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INDOOR STADIUM USING SketchUp SOFTWARE

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Abstract: Playing sports is a great way to stay fit and healthy, mingle with people, and have lots of fun. In order to make the most out of it, however, people need to practice regularly – and in order to be motivated to practice regularly, they need to fully enjoy the experience. This can only happen if they're able to play their favorite sport in comfort and safety, at a convenient time and When people can practice any sport they want, any time of the year, in an optimal environment, they're sure to frequent the athletic facility that provides them with the enjoyable experience. Despite the many advantages of outdoor sports facilities, such as space and natural light, indoor complex offers more efficient sports playing solutions – people don't have to skip games because of the weather and can play comfortably in a safe, climate-controlled environment. An indoor sports complex may be an investment, but it's important to factor in the many ways one can earn a high return on that investment. The ability to stay open no matter what the weather conditions are is already a major advantage for an indoor sports complex, but the other component to consider is the building itself. Buildings made from conventional materials, like wood and iron, can get quite expensive to build. Between the cost of excavating the ground to place a foundation and running artificial lights and heat or air-conditioning, building owners can find it challenging to make up for maintenance expenses throughout the year. Fabric buildings, on the other hand, are not only low cost per square foot, they're also inexpensive to operate and maintain

IndexTerms **– SketchUp software, prototype, Plan**

1.1 INTRODUCTION TO BUILDING

1.2.1 COMMERCIAL BUILDING

1. Indoor sports complexes are commercial buildings that are designed for various sporting activities.
2. They are enclosed structures that can house multiple courts or fields.
3. They can be used year-round, regardless of the season.
4. They can offer amenities like locker rooms, concessions, and spectator seating.
5. Some common types of indoor sports facilities include gymnasiums, multi-purpose sport centers, and indoor arenas.

Indoor sports complexes play a crucial role in promoting an active lifestyle and fostering community engagement. These facilities provide a safe and comfortable environment for individuals of all ages and skill levels to participate in a variety of sports, ranging from basketball and volleyball to soccer and tennis. Indoor sports complexes, aka recreational buildings, are enclosed structures specifically designed to accommodate various sporting activities. These complexes often house multiple courts or fields, allowing for simultaneous games and tournaments. One of the fundamental advantages of indoor sports complexes is the ability to provide a controlled environment, shielding athletes and spectators from adverse weather conditions.

1.2.2 TYPES OF INDOOR SPORTS

1. VOLLEYBALL
2. BASKETBALL
3. BADMINTON
4. KABADDI

1.3.1 SITE SELECTION

Selecting the site for an indoor sports complex is extremely important as the location can significantly impact its success by influencing factors like accessibility, potential user base, community engagement, and overall usability, making it a critical decision in the planning process.

Key reasons why site selection matters:

Accessibility:
The site should be easily reachable by the target audience, with good access to public transportation and major roads to maximize usage.
Parking availability:
Adequate parking space is crucial for both players and spectators, especially for large events.
Land size and shape:
The site should be large enough to accommodate the desired sports facilities and have a suitable layout for efficient design and construction.
Environmental considerations:
Factors like proximity to natural features, noise levels, and potential environmental impact should be assessed.

Fig. Site Selection

METHODOLOGY

1. DRAWING 2D PLANE IN AUTOCAD

2.DRAWING 3D BUILDING MODEL IN SKETCH UP

3.BUILDING ANALYSIS USING ETABS

Study of Architect Drawing:

Architectural drawings of the buildings were properly studied. Whatever the information is required for performing calculations are properly checked and analyz.

Load Calculation:

After the study of architectural drawing and preliminary design, load calculations were done using the IS 875:975 as reference. The exact value of Unit weights of the materials from the code was used in the calculation. The thickness of materials was taken as per design requirement.

Wind Loads:

The most common types of wind flow around Tall Buildings that need to be accounted for during and after construction.

Earthquake Load:

Severity of ground shaking at a given location during an earthquake can be minor, moderate and strong. Relatively speaking, minor shaking occurs frequently, moderate shaking occasionally and strong shaking rarely.

1.4 SOFTWARE USED

1. **AUTOCAD SOFTWARE**
2. **SKETCH UP SOFTWARE**
3. **ETABS ANALYSIS**

AUTOCAD SOFTWARE

AutoCAD is a general drafting and design application used in industry by architects, project managers, engineers, graphic designers, city planners, and other professionals to prepare technical drawings. After discontinuing the sale of perpetual licenses in January 2016,[3] commercial versions of AutoCAD are licensed through a term-based subscription or Autodesk Flex, a pay-as-you-go option introduced on September 24, 2021. Subscriptions to the desktop version of AutoCAD include access to the web and mobile applications. However, users can subscribe separately to the AutoCAD Web App online or AutoCAD Mobile through an in-app purchase.

