

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

Earthquake Retaining Structure & Design

Arvind Kumar Paswan¹, Prof. Alak Roy²

U.G. Student, Department of Civil Engineering, Buddha Institute of Technology (AKTU), Gida, Gorakhpur,
Uttar Pradesh, India.¹

Dean, Department of Civil Engineering, Buddha Institute of Technology (AKTU), Gida, Gorakhpur, Uttar Pradesh,
India.²

ABSTRACT:-In case of circular turn at corners in any building or structure, there is no more requirements of columns as in the case of bridge construction, there is no requirements of rectangular columns in between circular column because circular column also stands as column.

KEYWORDS:-Column, circular, cylindrical, tension and compression.

I. INTRODUCTION

Earthquake may be defined as “vibrations induced in the earth’s crust due to internal or external causes that virtually shake up a part of the crust and all the structures and living and non - living things existing on it”

There is no mechanical property in which the columns of circular cross -section with circular turn on corners reinforcement lag behind their counter parts rectangular ones. In the earthquake zones, they exhibit their superiority, thanks to their increased ductility. It is well known the case of columns.

Materials are used as normally according to the requirements as bar, cement, sands, etc.. Method is already discuss in methodology & discussion.

II. BACK GROUND OR RELATED WORK

As, we know that, elliptical structure, circular cross- sectional structure, cylindrical structure, or we can say that those structure whose corner is in circular shape. Then, these type of structure are not affected due to earthquake, if these type of structure are not so old. As, circular joints in between tress and their branches. Because, tree & their branches are not fall due to earthquake. Their is no related work because it is a research paper. Research paper is also a new thing and unique which has not used in past time / present time.

III. PRESENTATION OF THE MAIN COTRIBUTION OF THE PAPER / SCOPE OF RESEARCH

The main contribution of this research paper is to protect the building structure and also to reduce the effect of earthquake on structure with help of design, concepts & methods. The scope of this research paper will be provide the different types of design, concepts and methods to protect the building structure from the earthquake.

IV. METHODOLOGY & DISCUSSION

Firstly, I would like to ask 2 questions from everybody. They are:-

Ques.1:- Whether the branches of trees and any tree fall down due to earthquake?

Ques.2:-Everybody sees that any cylindrical structure which is not so old can be affected or destroyed due to earthquake?

Now, do you know why these structures do not fall due to the earthquake?

I would like to explain the same with the help of some examples and design also.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

In most of the cases we see that those type of constructions / structures which is not in circular or cylindrical shape or in which joints or turns are in maximum no. then in these type of structures fall or produce cracks. But those structures which are prepared by nature are mostly circular, cylindrical, conical or of spherical shape. Men, animals birds and so on, these type of living creature are not in circular shape because they can protect themselves in case of earthquake with movements. If we are talking about the earth then we get it is spherical shape. If we are talking about universe we get that all planets, natural satellites, stars, sun all are in circular or spherical shape. If we are talk about these shapes (circular, spherical, cylindrical section), we get that there are no joints or cleavage in them. So, the effect of earthquake is approximately negligible.

In case of earthquake structures mostly break on joints or on structure corners. In most of the cases structures do not break from walls it breaks from corners. Earthquake mostly affect columns and beams. If the corner or joints of the column and beam is constructed in circular turn, then structure become safe or earthquake resistant.

Now, the main reason for least effect on trees due to the earthquake waves is their joints. It means that the joints in trees is very well established by nature or we can say that these branches of tree's are arranged in a well circular shape like as summation of dx shape means



fig.1:-Arrangement of parts to make circular like arrangement of bricks to make circular path / wall.

