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ANALYSIS OF THE BUILDING MULTI-STOREY WITH SHEAR WALL IN BUILDING AND WITHOUT SHEAR WALL UNDER EFFECT OF NATURAL PHENOMENA SUCH AS WIND & EARTHQUAKE ON THE BEHAVIORE

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ABSTRACT

The Seismic design of buildings, the shear walls effect as primary earthquake-resisting elements in The Buildings Multy Story. Structural walls serve as an effective bracing system and have a high capacity for resistance to lateral loads.

The building's response was determined by the features of the seismic shear walls. It is critical to determine the seismic reaction of walls accurately. The primary goal is to provide a solution for shear wall placement in a multi-story building. Three separate models were used to investigate the effectiveness of shear walls. Model one was initially designed without a shear wall, while the other two models with a shear wall are dual-type structural systems. An earthquake load is applied to a 15-story building located in zones II, III, and V. Period frequency, base reaction, and lateral displacement were calculated for three buildings with and without shear walls. In the ETABS 2015 Program, 15 stores were built with an increasing number of columns to withstand wind and earthquakes.

Keywords: Shear Wall, Seismic,Etabs

LITERATURE REVIEW

As of late, fortified solid structures have turned out to be basic on the planet, especially nearby and urban areas. This section manages the survey of writing identified with deformity and impact the dampness and disappointment in structures.

- P.R.Vaidiya (2014 siesmic Analysis of Building with shear wall on sloping ground: - The seismic performance of shear wall buildings on sloping land is investigated in this study.

- S.B.Vanakudr (2017) ANALYSIS OF R.C.C MULTISTORIED BUILDING WITH AND WITHOUT SHEAR WALL AND OPTIMUM LOCATION OF SHEAR WALL :-

Buildings with shear walls are becoming more common than buildings without shear walls in earthquake-prone areas, particularly zones III, IV, and V, due to their potential for resistance during earthquakes.

MATHADOLOGY

1- General

In adding to gravity loads, the structure will be subject to strong lateral forces that will predominate during earthquake shaking. to design the structural building to withstand the earthquake, These lateral stresses on the structure must be estimated and specified to design it to survive an earthquake. The lateral seismic stresses that are expected to affect the structure over its lifetime are difficult to forecast.

However, it is crucial to estimate these pressures in a logical and realistic way while taking into account the aftereffects of earthquakes owing to the eventual failure of the structure.

A structure's ability to withstand an earthquake depends on a variety of variables, including

1. Earthquake characteristics (Magnitude, intensity, duration, frequency, etc.).
2- how far away the fault is.
3- Site geology.
4-The structure's lateral load resisting system and type.

2- Assumptions Made Designing Buildings to withstand Earthquakes

To achieve the goals of designing buildings that can withstand earthquakes, IS-1893 (2002) adopts the following assumptions "Clause: 6.2, IS 1893-2002" Ground motions caused by earthquakes are intricate and irregular, varying in terms of time and amplitude, and last for only brief time. Given that it would take some time for amplitudes to build-up to the point where the resonance we see under steady-state sinusoidal excitations would occur, this is not the case.

Maximum wind, maximum flood, or maximum sea waves are not likely to coexist with an earthquake. In the absence of a more precise value, static analysis can be performed using the elastic modulus of the materials.

3- Load combinations

The following load combinations are specified under "Clause:6.3 of IS-1893 (2002)".

Load combinations must be considered :

1- "1.7(DL+ IL)"
2 - " 1.7(DL± EL)"
3- " 1.3(DL + IL± EL)".

These load combinations must be considered in the design of reinforced and prestressed concrete buildings in their limited state:

1- "1.5(DL+ IL)"
2- "1.2 (Dl + IL± EL)"
3- "1.5 (DL± IL)"
4- "0.9 DL ±1.5 EL"

