"COMPARATIVE STUDY OF TRUSSES USING STAAD PRO AND ETABS SOFTWARE"

[1]Mohd Azaz, [2]Abhay Walke, [3]Mohd. Samir Ansari, [4]Ashraf Ansari, [5]Zishan Ali Khan
[1]Assistant Professor, [2,3,4&5] Undergraduate Students
[1]Civil Engineering Department,
[1]Anjuman College Of Engineering And Technology, Nagpur, INDIA

Abstract: Steel industry is rising rapidly in almost all the parts of the world. The use of steel structure is not only economical but also Eco friendly at the time when there is a threat of global warming. Steel roof trusses have a broad range of applications in construction industry owing to their various rewards involving of good load transfer mechanism without negotiating with the structural appearance. Steel is usually considered over any other building material for construction of trusses, since structural steel is durable and can be well molded to give desired shape to the structure. The construction in the present era is becoming challenging day by day in order to achieve more efficiency. The requirement of this study arises when sometimes it becomes difficult to choose an effective software for the truss during the design period. In the present study, analytical results of three different steel truss models are compared using STAAD-Pro software and ETABS software. Comparison of different parameters has been made in the form of graphical representation. The present paper shows the comparative graphs of displacement and axial force against loading (calculated as per SP 38) of all the three models. The results are compared to obtain the best and most efficient truss analyses software.

Keywords: Structural steel, Truss, STAAD-pro, ETABS, Displacement, Axial force.

I. INTRODUCTION

Trusses are generally classified under the following statement:
1. Perfect Trusses (m= 2j-3).
2. Deficient Trusses (m< 2j-3).
3. Redundant Trusses (m>2j-3).
Where, m = members, j =joints

Truss are one of the most commonly accepted structural design, many time being utilized as the structural solution of choice of bridges, roof, cranes, aircraft etc. Steel roof truss is one of structural engineering's most significant and problematic structure. In structural and architectural engineering, a truss is basically a triangulated coordination consist of straight interconnected structural elements. Truss can distribute a single point of weight over a wider area due to their geometry and rigidity. The members transfer equal counteracting tensile and compressive forces. Truss is a structure of assembled bars, commonly arranged in a triangular shape having two side lateral elements and bottom horizontal chord. Normally, the horizontal sides are under compression and bottom chord under tension during the service life of the truss structure. The interior members termed as webs or webbings are joined to form a simple system of triangles generating equilibrium of forces within the truss system. This is because triangle is a characteristically stable and rigid structure in itself. When pinned/connected at the nodes, truss is capable of taking sufficient load and transfer it to the supports below.

STAAD- PRO

In the present paper, STAAD-Pro software is adopted for analysis of truss models. STAAD-Pro is a structural analysis and design computer program which was originally developed by Research Engineers International at Yorba Linda, CA in 1997. STAAD- Pro is one of the most widely used structural analysis and design software. It has great advantages being a user friendly software. This is professional's first choice for model generation, analysis, visualization and result verification. In addition, it gives necessary warnings for structural improvement. Owing to its various advantages, the software is used for present paper work.

ETABS

ETABS stands for Extended Three dimensional Analysis of Building System which is a design oriented software program specially built for the analysis of multistory building. In this paper, etabs software has been adopted to determine its efficiency in analyzing a truss model as it is a building software. This software could more thoroughly detail, analyze and design the individual level of model. In addition it gives necessary warnings, iterations and conclusions owing to the load cases of model. This software has advantage over reiteration by providing sufficient properties to the failed members.

II. OBJECTIVES

The objectives of study are:

1. To study the behavior of each truss model under given loading conditions using staad-pro and e-tabs.
2. Comparing strength parameters which are axial force and displacement of truss models under provided loading.
3. Graphical representation of axial force and displacement of three models.
4. Selection of the best analyses software for truss among staad pro e-tabs.
5. The results are compared to obtain optimum and most efficient truss model.

III. MODEL STUDIES

A building of plan size 12m*36m was selected for study. Three properly configured truss models were selected to be compared Rise (h), slope angle (Ө) and spacing between intermediate trusses were kept same for each model to establish similarity in analysis. Loading on each truss was calculated with reference to SP 38, IS 875 part 2.