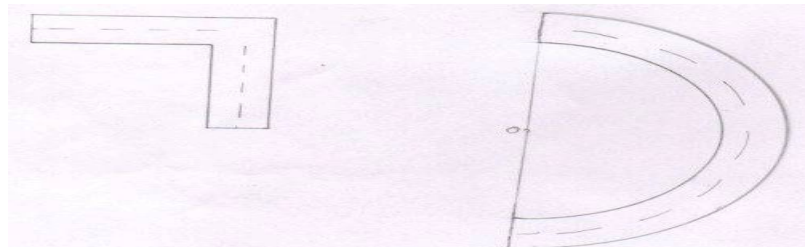


fig.2:- Comparison between two types of paths:- Rectangular corner & circular path.

In the above figure which path is better for driving at a higher speed. Which part is better for the same speed. Circular path is better than rectangular path, in my opinion.

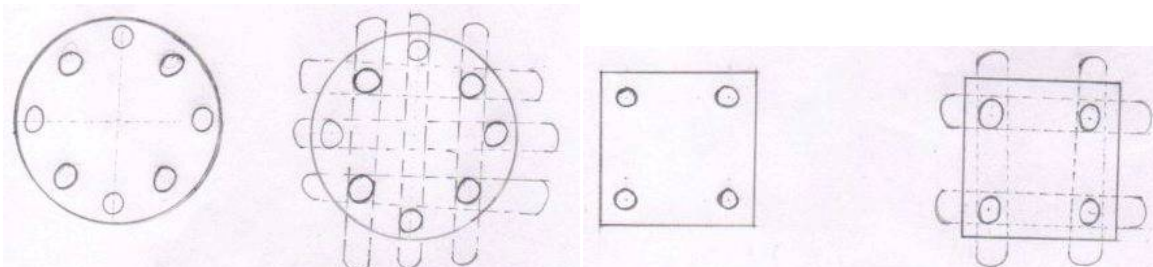


fig.3:-Arrangement of bars & number of bars can be increased or decreased as required.

In these diagram every bars are counter balanced to each other in case of compression and tension both. If one is in compression then another is in tension as shown in fig. in any direction. So, circular columns are better than rectangular column.

In most of the cases, we are seeing the construction of bridges on the public places like Dharmasala in Gorakhpur or beside the river where bridge construction are in progress. Now in case of bridge construction the shape of piers are

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

mostly in circular cross-section and the depth of this type of column is approximately 12 - 13 meter below the ground level.



Fig.4:-Flyover:- Circular piers, high durability, integral construction, low maintenance



Fig.5:-Flyover using integral bridge concept for Delhi Metro (the curved flyover has no bearing or expansion joints on piers/abutments; length: 115 m)

In present time those of the rectangular section structure which gives the strength to the structure for bearing the earthquake waves capacity approximately 7.0 to 7.5 Richter without any damage. If we are doing some changes in that structure then the capacity of that structure reaches the 8.0 to 8.5 Richter on following changes i.e. joints & corner make in circular, cylindrical or spherical shape.

V. DESIGN

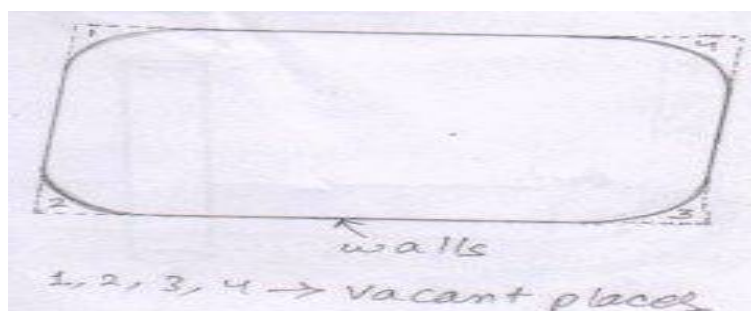


fig.6:-Arrangement and utilization of corner

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

If we are constructing the circular corner shape like well to the foundation of the structure. In fig. 1,2,3 & 4 are the vacant places, which can be used as window, exhaust, balcony, etc. as per requirement. This type of structure is used like design, sufficient lighting facility and safe from earthquake. This type of structure can be mostly useful for city areas because in the surrounding areas of the house proper drainage facilities is available. So , we can provide these design.

