

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

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ABSTRACT:

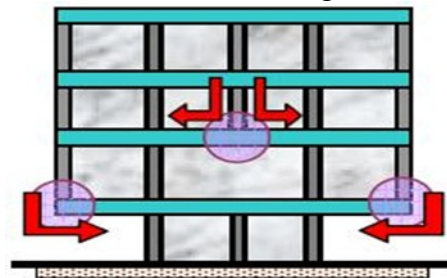
The sections which are bolstered on a shaft rather than inflexible establishment are called as coasting segments. A large number of the structures in India are developed with drifting segments. This is fundamentally pillar received to suit stopping or gathering entryways in the principal story. The seismic tremor constrain produced at various floor level of the building should be completed to the establishment by the most limited conceivable way which may not be the situation when drifting segments are given. Giving gliding segments may fulfill a portion of the useful prerequisites yet basic conduct changes unexpectedly due arrangements of coasting sections. The flexural and shear request of the pillars which underpins drifting segments are considerably higher than encompassing bars, this prompts solidness anomalies at a specific joint. In give situation structures gliding section is a commonplace component in the current multi-story G+5 development in urban India. Such highlights are profoundly undesirable in building worked in seismically dynamic ranges. This investigation features the significance of unequivocally perceiving the nearness of the coasting section in the examination of building. Substitute measures, including solidness adjust of the primary story and the story above, are proposed to diminish the anomaly presented by the coasting sections. The part spine displaying for the solid sections additionally needed to change with the goal that merging could be come to in the ETABS and the Perform-3D models. to keep a spine with negative solidness, a preservationist spine was utilized, in which the ostensible limit was taken at the beginning of steel yielding, and afterward a line was attracted to the pinnacle minute limit.

1. INTRODUCTION:

Numerous urban multi-story structures in India today have open first story as an unavoidable element. This is principally

being received to oblige stopping or gathering anterooms in the main story. While the aggregate seismic base shear as experienced by a working amid a quake is subject to its common period, the seismic power circulation is reliant on the appropriation of firmness and mass along the tallness.

The conduct of a working amid seismic



3.1 Hanging or floating columns

tremors depends basically on its general shape, size and geometry, notwithstanding how the quake powers are conveyed to the ground. The tremor powers created at various floor levels in a building should be conveyed down along the stature to the ground by the most limited way; any deviation or intermittence in this heap move way brings about poor execution of the building. Structures with vertical misfortunes (like the lodging structures with a couple of story more extensive than the rest) cause a sudden bounce in quake powers at the level of intermittence. Structures that have less sections or dividers in a specific story or with uncommonly tall story tend to harm or crumple which is started in that

story. Numerous structures with an open ground story proposed for stopping fallen or were seriously harmed in Gujarat amid the 2001 Buhl seismic tremor. Structures with segments that hang or buoy on pillars at a middle story and don't go the distance to the establishment, have discontinuities in the heap exchange way.

FLOATING COLUMN:

A segment should be a vertical part beginning from establishment level and exchanging the heap to the ground. The term drifting section is likewise a vertical component which (because of compositional outline/site circumstance) at its lower level (end Level) lays on a shaft which is an even part. The shafts thus exchange the heap to different segments underneath it

There are many activities in which gliding segments are received, particularly over the ground floor, where exchange supports are utilized, so more open space is accessible in the ground floor. These open spaces might be required for get together lobby or stopping reason. The exchange supports must be planned and point by point appropriately, particularly in earth shake zones. The section is a focused load on the pillar which bolsters it. To the extent examination is concerned, the section is regularly expected stuck at the base and is consequently taken as a point stack on the exchange pillar. ETABS can be utilized to do the investigation of this sort of structure. Skimming segments are sufficiently able to convey gravity stacking however exchange brace must be of satisfactory measurements (Stiffness) with exceptionally negligible diversion.

Looking forward, obviously, one will keep on making structures intriguing as opposed to dull. Be that as it may, this need not be done at the cost of poor conduct and seismic tremor wellbeing of structures.

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 REVIEW OF LITERATURES

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 preformed 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 anticipated dynamic properties are contrasted with the building's actual properties as beforehand decided from exploratory testing. 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)

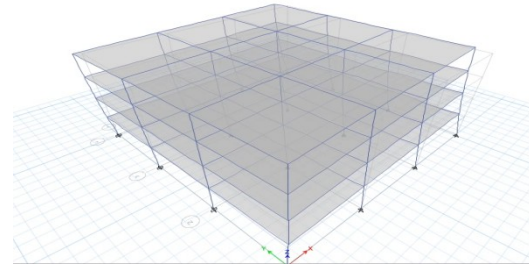
contemplated reactions of multi-story adaptably associated outlines subjected to tremor excitations utilizing a PC show. The model fuses association adaptability and in addition geometrical and material nonlinearities in the examinations and presumed that the investigation demonstrates that association adaptability tends to build upper stories' between story floats yet decrease base shears and base upsetting minutes for multi-story outlines.

3. METHODOLOGY:

3.1 PERFORM 3D MODEL ANALYSIS BY USING ETABS SOFTWARE

E-tabs is an advanced, yet simple to utilize, unique reason examination and configuration program grew particularly to build frameworks. E-tabs 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, e-tabs 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.



RUNNING ANALYSIS:

Number of joints	=	98
With restraints	=	34
With mass	=	18
Number of frame/cable/tendon elements	=	158
Number of shell elements	=	36
Number of constraints/welds	=	4
Number of load patterns	=	13
Number of acceleration loads	=	6
Number of load cases	=	4

FINITE ELEMENT FORMULATION

The limited component strategy (FEM), which is here and there likewise alluded as limited component examination (FEA), is a computational system which is utilized to acquire the arrangements of different limit esteem issues in designing, around. Limit esteem issues are now and again additionally

alluded to as field esteem issues. It can be said to be a scientific issue wherein at least one ward factors must ful fill a differential condition wherever inside the space of free factors and furthermore fulfil certain particular conditions at the limit of those areas. The field esteem issues in FEM for the most part has field as an area of intrigue which regularly speak to a physical structure.

