A Review on Comparative Study on Analysis of a Conventional Multi-Storey Building & a Single Column Building

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Abstract: The comparative study on analysis of RCC Frame structure supported on a single column and multi-column is done in this project. This paper presents structural modelling, stress, bending moment, shear force and displacement, deflection design considerations for a structure and it is analyzed using STAAD-Pro. Various steps involved in designing of RCC Frame structure supported on a single column and multi-column by using software are geometric modelling, providing material properties and sectional Properties, fixing supports and boundary Conditions, providing loads & load combinations, Special Commands, Analysis Specification , Design Command and Report. The influence of plan geometry has an important role in static analysis. Maximum values of stresses, bending moments, shear forces and displacements and deflection are presented. The acting loads considered in the present analysis were dead load, Live load, floor load, and seismic load. In these cases the floor load was applied perpendicular to the RCC structure. Comparison on the basis of analytically results occurs between RCC single column and RCC multi column is done.

In this paper, all those analysis & load calculation were executed with a Numerical Building Model by using software program, which were also compared following the analysis results. The results of the analysis on the axial forces, Base shear, Time period, Storey drift and Displacements are compared. The results are presented in tabular and graphical form.

The project is to planning & analysis by using software for a multi storied building and single column building of G+4 floors. The design is done by taking in to account the requirements and standards recommended by IS code and national building rules. Planning is done using the 3D modelling software with the help of Auto-CAD 2014. STAAD-Pro uses a command language based input format, which can be created through an editor called the editor file, these powerful software graphics input generator or through Auto-CAD based input generators like Auto-CAD. Output generated by STAAD-Pro consists of detailed numerical results for analysis and design.

Keywords: Multi-storied building, Single column building, Planning, STAAD-Pro, Modelling, Analysis…..

1. INTRODUCTION

Due to increase of population into urban cities there is a need to accommodate the influx in the urban cities. However, due to rapid increase of land cost, and limited availability of land the trend is to build multi storey building. A multi storey building is a building that has multiple floors above ground in the building. Multi-storey buildings aim to increase the floor area of the building without increasing the area of the land and saving money. These multi storey building s are sky scrapers are built not just for economy of space they are considered icons of a city's economic power and the city's identity. Various types of structural system have been used to facilitate the demand of high rise structures. Thousands of multi storey building s is being built all over the world with steel as well as reinforced concrete. Many of the multi storey building s are designed with structural components consisting of various systems such as flat slab, flat plate system, including commercial and uses because the systems have various advantages.

A single column provides better architectural view compared to structure supported on many columns. They save ground space as requires less area for providing foundation and provides more space for parking. They are also unique. Single column structure can be made either by using RCC or Steel. This structure supported on a mono column provides large serviceable floor space compared to structure supported on many columns. They save ground space as requires less area for providing foundation and provides more space for parking. Maximum space utilization is considered will serve its maximum serviceability. In this research describes planning, structural analysis, design and drawings with various components and approximate cost of the whole building. This building consists of mono column i.e. Single column structural system (each floor in whole structure is supported independently by mono column at the centre).

Earlier, modelling and structural analysis of buildings were carried out using hand calculation method based on simplified assumptions and understanding the whole behaviour of the structure .But it seems to be time consuming and

complicated for high rise buildings .At present ,computer hardware's and software's for modelling and analysis of structure is widely available. We need to know how the knowledge secured in the class room is applied in these practical sides of work. When we got this project, we come into practical field to collect construction techniques and to meet the various difficulties in the construction. Also it is necessary to have sufficient knowledge regarding various software's currently used in planning analysis and design of and are not included during the design process of the primary structure. Since the 1990s specialist software has become available to aid in the design of structure with the functionality to assist the drawing, analyzing and designing of structures with maximum precisions, example includes AutoCAD, STAAD-Pro, ETABS, Prokon, Revit structure, etc.

Our main aim to complete an Analysis between a conventional multi-stored building & a single column building by using STAAD-Pro against all possible loading conditions and to full fill the function for which they have built in economical expenditure. Safety requirements must be met so that the structure is able to serve its purpose with the maintain cost.

2. LITERATURE REVIEW

For this study literature review is categorized in to four sections namely structure with single column, multi-storey structure, structural material:-

2.1. For a Single column Structure

2.1.1. Ambati Venu Babu (2016)[1] : Analyzed a triangular shape building in which mono column situated at the edge of triangle not its centre & they found that a Single column structure is a critical one when it is being to an symmetrical and eccentric loading condition. The supporting condition of structural members determines their stability during their lifetime. A structure is said to be stable when it satisfies all stability requirements. Structures will be more stable when all the sides proportionally to balance the static and dynamic loads support it; the structure has supposed to be supported. For aesthetic appearance we create our building supported by a single column. Satisfying the requirement of stability conditions for a single column structures will be a complicated one, compare with the structures supporting in all the sides depends upon their configuration; single column structure is a critical one when it is being to a symmetrical and eccentric loading condition. Eccentric loading will cause the structure to twist in any direction and may cause failure of structure is very critical condition.

