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PLAN , DESIGN AND ANALYSIS OF COLLEGE AUDITORIUM AT ILAHIA ENGINEERING COLLEGE

[1]Akbar Muhammed, [2]Aslah N A, [3]Farseen T Faisal, [4]Muhammed Uwais P K, [5]Rasim Navas M S

[1234]Student, Dept. of Civil Engineering, Ilahia College of Engineering and Technology, Muvattupuzha, Kerala, India.
[5] Professor, Dept. of Civil Engineering, Ilahia College of Engineering and Technology, Muvattupuzha , Kerala, India

ABSTRACT –

An auditorium is a place where all the inhabitants entered together and watch programs. It comes under the occupational classification of Group D. The designing of an auditorium mainly considers the size, seating capacity, shape as well as the space utilized. This is very important aspects considered in the case of any institutional setup. In this project work , planning , designing and analysis of college auditorium is done using softwares like Auto Cad , Staad Pro and Rivet in different stages. While designing a auditorium, functional planning concepts have to apply. This type of design will helps to understand the structural aspects in detail.

Key Words: auditorium , occupational , planning designing , analysis , functional , structural

1.INTRODUCTION

This paper embarks on a comprehensive exploration of the intricate process involved in conceptualizing, scrutinizing, and crafting an exceptional auditorium space. From the initial stages of meticulous planning, which involves site selection, spatial optimization, and functionality considerations, to the in-depth analysis phase encompassing user requirements, regulatory compliance, and environmental impact, every aspect is scrutinized with precision. It embraces various design intricacies, where architectural vision converges with structural engineering to create a harmonious space that transcends mere aesthetics. Acoustic excellence, ergonomic design, and cutting-edge technology converge to form the backbone of a multifunctional auditorium that caters to a diverse array of performances and events. The narrative unfolds through the lens of sustainable principles, acknowledging the imperative of minimizing environmental impact and maximizing energy efficiency.

2. LITERATURE REVIEW

S. Charkha and Latesh S. Sanklecha (2014); Cost of steel is increasing day by day and use of steel has become inevitable in the construction industry in general and in industrial building in particular. Hence to achieve economic sustainability it is necessary to use steel to its optimum quantity. In this paper an attempt has been to present comparative study of conventional and Pre-engineered steel structures which is a truss of span 30m carrying a crane of 10tonne, 15t and 20t.It has shown considerable reduction in the quantity of material.
Sagar Wankhade (2014); In this paper Industrial Steel truss Building of 14m x 31.50m, 20m x 50m, 28m x 70m and bay spacing of 5.25m, 6.25m and 7m respectively having column height of 6m is compared with Pre-engineering Buildings of same dimension. Design is based on IS 800-2007 (LSM) Load considered in modeling are Dead load, Live Load, Wind load along with the combinations as specified in IS. Analysis results are observed for column base as hinge base. Results of Industrial steel truss buildings are compared with the same dimensions of Pre-Engineering Building.

2.1 SUMMARY OF LITERATURES

The literatures highlights the prominence of steel structures in industrial construction, particularly for their cost-effective creation of large span spaces. Originating alongside Conventional Steel Buildings (CSB) in the 1960s, Pre Engineered Buildings (PEB) have become a notable alternative. The complexity in PEB methodology stems from quality predesigning and pre-fabrication, as well as its lightweight nature and economic viability. The study utilizes STAAD Pro to design a structure with a 60m clear span, comparing it with a PEB structure. The optimization process involves assessing different sections, support conditions, ridge angles, and bay spacings to identify the most efficient structure.

3.Project Formulation

3.1 Aim

The main aim of the project is to Plan , Analyse and Design an Auditorium in college.

3.2 Objectives

- To Conduct reconnaissance survey to get idea about the ground condition
- and prepared site plan.
- To prepare Architectural drawing using software Auto CAD2013.
- To analyse and design of the structure using STAAD.Pro software.
- To prepare 3D model of Auditorium using Autodesk Revit software.
- To prepare Quantity estimation using CANDY

3.3 Scope of the Project

An auditorium is designed to have multiple stories to accommodate seating and acoustic requirements. The project is limited to a seating capacity of 1000 people, and its structural and architectural frame work is only done due to time and financial constraints.

5. Methodology

5.1 Selection of Site

The principal consideration for all type of construction is selection of site. The site selected for the proposed project is at Mulavoor. The plans to be born in mind while selecting a site. The soil at site should have sufficient safe bearing capacity. The building shall have utilities like electricity, water supply, transportation etc. The building can be constructed according to the legal aspects so there is no disturbance for the nearby locality.

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5.2 Site Surveying

The structure is planned according to nature of site. So, a clear idea about surface is required during planning and designing. According to Kerala Panchayath Building Rule, a project report must contain a site plan which is drawn to a scale not less than 1:400. Siteplan preparation is done during surveying and plotting.

