Airo International Research Journal
ISSN: 2320-3714
Volume 20
January 2020
Issue: 1

Impact Factor: 3.69
A Multidisciplinary Peer-Reviewed Journal

Review on Structure of an Earthquake Resistant building

Harshita Tiwari[1], P.H. Patil[2]

[1]M.Tech Scholar, Department of Civil Engineering, IES Institute of Technology & Management, Bhopal, M.P., India

[2]Assistant Professor, Department of Civil Engineering, IES Institute of Technology & Management, Bhopal, M.P., India

Abstract

Current earthquake codes characterize basic design as either ordinary or sporadic regarding size and state of the structure, course of action of the auxiliary and non-basic components inside the structure, conveyance of mass in the structure and so forth.Structurally speaking, buildings are built to support loads. The load, which is ever present and ever acting on a building, is the dead load which consists of the self-weight of member, finishes, plaster, etc. this provides the structure the required strength to with stand in strong resistive forces at times of earthquake or high wind cyclones. This paper is a review on construction of buildings and parameters considered while designing any building. Work done in the same field by previous scholars are discussed identifying their results obtained from investigations. A scope of work is formulated to work in future with multi storey buildings using analytical analysis approach.

Keywords:*earthquake, structure, multi storey, support loads, designing*

INTRODUCTION

In building development, an unbending vertical diaphragm fit for moving sidelong powers from outside dividers, floors, and rooftops to the ground establishment toward a path parallel to their planes. Models are the fortified solid divider. Sidelong powers brought about by wind, earthquake, and lopsided settlement loads, notwithstanding the heaviness of structure and tenants; make amazing curving (torsional) powers. This prompts the disappointment of the structures by shear.

An earthquake may be defined as wave like motion generated by forces in constant turmoil under the surface layer of the earth, enormous amounts of energy are released. The size and asperity of an earthquake is estimated by two important parameter- intensity and magnitude. The magnitude is a measure amount of energy released, while the intensity is the apparent effect experienced at a specific location.

Terminology

Slab: -These are the plate component and convey the loads principally by flexure. They typically convey the vertical loads. Under the activity of even loads, because of huge snapshot of latency, they can convey very enormous breeze and earthquake powers, and afterward move them to the beam.

Fig.1:*Slab*

Beam: **-** These Carry the loads from pieces and furthermore the immediate loads as brick work dividers and their self-loads. The Beams might be bolstered on different beams or might be upheld by sections shaping a vital piece of the edge. These are fundamentally the flexural members.

Fig. 2:*Beam*

Column: - These are the vertical individuals conveying loads from the beams and from upper columns. The loads conveyed might be axial or whimsical. Columns are the most significant when contrasted and beam and pieces. This is on the grounds that, on the off chance that one beam fails.it will be a neighborhood disappointment of one story yet on the off chance that one column comes up short, it can prompt the breakdown of the entire structure.

Fig. 3:*Column*

Foundation: - These are the load transmitting members. The load columns and walls are transmitted to the solid ground through the foundations.

Fig. 4:*Foundation*

Wind loading

Dead and live loads are vertical or gravity loads. While wind and earthquake cause even loads on a structure. Temperature and shrinkage additionally brings about flat loads on a structure. Impact, earth and water pressure likewise an even loads on a structure . IS:875 gives estimations of wind pressure shifting from 100kg/m2 following up on working up to a tallness of 30m over the mean impeding surface for example the mean degree of the connecting ground . For structures of tallness up to 10.0m, these breeze pressure esteems can be diminished by 25 %.

Earthquake loading as per IS code 1893 (part-1) 2002

IS 1893:2002 Criteria for earthquake resistant design of structures part 1 general provisions and buildings.

