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Earthquake Analysis, of RC Structure using Different Codes and Different Countries - A Review

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Abstract: ***Development is a vital part of each creating nation in present time. Each nation has explicit structure configuration codes which give the principles to architects to plan different basic parts like beam, column and slab. RC building plan of each nation depends on their land area. In the period and age of globalization, an architect must be able to comprehend and deal with codes of different nations. Considering this, the principle focal point of this exploration work is to bring out contrasts and resemblances between various RC configuration codes and to utilize it to build up a typical stage. In this exploration RC configuration code of USA, INDIA, and NEWZELAND are considered. The principle centre is the relative additions and deficiencies of different structures configuration codes under specific criteria like stacking examination, plan investigation, convenience and conservative perspective. Many parameters for various cross-segment and distinctive structure material on premise of solidarity are considered. Comparative work has worked out based on stacking correlation like live load, dead load, wind load and various parameters for different components of the structure. Load factor and load combination are also compared. This comparison investigates the design capacities for various building design codes.***
Keywords: Seismic codes, Seismic analysis, Comparative analysis, Base Shear, Displacement, Seismic Analysis, Storey Drift .

I. INTRODUCTION

Structural design is a workmanship and study of understanding the conduct of basic part oppressed powers and loads and structuring them with economy and style to give a protected, useful and tough. Structural design of structures of any nation depends on specific codes of practices which give the fundamental information and norms in breaking down and planning the structure from quality perspective and affordable perspective. These codes are completed by profoundly experienced basic architects, academicians and other prominent colleagues of separate regions. This paper concerned the comparison of nominal loads, load combination, load factor, design parameters like beam, column and beam and their suitability from various building codes. The utilization of various plan strategies and codes give various outcomes in basic investigation and structure that prompts changeability in conduct, expenses and strength of structures. Such examination gives heaps of data identified with basic structure that at what degree one nation code is vary from another nation code as far as level of exactness, security, multifaceted nature and subtleties. Thus, it is the obligation of basic designer to give precise measures that lead to ideal execution and economy by with respect to the most proper structure technique. Such inventive capacity and creative mind is completely founded on understanding of auxiliary architects. The auxiliary plan procedure includes basic arranging, activity of powers and loads, part investigation, part structure, correlation among various structures codes and their itemizing. It checked on that those nations where more than one code is received for basic plan so it is useful in establishing what code has higher factor of security and level of precision than another.

II. LITREATURE REVIEWS

1) *IbnuRusyd, Muksin Umar and LubnaAlam (2018)[1]:* on the analysis of earthquake displacement prediction with reference to magnitude and time through GIS model analysis for the UPLB campus of Philippines. The research was done to manufacture on intensity map and earthquake model for the UPLB campus to resolved. The destruction ratio of building to compare the casualty in the UPLB community and validation of earthquake mode with past events of earthquake in Philippines fragility curve of buildings of Philippines was used to investigate the destruction ratio for disparate building. The few results tell that ULPB buildings are experienced to the intensity range of MMI (6.1-7.7) Mw earthquake coming from various sources.
2) *SamreenBano (2018) [2]:* They was use application of building codes has been useful in safeguarding the health safety and welfare of the people. The building code needed things for related to what holds something together and makes it strong concrete provides minimum needed things for the related to what holds something together and makes it strong concrete building. Combinations of load factors and strength reduction factor, pushing aside judging requirements, related to what holds something together and makes it strong analysis method joining together and development of strengthening reward. The

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methods of process of figuring out the worth, amount or quality of something of strength of existing structure of different element like beam, column and slab.

