American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-03, Issue-10, pp-188-202
www.ajer.org

Research Paper Open Access

Study the Effective of Shear Wall on Behavior of Beam in Frame Structure

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ABSTRACT:*Shear walls are a type of structural system that provides lateral resistance to a building or structure. They resist in-plane loads that are applied along its height. The applied load is generally transferred to the wall by a diaphragm or collector or drag member. The performance of the framed buildings depends on the structural system adopted for the structure The term structural system or structural frame in structural engineering refers to load-resisting sub-system of a structure. The structural system transfers loads through interconnected structural components or members. These structural systems need to be chosen based on its height and loads and need to be carried out, etc. The selection of appropriate structural systems for building must satisfy both strength and stiffness requirements. The structural system must be adequate to resist lateral and gravity loads that cause horizontal shear deformation and overturning deformation. Other important issues that must be considered in planning the structural schemes and layouts are the requirements for architectural details, building services like vertical transportation and fire safety among others. Each of the structural system will be having its own prospects and considerations. The efficiency of a structural system is measured in terms of their ability to resist lateral load, which increases with the height of the frame. A building can be considered as tall when the effect of lateral loads is reflected in the design. Lateral deflections of framed buildings should be limited to prevent damage to both structural and nonstructural elements. In the present study, the structural performance of the framed building with shear wall will be analysis. The importance of the shear wall in resist the wind and earthquake load are study, the effect of the shear walls on the conventional frame system. The improvement in the structural performance of the building with frame system by using shear wall is study.*

Key words:Shear walls, Wind Load, Earthquake Load, frame system

I. INTRODUCTION

What Causes Lateral Loads?

Lateral loads result from wind or earthquake actions and both can cause a collapse of improperly braced building. The way that wind or earthquake loads act on a building is completely different, but they have the same general effect. These two sources of lateral load are discussed below.

Wind Load

Wind load is really the result of wind pressures acting on the building surfaces during a wind event. This wind pressure is primarily a function of the wind speed because the pressure or load increases with the square of the wind velocity (i.e., doubling of wind speed results in a four-fold increase in wind load or pressure). Wind load during a hurricane can last hours and a building experiences sustained wind load and short wind impacts (gusts). While the wind pressures are treated as a “static” (do not vary with time) or constant load for purposes of design, the real loads actually fluctuate dramatically with gustiness of wind as well as wind direction. Two fundamental wind effects are of a concern: (1)localized “spikes” in wind pressure that act on small areas of a building to cause damage to items such as roof panels or siding (known as components and cladding wind loads in engineering terms) and (2)averaged wind loads that act on larger areas of the building which the entire structure must resist(known in engineering terms as main wind force resisting system loads).

Earthquake Load

Earthquake forces experienced by a building result from ground motions (accelerations) which are also fluctuating or dynamic in nature, in fact they reverse direction some what chaotically. The magnitude of an earthquake force depends on the magnitude of an earthquake, distance from the earthquake source(epicenter), local ground conditions that may amplify ground shaking (or dampen it), the weight(or mass) of the structure, and the type of structural system and its ability to with stand abusive cyclic loading. In theory and practice, the lateral force that a building experiences from an earthquake increases in direct proportion with the acceleration of ground motion at the building site and the mass of the building (i.e., a doubling in ground motion acceleration or building mass will double the load).This theory rests on the simplicity and validity of Newton's law of physics: F = m x a, where 'F' represents force, 'm' represents mass or weight, and 'a' represents acceleration. For example, as a car accelerates forward, a force is imparted to the driver through the seat to push him forward with the car(this force is equivalent to the weight of the driver multiplied by the acceleration or rate of change in speed of the car). As the brake is applied, the car is decelerated and a force is imparted to the driver by the seat-belt to push him back toward the seat. Similarly, as the ground accelerates back and forth during an earthquake it imparts back-and-forth(cyclic) forces to a building through its foundation which is forced to move with the ground. One can imagine a very light structure such as fabric tent that will be undamaged in almost anyearthquake but it will not survive high wind. The reason is the low mass (weight) of the tent. Therefore, residential buildings generally perform reasonably well in earthquakes but are more vulnerable in high-wind load prone areas. Regardless, the proper amount of bracing is required in both cases.

Why Are Buildings With Shear Walls Preferred In Seismic Zones?

Reinforced concrete (RC) buildings often have vertical plate-like RC walls called Shear Walls in addition to slabs, beams and columns. These walls generally start at foundation level and are continuous throughout the building height. Their thickness can be as low as 150mm, or as high as 400mm in high rise buildings. Shear walls are usually provided along both length and width of buildings. Shear walls are like vertically-oriented wide beams that carry earthquake loads downwards to the foundation.

"We cannot afford to build concrete buildings meant to resist severe earthquakes without shear walls." Mark Fintel, a noted consulting engineer in USA Shear walls in high seismic regions requires special detailing. However, in past earthquakes, even buildings with sufficient amount of walls that were not specially detailed for seismic performance (but had enough well-distributed reinforcement) were saved from collapse. Shear wall buildings are a popular choice in many earthquake prone countries, like Chile, New Zealand and USA. Shear walls are easy to construct, because reinforcement detailing of walls is relatively straight-forward and therefore easily implemented at site. Shear walls are efficient; both in terms of construction cost properly designed and detailed buildings with Shear walls have shown very good performance in past earthquakes. The overwhelming success of buildings with shear walls in resisting strong earthquakes is summarized in the quote: And effectiveness in minimizing earthquake damage in structural and non- Structural elements (like glass windows and building contents).

When a building is subjected to wind or earthquake load, various types of failure must be prevented:

- slipping off the foundation (sliding)
- overturning and uplift (anchorage failure)
- shear distortion (drift or racking deflection)
- collapse (excessive racking deflection)

The first three types of failure are schematically shown in the Figure 1: Clearly, the entire system must be tied together to prevent building collapse or significant deformation.

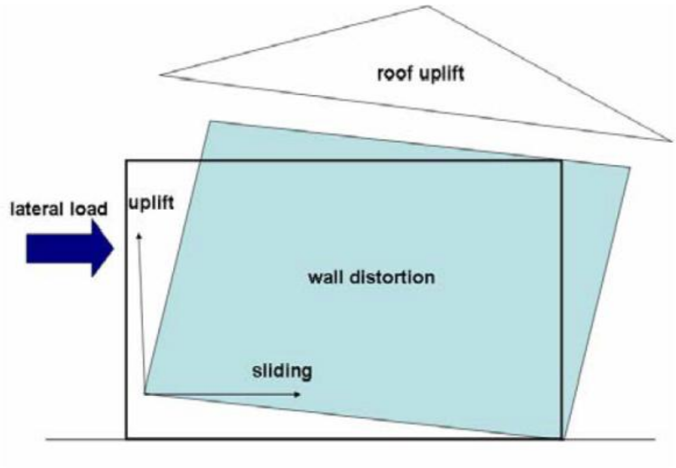


Fig 1: Schematic of the deformations of the structure due to the lateral loads

II. METHODOLOGY

Earthquake motion causes vibration of the structure leading to inertia forces. Thus a structure must be able to safely transmit the horizontal and the vertical inertia forces generated in the super structure through the foundation to the ground. Hence, for most of the ordinary structures, earthquake-resistant design requires ensuring that the structure has adequate lateral load carrying capacity. Seismic codes will guide a designer to safely design the structure for its intended purpose.

