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A Review of Seismic Analysis of Circular shape RC Building by Using Shear Wall at Different Position

Disha Dhingra[1], Sonu Mangla[2]

[1]M.Tech, Structural Engineering, College- VCTM, Aligarh, Uttar Pradesh
[2]Assistant Professor, College- VCTM, Aligarh, Uttar Pradesh

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Abstract - *In this review paper we study about the different shape of RCC building such as H, L, T, rectangular and other shape, which is provided with different position of the shear wall such as shear wall provided at outer wall of the building , inner wall of the building and also at the centre of the building. Most of the RCC building analyzes with the help of the Etabs software and SAP2000 software and some of the RCC structure is analyze with the help of the Staad-Pro software. We know that nowadays Advance RCC structure constructed such as tilted building, box shape building and Circular shape building. The main purpose of the using the shear wall in the strictures at different position to check that at which position of the shear wall in the building is more stable than other place of the shear wall. Most of paper which is given in the literature review is analyzed by using the IS code 1893 part-1:2002.*

***Key Words*:** Dynamic Analysis, Shear Wall, Circular Building and Seismic Analysis.

1. INTRODUCTION

The main concept of using the circular shape building is that we know, the aerodynamic effect on the circular shape of the building is less as compared to other shape of the building. When we construct the high rise building then the effect of the wind is high at top of the building, so we provide the circular shape at the top of the building to reduce the effect of the wind. There are so many advantage of the circular such as less embodied energy, Energy efficiency, and Earthquake and wind resistance and less expensive. The figure-1 of the circular building is given below:

Fig -1: Circular Shape Building.

There are two type of the circular building which is giving below:

Circular Building with Courtyards: In this type of the building, there are open space inside the circular building, which may be used for parking and other purpose. This type of the structure constructed in the California which is headquarter of the Apple Company.Figure-2 given below which is plan of the circular shape of the building and it represent the Circular building with courtyard.

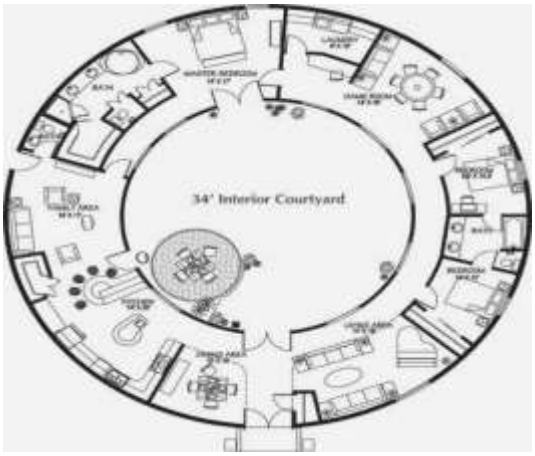

Fig -2: Circular Shape Building with Courtyard

In the above figure you can see there is Interior courtyard which is open space.

Circular Building without Courtyards

In this type of the circular building, there is no courtyard (no open space inside the circular). The main disadvantage of this type of the circular building is that no open space inside the building which can be used as parking .The figure-3 of the Circular Building without Courtyards is given below:

Fig -3: Circular Shape Building without Courtyard

At the above figure you can see there is no open space inside circular building.

1.1 Shear Wall

Shear wall is a structural member used to resist lateral forces i.e. parallel to the plane of the wall. For slender walls where the bending deformation is more, Shear wall resists the loads due to Cantilever Action. In other words, Shear walls are vertical elements of the horizontal force resisting system. The shear wall construct from the ground level to top of the building without any discontinuity in the building. The figure-4 of the shear wall is given below:

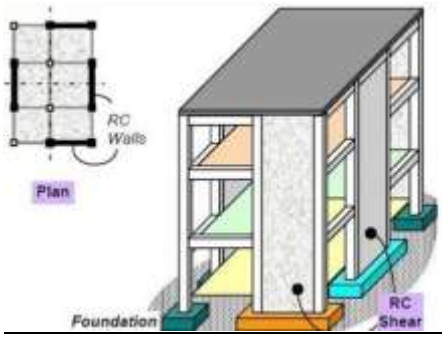

Fig -4: Shear Wall

1.2 Location of Shear Walls in a Building

The shape and plan position of the shear wall influences the behavior of the structure considerably. Structurally, the best position for the shear walls is in the centre of each half of the building. This is rarely practical, however, since it dictates the utilization of the space, so they are positioned at the ends.

This shape and position of the walls give good flexural stiffness in the short direction, but relies on the stiffness of the frame in the other direction.

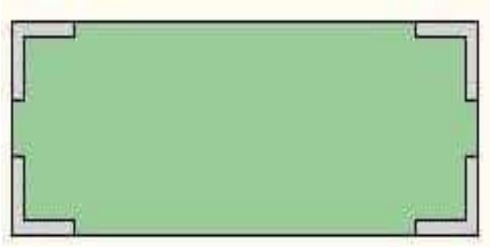

Fig -5: Location of Shear Wall

2. LITERATURE REVIEW

After study the paper related to my topic there are following conclusion given below:

[1]Shaikh A. Aijaj, G.S. Deshmukh[2013]

Title of the paper which is written by this author is "Seismic Analysis of Vertically Irregular Building" and in this paper the model of the building is like as set back building and conclusion of the paper is given below:

- Three dimensional analysis of a building using general purpose analysis computer programs is able to take care of the displacement but without displaying its magnitude. However, there is no general purpose computer programmed which is able to account for the design deflection & base shear, because there is no direct method to compute the center of Rigidity or Shear center at each floor/storey of a building. Several studies of structural damages during the past wind storms and earthquakes reveal that deflection is also critical factor leading to major damage or complete collapse of buildings. It is, therefore, necessary that irregular buildings should be carefully analyzed for deflection.

