Study of Literature Review Comparatively Study of Behavior of Hot Steel And Cold Steel From Steel Section

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Abstract- *In upcoming era of light weight construction light gauge steel construction is the prominent demand of the time. The sections used are light in weight as the thickness is less than the hot rolled section. This type of construction reduced the 30% of overall weight of structure without compromising in strength and stability. In this study the light gauge channel section is considered to compare behavior of CFS section with and without stiffeners. Initially the capacity of the CFS section is carried out using provisions of IS 801-1975 for flexure. The specimen is analytically studied using ANSYS.16 software. The specimen is then analytically investigated for the flexural behavior of CFS sections with and without stiffener. The main target for this study is to make the behavior of CFS equal to HRS. After comparison CFS are modeled with various types of stiffener such as diagonal stiffener, cross stiffener, vertical stiffener and comparing is made for design parameter such as normal stress, shear stress*

I. INTRODUCTION

In this study the light gauge channel section is considered to compare behavior of CFS section with and without stiffeners. Initially the capacity of the CFS section is carried out using provisions of IS 801-1975 for flexure. The specimen is analytically studied using ANSYS software for the flexural behavior of CFS sections with and without stiffener. Following procedure is adopted for project work

- The results where compared to the experimental work carried out for the true length specimen. Design the section under loading using Indian code guidelines.
- Analyzing the section using the FE software.
- Validating the analytical work with the experimental work.

The design of industrial building is governed mainly by functional requirements and the need for economy of construction. In cross sections these buildings will range from single or multi bay structures of larger span when intended for use as warehouses or aircraft hangers to smaller span buildings as required for factories, assembly plants, maintenance facilities, packing plants etc. The main dimensions will nearly always be dictated by the particular operational activities involved, but the structural designer's input on optimum spans and the selection of suitable cross sections profile can have an important bearing on achieving overall economy. An aspect where the structural designer can make a more direct contribution is in lengthwise dimensions i.e. the bay lengths of the building. Here a balance must be struck between larger bays involving fewer, heavier main components such as columns, trusses, purlins, crane beams, etc. and smaller bays with a large number of these items at lower unit mass. An important consideration in this regard is the cost of foundations, since a reduction in number of columns will always result in lower foundation costs.

II. STATE OF DEVELOPMENT

Cheng Yu. *et al* (2006) The objectives in this paper are to (i) validate the developed FE model, (ii) apply this model in a parametric study outside the bounds of the original tests with a particular focus on yield stress, and (iii) study the influence of moment gradient on distortional buckling failures. They predicted ultimate strengths from the developed FE model have good agreement with the test data. Extension of the tested sections to cover yield stresses from 33.0 to 73.4 ksi (228 to 506 MPa) indicates that the Direct Strength Method is applicable over this full range of yield stresses. They applied FE model to analyze the effect of moment gradient on distortional buckling. It was proposed and verified that the moment gradient effect on distortional buckling failures can be conservatively accounted for in the Direct Strength Method by using an elastic buckling moment that properly reflects the increased elastic distortional buckling moment due to the presence of moment gradient. They said an empirical equation, appropriate for use in design, to predict the increase in the elastic distortional buckling moment due to moment gradient, is provided.

Mahdi Bitarafan.et al., (2012)In this paper they said those cold form steel frames are reinforced with steel shear walls to withstand against side forces. They study the behavior of steel shear walls of cold formed steel. For this study they developed finite element models. Linear behavior and connection details of the frame analyzed under monotonic load and obtained results compared with empirical ones demonstrate adequate accuracy of finite element modeling. Their study includes longitude resistance of sheer wall, impacting factors on behavior of cold-formed steel frame shear walls, base sheer and demolition mechanisms of the frame.