Quite a few methods are available for the earthquake analysis of buildings; two of them are presented here:

1- Equivalent Static Lateral Force Method (pseudo static method).
2- Dynamic analysis.
I. Response spectrum method.
II. Time history method.

Equivalent lateral Force (Seismic Coefficient) Method

This method of finding lateral forces is also known as the static method or the equivalent static method or the seismic coefficient method. The static method is the simplest one and it requires less computational effort and is based on formulae given in the code of practice.

In all the methods of analyzing a multi storey buildings recommended in the code, the structure is treated as discrete system having concentrated masses at floor levels which include the weight of columns and walls in any storey should be equally distributed to the floors above and below the storey. In addition, the appropriate amount of imposed load at this floor is also lumped with it. It is also assumed that the structure flexible and will deflect with respect to the position of foundation the lumped mass system reduces to the solution of a system of second order differential equations. These equations are formed by distribution, of mass and stiffness in a structure, together with its damping characteristics of the ground motion.

Dynamic Analysis

Dynamic analysis shall be performed to obtain the design seismic force, and its distribution in different levels along the height of the building, and in the various lateral load resisting element, for the following buildings:

Regular buildings**:** Those greater than 40m in height in zones IV and V, those greater than 90m in height in zone II and III.

Irregular buildings**:** All framed buildings higher than 12m in zones IV and V, and those greater than 40m in height in zones II and III.

The analysis of model for dynamic analysis of buildings with unusual configuration should be such that it adequately models the types of irregularities present in the building configuration. Buildings with plan irregularities, as defined in Table 4 of IS code: 1893-2002 cannot be modeled for dynamic analysis.

Dynamic analysis may be performed either by the TIME HISTORY METHOD or by the RESPONSE SPECTRUM METHOD

Time History Method

The usage of this method shall be on an appropriate ground motion and shall be performed using accepted principles of dynamics. In this method, the mathematical model of the building is subjected to accelerations from earthquake records that represent the expected earthquake at the base of the structure.

Response Spectrum Method

The word spectrum in engineering conveys the idea that the response of buildings having a broad range of periods is summarized in a single graph. This method shall be performed using the design spectrum specified in code or by a site-specific design spectrum for a structure prepared at a project site. The values of damping for building may be taken as 2 and 5 percent of the critical, for the purposes of dynamic of steel and reinforce concrete buildings, respectively. For most buildings, inelastic response can be expected to occur during a major earthquake, implying that an inelastic analysis is more proper for design. However, in spite of the availability of nonlinear inelastic programs, they are not used in typical design practice because:

1- Their proper use requires knowledge of their inner workings and theories. design criteria, and
2- Result produced are difficult to interpret and apply to traditional design criteria , and
3- The necessary computations are expensive.

Therefore, analysis in practice typically use linear elastic procedures based on the response spectrum method. The response spectrum analysis is the preferred method because it is easier to use.

III. NUMERICAL ANALYSES

STRUCTURE

G+19 earthquake resistant structure with shear walls

Problems In The Building Due To Earthquake

Main problems that would be arising due to earthquake in the structure are story drift and deflection of the building due to its large height and also torsion and others, so if the structure is proved to be safe in all the above mentioned problems than the structure would be safe in all cases in respect earthquake.

Geometrical Properties

1.No.of stories of the Building model=20
2.Column size=500 mm x 500 mm
3.Beam size= 700 mm x 500 mm
4.Slab thickness=200mm

Loads

1.Live Load=3KN/m2
2.Wall Load=12.4KN/m
3.Floor Finishing =1KN/m2
4. Wind load

Wind coefficients
(i) Wind Speed=50m/s
(ii)Terrain Category =2
(iii) Structure Class=B
(iv) Risk Coefficient(k1)=1
(v)Topography(k3)=1

Seismic loading
(i) Seismic zone factor(Z)=0.36
(ii) Soil Type= Medium(II)
(iii) Response Reduction factor(R) =5%
(iv) Story Range=Base to 20
(v) Important factor(I)=1

Material Properties

Table I The materials used in structure and their general properties are

Material	Unit weight	Elastic Modulus	Shear Modulus	Poisson Ratio	Thermal expansion coefficient
Text	KN/m3	KN/m2	KN/m2	Unit less	1/C
Concrete	23.563	24855578.28	10356490.95	0.2	0.0000099
Rebar steel	76.973	199947978.8	76903068.77	0.3	0.0000117
Bar steel	76.9730	199947978.8	769030068.77	0.3	0.0000117

Load Combinations

Load combination is the foremost important criteria for designing any structure and more important is the distribution of those loads on to various components of the structure like beams, columns, slabs and in our case shears walls and concrete core wall too. There are many kinds of loads existing depending on the location of the where the structure is to be constructed for example in a place where wind is frequent there we have to consider the wind loads and places where rains are heavy rain loads are included and same way all the other loads such as snow loads, earthquake load and etc. are included however DEAD LOADS, LIVE LOADS AND IMPOSEDLOADS are always included. Dead loads are all common depending onthe structural components and specific gravity of the structure, to get the self weight of the structural component volume or area of the component is multiplied by the specific gravity of the component. Live loads depend on the purpose we are constructing the building. Imposed loads depend on the seismic loads, dead loads and according to are 1893 part 1 percentage of those values is finally considered.

The following Load Combinations have been considered for the design

1. 1.5(DL+ LL)
2. 1.5(DL ± EQXTP)
3. 1.5(DL ± EQYTP)
4. 1.5(DL ± EQXTN)
5. 1.5(DL ± EQYTN)
6. 1.2(DL + LL ± EQXTP)
7. 1.2(DL + LL ± EQYTP)
8. 1.2(DL + LL ± EQXTN)
9. 1.2(DL + LL ± EQYTN)
10. 1.5(DL ± WLX)
11. 1.5(DL ± WLY)
12. 1.2(DL + LL ± WLX)
13. 1.2(DL + LL ± WLY)

