Seismic Analysis And Design of Foundation Using Indian Standard Code And Euro Standard Code Under Different Soil Condition

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Abstract- *The aim of this paper is to analyse and overcome the differences and causes of settlement of Footing on various soil condition. Settlement under foundation cause due to bad compaction of soil, wrong design of footing, low bearing capacity of soil, inappropriate load calculation from super structure etc. All load from superstructure is carrying by the foundation, hence Foundation of structure is the most important and crucial element of structure .there are different types of Foundation which possesses different type strength on different soil conditions. In this paper the main concern to design the isolated footing using different code on different soil condition. The concepts of geotechnical and structural engineering discipline are used to analyse and design of fooling. This helps to understand the behavior of isolated footing which based on the empirical rules, also the rules of beam theory which helps to demonstrate shear force and bending moments caused in isolated footing.*

The model presented in this paper deals with the correlation between dimension predicted country codes provision namely IS 456:2000, IS 1893 (part 1): 2002, BS 8110-1:1997, Euro code 2 with application of checks using stadd pro Vi8 software

Keywords- IS:456-2000; BS 8110-1:1997; EURO CODE 2; Beam theory; Isolated footing, Stadd pro Vi8

I. INTRODUCTION

The basic engineering discipline to design and modeled the structure is broadly classified into two groups. The designing portion of any structural member or building is supervised by structural engineer and the stability of structural member is concern by the geotechnical engineer, who is concern with the properties of soil and it's structural aspects. Any structure is rest on basic part of it called as foundation, which carries all the loads from superstructure and forwarded it to the sub soil . The focus of this paper is to analyse the types of foundation and design according to different country codes and soil condition under seismic forces. India is divided various types of seismic zone. According to old code that is IS: 1893-1984, India is split into five different zones namely from Zone I to Zone V. But new as per new code which is IS:1893-2002 is split in four zones namely Zone II to Zone V. And first zone is removed (Zone I).

Foundations is basic part of structural which generally called as sub structure. It carry all the load basically in the form of dead load due to beams, colums, slab and moving load also a seismic load. That all load is to transfer to ground. To avoid excessive settlement the load is equally distributed to the ground, for that well design foundation with appropriate dimensions is required. The load from superstructure is minimum as compare to the safe bearing capacity of soil, but it can vary according to various soil conditions. The various types of footings are consider for various type of stucture on different soil conditions. Settlement of soil also cause the failure to structure which is most of the time is shear failure .Basically footing possess punching shear failure at the face, which is analysed in various ways using respective codal provision. The failure of sub structural effects overall life of structure and also cause the overturning of structure, which cause economical and life loss. This is the main concern to designing and analysing the foundation with precision.

II. OBJECTIVE

1. To analyse the effect lateral deflection response of building on foundation.
2. To do comparative study of performance of footing by using IS code and Euro code under seismic forces
3. To analyse of accuracy of both the code
4. To analyse and design there foundation under different soil conditions
5. To compare design parameter of Indian Standard and Euro standard
6. To do comparative Analysis and design of foundation using manual calculation and application of checks by using Stadd software

III. METHODOLOGY

Earthquake factors : Mercally intensity scale and Richter scale is basically used to measure the earthquake intensity and magnitude respectively. The magnitude scale is originally used to calculate the force and impact of the earthquake to soil. Richter scale is one of scale which can calculate the magnitude of earthquakes.

Factors affecting the earthquake forces are as follows:

(a**)**Seismic zone factor(Z): As India is divided into four seismic zones, The different zones possesses its own value of zone factors. Zone factor value is depend upon soil conditions and intensity of earthquake for perticular area of country. As the modeled calculation is done on zone II and III, hence values are taken accordingly.

(b) Importance factor(I): The Functionality of structure is decided the factor value.The consequences of strucure which defines this factor value are financial importance , ancient value , earthquake value etc . The higher value of I is given to water tank which is 1.5. For design the foundation in zone 2 and 3 the I value taken is 1.

