International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 04 Issue 02
February 2017

Experimental Research on Eco Friendly Concrete

P.Vikas Guptha
Research Scholar
M.TECH (Structural Engineering)
Aurora's Technological & Research Institute
Parvathapur(V), Ghatkesar(M),
Ranga Reddy, Telangana
Email: **culbuddy656@gmail.com,**

L.Aparna
Assistant Professor
M.TECH (Environmental Engineering)
Aurora's Technological & Research Institute
Parvathapur(V), Ghatkesar(M),
Ranga Reddy, Telangana
Email :-**lapps235@gmail.com**

ABSTRACT:- *The quick Urbanization and Industrialization everywhere throughout the world has brought about extensive statement of Plastic waste and Waste Tire Rubber. This waste can be used under appropriate condition to lessen the Cement content in Concrete. M30 concrete is utilized for the greater part of the constructional works. The quality of this concrete outcomes has contrasted and concrete acquired of Plastic waste and Waste Tire Rubber changing from 0% to 20% .Experimental examinations included testing physical prerequisites of coarse totals, fine totals, bond and the modifier waste plastic and waste tire elastic. M30 concrete plan blend considered according to IS 10262-1982. The said rate of modifier was mixed with the bond concrete blend and the ideal modifier substance was found. 3D shapes and barrels were thrown and tried for 28 days quality. These tests uncovered that by including Waste plastics and elastic as incomplete substitution in Fine Aggregate and Coarse total by volume, the quality of concrete diminished. The block qualities were diminished as the rate substitution expanded because of their poor bouncing properties. By utilizing Plastic waste and Waste Tire Rubber as modifier, we can lessen the amount of coarse total and fine total by their volume, henceforth diminishing the general cost of development .The Modified bond concrete can be utilized as a part of the development of little seepage works and unbending asphalt. Successful use of waste plastics should be possible for a decent aim securing worldwide condition and viable solid waste management.*

Key Words:-Plastic waste, Waste Tyre Rubber, M30 concrete, concrete, solid waste management.

INTRODUCTION

The changed way of life and unendingly expanding populace has brought about a critical ascent in the amount of post-customer Plastic waste and Waste Tire Rubber. The world's yearly utilization of plastic materials has expanded from around 5 million tons and 20 million tons in the 1950s to about 100 million tons lately, bringing about a huge increment in the measure of Plastic waste and Waste Tire Rubber era. Out of this waste, a critical part is reused yet the lion's share of post-purchaser Plastic waste and waste tire rubbers, similar to cleanser sachets, convey sacks, nitro packs, drain and water pockets and rubbers in Waste tires and so forth however recyclable, remains relatively untouched as they are hard to isolate from family unit junk. In the greater part of the cases, such post-shopper waste either litters all around or is discarded via arrive filling. The transfer of post-purchaser Plastic waste and Waste Tire Rubber in this way acts critical ecological dangers like it results in diminishment in soil richness, lessening in water permeation, emanation of poisonous gasses, wellbeing peril to creatures and fowls devouring the wastes, poor seepage because of landfill, contamination of ground water because of filtering of chemicals from these waste items and so forth. Looking to the worldwide issue of natural contamination by post-buyer Plastic waste and Waste Tire Rubber, explore endeavors have been centered around expending this waste on enormous scale in productive and ecological cordial way. Specialists wanted to utilize Plastic waste and Waste Tire Rubber in type of concrete fixing as the concrete is second most looked for material by people after water. The utilization of post-buyer Plastic waste and Waste Tire Rubber in concrete won't just be its protected transfer strategy however may likewise enhance the concrete properties like elasticity, concoction resistance, drying shrinkage and crawl on short and long haul premise. The Plastic waste and waste tire rubbers which can be utilized as fine and coarse total and their impact on properties of concrete. It additionally introduces current patterns and future needs of Investigate in the zone of utilization of post-customer Plastic waste and Waste Tire Rubber in Concrete. The quick Urbanization and Industrialization in India has Resulted in extensive affidavit of Plastic waste. Plastic waste, comprising of convey packs, glasses and so forth. Can be utilized as a covering over total and this covered stone can be utilized for street. This is an co-accommodating procedure. By utilizing plastic waste as modifier, the amount of bond and sand by their weight can be diminished, along these lines diminishing the general cost of development. Disposed of vehicle tires constitute an essential piece of waste material, which had truly been discarded into landfills. The creation of waste by the tire business has been a developing issue, demonstrating the requirement for its reuse in the development field. Elastic can be added to black-top, which expands its strength and enhance asphalt quality and security conditions by engrossing the elastic versatile properties. Elastic can likewise be utilized for concrete asphalts for light movement. Throughout the years, research is continuing for the utilization of reused tire elastic in PCC blend as a conceivable option total incompletely supplanting some piece of total. Elastic totals from disposed of tire elastic in sizes 20mm can be incompletely supplanted characteristic totals in bond concrete development. Scrap feels sick of different vehicles are ceaselessly amassed in the landfills everywhere throughout the world. After the administration life of truck and auto tires is over their stockpiling and transfer turns into a testing issue for the civil specialists. The waste tires additionally represent an extraordinary wellbeing hand natural risk because of expanded rearing of mosquitoes and different bugs or increment in flame perils at their capacity areas. The civil experts in numerous nations have officially restricted dumping of waste tires into the landfills because of the previously mentioned issues subsequently their transfer needs a suitable and natural inviting arrangement. Distinctive techniques have been received for the transfer of scrap tires. They incorporate utilization of tires as fuel, ground elastic applications for play-ground or games surfacing or use in new elastic items and use in black-top elastic altered concrete. A portion of the other structural designing applications incorporate street and landfill development, septic tank development and so on. Remaining tires are discarded into the landfills. The tire infers are represented 40.3%, ground elastic applications are represented around 26.2% and 5.5% represented different structural building uses of the aggregate era of scrap tires in the year 2009. In any case, toward the finish of 2010, around 112 million piece Tires still stayed in the stock heaps and this number is expanding each year. The measurements draws out the significance of the more far reaching and solid application program for the reuse of the piece tires.