The Code is now split into five parts

Part 1 - General provisions and buildings

Part 2 - Liquid retaining tanks - Elevated and ground supported

Part 3 - Bridges and retaining walls

Part 4 - Industrial structures including stack like structures

Part 5 - Dams and embankments

Part 6 contains arrangements that are general in nature and material to all structures. Additionally, it contains arrangements that are explicit to structures as it were. The significant changes when contrasted with IS 1893:1984 are as per the following:

1. Seismic zone map is updated with only four seismic zones. Zone I is climbed to Zone II. Killari domain is moved up to Zone III. Bellary isolates zone is cleared. East coast is moved up to Zone III and related with Zone III of Godavari Graben zone.

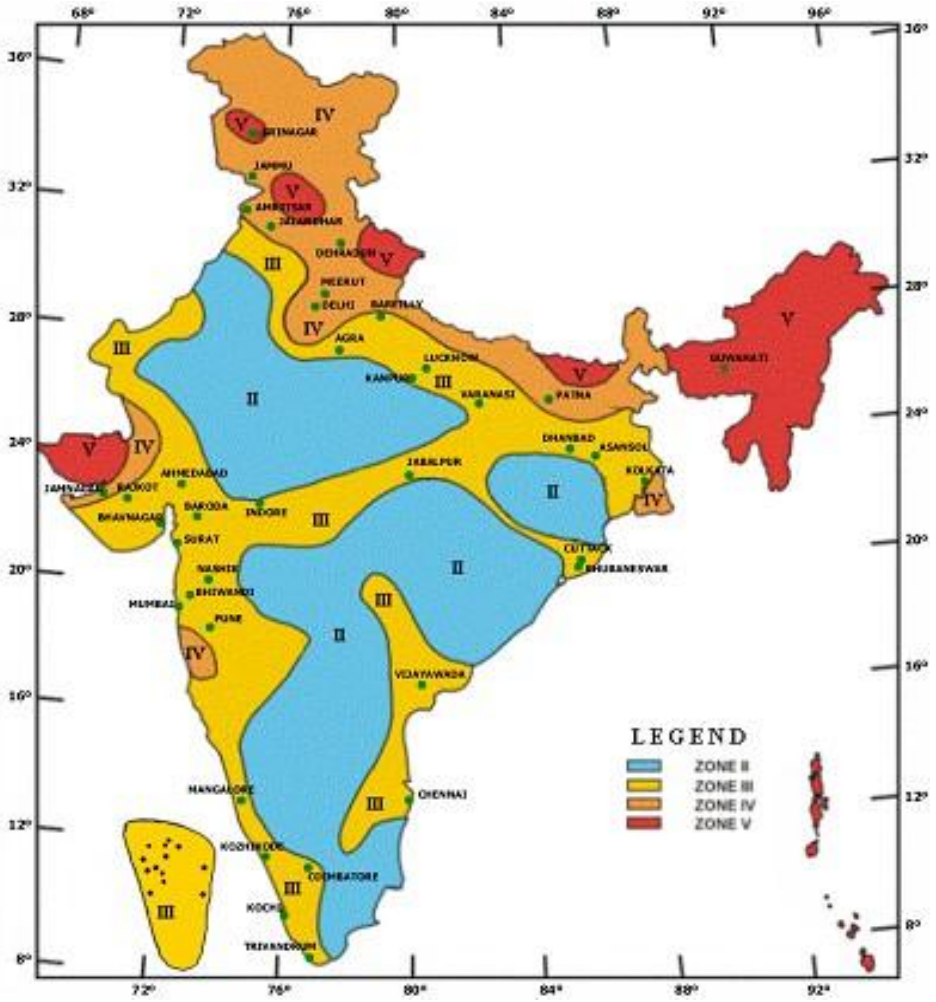

Fig. 5:*Map Of India Showing Seismic Zone Of India*

Literature reviews

P.S. Girigosavi, Prof. M. S. Kakamare Apr-2018“ STATIC ANALYSIS OF MULTI-STORIED BUILDING AS PER IS 1893-2002 AND IS 1893-2016”[3]: This paper worried about investigation on modification of IS 1893-2016.The static analysis of multi-celebrated structure is finished by utilizing FEM based programming. In present examination, the static analysis is done according to IS 1893-2016 and results, for example, parallel uprooting, base shear, story drift are contrasted and IS1893-2002. This paper manages the examination of configuration powers for multi-celebrated buildings, acquired by utilizing IS 1893-2016 code, with those got by the past IS1893-2002 rendition. From the aftereffects of seismic analysis of buildings it is presumed that the IS1893-2016 is increasingly moderate for tremor analysis of multi-story buildings.

