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# **Price assessment of RC-Frame with Bracing and Shear Wall Structure**

**Dr. Vaibhav Chaudhary<sup>1</sup>, Javed Ul Islam<sup>2</sup>, Teekam Singh<sup>3</sup>, Hetram Sharma<sup>4</sup>,  
Yogesh Kumar Agrawal<sup>5</sup>**

Assistant Professor, Department of Civil Engineering, Jaipur Engineering College and Research Centre, Jaipur, India<sup>1-5</sup>

**ABSTRACT:** Earthquakes comprise probably the best danger of life and property on the earth. Because of abruptness of their event, they are least perceived and generally feared. The tremor safe development is viewed as vital to relieve their belongings. This paper presents the concise basics of seismic tremor safe development and a couple of methods to work on the obstruction of endlessly constructing materials to quake powers, monetarily.

Tremor safe or Aseismic structures are intended to safeguard structures to some or more noteworthy degree from quakes. While no design can be totally insusceptible to harm from tremors, the objective of quake safe development is to raise structures that charge preferable during Seismic movement over their customary partners. As per construction regulations, quake safe designs are expected to endure the biggest tremor of a specific likelihood that is probably going to happen at their area. This implies the death toll ought to be limited by forestalling breakdown of the structures for uncommon quakes while the deficiency of the usefulness ought to be restricted for additional regular ones.

**KEYWORDS:** Steel, Concrete, Shear Wall Structure, RC-Frame, Bracing, Cost, Staad Pro.

## **I. INTRODUCTION**

The effect of the seismic tremor on the structure. How might we at any point diminish the effect of the earthquake? Seismic tremors are one of the most horrendous of regular risks. Tremor happens because of abrupt transient movement of the ground because of arrival of flexible energy in an issue of few moments. The effect of the occasion is most horrendous on the grounds that it influences enormous region, happens all on an unexpected and eccentric. They can affect like and society, property (Buildings, structure and their substance) and upsets life saver Facilities (fundamental administrations, for example, water supply, transport and so on.). They don't simply obliterate towns, town and urban areas however the results prompts undermine the monetary and social design of the country, and advancement. Tremor is unexpected rolling or shaking occasions brought about by development under the earth surface, coming about because of the abrupt arrival of energy in the world's hull that makes seismic waves. Quakes are estimated utilizing perceptions from seismometers. Seismic tremor safe designs are those designs intended to endure quakes. As there are no design which can be 100% or absolutely insusceptible to harm from tremors, the essential goal of quake safe development is to raise structures that charge preferred during seismic movement over their customary partners. In this article we will examine four strategies through which we can develop seismic tremor safe construction with the goal that the design and the structure will confront least impacts when quake happens.

Appropriately endeavours have been made in this heading everywhere. Consequences of such endeavours are extremely uplifting in created nations however hopelessly poor in non-industrial nations including our nation India. This is demonstrated by insignificant harm by and large without any death toll when moderate to serious tremor strikes created nations, whereas even a moderate quake cause's wide spread obliteration in emerging nations as has been seen in late seismic tremors. It isn't the seismic tremor which kills individuals yet it is the risky structures which is liable for the wide spread demolition. Keeping in view the gigantic death toll and property in ongoing seismic tremors, it has turned into a hot theme overall and parcel of examination is proceeding to comprehend the reasons of such disappointments and learning helpful examples to moderate the reiteration of such annihilation. Assuming that structures are fabricated tremor safe at its in front of the pack (which is to be expected in evolved nations like USA, Japan and so forth) the obliteration brought about by tremors will be alleviated most really. The experts engaged with the plan/development of such designs are underlying/structural architects, who are liable for building quake safe designs and keep the general public on the loose in a protected climate.



