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Analysis of G +10 Building With Or Iwthout Shear Wall

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Abstract:*Shearwallisastructuralelementwhichisprovidedforresistinghorizontalforces(likewindforce,earthquakeforce,etc) parallel to the plane of the wall and for supporting gravity loads simultaneously. These are basically flexural members which aregenerally provided in high rise buildings to avoid the total collapse of the building exposed to seismic forces. For seismic design ofbuildings,RCstructuralwallsorshearwallsaremajorearthquakeresistingmemberswhichofferlateralloadresistancebyprovidingan efficient bracing system. The response of the buildings is dominated by the properties of seismic shear walls and so it becomesimportant to evaluate the seismic response of the shear walls appropriately. In this study, the effect of presence of shear walls inRCC and composite structures in being analysed on basis of storey displacement, storey drift, stiffness, lateral force and base shearfor G+10 buildings. Effectiveness of shear wall is being studied with the help of two different models. Model 1 is RCC buildingwithout shear wall, Model 2 is RCC building with shear wall, The earthquake load is applied to a building in zone IV and theanalysisisdoneusingstaticanalysismethod.Keywords:ETAB2018,RCCbuildings,Buildingwithsteel-concrete,composite,columns,Seismic.*

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I. INTRODUCTION

In recent time, a lot of effort is given to develop the structural control devices so that seismic impact in buildings can be reduced.One such practice is introduction of shear wall in the buildings. Shear walls are one of the best means to provide earthquakeresistanceinmulti-storiedbuilding.Behaviourofbuildingunderearthquakeloaddependsonhowtheweight,stiffnessandstrengthare distributed in the horizontal and lateral direction. Shear walls are used in the building to reduce the effect of earthquake byimprovingtheseismicresponseofbuildings. Itbecomesimportanttoensureadequatelateralstiffnesstoresistlateralload.Forhigh-rise buildings, beam and column sizes are very heavy and requirement of steel is large because of which there is a lot of congestionatthejointsandmakingitdifficulttovibrateconcreteat thejointsandalsothedisplacementis quiteheavy.

InIndiamostofthe buildingsarelowrise.So,RCCmembersareusedwidelyasitiseasytoconstructandiseconomical.Howeverwith the growth of population there is increasing growth in high-rise buildings in metropolis. It is observed that the use of RCCshear wall with RCC column over without RCC shear wall with RCC column members is much more effective and economical inhighrisebuildings .InthisprojecteffectivenessofshearwallinRCCbuildingwithRCCcolumnshavebeenstudiedwiththehelpoffourdifferentmodelsusingEtabsinzone IV.Theanalysisisdonebystaticanalysismethod. ThemodelsconsideredfortheanalysisareasfollowsModel1 isRCCbuilding withoutshear wall, Model2isRCCbuildingwithshearwall

BuildingModeling

For the analysis G+10 storey building has been considered havinga height of 3m for each story including theground storey. The structure model in symmetrical about both the axis. The modeling has been done in accordanceto IS 456 and IS 1893 .The buildings has the fixed support at the base. The buildings are model using softwareETABforzoneIV.Centretocenterdistance betweenthetwoconsecutivecolumnsare4m,thecolumnsprovidedissquareastheyresistearthquake loadingbetter.Thestudyiscarriedoutforthesamebuildingplanwithandwithoutshear wall for both RCC

columns and composite columns by making four different models. Equivalent staticmethod and response spectrum method have been used for the analysis and analysis has been done considering theparameterslikestoreydisplacement,storeydrift, stiffness,lateralforceandbaseshear.

