International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 03 | Mar 2020 www.irjet.net p-ISSN: 2395-0072

AN EXPERIMENTAL STUDY OF FLEXURAL BEHAVIOUR AND CORROSION PROPERTIES OF BEAM

Rashmi Pantawane[1], Mohammad Shahbaz Anwar[2], Hemant Hiware[3], Ahtesham Raza[4], Aafaque Rehan[5], Mohammad Hakeem Ashraf[6]

[1]Assistant Professor, Department of Civil Engineering, Guru Nanak Institute of Engineering & Mangment, Nagpur
[2,3,4,5,6]UG Student, Department of Civil Engineering, Guru Nanak Institute of Engineering & Mangment, Nagpur

---

ABSTRACT:- The general objective of this work is to study the effect of reinforcement corrosion on the flexural strength of reinforced concrete beams.

- To induce accelerated corrosion on bare steel (TMT) bars and Corrosion Resistant BITUTHANE coating in the RCC beams and determine the effect of corrosion on its residual Flexural Capacity.
- Develop a test set up to carry out load-test on the RCC beam.
- Study of residual flexural capacity of degraded reinforced concrete beams due to corrosion and their effect.
- The main objective of our study is to find an easy and cheap alternative to resist corrosion and also not compromising its strength and load carrying capacity

INTRODUCTION:-Flexure or bending is commonly encountered in structural elements such as beams and slabs which are transversely loaded. Flexural strength is measure of the tensile strength of OPC concrete, in other words it is a measure of a resistance against failure in bending. Although the probability of the structures being flexure deficient is low, failures have occurred due to a variety of factors: errors in design calculations and improper detailing of reinforcement, construction fails or poor construction practices, changing the function of a structure from a lower service load to a higher service load, seismic and wind action, reduction or total loss of reinforcement steel area causing the corrosion in service environment

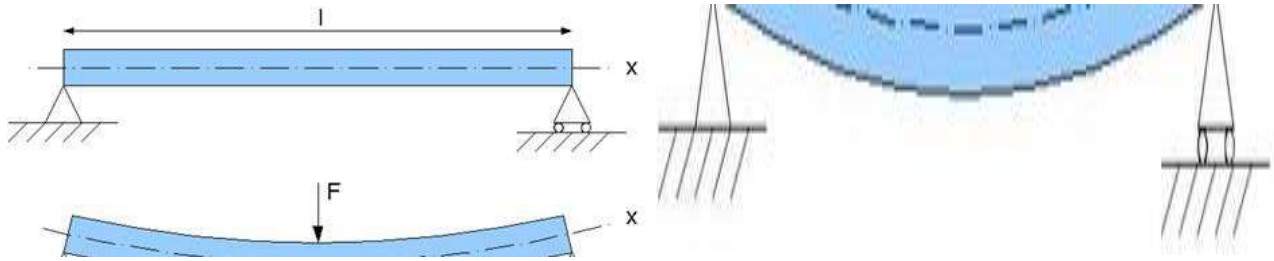

Fig.1 Deflection of beam.

Corrosion:-Corrosion is caused by the destructive attack of chloride ions penetrating by diffusion or other penetration mechanisms from the outside, by incorporation into the ppc concrete mixture, by carbonation of the cement cover, or their combination. Carbonation of concrete or penetrations of acidic gases into the concrete causes of reinforcement corrosion. Besides these there are few factors, some related to the concrete quality, such as w/c ratio, cement content, impurities in the concrete ingredients, presence of surface cracking, etc. and others related to the external environment, such as moisture, bacterial attack, stray currents, etc., which affect reinforcement corrosion. Uncontaminated cover concrete provides a physical barrier that prevents the direct exposure of the steel surface to the outside environment. It also provides a highly alkaline chemical environment that protects steel from corrosion.

Corrosion of steel reinforcing bars is an electrochemical process that requires a flow of current and several chemical reactions. The three essential components of a galvanic corrosion cell are like,,Anode ,Cathode ,Electrolyte .