IV. SELECTED MODELS

Loading Details In Staad Pro Software

MODEL 1

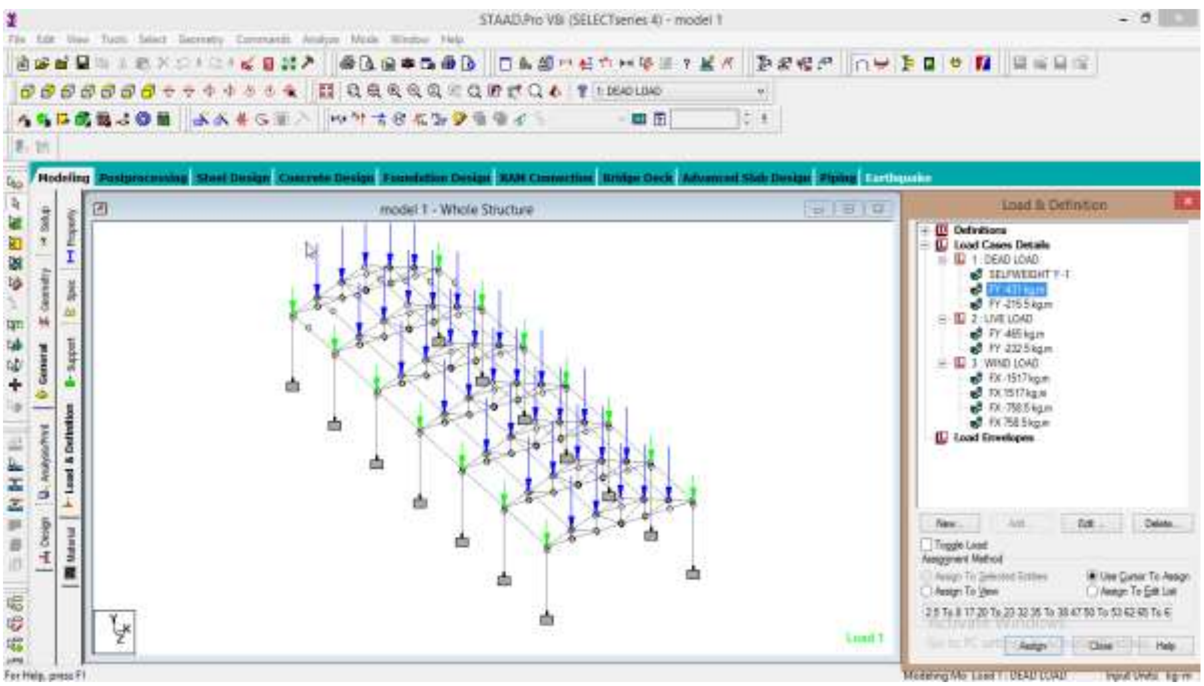


Fig No. 1 shows loading details of model no.1

MODEL 2

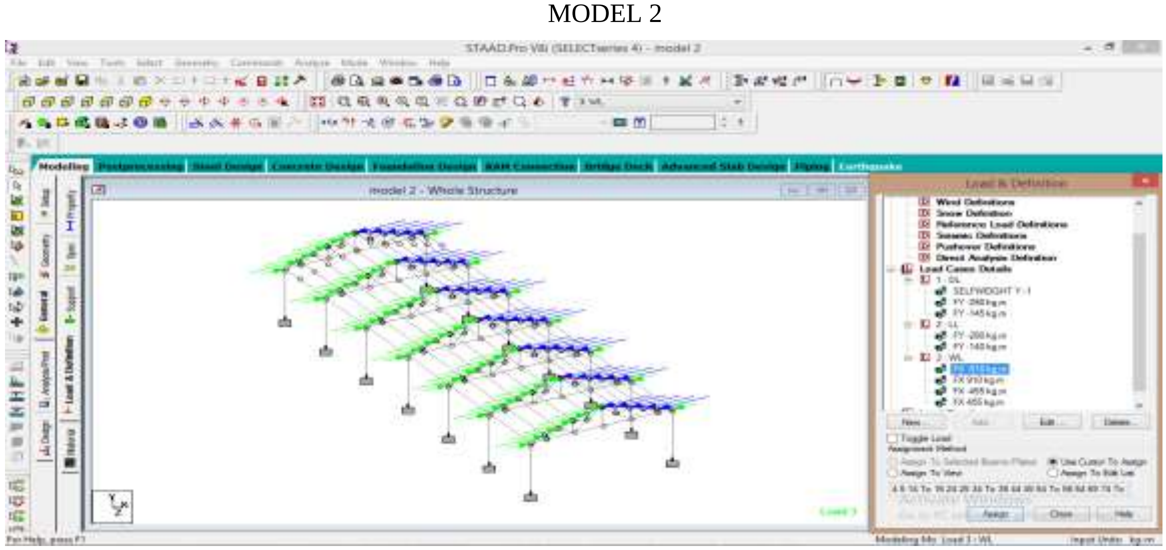


Fig No.2 shows loading details of model no.2

MODEL 3

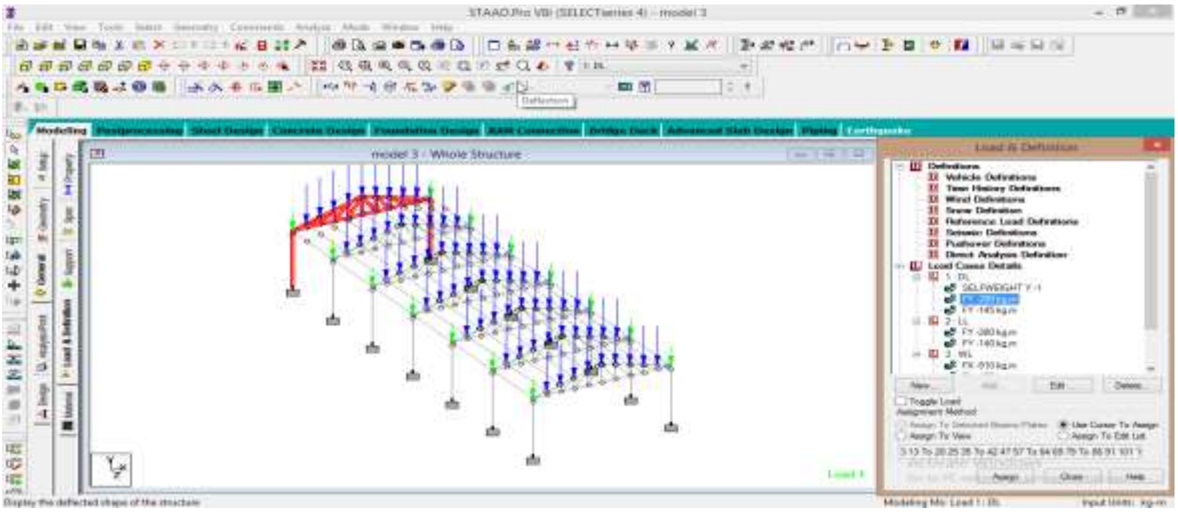


Fig No. 3 shows loading details of model no. 3

Loading Details In E-Tabs Software.

