PREDICTION OF BLAST LOADING UNDER SEISMIC CONDITIONS WITH INDIAN CODES

SHIKARI SIDDARTHA
M.TECH (Civil) Structural engineering
St.Martin's Engineering College

G.S VIGNAN
Assistant Professor
St.Martin's Engineering College

Abstract:
An explosion is a rapid and sudden release of stored potential energy characterized by a bright flash and an audible blast. Part of the energy is released as heat radiation (glimmer); and part is coupled into the air as air impact and into the soil (ground) as ground stun, both as spiral growing stun waves. Impact stacking is not normal for different kinds of serious burdens brought about by outrageous occasions, for example, seismic tremor or high wind. These sorts of burdens create harm that is restricted to a not many auxiliary reaction instruments, and they are connected "all inclusive" with the end goal that the whole basic system attempts to oppose the heap. In the present investigation, a run of the mill ten storied OGS confined structure is considered and the structure considered is situated in Seismic Zone-II. The plan powers for the ground story segments are assessed based as Indian and OGS edges are planned thinking about MF as 2.5 (Indian), The exhibition of structure is considered by utilizing stadd.pro analysis software. The computational models are developed in the program and observed in each case. The relative performances of building designed as per Indian code as well as British code.

Keyword: *Fragility curves, Open ground storey (OGS), Probabilistic Seismic Demand Model (PSDM),Stadd-pro seismic analysis*

1.0 Introduction

Because of different inadvertent or purposeful occasions identified with significant structures everywhere throughout the world, touchy burdens have gotten impressive consideration as of late. To give satisfactory parking spots, ground story of the structure is used. These sorts of structures (Figure 1.1) having no infilled dividers in ground story, yet infilled in every single upper story, are called Open Ground Story (OGS) structures. Most of lofts are of this sort and the infill dividers utilized are of principally block stone work.

Figure 1.1: Typical example of OGS building

Upper accounts of these structures are firm and the between story floats will be little, bringing about enormous arches, shear powers and bowing snapshots of the ground story segments. Consequently, the quality interest on the segments in the ground story of the structures is extremely high. Most of this sort of structures had fell in the past quakes in numerous nations.

Blast Loading

The blast loading on structures can be divided into two main groups based upon the confinementof the explosive charge. This weight increment or stun voyages

radially from the burst point with a lessening speed (U) which is dependably in abundance of the sonic speed of the medium. Gas Molecules, making up the front move at lower speeds (u). This last molecule speed is related with a dynamic weight or the weight framed by the breezes created by the stun fronts and it's an element of air thickness and wind speed. As the stun front ventures into progressively bigger volumes of the medium, the pinnacle occurrence weight at the front declines and the term of the weight increments.

Open ground storey (OGS)

The nearness of infill dividers in the upper accounts of the OGS building expands the solidness of the structure internationally, as found in a normal in-filled confined structure. Because of the expansion of worldwide solidness, the base shear request on the structure increments. On account of normal infilled casing building, the expanded base shear is shared by the two edges and infill dividers in every one of the narratives. Useful structuring of the structure has turned out to be significant and necessities of structures differ from structure to building. Subsequently it is basic to settle the program with reference to the general population will's identity utilizing the structures. So it is vital that each Civil Engineer realizes the fundamental standards engaged with plan of R.C.C. structures henceforth, this undertaking is proposed at DESIGN of a Multi-story structure.

Objectives

- To investigate the dynamic response and damage of RC framed structures subjected to external blast loading including; the threat definition, blast wave parameters and dynamic properties of materials.
- To look into available procedure for blast analysis on framed structures and to lay the basis for their consideration in the Indian Building Code Stand
- The present study is limited to reinforced concrete multi-storey framed buildings that are regular in plan.
- The present study is based on a case study of ten storey six bays and the buildings with basement, shear wall and stiff plinth beams are not considered in this study.

Literature review

Impact stacking is not normal for different kinds of serious burdens brought about by outrageous occasions, for example, tremor or high wind. These sorts of burdens produce harm that is constrained to a not many basic reaction components, and they are connected "all around" with the end goal that the whole basic framework attempts to oppose the heap. Hazardous impact enacts numerous auxiliary reaction systems in light of its outrageous spatial and time varieties in greatness and time of utilization (span)

Sattar and Abbie (2010) in their study concluded that the pushover analysis showed an increase in initial stiffness, strength, and energy dissipation of the infilled frame, compared to the bare frame, despite the wall's brittle failure modes. Likewise, dynamic analysis results indicated that fully-infilled frame has the lowest collapse risk and the bare frames were found to be the most vulnerable to earthquake-induced collapse.