DL – Dead Load

LL – Live Load

EQTP–Earthquake load

With torsion positive

EQTN–Earthquake load

With torsion negative

WL- Wind load

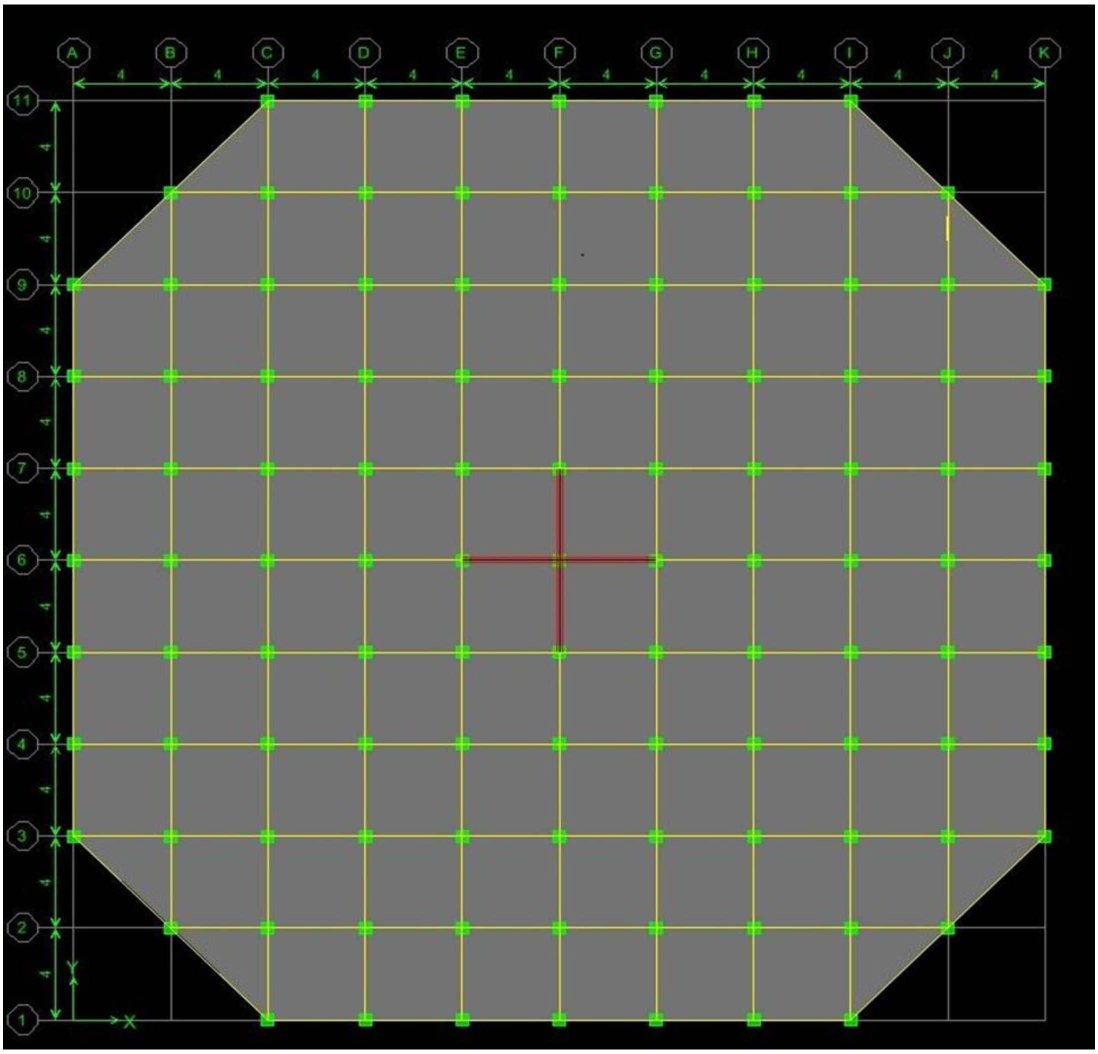
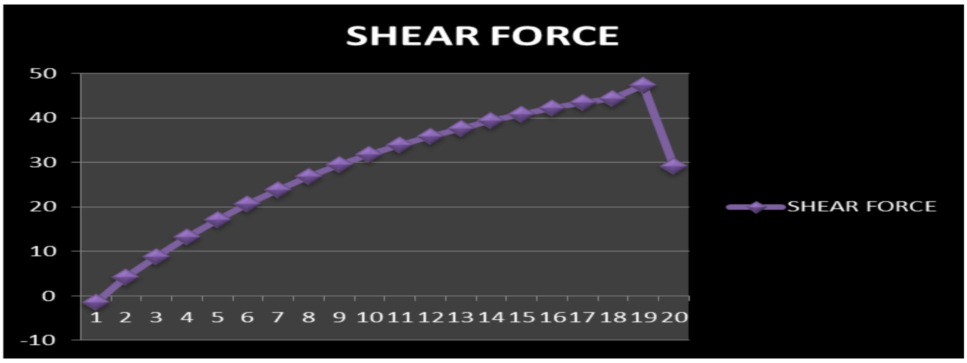
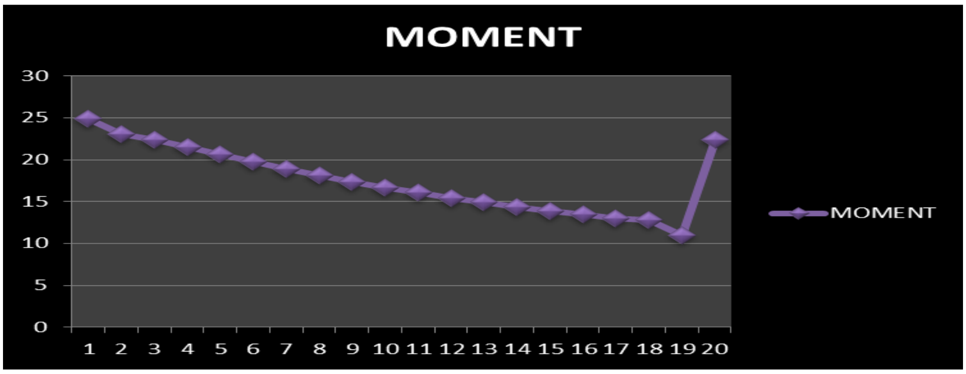


Figure2: Basic Plan of The Building

Table II: Shear Force, Torsion and Moment for Beam B1

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B1	1.2DLLLWLX	2.25	0	-1.53	-0.372	24.927
STORY2	B1	1.2DLLLWLX	2.25	0	4.28	-0.893	23.077
STORY3	B1	1.2DLLLWLX	2.25	0	8.83	-1.261	22.389
STORY4	B1	1.2DLLLWLX	2.25	0	13.15	-1.617	21.487
STORY5	B1	1.2DLLLWLX	2.25	0	17.1	-1.932	20.602
STORY6	B1	1.2DLLLWLX	2.25	0	20.69	-2.214	19.736
STORY7	B1	1.2DLLLWLX	2.25	0	23.92	-2.463	18.908
STORY8	B1	1.2DLLLWLX	2.25	0	26.84	-2.683	18.126
STORY9	B1	1.2DLLLWLX	2.25	0	29.47	-2.878	17.39
STORY10	B1	1.2DLLLWLX	2.25	0	31.84	-3.049	16.702
STORY11	B1	1.2DLLLWLX	2.25	0	33.99	-3.2	16.058
STORY12	B1	1.2DLLLWLX	2.25	0	35.93	-3.334	15.457
STORY13	B1	1.2DLLLWLX	2.25	0	37.71	-3.452	14.897
STORY14	B1	1.2DLLLWLX	2.25	0	39.33	-3.556	14.374
STORY15	B1	1.2DLLLWLX	2.25	0	40.82	-3.65	13.886
STORY16	B1	1.2DLLLWLX	2.25	0	42.2	-3.732	13.438
STORY17	B1	1.2DLLLWLX	2.25	0	43.49	-3.811	12.995
STORY18	B1	1.2DLLLWLX	2.25	0	44.42	-3.849	12.841
STORY19	B1	1.2DLLLWLX	2.25	0	47.46	-3.996	10.936
STORY20	B1	1.2DLLLWLX	2.25	0	29.08	-4.471	22.397





