ANALYSIS & DESIGN OF INDUSTRIAL BUILDING USING STAAD PRO

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ABSTRACT: Trusses are triangular frame works, consisting of axially loaded members. Span and weight of industrial building play vital role in the planning of entire structure. They are more capable in resisting external loads as the cross sections of all the members. They are largely used for larger spans. Truss members are regarded as being pinned joints. This paper represents the analysis and design of truss for 27.69 m span by limit state method (is 800:2007).the data's are calculated using indian standard code is 875-1975 (part i, ii & iii), is 800 – 2007 using limit state method and the section properties of the specimens are obtained using steel table. Analysis of shed's elements was carried out by software, and calculation load manually with the help of indian standards.

Keywords: truss, STAAD pro v8i, Autocad, is 800 ,limit state method (is 800:2007, is 875-1975 (part i, ii & iii)

INTRODUCTION

Any building structure employed by the business to store raw materials or for producing product of the business is thought as associate degree industrial building. Industrial sheds square measure low rise steel buildings generally used as workshops, factories. Factories used for producing, altering, repairing, cleaning, washing, breaking-up, adapting or processing, generating power. A truss may be a stable configuration obtained by the assembly of long, slender structural elements which are connected with pin joints. Roof truss and portal frame is used to cover and shelter the area of an industrial building. All the members of truss are usually subjected to axial forces. The joints are created as resistance pins however is made either the method of fastening or bolting. This study includes planning of sections taking in consideration of wind load working on the structure. A roof truss may be a structural framework designed to attach the area on top of an area and to produce support for a roof. Trusses usually occur at regular intervals. Roof truss is coupled by longitudinal members like purlins. The space between each truss is known as a bay. Roof truss are designed for dead load, live load, wind load and their combinations as per indian standards code . The primary aim of the present work is to analysis of roof truss of an industrial building using staad.pro software.

OBJECTIVE

- To study the actual industrial building on site and preparing its model and analyze in staad pro.
- Perform wind analysis and develop excel program for wind analysis with manual calculation and verify it using staad pro.
- Provide light weight and high strength structure.
- To get exposure to engineering experience and knowledge required in industry.
- To understand how to apply the engineering knowledge taught in classroom in real industrial situation.

LOAD COMBINATION

For the Truss, combination of Wind , Live and Dead load have to be considered. In this study all the above loads and load combinations as per IS standards are considered.

Dead Load [Ref. IS – 875 PART-1(1987)]:

The dead loads of the truss consist of the weight of roofing elements, purlins, trusses and bracing system.

Live Load [Ref. IS – 875 PART-2(1987)]:

The imposed load on inclined or sloping roofs slopes up to and including 10 degree is to be taken as 0.75kN/m^2 of plan area for roofs with slopes bigger than 10degree, an imposed load 0.75kN/m^2 < 0.02 kN/m^2 for every degree increase in slope over 10 degree, subject to a minimum of 0.4 kN/m^2 is to be taken as increase in roof load.

Wind Load [Ref. IS – 875 PART-3(1987]:

The most vital and crucial load case to be considered is wind load.
The Wind Load can be calculated as

Wind load (F) = (Cpe – Cpi) A Pd

Where,

Cpe = external pressure coefficient,

Cpi = internal pressure coefficient

A = surface area of structural element

Pz = design wind pressure

LOAD CALCULATION

Dead load for G.I sheet of1.61mmTK = 0.15 kN/m^2

Dead load for purlin = 0.092 kN/m^2

Liveload = 0.4 kN/m^2

Above mentioned loads for length of 5.5m (distance between two trussmembers)

D.L = (0.15x5.5 x 1.38) + (0.092 x 5.5 x 1.38) = 0.79 kN

L.L = (0.4x5.5 x 1.38) = 3.04 kN

WIND LOAD CALCULATION

Location = Coimbatore Basic wind speed, Vb = 39m/s

K1 = 0.92

K2 = 1.04

K3 = 1.00

Design wind speed = Vb x K1 x K2 xK3

= 39 x 0.92 x 1.04 x 1.00 = 37.48m/s

Design wind Pressure = 0.6Vz^2

= 0.6x37.48^2 = 0.850kN/m^2

WIND FORCE CALCULATION

F = (Cpe – Cpi) x A x Pz

Internal pressure coefficient = ±0.5

External Pressure Coefficient

H =11.8 m w =23.88 m

Design pressure coefficient for roof

For H/w = 0.49

External pressure coefficient.(Cpe) :[Ref. IS 875 PART-3 1987 P.14,16]

