

A Study on Golden Ratio (ϕ) and Its Implications on Seismic Design Using ETABS

Authors : Vishal A. S. Salelkar, Sumitra S. Kandolkar

Abstract : Golden ratio (ϕ) or Golden mean or Golden section, as it is often referred to, is a proportion or a mean, which is often used by architects while conceiving the aesthetics of a structure. Golden Ratio (ϕ) is an irrational number that can be roughly rounded to 1.618 and is derived out of quadratic equation $x^2-x-1=0$. The use of Golden Ratio (ϕ) can be observed throughout history, as far as ancient Egyptians, which later peaked during the Greek golden age. The use of this design technique is very much prevalent. At present, architects around the world prefer this as one of the primary techniques to decide aesthetics. In this study, an analysis has been performed to investigate whether the use of the golden ratio while planning a structure has any effects on the seismic behavior of the structure. The structure is modeled and analyzed on ETABS (by Computers and Structures, Inc.) for Seismic requirements equivalent to Zone III (Region: Goa-India) as per Indian Standard Code IS-1893. The results were compared to that of an identical structure modeled along the lines of normal design philosophy, not using the Golden Ratio tools. The results were then compared for Story Shear, Story Drift, and Story Displacement Readings. Improvement in performance, although slight, but was observed. Similar improvements were also observed in subsequent iterations, performed using time-acceleration data of previous major earthquakes matched to Zone III as per IS-1893.

Keywords : ETABS, golden ratio, seismic design, structural behavior

Conference Title : ICSESB 2020 : International Conference on Structural Engineering and Sustainable Buildings

Conference Location : London, United Kingdom

Conference Dates : September 24-25, 2020