U-BOOT CONSTRUCTION TECHOLOGY

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Abstract - *U-boot betons is a formwork made of recycled polypropylene, designed to create lightened intermediate slabs and raft foundations in reinforced concrete. The use of U-boot formworks permits to build specific mushroom slabs: the mushroom is part of the slab thickness. U-boot remains dip into the concrete casting. Thus, a grid of orthogonal beams, superiorly and inferiorly closed by plane slabs of different heights, is obtained without executing two distinct concrete castings, all that implies a remarkable saving of concrete and reinforcement. A simply supported reinforced concrete beam has two zones, one above neutral axis and other below neutral axis. The region below neutral axis is in tension and above neutral axis is in compression. As concrete is weak in tension, steel reinforcements are provided in tension zone. The concrete below the neutral axis acts as a stress transfer medium between the compression zone and tension zone. Polythene u boots of varying sizes of 50*50 mm, 60*60 mm & height of 40 cm, thickness of 10 cm at 5 cm, 10 cm, 15 cm spacing u boots are placed in compression zone. Hence the usage of concrete in beams and self-weight of the beams gets reduced considerably. The Load carrying capacity, Deflection of beams and crack patterns were studied and compared with conventional reinforced concrete beams.*

Key words: Orthogonal Slab, U- Boot, Mushroom slab

1. INTRODUCTION

U-boot betons are made of polypropylene used as a structural elements for different types such as beams, slabs and foundation. U-boot betons is a recycled polypropylene formwork that was designed to produce one way voided or either two way voided slabs as well as beams and foundations. The Non- reusable formworks for the two-way voided slabs within the concrete are casted in site. U-Boot Betons are be accustomed to construct slabs with massive spans upon that are ready to resist either little or heavy loads with out beams.

Fig 1-U-Boot Betons

1.1 U-Boots Made Of Polypropylene

Today the benefit of use of plastic waste is large. the utilization of plastic materials like hand baggage, cups, family plastics etc are perpetually increasing. Now- a-days, nearly five hundredth of total plastic are evangelical for packing however not for reusing. Plastic wastes so obtained are sturdy and non- biodegradable.

1.2 Closing Plate

The U-Boot must be closed by a closing plate beneath the u-boot, since the closing plate can enhance the reduction within the concrete consumption and thus the reduces the self weight of the structure. Once closing the plate of u- boots need to be placed within the reinforcing beam. The reinforcement cause is to be completed by disposing the higher bending steel bars in 2 directions, the shear and punching reinforcement, wherever necessary. The floating pressure exerted on U-boots, the concrete ought to be solidify in totally different phases: the primary casting must fill a thickness up to the feet height.

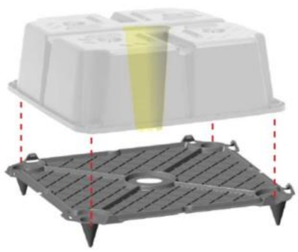

Fig 2 - Closing plate

1.3 Objective of the Present Study

Thetarget of this studyis to put the U-Boots beton within the beam of size 5*5 cm, 6*6 cm at a height of four cm and thickness of one cm is to be moulded and must be placed in the concrete at different spacing's 5 cm, 10 cm, 15 cm spacings.of grades M20. The concrete beam has to be cured for 28 days for the flexural strength of the beam.

2. Mix Design

2.1 Introduction:

Concrete is a mixture of Portland cement, coarse (gravel), fine aggregates (sand) and water. It is consolidates into a hard mass because of a chemical reaction called hydration between cement and water. The coarse aggregates (CA) in the mixture act as a filler. The fine aggregates (FA) fill up the voids in the CA. cement and water act as the binder. Concrete mix proportioning is governed by the properties required in the fresh as well as the hardened state. The properties of plastic concrete are important for proper compaction. The strength and durability for the final structure is provided by hardened concrete. The above two are related to W/C ratio

2.2 Concrete Mix Design (GRADE M25)

A. Design stipulations:

1. Characteristic compressive strength (ccs)

required in the field - 20Mpa

2. Maximum size of coarse aggregate - 20mm

3. Degree of workability for concrete - 0.89

4. Degree of quality control - Good

5. Type of exposure - Mild

6. Water cement ratio - 0.50

Test data for materials:

1. Specific gravity of ordinary Portland cement 3.14
2. Specific gravity of coarse aggregates (20mm) 2.80
3. Specific gravity of fine (sand) aggregates 2.60
4. Water absorption:

   Coarse aggregate 0.50%

   Fine aggregate 1.0%
5. Free (surface) moisture:

   Coarse aggregate 0.25%

   Fine aggregate 2%

Table 1: Comparison Of Plain Concrete With U-Boots Containing Concrete in the beam

Materials	**CC**	**5*5cm5 cm spacing**	**5*5 cm 10cm spacing**	**5*5 cm 15 cm spacing**	**6*6 cm 5 cm spacing**	**6*6 cm 10 cm spacing**	**6*6 cm 15 cm spacing**
No of U-boots	-	13	9	7	10	8	6
V (m^3)	0.020	0.0187	0.019	0.019	0.0186	0.018	0.0190
Cement (kg)	7.66	7.16	7.31	7.39	7.12	7.20	7.27
FA (kg)	10.92	10.21	10.42	10.53	10.15	10.26	10.3
CA (kg)	25.57	23.91	24.42	24.67	23.78	24.03	24.2
Water (Lit)	3.83	3.58	3.65	3.69	3.56	3.60	3.63

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Fig 3 - Formwork U-boot beton

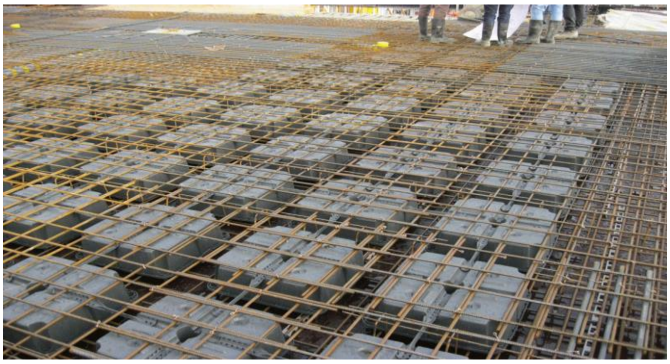
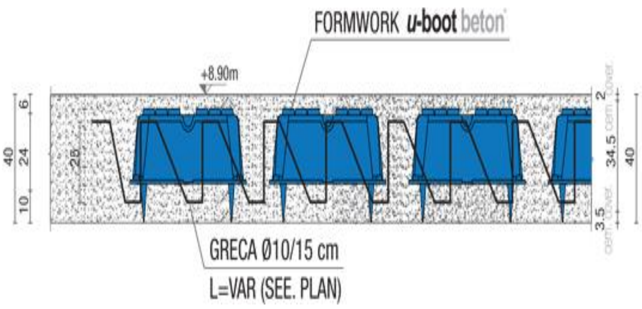


Fig 4 - Reinforcement Structural U-boot beton

3.0 Results And Discussions

3.1 Introduction

This chaper deals with the experimental results that are obtained from the experimental investigation. during this chapter the experimental results has been applied for the flexural strength of the beam, compressive strength, durability ofthe concrete cube.
The check results so obtained are compared with the standard concrete.



3.2 Flexural Strength Of The beam

The flexural strength of the beam is done by exploitation the universal testing machine. The flexural strength is in dire straits the standard concrete beam likewise because the U-Boots placed beam. The U-boots are embedded within the beam. The sizes of the U-Boots are 5* 5 cm , 6*6 cm that are maintained at a height of four cm and one cm in thickness which are placed Greek deity five cm, 10 cm, fifteen cm spacings.

Fig 5 - Failure Of Beam After Testing

Table 2: The Following Are The Result Obtained For The Beam

Tests	CC	1	2	3	4	5	6
PL (KN)	14.9	12.7	13.7	14.7	15.2	14.2	14.9
Dis (cm)	8.50	7.5	7.1	8.20	8.60	7.80	8.05
BP (KN)	7.38	6.40	6.53	7.32	7.92	7.15	7.58
UW (Kg/m^3)	3714	3492	3643	3580	3460	3564	3549
FS (N/mm2)	29.8	25.5	27.4	26.8	32.4	28.4	27.5

