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A NON-LINEAR DYNAMIC ANALYSIS OF RCC SHEAR WALL FOR SYMMETRIC REGULAR MUTISTOREY (G+19) BUILDING USING NEWMARK'S LINEAR ACCELERATION METHOD

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ABSTRACT

This paper presents the non linear dynamic analysis of G + 19 multi storied building using RCC shear wall as resisting system. The building considered is symmetric in plan and is analyzed using Newmark's linear acceleration method using time stepping method considering EL Centro ground acceleration values with time interval of 0.02seconds. This work is carried out for enhancing the use of non linear analysis procedures and use of real ground acceleration values for analysis of buildings which increases the safety of the building analysis and helps in effective understanding the effect of real acceleration values on the structures. Results presented in this paper detail the peak values of lateral force, displacement of the considered building made analyzed using ElCentro ground acceleration values.

KEYWORDS: Dynamic analysis, shear wall, Newmark's linear acceleration method.

INTRODUCTION

As we know that the earthquake and seismic forces are the major problems being faced in structural engineering field. As the earthquake is a natural phenomena, so one can't stop it but can resist it's effects by constructing different structural models by using different design and analytical methods, in that case we are going to a special case that is construction of a shear walls and analyzing them for a non-linear response.

Shear walls are the walls which are constructed mainly for high-rise RC frame buildings to resist seismic forces and wind forces coming on to the structures. These are the tall walls which are constructed from the foundation up to the top of the roof like as column. The shear wall has major advantages in structural field i.e., one can't afford to build concrete buildings meant to resist sever earthquakes without shear walls. 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 and effectiveness in minimizing earthquake damage in structural and non-structural elements (like glass windows and building contents). Shear walls are generally planar but often constructed in L, T, U shapes also for suit of plan and to increase the flexural stiffness of tall structures.

Literature review:

[12]M.S.Medhekar ,Gehad Ez-El-Din Rashad and Sudhir K.jain,[1992] suggests the required specifications in addition to IS: 4326-1976 Provisions regarding shear design of flexural members. Step by step procedure for calculation of plastic moment capacity is given. Ductile structure may yield during earthquake, increases its time period and reduces the earthquake forces. Shear failure is avoided because it is brittle failure. Members are designed for the factored moments and shears obtained from analysis for a given load combination. The design shear force will be larger of

1). Shear obtained from analysis for given load combinations

2). The actual shear that is likely to develop in a member after flexural failure has taken place.

The design shear force will be calculated on the basis of ultimate moment capacity of plastic hinges at the ends of members.

IS: 4326-1976 provisions for web reinforcement, spacing of stirrups shall be given. Partial safety

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factors for steel and concrete should be taken as 1.0, and stress in tension reinforcement of 1.25fy is assumed for calculation of plastic moment Capacity. Alternative parameters from ACI specifications are given for calculation of plastic moment capacity.

The author suggests that proposed method is quite accurate for under–reinforced section but considerably underestimates the plastic moment capacity of over reinforced section. But over reinforced sections are not be used in seismic design of structure due to poor ductility.

[13]Manoj S.Medhekar and Sudhir K.Jain,[1993] explain that the shear walls offer an economic means to provide lateral load resistance in multi-storey buildings. Their seismic behavior, modes of failure and the factors influencing their structural strength of rectangular shear wall sections with uniformly distributed their vertical reinforcement.

IS: 456-2000 incorporates some of provisions of RCC walls, no provisions for shear Walls. Extensive experimentations has been carried out under monotonic and reversed Cyclic loading. This paper summarizes the behavior of reinforced concrete shear walls under lateral loading. Based on available literature, the modes of failure and the factors influencing the structural response of shear walls are discussed. Failure modes in slender, squat and coupled shear walls are given.

The author suggests that the result obtained from experimental and alternative approach is same. Both the methods may be extended for the analysis of barbell and flanged wall sections.

