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# EVALUATE THE STRENGTH PERFORMANCE OF WEB OPENING IN H-SECTION

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**Abstract –***High-strength steel are better than normal steels. Commonly these are castoff for the construction of bridges, offshore constructions etc. In this project a (FEM) was developed for H-section in high-strength steel beams. Mainly used to calculate the presentation of H sections beams by changing the diameter of holes such as 67.5 mm, 74.25mm, 81.675mm and 89.84mm. To examine the presentation of crippling loading on H-section steel beams having changing number of circular opening. The result acquired that, the most apct diameter of the hole is about 89.84mm, also the four number of holes give maximum result.*

***Keywords:*** **FEA, Web opening, H-section, crippling loading**

## 1. INTRODUCTION

### 1.1 General Background

The use of steel have lately enhanced many architectural presentations such as bridges skyscrapers and offshore constructions. Related near normal strength steel, high strength steel have progressive strength and better stiffness. Which can reduce the weight of structures assembly it more proper for large intergalactic assemblies and long-span bridges.

## 2. OBJECTIVES

The main objectives are,

- To investigate the performance of H section beam by changing the diameter of the holes.
- To investigate the performance of crippling loading on of H-section high-strength steel beams having different number of circular opening

### 2.1 To investigate the performance of H section beam by changing the diameter of the holes.

**Table-1:** Material properties

| | |
|---|---|
| H Section | 125x225x6x6 |
| Material | High strength steel |
| Young's modulus (MPa) | 204376.2 |
| $\sigma y$ (MPa) | 677.9 |
| $\sigma u$ (MPa) | 725.8 |
| $\varepsilon f$ (%) | 29.1 |
| $\sigma y/\sigma u$ | 0.93 |

The diameter of the holes are changed to 67.5 mm diameter, 74.25mm, diameter, 81.675mmdiameter, 89.8425mm diameter. That means a 10% increase in hole section.

