SEISMIC ANALYSIS OF REGULAR AND IRREGULAR BUILDING BY TIME HISTORY METHOD AND RESPONSE SPECTRUM ANALYSIS

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Abstract— Research studies for earthquake since long time indicate that we are not fully predicted the sign of earthquake and still they earthquake are unpredicted to safely design asnd construct the structure.So many research are carry out to consrtuct the earthquake safe structure.We observed from last earthquake ane research regular stucture may safe in low zone but irregular structure required a properly earthquake design.Any type of irregularity may affect the building behaviour .Concept of regular and irregular configration to perform well in earthquake a building should posses four main atribute simple and regular configration and adequate lateral strength stiffness and ducyility.STAAD PRO software is used to study and analized on multistoried RC framed structure model .I consider G+10 building for analysis purpose.Method of analysis adopted are the time history analysis and respnse spectrum analysis to analyze the model for the present study and observe the lateral displacement of structure in regular and irregular structure .The major parameter consider in this study to observe the seismic conduct amd base shear lateral displacement in various level .according to IS 1893-2002 seismic laod are calculated .The lateral displacment forces are by calculated using STAAD pro and result are compared . In this research will compare regular structure to vertical irregular by response spectrum and time history method.

Keywords—comperession of irregular structure to regular structure.

1.INTRODUCTION

Earthquake is unpredictable natural disasters during earthquake it is very difficult to protect our enigeering property it may cause loss of life in dense area.The behaviour of building during the earthquake is depend upon many conditions like stiffness ,strength, ductility and most probably on configration of structure.

1.1 Structural irregularity in buildings

VERTICAL IRREGULARITY;

1)Stiffness irregularity ;it is nothing but soft storey in this stiffness of the member in the frame are not equal and they vary according to floor height.Soft storey in which the lateral stiffness is les than 70percent of the storey above or less than 80% of the average latral stiffness of the storey above. extreme soft storey –an extreme soft storey is one in which the latral stiffness is less than the 60% of the storey above or less than 70% of the average stiffness of the three storey above.

2) Mass irregularity; mass irregularity shall be considered to exist where the seismic weight of any storey is more than 200% of that of its adjacent stories.In case of roof irregularity need not to be considered.

3)Vertical geometric irregularity**;** the structure is considered to be geomtrical irregular when horizontal dimension of latral force resisting system in any storey is more than 150 % of that in its adjacent storey**.**

4) In plan discontinuity in vertical element resisting latral force**:** an in plan offset of latrel force resisting element greater than the lenght of those element.

5) Discontinuity in capacity**:** weak storey, weak storey is one in which storey latral strength is lass than is 80% of that in storey above.

1.2 Failure due to vertical irregularities

The vertical irregularities can be sub - classified into mass, stiffness, strength and setback irregularity.In 1971 the Olive medical center building which was failed during San Fernado earthquake.that was fail due to mass irregularity It was a six-

storeyed building and excess earth fill at first storey and there was a excess irrulrity in stiffnes is present at second floor because more wall was present at second floor which result is stiffness and strength iregularity.colum which was present at ground story cause inadequate lateral confinement.

Therefore, the first two storeys of the building which contained irregularities of mass, strength and stiffness.Less damage is occur to last four storyi was obsereved that the firsttwo story support the whole building .stiff ness irregularity is coommon reason of collapse of highrise building during the earthquake.

In Turkey during the last decade *(Adalier and Aydingun 1998; Durumus et al. 1999; Huang and Skokan 2002; Sezen et al. 2003*.. The majority of the residential and commercial buildings built in Turkey had soft storeys at the first floor level which awere often used for commercial purposes. These storeys were generally enclosed with glass windows instead of brick infill walls so as to be used as showrooms. The heavy masonry infills starting immediately above the soft storey which created a large variation of mass, stiffness and strength in the bottom storeys. The previous earthquake damages and results of analytical studies showed that the structural systems with a soft storey lead to serious problems during severe earthquake ground shaking. During the occurence of an earthquake, the presence of a soft storey increased the deformation demands significantly and the first-storey columns were expected to dissipate the whole seismic energy.

2. METHOD OF ANALYSIS

2.1 Time history method

Time-History analysis is most accurate method for analysis of bulding procedure where the loading and the response history are evaluated at successive time increments. During each step the response is evaluated from the initial conditions existing at the beginning of the step (displacement and velocities and the loading history in the interval). In this method, the non-linear behaviour may be easily considered by changing the structural properties (e.g. stiffness) from one step to the another. Therefore, this method is very effective to determine the non-linear response,. However, in linear time history analysis, the structural properties are assumed to remain constant and a linear behaviour of structure is assumed during the entire loading history.