Since single column is supporting whole structure, all other members will act as cantilevers. To reduce the cantilever span for the structural beams converting two-third of the length as simply supported by providing the two ring beams and inclined beams. The structure is analyzed and designed using STAAD-Pro (structural analysis package), which is based on stiffness matrix method. The above structure has been analyzed for various possible loading conditions and the critical has been selected for design purpose.

2.1.2. E K Mohanraj, Kongu Engineering College, (2002)[2]: Building plays a vital role for improving the various activities. A structure is said to be stable when it satisfies all stability requirements. Structures will be more stable when all the sides proportionally to balance the static and dynamic loads support it; the structure has supposed to be supported. For aesthetic appearance we create our building supported by a single column. Satisfying the requirement of stability conditions for a single column structures will be a complicated one, compare with the structures supporting in all the sides depends upon their Configuration; single column structure is a critical one when it is being to a symmetrical and eccentric loading condition. Eccentric loading will cause the structure to twist in any direction and may cause failure of structure is very critical condition. This project has been selected with utmost enthusiasm and keen interest by us and has been successfully completed with our knowledge to our satisfaction. The project Office Building with Mono Column (single supported building) is analyzed and designed with special attention and it is completed. Maximum space utilization is considered while planning and designing and we assure it will serve its maximum serviceability.

2.1.3. Badikala Sravanthi (2016)[3]: The design and analysis of RCC structure supported on a single column is done in this project. Cost Comparisons done between RCC single column and RCC multi column structure. The influence of plan geometry has an important role in static analysis. Maximum values of stresses, bending moments, shear forces and displacements are presented. The acting loads considered in the present analysis were self weight, floor load, wind load and earthquake load. In these cases the floor load was applied perpendicular to the RCC structure. Comparison of RCC single column and RCC multi column is done.

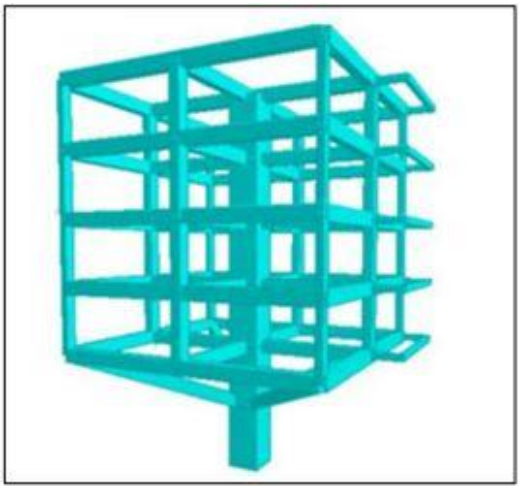

Fig. 2.1 Single column structure

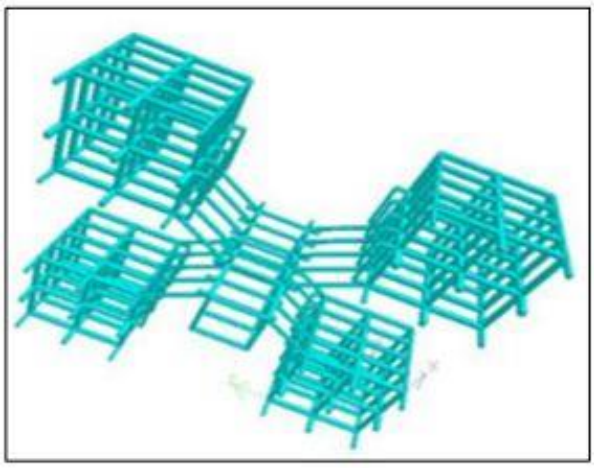

Fig. 2.2 Multi column structure

Multi column structure connected by a lift Single column structure has been designed successfully to withstand all loads including earthquake and wind load. Single column structure is 20% more costly when com-pared with multi column structure. Single column structure provides better architectural view and free ground space even though it costs bit more than multi column structure.

2.1.4. Donald Macleod et. al. (2011)[4]: researched a technology in which mono-column is supported directly on the existing jacket pile at the sea bed and uses the platform's existing redundant pile capacity to economically extend the space available for the new compression facilities. A simple spigot interface between the mono-column and existing pile also negates the need for grouting, temporary fixings and any subsea intervention. Traditional approaches to increasing real estate on offshore platforms involve the installation of cantilevers or shoe horning equipment into inefficient spaces leading to extensive offshore hours and lengthy shutdowns. The critical design consideration for this structure is its ability to survive a ship impact scenario. To address this, the structure adopts technology developed for the transport of nuclear materials. Energy absorbing technology and analysis expertise have been utilized to create a 'crumple zone' to protect the new structure. This innovative mono-column structure by appearance is deceptively simple yet complex when it comes to balancing the design for ship impact, fatigue and extreme environmental loading. Many iterations have been undertaken to optimize the design as far as possible whilst keeping the structure free from components that are challenging to fabricate or costly to maintain. The final solution, has realized considerable cost savings and had a significant positive influence on the project economics thereby helping to extend production from a North Sea field that might otherwise have been abandoned sooner.

