

Analysis and Design of Building in Different Seismic Zone Using Staad Pro

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Abstract

The damage caused by the earthquake affects a significant portion of India. Therefore, when designing a structure, seismic load must be taken into account. The most recent earthquakes have led to the conclusion that earthquakes can affect both built and unbuilt structures. The primary goal of this analysis is to use STAAD Pro to analyze and design a G+6 building in three dimensions for India's various seismic zones. STAAD Pro is used to analyze the entire structure, including the load calculation, in this work. The limit-state design method was used throughout the analysis work. IS 1893:2002 is utilized for seismic detail and analysis. A seven-story, RCC-framed structure known as G+6 is planned. The research paper's primary focus is static analysis of the structure in various seismic zones.

1. Introduction

Earthquake: An earthquake is a natural disturbance that devastates human life through the process of the earth shaking. It occurs as a result of the release of elastic energy, which causes the ground, or earth, to move suddenly in a few seconds. Unpredictable and affecting to a large extent, it is an activity. It kills people and causes significant damage to transportation, cities, villages, and towns. In the engineering field known as earthquake engineering, we investigate the destructive effects of earthquakes and the means by which we can lessen their damage. It is necessary to investigate solutions and implement them in practical operations, such as planning, designing, building, and so on, in order to minimize earthquake damage.

Damage to the physical quantities of a structure, road, pipeline, infrastructure, bridge, tower, building, human life, and so on are examples of physical damage. Additionally, aftershocks cause significant damage to earthquake-weakened structures. The minor vibrations that follow a major earthquake are known as aftershocks. Landslides, fire, and dam failure, which causes flooding in the area nearby, are some of the major effects of an earthquake. Numerous individuals lost their shelters as a result of the earthquake, lowering the standard of living of the local population and preventing communication.

Zones of earthquakes: When an earthquake occurs in India, it behaves differently depending on where it occurs. Therefore, in order to construct a building in various zones or locations, a seismic map with knowledge of the area's properties is required. Zone I, Zone II, Zone III, and Zone IV are the four seismic zones in India.

Approach to seismic design: The primary considerations for tall buildings are lateral forces. In tall buildings, lateral forces cause the structure to sway, which results in undesirable

vibrations and stresses, including critical stresses. The movement of a structure's top surface in relation to its base is known as sway. According to the scenario of seismic design, people should live in a building that won't damage anything even if there is a small and frequent shaking, and after an earthquake, the building should provide adequate services. There shouldn't be any structural or non-structural damage to the structure in a moderate earthquake. The earthquake forces taken into account for calculation when designing using the limit state method are comparable to or stronger than those of previous earthquakes.

The unique reason assessment and layout software STADD PRO is superior for building systems is complex but simple to use. STADD PRO Version 8 features a graphical user interface that is both powerful and user-friendly, as well as unparalleled modeling, analytical, and layout methods that are all integrated using a standard database. Even though STADDPRO is short and simple for smooth systems, it can be used to manipulate the most important and complicated building designs, which include a wide range of nonlinear behaviors. This makes it the tool of choice for structural engineers in the building industry. If earthquake is the type of load, there are several carlateral load codes. The seismic loading form contains fault values and settings that can be viewed and edited by the user after a code is selected. Based on the weights assigned or calculated from the asset's definitions, these values are used by the software application to generate lateral hundreds in the desired direction. After the story degree stress for an automated seismic load has been calculated by STADD PRO, that pressure is divided among each joint at the story diploma elevation in proportion to its mass..