II. LITERATUREREVIEW

1. TabassumGShrihatti(2015)-

TheresultsoftraditionalinvestigationwithRCandsteelbuildingconstructionstageanalysiswerestudied.Three-dimensionalRCCand30-storysteelbuildingmodellinglocatedherezoneIVwithsolidsandformbeconsideredwithconsequencesofthestudybegained.Thestructuresbeknownbywayofarigidframeinbothbuildings.ItwasobservedthatforTimeHistoryAnalysisthedeflectionwasinorderof5–20mmandthusweperformedEquivalentStaticMethodwithEarthquakeandWdLoads ofthatregionactingsimultaneouslytoanalyseandcometotheconclusionof howwecouldoptimizethestructure.

1.MeghnaB.SandT.HSadashivaMurthy(2016)-

The RC construction system about G+ 5 fluctuatingpillarnow outside locationwith RC handoverrafter has been exchangedthrough acombinationtransmissionstrutwithmodelinvestigationbepassedavailableusing**ETABS**software.Theresearchinvolvedhereistraditionalresearchand sequence analysis of the construction and comparison of the parameters such as beam moments and deflection of both buildings. StructuralAnalysis and Design Software. The analysis is done in a numerical way by the **E-Tabs** program, a finite element package, which enables us tosolvethelinearandthe nonlinearPDEsandthusthe modulus ofelasticityofthebeammaterialisobtained.

3.MichaelR.Dupuis(2016)

analyzed seismic performance of shear wall buildings with gravity-induced lateral demands using OpenSees software. Theinelastic response of concrete shear wall buildings was investigated. From the result, it was demonstrated that a seismicratcheting effect can develop and amplify inelastic displacement demands. But the effect is more prevalent in coupled shearwalls thancantileveredshearwalls.

4. Wi-ILiao(2017)

conducted an experimental investigationon highseismic performance shear wall. The test results of four large-scale shearwalls, (two shear walls under shake table tests and two shear walls under reversed cyclic loading) were presented. Theresponse time histories for accelerations. shear walls under dynamic loading induced byshaketable.Theforce-displacementhysteretic loops were presented for theshear walls under reversed cyclic loading. From the experimental results, it wasfoundthatthetestedhighperformanceshear walls havebetterductilitythanthat ofconventional shear walls.

5. Mr.K.LovaRaju(2017)

Conducted non-linear analysis of frames to identify effective position of shear wall in multi storey building. An earthquake loadwas applied to an eight-storey structure of four models with shear wall at different location in all seismic zones using ETABS.Push over curves were developed and has been found the structure with shear wall at appropriate location is more importantwhileconsideringdisplacementandbaseshear.

OBJECTIVEOFSTUDY

1. To analyzeamultistoriedbuildingwithandwithoutshearwallusingETABS.
2. Todesignthestructuralcomponentsbeams,columns,slabs,Shearwall.
3. Tostudytheeffectof storey-driftinRCCbuildingwithandwithout shear wall.
4. Todeterminethestiffness oftheRCCbuildingwithandwithoutshearwall.

FUTURESCOPEOFSTUDY

Shear wall are considered to be a gift to further construction industry.scope of shear walls in construction field is immerse.It'ssince their arrival in market there topic was always a topic of interest. Shear walls are the structures usually build to balancelatteralloadactingonthestructure.wherethelatteralloadaremostpredominantlywindandearthquakeloads.and predominantlyearthquakeloadaremoreintenseintheir effectonthebuildingstructures.Earthquakearebecomingmoreintensedue to the key reason that is ground water depletion.Hence in order to overcome the diverse effect of earthquake it is alwaysbesttosaveourselvesfromfuturedisastars.

Shear walls are quick in construction, as the walls doesn't need any special brick arrangement or plastering they are very quickin their construction.it just requires an effective from work and very few skills labour.It was estimated that a 20 floor buildingcanbebuiltwithinsixmonthswhichis mostastonishing.

Within the limited scope of the present work, the broad conclusions drawn from this work have been reported. However, further study can be undertaken in the following areas:

1) The study of changing position of shear wall can be done by variation of shape and sizes of shear wall.

2) Flexible foundation is not considered; therefore, work can be repeated by soil structure interaction.

