International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

Comparative Analysis Of High Rise Building On Sloping Ground With Steel And RCC Bracing

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ABSTRACT : Extinct earthquakes events demonstrate that, a building with irregularity is vulnerable to earthquake damages. So as it's essential to spot the seismic response of the structure even in high seismic zones to cut back the seismic damages in buildings. Objective: The most important objective of this study is to grasp the behavior of the structure in high seismic zone III and also to evaluate Storey overturning moment, Storey Drift, Lateral Displacement, Design lateral forces. For this purpose a 14 14-story-highilding of four different shapes like Rectangular, sloping ground, sslopingground with bracing in steel , and sloping ground with bracing in RCC are used as a comparison. The complete models were analyzed with the assistance of STAAD.Pro 2016 version. In the present study, Comparative Dynamic Analysis for all four cases have been invhasgated to evaluate the deformation of the structure. Results & Conclusion: The results indicates that, building wih sbuildingsregularity produces more deformation than those with less irregularity particularly in high seismic zones. And conjointly the sstoryoverturning moment varies inversely with height of the a storey. The storey base shear for regularbuildingsg is highestcomparede toirregular-shapede buildings.

Keyword: - Rectangular Building, sloping ground , sloping ground with bracing in steel, and sloping ground with bracing in RCC Static Force and Seismic Force, Bending Moment, Lateral Displacement, Story Drift.

Introduction:- A building, or edifice, is a structure with a roof and walls standing more or less permanently in one place, such as a house or factory. Buildings come in a variety of sizes, shapes, and functions, and have been adapted throughout history for a wide number of factors,

from building materials available to weather conditions, land prices, ground conditions, specific uses, and aesthetic reasons. To better understand the term *building* compare the list of no building structures.

Buildings serve several societal needs – primarily as shelter from weather, security, living space, privacy, to store belongings, and comfortably living anworkingrk. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety) and the *outside* (a place that at times may be harsh and harmful).

Ever since the first cave paintings, buildings have also become objects or canvasses of much artistic expression. In recent years, interest in sustainable planning and building practices has also become an intentional part of the design process of many new buildings.

High-rise building investment projects (towers) reflect a component of the economic power of the country and a sign of its features. ASeveralcountries seek to achieve their progression by motivating the preparation of comprehensive plans to construct high-rise investment projects to enhance their prestige and economic power. In countries like Malaysia, Hong Kong, the USA, the UK, Japetc. etc Funding such projects is a substantial component of their success. Varied and large investments are conducted after preparing serious feasibility studies to make sure that such projects accomplish the targeted gains at the state and economic levels for investors. These studies have been done through careful investigation of the architectural, planning, marketing, and financial aspects. A country's progression is effectuated through planning, econom,ic and urban progress; It is the most significant reason that encourages technological advancement by seeking to utilize the latest systems and materials. All those factors assist in attracting capital sources into the country. With the end of the 20th century, numerous countries started to makprogresson by preparing comprehensive plans to construct high-rise investment projects with the developments of many principles and standards to guarantee the success of these plans. Most of the Arab Gulf states, Hong Kong, and Malaysia have begun such procedures to enhance the country at several levels where feasibility studies played an important role in investigating all elements and factors that affect the project and the success level of the investing companies. High-rise buildings began in old Rome with its four-story woody residence buildings. Then, such residence buildings have been built utilizing brick units. In the 19th century, in North America, the Monadnock Building has been built in Chicago in 1891 out of sixteen stories utilizing the

load-bearing wall constructing method. As construction methods advanced, buildings ongoing to increase in height, reaching 60 stories in 1913 with the construction of the Woolworth Building in New York. High-rise buildings remain attractive for constructors throughout the time. Due to their extraordinary presence in the built environment, high-rise buildings have a particular importance and visible feature owing to their height, clearness and domination over other elements of the landscape

MODEL DESCRIPTION

Table : 1 - Details Of Model Applicable For All Models

SR. NO.	Elements Of Building Dimension
1	Length x width: 18m X 21m
2	Number of stories:14
3	Support conditions: Fixed
4	Storey height: 3.m
5	Grade of concrete: M25
6	Grade of steel: Fe500
7	Size of columns from 1-14storey: 600mm x 600mm
8	Size of beams: 300mm x 500mm
9	Depth of foundation: 3 m
10	Seismic zones-III(0.16)
11	Importance factor I: 1.0
12	Response reduction factor: 5.0
13	Damping ratio: 0.05
14	Soil type medium: 2
15	Height of parapet wall: 1 m
16	Thickness of the main wall: 230mm
17	Thickness of parapet wall: 230mm

18	Wall load : 0.230x20x(3.00-0.500)= 11.5 kN/m
19	Parapet wall : 0.230x20x1= 4.6 kN/m
20	Slab weight : 0.125x25x1 = 4 kN/m
21	Live load: 3 Kn/m^2
22	Floor finishing :1.5 Kn/m^2

RESULT AND DISCUSSION:

