Experimental Study of Mechanical Properties In Use of Waste Pet Bottles As The Partial Replacement of Fine Aggregate In Concrete

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Abstract- *The suitability of plastic pet bottle fiber as fine aggregate in concrete and its advantages are discussed here. The effect of the plastic fiber as a partial replacement of sand in concrete production was studied here. Several things which were invented for our convenient life are responsible for polluting environment due to improper waste management technique. Polyethylene Terephthalate (PET) is routinely used for carbonated beverage and water bottles. This is an environmental issue as waste plastic bottles are difficult to biodegrade. In the Modern world, the construction industry is searching for cost-effective materials for enhancing the strength of concrete structures. This work is carried out with use of waste PET bottles as the partial replacement of fine aggregate in Ordinary Portland cement. As 100% replacement of natural fine aggregate with plastic fine aggregate is not feasible, partial replacement at various percentage were examined. The properties of the materials were determined before the experimental works were carried out. The normal consistency, soundness, initial and final setting time, compressive strength and specific gravity of cement used for the experiment were found as 31%, 3mm ,65minutes, 280minutes, 59.38N/mm2 and 3.15 respectively. Water absorption and specific gravity of fine aggregate were found 1.40% and 2.63 respectively and for coarse aggregate were 1.19% and 2.69 respectively. Sieve Analysis was performed to determine the particle size distribution of sand and coarse aggregates from the fineness modulus, the average size of particle of sand and coarse aggregates used for the experimental works were found. M20 grade of concrete was prepared at 0.50 water cement ratio. Concrete cube of 150x150x150mm and beam of size 75x75x300mm were prepared for the tests. Cube specimens, beam specimens were casted, cured and tested for 7 day and 28 days strength. Concrete with 1%, 2%, 2.5%, 3% and 5% PET bottle fibers for fine aggregate were produced and compared against control mix with no replacement of sand. Tests such as Compressive strength test and flexural strength test were done and the results were compared with control specimens. The observed results revealed an increase in compression and Flexural strength up to 2%-2.5% of sand replacement. hence with the increasing demand for fine aggregate, PET bottle fiber replacements can be adopted. This study was carried out to investigate the properties of concrete with plastic pet bottle fiber as partial replacement of fine aggregates.*

Keywords- Plastic waste bottle, compressive strength, flexural strength, workability, water absorption, bulk density, M20 grade mix

I. INTRODUCTION

Concrete is widely used materials in the world. Based on global uses it is placed at second position after water. Concrete is a composite material consists of fine aggregate and coarse aggregate bonded together with cement paste that hardens with time. It requires workability, strength and durability that cannot be obtained with techniques and materials adopted for producing conventional cement concrete. Fine aggregate is important construction materials, which is widely used in construction works. Nowadays the cost of concrete is increasing since the cost of fine aggregates increasing. To reduce the requirements and cost of concrete some alternatives materials are needed to replace the fine aggregates. River sand is one of the constituents used in the production of the conventional concrete has become highly expensive and scarcity. In the backdrop of such a bleak atmosphere, there is large demand for alternative materials from the industrial and household waste. The waste plastic pet bottle can be used as an alternative materialfor replacement of the sand. 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 300 million tons in 2015 (Plastic : the fact 2015). 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. nclusion 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 a 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. Kathmandu alone uses around 4,700,000 to 4,800,000 plastic bags daily. In Nepal, 16 percent of urban waste is comprised of plastic, which is 2.7 tons of daily plastic garbage production (The Kathmandu post 5th June 2018). When you look at the global level the data is staggering. Researchers claim humans have produced 9.1 billion tons of plastic so far, and much of it ends up in nature causing harm to both living beings and the environment. The safe use of plastic waste is very important because plastics are normally stable andnot biodegradable. The aim of this research is to investigate the effect of two types of waste plastic on strength of concrete. Plastics are polymers, a very large molecule made up of smaller units called monomers which are joined together in a chain by a process called polymerization. The polymers generally contain carbon and hydrogen with, sometimes, other elements such as oxygen, nitrogen, chlorine or fluorine (UNEP, 2009). Plastics have become an integral part of our lives. The amount of plastics consumed annually has been growing steadily. Its low density, strength, user-friendly designs, fabrication capabilities, long life, lightweight, and low cost are the factors behind such phenomenal growth. Plastics have been used in packaging, automotive and industrial applications, medical delivery systems, artificial implants, other healthcare applications, water desalination, land/soil conservation, flood prevention, preservation and distribution of food, housing, communication materials, security systems, and other uses. With such large and varying applications, plastics contribute to an ever increasing volume in the solid waste stream. The world's annual consumption of plastic materials has increased from around 5 million tons in the 1950s to nearly100 million tons in 2001.Quantities of waste plastic have been rising rapidly during the recent decades due to the high increase in industrialization and the considerable improvement in the standards of living, but unfortunately, the majority of these waste quantities are not being recycled but rather abandoned causing certain serious problems such as the waste of natural resources and environmental pollution.