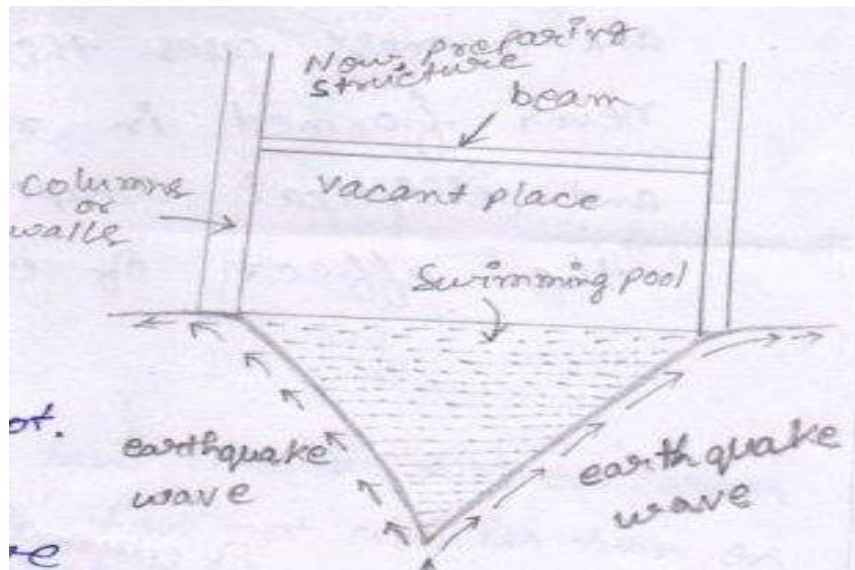


fig. 7:-Reduced the earthquake effect and utilization of area.

If waves are in straight direction, then there will be effect on this type of structure, if water is moving in the upward direction then there will be no effect on structure but its restriction is that the depth of swimming pool is approximately 3 - 4 foot. If we are talking about the foundation then these type of foundation should have more compressive strength as well as good tensile strength , according to requirement these vacant places used like as garage & play ground spaces.

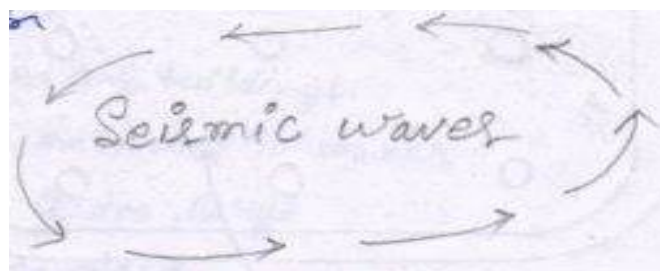


fig.8:-Movements of seismic waves.

Seismic waves can be blocked on rotation of round shape. We always try to use the circular and straight materials like circular rod, circular column, etc.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