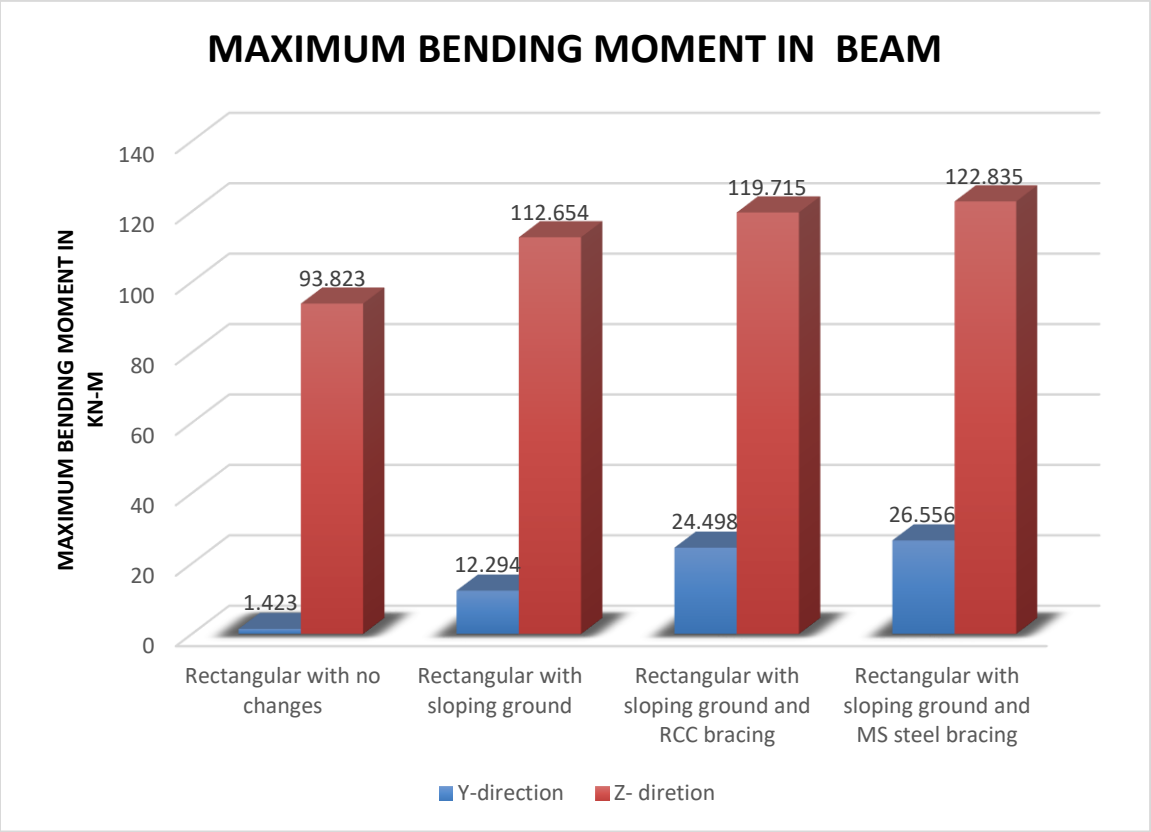

Figure No 1 Maximum Bending Moment in Beam

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ISSN 2581-7795

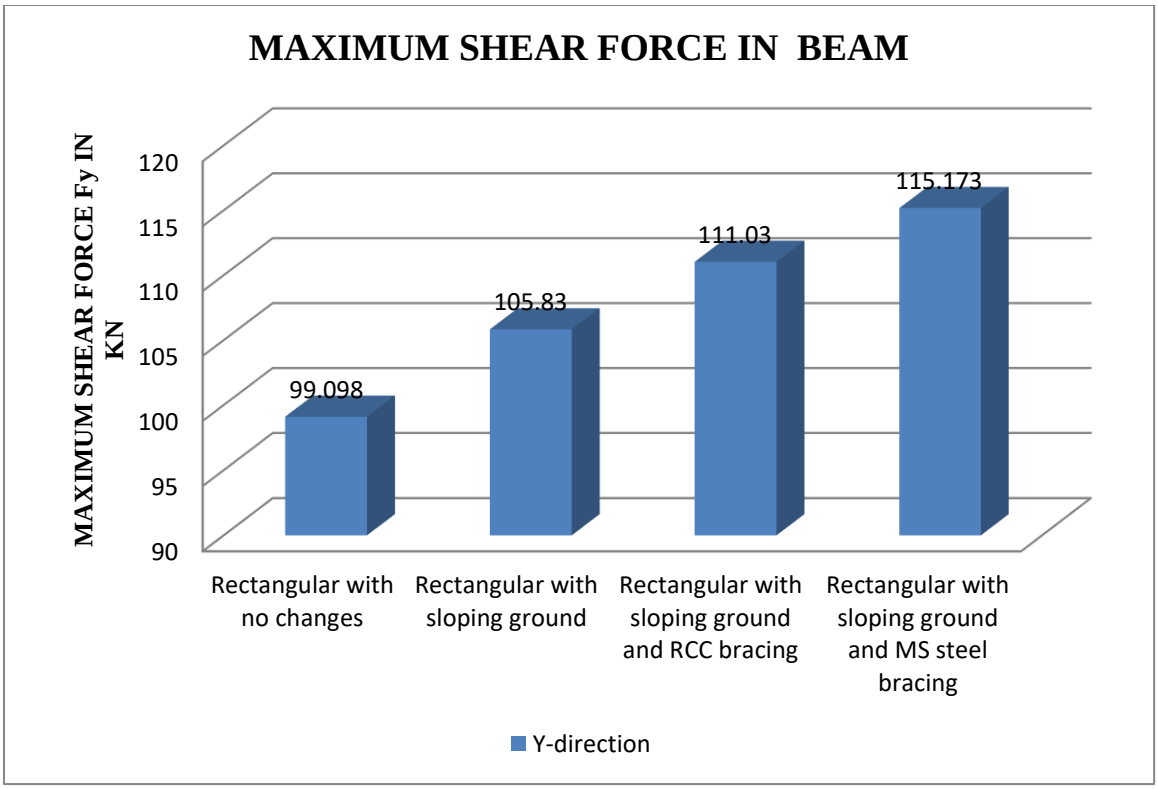

Figure No 2 Maximum Shear Force In Beam

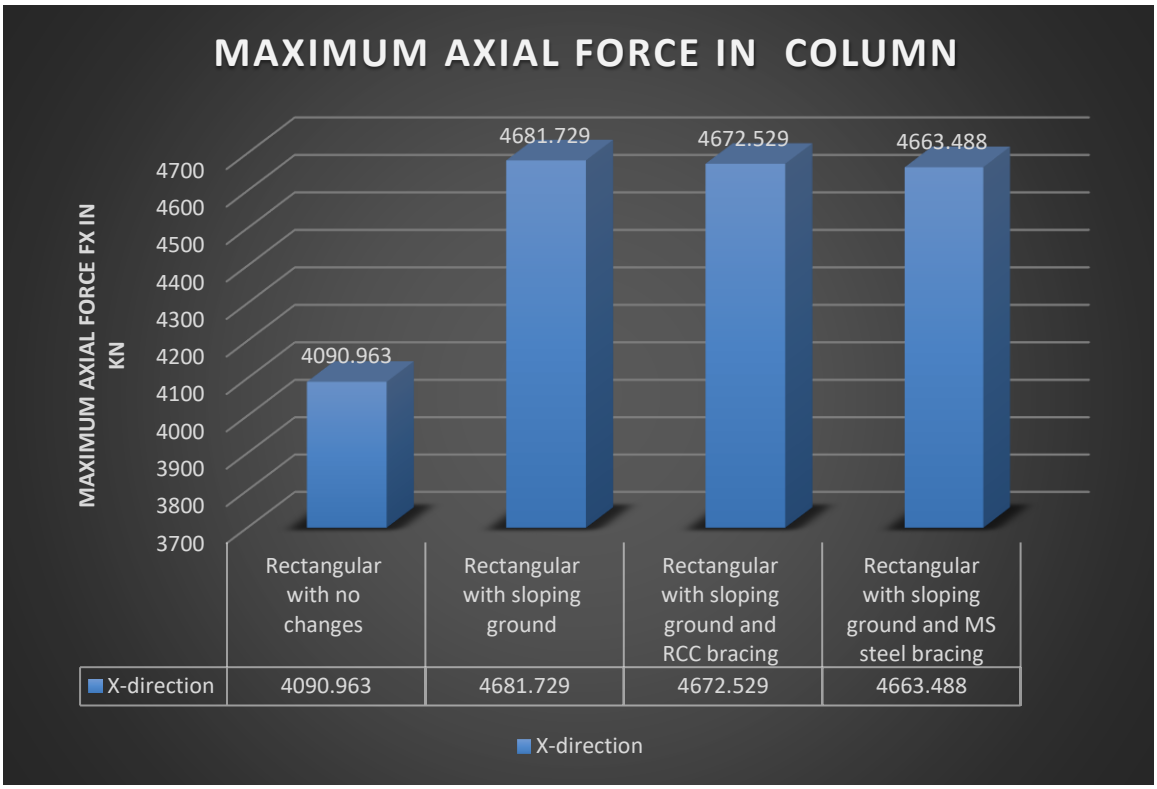

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Figure No 3 maximum Axial Force in column

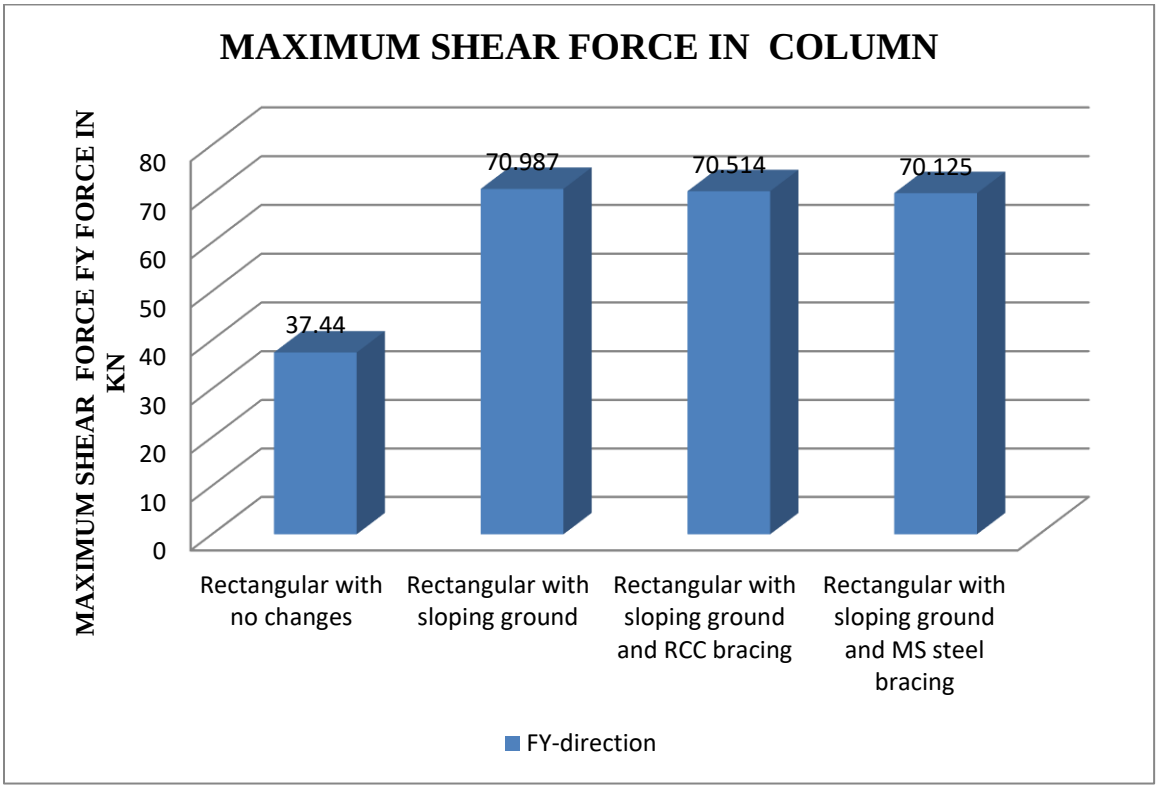

Figure No 4 Maximum Shear Force in Column Fy Direction

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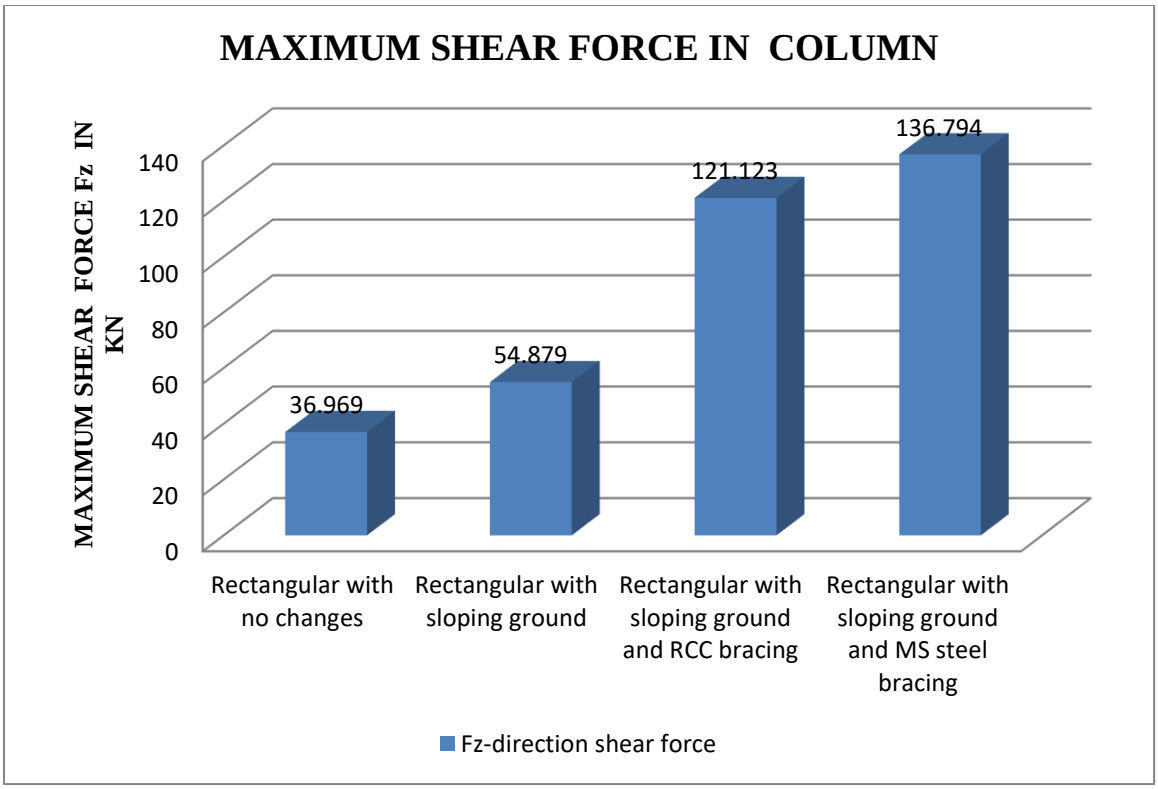