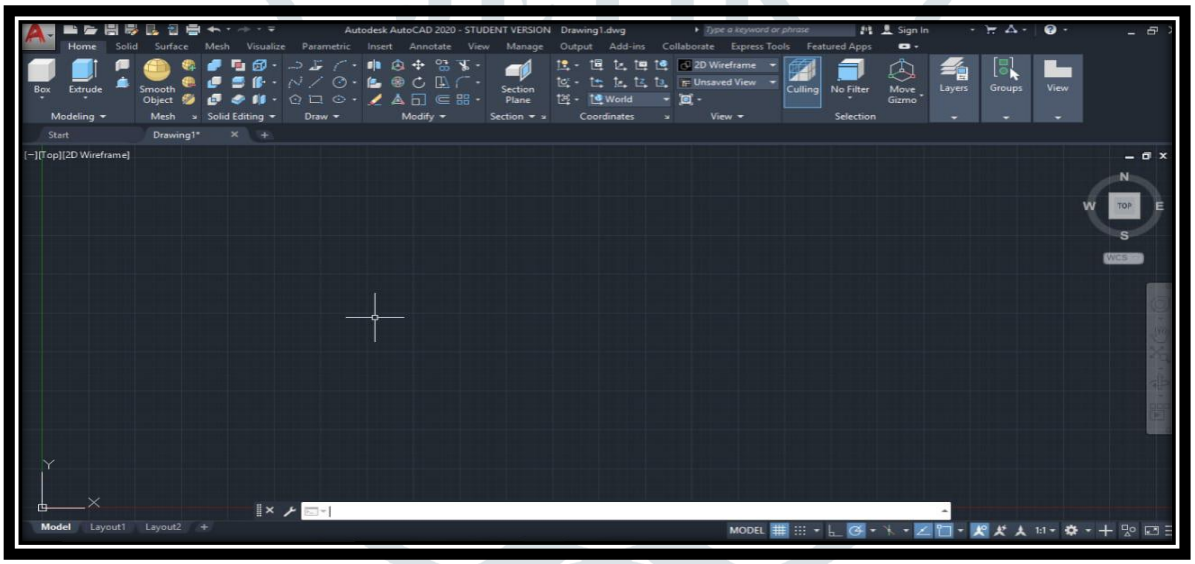

Fig.5.2 Welcome screen

AUTOCAD is a computer-aided design (CAD) and drafting software application. Developed and marketed by AutoCAD was first released in December 1982 as a desktop app running on microcomputers with internal graphics controllers. The main use of AUTOCAD software is to draw or drafting the plan, elevation and sections of structures in 2D or 3D view. For the present project AUTOCAD is used for representing the plan of considered Commercial Building.