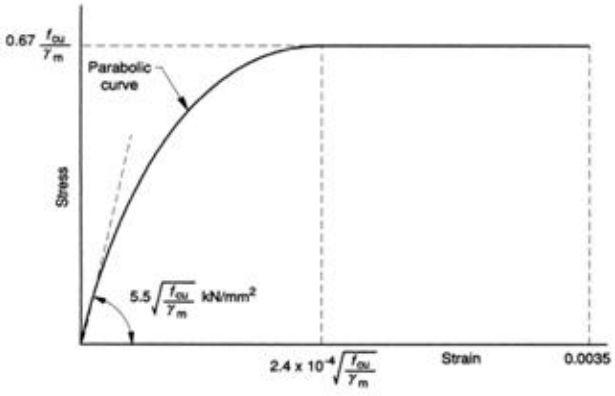
(c) Response reduction factor, R: The damage to any structure due to earthquake defines the value of R. The basic deformation in structures are brittle which seen in concrete and ductile which is seen in steel. The values of R for different structure such as tank is lesser as compare to building because it has less reductant reactions and less ductile. For the design R value is taken as 3.

(d) Structural response factor : The damping and vibration to any structure due to the seismic action with a spectrum response is decide the value of this. The concern of this paper is to analyse the types of footing their analysis and design according to different country codes and soil condition under seismic forces. The G+10 storey building is modeled in STAAD PRO V8i software. and design of pad footing is done .The structure is resting on two different soil condition i.e, stiff and medium stiff soil. An endeavour is made to analyse INDIAN standard with EURO standard using a software STAAD foundation.

The clause for shear stress in code :The design shear stress v at any cross-section should be calculated from equation

$$v = V/bd. \quad \text{.....(a)}$$

The above equation is helps to calculate shear stress at cross section and also helps to calculate the value of punching shear stress on the face and at specific distance from face of footing



Above graph shows the Short term design stress-strain curve for normal-weight concrete.

IV. FORMULATION OF MODEL

The model of building is formulate using STADD software for various soil conditions. It's hepls to calculate and analyse the structure. The calculation is done by manually and checks had applied by comparing the results with the stadd software . Column and Beam Sizes for Modeling of Building

Sr. No.	Element	Notation	Size (m)
1	Column	C1	0.6×0.6
2	Beam	B1	0.3×0.4

Building = G+10 Slab thickness = 0.15 m Live load = 3 ×10³ N/M² Floor finish = 1.5×10³ N/M Concrete Grade = M20 Steel Grade = Fe500 Seismic zone II , III

The analysis of modeled building are carried out using the Load combinations provided by IS:1893-2016 code

LOAD COMB 201 1.5(DL + LL)
LOAD COMB 202 1.2[DL+(ELX+0.3ELZ)]
LOAD COMB 203 1.2[DL+IL-(ELX-0.3ELZ)]
LOAD COMB 204 1.2[DL+(ELZ+0.3ELX)]
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LOAD COMB 210 0.9DL+1.5(ELX+0.3ELZ)

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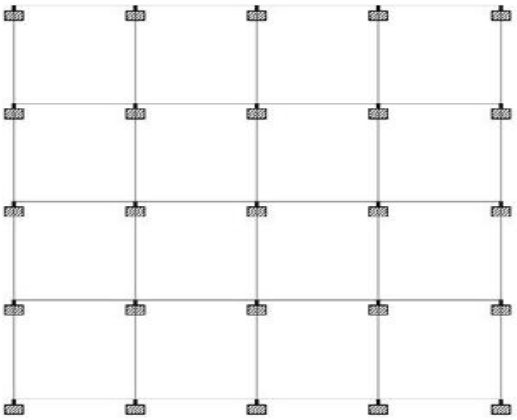
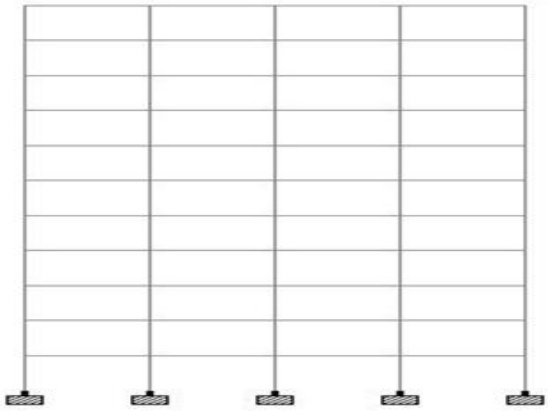


Typical plan of modeled building showing topview

V. RESULTS AND DISCUSSION

This chapter present the result of the analytic work carried out using linear equivalent static analysis. The paper is simply shows the dimensions of isolated square foundation on various soil conditions under the concentric load.