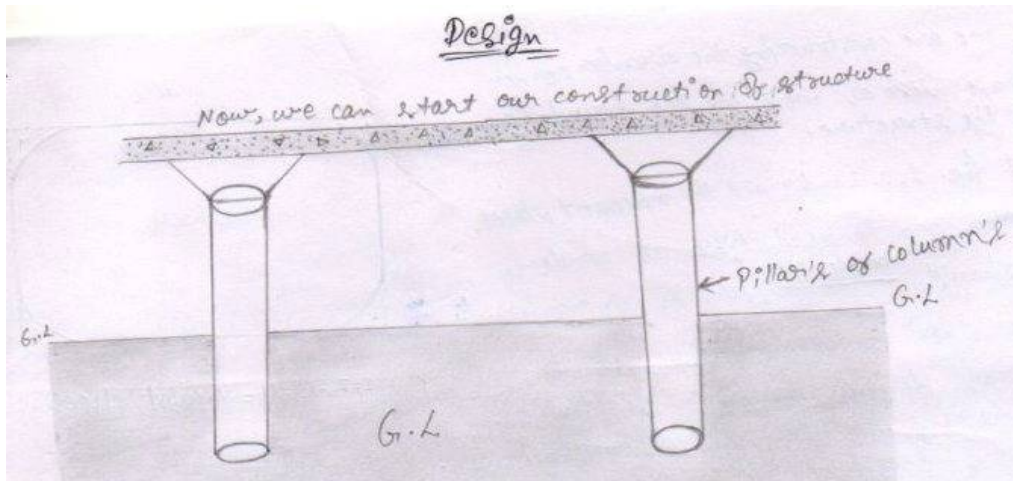


Fig.9:-Model of bridge can be prepared for 2-3 story building.

These type of structures are generally seen on the bridges, fly over bridges, etc. The cross – section of the pillars or columns are circular and elliptical, never formed in rectangular shape. Because circular and elliptical, never formed in rectangular shape. Because circular and elliptical shape structure can be able to reduce the effect of earthquake on the structure.

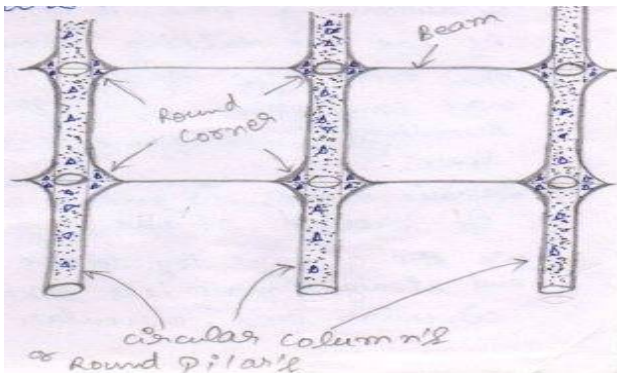


fig.10:-Circular corner between columns & beams.

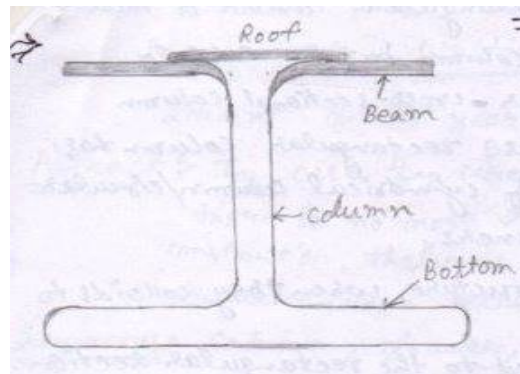


Fig.11:-Circular turn on corners.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

