Characteristics of Rectangular Section and Double Hat Section

S. Kalyanakumar, L. Prabhu, Vineeth. PC, Abhijeeth MP, Abhishek G

Abstract**:** ***This proposal defines the difference between the double hat section tubes &rectangular section for tremble energy consumption like in crash worth applications. The primary objective of this study is to "to gather information regarding the energy absorption & impact of double and single cap section tubes and to apply them in the system where energy absorption takes place.The double-hat and thin-walled top-hat in which spot-welded by quasi-static axial method. Many tests were identified such as associated energy-absorbing characteristics and several post-test collapse mode where scrutinized and compared with other previous tests. The best model was selected by crush analysis in universal testing machine by comparison of parameters such as mean force and energy absorbers. The efficient model is selected by comparatively lesser mean force and higher energy absorption.***

Keywords **:** ***Hat section, Crash***

I. INTRODUCTION

The energy absorption capacity of the crushing response and the energy absorption components are significantly affected by the slope pattern, inertia effects & strain rates. Since this exploration paper completely focuses on the crack up feedback of lean tubes under compression storing, some approaches of tremor kinetics are being inscribed for the nature of many general pipette segments.

II. ENERGY CONSUMPTION DUE TO STRUCTURAL BREAKDOWN

For energy absorption structures to be used in practical systems, they must collapse predictably with a controlled power level. The power consumption efficiency of pipe shapes can be differentiated in many manners to board their n number of applications. In order to define the power consumption range or capability of the energy receiving objects many quality principles has been adopted. And they are utilized in the pre point of the power absorbing entities. And here all the appropriate standard for evaluating the energy absorption energy is inscribed.

III. REVIEW OF LITERATURE

In [1] presented the paper for crash box application as crash excellence of CFRP/Aluminum square cavity slot axle for pivotal consequence storing. The minimum pace impact test specified in the RCAR terms was achieved with five lay-up scenarios and couple of laminate stiffness. Dual ends of the miscegenation model tightened with a distinctively described jig to pin on a same marginal framework to an failure scrutiny sample[2]. And the deactivation properties are given by the various carbon fibers and also at the same time they were stacked from each direction.

In [3] presented the paper the collapsed of the lean-walled lip-channel columns is prone to unity contraction in failure analysis, which deals with the buckling of narrow thin-walled lip-channel columns, which support both ends and distribute identical compression loads. The prime role of our proposal is to question the structure of the structure in the distant posterior position and the slope associated with the moment of erection loss in the column. The following measurement devices and methods were used: laser sensor, electrical strain gauges for strain gauges, and acoustic emission method for measuring displacements [4]. Running test runs and the linear nonlinearity of the compressed joint columns were analyzed by finite element method. The number and test results showed good agreement.

In [5] presented a paper on The absorbed power potential of the Carbon Fiber Reinforce Polymer structural division in accordance with the change in structure and stacking angle. CFRP is nothing but the structural member which is most widely accepted lightweight material [6]. CFRP of the latest conglomerate element as structure element for automobiles which has a vast employment or function in lightweight structural element of aviation, marine and locomotives due to high permeability and endurance[7]-[8]. Autoclave and crushing is specimen formation technique which is used for vertical shock test.

IV. MATERIALS AND METHODS

From the literature survey it is observed that experimental study and testing are done on the shapes like square, circular, elliptical, thin walled tubes[9]-[10]. Similarly for the rectangular single hat section the experimental study and testings were also analyzed for various materials like CFRP, Aluminum, silk/epoxy, composites and steel. The double hat section is not mostly

Revised Manuscript Received on December 16, 2019.

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analyzed. This gives that rectangular section and double hat shape is selected and steel is chosen as a material. The analysis and testing on double hat section is going to be done and compared with the existing rectangular shape.

In this experiment AISI 1026 steel is selected. The property of steel is follows in Table I.