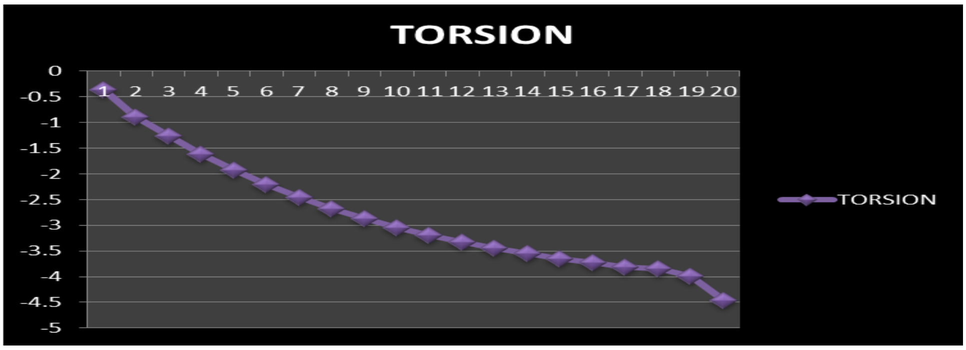


Figure 3: Shear Force, Torsion and Moment for Beam B1

Table III :Shear Force, Torsion and Moment for Beam B10

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B10	12DLLLWLX	2.25	0	6.26	-0.014	15.691
STORY2	B10	12DLLLWLX	2.25	0	6.32	-0.023	15.645
STORY3	B10	12DLLLWLX	2.25	0	6.36	-0.035	15.601
STORY4	B10	12DLLLWLX	2.25	0	6.4	-0.046	15.559
STORY5	B10	12DLLLWLX	2.25	0	6.44	-0.057	15.517
STORY6	B10	12DLLLWLX	2.25	0	6.47	-0.068	15.476
STORY7	B10	12DLLLWLX	2.25	0	6.5	-0.078	15.437
STORY8	B10	12DLLLWLX	2.25	0	6.53	-0.088	15.4
STORY9	B10	12DLLLWLX	2.25	0	6.56	-0.098	15.364
STORY10	B10	12DLLLWLX	2.25	0	6.59	-0.107	15.331
STORY11	B10	12DLLLWLX	2.25	0	6.61	-0.115	15.299
STORY12	B10	12DLLLWLX	2.25	0	6.63	-0.123	15.271
STORY13	B10	12DLLLWLX	2.25	0	6.65	-0.131	15.245
STORY14	B10	12DLLLWLX	2.25	0	6.66	-0.137	15.223
STORY15	B10	12DLLLWLX	2.25	0	6.68	-0.143	15.204
STORY16	B10	12DLLLWLX	2.25	0	6.69	-0.148	15.188
STORY17	B10	12DLLLWLX	2.25	0	6.7	-0.152	15.176
STORY18	B10	12DLLLWLX	2.25	0	6.7	-0.154	15.167
STORY19	B10	12DLLLWLX	2.25	0	6.73	-0.157	15.169
STORY20	B10	12DLLLWLX	2.25	0	6.48	-0.202	15.075

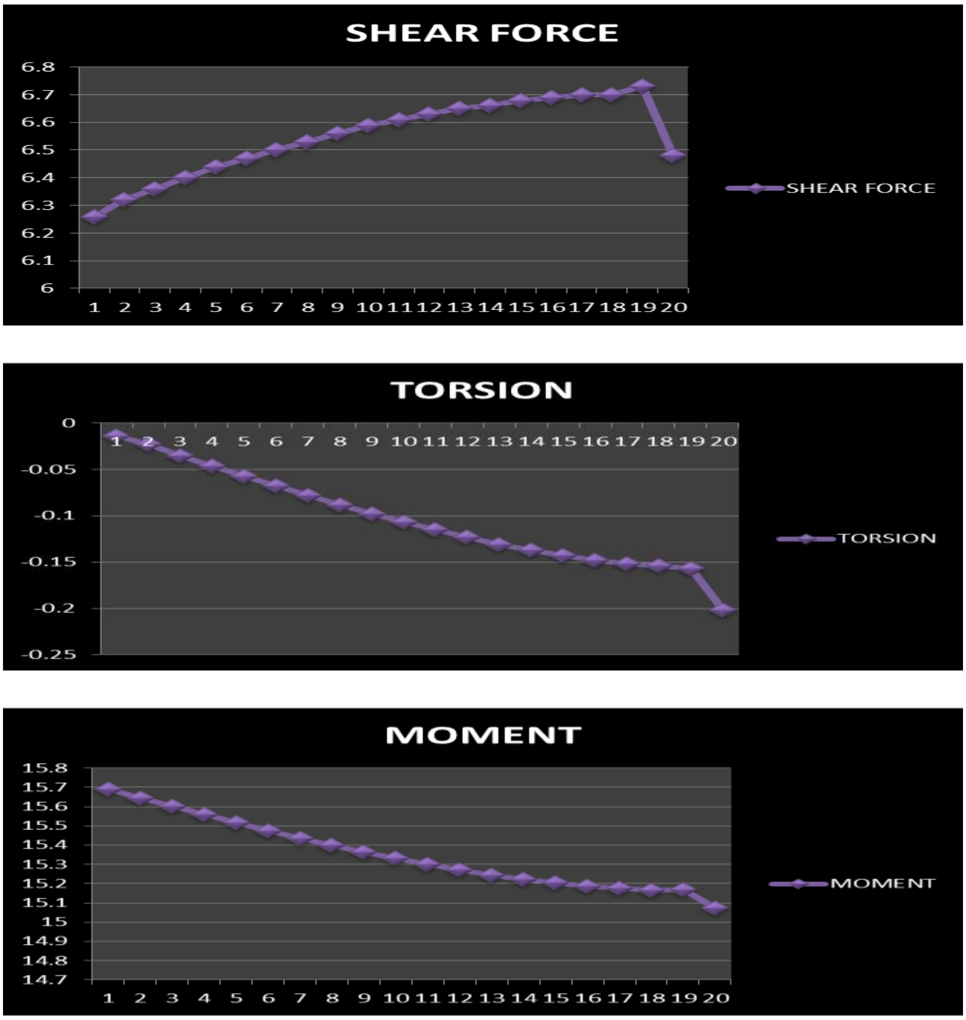
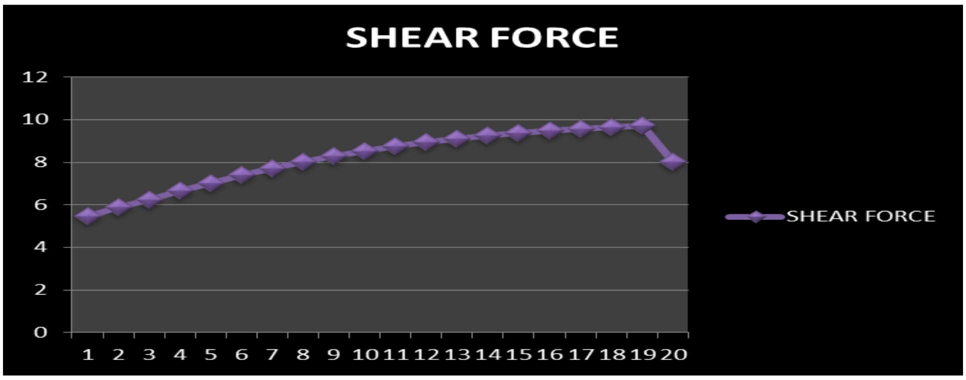
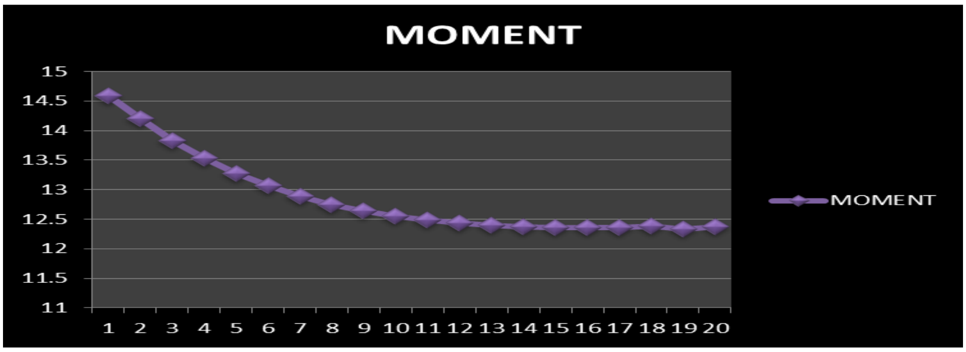