Model 1

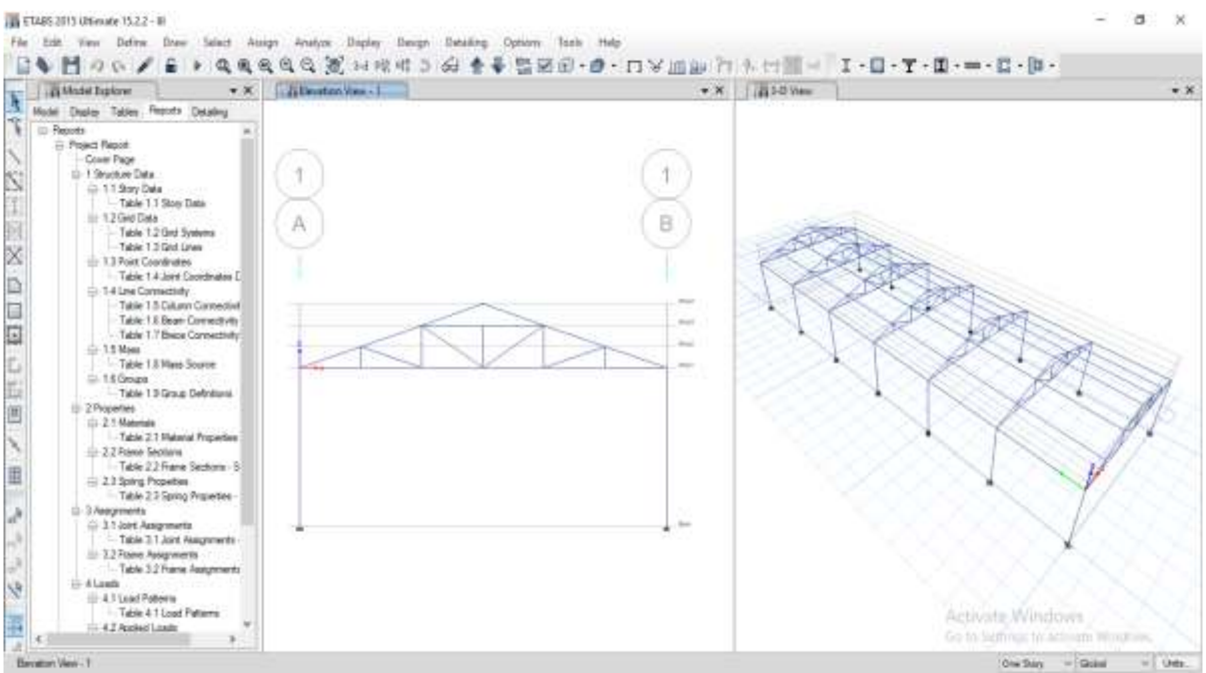


Fig No. 4 shows loading details of model no.1

MODEL 2

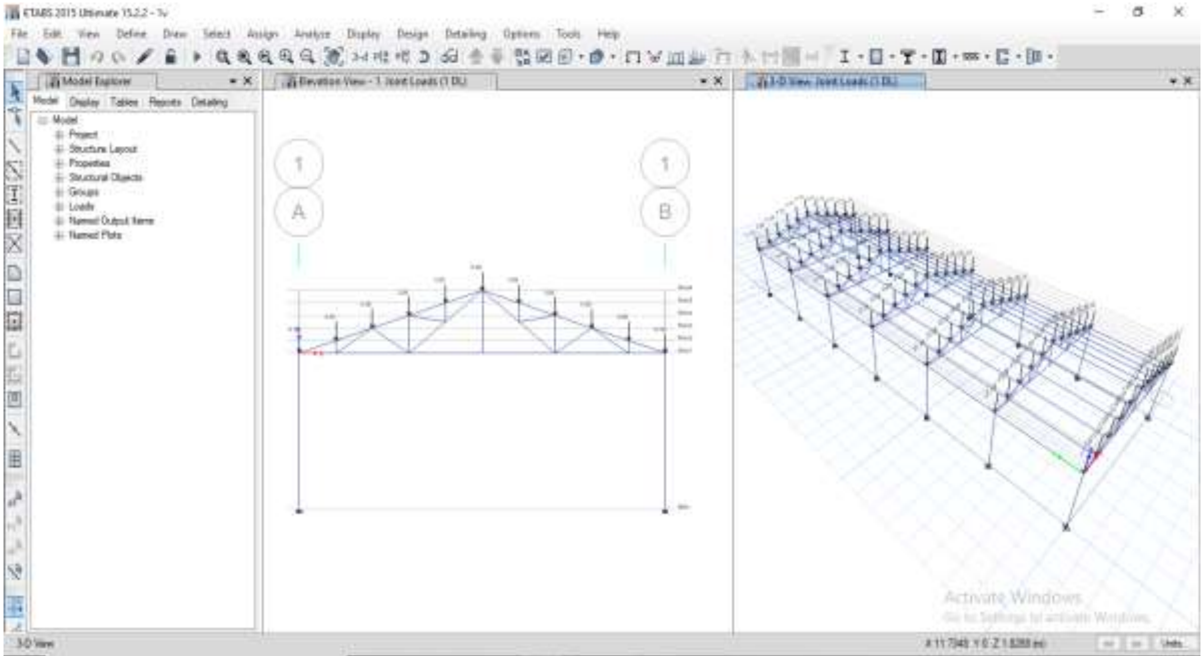


Fig No. 5 shows loading details of model no.2

MODEL 3

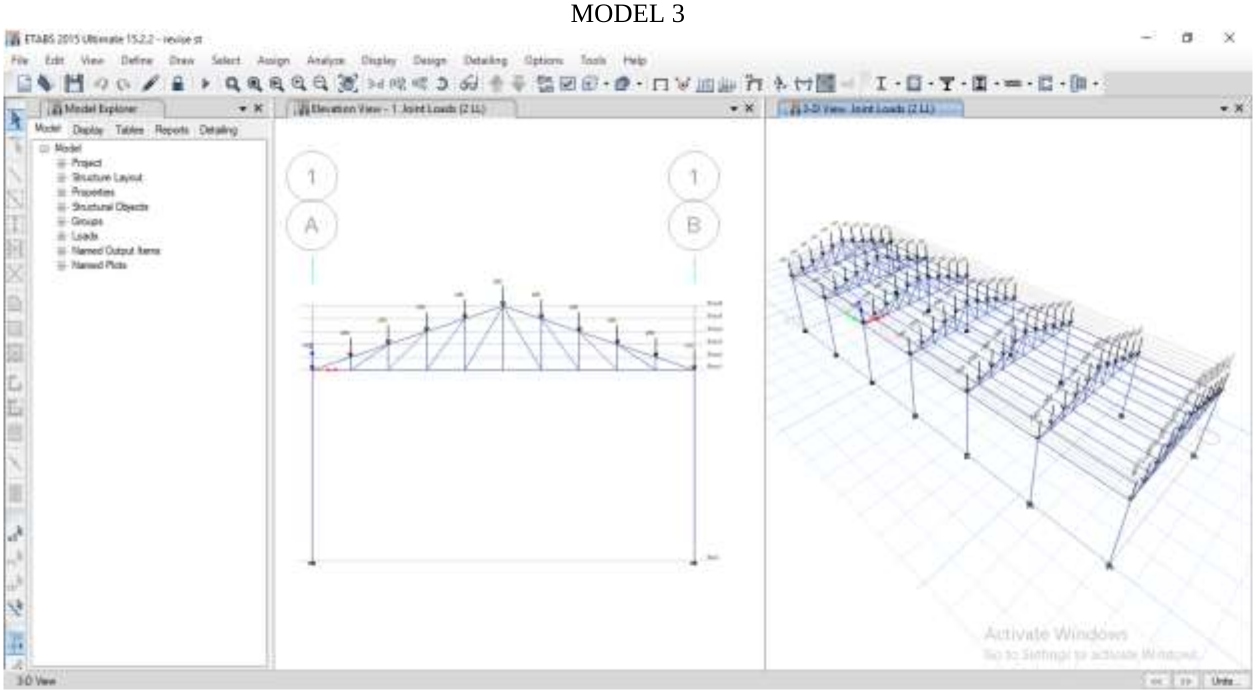


Fig No. 6 shows loading details of model no.3

