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Cyclonic Wind Analysis On Roof Truss Of Building At Coastal Area-Using Ansys

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Abstract— *Conventional roof rafters and ceiling joists are less often used in new home construction these days. In fact, nearly 80% of homes built today use pre-manufactured roof trusses instead of traditional rafters to support the roof. Also in this contemporary world people are using the roof shielded at the top for avoiding the water leakage through the walls and beams of old structures. In this paper considering roof truss with two crossection. The shapes are double cantilever truss. When wind load acts on these truss shapes the behaviour of the structure and the impact over the floor is changed. So a study is done using computational techniques to get the deformed structural results. The trusses are modelled, and using FEM techniques the model is analysed using ANSYS software. The flexibility in the roof design and complexity that roof trusses enable have also made them increasingly popular. With today's home styles, more complex roof designs, angles, cross gables and other features have added cost, which can be at least partially offset by using pre-manufactured roof trusses rather than building a roof frame on site. For computational ease symmetry sections are modelled. The wind load conditions are taken according to the standard and locality of the structures.*

Keywords—*Roof Truss, Double Cantilever, Tri Bearing, Bow String And Sloping Flat*

I. INTRODUCTION

Truss is very important for a construction, such as construction for roof, bridge and high rise building. Truss can give high esthetic value for mega construction such as Eiffel Tower, Paris and for building like stadium for football in Europe. In architecture and structural engineering, a truss is a structure comprising one or more triangular units constructed with straight members whose ends are connected at joints referred to as nodes. External forces and reactions to those forces are considered to act only at the nodes and result in forces in the members which are either tensile or compressive forces. Moments are explicitly excluded because all the joints in a truss are treated as revolute. Nowadays, the analysis of truss is concerned of many designers and consultants.The truss structures are required to be designed in such a way that they have enough strength and rigidity to satisfy the strength and serviceability limitation. In order to archive the minimum requirement, it is necessary to carry out an accurate analysis to investigate the reaction and stress that acting inside the member of the truss.. When the load acting on a truss, the structure may deform and change to different shape or size. This can be a result of compression (pulling) stresses or tension (pushing) stresses inside the truss members. For addition information, a compression will occurs when there is a result of the subjection of a material to compression force that induces the reduction of volume. Besides, a tension will occurs when there is a pulling force with a magnitude subjected to an object and results an elongation. Furthermore, it can be deformed or moved from its original position after the load is applied. So, there will be a displacement (deflection) occur at nodes. In order to come out with a proper design of truss, it is necessary for all the designers and consultants to examine all these important data and include them into their design.

II. TRUSS

A truss is a structure composed of slender members joined together at their end points. Roof trusses in general, the roof load is transmitted to the truss by a series of purlins. The roof truss along with its supporting columns is termed a bent. The space between bents is called a bay Planar trusses lie in a single plane. Typically, the joint connections are formed by bolting or welding the end members together to a common plate, called a gusset plate

Double cantilever truss or roof truss. The double cantilever truss or roof truss is used as a main structure to cover industrial buildings; it allows to build aisles with large spans. walls, panels , slabs. shown in fig 1

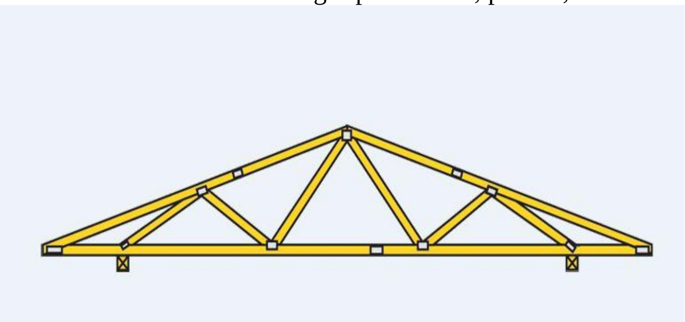

Fig.1. Double cantilever truss

III. SOFTWARE USED

A. CATIA V6

CATIA (an acronym of computer aided three-dimensional interactive application,) is a multi-platform software suite for computer aided design (CAD) developed by the French company Dassault Systèmes. In this paper, the roof truss are modeled .

B. ANSYS WORKBENCH

ANSYS Workbench is a platform which integrates simulation technologies and parametric CAD systems with unique automation and performance. The power of ANSYS Workbench comes from ANSYS solver algorithms with years of experience. ANSYS Workbench, which is written for high level compatibility with especially personal computer, is more than an interface and anybody who has an ANSYS license can work with ANSYS Workbench.Workbench provides a single interface to all of ANSYS‟ tools. The goal is to provide a single platform that allows users to take advantage of a simpler, schematic style approach to build simulation tasks.

