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"Dynamic Behavior of Various Structural System for Tall Buildings Subjected to Wind Load"

Hemant S. Gaikwad[1], B. N. Mulay[2], S. K. Patil[3], A. B. Pujari[4]

[1]Post Graduate Student, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.
[2]Assistant Professor of Civil Engineering Dept, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.
[3]Associate Professor and HOD of Civil Engineering Dept, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.
[4]Associate Professor of Civil Engineering Dept, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.

Abstract - *The increased population in urban societies and the constant pressure of limited land area with expensive prices have caused the evolution of high-rise buildings in India and rest of the world. High-rise buildings may be considered as a symbol of development and civilization. From structural point of view, these are buildings of which height will be affected by lateral forces resulting from earthquake and wind loads to the extent that such forces will play a major role in the design process.*

The present study is carried out on analysis and design of high rise tall buildings using ETABS 18 software. Modeling of S+17 storey structure considered for analytical investigation based on IS16700:2017 guidelines. Various Indian standards like IS 456:200, IS 875:2015 and IS 1893 (part 1):2016 were used. The said structure is modeled as three dimensional structure and all the loads are applied, gravity loading such as dead load and live load in the direction of gravity, lateral loads such as seismic and wind, and the behavior of the structure has been studied. All models have been analyzed for the same peak ground acceleration (PGA) and material characteristics. Then the outrigger and shear walls are placed for different height and behavior of structure for wind and modal studied. Investigation results show that provision of shear walls with response reduction factor 4 as per IS 1893 (Part-I):2016 and optimum location of outrigger system efficiently reduce the deflection and enhance the structural stiffness and dynamic behavior for tall buildings.

***Key Words*: IS 875 (part 3):2015, IS 16700:2017, Tall Buildings, Outrigger System, Shear Wall, Wind analysis.**

1. INTRODUCTION

A building is said to be a high-rise when its appearance and proportion is slender to give a tall building or it's reasonably higher than the surrounding buildings. As per IS 875 (Part 3):2015 building with height more than 50m and having height to smaller dimension more than 6. Also when wind interacts with a building, both positive and negative pressures occur simultaneously, the building must have sufficient strength to resist the applied loads from these pressures to prevent wind induced building failure. Load exerted on the building envelope are transferred to the structural system and they in turn must be transferred through the foundation into the ground, the magnitude of the wind pressure is a function of exposed basic wind speed, topography, building height, internal pressure, and building shape. According to the provisions of Bureau of Indian Standards for earthquake load, IS 1893(Part 1):2016, height of the structure, seismic zone, vertical and horizontal irregularities, soft and weak storey necessitates dynamic analysis for earthquake load. The contribution of the higher mode effects are included in arriving at the distribution of lateral forces along the height of the building. The common factor which affects the results in wind and seismic analysis is height of structure. Recently published Indian Standard on IS 16700: 2017 on 'Criteria for structural Safety of Tall Concrete Buildings', to covers structural safety and serviceability aspects relating to reinforced concrete buildings of height greater than 50 m and up to 250 m.

This standard is based on prescriptive approach and covers the following design and serviceability aspects of reinforced concrete tall buildings:

As the building goes higher and higher, the selection of cross-sections should be considered carefully along with materials and structural systems keeping in mind the demand of functionality. Unexpected deflections, wind and earth quakes leads to change in deflections and acceleration in horizontal loading are some of the major factors that need to be considered. Inhomogeneous sites result in causing imperfections in elements taking place during manufacture or maybe uneven foundation leading to unexpected deflections. Wind causes horizontal loading resulting in sway of the building. This is because high-rise buildings are susceptible to oscillation. Therefore, wind has to be considered as a static load inclusive to be considered as a dynamic load. Wind tunnel experiments are conducted usually to find the response of buildings under wind loads.

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Optimization of Single Cylinder Engine Crankshaft Using FEA software

Mr. Kishor Nandkumar Raskar, *Scholar,ME Design,* Prof. Gayatri S. Patil,
K.J. College of Engineering and Management Research, Pune, 411048.

Abstract-Crankshaft is very important component of an I.C. Engine, it convert the reciprocating motion of the piston into rotary motion it is use the 4-bar link mechanism for this conversion. The typical crankshaft consist of journal bearings, Crank Pin, crank arms or webs, crank pin. The main objective of this study is to analysis of stresses develop in the crankshaft and weight analysis. The two-wheeler Access 125 crankshaft taken for this study which having 4-stroke petrol engine. For CAD modeling of crankshaft Pro-creo 2.0 is being used and for analysis HyperMesh and Optistruct as a solver. Firstly, we used different materials for analysis in which around 60% weight optimization is possible using aluminium alloy with1-2% change in stress induced in the crankshafts

Index Term – **4-stroke petrol engine crankshaft, Optimization, HyperMesh, ANSYS.**

1. INTRODUCTION:

Crankshaft is critically very important component of Engine. It having very complex geometry consisting of webs, Journals, Bearing, Crank pins. Connecting rod transmits the reciprocating motion to journal, crankshaft start rotating with its bearing and other mounting mechanism and this motion is being transmitted to the Flywheel, Powertrain, and after that, it goes to wheels.

