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DESIGN OF TRUSS UNDER NORMAL PERMEABILITY CONDITION

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ABSTRACT

The main purpose of the "TRUSS DESIGN " is to analysis steel roof truss under a normal permeability condition of wind according to the I.S. CODE IS:875(Part 3) – 1987, in that intensity of wind load is calculating by considering various condition of class of structure, terrain ,height and structure size factor ,topography factor, permeability condition and compare results which obtained in the calculation which is made in SP-38 (S and T) : 1987-Handbook for designs for structure for steel roof trusses in that there is no consideration of for various conditions as above b. Because , there are major variations in calculated results for .The wind load erecters design forces in members of the truss. Analysis of truss is addressed A-shaped truss

Keywords: *Steel Truss And Topography , Normal Permeability Condition , Roof Terrain .*

I. INTRODUCTION

The steel roof truss is framed structure which consist of various members as tie , rafter , strut , siling , formings a triangles . i.e. a perfect frame . The truss which is commonly used in a industrial building .The truss is obtained from the old French word "TRUSS" around 1200 , it means "Accumulation of things which bound jointly ". But from the sence of Civil engineering . The truss is single plane structure of a individual structural member joints at the end of frame has a chain of triangle to span the major distance .

- Shaped truss – T he truss have a certain general shape similar the letter 'A' .
  At the simply supported column the steel roof truss is design .
  On the basis of relevant Indian standard for the below various parameters :
- Length of span = 25 m
- Spacing between truss = 6 m
- Slope of roof = 1 in 5
- Height of column = 9 m
- Zones of wind = I , II , III.
- Permeability of condition = Normal (useal)
- Class of structure = A , B , and C .

Truss configration :

The truss configration is a configration in which it is a admire of Fink and fink fan ii) Analysis of A –Shaped truss**.**

II. ANALYSIS

In the analysis of steel roof trusses is have been analyzed on simply supported on column assume the support of one end is to be hindge and another one is rollers for the meaning of analysis for dead load , live load , and wind load the truss has been analyzed according to IS : 875 (PART 3)-1987

III. METHODS

A) .According to IS :875 (PART I) -1987 Dead load calculation-

The load inclose the weight of roof sheeting , purlins ,bracing . also self weight of truss and other loads suspended from steel roof trusses

In IS :875 (PART I) -1987 , the unit weight of various material are given below :

i) AC sheet :

Corrugated (pitch = 146 mm)=118 to 130 N/m^2

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Semi corrugated (pitch = 340 mm= 118 to 127 N/m^2

Plain = 102 N/ m^2

ii)G.I. Sheet : 85 N/m^2

The roof covering weight including laps connector etc. may be taken as

G.I sheet -100-150 N/m^2

A.C. Sheet – 170-200N/m^2

iii) Weight of purlin : 100- 200 N/ m^2

iv) Self weight of truss for span L:

W= 10(L/3+5)N/m^2

Where,

S= Spacing of truss

L= Span of truss

B) According to I.S. 875(PART II)-1987 – Live or imposed load calculation for the design of sheets and purlin .

(Table 2 i.s. 875)-part ii

- Upto 10^0 slope ; L.L. = 0.75 KN/m^2
- More than 10^0slpoe,L.L = 0.75 – 0.02 (α -10)

  Where,

  α Is a slope of sheeting

  For the design of truss the imposed load may be reduced to (2/3)

- *According to I.S. -875(PART III) -1987- Design of wind load*

  Obtain design wind speed (V_Z) : (Clause 53 IS 875 part III)

  Wind speed depends upon i) Risk level ii) Terrain structure iii) local topography .

