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Planning, Designing And Analysis Of Hostel Building

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ABSTRACT

Planning, scheduling, controlling and measuring design and engineering activities is challenged now a days not only by the strong competition, but also by the technology and the way projects are organized. The project organization challenges the planning process through its variety of people, organizations and cultures participating along the whole building project. Concurrent engineering is a building method dependent on a dynamic planning process that integrates and coordinates all the entities involved in the project. 3D modeling is a tool that necessitates more specialized engineers and a more collaborative way of engineering a project. It seems that todays planning systems fail to take into consideration these challenges. This literature review is an attempt of in dif and how the fields of project management and lean construction deal with planning and measuring design/engineering activities in a concurrent engineering process that is globally dispersed both on engineering and on production part of a project.

Keywords:- Structural member, design, Analysis.

I. INTRODUCTION

Nowadays, due to the increase in population leads to the availability of horizontal coordination system (due to large area available per person) has been decreasing so that adoption of vertical co-ordination System (high rise building due to deficiency of area) is needed.

ETABS can also handle the largest and most complex building models, including a wide range of nonlinear behaviours, making it the tool of choice for structural engineers in the building industry. ETABS can be effectively used in the analysis and design of building structures which might consists of structural members like beams, columns, slabs, shear walls etc., With ETABS you can easily apply various construction materials to your structural members like concrete, structural steel, Reinforced Concrete etc. ETABS automatically generates the self-weight and the resultant gravity and lateral loads.

Codes recommended are IS 456-2000, SP 16, IS 875-1987 (Part I), IS 875-1987 (Part II)

II. OBJECTIVES

1. Provide more accommodation to the university students
2. Provide an environment that will ensure social and academic growth
3. Reduce the current accommodation crisis at the university.

BACKGROUND AND PROJECT JUSTIFICATION

Currently In most universities, including university of Nairobi, the number of students admitted is not determined by the bed spaces available. This is as a result of the high demand for higher education and the high number of form four candidates who qualify for university admission.

This has created accommodation shortage such that each year some students lack accommodation within the school hostel. This is a disadvantage to those who cannot afford accommodation outside the university , to those who do not hail from Nairobi and probably they have never been to Nairobi before. If a hostel is put up in this land it will reduce the problem if not eradicate it The proposed hostel will provide the following:

a) Appropriate environment for living as well as studying

b) opportunities for informal academic and social interchange

c) privacy and quiet place where people are living in close proximity and are sharing facilities most students will not have the opportunity to choose their neighbours

d) There will be a proportion of foreign students and those attending short courses, who need to be helped to settle in quickly

III. DESIGN REQUIREMENTS

Structural design is an art and science of designing with economy and elegance, a safe, serviceable and a durable structure, primarily to meet the functional requirements of the user or client. The functional requirements and economy of the structure for its intended use over the life span of the structure are looked by the structural designer.

The design of the structure must satisfy three basic requirements:

Stability: To prevent overturning, sliding or buckling of the structure or parts of it under the action of loads.

Strength: To resist safely the stress induced by the load in the various structural members.

Serviceability: To ensure satisfactory performance under service load condition which implies providing adequate stiffness to contain deflection, crack width, vibrations within acceptable limits and providing im permeability, durability etc.,

The process of structural design involves the following data:

Structural planning

Estimation of loads

Analysis of structural elements

Design of structural elements

The principle elements of an RCC building frame are as follows:

Slabs to cover large area

Beams to support slabs

Columns to support beams

Footings to distribute the column loads over large area of soil

DESIGN PHILOSOPHIES:

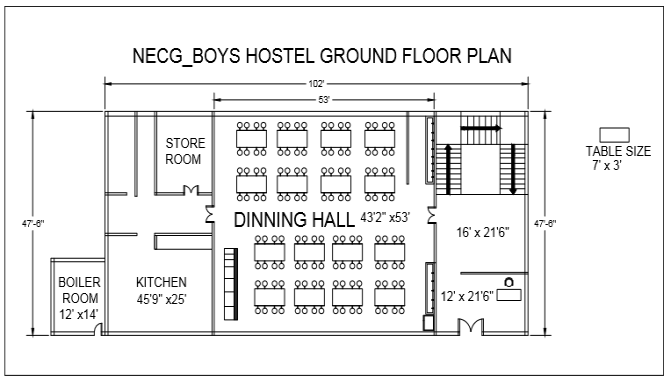
RC structures can be designed by using the following design philosophies

