Review of Experimental Analysis of Trapezoidal Corrugated web beam with stiffener for its strength and modes

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Abstract- They are horizontal elements of the "I" are known as flanges, while the vertical element is termed the "web". The method of producing an I-beam, as rolled from a single piece of steel, was patented by Alphonse Halbou of the company Forges de la Providence in 1849. There are two standard I-beam forms: Rolled I-beam, formed by hot rolling, cold rolling or extrusion (depending on material). Plate girder, formed by welding (or occasionally bolting or riveting) plates I-shaped section is a very efficient form for carrying both bending and shear loads in the plane of the web. On the other hand, the cross-section has a reduced capacity in the transverse direction, and is also inefficient in carryingthus, by using greater part of the material for the flanges and thinner web, materials saving could be achieved without weakening the load-carrying capabilityof the beam. Nevertheless, as the compressive stress in the web has exceeded the critical point prior to the occurrence of yielding, the flat web loses its stability and deforms transversely. This could be improved by using corrugated web, an alternative to the plane web, which produceshigher stability and strength without additional stiffening and use of larger thickness.

Key Words: **I-beam, Corrugated Web beam**

I. INTRODUCTION

I-beams are widely used in the construction,Mechanical industry such as bridges, slender structure etc and are available in a variety of standard sizes. The horizontal elements of the "I" are known as flanges, while the vertical element is termed the "web". The method of producing an I-beam, as rolled from a single piece of steel, was patented by Alphonse Halbou of the company Forges de la Providence in 1849. There are two standard I-beam forms:

- Rolled I-beam, formed by hot rolling, cold rolling or extrusion (depending on material).
- Plate girder, formed by welding (or occasionally bolting or riveting) plates.

Design of I-section beam may be governed by any of the following criteria: analytically. But detailed experimental work of castellated beam with stiffeners for trapezoidal corrugated webbeam was not carried out. Therefore in this project behavior of trapezoidal castellated web beam with Stiffeners under loading and Vibration analysis are carried out experimentally.

- Deflection: the stiffness of the I-beam will be chosen to minimize deformation.
- Vibration: The stiffness and mass are chosen to prevent unacceptable vibrations, particularly in settings sensitive to vibrations, such as offices and libraries.
- Bending failure by yielding: where the stress in the cross section exceeds the yield stress.
- Bending failure by lateral torsional buckling: where a flange in compression tends to buckle sideways or the entire cross-section buckles torsionally.
- Bending failure by local buckling: where the flange or web is so slender as to buckle locally.
- Local yield: caused by concentrated loads, such as at the beam's point of support.
- Shear failure: where the web fails. Slender webs will fail by buckling, rippling in a phenomenon termed tension field action, but shear failure is also resisted by the stiffness of the flanges.

II.OBJECTIVES

In load carrying application, the web usually bears most of the compressive stress and transmits shear in the beam while the flanges support the major external loads. The web resists shear forces, while the flanges resist most of the bending moment experienced by the beam. I-shaped section is a very efficient form for carrying both bending and shear loads in the plane of the web. On the other hand, the cross-section has a reduced capacity in the transverse direction, and is also inefficient in carrying torsion, thus, by using greater part of the material for the flanges and thinner web, materials saving could be achieved without weakening the load-carrying capability of the beam. Nevertheless, as the compressive stress in the web has exceeded the critical point prior to the occurrence of yielding, the flat web loses its stability and deforms transversely. This could be improved by using corrugated web, an alternative to the plane web, which produces higher stability and strength without additional stiffening and use of larger thickness.
From the above reviews it is concluded that the failure modes comprise shear, flexural, lateral torsional buckling, rupture of welded joints and web post buckling failure modes was investigated by numerically experimentally &
The design of Trapezoidal castellated corrugated web beam and selection of standard I- section beam as per BIS (808:1989) (Reaffirmed 2004) as shown in. To build up a 3-D solid model of Trapezoidal castellated corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004) by using modeling software suchas CATIA. To perform

stress analysis of Trapezoidal castellated corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004) by using FEA software, such as ANSYS suitable To perform vibration analysis of trapezoid castellated corrugated web beam and I-section beam as per BIS(808:1989) (Reaffirmed 2004) using FEA software's such as ANSYS. Redesign and fabrication of Trapezoidal castellated corrugated web beam and standard I-section beam to get deformation induced in critical location will be carried out. To perform the vibration analysis of trapezoid castellatedcorrugated web beam and I-section beam as perBIS(808:1989) (Reaffirmed 2004) by using FFT analyzer as shown in fig.2. To compare and validate the result obtained by usingsoftware analysis with results obtained by experimental Analysis for both strength andvibration for Trapezoidal castellated corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004)