[14]Manoj S.Medhekar and Sudhir K.Jain, [1993], gave the specifications for the design and detailing of ductile earthquake – resist ant shear walls. IS 456-1978, IS: 4326-1976 does not give for the same. The detailed commentary is included to explain the basis of these specifications. A worked out example in shear wall design also given. Building codes used in U.S.A, Canada and New Zealand for design of shear walls does not use directly in India. The commentary on each and every provision for shear wall is given.

1. It recommends the thickness (min is 150 mm) due to every thin sections are Susceptible to lateral instability in zones where inelastic cyclic loading may have to be sustained.

2. Distribution of minimum reinforcement uniformly across the height and width of wall helps to control the width of inclined cracks that are caused due to shear.

3. The diameter of bar specified to prevent the use of very large diameter bars in thin wall sections.

4. Concentrated vertical reinforcement near the edges of wall is more effective in resisting bending moment.

   During very severe earthquake, the flanges of a wall are subjected to high compressive and tensile stresses. Hence the concrete needs to be well confined so as to sustain the load reversal without a large degradation in strength.

The load factor of 0.8 has been used for the gravity load as the gravity load adds to the strength of the wall by reducing design tension in the boundary element.

An opening in a shear wall causes high shear stresses in the region of the wall adjacent to it. Hence it is necessary to check such regions for adequacy of horizontal shear reinforcement in order to prevent a diagonal tension failure due to shear.

Finally a solved example is given for design of shear wall with opening

[16]Joseph M. Bracci, et.al [1997] have given , a procedure for evaluating the seismic performance and retrofit of existing low to mid rise reinforced concrete (RC) buildings . The procedure is derived from the well-known capacity spectrum method and is intended to practicing engineers with a methodology for estimating the margin against structural failure. A series of seismic story demand curves are established from modal superposition analysis where in changes in the dynamic characteristics at various response phases ranging from elastic to full failure mechanism are considered. These demands are compared to the lateral storey capacities as determined from independent inelastic pushover analysis. The proposed technique is applied to a one- third scale modal; three- storey reinforced concrete frame building this was subjected to repeated shaking table excitations and that was later reinforced and tested again at the same intensities. The author observed that the proposed technique can be used to successfully evaluate the experiment seismic response of a non-ductile low-rise modal building and the subsequent response of the same building after retrofit. The procedure can be used to evaluate the seismic performance of both new and existing structural systems. It can also be used to evaluate various seismic retrofit schemes by comparing the relative improvements in strength and deformation demands and capacities of original and modified structural systems.

[18]Sudhir K.Jain., et.al,[2002], describes the context of the push-over analysis and illustrates its utility with the results of analysis on a hypothetical example building. Author observed that, a large number of buildings in our country need seismic retrofitting. These buildings are to be provided with additional strength, stiffness and ductility to ensure acceptable performance in a future earthquake. This paper discusses the concept of "push over analysis", that is becoming a popular tool in the profession for,

i) Design of new buildings.

ii) Seismic evaluation of existing buildings, and

iii) Developing appropriate strategy for seismic retrofitting of buildings.

It is clear that the earthquake resistant building is expected to perform satisfactorily even when subjected to earthquake loads much higher than the code – specified design force. A typical example of push-over analysis results by using computer programmed SNAP-2DX are given. Lateral loads are applied at different floors in an inverted distribution. The retrofitting options being considered are

i) Jacketing of column only,

ii) Providing additional beams and

iii) Providing both column jacketing and additional beams.

Author observed that the structural engineering profession is fast moving towards static –linear analysis (push-over analysis) for seismic design of new buildings, and for development of retrofitting evaluation of existing and for development of retrofitting methodology of deficient building.

[19]Sudhir K.Jain [2003] reviewed the code of IS 1893 (Part-1): 2002, contains a discussion on clauses that are confusing and need classifications. The topographical and editorial errors are pointed out. Suggestions are also included for next revision of the code

The following observations are made from this paper

1. The seismic zone map now contains only four zones as compared to the five zones earlier, and relative values of zone factors are different.