Patel (2012) directed both straight (Equivalent Static Analysis and Response Spectrum Analysis) and nonlinear

investigations (Pushover Analysis and Time History Analysis) for Low-ascent open ground story encircled structure with infill divider solidness as an identical inclining swagger model. What's more, the examination results demonstrates that a factor of 2.5 is too high to be in any way increased to the shaft and segment powers of the ground story of low-ascent open ground story structures.

Tavares et. al (2012) led an investigation to discover the delicacy bends for various extension classes in eastern Canada. Extension framework delicacy bends are created thinking about the helplessness of basic segments to evaluate the likelihood of scaffold harm. The connection between the extension harm and the ground movement force is spoken to by power law proposed.

3.0 Analysis methods for blast loading

A few examination strategies are utilized for impact opposition configuration going from basic hand figuring's and graphical answers for increasingly complex PC dynamic based applications. Normal techniques/approaches for impact examination are talked about underneath

Equivalent Static Method

One technique for impact examination which had been ordinarily utilized before, however which is never again upheld is the equal static strategy the technique utilizes a static investigation with an estimated connected burden to recreate the dynamic reaction. Dynamic parameters, for example, time differing loads, quick strain rate material qualities, load enhancement factors, mass, firmness, time of vibration, and passable plastic distortions are not utilized. The basically trouble with this strategy is deciding a fitting static stacking which will yield sensible outcomes. This technique isn't prescribed for general use aside from situations where the structure is far expelled from the impact source, with the end goal that the impact stacking takes after a breeze blast

Single Degree Of Freedom System (SDOF)

Multifaceted nature in breaking down the dynamic reaction of impact stacked structures includes the impact of high strain rates, the non-direct inelastic material conduct, the vulnerabilities of impact load estimations and the time-subordinate distortions. Accordingly, to streamline the-examination, various suspicions identified with the reaction of structures and the heaps has been proposed and generally acknowledged.

Material Specifications:

Steel Reinforcement Modelled as uni-axial bilinear stress-strain model with kinematic strain hardening

Material Properties	
Modulus of Elasticity (kPa)	2.00E+08
Yield Strength (kPa)	250000
Strain Hardening Parameter (-)	0.005
Facture/Buckling Strain (-)	0.1
Specific Weight (kN/m3)	78

4.0 Results

The following are analysis results of a building by applying earthquake loading and dead loading along X Y Z axis using STADD PRO.

