Civil Infrastructure Researches, Vol. 7, Issue.1, Spring and Summer 2021, pp. 173-188

F. Masoumi-Zahandeh

Department of Civil Engineering, Nour branch, Islamic Azad University, Nour, Iran.

e-mail: masoumi.fereydoun@gmail.com

M. Hoseinzadeh

Department of Civil Engineering, Islamic Azad University Nour Branch, Nour, Iran.

e-mail: m_hoseinzadeh@iaunour.ac.ir

S. Rahimi

Department of Civil Engineering, School of Engineering, Islamic Azad University Nour Branch, Nour.

e-mail: s_rahimi@iaunour.ac.ir

M. Ebadi-Jamkhaneh*

Department of Civil Engineering, School of Engineering, Damghan University.

e-mail: m.ebadi@du.ac.ir

Investigation of the Behavior of Buckling-Restrained Steel Plate Shear Wall under Fire Loading

In this study, the seismic behavior of an all-steel buckling-restrained (AB) steel plate shear wall (SPSW) with incline slits under fire and cyclic loading was investigated. ABSPSW was composed of two thin steel infill plates with a narrow distance from each other, which were embedded with incline slits on each plate. These slits were in opposite directions to each other. The finite element (FE) numerical model was validated with three test specimens and after ensuring the modeling strategy, the parametric study was performed by considering variables such as wall plate thickness, slit width, strip width between two slits, and degree of temperature. A total of 256 FE numerical models were subjected to coupled temperature-displacement analysis. The results of the analysis showed that the high temperature reduced the seismic performance of the ABSPSW so that at 917oC, the load-bearing capacity was reduced by 92%. In addition, with the increase in the temperature, the yield point of the infill plate and frame occurred in a small displacement. The average decrease in shear strength at 458°C, 642°C, and 917°C was 18%, 46%, and 92%, respectively, compared to the shear strength at 20°C. Also, with increasing the temperature to 917°C, ductility increased by an average of 75%.

Keywords: Fire engineering, Steel structures, Thermal effects, Seismic engineering.

* Corresponding author

Received 16 September 2021, Revised 26 October 2021, Accepted 07 November 2021.
DOI: 10.22091/cer.2021.7372.1298