2. The design spectrum shape depends on the type of soil and foundation soil factor has been dripped.

3. The minimum design force based in empirical fundamental period of the building even if the dynamic analysis gives a very high value of natural period and thus low seismic force.

4. Most India buildings are soft storey buildings as per codal definitions simply because the ground storey height is usually different from that in the upper storey.

5. In the load combination the load factor 0.90 for gravity load, 1.5 for earthquake loads is used the in RC structures.

Comments and suggestions on earthquake intensity, risk level, service life of structure, response spectrums etc are given. The author suggests that there is need to simplify provisions on torsion in buildings, treatment of soft storey buildings, treatment of building, treatment of building with masonry infill walls etc.

[20]M.S.Alpha Sheath,[2003], discussed a case for a simplified methodology of detailing for ordinary buildings in Zones with moderate seismic hazard which will greatly ease the application of earthquake engineering for buildings in zone III. The author argues that the simplification of ductile detailing in zone III would greatly encourage its wide spread implementation. IS 13920:1993 covers the requirements for design and detailing of monolithic special reinforced concrete, moment resisting frames (SMRF) so as to give them adequate toughness and ductility to resist severe earthquake shaking without collapse and moderate shaking with some non-structural damage. Code suggests same ductile detailing required for zones III, IV and V. The intensity of shaking in zone III towns and cities was

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much lower. To compensate for the reduction in the toughness due to a relaxation of the ductile criteria, the response reduction factor R be less than the value of 5 for special RC moment resistance frame but may be more than 3.0 for RC moment resisting frames. Some of the provisions are explained for flexural members, columns and structural walls etc. The author suggests that in zones II and III, buildings may be designed with less stringent ductility detailing but with an increase in design seismic force

Objective and Scope:

The main objective of this project is to show the importance of the earthquake resistant structures which will with stand the lateral forces. As the population of the world will goes on increasing so to provide the shelter, transportation, etc., for present and future population we have to construct more number of tall building structures which will satisfy the more people in economy space provided. But tall building structures are more sensitive regarding the lateral forces comparative to low and mid-rise buildings.

So, to resist that type of loadings, earthquake structural resisting systems to be used which will be a part of the structure. Different types of earthquake resisting systems are available for high-rise building but in which Shear walls are the most undertaking earthquake structural resisting systems which are simple to design and simple to execute. These shear walls are just like normal partition walls, they easily mix up with the structure. They will not destroy the appearance of the structure.

So, the present study is giving more importance to the analysis of shear wall for high-rise buildings. As the current project is analyzing the shear wall under dynamic method that is non-linear analysis for ground acceleration values of EL Centro which were recorded in 1940 at California, at that time these are the peak ground acceleration values in addition to that some more ground acceleration values which are recorded at different positions in different time but most of the scientists taken these values as a reference for the earthquake resistant design of structure and also the present softwares which are working for structural engineering filed also using these EL Centro values as a reference medium.

So, basing on these typical values and procedures the present project will give a peak and accurate result which will have a very good scope for future analysis.

METHOD OF ANALYSIS

Time history analysis:

Nonlinear dynamic analysis utilizes the combination of ground motion records with a detailed structural model, therefore is capable of producing results with relatively low uncertainty. In nonlinear dynamic analyses, the detailed structural model subjected to a ground-motion record produces estimates of component deformations for each degree of freedom in the model and the modal responses are combined using schemes such as the square-root-sum-of-squares.

Time history analysis provides for linear or Non-linear evaluation dynamic structural response under loading, which may vary according to the specified time function.

Time history and response spectrum methods are the two basic methods that are commonly used for the seismic dynamic analysis. The time history method is relatively more time consuming, lengthy and costly. The response spectrum method, on the other hand it is relatively more time consuming more rapid concise and economical. Now days it's more convenient for using time history method than before for advancing of computer's hardware and software.

Several methods exist to input seismic excitation when making the seismic time history analysis for design.

- ✓ To input displacement time history at the base, this is called displacement method.
- ✓ To input the inertia loading, calculated from the time history of support motion acceleration, this is called acceleration method.

