"U-BOOT BETON TECHNOLOGY- A REVIEW"

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Abstract— A box like formwork structure made up of recycled polypropylene, which is a byproduct of industrial plastic waste used to create lightened void slabs in reinforced concrete structures is known as u boot beton. U-boot technology helps us to reduce the amount of concrete used in the slabs. That means we are saving the natural resources for future generation.

Keywords: U-Boot Technology, Foots/Needles (H Lower), Spacer Joint , voided slab

I. INTRODUCTION

The U-boot technology was introduced by Roberto II Grande an Italian engineer in 2001. He developed a new system of hollow formers in order to decrease the self-weight (Dead load) of the structure. U-boot earliest projects were executed in 2002 Italy and since that time it has been used all over the world , with pre-fabricated systems/pre stressing systems this technology is developed.

II. OBJECTIVES

U-Boot beton is used to create slabs that are able to support large loads without having large span . Rather than conventional principles due to monolithically structure it by directionally transmits the loads directly to the columns then to foundation and soil beneath. Due to beams are completely absent in this type of structures, it is also used for laying mushroom piller. It is very easy of placing u boot beton on lower reinforcement of slab, having (1 to 2 kg) weight.

III. U-BOOT BETON

The main element U-boot beton is main element of u boot beton technology . It also known as heart of U-boot technology, made up of recycled polypropylene which is a byproduct of industrial plastic waste. As we all know Polypropylene is a Thermal plastic Alkene material contains 3 carbon molecules & 6 molecules (C3H6). It is a versatile material available in plenty throughout the world.

The properties of U-boot beton are:

1) Beton having light weight which can easily handle wear and tear of structure.
2) Betons have high melting point.
3) It does not react with any other concrete material like cement, water, admixture etc.
4) Density is low of u boot beton
5) It is a durable.
6) It is flexible in nature
7) It not emit toxic gases in atmosphere at room temperature

IV. PARTS OF U-BOOT

A. Foots/Needles:

For fixing U-boot beton on formwork firmly the needles are used, which represent bottom portion of beton. These are in different heights according to structure.

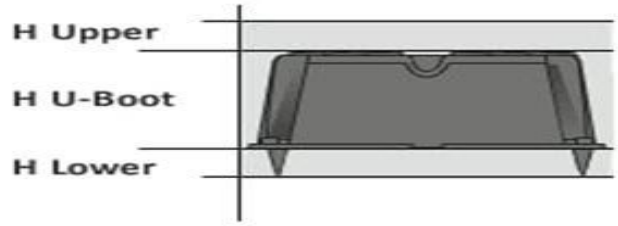

Fig. 1: Foot sharpness needles (2)

B U-boot beton:

It represents lightness for structure , it helps for reducing its self-weight of structure . It is a box like form which is used in structure to create voids in slab and reducing weight by replacing concrete.

C. Spacer Joint: For join two/more U-boot beton while fixing on the shuttering the spacer join is used, so that there cannot be any change in the distance between gaps when we poured concrete in slab.

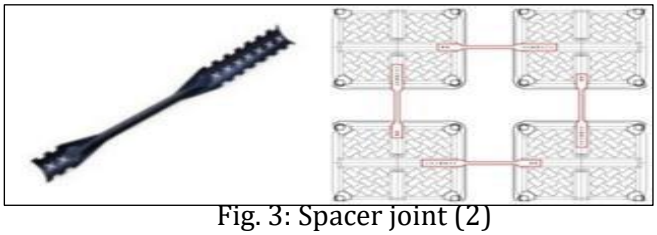

Fig. 3: Spacer joint (2)

Connection Bridge: Connection bridge is required when we increase length which place between two u boot beton shown in figure .