TYPES OF WASTE PLASTICS:

1. **House Hold Plastics:**
2. **E-plastics:**
3. **Industrial Plastics:**

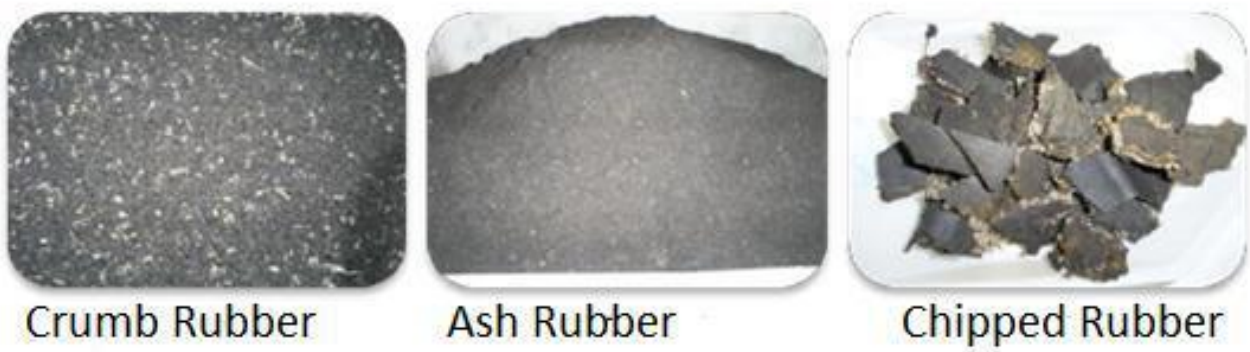
Fig.1.Waste plastics

TYPES OF WASTE TYRE RUBBER:

1. Chipped rubber:
2. Crumb rubber:
3. Ash rubber:

USAGE OF PLASTIC WASTE AND WASTE TYRE RUBBERS IN CONCRETE:

It is watched that plastic waste and waste tire elastic is utilized as concrete fixing in different structures. They are generally utilized as a part of the type of fine and coarse granular particles, powder and discrete filaments. This type of fixing is basically controlled by sparing, physical and concoction impediments of changing over the wastes in a particular shape or form. Few selective research efforts have been summarized here to present a general scenario of usage of post-consumer plastic waste and waste tyre rubber like carry bags, wrapping and packaging materials, left over or crushed bottles and



small to medium containers etc. in various forms. And waste and worn out tyres from the vehicles.