V. RESULTS

In the present paper, comparison of analytical results of the selected models is done using staad pro and e-tabs software. For better understanding, the most critical nodes are selected to be compared. Comparison of different strength parameters such as axial force, deflection of the selected members is done. At the end of paper the best truss analysis software can be established.

Members In Which Comparision Is Done

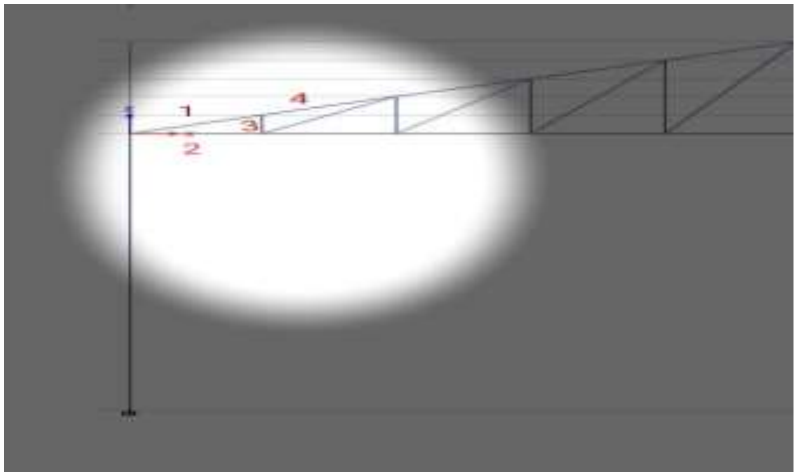
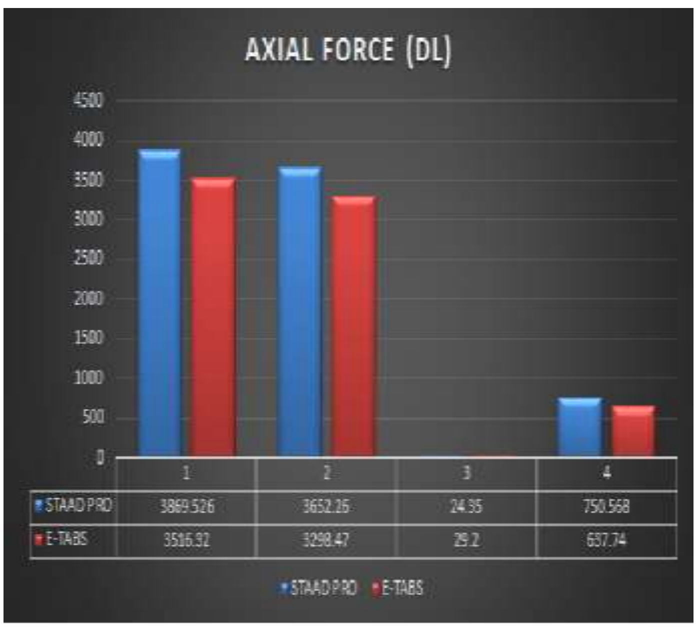
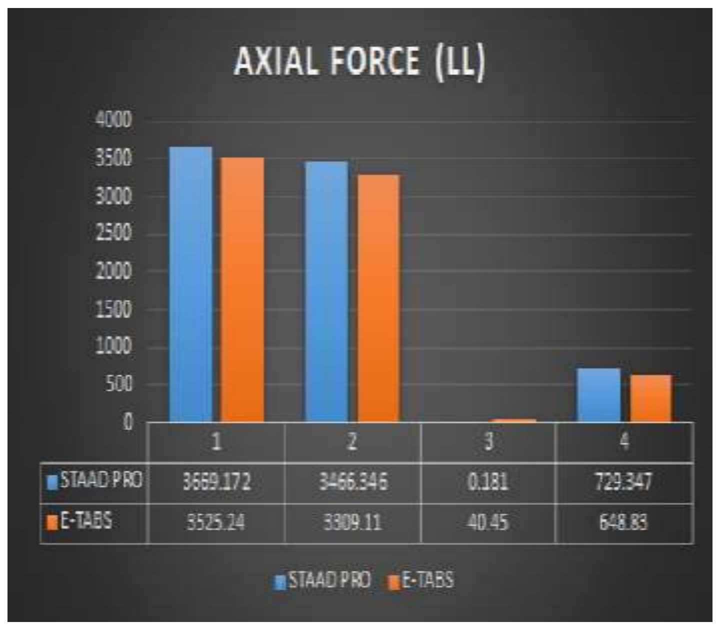