Figure 4:Shear Force, Torsion and Moment for Beam B10

Table IV: Shear Force, Torsion and Moment for Beam B20

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B20	1.2DLLLWLX	2.25	0	5.47	2.791	14.587
STORY2	B20	1.2DLLLWLX	2.25	0	5.88	2.613	14.206
STORY3	B20	1.2DLLLWLX	2.25	0	6.26	2.709	13.834
STORY4	B20	1.2DLLLWLX	2.25	0	6.65	2.75	13.526
STORY5	B20	1.2DLLLWLX	2.25	0	7.03	2.777	13.272
STORY6	B20	1.2DLLLWLX	2.25	0	7.39	2.79	13.062
STORY7	B20	1.2DLLLWLX	2.25	0	7.72	2.795	12.889
STORY8	B20	1.2DLLLWLX	2.25	0	8.02	2.791	12.749
STORY9	B20	1.2DLLLWLX	2.25	0	8.29	2.783	12.638
STORY10	B20	1.2DLLLWLX	2.25	0	8.54	2.77	12.55
STORY11	B20	1.2DLLLWLX	2.25	0	8.76	2.755	12.482
STORY12	B20	1.2DLLLWLX	2.25	0	8.95	2.737	12.432
STORY13	B20	1.2DLLLWLX	2.25	0	9.12	2.717	12.398
STORY14	B20	1.2DLLLWLX	2.25	0	9.26	2.697	12.375
STORY15	B20	1.2DLLLWLX	2.25	0	9.39	2.676	12.363
STORY16	B20	1.2DLLLWLX	2.25	0	9.49	2.655	12.36
STORY17	B20	1.2DLLLWLX	2.25	0	9.57	2.641	12.359
STORY18	B20	1.2DLLLWLX	2.25	0	9.64	2.602	12.383
STORY19	B20	1.2DLLLWLX	2.25	0	9.73	2.663	12.333
STORY20	B20	1.2DLLLWLX	2.25	0	8.04	2.925	12.372





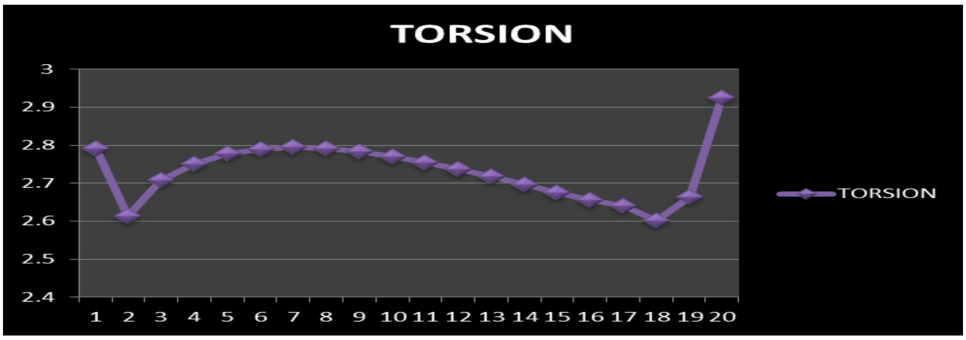
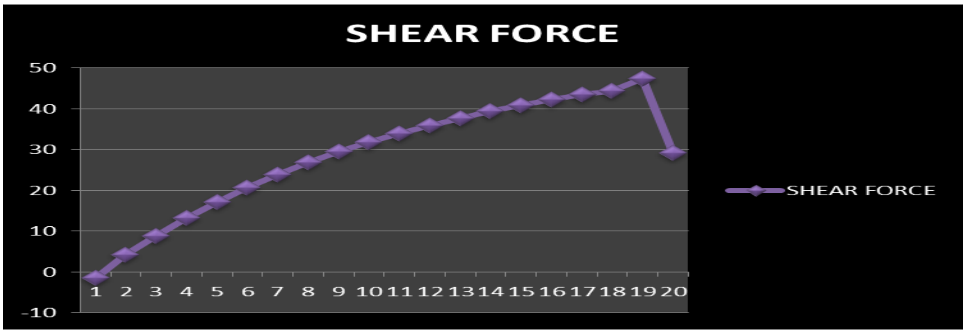
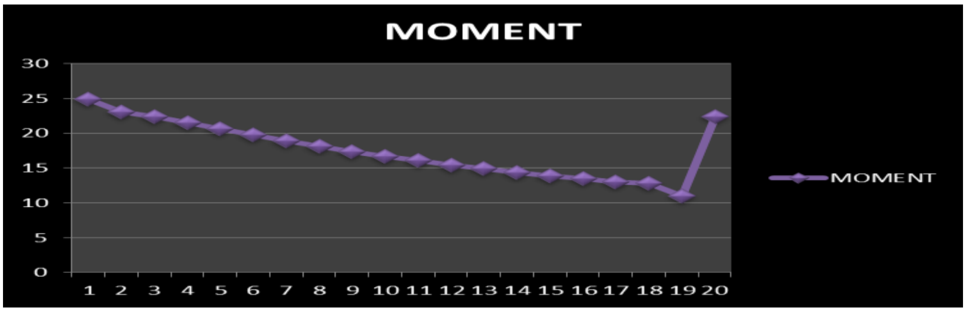