3) This study could be extended by including various other parameters such as torsional effects and soft storey effect sin a building.

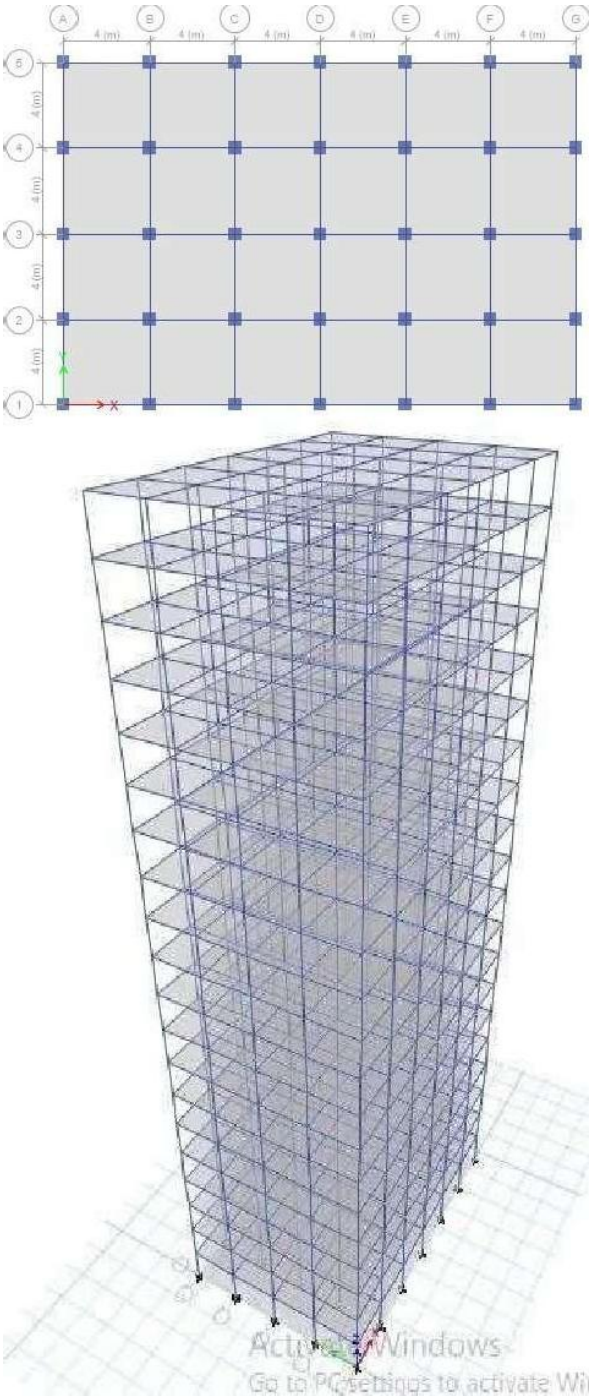
4) The structure with vertical or horizontal irregularity can be considered for future study.

III. METHODOLOGY

- Drafting of G+10 building in AutoCAD
- Transfer drawing to ETAB & preparation of building model
- Assigning properties to building with and without shear wall

Building storey	G+10
Total height of building	33m
Height of each storey	3.0m
Beam size 3	50m x 700m
Column size 6	00m x 600m
Shear wall thickness	250m
Slab thickness	225m
Thickness of external walls	230m
Thickness of internal walls	115m
Live load	3KN/m2
Floor finish	25KN/m2
Grade of Concrete	M30
Grade of reinforcing Steel	HYSD415
Grade of Steel	Fe250

Density of Concrete A	25KN/m3
Zone	IV
Importance factor	1.2
Soil condition	Medium soil



