Optimization of Porch location in a Multistory Building

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Abstract— While working in high earthquake-prone areas, seismic analysis of any type of structure with various porch locations is an important consideration. The structure can be designed and built to withstand the high lateral movement of the earth's crust during an earthquake with the help of seismic analysis. Porch placement is critical for any tall structure, not only in terms of aesthetics but also in terms of structural loading. The current job, which is part of the tall structure's innovative phase, involves the analysis and design of a tall structure subjected to seismic load conditions with various porch locations. The earthquake loads are applied to the structure in addition to the dead load and imposed load, and a structural analysis is performed. Design and analysis were carried out using design software. In the current situation, a hospital building structure of G+12 has been analysed for seismic zone III using Response Spectrum Analysis in accordance with IS 1893-2016. The results of Displacement, Storey Shear, and Base Shear, among others, have been assessed. For the seismic zone, the results are obtained and represented in the form of graphs and tables.

Keywords: Load Transferring Porch, Porch Location, Seismic Analysis

I. INTRODUCTION

Porches are a type of building element that is commonly used in the architectural field. In the building's entrance or any other type of structure. It is the projection of a building onto an open area on a construction site, with the primary goal of protecting various materials and people from the effects of rain and sunlight, as well as minimising dust entry into the house or structure. It has its own significance in religious architecture, as well as any other structure related to secularism; it comes in a variety of shapes and is made of a variety of materials. It comes in a variety of shapes, depending on the structure's suitability or the architect's perspective on how to make it look appealing. It's a subject on which researchers need to do more research. It is also an important parameter to consider when determining the location of the porch in the building, as it is most suitable for serving the most functions as a multipurpose work. It provides a larger entrance area for natural efficiencies, allowing people to fully benefit possible. The shape, size, and location of the porch are determined by several factors.

Porch is an old engineering component that has been modified, and various types of porches can now be seen, some of which are temporary and others which are permanent members of a structure. Porches in a variety of styles can be found. Porches allow people to relax comfortably before exiting or entering a house or any other type of structure. Many of them are supported by balusters, while others are supported by the column, or any other vertical member used in the construction.

II. OBJECTIVE

1) One of the main goals is to figure out what role porches play in rural and urban areas, as well as how they work. The effect of seismic forces on the porch is also considered. This is advantageous in earthquake-prone areas because it can withstand the seismic frequency. This goal is determined by the zone in which the porch will be built.
2) Examine and contrast the porch with a simple type of building porch that has been designed in a standard manner. The compared porch should not be the same as the standard one. It should meet the needs of those who will use it. It should have no negative impact on the environment around it. As a result, wooden members are commonly used.
3) Different cases are observed in different directions and the best position of the direction is considered. It ought to be as good as possible and as bad as possible. The various requirements of the people using it should be met economically. The porch should be portable according to the requirements for certain special reasons, so it should be examined according to its purpose.

III. METHODOLOGY

When considering this point, the first step in analysing the structure is to use software or a manual approach. There are several constraints and factors to consider when choosing a method for analysing the structure. When deciding, economic considerations are given too much weight. The availability of resources is visible; without them, analysing the structure will be difficult. The Indian standards also recommend a variety of methods and approaches. In this study, various cases are investigated using the stadd pro software, resulting in a wide range of results.

Models framed for analysis	Abbreviation
No porch exists	CASE PA1
Porch located at 0m from left end	CASE PB2
Porch located at 4m from left end	CASE PC3
Porch located at 8m from left end	CASE PD4
Porch located at 12m from left end	CASE PE5
Porch located at 16m from left end	CASE PF6
Porch located at 20m from left end	CASE PG7

Table 1:

Constraint	Assumed data for Hospital building G+12
Soil type	Medium
Seismic zone	III
Response reduction factor (SMRF)	4
Importance factor	1.5

