

Sensitivity analysis of force generated in high-strength, pre-tensioned bolts with T-stub connections

Alireza Hassan poor Yesaghi ¹, Davood Gilak Hakimabadi ², Hossain Jamshidi ³, Yaser ParvinDarabad ⁴

1.M.Sc. of civil engineering, hassanpour_y@hotmail.com

2.M.Sc. of civil engineering, Deputy of Golestan Regional Water Authority, DavoodGilak@yahoo.com

3.M.Sc. of civil engineering, Staff of Golestan Regional Water Authority, h.jamshidi.56@gmail.com

4.Ph.D. of civil engineering, Inspector of Golestan Regional Water Authority,
Yaserparvin@yahoo.com

Abstract

In this paper, the sensitivity analysis of the force generated in high-strength, pre-tensioned bolts with T-stub connections is needed to apply the pre-tensioning force in a bolt to an axis of force applied to the bolt and an interior surface parallel to the cross-section of the bolt (the section to which force is applied). The datum-axis command is used to create the force axis. To create the desired interior surface, a datum surface or other arbitrary options can be used. During the tensile loading, the bolts depend on the geometry of the connection, including several parameters such as the tensile stiffness of the bolt, flexural stiffness of the section flange, position of the bolt, geometric dimensions of the section, degree of pre-tensioning, and so on. Here, the change rates of the force generated in high-strength, pre-tensioned bolts and how it changes as well as the sensitivity analysis of the force generated in the high-strength, pre-tensioned bolt are explored. The random variable in terms of sensitivity to the limit-state function (g_{bolt}) is the bolt diameter (d), which has a higher sensitivity than the remaining random variables, because by applying the pre-tensioning force to the bolts, the tensile capacity of the bolts is increased by which the behavior of the bolts is completely different following the application of the tensile force to the T-stub connection. By increasing the length of the flange plate, the prying action could be intensified to influences the tensile behavior of the bolts. However, at the failure performance level of the web plate, it is the thickness of the plate (t_f), since at the moment when the bolt thread reaches the ultimate stress, the increase in length due to large non-elastic deformations could lead to the local failure of the flange as the pinching or rupture in contact with the bolt edge.

Key words: Analysis, strength, pre-tensioned, force, T-stub connections

1. Introduction

The beam-column connection in the frame of steel structures is used to transfer the load from beam to column. In general, the forces transferred through the connections include the axial forces, shear forces and torsional and flexural moments. In this study of the sensitivity analysis, the force generated in the high-strength, pre-tensioned bolts with T-stub connections is investigated. The