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COMPARISON OF SEISMIC BEHAVIOUR OF A TYPICAL MULTI-STOREY STRUCTURE WITH COMPOSITE COLUMNS AND STEEL COLUMNS

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ABSTRACT

A large overview has been executed on the way of behaving of composite segment in a creation. In composite segment development metallic and cement are joined in one of this manner that the advantages of the materials are utilized in a productive way. By holding and contact among steel and composite material these materials will acknowledge the out of doors stacking in composite segments. In this have a look at exam of composite and standard construction is finished. Simply transferring the plan of phase i.e., with the aid of making use of composite and conventional segment and saving any last underlying people identical for each the designs. Composite section configuration is completed through Euro code 4 and commonplace section configuration is via IS 456-2000. The systems are taken to be consistent with be installed III seismic region. Seismic plan is trailed by means of IS 1893- 2002. There are an extensive range of forms of composite phase from those we have taken concrete encased composite phase for our examination. Substantial encasement could expand the heap competition of metal segment. During seismic movement the reaction of design is likewise tormented by the cloth belongings which relies upon the materials and moreover its arrangement in the underlying framework. The foundation of the design is concept to be fixed. The shape stage is 36.8m which goes beneath low ascent constructing. Demonstrating and examination has been conveyed in E-TABSprogramming. The outcomes are obtained of various boundaries, for instance, base shear, tale provoking, story drift and so on; subsequently with the aid of getting the ones consequences charts had been plotted. Furthermore, correlation of two distinct type of design has been finished. Consequently, we observed that low ascent traditional shape is greater suitable than low ascent composite shape.

Watchwords: Composite segments, Seismic way of behaving, E-TABS Software, rooftop relocation, Story flow, Overturning 2nd and so forth.

INTRODUCTION

Planning and breaking down of G+6 multi celebrated pers structure using analyzing programming E-TABS Underlying research is the inspiration of structural desigr During late years, there was a developing accentuatior utilizing PC helped programmings and contraptions research the designs. These upgrades are usually welcom they alleviate the architect of the frequently widesp estimations and technique expected to be observed w extensive or confounded systems are investigated utili conventional strategies. Be that as it can, now not all of the time such precise examination is vital to be performed.

Presently a-days, tall systems and multistory structures are normal in metropolitanurban communities. These multistoried structures have big number of Joints which are allowed to transport and its miles undeniably challenging and tedious whilst it broke down

physically. Thus the PC approach for investigation is applied utilizing the reducing area breaking down programming E-

TABS Pro.

OBJECTIVE

To have a look at the multi-story private shape comprises c tales utilizing E-TABS Pro.

1. To collect the aftereffects of Maximum shear energy Maximum twisting Moment for radiates Maximum hub f for sections.
2. To plan the basic primary people from bar, section, ch stability and flight of stairs utilizing IS 456-2000 and SP-1
3.

1.2 PROCESSES INVOLVED

1. To go to the web page and ruin down the general page situations and its path.To set up the plans utilizing AutoCAD.

2. Breaking down the casing, concerning general researcl programming E-tabs for loadconditions according to IS 45 2000.Contrasting the fundamental pillar and phase and the manual computations deliberate makinguse of IS 456-200C Planning the section, stability, flight of stairs in step wit 456-2000 and SP-16 plan enables. A section is intende enroll in particular substances or two distinct grades material to form a primary component. A composite phas a part which is basically exposed to strainor to pressure twisting. Composite improvement that attempts to co-hc the capacities of substances i.e., concrete and mild we steel has been applied in the two systems and scaffolds ov many stages.

The structures in India are evolved with RCC and utilization of steel systems is by way of and huge restricte fashionable structures and of past due multi-story syste that have obtained prominence via embracing compo primary additives. Notwithstanding, as of overdue, composite sections are obtaining notoriety for use in multistorey structures by greatness in their static and tremor secure houses.