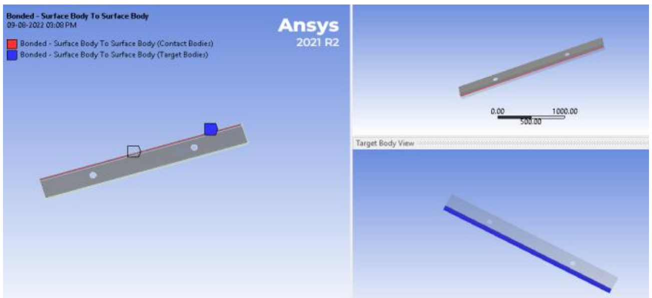


**Fig -1**: Connections provided in H section

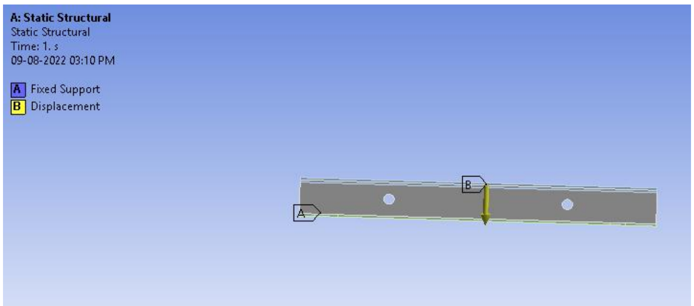


**Fig -2**: Boundary conditions in section having 67.5 diameter

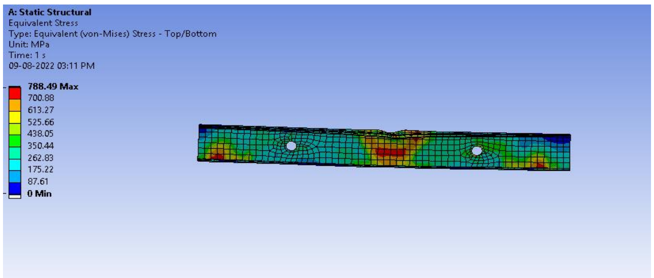


**Fig -3**: Equivalent stress in section having 67.5 diameter

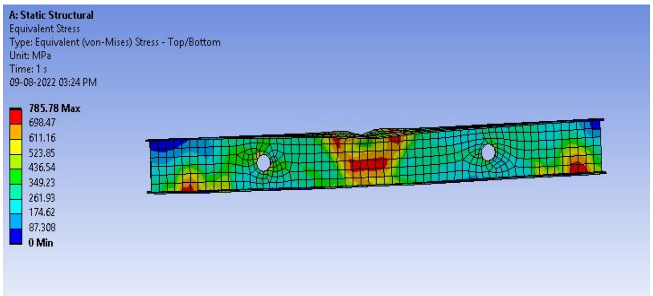


**Fig -4**: Equivalent stress in section having 74.25 diameter

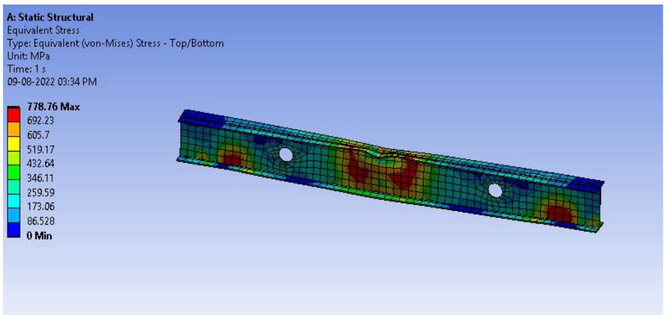


**Fig -5**: Equivalent stress in section having 81.675mmdiameter

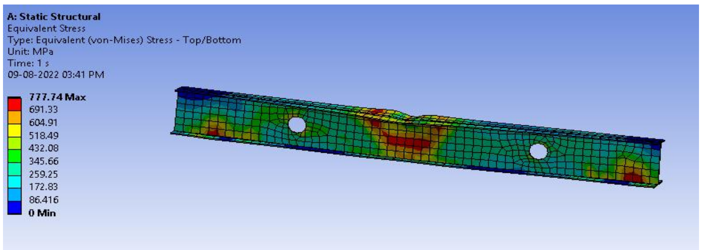


**Fig -6**: Equivalent stress in section having 89.84 mm diameter

**Table-2:** Result obtained from changing the diameter of H-section

| Section with different diameter | Total deformation (mm) | Equivalent stress (MPa) |
|---|---|---|
| 67.5 mm diameter | 26.274 | 788.49 |
| 74.25mm diameter | 26.831 | 785.78 |
| 81.675mmdiameter | 28.03 | 778.76 |
| 89.8425mm diameter | 27.52 | 777.74 |

By analyzing the section, H-section with 67.5mm having high equivalent stress as compared with other. But highest deformation can be seen the section with 81.675mm. Circular openings able to decrease the flexural capacities of section. Because of stress concentration happened near web openings. Also see, maximum failure happen on the place near the opening.

### 2.2 To investigate the performance of crippling loading on of H-section in high-strength steel beams having different number of circular opening

