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Analysis, and Design of G+ 7 Storey's Residential Building by using IS Code Methods and by Software's

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Abstract: ***Analysis and Design of G+7 storey residential building by using IS Code Methods, manual calculation and by software's.***

Keywords: Seismic Analysis and design, AutoCAD, STAAD Pro, Revit, IS codes Limit State methods

1. Introduction

Many earthquakes of severe to medium intensities occur in the Indian subcontinent almost once a decade. This earthquake causes severe damage to properties in general and multi-storeyed building in particular. Hence all the building constructed in Indian ' subcontinents and particularly situated in earthquake prone zones should be designed forloads and stresses, resulting out of earthquakes. We need to confirm to the safety against. The dynamic force like earthquake force that is affecting the structures, and determines seismic responses of such building.Analysis of any structural system to determine the deformations and forces induced by applied loads or ground excitation is an essential step in the design of a structure to resist earthquake. There is a range of methods from a linear analysis to a sophisticatednonlinear analysis depending on the purpose of the analysis in the design process. In this is study, seismic response of a residential G+7 RC frame building is analyzed by the Response Spectrum method and Time history method using the software STAAD-Pro V8i as per the IS- 1893-2002-Part-1.

2. Literature Review

Various literatures are reviewed which are based on study of analysis of seismic forces and its impact effect on living life. Literature review focused on various work done by various authors on analysis of seismic forces under various zones of earthquakes the. Seismic analyses are performed using various software. Review also explained studies Performed to reduce or control seismic effect and its hazardous effect.

Patil A. S, (2013) studied nonlinear dynamic analysis of 10 storied RCC building. Considering different seismic intensities and also studied seismic response of such building. The building under consideration is modeled with the help of SAP 2000-15 1 software and 5 different time histories have been used. The result of the study shows similar variations pattern in seismic response such as base shear and storey displacements and concluded that time history is realistic method used for seismic analysis. It provides a better check to the safety of structure analyzed and designed.

M.S. Aainawala et al. (2014). Comparative study of multi-stored R.C.C Building with and without shear walls. He did done the comparative study of multi-stored R.C.C Building with and without shear walls. They applied the earthquake load to a building for G+12, G+25, G+38 located in zone II, zone III, zone IV and zone V for different cases for shear wall position.It was observed that multi-storeyed R.C.C building with shear wall is economical as compared to without shear wall. As per analysis, it was concluded that displacement at different level in multi-stored building with shear wall is comparatively lesser as compared to R.C.C building without shear wall. This is important for building design and use of shear walls.

Mahesh et al., 2014, compared the behaviour of G+11 multi-storeyed building of regular and irregular configuration under earth quake is complex and it varies of wind loads are assumed to act simultaneously with earth quake loads. In this paper a residential building. Of G+11 multi storied building is studied for earth quake and wind load using ETABS and STAAD PRO.

In Prof Dr. Qaiseruz Zaman Khan's 2010paper Response spectrum analysis of 20 story building has been conferred in detail and comparison of static and dynamic analysis and design results of buildings up to 400 feet height (40story) in relations of percentage decrease in bending moments ad shear force of beams, bending moments of columns, top story deflection and support reaction are conferred.[**3**]

Mohan et al., 2011. Compared and studied linear equivalent static analysis performed for regularbuildings up to 90m height in zone I and II, dynamic analysis should be performed for regular and irregular buildings in zone IV and V. In present work, two. Multi stored buildings, one of six and other of eleven stories have been modeled using. Software package SAP 2000 for earthquake zone V in India.

3. Methodology

Process of designing G+7 Storey building by using STAAD PRO and manual calculation use with the IS Codes. We are designing the structure for maximum moment and moment and load analysis find out by STAAD PRO.