The tremor obstruction properties, for instance, follows

1. Lower mass and high power, unbending nature and firmness.
2. High durability and flexibility.

LITERATURE REVIEW

Preetha et al., [2] proposed the direct static and response range examination strategies for investigating the seismic exhibition of (G+10) multistoried commercial enterprise working with RCC and two wonderful composite sections viz. Concrete encased phase (CES) and square cement crammed tubes (CFST) underneath quake sector III. The plan and examination were accomplished utilizing ETABS 2017 programming. The tale flow for both RCC and composite designs is interior as a long way as possible, i.E., 0.004 times the extent of the tale. Story shear esteem is seen to be negligible within the composite design. The higher horizontal burden obstruction and coffee tale removal were visible in the RCC shape.

Ganwani., [3] proposed a near investigation of seismic execution of a three-D (G+eight) Story RCC and metallic-huge composite structure define beneath tremor sector IV. Identical static approach and response variety method are taken on for seismic exam. ETABS 2015 programming is utilized and outcomes are checked out. In composite designs, generally speakme expense decrease in improvement, understood pliability attributes of metal for better seismic balance, fast development, dwindled minutes, and hub powers are the advantages noticed contrasted with normal RCC shape.

STRUCTURAL COMPONENTS OF BUILDING

SLABS:

It is an underlying component uncovered to flexure and communicates forced and lifeless burden to uphold.

Forced loads are the masses of inhabitants, furnishi hardware, weight of snow and Dead masses are self-weigl chunk and weight of ground floor sections for flooring tops of constructing. By and massive, they may be anticip to bring consistently dispersed loads. As a rule, pieces broke down for flexure because it had been.

As a rule, portions are flat aside from flight of stairs slopes for placed away car leaves. Bars and dividers portions. The distinct forms of piece gave are accompanying,

2. Simply upheld pieces traversing in a single hea (One-manner chunks).
3. Simply upheld sections spreading over in two bea (Two-way portions).
4. Continuous sections. (These sections are prob one manner or two-way chunks).
5. Cantilever sections.
6. Flat sections.

E-TABS-PRO ANALYSIS

GENERAL:

ANALYSIS AND DESIGN

The casings can be investigated both by means of 2D or examination.2D ANALYSIS:

The 2D exam techniques are

1. Slope diversion approach.
2. Moment move strategy. Three. Matrix solidness strategy.
3. Conjugate shaft approach.
4. Matrix adaptability method.

3D ANALYSIS:

The individuals or pin - jointed area bring just hub po gave the thousands are applied at the joints and the people immediately. The concept of the pressure in the individ froma pin - jointed outline is a comparable whether or not it's miles a plane casing or an area outline. A vast quantity of pin - jointed procedures normally skilled practically speaking, for instance, radio and transmission tower are 3-D space outlines.

The 3-d exam strategies are

Force approach.

Displacement approach.

PROGRAMMING PACKAGE:

E-tabsV8i (SS6 Version) is the most widely recognized primary designingprogramming object for three-D model age, exam and multi - material plan.

It has an instinctive, clean to recognize, representation gadgets, robust research and plan offices and constant becoming a member of to 3 different demonstrating and plan items. For static or dynamic examination of scaffolds, manipulate systems, implanted structures (passages and ducts), pipe racks, metallic, cement, aluminum or lumber systems, transmission towers, arenas or numerous different truthful or complex construction, E-tabshas been the selection of plan specialists All over the planet for his or her unique research want.

E-TABS INPUT DETAILS:

The E-TABS Input document addresses our considering what we need to investigate or plan with records at the E-TABS order language, some different individual can likewise test the precision of labor.

There are severa approaches of creating shape in E-TABS Pro

- Structure Wizard
- E-tabs Editor
- Utilizing constructing organizer
- Add Beam

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- Add plate
- Duplicate and gluing the hubs

BUILDING DESCRIPTION

One of the prime objectives of this project is to study behavior of composite and conventional structure i particular seismic zone. Investigation is carried out to as the performance of the framed structure with two alterna column schemes, RCC and Encased. The structures modeled and analyzed using E-TABSsoftware package as IS 1893: 2002.

