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EXPERIMENTAL ANALYSIS OF TRAPEZOIDALLY CORRUGATED WEB BEAM FOR IT'S STRENGTH AND MODE- A REVIEW.

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ABSTRACT

The project deals with the how efficient corrugated web beam with respect to I-section beam. I' section beams are widely used in automobile chassis &in construction industry such as bridges, Slender structure etc, these application can efficiently replaced by using corrugation of web beam. By using trapezoidal corrugation of web beam, by decreasing the web thickness the strength against failure modes of the I-section beam are Bending failure by yielding, Bending failure by lateral torsional buckling, Bending failure by local buckling, Shear failure of beam is enhanced and also weight of the beam decreases which is very useful for various application of beam. There are various methods of fabrication such bending, press working and welding, hot rolling and cold rolling. I-section beam from BIS (808:1989)(Reaffirmed 2004) is chosen and keeping the weight same, flange dimension same thickness of web decreases because corrugated web require more length. Stress analysis of Trapezoidal corrugated web beam and I-section beam of as per BIS(808:1989) (Reaffirmed 2004) will be carried out to determine the stress/strain induced at critical location. By using FFT analyzer modal analysis of Trapezoidal corrugated web beam and I-section beam as per BIS(808:1989) (Reaffirmed 2004) will be carried out.

Keywords: FFT Analyzer, Stress Analysis, Trapezoidal Corrugated Web Beam.

I. INTRODUCTION

Now a day's building and civil infrastructures are becoming larger and higher, the demand for horizontal structure members, which are suitable for long spans so structural steel require high strength but steel member also have many weaknesses, such as less resistance to bucking, excessive deflection, fatigue strength, vibration. To overcome these disadvantages various types corrugated web beam are developed. Some of advantages to use corrugated web beam are stability against asymmetrical loads because the shear bucking strength in-plane and Out-of- plane load is greater than I-section beam.

Especially for the main frames of single-storey steel buildings the use of corrugated web beams, mainly with sinusoidal corrugation, has been increased very much during the last years. Due to the thin web of 2 or 3 mm, corrugated web beams afford a significant weight reduction compared with hot rolled profiles or welded I-sections. Buckling failure of the web is prevented by the corrugation.

In construction application, the web usually 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.

II. LITERATURE SURVEY

The project deals with experimentation and analysis of trapezoidal corrugated web beam and I-section beam so number of papers are available which describes the limitations of using I section beams, benefits of built up section, accordion effect, various shapes that can be used as web, design consideration in trapezoidal corrugated web and also effect of corrugation angle into strength of beam.

Chan et. al. [1]:- Experimentally tested three-point bending for I-beam and also F.E.A analysis of horizontally corrugated for one arc, two arcs while half-circular wave corrugated web was used for vertical corrugation type.

Khalid et. al. [2]:-Has done experimentally and computationally analysis using F.E.A of semi-circular web corrugated in the horizontal direction and across the span of the beam (vertical) direction.

Jae-Yuel oh et. al. [3] :-Paper deals with theoretical and experimental research on to find out the prestress effect for I-section beam For corrugated web.

Lincy P. Abraham et. al. **[4] :** This paper deals with experimental behaviorOf encased cold formed build up I-section with trapezoidally corrugated web beam and encased cold formed build up I-section with plane web under two point loading.

R.Divahar et. al. [5]: This paper deals with result of the experimental study of the lateral bucking behavior of cold-formed steel section with trapezoid web.The moment carrying capacity of cold-formed steel beam with plan web is studied and compared with the moment carrying capacity of beam with trapezoidal corrugated web beam.

Yogesh Shinde et.ac[6]: Paper deals with vibration analysis of a cantilever beam with single open transverse crack for different crack depth and different crack location is done using experimental method.

Magnucka et. al. [7] :-Devoted to the mathematical modeling of transverse shearing effect for sandwich beams with sinusoidal corrugated cores. Bending and buckling problem of two sandwich beam are find out by theoretical.

Mohammadi et. al. [8] :-Reviewed on analytical formulation for trapezoidal

Corrugated core based on energy approach for elastic modulus in different –direction, transverse and in-plane poissons ratio and mass density of the equivalent model.

JianJiang et. al. [9]:-Paper present on theoretical, experimental and numerical investigation on the flexural strength of compression flange of beam with corrugated webs.

Bureau of Indian Standards[8]

IS808:1989(Reaffirmed 1999) this standard covers the nominal dimensions, mass and sectional properties of hot rolled sloping flange beam and column section, sloping and parallel flange channel section and equal and unequal leg angle section.

III. Concluding remark of Literature Survey-

Realizing the fact, I-section beam have been extensively used whenever standard I-section could not satisfy the moment carrying and shear capacities desired. To built up an I-section it has been common practice to use more steel in webs rather flanges. This results in uneconomical sections as steel is an expensive material. The strength of I-section beam against lateral-torsional buckling along the length of the beam, and local buckling of the beam cross-section can be enhanced by using corrugation along horizontal direction and vertical direction. Different shapes of corrugation as like one arc and two arc sinusoidal along vertical direction and horizontal direction, trapezoidal corrugated shape for horizon direction of web.