Figure 5:Shear Force, Torsion and Moment for Beam B20

Table V: Shear Force, Torsion and Moment for Beam B1

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B1	1.2DLLLEQY	2.25	0	-1.53	-0.372	24.927
STORY2	B1	1.2DLLLEQY	2.25	0	4.28	-0.893	23.077
STORY3	B1	1.2DLLLEQY	2.25	0	8.83	-1.261	22.389
STORY4	B1	1.2DLLLEQY	2.25	0	13.15	-1.617	21.487
STORY5	B1	1.2DLLLEQY	2.25	0	17.1	-1.932	20.602
STORY6	B1	1.2DLLLEQY	2.25	0	20.69	-2.214	19.736
STORY7	B1	1.2DLLLEQY	2.25	0	23.92	-2.463	18.908
STORY8	B1	1.2DLLLEQY	2.25	0	26.84	-2.683	18.126
STORY9	B1	1.2DLLLEQY	2.25	0	29.47	-2.878	17.39
STORY10	B1	1.2DLLLEQY	2.25	0	31.84	-3.049	16.702
STORY11	B1	1.2DLLLEQY	2.25	0	33.99	-3.2	16.058
STORY12	B1	1.2DLLLEQY	2.25	0	35.93	-3.334	15.457
STORY13	B1	1.2DLLLEQY	2.25	0	37.71	-3.452	14.897
STORY14	B1	1.2DLLLEQY	2.25	0	39.33	-3.556	14.374
STORY15	B1	1.2DLLLEQY	2.25	0	40.82	-3.65	13.886
STORY16	B1	1.2DLLLEQY	2.25	0	42.2	-3.732	13.438
STORY17	B1	1.2DLLLEQY	2.25	0	43.49	-3.811	12.995
STORY18	B1	1.2DLLLEQY	2.25	0	44.42	-3.849	12.841
STORY19	B1	1.2DLLLEQY	2.25	0	47.46	-3.996	10.936
STORY20	B1	1.2DLLLEQY	2.25	0	29.08	-4.471	22.397





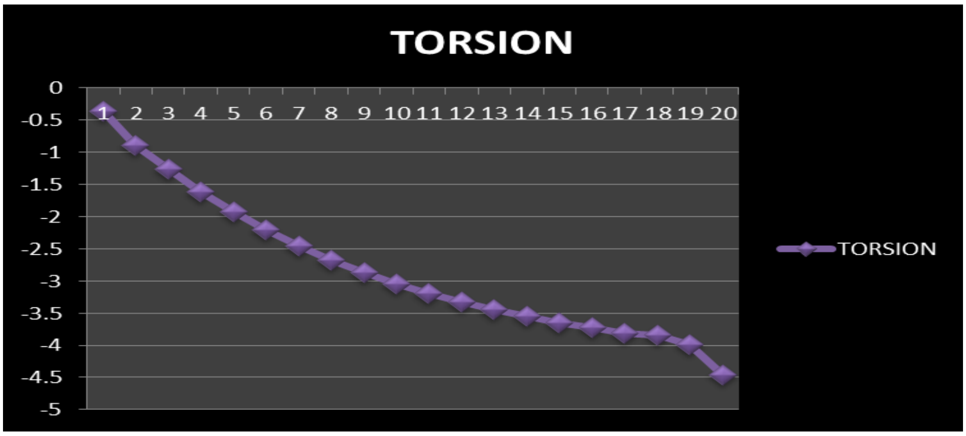
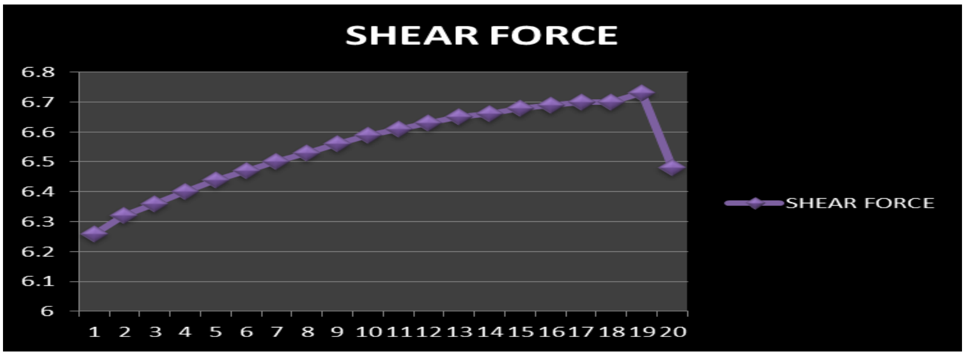
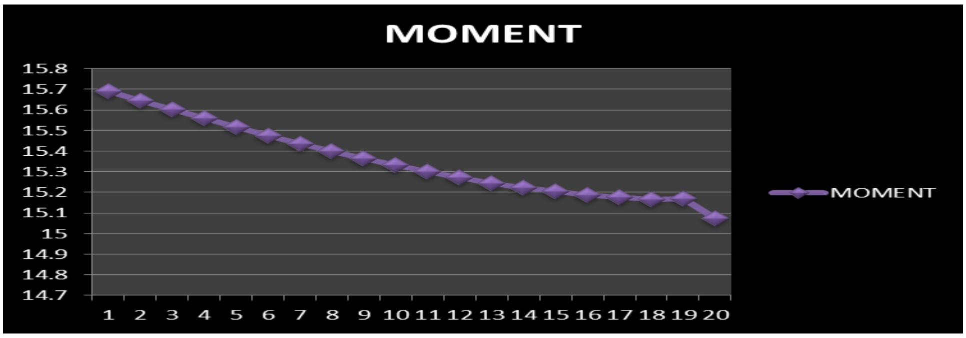


Figure 6:Shear Force, Torsion and Moment for Beam B1

Table VI: Shear Force, Torsion and Moment for Beam B10

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B10	1.2DLLLEQY	2.25	0	6.26	-0.014	15.691
STORY2	B10	1.2DLLLEQY	2.25	0	6.32	-0.023	15.645
STORY3	B10	1.2DLLLEQY	2.25	0	6.36	-0.035	15.601
STORY4	B10	1.2DLLLEQY	2.25	0	6.4	-0.046	15.559
STORY5	B10	1.2DLLLEQY	2.25	0	6.44	-0.057	15.517
STORY6	B10	1.2DLLLEQY	2.25	0	6.47	-0.068	15.476
STORY7	B10	1.2DLLLEQY	2.25	0	6.5	-0.078	15.437
STORY8	B10	1.2DLLLEQY	2.25	0	6.53	-0.088	15.4
STORY9	B10	1.2DLLLEQY	2.25	0	6.56	-0.098	15.364
STORY10	B10	1.2DLLLEQY	2.25	0	6.59	-0.107	15.331
STORY11	B10	1.2DLLLEQY	2.25	0	6.61	-0.115	15.299
STORY12	B10	1.2DLLLEQY	2.25	0	6.63	-0.123	15.271
STORY13	B10	1.2DLLLEQY	2.25	0	6.65	-0.131	15.245
STORY14	B10	1.2DLLLEQY	2.25	0	6.66	-0.137	15.223
STORY15	B10	1.2DLLLEQY	2.25	0	6.68	-0.143	15.204
STORY16	B10	1.2DLLLEQY	2.25	0	6.69	-0.148	15.188
STORY17	B10	1.2DLLLEQY	2.25	0	6.7	-0.152	15.176
STORY18	B10	1.2DLLLEQY	2.25	0	6.7	-0.154	15.167
STORY19	B10	1.2DLLLEQY	2.25	0	6.73	-0.157	15.169
STORY20	B10	1.2DLLLEQY	2.25	0	6.48	-0.202	15.075