5.3 Surveying

It is the art of taking measurements which will determine the relative position of various parts of the surface of the earth. During surveying the necessary measurements must be taken to plot the site plan and locate various features. Hence employed the chain surveying in which surveying and plotting can be done simultaneously.
Surveying is primarily divided into:

1. Reconnaissance survey
2. Detailed survey

5.3.1 Reconnaissance Survey

The preliminary examination of the ground to find out the suitable type of survey to conducted to see how best the work can be arranged .This survey is carried out to how an idea of the area to be surveyed.

5.3.2 Detailed survey

It includes the full details of the site showing its boundaries, general features, like existing buildings, approach to the road, area of the land, detailed drawings of the site in a suitable scale etc.

5.4 Preparation Of Site Plan

Site plan may be defined as the projection of ground and the features up on it as a horizontal plan, the line and the regular measurement drawn being only horizontal dimension. For a building construction, site plan is essential. This plan is prepared for showing the boundaries of land, nature of ground, existing features, north direction ,creation of a proposed work, etc.

5.5 Planning Of Building

A building should be planned to make it comfortable, economical and to meet all the requirements. The attempt of the planner should be to attain maximum convenience with the limited money available. Functional utility, cost, habits, taste, requirements, etc., should be considered by the planner. Circulation area should be minimum possible without effecting other requirements and convenience. To start with all the requirements should be collected and then planning should be taken up and a number of alternative proposals prepared and comparing their advantages and disadvantages the best one should be adopted.

5.6 Designing

A building has two basic part is, one foundation and other one super structure. Foundation is the lower portion of the building usually located below the ground level, which transmit the load of super structure to the supporting soil. The portion of the building above the ground level is known as superstructure. A part of superstructure is located between the ground level and the floor is known as plinth area. The built up and covered area measured at the floor level.

5.7 Modelling

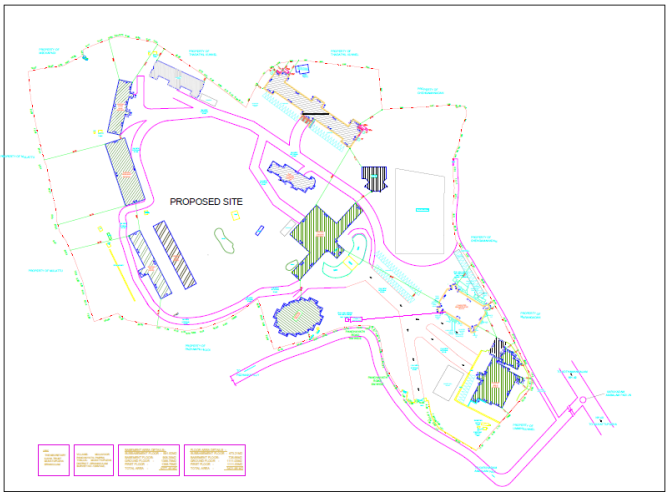
3D modelling of an auditorium using Revit software involves creating a digital representation of the space, including seating arrangements, stage layout, lighting fixtures, and architectural elements. Users can design, visualize, and analyze various aspects such as acoustics, sightlines, and space utilization to ensure optimal functionality and aesthetics.

5.8 Estimation

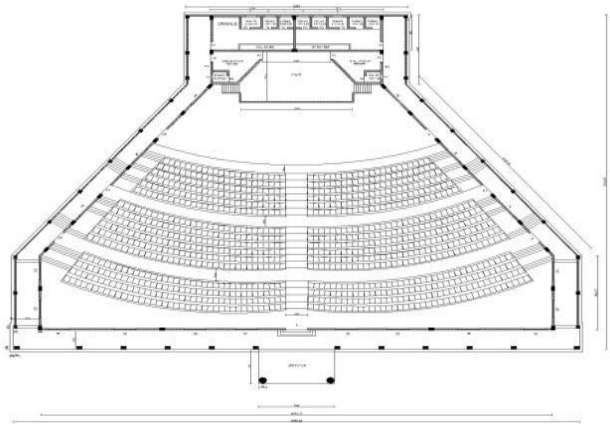
Creating a detailed estimate for an auditorium using Excel involves breaking down costs for various elements such as materials, labor, equipment, and overhead. Begin by listing all the components needed, such as seating, stage equipment, lighting, sound systems, and finishes. Then, research prices and quantities for each item and input them into separate columns. Utilize formulas to calculate totals, including taxes and contingencies. Finally, review and adjust as necessary to ensure accuracy and completeness.