Urunkar S. S., Bogar V. M., Hadkar P. S.(COMPARATIVE STUDY OF CODAL PROVISIONS IN IS 1893 (PART 1): 2002 & IS 1893 (PART 1): 2016) [4]: The conditions gave in seismic code manage the planners to improve the conduct of structures during a quake and withstand against it without critical death toll and property. For India, Indian Standard Criteria for Earthquake Resistant Design of Structures (IS 1893 Part 1) provides the required clauses to structural designers for designing earthquake resistant buildings. Because of nonstop research, picked up information and encounters, the IS 1893 Part 1 has been updated at whatever point required. The relative investigation of codal arrangements is required to be made at whatever point the code is reconsidered. This paper contains the near investigation of an IS 1893 (Part 1):2002 and IS 1893 (Part 1):2016. The paper for the most part centers around the modified codal arrangements in IS 1893 (Part 1):2016.

S. Farrukh Anwar, A. K. Asthana (2013) “Evaluation of Seismic Design Forces of Indian Building Code” [5]: The ongoing fifth modification of Indian Seismic Code, IS: 1893 has been part into five separate parts for various kinds of structures. The new code IS: 1893 (Part-1) 2002 contains arrangements explicit to buildings just, alongside general arrangements appropriate to all structures. This paper manages the examination of seismic plan powers for multi-celebrated buildings, acquired by utilizing the new code, with those got by the past 1984 adaptation. From the aftereffects of seismic analysis of buildings it is reasoned that the new code is increasingly traditionalist for buildings laying on delicate and medium soils.

S.K. Ahirwar, S.K. Jain and M. M. Pande (2008) “earthquake loads on multistorey buildings as per is: 1893- 1984 and is: 1893-2002: a comparative study” [6]: Accordingly Indian seismic code Seems to be: 1893 has likewise been amended in year 2002.This paper shows the seismic burden estimation for multi-story buildings according to May be: 1893-1984 and IS: 1893-2002 proposals. Four multistorey RC encircled buildings going from three celebrated to nine celebrated are considered and broke down. The procedure gives a lot of five individual analysis successions for each building and the outcomes are utilized to think about the seismic reaction viz. story shear and base shear registered according to the two adaptations of seismic code. The seismic powers, processed by IS: 1893-2002 are seen as essentially higher, the distinction fluctuates with structure properties. It is reasoned that such examination should be done for singular structure to foresee seismic helplessness of RC confined buildings that were planned utilizing before code and because of updates in the codal arrangements may have rendered perilous.

A. A. Kale,, S. A. Rasal, (2017) [7]: In this proposed examination four unique states of same territory multistorey model is created and tried by the ETABS under the rule of IS-875-Part3 and IS1893-2002-Part1. The conduct of 15, 30 and 45 story building has been contemplated. The Dynamic impacts additionally find by Response range strategy. Every one of the parameters like Story uprooting, Story drift, Base shear, Overturning minutes, Acceleration and Time period are determined. In the wake of contrasting all structure shapes results presumed what area is helpful and either seismic or wind impact is basic.

S.K. Ahirwar, S.K. Jain and M. M. Pande (2008) [8] : This paper exhibits the seismic burden estimation for multistorey buildings according to May be: 1893-1984 and IS: 1893-2002 suggestions.

Four multistorey RC surrounded buildings extending from three storeyed to nine storeyed are considered and broke down. The procedure gives a lot of five individual analysis arrangements for each building and the outcomes are utilized to think about the seismic reaction viz. story shear and base shear registered according to the two adaptations of seismic code. The seismic powers, processed by IS: 1893-2002 are seen as altogether higher, the distinction fluctuates with structure properties. It is reasoned that such examination should be completed for singular structure to foresee seismic powerlessness of RC confined buildings that were planned utilizing before code and because of corrections in the codal arrangements may have rendered dangerous.