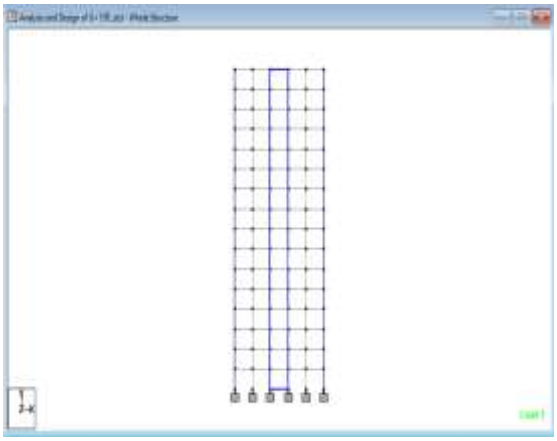

Figure: the design of a building using STADD PRO

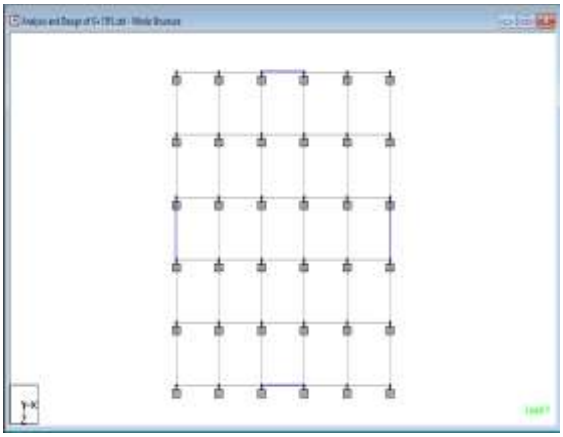

Figure: shows the piping structure of building

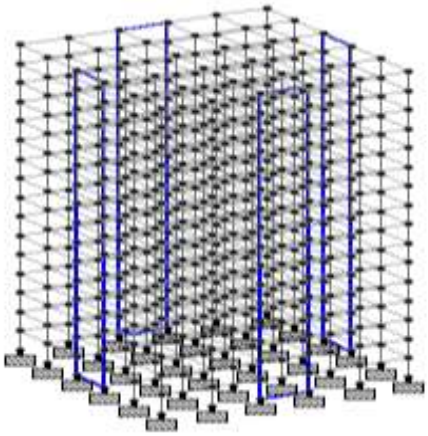

Figure: shows the earth quake load applying along X-axis on the building

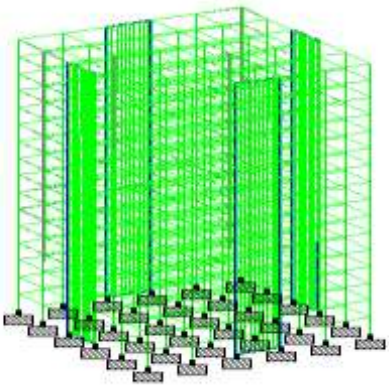

Figure: analysis simulation of high raised building at applied earthquake loading along X-axis

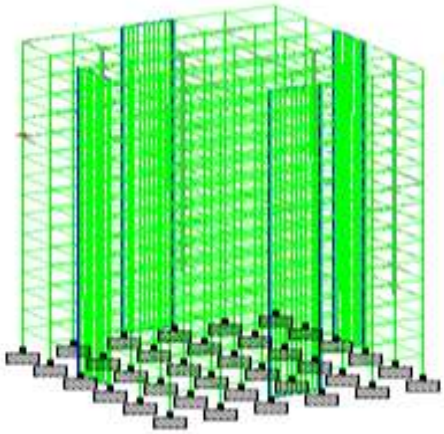

Figure: The analysis simulation of high raised building at applied earthquake loading at different condition along X-axis

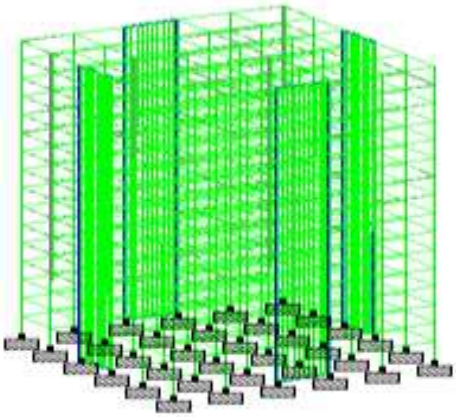

Figure: the analysis simulation of high raised building at applied earthquake loading along Z-axis

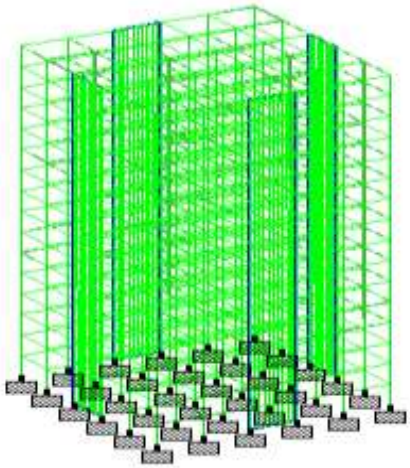

Figure: Analysis simulation of high raised building at applied earthquake loading at different conditioning along Z-axis