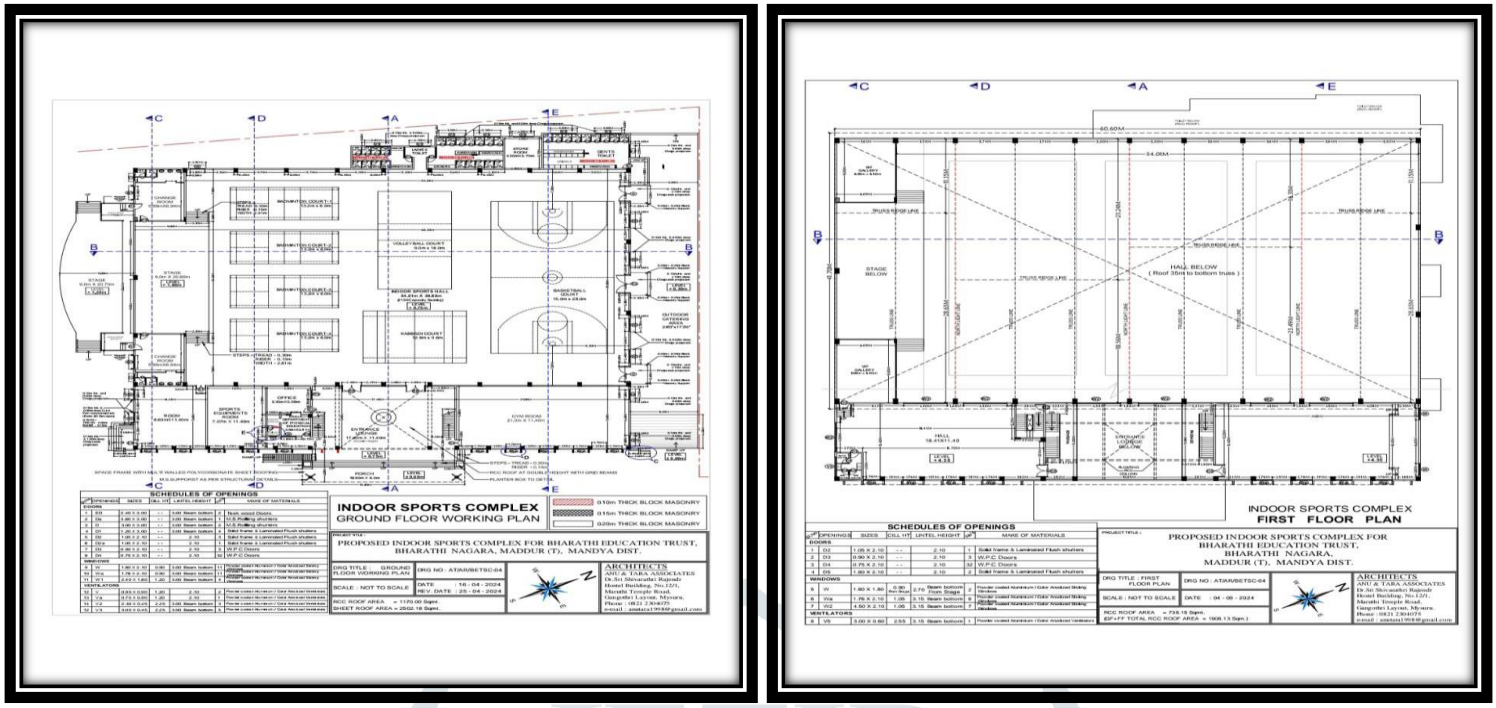

Fig: Auto Cad 2D Plan

SKETCH UP SOFTWARE

Sketch Up is a 3D modelling program made for architects, engineers, and moviemakers. It is easier to use than most programs used for three dimensional drawings. Sketch Up was created by the company @Last Software and released in August 2000. In 2006, @Last Software was bought by Google. They released SketchUp6 in January 2007. SketchUp6 can use add-ons that let things build with the program be made into files that can be used with Google Earth. In 2012, Sketch Up was bought by Trimble Navigation.

Sketch Up

Up for Desktop is simple, yet powerful, software that can help you create stunning 3D models. With Sketch Up you can:

Create 3D models of buildings, furniture, interiors, landscapes, and more. Work the way you want to with a fully customizable interface. Place your model in a real world location and add realistic light and shadow. Share your models with others as 2D or 3D images, an animated walkthrough, or even print your model using a 3D printer. Import files from other 3D modeling programs or tools.

Export your Sketch Up model for use with other modeling or image-editing software.