Where DL represents dead load, IL represents imposed load, and EL represents earthquake load. Design Designing for the effects of the whole, Thus, the reaction due to earthquake force (EL) is the maximum of the following When the elements that resist lateral loads are aligned along the orthogonal horizontal direction, just the horizontal direction subject to the earthquake design load needs to be considered. If the structure's lateral load-resisting elements are not oriented in orthogonal horizontal directions, it must be designed to withstand the full design earthquake load in one horizontal direction plus 30 percent of the design earthquake load in the other direction to account for earthquake effects. Earthquake Design Vertical Load: The design vertical force must be calculated according to "Clause: 6.4.5 of IS-1893 (2002)" in order to account for impacts caused by vertical earthquake loads (2002). That is, it is possible to apply up to two-thirds of the spectrum of horizontal accelerations to vertical motions. To evaluate responses from all three earthquake components, it is sufficient to assume that, when the maximum response from one component occurs, the responses from the other two components are only 30% of their maximum. All possible combinations of the three variables must be considered, as well as any significant changes that may occur "(ELx, Ely, and ELz, where x and y are two orthogonal directions and z is the vertical direction)".three scenarios "Clause: 6.3.4.1, IS 1893-2002" "Clause: 6.3.4.1, IS 1893-2002"

* " ± ELx ±0.3 Ely ±0.3 ELz"
* " ±0.3 ELx ± Ely ±0.3 ELz "
* " ±0.3 ELx ±0.3 Ely ± ELz"

If you choose, you may also calculate the EL that results from the interaction of the three components using SRSS (Clause: 6.3.4.2, IS 1893-2002) instead of the method described above.

In a nutshell: EL = (ELx)2 + (Ely)2 + (ELz)2

4- Fundamental period

The empirical expression can be used to calculate the approximate fundamental natural period of vibration (Ta) of a moment-resisting frame building in seconds without brick infill panels: IS-1893 Section 7.6.1 (2002)

Ta = 0.075h0.75.. (For RC frame building)

Ta = 0.085h .... (For steel frame building)

All other structures, including moment-resisting frame constructions with brick infill panels, can utilize the empirical expression to estimate their fundamental natural period of vibration (Ta), expressed in seconds: "IS-1893 Section 7.6.2 (2002)"

Ta= (0.09h)/(d)*(1/2)

h is the building's height in meters. This does not include the stories in the basement, where the basement walls are attached to the deck on the ground level or inserted between the building's columns. However, even though they are not closely related, it contains the basement stories.

d is the base dimension of the structure measured in meters along the lateral force's assumed direction.

MODALING

The creating building in ETABS-2015 software according to specific geometry according on column number will done in this chapter according to following step wise :-

4.1 MODEL DESCRIPTION:-

Selected three buildings type same area and same column and beam and thickness slab and same load applied (seismic and wind load) with 15-story concrete framed building, molding according the following table detail with Shear Wall in building and without Shear Wall in each shape

No.	DESCRPTION	DETAIL
1	storey height	3 m
2	beams and columns	3D frame elements
3	beam	400 *300 mm
4	column	550 *350
5	slab thickness	200 Mm
6	strength of concrete	20 Mpa
7	strength of steel	415 Mpa
8	live load in floor	5Kn/m2
9	density of concrete	2500 kg/m3
10	density of brick wall	2000 kg/m3
11	finishing Load	1.5 Kn/m2

Type of building without shear wall:.

1- Shape 1 building without shear wall

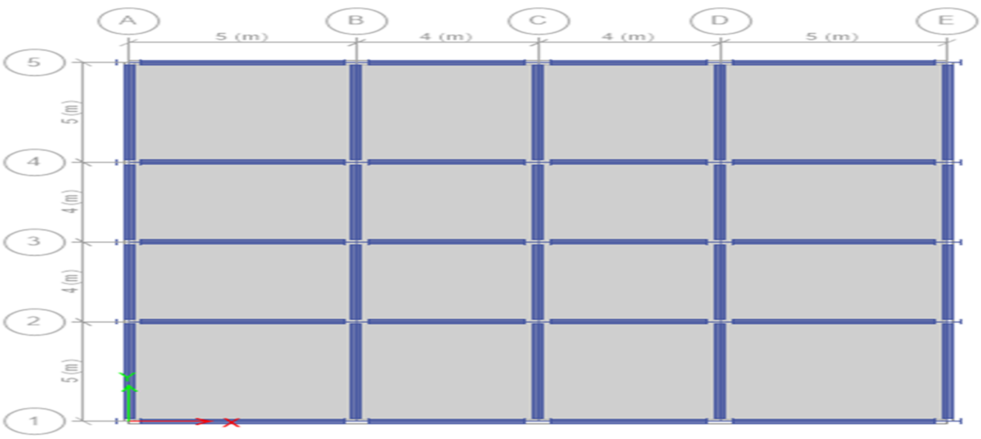

Fig.1 Shape 1 with 25 column (building 1)

Type of the building with shear wall:

1-Shape 2 with 13 column (building 2) and shear wall 32 meter

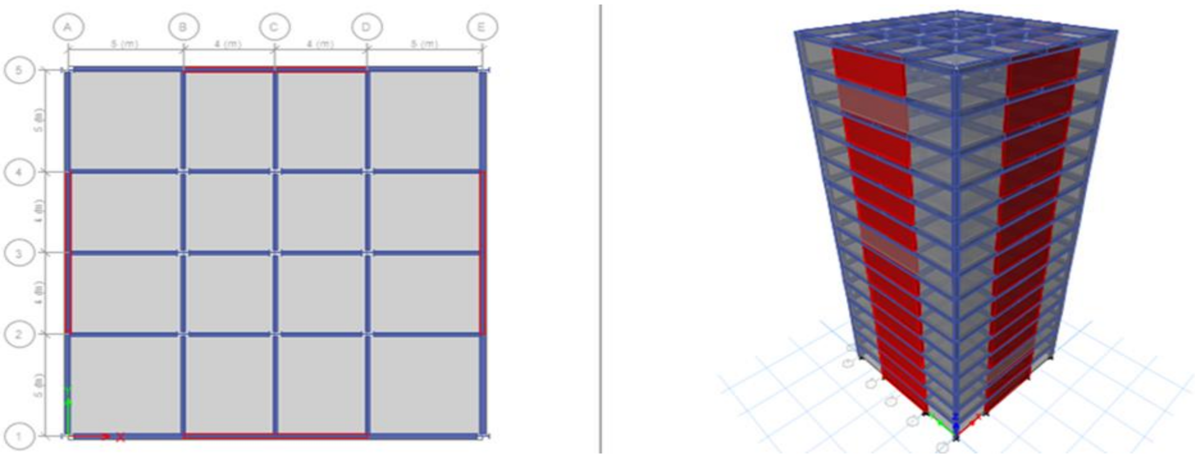

Fig.2 Shape 2 with 13 column (building 2) and shear wall 32 m

2- Shape 3 with 13column (building 3) and shear wall 40 meter

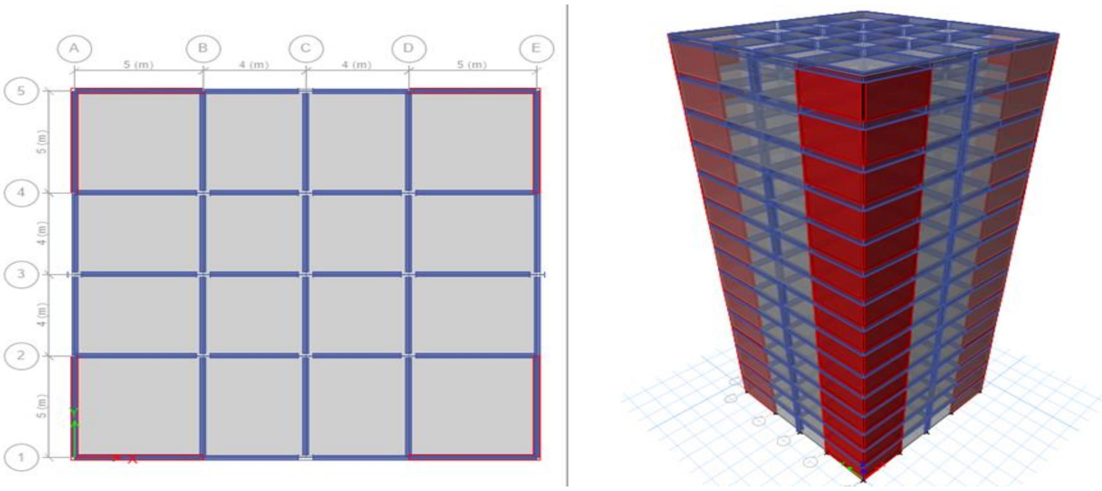

Fig.3 Shape 3 with 13column (building 3) and shear wall 40 m

4- ANALYSIS METHOD

Analysis in this study will done by response spectrum for each building as flowing:-
Linear dynamic Analysis (response spectrum Analysis Method):-
-The input parameter for building considering as-IS 1983-2002 CODE:-
input parameter for building considering as-IS 1983-2002 CODE

1- ZESMIC ZONE = 0.36
2- SOIL TYPE = 1 OR A
3- IMPORTANCE FACTOR = 1.5
4- REDUCTION FACTER = 5
5- Wind load = 100

This parameter selected to gives maximum response of building when subjected to earthquake load.

