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Research paper

Castellated Beam with and without Stiffners Using ANSYS

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Abstract

Castellated beam is escalation in vertical bending stiffness, simple carrier provision and appealing look. But one effect of presence of Web beginning will be the development of varied local results. Castellated beams are metal beams with web openings and that they benefit its benefit because of its multiplied depth of phase without any extra weight. To analyze the conduct of castellated metal beams having an I-shaped go-element. Analysis is carried from beam with two factor load and genuinely supported assist condition.

Keywords: *Castellated beam, with stiffners,* without stiffners, *ANSYS*

1. Introduction

A castellated beam is a beam fashion wherein an I-beam is subjected to a longitudinal reduces along its internet following a particular pattern with the intention to divide it, and reassemble the beam with a deeper net by taking advantage of the cutting pattern. Castellated beams have various particular conceivable outcomes and favorable circumstances. They are light and solid. They are shabby. Steeply curved castellated beams are developed from equal parts cut from independent rolled segments. The tooth widths and pitches of the internal and external parts are set in an unexpected way, to guarantee that in the wake of cambering they will splendidly coordinate each other. curved castellated beams can be provided in an extensive variety of sorts; for example elliptical and parabolic.

2. Methodology

Fig.1 shows the methodology.

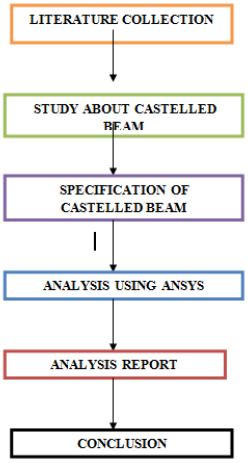

Fig.1: Methodology

3. About Software

3.1. Ansys

These days the Finite element method (FEM) is considered as one of the properly - hooked up and handy method for the computer solution of complicated problems in one of a kind fields of engineering: civil engineering, mechanical engineering, nuclear engineering, biomedical engineering, hydrodynamics, warmth conduction, geo-mechanics, etc.

4. Analysis Results

In this study, a three dimensional (3D) finite element model is developed using ANSYS for IC 225and IC 300.

Case (I)

Without stiffeners.
Fig.2 shows the without stiffeners.

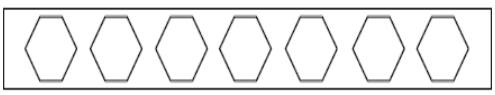

Fig 2: Without Stiffeners

Case (II)

With Diagonal Stiffeners

Fig.3 shows the case(II) with diagonal stiffeners.

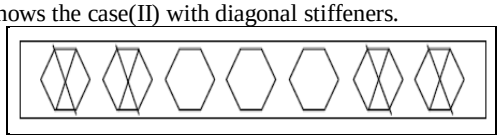

Fig. 3: Case(II) With Diagonal Stiffeners

Table 1 shows the specimen type I (IC 225).

Table 1: Specimen type I (IC 225)

Specimen detail	Length (m)	Thickness of flange t_y(mm)	Thickness of web t_w (mm)	B.webbb_w (mm)	Ht of web opening HW (mm)
WOS 225	1.6	7.5	5	80	150
WDS	1.6	7.5	5	80	150

Table 2 shows the specimen type II (IC 300).

Table 2: Specimen Type II (IC 300)

Specimen detail	Length (m)	Thickness of flange t_y(mm)	Thickness of web t_w (mm)	B.web bb_w (mm)	Ht of web opening HW (mm)	L .of. stiffner	w.of.stiffner	Thickness.of stiffner
Wds 300	1.6	10	6	100	200	260	20	6
Wvs 300	1.6	10	6	100	200	260	30	6

4.1. Castelled Beam Deformation & Bending StressWithout Stiffener

Fig.4 shows the deformation in y-axis.