During rotation, Varies forces acting on crankshaft. The mainly acting forces are torsional and bending which responsible for failure of crankshaft if it exceeds the design condition.

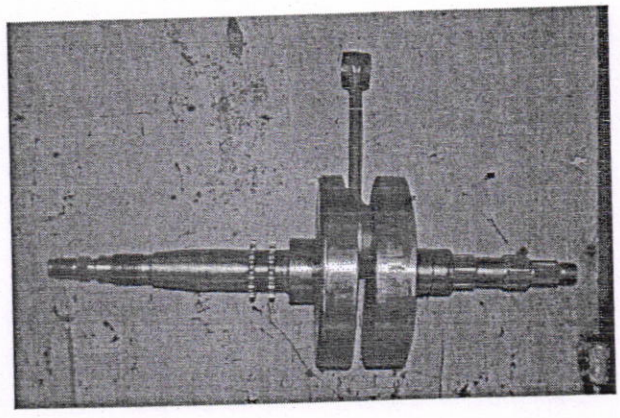

Fig.1 Single cylinder engine crankshaft

Types of Crankshaft:

a. Overhung Crankshaft
b. Centre Crankshaft
c. Single throw Crankshaft
d. Multi throw Crankshaft

This project is mainly dealing with the weight optimization of the crankshaft using shape optimization and material optimization methods.

2. PROBLEM STATEMENT

This project is mainly focusing on weight optimization and develop optimized geometry of crankshaft.This weight optimization will help to reduce the weight of component and improve the fuel efficiency of vehicle. Crankshaft should be strong enough to take all the torsional and bending forces acting on it.

In Today'scompetitive, market all the OEMs are trying to improve vehicle performance by reducing the weight of overall vehicle. If we take example of typical vehicle around 25-28%, vehicle weight is occupied by Engine and powertrain module. Untiltoday, OEMs reduced weight using composite materials and plastic materials as alternate material for sheet metal and other components. So further weight reduction in BIW, Chassis, Interior, and

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Lateral Stability of Irregular RC Building With Shear Wall Located on Slope

Muluk Shreyas Shankar[1] Mulay B.N.[2], Patil S.K.[3], Pujari A.B.[4]

[1]*Post Graduate Student, at K J College of Engineering and Management Research, Pune, Maharashtra, India.*
[2]*Assistant Professor of Civil Engineering Department, at K J College of Engineering and Management Research, Pune, Maharashtra, India.*
[3]*Associate Professor and HOD of Civil Engineering Department, at K J College of Engineering and Management Research, Pune, Maharashtra, India.*
[4]*Associate Professor of Civil Engineering Department, at K J College of Engineering and Management Research, Pune, Maharashtra, India.*

Abstract - *Structure subjected to seismic/earthquake forces are always vulnerable to damage and if it occurs on a sloped building as on hills which is at some inclination to the ground the chances of damage increases much more due to increased lateral forces on short columns on uphill side and thus leads to the formation of plastic hinges. Structures on slopes differ from those on plains because they are irregular horizontally as well as vertically. In north and northeastern parts of India have large scale of hilly terrain which falls in the category of seismic zone IV and V.*

In present work a parametric investigation has been carried out, in which hill buildings slopes are geometrically varied in angle and effect of shear wall studied. The ground slope variation is in range of 15⁰,25⁰,35⁰ and 45⁰ respectively. Total eight analytical models of S+8 storeyed buildings have been subjected to seismic forces along and across hill slope direction and Response Spectrum analysis have been done using structural engineering software ETABS 18.0.The seismic parameters based on IS 1893 (part 1):2016 obtained from analyses have been discussed in terms of fundamental time periods, diaphragm displacements, storey drifts and storey shear in buildings, modal behavior and diaphragm acceleration compared within the considered configurations of hill buildings.

Key Words: Response spectrum, diaphragm acceleration, Displacement, Drift, Shear Wall, ETAB-2017.