The time history analysis (THA) technique represents the most sophisticated method of dynamic analysis for buildings. in this method, the mathematical model of the buildings is subjected to accelerations from earthquakes records that represent the building is subjected at the base of the structure. the method consists of a step by step direct integration over a time interval the equations of motion are solved with the displacements, the equation of motion can be represented as:

$$\mathbf{Kx(t)+Cx^{*}(t)+Mx^{**}(t)=P(t)}$$

Where
K is the stiffness matrix,
C is the damping matrix;
M is the diagonal mass matrix.
p(t) is the applied load and
x, x^{*}, x^{**} are the displacements, velocities and accelerations of the structure

SHEAR WALLS

Shear walls are specially designed structural walls incorporated in building to resist lateral forces that are produced in the plane of the wall due to wind, earthquake and other forces. These walls behave more like flexural members. They are usually provided in tall buildings and have been found to be of immense use to avoid total collapse of building under seismic forces. It is always advisable to incorporate them in buildings in regions likely to experience earthquake of large intensity or high winds. Shear walls for wind are designed as simple concrete walls. The design of these walls for seismic forces requires special considerations as they should be safe under repeated loads. Shear walls are generally made of concrete or masonry. They are usually provided between columns, in stairwells, lift wells, toilets, utility shafts, etc. Tall buildings with flat slabs should invariably have shear walls. Such systems as compared to slabs with beams have very little resistance even to moderate lateral loads. Initially shear walls were used in reinforced concrete buildings to resist wind forces. These came into general practice only as late as 1940. With the introduction of shear walls, concrete construction can be used for tall buildings also. Earlier, tall buildings were made only of steel, as bracing to take lateral wind loads could be easily provided in steel construction. However, since recent observations have consistently shown the excellent performance of buildings with shear walls even under seismic forces, such walls are now extensively used for all earthquake resistant designs. Surveys of buildings after earthquakes have consistently shown that the loss of life due to complete collapse was minimal in buildings with some sort of reinforced concrete shear wall. However, the most important property of shear walls for design, as different from design for wind, is that it should have good ductility under reversible and repeated overloads. In planning shear walls, we should try to reduce the bending tensile stress due to lateral loads as much as possible by loading them with as much gravity forces as it can safely take. They should be also laid symmetrically to avoid torsional stresses. This chapter deals very briefly with the design of reinforced shear walls. Determination of the forces in these walls is not dealt with have as it is part of structural analysis.

It is very important to note that shear walls meant to resist earthquakes should be designed for ductility. Where a concrete frame is designed to resist lateral forces and then a stiff but brittle masonry filler wall is placed within this frame, there is a very great possibility that because of its greater stiffness, it will attract more of the earthquake forces and fail in shear when the brittle masonry fails. Unreinforced brick masonry filler-walls have been the first to fail in many buildings subjected to major earthquakes. Hence, un reinforced brick walls should not used as shear walls for resisting earthquake forces.

The primary function of shear walls is to resist loads although they are often used in conjunction with gravity frames and carry a proportion of gravity loads. Shear walls fulfill their lateral load resisting function by vertical cantilever action. The shear force and bending moment generated by earthquake actions increase down the height of the building. Since shear walls are generally both stiff and can be inherently robust, it is practical to design them to remain nominally elastic under design intensity loadings, particularly in regions of low or moderate seismicity. Under increased loading intensities, post-elastic deformations will develop within the lower portion of the wall (generally considered to extend over a height of twice the wall length above the foundation support system). This can result in difficulties in the provision of adequate foundation system tie-down to prevent uplift. The design of rocking foundations is common with shear walls, although care is requires ensuring permanent rational offsets are avoided following an earthquake. A good post-elastic response can be readily achieved within this region of reinforced concrete or masonry shear walls through the provision of adequate confinement of the principal reinforcing steel and the prohibition of lap splices of reinforcing bars.