Figure No 5 Maximum Shear Force In Column Fz Direction

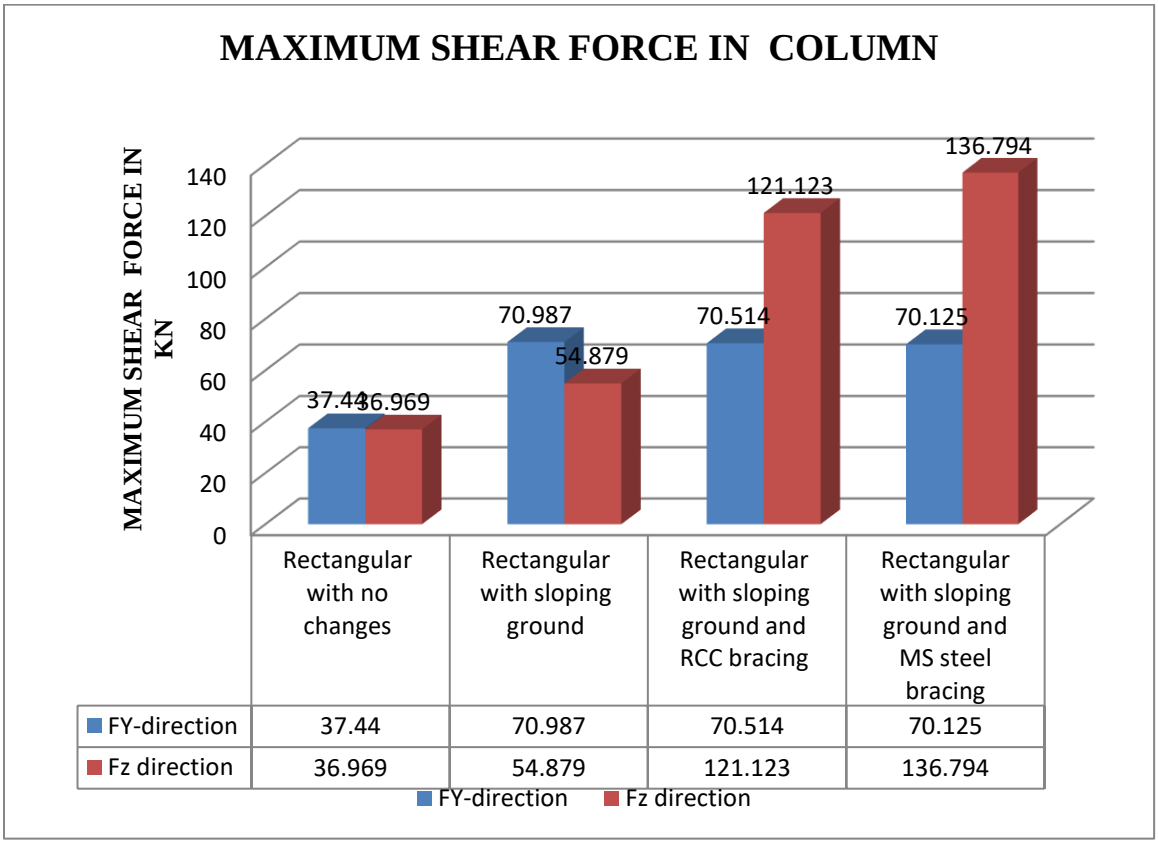

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Figure No 6 Maximum Shear Force In Column Fy And Fz Direction

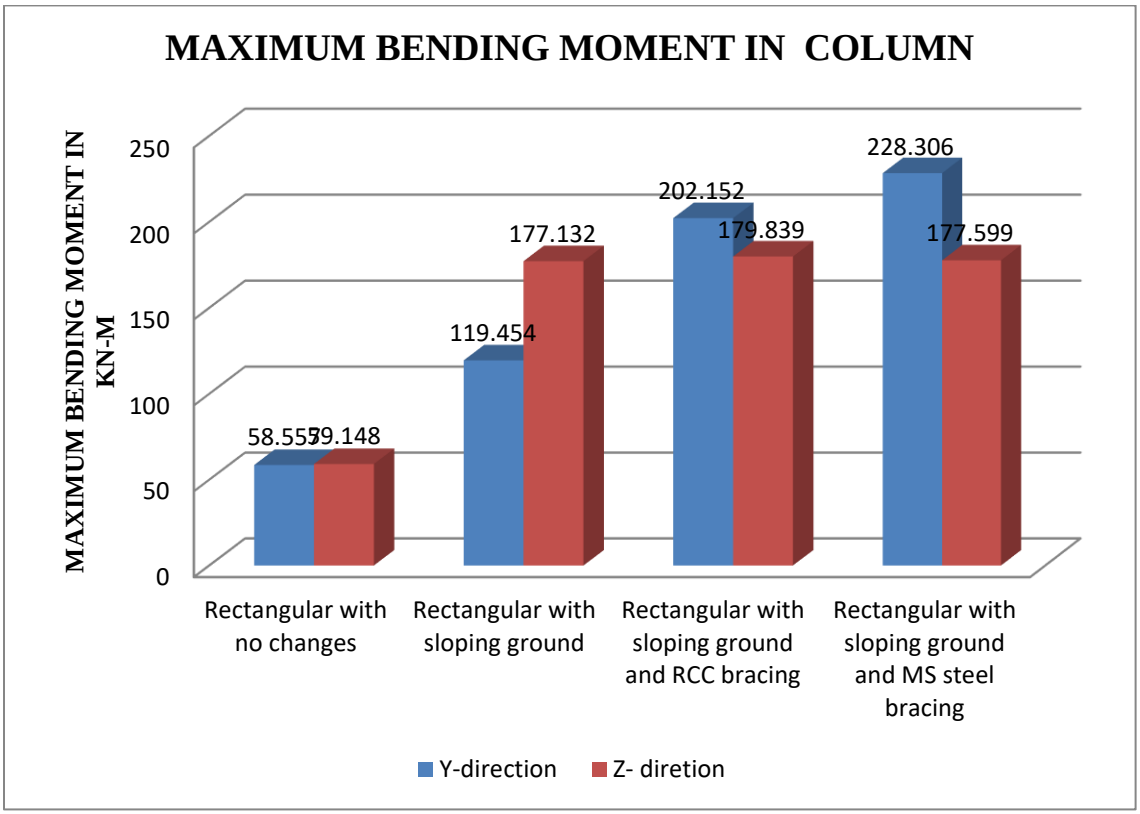

Figure No 7 Maximum Bending Moment In Column My And Mz Direction

Now Compares Between Height Vs Drift

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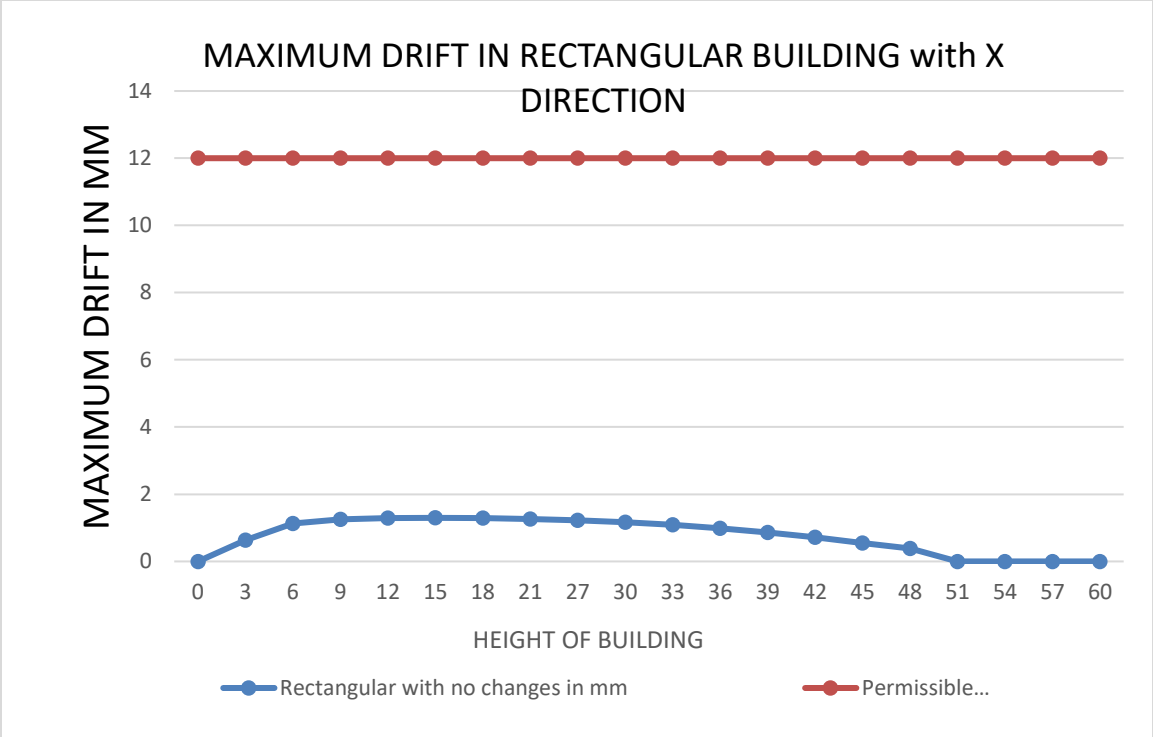