* CC- Conventional Concrete
1 - 5 5Cm U-Boot, 5 cm Spacing
2 - 5 5Cm U-Boot, 10 cm Spacing
3 - 5 5Cm U-Boot, 15 cm Spacing
4 - 6 6Cm U-Boot, 5 cm Spacing
5 - 6 6Cm U-Boot, 10 cm Spacing
6 - 6 6Cm U-Boot, 15 cm Spacing
* PK- Peak Load (KN)
*Dis- Displacement (Cm)
*BP - Breaking point (KN)
*UW- Unit Weight (Kg/m3)
* FS- Flexural Strength (KN)

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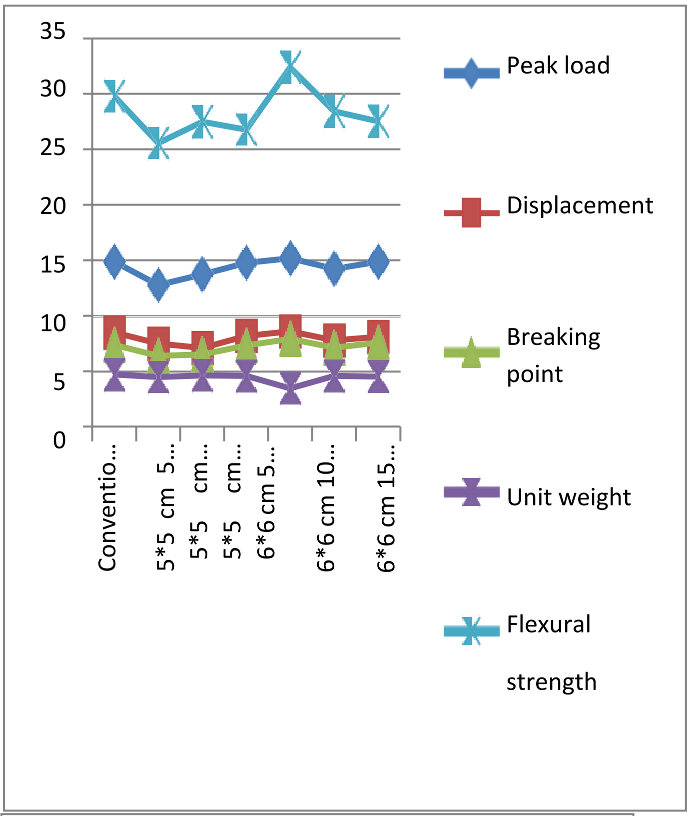
Graph1: Graph Between Spacing Of U Boot And Peak Load (KN) ,Displacement (cm),Breaking Point (KN) Unit Weight (g/m3) And Flexural Strength (N/mm2)



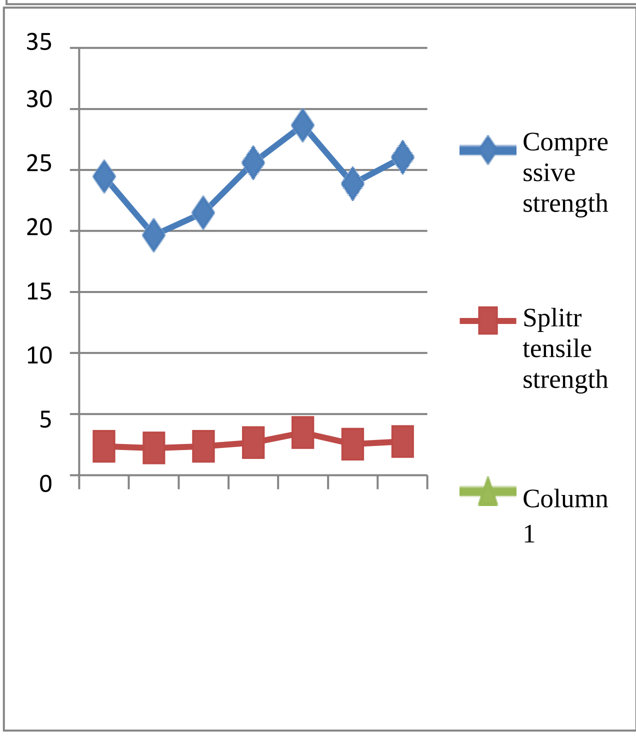
3.3 Compressive Strength Test And Split Tensile Strength Test

The compressive strength test and split tensile test for the standard concrete cubes and conjointly for the concrete cubes containing U-boot betons has been tested. The test values has been compared with the standard concrete cubes.

