

# Stilt Floor and its Impact on Safety of Building

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**Abstract** – In this paper the impact of stilt floor on the safety of building is discussed. There are different recommendations and laws pertaining to stilt floor by local bodies and codes. Recent collapse of buildings in major cities give an alarming bell to consider strict rules pertaining to construction of stilt floor.

**Key Words:** Stilt floor, collapse, codal provisions, soft storey, design.

## 1. INTRODUCTION

Stilt floor means ground level portion of a building consisting of structural column supporting the superstructure, without any enclosures, to provide space for parking, switch room, generator room. Generally, the height of stilt floor is kept at 2.5m. The provision of stilt floor depends on local bodies. Depending upon road width,

### 1.1 Difference between cellar and stilt floor

Cellar is a Utility and parking area which is generally below ground level, where as stilt floor is at ground level. Both cellar and basement are below ground level.

The difference between stilt floor and ground floor is height level. Stilt is generally kept at 2.5m, while ground floor is minimum 3.0m. Normally for plot dimensions less than 100sqm, no stilt provision is mandatory by most of the local municipal bodies.

### 2. Stilt floor impact on structure

IS Code 1893, specifies term soft storey for stilt floor. A soft storey is one in which the lateral stiffness is less than 70 percent of that in the storey above or less than 80 percent of the average lateral stiffness of the three storeys above

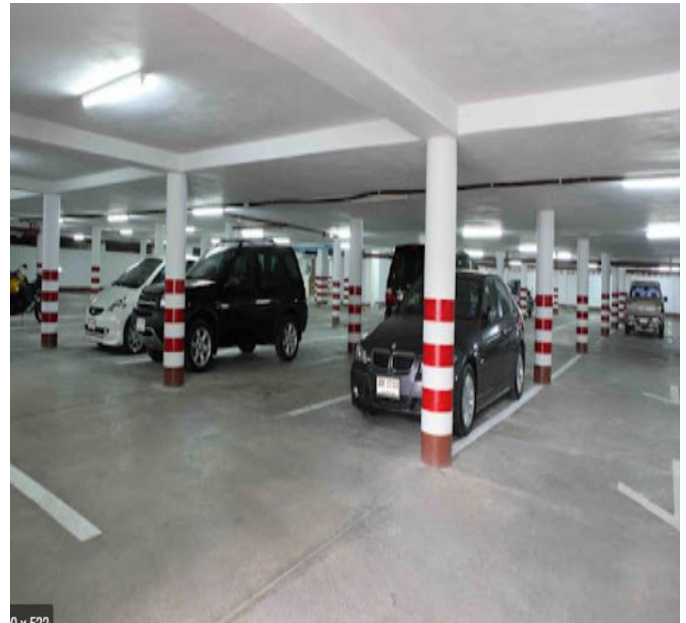


Fig. 1 Stilt floor



Fig. 2 Failure of stilt floor during earthquakes

### 3. Risk factor from stilt parking

Many local Municipal bodies have made stilt floor mandatory for providing space for parking.

Housing societies built on such structures can use the space only for stilt parking under the provisions of law.

Proper designing has to be done for stilt floor since it acts like a soft storey.

Some Builders and promoters to attract customers and to keep profit margin high may not consider all IS Code provisions for safe design of buildings.

A new trend has been started in architectural planning to keep minimum number of columns in stilt floor, to accommodate more vehicles and for free movement of vehicles. The floors above stilt are provided with floating columns which are extremely dangerous during earthquakes.

