

Compressive Strength and Tensile Strength of Granite Waste, Plastic Waste Concrete by Replacing Partially

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ABSTRACT: Due to rapid population growth and their consistent necessity the use of granite and plastic is increasing day by day. This creates a large quantity of garbage everyday, which is unhealthy and pollutes the environment. In present scenario solid waste management is a challenge in our country, also large scale depletion of source creates environmental problems. A substitute or replacement product for concrete industry needs to be found. Cement releases large amount of carbon dioxide in hydration process and also cement cost is increasing day by day by the usage of large amount of cement. The objective of this topic is to utilize granite waste and recycled plastic of 20mm size in the manufacturing of concrete with partially replacement of conventional cement and coarse aggregate respectively. So it is concluded that locally available granite waste is a good partial substitute in concrete. In the first step, granite waste is replaced as cement in the percentages of 5%,10%,15% in concrete. In the second step, plastic is replaced as coarse aggregate in the percentages of 2%,3%,5% in concrete. In third step, both granite waste and plastic waste is partially replaced in the percentages of 15% and 2%,3%,5% as cement and coarse aggregates respectively. The produced concrete is tested for physical and mechanical properties according to the requirements of Indian Standards for testing materials. The compressive strength of each sample and tensile strength of M40 samples are determined compared with conventional concrete mix. In granite waste concrete higher compressive strength and tensile strength are obtained at 15% replacement among 5%,10%,15% replacements. In plastic waste concrete higher compressive strength and tensile strength are obtained at 2% replacement among 2%,3%,5% replacements. In final replacement higher compressive strength is obtained at 2% plastic waste replacement by coarse aggregates and 15% granite waste replacement by cement.

KEYWORDS: plastic waste (PW), granite waste (GW), Compressive strength, Tensile strength.

I. INTRODUCTION

A. GENERAL:

Concrete is a construction material composed of Portland cement and water combined with sand, gravel, crushed stone, or other inert material such as expanded slag or vermiculite. The major constituent of concrete is aggregate which may be natural (gravel or crushed rock with sand) or artificial (blast furnace slag, broken brick and steel shot) another constituent is binder which serves to hold together the particles of aggregate to form concrete. Commonly used binder is the product of hydration of cement, which is the chemical reaction between cement and water. During the past 20 years, concrete mix design and manufacturing have been progressed quite rapidly and the concrete ingredients have been tailored to provide better performance that suites different types of environments. Since human safety in case of fire is one of the major considerations in the design of buildings, it is extremely necessary to have a complete knowledge about the behaviour of all construction materials before using them in the structural elements. Under normal

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conditions, most concrete structures are subjected to a range of temperature no more severe than that imposed by ambient environmental conditions.

Traditionally, the compressive strength of concrete used to be around 20 to 50MPa, which is classified as normal strength concrete (NSC). In recent years, concrete with a compressive strength in the range of 50 to 120MPa has become widely available and is referred to as high-strength concrete (HSC). When compressive strength exceeds 120MPa, it is often referred to as ultrahigh performance concrete (UHP). The strength of concrete degrades with temperature and the rate of strength degradation is highly influenced by the compressive strength of concrete.

Admixture may also be added to change some of the concrete properties. Admixtures are ingredients other than water, aggregates, hydraulic cement, and fibres that are added to the concrete batch immediately before or during mixing. A proper use of admixtures offers certain beneficial effects to concrete, including improved quality, acceleration or retardation of setting time, enhanced frost and sulphate resistance, control of strength development, improved workability, and enhanced finish ability.

B. GRANITE WASTE.

Granite waste is an industrial waste which is obtained from the granite polishing industry in a powder form. The waste is produced at surrounding areas of Khammam. Total waste produced by all industries in this region may be approximately 2000tonnes per week. This waste is easily carried away by the air and hence causes problems to human health and environment. With the enormous increase in the quantity of waste needing disposal coupled with acute shortage of dumping sites, and sharp increase in the transportation and dumping costs the quality of environment, has got seriously deteriorated preventing sustainable development. As granite powder waste (GPW) is a fine material, it will be easily carried away by the air and will cause nuisance causing health problems and environmental pollution.

The major effects of air pollution are lung diseases and inhaling problems with the majority of people living in and around being effected the worst. In this present work, GPW to cement. To find in this investigation have used GPW as partial replacement to different % the compressive strength, split tensile strength and flexural strengths of concrete have been determined. By doing so, the objective of the reduction of cost construction can be met and it will help to overcome the environmental problem associated with its disposal including the environmental problems of the region.

C. PLASTIC WASTE.

There is acute problem of disposal of wastes and it has become expensive due to over loaded landfills in present scenario. The threat due to non-biodegradable materials like waste plastics, scrap types etc. may contaminate the soil and ground water.

In order to modify the properties of concrete with the use of waste plastic materials such as low density polythene (LDPE), high density polythene (HDPE), polystyrene foam wastes, polythene terephthalate (PET), and other plastic materials have been investigated to be used in concrete in order to modify it and to improve the properties and reduce the cost. This will give a way for green construction and a eco-friendly environment. In this work recycled plastic aggregates were used as a partial replacement to natural coarse aggregate (NCE) of concrete. Intended percentages of re-cycled plastic coarse aggregates (RPCA) were in varying percentages from 0% to 5% (0%, 2%, 3%, and5%). The compressive strength of each sample was determined and compared with conventional concrete mix.

D. SUPER PLASTICIZER: CONPLAST SP430

Uses:

- To produce pump able concrete.
- To produce high strength, high concrete M30& above by substantial reduction in water resulting in low permeability and high early strength.
- To produce high workability concrete requiring little or no vibration during place.

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Advantages:

- **Improved workability:** Easier, quicker placing and compaction.
- **Increased strength:** Provides high early strength for precast concrete with the advantage of higher water reduction ability.
- **Improved quality:** Denser, close textured concrete with reduced porosity and hence more durable.
- **Higher cohesion:** Risk of segregation and bleeding minimized, thus aids pumping of concrete.
- **Chloride free:** Safe in prestressed concrete and with suitable resisting cements and marine aggregates.

E. FACTORS INFLUENCING COMPRESSIVE STRENGTH OF CONCRETE:

Concrete strength is effected by many factors, such as quality of raw materials, water/cement ratio, coarse/fine aggregate ratio, age of concrete, compaction of concrete, temperature, relative humidity and curing of concrete

F. QUALITY OF RAW MATERIALS: Cement, Aggregates, Water, Water / Cement Ratio, Coarse / fine aggregate ratio, Aggregate / Cement Ratio, Age of concrete, Compaction of concrete, Temperature, Relative humidity, Curing.

G. TENSILE STRENGTH OF CONCRETE:

The tensile strength of concrete is one of the basic and important properties. Splitting tensile strength test on concrete cylinder is a method to determine the tensile strength of concrete. The concrete is very weak in tension due to its brittle nature and is not expected to resist the direct tension. Split tensile strength of concrete is usually found by testing plain concrete cylinders. Cylinders of size 150mm x 300 mm were used to determine the split tensile strength. After curing, the specimens were tested for split tensile strength using a calibrated compression testing machine of 2000kN capacity.

H. PROPERTIES OF BOGUES COMPOUNDS: (C3A, C4AF, C2S, C3S) COMPOSITION:

C3S	:	30-50%
C2S	:	20-45%
C3A	:	8-10%
C4AF	:	6-10%

I. NEED FOR THE PRESENT WORK: Appearance of cracks fissures and is an inevitable phenomenon during the aging process of concrete structures under heavy loads. Such cracking leads to easy passage for aggressive environment to reach the reinforcement and initiate corrosion. Many admixtures are used for the structural behavior of concrete.