2.1.5 Examples for a Single Column Structure-

A) Astra Tower, Hamburg. Germany-

Finished in 1971, the Astra Tower loomed over Hamburg's red light district for more than three decades. The modernist edifice, which housed the brewery that made Astra beer, resembled a cross between a Barnett Newman sculpture and the early stages of a Jenga game. Located on top of a hill in Hamburg's St. Pauli neighborhood, the building became an iconic part of the area's skyline. In the 1990s, however, the brewery kept being bought out by larger and larger beverage companies, and production of Astra beer was eventually transferred elsewhere. Despite initial promises to revamp the building, the original Astra Tower was

demolished five years ago. The replacement building, also called the Astra Tower, hints at the original building with an all glass-façade on the fourth floor but doesn't have the gravity-defying feel of the original, or for that matter, a brewery.

Fig.2.3 The Astra building in Hamburg, Germany

The Astra house building is actually a brewery in Hamburg, Germany. The Floors can move up or down on its skinny column core. Although the unique building has been destroyed now. One of its more famous beer brands was recently bought by a big refreshment corporation. And that beer brand was called Astra.

B) 'Tree Of Knowledge'

The headquarters building, designed by architect and Parliamentarian Piloo Mody, was striking for being built on four pillars, each supporting an inverted four-sided pyramid supporting a generously-windowed, four-storied square block. The Knowledge Centre, to a basic design - deriving from the `Tree of Knowledge' concept - provided by K. S. Ranganath of Bangalore, is even more striking than its neighbor, the headquarters building, supported as it is by a single trunk. From the first floor level spread its branches, each a four-floored curved triangle that looks more like the petal of a flower but is conceived as a branch. In fact, the citation stated that the Jury "liked the impressive architecture... made of a series of levels with different orientations in a floral pattern spreading out from the central column".

Fig.2.4 L & T's Construction Headquarters at Manapakkam in Chennai

LARSEN & TOUBRO's Madras-based construction division, ECC (Engineering Construction & Contract), the biggest construction organization in the country, has done it again. For the fourth time it has won a fib award for `outstanding concrete

structures', this time a `Special Mention' fib, the international federation for structural concrete, was founded in the 1950s and presents its awards at its Quadrennial Congress, this year's, in Osaka, Japan, the 14th.The 2002 award was presented to L&T for its `Knowledge Centre' built to house the Engineering Design & Research Centre of the ECC.

2.2 For Conventional Multi-Storey Building

2.2.1. Janakkumar M. Mehta (2017)[5]: Observed that the building height is more and more slender, and more susceptible to sway and hence dangerous in the earthquake. Such type of the building can be strengthening by providing an appropriate lateral load resisting system. In the seismic design of the buildings, reinforced concrete structural walls or shear-wall, act as major earthquake resisting members. Structural walls provide an efficient bracing system and offer great potential for lateral load resistance. The properties of these seismic shear-walls dominate the response of the buildings and therefore, it was important to evaluate the seismic response of the walls appropriately. In this study the (G+17) storey building was analyze with different shear-wall configuration. The modeling is done to examine the effect of different cases on seismic parameters like base shear, lateral displacements, lateral drifts and model time period for the zone-V in medium soil as specified in IS: 1893-2002.

2.2.2. Pooja Liz Isaac et. al. (2017)[6]: Proposed a structural design of tall buildings is governed by the action of lateral loads due to wind or earthquake. Lateral load resistance of a structure is offered by interior structural systems or exterior structural systems. Exterior structural system constitutes Diagrid, Hexagrid, Pentagrid and Octagrid Systems. Recently, Diagrid structural system is adopted in tall buildings due to its structural efficiency, superiority in aesthetic appeal and flexibility in architectural planning. Diagrids, Hexagrids and Octagrids contain triangular or diamond shaped modules, hexagons and octagons respectively, throughout exterior of structure and they don't have any external vertical columns. Due to inclined columns, lateral loads are resisted by axial action of the diagonal. A regular floor plan of 36 m x 36 m size is considered. ETABS V15 software is used for modelling and analysis of structural members. Twelve models are created collectively of Exterior Braced steel frame structure, Diagrid, Octagrid and Hexagrid buildings with regard to variation in their diagonal angles and module density. Equivalent static and Response spectrum analysis of these models have been carried out to examine their performance. A comparison of parameters Storey Shear, Storey drift, Storey displacement, Time period and Structural weight is done to determine the efficient and cost effective structure.

They found the Equivalent static and Response spectrum analysis of Diagrid, Hexagrid, Octagrid and Exterior Braced steel building were performed. The performance of Diagrid buildings modeled with different diagonal angle, Hexagrid and Octagrid with different module density and Exterior Braced steel structure under dynamic loading were investigated and the values of parameters Storey Displacement, Storey Drift, Storey Shear, Time Period and Structural weight were compared.