The investigation is performed with UTM machine which owned to predefine the feedback of the lean zones exposed to center or mid mashing of 3 models

1. Rectangular Section(figure 1&4)
2. Simple double-hat section.(figure 2&5)
3. Simple double-hat section with holes selected(figure 3& 6).

Table- I: Material properties

Material	Density (kg/m^3)	Young's modulus (MPa)	Yield strength (MPa)	Poisson's ratio
AISI 1026	7858	200	350	0.3

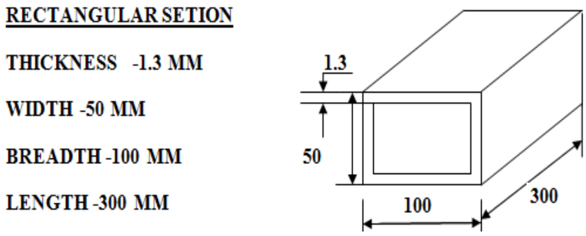

Fig. 1.Rectangular Section.

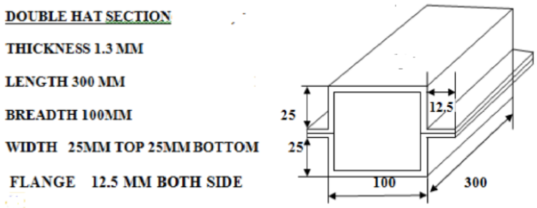

Fig. 2.Simple double-hat section.

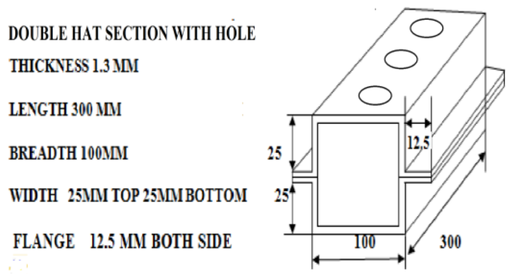

Fig. 3.Simple double-hat section with holes.

Fig. 4. Rectangular Specimen.

Fig. 5.double-hat specimen.

Fig. 6.Double-hat section with hole Specimen.

V. RESULT AND DISCUSSION

Universal testing machine is also known as a universal tester, it is used for both tensile and compressive test. In this experiment compression test has been performed. Figure 7,8 and 9 shows the tested rectangular specimen, double hat specimen and double hat with hole specimen.

Fig. 7.Tested Rectangular Specimen.

Fig. 8.Tested Double Hat Specimen.

Fig. 9.Tested Double Hat With Hole Specimen.

All the three models are tested till it is undergoing full deformation. As discussed above section the three models were crushed under a constant gradual load till get the energy absorption & peak force. The displacement curve vs area under the load will give the energy absorption value. And the tested specimens load vs displacement curve are shown below.

Among all the components we have selected 6 components for the comparison, which are R1, DH , DH H, which comparison graph is shown below figure 10,11,12,13,14 and 15.

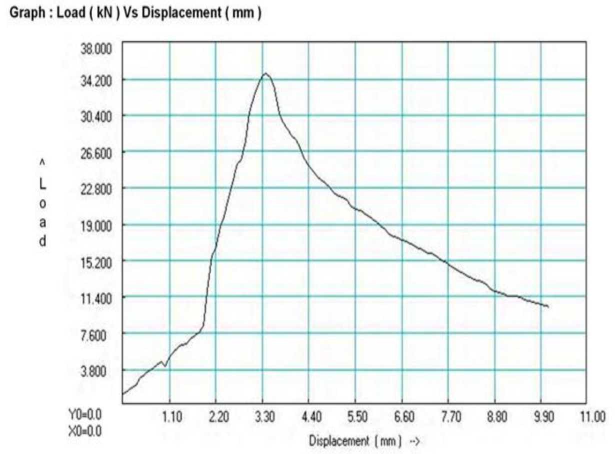

Fig. 10. Load Vs Displacement graph Rectangular Specimen.