Figure No 8 Drift Vs. Height Of Rectangular Building X Direction

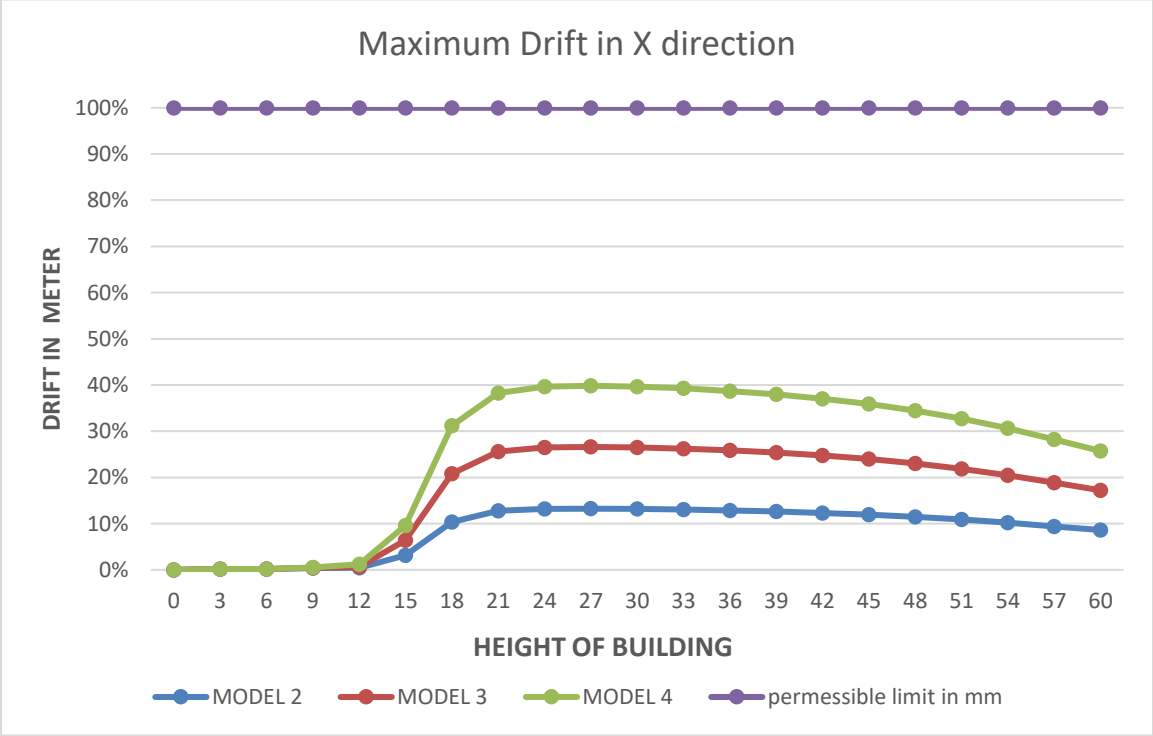

Figure No 9 Drift Vs. Height Of All Three Model With Changes Building X Direction

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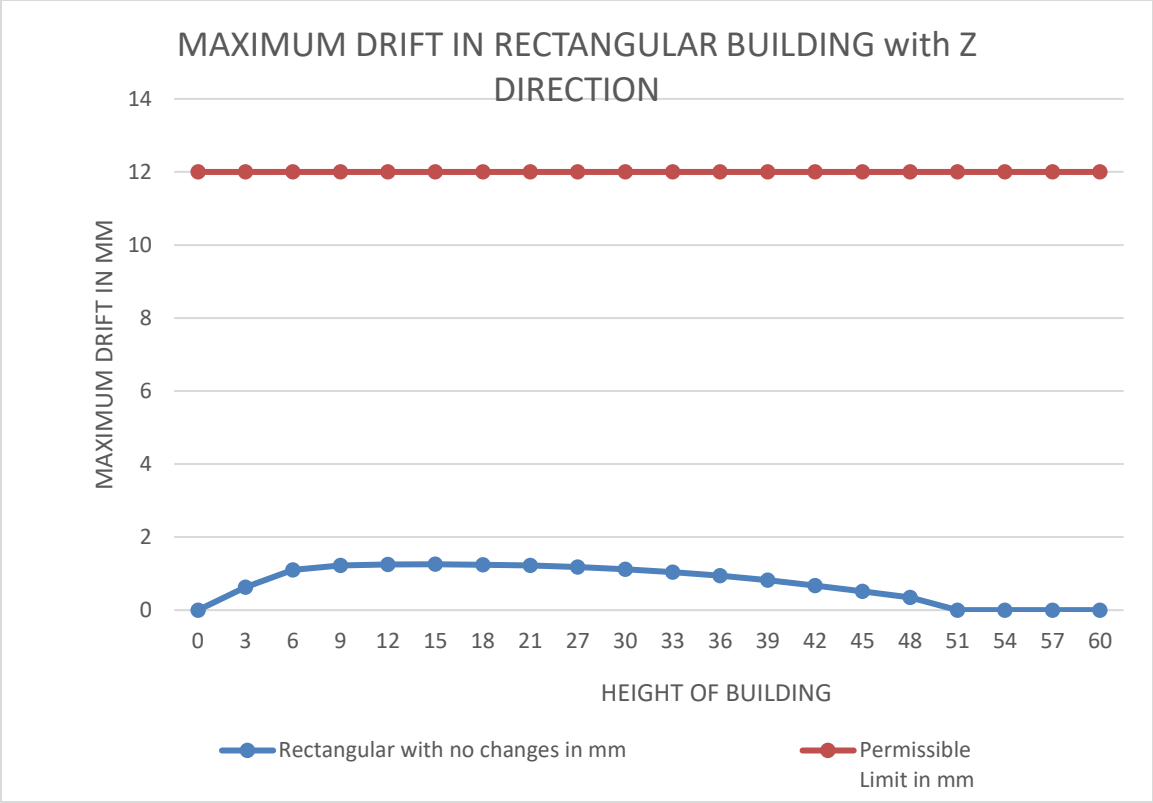

Figure No 10 Drift Vs. Height Of Rectangular Building Z- Direction

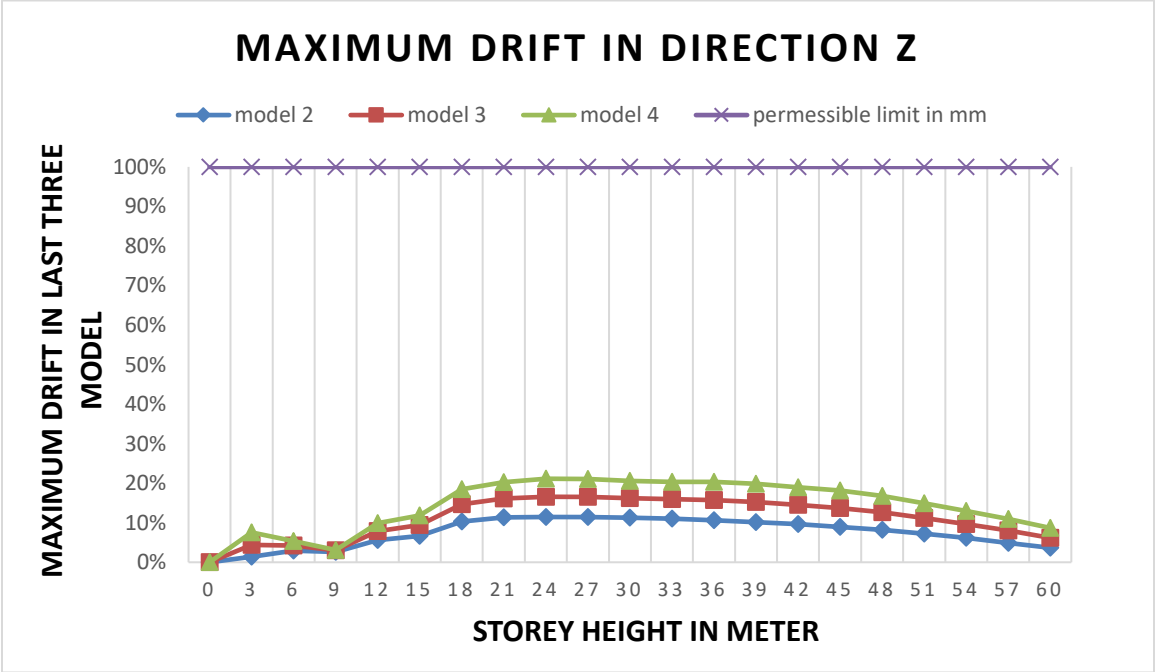

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Figure No 11 Drift vs. Height of M2, M3, M4 Building Z- Direction

5.6 Now Compares displacement between all types of building in graphically represented in both direction x and z direction