Fig 7 Selected members for comparisons of axial force and deflection.

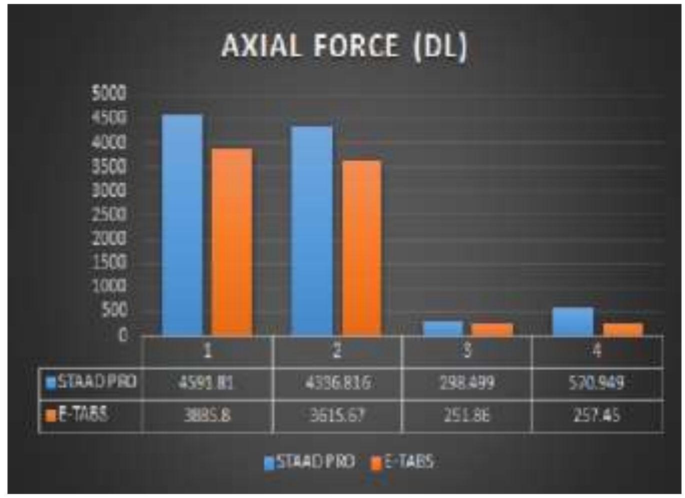


Graph 1 represents axial force (dl) in selected members of models 1. (All values are in kg)

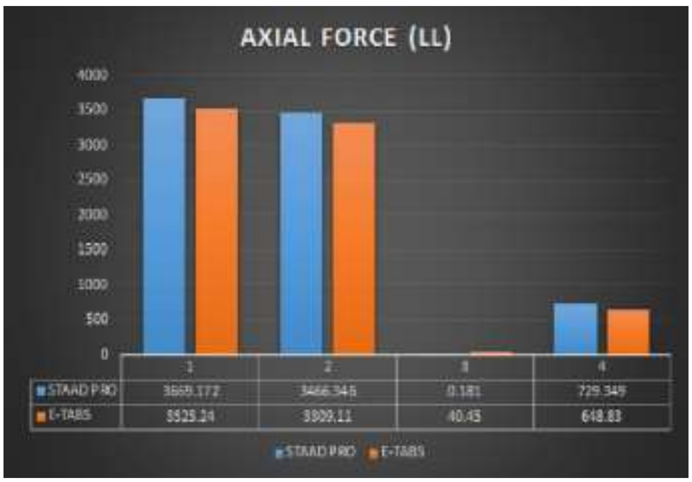


Graph 2 represents axial force (ll) in selected members of models 1. (All values are in kg).

Graph 3 represents axial force (wl) in selected members of models 1. (All values are in kg).