2.2.3. Erik Hallebrand et. al. (2016)[7]: Investigated the Dynamic effects such as resonance frequencies and accelerations are considered. The variation in static results from reaction forces, overturning moments, deflections, critical buckling loads, forces between prefabricated elements and force distributions between concrete cores are investigated with different models. Through investigations they found that when modelling a building, that are to be constructed with prefabricated concrete elements, the use of wall elements is a good way to create a model that represents the buildings global behaviour. This because they are time efficient, both in modelling and analyses, as well as providing reliable results. Hollow-core slabs are commonly used prefabricated slabs and span in one direction. In order to represent the load from these in a finite element models.

They can be modelled as a one-way floor load. This will provide a proper cumulative load calculation in order to design the foundation. For vertical and horizontal loads on a building, advantage can be taken to study each load-case separately. The force distributions and reaction forces due to vertical loading should be analyzed without the consideration of floor diaphragms. This because the floor diaphragms are very stiff and can thereby redistribute forces latterly between elements in a building, resulting in unwanted shear forces and misleading results. When analyzing horizontal load, however, the consideration of floor diaphragms are very useful.

2.2.4. Maikesh Chouhan (2016)[8]: The design of multi storey building is to have a good lateral load resisting system along with gravity load system for safety of occupant and for better performance of structure even in most adverse condition. Shear wall are more efficient in resisting lateral load in multi storied buildings. Steel and reinforced concrete shear walls are kept in major positions of multi storied buildings which are made in consideration of seismic forces and wind forces. To solve this purpose shear walls are a very powerful structural elements, if used judiciously can reduce deflections and stresses to a very great extent. Quantity of Concrete and steel required in shear wall building is more as compared to without shear wall building, which makes, it uneconomical.

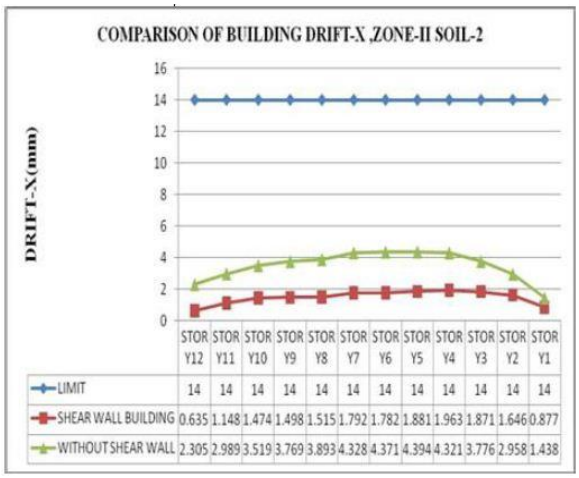

Fig. 2.5 Comparison of building drift- X, Zone II Soil-2

Base shear of building without shear wall is less than the base shear in shear wall building for all types of soil and all earthquake zones. Building drift for all storey of without shear wall building is about 34 % more than that of shear wall building.

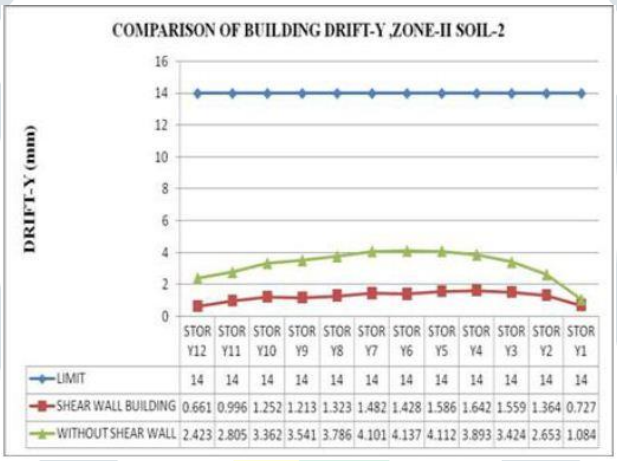

Fig. 2.6 Comparison of building drift-Y, Zone-II Soil-2

2.2.5. E. Pavan Kumar (2014)[9]: Earthquake occurred in multistoried building shows that if the structures are not well designed and constructed with and adequate strength it leads to the complete collapse of the structures. The main objective this paper is to study the seismic analysis of structure for static and dynamic analysis in ordinary moment resisting frame and special moment resisting frame. Equivalent static analysis and response spectrum analysis are the methods used in structural seismic analysis. We observed the response reduction of cases ordinary moment resisting frame and special moment resisting frame values with deflection diagrams in static and dynamic analysis. The special moment of resisting frame structured is good in resisting the seismic loads. The obtained results of static and dynamic analysis in OMRF & SMRF are compared for different columns under axial, torsion, bending moment and displacement forces.

