ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 8, March 2017

ANALYTICAL STUDY ON BEHAVIOUR OF REINFORCED CONCRETE BEAM REINFORCED WITH SLOTTED ANGLES

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ABSTRACT:

Concrete is a heterogeneous material which has high compressive strength but frail in tensile strength , TMT rods are homogenous material having capacity to carry tensile strength. These two materials has enormous variations in its properties. Reinforced concrete is a one in which TMT rods are implanted into the concrete , so that failure does not occur in high tensile strength Hence reinforced concrete is stable against both compressive and tensile strength. Though it has many advantages , they are hard to recycle, expensive and convert as a landfill . The aim of this project is to analyse the behaviour of RC beam replaced with slotted angle in the place of HYSD bar. Slotted angle due to its perforation it has greatinterlocking towards concrete and so the bond strength of slotted angle is muchhigher than TMT bars. Beams with slotted angle and also with TMT rods are analyzed in ABAQUS , the stress created in slotted angle is least when comparedwith TMT bars. Hence slotted angle has capability to carry great load than TMTbars. Therefore, in day to day practice slotted angle can be used as a substitute inconstruction of beams as a replacement for main rod.

1.1 GENERAL

Beam is a load bearing unit that can be used to carry vertical and horizontal loads. Normally TMT rods are used as reinforcement in beams. TMT rods has its development from MS rods and now only TMT rods were used because of its advantage over MS rods. And for further development these TMT rods are replaced with thin walled section. In this project we are going to analyse the behaviour of RC beam .

1.2 THIN WALLED SECTION

In steel construction, two main types of structural steel are used. They are hot-rolled and cold-formed steel. Hot rolled steel are more popular and has many applications in the construction industry. However, demand for cold-formed steel structures especially for residential, industrial and commercial buildings has increased significantly during the last decade. There are two major types of cold-formed structural member. They are primary load bearing members such as beams in floor assemblies, columns in wall assemblies, individual beams and columns, and truss

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members, and non-load bearing members in partition walls.

1.3 .ADVANTAGES OF COLD FORMING

1. The cold forming process enables material cost savings up to 70% by avoiding the production of scrap from the machining process.
2. Product performance is improved over other manufacturing processes as the cold forming process rearranges the grain structure to follow the part configuration. This favorable characteristic eliminates the potential for porosity fatigues, increases over-all strength performance (shear strength, etc.) and reduces risk of other types of material integrity.
3. Surface finish is improved versus machined surfaces.
4. Critical and close tolerances can be held versus more expensive machining processes and more important, these tolerances are maintained consistently throughout the production process.

1.4 SLOTTED ANGLE

Slotted angle (also sometimes referred to as Slotted angle iron) is a system of reusable metal strips used to construct shelving, frames, work benches, equipment stands and other structures. The name derives, first, from the use of elongated slots punched into the metal at uniform intervals to enable assembly of structures fixed with nuts and bolts, and second, from the longitudinal folding of the metal strips to form a right angle.

2.1 LITERATURE REVIEW

There is only replacement of reinforcement with other materials such as polyethylinfibre and bamboo etc., . But until now there is no replacement of reinforcement with other steel sections. This is for the first time we are replacing reinforcement with slotted angle.

3.1.ANALYSIS USING ABAQUS

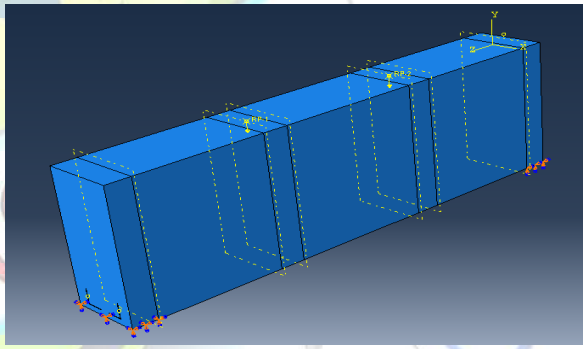

Fig.3.1.Beam model

In this we have created a beam of dimension 150 x 300mm to a length of 1000mm. The boundary condition of the beam is hinged since it is a simply supported beam. The method used to test the beam is two point loading. Using mesh command we have divided the beam into number of finite elements so that the stress created in the beam can be analysed easily.