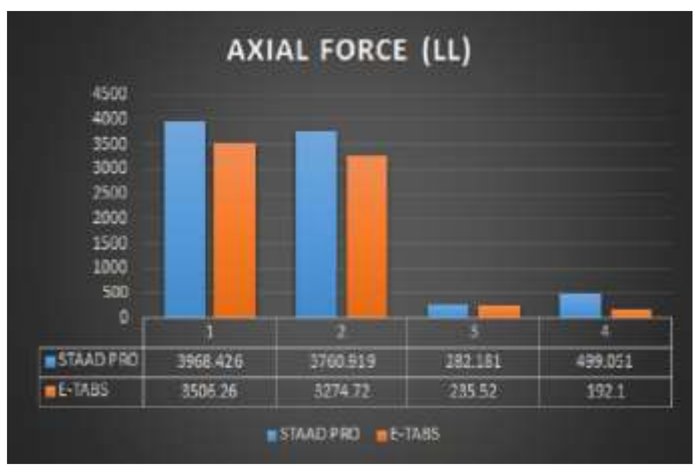
Graph 4 represents axial force (dl) in selected members of model 2. (All values are in kg).



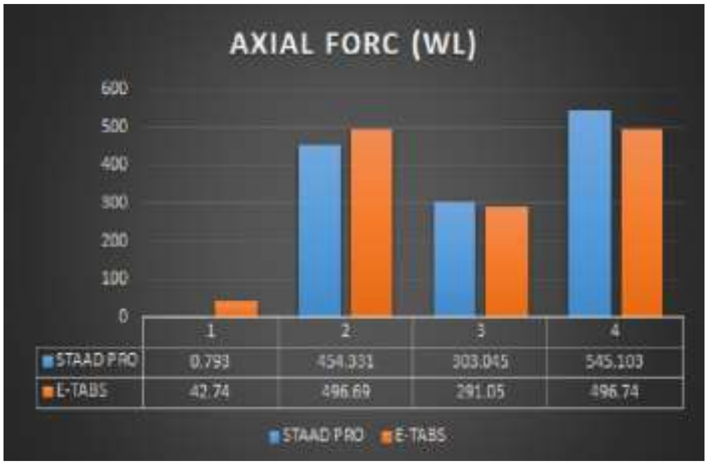
Graph 5 represents axial force (ll) in selected members of models 2.(All values are in kg).

Graph 6 represents axial force (wl) in selected members of models 2. (All values are in kg).

Graph 7 represents axial force (dl) in selected members of models 3.(All values are in kg).

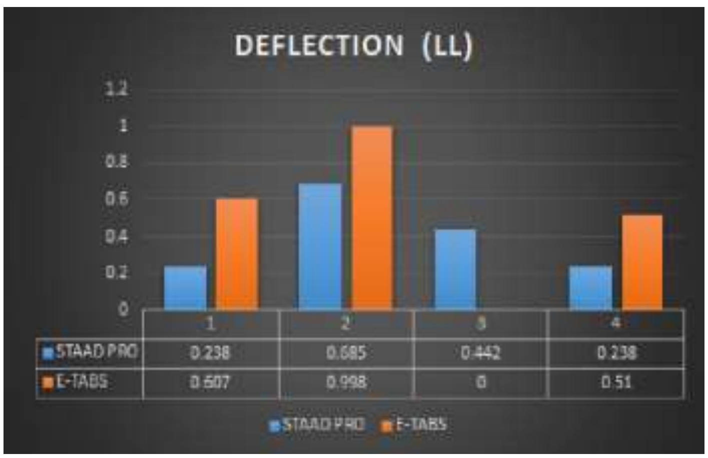


Graph 8 represents axial force (ll) in selected members of models 3.(All values are in kg).



Graph 9 represents axial force (wl) in selected members of models 3.(All values are in kg).

Graph 10 represents deflection (dl) in selected members of models 1.(All values are in mm).



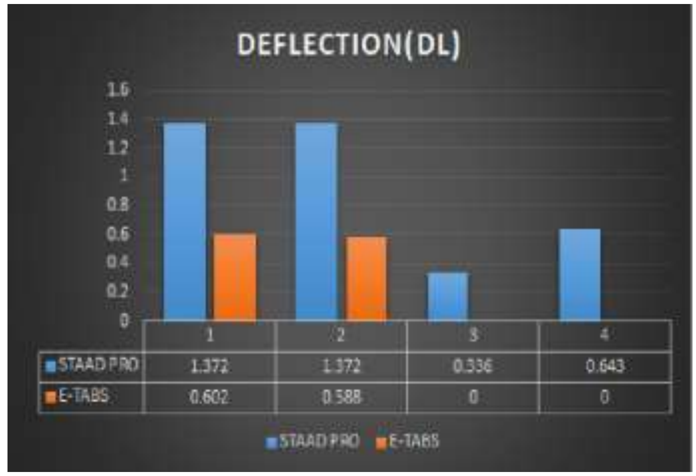
Graph 11 represents deflection (ll) in selected members of models 1.(All values are in mm).

