

Plastic Embedded Concrete

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Abstract- Now a day's plastic waste is a new issue of being disposal. Generation of waste plastic is in tremendous manner and its recycling process is insufficient to hold the waste plastic and its recycling. In India more than 15000 tons of plastic waste is generated out of which 6000 tonnes of plastic remains uncollected and littered. This paper discusses about recycling the PET plastic which is non-biodegradable. So our aim is to use PET plastic in moulded form to recycle more volume of plastic in single concrete block. This will not recycle the plastic but also will gain the strength of concrete equal or more than normal concrete block. Volume of plastic is about 15% to 20% in one single concrete block.

Index Terms- Compressive strength , Plastic Embedded concrete block , PET plastic plate , PET plastic strip I.

1. INTRODUCTION

Plastic waste is a huge problem as the population increased the generation of plastic waste is also goes on increases. The availability of dumping yard is insufficient to handle the waste plastic. By using the plastic waste in concrete block we can reuse and also load on dumping yard will be reduce. Many researchers have used plastic in proportion form in concrete. We are going to use plastic in casted form so more volume can be utilize in one single concrete block. This will reduce the load on recycling plant and more space will be available for other waste. The size of concrete block is 390x190x190 mm and size of the plastic strip is 210x60x50 mm.

II. MATERIAL USED

The materials used for this experiment are as follows:

1. Cement: Portland Pozzolona Cement (PPC) was used for this experiment.
2. Sand.
3. Crushed sand.
4. Plastic: The PET plastic in moulded form of size of 210 x 60 x 20 mm.

5. Water: Potable water was used for casting and curing of the concrete samples.

III. METHODOLOGY USED

Following steps were followed in the sequence to complete this research.

A. Preparation of plastic strip

The raw material such as PET bottle and other plastic will be collected in a shredded waste plastic form and then rinsed. Rinsing will be done in order to remove any kind of foreign particles such as grease and dust particles. After the rinsing the bottle will be dried and then shredded to smaller sizes for convenience of melting.

Melting was done under the controlled temperature of 240 - 250 C. The molten plastic was poured in a mould and then allow to set for 24 hrs. Finally it was cooled and the plastic strip was made.



Fig. Casted PET plastic strip

B. Concrete Mix Design :-

M10 mix was designed and a volumetric mix proportion of 1:3:6 was obtained. Water cement ratio of 0.45 was adopted for the mix design.

| Sr.no | material | weight in kg |
|-------|--------------|--------------|
| 1 | Cement | 2.33 |
| 2 | Sand | 7 |
| 3 | Crushed sand | 14 |

IV.PROCEDURE

A. Form work for block :-

For these we have selected the lightweight aluminum composite panel. The size of formwork is 430x230x210 mm.



Fig. Making of aluminum composite material mould for casting concrete block

Total 3 block are made for casting concrete block. In these mould the first layer was filled with concrete at 95mm from bottom side. Then plastic strip was placed at the Centre of the block and compaction was done from side of the plastic strip then after the concrete was filled up to the top level of the mould .

B. Formwork for plastic mould :-

For these we have used lightweight aluminum plates of 1/2 inch thickness. The size of these block is 210x60x50 mm. It has three holes of diameter 2cm at 2.5cm center to center.

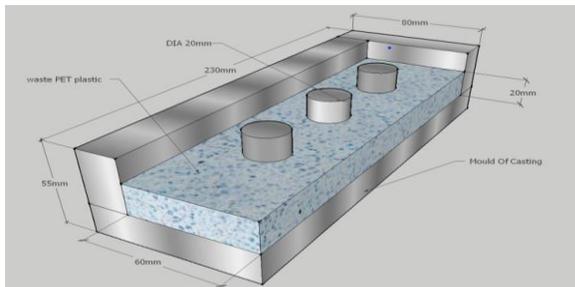


Fig. Details of the mould of PET plastic strip

First we have melted the plastic in a pan at 160°. These molted plastic placed in a aluminum mould carefully. For 1 hours we kept it for cooling purpose. After it was set completely then it was removed and placed in a concrete block at the Centre.