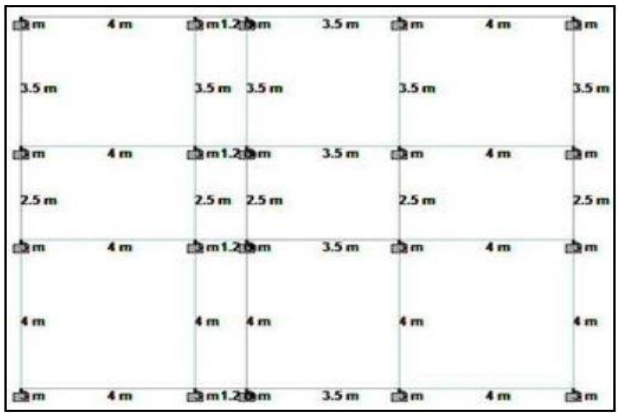

Fig. 2.7 Column position

Finally it can conclude that the results of static analysis in Ordinary Moment Resisting Frame (OMRF) & Special Moment Resisting Frame (SMRF) values are low when comparing to that of dynamic analysis in OMRF & SMRF values. Hence the performance of dynamic analysis OMRF & SMRF structure is quiet good in resisting the earthquake forces compared to that of the static analysis OMRF & SMRF.

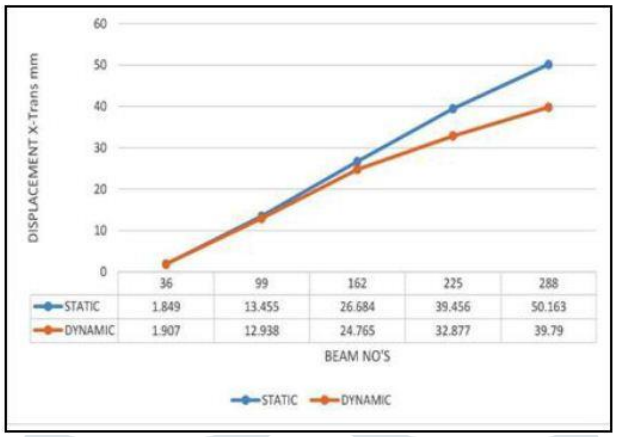

Fig. 2.8 Static and dynamic analysis of displacement in OMRF

2.2.6. Upendra singh dandotia, Rakesh Gupta , Mukesh Pandey (IJEDR): "A study of analysis and design of multi level parking" Car parking has been a serious issue due to rapid increase in vehicles and to cater this problem we require parking slots in important markets. We have limited land source so the construction of multilevel parking is very important as it accommodates large no. of vehicles at one place. In this project we have designed multi-level parking for capacity of 600 cars and 550 bikes. Multilevel parking is of G+2+2 Basement having 13 shops on ground floor and its design is based on framed structure. In this work we have designed different components of the multi-level parking i.e. raft foundation, retaining walls, beams, column and flat slab using STAAD-Pro, manual bases and AUTO-CAD software for making various structural drawings. For daily demand and fire demand we have also designed overhead tank and tank resting on ground.

2.3 Structural Material

2.3.1 A. Braconi et. al. (2002)[10] : A multi-level pseudo-dynamic (PSD) seismic test programme was performed on a full-scale three-bay two-storey steel–concrete composite moment-resisting frame built with partially encased composite columns and partial-strength connections. The system was designed to provide strength and ductility for earthquake resistance with energy dissipation located in ductile components of beam-to-column joints including flexural yielding of beam end-plates and shear yielding of the column web panel zone. In addition, the response of the frame depending on the column base yielding was analyzed. Firstly, the design of the test structure is presented in the paper, with particular emphasis on the ductile detailing of beam-to-column joints. Details of the construction of the test structure and the test set-up are also given. The paper then provides a description of the non-linear static and dynamic analytical studies that were carried out to preliminary assess the seismic performance of the test structure and establish a comprehensive multi-level PSD seismic test programme. The resulting test protocol included the application of a spectrum-compatible earthquake ground motion scaled to four different peak ground acceleration levels to reproduce an elastic response as well as serviceability, ultimate, and collapse limit state conditions, respectively. Severe damage to the building was finally induced by a cyclic test with stepwise increasing displacement amplitudes.

2.3.3. T. Andres Sanchez (2011)[12] : Developed steel-framed floor systems utilizing long-span metal deck have the potential of providing large column free areas with overall floor thicknesses approximately equal to concrete flat plates while typically imposing less dead load on the structure. The vibration serviceability of such floor systems is investigated in this paper. Two laboratory specimens, a full-scale mockup, and 13 in-situ floors were tested to measure their natural modes and responses to walking excitations. Natural modes determined using experimental modal analysis techniques or heel-drop test results. Response to walking was determined by measuring the maximum peak acceleration due to individual walkers traversing the floor. The natural frequencies for the laboratory specimens and mockup were in the range of those measured for typical composite framing systems where as all in-situ floors are high-frequency floors. The measured accelerations due to walking and subjective evaluations indicate that such floors will generally have adequate resistance to vibrations due to walking. Natural modes were determined using experimental modal analysis techniques or heel-drop test results. It is emphasized that LSCD designs must be evaluated during the project design phases.