RESULT AND COMPARSION

Analysis Section under effect seismic:.

The output result of the building that done in chapter four will presentation in this chapter and the comparative between the result will done towards the ends of each item , the items that will be study for each building as following:-

1- Time Periods, frequency

case	mode	shape1	shape2	shape3
modal	mode	Period1	Period2	Period3
modal	1	**2.381304**	**1.14807**	**1.219223**
modal	2	2.117492	1.111032	1.190608
modal	3	1.954874	0.682223	0.812046
modal	4	0.784075	0.256611	0.270573
modal	5	0.688284	0.253059	0.267627
modal	6	0.642607	0.146248	0.177564
modal	7	0.456742	0.108565	0.113325
modal	8	0.392137	0.107813	0.112644
modal	9	0.375473	0.063668	0.073881
modal	10	0.318415	0.063336	0.066038
modal	11	0.266321	0.062256	0.065719
modal	12	0.25869	0.043854	0.045456

Table1 Time Periods& frequency between building with 3shapes.

1-Time Periods, frequency (Comparison between Time-Periods of building with 3 shapes)

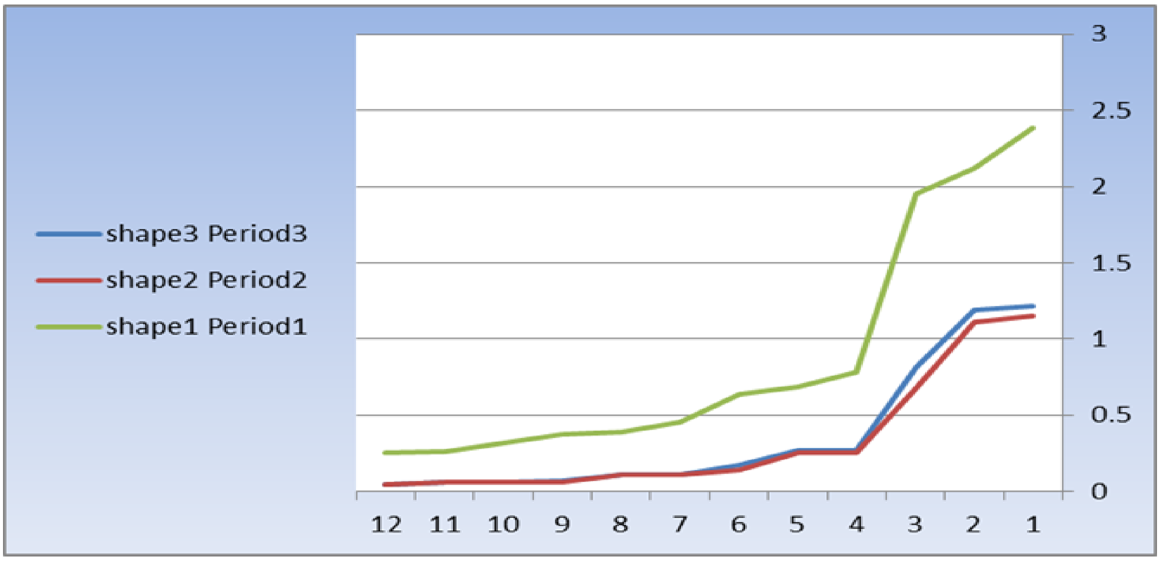

Fig.4 Comparison between Time-Periods of building with 3shapes

-From the Fig.4 can observed that time periods of building with shape 1 external configuration have highest time periods -

- From the Fig.4 can observed that time periods of building with shape 2 have the lowest time periods between all buildings.

-The difference between the highest and lowers time periods approximately change from (83) % according to number of modal.

-All the difference in time periods in another building lies between this ranges of time periods.

- The shape (modal) 1 the best from all building under effects seismic by time periods in building.