MATERIAL USED

Table : Materials used.

Basic materials	Specifications
Cement	Ordinary Portland cement 53 Grade from Ultratech Cement was used.
Sand	The fine aggregate was sand from River Sand Belkhu having a specific gravity 2.63.
Gravel	Maximum size of 20 mm, specific gravity of 2.69 was used as coarse aggregate.
Waste Plastic Pet Bottles	Recycled waste plastic PET Bottles with a percentage 1%, 2%, 2.5%, 3% and 5% replacement of sand was used.
Water	Fresh water was used for mixing process and curing.

GENERAL PROPERTIES OF MATERIALS

Properties of Cement –:

1) Normal Consistency Test
2) Soundness Test
3) Initial and Final Setting time
4) Compressive Strength Test

Properties of Fine Aggregates-:
1) Particle size distribution (Grading)
2) Specific Gravity and Water Absorption

Properties of Coarse Aggregates-
1) Particle size Distribution (grading)
2) Fineness Modulus
3) Specific Gravity and Water Absorption

Properties of PET Bottles Fiber The plastic aggregates were produced mainly from waste PET bottles the plastic bottles were crushed and cut into small pieces using a crushing machine or by manually. The plastic aggregates were washed properly to make them clean and to ensure that no other dust particles were present there. Polyethylene terephthalate (PET) is thermoplastic polyester with tensile and flexural modulus of elasticity of about 2.9 and 2.4MPa respectively tensile strength up to 60MPa and excellent chemical resistance. It is a semi-crystalline polymer, with a melting point of about 260°C and a glass transition temperature ranging from 70 to 80°C, in relation to the amount of crystalline regain enclosed

AIM AND OBJECTIVES

To evaluate the possibility of using plastic pet bottle fiber as partial replacement of sand in concrete.Specific objectives of this work include:

1) To study the effect of replacing sand with plastic pet bottle fiber on workability, compressive strength and flexural strength of concrete.
2) To study the effect of replacing sand with plastic pet bottle fiber on weight of concrete.
3) To find the optimum percentage of replacement of sand using plastic pet fiber.

LIMITATION OF THE STUDY

While carrying out this research, various limitations were considered. Due to this, the accuracy of the results obtained is limited. Some of them are as follows:

1) Only M20 grade of concrete was considered for the study and mixing was performed manually with hand.
2) The water cement ratio was chosen as 0.50 for the entire experimental works.
3) Plastic pet bottles are manually grinding of 3 mm size approximately.
4) Compressive strength test and Flexural strength test were carried out only forthe samples cured for 7 days and 28 days.
5) Among various tests, compressive strength test and flexural strength test were performed to check the effect of Plastic PET bottles fiber on the properties of concrete.
6) Only 2 samples each for compressive and flexural test are casted for 7 and 28 days of experiments

ORGANIZATION OF THE THESIS

The whole thesis is composed of five main chapters. Chapter one gives the background information of the research work including the research objectives and hypothesis. Chapter two reviews the available literature relating to the topic and the description of the various materials, their properties and the experimental tests. Chapter three describes the whole research methodology starting from the material collection to the experimental program adapted to this research. Various material test are listed here along with their procedures. Also the obtained data from various test are shown in this chapter. Chapter four covers the analysis of the data mentioned in chapter three and the discussion and comparison of the results obtained with the previous research. Chapter five contains conclusion and recommendation based on the results obtained, establishing the objectives of the research. The remaining includes reference and appendices at the end to shape this thesis as a complete works.