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4.1.RESULTS AND DISCUSSION

4.1.1.BEHAVIOUR OF MATERIALS

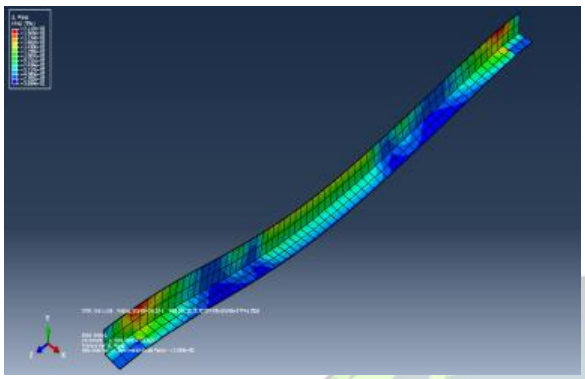

Fig.4.1.1.a.Slotted angle

This figure shows the behaviour of slotted angle on application of load.

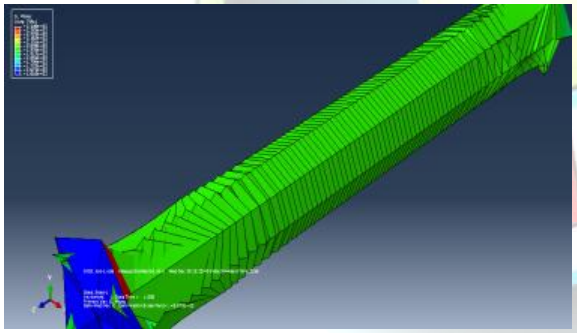

Fig.4.1.1.b.. TMT rod

This figure shows the behaviour of rod on application of load.

From the figures it is inferred that rod get ruptures while applying load but in case of slotted angle there is only deformation in it's shape and no rupture.

4.1.2.BEHAVIOUR OF BEAM

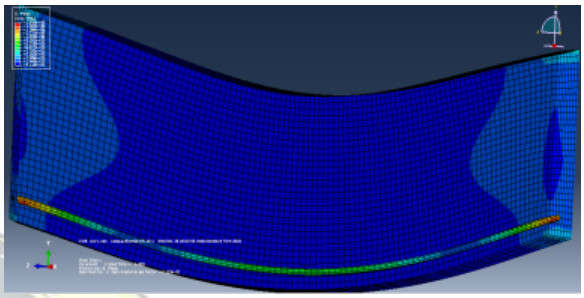

Fig.4.1.2a. Beam with TMT rod

This figure shows the stress distribution in beam reinforced with HYSD bars. The blue colour indicates that minimum amount of stress is taken by the concrete while the bars carries more stress than the concrete and it is indicated by red colour in the bars.

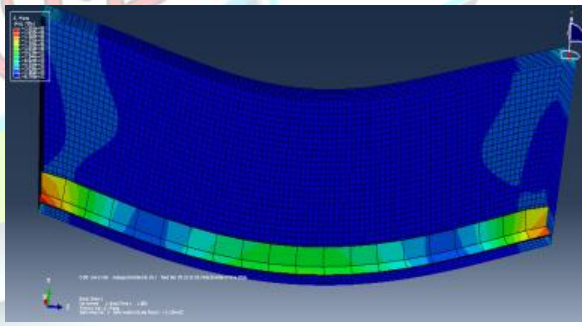

Fig.4.1.2b. Beam with slotted angle

This figure shows the variation of stresses in the beam embedded with slotted angle respect to its loading condition. On comparing the above two figures it is inferred that stress on slotted angle is minimum when compared to HYSD bars and

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it is indicated by it's colour variation.

5.1.CONCLUSION

The conclusions accomplished from analytical study are presented below,

- By using slotted angle as a reinforcement; there is a increase in the load carrying capacity of the specimen . This is due to the presence of perforations in slotted angle.
- The section are analysed using software Abaqus and stress created on slotted angle is less compared with MS and TMT rod.

6.1.REFERENCES

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