Table-1: Common Specifications for RCC and Encased Structures

Seismic zone	III
Zone factor	0.24
Importance factor	1
Response spectra as per IS 1893:2002 (part 1)	3
Damping ratio	5%
Type of soil	Rock or hard soil
Number of storey's	G+10
Base dimension of the building	17.2m x 21.35m
Total height of the building	36.8m
Typical storey height	3.2m
Plinth height	1.5m
Number of Bays along X-direction	3
Number of Bays along Y-direction	10
Live load	2kN/m

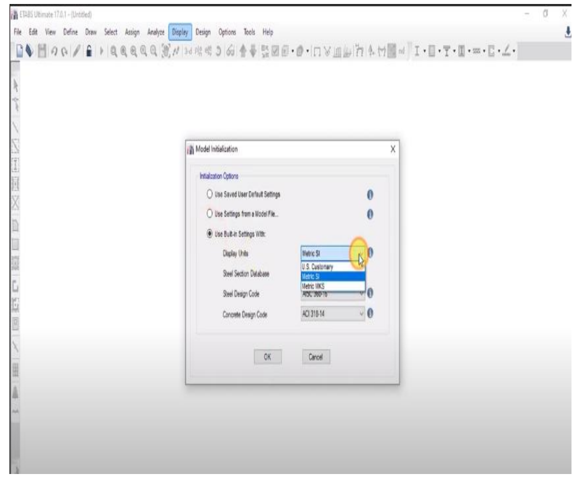

Fig -1: Typical Plan of RCC Building in E-TABS

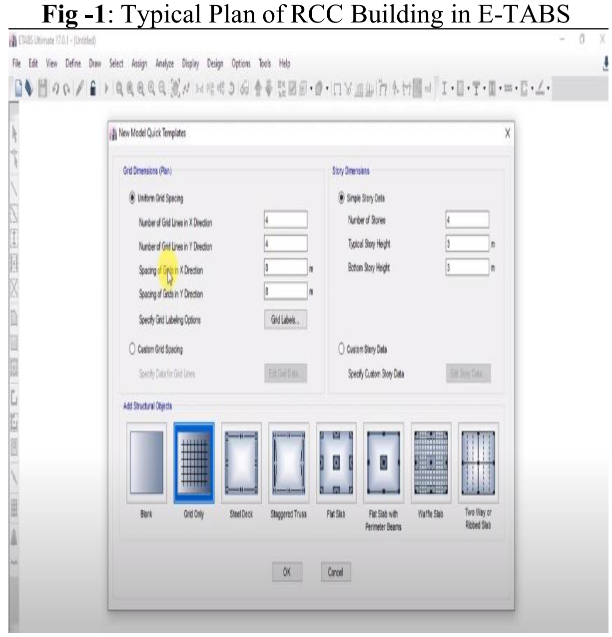

Fig -2: MODEL types of RCC Building in E-TABS

GENERAL

The edges have been distinguished from the shape and comparing loads have been decided making use of IS (section 1), (section 2). The research of casings for the upv powers became conveyed through E-tabs Software.

ANALYSIS OF THE FRAMES

2-DIMENSIONAL VIEW OF THE STRUCURE

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Table-8: Max BM and SF in RCC, steel and composite structure

Comparison property	Composite beam	Steel beam	RCC beam
Max Shear force (KN)	370	280	460
Max Bending moment in Z-direction (KN-m)	410	321	510