Wind Angle (ɵ)	Table 4		Table 5	
	Coeff. For Wall		Coeff. For Roof	
	Left	Right	Left	Right
0 degree	0.70	-0.20	-0.52	-0.40
90 degree	-0.50	-0.50	-0.72	-0.60

Interpollation calculation

		DEGREE	CO-EFF		ANS
0 DEGREE	EF	10	-1.2	18.44	-0.52
		20	-0.4		
	GH	10	-0.4	18.44	-0.40
		20	-0.4		
90 DEGREE	EG	10	-0.8	18.44	-0.72
		20	-0.7		
	FH	10	-0.6	18.44	-0.60
		20	-0.6		

Wind load diagram :

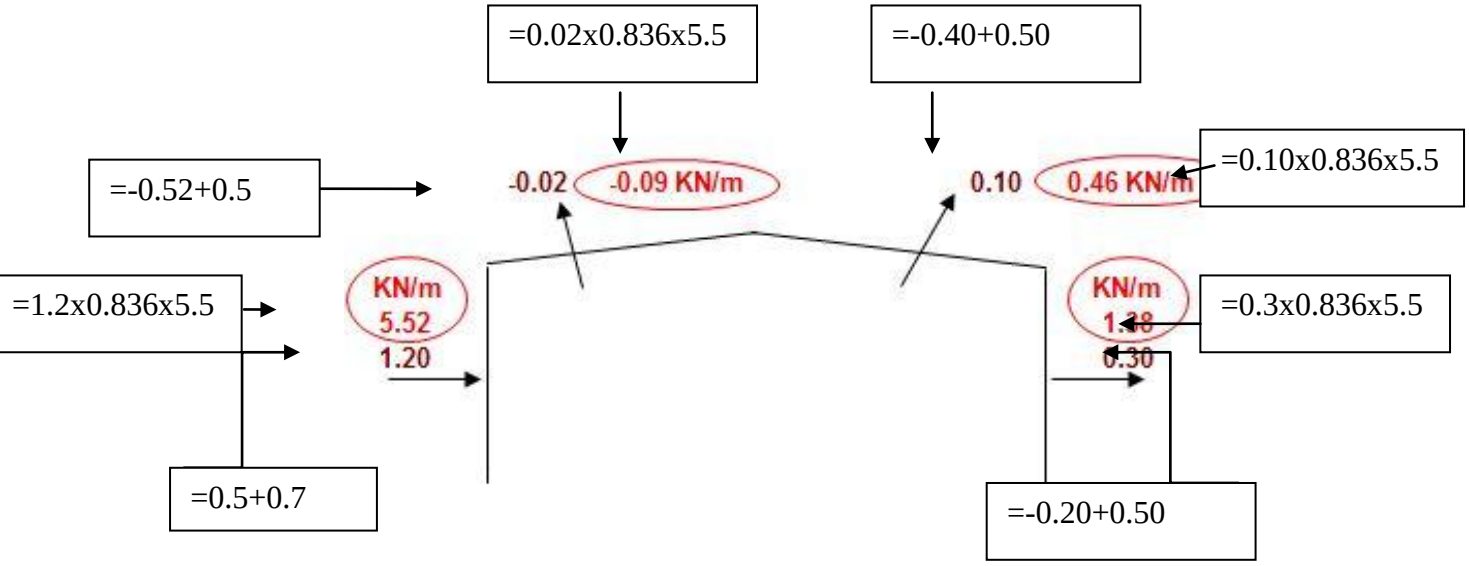

Fig: Wind Across the Ridge (With -Ve Cpi)

