A Review Paper on Analysis And Design of Cold Formed Section Buildings For Inaccessible Terrains

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Abstract- *The concept of cold-formed light steel (CFS) framing construction has become widely accepted as a result of extensive research into its structural behavior and properties over the years.Cold-formed steel structures continue to witness tremendous growth in terms of application, manufacture, design, and optimization, alterations and enhancements The purpose of this paper is to provide a concise overview of recent developments in the field. Different aspects of cold-formed steel structures have progressed. As a result, throughout this overview, the most recent initiatives and The importance of cold-formed steel structures research is underlined and explored.*

Keywords- Application, Cold-Formed Steel, Connections, Direct Strength Method, Optimization, Manufacturing.

I. INTRODUCTION

The building business is rapidly expanding, necessitating the development of more complex structures. In order to achieve the construction's advantage, quality, and economy, the construction material must be taken into account. As a result, reducing the amount of material used in various building industries has been a top focus for long-term development. As a result, steel has been regarded as a preferred alternative in the construction industry due to its numerous advantages over other materials, where the superior long-term performance of steel members reduces environmental consequences over the course of their entire life cycle. Furthermore, steel is a fundamental building material in the evolution chain, where it is regarded as an efficient material for any local energy production and transportation.Flexibility in designs. Manufacturers of cold formed steel sections purchase steel coils of 1.0 to 1.25 m width, slit them longitudinally to the correct width appropriate to the section required and then feed them into a series of roll forms. These rolls, containing male and female dies, are arranged in pairs, moving in opposite direction so that as the sheet is fed through them its shape is gradually altered to the required profile. The number of pairs of rolls (called *stages*) depends on the complexity of the cross sectional shape and varies from 5 to 15. At the end of the rolling stage a flying shearing machine cuts the member into the desired lengths.

II. APLLICATIONS

1. Inaccessible terrains - Hilly areas (Defense shelters at Jammu & Kashmir, Leh- Ladakh, Siachen, Kargil etc.)
2. Disturbed areas (Naxalites - Jharkhand, Chhattisgarh etc.)
3. Seismically prone areas (Bhuj, Assam etc.)
4. Rural Applications - Rural houses, Small class room, Government projects etc.
5. Temporarily shelters - In disaster's situation, project offices, rehabilitation etc.
6. Cold Storages - Small sized storages in villages.
7. Cold form section steel buildings (Ground story, G+1).

Numerous studies has been carried out over cold formed steel sections with different parameters, some of the important literature surveys discussed below as,

Adi susila and Jimmy tan (2015)[1], has done his works on flexural strength performance and buckling mode prediction of cold-formed steel and conclude that," web stiffeners to the C-section not improve the bending capacity significantly, it just helps to reduced local buckling".

Jun ye (2016)[2], Jun ye indicates that, a methodology that would enable the development of optimized CFS beam sections with maximum flexural strength for practical applications and concluded that," CFS beam with the folded flanges rather than the conventional gives 57% increment in the flexural capacity, where both having the same thickness and same coil width".

Ben young (2005)[3], carried his work on behaviour of cold-formed high strength stainless steel sections. In this paper, author use cold formed high strength stainless steel section as a column and analysis is carried out with different sections and practical results are compared with the various countries codes.

Kim J. R. Rasmussen (2004)[4], author work on design of stiffened elements in cold-formed stainless steel sections. This paper tries to established strength equations for single stainless steel stiffened elements applicable to the range of alloys included in the american, australian, and european standards for stainless steel structures.

Y. B. Kwon (2006)[5], has worked for, the flexural strength of the sections and structural behavior of the connections including the moment-rotation relation, the yield, and ultimate moment capacity of the connections.

Polyzois (1993)[6], he has done his work for web-flange interaction in cold-formed steel z-section columns. He come up with conclusion that, current AISI code overestimates 59% of web buckling in theoretical determination rather compared to the practical experimentation.

Derrick Y. Yap and Gregory Hancock (2008) [7], author has taken a specimen of cold-formed high-strength steel of 0.42 mm thickness and nominal yield stress of 550 mpa for compressive test. A new design methodology has been proposed by the author to improve the prediction of local buckling and distortional buckling.