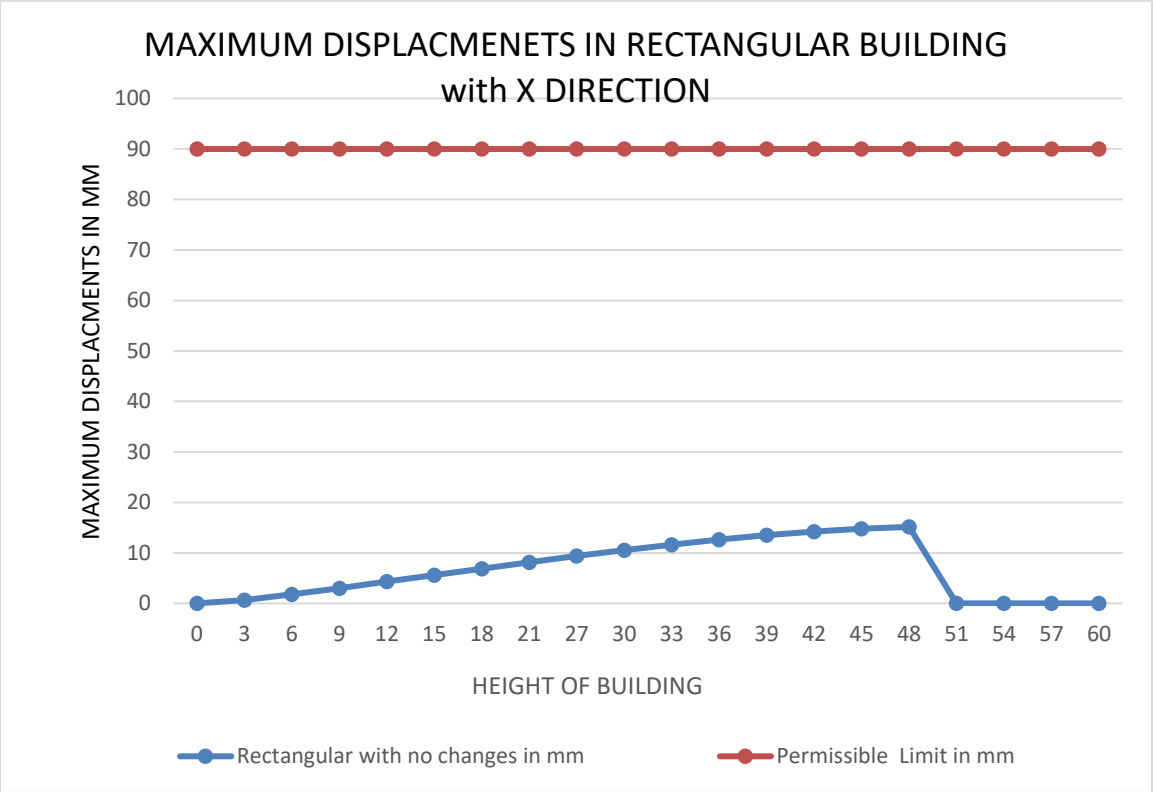

Figure No 12 Displacements Vs. Height Of Rectangular Building X Direction

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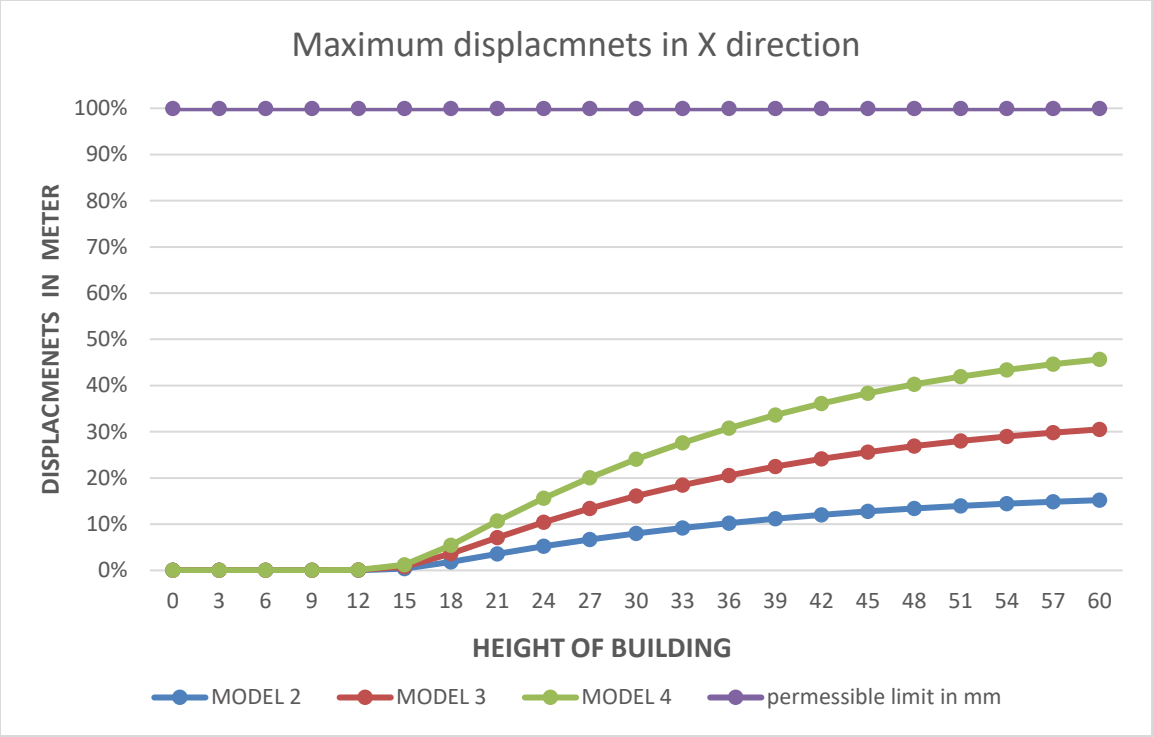

Figure No 13 Displacements Vs. Height Of M2, M3, M4 Building X Direction

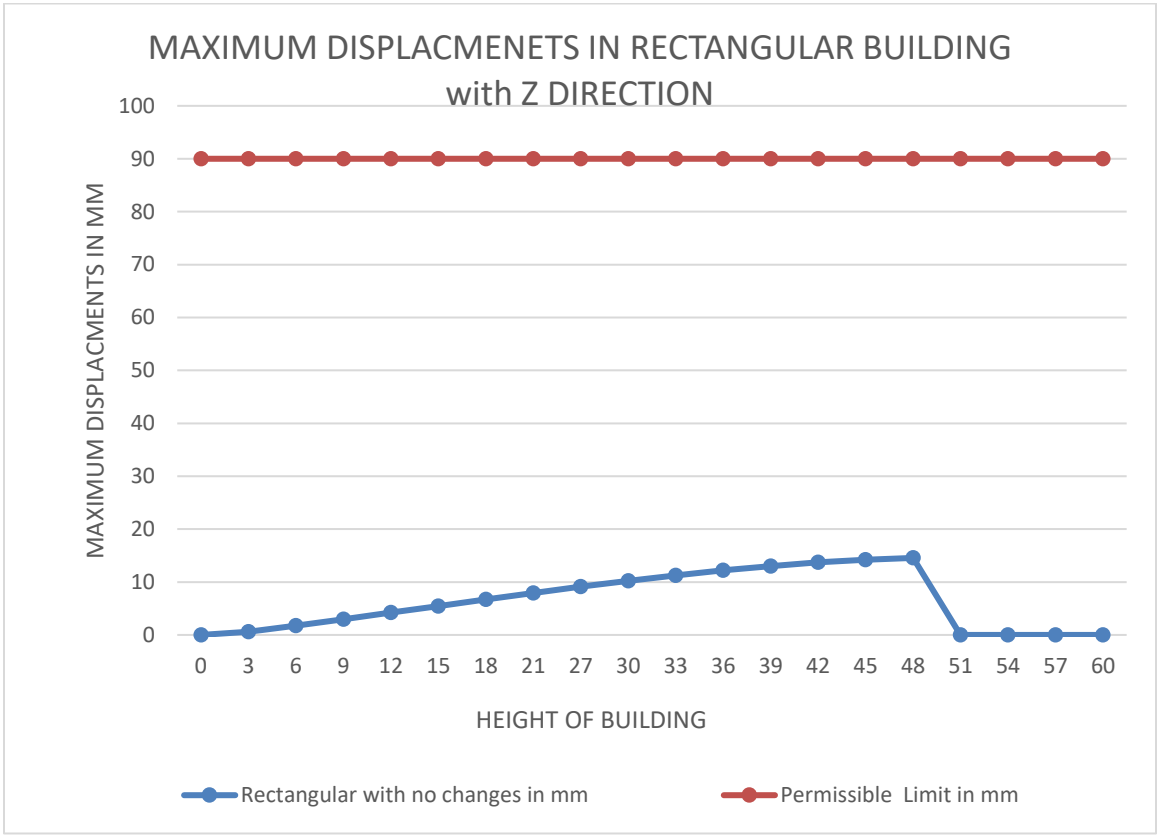

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Figure No 14 Displacements vs. Height of Rectangular Building Z Direction