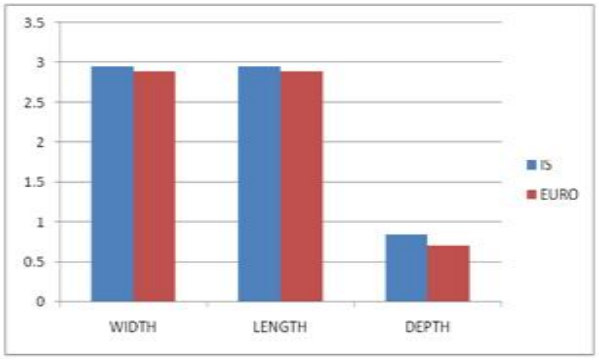
The seismic designs advantages of multistorey structure is carried out in this paper. The footings dimensions are calculate using manual calculation for different soil condition and campare it with stadd pro V8i software results.



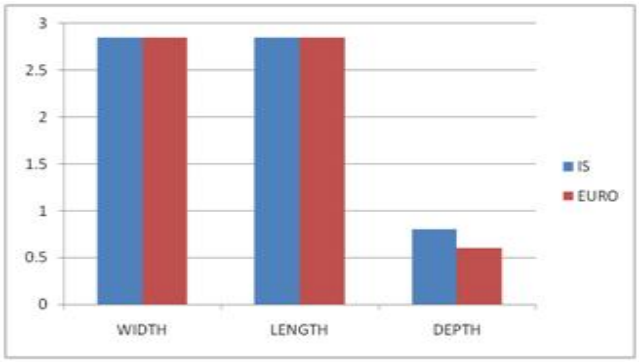
Typical plan of modeled building showing side view

DIMENSION OF FOOTING 1.

FOR HARD SOIL MANUAL CALCULATION

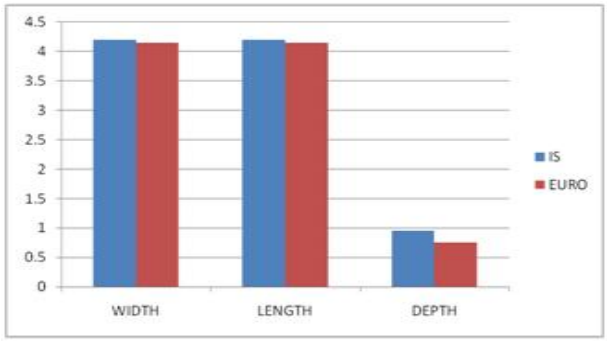


USING STADD SOFTWARE

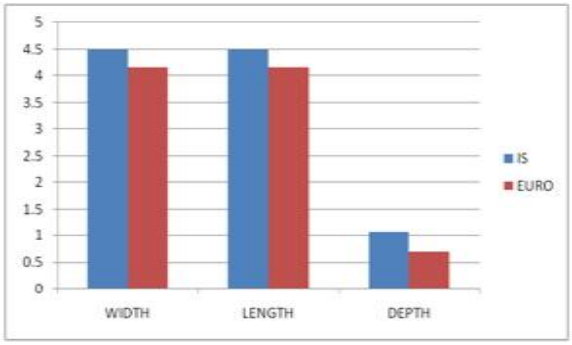


2. FOR MEDIUM STIFF SOIL

USING MANNUAL CALCULATION



USING STADD SOFTWARE



VI. FUTURE SCOPE

1. The design and analysis will be done with respect to soil structure interaction .
2. The design and analysis will be done for zone IV AND V for soft soil.

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