

Comparison of Steel and Composite Analysis of a Multi-Storey Building

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Abstract : Mitigation of structural damage caused by earthquake and reduction of fatality is one of the main concerns of engineers in seismic prone zones of the world. To achieve this aim many technologies have been developed in the last decades and applied in construction and retrofit of structures. On the one hand Turkey is well-known a country of high level of seismicity; on the other hand steel-composite structures appear competitive today in this country by comparison with other types of structures, for example only-steel or concrete structures. Composite construction is the dominant form of construction for the multi-storey building sector. The reason why composite construction is often so good can be expressed in one simple way - concrete is good in compression and steel is good in tension. By joining the two materials together structurally these strengths can be exploited to result in a highly efficient design. The reduced self-weight of composite elements has a knock-on effect by reducing the forces in those elements supporting them, including the foundations. The floor depth reductions that can be achieved using composite construction can also provide significant benefits in terms of the costs of services and the building envelope. The scope of this paper covers analysis, materials take-off, cost analysis and economic comparisons of a multi-storey building with composite and steel frames. The aim of this work is to show that designing load carrying systems as composite is more economical than designing as steel. Design of the nine stories building which is under consideration is done according to the regulation of the 2007, Turkish Earthquake Code and by using static and dynamic analysis methods. For the analyses of the steel and composite systems, plastic analysis methods have been used and whereas steel system analyses have been checked in compliance with EC3 and composite system analyses have been checked in compliance with EC4. At the end of the comparisons, it is revealed that composite load carrying systems analysis is more economical than the steel load carrying systems analysis considering the materials to be used in the load carrying system and the workmanship to be spent for this job.

Keywords : composite analysis, earthquake, steel, multi-storey building

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