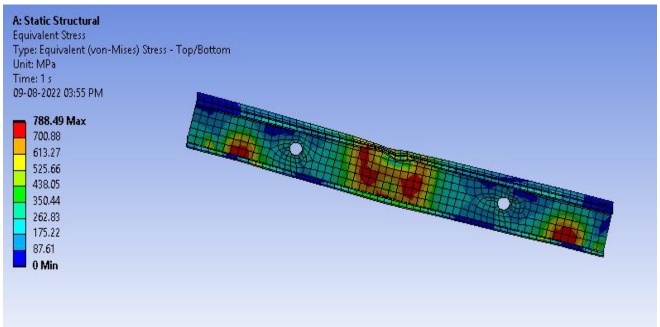


**Fig -7**: Equivalent stress in section with two holes

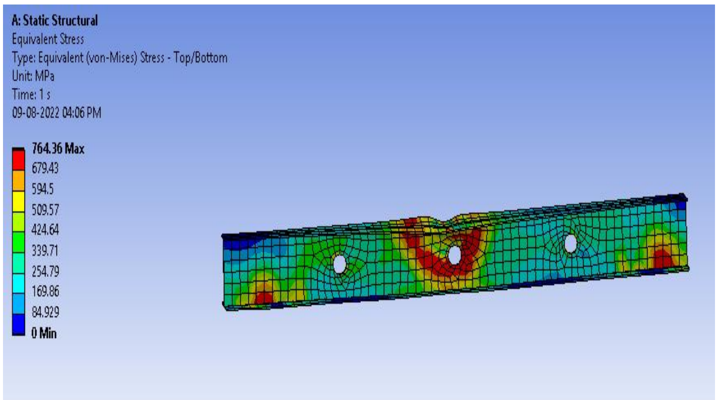


**Fig -8**: Equivalent stress in section with three holes

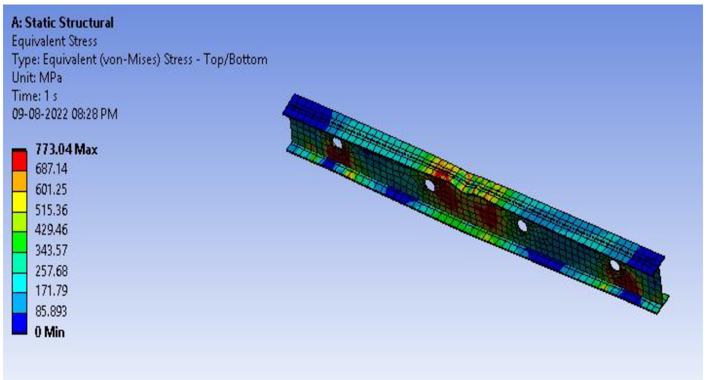


**Fig -9**: Equivalent stress in section with four holes

**Table-3:** Result obtained from section with different number of holes H-section

| Section with different number of holes | Total deformation (mm) | Equivalent stress (MPa) |
|---|---|---|
| Two holes | 26.274 | 788.49 |
| Three holes | 29.081 | 764.36 |
| Four holes | 27.108 | 773.04 |

By analyzing the section, H-section with three holes having high total deformation as compared with other. But highest equivalent stress can be seen on the section with two holes. Around the holes a sudden change in the cross sectional area will be there. Due to these irregularities and increase in the intensity of stress in the body.

**RESULTS**

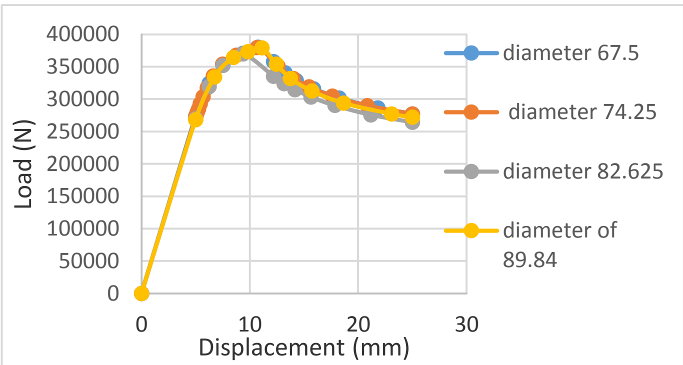


**Chart-1**: Comparison of Load displacement diagram of section with diameter

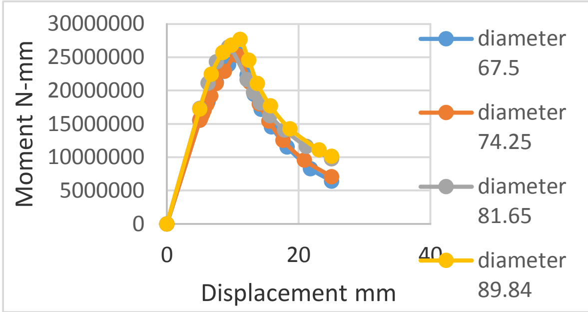


**Chart-2**: Comparison of moment displacement diagram of section with diameter mm

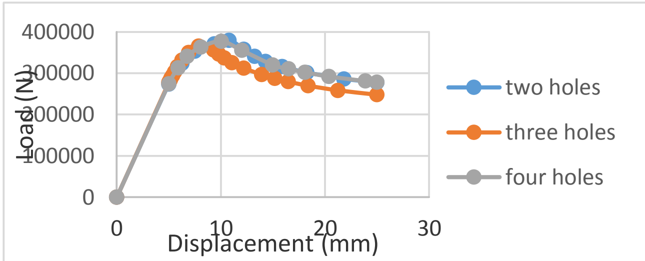


**Chart-3:** Comparison of Load displacement diagram of section with different number of holes

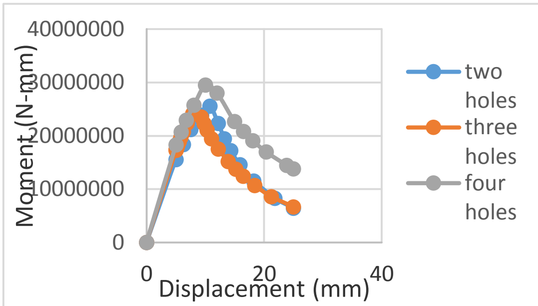


**Chart-4:** Comparison of Moment displacement diagram of section with different number of holes

## 3. CONCLUSIONS

The result obtained that, the circular openings able to reduce the flexural capacities of the section. Because of stress concentration happened near web openings. Also see, maximum failure happen on the place near the opening. By comparing the result the most apct diameter of the hole is about 89.84mm, also the four number of holes give maximum result.

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