Dr. H. SudarsanaRao [9]: thought about lateral powers determined according to the arrangements of IS 1893-1984 and IS 1893-2002 for two buildings, one is of 12 stories in region which was in zone I yet later on moved up to zone II, and another structure is of 11 stories arranged in zone II. The STAAD Pro programming was utilized for analysis of both contextual investigations. Creator inferred that the powers determined according to IS 1893-2002 gave higher qualities than the past rendition of working in zone I moved up to zone II. The perception made that the base shear an incentive according to amended IS 1893-2002 is higher for structures in zone II.

AnojSurwase, Dr. Sanjay K. Kulkarni , Prof. ManojDeosarkar(2018) [10]:"Seismic Analysis and Comparison of IS 1893(Part-1) 2002 and 2016 of (G+4) Regular and Irregular Building": Considerable improvement in tremor safe structure has been seen in later past. Thus, Indian seismic code IS: 1893 has additionally been reconsidered in year 2016, following a hole of 14 years. This paper displays the seismic burden estimation for multistorey buildings according to May be: 1893-2002 and IS: 1893-2016 proposals. The strategy for analysis and structure of multi-story (G+4) private structure situated in zone III, IV. The extension behind exhibiting this task is to learn applicable Indian standard codes are utilized for plan of different structure component, for example, shaft, segment, section, establishment and stair case utilizing a product E-tab under the seismic burden and wind load acting the structure. We need to discover the qualities in venture base shear, timespan, most extreme story removal.

N.Veerababu, B Anil Kumar, 2016, [11] : In this investigation an undertaking has been made to deliver response spectra using site specific soil parameters for a couple of goals in seismic zone V, for example Arunachal Pradesh and Meghalaya and the delivered response spectra is used to separate a couple of structures using business programming STAAD Pro. The effect of soil properties, its sorts and the significance of soil in the response go is discussed. The response go is gotten in which the physical properties and time history data of a tremor for example North-East seismic tremor of September 10, 1986 which had the significance of 5.2 is considered. Finally assessments have been made in the structure plot by taking IS 1893:2002 response spectra under idea with the structure arranged by considering the made response spectra for various sorts of soil for the seismic zone the extent that bending minute, shear forces and fortress.

K VenuManikanta, Dr. DumpaVenkateswarlu, 2016, [12] : The principle reason for this investigation is to do a point by point analysis on reenactment instruments ETABS and STAAD PRO,which have been utilized for analysis and structure of rectangular Plan with vertical normal and rectangular Plan with Vertical geometrically unpredictable multi-story building. This examination is centered around bringing out focal points of utilizing ETABS overcurrent practices of STAAD PRO forms to light. It was seen that ETABS is more easy to understand, precise, perfect for dissecting configuration results and a lot more points of interest to be examined in this investigation over STAADPRO. Upsides and downsides of utilizing these product's are additionally be referenced in this investigation.

Sanjay Kumar Sadh, Dr. Umesh Pendharkar, 2016, [13] : Creators centers around the impact of both Vertical Aspect Ratio (H/B proportion for example Thinness Ratio) and Horizontal or Plan Aspect Ratio (L/B proportion), where H is the all out Height of the structure outline, B is the Base width and L is the Length of the structure outline with various Plan Configurations on the Seismic

Analysis of Multistoried Regular R.C.C. Buildings. In the present examination, four structure models having distinctive Horizontal Aspect proportions viz. 1, 4, 6 and 8 running from 12m.to 96m.length of various Vertical Aspect proportions (slimness proportions) viz. 1, 4, 6 and 8 of shifting 4, 16, 24 and 32 stories have been considered and their impact on the conduct of the RCC Multi celebrated buildings is illustrated, utilizing the parameters for the plan according to the Seems to be 1893-2002-Part-1 for the seismic zone-3. Along these lines all out 16 structure models are examined for various burden blends by Linear Elastic Static Analysis (Equivalent static power analysis) with the assistance of ETABS-2015 programming and the outcomes acquired on seismic reaction of buildings have been outlined.