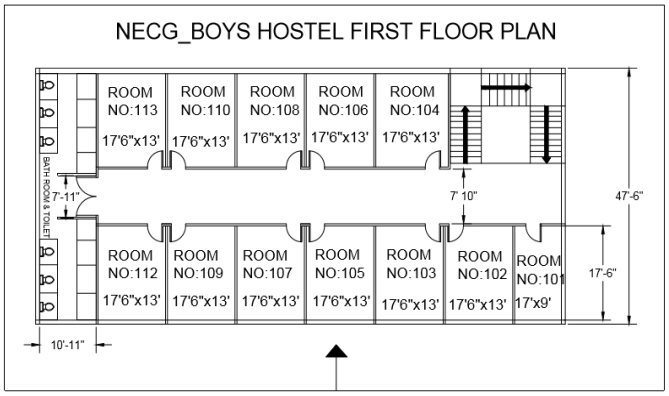
Working stress method for serviceability

Ultimate load method for safety

Limit state method

PLANS OF HOSTEL:





WORKING STRESS METHOD:

Working stress method was traditional method of design basically assumes that the structural material behaves in a linear elastic manner, and that adequate safety can be ensured by restricting the stresses induced in the material by the expected working loads (service loads) on the structure. Permissible stresses are kept well below the material strength. The ratio of strength of the material to the permissible stresses is referred to as the "Factor of safety ". The design usually results in relatively large section of structural members (comparative U.L.M) there by resulting in better serviceability, performance under the usual working loads. This method is notable for its essential simplicity in concept as well as in application.

ULTIMATE LOAD METHOD (ULM):

The ultimate load method design, the stress condition at the stage of impending collapse of structure is analysed and the non - linear stress strain curves of concrete and steel are made use of, the safety measures in design is introduced "Load factor "which is the ratio of ultimate load (design load) to working load. This method generally

results in more slender sections and often more economical designs when compared to WSM, particularly when high strength steel and concrete are used.

LIMIT STATE METHOD (LSM):

Limit state method is judicious amalgamation of WSM and ULM removing all drawbacks of both methods, but maintaining their good points. LSM aims for a comprehensive and rational solution to design problems by considering safety at ultimate loads and serviceability at working loads. The structures shall be designed to carry design loads safety throughout its life, and also satisfy the serviceability requirements such as limitations on deflection and cracking. The acceptable limit for safety and serviceability requirements before failure occurs is called a "Limit state ". The aim of design is to achieve acceptable probabilities so that the structures will not become unfit for the use for which it is intended.

There are two types of limit states:

Limit state of collapse: Deals with strength, overturning, sliding, buckling, fatigue, fracture etc.,

Limit state of serviceability: Deals with comfort to accompany and malfunction, caused by excessive deflection, crack width, vibration etc., and loss of durability etc.,

METHOD OF ANALYSIS:

Structural analysis involves the determination of internal forces like axial forces, bending moments, shear forces etc., in the component members for which these members are to designed under the action of given external loads.

The different approaches to structural analysis are as given below…

Elastic analysis based on elastic theory

Limit analysis based on plastic theory or ultimate load theory

In this project, an elastic analysis has been adopted. Elastic analysis deals with the study of strength and behaviour of members and structures at working loads.

The elastic analysis is based on the following assumptions:

Relation between force and displacement is linear.

Displacements are extremely small when compared to the geometry of the structure.

LOADS AND CALCULATIONS:

The various loads acting on the structure which need consideration in building design are as follows:

Dead loads.

Live loads.

Wind loads.

Seismic loads.

DEAD LOADS: [IS: 875-1987(Part-I)]

Dead loads are the loads which do not vary in magnitude and in position. The dead Load of a structure is not known before it is not known before it is designed. After designing, the assumed load is compared with the actual dead load. If the difference is in significant, the assumed dead load is revised and the structure is redesigned. The dead calculations should also include the superimposed loads that are permanently attached the structure.

The dead loads include:

Self-weight of members.

Weight of finishes.

Weight of partitions, walls etc.

The unit weights of different materials are as follows:

Reinforced concrete	:	25KN/ m3
Hollow Brick masonry:		19KN/ m3
Brick masonry:		20KN/ m3
Floor finishes:		1KN/ m2

LIVE LOADS:

Live loads are the loads which very in magnitude and in position. Live loads on roofs and floors are as follows:

Roof slab:	4.0 KN/m2
Other slabs:	4.0 KN/m
Balconies :	3.0 KN/m2

WIND LOADS:

Wind loads are not necessary to consider for design of multi-storeyed building (G+2)

