DESIGN AND ANALYSIS OF G+ 5 STRUCTURES WITH AND WITHOUT FLOATING COLUMNS

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Abstract

The areas which are supported on a pole as opposed to unbendable foundation are called as drifting fragments. Countless the structures in India are created with floating portions. This is essentially column gotten to suit ceasing or assembling passages in the vital story. The seismic tremor compels delivered at different floor level of the structure ought to be finished to the foundation by the most constrained possible way which may not be the circumstance when floating portions are given. Giving skimming fragments may satisfy a bit of the valuable requirements yet essential direct changes startlingly due plans of drifting areas. The flexural and shear solicitation of the columns which supports floating portions are extensively higher than including bars, this prompts robustness abnormalities at a particular joint. In give circumstance structures skimming area is a typical segment in the current multi-story G+5 improvement in urban India. Such features are significantly bothersome in structure worked in seismically powerful ranges. This examination includes the criticalness of unequivocally seeing the proximity of the drifting segment in the examination of structure. Substitute measures, including strength modify of the essential story and the story above, are proposed to reduce the inconsistency exhibited by the drifting segments. The part spine showing for the strong segments also expected to change with the objective that consolidating could be come to in the ETABS and the Perform-3D models. To keep a spine with negative strength, a preservationist spine was used, in which as far as possible was taken toward the start of steel yielding, and a while later a line was pulled in to the apex moment limit. Presently, the fragment was required to have lost any tremendous farthest point. Since the rotational solicitation was commonly little for the areas in this endeavor, this outrageous motivation behind unrest was never come to. FEM codes are delivered for 2D multi story traces with and without skimming segment to consider the responses of the structure under different shudder excitation having particular repeat substance keeping the PGA and time length factor steady. The time history of floor relocation, entomb story float, base shear, toppling minute are registered for both the edges with and without gliding segment.

1.0 Introduction

Various urban multi-story structures in India today have open first story as an unavoidable component. This is chiefly being gotten to oblige halting or assembling antechambers in the primary story. While the total seismic base shear as experienced by a working in the midst of a shake is liable to its regular period, the seismic power dissemination is dependent on the appointment of solidness and mass along the height. The direct of a working in the midst of seismic tremors depends essentially on its general shape, size and geometry, despite how the shudder forces are passed on to the ground. The tremor forces made at different floor levels in a structure ought to be passed on down along the stature to the ground by the most restricted way; any deviation or irregularity in this load move route achieves poor execution of the structure. Structures with sections that hang or float on columns at a center story and don't take care of business to the foundation, have discontinuities in the load trade way.

Floating column:

A portion ought to be a vertical part starting from foundation level and trading the pile to the ground. The term floating segment is in like manner a vertical segment which (due to compositional layout/site situation) at its lower level (end Level) lays on a pole which is an even part. The poles in this manner trade the store to various fragments underneath it.
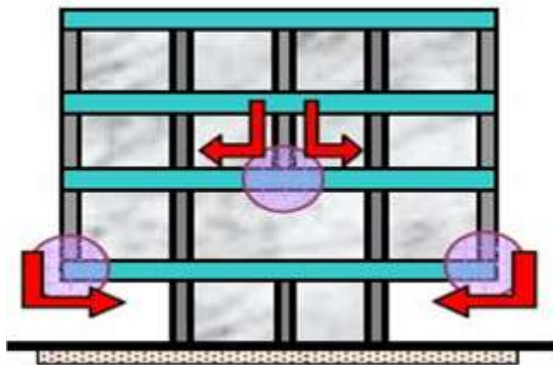
Fig 1.1   Hanging or floating columns

There are numerous exercises wherein skimming sections are gotten, especially over the ground floor, where trade supports are used, so progressively open space is available in the ground floor. These open spaces may be required for get together anteroom or ceasing reason.

Objective and scope of present work

The goal of the present work is to consider the conduct of multi-story structures with skimming sections under seismic tremor excitations. Limited component technique is utilized to explain the dynamic overseeing condition. Straight time history investigation is completed for the multi-story structures under various seismic tremor stacking of changing recurrence content. The base of the building outline is thought to be settled.