1. INTRODUCTION

Earthquake is the most disastrous and unpredictable phenomenon of nature. When a structure is subjected to seismic forces it does not cause loss to human lives directly but due to the damage cause to the structures that leads to the collapse of the building and hence to the occupants and the property. Mass destruction of the low and high rise buildings in the recent earthquakes leads to the need of investigation especially in a developing country like India.

The adobe burnt brick, stone masonry & dressed stone masonry buildings are generally made over level ground in hilly regions. Since level land in hilly regions is very limited, there is a pressing demand to construct buildings on hill slope. Hence construction of multi-storey RC Framed buildings on hill slope is the only feasible choice to accommodate increasing demand of residential & commercial activities.

Now a days, rapid construction is taking place in hilly areas due to scarcity of plain ground. As a result the hilly areas have marked effect on the buildings in terms of style, material and method of construction leading to popularity of multi-storeyed structures in hilly regions. Due to sloping profile, the various levels of such structures step back towards the hill slope and may also have setback also at the same time.

1.1 Need of Structure General

India consists of great arc of mountains which consists of Himalayas in its northern part which was formed by on-going tectonic collision of plates. In this region the housing densities in good quantity. Hence there is need of study of seismic safety and the design of the structures on slopes. The response of a sloped building depends on frequency content of the earthquake as it affects its performance when it is subjected to ground motion. Such buildings have mass and stiffness varying along the vertical and horizontal plains, resulting the center of mass and center of rigidity do not coincide on various floors. This requires torsional analysis; in addition to lateral forces under the action of earthquakes

2. Objective of Study

The purpose of this project is to study three dimensional analysis of two different configurations of buildings which is built on sloping ground has been undertaken and the effect of plain aspect ratio has been parametrically studied by altering slopes using 15, 25 and 35 degree angles. Results have been discussed in terms of static and dynamic properties of buildings such as shear forces, bending moments induced in the columns at foundation level, fundamental time periods, diaphragm displacements,

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STRUCTURAL HEALTH MONITORING & AUDITING OF RCC BUILDING

Ashwini Salunke[1], Dr. Santosh Patil[2]

[1] PG Student of KJ College of Engineering and Management Research, Pune, Maharashtra, India, [2] H.O.D. Civil Engineering Department of KJ College of Engineering and Management Research, Pune, Maharashtra, India

ABSTRACT: Structural audit is a health check-up of whole building. Structural auditing gives an idea about current condition of building and necessary measures taken so that the life of building can be increased. It also suggests some repair & retrofitting techniques required to increase the serviceability & overall health of old building. This paper deals with a case study of structural auditing of RCC building by visual inspection & NDT tests. From visual inspection, HRI is found out. Recently various methods and techniques are used for structural health monitoring called as NDE (Non Destructive Evaluation) techniques.

KEYWORDS: Structural auditing, SHM, NDT tests, HRI, Carbonation test, Core extraction test.

1. INTRODUCTION

In India RCC has been used extensively since last 50-60 years. After the independence a rapid development in multi-storied infrastructure is seen. Also after the independence, the construction activity in India has been increasing geometrically. Structural audit was first introduced by Indian society of structural engineers from 1975.

Due to increase in population, people migrating from village to cities therefore the population in cities increasing & number of people living in building are more than the actual design consideration. In India there are many old buildings which have reduced strength due to low quality material, improper techniques used in construction, the chances of failure of building are increased. The first step in repairing process of building is structural audit. Structural auditing is the process in which health of building is checked.

Structural audit also highlights and investigate risk areas, critical areas of building & also suggests if any urgent attention is required or not. Every structure has its own service life. Due to maintenance of the structure health of the building increases.

The building constructed usually reduces its strength when the building becomes older. Therefore it is compulsory for all building to carry out structural auditing once in 5 years whose age is 15 to 30 years & also for 3 years for building older than 30 years. If the structural condition gets bad, we can go earlier for structural auditing. The need of audit is to save life and building.

The major issues that occurs in structural audit is that the people are not aware about the structural audit & its importance.

2. LITERATURE SURVEY

2.1 "Structural Audit For An Educational Building", Abhinav Kale, Mahesh Gond, Pallavi Kharat

In this paper, authors were carried out the structural auditing of Sant. Tukaram Maharaj Vidyalaya which is located at Lohgaon, Pune. The shape of building is L-shaped, which RCC framed structure with two storied.The internal and external walls are made up of bricks. The authors were inspected external building faces, staircase, lobby, passage, rooms etc. From visual inspection and Rebound Hammer Test, they concluded that the building will require major repairs and the remaining members of the building need major up-gradation.

