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Planning, Analysis and Design of group Houses with Emphasis on Serviceusing Staad Pro

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Abstract—

The proposed project work is “Planning, Analysis and Design of Group Houses with Emphasis on Services and Project Planning”. It is proposed in Vedasandhur near adamadurai to Oddanchatram main road. The total area of the land is 10,6669.6sq.m (26 acres). By studying the project planning methodologies it helps us to understand the practical difficulties which may possibly occur during a project. The purpose of our project is to gain experience in current specifications of buildings, applying the design principles to gain the knowledge in a practical way. Planning and provisions of the layout is done as per Directory of Town and Country Planning. AUTOCAD 2018 has been used for drawing the plan and structural elements detailing. Structural elements were analyzed and designed using Structural Analysis and Design Program (STAAD.PRO V8i) and the reinforcement details have been obtained from STADD PRO.

Key words: Group Houses, Staad Pro, Auto Cad Software

I. INTRODUCTION

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built the good environment, including works like roads, bridges, canals, dams, and buildings .It is a wide field and includes many types of structures such as residential buildings, public buildings, industrial buildings, roads, bridges, tunnels, railways, dams, canal, and canal structures etc. Civil engineering projects involve planning, designing, estimating, supervising construction, managing construction, execution, and maintenance of structures. The role of civil engineers is to solve different engineering problems with the help of field experience, laboratory techniques, numerical methods, mathematical models, using computer and information technology. The scope of civil engineering is vast and includes many branches such as surveying and leveling, building planning and construction, advance construction, structural engineering, geotechnical engineering, water resources engineering, transportation engineering, environmental engineering, and town planning.

1.1 AIM & OBJECTIVE

The Main aim of our project to apply practically the various theories we have studied in the last three years.

The Main objectives of our work are,To collect the literature and study about the College building and its components.

• To prepare the plan and structural layout of columns, beams and slabs in the AUTOCADD 2022.

• To analyze the structure manually by moment distribution method.

• To design the structural component such as Footing, Column and Beam.

• To design the College Building with consideration for all types of forces.

• The various structural elements like Slab, Column, Beam, Footing and Staircase are analysed. In the design project we can know about the various methods of load calculation.

1.2 PROJECT PLAN

The aim of our project "Planning, Analysis and Design of College Building" is to provide education for students. This Building is designed to be an G+3 storey building. The total area of the site is 146.06m². The planning of the College Building were done by using Autocadd software. The doors, windows, toilet and required facilities as per specifications of BIS and NBC.

1.3 DESIGN PROCESS

The process of design commences with planning of the structure. Preliminary to meets its functional requirements. The clients vision and requirements must be taken into consideration, it may be vague, ambiguous (or) even unacceptable from engineering point of view.The design of structure can be classification into the following types Structural design

➢ Functional design

1.4 Functional Design

The structure to be constructed should primarily serve the basic purpose for which it is to be used and must have a pleasing look. Therefore the functional planning of a building must take into account the proper arrangements of rooms to satisfy the need of client, good ventilation, lighting acoustics, unobstructed view in cinema theatres etc., Bearing structure or R.C.C, framed structure or steel structure. After deciding the tentative form of the structure the designer should appropriate material for its construction. All these aspects are inter linked and final decision has to be taken considering requirements of user, functional aspects, aesthetics and cost.

1.5 Structural Design

Structural design is the methodical investigation of the stability, strength and rigidity of structures. The basic objective in structural analysis and design is to produce a structure capable of resisting all applied loads without failure during its intended life. The primary purpose of a structure is to transmit or support loads. If the structure is improperly designed or fabricated, or if the actual loads exceed the design specifications, the device will probably fail to perform its intended function, with possible serious consequences. A well engineered structure greatly minimizes the possibility of costly failures. A structural design project may be divided into three phases, i.e. planning, design and construction. The design of reinforced concrete is to resist a given system of external load involves the material properties and the skeletal demands such as width and depth are assumed based on specific guidelines. The cross-sectional dimension is generally assumed to satisfy the serviceability criteria and the housing of reinforced cements with suitable spacing and cover is required to estimate the dead loads and moments.

A comprehensive design of a beam requires the considerations of safety under the ultimate limit state of flexure, shear, tension, and bond together with the limit state of serviceability criteria by an empirical method.

II. SPECIFICATIONS

The observation from the site helped us to know about shape, size and levels of plot. The plot was approximately same level then the soil condition was checked and determined that the soil is a hard one and suitable for construction. From the study the total cost of College building including water supply and sanitary fittings and the supervision will be determined. The project shall be executed which reduces the cost at certain extent. The complexities and problems in the project increase our practical knowledge in civil engineering toa great extent.

a) EARTH WORK EXCAVATION

Foundation trenches shall be out to extract of foundation concrete and the side be vertical, the side should be stopped back of protected with timber shorting. Excavation earth shall not be placed within the edge of the trench. Bottom of the foundation trenches shall be perfectly leveled both longitudinally and the side of the trench shall be dress perfectly vertical from bottom up to the least thickness of the loose concrete so that concrete may be laid to the exact width as per the design. The bed of trench shall be slightly watered and well rammed. Excess designing done through shall be filled with concrete at the expenses of contractor. If the rock or builders in foundation during excavation, these should be removed. The measurements of excavation

b) CEMENT CONCRETE 1:4:8 FOR FOUNDATION

Fine aggregate should be clean, hard sand and durable. Coarse aggregate should be hard Brocken stone of granite of similar stones. Free from dust and other matter. Size of course aggregate shall be 40mm; cement shall be fresh Portland cement of IS specification. The proportion of concrete shall be 1:4:8 as cements sand course aggregate by volume centering, shuttering shall be provided as required s per specification. Concrete shall be laid gently in layer of 15 mm thick and compacted by roads and tempering with wooden timbers after 2 hours layering in concrete the surface should be kept with water.