2.0 literature review

Current writing study incorporates seismic tremor reaction of multi-story building outlines with normal sections. A portion of the written works underscored on reinforcing of the current structures in seismic inclined districts.

[1] Maison and Neuss (1984) Individuals from ASCE have performed the PC examination of a current forty-four story steel outline elevated structure to think about the impact of different displaying angles on the anticipated dynamic properties and processed seismic reaction practices. The seismic reaction practices are processed utilizing the reaction range (Newmark and ATC spectra) and proportional static load techniques.

[2] Maison and Ventura (1991) Individuals from ASCE processed dynamic properties and reaction practices OF THIRTEEN-STORY BUILDING and this outcome are contrasted with the genuine esteems as decided from the recorded movements in the working amid two real seismic tremors and demonstrated that condition of-hone configuration sort diagnostic models can foresee the real unique properties.

[3] Arlekar, Jain and Murty, (1997) said that such highlights were profoundly undesirable in structures worked in seismically dynamic regions; this has been confirmed in various encounters of solid shaking amid the past tremors. They featured the significance of expressly perceiving the nearness of the open first story in the examination of the building, including firmness adjust of the open first story and the story above, were proposed to decrease the anomaly presented by the open first story.

[4] Awkar and Lui (1997) contemplated reactions of multi-story adaptably associated outlines subjected to tremor excitations utilizing a PC show. The model fuses association adaptability and in

addition geometrical and material nonlinearities in the examinations and presumed that the investigation demonstrates that association adaptability tends to build upper stories' between story floats yet decrease base shears and base upsetting minutes for multi-story outlines.

3.0 model analysis by using E-tabs software:

ETABS is an advanced, yet simple to utilize, unique reason examination and configuration program grew particularly to build frameworks. ETABS highlights a natural and capable graphical interface combined with unmatched displaying, scientific, and plan methods, all incorporated utilizing a typical database. Albeit snappy and simple for basic structures, ETABS can likewise deal with the biggest and most complex building models, including an extensive variety of geometrical nonlinear practices, settling on it the instrument of decision for auxiliary architects in the building business. The precision of logical demonstrating of complex Wall Systems has dependably been of worry to the Structural Engineer. The PC models of these frameworks are typically glorified as line components rather than continuum components. Single dividers are displayed as cantilevers and dividers with openings are demonstrated as dock and spandrel frameworks.
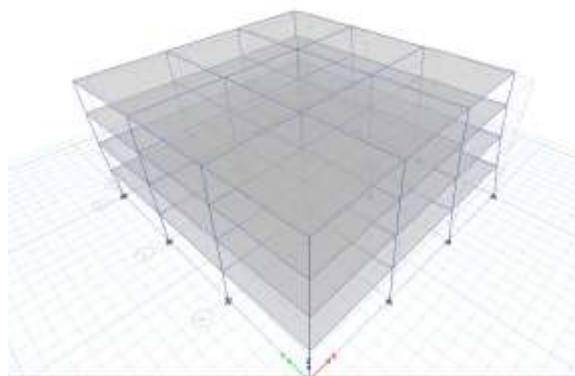