Pardeshisameer, 2016, [14] : The present rendition of the IS: 1893-2002 necessitates that basically all multi celebrated buildings be broke down as three-dimensional frameworks. Buildings might be considered as lopsided in plan, in mass and solidness along story, of the buildings. The vast majority of the bumpy locales of India are exceptionally seismic. In this examination, 3D explanatory model of G+15 celebrated buildings have been created for symmetric and hilter kilter building models and investigated utilizing auxiliary analysis device ETABS programming. Mass and solidness are two essential parameters to assess the dynamic response of an auxiliary framework. Multi-celebrated buildings are acted contrastingly relying on the different parameters like mass-firmness dissemination, establishment types and soil conditions. 2001 Bhuj seismic tremor in Gujarat, India exhibited the harm and breakdown of the buildings because of the inconsistencies in auxiliary firmness and floor mass. This paper is worried about the impacts of different vertical abnormalities on the seismic response of a structure. The target of the exploration is to do Response spectrum analysis (RSA) of ordinary and unpredictable RC building edges and Time history Analysis (THA) of normal RC building edges and complete the flexibility based structure utilizing IS 13920 comparing to response spectrum analysis. Correlation of the consequences of analysis of unpredictable structures with standard structure is finished.

S.Mahesh, B.PandurangaRao, 2014,[15] : The conduct of G+11 multistorey structure of customary and sporadic design under earth tremor is perplexing and it changes of wind loads are accepted to act at the same time with earth shudder loads. In this paper a private of G+11 multistorey structure is read for earth shake and wind load utilizing ETABS and STAAS PRO V8i .Assuming that material property is linear static and dynamic analysis are performed. These analysis are done by thinking about various seismic zones and for each zone the conduct is surveyed by taking three unique sorts of soils specifically Hard , Medium and Soft .Different response like story drift, removals base shear are plotted for various zones and various kinds of soils.

Gauri G. Kakpure, Ashok R. Mundhada (2016) [16] : This paper exhibits a survey of the past work done on multistoried buildings versus seismic tremor analysis. It centers around static and dynamic analysis of buildings. This paper exhibits an audit of the correlation of static and dynamic analysis multistoried structure. Plan parameters, for example, Displacement, Bending minute, Base shear, Story drift, Torsion, Axial Force were the focal point of the examination.

Prashanth.P, Anshuman.S, Pandey.R.K (2012) [17]: STAADPro and ETABS are the present day driving plan programming's in the market. Many structure organizations' utilization these product's for their undertaking configuration purposes. In this way, this venture predominantly manages the relative analysis of the outcomes acquired from the structure of a normal and an arrangement unpredictable (according to IS 1893) multi story building structure when planned utilizing STAADPro and ETABS programming's independently. These outcomes will likewise be contrasted and manual counts of an example bar and segment of a similar structure planned according to IS 456.

From the structure aftereffects of bars, it might infer that ETABS gave lesser zone of required steel when contrasted with STAAD PRO. It is discovered from past investigations on correlation of STAAD results with manual figurings that STAADPro gives moderate structure results which is again demonstrated in this examination by looking at the consequences of STAADPro, ETABS and Manual

computations (allude beneath table). Structure the plan consequences of section; since the necessary steel for the segment powers in this specific issue is not exactly the base steel utmost of segment (i.e., 0.8%), the measure of steel determined by both the product is equivalent. So examination of results for this case is absurd.

