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Analysis of Cold Formed Steel Member in Compression using Abaqus

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Abstract – Cold formed steel structure is used frequently in the structural system. CFS section used to enhance various capacities of sections. This paper aims to provide methodology that would enable to development of optimized CFS of column section with maximum of load carrying capacity in compression. In abaqus different Column sections are analyzed and compared with load carrying capacity to weight ratio. Also regular CFS channel section is compared with folded flange section.

***Key Words*: Cold Formed Steel, Channel Section, Folded Flange, Load Carrying Capacity, Compression, Abaqus etc**.

1. INTRODUCTION

Cold formed steel section have several advantages of economy and efficiency with high strength for light weight .The CFS section are made up of metal sheet press breaking process and folding process. Before the fabrication there is need to analysis the CFS section with different parameters Software gives proper result with load carrying capacity to select the best CFS structure. The CFS section is modified according to shape, aesthetic appearance, height of section.

The compressive load given to section and load carrying capacity of different section is found out. Failure due to compression causes distortional and local buckling of the column section.

1.1 Modelling data

The channel section is considered and modified with folded flange and stiffened in the web and flange. For analysis 15 different modified section are considered and different parameters are considered to find out the best CFS section.

For analysis a 1m constant length is considered and also the thickness 1.6mm is considered the support condition for the column section in compression action is considered as one end is fixed and other is hinged. The yield strength is 250 Mpa and poissons ratio 0.3 is considered. The Finite element mesh for all prototype of size 25x25mm is used. Some prototype of CFS channel section are given in the following figure.

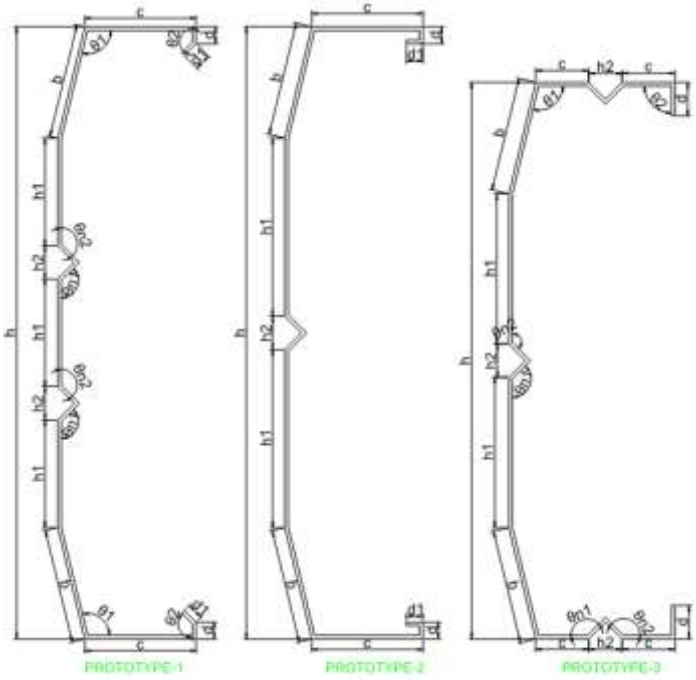


Fig-1 CFS prototype

1.2 Analysis

The different sections are analyzed with modification in flange and web with keeping length and thickness constant for all section The concentrated compressive load is applied to the hinged end. The following figure shows the analytical modeling of cold formed channel section in abaqus software.

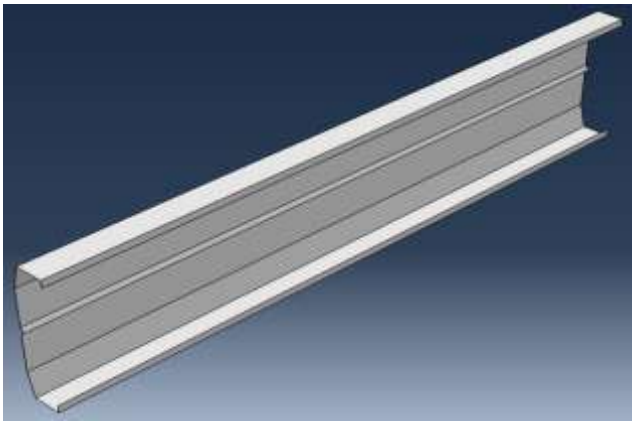


Fig-2 CFS analytical model

The following table shows the dimensions of 15 CFS channel section with their load carrying capacity

