COMPARATIVE STUDY OF R.C. TALL BUILDINGS BETWEEN SYMMENTRICAL AND UNSYMMENTRICAL SHAPES IN CONSIDERATION OF NON DUCTILE USING WITH AND WITHOUT OUTRIGGER AND BELT TRUSS SYSTEM

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ABSTRACT: Should be met through engineering judgment. In Metro cities like Mumbai, Delhi, Chennai, Bangalore, Kolkata, Hyderabad etc multi-storied buildings are common and disregarding that individuals are willing to remain in elevated structure (36 storeys').The analysis and outline of tall building structural system require more concentration than that of regular multi-storied building. The lateral stability of tall building assumes an important role in safe analysis and plan. demonstrate is generated in ETABS, the state of building like a rectangular(symmetrical) Y-formed and C molded buildings i.e. (Non symmetrical) The building is strengthened in lateral direction by providing Outrigger and Belt non truss system at every 9 to 10 ,18 to 19, 27 to 28 story levels Two strategies for analysis have been considered for lateral stability analysis viz linear static and linear dynamic for both seismic and wind. The various parameters like (1) Lateral displacement story.

I. INTRODUCTION

Tall building is need of developing scenario. Rapid improvement of tall building in the world has been creating impact on innovative advancement of structural system for tall building, result of which buildings are growing taller. There is no specific definition of tall building however Council on Tall Building and Urban Habitat (CTBUH) gives a few measures to define tall building. Tall building phenomenon will continue in a greater scale to address the issues of the growing populace in future large cities. The advancement in concrete technology over the twentieth century covering materials, structural systems, analysis and construction techniques, made it conceivable to manufacture concrete tall buildings. Structural system like minute resisting frame and shear divider and bracing system fulfill primary need of building . As building increases in stature there is effect of lateral load i.e. wind and earthquake on building structure. The impact of wind and seismic forces acting on tall building becomes an important aspect of the outline. Improving the structural systems of tall buildings can control their dynamic response Wind and earthquake stack plays major impact on building deflection. To overcome lateral load because of earthquake and wind, concrete core has been provided at center of building. Concrete core is a very effective and practical structural system which supportive in reducing the deflection because of seismic and wind forces. During recent years, the frame-concrete core divider hybrid structure has been rapidly created and profoundly concerned by owners with its performance and economic favorable circumstances. The outrigger and belt truss system is commonly utilized as one of the structural system to effectively control the excessive drift because of lateral load, so that, during little or medium lateral load due to either wind or earthquake stack, the risk of structural and non-structural harm can be minimized. For elevated structures, particularly in seismic active zone or wind stack dominant, this system can be chosen as an appropriate structure. Outriggers have been utilized in the sailing ship industry for some years. They are utilized to resist wind. The slender pole provides the utilization of outriggers. As a comparison the core can be related to the pole, the outriggers resemble the spreaders and the exterior columns resemble the shrouds or remains. Innovative structural schemes are continuously being looked for in the field. Structural Design of High Rise Structures with the intention of limiting the Drift because of Lateral Loads as far as possible without paying a high premium in steel tonnage.

