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Comparative Study of Hot Rolled Steel Sections and Cold Formed Steel Sections for Industrial Shed

Shah Foram Ashokbhai
P.G.Student
Civil (Structure Engineering)Department,
Merchant Institute of Technology,
Piludara,Mehasana.

Mr. Kaushal R. Thakkar[2]
[2]Structure Dynamics
Ahmedabad

Mr. Paresh N. Nimodiya[3]
[3]Assistant Professor
Government Engineering College, Patan

***Abstract*—Cold formed steel sections are extensively used in Industrial and many other non- industrial constructions in World wid. It is relatively a new concept in India. So, here in this research, an attempt is being to carry out the comparison between hot rolled and cold formed steel sections. The results shall be checked with the ultimate goal of reducing the tonnage. Structural analysis and design shall be carried out in STAAD.Pro.V8i SS6 by Bentley systems because of its strong analysis engine, easy graphic user interface and universal acceptability.**

Keywords*—Hot rolled sections, cold formed sections, Weight comparison,Linear Elastic Method

I. INTRODUCTION

The principal objective of this research is to carry out the analysis and design of industrial sheds with 15m span using Hot rolled steel sections and cold formed steel sections. The results shall be achieved with the ultimate goal of reducing the tonnage. Structure analysis and design shall be carried out in STAAD Pro. V8i SS6 Software.

Cold formed steel is used in building construction, for wall coverings, floor decking etc. Cold formed steel is a basic component in construction of lightweight prefabricated structures like stud frame panels, trusses and portal frames. Cold formed steel sections can be made easily available at any place whereas hot rolled sections difficult to produce.

In the present work an attempt has been made to find the minimum weight for various steel sections such as hot rolled and cold formed on industrial shed under linear elastic method. The structure is modeled using constant parameters such as bracing systems, height, span with various load combination.

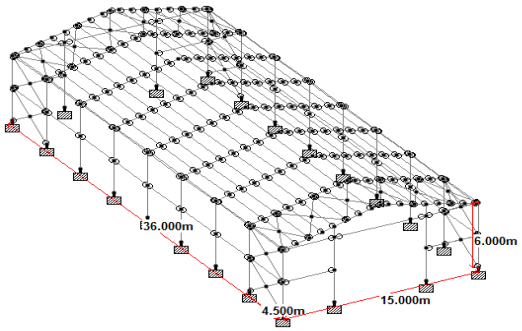

Figure: 15m span hot rolled structure geometry

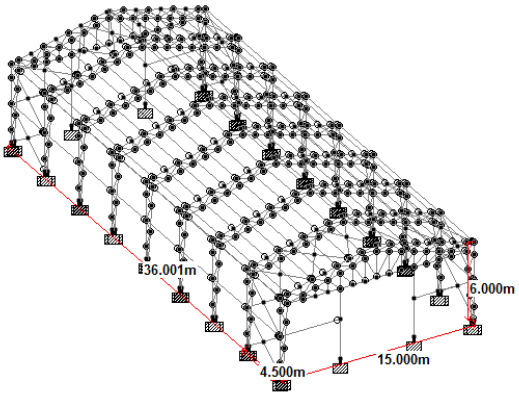

Figure: 15m span cold formed structure geometry

II. LOADING CALCULATION

No. of Bays in X- Direction=3
No. of Bays in Z- Direction=6
Span of industrial shed =15m
Purlin distance=1m
Height of Industrial shed structure at edge=6m
Total Height of structure=8m

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Support condition for hot rolled structure= Hinged
Support condition for cold formed structure=Fixed

Table: 1
Weight of hot rolled Structure

Property	Weight (KN)
ISMC 400	133.531
ISMB 300	63.003
ISMB 200	17.035
ISMC 200	148.809
ISMC 225	54.071
ISMC 300	5.034
TOTAL WEIGHT	421.483
TOTAL WEIGHT	43008.46 Kg

Table: 1
Weight of cold formed Structure

Property	Weight (KN)
250CS80*5	319.224
TOTAL WEIGHT	319.224
TOTAL WEIGHT	32573.87Kg

A. Dead load:

Self-weight= -1Kn/m
Member load=0.05*1=0.05kn/m

B. Live Load:

Live load on purlin=750-20(α-10)
Where α=14.94
So α>10º
Live load on purlin=750-20(α-10)
=750-20(14.94-10)
=651.2 N/m
=0.651 KN/m