2- Inter Story

Table2 inter story between building with 3shapes

stories	load	story drift1	story drift2	story drift3
base	SPEC	Shape1	Shape2	Shape3
1	SPEC	0.000584	0.000096	0.000101
2	SPEC	0.001059	0.000216	0.000225
3	SPEC	**0.001153**	0.00031	0.000326
4	SPEC	0.00114	0.000386	0.000407
5	SPEC	0.001099	0.000446	0.000472
6	SPEC	0.001052	0.000492	0.000521
7	SPEC	0.001003	0.000526	0.000558
8	SPEC	0.000953	0.000549	0.000584
9	SPEC	0.000901	0.000563	0.000600
10	SPEC	0.000842	**0.000570**	0.000608
11	SPEC	0.000771	0.000569	**0.000609**
12	SPEC	0.000685	0.000564	0.000604
13	SPEC	0.000576	0.000554	0.000595
14	SPEC	0.000442	0.000542	0.000584
15	SPEC	0.000298	0.000529	0.000571

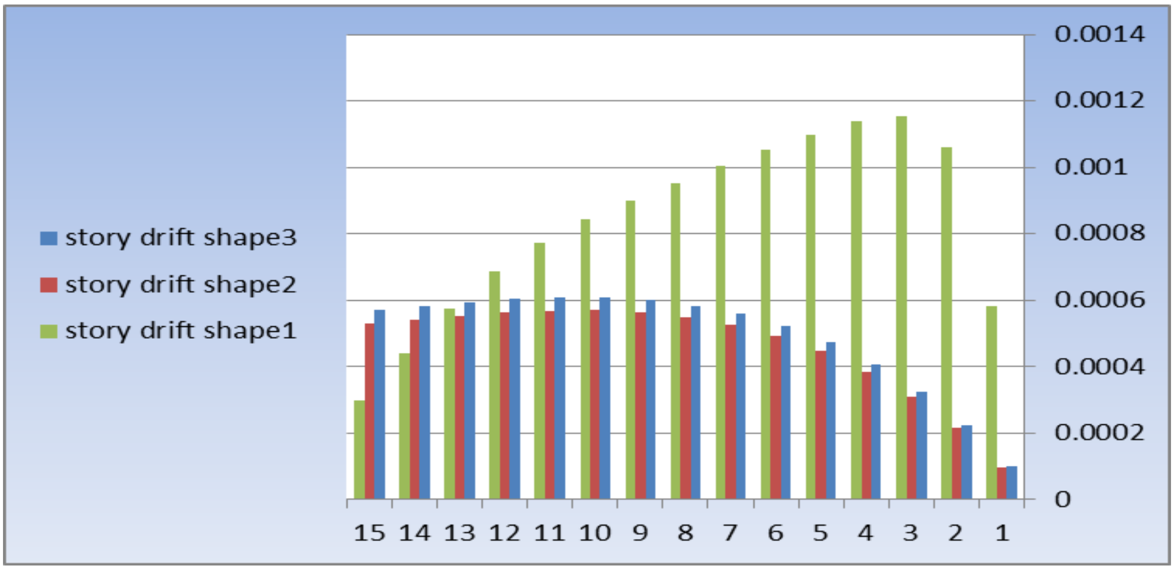

Fig.5 Comparison between inter story drift of building with 3shapes

-From the Fig.5 can observed that inter story drift of building with shape 1 external configuration have highest value.

-The difference between the highest and lowers inter story drift approximately (74%) according to number of modal..

-All the difference in inter story drift and bending moment for another building between this ranges of time periods .

- Maximum of the value inter-story drift in shape 1 is (**0.001153**).
- Maximum of the value inter-story drift in shape 2 is (**0.000570**).
- Maximum of the value inter-story drift in shape 1 is (**0.000609**).
- All shapes is check the permissible value with IS code (.004xheight of story)in this building
- The shape (modal) 1 the best from all building under effects seismic by inter story drift of building.

3- Displacement

Table3 displacement between building with 3shapes

stores	load	Ux1	Ux2	Ux3
	SPEC	Shape1	Shape2	Shape3
Base	SPEC	0	0	0
1	SPEC	0.0018	0.0003	0.0003
2	SPEC	0.0049	0.0009	0.001
3	SPEC	0.0084	0.0019	0.002
4	SPEC	0.0118	0.003	0.0032
5	SPEC	0.0150	0.0044	0.0046
6	SPEC	0.0180	0.0058	0.0061
7	SPEC	0.0208	0.0074	0.0078
8	SPEC	0.0234	0.0090	0.0095
9	SPEC	0.0258	0.0107	0.0113
10	SPEC	0.0280	0.0124	0.0131
11	SPEC	0.0299	0.0141	0.0149
12	SPEC	0.0316	0.0157	0.0167
13	SPEC	0.0329	0.0173	0.0184
14	SPEC	0.0339	0.0189	0.0202
15	SPEC	**0.0346**	**0.0205**	**0.0218**