Advantages of waste plastic in concrete:

i) Concrete with waste plastics has more elastic property then P.C.C value of young's modulus of concrete with waste plastics is also found to be more than P.C.C

ii) Compressive strength increases substantially when compared to P.C.C

iii) Flexural strength increases by approximately 2 to 3 times throughout the mix.

iv) Increase in cube strength of concrete.

Advantages of waste tyre rubber in concrete:

I). Concretes with waste tyre rubber are found to be more tougher compared to concretes

ii) Modulus of elasticity and Energy absorption capacity of concrete are increased slightly when waste tyre rubber are used in concrete

iii) The durability of the concrete cast with waste tyre rubbers are bound to be more durable compared to conventional concretes

PROBLEMS ASSOCIATED WITH THE USE OF PLASTIC WASTE AND WASTE TYRE RUBBERS IN CONCRETE:

As the surface of the considerable number of types of plastic waste and waste tire elastic is smooth, their bond qualities turn into an obstacle to utilize them as concrete fixing. The real worry of utilizing plastic waste and waste tire elastic in concrete is to create harshness on the surface of the plastics utilized. Henceforth, when plastic waste and waste tire elastic is required to be utilized as a part of concrete, they require surface roughening treatment for better bond properties. These medicines change with the sort of plastic waste and waste tire elastic. This angle confines the full use of Plastic waste and waste tire rubbers created by shoppers as concrete fixing.

Though plastics and rubber had brought a rapid change in the life style, it had become a great problem to the mankind to dispose them.

DISPOSAL METHODS	**DRAW BACKS**
Land filling	Decreasing soil fertility
Burning	Releasing gases

The partial replacement of waste plastic in concrete has no draw backs. These have smooth surface. The special treatment is needed for better bonding. The present investigation deals with the effective utilization of those accumulated plastics and rubber as partial replacement in concrete. Till now the experimental investigations were done either by replacing partially the Fine or Coarse aggregate by either Plastics or Rubber but not both. In the present investigation we intend to partially replace Fine and Coarse Aggregates with both Waste Plastics and Waste tyre Rubber Respectively.

MATERIALS USED:

Concrete is a misleadingly designed material produced using a blend of Portland bond, totals and water. It is most generally utilized development material on the planet. It is solid, shoddy and tough. Portland concrete consolidates with water because of hydration to bond the totals together into a solid entirety. The materials utilized as a part of the present examination are concrete, fine total, coarse total, water, super plasticizer, plastic wastes and waste tire rubbers.

The physical properties of the Portland bond utilized are given in the beneath table.

S.No	Property	Value
1	Grade	53
2	Specific Gravity	3.1
3	Standard Consistency	32%
4	Initial Setting Time	35 Minutes

Table 1.Physical Properties of Cement

S.No	Property	Value
1	Specific Gravity	2.57
2	Fineness modulus	3.36
3	Zone of sand	II

Table 2. Physical Properties of Fine Aggregates

RANGE	ZONE
4 – 2.71	ZONE I
3.37 – 2.10	ZONE II
2.78 – 1.71	ZONE III
2.25 – 1.35	ZONE IV

Table No.3: Classification of Fine Aggregate

NOTE: Since the Fineness modulus of fine aggregates is 3.36; Zone II has been adopted.

Coarse Aggregate:

The coarse aggregate is procured from Jayagiri, Hanamkonda and used for investigation. The properties of coarse aggregate used are shown in Table .

S.No	Property	Value
1	Specific Gravity	2.79
2	Fineness Modulus	7.33

Table 4: Physical Properties of Coarse Aggregate

PROPERTIES OF HARDENED CONCRETE:

The basic characteristic of concrete, after it has set, is that it is hard

- ◊ Strength
- ◊ Shrinkage of concrete
- ◊ Creep of concrete
- ◊ Thermal expansion
- ◊ Durability

FACTORS EFFECTING STRENGTH OF CONCRETE:

Following are the factors that affect the strength of concrete:

1. Water-Cement ratio
2. Type of cementing material
3. Amount of cementing material
4. Type of aggregate
5. Air content
6. Admixtures

-3.3 MIX DESIGN:

In this study, the normal strength concrete of M30 grade is considered. BIS code procedure as per IS: 10262-1982 & 2009 was followed for finding the mix proportions of all the concrete specimens.