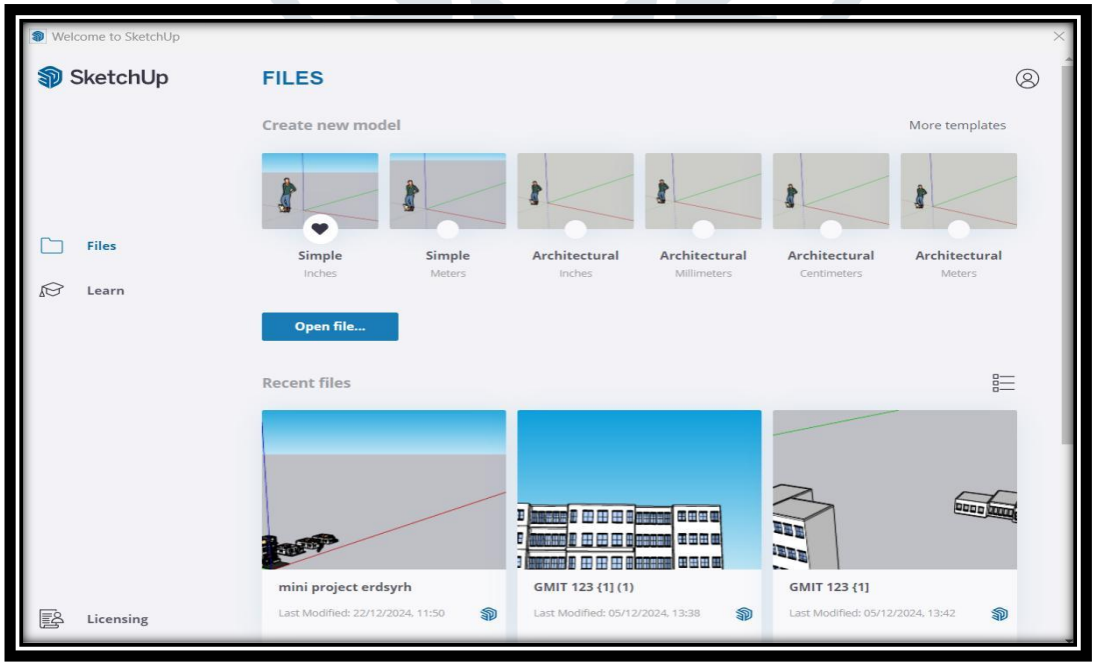

Fig. Welcome screen

Fig: final 3D View

Fig : PHYSICAL MODEL

TRUSS

A truss is a load bearing structure with its members generally connected to form triangular elements with any two members joined by different types of joints. Triangular structure is found to be the strongest shape to exist. The reason being the other structures may distortion application of force on its joints, but the triangle does not.

A truss is a structural system made of straight members that are connected at joints to form triangles. Trusses are used in many structures, including buildings, bridges, and towers.

Trusses can be manufactured in a multitude of shapes and configurations. The type and style of truss chosen for a given design depend on the design requirements—including the span (the length between supports), the design load(s), and sometimes (when aesthetics are important) the truss form.