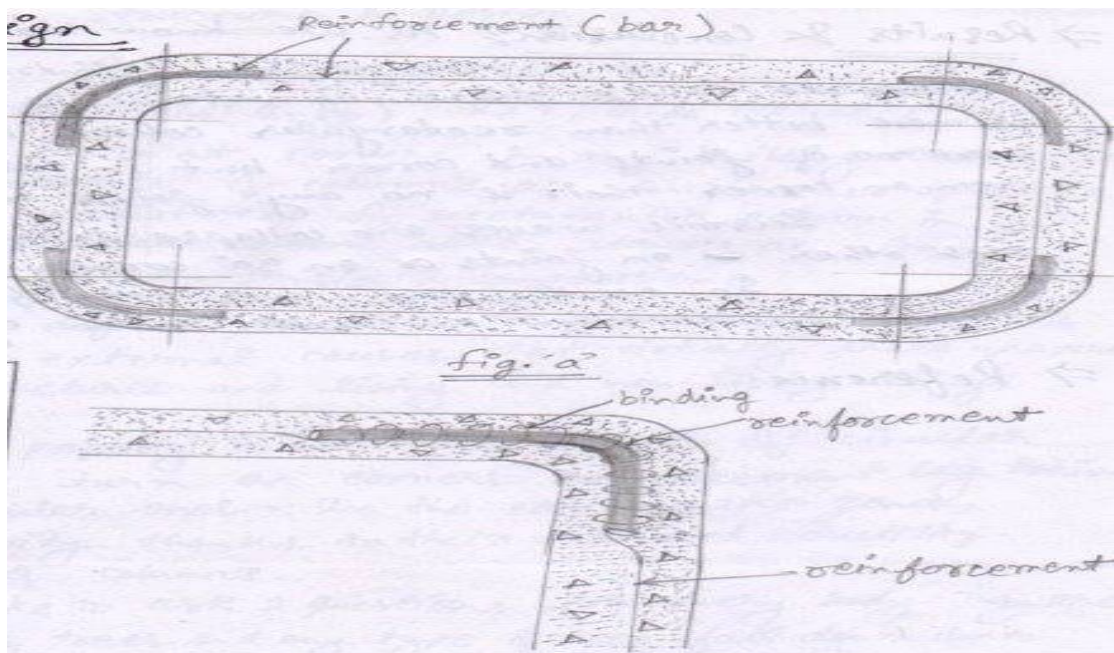


Fig.12(a):-Arrangement of reinforcement and binding on corners.

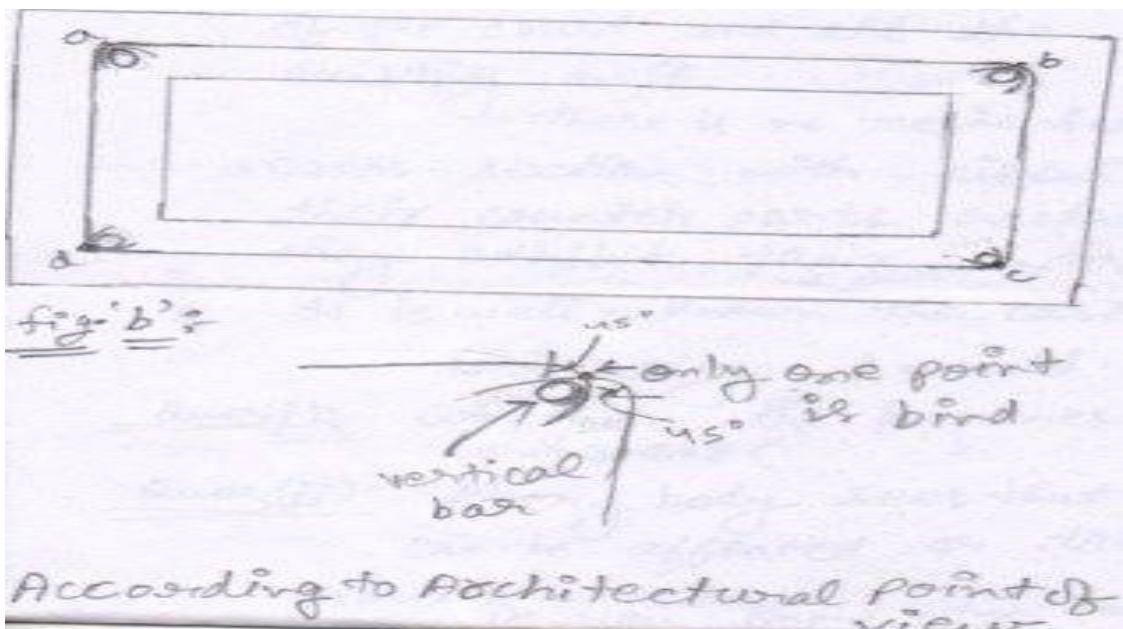


Fig.12(b):-According to architectural point of view

Fig.12 (a) have circular turn on corner but in fig.12 (b) have not circular turn on corner fig.12 (b) have less no. of binding approx 1-2, and make the angle of approx 90 degree on corner between the reinforcement, in fig.12 (b) on point a, b, c & d have only one binding on each point But in fig. 'a' so many strong binding on it. Then, we can say that fig.12 (a) is better than fig. 12 (b). So, we should provide the circular turn on corner.