c) BRICKWORK FOR SUPER STRUCTURE

All brick should be first class for standard specification made of good brick, earth thoroughly and shall be deep red or copper color. Brick shall be regular in shape and their edge should be square and shall emit clear ringing sound on being stuck and shall be free from cracks, chips flows and lumps any kind. Bricks shall not absorb water more than 1/6 their weights, after one hour of soaking by immersing in water bricks shall have minimum crushing strength of 150 kg/cm² Mortar shall be bonded and laid in English bond unless orotherwise specified. Every course shall be truly horizontal and shall be truly in pump vertical joints of consecutive courses should not come over one another.Bricks shall be laid with frog pointing upwards. The brickwork shall be kept for a period of 10 days after laying. Measurements are taken in cubic meter.

II RESULTS AND DISCUSSION

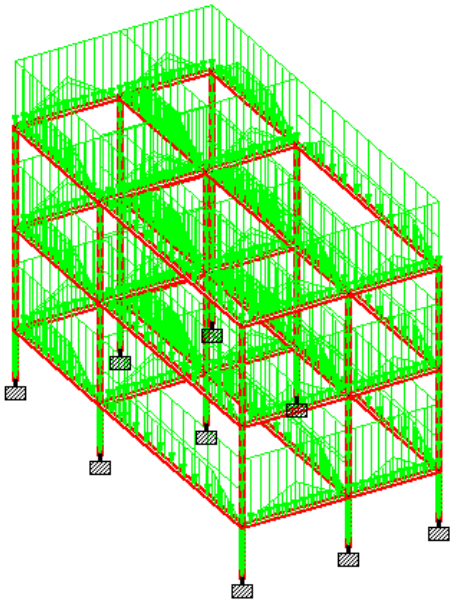
Modern reinforced structures are mostly complex and they are assembled as structure comprising of structural elements namely beams, columns, slabs, walls, and pile foundation. These elements are subjected structural loads of various combinations and for these structures have to be analysed and designed after.

ANALYSIS OF A STRUCTURE

The prime motive of analysis of a structure is to find out, what magnitude of force acts on the structure, what sort of forces will tend to act on the structure, how will the structure react when the load begins to act, will the structure safely withstand the load etc., the solution for all these can be obtained from of load analysis and frame analysis.

FRAME ANALYSIS

A building frame contains a number of continuous beams and columns. For design purposes bending moments, shear forces and direct thrust in beams and columns at critical sections are required to be obtained. The structure being highly inderminate, an exact analysis becomes tedious. In fact the assumptions involved even in exact analysis lead to considerable error and thus approximate method of analysis can be considered as reasonably accurate for practical purposes. Such approximate methods of analysis are preferred because of simplicity.



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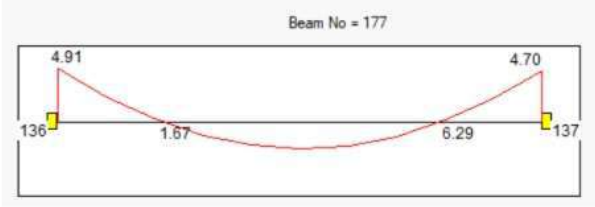

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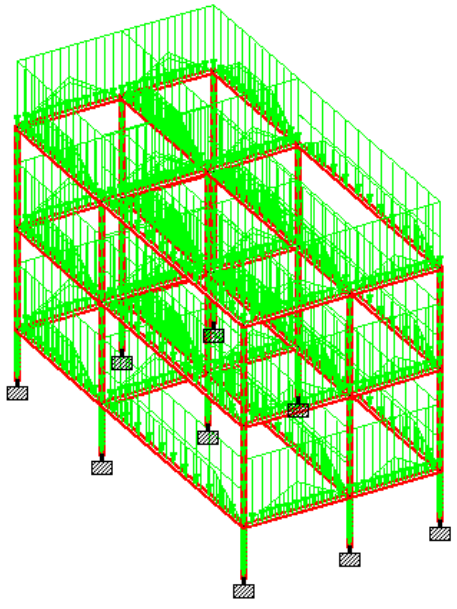

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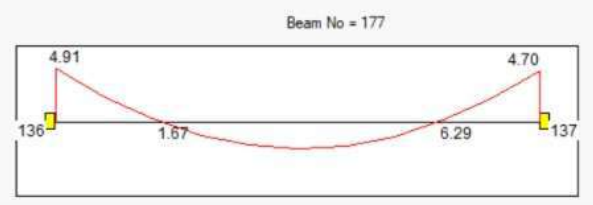

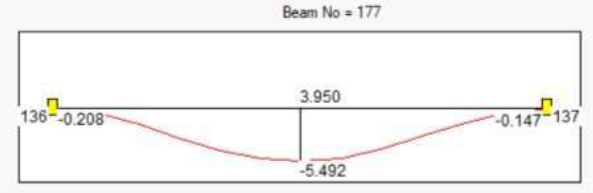

Shear Bending and Deflection Diagram

IV. CONCLUSION

The purpose of this project is to, "learn practice and excel in various subjects which we have learned in our classrooms by applying them practically by performing analysis, design and detailing for the usage of accommodation purpose, efficiently to reach the requirement as well economy", has been fulfilled successively.

Planning of building has been completed as per IS codespecifications. AUTOCADD software used for drafting the entire building. The manual designs of other components are also given high importance and calculations of desired reinforcement are found with required factor of safety.

The experience in doing this project is very helpful in learning about planning,analysis and design of a "COLLEG BUILDING". This project is also developing a confidence in analysing any civil structure..

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