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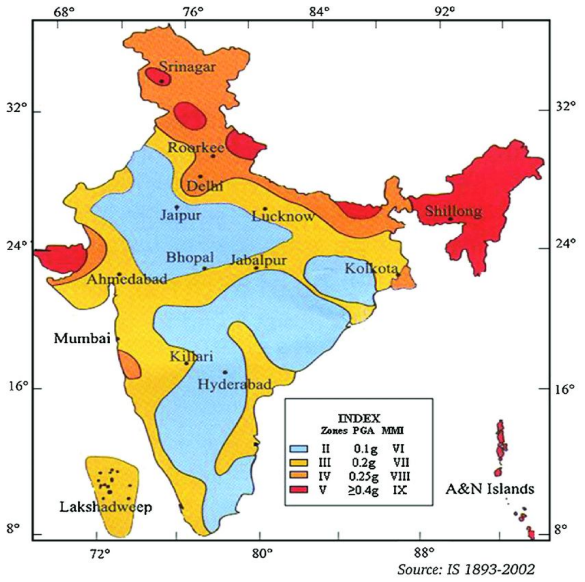
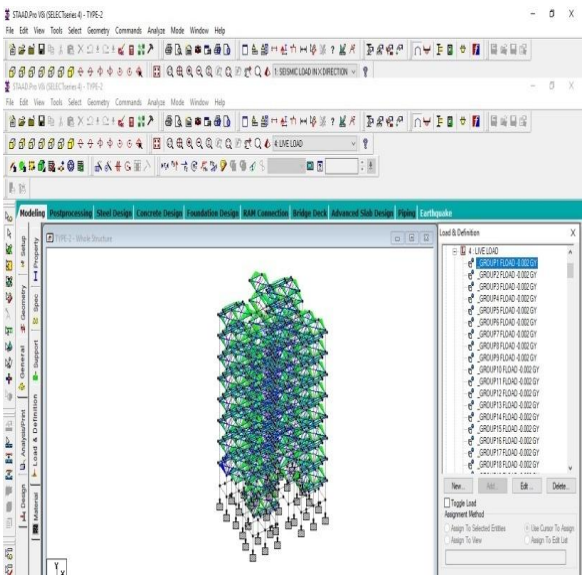


Source: IS 1893-2002


Live Load

4. Analysis of G+7 Storey Building

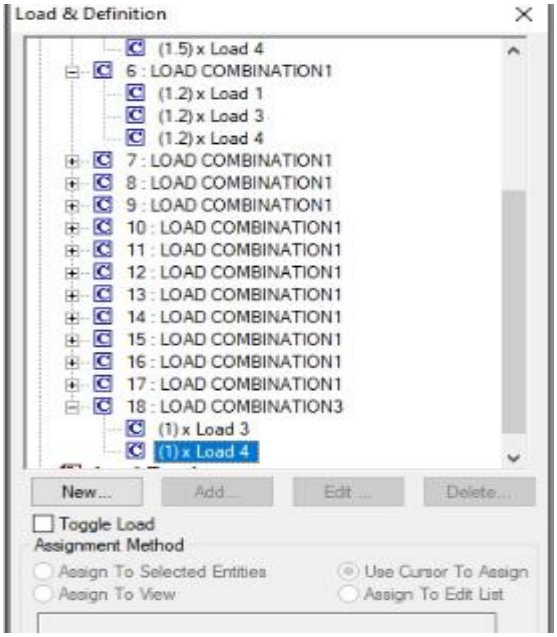
Material properties: The analysis has been done considering the following material properties

Structural Steel: Tor steel
Reinforced concrete: Reinforced concrete of design mix with grade M 25
Steel reinforced:Fe 415
Stirrups and links: Fe 415

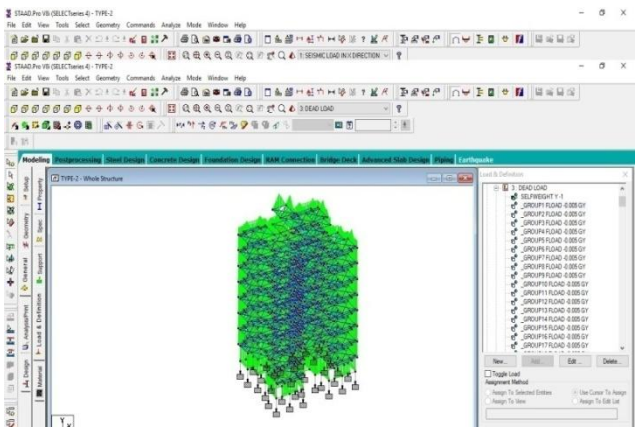
Load calculation: Following assumption are made for load calculation

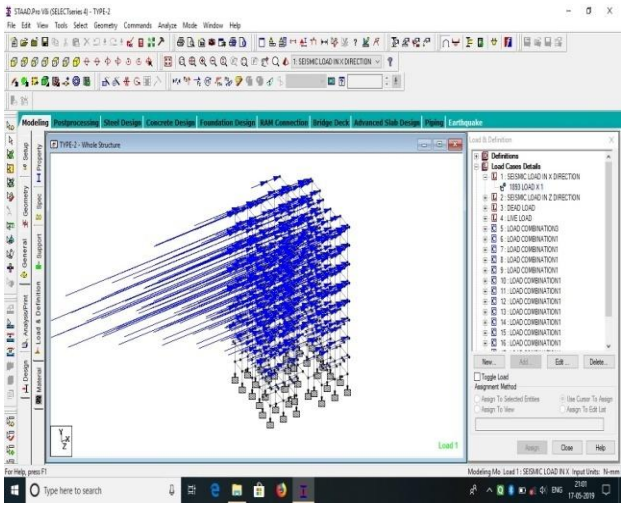
Density of concrete:	25KN/m3
Density of brick:	18KN/m3
Thickness of slab:	150MM
Thickness of wall:	230mm.
Finish load:	1KN/m.
LL on floor slabs:	3KN/m2.