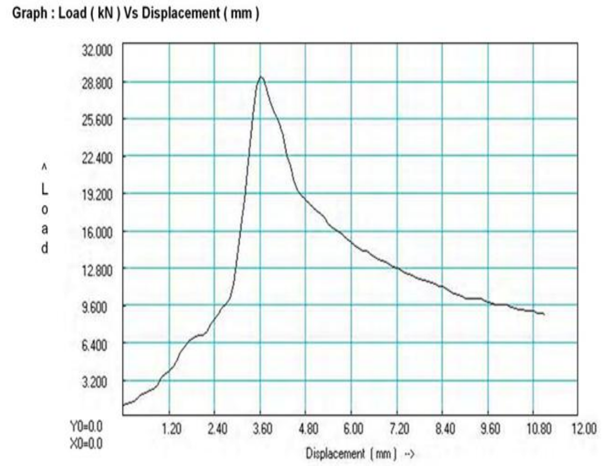

Fig. 11. Load Vs Displacement graph Rectangular Specimen.

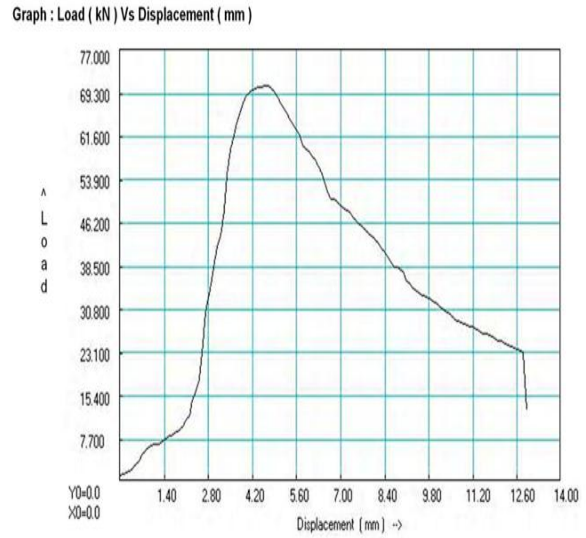

Fig. 12. Load Vs Displacement graph Double hat Specimen.

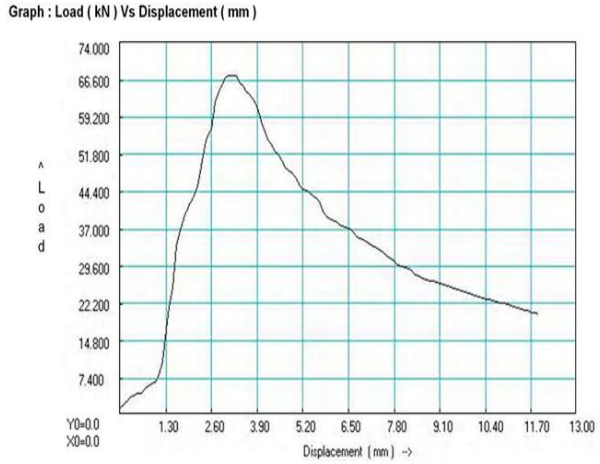

Fig. 13. Load Vs Displacement graph Double hat Sampling.

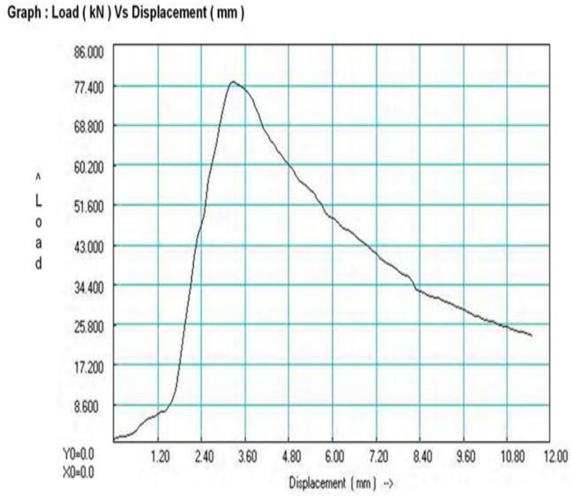

Fig. 14. Load Vs Displacement graph Double hat with hot Specimen.