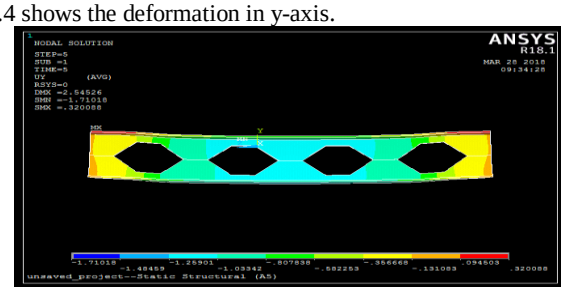

Fig.4: Deformation in y axis

Fig.5 shows the bending area.

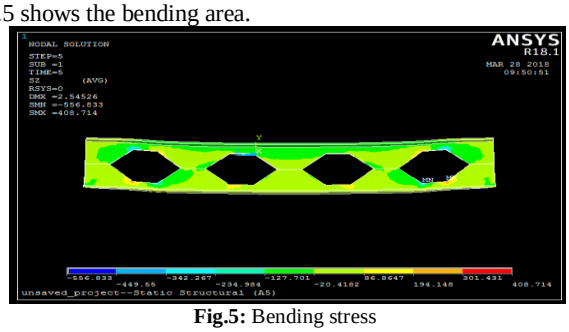

Fig.5: Bending stress

Table 3 shows the deformation results without stiffener.

Table 3: Deformation Results without stiffener

LOAD (KN)	DEFORMATION (MM)	BENDING STRESS(MPA)
10	0.064018	81.7427
20	0.128035	163.485
30	0.192053	245.228
40	0.25607	326.971
50	0.32088	408.714

Fig.6 shows the results of Load Vs Deformation.

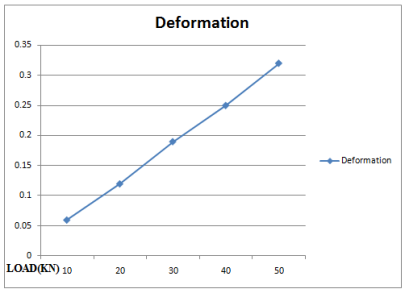

Fig.6: Results of Load Vs Deformation

Fig.7 shows the results of Load Vs Bending area.

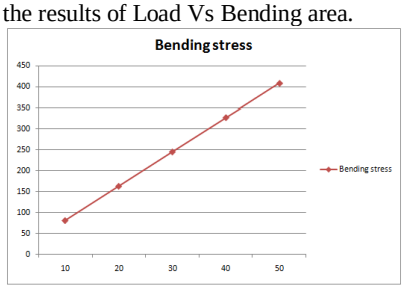

Fig. 7: Results of Load Vs Bending stress

4.2. Castelled Beam Deformation & Bending Stress with Stiffener

Fig.8 shows the deformation in y axis.

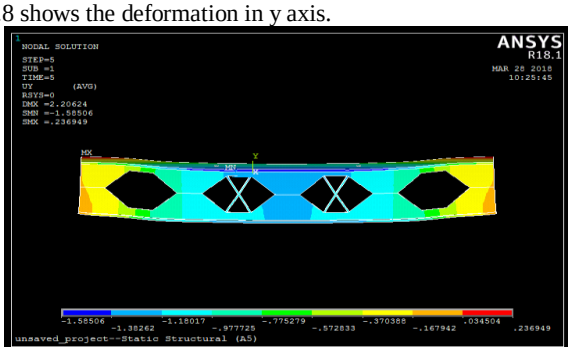

Fig. 8: Deformation in y axis

Fig.9 shows the bending stress.

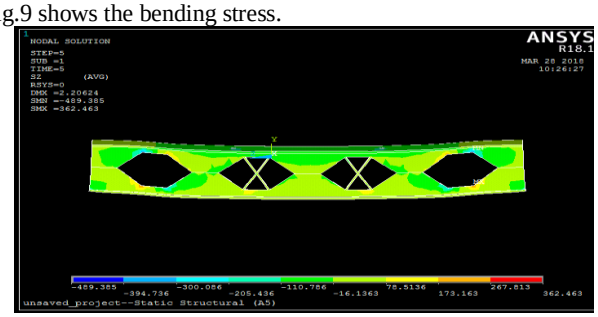

Fig.9: Bending stress

Table 4 shows the deformation results with stiffener.

