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Analysis and design of Indoor Stadium building Using ETABS proposed at Sapthagiri college of Engineering, Bangalore

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Abstract - In this growing world, as civil engineering student one needs to be fully aware of structural elements and the safety parameters before and during the execution of project. As an outcome to this an attempt has been made to learn the process of analysis and design of multistory building using Limit state method. This project focuses on Analysis and Design of Indoor Stadium for Sapthagiri College of Engineering. The design, using Limit State Method is taken up. In the limit state of collapse, the strength and stability of structure is ensured. The guidelines being followed are as per IS 456:2000 and IS 800:2007. The present project deals with the Analysis and Design of Indoor stadium of G+2 Floors proposed for Sapthagiri College of engineering. All the structural elements are designed as per codal provision ETABS features contains powerful graphical interface with modeling, analytical, and design procedures. It is quick and very easy for simple structures. It can handle the largest and most complex building models.

Key Words: Design, Analysis, ETABS, AUTOCADD.

1. INTRODUCTION

The indoor stadium is a covered or a not covered enclosed area, often circular or oval shaped, designed to showcase theatre, musical performances, or sporting events. It is composed of large open space surrounded on most or all sides by seating for spectators. The key feature of an indoor stadium is that the event space is the lowest point, allowing for maximum visibility.

College indoor stadium is an important indicator to measure universities physical education, its function not only is required to meet college sports education , sports events undertaking, but also it should provide social services for mass sports activities development An Indoor stadium is a group of sports facilities. The sports facilities are of indoor kind for e.g. table tennis, carom, chess, gymnasium etc. sports are the integral part of the student life so it is the essential requirement of good educational institution. It makes institution reputation higher and also increases the financial status.

The design guide provides design principles to achieving an appropriately high quality stadium development that makes a positive contribution to the public environment.

The stadium sites is ideally suited for its intended use, being large, flat and also close enough to the city to be identified with its center and to facilitate excellent access to all modes of transport. Furthermore this site being close to the railway station, defining a major route into the city, provides an ideal setting for building that by virtue of its scale and function alone will become a major land mark and make a positive contribution to the urban form and image of the college.

Indoor stadium solve all the problems and limitations inherent in outdoor stadium. You do not have to skip games because of the weather and you can play in comfort in a controlled environment.

2. LITERATURE REVIEW

1. Analysis& Design of sports complex using ETABS

Sachin P Dyavappanavar ,Maheshkumar VS, Abhishek GJ, Chethan GN (IJIRSET)

The design process of structural planning and design requires not only imagination and conceptual thinking but also sound knowledge of science of structural engineering besides the knowledge of practical aspects. The purpose of standards is to ensure and enhance the safety, keeping careful balance between economy and safety. In the present study G+1 building is designed (Slabs, Beams, Columns and Footings) ETAB's software. In order to design them, it is important to first obtain the plan of the particular building that is, positioning of the particular rooms, that they serve their respective purpose and also suiting to the requirement and comfort of the users. Thereby depending on the suitability; plan layout of beams and the position of columns are fixed. Thereafter, the loads are calculated namely the dead loads, which depend on the unit weight of the materials used (concrete, brick) and the live loads, which according to the code IS:456- 2000 and HYSD BARS Fe500 as per IS:875-1987 part II. Safe bearing capacity of soil is adopted as 140KN/m2.

2. Seismic Analysis of Indoor auditorium

DilipanboseS, Aravindan S (JCEE) The project titled "Seismic analysis of Indoor Auditorium" has been taken up with an objective to determine the seismic response and behavior of an Auditorium constructed in Chennai area. Even though Chennai is considered as least prone to major earthquake, it is expected that a structure would survive major

earthquakes without collapse that might occur unexpectedly during the life of the building. It should also be noted that after the Bhuj earthquake, Indian Standard IS: 1893 was revised and Chennai city was upgraded from zone II to zone III which leads to a substantial increase of the design ground motion parameters. Hence, this project presents an exploratory analysis of the seismic performance of multi-storey buildings system built in the specified area with a comparative study of the structures under past major earthquakes.

