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Seismic Analysis of High Rise Building with Is Code 1893-2016

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Abstract*ThestudyofseismicanalysisanddesignofG+6multistoreybuildingofregularandirregularconfigurationiscarrie doutusing STAADpro.Assumingthatmaterialproperties are linear static and dynamic analysis is performed considering the static behaviourof the material. The analysis is carried out by consideringseismiczonesiiiandformedium soil. The result is tabulated and graphs are plottedfordisplacement,baseshear,andtimeperiod.Thecomparativestudyofregularandirregularbuildingusingiscode1 893-2016.*

Keywords*- staad -pro, base shear, displacement etc*

I. Introduction

Earthquakemeansthesuddenvibrationof earth which is caused by naturally or manually. We know that different type of verticalirregularbuildingsisusedinmodern infrastructure. During an earthquake, the buildingtendstocollapse.Thisismainlydue to discontinuity in geometry, mass and stiffness. This discontinuity is termed as Irregular structures. So verticalirregularities areoneofthemajorreasonsoffailuresof structuresduringearthquakes.Inplanning stage of vertical irregularity due to some architecturalandfunctionalreasons.Duringanearthquake,failureofstructurestartsat pointsofweakness.Thisweaknessarisesdue to discontinuity in mass, stiffness and geometry ofstructure.

1.1 Objective:

1. To design and analyse G+6 regular and irregularbuildingwithnewdesigncode.
2. Tocompareanalysisresultforregularand irregular buildingstructure.

II. Literaturereview

Paper [1] shows Reinforced Concrete(RC) building frames are most common types of constructions in urban India. These are subjected to several types of forces during theirlifetime,suchasstaticforcesduetodead and live loads and dynamic forces due to earthquake.Thispaperpresentsareviewof the previous work done on multistoried buildings vis-à-vis earthquake analysis. It focuses on static and dynamic analysis of buildings.

Inpaper[2]thebehaviourofG+11multistory building of regular and irregular configuration underearthquakeiscomplexanditvariesof windloadsareassumedtoactsimultaneously with earth quake loads. In this paper a residential of G+11 multi story building is studiedforearthquakeandwindloadusing ETABS and STAAS PRO V8i. Assuming that materialpropertyislinearstaticanddynamic analysis are performed. These analyses are carried out by considering differentseismic zones and for each zone the behaviour is assessedbytakingthreedifferenttypesofsoils namely Hard, Medium and Soft. Different response like story drift, displacements base shear is plotted for different zones and differenttypesofsoils[13].

Paper[3]dealswiththecomparisonbetween equivalent static technique &response spectrum technique. The earthquakeeffect leadstothedamagethepropertyandmany peoplelossoflife.So,wehavetoknowthe structural performance under seismic load before construction. [7] Method of analysis Adopt the equivalent static and response spectrumtechniquestoanalysethemodelfor the present study and observe the lateral displacementofthestructureinaregularand irregularstructureinvariouszones[11].

Paper[4]shows,it'saverybigchallengethat building or structure must withstand lateral forcessuchasearthquakeandwindload.In thepresentwork,thecomparativeanalysisof various structures is performed using SAP 2000. [8] The main aim of the project is comparative study of the stiffness of thestructurebyconsideringthethreemodelsthatisRegularStructure,PlanirregularstructureandVerticalirregularstructure. Allthesethreemodelsareanalyzedwithstaticanddynamic earthquakeloadingfortheZonesII,III,IV&V.The results are tabulated and graphs are plottedfordisplacement,drift,baseshearand time period. Based on the results and discussion the structural behaviour and stiffnessisconcludedforregularandirregular structures, among these structures regular structure shown maximum displacementand drift for all the zones in both static and dynamic analysis.

Inthispaper[5]Thenationalbuildingcodeof India(NBC)2015wasreleasedbybureauof Indian standards during December 2016/january2017.Thevarioussectionsofthis NBChaveundergonechangesasperlatest technologies and user requirements. It is necessarytoidentifytheperformanceofthe structures to withstand against disaster for both new and existing one. The paper discusses the performance evaluation of RC (Reinforced Concrete) Buildings with plan irregularity. Structural irregularities are important factors which decrease theseismic performanceofthestructures[6].ThisstudyasawholemakesaneffforttoevaluatetheeffectofplanirregularityonRCbuildin gsusingIS 1893:2002 and IS 1893:2016 in terms of dynamiccharacteristics.