M. Raizamzamani and M. Zain (2010)[8], author investigates the structural behavior of cold-formed steel channel columns (without or with stiffeners) subjected to axial thrust and proves that, the importance of edge and intermediate stiffener to show less deformation in terms of buckling.

S.A. Kakade (2014)[9], has done his work for various design methods for cold formed light gauge steel sections for compressive strength and concluded that, IS 801 is in working stress method and in MKS system. So full cross section of the member is not utilized. It is very essential to revise the code to the limit state method and in SI system.

Yin-hai Zhao (2015)[10], he carried his work on comparative analysis of different stiffening types (rectangular, V-shape, arc-shape) with their locations on the web and conclude that, the V-shape stiffener is the optimal choice and the effect of the rectangular stiffener is the worst and arc-shape stiffener is the second one.

III. LITERATURE SUMMARY

C and Z are very usual sections to be used in the design of cold form sections. Many researches had been carried out for the different properties of the cold form section in line with American code AISI. Research for different shapes of the web with respect to its stiffness (V- shape, rectangular, arc shape, inclined lipped etc) has been carried out. Researchers all over the world use AISI code for cold form sections to deal with different aspects. Indian cold formed code IS:801(1975) is in Working Stress Method (W.S.M.) and in (M.K.S.) system. So revision in the cold form Indian standard code IS:801(1975) and it's comparison with famous American code AISI-2007 is imminent.

REFERENCES

[1] Adi Susila and Jimmy Tan,"Flexural strength performance and buckling mode prediction of cold-formed steel (C section)", ELSEVIER, pp. 979 – 986, November 2015.

[2] Jun Ye, Iman Hajirasouliha, JurgenBecque and Kypros Pilakoutas, "Development of more efficient cold-formed steel channel sections in bending", ELSEVIER , pp.01 – 13, December 2015.

[3] Ben Young, and Wing-Man Lui, "Behavior of Cold-Formed High Strength Stainless Steel Sections", Journal of Structural Engineering, ASCE, pp.1738 - 1745 November 2005..

[4] Kim J. R. Rasmussen, Tim Burns, and Paul Bezkorovainy, "Design of Stiffened Elements in Cold-Formed Stainless Steel Sections", Journal of Structural Engineering , ASCE, pp.1764-1771, November2004.

[5] Y. B. Kwon, H. S. Chung, and G. D. Kim, "Experiments of Cold- Formed Steel Connections and Portal Frames", Journal of Structural Engineering, ASCE, pp.600-607, April2006.

[6] D. Polyzois , "Web-Flange Interaction In Cold-Formed Steel Z-Section Columns", Journal of Structural Engineering, ASCE , vol. 119, pp.2607- 2628, September 1993.

[7] Derrick C. Y. Yap and Gregory J. Hancock, "Experimental Study of Complex High-Strength Cold-Formed Cross-Shaped Steel Section", Journal of Structural Engineering, ASCE, vol.134, pp.1322-1333, August 2008.

[8] M. Raizamzamani and M. Zain, "Numerical Investigation of Cold- Formed Steel Channel Columns Subjected To Axial Thrust", IEEE, pp. 292-297, December 2010.

[9] S.A.Kakade, B.A.Bhandarkar, S.K. Sonar, A.D.Samare, " Study of Various Design Methods For Cold Formed Light Gauge Steel Sections For Compressive Strength", International Journal of Research in Engineering and Technology ,Volume: 03, June-2014.

[10] Yin-hai Zhao, "Comparative analysis of stiffening style of cold formed thin-walled channel steel members", IEEE, December 2015.

[11] R. Parnell (2010), "Vibration Performance of Lightweight Cold- Formed Steel Floors", Journal of Structural Engineering, ASCE, pp. 645 – 653, Vol. 136, June, 2010.
[12] Ben Young (2008), "Design of Cold-Formed Steel Built-Up Closed Sections with Intermediate Stiffeners", Journal of Structural Engineering, Vol. 134, No. 5, ASCE.