2.2 Response spectrum method

It is the exact method The representation of maximum response idealized single degree freedom system having certain period and damping during earthquake ground motion .The maximum response plotted against of undamped natural period and for vari.ous damping valve and can be expresed in term of maximum absolute acceleration maximum relative velocity or maximum relative displacment for this purpose response spectrum analysis have been performed according to IS1893-2002 . The story displacment base shear and frequency time period in response spectrum method are performed.response spectrum shows the maximum response of SDoF system corresponding to various earthquake having time periods as represns\ted on the horizontal axis.

It is an exact method for analysis .The design horizontal force at each floor in each mode is calculated by STAAD provide outcomes i.e. design value, story base shear, and modal masses.

The design latral shear force at each loor at each mode is copmuted by staad pro acordance with is 1893 part 1.user provive the (z/2)x(i/r)as factore input spectrum.programe calculate the time period for first six mose by defult.program is calculate the sa/g for each mode utilizing time period and damping for each mode.the progame is calculate the design horizontal acceleration spectrum Ak for different mode .than program calculate the mode prticipation factor for the different mode.the peak latral seiemic force at each loor at each mode is calculated.the peak response quantitiesare thaen calculated as per CQC SRSS or TEN OR CSM as defined by user to find the result.

3. REVIEW OF LITERATURE

3.1 Poncet ,L.And Trembly(2004) he used the equivalent static load method and response sepectrum analysis method for the analysis of eight storey building and considering the the effect of mass irregularity and impact of braced steel frames structure with different setback configration.and find response spectrum give the more accurate result.

3.2 J.P.Sweetlin,R.Saranraj,P.Vijayakumar(2016) Studied comparison of displacement for regular and irregualr building for the zone 2 .They analyse the G+10 building for the analisis purpose by using the STAAD-PRO software. They consider only the geometric irregular building with different set back. And conclude that the displacment have direct co relation with mass of building so displacment in regular buildin g is more than irregular building and story drift is also more in regular building.because they consider only the geometric irregular building.

3.3 Ashvin soni (2015) present apaper on effect of irregularities in building and their consequense.she use the response spectrum method for the analysis of G+10 building .She comsider the 5 frames to make the building irregular in 1 frame consider regular building in second floor consider swimimg pool on top storey in third frame consider heavy loading at 4^{th} and 7^{th} floor in fourth frame consider 1^{st} and 2^{nd} floor have a soft storey and in last 5^{th} frame consider 4^{th} and 5^{th} storey is soft storey and find the result in form of storey drift and displacment. So she observed that frame 2 and frame 5 was weakest it suffer maximum displacment and frame 1 suffer least dispacment.and storey drift is maximum in faame 3 which chang abruptly and frame 4 and frame 5 also give max storey drift for bottom two storey and middle storey.

3.4 Hassballa A.E. et al.2018 he analyse the multistorey building by response spectrum mrthod by using STAAd PRO SOFTWARE studied the seismic analysis of RC building and investigate the performance of existing building if exposed to seismic loads. .They consider the static load and siesmic load for the anlysis of multistoried building and result was obtained from this study is that for the large displacment response spectrum require a large dimension for seismic analysis.And conclude that drift is obtained from this analysis is about 2 to 3 times the allowable drift. resulting from large dicplasment due to combination of static load and seismic load .

3.5 Dubey et al.2015 presented design of multistory irregular building with 20 storey and modeling it throw software STAAD Pro for the seismic zone for in india, dynamic response of the building under the actual earthquake DELINA(ALASKA2000) have been consider this paper highlits the comparison of time history method and response spectrum method the story displacement method has been obtained both the method of dynamic analysis and concluded that time history analysis is 2 to 8% higher than response spectrum analysis in both the type of building i.e regular and the irregulr building for highrise building it is neccesary to privide the dynamic analysis for non linger distribution of force storey displacement id found greater in THM as compared to RSM and base shear is greater than RSM than the THM hence it is concluded that time history method is better and more economical for designing

3.6 Rakesh Kumar Gupta1 , Prof. D. L. Budhlani2(2018)

Present a paper on plan irregularity of different type he used a G+10 building for the seiesmic anlysis by considering the seismic load live and dead load using the STAAD PRO software by using the response spectrum method as per is 1893 :2016 and 1893:2002. All combinations are considered as per IS 1893-(part I).

Result is obtained from this study is such that seismic analysis as per guidelines of IS 1893:2016 shows higher value of base shear than as per IS 1893:2002. Also maximum lateral displacement in horizontal directions shows large value by response spectrum method as pe IS1893-2016

3.7 V.Rajendra kumar.Ranga rao V.

Compare the regular and irregular structure using staad pro and using method of analysis are response spectrum and time history and observe the result for structure in various zone .result is obtained in form of displacment and base shear at various level analysis is done for G+10 building it is observed that the zone 3,zone4,zone5 having 37%,58%,and 72% more base shear than zone 2.and latral displacment is maximum in zone 5 and minimum in zone 2.

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