2.2 "Structural Audit of RCC Building", Sanket Sanjay Suryawanshi, Vaibhav Vishnu Vishe, Deepak Premchand Sah, Reetika Sharan

In this paper, authors were tried to find out the faulty mechanism in structure to prevent the failure of structure. The authors carried out the structural auditing of RCC building i.e. Vidhata apartment of G+4 floors which is located at Thane. The age of building was 28 years and also the weather effect is present. They performed Rebound Hammer Test, Ultrasonic Pulse Velocity Test & carbonation test to check the performance of the structural components like beams, slabs, columns, internal & external walls. They concluded that principle repairs are required at various levels, all the vegetation should be removed, minor cracks should be repaired by injection of Epoxy or by using grouting method, deteriorated plaster surface must be removed & plastering should be done with mortar proportions 1:3, corroded steel must be replaced wherever necessary.

2.3 "Structural Auditing With a Case Study", J.M. Sadamate, Dr. G.A. Hinge

This paper deals with a case study of RCC building i.e. Renuka Residency with G+8 floors which is located at Katraj. From visual inspection, they said that there is no serious problem in settlement of components, corrosion of steel and deflection of components. Also

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Pushover Analysis of R.C. Building with Effect of Brick Masonry Infill Wall

Jagtap Umesh Mahadeo[1], Satpute S.S.[2], Patil S.K.[3], Pujari A.B.[4]

[1]Post Graduate Student, at
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[2]Assistant Professor of Civil Engineering Department, at
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[3]Associate Professor and HOD of Civil Engineering Department, at
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[4]Associate Professor of Civil Engineering Department, at
K J College of Engineering and Management Research, Pune, Maharashtra, India.

Abstract - *The pushover analysis is a course of action in which simplified nonlinear technique uses to estimate seismic structural deformation. Now a days in Reinforced concrete (R/C) frame we are using masonry infill's for architectural, aesthetic or economic reasons. In this project, we have to study the effect on the infill's on the failure patterns of the RC frames.*

The main intend of this study is to demonstrate that the addition of in infilled walls to RC frame effectively contributes strength and stiffness of the structure against seismic load and suggest the guideline for evaluating strength and stiffness of unreinforced infill panels. These guidelines are strictly based on FEMA-356. In this project we are using three types of bricks such as Red brick, Fly ash brick, Light weight brick i.e. siporex bricks. From output non-linear analysis, we compare Storey V/S i) Base shear, ii) Srorey displacement, iii) storey drift also Base Shear V/S Monitored Displacement and Spectral acceleration V/S Spectral Displacement. We are also study the effect of bare frame with shear wall using ETABS 2017 software.

Key Words: Pushover Analysis, Brick infill, FEMA-356, Displacement, Drift, Shear Wall, ETAB-2017.

1. INTRODUCTION

Now a days, it becomes important to find out the earthquake behavior of the structure with infill walls in earthquake engineering. For analysis of the frame there are several methods used for earthquake analysis, such as Seismic analysis, i.e. linear static method, Response spectrum analysis, i.e. linear dynamic method, Pushover analysis i.e. nonlinear static analysis, time history method i.e. nonlinear dynamic method. But here we use a nonlinear static method. The aim of pushover analysis is to determine and control the performance of structure under earthquake. In older IS 1893 code we don't consider the strength and stiffness of infill wall, but in upgraded IS code we have to consider strength and stiffness of infill wall.

In this project we are using 17 Storey model with different types of wall as an equivalent diagonal strut.

- Model 1: Bare frame as a structural model.
- Model 2: Structural model with Siporex brick infill wall model as equivalent diagonal struts
- Model 3: Structural model with fly ash brick infill wall model as equivalent diagonal struts
- Model 4: Structural model with red brick infill wall model as equivalent diagonal struts.
- Model 5: Bare frame with Shear wall as a structural model.

1.1 Pushover Analysis

It is a Nonlinear Static analysis under permanent vertical load. Here displacement is incrementally increased from zero to a prescribed ultimate displacement or until the structure is unable to resist further loads. In pushover analysis, we focous on the yielding plastic hinge formation and failure of different structural components are noted and the total force is plotted against displacement to define a capacity curve.

2. Objective of Study

a. To study the effect of various types of brick masonry infill walls, in RC framed building, using pushover analysis.
b. To study the effect of providing shear walls, in RC framed building, using pushover analysis.
c. To compare the seismic response of building in terms of Storey V/S i) Base shear, ii) Srorey displacement, iii) storey drift also Base Shear V/S Monitored Displacement and Spectral acceleration V/S Spectral Displacement
d. Determination of performance point of building for seismic performance.
e. To determine the best possible combination of structural system that would be both economical and effective.