IV. CYCLONIC WIND ANALYSIS OF ROOF TRUSS OF DOUBLE CANTILEVER TRUSS

The roof truss are placed on top of a building of height 6m.building of size 12mx9m.Roof truss of height 5m Building is located near the costal area were the wind effect is high. Providing wind speed of 50m/s. The intensity of wind pressure is calculated according to Is 875 part 3.

Roof truss of square section & circular section are modeled .provding steel section of square of 60x60x.3mm and circular section of 60mm.The deformation of the roof truss are find out . from that less deformed structure is more safe .The roof of square truss modled in catia imported in ANSYS workbench are shown below.

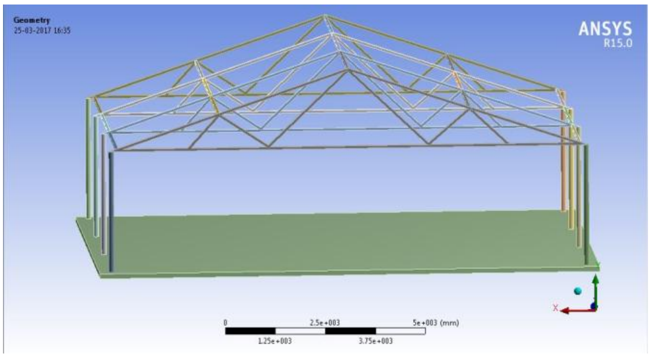

Fig.4.Double Cantilever Truss

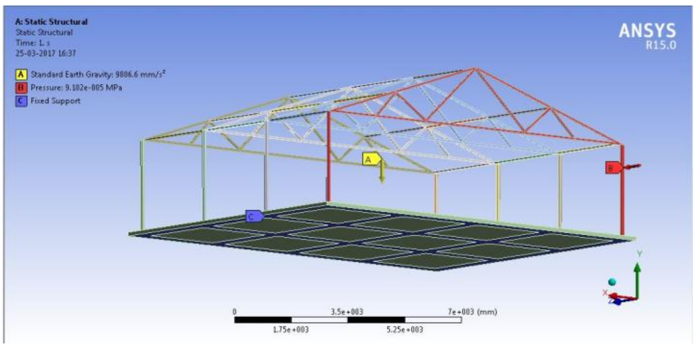

Fig.5. Boundary Condtions

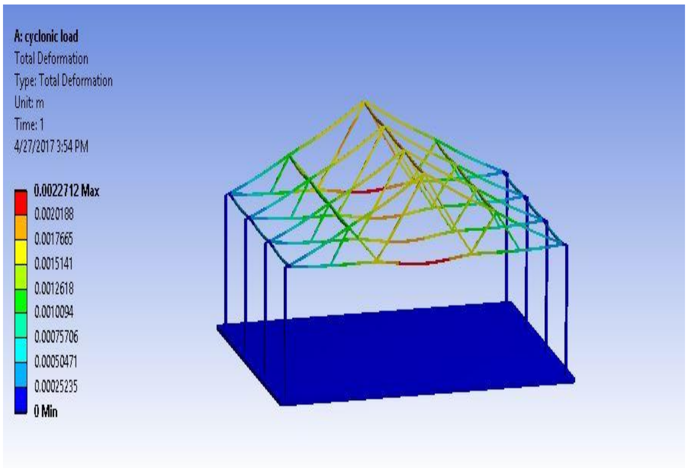

Fig.6.Deformation Of Truss

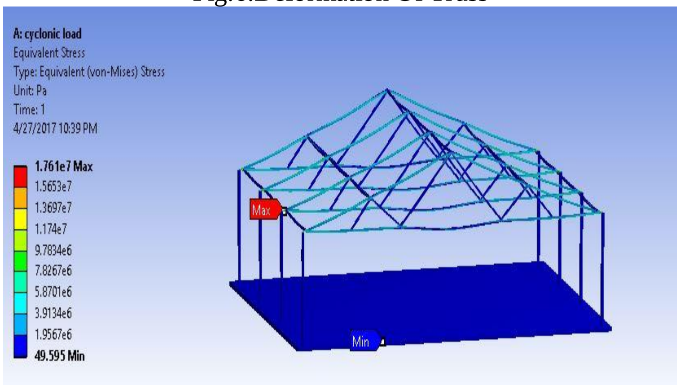

Fig.7.Equivalent stress of truss

Second case of circular section of 12m along X axis 9m along Y axis and 5m along Z axis .The wind pressure is same as above . The roof of circular truss modled in catia imported in ANSYS workbench are shown below .

