International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

USE OF PLASTIC WASTE FOR FLOOR TILES

Shubham Sanjay Adsul[1], Shubham Rahul Shitole[2], Aparna H Chavan[3]

[1, 2,] Student, [3,]Professor, Department Of Civil Engineering , RMDSSOE,SPPU University, Pune

ABSTRACT:

The accumulation of plastic waste has become a significant environmental challenge, necessitating innovative solutions for its management. This study explores the potential of utilizing plastic waste as a primary material in the production of floor tiles. By incorporating various types of discarded plastics, such as polyethylene terephthalate (PET), high-density polyethylene (HDPE), and polypropylene (PP), this research aims to create sustainable, durable, and cost-effective floor tiles. The methodology involves processing the plastic waste through sorting, cleaning, shredding, and heating, followed by moulding the material into tile shapes under specific conditions. The resulting tiles are then subjected to a series of tests to evaluate their mechanical properties, such as compressive strength, water absorption, thermal resistance, and abrasion resistance, comparing them with conventional ceramic tiles. Preliminary results indicate that plastic waste-based tiles exhibit promising characteristics, with enhanced durability and reduced weight compared to traditional materials. Furthermore, these tiles demonstrate excellent resistance to chemicals and moisture, making them suitable for various flooring applications. The environmental benefits include significant reductions in landfill waste and lower carbon footprints due to the recycling process. Economic analysis reveals that producing tiles from plastic waste is cost-competitive potentially offering an affordable alternative to consumers while promoting sustainable construction practices.

Keywords : Plastic waste recycling ,Eco friendly flooring ,based floor ,Reuse recycle plastic ,Sustainable construction material ,Green building construction ,Low cost building material ,Environmental impact reduction

Introduction:

Plastic recycling is the process of recovering plastic wastes and turning old or scrap plastic into useable products that can re-enter the manufacturing chains. This will in turn generate revenue, create more job opportunities and reduce the hazards associated with improper disposal of plastic waste. The tile provided between machines and floor to avoid damages due to vibration from machines to floors becoming important one i.e. way by modern techniques. Plastic is a kind of material that is commonly known and used in everyday life in many forms. It becomes an important part of every one's life. Plastic pollution is the accumulation of plastic objects and particles (e.g.: plastic bottles and much more) in the Earth's environment that adversely affects wildlife, wildlife habitat, and humans, Plastics are inexpensive and durable, and as a result levels of plastic production by humans are high. However, the chemical structure of most plastics renders them resistant to many natural processes of degradation and as a result they are slow to degrade. Plastic pollution can afflict land, waterways and oceans. It is estimated that 1.1 to 8.8 million metric tons (MT) of plastic waste enters the ocean from coastal communities each year. This study aims at investigating the possibility of how plastics can be applied in construction industry waste plastics have no value, resulting in uncontrolled disposal Dumping into waterways has severe adverse effects on local communities. Waste plastics are not only unsightly, but they block urban drainage systems and sewers, causing flash floods, as well as providing a fertile breeding ground for mosquitoes and other water- borne diseases. Plastics have become a vital asset for humanity, often providing functionality that cannot be easily or economically replaced by other materials. Plastic products have brought benefits to society in terms of economic activity, jobs and quality of life. Most plastics are robust and last for hundreds of years. They have replaced metals in the components of most manufactured goods, including for such products as computers, car parts and refrigerators, and in so doing have often made the products cheaper, lighter, safer, stronger. Plastics have taken over from paper, glass and cardboard in packaging, usually reducing cost and also providing better care of the items.

Methodology:

In this research work recycled plastic aggregates were used as a partial replacement to natural coarse aggregate of concrete. Intended percentages of recycled plastic coarse were in varying with a different ratios (3:5, 1.5:3:5, 1:1.5:1.5). The breaking strength, breaking load and water absorption of each sample was determined and compared with conventional cement board.

1. Collect the required plastic raw material for the project.
2. Categories of the collected plastic raw material.
3. Creating mixture with selected ratios
4. This mixture is cast in to different moulds to form tiles board.
5. Carry out various physical tests on the casted board
6. Compare the obtained results from the conducted tests with standard material. Carry out cost analysis of moulded material.

Carry out various physical test on casted board:-

1. Water absorption test:

AIM: The water absorption test for tile is essential for quality control measure to determine the porosity of tile and their suitability for different applications. This test measures amount of water absorb by tile under the specified condition.

Equipment required:

a) Drying oven
b) Balance
c) Container
d) Water

Procedure:

1. Preparation:
   - Select a representative sample of tiles (usually at least five).
   - Clean the tiles to remove any dust, dirt, or contaminants.
2. Drying:
   - Dry the tiles in the oven at 110°C ± 5°C for at least 24 hours.
   - Cool the tiles in a desiccator to room temperature
   - Weigh each tile to the nearest 0.01 grams (this is the dry weight, \ (W_d \)).
3. Water Immersion:
   - Immerse the dried tiles completely in distilled water at room temperature for a specified period, typically 24 hours.
   - Maintain the water at a constant temperature, generally around 20°C to 25°C.
4. Surface Drying:
   - After immersion, remove the tiles from the water.
   - Wipe off the surface water with a damp cloth (not too dry to avoid removing water from the pores).
5. Weighing:
   - Weigh the surface-dried tiles immediately to the nearest 0.01 grams (this is the wet weight).