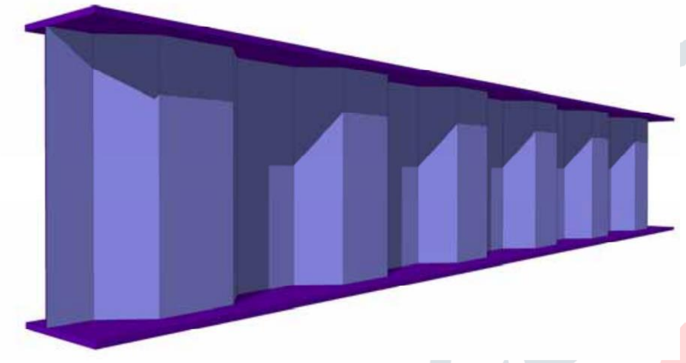

Fig:1Trapezoidally Corrugated web Beam

III.LITERATURE REVIEW

1.Delphine Soncket.al.(2016):- During this paper, the weak-axis flexural buckling resistance is examined, taking under consideration the Influence of the modified residual stress pattern and the modified pure mathematics of cellular and crenellated members. Therefore, the essential buckling loadand the buckling resistance of merely supported cellular and castellated members were investigated numerically. within the numerical model, a modified residual stress pattern was introduced, supported earlier measurements. because the quantity of measurements was comparatively restricted, the results of these simulations should be thought-about as preliminary results, in group action of a urban area of the used residual stress pattern.

2.Delphine Sonck.et.al.(2015):- In these paper lateral-tensional buckling behavior of cellular beams is investigated employing a numerical model that was valid supported experimental results. during this model, the impact of the changed residual stress pattern was taken into consideration. using the results of the constant quantity study, a preliminary style approach was planned.

3.Dan Dubina et.al.(2015):-This paper deals with experimental investigation of cold formed steel beams of corrugated web and built up section in flanges. in specimen used here is bolted instead of welding. A thin corrugated web affords a significant weight reduction of these beams compared to hot rolled or welded ones. Also here sinusoidal profile is used for web and four types of beams are analysed.

4.Jae-Yuel Oh et.al.(2015):-Paper deals with theoretical and experimental research on to find out the prestress effect for I-section beam for corrugated web. when pre-stressing force is applied to a corrugated web behaves like an accordion and folds easily to the longitudinal direction which is called the accordion effect. Here by the introduction of pre-stress to corrugated webbed steel beams, and performed experiments on two steel beams with corrugated webs and one with typical wide flange section.

5.S.Durif. et.al.(2013):-In this paper, the new variety of cellular beam with sinusoidal form of openings shows a specific behavior in comparison with normal circular openings. Full scale tests were accomplished on 3 beams representing varied dimensions of the openings. The aim was to look at the failure modes of beams the last word values of strength. The specimen were heavily gauged to obviously determine the local failure modes of the gap zone. during this 2 specific failure mode were discovered.

6.FerhatErdal et.al.(2013):-The objective of the current|this} analysis is to present final load carrying capacities and finite part analysis of optimally designed steel cellular beams below loading conditions. The tests are carried out on twelve complete non-composite cellular beams. There square measure 3 completely different sorts of NPI_CB_240, NPI_CB_260 and NPI_CB_280 I- section beams, and 4 tests are conducted for every specimen. These optimally designed beams that have starting span lengths of 3000 metric linear unit square measure subjected to purpose load acting within the middle of higher flange

7.Mohsen Gerami et.al.(2013):-In this Paper non-linear behavior of castellated beam under moment gradient loading & the effect of beam length & braced length on moment rotation behavior & ductility of this type of behavior was investigated. Accuracy of Finite Element Models of Plain-webbed beams is estimated comparing moment-rotational behavior & failure mode of other researches numerical models & cleared a satisfactory accuracy. From this comparison it is cleared that for the short beams, web opening reduces energy absorbance & plastic moment capacity of the beam is more than long one.

4.CONCLUSION

From the above reviews it is concluded that the failure modes comprise shear, flexural, lateral torsional buckling, rupture of welded joints and web post buckling failure modes was investigated by numerically experimentally & analytically. But detailed experimental work of castellated beam with stiffeners for trapezoidal corrugated web beam was not carried out. Therefore in this project behavior of trapezoidal castellated web beam with Stiffeners under loading and Vibration analysis are carried out experimentally.

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