6. Plot details

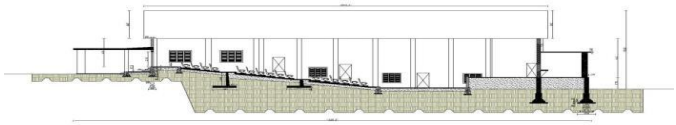
Survey No – 1205/1A/2.
Total cent – 3.7 acre plot.
Total Built up Area - 162.26
Ward No - 6
Panchayath - Paipra
Village - Mulavoor
Taluk - Muvattupuzha
District - Ernakulam
Building facing to North direction.
Electric post is provided 10 m from the site.
Total area purposed to build 1 auditorium
- 15882 sq. ft/house
Expect a budget of 2.01 Cr.
Height of Building – 8.5m.
Earthwork to be excavated - 10m
Open Space
Front - 8m
Back - 9m
Side - 6m



6.1 Site Plan Drawing



6.1 Plan of the proposed building



6.2 Section

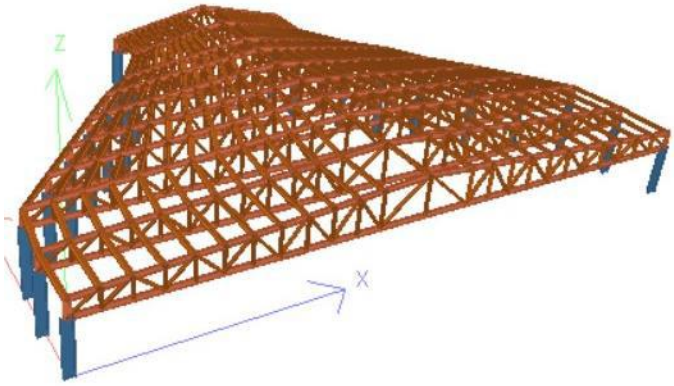
6.3 Elevation

7. Structural Design

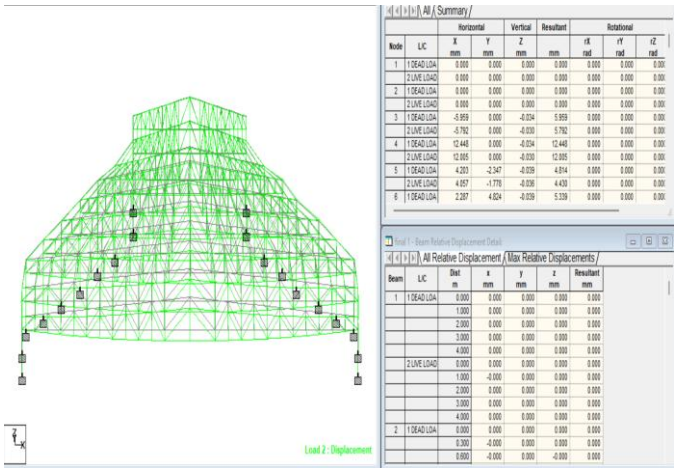
Given span (L) = 47.07 m
Pitch = 1/5
Height of eve's level, h = 7 m
Spacing of truss = 4 m

Dead load	506.9 N/m^2
Live load	342.64 N/m^2
Wind load	-0.848 kN/m2

7.1 Design of truss



7.1 3D view of truss



7.2 Deflection diagram

SECTION	WEIGHT(NEWTON)
ISMC400	396350.2
ISA200x200x25	332474.36
ISA200x200x25	782435.1
I160016C55040	871970.5

7.3 Steel take off

8. 3D Rendered Model

3D model of an auditorium in Revit involves designing the layout of the seating area, stage, aisles, and other architectural features. You start by setting up the project with appropriate units and levels. Then, you can use Revit's tools to draw walls, floors, and ceilings to define the space. Adding seating elements, such as chairs or benches, is crucial for representing the audience area. Detailed modeling of the stage, including platforms, curtains, and lighting fixtures, enhances the realism of the model. Additionally, incorporating elements like stairs, entrances, and exits ensures the model accurately reflects the auditorium's design.

8.1 Rendered Model

9.Abstract Estimate

Estimated cost of building = 17341395.1/-
Add 8% for electrical fittings = 1387311.65/-
Add 5% for electrical fittings = 867069.7/-
Add 3% for contigencies = 520241.86/-
Total cost = 20116018.3/-
Lump sum round off = 10000/-

Grand Total = 2,01,26,018.3/-

9. Conclusion

- Our journey culminates in the successful completion of the college auditorium project.
- A harmonious blend of creativity, technical precision, and collaborative effort.
- The following key aspects define our achievement:Our auditorium seamlessly integrates functionality and aesthetics.
- Thoughtful spatial layout, acoustical considerations, and captivating lighting create an inviting space for performances and events.Through iterative refinement, we transformed our vision into detailed 3D models. Industry-standard tools like AutoCAD, Revit, and Lumion allowed us to represent materials, textures, and spatial relationships accurately.
- Rigorous load calculations, material selection, and safety measures ensured the auditorium's structural integrity. Steel trusses, reinforced concrete columns, and pre-stressed beams form the backbone.Our auditorium comfortably accommodates 1000 attendees, with optimal acoustics and accessibility.
- It stands ready to host a variety of events, from lectures to cultural performances.As we celebrate, we look ahead—seeking feedback, exploring sustainability measures, and embracing digital twin technology for ongoing maintenance.
- In closing, our college auditorium stands as a testament to creativity, collaboration, and unwavering dedication.
- May it resonate with applause, laughter, and inspiration for generations to come.

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[10] The concrete is designed as per "IS; 456-2000".
[11] The coefficient values are taken from the code book "IS; 456-2000"
[12] the steel is designed as per "IS; 800 (2007)"