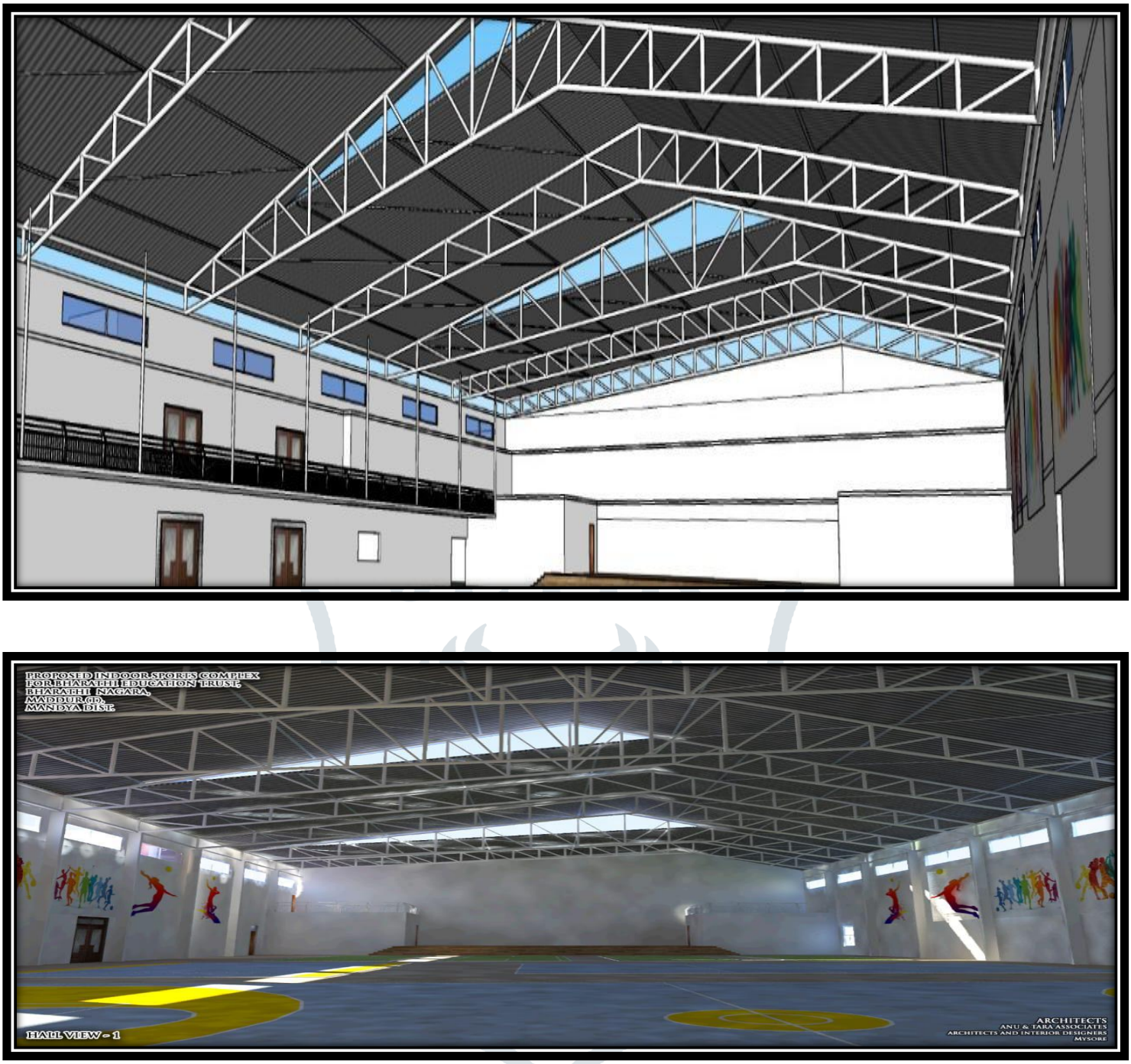

fig: Truss design

ETABS ANALYSIS:

ETABS is an engineering software product that caters to multi-story building analysis and design. Modeling tools and templates, code-based load prescriptions, analysis methods and solution techniques, all coordinate with the grid-like geometry unique to this class of structure. Basic or advanced systems under static or dynamic conditions may be evaluated using ETABS. For a sophisticated assessment of seismic performance, modal and direct-integration time-history analyses may couple with P-Delta and Large Displacement effects. Nonlinear links and concentrated PMM or fiber hinges may capture material nonlinearity under monotonic or hysteretic behavior. Intuitive and integrated features make applications of any complexity practical to implement. Interoperability with a series of design and documentation platforms makes ETABS a coordinated and productive tool for designs which range from simple 2D frames to elaborate modern high-rises.

Modeling of Structural Systems:

Fundamental to ETABS modeling is the generalization that multi-story buildings typically consist of identical or similar floor plans that repeat in the vertical direction. Modeling features that streamline analytical-model generation, and simulate advanced seismic systems, are listed as follows:

Templates for global-system and local-element modeling

Customized section geometry and constitutive behavior

ADVANTAGES

1. ETABS allows user for Graphic input and modification for the sake of easy and quick model creation for any type of structure.

2. Creation of 3D model with the utilization of plan views and elevations, 3D model of kind complex structure can be created easily.

3. With the help of similar story concept creation of 3D model is very easy and quicker. If the story's are similar then the model generation time can be reduced multiple time through similar story concept.

4. Editing of model is very easy. Moving any object from one position to other, combining two or more objects using merge command, making the similar object using Mirror command and make copy of any object in the same level of different story level.

5. Drawing of object with most accuracy using snap command consisting of end, perpendicular and middle or some other options. 6. Creation of object is very quick for any type of object like beam, column, slab, wall etc. with one click of mouse.

6. Easy navigation through multiple viewing of windows. This feature allows you to create or edit your model very easily with real time view.

7. Create your model and editing has been easy through 3D view with different type of zoom option as well as panning command for moving the whole model easily without any rotation.

8. Different view option of the 3D model including plan view, any side elevation view, and also customization view created by the modeller.