2.3.4. Mahbuba Begum, et. al. (2013)[13]: Investigated the behavior of partially encased composite columns with high strength concrete. It's under eccentric and concentric axial loading tends to be complex because of the interaction of the concrete with the thin-walled steel section. When constructed with high strength concrete, developing numerical simulations of the response of these columns under load is particularly challenging. They conclude by the dynamic explicit solution strategy. The model is able to simulate the full behavioral histories of a variety of PEC columns tested under concentric and eccentric loading, with

excellent accuracy. The interaction between the steel and concrete and their separation at the common interface due to the local instability of the flange was successfully modeled with the contact pair algorithm. The model provided good representations of the peak load, axial deformation at the peak load, post peak behavior, and the failure mode observed in the test.

2.3.5. Dr. D. R. Panchal (2014)[14] : Analyzed composite framing system consisting of steel beams acting interactively with metal deck concrete slab and concrete encased composite columns, has been as a viable alternative to the conventional steel or reinforced concrete system in the high-rise construction. However, in Indian context, it is comparatively new and no appropriate design codes are available for the same. Complications in the analysis and design of composite structures have led numerous researchers to develop simplified methods so as to eliminate a number of large scale tests needed for the design. In the present work, a simplified method of composite slabs, beams and columns design is used and software is developed with pre and post processing facilities in VB.NET. All principal design checks are incorporated in the software. The full and partial shear connection and the requirement for transverse reinforcement are also considered. To facilitate direct selection of steel section, a database is prepared and is available at the back end with the properties of all standard steel sections. The proposed computational method, for composite columns with a variety of steel sections encased in concrete and various concrete filled sections, is found to provide accurate results. For the analysis of a composite frame, a concept of the effective elastic bending stiffness of the composite section is proposed and calculations are carried out by moment distribution method using Microsoft excel sheet. Results obtained are found in good agreement with those obtained by using ETABS software.

2.3.6. M. S. Matsumoto (2012)[15] : Studied on composite material used in high-rise structure and said that Nowadays, structural needs for ultra high-rise buildings are changing and expansion of planning flexibility is becoming significant. For example, long span girders for large workspace, altering column position in middle stories to achieve different use in height direction and great public atrium in lower stories that provides attractive free space. Moreover, high seismic performance is becoming more demanded which protects human life and maintains the function of the building under severe earthquakes. In order to achieve these needs, as one of technology, we have developed ultra high strength concrete filled tubular (CFT) columns that combine ultra high strength concrete with specified standard strength Fc150 N/ mm2 and ultra high strength steel material with tensile strength of 780 N/mm2 . In this paper, the outline of development of a ultra high strength CFT column is reported. Also, the structural design of the ultra high-rise building using the CFT columns is reported. By combining with response control systems, these members have elastic deformation capability suitable for satisfying high design criteria. In addition these members can achieve structural framing and architectural spaces with a high degree of freedom as a result of their large load bearing capacity, so it is considered that in the future their application to ultra high rise buildings will expand.

2.3.7. Jibi Abraham (2018)[16]: Pyramid shape structures are one of the most applicable shapes that are used for designing of high rise buildings. Concrete braced frame is one of the structural systems used to resist earthquake loads in multistoried buildings. Concrete bracing is economical, easy to erect, occupies less space and has flexibility to design for meeting the required strength and stiffness. The results of the analysis on the axial forces, storey drift and displacements are compared. The results are presented in tabular and graphical form. The results on the displacement are checked with serviceability conditions and are compared and presented in tabular form.
The displacement is decreased in pyramid shaped building with x bracing as compared to pyramid shaped building without bracing.

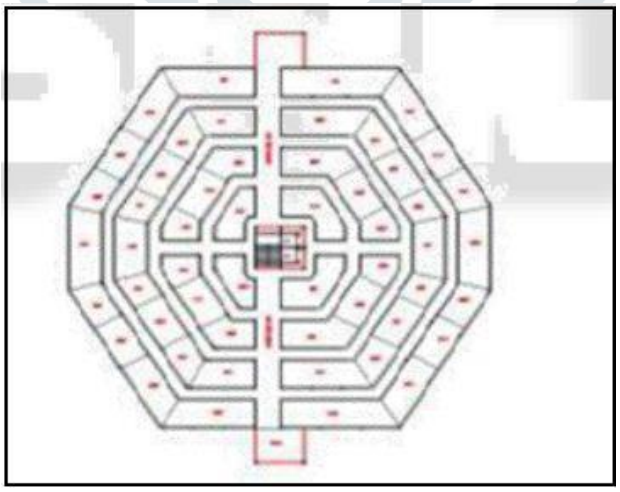

Fig. 2.9 Floor plan of building

The story stiffness is more in pyramid building with x bracing than the pyramid building without bracing.