OUTRIGGER AND BELT TRUSS SYSTEM

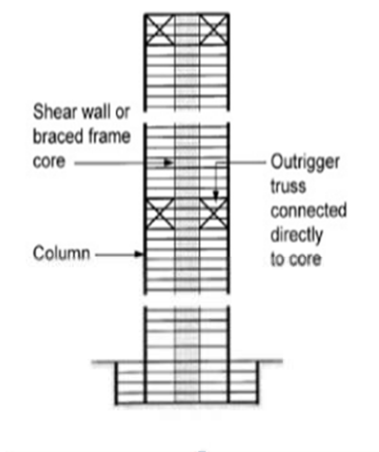
Outriggers are rigid horizontal structure i.e. truss or shaft which connect core divider and outer column of building to improve building strength and overturning stiffness. Outriggers have been utilized in tall building for nearly 50 years, however innovative plan principle has been improving its efficiency. Outrigger system is one sort of structural system which is formed from a cantilever molded horizontal member connected to structures inner core and outer columns. Through the connection, the minute arm of the core will be increased which prompt higher lateral stiffness of the system. Central core in a building act as cantilever, outriggers are provided to reduce overturning minute in core and to transfer minute from core to outer column by connecting the core and column. Divider frame outrigger trusses is a standout amongst the most efficient and economical structures in tall building, at outer end they connected to the establishment through exterior columns. At the point when the structure is subjected to horizontal loading, the divider and outrigger trusses will rotate, causing compression in the downwind column and strain in column on the upwind side, these hub forces will resist the rotation in the divider. The outrigger systems can be produced in any combination of steel, concrete and composite construction. Normally in steel structure outrigger are in the form of trusses and in the form of divider or profound bar in concrete structure. Outrigger might be stretched out to both side of central core or core might be located at one side of building with outrigger extending to other side columns. Belt truss connects outer perimeter column of a building and offer a wider perimeter to resist lateral deflection of building. This efficient structural form consists of a central core, comprising either Braced Frames or Shear Walls, with horizontal cantilever trusses or girders known as outrigger Trusses, connecting the core to the outer columns.

The core might be centrally located with outriggers extending on both.

TYPES OF OUTRIGGER TRUSS SYSTEM

Conventional Outrigger Concept

In the conventional outrigger concept, the outrigger trusses or girders are connected directly to shear dividers or braced frames at the core and to columns located outboard of the core. Typically (however not necessarily), the columns are at the outer edges of the building. Figure 1 is a romanticized section through a tall building with two arrangements of outrigger trusses, including one at the best. The outrigger trusses configuration. Shallower and deeper trusses have been utilized, with diagonals of various configurations.



Tall building with conventional outriggers

Virtual Outrigger Concept

In the "virtual" outrigger, a similar transfer of overturning from the core to components outboard of the core is achieved, yet without a direct connection between the outrigger trusses and the core. The basic thought behind the virtual outrigger concept is to utilize floor diaphragms, which are typically very solid and strong in their own plane.

Belt Trusses As Virtual Outriggers

The utilization of belt trusses as virtual outriggers keeps away from a considerable lot of the problems associated with the utilization of conventional outriggers. The principle is the same as when belt trusses are utilized as virtual outriggers. Some fraction existing apart from everything else in the core is converted into a horizontal couple in the floors at the best and the base of the storm cellar.

NEED OF THE PROJECT

Accumulation of growing populace especially in developing countries has resulted in an increased tallness of buildings, this need creating impact on structural improvement of tall building. As building increases in tallness there is effect of wind and earthquake forces, to increase stiffness of building against lateral load extra structural system such as belt truss and outriggers is required. The reviewed approach for the outline and improvement of tall building using outrigger and belt truss is helpful to provide a potential arrangement. The study in turn is helpful for various research persons involved in outline the tall buildings by using outrigger and belt truss system

OBJECTIVE OF THE STUDY

To study the effect of introduction of Outriggers in tall structure subjected to dynamic wind loading. To study the influence of core divider and braced core divider with X braced outriggers C. To stud influence of concrete outrigger. To study the effect of Outriggers with Peripheral Belt Truss. To study the different configuration of the building under different arrangement molded building i.e symmetrical and Unsymmetrical Buildings (Rectangular and Y formed building , C formed Building