DESIGN OF STRUCTURAL ELEMENTS

DESIGN OF BEAM: Depth =350 mm

DESIGN OF COLOUMN: Size 300*400 mm

DESIGN OF FOOTING:Size 2.8*1.8m

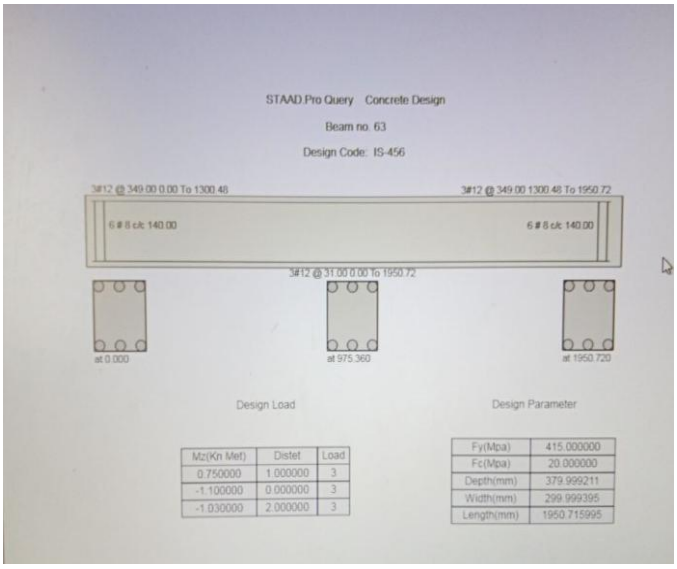
DESIGN OF STAIR CASE: Open newel staircase used

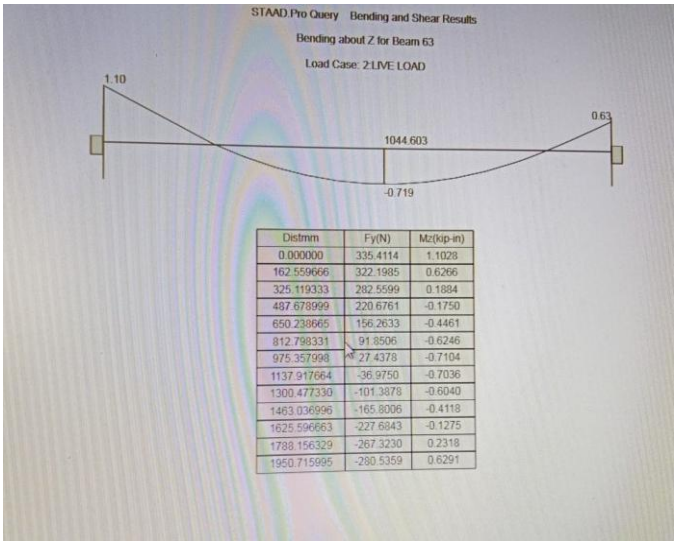
DESIGN OF SLAB: Size =31*14.4m

Literature

literature review was based on internet search and through Molde University College a number of databases were searched, such as ProQuest; Science Direct; Planning Planet; Google Scholars; Project Management Institute, Lean Advancement Initiative; International Council on Systems Engineering, and Lean Construction Institute. The subsequent phase of the research was to find literature that is specialized in project planning, scheduling, measuring metrics for engineering activities in order to find out how this is done in domains like: shipbuilding, construction, IT, systems engineering, and project management.
One of the most useful documents found is "The Guide to Lean Enablers for Managing Engineering Programs" published as a joint collaboration between Massachusetts Institute of Technology, International Council for Systems Engineering and Project Management Institute (Oehmen et al. 2012). The guide actually combines known best practices from lean literature, project management and systems engineering with input from an extensive community of practitioners. The guide identifies and analyse ten major challenge themes in managing engineering programs and their possible solutions based on practices from lean thinking, project management and systems engineering. The references provided throughout this guide are also useful theoretical background for this research. Broadly speaking, the most useful literature is found in Project Management literature and Lean Construction literature as presented in the next two sections.

STAAD PRO RESULTS:





IV. CONCLUSION

In this present work ETABS is used to analyse the R.C moment resting frame structure of G+2 considering the gravity loads. The following conclusion is drawn from present work.

- G+2 Hostel building plan has been drawn in Auto CAD software and designed for Beams, Columns, Footings, stairs and slabs. The dead load, live load are referred using IS 875-1987
- Part I and Part II. And designed according to the IS 456-2000 and SP16 by considering concrete grade of M25 and steel of HYSD bars Fe500 are used.
- By proposing our project on girls hostel building which meets the requirements of our JIT girls.
- The results obtained are safe from manual calculation i.e., in MS Excel as well as in software results.
- Manual design has been done for one of the different dimensions of the beam, column, stairs, footing and slab of the Hostel building as per the IS 456-2000 and SP16.

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