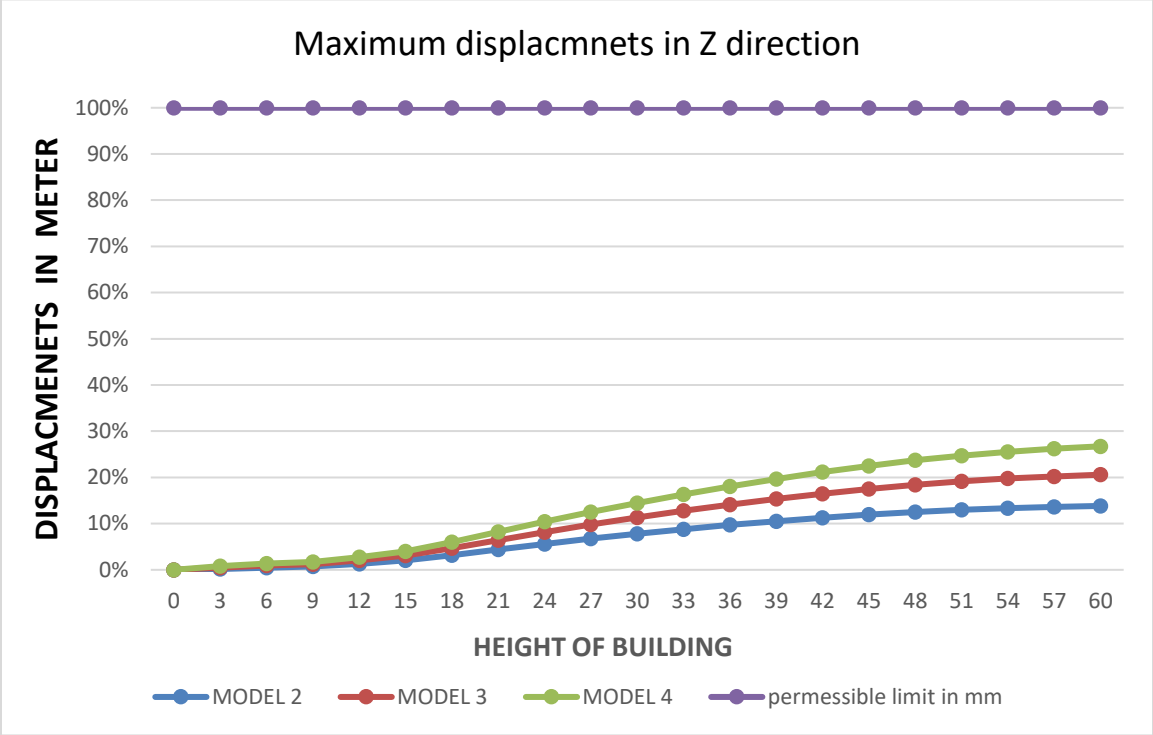

Figure No 15 Displacements Vs. Height Of Building M2, M3, M4 IN Z Direction

Now Compare Graphically Between Drift In Direction Of X And Z Direction

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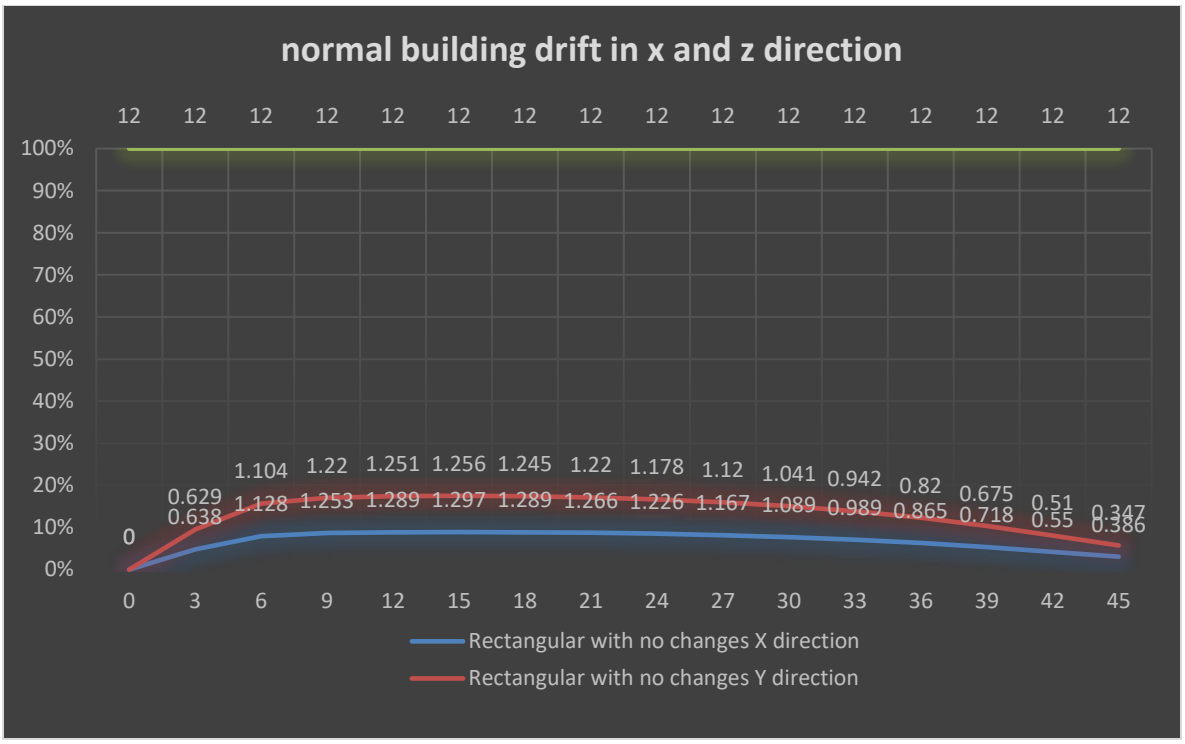

Figure No 16 Normal Building Drift In X And Z Direction

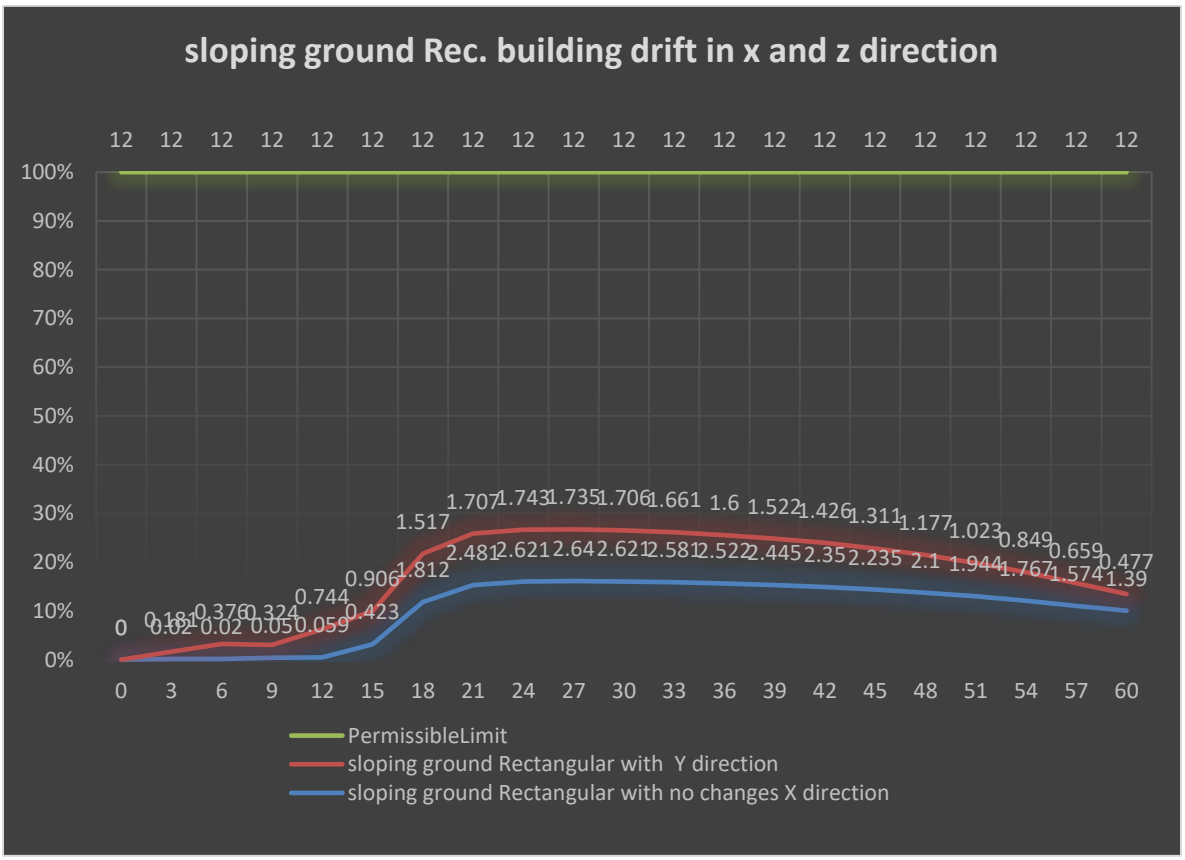

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Figure No 17 Sloping Ground Rec. Building Drift In X And Z Direction