Fig-1

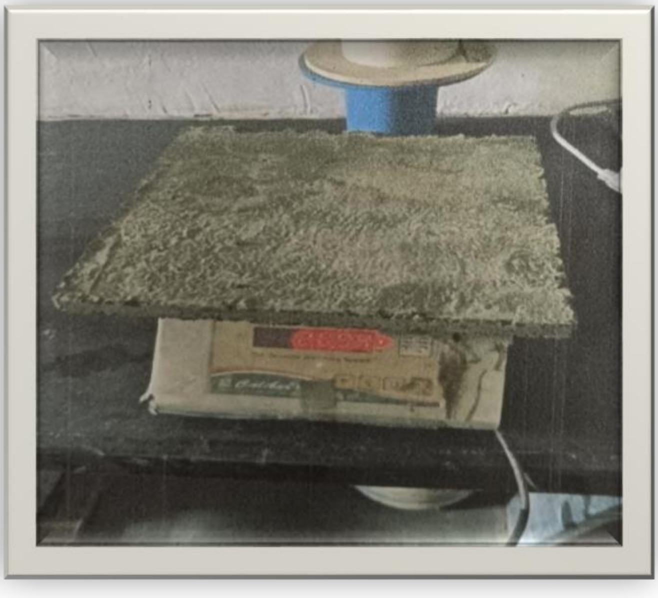

Fig-2

Flexural Test:

AIM: The flexural test for tiles is an important mechanical test used to determine the breaking strength or modulus of rupture of tiles. This test helps to assess the tile's ability to withstand bending forces and provides insights into its durability and structural integrity.

Equipment required:

a) Testing Machine
b) Supports and Loading Heads
c) Tile Specimens

Procedure:

1. Sample Preparation:
   - Select representative tile samples. If necessary, cut the tiles to the specified dimensions, ensuring smooth and even edges.

2. Conditioning:
   - Condition the tile samples at standard laboratory conditions (typically 23°C ± 2°C and 50% ± 5% relative humidity) for at least 24 hours.
3. Test Setup:
   - Place the tile specimen on two cylindrical supports, which are typically 200 mm apart for standard tiles.
   - Position the loading head centrally between the supports, ensuring that it will apply the load at the midpoint of the tile.
4. Loading:
   - the load at a uniform rate, typically 1 mm/min, until the tile breaks. Apply
   - Record the maximum load (F) applied at the point of fracture.
5. Calculation:
   - Calculate the modulus of rupture (r) using : [Sigma = frac{3 /cdot F\cdot L} {2 \cdot b\cdot d^2}\]0

Fig-3

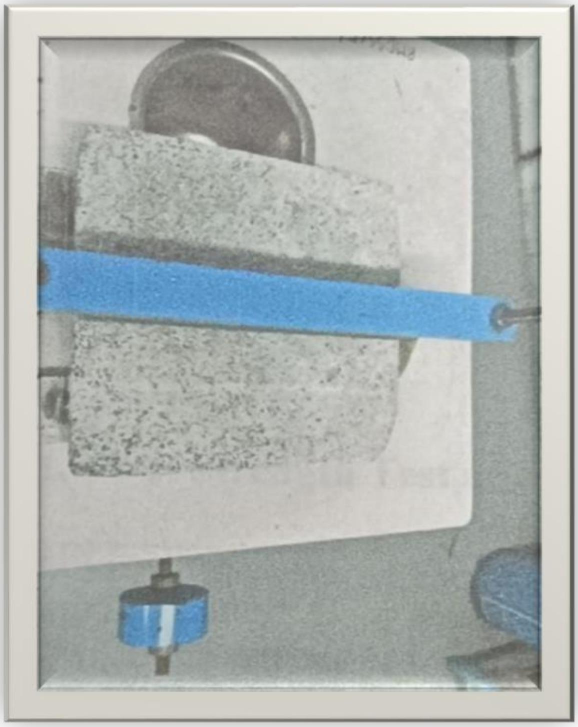

Fig-4

Result ;-

Experimental Study on Cement Sand Plastic Tile Dimension of tile 1 x b x t=300mm x300mm x 18mm Loading Span=200mm
Type of Board Ratio

1. Plastic-Cement Tile 3:5
2. Cement Sand Plastic Tile 1.5:3-5
3. Cement Sand Plastic 1:1.5:1.5 Breaking load (p)

Table no. 3.2 (Observation Table)