3. DETAILS OF STRUCTURE CONSIDERED

Details of structure:
Structure Type = G+15 storey RCC building
Storey Height = 3 meter

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Economical Solution for Water Tanks by using Different types of Stiffeners

Kshirsagar Lalit Nitin[1], Patil. S.K.[2], Pujari. A. B.[3]

[1]Post Graduate Student, KJ's Educational Institute
KJCOEMR, Pune, Maharashtra, India.
[2]Associate Professor and HOD of Civil Engineering Dept, KJ's Educational Institute
KJCOEMR, Pune, Maharashtra, India.
[3]Associate Professor of Civil Engineering Dept, KJ's Educational Institute
KJCOEMR, Pune, Maharashtra, India.

Abstract – *In this paper the circular water tank is analyzed by using finite element method. The wall of the circular water tank is analyzed for parameters such as moment and hoop tension at various levels subjected to hydrostatic pressure by using eccentric stiffeners. The wall is divided into number of 4 noded rectangular(quadrilateral) plate elements. The vertical beam elements are attached to the wall up to 40% height of the tank. Then the tank is subjected to triangularly varying hydrostatic load. The analysis is carried out for different H^2/Dt ratios such as 16 and 25.5. Vertical eccentric stiffeners are attached to the tank having H^2/Dt ratio 25.5 and tank having H^2/Dt 16 is analyzed without stiffeners.*

***Key Words*: Water Tank, Stiffeners, FEM, STAAD-Pro.**

1. INTRODUCTION

There is Always a need of some improved kind of structural forms in the construction industry. One such common form is stiffened shell. Because of their improved performance under different load conditions stiffened structural elements have found wide application in modern structures. The primary advantage of stiffened shell is structural efficiency. The stiffened structural system achieves conservation of weight with no sacrifice of strength or reduction of critical buckling load. Economy is usually simultaneously achieved and appearance of structure is enhanced as bonus. Here, a stiffened cylindrical wall of circular water tank is considered and analyzed by finite element method by using STAAD-Pro software

Water tank parameters include the general design of the tank, and choice of construction materials, linings. Reinforced Concrete Water tank design is based on IS 3370: 2009 (Parts I – IV). The design depends on the location of tanks, i.e. overhead, on ground or underground water tanks. The tanks can be made of RCC or even of steel. The overhead tanks are usually elevated from the ground level using number of columns and beams. On the other hand the underground tanks rest below the ground level.

1.1 STIFFENERS

Stiffeners are secondary plates or sections which are attached to structures to stiffen them against out of plane deformations. Almost all main bridge beams will have stiffeners. However, most will only have transverse web stiffeners, i.e. vertical stiffeners attached to the web. Deep beams sometimes also have longitudinal web stiffeners. Flange stiffeners may be used on large span box girder bridges but are unlikely to be encountered elsewhere.

TYPES OF STIFFENERS

1. Longitudinal Stiffener
2. Transverse Stiffener

- Longitudinal web stiffeners are the stiffeners which are aligned in the span direction. Transverse stiffeners are the stiffeners which are aligned normal to the span direction of the beam.

- Transverse web stiffeners are usually provided at bearing positions and these are known as bearing stiffeners. For future maintenance it is good practice to provide bearing stiffeners at jacking points (for when girders have to be raised to free bearings for replacement). Other transverse stiffeners are called intermediate transverse web stiffeners.

2. OBJECTIVES OF THE STUDY

1) To make the study about the analysis and design of water tanks.
2) To study the behaviour of different type of stiffeners in different position under different load conditions.
3) To compare the conventional design of water tank with the design of water tank using different type of stiffeners.
4) To know economical design of water tank.

Dr. Suhas S. Khot
Principal
K J College of Engineering & Management Research
Sr. No. 25 & 27, Kondhwa-Saswad Road
Boppdev Ghat, Pune - 48.

K J College of Engineering & Management Research PUNE

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Seismic Analysis of Multistory R.C. Building by using Indian Code and United State Code

Ganesh Changdev Phadtare[1], Patil S.K.[2], Pujari A.B.[3]

[1]*Post Graduate Student, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.*
[2]*Associate Professor and HOD of Civil Engineering Dept, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.*
[3]*Associate Professor of Civil Engineering Dept, KJ's Educational Institute, K J College of Engineering and Management Research, Pune, Maharashtra, India.*

Abstract – *This study involve seismic parameters required for seismic analysis of building by using international codes. For study selected international codes are Indian Code (IS 1893:2002) and ASCE 7-10 (American Society of Civil Engineers). This study helps to understand seismic parameter which helps to improve the behaviour of structures so that they may withstand the earthquake effects without significant loss of life and property. The model consist of G+10 RC building and modeling of structure is done by using ETABS 2016 software. Time period for analysis of structure is taken as per software calculated for both Indian code and US code. In this study base shear, maximum story displacement, maximum story drift, Maximum story moments is calculated in X direction and Y direction for Indian code and US code, also differentiation in graphical representation of maximum base shear, maximum story displacement, maximum story drift, mode vs period for Indian code and US code.*

Key Words: IS 1893:2002 (Indian Code), ASCE 7-10 (American Society of Civil Engineers), Response spectrum method, ETAB-2016.