C. Wind Load :(As per IS:875)

Wind Load intensity=0.823Kn/ m
Wind load factor for
1) WL+X
2) WL-X
3) WL+Z
4) WL-Z
5) WL UPWARD
6) WL DOWNWARD

D. Wind Speed:

vb =39m/s
Design wind pressure= vz
Vz=vb*k1*k2*k3

Design factors:
Risk co-efficient =k1=1
k2=0.95 class-A Category -3
k3 factor=1

III. LOADING COMBINATION

1) DL+LL
2) DL+LL+WL+X+WL UPWARD
3) DL+LL+WL-X+WL UPWARD
4) DL+LL+WL+Z+WL UPWARD
5) DL+LL+WL-Z+WL UPWARD
6) DL+LL+WL+X+WL DOWNWARD
7) DL+LL+WL-X+WL DOWNWARD
8) DL+LL+WL+Z+WL DOWNWARD
9) DL+LL+WL-Z+WL DOWNWARD

(All Loads are in kN)

IV. MODELLING APPROACH

The STAAD-Pro. V8i SS6 has been used for analysis and design. In this study industrial shed is modeled as a 3D model. In this study two industrial sheds are modelled with same geometric configuration. One industrial shed is modelled with using different beam sections and channel sections with use of hot rolled sections and other industrial shed is modelled by using channel section with use of cold formed sections. Wind load considered is acting in X and Z directions.

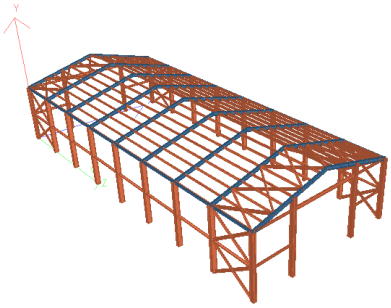

Figure: 15m span hot rolled 3D Industrial shed structure

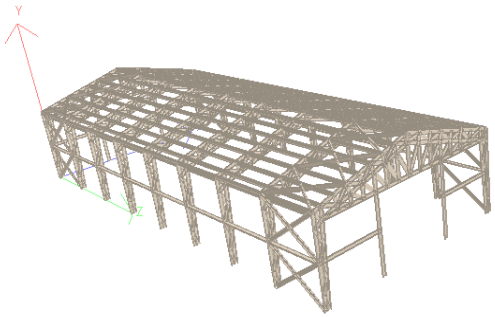

Figure: 15m span cold formed 3D Industrial shed structure

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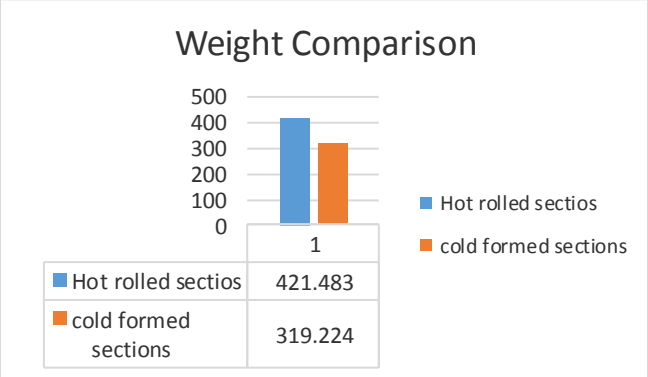

V. RESULTS AND DISCUSSION

From the above tables and graph is observe that steel consumption is more in industrial shed structure using hot rolled steel sections as compare to industrial shed structure using cold formed steel sections. The weight is more in industrial shed which use of hot rolled sections.

VI. CONCLUSION

The Industrial shed structure of hot rolled sections and cold formed sections with 15m span are design and analyzed using STAAD- Pro. V8i SS6 software. From preceding results and discussion following conclusions can be made:

The weight of industrial shed with cold formed sections are 10435 Kg reduced than industrial shed structure with hot rolled sections. The weight of industrial shed with cold formed sections are reduced with 32.03% than industrial shed structure with hot rolled sections. So from the above conclusion, Industrial shed with cold formed sections is very economical than Industrial shed with hot rolled sections.

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