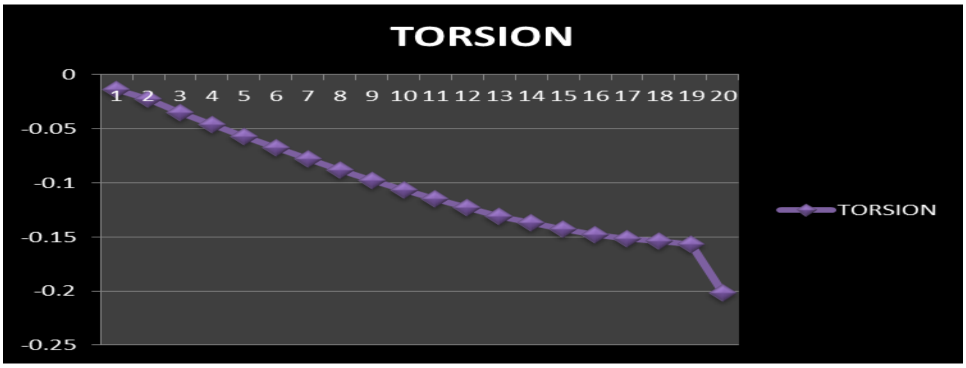


Figure 7: Shear Force, Torsion and Moment for Beam B10

Table VII: Shear Force, Torsion and Moment for Beam B20

Story	Beam	Load	Loc	AXIAL FORCE	SHEAR FORCE	TORSION	MOMENT
STORY1	B20	1.2DLLLEQY	2.25	0	5.47	2.791	14.587
STORY2	B20	1.2DLLLEQY	2.25	0	5.88	2.613	14.206
STORY3	B20	1.2DLLLEQY	2.25	0	6.26	2.709	13.834
STORY4	B20	1.2DLLLEQY	2.25	0	6.65	2.75	13.526
STORY5	B20	1.2DLLLEQY	2.25	0	7.03	2.777	13.272
STORY6	B20	1.2DLLLEQY	2.25	0	7.39	2.79	13.062
STORY7	B20	1.2DLLLEQY	2.25	0	7.72	2.795	12.889
STORY8	B20	1.2DLLLEQY	2.25	0	8.02	2.791	12.749
STORY9	B20	1.2DLLLEQY	2.25	0	8.29	2.783	12.638
STORY10	B20	1.2DLLLEQY	2.25	0	8.54	2.77	12.55
STORY11	B20	1.2DLLLEQY	2.25	0	8.76	2.755	12.482
STORY12	B20	1.2DLLLEQY	2.25	0	8.95	2.737	12.432
STORY13	B20	1.2DLLLEQY	2.25	0	9.12	2.717	12.398
STORY14	B20	1.2DLLLEQY	2.25	0	9.26	2.697	12.375
STORY15	B20	1.2DLLLEQY	2.25	0	9.39	2.676	12.363
STORY16	B20	1.2DLLLEQY	2.25	0	9.49	2.655	12.36
STORY17	B20	1.2DLLLEQY	2.25	0	9.57	2.641	12.359
STORY18	B20	1.2DLLLEQY	2.25	0	9.64	2.602	12.383
STORY19	B20	1.2DLLLEQY	2.25	0	9.73	2.663	12.333
STORY20	B20	1.2DLLLEQY	2.25	0	8.04	2.925	12.372

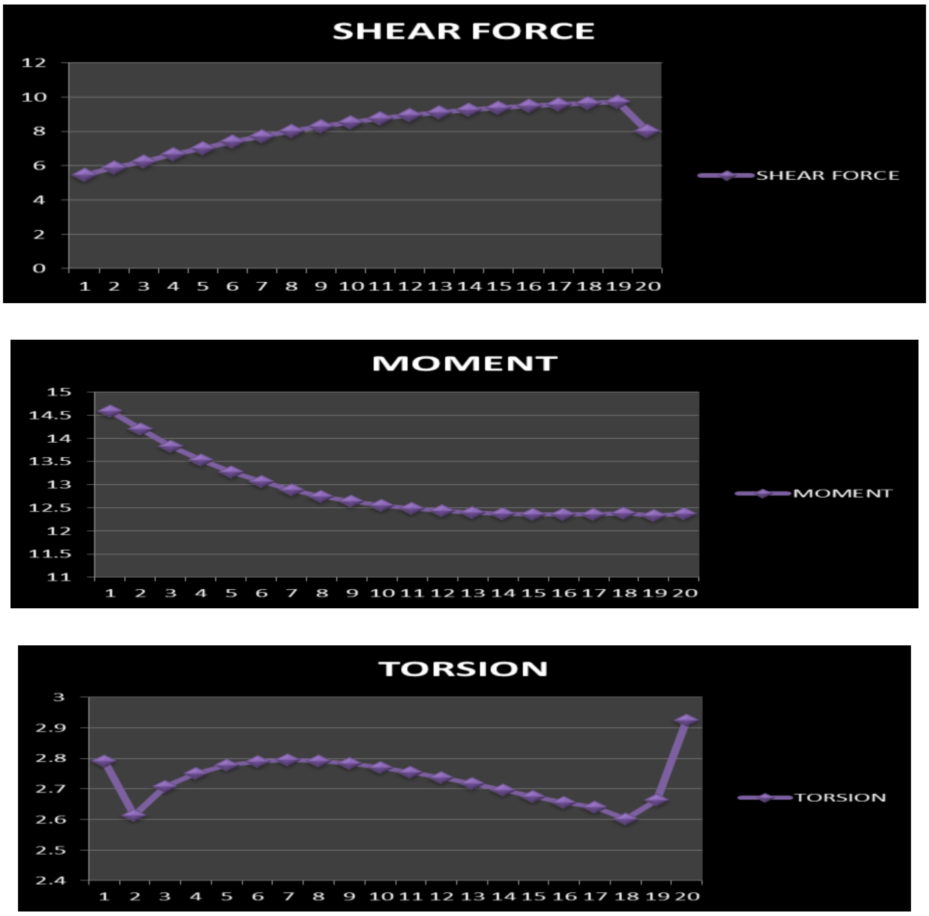
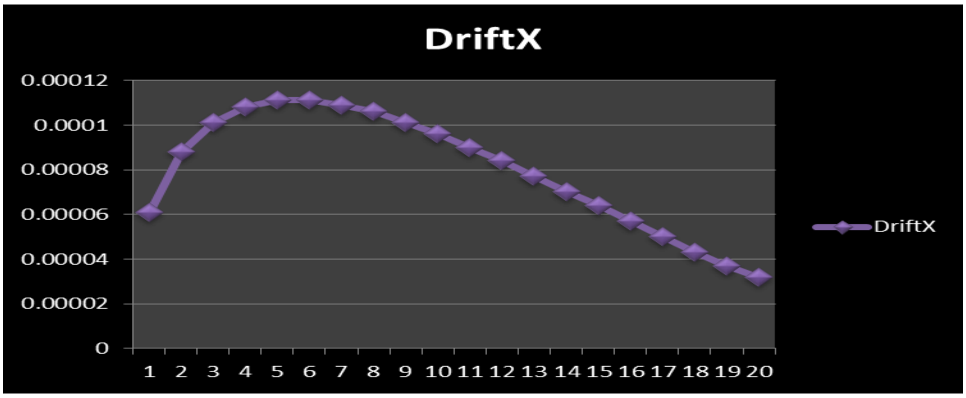


