

Differences of Forces and Behavior of Roof Truss Member on the Placement of Pints and Roller-Joints

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Abstract

Planning Truss rafter-shaped curves that support the placement of pints and roller-joints will affect the magnitude of the member forces and behavior of each member. In this paper, to find the magnitude of the member forces in each type of placement is to use the SAP 2000 V15 auxiliary program. The implementation procedure of this research is to collect data on each type of placement with the same load, so that the results of the member forces can be used as a reference for analysis. From the analysis and data processing, it can be concluded that for the placement of the roller-joints with right angle dimensions 2x60.60.6 and 2x50.50.5 do not meet the requirements, it is necessary to change the dimensions to 2x80.80.8, 2x70.70.7, 2x60.60.6 and 2x50.50.5. The placement of pints with 2x60.60.6 and 2x50.50.5 in right angle dimensions meet the requirements. But on the implementation, need to be mounted support beam between the trusses, caused at the bottom of the member, there is a compressive press force that resulted in the Kip, while the top side of the kip has been retained by rafter. For truss with roller-joint placement, no need to add the support beam because the tensile force occurs on the bottom.

Keywords: Placements, Member Forces, Right angle Profile Dimensions.

I. INTRODUCTION

A. Background: In planning the truss with the assumption of the placement of the pints and the roller-joints, the results of the member forces analysis will be different. So it affects the dimensions of the truss member plan and the detail of the truss support (Column or Beam). Besides that the behavior of the member of the truss will be different. Of course in some planning the truss, we have to determine when to use the placement of the pints and when to use the placement of the roller-joints.

B. Objective: To produce an efficient truss structure, then try with several different models and placements. From several different models and placements, each will notice the difference between the member forces and the behavior of the member obtained. So it will be easier to determine the model design and profile dimensions as well as matching placement details.

C. Limitation of Problems

The research was conducted on the basis of limitations:

- a. Calculations of truss with right angle profiles
- b. Quality of material BJ 37
- c. The load used is the gravity load
- d. Placement prop on beams or columns of reinforced concrete.

II. METHODS

A. Sources of Data

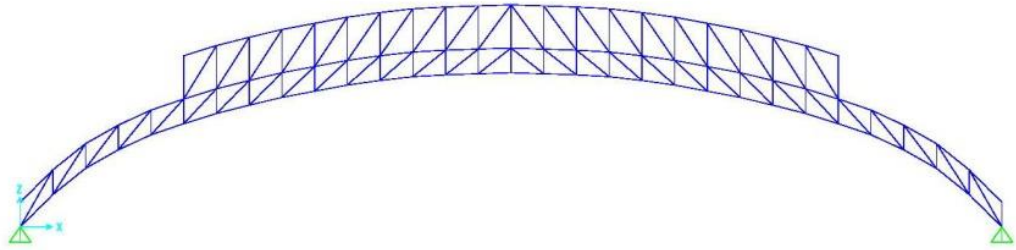
The data obtained from the development planning activities of IAIN AL-FATAH Jayapura Lecture Building with size 30 m x 60 m using right angle-truss construction and reinforced concrete structure calculated with the help of SAP 2000 V15 auxiliary program, can be categorized as follows:

- a. By its nature is qualitative data
- b. According to the source of retrieval is primary data.

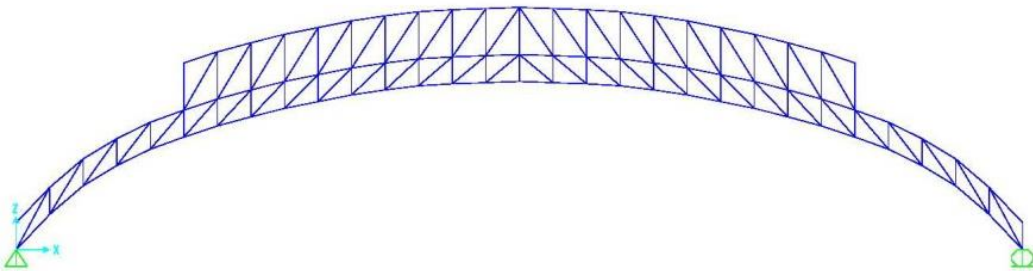
III. RESULTS

After data collection was done thoroughly, the data was arranged in tabulation and then analyzed.

