Design of Reinforced Masonry Block for Pavement

Tanushree P. Gurve[1], Kalyani S. Sadanshiv[2], Shejal A. Tembhurne[3], Sitara S. Nagrale[4], Kadambari M. Zarkar[5], Rani S. Dambhare[6], Sumit S. Sarkar[7]
[1,2,3,4,5,6,7]*UG Student, TGPCET, Mohgao, Nagpur*

***Abstract*— The construction of block pavements has grown fast in the last decade. There is still a need for simple tools that could be applied to design. This paper analyzed and verified concrete block pavements for urban and local roads composed of rectangular concrete pavers with plane side surfaces. Three wheel positions, five blocks patterns, three bedding sand thicknesses and joints gaps have been considered to evaluate stress-strain condition on pavement materials. Fatigue and rutting verification was performed respectively for bound and unbound pavement materials using analytical curves available in the literature. The aim of this project is to determine the properties of those blocks that deteriorated rapidly in contrast with those that had provided long-term satisfactory service, and to identify test methods and specifications that will ensure that blocks are durable.**
This project covered major aspect of concrete mix design as the quality control measure of concrete production, as per the Indian Standard Code IS: 10262-1982. It is aimed at highlighting the importance of reinforced designed concrete as compared to ordinary ratio analysed concrete in concrete production for any civil / structural concrete work. It equally includes the whole laboratory test analysis, to determine the physical and geotechnical properties of the material needed for the design of reinforced concrete in order to attain the required data for the design procedure, in accordance to the parent material type and location, and specific density of the designed reinforced concrete, that will be suitable, adoptable, durable, economical, workable and generally safe for the structural design objective of the weather condition in any specific locality. In these project we use M20 grade of concrete.

***Index Terms*— Reinforced, Mix Design, Concrete,**

I.INTRODUCTION

The word "Concrete" comes from the Latin word ***concretus***. Concrete is used nearly every type of construction. Concrete has been primarily composed of cement, aggregate, water (aggregate also includes fine aggregate and coarse aggregate). The aggregate make up the bulk of mix, it is the hardened cement paste that binds the aggregates together and contributes to the strength of concrete [although the strength is also important]. By providing reinforcement in concrete masonary pavements to increase the strength, durability and to resist weathering effect.

In masonry buildings the masonry beams are the structural elements responsible for the distribution of vertical loads over openings Masonry beams are subjected to shear and flexure efforts and according to several authors, the design of masonry beams can be performed using the ultimate strength design method similar to what is used in reinforced concrete beams. This contrasts with many countries in Europe and North America where basements have continued to be incorporated into new dwellings. Nowadays such space tends to be used for additional living rather than storage space and the construction industry has developed ways of making basements cheaper to construct, warmer and drier.

Steel – The steel reinforcement is generally in the form of round bars of mild steel. The diameters of bars vary from 5mm to 40mm. Sometimes the square bars or twisted bars or ribbed-t or steel are used as steel reinforcement. For road slabs and such other constructions, the reinforcement may also consist of sheets of rolled steel of suitable thickness. The hyrib which is a steel lath may also be used as the steel reinforcement. Steel is a costly anad strong material. The steel used in a concrete for the high strength of cube. The 4 steel vertical placed and 2 rings (stirrups) used in a cube 6mm and 8mm. IS 800:2007.

Fibre – The fibre is a filament thread like piece of any material. The term sometimes also refer to a raw material that can be drawn into threads. Fibre mixed in a concrete for high strength. In these project we used fibre in the concrete for increase the strenght of concrete. It is lightweight material and having high strength properties. We use Plastic Fibre in these project about 10%, 15%, 20% and 25%.

Fibres may be of the following types:

1. Mineral Fibre
2. Vegetable Fibre
3. Animal Fibre

II. LITERATURE REVIEW

1. Masakazu Terai Koichi Minami (2012)

This research paper by replacing steel Bamboo was used. In this paper author compare between Steel Reinforced Concrete and Bamboo Reinforced concrete also identify the mechanical properties of Bamboo Reinforced Concrete.

2. Bhimaji Dashrath Kanawade (April 2018)

The aim of this paper is to be determine the properties of block to long term satisfactory service to identify test methods and specification that will ensure that blocks are durable.

3. Charin Namarak, Chai Jaturapitakkul Weerachart Tangchirapat (June 2017)

This experiment used three types of waste materials: Calcium Carbide residue, Fly ash, Recycled concrete aggregate without Ordinary Portland Cement(OPC) to find out compressive strength of the concrete paving blocks.

III. EXPERIMENTAL WORKDONE

Testing of Materials

1) Sieve Analysis Test for Coarse Aggregate
For 1kg Coarse Aggregate

Sieve Size	Weight Retained
25mm	0gm
20mm	140gm
12.5mm	640gm
10mm	170gm
4.75mm	50gm

Fig. I Sieve Analysis sample for Coarse Aggregate

2) Flakiness and Elongation Test Sample 1320gm

Fig. II FLAKINEE INDEX SAMPLE

Fig. III ELONGATION INDEX SAMPLE

3) Sieve Analysis Test for Fine Aggregate Sample 2kg

Sieve Size	Weight Retained
10mm	0gm
4.75mm	0gm
2.36mm	10gm
1.18mm	30gm
600micron	600gm
300micron	500gm
90micron	400gm
75micron	300gm
Pan	160gm

Fig. IV SIEVE ANALYSIS SAMPLE FOR FINE AGGREGATE

4) Fineness Test of Cement
Weight of Cement=100gm(W1)
Size of sieve=90 micron(W2)
Fineness of Cement=W2/W1*100
=10/100*10
=10%

Fig. V & VI FINENESS TEST OF CEMENT

5) Initial and Final Setting Time of Cement
Weight of Cement= 400gm % of Water= 25/100*Weight of Cement
=25/100*400
=100ml
Normal Consistency= Weight of Water/Weight of Cement*100
=104/400*100
=26%
For Initial Setting Time
Weight of Water= 0.85*P
=0.85*26/100*400
=88.4cc
=88.ml
Initial Time=28min.
Final Time=24hrs.