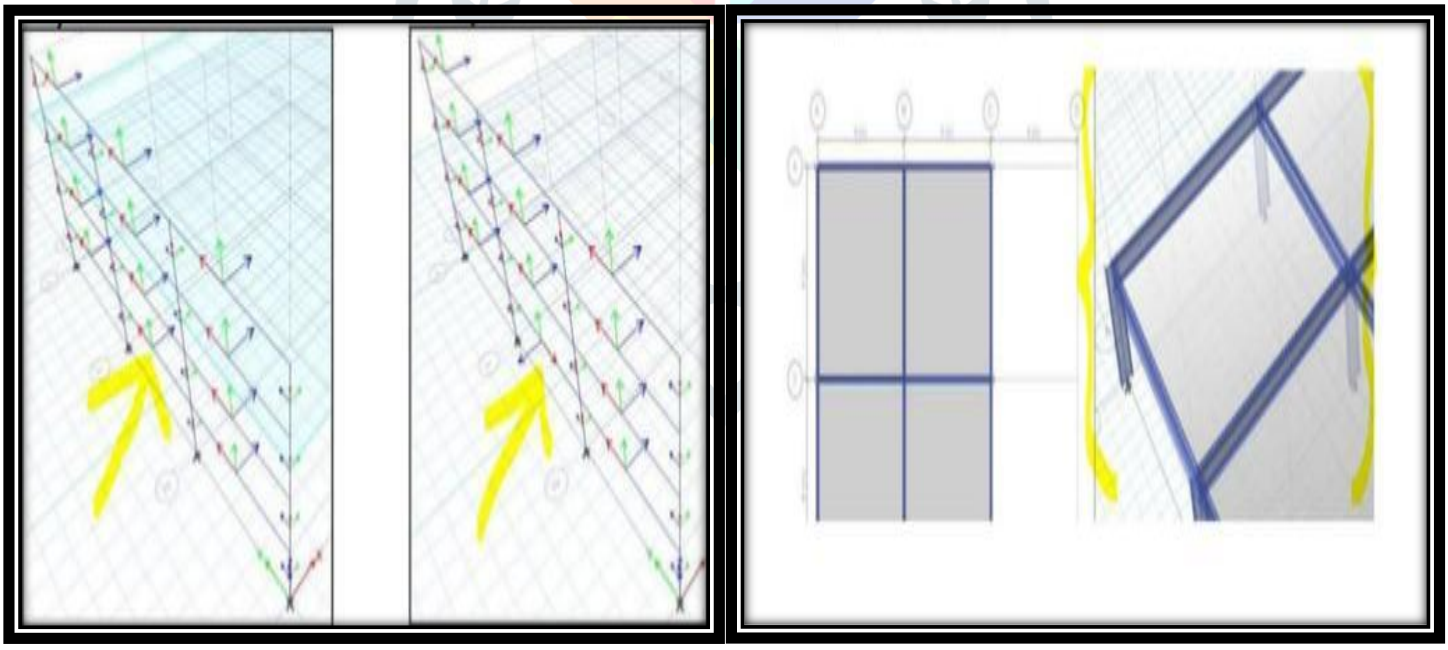

Fig: ETABS Analysis

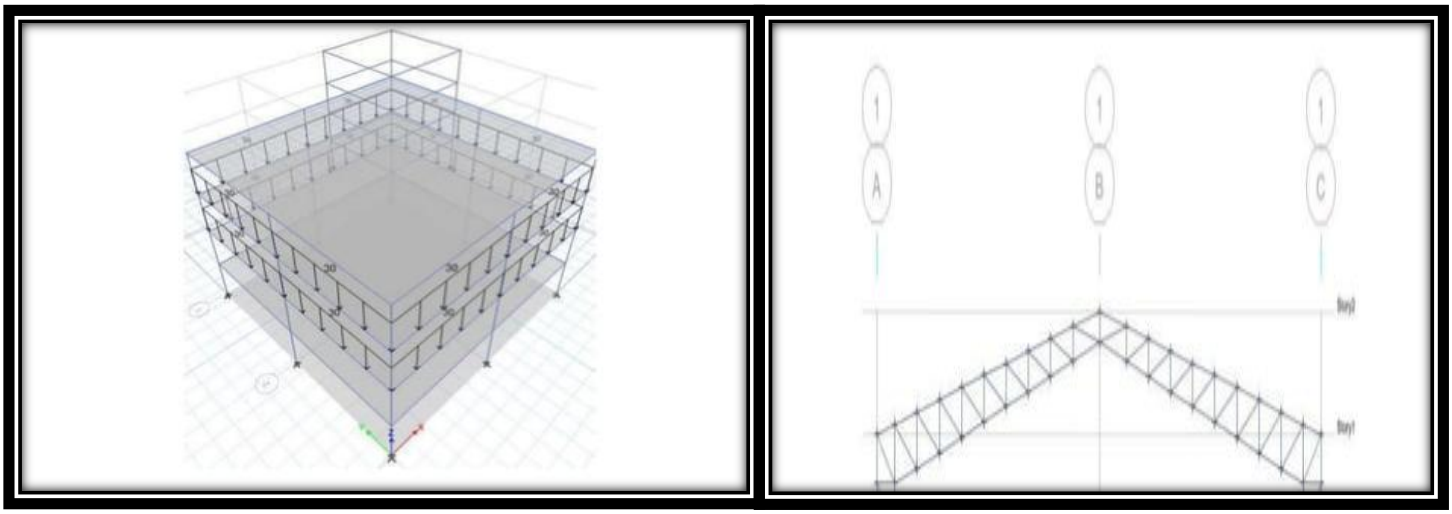

Fig: ETABS Analysis

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