1. INTRODUCTION

Earthquake is caused due to suddenly release of stored energy in earth crust which creates seismic waves. However, earthquake results in ground shaking, ground rupture, landslides, tsunamis, and liquefaction etc. which results in collapsing structures, unwanted death, transportation abrupt etc. we cannot hold back such a natural disaster problem but we can minimized effects by providing safer building structure. Civil engineers plays an important roll to Identify seismic parameters which are used to reduce dangerous effects of earthquake and also provide education on earthquake safety majors.

The purpose of this paper is to study and understand the seismic parameters which are leads to contributing in seismic analysis of RC building, for Indian code and US code.

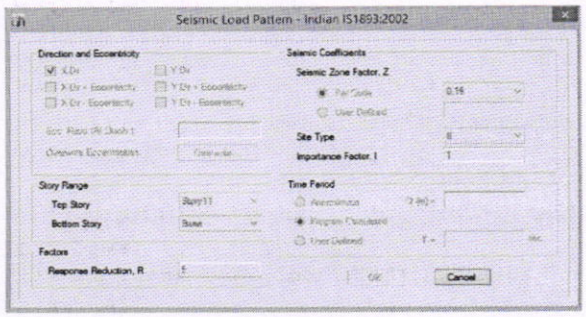
2. OJECTIVE OF STUDY

a. To study and understand seismic parameters which are usually used in seismic analysis of RC building in international code, IS 1893:2000 and ASCE 7-10, (American Society of Civil Engineers)
b. To allocate seismic parameters to the structure as per code with respect to their country
C. Seismic Analysis of structure by using response spectrum method or linear dynamic analysis.
d. To generate the graph response of building on the subject of Storey V/S i) Base shear, ii) Storey displacement, iii) storey drift, iii) Overturning moments, iv) Mode vs periods of the building
e. To compare the results of seismic response of building on the subject of Storey V/S i) Base shear, ii) Storey displacement, iii) storey drift, iii) Overturning moments, iv) Mode vs periods of the building

3. METHODOLOGY

The method carried out to reach objective mention above are as follows:

1) To create model for selected G+10 RC building in ETAB 2016 software.
2) The models as per Indian code (IS 1893:2002) and United state code (ASCE 7-10).
3) Apply gravity loading and load combination to the model with respect to IS code and US code
4) Add seismic parameters to the Indian model as follows.



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A novel image compression model by adaptive vector quantization: modified rider optimization algorithm

PRATIBHA PRAMOD CHAVAN[1,2], B SHEELA RANI[1,*], M MURUGAN[3] and PRAMOD CHAVAN[4]

[1]Sathyabama Institute of Science and Technology (Deemed to be University), Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai 600 119, Tamil Nadu, India
[2]Department of E&TC Engineering, Trinity College of Engineering and Research, Pisoli, Pune 411 048, Maharashtra, India
[3]ECE Department, SRM Valliammai Engineering College, Kattankulathur, Chengalpet (Dist.) 603 203, Tamil Nadu, India
[4]Department of E&TC Engineering, K J College of Engineering and Management Research, Pisoli, Pune 411048, Maharashtra, India
e-mail: cpratibhapramod@gmail.com; sheelarani@sathyabama.ac.in; dr.murugan.m@gmail.com; pramodp.chavan@gmail.com

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Abstract. In recent days over the internet, the uploading of enormous new images is being made every day, and they necessitate large storage to accumulate the image data. For the earlier few decades, more analysts have evolved skillful image compression schemes to enhance the compression rates and the image quality. In this work, Vector Quantization is used, which uses the *Linde–Buzo–Gray algorithm*. As a novel intention, the codebooks are optimized by an improved optimization algorithm. In this approach, the database image is firstly separated into a set of blocks, i.e., pixels, and these sets of blocks are referred to as vectors. Then a suitable codeword is selected for each vector such that is the closest representation of that input vector. The encoder generates a codebook by mapping the vectors on the basis of these code words, and the compression of the vectors takes place. The encoder then sends a compressed stream of these vectors by pointing out their indices from the codebook to the decoder through a channel. The decoder then decodes the index to find out the compressed vector and places it on the image. For attaining a better image compression effect, the codebook is optimized using the Best Fitness Updated Rider Optimization Algorithm. The optimization of codebooks is done so that the summation of the compression ratio and the error difference between the original and decompressed images has to be minimized. Moreover, the proposed model is scruntized with other existing algorithms, and the experimental outcomes are validated.