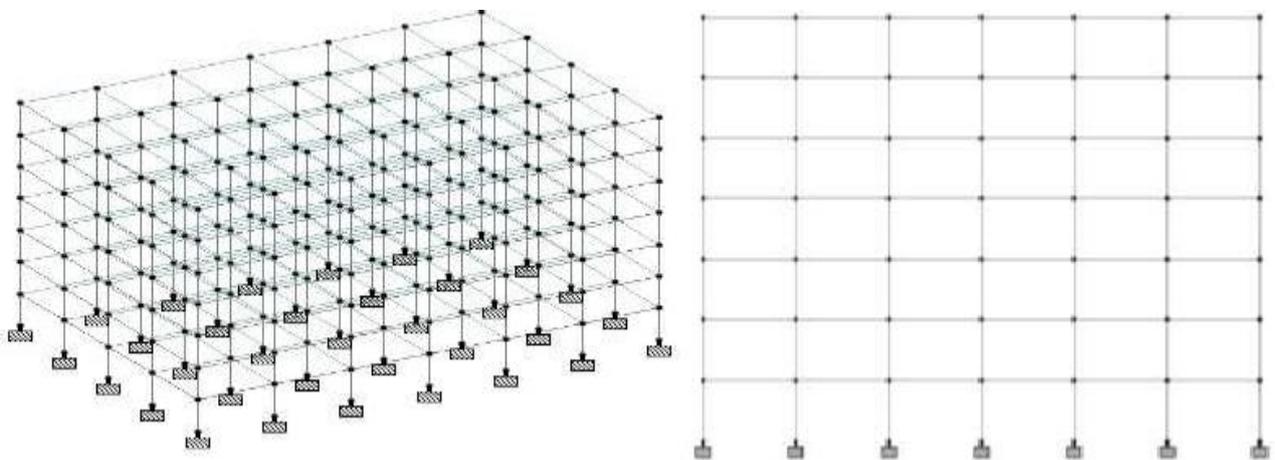


Fig.1 Isometric model

2. Literature Review

Common building terminology is used in both the input and output conventions. The models in STADDPRO are logically defined as ground-with-the-beneficial aid of way of ground, column-with-the-beneficial aid of way of column, bay-with-the-beneficial aid of way of bay, and wall-with-the-beneficial aid of wall, rather than as a stream of non-descript nodes and elements as in massive reason applications. As a result, the structural definition is clear,

concise, and extensive.

Near the bay widths and story heights, the participants in the largest homes are enormous. The body's stiffness is significantly affected by those dimensions. STADDPRO, in contrast to the majority of well-known cause programs that work on center line-to-centerline dimensions, corrects for such results within the device of the member's stiffness.

The results that are produced by the method of using the packages need to be immediately usable with the engineer's assistance. General-purpose laptop programs produce big results that may require more processing before they can be used in a structural format.

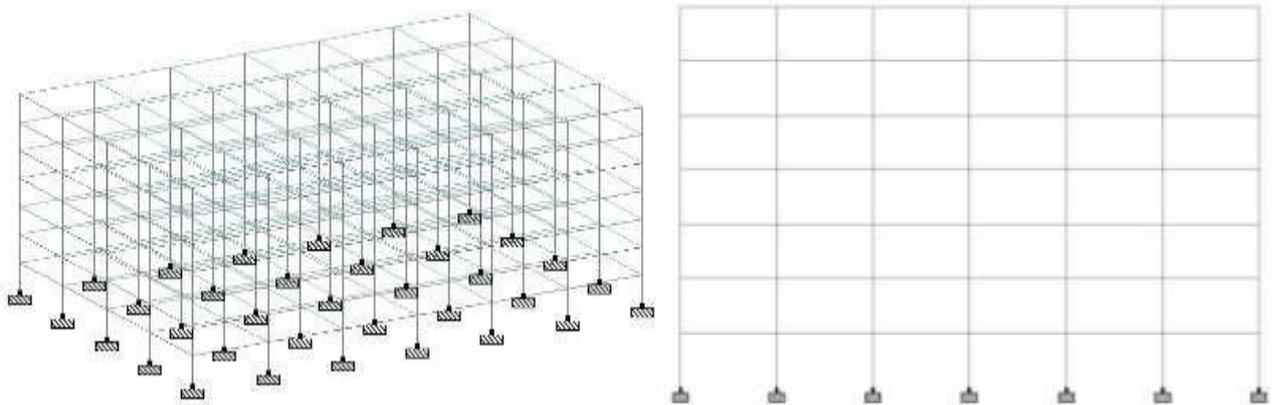


Fig.2 Front view

3. Proposed System

This project aims to learn how to conduct a proper seismic analysis of a building with 20 stories and a height of 3 meters for each story. It also aims to investigate the structure's behavior under the influence of wind and seismic load and to compare the results of ETABS analysis of buildings in various zones. In this project, they look at a building with 20 stories and a 3 meter ceiling on each one. Five models are used to calculate the length of each bay throughout the analysis, and the width of each bay is kept constant in two horizontal directions for ease of use.

analyzethestructureintwodifferentconditionsfirstiswithearthquakeandsecondiswithoutearthquake. According to IS1893-2000, they manually calculate earth load and gravity load in this paper. Using STAAD Pro, this study demonstrates the behavior and changes in steel quantity for the entire structure in various Indian seismic zones. They compared the axial load in various Indian seismic zones and calculated the bending moment, shear force, and column axial load using this software.