J. OBJECTIVE OF THE EXPERIMENT:

- To study the behaviour of the Granite Waste Concrete & Plastic Waste Concrete under constant water cement ratio.
- To investigate the compressive strength and split tensile strength of Granite Waste Concrete & Plastic Waste Concrete.
- To study the behaviour of the Granite Waste Concrete & Plastic Waste Concrete for one Normal grade (M40).
- To study the compressive strength of Granite & Plastic waste Concrete for grade (M20).

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K. SCOPE OF THE PRESENT INVESTIGATION:

Keeping in view of the above, the present investigation is considered in two different phases.

In the first phase investigation is carried out to study the compressive strength, split tensile strength and of plastic granite waste concrete. This investigation is meant for the consideration of normal cement concrete mixes and Granite Waste Concrete & Plastic Waste Concrete by adopting one normal grade..

II. REVIEW OF LITERATURE

II.I Granite Waste:

B.Vidivelli et.al. Had studied on fly ash concrete using SEM analysis as partial replacement to cement and had reported a significant increase of 20% compressive strength respectively.

Lalit Gamashta et.al.: Developed the concrete strength by using masonry waste material in concrete mix in construction to minimize the environmental damages due to quarrying. It is highly desirable that the waste materials of concrete and bricks are further.

Dr. G.Vijayakumar et.al. : Had found that use of glass powder as partial replacement to cement was effective.

Ankit Nileshchandra Patel et.al. : Examined the possibility of using stone waste as replacement of Pozzolana Portland Cement in the range of 5%, 10%, 30%, 40% and 50% by weight of M 25 grade concrete. They reported that stone waste of marginal quantity as partial replacement to the cement had beneficial effect on the mechanical properties such as compressive strength values for 7, 14, 28 days were less than the PPC cement.

Venkata Sairam Kumar et.al.: Investigated the effect of using quarry dust as a possible substitute for cement in concrete. Partial replacement of cement with varying percentage of quarry dust (0%, 10%, 15%, 20%, 25%, 30%, 35%, 40%) by weight of M 20, M 30 and M 40 grade of concrete cubes were made for conducting compressive strength. From the experimental studies 25% partial replacement of cement with quarry dust showed improvement in hardened of concrete.

Dr.K.A.Abubakar: The research work carried out included an experimental investigation on strength properties of concrete made with 2.5% to 20% replacement of cement by quarry dust of less than 75 micron particle size. The tests were carried out to find the compressive strength, splitting tensile strength and flexural strength on specimens. Results showed that up to 7.5 % replacement of cement by quarry dust there was no reduction in compressive strength, splitting tensile strength and flexural strength.

II.II Plastic:

T.Subramani: The initial questions arising of the bond strength and the heat of hydration regarding plastic aggregate were solved. Tests were conducted to determine the properties of plastic aggregate such as density, specific gravity and aggregate crushing value. As 100% replacement of natural coarse aggregate (NCA) with plastic coarse aggregate (PCA) is not feasible, partial replacement at various percentage were examined. The percentage substitution that gave higher compressive strength was used for determining the other properties such as modulus of elasticity, split tensile strength and flexural strength. Higher compressive strength was found with 20% NCA replaced concrete.

Al-Manaseer and Dalal, (1997) investigated the effect of plastic aggregates on the bulk density of concrete. For this purpose, they made 12 concrete mixes with different w/c containing varying percentages (0%, 10%, 30%, and 50%) of plastic aggregates. Angular post-consumer plastic aggregates having a maximum size of 13 mm were used. They concluded that: (i) bulk density of concrete decreased with the increase in plastic aggregates content; (ii) reduction in bulk density was directly proportional to the plastic aggregates content; and (iii) density of concrete was reduced by

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2.5%, 6%, and 13% for concrete containing 10%, 30%, and 50% plastic aggregates, respectively. Reduction in density was attributed to the lower unit weight of the plastics.

Marzouk et.al.(2007) reported the bulk density of cement mortar mixes prepared by replacing 0–100% in volume of sand by two different sizes of PET aggregates. Their results showed that the reduction of bulk density remained small when the volume occupied by aggregates varies between 0% and 30%, regardless of their size. However, when this volume exceeded 50%, the composite bulk densities started to decrease until reaching a value 1000 kg/ m³. They also found that for the same volumetric percentage of substitution the bulk density decreased with decreasing particle size.

Brajesh Mishra et.al.: Complete replacement of natural coarse aggregate by recycle plastic aggregate is not realistic so partial replacement in various percentages were incorporated. Intended percentages of recycled plastic aggregates were from 0% to 40% with a increment of 10. It was observed that higher compressive strength was obtained with replacement of 20% natural coarse aggregate by recycled plastic aggregate in concrete mix.

Youcef Ghernouti et.al.: The aim of this study is to explore the possibility of re-cycling a plastic bag waste material (BBW) that is now produced in large quantities in the formulation of concrete as fine aggregate by substitution of a variable percentage of sand (10, 20, 30 and 40 %). The influence of the PBW on the fresh and hardened states properties of the concrete: workability, bulk density, ultrasonic pulse velocity testing, compressive and flexural strength of the different concretes, has been investigated and analyzed in comparison to the control concrete.

III. RESEARCH WORK

The Research was carried out in building laboratory of Swarna Bharati Institute of Science and Technology (SBIT) Khammam. Granite powder waste (GPW) and plastic used for the research. Ordinary Portland Cement (OPC) was used. The cement was defined according to the Indian replacement of cement in concrete production. Properties such as specific gravity, bulk density, moisture content and absorption capacity of GWP and sand were investigated. The specific gravity of GPW and sand was determined in the Laboratory in accordance with the requirement. Compacted and un-compacted bulk density of the materials was determined by the method recommended.

The moisture content and absorption capacity test of GPW and sand was determined in accordance to standards. To assess the suitability of GPW as partial replacement of OPC in concrete production, trial mix with absolute volume method of mix design was first carried out at varying percentage (%) replacement level of 0, 5, 10, 15 and 20% of OPC for GPW at different water/cement (w/c) ratio of 0.45. They were immersed in ordinary water for 28 days and crushed to determine their compressive strength. The 0% specimen served as the control. The preparation of the test specimens follows the procedure as outlined by appropriate Indian standards. In the process of the research the compressive strength and split tensile strength at elevated temperatures was carried.

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No of samples for M40

GW %	PW%	Cubes	Cylinders	Total
0	0	9	9	18
5	2	18	18	36
10	3	18	18	36
15	5	18	18	36
				126

No of samples for M20:

GW%	PW%	Cubes	Total
15	2	9	9
15	3	9	9
15	5	9	9
			153

III.I General: The present investigation is aimed at arriving the compressive strength of the granite waste powder (GWP) and plastic by considering M-40 grade after thoroughly understanding the parameters influencing the strength improvement which are designed with the help of IS:10262-2009. The experimental program is divided in five phases.

Phase 1: Laboratory setup and procurement of materials.

Phase 2: Mix design, mixing of cement mortar, Molding and curing of cement mortar specimens.

Phase 3: It is about the mixing of cement concrete, testing procedure for evaluating the strength parameters of cement mortar & concrete specimens molding and curing of cement concrete specimens.

Phase 4: finding out the maximum compressive strength and minimum compressive strength for both M-40 grade concrete under normal room temperature

Phase 5: Evaluating the results

Laboratory setup: The Concrete Technology Laboratory available with the SBIT College is used for this project. Compressive testing machine was used to test all the concrete specimens and storage tanks were used for the curing of the concrete specimens.

Procurement of materials: The materials used for the investigative study of granite waste and plastic waste Concrete are given below.