3) *C. U. Nwoji and A. I. UGWU (2017) [3]:* Estimate the BS 8110 and Eurocode2 in the design of structure to check out .The relative gains and shear loadings of Eurocode2 and BS8110 under followings criteria like loading analysis without no trouble use and technological advancement. Conducts inquire for beam Eurocode2 gave higher internal support moments. Eurocode2 is capable of bending easily without breaking and now the no of moments are higher than the BS8110 values. At the last it will provide further economical section and technically more advanced than BS8110.
4) *Kamaldeep Kaur and Jaspal Singh (2017)[4]:* To withstand the earthquake effect without any damage to life and property, the seismic design of building is constructed. It provides sufficient safety against the seismic forces using various codes, the comparisons between static and dynamic analysis on different types of structures is made. Its several out the variations that comes in parameters such as displacement, base shear, axial and shear force, during the use of different codes. In this review paper the seismic behaviors of various structure using different provisions in Indian code, American code, Newzealand code is presented.
5) *S.H.C Santos (2017) [5]:* Serving was to compare two or more things study of a set of codes for the earthquake-related design of buildings is presented. This comparison shows a general agreement related to the desired main features of an earthquake-related resistant structure. Simplexes having a left that's a perfect mirror image of the right half evenness and equality and unnecessary thing. Also all the examined codes agree on the need that the related to what holds something together and makes it strong detailing should provide enough the ability to be flattened or drawn into wire for the disappearing of energy in the non-line arrange. Obviously, this is a point to be better talked to in future serving to compare two or more things. Studies Santos 5.HC, Zanaica L, Bu M, Giarlelis C. Lima serving to compare two or more things study of some for design of buildings 16WCEE, Santiago Chile, 20 B. ASCE minimum design Lo- and other structures Washington, DC 2010 (4) related to Europe. Committee for EN 1998-1:2004 Structure for earthquake Europe 1, ECS, Brussels, 2004. (5) Italian ministry of infers religious legal statement of 14 technique per le constrain another point, already stressed, to be further examined something closely so the truth can be found regards the definition of the related to ghosts or the colors of the rainbow shapes with the exception of ASCE/SEI/7/10.
6) *Khan Prasad (2016) [6]:* Correlated the seismic behavior of multistory RC building using provision made in India code i.e. IS1893:2002, American code IBC2006, and Australian code AS1170:2007 by taking residential building storey G+5 as reference. The Observation Explains the different kind of result by applying three codes by specifically in shear lateral loads drift and area of steel supporting members of RC building with the habitual moments frame was molded and equivalent with static method was accomplish by using STAAD pro software. The shear base higher value than AS1170 it is also illustrate that building design using IBC code would be more conventional than IS 1893 and AS 1170 codes due to cause of the area of steel required for the RCC member for IBC code would be more than IS1893 and AS1170 codes.
7) *Swajit Gaud (2016) [7]:* As per the standards of the following countries like Indian, European, Newzealand, and Japanese. The present a extensive literature review on the design strength of material stress strain curve for concert steel and confined concert safety factor and limitations of grade of concrete and grade of steel reinforcement. The Impact of high grade concert on the properties and stress block parameter was not mentioned in IS code. Representing the material properties which give Impact on strength of concrete make better with the temperatures respecting to the strength of concrete and tensile strength of concrete was not expanded properly. Only New Zeeland has least and higher value of concrete strength in seismic environment which is 20N/mm and 70N/mm respectively. On the basis of previous standard it was observed carefully that the recommend concrete strength lies between 20Mpa and 50Mpa and between 420Mpa to 500Mpa.
8) *Mourad M and Bakhoun (2015) [8]:* It is noticed that the building codes from USA, ACI, Europe and Egypt are carefully taken before making any decision. Estimate is carried out for various parameters like action and for the resistance of section in flexural and comp arrive axial loading. Dissimilarly it is observed in the safety factor used in calculating the resistance of different section. They discovered the Egyptian code stipulates values that are so me European code except office building. Egyptian standards provide the largest ultimate load combination and lower sectional capacity. The axial capacity calculated by EC3 is larger than AISC360-10 and ECP203-2007 by % between = 1.6%and 4%.
9) *T.C. Nwofar (2015) [9]:* Distinguished between BS8110-97 and Eurocode2 for the design of reinforced concrete beam specifically on the area of tension and shear reinforcement from economical point of view. A six span continuous beam from the roof of a three storey shopping complex was taken for the analysis and design with the help of programmed excel spread shut. The self weight of the beam was taken as the weight of the and the line load was considered as unity. IT was concluded

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that eurocode2 required less amount of tension reinforcement at span as well as support. The average percentage in both cases is 3.08% and 2.83% respectively. The percentage of shear reinforcement for BS8110 is more than eurocode2. The BS8110 required about 1.3%more of the ultimate design loads than that of eurocode2 for the combination of live and dead load. Thus eurocode2 considered to be more economical design with the desired margin of safety.