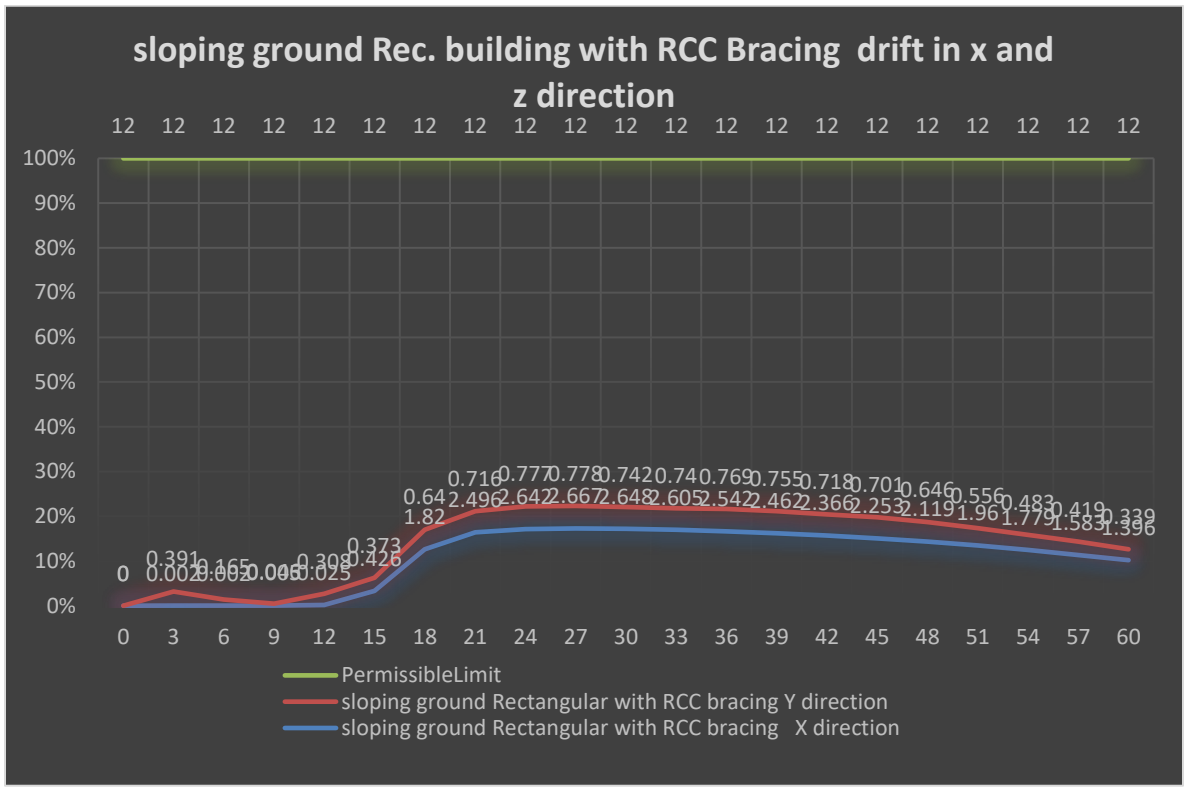

Figure No 18 Sloping Ground Rec. Building with RCC Bracing Drift In X And Z Direction

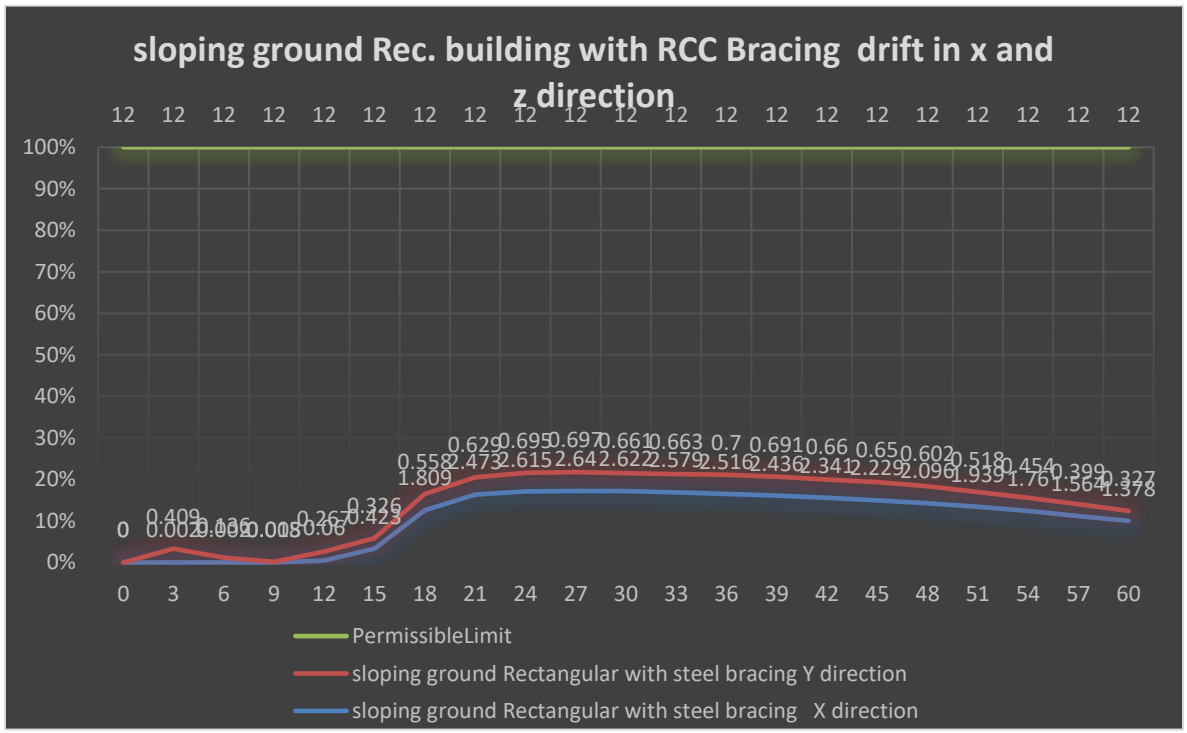

Figure No 19 sloping ground Rec. building with Steel Bracing drift in x and z direction

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Now Compare Graphically Between Displacements in Direction Of X And Z Direction

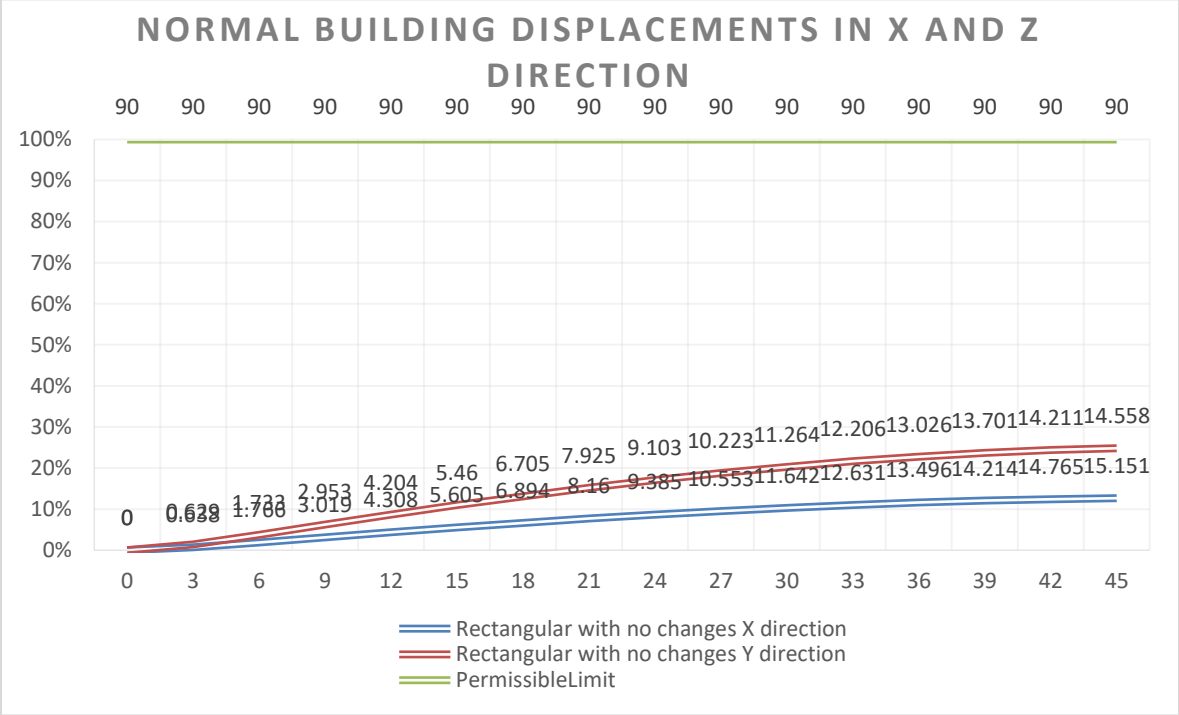

Figure No 20 Normal Building Displacements In X And Z Direction

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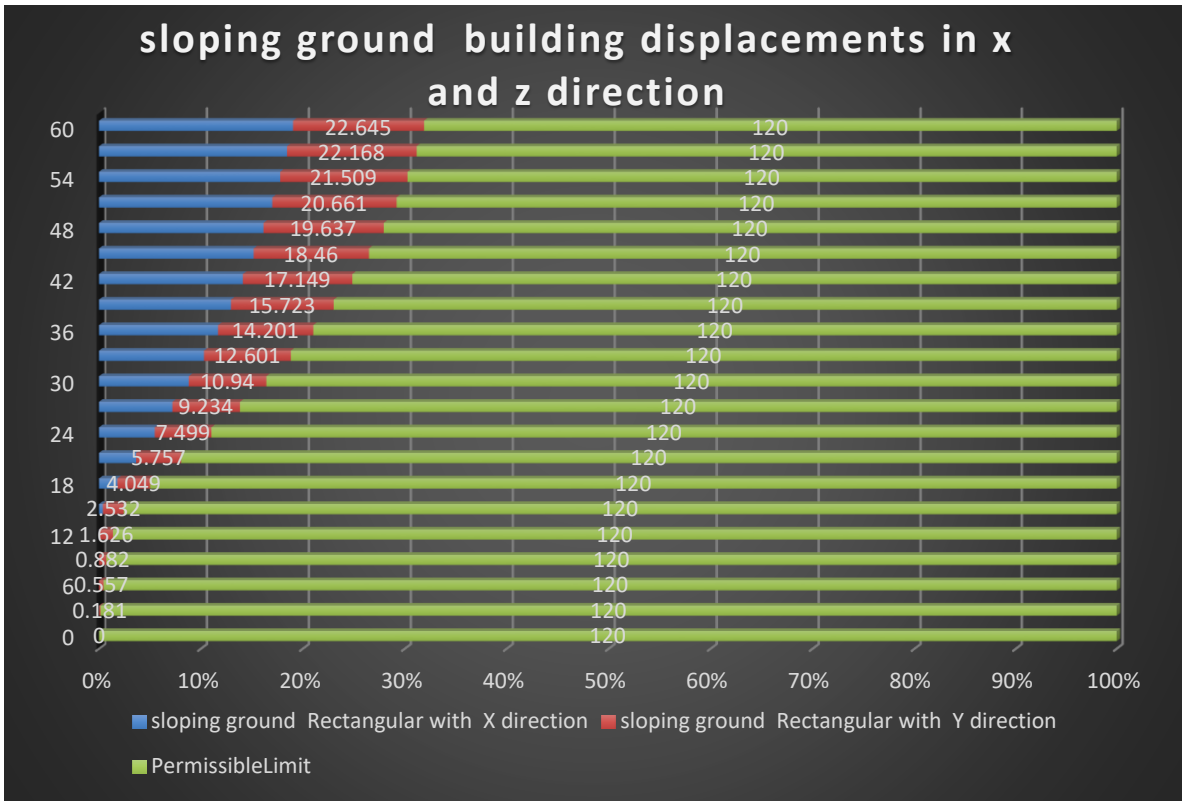