Cement, Fine Aggregate, Course Aggregate, Water, Granite Waste, Plastic Waste.

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III.II Tests on Granite Waste:

Fineness of Granite waste:

S.No	Weight Of Sample(gms)	Wt of residue	Fineness
1	300	3.2 gr	$2/300 \times 100 = 1.2\%$
2	300	3 gr	$3/300 \times 100 = 1\%$
3	300	3.2 gr	$2.5/300 \times 100 = 1.04\%$

Fineness of granite waste = 1.02%

Normal consistency of Granite waste

SNO	Weight of Sample(gms)(a)	Qty of Water(ml)(b)	Penetration(mm)	Time(seconds)	b/a x100(%)
1	300	90	40	5	30
2	300	93	33	5	31
3	300	96	35	5	32

Normal Consistency Of granite waste = 32 %

Soundness of Granite waste:

S.No	Initial Distance between Indicators(mm)	Final Distance between Indicators(mm)	Difference
1	15	19	4
2	8	10	2

Initial and final setting of Granite waste:

- Initial setting of Cement is 33Mins.
- Final setting of cement is 480mins.

IV. RESEARCH WORK

IV. I M40 MIX DESIGN:

Workability : Good

S.NO	Test	Value
1	Slump value	100mm
2	Vee-bee time	5sec
3	Compaction factor	0.92

Compressive Strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	32.58
2	14	38
3	28	48.88

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Tensile strength:

S.No	Number of days	Weight of Cylinder(kg)	Tensile strength(N/mm ²)
1	7	13.3	4.64
2	14	13.4	4.94
3	28	13.3	5.4

Above tables shows the values of the compression and tensile strength of the conventional M40 grade concrete.

5% Replacement of cement by granite waste (M40):

Workability: Medium

S.No	Test	Value	Number of days	Weight of Cube(kg)
1	Slump value	70mm	7	8.4
2	Vee-bee time	5sec	14	8.45
3	Compaction factor	0.91	28	8.51

Compressive strength:

S.No	Number of days	Compressive strength(N/mm ²)
1	7	34
2	14	36
3	28	40.44

Tensile strength:

S.No	Number of days	Weight of Cylinder(kg)	Tensile strength(N/mm ²)
1	7	13.1	2.14
2	14	13.02	2.24
3	28	13.15	2.37

The above values shows the compression and tensile strength of 5% replacement of granite waste in cement for M40 grade concrete at 7,14,28 days of curing.

10% Replacement of granite waste by cement (M40):

Workability:

S.No	Test	Value	Weight of cube(kg)
1	Slump value	70mm	8.57
2	Vee-bee time	5sec	8.6
3	Compaction factor	0.91	8.61

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Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	35.55
2	14	37
3	28	40

Tensile strength:

S.No	Number of days	Weight of Cylinder(kg)	Tensile strength (N/mm ²)
1	7	13.15	2.13
2	14	13.2	2.23
3	28	13.13	2.35

The above values shows the compression and tensile strength of 10% replacement of granite waste in cement for M40 grade concrete at 7,14,28 days of curing.

15% Replacement of granite waste by cement (M40):

Workability: Medium

S.No	Test	Value	Number of days	Weight of cube(kg)
1	Slump value	80mm	7	8.7
2	Vee-bee time	4sec	14	8.6
3	Compaction factor	0.90	28	8.56

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	36.7
2	14	34
3	28	44.44

Tensile strength:

S.No	Number of days	Weight of Cylinder(kg)	Tensile strength (N/mm ²)
1	7	13.2	2.2
2	14	13.21	2.28
3	28	13.3	2.43

The above values shows the compression and tensile strength of 15% replacement of granite waste in cement for M40 grade concrete at 7,14,28 days of curing.

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2% Replacement of plastic waste by coarse aggregate (M40):

Workability: low

S.No	Test	Value	Number of days	Weight of cube(kg)
1	Slump value	50mm	7	8.4
2	Vee-bee time	7sec	14	8.45
3	Compaction factor	0.85	28	8.5

Compressive strength :

S.No	Number of days	Compressive strength (N/mm ²)
1	7	18.8
2	14	24.3
3	28	36.22

Tensile strength:

S.No	Number of days	Weight of Cylinder(kg)	Tensile strength (N/mm ²)
1	7	12.9	1.92
2	14	12.92	2.09
3	28	12.92	2.20

The above values shows the compression and tensile strength of 2% replacement of plastic waste in coarse aggregate for M40 grade concrete at 7,14,28 days of curing.

3% Replacement of plastic waste by coarse aggregate (M40):

Workability: Low

S.No	Test	Value	Number of days	Weight of cube(kg)
1	Slump value	45mm	7	8.3
2	Vee-bee time	6sec	14	8.31
3	Compaction factor	0.83	28	8.35

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	16
2	14	24
3	28	35.7

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Tensile strength:

S.No	Number of days	Tensile strength (N/mm ²)	Weight of Cylinder(kg)
1	7	1.84	12.81
2	14	2	12.84
3	28	2.12	12.89

The above values shows the compression and tensile strength of 3% replacement of plastic waste in coarse aggregate for M40 grade concrete at 7,14,28 days of curing

5% Replacement of plastic waste by coarse aggregate (M40):

Workability: Low

S.No	Test	Number of days	Weight of cube(kg)	Value
1	Slump value	7	8.2	42mm
2	Vee-bee time	14	8.21	5sec
3	Compaction factor	28	8.24	0.82

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	15
2	14	23
3	28	35.33

Tensile strength:

S.No	Number of days	Tensile strength (N/mm ²)	Weight of Cylinder(kg)
1	7	1.72	12.75
2	14	1.88	12.8
3	28	1.99	12.78

The above values shows the compression and tensile strength of 5% replacement of plastic waste in coarse aggregate for M40 grade concrete at 7,14,28 days of curing.

IV.II M20 Methodology:

Workability: good

S.No	Test	Number of days	Weight of cube(kg)	Value
1	Slump value	7	8.53	110mm
2	Vee-bee	14	8.54	2sec
3	Compaction factor	28	8.56	0.95

Compressive strength :

S.No	Number of days	Compressive strength (N/mm ²)
1	7	10.34
2	14	15.84
3	28	26

The above tables shows the workability and compressive strength of conventional M20 grade concrete.

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Replacement of cement by 15% GW and C.A by PW by 2%:

Workability: Low

S.No	Test	Number of days	Weight of cube(kg)	Value
1	Slump value	7	8.5	42mm
2	Vee-bee time	14	8.52	5sec
3	Compaction factor	28	8.54	0.81

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	13.3
2	14	15.33
3	28	25.5

The above tables shows the workability and compressive strength of M20 grade by partial replacement of granite waste by 15% in place of cement and plastic waste by 2% in place of coarse aggregate.

Replacement of cement by 15% GW and C.A by PW by 3%:

Workability: Low

S.No	Test	Number of days	Weight of cube(kg)	Value
1	Slump value	7	8.19	41mm
2	Vee-bee time	14	8.2	4sec
3	Compaction factor	28	8.2	0.81

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	13
2	14	15
3	28	24.5

The above tables shows the workability and compressive strength of M20 grade by partial replacement of granite waste by 15% in place of cement and plastic waste by 3% in place of coarse aggregate.