The mix proportions is as follows

MATERIALS:

Cement : OPC 53 grade

Coarse aggregate: crushed stone

Fine aggregate : natural river sand

PARAMETERS:

Standard deviation = 6.0 N/mm^2 (For Good mix as per specifications)

Assume slump of concrete = 95 mm

DESIGN OF M30 GRADE CONCRETE BY B.I.S.METHOD:

Materials:

Cement	: OPC 53 grade
Coarse aggregate	: crushed stone
Fine aggregate	: natural river sand

Properties of materials:

Cement	: specific gravity =3.1
Coarse aggregate	: Fineness modulus=7.14
	Bulk specific gravity=2.64
	Absorption characteristic=0%
Fine aggregate	: Fineness modulus=2.57
	Absorption characteristics=1%

Parameters:

Assume standard deviation = 6.0 N/mm^2

Assume slump of concrete = 95mm

VOLUME BATCHING

$1m^3$ OF CONCRETE:

Cement	**= 508.9 kg**
Fine aggregate	**= 518.54 kg**
Coarse aggregate	**= 1216.59 kg**
Water	**= 186 kg**

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 04 Issue 02
February 2017

WEIGHT BATCHING IN 1 CUBE MOULD OF CONCRETE:

Size of the mould chosen 150mm X 150mm X 150mm

Data: Characteristic Strength = 30 Mpa
Target Mean Strength = 39.9 Mpa
Standard deviation = 6.0 N/mm^2

Volume of cube chosen is 150x150x150 = 3.375 x $10^{-3}mm^3$
Total quantity = 2424.24 kg/mm^3

Absolute Volume = 8.191 kg
Cement content = 1.71 kg
Fine Aggregate content = 1.75 kg
Coarse Aggregate content = 4.10 kg
Water Content = 0.61 kg

WATER	CEMENT	FINE AGGREGATE	COARSE AGGREGATE
186 kg/m^3	501 kg/m^3	520 kg/m^3	1220kg/m^3
0.36	1	1.03	2.43

Table No.5: Mix proportion

The replacement of waste plastic and waste tyre rubber in order to fine and coarse aggregate was done according to the volume replacement. For 10% of material replacement, considered 5% waste plastic in the replacement of fine aggregate and 5% waste tyre rubber in the replacement of coarse aggregate.

CASTING OF TEST SPECIMENS

The present experimental programmed includes casting and testing of specimens for compression. (Note: all of the following specifications are in adherence to IS: 516-1959)

RESULTS AND DISCUSSION

COMPRESSIVE STRENGTH OF CUBE SPECIMENS

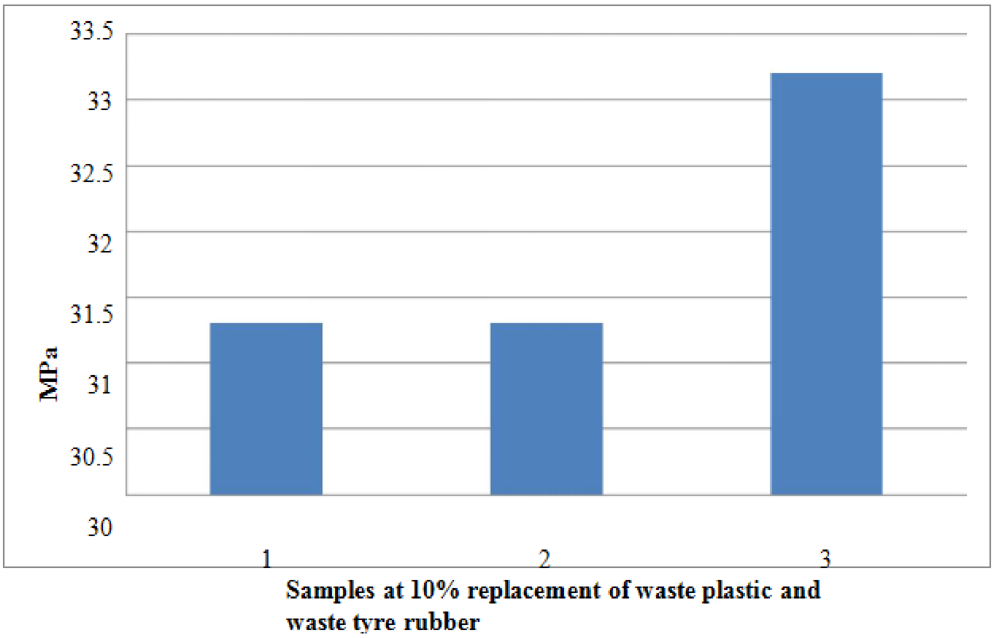
The compressive strength of cubes are given below in N/mm^2