Fig 3.1 ETABS -3D Mode

ANALYSIS IN ETABS

The initial phase in ETABS is to set the framework measurements. This incorporates setting number of lines in X course, Y heading and the dividing between network lines. At that point the story information is characterized which incorporates setting the quantity of stories, tallness of run of the mill and base story. The sort of chunk is additionally said in the network information.
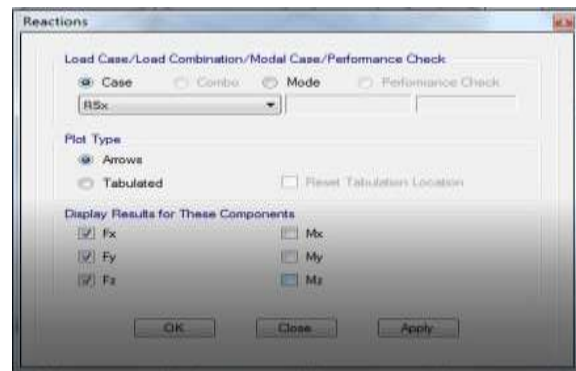
There was great ascension between the reactions from the two examination models. The Perform-3D demonstrate, which used fibre cross-area components, had numerous occasions of nonlinearity while the ETABS lumped pivot show was bilinear. This conduct was normal since the fibre cross-segment component has an alternate solidness with every cycle in removal, while the edge component is straight until yielding happens. Since the solid dividers in this venture all had similar properties, pivoting happened all the while in each of the four in-plane stacked dividers in a provided guidance, and there was correspondingly just a single difference in auxiliary solidness.

Dynamic analysis:

Dynamic investigation of structure is a piece of basic examination in which conduct of adaptable structure subjected to dynamic stacking is contemplated. Dynamic load dependably changes with

time. Dynamic load includes twist, live load, seismic tremor stack and so forth. In this manner when all is said in done we can state all the genuine issues can be examined powerfully. On the off chance that dynamic burdens changes bit by bit the structure's reaction might be around by a static examination in which idleness powers can be dismissed. Be that as it may, if the dynamic load changes rapidly, the reaction must be resolved with the assistance of dynamic examination in which we can't disregard inertial power which is equivalent to mass time of quickening (Newton's second law).

Scientifically $F = m$ x a

Where F is inertial power, m is inertial mass and a isacceleration.

Moreover, dynamic reaction (dislodging and pushes) are by and large considerably higher than the comparing static relocations for same stacking amplitudes, particularly at resounding conditions.

4.0 Result and discussion

The conduct of building outline with and without drifting segment is contemplated under static load, free vibration and constrained vibration condition. The limited component code has been produced in ETABS programming.

Static analysis

A four story two narrows 2d outline with skimming section are investigated for static stacking utilizing the present FEM code and the business programming ETABS.

The accompanying are the information of the test example:

Size of beam – 0.1 X 0.15 m

Size of segment – 0.1 X 0.125 m

Traverse of each straight – 3.0 m

Story tallness – 3.0 m

Modulus of Elasticity, E = 206.84 X 10^6kN/m^2

Bolster condition – Fixed

Stacking sort – Live (3.0 kN at third floor and 2 kN at fourth floor)

The schematic perspective of the two edge without and with gliding section separately. From we can watch that the nodal relocation esteems got from exhibit FEM if there should be an occurrence of edge with drifting segment are more than the comparing nodal removal estimations of the casing without coasting segment. the nodal uprooting esteem got from E-TABS of the edge without and with coasting.
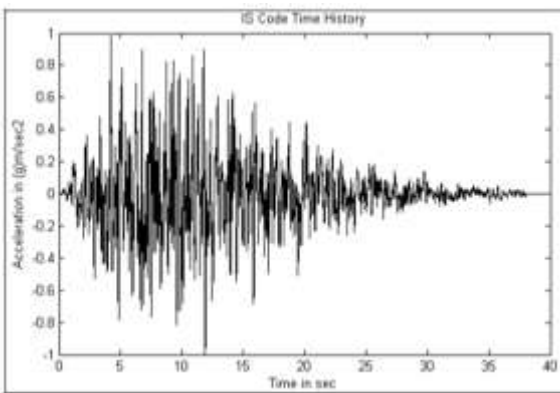

