



## Time history analysis of an existing structure in accordance with Turkish and European standards

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### Abstract

Turkey is located on active seismic fault lines. Having this major issue makes the seismic performance analysis a critical step to decide the safety or whether demolishing or reinforcing is more efficient. In this study, a seismic analysis comparison is performed on an existing steel structure via SAP2000 software. The seismic analysis method is Linear Time History Analysis. A comparison of results attained from dynamic analysis is obtained for an existing steel structure serving as a garage in Istanbul, Turkey. The results are demonstrated using graphics where base shear forces as well as lateral displacements obtained for two models are plotted for comparison.

**Keywords:** Seismicity, Time History Analysis, Eurocode 8.

## 1 Introduction

The aim of this study is the comparative evaluation of the Time History based seismic analyses according to Turkish Seismic Code 2007 [1] and Eurocode 8 [2] on an existing steel structure. For this purpose, three seismic data supplied from PEER archive [3] are scaled separately in line with the elastic design acceleration spectrums of the codes mentioned. Two structural analysis models are created, having different seismic target spectrums and the results are compared in terms of base shear forces, periods and lateral displacements parameters.

## 2 Linear Time History Analysis

### 2.1 Basis of The Calculation

The behavior of single degree of freedom systems is obtained by the solution of the equation of motion, which is a second order differential equation in the time domain, under initial conditions. The same process may be expanded for a multi-degree of freedom system like a frame system. The output obtained is for example the change of displacement with respect to time. By integrating the equation of motion of the structure in the time interval, displacement, velocity, acceleration and elastic forces could be calculated. This is the basis of the Time History Analysis via the acceleration records [4].