The author of the project uses ETABS, a computer software, to create four distinct shapes of the same area for a multistory building in accordance with IS-875, Part 3, and IS-1893, Part 1. In this paper, they looked at the 15, 30, and 35-story building. Displacement, base shear, overturning moment, acceleration, and time are well-studied and calculated parameters that affect high-rise buildings.

The study used STAAD Pro and ETABS to analyze and design rectangular plans with regular

and irregular plans, including irregular multistory buildings with vertical geometry. The purpose of this study is to determine the advantages of ETABS over STAAD Pro. It has been observed that the ETABS software is simpler to use and produces results that are more precise than those produced by STAAD Pro. In their paper, a number of additional advantages of ETABS over STAAD Pro are discussed.

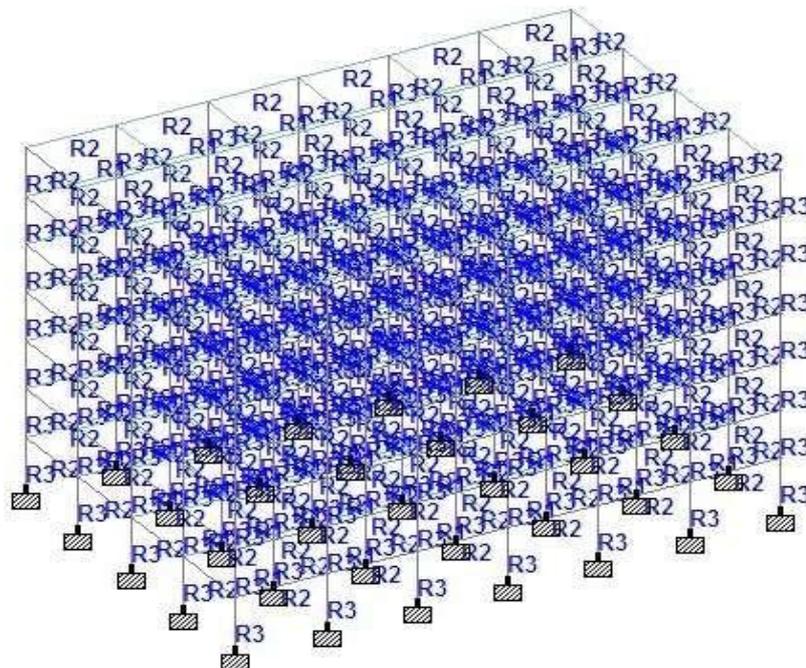


Fig.3 Isometric view column

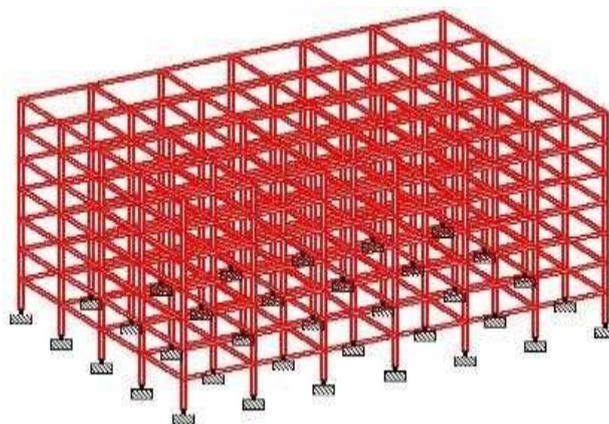


Fig.5 Structure showing beam in X and Z direction and column in Y direction

4. Conclusion

Using STAAD Pro, the volume of concrete and steel weight required for the design of a G+6 building obtained for various seismic zones. Concrete volume in cubic meters is shown in Table 4, and steel mass in Newtons is shown in Table 5 for various seismic zones calculated with STAAD Pro. Fig. While Fig. 18 depicts the concrete volume graph in cum, 19 depicts

the Newtonian weight-to-steel graph used in the design of the G+6 building with STAADPro.

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