10) *S. Karthiga (2015) [10]:* On going the analysis and design of G+10 for seismic forces using four International buildings standard IS1893 , Eurocode2 & ASCE 710 and British code using STAAD PRO V8i. After a plan design the function and working of building a pushover analysis was done in SAP 2000. The check the seismic preservation of building after the observation it was considered that maximum shear is obtained from IS code and it undergoes minimum displacement than other stander codes.
11) *Rajmahendra Manikaro Sawant (2015) [11]:* Evaluate the effectiveness of steelfiber along with shear reinforcement concrete. Immediate shear test using push off specimens used to investigate out the shear strength of concrete shear stress is computed as the ratio of shear load per unit area of shear plane. The Investigation was carried out on M60 grade of concrete find out workability density and shear strength with various kind of volume of concrete. The strength is Expand up to 29.42% and 28.76% at 7 and 28 days respectively over normal concrete at 1.5% fiber coefficient.
12) *Labani Nandi , PriyabrataGuha (2014) [12]:* Took three different non identical famous structural building codes such as IS, BS and EC for comparing the design of reinforced concrete structure from economical point of view. The principal contained in considering the grade of concrete is same of all three codes but difference in grade of steel. They concluded that the area of steel for slab is maximum as per IS code than BS and EC, area of steel for beam is maximum as per EC code than IS and BS area of steel for column is maximum as per BS code than IS and EC and area of steel for foundation is minimum as per IS than BS & EC.
13) *Ali S. Alnuaimi (2013) [13]:* Measure the amount of required reinforcement American concrete Institute [ACI] and British standard Institute [BSI] for the design of rectangular beam section subjected to combined loads of bending shear and torsion and punching shear in slab column connection. It alsoinvolves the desired factory for design loads. It is observed that the punching shear strength of flat column connection is more than BSI for same geometry material and loading cases. The least area of flexural reinforcement as per ACI was noticed greater than BSI while the grater for shear reinforcement than BSI. It was observed that for various design loads longitudinal and transverse reinforcement is less for ACI method than BSI method.
14) *Jaime Landingin (2013) [14]:* For the habitual frames of standard occupancy to display a differentiation of seismic provender by using three codes of Philippines, Eurocode2 and American code. A four regular building and irregular building frame was considered and compare with different countries. Response spectrum consideration and Equivalent lateral force analysis were observed on the basis of SAP2000 Software. Comparatively it was found that NSCP 2010 and 2009 IBC are demodernized and EC8 provisions are safe.
15) *Satya Prakash Mishra (2012) [15]:* Carried out a comparison between mix design procedures of IS method, BS method and ACI method. It was noticed that water-cement ratio is highest for BS method and lowest for IS method and water cement content in BS method is less than in the another two methods, the total aggregate content and the aggregate cement ratio in BS method is much high. It was observed that the percentage of fine aggregate content in ACI method is more consistent with increased strength. Due to the use of higher water cement ratio less amount of water content and cement content and higher amount of aggregate content the mixes designed by BS method failed to achieve the target mean strength. Being more consistent, the mixes designed by IS method and ACI method achieved the target mean strength.
16) *C.M Chan, M.F. Huang (2010)[16]:* Reinvestigate the potential sensitivity of taller and irregularity shaped buildings towards wind excitation. This review paper comprises of a computer based technique for effective and favorable wind resistant performance based design of tall building under various storey's of wind hazard. To find out the optimal structural solution satisfying the strength (life safety), drift (damage) and acceleration (occupant comfort) design performance constraints. A rigorously derived optimality criteria method is to be developed. The paper also suggests an integrated wind- induced dynamic analysis and automatic performance based design optimization technique for lowering down the structural cost of tall buildings.
17) *Alice E. Diaz De Leon (2010) [17]: Allowed* to be perceived that the building codes are the primary source for guiding in the construction and design of building structure for many years. During the performance of a forensic investigation a sound knowledge and proper application of building design is necessary.This review paper shows the organizational structure of both codes and also presents a comparative example with the use of structural design provisional of both codes. It also includes the load combination case for both IBC and NBCI. It is concluded that, IBC seismic provisional are more performance based whereas NBCI seismic provision are based on empirical data.

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18) *Richard Fenwick, Greogory Macrae (2009) [18]:* For the different outcome in the required design strength stiffness level and the sufficient design provision for the building in which reinforced concrete moment frame provide lateral force resistance. The differentiation between the present data and corresponding 2009 design requirement for regular building is provided by the resisting frames. This paper review lots of information which are related to seismic retrofitting to the engineers to cause to be visible.The various factors which should be taken in assessing existing structure opposite to the current design criteria. This difference show that the Newzeland code in general required lower strength and stiffness level for the flexible moment resisting frame design than the over's as code of practice.
19) *MarjanFaizian, Yuji Ishiyama (2004) [19]:* AS per 1981 Japan [BSL], 2000USA [IBC], 1999 IRAN [ICS] with their similarities and dissimilarities it was noticed the basic natural period of structure base shear and distribution of lateral force along with structural height was compared. For commutation of seismic load it is essential to observes base shear coefficient, seismic zoning spectral content fundamental period structural behavior coefficient and important factor effect of soil profit and foundation and weight of building. Today's study shows that ICS is quite resemblance to IBC, but there is conductionbetween these two Japanese BSLJ. The signification of building is considered in ICS and IBS but not as like as BSLJ. The basic period is computed with the reference of dynamic analysis using linear &non linear time according to the previous analysis ISC height is more than 50 meter analyses.
20) *Weizi Zhang and Bahram M. Sharooz (1999) [20]:* The old or the pervious experimental data and analytical results with the help of two design code ACI and AISC to ascertain. The capacity of concrete filled steel tabular column [CFTs]. The data was composed with the help of past studies and then testing of short and lavender CFT made with normal and high steel power conservative. The similarly dissimilarity between ACI and AISC is that the amount from the ACI and detailed analytical result are general closer having many fault about the analytical techniques including cross-section fiber analysis' and numerical integration of the moment with curvature relationship was calculated

