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"Camparision Between Design And Analysis Of Various Configuration Of Industrial Sheds"

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ABSTRACT

Paper includes the comparison between various configurations of industrial shed. There are various types of industrial sheds. But here we compare the various configurations of industrial sheds, such as hot rolled steel shed such as shed using Howe truss, A-type, portal truss etc. This paper will gives us the suitable configuration of industrial shed by making and comparing design and analysis of various configurations of industrial sheds. Design of industrial shed, by using STAAD-Pro 2007 which gives results very quickly and accurately. This paper work compares the design of various configuration of industrial shed and concluded that which is suitable & economical in all views. The comparison gives us suitable configuration which suitable strength point of view.

Keywords – A- type truss, portal frame, Saw tooth type truss, STAAD-Pro 2007

1. INTRODUCTION

Comparison between various configurations of industrial shed using various types of truss type which gives us that which shed is suitable for the industrial shed and which is more effective in strength and economical point of view. Design of various types of industrial frame by using STAAD-Pro 2007 software which gives us there total design and suitability. A truss is essentially a triangulated system of (usually) straight interconnected structural elements; it is sometimes referred to as an open web girder. The individual elements are connected at nodes; the connections are often assumed to be nominally pinned. The external forces applied to the system and the reactions at the supports are generally applied at the nodes. When all the members and applied forces are in a same plane, the system is a plane or 2D truss. In a typical single-storey industrial building, trusses are very widely used to serve two main functions:

- To carry the roof load:
  - Gravity loads (self-weight, roofing and equipment, either on the roof or hung to the structure, snow loads)
  - Actions due to the wind (including uplift due to negative pressure).
- To provide horizontal stability:
  - Wind girders at roof level, or at intermediate levels if required
  - Vertical bracing in the side walls and/or in the gables.

In this paper we will design tree types of industrial shed using three types of truss which is portal frame type, A-type and saw tooth type by using STAAD-Pro which gives us steel required and strength and economy of different sheds. And then we compare all the results given by software of all three types and finally we got which type is suitable one.

2. GEOMETRY OF SHED

As research based on Industrial Shed, the Model of shed is (216*60*13.7) meter.

- Geometry of model : column height is 13.7m, rise is 60*10/100=6m, purlin spacing = 1.7m
- Tie beam is at 7 m from bottom. At bottom there are RCC beam of (1*0.6) m.
- Column of ISMB600, Tie beam of ISMB500, Purlin of ISMC300.

3. LOADING CALCULATION

Loading calculation for all configurations of Industrial sheds is as follow-

3.1 Dead load (As per IS 875 Part –I)

i. Self weight of structure- Given by STAAD

ii. Self weight of A.C. sheet = 0.138 KN/m²

= 0.138*1.7

= 0.23 KN/m

(As per IS 875-I Table no 9)

3.2 Live Load(As per IS-875 Part –II)

i. On pitch roof = 0.75 KN/m².

As per IS 875-II net live load

= 0.75- 0.02 (ø-10)

= 0.75 – 0.02 (11.3-10)

=0.724 KN/m²

Live Load on purlin = 0.724 * 1.7

= 1.23 KN/m

3.3 Wind Load (As per IS 875-III)

Basic wind speed = 44 m/s

Design wind speed (Vz) = Vb*k1*K2*k3

= 44*1*1.09*1
= 47.96 m/s

Design wind pressure (Pz) = 0.6*Vz²
= 0.6*47.96²
= 1380 N/m²
= 1.38 KN/m²

3.3.1 Calculation for internal and external wind coefficient:-

Cpe = External wind coefficient
Cpi = Internal wind coefficient
Pz = Design wind pressure

For wall:-

Cpe = +0.7
Cpi = +/-0.2
Wind force = (Cpe+/-Cpi) Pz
= (0.7-0.2) * 1.38
= 0.69 KN/m²
Wind force = (0.7+0.2) * 1.38
= 1.242 KN/m²
Spacing of portal frame = 6m
Wind force (F) = 1.242 * 6
= 7.452 KN/m

For roof:-

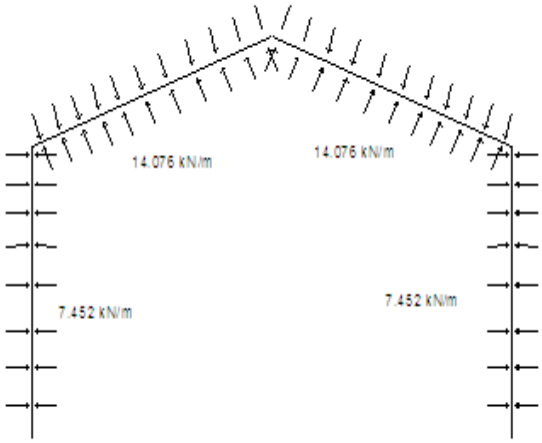
Cpe = -1.2
Cpi = +/-0.5
Wind force = (-1.2-0.5)*1.38
= -2.346 KN/m²