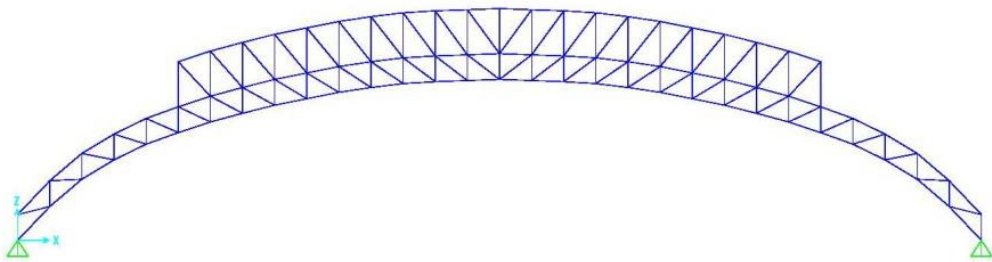
1. Identification of Structure of rafter:
 - a. Span of rafter 30.00 m, distance between columns 5.00 m
 - b. Right angle Dimensions 2x50.50.5, 2x60.60.6, 2x70.70.7 and 2x80.80.8
 - c. Placement of truss on a 50/60 concrete column
 - d. Rafter using C.150.65.20.2,3
 - e. Roof using galvalume
2. Placement and Structure Models of the Truss :
 - a. Type 1 Pints