- Comparisonofoutputdatafromdifferentstructural

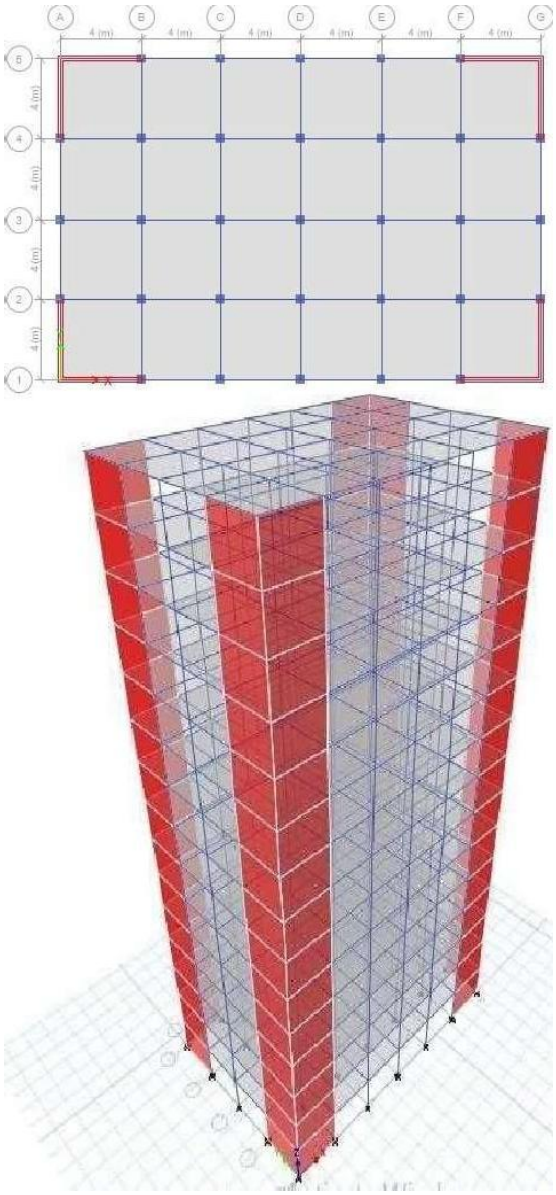


Fig3:PlanandElavationviewofbuildingwithshearwall

IV. RESULTS

LateralDisplacement-
FromtheobservedresultsitwasfoundthatbuildingwithRCCcolumninpresenceofshearwallshowed minimumdisplacement

Table2: Storeydisplacement

Storey	Rcc(mm)	Rccwithshearwall(mm)
1	6.562	1.427
2	17.543	4.305
3	29.419	8.29
4	41.529	13.165
5	53.728	18.744
6	65.909	24.868
7	78.016	31.398
8	89.997	39.211
9	101.723	45.199

10	113.168	52.261
11	124.227	59.311

StoreyDrift-
DecreaseinstoreydriftwasobservedinpresenceofshearwallinbuildingwithRCCcolumn.Maximumdriftwasobserved inRCC buildingwithout shearwall.

Table3:StoreyDrift

Story	RCC(mm)	RCCwithshearwall(mm)
1	6.562	1.427
2	10.972	2.879
3	11.885	3.985
4	12.12	4.875
5	12.189	5.579
6	12.181	6.124
7	12.107	6.53
8	11.963	6.814
9	11.744	6.987
10	11.445	7.063
11	11.059	7.05

Stiffness-
ItisobservedthatbuildingwithRCCcolumnhavingshearwallhasmaximumstiffnessandRCCbuildingwithoutshearwa llshowsminimumstiffnessasevidentfromthegraphbelow.