Evaluation of loads
Dead load of slab= 0.150x1x25 =3.750KN/m
LL on floors =3X1 = 3KN/m.



Load Combination


Dead Load


Seismic Load in X-Direction

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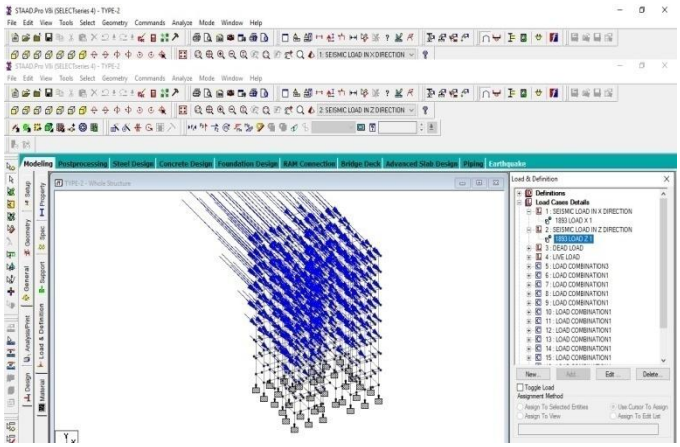
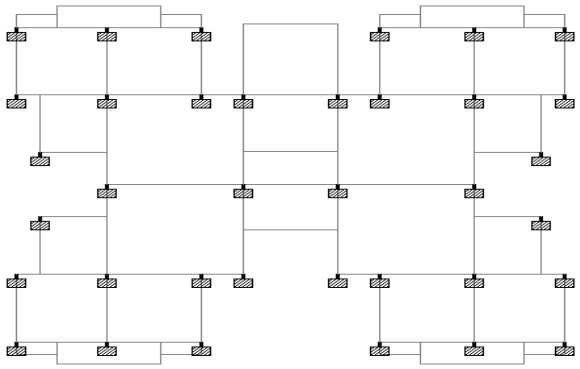


Seismic Load in Z-Direction



Modelling in Staad

Design and Analysis of G+ 7 Storeys Building Using Staad Pro and is Codes Methods

Analysis is done using STAD PRO developed by BENTLEY once the load and load combinations are assigned to the structures, analysis is to be done 'Analysis is done for RCC structure

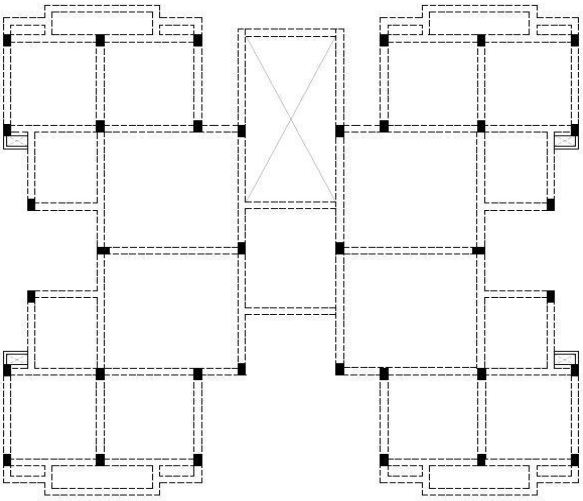
1) Assign the properties of structure
2) Assign the loads on the floor
3) Assign the loads on the Walls
4) Assign the seismic load in z- direction
5) Assign the seismic load in x- direction

RCC analysis 'Code is assigned as IS: 456-2000 Command to be given are

1) Concrete design
2) Define parameters
3) Loads

Objective

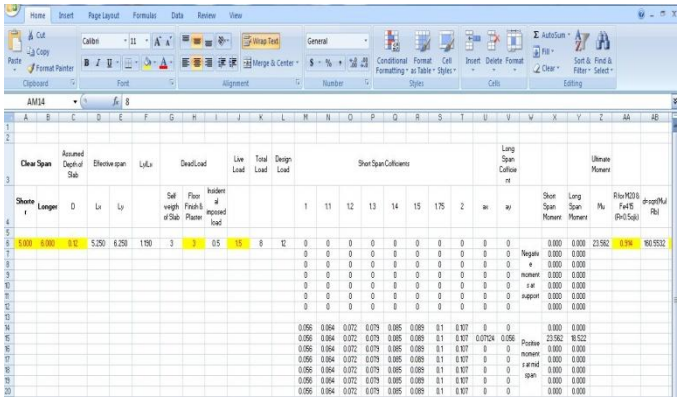
Structure designed should satisfy the Criteration of ultimate strength and structures should satisfy the serviceability. It should satisfy the stability against overturning, sliding, and buckling. The main objective of the design are 'Foundation design 'Column design 'beam design ' Slab design.