Shear wall structures are generally quite stiff and, as such inter-storey drift problems are rare and generally easily contained. The shear walls tend to act as a rigid body rotating about a plastic hinge which forms at the base of the wall. Overall structural deformation is thus a function of the wall rotation. Inter-storey drift problems which do occur are limited to the lower few floors. A major shortcoming with shear walls within buildings is that their size provides internal (or external) access barriers which may contravene the architectural requirements. This problem can be alleviated by coupling adjacent more slender shear walls. The coupling beams then become shear links between the two walls and with careful detailing can provide a varied effective, ductile control mechanism.

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Different geometries of shear walls:

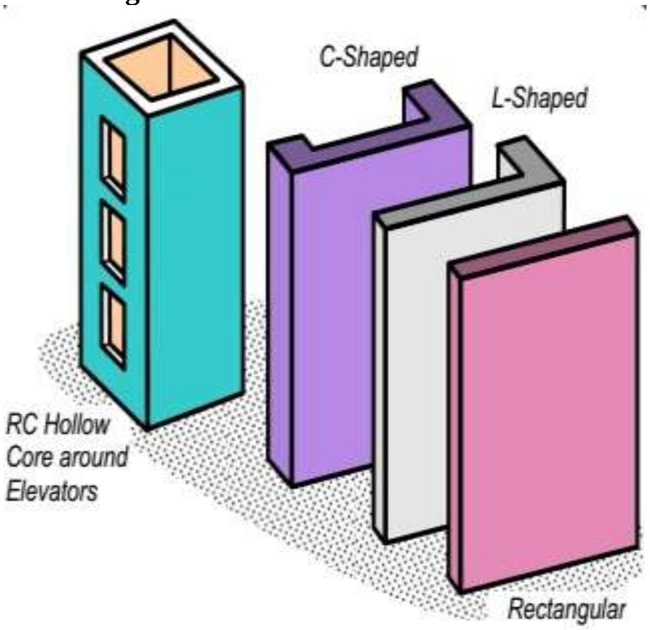

Fig-1: Different geometries of shear wall

Plan:

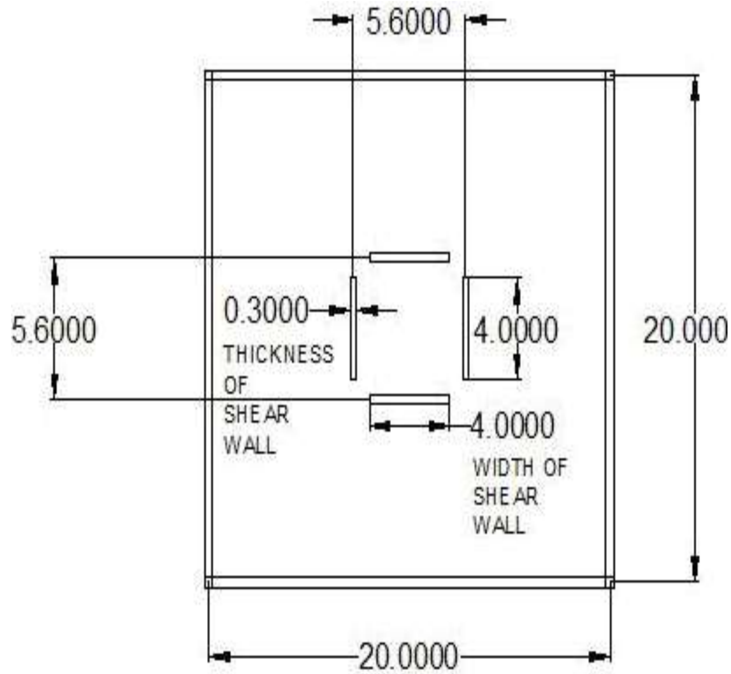

Fig-3: Plan of building

EXPERIMENTAL DATA

No of stories = G + 19
Columns size = (0.4 x 0.4) m
Girders : (0.3 x 0.6) m.
Dead Load + Live Load = 10 kN/m^2.

