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Study on ultimate seismic behavior and repair method of damaged steel frames

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On the countries with frequent earthquakes, the terrible seismic disasters have been reported. So the various type of vibration control system for building structures has been developed and which is widely recognized as effective system against seismic excitations. In our previous study, the vibration control device called as Scaling-frame (SF) structures were suggested and the experimental studies were performed to investigate the resistant mechanism and seismic mitigation effects. Furthermore, the analytical method and design procedure of SF structure were established. Generally, the plastic deformation of vibration control device is excited and the ductile fracture by low cycle fatigue is occurred. It is desirable that the low cycle fatigue characteristics and capacities are clarified and the evaluation method of cumulative ductility till fracture is prepared. In general, it is clarified that the difference of cumulative ductility of steel member is quite large between small and large ductility amplitude. This is summarized in Similitude Law of Prefracture Hysteresis. In this study, the plastic cyclic loading tests are conducted. From test results, the effect of ductility amplitude is expressed by a certain formula, from which the relationship between ductility amplitude, cumulative ductility and number of cycles prior to fracture are presented. Furthermore, when the random deformation amplitude such as seismic response is given to vibration control structure, Linear Damage Rule is applied for the prediction of the fracture, which is frequently used to estimate fatigue life. By use of these rules, the cumulative ductility under random plastic deformations can be predicted well.

Biography

Ayumu Ushigome has completed his Bachelor's degree from Tokyo University of Science. He is currently pursuing 1st year of his Master's degree in Architecture from Tokyo University of Science.

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