G. Arunkumar. et al., (2013)In this paper the effect of web corrugation and (hw/tw) ratio on the flexural strength of cold formed steel (CFS) lipped I section is presented. They had done experiment on five specimens out of which one with flat web and the remaining with trapezoidal corrugation in web. They kept length of the specimen constant 3600 mm and (hw/tw) ratio is varied from 333.33 to 583.33 and kept all other parameters constant. All these specimens are then experimented under two points loading with simply supported condition. Then the experimental results are verified with finite element analysis using ANSYS software. Then they compared Experimental and numerical results with the predicted resistance by North American Specifications (AISI S100-2007) and Australian/New Zealand Standards (AS/NZS: 4600-2005). They said from the experimental result that flexural capacity of the corrugated web is larger than flat web. Within this parametric study the effect of (hw/tw) ratio on the flexural strength capacity is discussed and presented.

Bayan Anwer Ali. et al., (2011) In this paper they presented a study on the structural performance of column-base and beam-column connections of cold-formed steel with the use of single-lipped C-sections with bolted moment connections. They conducted Experiment on two specimens one a column-base connection and other a beam column connection and the results showed by this section failure caused by flexural buckling was always critical. Managing to attain moment resistances which are close to the results of connected sections, they proven that the proposed connections were structurally efficient. They established finite model with the use of shell elements to model the sections while bar elements were used to model the bolted fastenings for the purpose of examining the structural behavior of both the column-base and the beam-column connections. Incorporation of material non-linearity and comparison between the experimental and numerical results were presented by them. They said that the proposed analysis method for predicting structural behavior of column-base and beam column connections with similar connection configuration proved to be adequate.

Amit M. Chavan1. et al., (2016)The aim of this paper was to present a simple and accurate three dimensional finite element Model (FE) which should be capable of predicting the actual behavior of beam-to-column joints in cold form perforated steel frame subjected to static loads. They used software package ANSYS for the modeling of joint. They used beam- column type connection for study. They chose this for complexity in the analysis and for their inheritable non-linear behavior. In the experimental test the literature of normal section was chosen to verify the finite element model. They obtained the results of normal section of model in literature which they compared with normal section of analytical model. Then the normal section of analytical model compared with perforated section of analytical model, to check the compatibility of the perforated section. Then the structural behavior of the connection including the moment – rotation relation, Load -deflection curve, the yield strength, and ultimate moment capacity of the connections were studied. They considered main parameters in there study they are thickness of section for the constant span and number of bolts and its arrangement for the connection.

R. Landolfo (2000)They studied that from many years, the behavior of metallic cold-formed thin-walled structures is one of the main research subject developed at the University of Naples “Federico II”. The activity has included theoretical and experimental investigations on the structural behavior of members, connections as well as structural systems subjected as a whole to monotonic and cyclic loads. The results of some current research projects together with the most significant advances in calculation method and design are briefly summarized in this paper by them.

M. adildar. (2015) In this paper they said that cold formed steel structures are structural products that are made by forming plane sheets of steel at an ambient temperature into different shapes that can be used to satisfy structural and functional requirements. They say that in recent years, the demand for high strength materials for wide range of structural applications has been instrumental for more developments in cold-formed steel sections as compared to the hot rolled steel sections. Therefore, the understanding of cold formed steel performance becomes an important issue to be studied. In this paper they hold three works. First, it reviews an introduction on cold formed steel structures. Second, it summarizes special design criteria and local buckling and post buckling strength of cold formed steel constructions. Finally, it offers a conclusion on the need for innovative sectional profiles over the conventional sections for cold formed steel.

Martin MacDonald Muditha P. Kulatunga (2013)In this paper they done numerical investigation on the behavior of cold–formed thin–walled steel structural members with perforations is presented in this paper. They said that many structural cold–formed steel members are provided with cut–outs to accommodate electrical, plumbing, and heating services and so on. Due to the position of cut–outs, the elastic stiffness and ultimate strength of a structural member could be varied. The primary interest of them in this paper is to study the possible buckling occurrence on cold formed steel structural sections used as columns with perforations. They generated finite element model using the ANSYS software package to be able to predict the ultimate strength of cold–formed structural sections and to obtain a better understanding of the buckling failure behavior highlighted, and conclusions has been drawn on this basis.