Member properties:

Inertia of a single wall about its strong axis
= $(0.3 * 4^3)/12 = 1.6m^4$
Inertia of a single column
= $(0.4 * 0.4^3)/12$
= $0.002m^4$
Inertia of a girder = $(0.3 * 0.6^3)/12 = 0.005m^4$
Modulus of elasticity E = $2.5 * 10^7$kN/m^2

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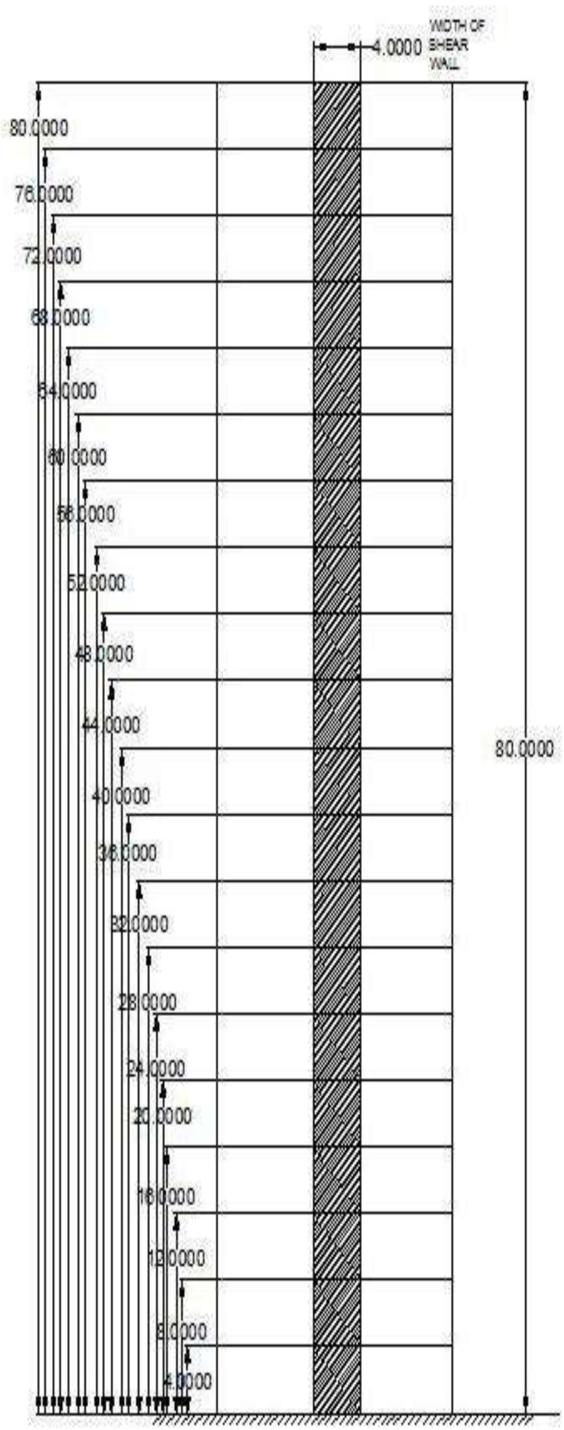
Elevation:



Newmark's Non-Linear Equations:

Initial calculations:

$$a = \frac{1}{\beta*\Delta t}m + \frac{\gamma}{\beta}c$$

$$b = \frac{1}{2\beta}m + \Delta t\left(\frac{\gamma}{2\beta} - 1\right)c$$

Calculations for each time step:

Incremental Load, $\Delta\hat{p}_I = \Delta p_i + a\dot{u}_i + b\ddot{u}_i$

Effective Stiffness, $\hat{k}_i = k_i + \frac{\gamma}{\beta*\Delta t}c + \frac{1}{\beta*(\Delta t)2}m$

Incremental Velocity, $\Delta\dot{u}_i = \frac{\gamma}{\beta*\Delta t}\Delta u_i - \frac{\gamma}{\beta}\dot{u}_I + \Delta t\left(1 - \frac{\gamma}{2\beta}\right)\ddot{u}_i$