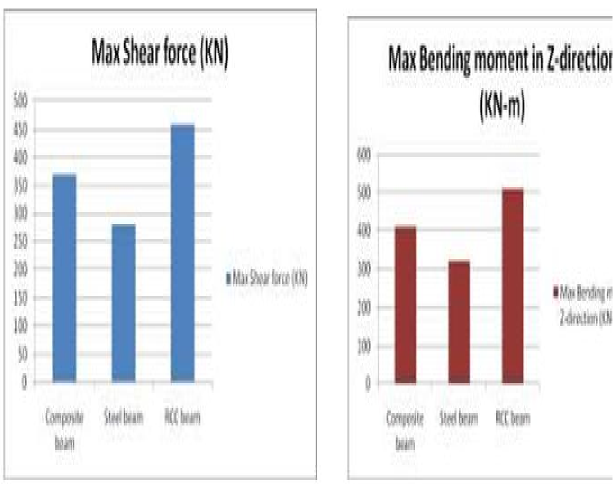
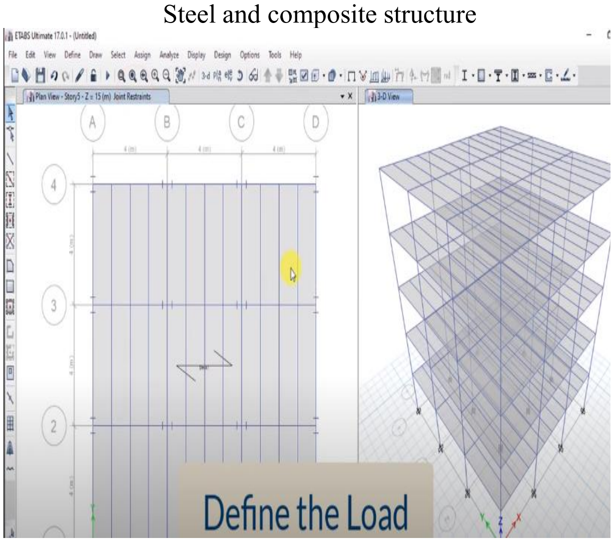


Fig-10: Max shear force and Max Bending Moment for R Steel and composite structure