Figure 8:Shear Force, Torsion and Moment for Beam B20

Table VIII: Story Drift in X and Y Direction

Story	Load	DriftX	DriftY
STORY20	DLLLWLX	0.000032	
STORY20	DLLLWLX		0.000026
STORY19	DLLLWLX	0.000037	
STORY19	DLLLWLX		0.000032
STORY18	DLLLWLX	0.000043	
STORY18	DLLLWLX		0.000038
STORY17	DLLLWLX	0.00005	
STORY17	DLLLWLX		0.000044
STORY16	DLLLWLX	0.000057	
STORY16	DLLLWLX		0.000051
STORY15	DLLLWLX	0.000064	
STORY15	DLLLWLX		0.000058
STORY14	DLLLWLX	0.00007	
STORY14	DLLLWLX		0.000065
STORY13	DLLLWLX	0.000077	
STORY13	DLLLWLX		0.000072
STORY12	DLLLWLX	0.000084	
STORY12	DLLLWLX		0.000079
STORY11	DLLLWLX	0.00009	
STORY11	DLLLWLX		0.000086
STORY10	DLLLWLX	0.000096	
STORY10	DLLLWLX		0.000092
STORY9	DLLLWLX	0.000101	
STORY9	DLLLWLX		0.000098
STORY8	DLLLWLX	0.000106	
STORY8	DLLLWLX		0.000103
STORY7	DLLLWLX	0.000109	
STORY7	DLLLWLX		0.000106
STORY6	DLLLWLX	0.000111	
STORY6	DLLLWLX		0.000109
STORY5	DLLLWLX	0.000111	
STORY5	DLLLWLX		0.000109
STORY4	DLLLWLX	0.000108	
STORY4	DLLLWLX		0.000106
STORY3	DLLLWLX	0.000101	
STORY3	DLLLWLX		0.0001
STORY2	DLLLWLX	0.000088	
STORY2	DLLLWLX		0.000088
STORY1	DLLLWLX	0.000061	
STORY1	DLLLWLX		0.000061



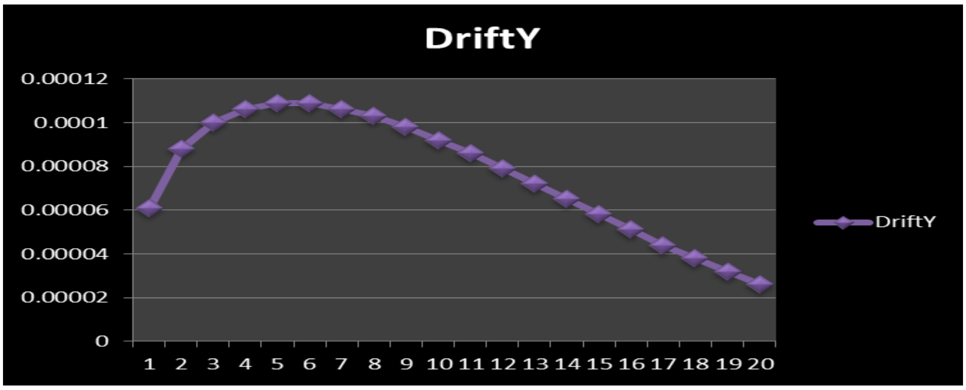


Figure 9:Story Drift in X and Y Direction

IV. DISCUSSION ON RESULTS

The structural prototype is prepared and lots of data is been collected from the prototype. All the aspects such as safety of structure in shear, moment and in story drift have been collected. So now to check whether to know whether the structure is safe with established shear walls and all construction of core wall in the center we need to compare the graphical values of structure with the shear wall and a simple rigid frame structure.

Story Drift

The tallness of a structure is relative and cannot be defined in absolute terms either in relation to height or the number of stories. The council of Tall Buildings and Urban Habitat considers building having 9 or more stories as high-rise structures. But, from a structural engineer's point of view the tall structure or multi-storied building can be defined as one that, by virtue of its height, is affected by lateral forces due to wind or earthquake or both to an extent. Lateral loads can develop high stresses, produce sway movement or cause vibration. Therefore, it is very important for the structure to have sufficient strength against vertical loads together with adequate stiffness to resist lateral forces. So lateral forces due to wind or seismic loading must be considered for tall building design along with gravity forces vertical loads. Tall and slender buildings are strongly wind sensitive and wind forces are applied to the exposed surfaces of the building, whereas seismic forces are inertial (body forces), which result from the distortion of the ground and the inertial resistance of the building. These forces cause horizontal deflection is the predicted movement of a structure under lateral loads and story drift is defined as the difference in lateral deflection between two adjacent stories. Lateral deflection and drift have three effects on a structure; the movement can affect the structural elements (such as beams and columns); the movements can affect non-structural elements (such as the windows and cladding); and the movements can affect adjacent structures. Without proper consideration during the design process, large deflections and drifts can have adverse effects on structural elements, nonstructural elements, and adjacent structures. When the initial sizes of the frame members have been selected, an approximate check on the horizontal drift of the structures can be made. The drift in the non-slender rigid frame is mainly caused by racking. This racking may be considered as comprising two components: the first is due to rotation of the joints, as allowed by the double bending of the girders, while the second is caused by double bending of the columns. If the rigid frame is slender, a contribution to drift caused by the overall bending of the frame, resulting from axial deformations of the columns, may be significant. If the frame has height width ratio less than 4:1, the contribution of overall bending to the total drift at the top of the structure is usually less than 10% of that due to racking. [2]. The following method of calculation for drift allows the separate determination of the components attributable to beam bending, and overall cantilever action. Drift problem as the horizontal displacement of all tall buildings is one of the most serious issues in tall buildingdesign, relating to the dynamic characteristics of the building during earthquakes and strong winds. Drift shall be caused by the accumulated deformations of each member, such as a beam, column and shear wall. In this study analysis is done with changing structural parameters to observe the effect on the drift (lateral deflection) of the tall building due to both wind and earthquake loading. There are three major types of structures were identified in this study, such as rigid frame, coupled shear wall and wall frame structures.

Is 1893 Part 1 CodalProvoisionsForStoreyDriftLimitations

The storey drift in any storey due to the minimum specified design lateral force, with partial load factor of 1.0, shall not exceed 0.004 times the storey height For the purposes of displacement requirements only, it is permissible to use seismic force obtained from the computed fundamental period (T) of the building without the lower bound limit on design seismic force specified in dynamic analysis.

V. CONCLUSION

- It is evident from the observing result that the shear wall are making value of torsion very low.

- The story drift for the combination load DL+LL+WLx in X&Y direction shown same performance for the building, and less value for story drift in all combinations at story 20.The value of story drift is very low because of adding shear walls to the building.
- It is evidentfrom the observing result that for combination loads 1.2 DLLLWLX&1.2DLLLEQY ,maximum value of moment at story one and minimum value of shear force also at story one . The Moment is maximum when the shear force is minimum or changes sign.
- Based on the analysis and discussion ,shear wall are very much suitable for resisting earthquake induced lateral forces in multistoried structural systems when compared to multistoried structural systems whit out shear walls. They can be made to behave in a ductile manner by adopting proper detailing techniques.
- The vertical reinforcement that is uniformly distributed in the shear wall shall not be less than the horizontal reinforcement .This provision is particularly for squat walls (i.e. Height-to-width ratio is about 1.0).However ,for walls whit height-to-width ratio less than 1.0, a major part of the shear force is resisted by the vertical reinforcement. Hence ,adequate vertical reinforcement should be provided for such walls.

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