Table no-01

SECTION	h (mm)	h1 (mm)	h2 (mm)	b (mm)	c (mm)	d (mm)	d1 (mm)	θ1 (deg)	θ2 (deg)	θn1 (deg)	θn2 (deg)	Load Carrying capacity(KN/m)
S01	275	-	-	-	50.00	15	-	-	-	-	-	24.2
S02	275	130	15	-	50.00	15	-	-	-	135	135	47.75
S03	275	81.66	15	-	50.00	15	-	-	-	135	135	52.76
S1	275	175	-	51.45	50	15	-	104	90	-	-	56.1
S2	275	80	15	51.45	50	15	-	104	90	135	135	90.77
S3	275	48.33	15	51.45	50	15	-	104	90	135	135	88.06
S4	275	185	-	48.00	50	15	-	105	95	-	-	51.16
S5	275	85	15	48.00	50	15	-	105	95	135	135	87.89
S6	275	48.33	15	51.45	50	15	-	105	95	135	135	88.01
S7	275	185	-	48.00	50	7.5	7.5	105	135	-	-	51.19
S8	275	85	15	48.00	50	7.5	7.5	105	135	135	135	86.39
S9	275	48.33	15	51.45	50	7.5	7.5	105	135	135	135	89.59
S10	275	80	15	51.45	50	7.5	7.5	104	90	135	135	87.91
S11	250	67.5	15	51.45	63	15	-	104	90	135	135	112.89
S12	250	67.5	15	51.45	23.75	15	-	104	90	135	135	111.05

From table no-1, section s11 having highest load carrying capacity as compare to other in compression.

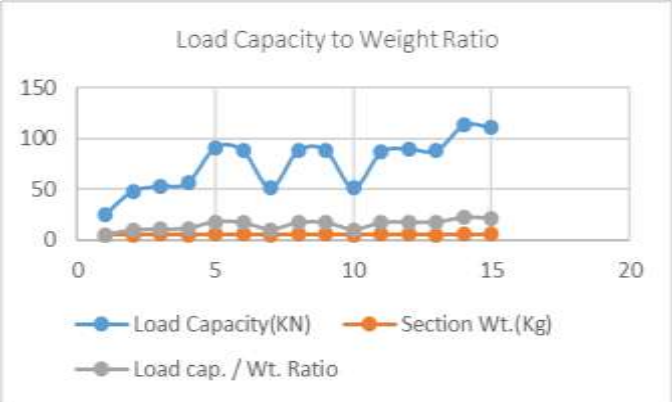
2. Result

Again the sections are compared with section weight and load carrying capacity to weight ratio

Table no-02

Section	Load Capacity(KN)	Section Wt.(Kg)	Load cap. / Wt. Ratio
S01	24.2	5.01	4.83
S02	47.75	5.08	9.40
S03	52.76	5.16	10.22
S1	56.1	5.04	11.13
S2	90.77	5.12	17.73
S3	88.06	5.21	16.90
S4	51.16	5.08	10.07
S5	87.89	5.17	17.00
S6	88.01	5.21	16.89
S7	51.19	5.06	10.12
S8	86.39	5.15	16.77
S9	89.59	5.19	17.26
S10	87.91	5.08	17.31
S11	112.89	5.13	22.01
S12	111.05	5.29	20.99

The section S01 having less section weight but low load carrying capacity to weight ratio, So S11 section having averagely same section weight but higher load carrying capacity to weight ratio.



Graph -1: Load to Weight Ratio

The above Graph shows variation of Section weight, load carrying capacity and load capacity to weight ratio. The above graph can be used For easily identification of efficient section with respect to different parameters.

3. CONCLUSIONS

1) As Per Load Carrying capacity to Weight Ratio, Section S11 is the Economic Section.

2) By Comparing all section with S11 we came to know that, capacity of section increases by decreasing Section height in major axis.

3) Folded Flange Gives better result than the regular channel.

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