3. Seismic Analysis & design of multistory building using ETABS.

Rinkesh R Bhandarkar, Utsav M Ratanpara(IJEDR) ETABS issue, for analysis and design for building systems. ETABS features are contain powerful graphical interface coupled with unmatched modeling, analytical, and design procedures, all integrated using a common database. It is quick and very easy for simple DESIGN AND ANALYSIS OF INDOOR STADIUM USING ETABS SOFTWARE 2017-18 DEPARTMENT OF CIVIL ENGINEERING, SCE BANGALORE Page 11 structures. It can handle the largest and most complex building models. ETABS mainly offers following types of analysis: (a) Linear (b) Nonlinear (c) Pushover Analysis (d) PΔ Effect Analysis This program has been thoroughly tested and used in using the program. However, all the user accepts and understands that no warranty is expressed by the developers or the distributors on the accuracy or the reliability of the program. This program is a very useful tool for the design check of concrete structures.

4. Design & analysis of Multistorey building under static & dynamic loading condition using ETABS

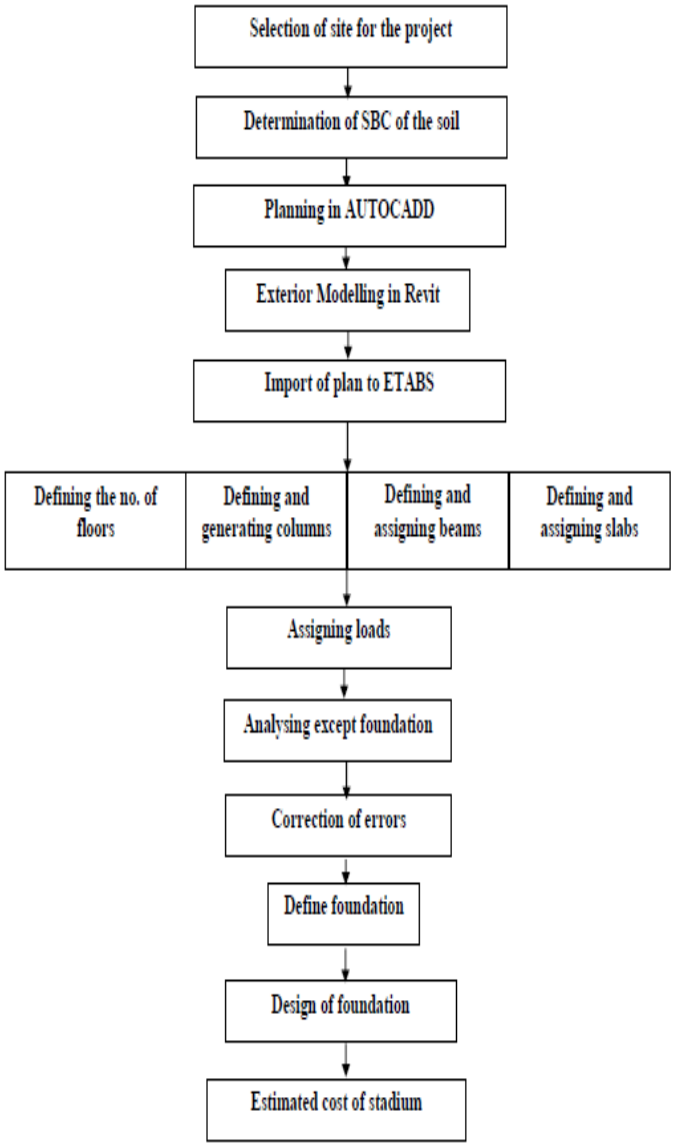
Balaji UA, SelvarasanB(IJTRA) In this project a residential of G+13 multi-story building is studied for earth quake loads using ETABS. .Assuming that material property is linear static and dynamic analysis are performed. These non-linear analysis are carried out by considering severe seismic zones and the behavior is assessed by taking types II soil condition. Different response like, displacements, base shear are plotted.

3. OBJECTIVES

The objective of the structural design is to plan a structure which meets the basic requirements. The project is to design an auditorium with a large span without compromising safety.

- Safety: It's has been the prime requirement of structural design and construction that a structure shall be so designed that it will not collapse in any way during its expected life span.
- Strength and stability: Besides strength, ductility of structure is also nowadays considered to be an additional desired quality from a view point that if at all failure occurs, it should not be sudden but should give prior warning of its probable occurrence so as to enable one to minimize the consequences of collapse ad avoid loss of human life.
- Economy: The economy shall be of material by optimum utilization of its strength or it may be the economy of cost of construction as well of cost of maintenance and repairs.
- Aesthetic: The structure should not only be safe, durable but should also give a pleasing appearance.
- Feasibility, practicable and Acceptability: The structure has to be so designed that the proposed solution is feasible, practicable and acceptable.