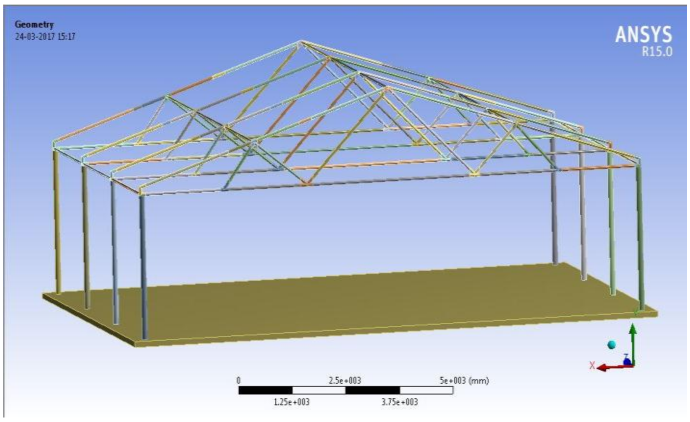

Fig.7.Double Cantilever Truss

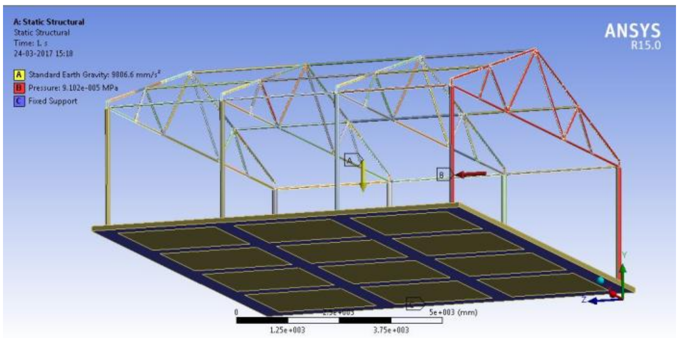

Fig.8. Boundary Condtions

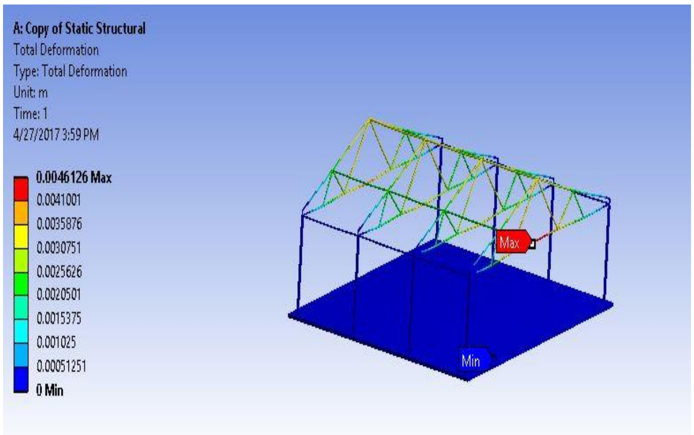

Fig.6.Deformation Of Truss

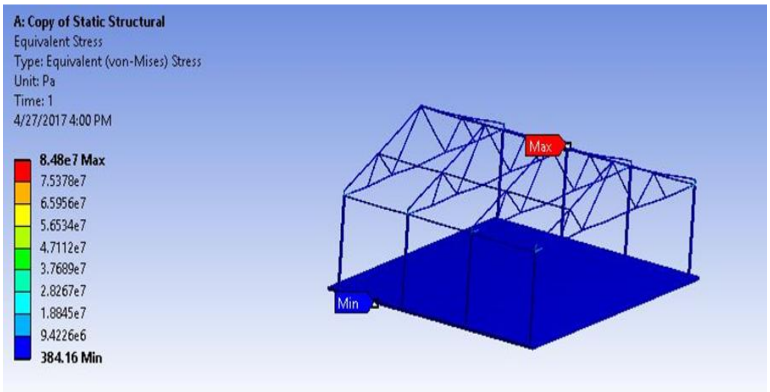

Fig.8. Equivalent stress of truss

Table 1

Double Cantilever Truss			
Shape	Deformation (mm)	Stress (Mpa)	Strain
Square section	2.27	17.61	0.000117
Circular section	4.612	84.8	0.00039

V. CONCLUSIONS

While comparing the results of various shapes the double cantilever truss of square section have less deformation .

These methods should help engineers and contractors resolve the disputes arising from damages caused by a wind loads. If the structures are considered nearby coastal areas, the cyclonic effect over the structures is common. However, since the wind profile varies with the terrain exposure, adjustment of terrain transition needs to be taken into account. So the study will be helping for a better roofing structure.

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