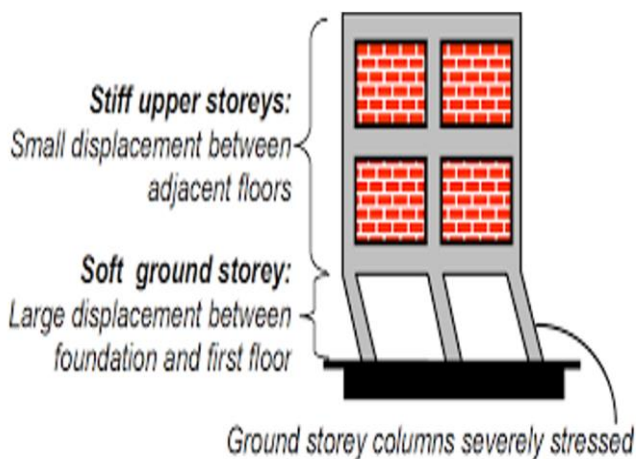


Fig.3



Fig. 4 stilt/Floating columns above floors

### 4. Architectural planning and Structural design coordination

There should be proper coordination between architect and structural designer at every stage of planning. Architect will focus mainly on client requirements, some time the plan may be different at each single floor. Placing of columns will be difficult under such circumstances. The stability of structure should be given due importance. Sometimes the stilt parking is modified as flat, partially, which effect the stiffness of the building. Having different floor plans will affect the slab and beam layout. The layout will be different at each level, disturbing the smooth transfer of loads.

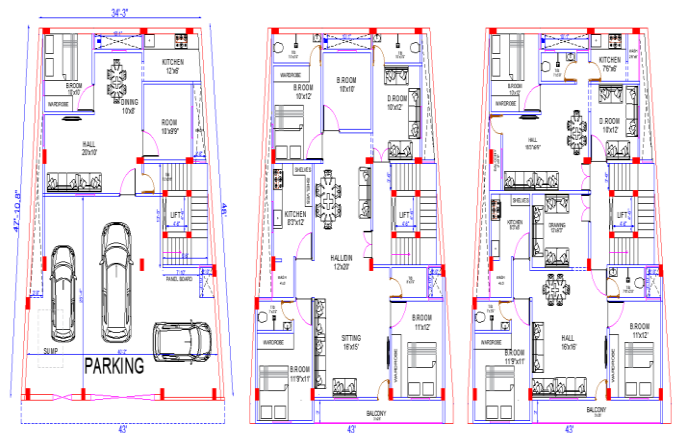


Fig. 5 different floor plans at each level.

### 5. Recent building collapses in Bangalore city

The incessant rain during the month of September and October led to collapse of at least 7 buildings in the city of Bangalore. A survey was conducted by the Municipal authorities, which found around 600 structurally unsafe buildings. The major factor for structurally unsafe buildings is no proper Soil investigation, no proper structural design and no check on quality of material and construction.

Another major defect is use of 150mm wide columns, so they merge with walls. The code specifies minimum width of 200mm. The Use of 150mm columns in stilt floor does catastrophic damage to the building during earthquakes or if additional load is added to the building. It has been found during the survey that additional floors were constructed beyond the permitted floors.



Fig. 6 collapse of apartment building Bangalore.



Fig. 7 collapse of apartment building Bangalore.

## 6. Building design provision for soft storey as per

### IS 1893-2002

In case of buildings with flexible storey, such as ground storey consisting of open spaces for parking that is stilt building, special arrangement needs to be made to increase the lateral strength and stiffness of the soft/open storey.

Dynamic analysis of building is carried out including the strength and stiffness effects of infills and inelastic deformations in the members, particularly those in the soft storey and the members designed accordingly.

Alternatively, the following design criteria are to be adopted after carrying out earthquake analysis, neglecting the effect of infill walls in other storeys.

a) The columns and beams of the soft storey are to be designed for 2.5 times storey shears and moments calculated under seismic load.

b) besides the columns designed and detailed for the calculated storey shears and moments, shear wall placed symmetrically in both direction of the building as far away from the centre of the building as feasible to be designed exclusively for 1.5 times the lateral storey shear force as calculated before.

## 5. CONCLUSIONS

With growing population and migration of people to cities for better opportunities, the demand to provide housing has increased.

The cost of land has increased in major cities.

The need for multistoried buildings increased.

All the major municipal bodies of major cities have made mandatory to provide adequate parking spaces for all the units.

It should be made mandatory to do proper design for buildings with stilt floor.

Since open spaces cave in during earthquakes, it should also be made mandatory to design earthquake resistant buildings.

The column minimum dimension should be at least 300mm in stilt floor.

Soil Investigation should be made mandatory for all buildings.

Local bodies should ensure the sanctioned plan and design is followed during the construction, otherwise work should be stopped.

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## BIOGRAPHIES



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