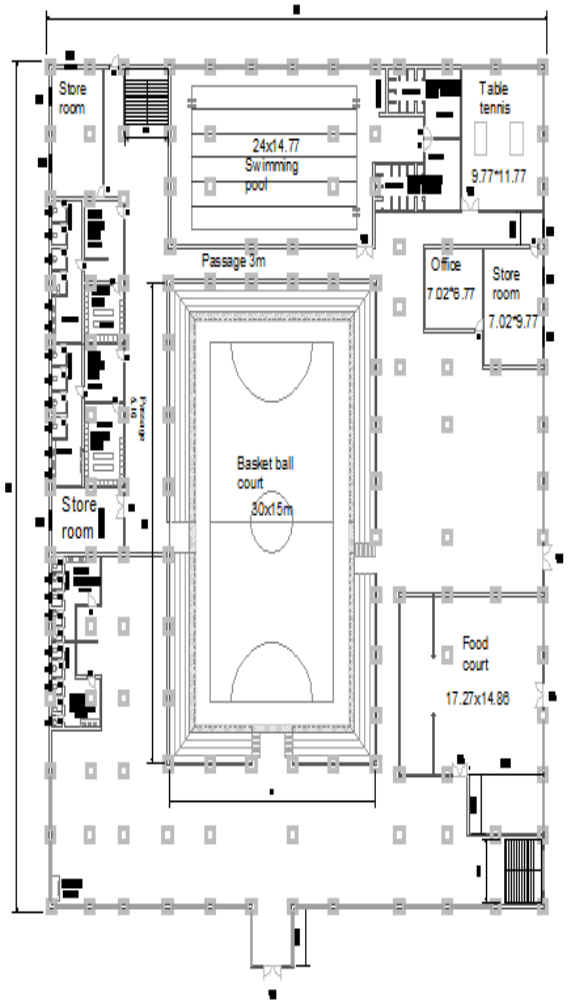
4. METHODOLOGY



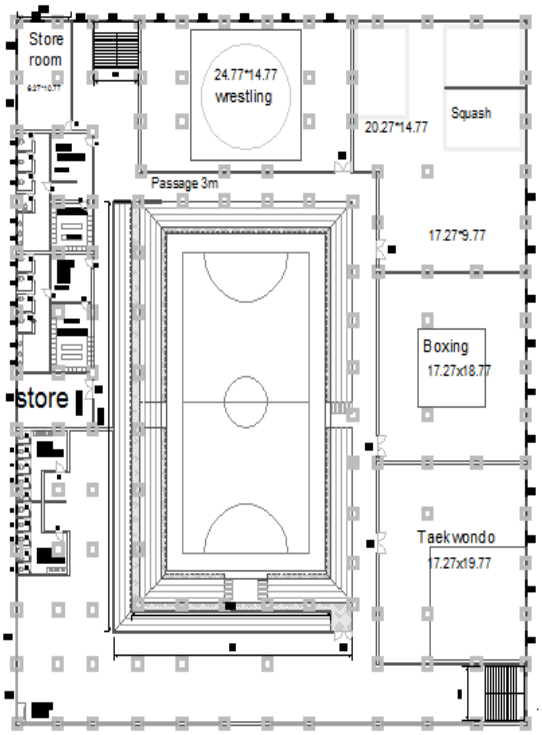
5. Planning of indoor stadium using AutoCAD.

The indoor stadium consists of following indoor sports

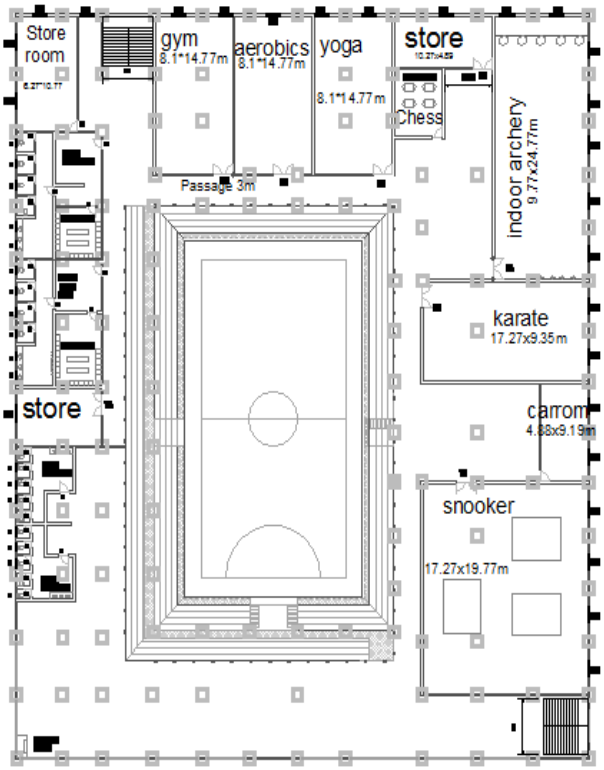
Ground floor	First floor	Second floor
Basketball court	Squash	Gym
Table tennis	Taekwondo	Yoga
Badminton	Wrestling	Aerobics
Swimming pool	Boxing	Karate
Carom		
Chess		
Archery		
Snooker		



