Main Objectives of Earthquake Engineering and Its Simulation

Visal Kumar*

Department of Electronics and Communication Engineering, Rajasthan Technical University, Rajasthan, India

Commentary

Received: 25-Nov-2022, Manuscript No. JET-22-84605; **Editor assigned:** 29-Nov -2022, Pre QC No. JET-22-84605 (PQ); **Reviewed:** 12- Dec-2022, QC No. JET-22-84605; **Revised:** 19-Dec-2022, Manuscript No. JET-22-84605 (R); **Published:** 26-Dec-2022, DOI: 10.4172/2319-9857.11.7.004.

***For Correspondence:**
Visal Kumar, Department of Electronics and Communication Engineering, Rajasthan Technical University, Rajasthan, India

E-mail: visalkmar@nth.in

ABOUT THE STUDY

Earthquake engineering is an interdisciplinary branch of engineering that designs and analyses structures with earthquakes in mind, such as buildings and bridges. Its overall goal is to make such structures more earthquake resistant. An earthquake (or seismic) engineer strives to build structures that will not be damaged by minor shaking and will not sustain serious damage or collapse in the event of a major earthquake. Earthquake engineering is the scientific discipline concerned with reducing seismic risk to socioeconomically acceptable levels in order to protect society, the natural environment, and the man-made environment from earthquakes. It has traditionally been defined as the study of the behaviour of structures and geo-structures subject to seismic loading; it is regarded as a subset of structural engineering, geotechnical engineering, mechanical engineering, chemical engineering, applied physics, and other disciplines. However, due to the enormous costs incurred in recent earthquakes, its scope has been expanded to include disciplines from the broader field of civil engineering, mechanical engineering, nuclear engineering, and the social sciences, particularly sociology, political science, economics, and finance.

Main objectives

1. Anticipate the effects of strong earthquakes on urban areas and civil infrastructure.
2. Design, build, and maintain structures to perform as expected and in accordance with building codes during earthquake exposure.

Earthquake simulation

The first earthquake simulations were carried out by statically applying some horizontal inertia forces to a mathematical model of a building based on scaled peak ground accelerations. Static approaches began to give way to dynamic ones as computational technologies advanced. Dynamic experiments on building and non-building structures can be physical or virtual, such as shake-table testing. In both cases, some researchers prefer to deal with so-called "real time histories" to verify a structure's expected seismic performance, even though the latter cannot be "real" for a hypothetical earthquake specified by either a building code or some specific research requirements. As a result, there is a strong incentive to use an earthquake simulation, which is a seismic input with only the essential features of a real earthquake.

Structure simulation

A structure simulation based on the concept of structural likeness or similarity is typically required for the theoretical or experimental evaluation of anticipated seismic performance. A degree of analogy or resemblance between two or more objects is defined as similarity. Similarity is based on exact or approximate repetitions of patterns in the compared items. In general, a building model is said to be similar to the real object if the two share geometric, kinematic, and dynamic similarities. Kinematic similarity is the most vivid and effective type of similarity. Kinematic similarity exists when the moving particle paths and velocities of a model and its prototype are similar.

In the case of earthquake engineering, kinematic equivalence occurs when the time histories of each story's lateral displacements of the model and its prototype are the same.

Prediction of earthquake losses

Earthquake loss estimation is commonly defined as a Damage Ratio (DR), which is a ratio of the cost of repairing earthquake damage to the total value of a building. The term "Probable Maximum Loss" (PML) is frequently used in earthquake loss estimation, but it lacks a precise definition. Seismic Risk Assessments are another name for earthquake loss estimates. The risk assessment process generally entails determining the likelihood of various ground motions as well as the vulnerability or damage to the building as a result of those ground motions. The results are expressed as a percentage of the building's replacement value.