Sudhir K Jain (2003)[18]: "Audit of Indian seismic code, IS 1893 (Part 1) : 2002"[3] : The Indian seismic code IS 1893 has now been part into various parts and the initial segment containing general arrangements and those relating to buildings has been discharged in 2002. There has been a hole of a long time since the past release in 1984. Considering the progressions in comprehension of quake safe structure during these years, the new release is a significant up degree of the past variant. This paper surveys the new code; it contains a talk on Clauses that are confounding or unclear and need explanations right away. The typographical and article mistakes are called attention to. Recommendations are likewise included for next correction of the code.

Naveen.G.M, Chaya. S(November 2016) [19]: "STUDY ON REGULAR AND IRREGULAR BUILDING STRUCTURES DURING AN EARTHQUAKE" Multi-story structures development by Reinforced Concrete are Subjected to most hazardous seismic waves during quakes .The fundamental explanation found that RCC building disappointment is caused because of Irregularity in its arrangement measurement and lateral power dispersion. In this paper study is made to discover the Response of the Regular and Irregular Structures having plan Irregularity situated in Seismic zone V. In the Present Study, Analysis has been made by taking 10 story working by Response Spectrum Method utilizing ETABS 2015 and IS Code 1893:2002 (part 1).Analysis can be performed for Regular and Irregular Buildings and a tallness of 35.5 m in zone V by utilizing Response Spectrum Analysis technique. Conduct of structures will be found by looking at the responses as most extreme story removal, story drift, story solidness, periods and frequencies of modes during seismic tremor. By and by there are six models. One is Regular structure and remaining are Irregular basic models, all models have distinctive shape yet having same region. An endeavor is made to think about the auxiliary conduct of 3Dimensional (3D) 10.

Balaji U &Selvarasan M. E.[20] :"Design And Analysis of Multi Storied Building Under Static And Dynamic Loading Condition Using ETABS."examined a private structure G+13 celebrated. The structure was examined for seismic tremor loads utilizing ETABS. Accepting that the material properties were linear, static and dynamic analysis was performed. These non-linear examinations were completed by considering extreme seismic zones and the conduct was surveyed by taking sorts II soil condition. Diverse response like removal and base shear were determined and it was seen that uprooting expanded with the structure stature

Parameters in Methodology

Shear walls: - These are significant basic components in elevated structures. Shear walls are in reality huge columns as a result of which they seem like wall instead of columns. These deal with the level loads like breeze and earthquake loads. Shear walls additionally convey the vertical loads. Its a significant point to comprehend that they work for even loads a single way, which is the pivot of long component of wall.

Design basis Earthquake:-It is the earthquake which can be expected to occur at least once during the design life of the structure.

Damping: -The impact of inner erosion, flawed versatility of material slipping, sliding and so forth in diminishing the abundancy of vibration and is communicated as a level of basic damping.

Design Lateral force: - It is the even seismic power endorsed by this standard that will be utilized to plan a structure.

Ductility: - It is the limit of structure to experience enormous inelastic disfigurements without noteworthy loss of solidarity or solidness.

Design Acceleration Spectrum:-Structure speeding up range alludes to a normal smoothened chart of most extreme increasing speed as an element of recurrence or timespan of vibration for a predefined damping proportion for seismic tremor excitations at the base of a solitary level of opportunity framework.

Importance Factor (I):- It is a factor used to acquire the plan seismic tremor power contingent upon the utilitarian utilization of structure, described by unsafe results of its disappointment, its post-quake practical need, memorable worth , or monetary significance.

Response Reduction Factor(R):- It is the factor by which the genuine base shear power, that would be produced if the structure were to stay versatile during its response to the plan premise quake (DBE) shaking, will be decreased to acquire the structure horizontal power.

Normal mode:- A framework is said to vibrate in an ordinary mode when every one of its masses achieve greatest qualities od removal and pivots all the while, and go through balance positions at the same time.

Response Spectrum: - The portrayal of the greatest response of glorified single degree opportunity framework having certain period and damping , during seismic tremor ground movement. The greatest response is plotted against the undamped common period and for different damping esteem, and can be communicated as far as most extreme outright increasing speed, greatest relative speed, or greatest relative relocation.