II. METHODOLOGY

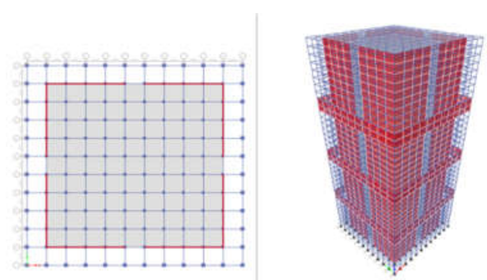
ANALYSIS OF A 36 STOREY BUILDING

The model considered for this study is 111.5 m skyscraper reinforced concrete building frame. The building represents a 36 storied office building. The stature of each story is 3m and every one of the floors are considered as Typical Floors. The location of the building is thought to be at Bhuj (Gujarat) . All divider piers are identical with a uniform divider thickness of 230mm over the entire stature. The Bracing bars (outriggers) and every other bar are 600mm wide and 600mm profound, Grade 40 concrete is considered (Compressive strength 40 N/mm²) throughout the tallness of the building. And number of stories considered for every one of the cases is 36 stories, and roof tallness is considered as 111.5 m. And story to story tallness is 3.0 m. And the outer columns sizes are considered as 800X800 mm and Inner columns measure are consider as 550X600 mm. shear divider thickness is considered as 230 mm.The technique for analysis of the previously mentioned system is construct up in light of the presumptions that the outriggers are rigidly attached to the core; The core is rigidly attached to the establishment; The sectional properties of the core, shafts and columns are uniform throughout the stature; Tensional effects are not considered; Material behavior is in linear elastic range; The Outrigger Beams are flexural rigid and induce just pivotal forces in the columns; The lateral resistance is provided just by the bending resistance of the core and the secure action of the exterior columns connected to the outrigger; The rotation of the core because of the shear deformation is immaterial.

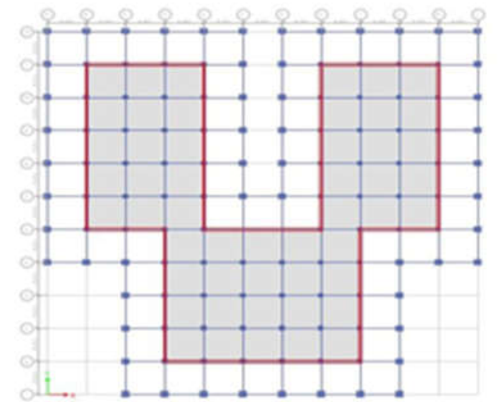
STRUCTURAL MODELLNG

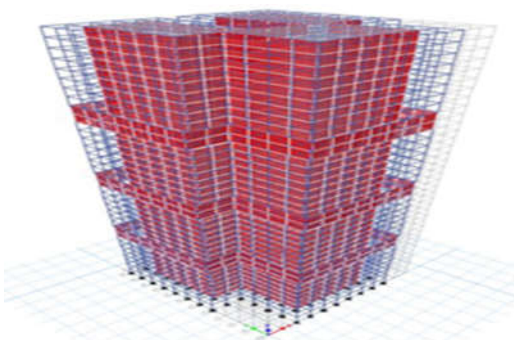
SL No	Structural details	Type of location
1	Utility of Buildings	Office Building
2	No of Storey	G+36
3	Area	2308 sq mts
4	Height of Building	111.5 mts
5	Shape of the Building	Rectangle, Y shaped, C shaped building
6	Types of Walls	SHEAR Wall -230 mm thickness Masonry wall – 230 mm thickness
7	**Geometric Details** Ground Floor	3.5 mts
	Story to story height	3.0 mts
	Beam	0.60X0.60 mts
	Columns (outer)	0.80X0.80 mts
	Columns (Inner)	0.55X0.60 mts
	Slab	0.150 mts
8	**Material Details** Concrete Grade All Steel Grades	M40 (All structural elements) FE 415 (All structural elements)
9	Type Of Construction	R.C.C FRAMED STRUCTURE
10	Place of construction	Bhuj - Gujarat
11	Loads considered in Buildings	Dead load, Live load, Earthquake ,Wind load
12	Wind Speed	50 m/s (Bhuj wind speed)
13	Seismic Zone	Zone – V (Bhuj)
14	Method of Analysis	RESPONSE SPECTRUM ANALYSIS EQUIVALENT STATIC ANALYSIS
15	NON Ductile properties	5 (Response reduction factor)
16	STATIC COMBINATION USED	1.2(Dead load+ Live load+ Earthquake in X direction)
17	IS codes used	IS456 :2000,IS1893:2002,IS 16700:2017,IS 875:1987 (Part 1, Part 2, Part 3)