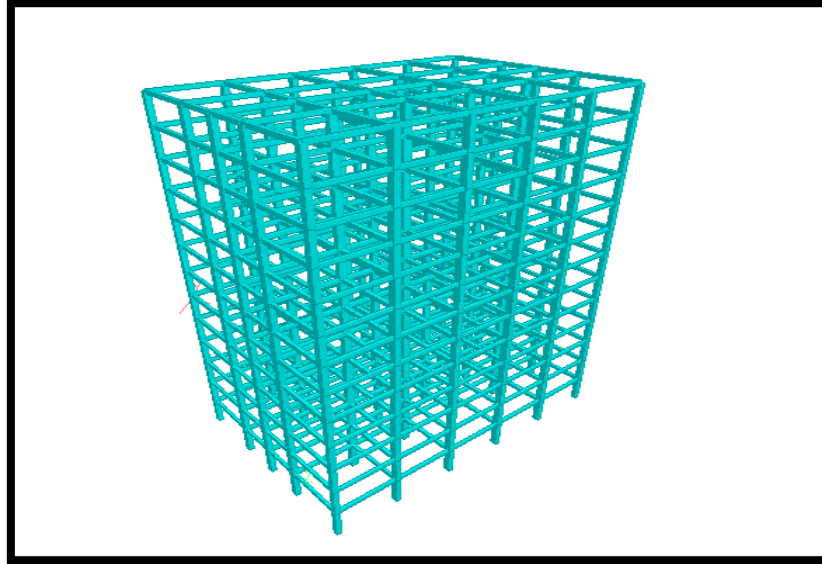


Figure-3D Model of Building

## II. LITERATURE REVIEW

A brief review on earthquake resistant techniques by some of the researchers is given below:

1. **Manish Kumar Pandey (2021)** - In his paper, it is presented that, the interest for multi-story structures is expanding step by step. Private in addition to business building is essentially utilized for wide range needs. Wide range expected for Flat piece, Waffle section and ribbed chunk stands an incredible choice for engineers when bigger openings in a structure should be covered with a couple of segments as could be expected. The utilization of various sorts of plates is creating as a recent fad and is turning into a significant test for primary specialists. Subsequently, it is important to learn about its underlying way of behaving. The task is completed under quake zone III under the seismic tremor examination of G+9 story building. For this review, four distinct kinds of enormous range piece structure are demonstrated in C-shape (Horizontal Setback Building) having 10-stories for example G+9 celebrated structures with 3.50 meters level for every story is displayed and dissected. The arrangement region of each of the four structures is same for example 2859 square meters (49.50 m x 82.50 m) each. These structures were planned in consistence with the Indian Code of Practices for seismic tremor safe plan of structures. Base of the structure were fixed. The square segments are utilized for primary components. The level of the structures is viewed as steady all through the design.

2. **Deepesh Panchal (2019)**-In his paper, to forestall the structures from quake excitations there are a few strategies that are utilized these days like base detachment, dampers, bracings, and so on. This paper is a survey on different investigates did by different specialists and engineers on such frameworks. The paper comprises of a short audit on the tests and examinations on frameworks for quake obstruction in structures done by teachers, understudies, and so forth of different colleges from everywhere the globe and furthermore centres on the outcome they acquired.

3. **Prof. Katta Venkataramana, Shreyasvi C (2018)** - It was likewise viewed that as even the non-designed developments now and then have the expected protection from quake ground movements. For instance, the Assam-type customary lodging in North-eastern states and the Dhajji-Diwari structures in Kashmir have great quake opposition. The quake safe development innovation ought to principally include utilization of materials of bendable nature, quake tough structure arrangement, lightweight primary parts to lessen the seismic powers and vigorous compositional structures.

4. **Mr Ashish A Mohite, Prof. G.R. Patil (2015)** - In his paper "tremor investigation of tall structure with tuned mass damper", a product concentrate on tmd was led. In which tmd is put on the highest point of the structure and story float,

story dislodging and base shear was examined with and without tmd on etab. The investigation was finished by examining seismic way of behaving of tenth, twelfth, fourteenth, sixteenth, eighteenth and 21st floor and excitations of bhuj tremor were applied utilizing time history investigation. They reasoned that the tmd ought to be set at highest level for best control of the primary mode and furthermore legitimate execution is vital.

### III. METHODOLOGY

All storeys including ground storey having 3 meter floor to floor height is considered or the analysis. Area of the plan of the building is 600 square meter ( $m^2$ ). Structures are having 5 bays in X- direction and each bay is having having length of 6 m and in Z- direction number of bays are 4 with different length two corner or end bays having length of 6 meter (m) each and two middle bays is having length of 4 meter (m) each. Three types of column are considered in this study and shape of the column is rectangular and square as per structure requirement. Two types of beam is considered in the study with different cross sections used. The size of the column and beam are shown below in tabular form. All the supports of the structure are fixed at the bottom. Three types of walls are used - main wall, partition wall and parapet wall. The thickness of the wall varies as main wall is having a thickness of 230 mm, partition wall and parapet wall are half of the main wall thickness. Height of the main and partition wall is same as the height of the storey. Parapet wall is considered with a height of 1 m. Shear wall is also provided in one model and the thickness of shear wall is taken 300 mm. In some other model cross bracings are provided these bracings are having steel – I section ISMB-100. Building is located in earthquake zone (Zone -). Soil condition are considered medium stiff and a damping ration of 5% and importance factor is taken as 1. Dead load and live load are applied accordingly. Earthquake loads are applied as per IS 1893 (Part- 1) 2016.