Following points are dangerous for seismic forces on any buildings:-

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

- Poor quality of cement, brick and mortar joints
- Doors are too close to corner
- Dangerous overhanging section
- Window opening is too large
- Wall is too long
- Window spacing is too close
- Poor connection of roof to wall
- Walls are too high
- Buildings are too much high.

VI. RESULTS & CONCLUSION

We know that rectangular columns are stronger than cylindrical column. In general but in case of earthquake, wind & flow of water, circular cross-sectional column is better than rectangular column because rectangular column has more no. of joints and corner but in case of cylindrical column / circular turn on corner there are no any joints or 90 degree corners. Seismic waves can collapse the structure, when they collide with each other on joints or on 90 degree corners. It is never possible to generate any type of reaction alone. Reactions are created only when two things / component intersect or match to each other like sound is produced only when two things collide with each other.

So, earthquake waves effect more on the rectangular column than circular columns.

VII. ACKNOWLEDGEMENT

I would like to express my thanks to Prof. Alak Roy (Dean of Civil Engineering) Buddha Institute of Technology, Gida, Gorakhpur, U.P, INDIA. Who have directly and indirectly helped me in correction of this research paper.

REFERENCES

- [1] Seminar attended on earthquake in BIT, Gida, Gorakhpur. Analysis to the environmental activity, earthquake related video's, analysis through net.
- [2] Bertero, V.V., Bresler, B., Selna, S.G., Chopra, A.K., Koretsky, A.V., "Design implications of damage observed in the olive view medical center buildings", Proceedings of the 5th World conference on Earthquake Engineering, Rome, Italy, 1974.
- [3] ACI Committee 363, "State of-the-art report on high strength concrete", SCM 15-87, American Concrete Institute, Detroit, 1987, pp. 364-411.
- [4] Chopra, A.K., Bertero, V.V., Mahin, S.A., "Response of the Olive View Medical Center main building during the San Fernando earthquake" Proceedings of the fifth World Conference on Earthquake Engineering, Rome, Italy, 1974.
- [5] Ministry of Environment, Planning and Public Works. "Greek Code for the Design and Construction of Concrete Works", Athens Greece, 1991 (In Greek).
- [6] Ministry of Environment, Planning and Public Works. "Greek Code for the Design and Construction of Concrete Works.", Athens Greece, 2000 (In Greek).
- [7] European committee of Standardization, "EN 1992-1.1:2004, Euro code 2: Design of concrete structures part-1.1:General rules and rules for buildings (Incorporating corrigendum January 2008)", Brussels, Belgium 2004.
- [8] Fintel, M., "Hand book of Concrete Engineering Van Nostand Reinhold Company, 1974.
- [9] CEB-FIP, "Model Code 1990 (Final Draft 1993)" Comite Euro-International Du-Beton, lausanne, 1991.
- [10] Albinger, J., Moreno, S.E.J., "High Strength Concrete Chicago Style", Concrete Construction, Vol.26, No.2, 1981, pp-241-245.
- [11] Aitcin, P.C., Neville, A., "High performance concrete demystified", Concrete International volume 15, No.1, Jan.1993, pp. 21-26.
- [12] Jennings, P.C., Housner, G.W., "The San Fernando, California Earthquake of February 9, 1971", proceeding of the fifth World Conference on Earthquake Engineering, Rome, Italy, 1974.
- [13] Hsu, I., Hsu T., "Strees-Strain behavior of steel fiber high- strength concrete", ACI Structural Journal vol.91, No.4 July-August, 1994, PP.448-457

BIOGRAPHY



Arvind Kumar Paswan (Student of civil engineering, Buddha Institute of Technology (AKTU), Gida, Gorakhpur, U.P, INDIA)