Incremental Acceleration, $\Delta\ddot{u}_I = \frac{1}{\beta*(\Delta t)2}\Delta u_i - \frac{1}{\beta*\Delta t}\dot{u}_I - \frac{1}{2\beta}\ddot{u}_i$

Incremental Displacement, $\Delta u_i = \Delta\hat{p}_i / \hat{k}_i$

$u_{i+1} = u_i + \Delta u_i$; $\dot{u}_{i+1} = \dot{u}_I + \Delta\dot{u}_I$; $\ddot{u}_{i+1} = \ddot{u}_I + \Delta\ddot{u}_i$

Where u_i, $\dot{u}_I$, $\ddot{u}_I$, are initial displacement, velocity, acceleration respectively and u_{i+1}, $\dot{u}_{i+1}$, $\ddot{u}_{i+1}$ are final displacement, velocity, acceleration respectively.

Analytical Parameters:

Dividing the floor plan at a typical level into 25parts, 4m X 4m region, each carrying 160kN gravity load,

$\Sigma p = 25 * 160 = 4000$kN

Shape value= $1 - \cos\left(3.14 * \frac{x}{160}\right)$

Stiffness = $12 * \frac{80000000}{x^3}$

Where x = height of the each storey from the base.

Mass of each storey = (4000/9.81) = 407.7472

Using shape function concept the following generalized parameters calculated are

Mass = 2054.90377 kN-sec^2/ m.
Stiffness = 1137.1785 kN/m.
Damping = 11.4 kN-sec/m.

By using these values, the calculated constant values used in the iteration process are:

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Taking, $\gamma = \frac{1}{2}$ & $\beta = \frac{1}{6}$; and acceleration due to gravity, g = 9.81 m/sec^2.

Effective stiffens = 30826403.73 kN/m.

Using newmark's time history linear acceleration values the analysis was carried out by a preparation of a spread sheet for considered EL Centro ground acceleration values the analysis procedure was carried

Analysis philosophy:

The maximum shear force in the entire considered loading history of seismic activity has been identified. For solving this non linear response of shear walls by linear acceleration method, the following parameters are required to be taken and are analyzed in a chronological order.

The time interval selected for this problem is 0.02 sec. i.e., at each and every time step of 0.02 the shear force exerted on to the shear wall has been calculated and maximum shear force generated is identified and for maximum value of shear force, structural element (shear wall) is to be designed. For every time interval, acceleration, velocity, displacement (drift) of the shear wall is calculated. i.e., Initial stiffness of shear wall at first time step 0.02sec is to be calculated by using load deflection relationship. A Damping coefficient is also calculated which break downs or shut down earthquake load after that the stiffness of the shear wall and incremental effective force is calculated. With the help of these values the incremental displacement, velocity are calculated for every time interval and therefore the shear force using load deflection relationship is calculated and acceleration is checked for each and every time interval

The above procedure is repeated till maximum shear force in each time interval is achieved.

Table-1: Details of base shear distribution for each floor with respect to height.

FLOOR LEVEL	BASE SHEAR	% Distribution of base shear for each floor	% change with height	% difference of base shear with floor to floor
4	0.013465363	0.000187847	0.018784721	6.247449045
8	0.214887658	0.002997769	6.266233766	13.60473398
12	1.08141516	0.015086175	19.87096774	11.95654766
16	3.397736664	0.047399789	31.8275154	9.496201188
20	8.222243652	0.114703597	41.32371659	7.435075302
24	16.86309962	0.235247003	48.75879189	5.986394972
28	30.80288988	0.429712668	54.74518686	4.756160846
32	51.76839024	0.722189806	59.50134771	4.026049551
36	81.48986496	1.136816299	63.52739726	3.38752683
40	121.7813008	1.698897988	66.91492409	2.889718888
44	174.4601728	2.433789381	69.80464298	2.513661096
48	241.2393031	3.365385032	72.31830407	2.20912345
52	323.6919764	4.515632893	74.52742752	1.94427572
56	423.2833358	5.904972299	76.47170324	1.758023523
60	541.0773542	7.548246099	78.22972677	1.581943501