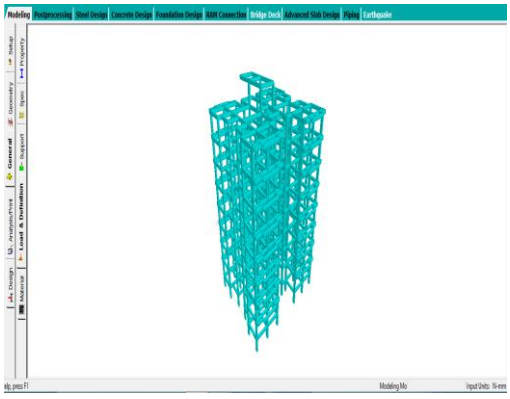
Beam Plan

TYPE II RESIDENCE														
Col. No.	Column Size	Required Steel Area plinth	Required Steel Area GF	Require d Steel Area FF	Required Steel Area SF	Require d Steel TF	Require d Steel FF	Require d Steel SF	Require d Steel SF	Require d Steel SF	Required Steel Area Mumty	Max	Longitudinal Rein.	Column Type
1	250X450	2374	2881	2610	2180	1706	1218	729	620	590	-	2881		
2	250X450	3554	3565	2791	2348	1732	1152	598	364	152	-	3565		
3	250X450	3124	3412	2701	2192	1655	1070	531	410	590	-	3412		
4	250X450	3135	3431	2701	2192	1661	1074	574	435	618	-	3431		
5	250X450	3564	3581	2791	2274	1735	1110	625	363	153	-	3581		
6	250X450	2394	2880	2610	2210	1648	1175	734	610	610	-	2880		
7	250X450	2071	2341	2022	1697	1317	1010	795	790	617	-	2341		
8	250X450	3131	3152	2881	2494	2071	1490	908	585	410	-	3152		
9	250X450	3460	3695	3151	2666	2188	1597	951	685	577	-	3695		
10	250X450	F	F	F	3531	2858	2474	1990	1557	950	1223	3531		
11	250X450	F	F	F	F	2861	2473	1990	1556	950	1230	2861		
12	250X450	3463	3700	3151	2670	2117	1542	995	686	584	-	3700		
13	250X450	3138	3151	2881	2500	2010	1493	912	593	450	-	3151		
14	250X450	2071	2350	2019	1627	1316	1010	796	790	610	-	2350		

Manual Calculation of Reinforecment in Column



Slab Design Using is Codes Method



3D-VIEW IN STAAD PRO

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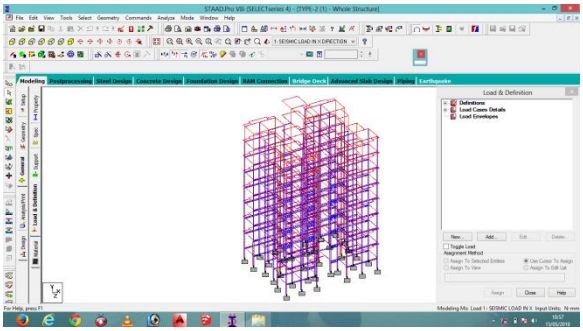
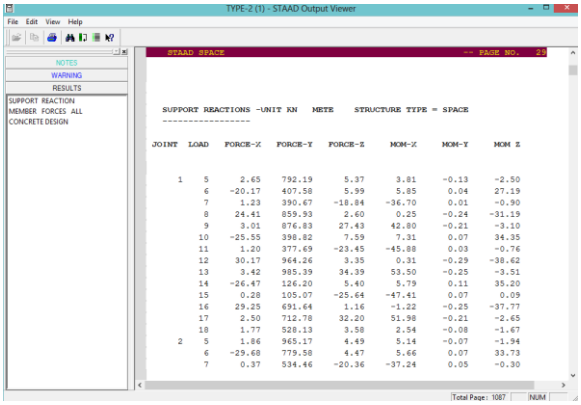


Bending Moment



Support Reaction

5. Conclusions

'The design of slab, beam, column, rectangular footing and staircase are done in limit state method which is safe at control of deflection and in all aspects 'Using staad.pro software. We are design the structure use limit state methods and analysis using by staad pro and manual calculation.
After analyzing the G+7 storey building structure, concluded that structure is safe in loading like dead load, live load, and seismic load. Member dimensions (Beam, Column, Slab, and Footing) are changed by calculating the load type and its quantity applied on it. Manual calculations give min.

1) All the analysis can be repeated by changing plan dimensions and height of the structure.
2) A comparison of cost may be studied by changing different grade of steel and concrete.
3) Analysis and design of frames with dual systems.
4) Analysis and design of frames with dual systems (moment resisting frames with shear walls)
5) A comparison of cost may be studied by changing different grade of steel and concrete.

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