III. Problem for mulation

Theproblemisdefinedandconsideredasthedesignofbuildingwith IScode1893-2016.the buildingspecificationareasfollows:

Building plan= 20mx20m Beam size=0.3 mx 0.45 m Columnsize=0.3mx0.5m Storeyheight=3meachfloor Liveload=3KN/m^2

Bay distance: 4m Seismic: III

Material grade: M30

Load Combination as per New Code

0.9DL+1.5(ELX+0.3ELY+0.3ELZ)
0.9DL+1.5(ELY+0.3ELX+0.3ELZ)
0.9DL-1.5(ELX+0.3ELY+0.3ELZ)
0.9DL-1.5(ELY+0.3ELX+0.3ELZ)
1.2(DL+LL-(ELX+0.3ELY+0.3ELZ))
1.2(DL+LL-(ELY+0.3ELX+0.3ELZ))
1.2(DL+LL+(ELX+0.3ELY+0.3ELZ))
1.2(DL+LL+(ELY+0.3ELX+0.3ELZ))
1.5((DL-(ELX+0.3ELY+0.3ELZ))
1.5((DL-(ELY+0.3ELX+0.3ELZ))
1.5((DL+(ELX+0.3ELY+0.3ELZ))

1.5((DL+(ELY+0.3ELX+0.3ELZ))

IV. Modelling

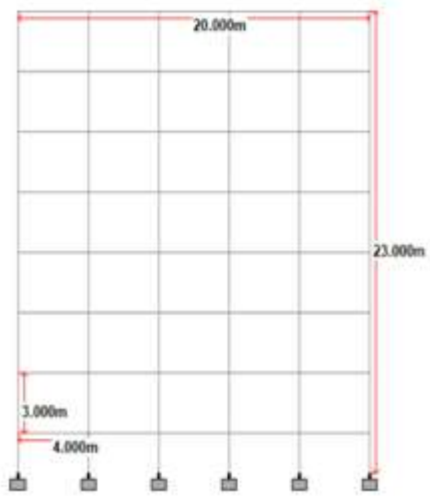

Fig: Regular plan front view

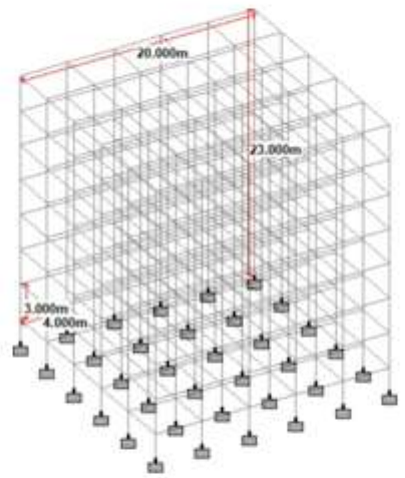

Fig: Regular building 3D view

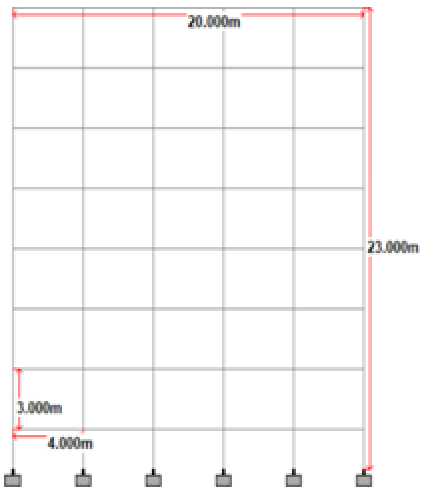

Fig: Irregular T- shape front view

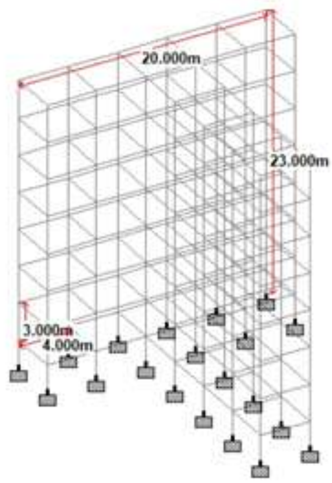

Fig: Irregular building 3D view

V. Analysis result

DISPLACEMENT [REGULAR BUILDING]