Fig. 4.1 2D Frame with usual columns

Fig.4.2 2D Frame with Floating column
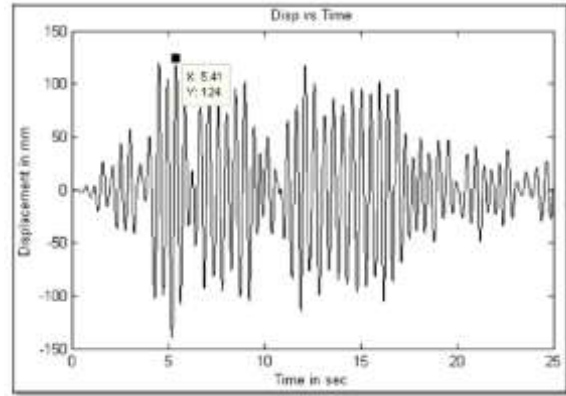**Table 4.2 Global deflection at each node for general frame obtained in E-tabs**

Node	Horizontal X mm	Vertical Y mm	Rotational rZ rad
1	0	0	0
2	0	0	0
3	0	0	0
4	1.4	0	0
5	1.4	0	0
6	1.4	0	0
7	3.6	0	0
8	3.6	0	0
9	3.6	0	0
10	5.6	0	0
11	5.6	0	0
12	5.6	0	0
13	6.8	0	0
14	6.8	0	0
15	6.8	0	0

Fig. 4.7 Displacement vs time response of the 2D steel frame with floating column

Fig. Displacement vs time response of the 2D steel frame with floating column obtained ine-tabs

Free vibration frequencies of the 2D steel outline with skimming section are displayed in Table 4.6. In this table the qualities got in introduce FEM and E-tabs are thought about. Table 4.7 demonstrates the examination of greatest best floor relocation of the edge acquired in show FEM and E-tabs which are in close understanding.

Table Comparison of predicted frequency (Hz) of the 2D steel frame with floating column obtained in present FEM and E-tabs.

	E-tabs	Present FEM	% Variation
1	2.16	2.17	0.28
2	6.78	7.00	3.13
3	11.57	12.62	8.32
4	12.37	13.04	5.14
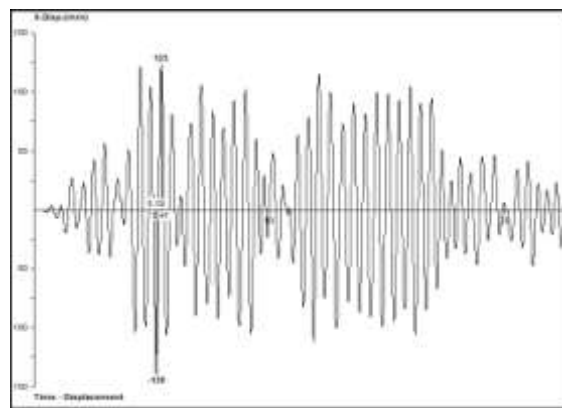
Size and material property of the structural members are as follows:

Size of beam = (0.25 x 0.3) m

Size of column = (0.25 x 0.25) m

Young's modulus, E= 22.36 x 10^9 N/m^2

Density, ρ = 2500 Kg/m^3

Fig.4.9 and 4.10 show the maximum top floor displacement of the 2D frame obtained in E-tabs and present FEM and respectively. Free vibration frequencies of the 2D concrete frame with floating column are presented. In this table the values obtained in present FEM and e-tabs are compared. the comparison of maximum top floor displacement of the frame obtained in present FEM and E-tabs which are in very close agreement.
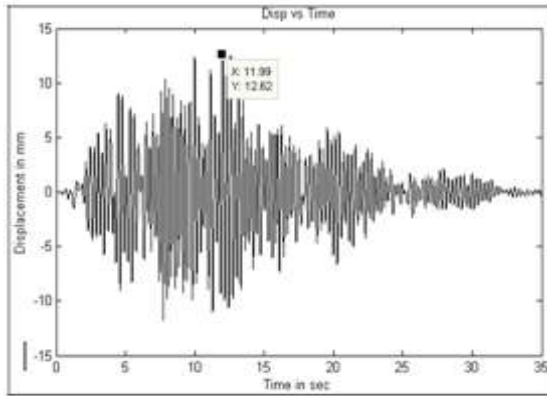
Table: Comparison of predicted frequency(Hz) of the 2D concrete frame with floating column obtained in present FEM and E-tabs.