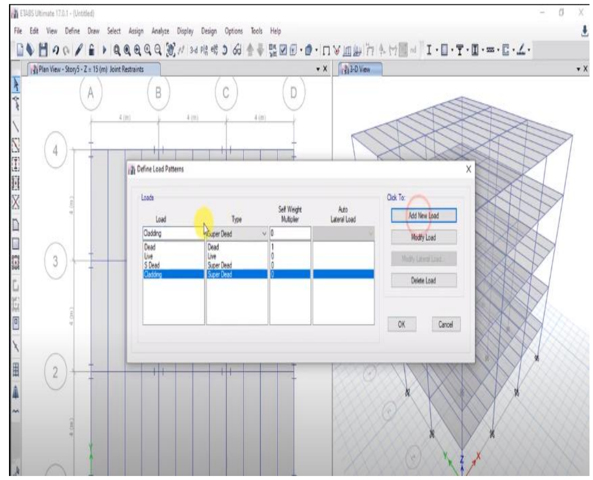


Fig -6: load of RCC Building in E-TABS

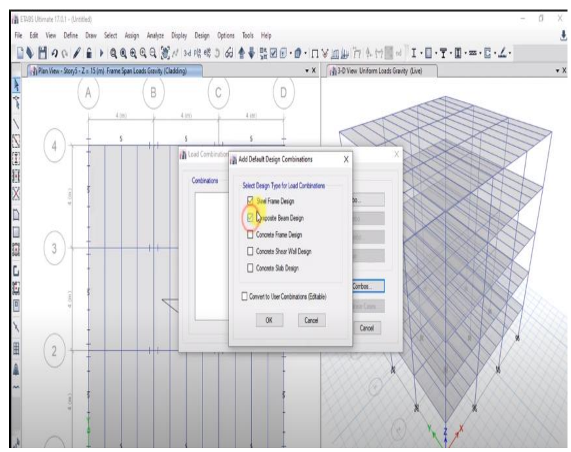


Fig -7: add default design of RCC Building in E-TABS

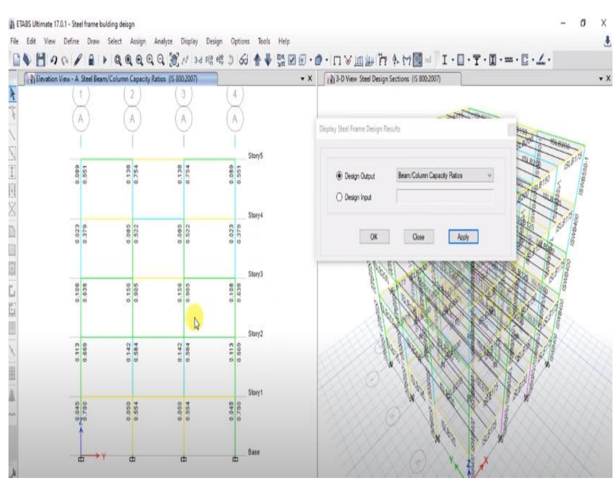


Fig -8: beam x columns of RCC Building in E-TABS

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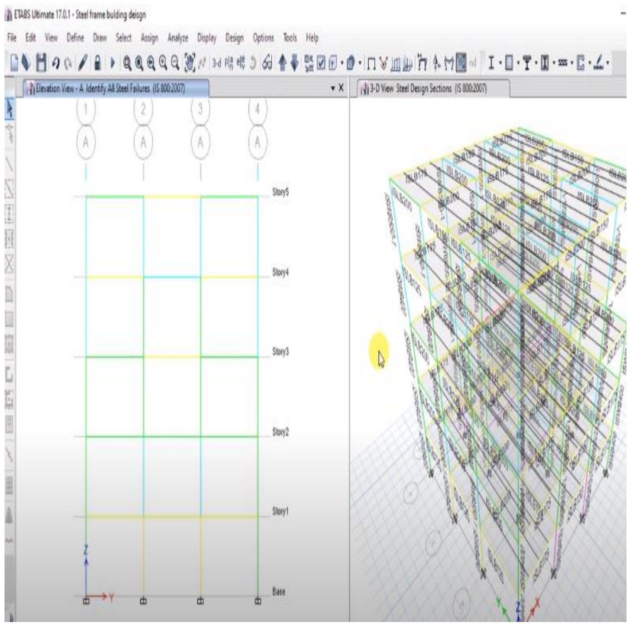

Fig -9: beam y columns of RCC Building in E-TABS

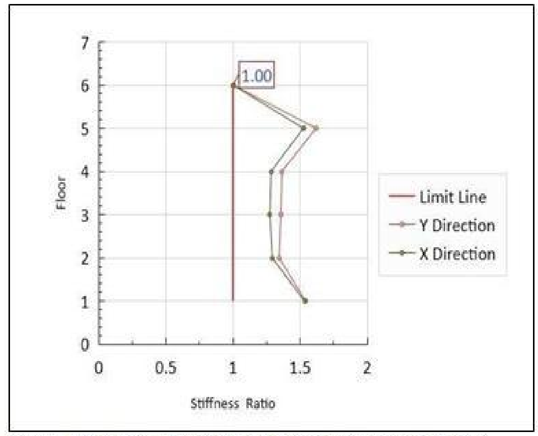

Figure 13: Multi-dir Stiffness Ratio diagram (Tower 1)

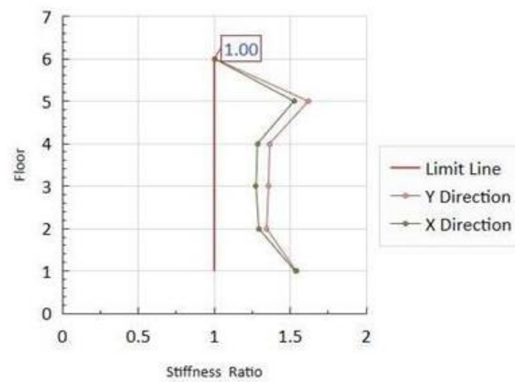

Figure 15: Multi-dir Stiffness Ratio diagram (Tower 1)

RESULTS AND DISCUSSION

After examination of the normal and composite p structures located in seismic sector III adjusting to 1893:2002 by using making use of E-TABS PRO, consequences are extricated and checked out as a way fundamental quake reaction obstacles, for instance, base s most intense tale floats, rooftop relocations and tale provo mines. Similar consequences are recorded in tables and cl below.