Node	LOAD COMBINATION	U(Meter)
139	1.5[DL+(ELX+0.3ELZ)]	0.07112
45	1.5[DL+(ELZ+0.3ELX)]	0.1021
15	1.5[DL+(ELZ+0.3ELX)]	0.039
47	1.5[DL+(ELZ+0.3ELX)]	0.100
162	1.5[DL-(ELX-0.3ELZ)]	0.0265

DISPLACEMENT [IRREGULAR BUILDING]

Node	LOAD COMBINATION	U(Meter)
285	1.5[DL+(ELX+0.3ELZ)]	0.0805
43	1.5[DL+(ELZ+0.3ELX)]	0.0924
9	1.5[DL+(ELZ+0.3ELX)]	0.0189
142	1.5[DL+(ELX+0.3ELZ)]	0.0709
256	1.5[DL-(ELX-0.3ELZ)]	0.0434
96	1.5[DL-(ELZ-0.3ELX)]	0.0935

SHEAR FORCE [REGULAR BUILDING]

Node	Load combination	Fy N
303	1.5[DL+(ELZ+0.3ELX)]	2.49E+06
298	1.5[DL-(ELZ-0.3ELX)]	2.35E+06
316	1.5[DL+(ELZ+0.3ELX)]	2.35E+06
298	1.5[DL-(ELZ-0.3ELX)]	2.35E+06
311	1.5[DL+(ELX+0.3ELZ)]	2.38E+06
302	1.5[DL-(ELX-0.3ELZ)]	2.38E+06

SHEAR FORCE IN IRREGULAR BUILDINGMOMENT in regular building

Node	Load combination	Mz KN-M
303	1.5[DL+(ELZ+0.3ELX)]	49.523
298	1.5[DL-(ELZ-0.3ELX)]	49.361
316	1.5[DL+(ELZ+0.3ELX)]	49.361
295	0.9DL-1.5(ELX-0.3ELY)	-146.866
300	1.5[DL+(ELX+0.3ELZ)]	149.692
311	1.5[DL+(ELX+0.3ELZ)]	168.098

MOMENT in Irregular building

Node	Load combination	Mz KN-M
299	106 1.5[DL+(ELX+0.3ELZ)]	146.739
309	107 1.5[DL-(ELX-0.3ELZ)]	-137.261
316	113 0.9DL-1.5(ELZ-0.3ELX)	44.475
316	113 0.9DL-1.5(ELZ-0.3ELX)	44.475
299	106 1.5[DL+(ELX+0.3ELZ)]	146.739
322	106 1.5[DL+(ELX+0.3ELZ)]	147.655

VI. Conclusion

1. Themaximumdeflectionfoundinthe regularbuildingis0.1021Mandinthe irregularbuildingis0.0935M.
2. Themaximumshearforcefoundinthe regularbuildingis2.49E+06Nandin theirregularbuildingis1.79E+06
3. ThemaximumBendingmomentfound intheregularbuildingis168.098KN-M andintheirregularbuildingis147.655 KN-M

Node	Load combination	Fy N
296	1.5[DL-(ELX-0.3ELZ)]	1.50E+06
316	0.9DL-1.5(ELZ-0.3ELX)	1.20E+06
299	1.5[DL+(ELX+0.3ELZ)]	1.79E+06
322	1.5[DL+(ELX+0.3ELZ)]	1.81E+06
321	1.5[DL-(ELX-0.3ELZ)]	1.53E+06

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REFERENCES

[1]. Gauri G. Kakpure, Ashok R. Mundhada," Comparative study of static and dynamic seismicanalysisofmultistoriedrccbuildingby Etab: a review" International Journal of Emerging Research in Management &Technology Volume-5, Issue-12, Dec2016,