Replacement of cement by 15% GW and C.A by PW by 5%:

Workability: Low

S.No	Test	Number of days	Weight of cube(kg)	Value
1	Slump value	7	7.92	40mm
2	Vee-bee time	14	7.97	3sec
3	Compaction factor	28	7.95	0.80

Compressive strength:

S.No	Number of days	Compressive strength (N/mm ²)
1	7	12
2	14	14.5
3	28	23

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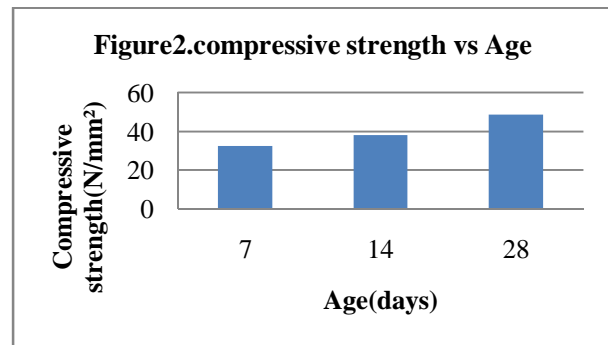
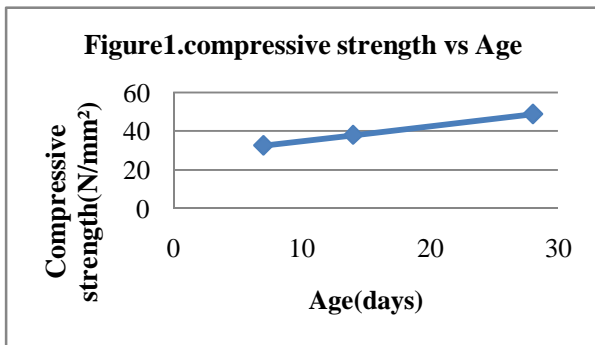
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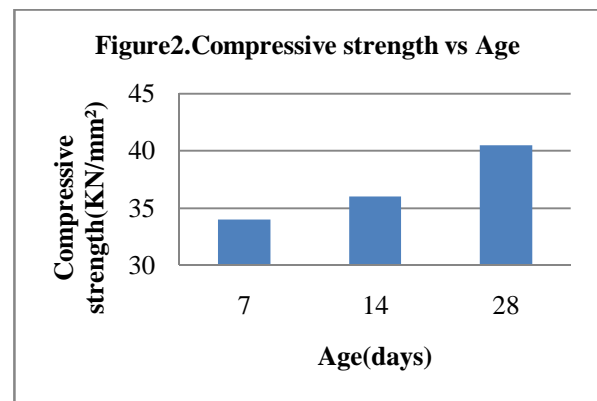
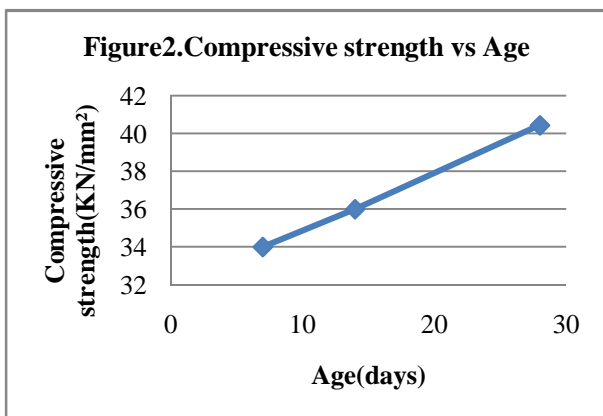
The above tables shows the workability and compressive strength of M20 grade by partial replacement of granite waste by 15% in place of cement and plastic waste by 5% in place of coarse aggregate.

IV.III Line and Bar Charts:

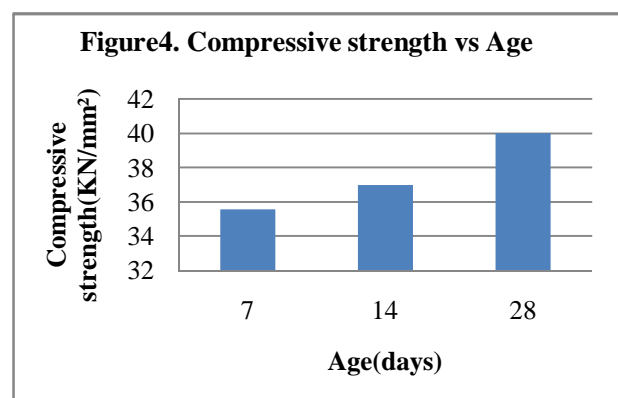
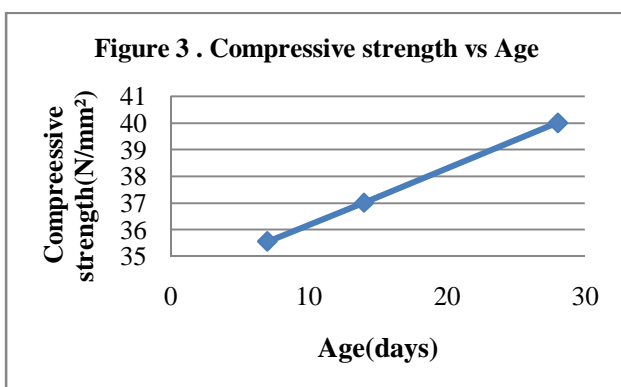
IV.III.I M40 Mix Concrete:



5% Replacement of granite waste by cement (M40):



10% Replacement of granite waste by cement (M40):



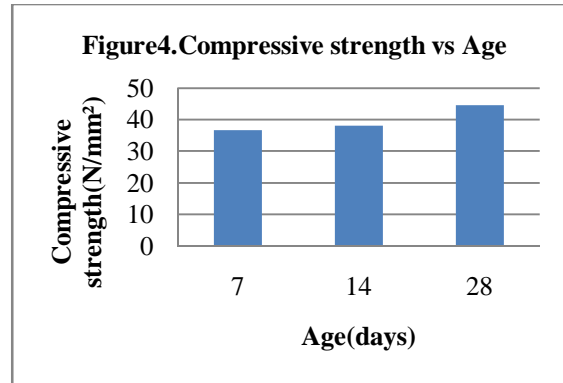
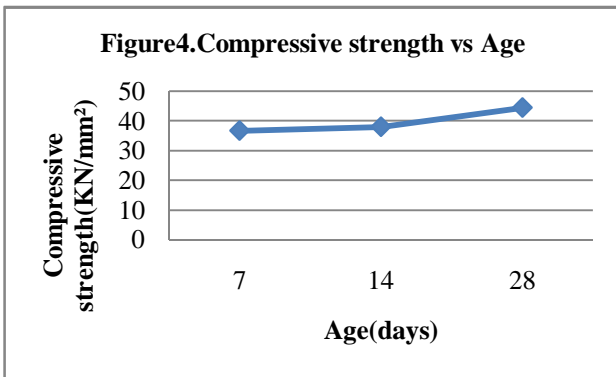
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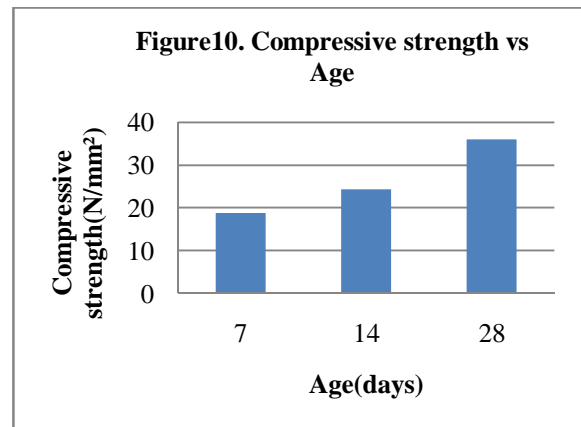
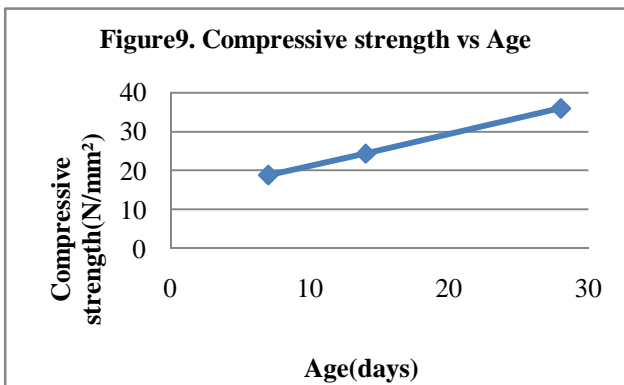
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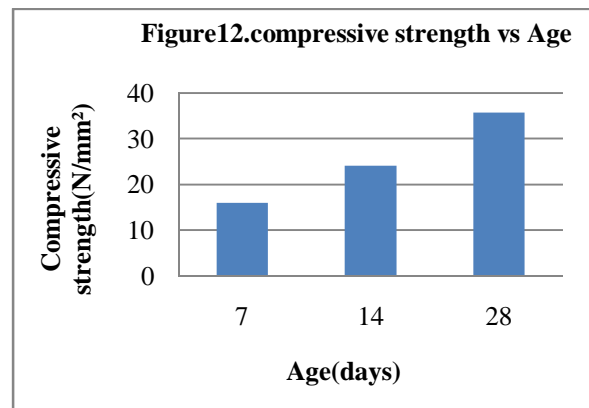
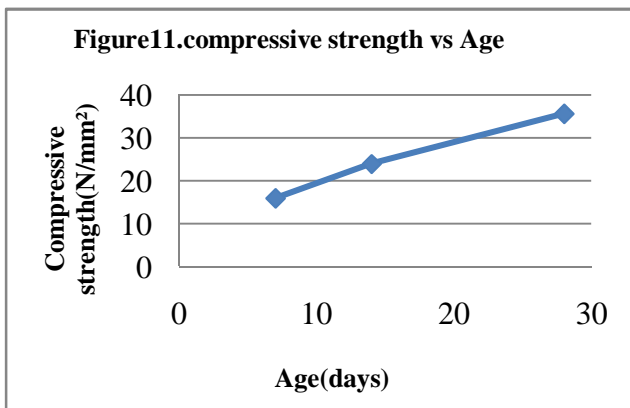
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2% Replacement of plastic waste by coarse aggregate (M40):