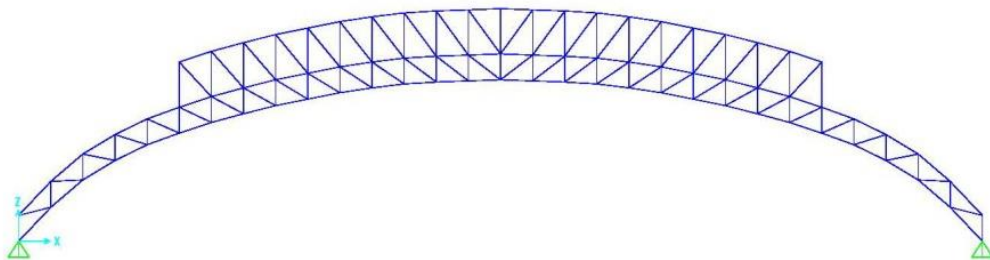
b. Type 2 Roller-joints



c. Type 3 Pints



d. Type 4 Roller-joints



3. Calculation result due to gravity load

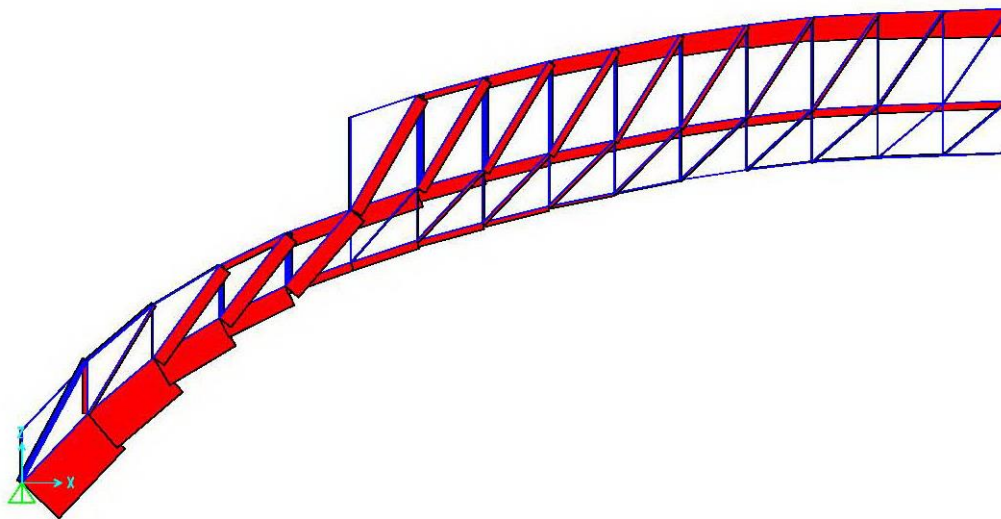
Table 1. result due to gravity load

Type of Rafter	Member Percentage	Maximum Member forces (kg)
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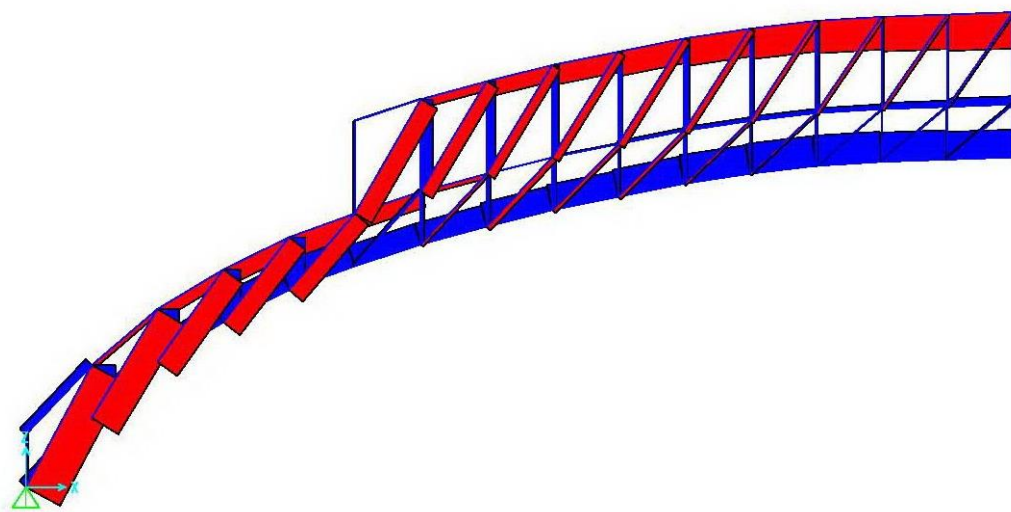
	Tensile	Press	Tensile	Press	Dimension Profile required	Deflexion of vertical direction (mm)
Type 1	22.83	77.17	1243	8663	60.60.6 50.50.5	9.76
Type 2	52.17	47.83	6575	8412	80.80.8 70.70.7 60.60.6 50.50.5	37.41
Type 3	30.43	69.57	2133	7940	60.60.6 50.50.5	11.16
Type 4	50	50	5720	7164	80.80.8 70.70.7 60.60.6 50.50.5	32.41

4. Member Forces :

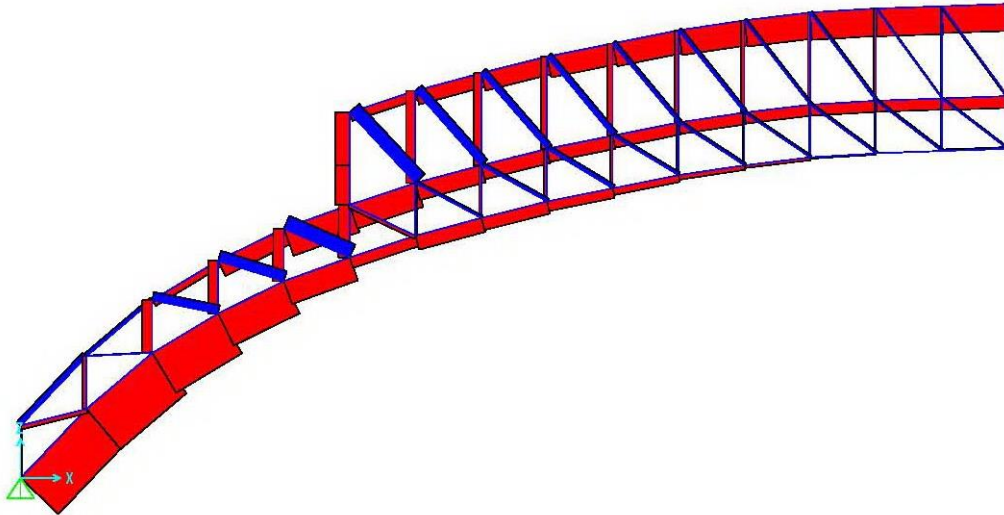
a. Truss type 1.



