Effect Of Plastic Waste On Tile By Using Thermosetting Method

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Abstract : *This study has been undertaken to investigate thetiles prepared from the waste plastic which can be recycle and make plastic granules, chemical methyl ethyl ketone peroxide as hardener, Epoxy Resin as glue, sand which is mix in proportiondeterminants.Samples of 300mm X 300 mm X 15mm size samples are prepared at normal temperature and are tested for flexure and abrasion. This material used in these tiles is an alternative to the traditional material. Plastic being reused can help to control over dumping and resulting pollution. Casting and curing of tiles doesn't need water at all. These tiles can be a better alternative to the concrete or other traditional tiles.*

IndexTerms– epoxy resin, recycle plastic

I. INTRODUCTION

India is developing country, and pollution is also day by day increasing as the development process is at its verge.Also population is increased and for daily large amount of plastic products like plastics bags, water bottles, various plastic utensils etc. are used. There is about 15.342 tonnes of plastic waste is produced every day, scientists say that it take 300 year for complete combustion. This is very dangerous for environment & human life.

Here a sincere effort is made to reuse the plastic in recycle stage in manufacturing of tiles. Plastic waste in the form of granules is usedwith sand and epoxy resin. This can replace the traditional tiles and can be used where much loading is found on the floor.

II. PROCESS

Plastic granules along with the sand and the binding material is mixed in proportion to get the mix. The bindig material used here is the epoxy resin and MEKP. Following proportions are used to mix the material. These proportions are made on trial and error method for instance.

A. 1:1:4:2 (Epoxy resin : MEKP :Plastic : Sand)
B. 1:1:3:3 (Epoxy resin : MEKP :Plastic : Sand)
C. 1:1:2:4 (Epoxy resin : MEKP :Plastic : Sand)

The mix of Epoxy resin and MEKP is prepared in beaker. Then in mixing pan plastic granules, beaker mix material & Sand is mixed manually. This method is known as thermosetting casting method i.e. in absence of heat. It takes 24 hrs. for setting so which material for making tile of size 300mm x 300mm x 15 mm. Several samples for different proportions are thus prepared and made ready for testing. There is absolutely no need of curing these tiles. After setting time, the tiles are tested for abrasion and flexure test.

III. OBSERVATIONS WHILE TESTING OF TILES

- Flexural Test: - Determine transverse strength of casting material for flooring tiles. Adhering to IS code the test is performed on flexure testing machine and load is applied through lead shots. But we observed that load applied through lead shot is not sufficient to breakthe tile. An alternative arrangement has been made on Universal Testing Machine as shown in the below photograph and the rest of the tiles are tested.

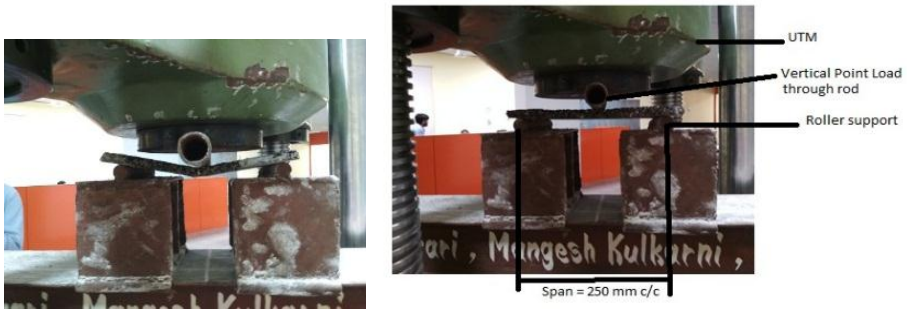

Fig1. Setup of flexural strength on UTM Machine

Table 1: Observations of Flexural Test (Sample Size L=250 mm, b=300 mm, t=15 mm)

Sr. No.	Description	Breaking loadi.e. W(N)	Strength $F=3WL/2bt^2$ (N / mm^2)	Deflection (mm)
1.	Proportion1:1:2:4			
	1	15.85×10^3	88.05	21
	2	16.55×10^3	91.94	24
	3	16.20×10^3	90	23
2.	Proportion1:1:3:3			
	1	16.75×10^3	93.05	23
	2	17.35×10^3	96.39	20
	3	17.05×10^3	94.72	21
3.	Proportion1:1:4:2			
	1	17.15×10^3	95.27	19
	2	16.80×10^3	93.33	19
	3	17.00×10^3	94.44	19

Calculation: - L = Width – 50 = 300 – 50 = 250 mm
b = 300 mm
t = 15 mm
$W = 15.85 \times 10^3$ N
$F = 3WL / 2bt^2 = 3 \times 15.85 \times 10^3 \times 250 / 2 \times 300 \times 15^2$
$= 88.05$ N / mm^2

Similarly other calculations are carried out.
The testing of tile is done as per IS code 1237:2012. The average transverse strength shall not be less than 3N/mm2. As per IS code our all tile have strength more than 3N/mm^2.We Observed that our tile proportions have more than 3 N/mm^2. So tiles are more safe tile in flexural test. Have good strength shock absorbing Capacity.

- Abrasion Test: -

Fig.2 Abrasion Testing Machine

Table 2: Observations of abrasion Test (A=Area in mm^2, V=Volume in mm^3)

Sr. No.	Description	Area cm^2	T_1 mm	T_2 mm	$T_3=T_1-T_2$ mm	W_1 gm	W_2 gm	W_1-W_2 gm
1.	Proportion 1:1:2:4	49	15.29	14.47	0.82	83	80	3
2.	Proportion1:1:3:3	49	15.47	14.6	0.87	88	84	4
3.	Proportion1:1:4:2	49	15.38	14.63	0.75	85	83	2

Calculation: - Loss in thickness $T_3 = T_1 – T_2$
$= 15.29 – 14.47 = 0.82$ mm
Similarly, the loss of thickness is calculated for other proportion.

The wear should not exceed the following limiting values as specified in IS code 1237:2012

1. For general purpose of tile
   - I. Average wear = 3.5 mm
   - II. Wear on individual specimen = 4 mm
2. For heavy duty
   - I. Average wear = 2 mm
   - II. Wear on individual specimen = 2.5 mm

IV. Results And Discussion

Flexural strength of plastic tile is much higher than the regular/ordinary tile. Abrasion of plastic tile is very negligible as compared to ordinary tile. As far as the permeability and aesthetic of plastic tiles are concern, are more and better respectively against the ordinary tiles. Bond strength is better than the ordinary tile. While comparing the cost, plastic tiles are slightly expensive than the ordinary tiles. Table below shows the experimental value comparison of Plastic Tiles and the traditional Tiles

Table 3 Comparison of Traditional Tiles and Plastic Tiles

Description	Plastic Tile	Ordinary Tile
Flexural Strength	95 N/mm^2	2.24 N/mm^2
Abrasion Test	0.87 mm	1.32 mm
Cost	Rs.147 per tile	Rs.70 per tile
Aesthetic Class	Better	Good
Permeability	More	Less
Bond Strength	More as compared to Ordinary Tile	More
Chemical Resistance	Negligible	Less

V. Conclusion

The plastic tiles are more durable than the traditional tiles with respect to various perspectives as written in results. Looking towards the flexural capacity of the tiles, those can be used under heavy loads. The areas of heavy loads can be garages, workshops, parking, etc. The less wear and tear will be seen in these plastic tiles. Only thing, the cost of the tiles is slightly more than the traditional tiles but this can be overseen with the other properties.

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