Figure No 21 Sloping Ground Building Displacements In X And Z Direction

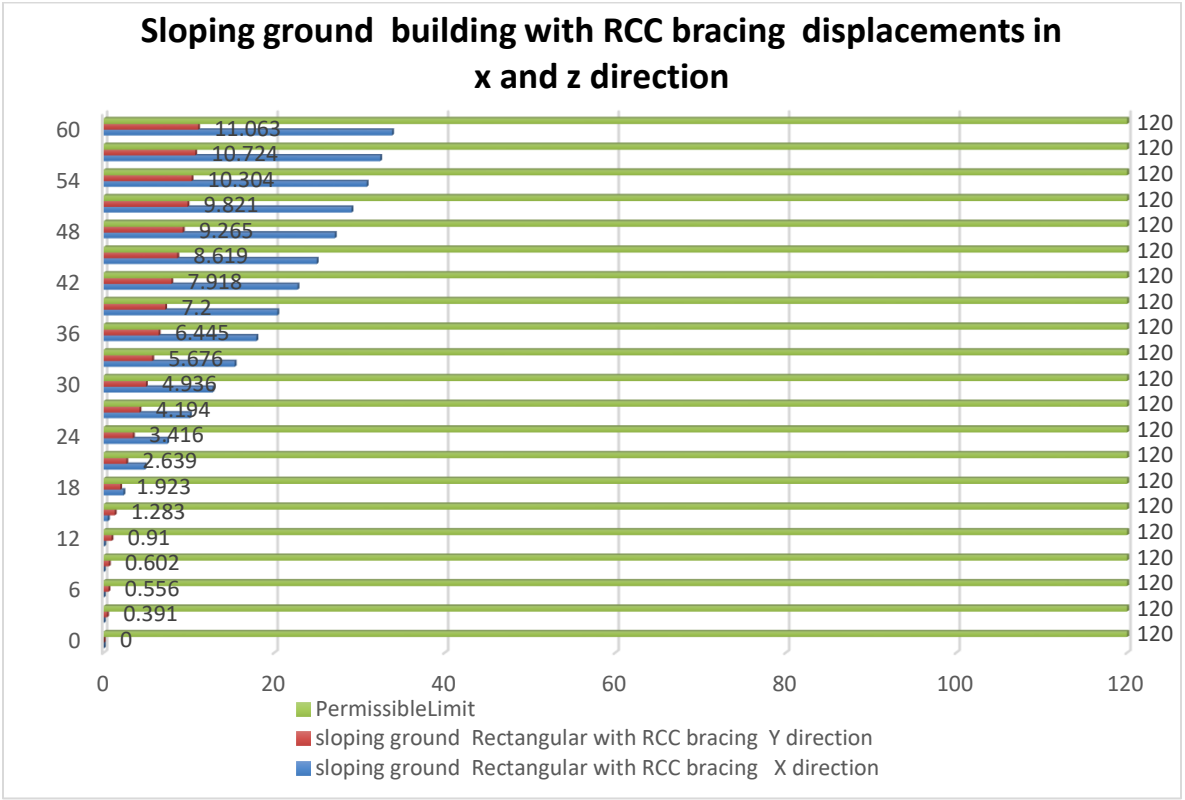

Figure No 22 Sloping Ground Building Displacements In X And Z Direction With RCC Bracing

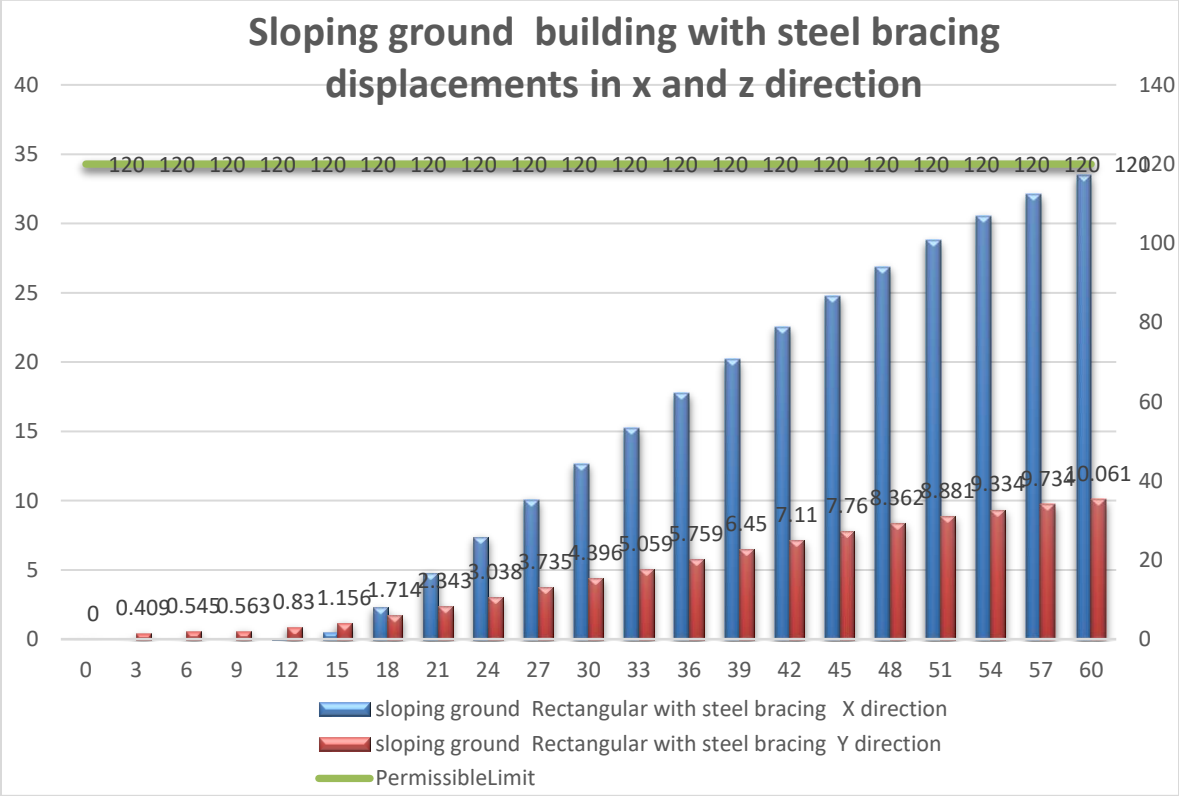

Figure No 23 Sloping Ground Building Displacements In X And Z Direction With Steel Bracing

Conclusion:-

Within the scope of present work following conclusions are drawn:

1) Bracing Structures gives more resistance to lateral deflection and also it suitable in earthquake prone areas
2) The bracing system effectively reduces the lateral displacement and drift for the A bracing of the structure compared to other bracings
3) By using A bracing it is possible to adopt openings for windows and doors which are critical in XBS because X-bracings run across the entire wall area
4) The X braced system give a well performance as compared to normal building.

5) In case of bending moment and shear force of beam increasing model 1 to model 4 but we can see that bending moment and shear force hold from M3 to M4 model.
6) But In case of bending moment and shear force of column just apposite of beam decreasing value of BM and SF of column to model 1 to model 4 but we can see that bending moment and shear force decreasing from M3 to M4 model.
7) The Storey Displacement is reduced in buildings after providing a bracing system.
8) The storey force changes with the shape of the building even though the lateral displacement and the storey drift change
9) Maximum Bending Moment in Column Mz and My Direction. Mz is maximum in rectangular building 59.148 kN-m and other three model M2, M3 and M3 where M3 is maximum 177.599 kn-m
10) Maximum Bending Moment In Column Mz And My Direction. where prefer the rectangular building with Sloping ground and bracing increasing bending moment
11) Maximum Axial Force In column 4681.729kN in rectangular building where prefer the rectangular building with sloping ground like M1, M3 and M4.
12) After analysis we find that storey displacement is considerably increased after provision of bracing.
13) The Fig. shows that irregular shape buildings undergo more deformation and hence regular shape building must be preferred
14) As the height of the building increases, drift stories also increase up to certain then decreases. From the results the drift values for A bracing is lesser compared to all building but in the direction of z is more than x direction.
15) But in the case of displacements of all building where displacements of x direction is more than z direction. Displacements is more in the model 4.
16) Overall, we can say we adopt M4 building (sloping ground with RCC building and rectangular building) is economical and safe.

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