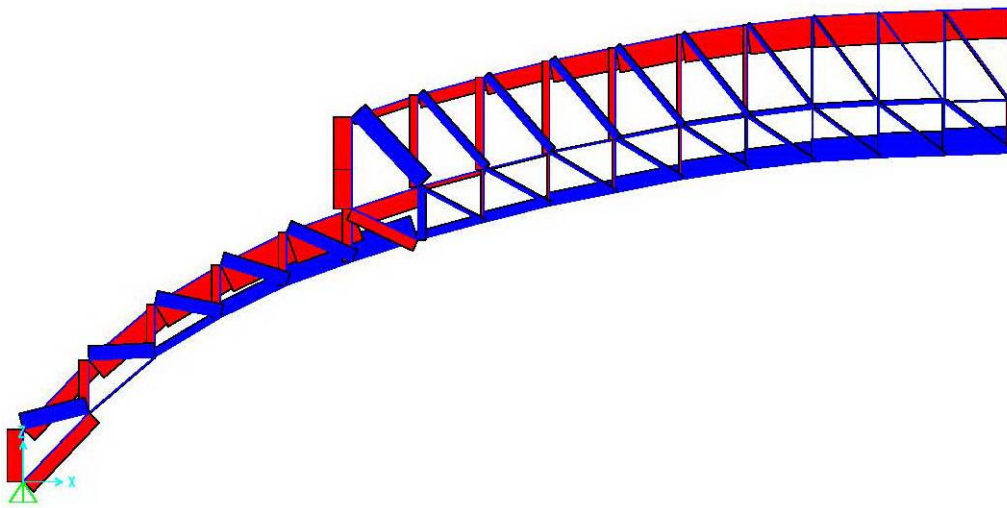
b. Truss type 2.