Mode	E-tabs	Present FEM	% Variation
1	2.486	2.52	1.37
2	7.780	8.09	3.98
3	13.349	14.67	9.89
4	13.938	14.67	5.25

In this illustration two solid edges with and without gliding segment having same material property and measurement are dissected under same stacking condition. Here "Good time history according to spectra of IS 1893 (section 1): 2002" is connected on the structures. IS code information is a middle of the road recurrence content information. IS code information has PGA esteem as 1.0g This casing is additionally dissected under other tremor information having diverse PGA esteem in encourage cases, henceforth it has downsized to 0.2g. The segment and material property for show think about are as per the following:
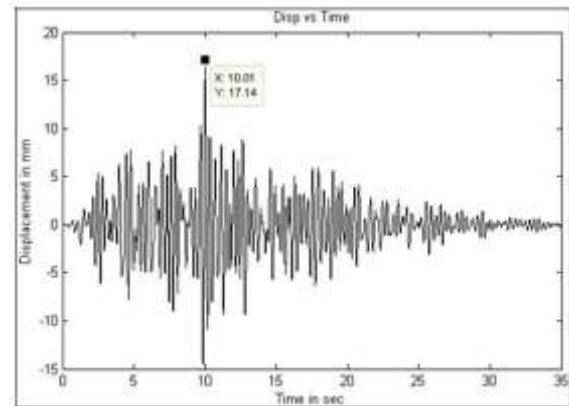
Youthful modulus, E= 22.36 x 10^6kN/m^2, Density, ρ = 2500 Kg/m^3

Size of shaft = (0.25 x 0.4) m, Size of section = (0.25 x 0.3) m

Story stature, h = 3.0m, Span = 3.0m

Fig. Displacement vs time response of the 2D concrete frame without floating column underIS code time history excitation

Fig. Displacement vs time response of the 2D concrete frame with floating column under IScode time history excitation

Comparison of different structural systems

The examination performed in this undertaking was in like manner performed for steel phenomenal moment edges, SMF extraordinary concentric bolstered housings, SCBF and catching controlled propped traces, BRBF The results from the approach were generally unsurprising with one another when seeing general structure execution. For all systems notwithstanding the outstanding concentric propped plot, the nonlinear strategies made favored structure execution over the immediate strategy. The remarkable concentric propped layout made increasingly awful execution levels for the nonlinear frameworks than it improved the circumstance the straight strategies, possibly due to the non-flexible fastening behavior of the weight underpins, identifying with a brisk loss of value and immovability.

Conclusion

The conduct of multi-story working with and without drifting segment is examined

under various tremor excitations. The good time history and Electro quake information has been considered. The PGA of both the quake has been scaled to 0.2g and length of excitation is kept same. A limited component show has been created to contemplate the dynamic conduct of multi - story outline. The static and free vibration comes about got utilizing present limited component code are approved. The dynamic investigation of edge is considered by changing the section measurement. It is inferred that with increment in ground floor section the greatest dislodging, bury story float esteems are lessening. The base shear and toppling minute differ with the adjustment in section measurement. The ETABS and Perform-3D models had comparative outcomes. The powerful period computed from the Perform-3D show was in great concurrence with the ETABS demonstrate that used split segment properties from minute bend investigation, just 1.7% longer. The NSP in ETABS demonstrated somewhat preferable execution over the NSP in Perform-3D. In spite of the fact that the unpredictability in the two models upset desires for the very same outcomes, a property that could have influenced the information yield is the task of the revolution gage in Perform-3D. The pivot gage task for this examination depended on the plastic pivot length foreseen at the divider's definitive relocation limit. As a general rule, the degree of pivoting was always showing signs of change regarding building reaction at each given dislodging interim, and in this manner the rotational gages ought to hypothetically change measure in relationship to the changing degree of versatility. Since most extreme turns were of the best enthusiasm for this task, the greatest foreseen degree of pivoting was

chosen to be a sensible gauge for a fitting revolution gage length.

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