Keywords. Image compression; vector quantization; Linde–Buzo–Gray; codebook; rider optimization algorithm; fitness.

1. Introduction

Image compression [1–3] is considered as the progression of minimizing the byte size in a graphics file in spite of weakening the quality of image to a detrimental level. The file size minimization thus authorizes more images to be accumulated around the disk or memory space in specified amount. The time needed for the transmission of image around the Internet or downloaded from Web pages is as well minimized [4–6]. Various novel approaches are in the literature for the image files to be compressed. Typically, more used image formats for the compressed graphic in the internet are GIF format and the JPEG format. We all know that the JPEG model and GIF images are commonly facilitated for images and, line art erstwhile images, respectively, wherein the geometric shapes are fairly easier [7–10].

The typical categorization of image compression techniques are mainly of two types, (a) Lossy Compression and (b) Lossless Compression. The compression of text file or program can be made to a particular extent only and is exploited as lossless compression. On exceeding this threshold, errors may occur [11]. The redundancy is used by the Lossless image compression

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Assessment on Torsional Effect of Unsymmetrical Buildings

Rajkumar D. Patil[1], B. N. Mulay[2], S. K. Patil[3], A. B. Pujari[4]

[1]Post Graduate Student, KJ's Educational Institute
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[2]Assistant Professor of Civil Engineering Dept, KJ's Educational Institute
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[3]Associate Professor and HOD of Civil Engineering Dept, KJ's Educational Institute
K J College of Engineering and Management Research, Pune, Maharashtra, India.
[4]Associate Professor of Civil Engineering Dept, KJ's Educational Institute
K J College of Engineering and Management Research, Pune, Maharashtra, India.

Abstract - *The building with torsion is not performing well; it is observed in the past earthquake and is more damages. So, it is become essential to identify the torsional effect on building and irregularity of building which create torsion. The main objective of this present work is to minimize torsion ratio up to IS 1893:2016 (part1) limit by changing vertical element stiffness in plan configuration. For this purpose, IS code 1893:2016 (part1) give guidelines, according to that L Shape G+15 storey models are done in ETABs 2017 with beam-column and slab and beam-shear wall and slab method. Response reduction method is used for analysis. Results are obtained based on max. storey drift, mode vs. frequency and torsional irregularity.*

Key Words: Frequency, IS code 1893:2016 (part1), Storey drift, mode, Response Reduction Method, torsional irregularity.

1. INTRODUCTION

In the past earthquake, it is observed that building with the torsional effect is more damaged as compared with other normal or ordinary-buildings, which may lead to a collapse of the structure. As the population increase demand of the structure increase but the availability of land or plot size is not fulfilled that criterion. So, it is necessary or become essential that use maximum plot size and FSI for constructing structures. And the available plot doesn't need to be always rectangular, square or in regular shape. Which leads to the planning of irregular shape structure and this irregular shape of the structure becomes a reason for generating torsion in it. So, the structural engineer has to challenge to find out the reasons of torsion and try to minimize it.

IS code 1893:2016 specifies the various reasons which introduce torsion effect which is generally irregular mass, strength and stiffness distribution. These projects dealing with G+15 storey L shape model analysed for earthquake load and its torsional ratio is minimized to the permissible limit as noted in IS code 1893:2016 by arranging beams, columns and shear walls.

IS code 1893:2016 classifying irregularity into two types:

- Plan Irregularities: -It is generally irregularity in a plan or it is horizontal irregularity. It includes Torsion Irregularity, Re-entrant Corners, Diaphragm Discontinuity, Out-of-Plane Offsets and Non-Parallel Systems.

- Vertical Irregularities: - It is an irregularity in the vertical direction of the building. It includes Stiffness Irregularity – Soft Storey & Extreme Soft Storey, Mass Irregularity, Vertical Geometric Irregularity and In-plane Discontinuity.

2. OBJECTIVES OF THE STUDY

- To find out the effect of torsion on the building.
- To find the cause of torsion generated in the building.
- To study the different methodologies for torsion reduction.
- To compare different torsion reduction method using the vertical element stiffness plan configuration.
- To study the parameter of all models during the earthquake.

3. PROBLEM STATEMENT

Analyse G+ 15 storeys L shape structure situated in Pune by IS 1893:2016.

