

Experimental Studies for Determining the Strength Reduction Factor and Bearing Capacity of Cold-formed Steel Frame with Light-weight Concrete-Filled Shear Walls

Abstract

Cold-formed steel shear wall systems have been widely used in lightweight steel construction. They are cost-effective, light and easy to assemble. However, the performance of lateral resisting systems in cold-formed steel structures specially the behavior of cold-formed steel shear walls filled with light-weight structural concrete under seismic loads has not been studied. In this study, we have conducted an experimental study on cold-formed steel frames filled with light-weight structural concrete, the results of which are presented here. A total of 12 full-scale cold-formed steel frames filled with light-weight structural concrete with four different configurations are considered, and the responses investigated under a standard cyclic loading regime. This study is focused on the lateral load capacity and rational estimation of seismic response modification factor of cold-formed steel walls filled with light-weight concrete subjected to cyclic loads. Based on the test observation, detailed discussions on the failure modes of cold-formed steel wall specimens are given. Finally, the results showed that the shear wall type C with interior stud and noggin has the highest ultimate resistance and response modification factor. Also the lowest ultimate resistance and response modification factor is related to shear wall type B with single section chord stud.

Keywords: Cold-formed steel; Steel shear walls; light-weight concrete; seismic response modification factor