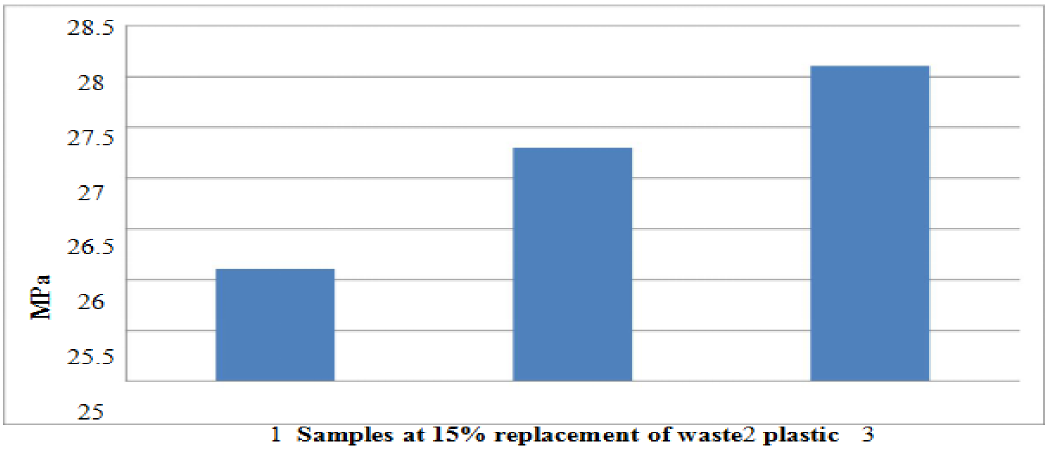
No. of samples	0% of waste material replacement	5% of waste material replacement	10% of waste material replacement	15%of waste material replacement	20% of waste material replacement

Sample 1	47.7	40.5	31.3	26.1	26.1
Sample 2	45.6	41.2	31.3	27.3	25.4
Sample 3	47.9	39.6	33.2	28.1	25.4
Avg	47.01	40.3	31.9	27.2	25.8

Comparison of compressive strength of cubes vs. percentage replacement of waste plastic and waste tyre rubber

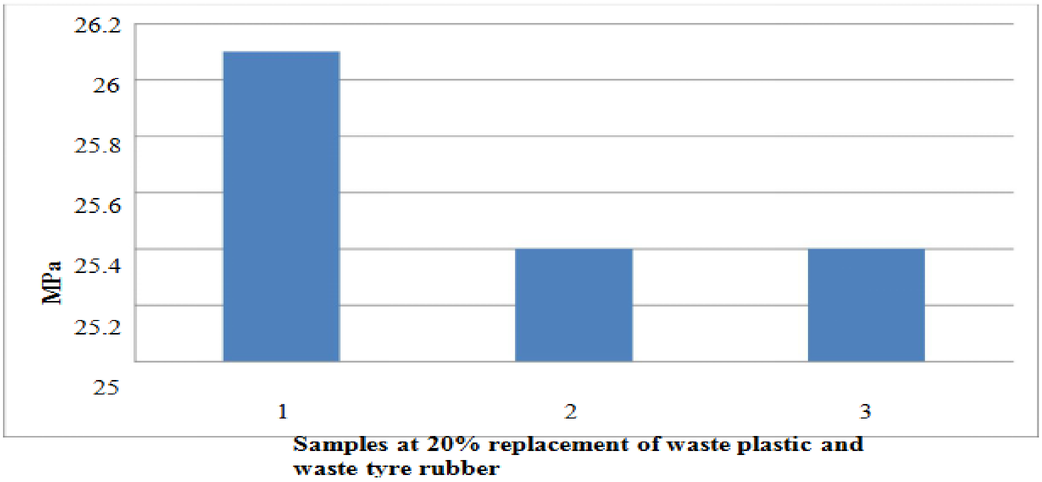
Graph showing Compressive strength of cubes at the age of 28Days