  Mathemattically ,

$$V_z = V_b * K_1 * K_2 * K_3$$

Where,

V_z =Design wind speed at any hight z in m/s

V_b= Basic wind speed in m/s

K_1 =Probabilty factor (rick coefficient)

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K_2 = Terrain height and structure size

&

K_3 = Topography factor

Basic wind speed (V_b) – have been worked out for a 50 year return period

Terrain categories :

- Category 1 : It includes open sea coasts and flat treeless plains . Exposed open terrain with few obstruction and in which average hight of any object surrounding the structure is less than 1.5 m .
- Category 2: Open terrain with well scattered obstruction have hights between 1.5 – 10m . It includes airfields, open park lands , open land near sea coasts , town out skirts
- Category 3: Terrain with numerous closely space barrier having heights upto 10 m . It includes well wooded area , town and industrial area .
- Category 4: Terrain with numerous closely space large and high barrier . It includes large city center and well developed industrial multipl .

Topography factor (k_3) : The effect of topogrsphy fetures is to accelearate wind near the summits of hills.

Design of wind pressure = $P_d = 0.6V_z^2$

$K_3 = 1$ for of winds slope $\theta < 3^0$

$K_3 = 1$ to 1.36 for upwind slope $\theta > 3^0$

Wind pressure and forces on building /structure classes : For clad structure it is necessary to know the internal pressure as well as external pressure .

- Class A : Structure and there componants like cladding , roofing etc. having gretest horizonatal or vertical dimension less than 20m
- Class B : Structure and there componants like cladding , roofing etc. having maximum dimensions between 20 to 50 m .
- Class C : Structure and there componants like cladding , roofing etc. having maximum dimension greter

Wind load on a building :

- For building as a whole

$F = C_f * A_e * P_d$

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Where ,

C_f = force coefficient for building

- For individual structurl members as roof , walls , glazing and there fixing

$$F = (C_{pe} – C_{pi})*A*P_z$$

Where ,

C_{pe} = External pressure coefficient

C_{pi} = Internal pressure coefficient

A = Surface area of structural element or cladding unit

P_z = Design wind pressure

IV. DESIGN EXAMPLE

- Plan area = 25m X 120 m
- Roof truss span = 25 m
- Roof slope = 1in 5
- Depth = 1m
- Height of column = 9m
- Type of roofing = G.I. sheet
- Location of shed = Pune
- Type of truss = A type truss
- Permeability condition = normal condition
- Wind speed = 50 m/s
- Spacing = 6m
- Rise = 3.5 m

V. TRUSS ANALYSIS

According to truss analysis of wind load calculation given in SP: 38-1987:

Basic parameter :

- Spacing of truss = 6m
- Roof slope = 1in 5
- Basic wind pressure = 0.78 KN/m^2
- Weight of roofing material =0.11 KN/m^2(including extra weight due to fixing)
- The roof slope of 1in 5 and spacing 6m give the minimum weight of truss as observed from table 148 to 150 of SP: 38-1987
- Live load = 0.35KN/m^2
- For design with normal permability = 1.2 KN /m^2

Load calculation:

Dead load :

Total dead load = 62.0 KN

No. of panel = 20

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Panel pont dead load = 3.1 KN
End panel dead load = 1.55 KN

Live load :

Total live load = 0.35 KN/m
Panel point live load = 2.63 KN
End panel point load = 1.32 KN

According to IS 875 PART III – 1987

Wind load =($C_{pe} – C_{pi}$) * A* P_z
Risk coefficient (K_1) = topography factor (K_3) = 0.1
K_2 = terrain factor
Basic wind speed (m/s) V_b = 39 (for pune)
Total wind load =($C_{pe} – C_{pi}$) *A* P_z
Wind load on one panel point = ($C_{pe} – C_{pi}$)*A*P_z /20
No of panel = 20 .

VI. CONCLUSION

It is observed from table that case of terrain category calaculated wind forces are greater than values as per SP : 38 – 1987 on the other hand for terrain category calculated wind forces are lesser value as per SP 381987 . in above result it can be conclude that analysis made in which SP : 38 -1987 can not be follow without taking into consideration different of structure of class risk coefficient , terrain condition , topography factor and permeability condition.

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