64	677.9426522	9.457571899	79.81167027	1.439923699
68	834.3745878	11.63986014	81.25159397	1.322113137
72	1010.460372	14.09632745	82.5737071	1.215705681
76	1205.952325	16.8235186	83.78941279	1.128715036
80	1420.135319	19.81145726	84.91812782	
	7168.405258			

RESULTS AND DISCUSSION

The results are presented in table 1. By observing the results obtained using the EL Centro ground acceleration values a peak base shear is obtained for the consider shear wall for the considered structural plan after a huge successful iteration process, at last the peak base shear value would obtained is 7168.405258 kN at ground acceleration value of -0.3556 and this peak base shear value can be used for the further process of designing of a shear wall for the considered structure.

The work was done in consideration of a 20 storey building contains shear wall of (0.3 x 4) m in dimension with considering E = 2.5 x 10^7 kN/m^2. A service load of 10 kN/m^2 was considered for a total area of building of 20 x 20m i.e, 400 m^2, each floor area is divided into 25 equal parts of (4 x 4) m. Hence the split of 25 equal parts of area was made each part of the floor occupies a service load of 160 kN, Hence for each floor a load of 4000 kN was considered a total load of 8 x 10^4 kN was calculated.

This total weight of the building was then calculated for generalized mass, generalized stiffness, generalized damping for all the floors using generalized coordinate method using mode shape values.

Shear wall from each floor to base was considered, as shear wall/ structural wall is a continuous system from the bottom of base level to each individual floor level. The effect of lateral force will be observed by shear wall at each floor and is dissipated. As structural wall/ shear wall is a continuous system, cumulative height was considered for each floor from base level and then stiffness of each floor was calculated.

The building with shear wall was analyzed by the use of non linear newmark's equation by considered time period of 0.02sec for EL Centro ground acceleration values.

The change of base shear was linear when observed with height and a significant effect of change of pattern of lateral force was started at 36m height of building where nearly 1.13% of total lateral force was concentrated at the height and 19% of total base shear was observed at 80m level of building.

When compared with height the change of base shear was 6% from 4m to 8m height of building, 13% from 8m to 13m of building, 11% from 12 to 16m of building, 9% from 16 to 20m, 7% from 20 to 24m, 6% from 24m to 28m, 5% from 28 to 32m, 4% from 32 to 36m, 3.5% from 36 to 40m, 2.5% to 2% from 40m to 52m of height of building, 2% to 1.2% from 52m to 80m height of the building, this mentioned change of base shear from storey to storey represents marginal percentage increase with respect to floor to floor levels of considered 20 storey building. A total of 7168.41kN of base shear was observed for the building with use of EL Centro values and with time interval of 0.02 seconds.

CONCLUSIONS

In the present study, 1559 EL Centro ground acceleration values are considered and these values are used for finding peak base shear of shear wall at each floor, the procedure is repeated to find out the peak base shear of a shear wall, so that here we concluded that shear walls are the more prominent structures in earthquake resistant design for high-rise buildings. In this project we got a peak base shear of 7168 kN at a ground acceleration value of -0.3556 so it is shown that the shear wall would resist the base shear of great value which will a building cannot with stand for that lateral force. Here also the shear wall is responding in a short interval of time when the earthquake is produced, so this show that importance of shear wall in high-rise buildings which are analyzed under non-linear analysis for peak ground acceleration values.

Future scope

The present study has been used for future analysis also and it is said to be as follows:

- The peak base shear which is find out in this project can be used for the future design process so that we can easily work out the detailing of reinforcement and remaining parameters.

- The translational parameters are also useful for the building design simultaneously in the design of a shear wall.
- As in this project we analyzed the considered problem under non-linear analysis that is dynamic method for peak ground acceleration values which shows that the results obtained are at ultimate state values.
- As we know that earthquake is a natural disaster and losses from these phenomena giving more interest on the earthquake resist design especially for high rise buildings, for this type of discussions this study has a good future scope.

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