Table4:Stiffness

STORY	RCC(kN/m)	RCCwithshearwall(kN/m)
1	0	0
2	1268830	6058615.79
3	758607.9	3000926.082
4	699311.8	2164984.441
5	683496.6	1764036.19
6	675719.4	1532494.518
7	670043.4	1383341.694
8	665269	1280102.383
9	661009	1204476.322
10	657014.2	1146030.216
11	653038.4	1098099.278

V. CONCLUSIONS

- it is observed that for high rise building of G + 10 storey , building with RCC shear wall and RCC column is more efficient. It is observed thatdisplacementanddriftisreducedsubstantiallyandstiffnessofthebuilding.Henceitisconcludedthatcompositecolu mnbuildingwithshearwallcounterseismicforcemoreascomparedtoother models.IncaseofRCCframedstructurethelateraldisplacementisveryhigh.Itisobservedthatin presence of shear wall the displacement at top reduces by approx. 40% in case of static analysis in both RCC shear wall and RCC columnbuildings.
- Hencethebuildinginpresenceofshear wallwithRCCcolumncounterstheseismiceffectmoreefficiently.
- Storey-
driftistherelativedisplacement,itmeansthedriftofonelevelrelativetothelevelbelow.Itisobservedthatthedriftattopisre ducedby13% inpresenceofshearwallincaseofstaticanalysis.

- BuildingwithRCCshearwallandRCCcolumnreducesthedriftbyapprox. 25%comparedtoRCCcolumnbuildings.
- Stiffnessofthebuildingis moreincaseofRCCshearwallandRCCcolumntowithoutRCCshearwallandRCCcolumnbuilding.

REFERENCES

[1]. M. R. Suresh (2015), "The Optimum Location of shear wall in high rise R.C BUILDINGS Under LateralLoading",IJRET:internationaljournalofResearchinEngineeringandtechnology,eISSN:2319-1163/pISSN:2321-7308

[2]. BureauofIndianStandards,IS456(2000),"Plainandreinforcedconcretecodeofpractice".

[3]. IS1893(part-1)2002"Criteriaof earthquakeresistancedesignofstructuresBureauofIndianStandards",NewDelhi

[4]. Himalee,Rahangdale,S.R.Satone(2013),"Designandanalysisofmultistoriedbuildingwitheffectof Shear Wall",International journalofengineeringresearchandapplication", Vol-3, issue-3,pp.223-232.

[5]. P.P.Chandurkar,Dr.P.S.Pajgade(2013),"SeismicanalysisofRCCBuildingwithandWithout Shear Wall", internationaljournalforresearchinengineeringapplication&management(IJREAM)Vol-3,Issue.3,pp.1805-1810.

[6]. AxayThapa&SajalSarkar(2017),"Comparativestudyofmulti-storiedRCCbuildingwithandwithoutshearwall",Issue. 2,Vol-6,pp.11-20.

[7]. PrakashAN(2018)"Analysisofamultistoriedbuildingwithandwithoutshearwall",internationaljournalforresearchinengineeringapplicati on& management(IJREAM)vol-04,Issue-03, pp.243-246.

[8]. Chandana kurma, G. Siva vignan, T. Sai Krishna Teja (2018), "Non-linear analysis of multistoried building with andwithoutshearwall",internationaljournalforresearchinengineeringapplication& management(IJREAM)vol-07,Issue-01,pp. 23-28.

[9]. ETABNon-linearver.18,Extendedthreedimensionalanalysisof Buildingsystems,ComputersandstructuresInc

[10]. GeneralServicesAdministration(GSA).(2003).Progressivecollapseanalysisanddesignguidelinesfor Newfederalofficebuildingsandmaj ormodernizationprojects,GSA.

[11]. QuanfengWang,LingyunWang,QiangshengLiu(2001),"Effectofshearwallheightonearthquakeresponse" EngineeringStructures,vol.23,pp.376-384.

[12]. P.A.Hidalgo,R.M.Jordan,M.P. Martinez(2002),"Ananalyticalmodeltopredicttheinelasticseismicbehaviorof Shear-wall,reinforcedconcretestructures"EngineeringStuctures,vol.24,pp.85-98.

[13]. UgaleAshishB.,RautHarshalataR.(2014),"EffectofSteelPlateShearWallonBehaviourofStructure"International Journal ofCivilEngineeringResearch, Volume:05, Issue:02, ISSN: 2278-3652,pp.295-300.