[2]. ISSN: 22789359

[3]. S. Mahesh1, Mr. Dr.B.PandurangaRao," Comparisonofanalysisanddesignofregular and irregular configuration of multi-story buildinginIOSRJournalofMechanicalandCivil Engineering (IOSR-JMCE) e-ISSN: 22781684,p- ISSN:2320-334X,Volume11,Issue6Ver.I (Nov-Dec.2014),PP45-52variousseismic zonesandvarioustypesofsoilsusingEtabsand Staad.",

[4]. V. Rajendra Kumar, Ranga Rao.V," Comparative study on regular & irregular structuresusingequivalentstaticandresponse spectrummethods",InternationalJournalof Civil Engineering and Technology (IJCIET) Volume8,Issue1,January2017,pp.615–622

[5]. RaviKiran,Sridhar.R,"Comparativestudy of regular and vertically irregular building under seismic loading", IJRET: International Journal of Research in Engineering and TechnologyeISSN:2319-1163|pISSN:2321- 7308

[6]. RakeshKumarGupta1,Prof.D.L.Budhlani

[7]. ,"Reviewofis1893:2016withis1893:2002 with plan irregularity", International Journalof Scientific Engineering and Research (IJSER),ISSN(Online):2347-3878.

[8]. NarayanMalviya,SumitPahwa,"Seismic analysisofhighrisebuildingwithiscode1893- 2002 and is code1893-2016", International Research Journal of Engineering and Technology(IRJET)e-ISSN:2395-0056Volume: 04Issue:11|Nov-2017www.irjet.netp-ISSN: 2395-0072

[9]. RaúlGonzálezHerrera1andConsueloGómezSoberón,"Influenceofplanirregularityofbuildings",The14thWorldConferenceon EarthquakeEngineeringOctober12-17,2008,

[10]. Beijing, China

[11]. T.Mahdi*aandV.SoltanGharaieb,"Plan irregularrcframes:comparisonofpushover with nonlinear dynamic analysis", asian journal of civil engineering (building and housing)vol.12,no.6(2011)pages679-690.

[12]. 1Amin Alavi, 2Prof. P.Srinivasa Rao," Influence of torsional irregularities of rc buildings in high seismic zone" Australian Journal of Basic and Applied Sciences, 7(13) November2013,Pages:16-23.[10]RuchaS. Banginwar,M.R.Vyawahare,P.O.Modani" Effectofplansconfigurationsontheseismic behaviour of the structure by response spectrum method", International Journal of EngineeringResearchandApplications(IJERA) ISSN:2248-9622Vol.2,Issue3,May-Jun2012, pp.1439-1443

[13]. NarayanMalviya,SumitPahwa,"Seismic analysisofhighrisebuildingwithiscode1893- 2002 and is code 1893-2016",International Research Journal of Engineering and Technology(IRJET)e-ISSN:2395-0056

[14]. Miss.AadishriDKadam1,Dr.P.S.Pajgade," DESIGNING OF SOFT STOREY FOR RC STRUCTUREUSINGIS-1893(PARTI)-2016,AND IS13920-2016", International Research Journal ofEngineeringandTechnology(IRJET)e-ISSN: 2395-0056Volume:05Issue:05|May-2018p-ISSN: 2395-0072

[15]. RavikantSingh1andVinayKumarSingh2, "Analysisofseismicloadsactingonmultistory building as per is: 1893-2002 and is:1893-2016:-Acomparativestudy",JournalofCivil EngineeringandEnvironmentalTechnologyp-ISSN:2349-8404;e-ISSN:2349-879X;Volume4,Issue 5; July – September,2017, pp. 405-408

[16]. Akhil R, Aswathy S Kumar,"Seismic analysisofregularandirregularbuildingswith vertical irregularity using Staad.pro"

InternationalResearchJournalofEngineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 06 | June -2017 www.irjet.net p-ISSN:2395-0072

[17]. Arun Babu M, Ajisha R,"Analysis of multistoriedbuildingindifferentseismiczones with different soil conditions", International Research Journal of Engineering and Technology(IRJET)e-ISSN:2395-0056Volume: 05Issue:05|May-2018www.irjet.netp-ISSN: 2395-0072.