II. LITERATURE REVIEW

Akcaozoglu et al. (2009) reported that waste Poly-ethylene Terephthalate (PET) bottle granules can be used as lightweight aggregates of sizes between 0 to 4mm, in mortar. Tests were conducted on mortars prepared with only PET aggregates with PET and sand aggregates together and blast-furnace slag as the replacement of cement on mass basis up to 50% to reduce the amount of cement used and provide savings. The water–binder ratio and PET–binder ratios of 0.45 and 0.50 were used. It was reported that mortars containing only PET aggregate, mortar containing PET and sand aggregate, and mortars modified with slag as cement replacement can be considered as structural lightweight concretes, as far unit weight and strength properties are concerned. Authors further concluded that shredded waste PET granules can be used as aggregate in the production of structural lightweight concrete since shredded waste PET granules reduces the unit weight of concrete, being light. This is helpful in reduction of dead load of the structure as a whole, thus resulting in economy and reduced dead weight in seismic design. The eco-friendly advantages include reduction in the use of natural resources, disposal of wastes, prevention of environmental pollution, and energy saving.

Ramadev K.et. al. (2012) in his research paper “Experimental Investigation on the Properties of Concrete with Plastic PET (Bottle) Fibers as Fine Aggregates” minvestigates that Waste plastic bottles are major cause of solid waste disposal. Polyethylene Terephthalate (PET) is commonly used for carbonated beverage and water bottles. This is an environmental issue as waste plastic bottles are difficult to biodegrade and involves processes either to recycle or reuse. Concrete with 1%, 2%, 4% and 6% PET bottle fibers for fine aggregate were produced and compared against control mix with no replacement. Cube specimens, cylinder specimens and prism specimens of 18 numbers each were cast, cured and tested for 7 day and 28 days strength. This paper concluded that the concrete with PET fiber reduced the weight of concrete and thus if mortar with plastic fibers can be made into light weight concrete based on unit weight

(1) It was observed that the compressive strength increased up to 2% replacement of the fine aggregate with PET bottle fibers and it gradually decreased for 4% and 6% replacements. Hence replacement of fine aggregate with 2% replacement will be reasonable.
(2) It was observed that the split tensile strength increased up to 2% replacement of the fine aggregate with PET bottle fibers

and it gradually decreased for 4% and 6% replacements. Hence, the replacement of the fine aggregate with 2% replacement will be reasonable with high split tensile strength compared to the other specimens casted and tested.
(3) It was observed that the flexural strength increased up to 2% replacement of the fine aggregate with PET bottle fibers and it gradually decreased for 4% and remains the same for 6% replacements.
(4) Hence, the replacement of the fine aggregate with 2% of PET bottle fibers will be reasonable than other replacement percentages like 4% and 6% as the compression and split tensile strength reduces gradually.

Frigione (2010) from Department of Engineering (Italy) had tried to reuse the plastic by recycling of pet bottle as partial replacement for fine aggregate in concrete. Sand in concrete was replaced by PET aggregates manufactured from the waste un-washed pet bottles to the extent of 5% by weight of fine aggregate. Specimens with different cement content and water/cement ratio were manufactured and various tests like compressive strength at 28 days and 365 days, workability test etc. were conducted. It was reported that the increase in strength at 365 days with respect to the value measured at 28 days is similar for the two concrete and in line with standard concrete. Compressive strength was slightly decreased when PET bottle aggregates were added in substitution of sand. From the stress-strain curve determined from compression test for the reference concrete and PET concrete, it was observed that these two types of concretes display very similar compressive strength trends. It was also concluded that for both type of fresh concretes, same workability was observed. Also, the difference in 28-days and one year compressive strength for ordinary concrete and PET concrete was very low for water: cement ratio of 0.45, but increased at higher water: cement ratios up to 0.55. Thus, it was felt that waste PET can be used in concrete without any special treatment and in eco-friendly manner.

Hopewell et al. (2009) found that adverse impact of plastics on surrounding can be reduced by recycling. Recycling reduces the quantity of wastes which are thrown in open areas, and also reduces the use of oil and emission of carbon dioxide. These recycled plastics are used for packaging, agricultural films, etc. It was also reported that substantial increase in the rate of recovery and recycling of plastic waste is possible.