Damping ratio	5%
Fundamental natural period of vibration (Ta)	Ta=1.0931 sec Ta=1.5459 sec
Length of building	24m
Width of building	12m
Height of building	59.5m
Floor to floor height	4m each
Depth of foundation	3.5m
Beam sizes	0.40X0.35
Column sizes	0.50x0.40
Support	Fixed
Material properties	Concrete- M30 & Steel- Fe415 grade

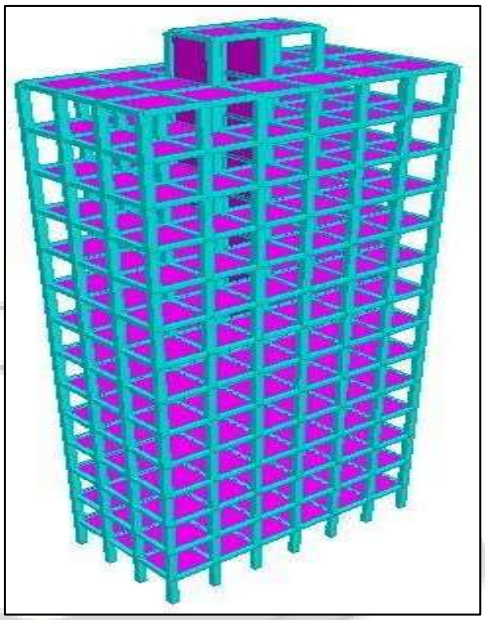


Fig. 1:

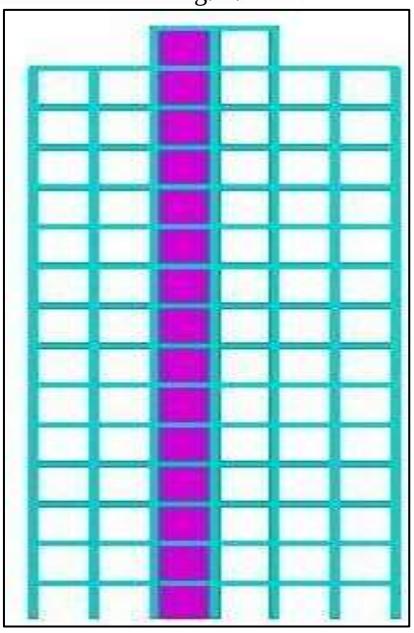
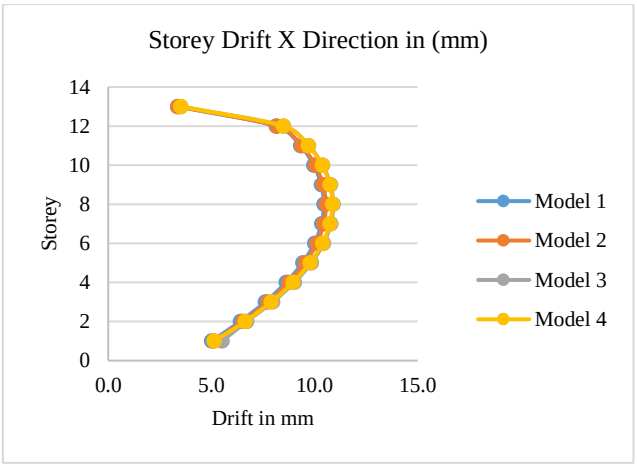
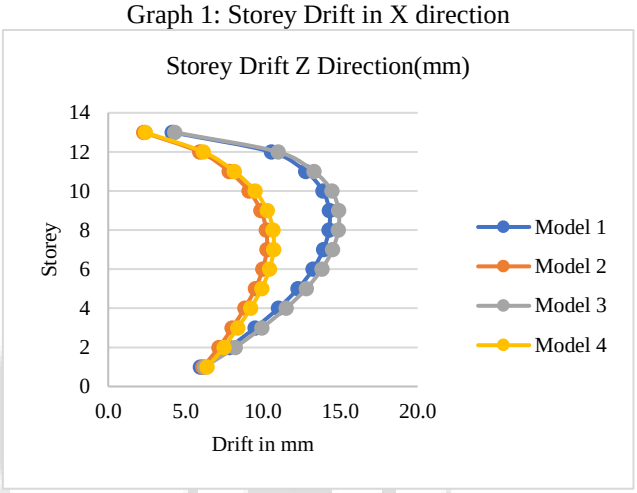