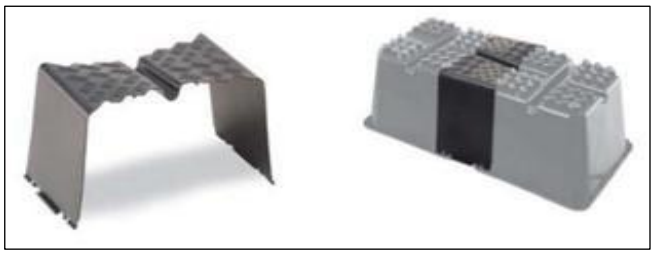

Fig. 4: Connection Bridge (2)

E. Closing plate:

To close the U-boot beton box closing plate is placed at bottom of box, for resisting the flow of concrete into box. The closing plate having main role in u boot beton technology because if closing plate is damaged then , the flow of concrete is not resisted.

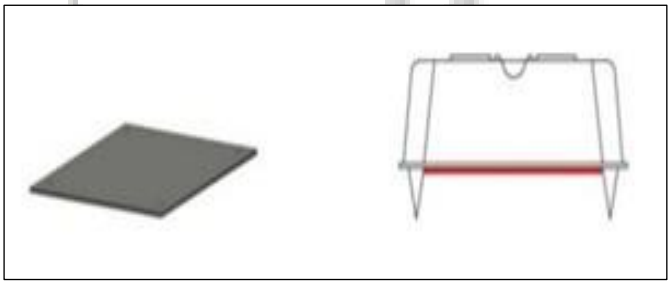

Fig. 5: Closing plate (2)

The general working cross sectional dimensions of the U-boot beton is 52X52cm. The height of the U-boot beton is can vary from (10,13,16,18,20,22,23,24,25,28 cm) based on the mode of slab. If dimensions is changed then weight also changed of betons.

Fig. 6: Size of U boot beton (2)

VI. TYPES OF U BETON

There are mainly 2 types for arranging U-boot betons;

A. Single U-boot beton:

The single U-boot beton is used while laying single reinforced slabs. It is open type polypropylene box which can be closed by using a closing a plate to resist the entry of concrete into the beton.

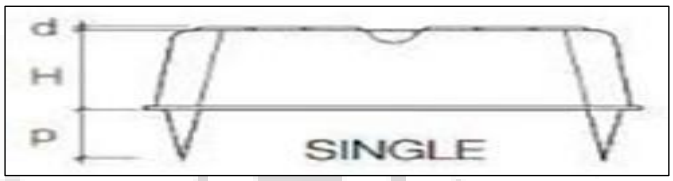

Fig. 7: Single U-boot beton (2)

B. Double U-boot beton:

The double U-boot beton is used for laying double reinforced slabs. It consists of 2 boxes which are closed against each other to prevent entry of concrete into beton . Hence for making double reinforced slab closing plate is not required .

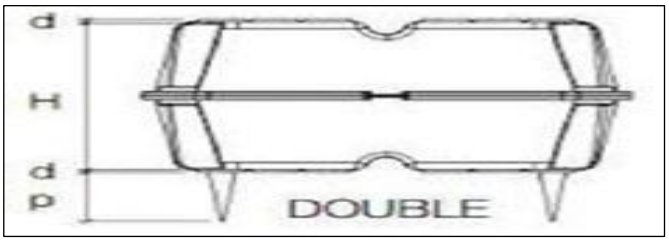

Fig. 8: Double U-boot beton(2)

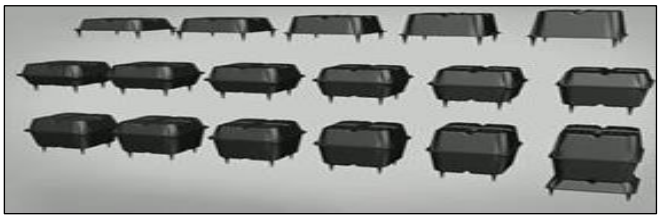

Fig. 9: Different types of U-boot beton (2)

VII. CONCEPT OF U-BOOT TECHNOLOGY

A. *Bending Stress Concept:*

In this type of slab due to U-boot beton voids created in central section and the cross section behaves like as I section (Double T). I section is the best section is more bending stresses resistance by saving concrete material.