Maqbool Younus et al (2019) studied Experimental investigation on the properties of concrete with plastic pet (bottle) fiber as partial replacement of fine aggregates with the varying percentage (1%, 2%, 2.5%, 3% and 5%) of the Plastic PET bottles. In this research we can found that the compressive strength of the concrete increase with increase in plastic fiber up to 2% added of the Plastic fiber, there after the Compressive strength reduces with increase of the addition of the plastic fiber. Whereas the Flexural strength of the Concrete increases with increases as percentage increase up to 2.5%. Thereafter it reduces with increase of the addition of the plastic fiber.

Elango A and Ashok Kumar [2018] Concrete containing flexible fine particles was used in a study. They used crushed aggregates, river sand, and OPC 53 grade. Plastic was utilised in place of fine aggregates in proportions of 10%, 20%, and 30%. On their concrete samples, they test mechanical and durability attributes. They discovered a drop in concrete strength. However, it was discovered that the concrete has good resistance to acid assaults and increased flexibility. As a result, they determined that flexible aggregate concrete can be employed in places where compressive strength is less important than durability.

Lhakpa Wangmo Thingh Tamanget [2017] Plastics in Concrete as Coarse Aggregate was the subject of a test. They investigated the mechanical characteristics of concrete with plastic particles. They employ plastic aggregates in three different proportions: 10%, 15%, and 20%. They discovered a slight drop in strength and recommended a 15 percent replacement as the best result.

B Jaivignesh and A Sofi in [2017] Study of Concrete Properties using Plastic Waste as Aggregate was completed. They used plastic in the place of fine and coarse aggregates in proportions of 10%, 15%, and 20%. Steel fibre was also added to the concrete. Their findings point to a drop in strength, but they recommend using it instead to save waste and use environmentally acceptable products.

MB Hossain et. al. in[2016] did research on the use of waste plastic as a component ingredient in concrete. They are used to replace coarse aggregates in proportions of 5%, 10%, and 20%. They discovered that the concrete was lighter. However, the compressive strength of the concrete was lower than that of traditional concrete. They also discovered that the concrete with 10% plastic particles had a strength that is virtually identical to normal concrete. As a consequence, the best outcome was 10% plastic aggregates.

Amalu.R.Get. al. in [2016] The use of waste plastic as fine aggregate in concrete was investigated. They employ plastic to replace fine aggregates in proportions of 10%, 15%, 20%, and 25%. They discovered a drop in concrete strength, but they encourage the use of plastic in non-structural concrete because it has a better workability and produces less waste.

Manhal A Jibrael and Farah Peter in [2016] The Strength and Behaviour of Concrete Containing Waste Plastic is being investigated. Plastic bottles and plastic bags are used to replace fine aggregates in concrete in proportions ranging from 0% to 5%. They came to the conclusion that using plastic in concrete for non-structural uses is not a good idea because it affects strength in both circumstances.

B.Harini and K.V.Ramana [2015] Experiments on the strength properties of M30 grade concrete with various plastic percentage proportions were carried out. By volume, the various plastic proportions are 5 percent, 6 percent, 8%, 10%, 15%, and 20%. When the plastic to aggregate ratio is raised, the compressive strength decreases. Which mix had the lowest compressive strength, and which mix had silica fume of 5%, 10%, and 15% by weight partially replaced cement. The strength properties were examined once more, and it was discovered that when 10% of the cement was substituted with silica fume, the concentration of silica fume was 15% greater than in the reference mix.

III. HISTORY OF CONCRETE

Today, the Indian cement industry is about 93 years old. The first factory, with an annual capacity of 0.01 106 t/a, was constructed in 1913. India has seen an upsurge in cement production. The transition from the control regime to the "free regime" in the year 1989 was the most significant development in India's growth of cement manufacturing. The cement and concrete industries saw both quantitative and qualitative growth in the free system, which is still in place today.