Fig. 2: Multistory Building Frame

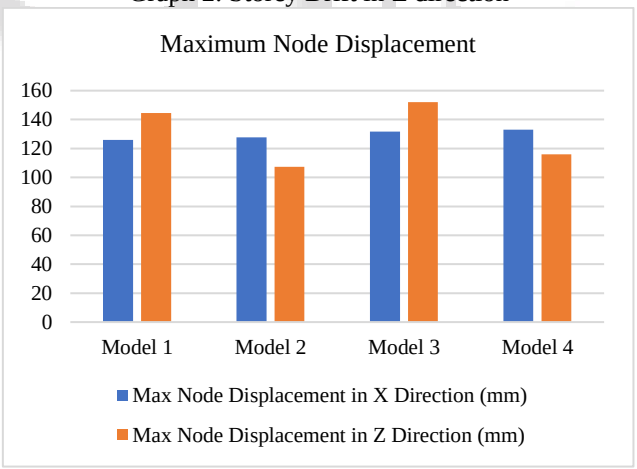
IV. RESULT



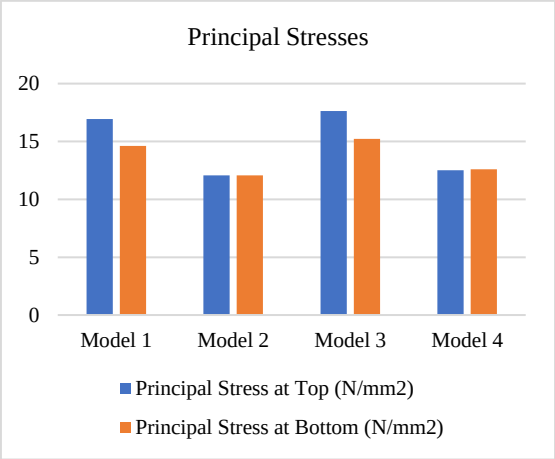
Graph 1: Storey Drift in X direction



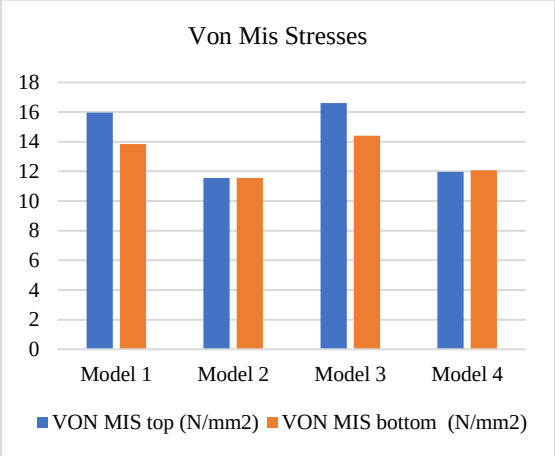
Graph 2: Storey Drift in Z direction



Graph 3: Node Displacement



Graph 4: Pricipal Stresses on slab



Graph 5: Von Mis Stresses on slab

V. CONCLUSION

Building Model 2 is the best building model in terms of nodal displacement in the X and Z directions, with the lowest value of all the models. In comparison to all other models considered for this study, Max Von Mis Stresses at Top and Bottom is found to be satisfactory in Model 2. Similarly, when compared to all other models considered for this study, Principal Stresses at Top and Bottom is found to be satisfactory in Model 2. The observations clearly state that the building Model 2 is an optimum Model with a minimum value of 102 mm in the X and Z directions. As a result, the most efficient Model will construct Model 2.

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