Ju Chen. (2004)In this paper they present the mechanical properties data for cold-formed steel at elevated temperatures. The deterioration of the mechanical properties of yield strength (0.2% proof stress) and Young's modulus of elasticity are the primary properties in the design and analysis of cold-formed steel structures under fire. However, values of these properties at different temperatures are not well reported. Therefore, both steady and transient tensile coupon tests were conducted at different temperatures ranged approximately from 20 to 1000°C to obtain the mechanical properties of cold-formed steel structural material. In this study they included cold-formed steel of grade G550 and G500 with plate thickness of 1.0 and 1.9mm, respectively. Also Stress-strain curves at different temperatures are plotted. In addition, curves of elasticity modulus, yield strength are also obtained at different strain levels, ultimate strength and thermal elongation versus different temperatures are also plotted and then these results compared from the Australian, British and European standards. They also compared with the test results predicted by other researchers. They proposed a unified equation in this paper for yield strength and Young's modulus of cold-formed steel at elevated temperatures. They also shown that the proposed equation accurately predicted the yield strength and Young's modulus compared with the test results.

III. CONCLUSION

This paper focuses only on the literature review of previously published studies.The findings of this study deals with proposed analysis method for predicting structural behavior of column-base and beam column connections with similar connection configuration proved to be adequatein this paper for yield strength and Young's modulus of cold-formed steel at elevated temperatures. They also shown that the proposed equation accurately predicted the yield strength and Young's modulus compared with the test results.In this paper is to study the possible buckling occurrence on cold formed steel structural sections used as columns with perforations. They generated finite element model using the ANSYS software package to be able to predict the ultimate strength of cold–formed structural sections and to obtain a better understanding of the buckling failure behaviour highlighted, and conclusions has been drawn on this basis.

REFRENCES

[1] Cheng Yu. et al ,HongpingZhu a, XiaowuZhang a, YongLu(2006) “Experimental study and analysis of inner-stiffened cold-formed SHS steel stub columns” Vol 107(2016)pgno28–38

[2] Mahdi Bitarafan, Youssef Hussein- Zadeh, FarzadPichkah, and ShahinLaleArefi (2012)”Finite Elements Modeling and Analysis of Cold-Formed Steel Frame Shear Walls” Vol. 4, No. 6

[3] G. Arunkumar P. Sampathkumar S. Sukumar (2013) “Investigation On Cold – Formed Steel Lipped IBeam With Trapezoidal Corrugation In Web By Varying Depth” Vol 2 Issue

[4] BayanAnwer Ali, SariffuddinSaad, MohdHanim Osman &Yusof Ahmad International Journal of Engineering (IJE), Volume (5) : Issue (2) : 2011 185 “Finite Element Analysis of Cold-formed Steel Connections”

[5] Amit M. Chavan1, Dr.S.S.Angalekar2, July-2016 “Finite element analysis of cold form perforated steel beam column connection” Vol 03 Issue: 07

[6] GuanboBiana,n, KaraD.Petermana,b, ShahabeddinTorabiana,c, BenjaminW.Schafer a (2016) “Torsion of cold-formed steel lipped channels dominated by warping response” 98565–577

[7] M. adildar Dan Dubin, ViorelUngureanu, Lucian Gîlia (2015) “Experimental investigations of cold-formed steel beams of corrugated web and built-up section for flanges” vol 90 pgno159–170

[8] Martin MacDonald Muditha P. Kulatunga (2013) “Finite Element Analysis of Cold{Formed Steel Structural Members with Performations Subjected to Compression Loading” Vol. 17, No. 2 (2013) 127–139
”

[9] Ju Cheng Yu Benjamin W. Schafer(2006) “Finite Element Modeling of Cold-formed Steel Beams Validation and Application