LITERATURE REVIEW

By STejaswi and J Eeshwar Ram. In this study, reinforced cement concrete is a general material which is widely used for various types of constructions and structural elements. For the efficient use of RCC it is necessary to know the properties and the behaviour of RCC elements under various constrains. To estimate and analyse the basic properties and behaviour of RCC an experimental study is needed. In the present study an experiment in which flexural behaviour of RCC under various constrains was the major criteria. For the experimental analysis simply supported beams of under reinforced, balanced and over reinforced sections are considered. When the beam is simply supported and is subjected to some

external loading the corresponding deflections are examined such that the flexural behaviour of the RCC beams of under reinforce, balanced and over reinforced sections analysed. In order to study the flexural behaviour of any material one had need some basic constant conditions as their limitations. In the present study stress-strain behaviour of Concrete and steel are taken as a base and the flexural behaviour of the material in various fibres.

By K. Venkateswara Rao, B. Devi Pravallika and K. Phani Krishna.

The main aim of this study is to investigate and compare the flexural strength and theoretically estimated steel loss of corroded and un corroded reinforced concrete beams replaced with 0%, 10%, 20%, 30% fly ash with cement respectively. Accelerated corrosion technique using 5%Nacl and impressed current were adopted to corrode the beam experimentally. The important factors that influence the test results are grade of the concrete and percentage replacement of fly ash. At 10% replacement of fly ash there is a much reduction in the steel loss and as the replacement increases there is a little reduction in steel loss and considerable change in flexural strength. **By**

Naga Chaitanya. C and Vamsi Krishna. B

In this study, reinforced concrete beams are normally designed as under reinforced to provide ductile behaviour such as the tensile moment of resistance. In coastal environment reinforcement corrosion is an obvious cause of deterioration of concrete structure, which affects the durability and service of reinforced concrete structure. The corrosion was measured using Applied Corrosion monitoring instrument. Beam specimens are prepared using M20 grade concrete for OPC. Beam specimens casted are tested as vertical cantilever beam in specially prepared loading setup and load deflection behaviour is studied.

CONCLUSIONS

By completion of our experimental study we conclude these following points:

- The 7 days Corrosion resistant beams have marginally the least load taking capacity and intermediate deflection compared to the conventional 7 days beams and 7 days corroded beam.
- The 28 days Corrosion resistant beams have higher load taking capacity and intermediate deflection compared to 28 days conventional and corroded beam.
- The corrosion on 'BITUTHANE' coated beams have been marginally resisted which is exhibited by steel loss readings.
- The 'BITUTHANE Anti-Corrosive Coating' is a cheaper alternative for resisting the corrosion on the bars of RCC beams.
- Its cost friendly nature and least applying procedure is suitable for any construction site.
- Tests should be carried out on different grades of concrete to study their effects on strength.
- Tests should be carried out on different beam sizes to verify the accuracy of the proposed method and to observe the size effect.
- Study should be carried out in different exposure conditions such as, natural corrosion and sea corrosion, to study the effect of corrosion on strength and durability aspects of structures.
- The corroded beam will have lesser load carrying capacity and higher deflection then conventional beams in general.
- Poor workmanship gives ultimate results in the form of failure but corrosion is time consuming and deadly and its failure is mostly uncertain.
- Tests should be conducted with new corrosion resistant materials to be applied on steel reinforcement which are cheap and reliable.
- All the above four future works are subsequently vast making them topics of independent studies.
- Corrosion resistant beams with 'BITUTHANE' coating exhibits higher load taking capacity and intermediate deflection in general.
-
- From the flexural strength and theoretically estimated steel loss values we can conclude that in conventional beams the strength is gained after 7 days and in corroded beams the corrosion comes into play after 7 days and tamper the strength there after.

REFERENCES

[1] International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV5IS020611 Vol. 5 Issue 02, February-2016 by K. Venkateswara Rao, B. Devi Pravallika and K. Phani Krishna.

[2] International Journal of Innovations in Engineering and Technology (IJIET) ISSN: 2319-1058 Vol.5 Issue 01 February 2015 By STejaswi and J Eeshwar Ram.

[3] International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV5IS020611 Vol. 5 Issue 02, February-2016 by K. Venkateswara Rao, B. Devi Pravallika and K. Phani Krishna.

[4] For design purpose IS 456:2000, IS10262: 1982 are used.

[5] Concrete technology by Dr.MS SHETTY.

[6] IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 4 Ver. II (Jul- Aug. 2014), PP 98-109 www.iosrjournals.org by Naga Chaitanya and Vamsi Krishna.