Response Evaluation of Steel Frame systems with Settlement Load under Seismic Excitation using Structural Health Monitoring

Hasan Shahriyer, Mosbeh Kaloop and Jong Wan Hu (Republic of Korea)

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SUMMARY

Due to uneven homogeneity of the soil in the ground, it is surely not possible to say whether a structure will stay as if it was constructed before. Displacement of the components is inevitable. In the earthquake-prone area, certain degree of settlement is unavoidable even if the whole structure is constructed over a rigid base. Several studies have already proven that differential settlement poses a significant threat over the structural components like member strength, joints, supports and causes redistribution of internal forces of the structure. Sometimes load distribution changes due to the settlement load over the structures. Each structure has its unique response depending on its mass, damping and stiffness for a particular seismic action. Nowadays numerous control systems have been used to mitigate the vibration in order to protect the structure and inhabitants. At present the study is focused on the modeling of simple frames having different story height to understand the response of the frame system in combination with seismic motion and settlement through structural health monitoring system. Damage due to the settlement load reduces the stiffness of frame system as a matter which indicate the damage in the system. A damage frame shows less response compared to a healthy structure as vibration energy radiant through the damage part of the system. A comparison has been made between the settled and unsettled structures to understand the response parameters and observe whether introducing any passive control device can have any significance over the improvement of the response and safeguard the structure. The verification of the system can be possible through laboratory scale frame model which may justify the outcome from the simulation models. This study provides some significant interest for the frame system which may undergo damage due to the settlement load and the change of response under seismic excitation.