Ground Floor Plan



First floor Plan



Second Floor Plan

6. EXTERIOR MODELLING IN REVIT

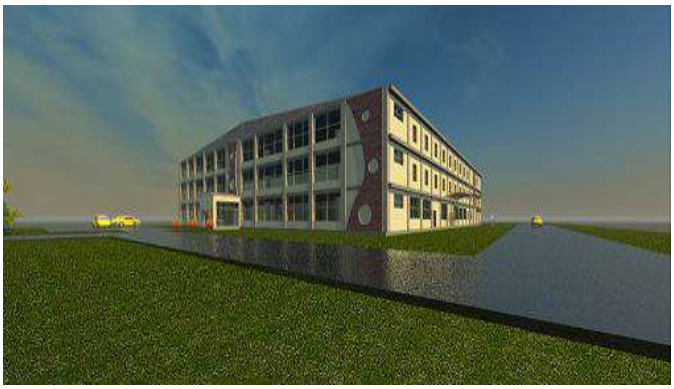


Fig. 3D Modeling in revit.

2. MODELING AND ANALYSIS IN E-TABs

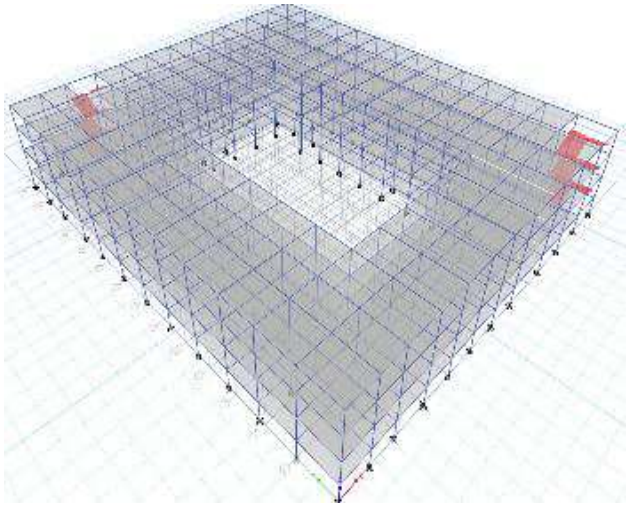


Fig. 3D view of Beam Column layout.

