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A Review on Partial Replacement of Aggregate by Recycled Plastic Waste

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Abstract- **The rapid urbanization and industrialization all over the world has resulted in large deposition of waste polymer materials. The world's annual consumption of plastic materials has increased from around 5 million tons in the 1950s to nearly 100 million tons in 2001. Plastic waste materials consist of surplus, obsolete, broken, old plastic furniture, different household plastic materials, equipment, anti-static packaging materials and devices made of plastic. These polymer wastes are almost non-degradable in the natural environment even after a long period of exposure. Inclusion of polymer waste in concrete can be a proper utilization of this valuable property. Thus, utilization of waste polymer material in making concrete/mortar can be good solution to this environmental hazard. Very few information is available regarding recycling of polyurethane formaldehyde (PUF) -based polymer wastes and its use as construction materials. The safe use of plastic waste (plastic bags or plastic containers such as water bottle) is very important because plastics are normally stable and not biodegradable.**

Index Terms- **– Partial replacement, material, concrete.**

I. INTRODUCTION

Concrete is a composite construction material made primarily with aggregate cement and water. The word concrete comes from the Latin word "concretes" (meaning compact or condensed), the perfect passive participle of "concrescere", from "con-" (together) and "crescere" (to grow).

Properties:

- Concrete has relatively high compressive strength, but much lower tensile strength. For this reason is usually reinforced with materials that are strong in tension (often steel).
- The elasticity of concrete is relatively constant at low stress levels but starts decreasing at higher stress levels as matrix cracking develop.
- Concrete has a very low coefficient of thermal expansion and shrinks as it matures. All concrete structures crack to some extent, due to shrinkage and tension. Concrete that is subjected to long-duration forces is prone to creep.

Definition of plastic

A material which contains one or more number of polymers having large molecular weight." Solid in its finished state or same state will manufacturing or processing into finished articles is known as Plastic. Looking to the global issue of environmental pollution by post-consumer plastic waste, research efforts have been focused on consuming this waste on massive scale in efficient and environmental friendly manner. Researchers planned to use plastic waste in form of concrete ingredient as the concrete is second most sought material by human beings after water. The use of post-consumer plastic waste in concrete will not only be its safe disposal method but may also improve the concrete properties like tensile strength, chemical resistance, drying shrinkage and creep on short and long term basis

II.METHODOLOGY

Different types of plastics

Plastic is an essential component of numerous consumer products, including water bottles and product containers. However, not every kind of plastic is the same. In 1988, the Society of the Plastics Industry (SPI) established a classification system to help consumers and recyclers properly recycle and dispose of each different type based on its chemical makeup. Today, manufacturers follow a coding system and place a number, or SPI code, on each plastic product, usually moulded into the bottom. Although you should always verify the plastic classification number of each product you use, especially if you plan on recycling it, this guide provides a basic outline of the different plastic types associated with each code number.

The types are as follows-

PET OR PETE

Plastic marked with an SPI code of 1 is made with polyethylene terephthalate, which is also known as PETE or PET. PETE-based containers sometimes absorb odors and flavors from foods and drinks that are stored inside of them. Items made from this plastic are commonly recycled. PETE plastic is used to make many common household items like beverage bottles, medicine jars, peanut butter jars, combs, bean bags, and rope recycled.

PETE is used to make tote bags, carpet, fiberfill material in winter clothing, some shampoo and mouthwash bottles etc.

HDPE

The SPI code of 2 identifies plastic made with high-density polyethylene, or HDPE. HDPE products are very safe and are not known to leach any chemicals into foods or drinks. (However, due to the risk of contamination from previously held substances, please note: it is NEVER safe to reuse an HDPE bottle as a food or drink container if it didn't originally contain food or drink!) HDPE products are commonlyrecycled.

Items made from this plastic include containers for milk, motor oil, shampoos and conditioners, soap bottles, detergents, and bleaches. Many personalized toys are made from this plastic as well. Recycled HDPE is used to make plastic crates, plastic lumber.

PVC

Plastic labeled with an SPI code of 3 is made with polyvinyl chloride, or PVC. PVC is not often recycled and can be harmful if ingested. PVC is used for all kinds of pipes and tiles, but its most commonly found in plumbing pipes. This kind of plastic should not come in contact with food items. Recycled PVC is used to make flooring, mobile home skirting, and other industrial-grade items.

LDPE

Plastic marked with an SPI code of 4 is made with low-density polyethylene, or LDPE. LDPE is not commonly recycled, but it is recyclable in certain areas. It tends to be both durable and flexible. It also is not known to release harmful chemicals into objects in contact with it, making it a safe choice for food storage.

Plastic cling wrap, sandwich bags, squeezable bottles, and plastic grocery bags all are made from LDPE. Recycled LDPE is used to make garbage cans, lumber, furniture, and many other products seen in and around the house.

PP

Consumers will find the SPI code of 5 on plastic items made with polypropylene, or PP. PP can be recycled but is not accepted for recycling as commonly as PETE or HDPE.

This type of plastic is strong and can usually withstand higher temperatures. Among many other products, it is used to make plastic diapers, Tupperware, margarine containers, yogurt boxes, syrup bottles, prescription bottles, and some stadium cups.

Plastic bottle caps often are made from PP as well. Recycled PP is used to make ice scrapers, rakes, battery cables, and similar items that need to be durable.

PS

Plastic marked with an SPI code of 6 is made with polystyrene, also known as PS and most commonly known as Styrofoam. PS can be recycled, but not efficiently; recycling it takes a lot of energy, which means that few places accept it.

Disposable coffee cups, plastic food boxes, plastic cutlery, packing foam, and packing peanuts are made from PS. Recycled PS is used to make many different kinds of products, including insulation, license plate frames, and rulers.

Materials used:-

Plastic waste:

The plastic waste used as aggregate was collected from a plastic recycling plant. The plant mainly recycles post-consumer PET bottles collected as compressed bales that come from urban and industrial collection sites. The bales of PET-waste mostly consist of dirty PET-bottles, which are usually contaminated with other materials and with some non-PET containers such as PVC, HDPE and poly propylene, bottles.

In this plastic waste treatment plant, several steps are adopted to recycle waste plastic. The coarse flakes and fine fractions were obtained after mechanical grinding of PET wastes followed by cleaning and separation by physic-chemical methods. The plastic pellet is produced from plastic flakes. This material consists of predefined and even-sized PET-grains, free of contamination at the microscopic level.

Tests to be performed:

1. Slump Cone Test
2. Compaction Factor Test
3. Flow Table Test
4. Compressive strength Test
5. Splitting Tensile strength Test
6. Flexural Strength test
7. Water Permeability Test
8. Water absorption Test

III.CONCLUSION

The objective of the research is to find out the variation in various properties (Workability, Compressive strength, Tensile strength and Modulus of Elasticity) with different proportions of plastic in ordinary concrete and to find out the durability of concrete

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