Wind force = (-1.2+0.5)*1.38
= -0.966 KN/m²
Wind force (F) = -2.346*6
= -14.076 KN/m

For purlin wind force = -14.076*1.7
= -23.93 KN

3.4 Analysis for Load Combinations-

- Dead load+live Load
- Dead load +Wind load
- Dead Load+0.25 Live Load

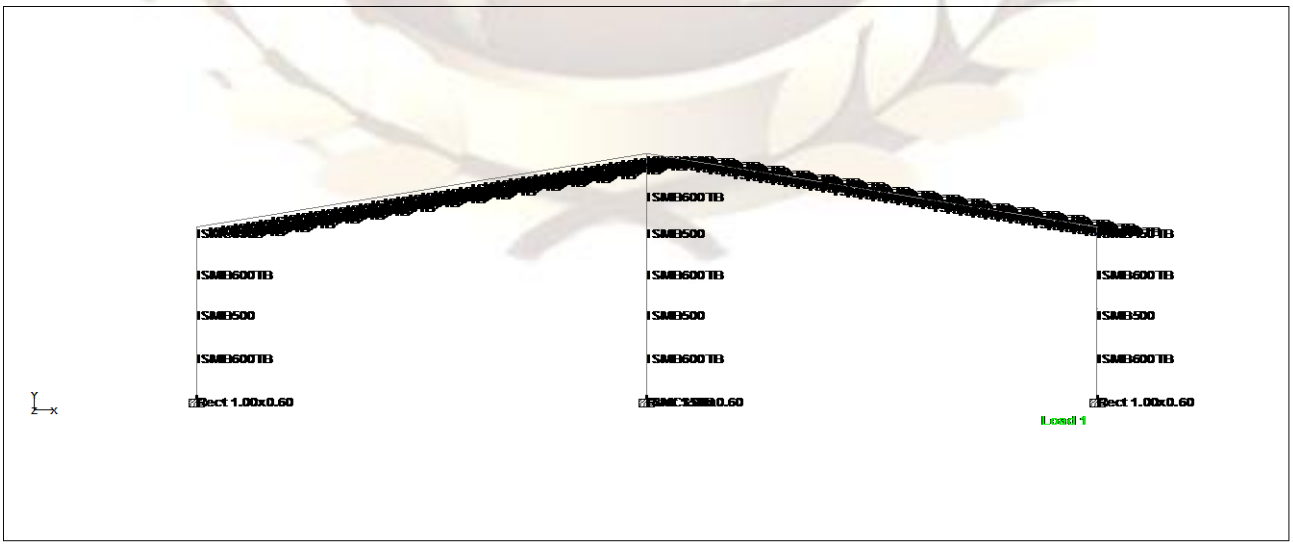


3. DESIGN AND ANALYSIS OF VARIOUS CONFIGURATION OF INDUSTRAIAL SHED

3.1 Portal frame type industrial shed-

After designing above portal frame in STAAD-Pro we use different sections for different parts of the frame for making the frame safe and economical. The details of the sections are as- ISMB600 with top & bottom cover plate used for vertical beam. ISMB600 with top cover plate used for middle vertical beam. ISMB300 with top & bottom cover plate used for top chord members. Double channel section i.e. ISMC350 used for purlin. And ISMB500 used for horizontal beams. And total length and weight of each section required along whole frame are tabulated below-

FRONT VIEW



Steel required for portal frame type industrial shed -

PROFILE	LENGTH (METER)	WEIGHT (KN)
TB ISMB600	728.90	2554.434
TB ISMB450	2479.97	18904.274
TB ISMB600	1013.80	10562.033
ST ISMB500	864.00	734.739
D ISMC350	7781.95	6415.69
	TOTAL	39171.170

Finally after calculating steel required for each section used in frame the total steel required for Portal frame type Industrial shed is 3994.3477 Ton3.2 A-type frame industrial shed-

After designing above A-type frame in STAAD-Pro we use different sections for different parts of the frame for making the frame safe and economical. The details of the sections are as- Double channel section i.e. ISMC350 used for purlin. ISMB600 with top & bottom cover plate used for vertical beam. Also ISMB600 used for lower chord member. ISMB400 used for top chord members. Angle section i.e. ISA 130*130*15 used for vertical and diagonal bracings. And ISMB500 used for horizontal beams. And total length and weight of each section required along whole frame are tabulated below