Fig 6 - Specimen Under Tension

Table 3 : The Results Obtained From Compression Test And Split Tensile Test:

Test specimen	Compression test (N/mm^2)	Split tensile test (N/mm^2)
Conventional concrete	24.50	2.40
5*5 cm 5 cm spacing	19.67	2.24
5*5 cm 10 cm spacing	21.52	2.37
5*5 cm 15 cm spacing	25.60	2.70
6*6 cm 5 cm spacing	28.67	2.92
6*6 cm 10 cm spacing	23.89	2.54
6*6 cm 15 cm spacing	26.02	2.79



Graph 2: Graph between Spacing Of U Boot And Compression Test (N/Mm^2) And Split Tensile Test(N/mm^2)

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4. Cost analysis

4.1 Introduction

This chapter deals with the value analysis of the u- boot beams that is compared with typical concrete. Now- a- days the value of construction is one amongst the parameter. If it value an excessive amount we are progressing to decline the building elements. Therefore for that we've to arrange for the value of the building for lot of econmy. By mistreatment the U-Boot betons will decrease the cost of the buiding in such a way that's fabricated from polypropene. And additionally the amount of concrete has been reduced which boost the reduction of cost.

Table 4 Comparison Of Cost Analysis Of The U-Boot Placing Beam With Conventional Concrete.

S. No	Type of beam	Cost of the beam
1	Conventional concrete	220/-
2	5*5 cm 5 cm spacing	200/-
3	5*5 cm 10 cm spacing	203/-
4	5*5 cm 5 cm spacing	206/-
5	6*6 cm 5 cm spacing	198/-
6	6*6 cm 10 cm spacing	200/-
7	6*6 cm 15 cm spacing	202/-

5. Conclusion

From the investigation, I will conclude that the beam that is formed of 6*6 cm and height four cm, thickness one cm u boots at spacing of five cm reduces additional self-weight compared with the standard concrete beam. I can also conclude that the self mass of all the beam which is made of U-Boots betons can be very less when compared with the standard concrete. The compressive strength and the split tensile strength gives best result for U-Boot of 5 cm spacing of 6*6 cm and height 4 cm ,thickness 1 cm when compared with the standard concrete. The flexural strength of the beam is more for the beam which is made of U-Boots 6*6 cm and height 4 cm, thickness 1 cm when compared with the standard concrete. The amount of the fabric consumed for the beams having U-Boots is incredibly less in comparison with the standard concrete. The amount of the fabric reduced depends on the amount of the beam that is mentioned within the mix design chapter. The cost of construction is very less when it is made with the U-Boots. But it is not achieved when the construction is made with conventional concrete. The U-Boots can be introduced not only in the beam but also I various structural elements like slab, columns, footings etc which enhanced the increase in storeys of the buiding. Finally, I can conclude that the self weight of the beam has been reduced when compared with standard concrete with u boot of 6*6 cm and 5 cm spacing at a height of 4 cm. And also the compression test and split tensile tensile strength has been improved of the same specimen of u boot and also we can reduce the concrete consumption, therefore the value of construction has been reduced.

5.1 Scope Of Future Work

- The utilization of U-Boots not solely helpful within the reduction of the self weight of the structure however conjointly we are able to modify by Cobiax that is created of polypropene in rounded form also reduces the selfweight. It conjointly decreases the cost of construction.
- we can opt on M25 grade of concrete for higher result.
- Addition of ash are often opted for accrued sturdiness of the structure.

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BIOGRAPHIES

Kandukur Chandra Sekhar completed his Bachelor Engineering at Jawaharlal Nehru Technological University Anantapur in 2016. He researched project on "A STUDY ON USE OF WASTE POLYETHYLENE IN BITUMINOUS MIXES"(Plastic Roads), based on Principles of Transportation Engineering. His research focuses on recycled polypropylene and non-biodegradable properties are used in Construction and Building Materials. He was trained in Architectural Designs and Planning at the Rs architects&engineers Pvt. Ltd., under the supervision of Lingisetty Sreenivasa Rao.

Chandra Sekhar is currently pursuing his M.Tech in Structural Engineering at the SKR College of Engineering & Technology -[SKRCET] and is expected to graduate in early 2022.