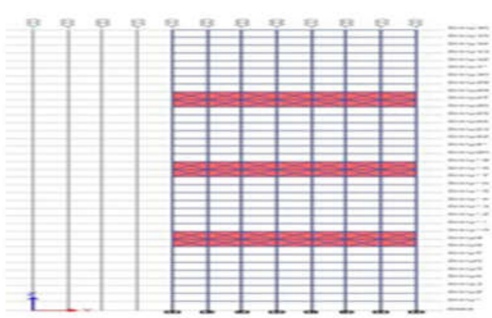
Rectangle Building



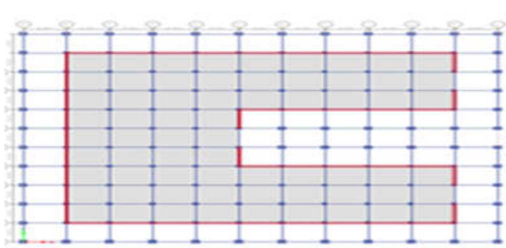
Y shaped building

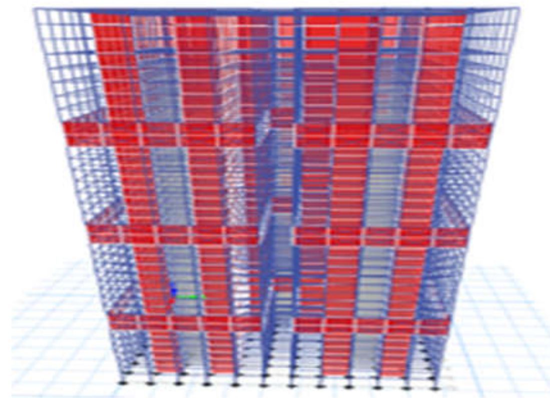


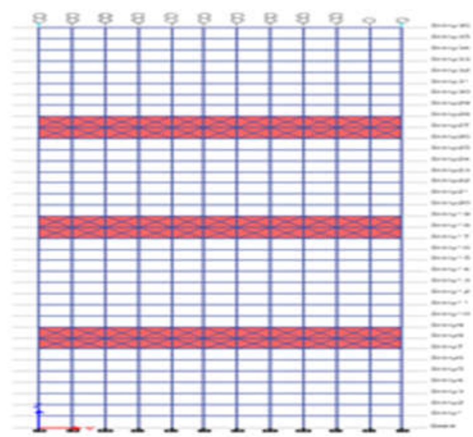




C shaped building

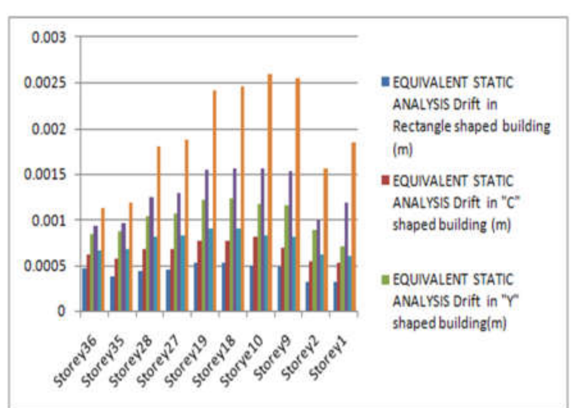


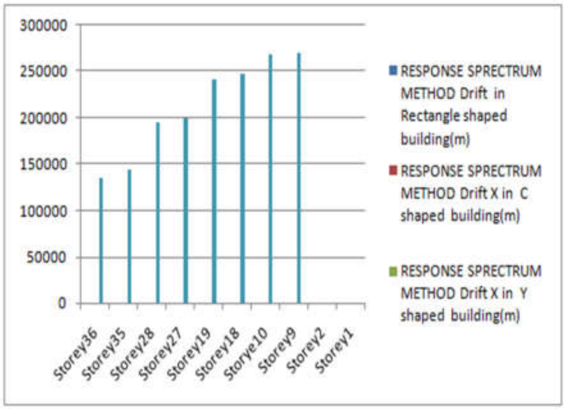




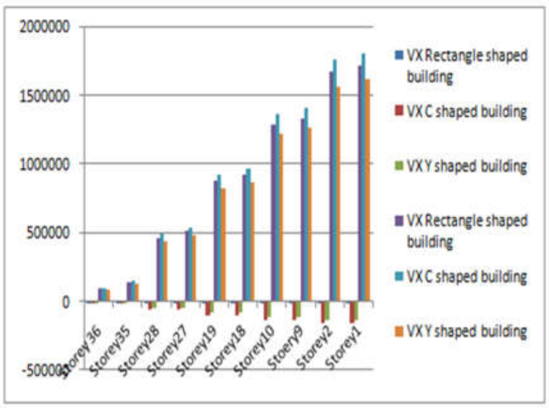
COMPARASTION OF EQUIVALENT STATIC ANALYSIS AND RESPONSE STRECTRUM ANALYSIS.

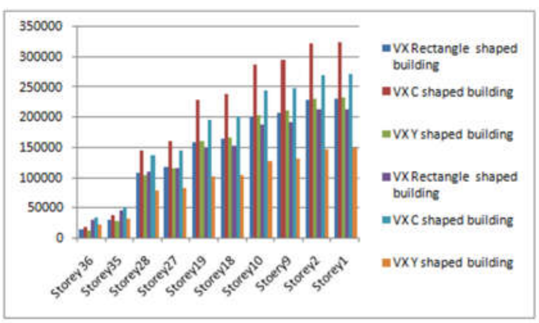
A.STOREY DRIFT



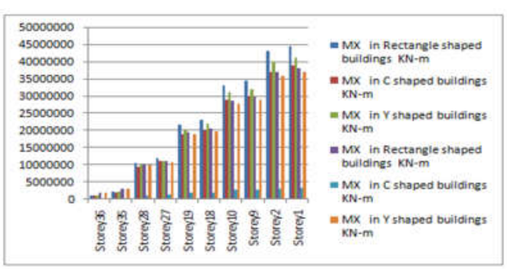


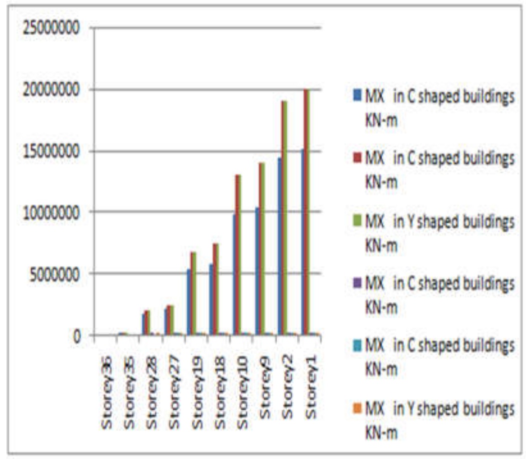
B.STOREY SHEAR FORCE





C.MOMENT FORCE





III. .CONCLUSIONS

After performing analysis and studying the results we can come to the below conclusion's:

1) The behavior of a structure under earthquake load is different from earthquake to earthquake. This well known phenomenon is well presented in the lateral displacement results obtained for both of the options. The location of the outrigger beam has a critical influence on the lateral behavior of the structure under earthquake load and the optimum outrigger locations of the building have to be carefully selected in the building design.
2) Comparison drift values both in the equivalent static analysis and response spectrum analysis the drift values show the less values in Rectangle shaped building(symmetrical) in static analysis. The response spectrum analysis shows much higher values due to the combination of all forces including static and dynamic loadings.
3) Considering the shear force in the both static and response spectrum analysis the

static analysis is having the least values in negative as compared to the response spectrum analysis.

4) The building minute demonstrates that the minute in response spectrum having less qualities as compared to the static analysis.
5) Considering all the above results and graphs the best reasonable structure is C formed building for the unsymmetrical shapes as compared to other building Y molded building both in static and response spectrum technique.
6) The utilization of outrigger and belt truss system in elevated structures increase the stiffness and make the structural form efficient under lateral burdens. Outrigger system is observed to be efficient in controlling the lateral loads and has proved to be Economical.

IV. REFERENCES

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