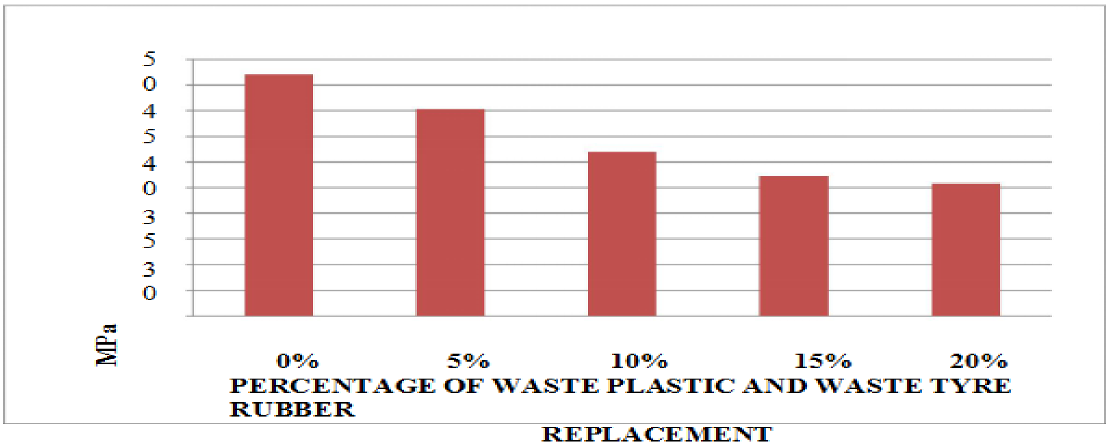


Graph showing Compressive strength of cubes at the age of 28 days

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 04 Issue 02
February 2017



Comparison of average compressive strength of cubes vs. percentage replacement of waste plastic and waste tyre rubber

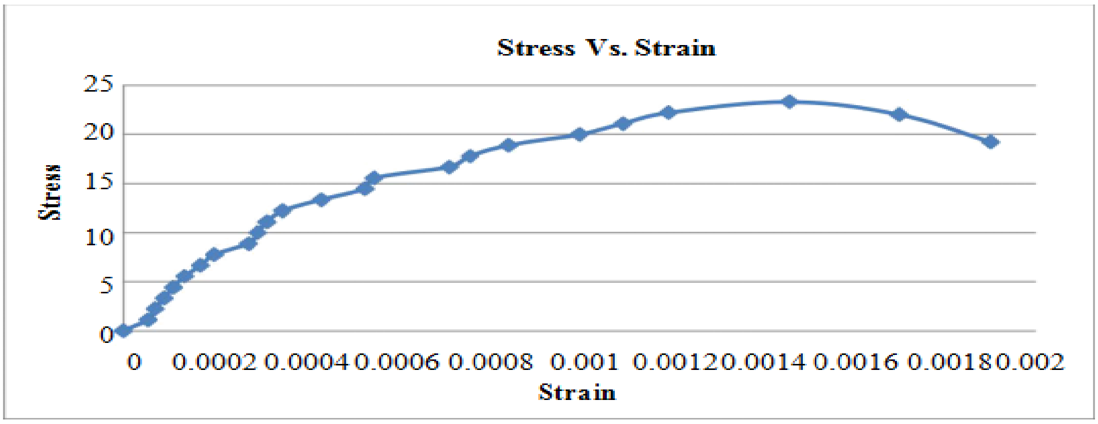


THE FOLLOWING GRAPHS SHOWING STRESS vs. STRAIN:

THE GRAPHS SHOWING STRESS vs. STRAIN AT 0% PERCENTAGE REPLACEMENT OF WASTE PLASTIC AND WASTE TYRE RUBBER: SAMPLE 1:

Load	Extensometer reading		Mean	Area	Strain	Stress
KN	Left	Right		cm^2		N/mm^2
0	0	0	0	17671.45	0	0
2	4	7	5.5	17671.45	0.00005	1.11
4	5	9	7	17671.45	0.00007	2.22
6	7	11	9	17671.45	0.00009	3.33
8	9	13	11	17671.45	0.00011	4.441
10	10	17	13.5	17671.45	0.00013	5.551
12	13	21	17	17671.45	0.00017	6.661
14	14	26	20	17671.45	0.00021	7.771
16	19	36	27.5	17671.45	0.00027	8.882
18	20	39	29.5	17671.45	0.00029	9.992
20	22	41	31.5	17671.45	0.00031	11.102
22	23	47	35	17671.45	0.00035	12.212
24	33	54	43.5	17671.45	0.00043	13.323
26	47	59	53	17671.45	0.00053	14.433