PLANE FRAME ELEMENT:

The plane edge component is a two-dimensional limited component with both nearby and worldwide directions. The plane edge component has modulus of versatility E, snapshot of inactivity I, cross-sectional range An, and length L.

Each plane edge component has two hubs and is slanted with a point of θ measured counter clockwise from the positive worldwide X pivot as appeared in figure. Let $C = \cos\theta$ and $S = \sin\theta$.

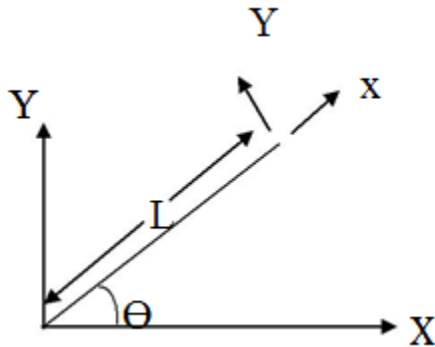


Fig. 3.1 The plane frame element

Obviously the plane casing component has six level of flexibility – three at every hub (two relocations and a revolution). The sign tradition utilized is that relocations are certain on the off chance that they point upwards and revolutions are sure in the event that they are counter clockwise.

RESULTS:

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 .

EXAMPLE 4.1

The accompanying are the information of the test example:

Size of bar – 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, $E = 206.84 \times 10^6$ kN/m²

Bolster condition – Fixed

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

The sketchmatic 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.

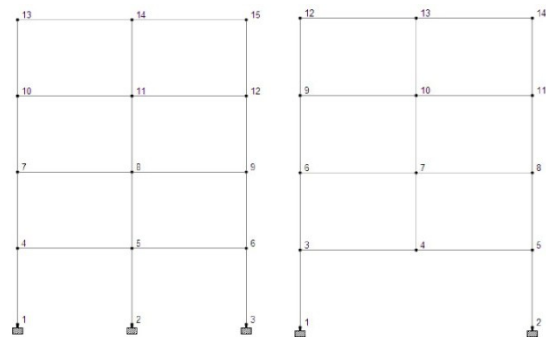


FIG. 4.1 2D FRAME WITH USUAL COLUMNS

TABLE 4.1 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

FREE VIBRATION ANALYSIS

EXAMPLE 4.2

In this example a two storey one bay 2D frame is taken. Fig.4.3 shows the sketchmatic view of the 2D frame. The results obtained are compared with Maurice PetytThe input data are as follows:

- Span of bay = 0.4572 m
- Storey height = 0.2286 m
- Size of beam = (0.0127 x 0.003175) m
- Size of column = (0.0127 x 0.003175) m
- Modulus of elasticity, E = 206.84 x10⁶kN/m²

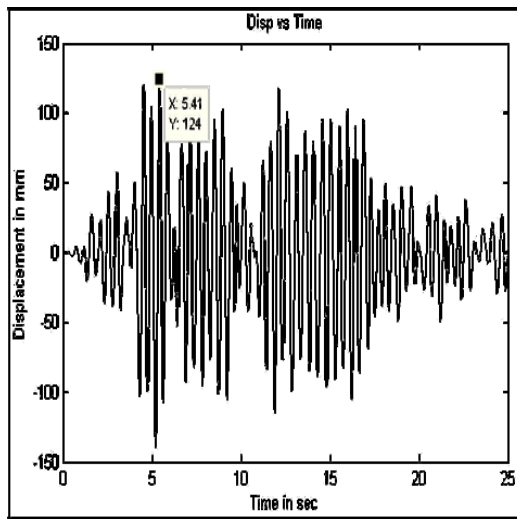


FIG. 4.2 DISPLACEMENT VS TIME RESPONSE OF THE 2D STEEL FRAME WITH FLOATING COLUMN.

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	7.78	8.09	3.98
3	13.349	14.67	9.89
4	13.938	14.67	5.25

CONCLUSION

The conduct of multi-storey working with and without drifting segment is examined under various tremor excitation. 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 are 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.

REFERENCES:

- [1] Maison Bruce F. and Neuss Carl F., "Dynamic analysis of a forty four story building", *Journal of Structural Engineering*, Vol. 111, No. 7, Page No:1559- 572, July, 1985. ISSN: 2395 -0056
- [2] Maison and Ventura (1991) ISSN: 0924-0829 Pages 7787-7594

[3] ArlekarJaswant N, Jain Sudhir K. and Murty C.V.R, (1997), "Seismic Response of RC Frame Buildings with Soft First Storeys". *Proceedings of the CBRI Golden Jubilee Conference on Natural Hazards in Urban Habitat, 1997, New Delhi.*

[4] Awkar J. C. and Lui E.M, "Seismic analysis and response of multistorysemirigid frames", *Journal of Engineering Structures*, Volume 21, Issue 5, Page no: 425-442, 1997.

[5] AgarwalPankaj, Shrikhande Manish (2009), "Earthquake resistant design of structures", PHI learning private limited, New Delhi.

[6] Balsamoa A, Colombo A, Manfredi G, Negro P &Prota P (2005), "Seismic behavior of a full-scale RC frame repaired using CFRP laminates". *Engineering Structures* 27 (2005) 769– 780.

[7] Bardakis V.G., Dritsos S.E. (2007), "Evaluating assumptions for seismic assessment of existing buildings ".*Soil Dynamics and Earthquake Engineering* 27 (2007) 223–233.