3% Replacement of plastic waste by coarse aggregate (M40):



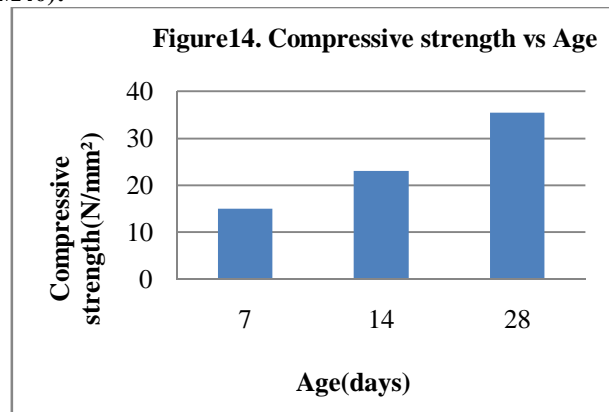
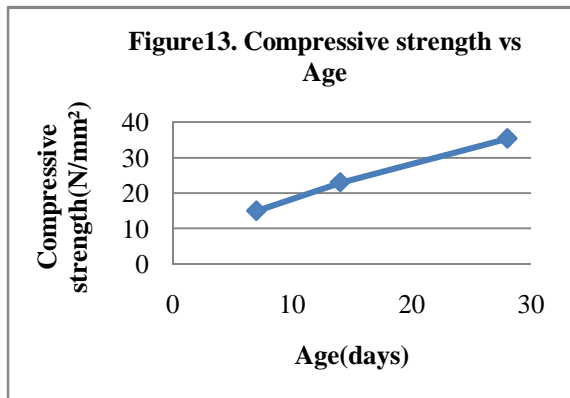
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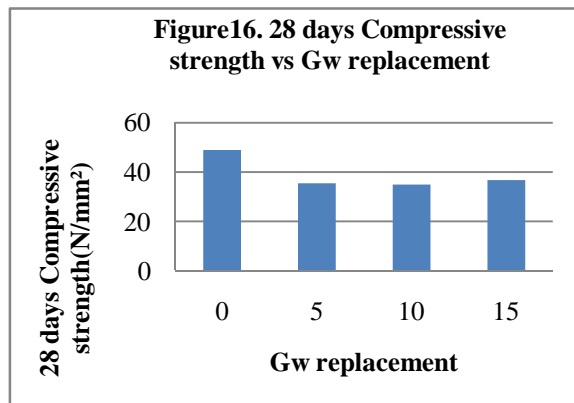
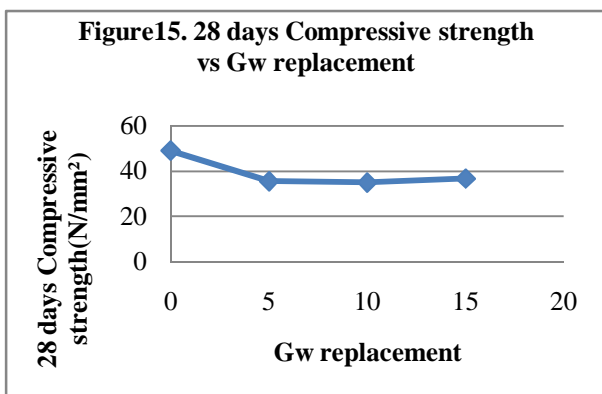
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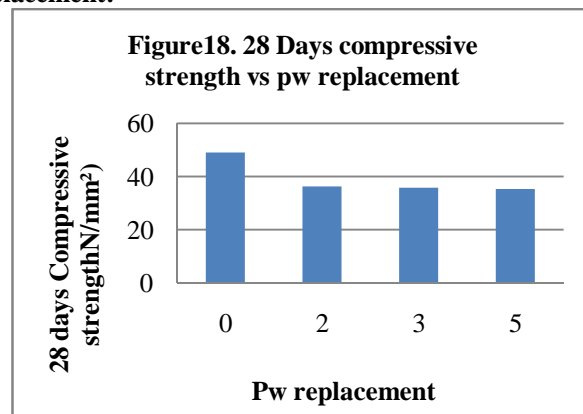
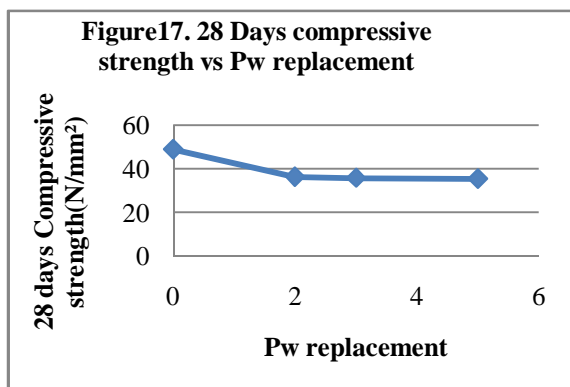
5% Replacement of plastic waste by coarse aggregate (M40):



28 days compressive strength for granite waste (GW) replacement:



28 days compressive strength for plastic waste (Pw) replacement:



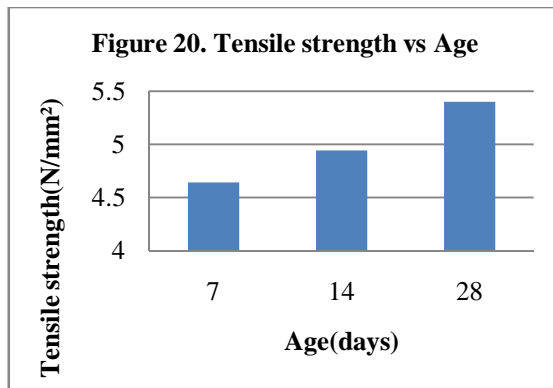
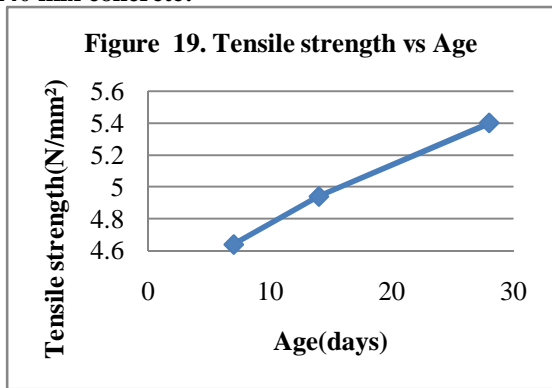
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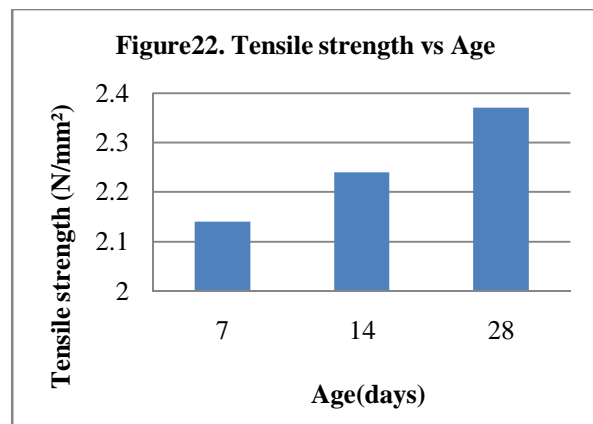
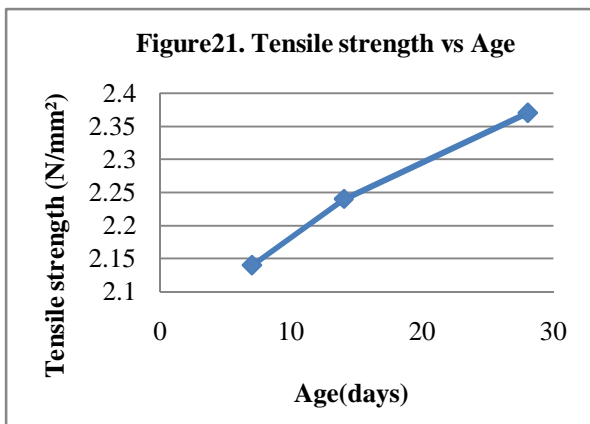
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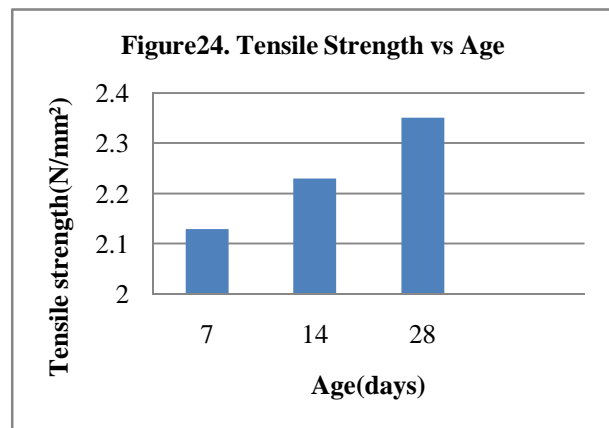
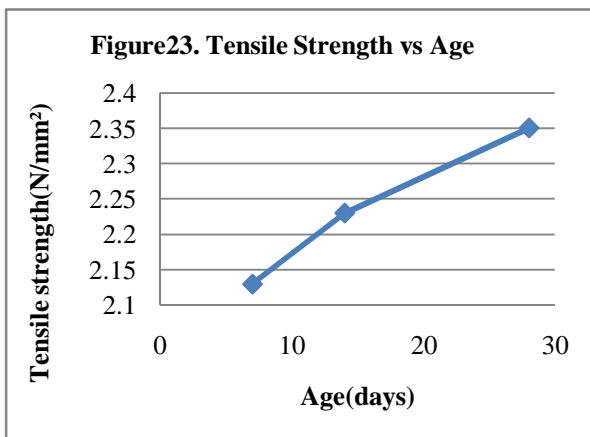
M40 mix concrete:



5% Replacement of granite waste by cement (M40):



10% Replacement of granite waste by cement (M40):



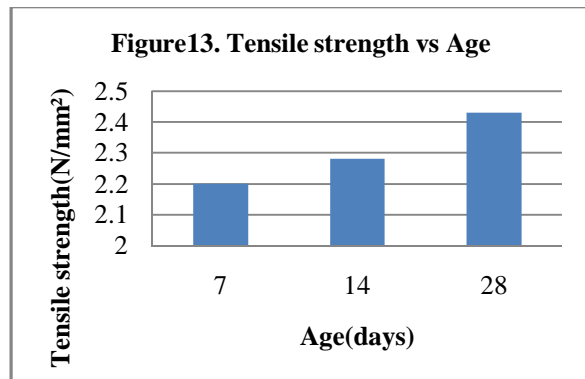
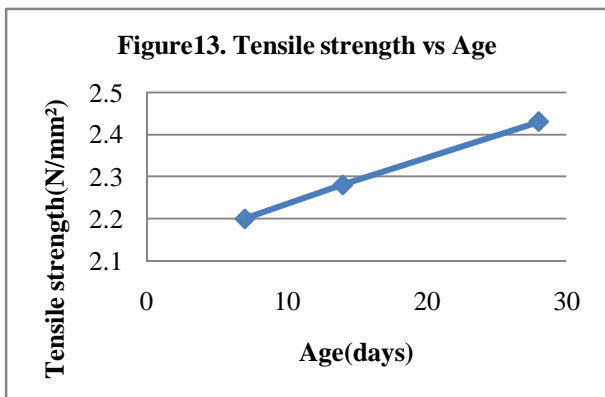
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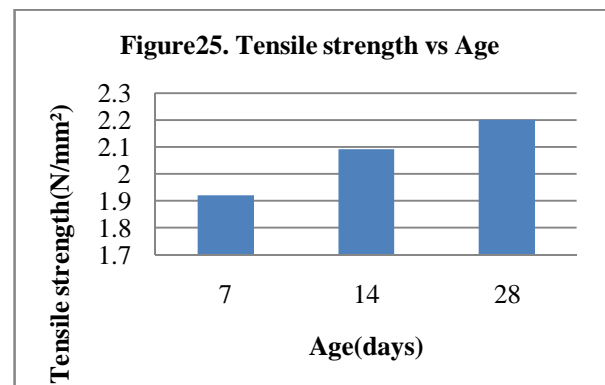
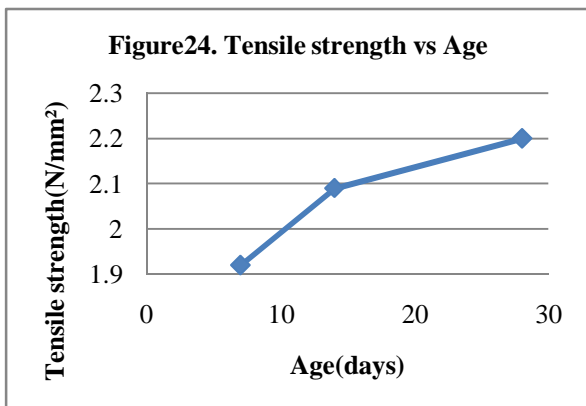
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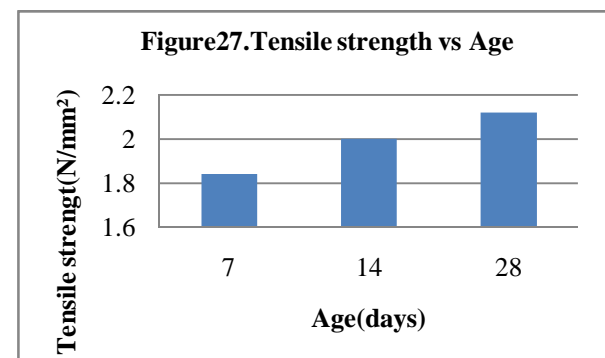
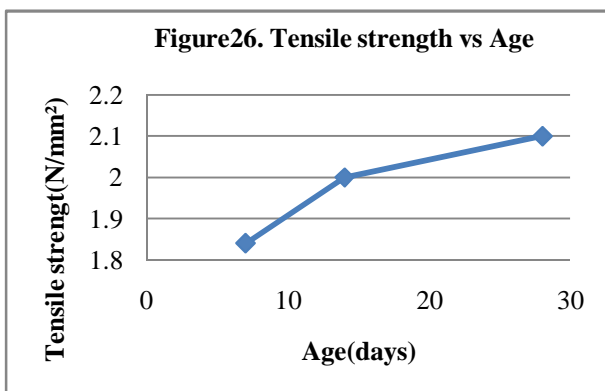
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3% Replacement of plastic waste by coarse aggregate (M40):