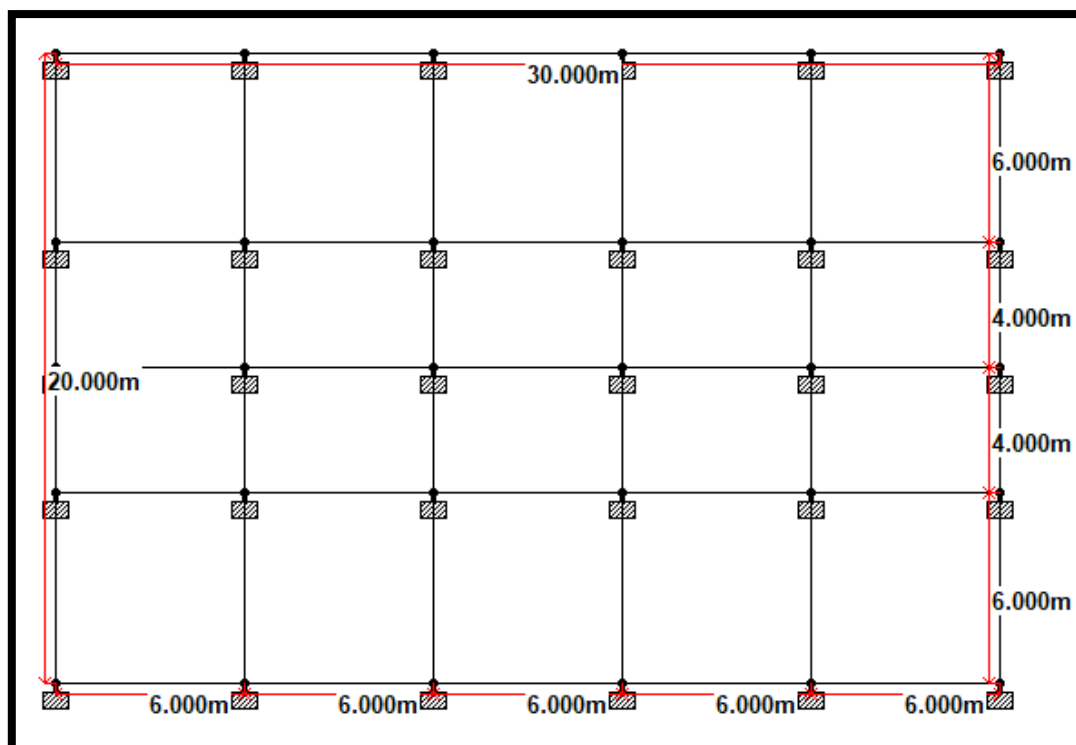


Figure- Plan of Model

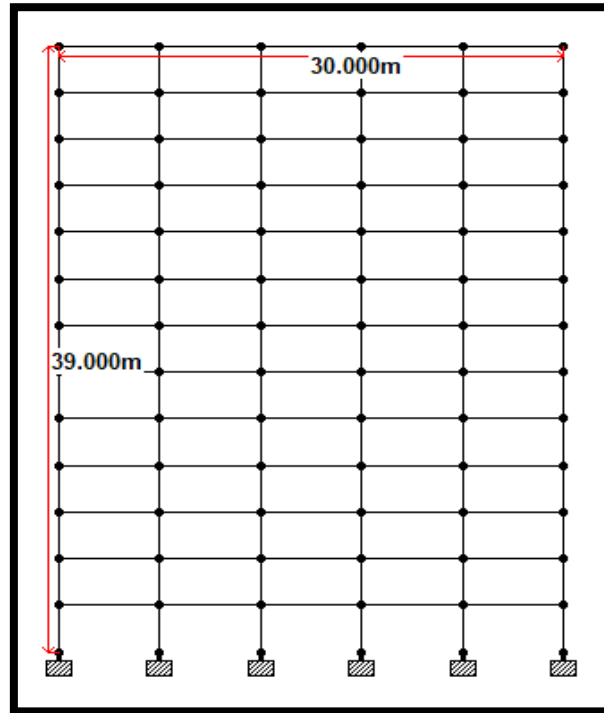


Figure- Elevation of General Model

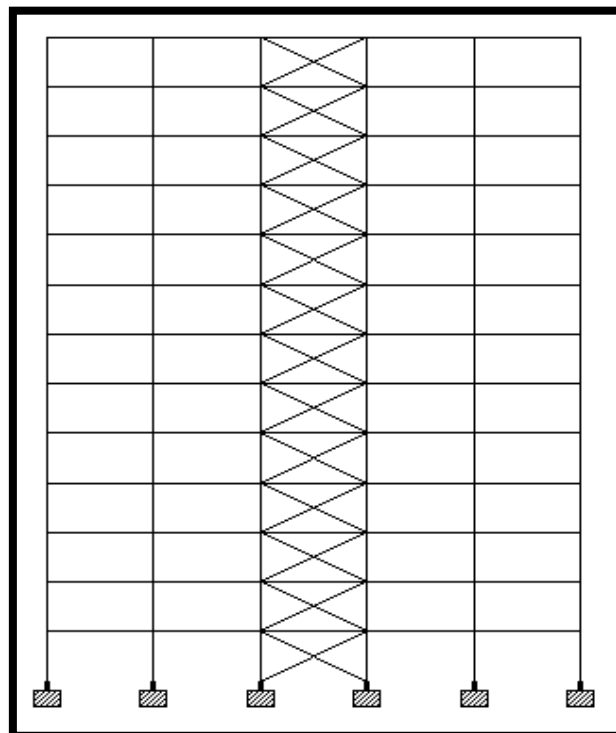


Figure- Elevation of Braced Frame Structure

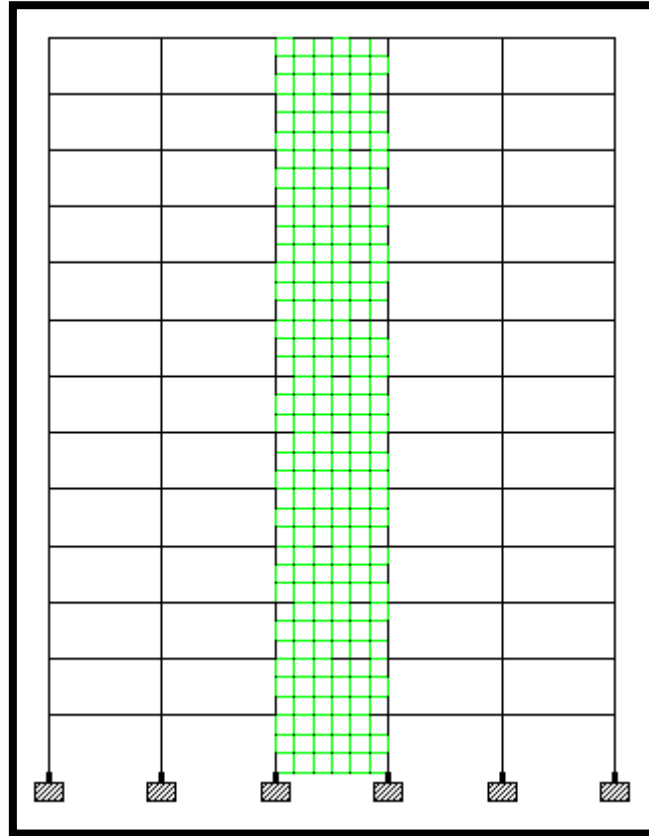


Figure- Elevation of Shear Wall Structure

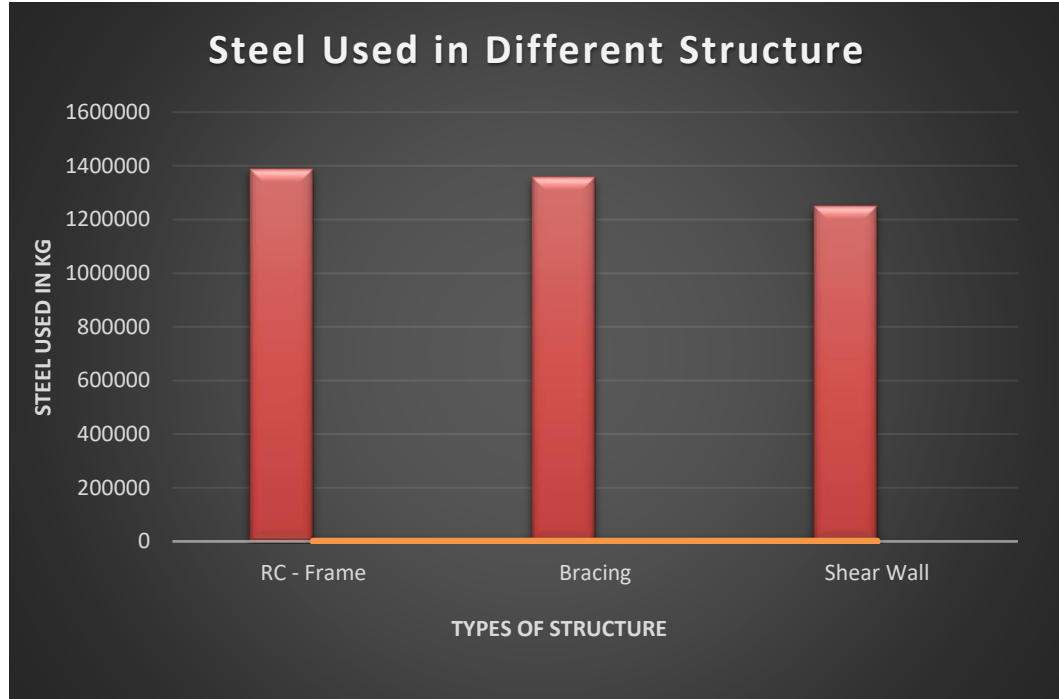
#### IV. EXPERIMENTAL RESULTS

In this chapter analysis is done for different 3 models, of RC –Frame, Bracing Structure and Shear Wall Structure in earthquake zones and with different types of arrangements. Main focus of this study is to control the cost of construction in high rise buildings and make them safe against lateral