Abstract

Pre-engineered steel structures have become an indispensable tool in the construction industry because of their widespread use in large shopping malls, exhibition halls and industrial buildings. Such special buildings generally contain stacked materials, heavy machinery and a heavy-duty crane. Seismic loads are critical for these structures, as the location of the building changes depending on seismic activities. In this research, the performance of a typical structural steel building to be used as a shopping mall and constructed using the section variation technique is studied for all five seismic zones of Uniform Building Code 97, namely 1, 2A, 2B, 3 and 4. This study investigated the effects of the variation of the seismic forces in various seismic zones for special and ordinary steel moment-resisting building frames with response modification factor values of R=8.5 and R=4.5, respectively. The parameters studied were the economy and the structural factors, design performance and detailing of the structures. The results indicate that structural steel can be saved by up to 7% for main frames and 60-130% for the lateral bracing by using special moment-resisting building frames (R=8.5) if proper detailing/construction of the steel moment-resisting frames is carried out according to the guidelines set forth by the AISC seismic provisions.

Keywords

Structural Economic Performance, Pre-Engineered Structures, Special Moment-Resisting Frames, Economy of Structures, Structural Detailing.