c. Truss type 3



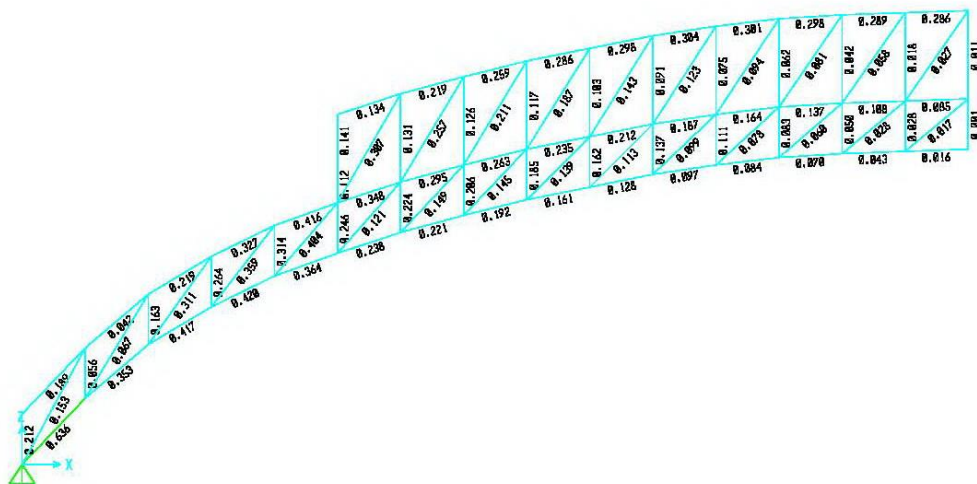
d. Truss type 4



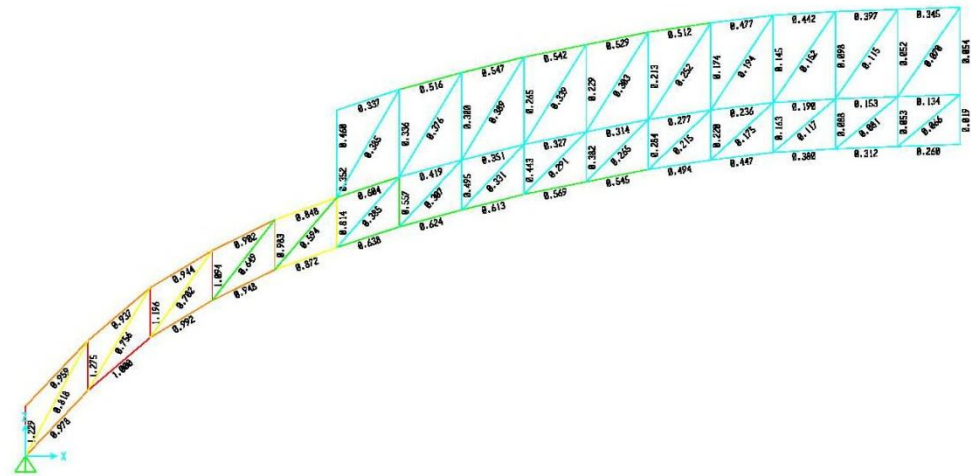
Description : Red → Press member
 Blue → Tensile member

5. Deman / Capacity Ratio

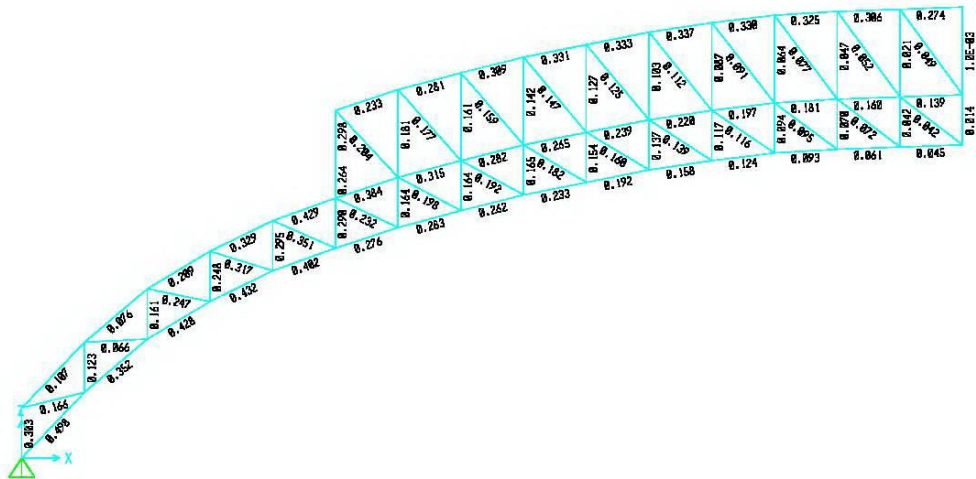
a. Truss type 1.