Table 14: Rs: Weak layer seismic sheat amplification coefficient

Floor	Tower	Ratx,Raty	Ratx1,Raty1	RJX1,RJY1 (kN/m)	RJX3,RJY3 (kN/m)
6	1	1.00,1.00	1.00,1.00	2.32E+006 2.32E+006	5.58E+005 5.11E+005
5	1	1.00,1.00	1.52,1.62	2.32E+006 2.32E+006	5.96E+005 5.79E+005
4	1	1.00,1.00	1.28,1.36	2.32E+006 2.32E+006	5.93E+005 5.95E+005
3	1	1.00,1.00	1.28,1.36	2.32E+006 2.32E+006	5.94E+005 6.10E+005
2	1	1.59,1.59	1.29,1.34	2.32E+006 2.32E+006	6.15E+005 6.39E+005
1	1	1.00,1.00	1.53,1.54	1.46E+006 1.46E+006	7.36E+005 7.57E+005

Minimum stiffness ratio in X direction: 1.0000(6 Floor 1 Tower)
Minimum stiffness ratio in Y direction: 1.0000(6 Floor 1 Tower)

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Checking Calculation for Structure Whole Stability

Table 15: Earthquake

Floor	Tower	Stiffness X	Stiffness Y	Floor height	Mass-Above	Rigidity/gravity-X
1	1	7.360E+005	7.573E+005	4.200	55311	5.589E+001
2	1	6.146E+005	6.394E+005	3.600	45662	4.846E+001
3	1	5.940E+005	6.098E+005	3.600	36194	5.909E+001
4	1	5.929E+005	5.949E+005	3.600	26726	7.986E+001
5	1	5.958E+005	5.790E+005	3.600	17258	1.243E+002
6	1	5.584E+005	5.111E+005	3.600	7790	2.581E+002

The ratio of rigidity-to-gravity of the structure Di*Hi/Gi is bigger than the overall stability checking calculation in Code 5.4.4

The ratio of rigidity-to-gravity of the structure Di*Hi/Gi is bigger than Code 5.4.1, gravity second-order effect can be left out

Table 16: Checking Calculation for the Overturn Resistance of the Whole Structure (units:kN.m)

Floor	Tower	Case	Anti-Overturn Mr	Overturn Mov	Ratio Mr/Mov	Zero stressed zone(%)
1	1	Wind X	9.179E+005	3.667E+003	250.33	0.00
		Wind Y	3.307E+005	9.844E+003	33.60	0.00
		Seism X	8.852E+005	4.304E+004	20.57	0.00
		Seism Y	3.190E+005	4.335E+004	7.36	0.00

The rest of the structural design calculation can be found in the YJK calculation report attached to thesis. From the theoretical and experience point of view, the structure has passed the design test meeting the basic requirement; economical and safety.

The statistical frame shear under wind load

Table 17 Frame Column, Shear Wall In X direction Wind Shear and Percentage (units:kN)

Floor	Tower	Column shear	Wall shear	Total shear	Column shear percentage	Wall shear percentage
6	1	53.5	0.0	53.5	100.00%	0.00%
5	1	100.7	0.0	100.7	100.00%	0.00%
4	1	141.6	0.0	141.6	100.00%	0.00%
3	1	178.9	0.0	178.9	100.00%	0.00%
2	1	212.7	0.0	212.7	100.00%	0.00%
1	1	247.7	0.0	247.7	100.00%	0.00%

Table 19: Frame Column Wind Overturn Moment and Percentage In X direction (units:kN.m)

Floor	Tower	Column moment	Total moment	Column moment percentage
6	1	192.7	192.7	100.00%
5	1	555.1	555.1	100.00%
4	1	1064.9	1064.9	100.00%
3	1	1709.0	1709.0	100.00%
2	1	2474.6	2474.6	100.00%
1	1	3515.2	3515.2	100.00%

Table 20: Frame Column Wind Overturn Moment and Percentage In Y direction (units:kN.m)

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Checking Calculation for Structure Whole Stability

