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 stiffeners, without stiffeners, 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.

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 225 and IC 300.

Case (I)

Without stiffeners, Fig.2 shows the without stiffeners.

Case (II)

With Diagonal Stiffeners

Fig.3 shows the case(II) with diagonal stiffeners.
Table 1 shows the specimen type I (IC 225).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length (m)</th>
<th>Thickness of flange</th>
<th>B of web (mm)</th>
<th>B of web opening (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDS 225</td>
<td>1.6</td>
<td>7.5</td>
<td>80</td>
<td>150</td>
</tr>
<tr>
<td>WDS 225</td>
<td>1.6</td>
<td>7.5</td>
<td>80</td>
<td>150</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length (m)</th>
<th>Thickness of flange</th>
<th>B of web (mm)</th>
<th>B of web opening (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDS 300</td>
<td>1.6</td>
<td>10</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>WDS 300</td>
<td>1.6</td>
<td>10</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

4.1. Castelled Beam Deformation & Bending Stress Without Stiffener

Fig.4 shows the deformation in y-axis.

Fig.5 shows the bending area.

Table 3 shows the deformation results without stiffener.

<table>
<thead>
<tr>
<th>Load (kN)</th>
<th>Deformation (mm)</th>
<th>Bending Stress (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.06493</td>
<td>87.747</td>
</tr>
<tr>
<td>20</td>
<td>0.12805</td>
<td>103.405</td>
</tr>
<tr>
<td>30</td>
<td>0.18753</td>
<td>125.228</td>
</tr>
<tr>
<td>#</td>
<td>0.25957</td>
<td>149.07</td>
</tr>
<tr>
<td>#</td>
<td>0.32988</td>
<td>168.314</td>
</tr>
</tbody>
</table>

Fig.6 shows the results of Load Vs Deformation.

4.2. Castelled Beam Deformation & Bending Stress with Stiffener

Fig.8 shows the deformation in y-axis.

Fig.9 shows the bending stress.

Table 4 shows the deformation results with stiffener.

<table>
<thead>
<tr>
<th>Load (kN)</th>
<th>Deformation (mm)</th>
<th>Bending Stress (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.04739</td>
<td>72.4926</td>
</tr>
<tr>
<td>20</td>
<td>0.09478</td>
<td>144.985</td>
</tr>
<tr>
<td>30</td>
<td>0.14217</td>
<td>217.478</td>
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<tr>
<td>40</td>
<td>0.18956</td>
<td>289.07</td>
</tr>
<tr>
<td>50</td>
<td>0.234949</td>
<td>362.163</td>
</tr>
</tbody>
</table>

Fig.10 shows the results of Load Vs Deformation.
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.

References