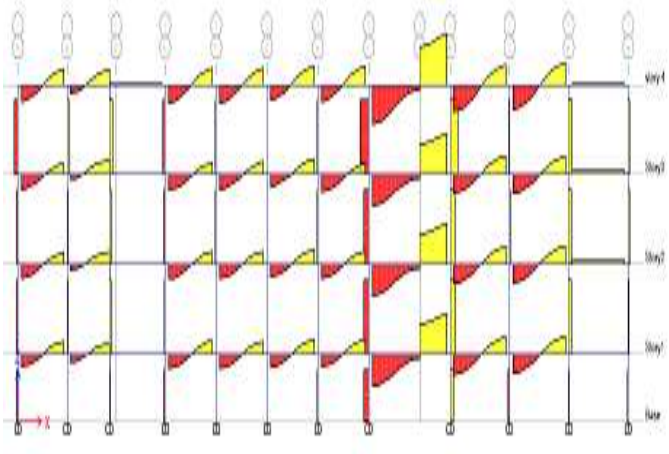


Fig. Shear force diagram

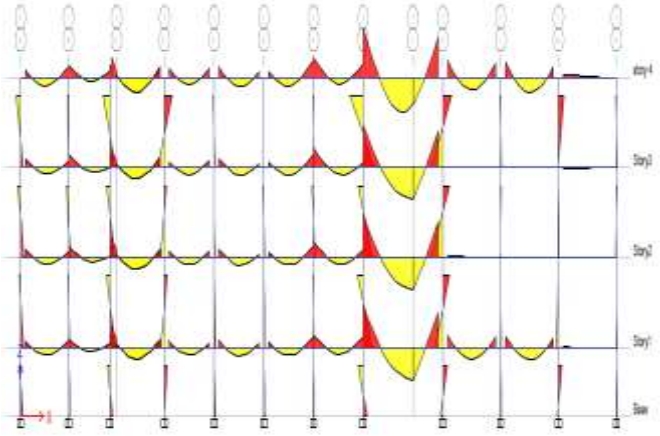


Fig. Bending Moment diagram

8. DESIGN OF BUILDING COMPONENTS.

8.1. BEAM AND COLUMN IN E-TABS.

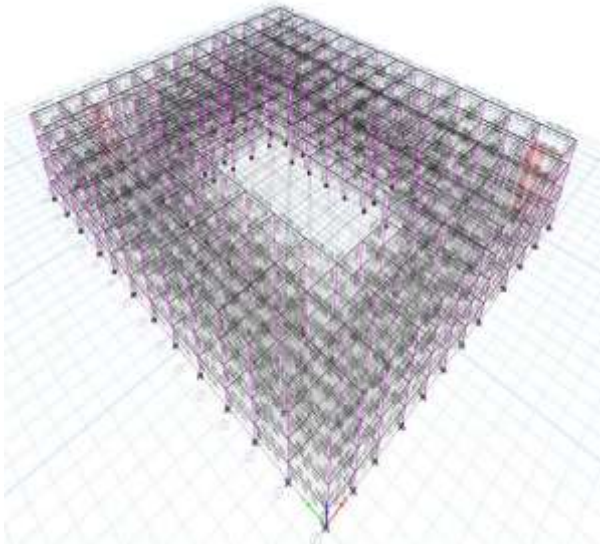


Fig. Concrete frame design check.

8.1.1. DESIGN OF COLUMN AND FOOTING

Column: 600mm x 700mm

Footing: 1.2m x 1.2m

M30 concrete & Fe 500 steel used

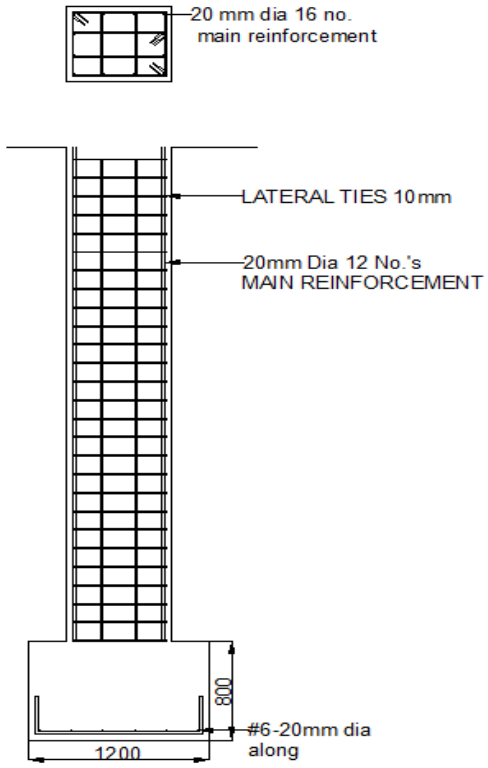


Fig5. Reinforcement details of column with footing.

8.1.2. DESIGN OF BEAM

Sectional area: 500mm x 700mm

Grade of materials:

Concrete: M30, Steel: Fe500

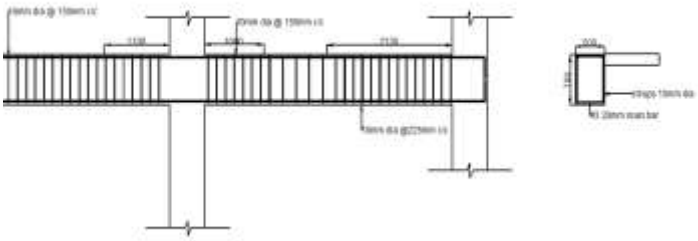


Fig5. Reinforcement details of beam.

