

COMPOSITE TILES

Project Reference No.: 45S_ BE_ 1596

College : *G.M. Institute of Technology, Davanagere*
Branch : *Department of Civil Engineering*
Guide(s) : *Mr. Puttaraj M H*
Student(s) : *Mr. Amarnath Swamy S M*
Ms. Devika Hebbal
Mr. Hanumantha Gowda M
Mr. Hemanth M Ambedkar

Keywords:

LDPE plastic waste, water absorption, bond strength Scratch resistance.

Introduction/Background:

Plastic materials are having high molecular mass with the composition of organic Polymers these are non biodegradable materials so it will take a long time to decompose hence these materials cause soil and land pollution. Ceramic tiles are one of the most widely used materials in both commercial and residential buildings which consume natural resource and it is leading to the depletion of natural resource with intense extraction of clay materials. As environmental problems increases, the need for environment- friendly building material design will be in the need. The plastic composite tile may found to be an alternative for this.

Objectives:

- To recycle waste LDPE plastic bags.
- To create a prototype which tackles the threatening issue of disposal of plastic.
- To manufacture plastic tiles from the used plastic bags.
- To test various mechanical properties of the manufactured product like compressive strength, water absorption, bulk density, etc.
- To reduce cost compared to conventional tiles.

Methodology:

MATERIALS

Materials intended to be use in this work are:

1. Waste plastic
2. Fine aggregate
3. Cement
4. Integral liquid waterproofing compound

Waste plastic: The plastic used in our project is LDPE (low density polyethylene) which is collected from the municipality corporation used as layer by layer sheets which is placed between cement motor.

Fine Aggregate: Fine aggregate used to enhance the stress of the motor. the aggregate is passed through 1.18 micron sieve. The tests conducted to know the properties of fine aggregate are specific gravity, sieve analysis, water absorption and silt content.

Cement: A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. The test conducted to know the properties of cement is specific gravity, consistency and initial, final setting time of cement and compression strength of cement.

Methodology:

The methodology adopted for producing floor tiles using waste plastic involves following experimental work.

Plastic Collection and Shaping: The plastics wastes for recycling were collected from municipal solid waste management, bins kept at different crowded places of the city, from rappers used in the packing of amazon products and other shopping bags with LDPE4 label on them. The LDPE plastic waste is then sent for manual sorting where the selected plastic wastes are washed to remove glue, tags etc. The polyethylene bags are cut into required shapes.

Compression and Moulding: The adhesive is applied to each plastic sheet and then compressed, in the same way for many plastic sheets adhesive is applied and compressed to bind strongly with other plastic sheet. The plastic are cut into strips and they are made into mesh and made to bind both cement layers. After formation of mesh, pour the cement motor in the mould of some thickness and place the prepared plastic mesh and then pour one more layer of cement mixture above the plastic mesh.

Demoulding: After moulding, the sample is kept for curing, after curing it is demoulded and then the polish coating is done on the prepared tile to get aesthetic appearance.

Results and Conclusions:

Bond Strength Test

The bond strength obtained from this test is 0.12.

Compression Strength Test

The compression strength test done by different methods of work processes,

1. Compression strength of composition cement and fine aggregate with 1:1 ratio using plastic sheet is 0.1 N/mm²
2. Compression strength of composition cement and fine aggregate with 1:2 ratio using plastic sheet is 0.2 N/mm²

3. Compression strength of composition cement and fine aggregate with 1:1 ratio using plastic strips in mesh pattern is 7.36 N/mm²
4. Compression strength of composition cement and fine aggregate with 1:2 ratio using plastic strips in mesh pattern is 7.77 N/mm²
5. Compression strength of composition cement and fine aggregate with 1:1 ratio using plastic strips in mesh pattern (with scratches) is 8.51 N/mm²
6. Compression strength of composition cement and fine aggregate with 1:2 ratio using plastic strips in mesh pattern (with scratches) is 19.92 N/mm²

Water Absorption Test: The result obtained from the water absorption test is 3.94%

Bulk Density: Bulk density is the quotient of its dry mass divided by exterior volume including pores. The bulk density obtained was 1.84 g/cm³.

Scratch Resistance: Mohs hardness of each sample is hardness 7 i.e., Quartz mineral. Scratch resistance was carried out using Mohs scale. This standard covers a method of test for determining the scratch hardness of the surface of composite tiles was obtained.

Rectangularity Test: The Rectangularity obtained was 0.56% ,
This standard covers the determination of dimensional characteristics i.e., the rectangularity of tiles.

Conclusion:

- 1) Waste which plastic is available everywhere may be use as an effective use in tile.
- 2) Composite tiles can help to reduce an environmental pollution.
- 3) By using water proofing admixture the water absorption in composite tiles reduces.
- 4) The cost of composite tiles is reduced compared to conventional tiles available in market.
- 5) Recycling of the plastic can be achieved by using it as a constructive materials.
- 6) It helps to overcome threatening issues of disposal of plastic.

Scope for future study:

The future scopes for these recycled plastic waste in tile composition are:

- Increasing their strength by adding other materials.
- Recycling the plastic and using as a construction material.
- Protection to environment.