28	50	60	55	17671.45	0.00071	15.543
30	73	70	71.5	17671.45	0.00076	16.653
32	80	72	76	17671.45	0.00084	17.764
34	86	83	84.5	17671.45	0.0009	18.874
36	110	90	100	17671.45	0.0011	19.984
38	125	94	109.5	17671.45	0.0013	18.987
40	142	97	119.5	17671.45	0.0014	17.987



THE GRAPHS SHOWING STRESS vs. STRAIN AT 0% PERCENTAGE REPLACEMENT OF

CONCLUSION

In view of the above review taking after conclusions are exhibited. The 3D squares example cast with 0% substitution of waste plastic and waste tire elastic have the greatest compressive quality of 47.9 MPa The shapes example cast with 5% substitution of waste plastic and waste tire elastic have the most extreme compressive quality of 41.2 MPa The 3D shapes example cast with 10% substitution of waste plastic and waste tire elastic have the most extreme compressive quality of 33.2 MPa. The 3D squares example cast with 15% substitution of waste plastic and waste tire elastic have the most extreme compressive quality of 28.1 MPa. The solid shapes example cast with 20% substitution of waste plastic and waste tire elastic have the most extreme compressive quality of 26.1 MPa. In the present examination it was affectionate that at 0% substitution of waste plastic and waste tire elastic the compressive quality is expanded and at 20% substitution of waste plastic and waste tire elastic the compressive quality is diminished. As the rate substitution of waste plastic and waste tire elastic expanded, it was found that the concrete has poor holding properties and consequently there is a lessening in compressive quality. This kind of concrete is being utilized for non-auxiliary works, for example, asphalts and drainages.As the rate of waste plastic and waste tire elastic is being expanded it is found that there is a diminishing in extreme anxiety.

REFERENCES

[1]. Afpc-afrem. (1997), "methodsrecommenders pour la measure des grandeurs physiques associées à la durability", compterendu des journes techniques du 11 au 12 décembre, toulouse, france.

[2]. Albano c., camacho n., reyes j., feliu j. L. And hernandez m. (2005), "influence of crap rubber addition to portland i concrete composites: destructive and nondestructive testing", composite structures, 71(3-4), pp.

[3]. Al-hadidy a. I. And yi-qiu t. (2009), "effect of polyethylene on life of flexible pavements", construction and building materials, 23(3), pp .

[4]. Côte d'ivoire normalisation. (2002), "normesivoiriennes pour les pavés de voirieen béton", 2ème édition.

[5]. Hinislioglu s. And agar e. (2004), "use of waste high density polyethylene as bitumen

modifier in asphalt concrete mix", materials letters, 58(3-4), pp .

[6]. 6. Ho s., church r., klassen k., law b., mac leod d. And zanzotto l. (2006), "study of recycled polyethylene materials as asphalt modifiers", canadian journal of civil engineering, 33(8), pp .

[7]. Konin a. (2011), "use of plastic waste and waste tyre rubbers as a binding material in the manufacture of tiles: case of wastes with a basis of polypropylene", materials and structures,

[8]. Omrane m., mouli m. Benosman s. And senhadji y. (2009), "comportement desmatériauxpolyphasésmortier– polymèr en environnementagressif", in effect of plastic waste and waste tyre rubber content on physico-mechanical properties of engineering volume 2 issue 1 2011, pg no: 394

[9]. Proceeding of 1st international conference on sustainable built environment infrastructures in developing countries, 12 – 14 october, pp.

[10]. Rebeiz k., s. And craft a. P. (1995), "plastic waste and waste tyre rubber management in construction: technological and institutional issues", resources, conservation and recycling, 15, pp 245-257.

[11]. Sam t. D. And tam m. N. (2002), "polymer concrete based on recycled polyethylene terephtalate (pet)", in proceedings of 3rd international conference non-conventional material and technologies, vietnam, pp 226-228.

[12]. Sukontasukkul p. And chaikaew c. (2006), "properties of concrete pedestrian mixed with crumb rubber", construction and building materials, 20(7), pp.

P.VIKAS GUPTHA
Research Scholar in M.Tech, Structures
Aurora's Technological and Research Institute,Uppal, Hyderabad,T.S.- 500097.

L.APARNA, Assistant Professor,
M.TECH ENVIRONMENTAL ENGINEERING
Aurora's Technological and Research Institute,Uppal, Hyderabad,T.S.- 500097.