Indian Cement Company Limited laid the groundwork for India's cement industry. Construction started in 1914 at Porbandar (Gujarat State) between 1912 and 1913. The city of Chandigarh, which goes back to the middle of the 1950s, is widely seen as the starting point for the use of toughened concrete in India by many people who study the country's built environment. By that time, reinforced concrete had been used for more than 50 years in North America and Europe. As a result, this paper examines how reinforced concrete was used in India for the first half of the 20th century. The buildings designed by Lutyens and Baker in New Delhi have received the least attention in India's construction environment since the first half of the 20th century. There are numerous reasons for this circumstance. In order to facilitate the remnants, which were so appealing to many writers of Indian architectural history, the structures of this period began to take on a more cosmopolitan form and replaced the exoticism of the Indo-Saracenic style of the late 19th and early 20th century. The legal age of structures, where a trend is acknowledged, was created by an architect who is mostly unknown both inside and outside of India and has not attracted the attention of western architectural historians. The inquiry was finished in 1947 through the end of the British's presence in India, which was going through a period of conversion and was just before the "stop" in the construction sector. Despite the fact that Anglo-Indian designers persisted in working after the war, they were initially hidden by Le Corbusier and Louis Khan—notable figures brought in to help support a new India—and then by Indian designers like Charles Correa, Balkrishna Doshi, and Raj Rewal.

IV. PROPERTIES OF CONCRETE

Concrete is a common building material because of its various qualities. For these features to be most advantageous in legislative procedure, the proper amount of ingredients, positioning, and curing are necessary. Numerous advantages of superior concrete contribute to its reputation. In the first place, it makes sense when the constituents are willing to be used. Concrete's long lifespan and minimal preservation requirements increase its financial return. Concrete is not always as likely to degrade, rot, or fester as other building materials. Concrete is capable of being shaped or transmitted into almost any desired type. Costs can be decreased by having the casting and construction done on the jobsite. Concrete has a strong fire resistance property and is able to withstand fires and high temperatures because it is a non-flammable substance. It is hostile to worms, rodents, water, air, and water. Consequently, concrete is frequently employed as a storm protection material. Despite its many advantages, concrete material has some limitations. Concrete is brittle due to its (i) low tensile strength, (ii) low ductility, (iii) low strength-to-weight ratio, and (iv) low strength-to-weight ratio. Despite these limitations, concrete residue is the material of choice for many applications.

V. STRENGTH OF CONCRETE

Concrete's ability to be strengthened heavily depends on the hydration process. The quantity of water consumed, in particular, plays a crucial influence. When less water is used to create concrete, the concrete's strengthening expands. The hydration effect itself graphs a certain amount of water. In essence, adding extra water to the concrete mix is beneficial for the hydration process. This additional water is mixed to offer enough workability for concrete. Smooth concrete is preferred to achieve appropriate filling and to create the desired shapes. The water that is not used in the hydration action will remain in the stoma space of the microstructure. Due to the weak connections made by the calcium silicate hydrate, these pores make the concrete unstable. No matter how well the concrete has been crushed, a few pairs will remain. Water added to cement increases strength but reduces workability. The high water content of cement results in minimal strengthening but excellent workability. The texture and amount of the form are what make aggregates objectively distinct. These can ultimately impair strengthening since they have an impact on how easily concrete can be worked. However, the aggregates make concrete impractical; therefore, the service provider will probably add additional water, making concrete weaker by increasing the mass proportion of water in concrete.

The accumulation of admixtures may contribute to the strength of concrete. Admixtures are substances that are added to a mixture during mixing that are neither essential ingredients or strengthening agents. Some mixing ingredients provide variety to concrete while requiring less water to be used. Super plasticizer is to be added as a strengthening additive. As a result, concrete is made more workable or fluid without the use of more water. Below is a list of various admixtures and how they work. Keep in mind that not all admixtures strengthen concrete. The phrase "stability" is crucial when referring to the use of concrete for a known function. When concrete is mixed properly and properly cared for throughout the curing process, it delivers good presentation for the whole life of the organisation. Under the right conditions, high-quality concrete has an endless lifespan. While water is important for concrete because of its hydration or hardening qualities, it also serves the goal of lessening toughness after the formation is built. This only happens because water can introduce harmful substances to the interior of concrete, leading to various forms of degeneration. As a result of the maintenance and restoration of the concrete organisation, such weakening eventually introduces costs. If environmental concerns are taken into account when building concrete structures, the service provider must be skilled at taking these into account and creating a long-lasting concrete organisation.

VI. MATERIALS USED FOR CONCRETE MIXTURE

MATERIAL USED

Cement

The ordinary Portland cement (grade 43) was utilized confirming to IS: 8112. Various properties of cement such as consistency, setting time, Specific gravity etc were determined through laboratory tests and the results are mentioned in table.