forces. Cost is controlled by decreasing the columns sizes and by providing shear wall or bracings at the place of columns.

Comparison between Materials which are used-

1. Table show below is the comparison of material used in all 3 types of structures-

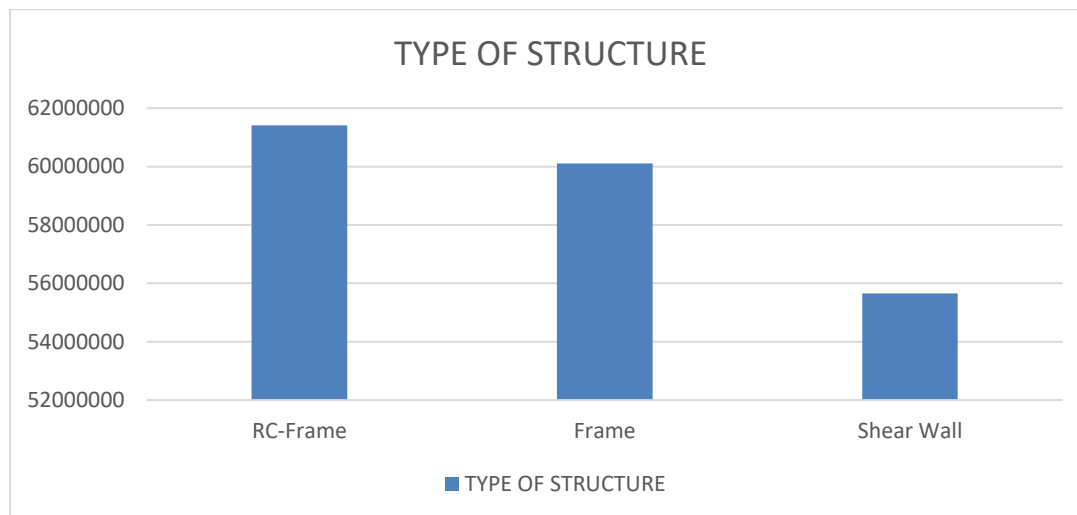
Material used	RC-Frames	Braced Frames	Shear Wall
Concrete (m <sup>3</sup> )	814	814	814
Steel (kg)	1386659	1355382	1249611



Graph-1: Steel Used in Different Structure

2. Table below shows the percentage-change in the cost of the material-

I. ATERIAL USED	RC- FRAMES	BRACED FRAMES	SHEAR WALL	% CHANGE IN BRACIN G COST W.R.T. RC	% CHANGE IN SHEAR WALL W.R.T. RC
II. ONCRETE	6,14,14,27 8.00	6,01,00,64 4.00	5,56,58.26 2.00	2.138971 657	9.372439 419
III. TEEL					



## V. CONCLUSION

- The amount of material used in case of shear wall structure is less than that of bracing and RC-frame in high rise buildings
- The amount of concrete used in all three cases i.e. shear wall, bracing and RC-frame is same. But the amount of steel used in minimum in shear wall structure as compared to bracing and RC-frame. Hence it can be concluded that total cost of shear wall structure is very less as compared to RC-frame and bracing.
- If judge both the above factors, shear wall structure is more economical as compared to RC-frame and bracing.

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