Fig. VII INITIAL SETTING TIME

Fig.VIII FINAL SETTING TIME

6) Slump Cone Test

Fig. IX SLUMP CONE 100mm

7) Compressive Test

Fig. X COMPRESSIVE TSTING MACHINE

Fig. XI REINFORCED CUBE

IV. MIX DESIGN

The ratio of dry volume to wet volume of concrete is 1.54.

Volume of cement required =1/1+1.5+3*1.54
=0.28cu.m

Volume of sand required =1.5/1+1.5+3*1.54
=0.42cu.m

Volume of aggregate required =3/1+1.5+3*1.54
=0.84cu.m

For 1cu.m of concrete

1)Cement required =0.28*1440
=403.2kg

No. of bag = 403.2/50
= 8.06bag

2)Sand required =0.42*1600
=672liters

3)Aggregate required =0.84*2400
=2016liter

Volume of cube =0.15m*0.15m*0.15
=0.003375cu.m

V. ANALYSIS OF RESULT

Fibre Cube

Average Compressive strength for 7 days - 22.85
Average Compressive strength for 14 days – 25.50
Average Compressive Strength for 28 days – 27.92

Reinforced Cube

Average Compressive Strength for 7 days – 26.74
Average Compressive Strength for 14 days – 30.88
Average Compressive Strength for 28 days – 35.58

VI. CONCLUSION

1. By using fibre and steel environmental issues can be decreases.
2. Fibre is lightweigth material it can reduce weight of structure.
3. Fibre and Steel bars both are chemical resistance.
4. The test was conducted to evaluate the structural behavior of normal cube and reinforced cube.
5. It was observed that reinforced cube is strong as compare to normal cube.
6. As a result, it was observed that reinforced cube is superior it gives high tensile property.

REFERENCE

[1]Virat Choudhary “A Research Paper on the Performance of Synthetic Fiber Reinforced Concrete” 1Student M.Tech Dept. Of Civil Engineering, IEC College of Engineering & Technology, U.P., India.

[2]Andrey Anatolievich Shubin, Pavel Kirillovich Tulin and Irina Vitalyevna Potseshkovskaya “Research of the Effect of the Concrete Reinforcement Structure on the Stress-Strain State of Structures” Saint Petersburg Mining University, 2, V.O., 21st Line, Saint Petersburg, Russia.

[3]Jing Gong, Zezhong Zhu, Cong Zeng “Review of Research and Application of Reinforced Concrete Structures Strengthened by Braces” School of Civil Engineering and Architecture, Northeast Electrical Power University, Jilin City, Jilin, China

[4]Masakazu TERAI & Koichi MINAMI “ Research and Development on Bamboo Reinforced Concrete Structure” Fukuyama University, Japan.

[5]V. S. PARAMESWARAN, T. S. KRISHNAMOORTHY AND K. BALASUBRAMANIAN-“Current Research and Applications of Fiber Reinforced Concrete Composites in India “

[6]J.J.ROBERTS "The development of Design methods for reinforced and unreinforced mesonry basement wall."
[7]Arun Singh Chahar, Priyaranjan Pal " Study on various properties of reinforced concrete"
[8]GracaVasconcelos,Paulo.B.Laurenco,Vladimir G. Haach "Experimental analysis of reinforced concrete block masonry spandrels using pre-fabricated planar trussed bars."
[9]V.S.Parameshwaran,T.S.Krishnamurty,K. Basuman "Fiber reinforced concrete behaves like a composite subject to combine static loads and to impact dynamic and blast load."
[10]Paola Di Mascio, Laura Moretti , Americo Capannolo Department of Civil, Building and Environmental Engineering, Sapienza University of Rome, Rome 00184, Italy "Concrete block pavements in urban and local roads: Analysis of stress-strain condition and proposal for a catalogue".
[11]Bhimaji Dashrath Kanawade , Sonali Ratnakar Nawale Assistant Professor , B. E.2Department of Civil Engineering Dr.Vithalrao Vikhe Patil College of Engineering, Ahmednagar Sandip Foundation SITRC, Nashik "Strength and Durability of Concrete Paver Block".
[12]Charin Namarak, Chaiwut Bumrungsri, Weerachart Tangchirapat, Chai Jaturapitakkil, Department of Civil Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand "Development of Concrete Paving Blocks Prepared from Waste Materials without Portland Cement."
[13]Jing Gong, Zezhong Zhu, Cong Zeng "Review of Research and application of Reinforced Concrete Structures Strengthened by Braces."
[14]Ricardo N. F., Eduardo Julio "New trends for Reinforced Concrete Structures: Some resulis of Exploratory Studies."
[15] Preethi Gopalkrishnan, Nikhil N. Joshi, R. Gokulraj "Experimental investigation construction of Masonry wall with Crumb Rubber Concrete Blocks."