III. CONCLUSION

This paper presents a review on seismic behavior of various structures using different codal provision as given Indian code, American code, &Newzealand code for earthquake analysis. This project a residential building of G+5, G+11, G+21.Special RC structure. Modeling of the structure is one as per ETAB software. Time period of the structure in both the direction is taken from the software as per the three standard (9 model are made 3 model for each code). A comparative analysis is performed in terms of base shear, deflection limit, stores drift at linearly static and response spectrum.

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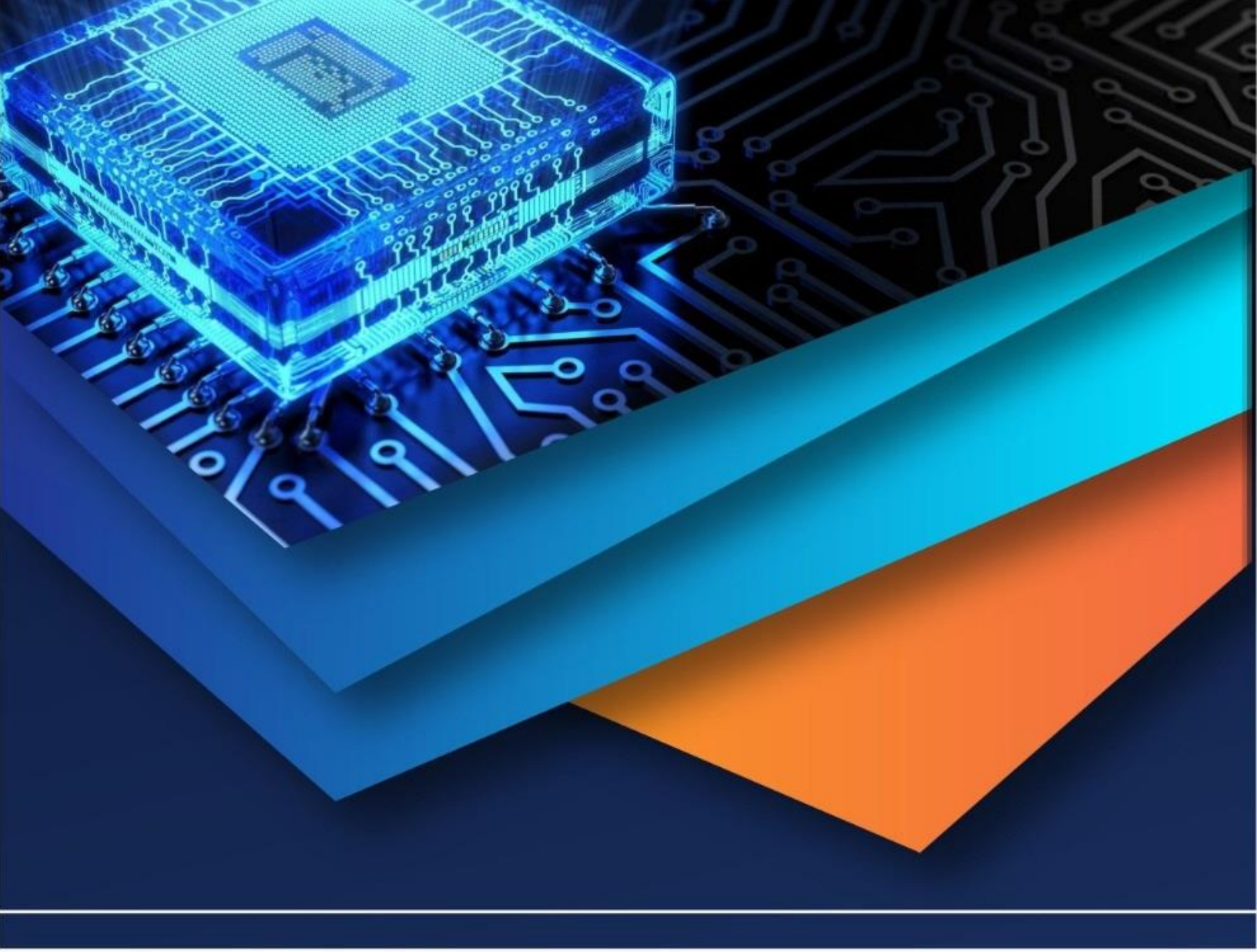

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