FRONT VIEW

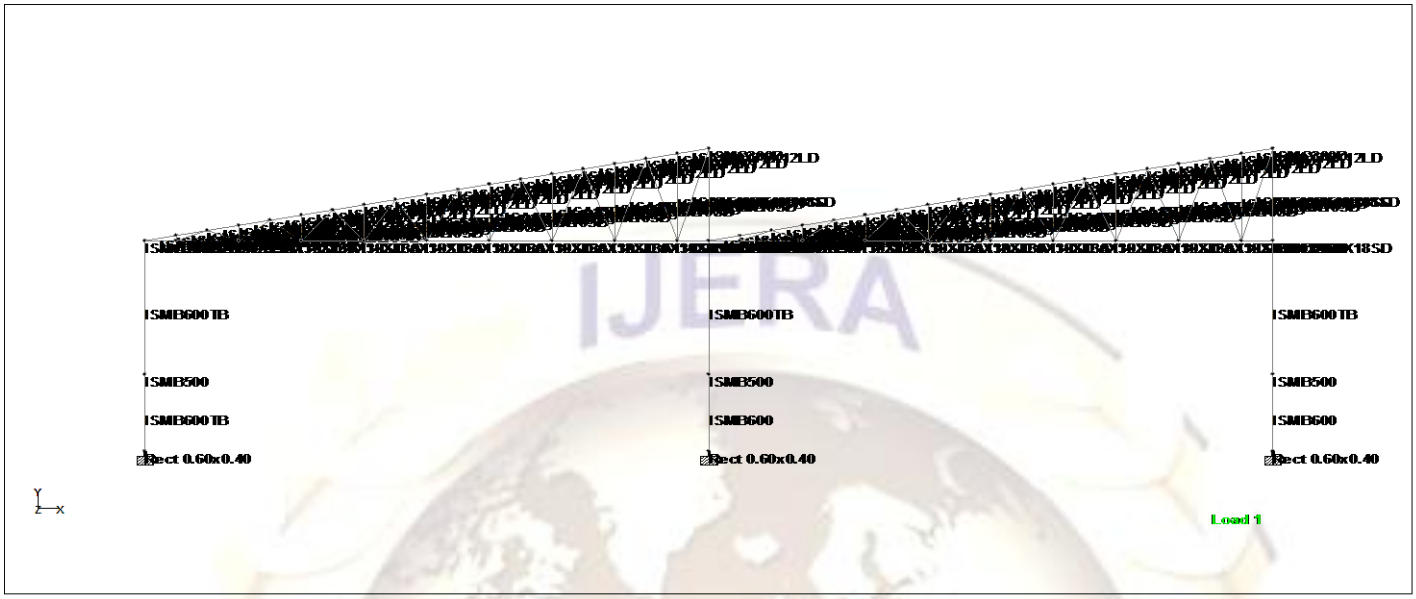
Steel required for A-type frame type industrial shed -

PROFILE	LENGTH (METER)	WEIGHT (KN)
TB ISMB600	259.00	2698.330
TB ISMB500	2220.01	12120.228
TB ISMB400	2263.97	11800.245
LD ISA200X150X12	8021.51	4998.660
TB ISMB600	754.80	6124.202
SD ISA200X200X15	230.80	204.959
ST ISMB500	432.00	367.369
D ISMC300	7991.95	5604.058
	TOTAL	43918.053

Finally after calculating steel required for each section used in frame the total steel required for A-Type Industrial shed is 4407.665 Ton.

3.3 Saw-tooth type industrial shed-

After designing above saw tooth type frame in STAAD-Pro we use different sections for different parts of the frame for making the frame safe and economical. The details of the sections are as-



FRONT VIEW

Steel required for Saw tooth type frame type industrial shed -

PROFILE	LENGTH (METER)	WEIGHT (KN)
TB ISMB600	1119.60	2581.933
SD ISA130X130X8	2351.69	730.572
LD ISA100X75X12	2080.80	625.318
ST ISMB600	360.00	431.971
SD ISA200X200X25	241.02	348.153
SD ISA150X150X18	120.02	93.659
SD ISA130X130X12	1920.37	879.820
LD ISA150X115X8	23.92	7.563
SD ISA150X150X10	4520.50	2016.203
ST ISMB500	630.00	535.747
D ISMC300	8189.95	5742.897
	TOTAL	13993.836

Finally after calculating steel required for each section used in frame the total steel required for Saw tooth- Type Industrial shed is 1426.973 Ton.

4. CONCLUSION

By comparing all above three configurations we shall know that Saw tooth type industrial shed require less steel as compare to other two. That means it is economically good. We also compare Pre-engineered industrial shed with all above three and then go to conclusion which is the best industrial shed economically and strength point of view.

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