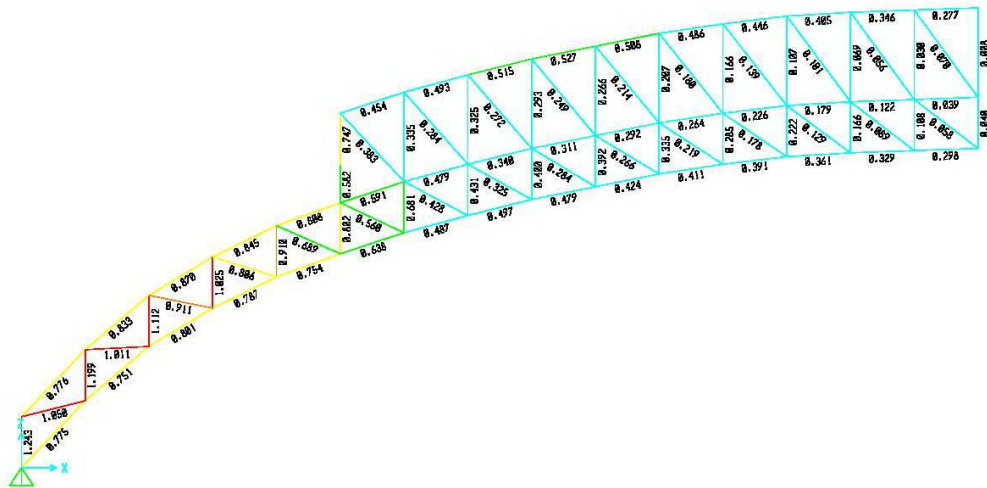
b. Truss type 2.



c. Truss type 3



d. Truss type 4



Deman / Capacity Ratio Limit = 0.95 (SAP 2000.V15 Calculation)

IV. DISCUSSION

From the evaluation results can be controlled to the stability of the truss as follows:

1. Truss Type 1:

- a. The required right angle profile dimensions are 2x60.60.6 and 2x50.50.5.
- b. Comparison of the press and tensile member : more press member located on the bottom and the top side, to resist the kip forces on the upper side held by the rafter while the lower side needs to be added support beam to withstand the Kip force.
- c. Maximum press member force = 8663 kg is larger than the other three types
- d. The vertical deflection at the center of the span = 9.76 mm is smallest against the other three types.

2. Truss Type 2:

- a. The required right angle profile dimensions are 2x80.80.8, 2x70.70.7, 2x60.60.6 and 2x50.50.5.
- b. Comparison of the press and tensile member : more tensile member, the press member is located on the top side, to hold the Kip already held by the rafter, while the lower side does not require support beam.
- c. Maximum press member force = 8412 kg is smaller than type 1, but larger than type 3 and type 4.
- d. The vertical deflection at the center of the span = 37.41 mm, greater than the other three types.

3. Truss Type 3:

- a. The required right angle profile dimensions are 2x60.60.6 and 2x50.50.5.
- b. Comparison of the press and tensile member : more press member located on the bottom and the top side, to resist the kip force on the upper side held by the rafter while the lower side of the member needs to be added support beam to withstand the Kip force.
- c. Maximum press member force = 7940 kg is smaller than type 1 and type 2 but larger than type 4.
- d. The vertical deflection at the center of the span = 11.16 mm is larger than type 1, but smaller than type 2 and type 4.

4. Truss Type 4:

- a. The required right angle profile dimensions are 2x80.80.8, 2x70.70.7, 2x60.60.6 and 2x50.50.5.
- b. The ratio of the press and tensile member is the same, the press member is located on the top side, to hold the Kip already held by the rafter, while the lower side does not require support beam.
- c. The maximum press member force = 7164 kg is smaller than the other three types.
- d. The vertical deflection at the center of the span = 32.41 mm, greater than type 1 and type 3, but smaller than type 2.

V. CONCLUSION

The results of the above analysis can be concluded :

- a. Material requirements for the truss of type 1 and type 3 need less main material than the truss of type 2 and type 4.

- b. Prop of truss type 1 and type 3 must be calculated against horizontal force, whereas truss of type 2 and type 4 do not occur horizontal force.
- c. For the stability of laying the pints required a larger anchor than the placement of the roller-joints.

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