Strength of the beam can enhance by using corrugation of beam which also optimization the material of web is useful for the application for many construction. The strength analysis and modal analysis of such corrugated I-section beam will be carried out for its application.

IV. GAP IN LITERATURE

From above literature review, it is found that the stress carrying capacity of trapezoidal corrugated web beam is high as compared with plane web beam. Till date, modal analysis of Trapezoidal corrugated web beam has not been carried out. The synopsis deals with modal analysis along with stress analysis of Trapezoidal corrugated web beam which will be useful for various application and also help to determine working frequencies.

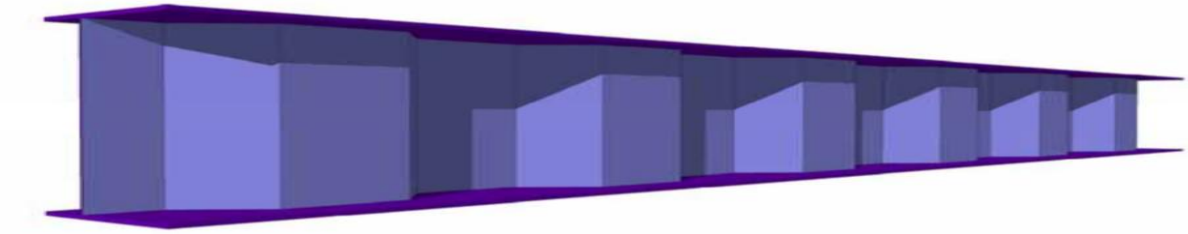

Fig: 1A Trapezoidally Corrugated web Beam.

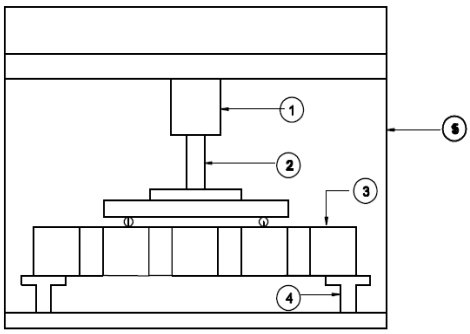

FIG.1B. Proposed Experimental set-up for testing of stress analysis

1. hydraulic cylinder, 2.ram, 3.test specimen, 4.support, 5.frame

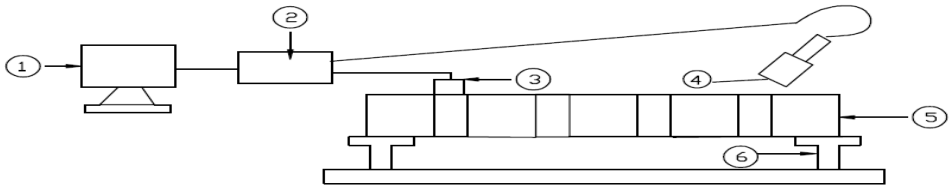

FIG.1C. Proposed experimental set-up for vibration analysis

1.computer, 2.fft,3. accelerometer, 4.hammer, 5.test specimen, 6.support.

V. PROPOSED WORK TO FILL UP LITERATURE GAP OBSERVED

The design and fabrication of Trapezoidal corrugated web beam will be carried out as shown in fig. which recognizes top view and front view of proposed model of beam.3D model of proposed beam have to be created in CATIA and FEA is to be done for strength and modal analysis. The

VI. METHODOLOGY

1. The design of Trapezoidal corrugated web beam and selection of standard I-section beam as per BIS (808:1989) (Reaffirmed 2004)[10] as shown in fig.1A.
2. To build up a 3-D solid model of Trapezoidal corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004)[10] by using suitable modeling software such as CATIA.
3. To perform stress analysis of Trapezoidal corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004)[10] by using FEA software, such as ANSYS.
4. To find out the mode shapes of trapezoid corrugated web beam and I-section beam as per BIS(808:1989) (Reaffirmed 2004)[10] by using FEA software's such as ANSYS.
5. The design and fabrication of Trapezoidal corrugated web beam and standard I-section beam to get deformation/stress induced in critical location will be carried out.
6. By using suitable Experimental set up as shown in fig.1B Stress analysis of trapezoidal corrugated web beam and I-section beam as per BIS(808:1989) (Reaffirmed 2004)[10] will be carried out.
7. Measurement of actual stresses induced at critical location using suitable strain gauge arrangement.
8. To perform the vibration analysis of trapezoid corrugated web beam and I-section beam as per BIS(808:1989) (Reaffirmed 2004)[10] by using
   FFT analyzer as shown in fig.1C.
9. To compare and validate the result obtained by using software analysis with results obtained by experimental Analysis for both strength and vibration for Trapezoidal corrugated web beam and I-section beam as per BIS (808:1989) (Reaffirmed 2004)[10].

VII EXPECTED/ POSSIBLE OUTCOME

On UTM loading condition, as load goes on increasing the first flange buckling then torsional bucking or shear failure will observed, deflection is measured by using strain gauge. On FFT the natural frequencies of beam can be observed.

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PROFILE

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