Graph 12 represents deflection (wl) in selected members of models 1.(All values are in mm).

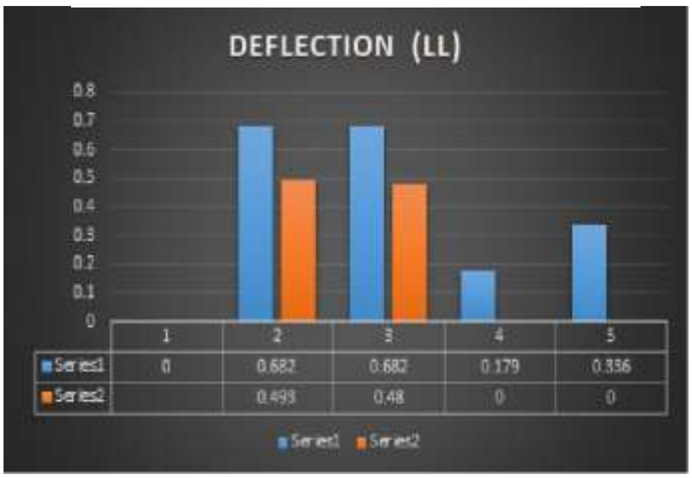
Graph 13 represents deflection (dl) in selected members of models 2.(All values are in mm).

Graph 14 represents deflection (ll) in selected members of models 2.(All values are in mm).

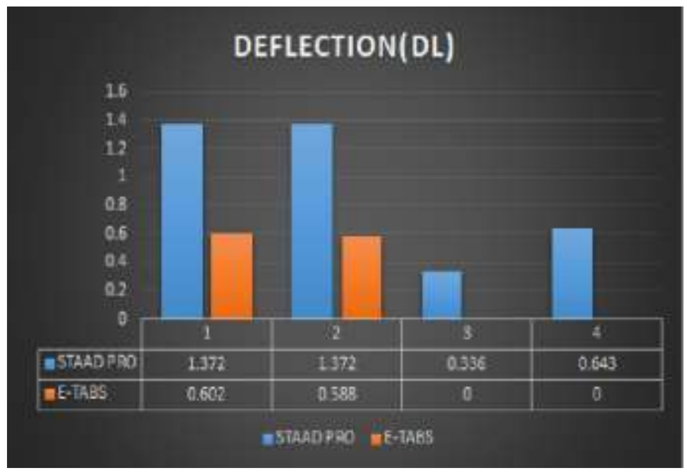
Graph 15 represents deflection (wl) in selected members of models 2.(All values are in mm).



Graph 16 represents deflection (dl) in selected members of models 3.(All values are in mm).



Graph 17 represents deflection (ll) in selected members of models 3.(All values are in mm).



Graph 18 represents deflection (dl) in selected members of models 3.(All values are in mm).

VI. CONCLUSION

1. From the above results we can conclude that axial forces in staad - pro are more as compared to e-tabs.
2. From the above results we can conclude that deflection in staad-pro are more as compared in e-tabs.
3. From the above result we can conclude that e-tabs is more economic software than staad-pro as less axial forces required less angle sections .
4. Overall we can conclude that from e-tabs point of view model no 1 is more economic and efficient as compared to rest of the models.

VII. ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of our project. All that we have done is only due to such supervision and we would not forget to thank them.
We owe our deep gratitude to our project guide Prof. Mohd. Azaz, who took keen interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system.
We would not forget to remember our HOD of Civil Dept. Prof Amir Hussain for his encouragement and more over for the timely support and guidance till the completion of our project work.

We are thankful and fortunate enough to get constant encouragement, support and guidance from all Teaching staff of department which helped us in successfully completing our project work. Also, we would like to extend our sincere esteems to all staff in laboratory for their timely support.

REFERENCES

[1] SP 38: Handbook of Typified Designs for structures with Steel Roof Trusses (with and without cranes)(Based on IS Codes)
[2] IS 875 (Part 2) 1987: Code of practice for Design Loads (other than earthquake) for buildings and structures. Part 2 Imposed Loads (Second revision)
[3] Design of steel structures by L.S. Negi.
[4] Design of steel structures by Dr .B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain.
[5] Limit State Design of steel structures by Duggal.