Table 21 Earthquake

Floor	Tower	Stiffness X	Stiffness Y	Floor height	Mass-Above	Rigidity/gravity-X	Rigidity/gravity-Y
1	1	7.360E+005	7.573E+005	4.200	55311	5.589E+001	5.750E+001
2	1	6.146E+005	6.394E+005	3.600	45662	4.846E+001	5.041E+001
3	1	5.940E+005	6.098E+005	3.600	36194	5.909E+001	6.066E+001
4	1	5.929E+005	5.949E+005	3.600	26726	7.986E+001	8.014E+001
5	1	5.958E+005	5.790E+005	3.600	17258	1.243E+002	1.208E+002
6	1	5.584E+005	5.111E+005	3.600	7790	2.581E+002	2.362E+002

The ratio of rigidity-to-gravity of the structure Di*Hi/Gi is bigger than 10, satisfying the overall stability checking calculation in Code 5.4.4

The ratio of rigidity-to-gravity of the structure Di*Hi/Gi is bigger than 20, satisfying Code 5.4.1, gravity second-order effect can be left out

Table- 2: Comparison of composite and conventional (RC) building for base shear

STOREY LEVEL	BASE SHEAR (kN)		% increase of base shear
	COMPOSITE	CONVENTIONAL	
LMR TOP	281.616	0	100
LMR BOTTOM	776.5786	0	100
TERRACE	2566.665	349.305	86.39
8F	4777.847	737.262	84.56
7F	6755.505	1047.6	84.49
6F	8499.639	1288.98	84.83
5F	10010.25	1470.04	85.31
4F	11287.33	1599.46	85.82
3F	12330.9	1685.87	86.32
2F	13140.93	1737.93	86.77
FF	13717.45	1764	87.14
GROUND FLOOR	14100.11	1774.75	87.41
PLINTH	14128.06	1774.98	87.43

Base shear for composite structure is seen to be a coupl times better than that of regular structure. Most extreme shear is visible if there have to be an occurrence of compo designs. From this it's miles visible that normal constructio greater secure.

Table- 3: Comparison of composite and conventional (RC) building for overturning moment

STOREY LEVEL	STOREY OVERTURNING MOMENT (MN-m)along X direction		% increase
	COMPOSITE	CONVENTIONAL	
LMR TOP	0	0	0
LMR BOTTOM	0.5913	0	100
TERRACE	1.5232	0	100
8F	9.7366	1.1177	88.52
7F	25.0257	3.4770	86.10
6F	46.6433	6.8293	85.35
5F	73.8422	10.9540	85.16
4F	105.875	15.6582	85.21
3F	141.994	20.7764	85.36
2F	181.453	26.1712	85.57
FF	223.504	31.7326	85.80
GROUND FLOOR	267.4	37.3784	86.02
PLINTH	312.52	43.0576	86.22
BASE	333.713	45.7200	86.29

When contrasted and composite shape conventional structure have surprisingly low frightening 2nd nearly eight to a couple of times difference is observed. Toppling 2d is finest at the muse of the shape. A pretty excessive exchange is seen within the designs while checked out.

Table- 4: Comparison of composite and conventional (RC) building for storey drift.

STOREY LEVEL	STOREY DRIFT along X direction		% increase
	COMPOSITE	CONVENTIONAL	
LMR TOP	0.00398	0.00052	86.93
LMR BOTTOM	0.00406	0.000551	86.42
TERRACE	0.005007	0.00081	83.82
8F	0.007158	0.001231	83.80
7F	0.00927	0.001614	82.58
6F	0.01114	0.001916	82.80
5F	0.01272	0.002136	83.20
4F	0.01399	0.002282	83.68
3F	0.01493	0.002362	84.17
2F	0.015547	0.002377	84.71
FF	0.01530	0.002301	84.96
GROUND FLOOR	0.01301	0.001959	84.94
PLINTH	0.005069	0.000762	84.96
BASE	0	0	0

Story drift alongside both X and Y route is best in 2Floor in composite shape. In normal structure widespread difference is seen between the floors. More go with the flow is visible in X heading while idea approximately along Y bearing.

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Table- 5: Comparison of composite and conventional (RC) building for roof displacement.