Response Acceleration Coefficient of a structure (Sa/g) :-It is a factor signifying the standardized plan quickening range an incentive to be considered for the plan of structures exposed to seismic tremor ground shaking; this worth rely upon the common time of swaying of the structure and damping to be considered in the plan of the structure.

Seismic Zone Factor(Z) :-It is the value of peak ground acceleration considered by this standard for the design of structure located in each seismic zone.

Design Seismic Base Shear:-It is the horizontal lateral force in the considered direction of earthquake shaking that the structure shall be design for.

Diaphragm:-It is the horizontal or nearly horizontal structural system (for example , reinforced concrete floors and horizontal bracing system) , which transmits lateral forces to vertical elements connected to it.

Storey Drift:-It is relative displacement between the floor above and/ or below the storey under consideration.

Storey Shear (Vi):-It is the sum of design lateral forces at all levels above the storey*i* under consideration.

Intensity of earthquake:-It is the measure of the strength of ground shaking manifested at a place during the earthquake, and is indicate by a roman capital number on the MSK scale of the seismic intensity.

Seismic weight of a floor (W) :-It is the some of dead load of the floor, appropriate contributions of weight of columns, wall and any other permanent elements from the storeys above and below, finishes and services, and appropriate amount of specified imposed load on the floor.

Moment-Resisting Frame:-It is a frame in which members and joints are capable of resisting forces primarily by flexure.

Ordinary Moment-Resisting Frame: -It is a moment-resisting frame not meetingspecial detailing requirements for ductile behaviour.

Special Moment-Resisting Frame*:* - It is a moment-resisting frame specially detailed to provide ductile behaviour.

Conclusions

India is one of the nations that undergo severe earthquakes, therefore, design structure which are resistant to earthquake are vital for construction. The size and asperity of an earthquake is estimated by two important parameter- intensity and magnitude. The magnitude is a measure amount of energy released, while the intensity is the apparent effect experienced at a specific location. The analysis process can be classified on the nature of the considered variables, the method of analysis can be classified on the type of external action and behaviour of structure, the analysis can be further classified as linear static analysis, linear dynamic analysis, non- linear static analysis, non-linear dynamic analysis. Linear static investigation or Equivalent static examination can be utilized for customary auxiliary with constrained stature.

References

1 IS: 1893(Part 1): 2002, " Criteria for Earthquake Resistant Design of Structures." Part-1, Bureau of Indian Standards, New Delhi, 2002.
2 IS: 1893(Part 1): 2016, " Criteria for Earthquake Resistant Design of Structures." Part-1, Bureau of Indian Standards, New Delhi, 2016.
3 Earthquake-Resistant Design of Structures Second Edition S.K.Duggal.
4 Mayur R. Rethaliya, Bhavik R. Patel , Dr. R. P. RethaliyaComparative Study of Various Clauses of New IS 1893 (Part 1):2016 and Old IS 1893 (Part1):2002 International Journal for Research in Applied Science & Engineering Technology (IJRASET**)** Volume 6 Issue I, January 2018-
5 Urunkar S. S., Bogar V. M., Hadkar P. S.(COMPARATIVE STUDY OF CODAL PROVISIONS IN IS 1893 (PART 1): 2002 & IS 1893 (PART 1): 2016) International Journal for Research in Applied Science & Engineering Technology (IJRASET**)** Volume 7 special Issue no. 1 march 2018-
6 P.S. Girigosavi, Prof. M. S. KakamareSTATIC ANALYSIS OF MULTI-STORIED BUILDING AS PER IS 1893-2002 AND IS 1893-2016 International Research Journal of Engineering and Technology (IRJET)Volume: 05 Issue: 04 | Apr-2018.
7 S. Farrukh Anwar, A. K. Asthana (2013) "Evaluation of Seismic Design Forces of Indian Building Code" International Journal of Engineering Research & Technology (IJERT)(ISSN: 2278-0181, Vol. 2 Issue 6, June – 2013).
8 S.K. Ahirwar, S.K. Jain and M. M. Pande (2008) "Earthquake loads on multistorey buildings as per is:1893-1984 and is: 1893-2002: a comparative study" The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China.
9 A. A. Kale, S. A. Rasal, Seismic & Wind Analysis of Multistorey Building: A Review, International Journal of Science and Research (IJSR), Volume 6 Issue 3, March 2017.
10 S.K. Ahirwar, S.K. Jain and M. M. Pande, Earthquake Loads on Multistorey Buildings as Per IS: 1893-1984 AND IS: 1893- 2002: A COMPARATIVE STUDY, The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China.

