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Mechanical behaviour of bolt replacement of bolted connection in bending and tensile

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ABSTRACT

The component of bolted connection is sometimes replaced due to some reasons, which are corrosion, bolt delayed fracture and so on. The influence or mechanical behaviour of bolt replacement of bolted connection applied tensile force was already investigated in previous studies. However, that of the connection applied the bending moment is not cleared. In this study, simple and small specimens of bolted connection were prepared and bolt replacement experiments under bending were conducted to clear the behaviour and compare it and that of bolted connection applied tensile force. And, numerical analysis was carried out to investigate the influence of bolt replacement focused on the order of bolt replacement. As a result, although the centre opening stretch of the upper side and the lower side was different due to bending, the averaged opening stretch was the same as that of the connection in tensile. The order of bolt replacement affected the opening stretch, however, did not affect the elongation of bolted connection.

Keywords: Bolted connection, bolt replacement, bending moment, mechanical behaviour.

1 INTRODUCTION

Bolted connection is well used joining technique of steel members. For some reason, the component of bolted connection sometimes may be necessary to be replaced. The reasons are corrosion, delayed fracture of a bolt, prevention of it, and so on.

Sameshima et al. (1987) reported the replacement of the bolt, whose bolt head was buried in the concrete deck, to replace delayed fractured bolts. Nakajima et al. (2017) also investigated bolt replacement from existing bolts to one-sided bolts. The behaviour of connection during bolt replacement was measured experimentally. Takai and Moriyama (2019) investigated bolt replacement behaviour by numerical analysis. These studies discuss the behaviour of bolted connections in tensile force. For example, the behaviour of bolted connection in a flange plate of a girder applied bending moment might be almost the same as that of the connection applied tensile forces. However, the bolted connection in the web plate is affected by an unignorable bending moment in the point of the distribution of bending stress.