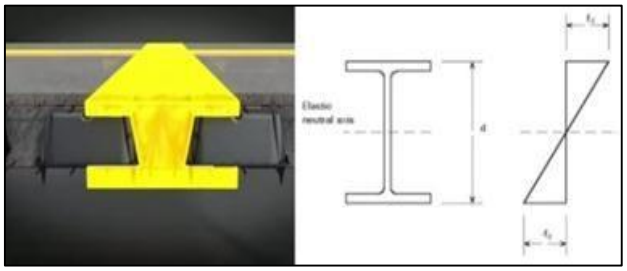

Fig. 10: Bending stress diagram (2)

B. *Shear Stress Concept:*

In this type of voided slab the negligible amount of shear stresses is taken at columns, otherwise very low quantity of shear stresses are developed in slab . So at corners column caps are provided to take shear stresses, hence column caps reduces shear stresses. This is achieved by providing solid section and do not provide the u boot beton at corner.

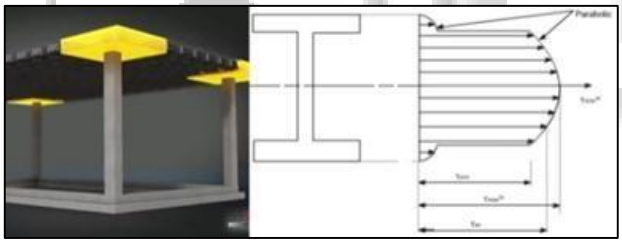

Fig. 11: Shear stress diagram (2)

VIII. INSTALLATION

The installation process of U-boot slab is done by six simple steps as follows -

1) Step 1- For laying of U boot slab strong formwork properly fixed
2) Step 2- compression reinforcement of the slab placed at lower of slab act as lower reinforcement
3) Step 3- For fixing U-boot Beton and for proper alignment of beton. Place the triangular reinforcement for the purpose of work as beam.
4) Step 4- place the U-boot betons between triangular reinforcement. If needed spacer joint are used.
5) Step 5- Above the U-boot betons which acts as tension reinforcement for slab complete the upper reinforcement properly.
6) Step 6- Now, pouring of concrete is being done up to needles of foots of U-boot betons/till closing plate to bind concrete to foots of betons. Then after concrete is laid, now slab is complete.

IX. APPLICATIONS

1) Mushroom pillars
2) Sky scrapers/ High buildings
3) Parking lots, Hotels, Auditoriums and Hospitals
4) Fire resistant structures and Temples
5) Schools and public buildings Earthquake resistant structures
6) Malls, Restaurant
7) Raft foundation

X. ADVANTAGES

Voided slab decreases it's self-weight up to 40% without beams and reduce deflection. It reduce total load on foundation due to its decreased self-weight.

Longer spans of slab construction achieved, due to its very low weight.

There is no need of lifting devices and movement devices in voided slab construction.

Number of columns reduced in these voided slab construction. Usable height saving in each floor enables a higher number of floors.

Voided Slab thickness is very less when we compared to normal slabs. Reinforcement and course aggregates quantity reduced, so there is great saving in material. Up to 15% of total cost of construction reduced. Due to this construction there is no need of false ceiling at an aesthetical level. It's, advantage is, it is fire resistance Due to its shape. Voided slab made up of using u boot beton technology have high stiffness due to its U-boot property of wear and tear resistance. It is light weight structure hence it reduces the foundation sizes and this structure takes more vibrations than normal structures, hence it is need of new generation.

XI. RESULTS

As we study about the U-boot technology used for making light weight, long span voided slab having high load carrying capacity. We come to know that using polypropylene gives many advantages than using polystyrene. When the slab which made up of polystyrene catches to fire, it releases toxic gases and if we don't make any vents, there is chance of blasting of voided slab. So the U-boot technology is the best technique for making economically strong slab. By using u boot beton system concrete usage is reduced

approximately 1kg of recycled plastic replaces 100kg of concrete.

XII. CONCLUSION

As we know the concrete structures are economically very high, hence for reducing the cost of concrete structure the voids are formed in slab. The structural behaviour of this new kind of monolithic flat voided slab is the same as for solid slab, excluding slab-edge column connection. This u boot technology is very appreciated in modern construction. In future, this technology is used in higher rate, for reducing cost of structure and making structure which are easily affordable to poor generation .

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