Fig. Melted PET plastic in the mould

For this 3 blocks were casted in which the casted plastic strip was placed. The size of concrete block is 390x190x190mm and plastic strip is 210x60x20mm with three holes of diameter 2cm at 2.5cm Centre to Centre distance provides the proper bonding with concrete.



Fig. Plastic strip placed after one layer of concrete in mould

Curing

Samples that was casted was placed for curing for the period of 7 days and 28 days in potable water.

(Fully submerged)

Testing

Our project aim was to check the plastic embedded solid concrete block for the compressive strength. Out of the 3 blocks 1 block was tested to check the compressive strength under the CTM and another 2 was tested under the UTM machine and the obtained results are compared with the standard strength of M10 concrete block. (As the strength of our block is near to strength of Standard M10 block.)



Fig. Testing of block under CTM machine"

V. OUTCOME OF THE WORK

The plastic embedded blocks are tested for the compressive strength and the results are nears to the standard strength of M10 block that is 10 N/m. If we compare the plastic embedded concrete block with standard M10 block - both are producing the same strength, so we can use this "Plastic embedded concrete blocks" for various purposes.(ex. For construction of compound wall). These use of PET plastic in concrete block will help to reduce PET plastic disposal problem around the world.

VI RESULT OF THE WORK

We got the strength of 7.24 MPA after 14 Days of curing period.

1. Strength of the standard M10 concrete block : 10 MPA for 28 Days curing period.
2. Plastic embedded concrete block strength : 7.24 MPA for 14 Days curing period.

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TEST REPORT
(Solid blocks)

| | | | |
|---------------------|--|-------------------|------------------|
| Sample No: | CTL180411-15-001_1 to 3 | Report No: | CTL180411-15-001 |
| Customer Name: | Mayur S. Khatke | Date Of Receipt: | 11 Apr 2018 |
| Customer Address: | Puneji Chhatravadi College Of Engineering Sector 26, Pratikaran, Nigdi Near Akash Railway Station PUNE, Maharashtra India-411044 | Date Of Testing: | 11 Apr 2018 |
| Client Name: | | Report Date: | 20 Apr 2018 |
| Consultant name: | | Sample Condition: | Acceptable |
| Site: | Plastic Embedded concrete block project PCCOE PUNE, Maharashtra India 411044 | Witnessed By: | |
| Sample Description: | Solid blocks | Id. No.: | 290*190*190mm |
| Letter Ref.: | | | |

Observation Table & Test Results:

| Compressive strength of Solid block | | Test Particulars | | 1 | Average | Test Method |
|-------------------------------------|----------------------------------|------------------|--|-------|---------|-------------------|
| 1 | Length (mm) | | | 190 | -- | -- |
| 2 | Width (mm) | | | 190 | -- | -- |
| 3 | Height (mm) | | | 190 | -- | -- |
| 4 | Cross section area (sq. mm) | | | 36100 | -- | -- |
| 5 | Max Load (kN) | | | 264.2 | -- | -- |
| 6 | Compressive Strength (N/ sq. mm) | | | 7.4 | 7.4 | IS 2185 P.A. 1998 |

| Specification Limits as per IS 2185 (P-1)2005 | | | | | |
|---|-------|-------------------------------|--|--|---------------------------------|
| Sl. No | Grade | Min density of block (kg/cum) | Min. Avg. Comp. strength (N/m ²) | Min. Individual Comp. strength (N/m ²) | Max. water absorption (Percent) |
| 10 | C-5 | 1800 | 5.0 | 4.0 | 10 |
| 10 | C-4 | 1800 | 4.0 | 3.2 | 10 |

Remarks:

Note: 1) The test report and result relate to the particular specimen/ sample (s) of the material as delivered/ received and tested in the laboratory. 2) Any test report shall be considered correct in full, without the written permission from Constrologix.

Tested By: Amel Sembhane

Authorized Signatory
(Signature)
Vijay Surve (Manager- Technical)
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Reporting Conditions Overleaf

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