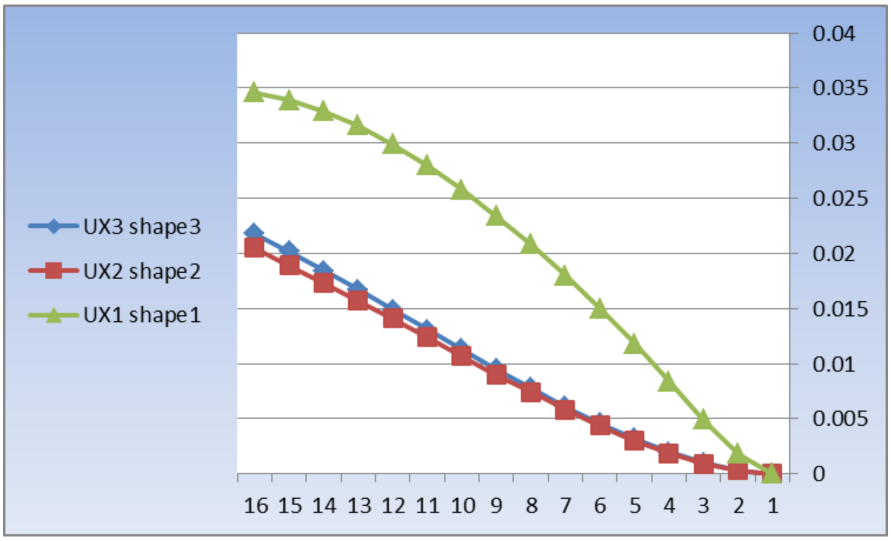

Fig.6 Comparison between displacement of building with 3shapes.

- From the Figure 6 can observed that Displacement of the building with shape 2 have the lowest value between all buildings.
-The difference between the highest and lowers displacement approximately (94%) according to number of modal..
-All the difference in displacement t for another building between this ranges of time periods .
-The maximum value of displacement in shape 1 is (**0.0346**).
- Maximum of the value inter-story drift in shape 2 is (**0.0205**).
- Maximum of the value inter-story drift in shape 1 is (**0.0218**).
- The shape (modal) 2 the best from all building under effects seismic by displacement of building.

Conclusion

The behaviour of 15 stores building under the effect of seismic force and wind force presented and comparative studies between the response of building with shear wall in one modal and two modal without shear wall to the seismic load and wind load according to IS code will done , the first building with (25) columns building without shear wall and the second building with with 13 column and shear wall 23 meter and third building 13column and shear wall 40 meter, in this research will explain how that change of column distribution effect on response of building to the Time Periods& frequency, inter story drift and lateral displacement after analysis and comparison performance of each modal in chapter five we can conclude the following point
Under seismic load

1- Time periods

1-The maximum time periods in 1 modal (shape1)is (2.381304 second) and the maximum time periods in 2 modal (shape2) (1.14807)
2- As number of column decrease then time periods will increase
3- The difference between the maximum time periods and minimum time periods change from (83) % according to modal number
4-From the above point can consider that **building no.1** is the best time periods

2- Inter story drift

-From the Fig.5 can observed that inter story drift of building with shape 1 external configuration have highest value.

-The difference between the highest and lowers inter story drift approximately (74%) according to number of modal..

-All the difference in inter story drift and bending moment for another building between this ranges of time periods .

- Maximum of the value inter-story drift in shape 1 is (0.001153).
- Maximum of the value inter-story drift in shape 2 is (0.000570).
- Maximum of the value inter-story drift in shape 1 is (0.000609).
- All shapes is check the permissible value with IS code (.004xheight of story)in this building
- The **shape (modal) 1 the best** from all building under effects seismic by inter story drift of building.

3- Displacement

1- From the Figure 6 can observed that Displacement of Building with Shape 2 have the Lowest value between all buildings.

2-The difference between the highest and lowers displacement approximately (94%) according to number of modal..

3-All the difference in displacement t for another building between this ranges of time periods .

4-The Maxi. value of Displacement in shape 1 is (0.0346).

5-Maximum of the value inter-story drift in shape 2 is (0.0205).

6-Maximum of the value inter-story drift in shape 1 is (0.0218).

7-The **shape (modal) 2 the best** from all building under effects seismic by displacement of building.

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