre-stressed, T-stub Connection, Finite Element Method, Nonlinear Analysis, Abaqus.