[14]. G.SHiremath,Md.SaddamHussain(2014),"EffectofChangeinShearWallLocationWithUniformandVarying ThicknessInHighRiseBuilding"InternationalJournalofScienceandResearch(IJSR),Volume:3,Issue:10,ISSN:2319-7064,pp.284-288.

[15]. U.L.Salve,R.S.Londhe,"EffectofCurtailedShearWallonStoreyDriftofHighRiseBuildingsSubjectedtoSeismic Loads",IOSRJournalofMechanicalandCivilEngineering(IOSR-JMCE),Volume11,Issue4pp.45-49,e-ISSN:2278-1684,p-ISSN:2320-334,July2014.

[16]. RamanKumar,ShagunveerSinghSidhu,ShwetaSidhu,HarjotSinghGill(2014),"SeismicBehaviourofShearWallFramedBuildings"Internatio nalJournalofEngineeringTechnology,ManagementandAppliedSciences(IJETMAS),Volume:2,Issue: 1,ISSN: 2349-4476,pp.28-38.

[17]. Nishith B. Panchal, Vinubhai R. Patel (2014), "Diagrid Structural System: Strategies to Reduce Lateral Forces on High-RiseBuildings" InternationalJournalofResearchinEngineeringandTechnology(IJRET),Volume:03,Issue:04,pp.374-378,

[18]. NitinChoudhry,MahendraMalia(2014),"PushoverAnalysisofR.C.FramedBuildingwithShearWall"IOSRJournal ofMechanicalandCivilEngineering(IOSR-JMCE),Volume:11,Issue:02,e-ISSN:2278-1684,p-ISSN:2320-334X ,pp.09-13.

[19]. Giovanni Maria Montuori, Elena Mele, Giuseppe Brandonisio, Antonello De Luca (2014), "Geometrical Patterns forDiagridBuildings:Exploringalternativedesignstrategiesfromthestructuralpointofview",EngineeringStructure71,pp.112-127.

[20]. SepidehKorsavi,andMohammadRezaMaqhareh(2014),"TheEvolutionaryProcessofDiagridStructureTowardsArchitectural" ArchitecturalEngineeringTechnology(J.Archit EngTech), Volume:03,Issue: 02,pp.1-11.

[21]. RajeshJayarambhaiPrajapati,Vinubhai.R.Patel(2014),"EffectofDifferentPositionofShearWallonDeflectionin HighRiseBuilding"InternationalJournalof AdvancesinEngineering&Technology(IJAET),,Vol.6,Issue:4,ISSN:22311963,pp.1848-1854.

[22]. P.P.Chandurkar,Dr.P.S.Pajgade(2013),"SeismicAnalysisofRCCBuildingwithandwithoutShearWall" InternationalJournalofModernEngineeringResearch(IJMER),Volume:03,Issue:03,ISSN:2249-6645,pp-1805-1810.

[23]. KhushbuJania,PareshV.Patel(2013),"AnalysisandDesignofDiagridStructuralSystemforHighRiseSteelBuilding",Chemical, Civil and Mechanical Engineering Tracks of 3rd Nirma University International Conference on Engineering(NUICONE),pp.92-100,

[24]. KhushbuJania,PareshV.Patel(2013),"DesignofDiagridStructuralSystemforHighRiseSteelBuildingsasperIndianStandards"Structures Congress,pp.1070-1081

[25]. EhsanSalimiFiroozbad,Dr.K.RamaMohanRao,BahadorBagheri(2012),"EffectofShearWallConfigurationon SeismicPerformanceofBuilding"Proc.Of InternationalConferenceonAdvancesinCivilEngineering,pp.121-125.

[26]. ISCodes: -

a. IS–456-2000

b. IS– 875(Part1)–1987

c. IS– 875(Part2)–1987

d. IS–875(Part3) -1987

e. IS–1893(Part1)–20164.