Table: Physical Properties of OPC 43 grade

S. No.	Properties	OPC 43 Grade	Requirement As Per IS Code
1.	Standard Consistency	31%	-
2	Initial Setting Time (min.)	65	>30
3	Final Setting Time (min.)	280	<600
4	Specific Gravity	3.15	3-3.15
5	Soundness	3mm	10 (max.)
6	Compressie strength of 1:3 cement sand mortar cubes at 28 days	59.38N/ mm^2	

Fineaggregate

The aggregates of size ranging from 4.75mm to 150 microns is used as a fine aggregate. The physical properties and sieve analysis confirming to IS 383:2016 of these aggregates are represented in the Table

Table: Physical Properties of Fine Aggre

Test	Result
Specific Gravity	2.64
Fineness Modulus	2.63
Water Absorption	1.40%

Coarse aggregate

Crushed and angular aggregates were used in current work. The Coarse aggregate of size 10 mm were collected from local area. Various tests on coarse aggregates were conducted to determine the specific gravity, water absorption values confirming to IS 383:2016.

Table: Physical Properties of Graded Coarse Aggregates

Test	Result
Color	Grey
Shape	Angular
Specific Gravity	2.69
Water absorption	1.1%

Water

Portable water available at the work place is used for mixing and curing.

PET Bottles Fiber

The plastic aggregates were produced mainly from waste PET bottles the plastic bottles were crushed and cut into small pieces using a crushing machine or by manually. The plastic aggregates were washed properly to make them clean and to ensure that no other dust particles were present there. Polyethylene terephthalate (PET) is thermoplastic polyester with tensile and flexural modulus of elasticity of about 2.9 and 2.4MPa respectively tensile strength up to 60MPa and excellent chemical resistance. It is a semi-crystalline polymer, with a melting point of about 260°C and a glass transition temperature ranging from 70 to 80°C, in relation to the amount of crystalline region enclosed in the amorphous phase.

Concrete mix Design

Mix design involves a process for the selection of proportion of concrete constituents like cement, water and aggregates to produce an economical concrete mix satisfying the required workability conditions. In order to optimize the amount of quantities used to prepare the concrete, mix design is performed. Maximum water-cement ratio, minimum cement content, minimum strength minimum workability maximum size of aggregates, air content within specified limit and type of exposure are considered as limiting values for the design
Considering the M20 grade of concrete with water cement ratio as 0.50, the concrete mix was designed according to IS 10262:2009.concret without the mix of Plastic PET bottles fibers was used as the control concrete. The different proportions of cement, sand, aggregate, plastic fiber and water were determined as shown in table 5 as per the procedure defined in and value obtained

EXPERIMENTAL PROGRAM

The following properties were tested with the samples prepared.

a) Bulk Density/ Unit Weight
b) Water Absorption
c) Compressive Strength
d) Flexural Strength

Total 24 cubes of size 150x150x150mm, 4 sample each for 0%, 1%, 2%, 2.5%, 3% and 5% of the sand replacement by plastic pet bottle fiber were prepared to determine the bulk density, water absorption and compressive strength. Similarly, total 24 plain concrete beam of size 75x75x300mm were prepared, 4 sample each for 0%, 1%, 2%, 2.5%, 3% and 5% of the sand replacement by plastic pet bottle fiber were prepared to determine the Flexural strength for 7 days and 28 days respectively. The procedure followed to determine the above properties according to the IS 516:1959

VII. CONCLUSION

1) The mix proportions of concrete containing cement, sand and coarse aggregates considering M20 grade was determined as 1:1.47:2.92.
2) The degree of workability of concrete varied between 35mm to 75mm. This showed that the increase in workability with the increase in percent replacement of sand by plastic pet bottle fiber.
3) The concrete with Plastic PET bottle fiber increases the flow properties of concrete and reduces the weight of concrete and thus Concrete with plastic pet bottle fiber can be made into lightweight concrete based on unit weight.
4) The maximum compressive strength was at 2% of plastic fiber content was 14.92 % and maximum flexural strength was at 2.5% of plastic fiber content was 24.61% at 28 day more over control concrete. The increase in strength was observed with the inclusion of plastic fibers in concrete. The optimum strength was observed between 2 to 2.5% of fiber content for all types of strength thereafter reduction in strength were observed.
5) Other kinds of admixtures can be used to increase the strength of concrete at further addition of plastic pet bottles fiber.

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