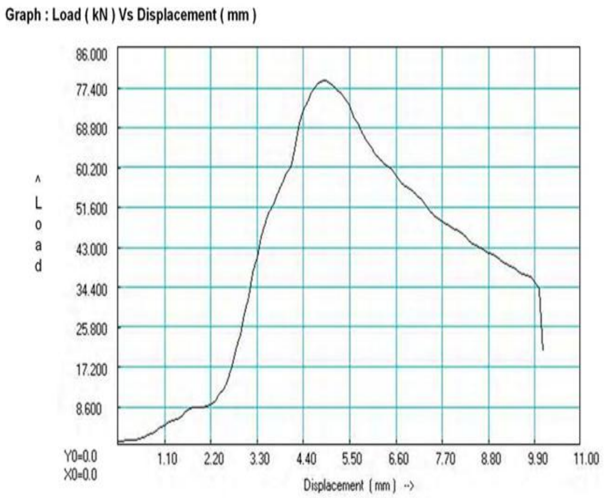

Fig. 15. Load Vs Displacement graph Double hat with hole Specimen.

VI. CONCLUSION

When we have compared the rectangular, double hat double hat with hole hat respectively. we got result that double hat is absorbing more energy than all the components which we have tested using universal testing machine, after double hat with hole is selected and then rectangular is also absorbing least energy in these testing. Graph for Load versus displacement comparison is shown in the Fig.16

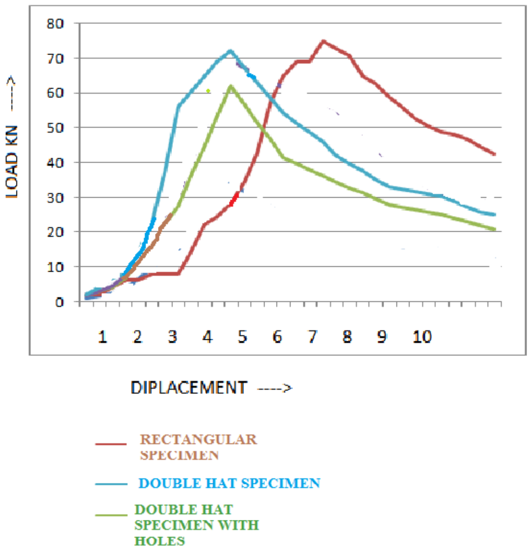

Fig. 16. Load Vs Displacement comparison Graph.

After conducting several testing the area under the curve is more in double hat compared to rectangular section the energy absorbed by the double hat specimen is more. The table is describing the value.Energy Absorption in KJ is illustrated in KJ.and Figure 17 shows the perfromance for energy absorption graph.

Table- II: Energy Absorption in KJ

DH -460	DOUBLE HAT
DH H -408	DOUBLE HAT WITH HOLES
A1-144	RECTANGULAR

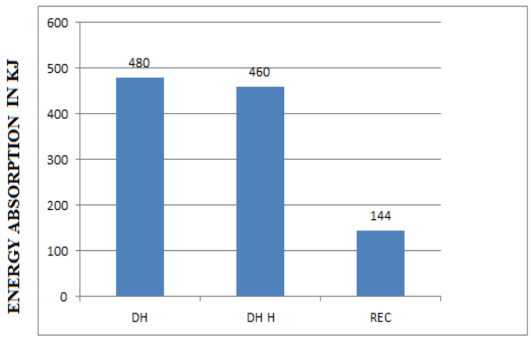

Fig. 17. Energy Absorption Graph.

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