Table 4: Deformation Results with stiffener

LOAD (KN)	DEFORMATION(mm)	BENDING STRESS(MPA)
10	0.04739	72.4926
20	0.09478	144.985
30	0.14217	217.478
40	0.18956	289.97
50	0.236949	362.463

Fig.10 shows the results of Load Vs Deformation.

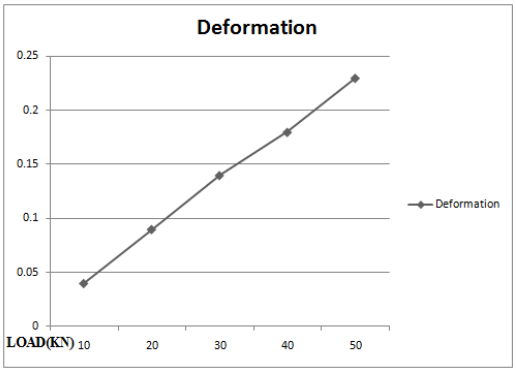

Fig.10: Results of Load vs Deformation (With stiffener)

Fig.11 shows the results of Load Vs Bending stress.

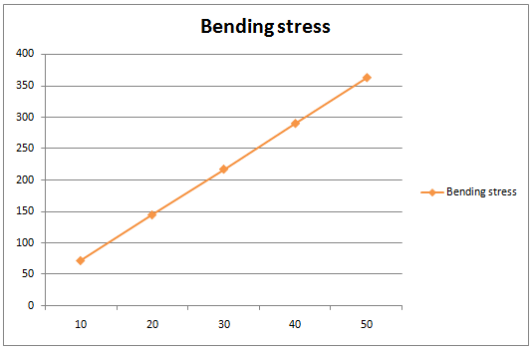

Fig.11: Results of Load vs Bending stress

Fig.12 shows the comparison deformation results for without & with stiffener.

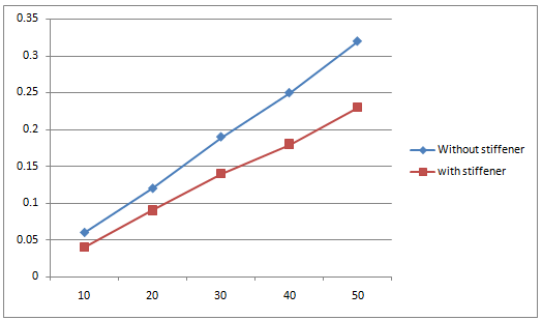

Fig.12: Comparison deformation results for without & with stiffener

Fig.13 shows the comparison bending stress results for without & with stiffener.

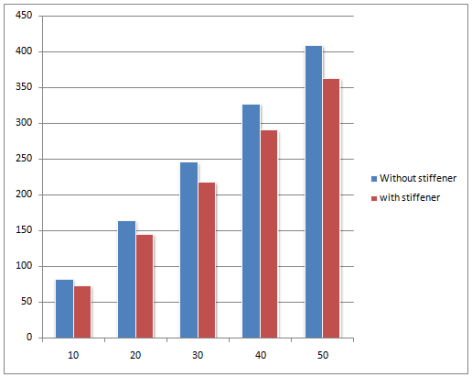

Fig.13: Comparison Bending stress results for without & with stiffener

5. Conclusion

From this analysis, it was observed that as the depth of opening increases, stress concentrations increases. From analysis results comparison of deformation with and without stiffener, with stiffener castellated beam less deformation (Type II – 0.23, Type I – 0.32) compared to Type I specimen. So castellated beam with stiffener will be more economical and strength compared conventional castellated beam.

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