8.2. DESIGN OF SLABS.

Slab dimension: 10m x 10m

Concrete grade: M30

Steel used: Fe500

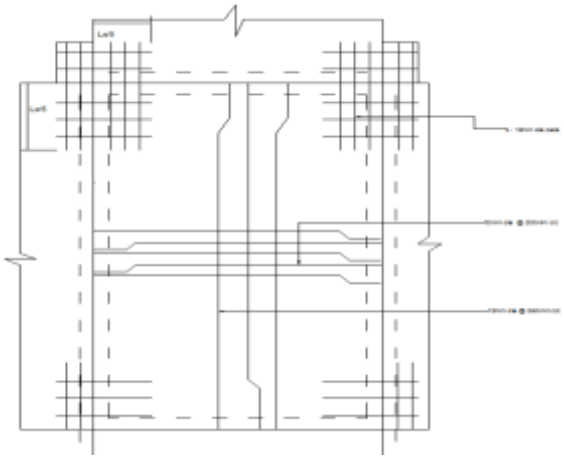


Fig5. Reinforcement details of slab.

8.3. DESIGN OF STAIR CASE.

Concrete grade: M30

Steel used: Fe415

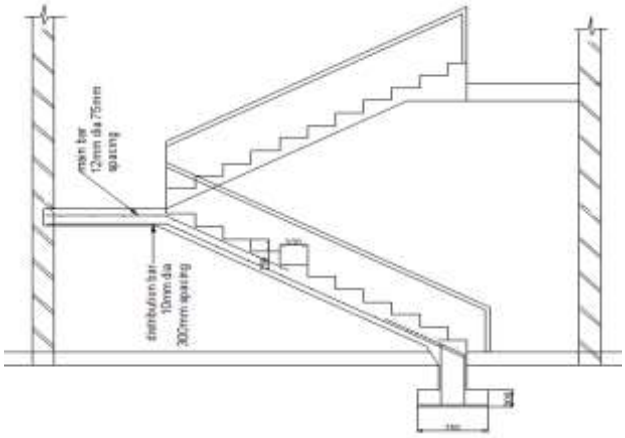


Fig5. Reinforcement details of slab.

9. CONCLUSION

1. By conducting Soil Bearing capacity test, the bearing capacity of soil was found feasible for construction.

2. Planning was done effectively within the available space

3. Revit architecture is used for aesthetic appearance of Indoor Stadium

4. The structure analysed using ETABS Software and is checked for safety. The structure is redesigned until the safety of the building is attained

5. Designed is carried out for structural elements (Footing, Stairs, Slabs, Roof truss) which cannot be obtained in ETABS.

6. The designed Indoor Stadium proposed for the campus gives an add on value

7. Indoor Stadium will increase the revenue for the college

8. By designing a sports complex for Sapthagiri college of Engineering it will help in overall development of the institute.

REFERENCES

1) AbhayGuleria – "Structural Analysis of a Multi-Storeyed Building using ETABS for different Plan Configurations". International Journal of Engineering Research & Technology.Vol. 3, May – 2014.

2) V Varalakshmi,G Shiva Kumar, R Sunil Sarma - "Analysis and design of g+5 residential building". Journal of Mechanical and Civil Engineering. 2014.

3) Balaji U A, Mr. Selvarasan M E – "Design and analysis of multi-storeyed building under static and dynamic loading conditions using etabs".International Journal of Technical Research and Applications. Volume 4, (July-Aug, 2016), PP. 1-5.

4) Ashok K Jain – "R C C Designs", 10th edition, Laxmi publications (P) LTD, ISBN 978-81-318-0942-6. 8) Code books IS 456-2000, SP-16, IS 875.

5) S SBhavikatti – "Design of RCC structural elements", volume-1, New age international (P) LTD, publishers, ISBN 81-224-169-4.

6) B C Punmia – "Soil mechanics and foundations", 16th edition, Laxmi publications (P) LTD, ISBN 81-7008-791-0.

7) N Krishna Raju- "Design of Reinforced concrete structures" 3rd edition, CBS publishers and distributors, ISBN 81-239-0989-6.

9. Code books referred:

[1] SP : 7 - National Building Code.

[2] IS 456:2000-Design of reinforced structures

[3] IS 875 Part 1: Dead load considerations,

[4] Part 2: Live load considerations,

[5] Part 3: Wind load consideration.

[6] IS 1893:2002- Earthquake effects

[7] SP: 16 - Design aid for reinforced concrete to IS 456.