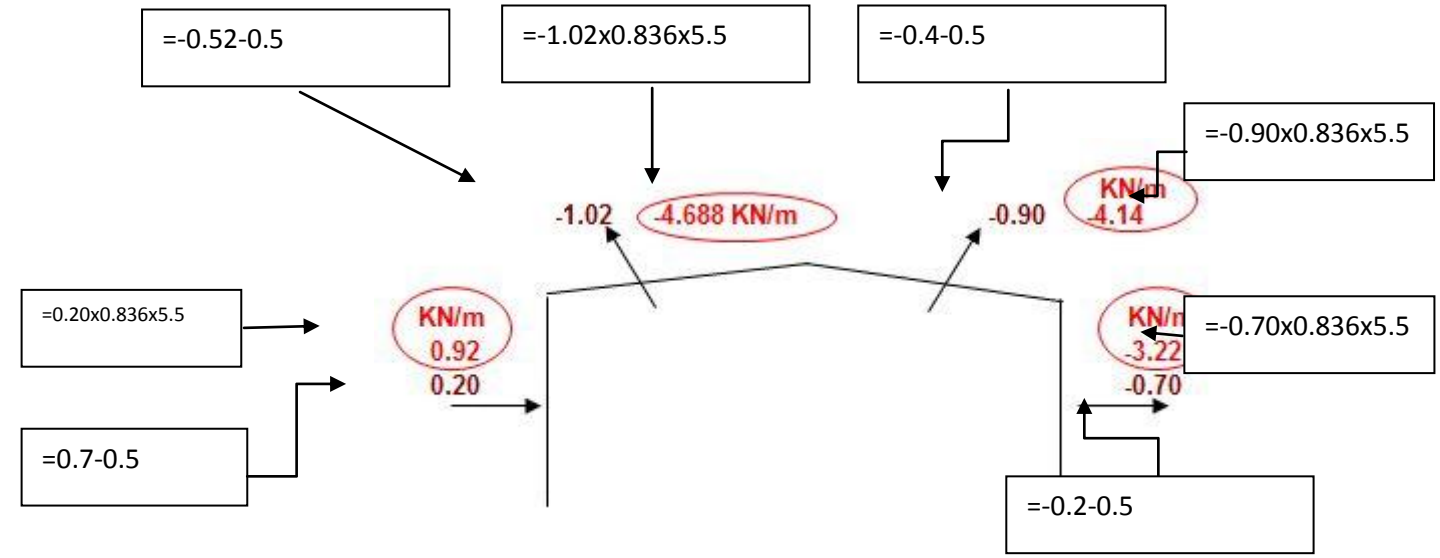

Fig: Wind Across the Ridge (With +Ve Cpi

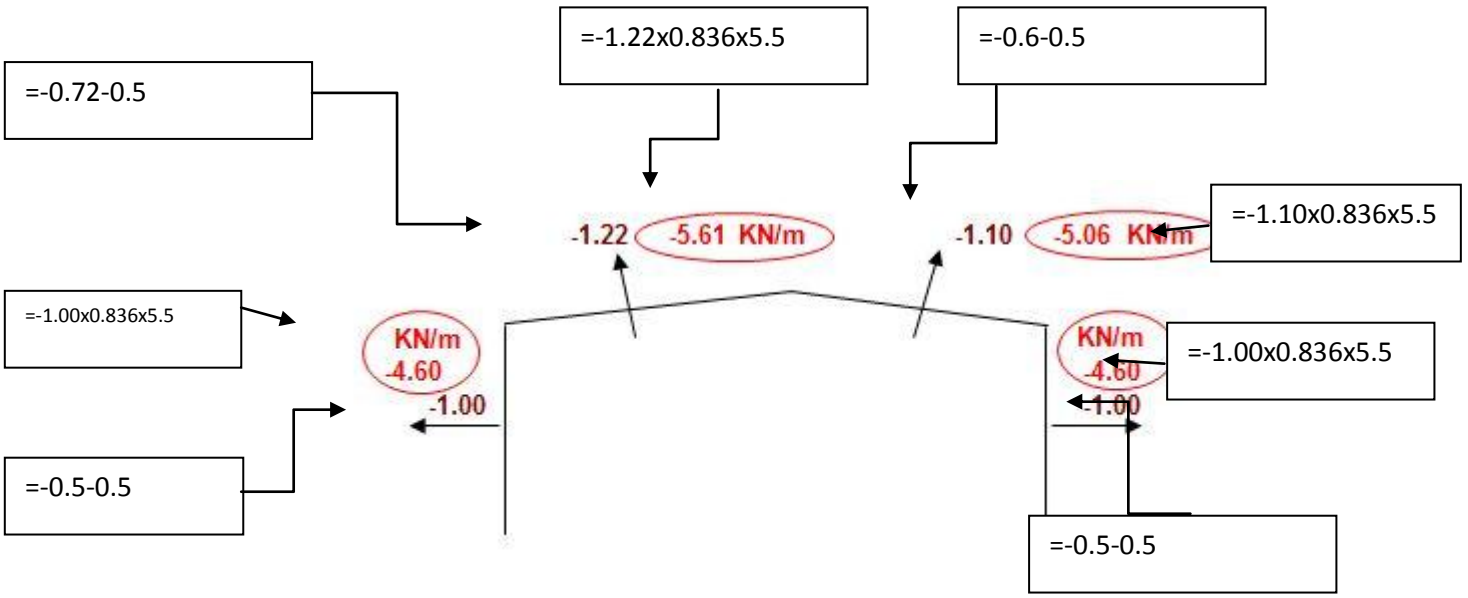

Fig: Wind Parallel to Ridge(With +Ve Cpi)

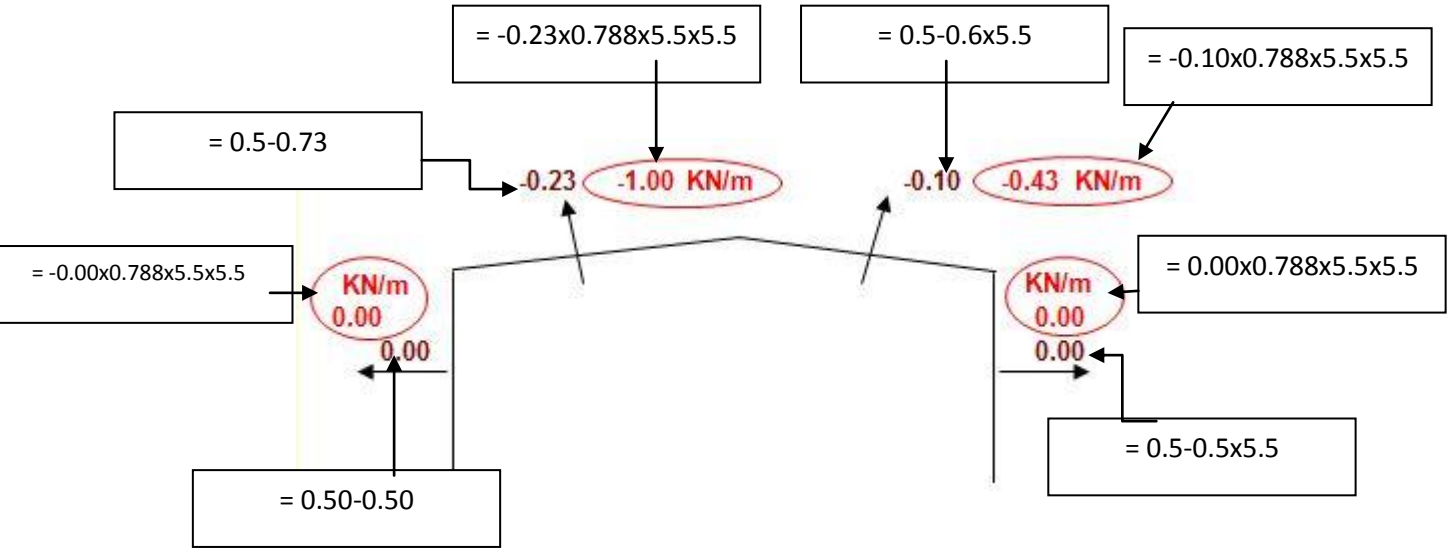

Fig 4. 1 Wind Parallel to Ridge (With -Ve Cpi)

CONCLUSION

From above analysis and design of truss following points can be concluded

- From the analysis and using software staad pro we utilize the built up sections to give the economic and high strength design compare to the conventional building.
- Limit state method is reliable and economical for designing roof trusses
- We have develop excel program to calculate the wind load on industrial building as per IS code 875 part-3 and verify the calculations using staad pro software.
- Limit states design, by providing consistent safety and serviceability, ensures an economical use of materials and a wide range of applications

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