11 Dr. H. SudarsanaRao, Comparative study of seismic lateral forces as per IS 1893- 1984 & IS 1893- 2002, International Journal of Emerging Trends Engineering & Development, issue 4, vol. 4,282-299.
12 AnojSurwase, Dr. Sanjay K. Kulkarni, Prof. Manoj DeosarkarSeismic Analysis and Comparison of IS 1893(Part-1) 2002 and 2016 of (G+4) Regular and Irregular Building International Journal of Innovative Research in Science, Engineering and Technology Vol. 7, Issue 6, June 2018
13 N.Veerababu, B Anil Kumar, Design of Earthquake Resistant Building Using Response Spectra,International Journal of Mechanical Engineering and Computer, Vol 4, No. 1, 2016.
14 K VenuManikanta, Dr.DumpaVenkateswarlu,Comparative Study On Design Results Of A Multi-Storied Building Using Staad Pro And ETABS For Regular And Irregular Plan Configuration, Volume 2, Issue 15, PP: 204 - 215, September' 2016.
15 Sanjay Kumar Sadh, Dr. Umesh Pendharkar, Effect of Aspect Ratio & Plan Configurations on Seismic Performance of Multistoreyed Regular R.C.C. Buildings: An Evaluation by Static Analysis, International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 1, January 2016.
16 Pardeshisameer, Prof. N. G. Gore, Study of seismic analysis and design of multi storey symmetrical and asymmetrical building, International Research Journal of Engineering and Technology (IRJET), Volume:03 Issue: 01, Jan-2016.
17 S.Mahesh, B.PandurangaRao, Comparison of analysis and design of regular and irregular configuration of multi-Storey building in various seismic zones and various types of soils using ETABS and STAAD IOSR Journal of Mechanical and Civil Engineering (IOSRJMCE), Volume 11, Issue 6 Ver. I (Nov- Dec. 2014), PP 45-52.
18 Gauri G. Kakpure, Ashok R. Mundhada, Comparative Study of Static and Dynamic Seismic Analysis of Multistoried RCC Building by ETAB: A Review, International Journal of Emerging Research in Management &Technology, Volume-5, Issue-12, 2016.
19 Prashanth.P, Anshuman.S, Pandey.R.K, Arpan Herbert, and Comparison of design results of a Structure designed using STAAD and ETABS Software, International Journal of Civil and Structural Engineering Volume 2, No 3, 2012.
20 Sudhir K Jain (2003) "Review of Indian seismic code, IS 1893 (Part 1): 2002" The Indian Concrete Journal , November 2003.
21 Naveen. G.M, Chaya. S(November 2016) [20]: "STUDY ON REGULAR AND IRREGULAR BUILDING STRUCTURES DURING AN EARTHQUAKE" International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137 Volume – 01, Issue – 08, November – 2016
22 Balaji.U and Selvarasan M.E *"Design And Analysis of Multi Storied Building Under Static And Dynamic Loading Condition Using ETABS.*" International Journal of Technical Research and Applications Volume 4, Issue 4. (July-Aug, 2016.
23 https://www.civilsimplified.com/resources/what-are-shear-walls
24 Structural Analysis and Design of Commercial Building for Earthquake Resistance.
25 Akshay R. Kohli, Prof. N. G. Gore "Analysis and Design of an Earthquake Resistant Structure using STADD". Pro International Research Journal of Engineering and Technology (IRJET)Volume: 04 Issue: 12 | Dec-2017