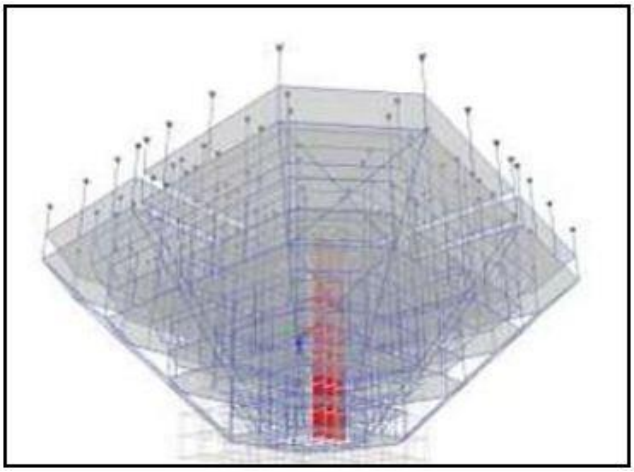

Fig. 2.10 Pyramid shaped building with bracing

The story drift is decreased in pyramid building with x bracing than the pyramid shaped building without bracing.

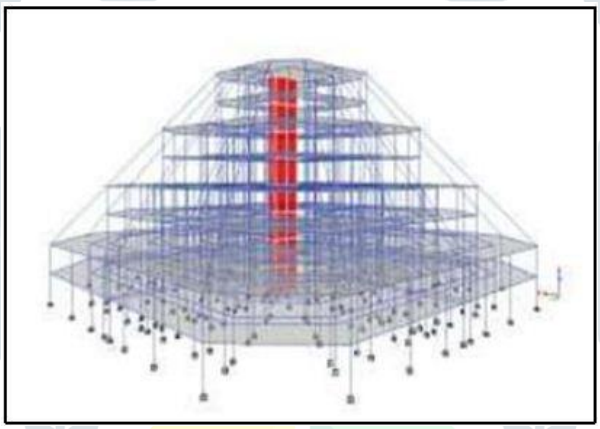

Fig. 2.11 Pyramid shaped building without bracing

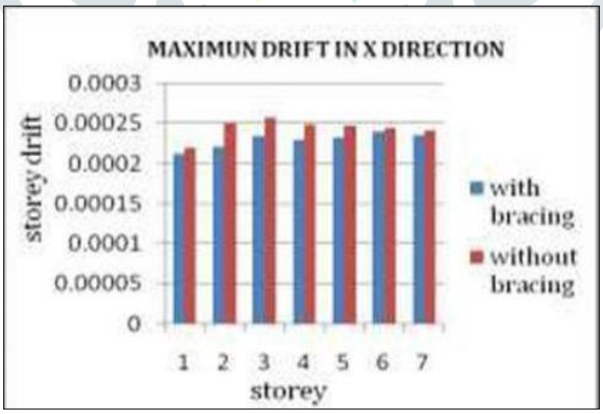

Fig. 2.12 Maximum drift in x direction

2.3.8 Faizulla Z Shariff et al. (2015)[17]: Presented a paper on "Comparative study on RCC and CFT multi-storied buildings" Use of composite material is of particular interest, due to its significant potential in improving the overall performance through rather modest changes in manufacturing and constructional technologies. Steel concrete composite columns are used extensively in modern buildings. Extensive researches on composite columns in which structural steel section are encased in concrete have been carried out. In-filled composite columns, however have received limited attention compared to encased columns. In this study E-Tabs nonlinear software is used for simulation of steel concrete composite (CFT) with steel reinforced concrete structures (RCC)

of G+14, G+19 and G+24 stories each are considered for comparative study. Comparison of parameters like base shear, axial force and bending moment is done.

2.3.9 Shilpa Sara Kurian et al. (2016)[18]: Presented a paper on "Study on Concrete Filled Steel Tube" study is an attempt to understand the behavior of Concrete filled steel tubular column under axial load. Concrete-filled steel tubular (CFST) column is formed by filling a steel tube with concrete. It is well known that concrete-filled steel tubular (CFST) columns are currently being increasingly used in the construction of buildings, due to their excellent static and earthquake-resistant properties, such as high strength, high ductility, large energy absorption capacity, bending stiffness, fire performance along with favorable construction ability etc. Recently, the behavior of the CFST columns has become of great interest to design engineers, infrastructure owners and researchers, therefore to understand the load deformation characteristics of composite columns critically, numerical finite element analysis using software package ANSYS is carried out in this paper. This paper focuses on modeling of concrete filled steel tube (CFST) column under axial loading.

3. CONCLUSION

Following conclusions can be drawn on the basis of analysis on a conventional multi-storey building & a Single column structural system:-

1. A conventional multi-storey building & a Single column structure has been designed successfully to withstand all loads including earthquake load.
2. Single column structure is 20 % more costly when compared with multi- column structure.
3. We may also check the deflection of various members under the given loading combinations.
4. The Result of deflection obtained from the software for a conventional multi-storey building & a single column building structure.
5. RCC column give satisfactory result under static loading condition.
6. Study the performance of lateral displacement at II zones when seismic load applied to the structure.
7. Storey drift in high rise structures are subjected to excessive deflection. Deflection obtained by STAAD-Pro is checked by IS Codal limitation for serviceability. Base shear gives the base shears for entire structures.
8. STAAD-Pro advanced software which provides us a fast, efficient, easy to use and accurate platform for analyzing and designing structures.