$I=bd^3/12= (300 \times 300^3/12) = 6.75 \times 10^8$ mm^4 Y= 300/2=150mm

$$\frac{M}{I} = \frac{\sigma}{Y}$$

Table no.1: Result of Flexural Strength Test after 24 days

Sr. No.	Plastic Cement Sand Ratio	Weight (kg)	Breaking load (N)	BM =WL/4 (N.mm)	Modulus of Ruptureσ) (N/mm^4)	Flexural Strength (f) F=3PI/Zbt^2 (N/mm^2)	Percenta- ge Increase
1.	**3:5**	**3.64**	**18.78**	**1408**	**3.12 × 10**	**0.86**	70 %
2.	**1.5:3.5**	**3.14**	**9.96**	**747**	**1.66 × 10**	**0.046**	76 %
3.	Cement Board	2.81	5.74	430.5	9.56×10^{-5}	0.026	

Table no.2: Result of Water Absorption Test Weight reduction in %

Sr. No.	Cement Sand Plastic Tile	After Curing	After Drying	Water Absorption (%)	Percentage by Weight of Cement tile
1.	**3:5**	**4.6**	**3.64**	**14%**	33%
2.	**1:1.5:1.5**	**3.64**	**3.14**	**15%**	33.8%
3.	Cement board	2.29	2.81	0.39	

Conclusion;-

1. Tests are carried out during manufacturing of tiles as set in objectives and results obtained have shown better results than normal cement tile. The proportion of 500%of plastic binder give the best results both physically (water absorption test) and mechanically (transverse resistance, resistance to impact, and). Therefore this gauging is to be used for the formulations of plastic waste tiles.
   The use of plastic waste in the manufacture of tiles can be considered while taking into account for this study, Instead of using cement, can go for polypropylene plastic.

2. Flexural strength decreases as the plastic aggregate content increases By replacement of 10%, 30% of natural aggregate by plastic aggregates, reduction in flexural strength were noticed by 10%% to 30% Is the best option for the disposal of plastic & ultimately reduces the plastic pollution in the Environment.

3. Plastic and fly ash tile possess more advantage which include cost efficiency, resource efficiency, reduction in waste etc. Plastic fly ash tile can also be known as "Eco-Tile" made of plastic waste can be used for construction purposes. It increases the compressive strength when compared to normal tiles. Considering the total requirement and need of society, as well as according to cost analysis and project profitability statement it is concluded that the project is technically viable and financially feasible.

4. In these project we make the tiles with the help of plastic waste then it can reduces the plastic waste in the environment. The plastic is very harmful for the environment because it cannot disposed easily. We think about that this plastic is used can be used in the tiles making. This tiles are useful for the floor finish. Purpose of finding the project is to reduce the plastic waste. To increase the demand of plastic in construction making tiles. In these project we use the advance technology used for the reuse of plastic for making tiles without any chemical is used. Also in tile making process we can used the rubber in the mixture because the rubber is good elastic property Main point to be is reduce the plastic waste and keep environmental eco- friendly. The scope is this is in future that we can use this as low cost material and eco-friendly way.

REFERENCES:

List all the material used from various sources for making this project proposal

Research Papers:

1. "Application of Waste Plastic as an Effective Construction Material in Flexible Pavement", International Research Journal of Engineering and Technology (URJET) Sasane Neha, Gaikwad Harish. Dr. JR Patil and Dr. SD Khandekar e- ISSN: 2395-0056, p ISSN: 2395-0072 Volume: 02 Issue: 03 | June-2015 www.irjet.net PAGE 1943-1948.
2. J. Cook D., R. P. Puma, S.A. Damper. "The behavior of concrete and cement paste containing rice husk ash Proceedings. Conference of Hydraulic Cement Pastes, Their Structure and Properties, University of Sheffield (April 1976), pp. 268-283.

A. Sales. S. A. Lima, "Use of Brazilian sugarcane biogases ash in concrete as sand replacement", Waste Management 10 (2010), 1114-1122. 248

3. Karaka, S., Tankan, M., Omar, M., Aslant, G., Arias, O., 2006. An economic perspective of advantages of using lightweight concrete in construction. Our world in concrete and structures [Online] (accessed 13.8.17).
4. A. Sales. S. A. Lima, "Use of Brazilian sugarcane biogases ash in concrete as sand replacement", Waste Management 30 (2010), 1114-1122. 248
5. Karaka, S., Tankan, M., Omar, M., Aslant, G., Arias, O., 2006. An economic perspective of advantages of using lightweight concrete in construction. Our world in concrete and structures. [Online) (accessed 13.8.17)
6. Lenkiewicz, Z, Webster, M., 2017. Making waste work: a toolkit, community waste management in middle and low income countries. [Online]
7. Allan M.I., Kukacka LE (1995) Strength and durability of polypropylene fibres reinforcement grouts cement concrete research 25(3):511-521
8. Mesbah HA, Buyle-bodin F. (1999) efficiency of polypropylene and metallic fibres on control of shrinkage and cracking of recycled aggregates mortars. Construction building material 13(1)-439-447.
9. Athanas Konin use of plastic wastes as a building material in the manufacture of tiles: plastic wastes with a basis of polypropylene.