STOREY LEVEL	DISPLACEMENT (mm) along X direction		% increase
	COMPOSITE	CONVENTIONAL	
LMR TOP	394.6	62.7	84.11
LMR BOTTOM	386.4	61.7	84.03
TERRACE	384.7	61.8	83.93
8F	368.7	59.2	83.94
7F	345.8	55.3	84.00
6F	316.1	50.1	84.15
5F	280.5	44	84.31
4F	239.8	37.1	84.52
3F	195	29.8	84.71
2F	147.2	22.3	84.85
FF	97.7	14.7	84.95
GROUND FLOOR	48.7	7.3	85.01
PLINTH	7.6	1.1	85.52
BASE	0	0	0

CONCLUSIONS

Logical evaluate has been led to comprehend the manne behaving of cement encased segments in a production TABSprogramming is utilized to complete the examinat Examination of ordinary and composite plan has accomplis What's more, the accompanying give up has been drawn f it. Both the composite and traditional systems/structures w might be further examined, act indistinguishably for boundaries taken into consideration, but greater assessmen their sizes. It is visible that the bottom shear is around comparison in composite sections structure when contra with the design with RC segments. Consequently, reg shape can be viewed as regularly occurring than the compo structure almost about base shear. From the near observe n for a regular low upward push running with a stage 36.Eight m, the bottom shear is more in composite design accordingly it is extra powerless towards quake than the RC building. Story floats and toppling minutes are moreover higher that is eighty% and eighty five% due to composite shape. The tale flow is greatest at 2nd ground which may additionally make more damage the flooring above it, in particular in the event of composite production. However, in traditional shape, now not a lot float are inside the middle of between revolutionary flooring, which makes it normally covered. These results and close to look at observations result in an quit that for low ascent structures composite section configuration isn't always reasonable.

REFERENCES

1. C.C.Weng, S.I.Yen (2001)."Comparisons of concrete encased composite segment energy preparations of ACI code and AISC^specification", Department of Civil Engineering, National Chiao Tung University, Hinchey, 30050, Taiwan, ROC. Designing Structures 24 (2002) fifty nine-seventy two.

2. P. Villach, Š. Gramblička (2007),"Theoretical and trial investigations of composite metallic- constructed up concrete (SRC) sections" Slovak diary of structural designing 2007/four PAGES 1 - nine RECEIVED 15. 5. 2007 ACCEPTED 20. Nine. 2007.

3. Cheng-Chi Chen, Jean-Ming Li, C.C. Wing (2005)," Experimental manner of behaving and power of cement encased composite shaft segments with T-fashioned metallic vicinity underneath cyclic stacking" Journal of Constructional Steel Research 61 (2005) 863-881.

4. N.E. Shanmugam, B.Lakshmi (2001), "Cutting side file on steel-substantial composite sections" Journal of Constructional Steel Research 57 (2001) 1041-1080.

5. Mahbuba Begum et al., (2013),"value exam of metal

ISSN: 2057-5688

extensive composite designs in Bangladesh" AS
JOURNAL OF CIVIL ENGINEERING (BHRC) VOL.
NO. 6 (2013) PAGES 935-944.

6. Prof. S. S. Charantimath et al.,(2014), "Similar Stud
Structural Parameter of R.C.C and Composite Building" (
and Environmental Research ISSN 2224-5790 (Paper) I
2225- 0514 (Online).Vol.6, No.6, 2014.

7. Sweat A. Waugh and Dr. U. P. Wage (2014), "Sin
Study of R.C.C and Steel Concrete Composite Structu
Journal of Engineering Research and Applications IS
2248-9622, Vol.Four, Issue 4(Version 1), April 2014, pp.
376.

Eight. Afar Muja war and Prakash Angove (2015), "Sin
Evaluation of Reinforced Concrete, Steel and Comp
Structures under the Effect of Static and Dynamic Lo
Journal of Engineering Research and Applications IS
2248-9622, Vol. 5, Issue 1(Part 5), January 2015, and pp.F
one-44

Nine. Shashikala. Kop pad and Dr. S.V
(2013),"Comparative Study of RCC and Comp
Multistoried Buildings" International Journal of Enginee
and Innovative Technology (IJEIT) Volume three, Issue
November 2013.