This project has been selected with utmost enthusiasm and keen interest by me and has been successfully completed with our knowledge to our satisfaction. We have applied our gained knowledge during this project. A comparative study on analysis of a conventional multi-storey building & a single column building is analyzed with special attention and it is completed. Maximum space utilization is considered while planning and designing and we assure it will serve its maximum serviceability.

REFERENCE

1. Venu Babu A, Et Al, (2016)[1] "Design Of A Structure Supported On Single Column Office Building", International Journal Of Research Sciences And Advanced Engineering [IJRSAE] Volume 2, Issue 15, Pp: 112-123.
2. E K Mohanraj, S Nisar Ahmad, A Gowri Sankar, Kongu Engineering College, (2002)[2] "Analysis and Design of an Office Building with Mono Column," PP. 27th Conference on Our World in Concrete & Structures.
3. Badikala Sravanthi, Dr. K.Rajasekhar, (2016)[3] "Design Of A Structure Supported On Single Column",Pp In ISSN-2349-8439.
4. Donald MacLeod, Tom Mathie, Graham Dunlop, and Sean Duvall, (2011)[4] "Innovative Mono-Column Support Structure "PP. at the SPE Offshore Europe Oil and Gas Conference and Exhibition held in Aberdeen, UK.
5. Janakkumar M. Mehta (2017)[5] "In this study the (G+17) storey building was analyze with different shear-wall configuration"
6. Pooja Liz Isaac et. al. (2017)[6] "They found the Equivalent static and Response spectrum analysis of Diagrid, Hexagrid, Octagrid and Exterior Braced steel building were performed."
7. Erik Hallebrand et. al. (2016)[7] "For vertical and horizontal loads on a building, advantage can be taken to study each load-case separately. The force distributions and reaction forces due to vertical loading should be analyzed without the consideration of floor diaphragms."
8. Maikesh Chouhan, (August 2016)[8] "Dynamic Analysis of MultiStoreyed Frame-Shear Wall Building Considering SSI", Int. Journal of Engineering Research and Application www.ijera.com ISSN: 2248-9622, Vol. 6, Issue 8, (Part - 1), pp.31-35 www.
9. Pavan Kumar, (November 2014)[9] "Earthquake Analysis of Multi Storied Residential Building - A Case Study," Int. Journal of Engineering Research and Applications www.ijera.com ISSN : 2248-9622, Vol. 4, Issue 11(Version 1), , pp.59-64
10. Upendra singh dandotia1 , Rakesh Gupta2 , Mukesh Pandey (2016)[10] IJEDR | Volume 4, Issue 2 | ISSN: 2321-9939 "A study of analysis and design of multi level parking"

11. A. Braconi et. al., (2008)[11] " Seismic performance of a 3D full-scale high-ductility steel–concrete composite moment-resisting structure—Part I: Design and testing procedure" Published online in Inter Science Wiley.
12. T. Andres Sanchez, M.S., E.I.T., Brad Davis, Ph.D., S.E., and Thomas M. Murray, Ph.D., P.E, (2011)[12] "Floor Vibration Characteristics of Long Span Composite Slab Systems", Structures Congress © Asce.
13. Mahbuba Begum Robert G. Driver, M.ASCE and Alaa E. Elwi, M.ASCE, (2007)[13] " Finite-Element Modeling of Partially Encased Composite Columns Using the Dynamic Explicit Method", Journal Of Structural Engineering © Asce.
14. Dr. D. R. Panchal, (2014)[14] "Advanced Design of Composite Steel-Concrete Structural element" Pp in ISSN - 2248-9622, Vol. 4, Issue 7 (Version 2).
15. Morita, K., Keii, M. And Matsumoto. S, (2011)[15] "Applications of high performance structural steels to high-rise steel buildings" the 6th international symposium on steel structure" (isss), international journal of steel structure, pp.21-35.
16. Jibi Abraham, (2018)[16] "Seismic Analysis of Pyramid Shaped Building With and Without Bracing", International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056Volume: 05 Issue: 05 May2018.
17. Faizulla Z Shariff et al. (2015)[17]: Presented a paper on "Comparative study on RCC and CFT multi-storied buildings"
18. Shilpa Sara Kurian et al. (2016)[18]: Presented a paper on "Study on Concrete Filled Steel Tube"
19. IS 875-PART 1- DEAD LOADS - Unit Weights of Building Materials and Stored material.
20. IS 875-PART 2- LIVE LOADS - Unit Weights of Building Materials and Stored material.
21. IS 1893 (PART 1):2002- EARTHQUAKE LOAD-Criteria for earthquake resistant Design of Structures.
22. IS: 456-2000: DESIGN OF RCC STRUCTURAL ELEMENTS -Code of Practice for Plain and Reinforced Concrete, New Delhi, Bureau Of Indian Standards.
23. IS: 11384 (1985), "Code of practice for composite construction in structural steel and concrete", Bureau of Indian Standards, New Delhi.