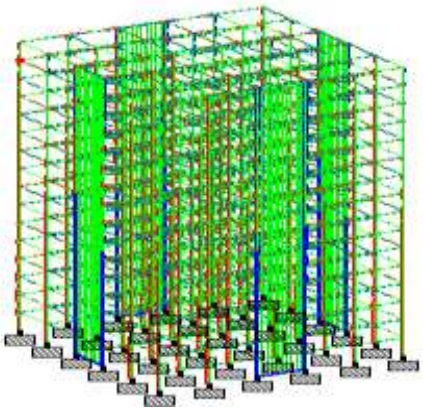

Figure: the beam stress analysis when DEAD LOAD is applied

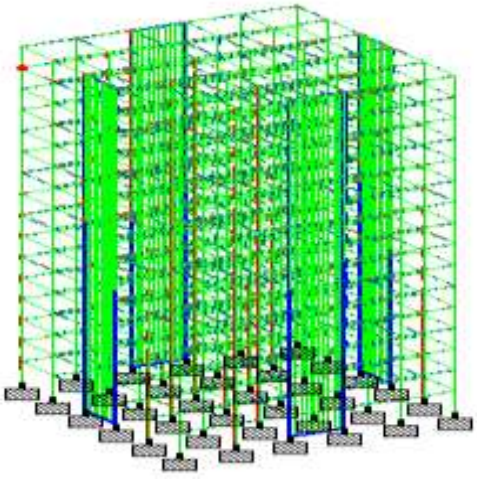

Figure: simulation of the analysis of the building when LIVE LOAD is applied

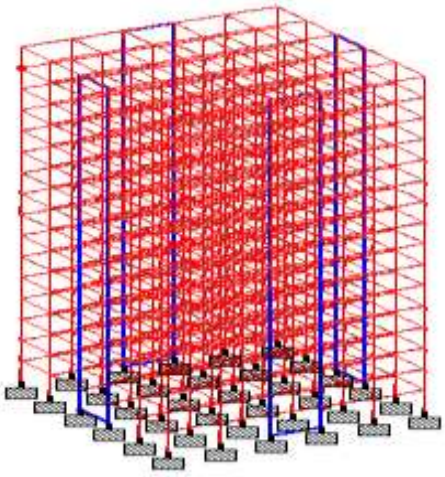

Figure: bending analysis of the high raised building at WIND LOAD applied

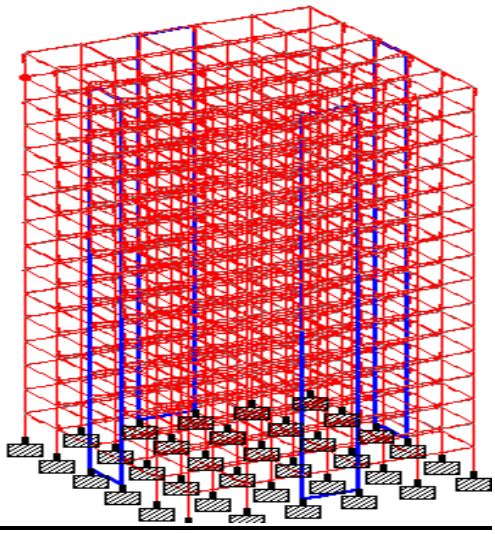

Figure: bending analysis of the high raised building at LIVELOAD applied

Conclusions

The case study analysis puts forth that high rise residential structures are not popular due to user perception that they are expensive and the associated fear of safety during fire. STAAD PRO is versatile software has the capability to calculate the reinforcement needed for any concrete section, to find lateral deflection due to earthquake loadBeam Design Output default design output of the beam contains flexural and shear reinforcement provided along the length of the beam. Column Design for axial forces, uniaxial and biaxial moments at the ends Square

columns are designed with reinforcement distributed on each side equally for the sections under biaxial moments and with reinforcement distributed equally in two faces for sections under uni-axial moment. Base shear plays an important role. Its gives the base shears for entire structures. Storey drift: High rise structures are subjected to excessive deflection. Deflection obtained by STAAD pro is checked by IS Codal limitation for serviceability.

Future scope

As per analysis, it is concluded that displacement as well as its stress also at different level in multi-storied building with shear wall is comparatively lesser as compared to R.C.C. building Without Shear Wall. So now a day we can adopt with shear wall at analyzed and optimized locationLess obstruction will be there because of reduced size of column and provision of shear wall. It is concluded that building with shear wall is constructed in lower cost as compared to structure without shear wall.

References:

1.*Kulkarni J.G., Kore P. N., S. B. Tanawade, "Analysis of Multi-storey Building Frames Subjected to Gravity and Seismic Loads with Varying Inertia" ISSN: 2277-3754, International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 10, April 2013 Page 132.*

2.D.V.Bangara,Raju,Chandan,"comparative study of response of multi storey buildings subjected to earthquake forces with and without dampers", International Journal of Research in Engineering and Technology, ISSN: 2321-7308 Volume: 04 Special Issue: 01, NCRTCE-2014, Page 91

3.E. Pavan Kumar1, A. Naresh2, M. Nagajyothi3, M. Rajasekhar4, "Earthquake Analysis of Multi Storied Residential Building", Journal of Engineering Research and Applications,ISSN : 2248-9622, Vol. 4, Issue 11(Version 1), November 2014, page 59-64

4.Mohit Sharma1, Dr.SavitaMaru2, "Dynamic Analysis of Multistoried Regular Building" , IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 1 Ver. II (Jan. 2014), PP 37-42.

5.Pralobh S. Gaikwad and Kanhaiya K. Tolani, "Review Paper on Dynamic Analysis of Building", International Journal of Current Engineering and Technology" E-ISSN 2277 – 4106,Vol.5, No.1, 31 March 2015.