- Soft storey-For all new RC frame buildings, the best option is to avoid such sudden and large decrease in stiffness and/or strength in any storey; it would be ideal to build walls (either masonry or RC walls) in the ground storey also. Designers can avoid dangerous effects of flexible and weak ground storey by ensuring that too many walls are not discontinued in the ground storey, i.e., the drop in stiffness and strength in the ground storey level is not abrupt due to the absence of infill walls. The existing open ground storey buildings need to be strengthened suitably so as to prevent them from collapsing during strong earthquake shaking.

[2]BAJARANG GUPTA [2015]

The paper written by this author is "Study of Different Shear Wall Locations on Seismic Performance of RCC Framed Buildings" and conclusion of the paper is given below:

The analytical study on various staggered shear wall configurations is done and the lateral displacements and Storey drifts) various staggered shear wall configurations are obtained. From the study, the following conclusions can be drawn out:

- Among all the load combination, the load combination of 1.5DL+1.5EQ is found to be the most critical combination in both X and Y directions for all the models.
- Zigzag shear wall configuration is most effective for the structures in the earthquake prone areas.
- Diagonal shear wall configuration is also found to be effective for structures in the earthquake prone areas.
- Presence of zigzag shear walls enhances the strength and stiffness of the structure by reducing the lateral displacement and storey drift than other types of shear walls.

[3]Mohaiminul Haque, Sourav Ray [2016]

The paper written by this author is "Seismic Performance Analysis of RCC Multi-Storied Buildings with Plan Irregularity" and conclusion of this paper is given below:

From the analysis of various shaped multi-storied buildings it is found that all structures fulfill displacement criteria for equivalent static analysis though Model-1 just touches allowable limit curve. Deflection in Model-1 has been found more than 80% from Model-4. Storey drift indexes increase with the storey height up to 3rd storey reaching to maximum that start to decrease for all four models. Displacements obtained from the time history analysis are much higher than the allowable limit for all the Models. The difference of displacement values among all the models is insignificant since the weights of the structures are similar. From the response spectrum analysis it is also found that maximum displacement for all the structures exceed allowable limit. However, these values are much lesser than the values obtained from time history analysis. The difference of displacement values among all four shapes is insignificant in lower stories but it increased in higher stories and reached peak at top stories. Irregular shaped structures (Model-1 and Model-2) shows greater displacement than Regular shaped structures (Model-3 and Model-4). So from the overall analysis it can be conclude that performance of buildings irregular in plan is more susceptible to earthquake load than regular shaped buildings.

[4]Anju Nayas [2017]

The paper written by this author is "SEISMIC ANALYSIS OF IRREGULAR RC FRAME BUILDINGS WITH SPECIAL COLUMNS" and conclusion is given below:

For models considering plan irregularity only

- The lateral displacement and story drifts were lower for H shape model with L shape column when compared with the models with Tee and Cross shaped columns.
- The lateral displacement and story drifts were lower for both L and Tee model with Tee shaped column when compared with the models with L and Cross shaped columns.

For models considering both plan and stiffness irregularity

- The lateral displacement and story drifts were lower for H shape model with Cross shaped column when compared with the models with Tee and L shaped columns.
- The lateral displacement and story drifts were lower for both L and Tee model with Tee shaped column when compared with the models with Cross and L shaped columns.

[5]Sanisha Santhosh, Linda Ann Mathew [2017]

The paper written by this author is "Seismic Analysis of Multi-Storied Building with Shear Walls of Different Shapes" and conclusion is given below:

In the present study, an attempt is made to study the seismic behavior of building with shear walls of four different shapes.

- First part of study included the dynamic analysis of building. The storey drift (the relative displacement between the two floor) and base shear were obtained. A comparative table of these results for all the shapes of shear wall has also been presented. In the next section conclusions obtained from the study is presented.
- On the basis of storey drift and base shear value G+14 building with W and U shaped shear wall shows better performance (X - direction) in both zone V and III.
- G+14 building with H shaped shear wall is good in terms of storey drift (Y – direction) in zone V and III.
- G+14 building with T shaped shear wall is good in terms of base shear (Y – direction) in zone and III.

- On the basis of storey drift and base shear value G+29 building with W and H shaped shear wall shows better performance (X and Y direction) in both zone V and III.
- G+29 building with T shaped shear wall is good in terms of storey drift and base shear value (both X and Y direction) in zone V and III.
- There is no change in the better shape of shear Wall in both zones.

[6]Yaseen Tarique, Vijayalaxmi Gajare[2018]

The paper written by these authors "Seismic Behavior of Circular Building with Mass Irregularity" and conclusion is given below:

- The values of storey displacement and storey drift increases as the heavy mass shifts upwards.
- The location of heavy mass in the building does not affect the base shear considerably.
- The base shear values are considerably high in building having vertical mass irregularity
- More mass means higher inertia forces therefore lighter building sustain the earthquake shaking better.

3. CONCLUSIONS

After study some research paper related to my topic, there are following conclusion come out for the different position of the shear wall in the different shape of the building:

- If we constructing the circular building in the small area then it is so difficult to construct because we cannot provide the circular beam (curved beam) but if the area is large where we are constructing the spherical building then we can easily construct the curved beam.
- If the width increases the deflection values goes on increasing simultaneously for rectangular cross section in the curved beam. If the width is constant and the breadth increases the deflection values is identical varying in decimal units.
- The value of deflection in the circular cross section in the rounded beam is less than the deflection in the rectangular cross section in the curved beam if the considered the dead load of the beam.
- Due to using the circular building, the cost of the building decreases the 15% to 18% as compared to the rectangular or normal shape building.

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