4. METHODOLOGY

The present study is carried out on the analysis of G+15 storey L shape models using ETABS 2017 software. The models in the present work are analyzed for Response reduction method according to IS 1893:2016. Following is a procedure for model making:

- Firstly, gravity load i.e. Dead Load (DL), Super Dead Load (SDL) and Live Load (LL) is defined.
- After that, the seismic load is defined i.e. static (EQX and EQY in X and Y direction respectively) as well as dynamic load (RSX and RSY in X and Y direction respectively).

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Low Power RF Transceiver using Piezoelectric Vibration Energy Harvesting Technique for Wireless Sensor Node

Sanjay S.Khonde[1], Dr.Ashok Ghatol[2] and Dr.Sanjay .V.Dudul[3]

[1]Associate Professor & Head, Department of Electronics& Telecommunication, Genba Sopanrao Moze College of Engineering, 25/1/3, Balewadi, Haveli, Pune, Maharashtra 411045, India.
[1] Orcid Id: 0000-0002-2064-372X
[2]Director, Genba Sopanrao Moze College of Engineering, 25/1/3, Balewadi, Haveli, Pune, Maharashtra 411045 India.
[3]Professor & Head, Department of Applied Electronics, Sant Gadge Baba Amravati University, Camp Area, Near Tapovan Gate, Amravati, Maharashtra 444602, India.

Abstract

In a wireless sensor network the sensor nodes are placed at remote location and they operate on batteries .The major issue in wireless sensor network is the power consumption of the sensor node. Even though the sensor nodes operate on batteries, the batteries are to be changed after specific time interval. The battery replacement is not a viable solution as it is costly and time consuming .So some alternative method for battery replacement is to be used .The ambient energy can be used to power up the sensor node. The technique of converting ambient energy into electrical energy is called energy harvesting .In this paper the piezoelectric vibration energy is used as energy harvesting technique. The technique generates electrical energy which is used in place of batteries for wireless sensor node. The hardware of the system consists of RF transceiver CC2500, microcontroller MSP 430, piezoelectric crystal and other components. Batteries are not required for the system. The system is maintenance free and coves a distance upto 300 ft. The current consumption is from few microampere to 20 mA from wakeup to transmission.

Keywords: RF Transceiver; Energy harvesting; piezo electric effect.

INTRODUCTION

Energy harvesting is a technique used to convert the ambient energy present in the environment into electrical energy. This technique has the capability to act as an independent power supply for wireless microsystems, as an alternative to use batteries. The wireless sensor nodes are using batteries and operates at extremely economical energy budget. Since battery replacement is not a viable solution, these low power wireless sensor nodes need an alternative type of power source instead of traditional batteries. Renewable power can be obtained by generating electrical energy from the environment. Thus extracting power from the ambient sources is called energy harvesting or energy scavenging [4]. The available energy sources for harvesting are light, wind, motion, RF electromagnetic radiations. In this paper a nonlinear vibration energy harvester is used to power a low power wireless RF transceiver device. This RF transceiver is powering itself or self-powered and no batteries are required. It is able to transmit the data at few meters distance such as temperature and operated in 2.4 GHz ISM band. The rest of the paper includes details of vibrational energy harvester, the hardware part of the system and the system evaluation.

ENERGY HARVESTING

As a part of energy harvesting the solar and wind energy have been widely used to provide electrical energy during the last decade. The power consumption of sensor node has been significantly reduced due to recent advancement in low power electronics. Hence ambient harvesting energy may provide a long term solution and reduce the dependency on batteries [2]. The fig 1. shows energy harvesting as alternative for micro powering. The figure consists of energy harvesting generator, temporary storage system and an electronic device which is being charged up. The energy harvester generator can be piezoelectric, electrodynamic, photovoltaic or thermostatic. The temporary storage system can be ultra-capacitor or rechargeable batteries. This stored power is then given to any electronic device like low power devices, wireless sensors, MEMS actuators or any consumer electronic device.

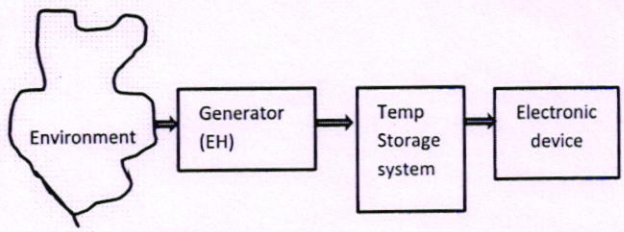

Figure 1: Energy harvesting as alternative for micro powering

Energy harvesting from vibrations and movement has recently become promising for powering sensor nodes .Kinetic energy in the form of small scale vibrations is a common form of