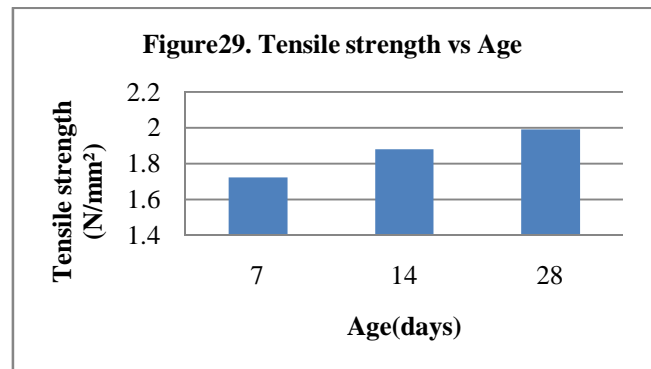
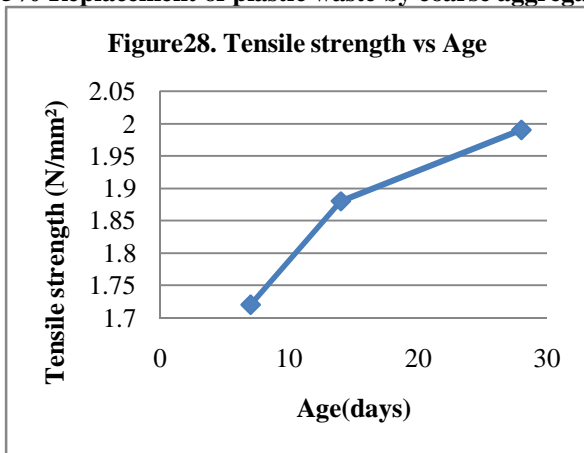
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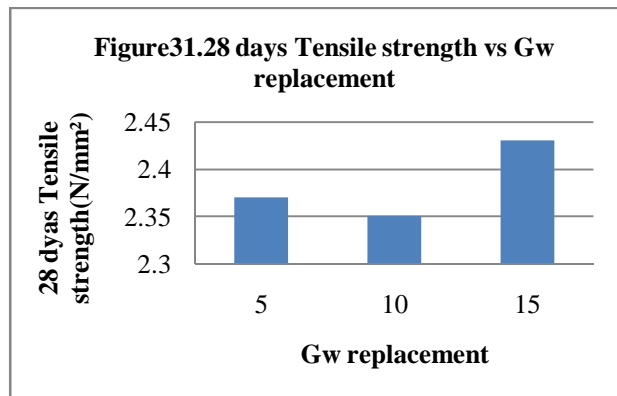
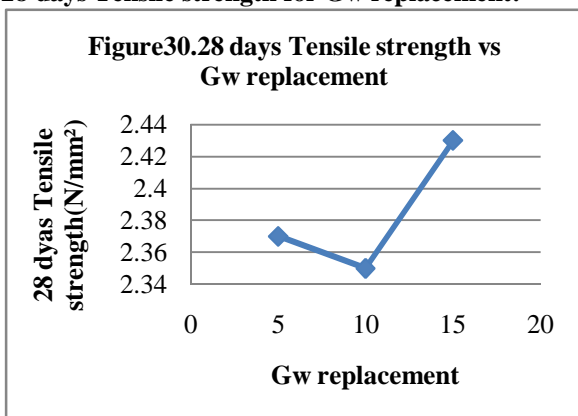
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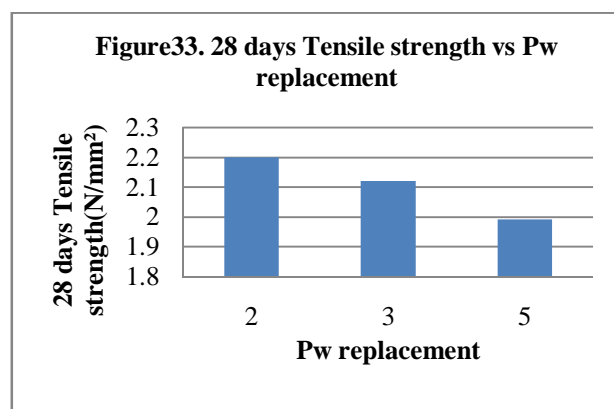
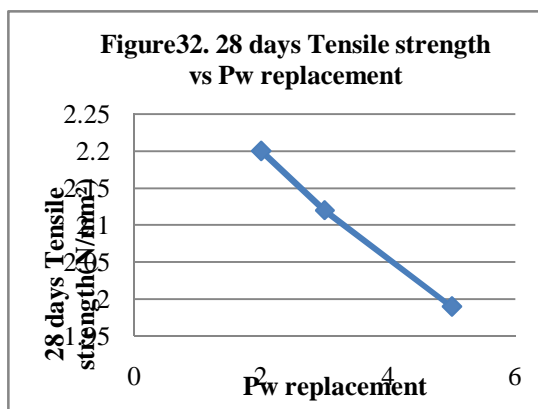
5% Replacement of plastic waste by coarse aggregate (M40):



28 days Tensile strength for Gw replacement:



28 days Tensile strength for Pw replacement:



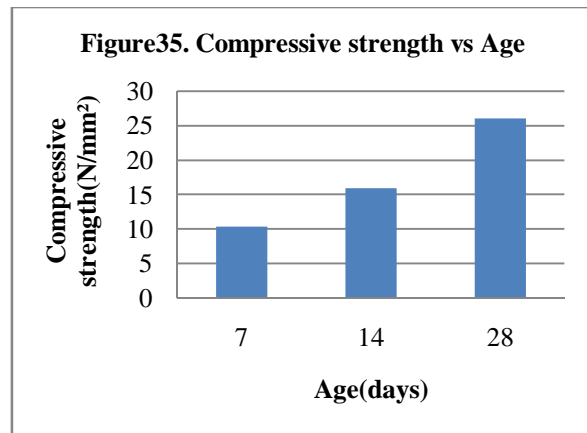
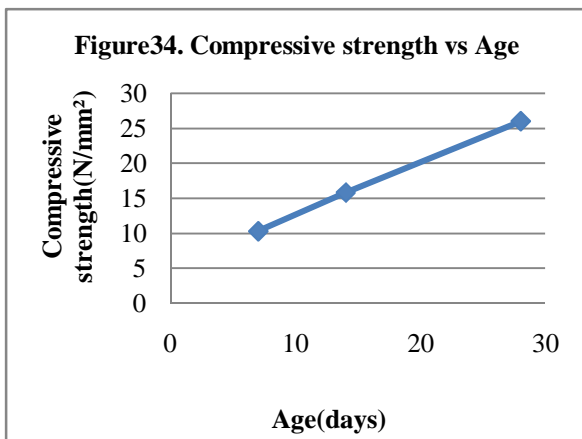
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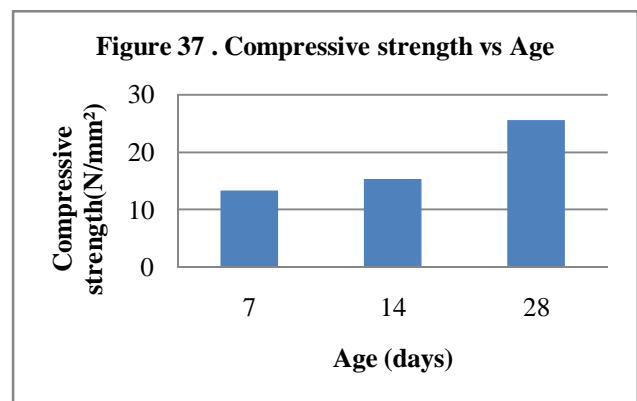
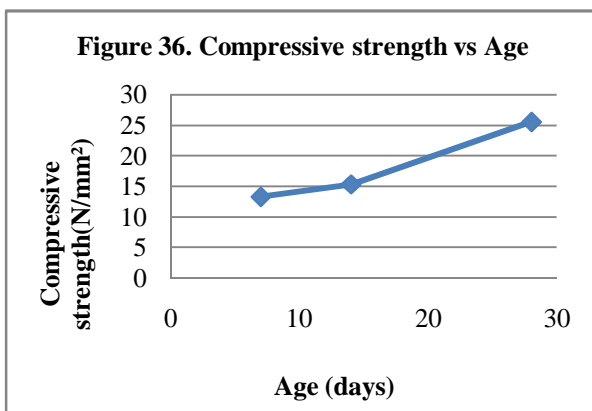
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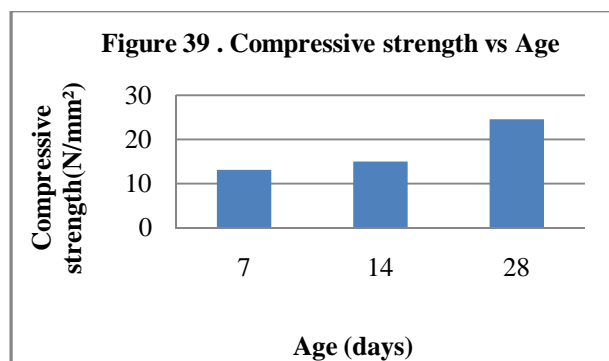
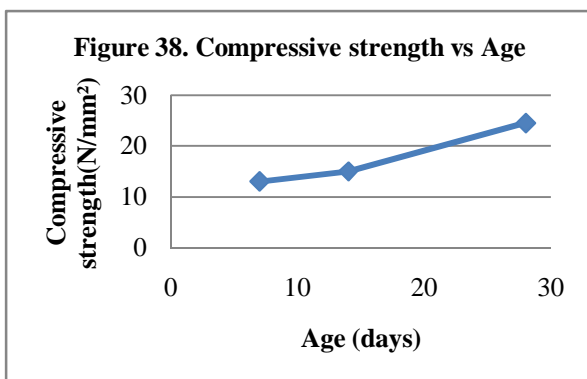
IV.III.II M20 Mix concrete:



Replacement of cement by 15% GW and C.A by PW by 2%:



Replacement of cement by 15% GW and C.A by PW by 3%:



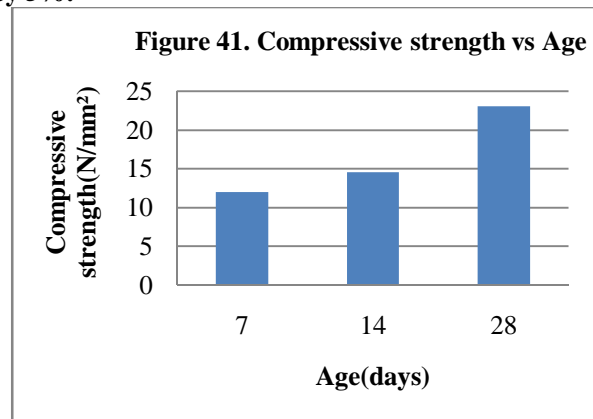
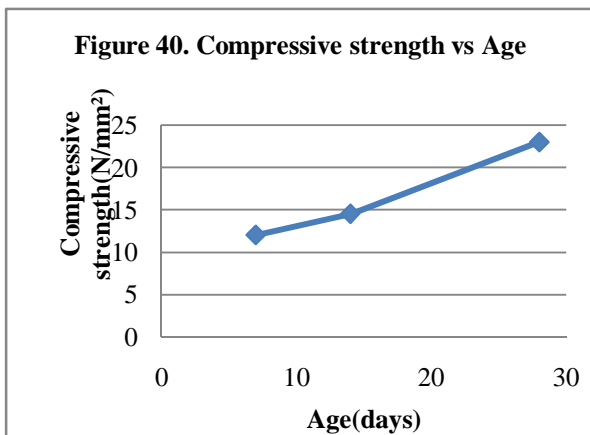
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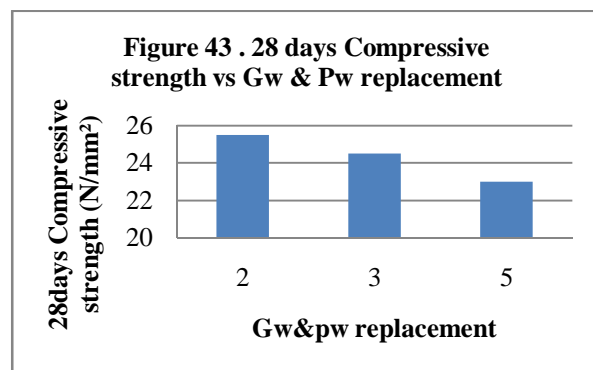
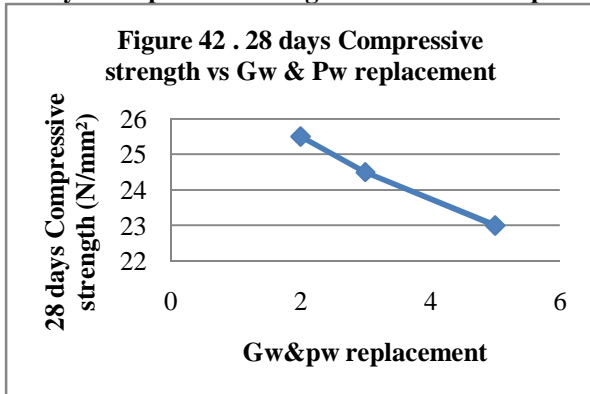
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Replacement of cement by 15% GW and C.A by PW by 5%:



28 days Compressive strength for Gw & Pw replacement:



V. DISCUSSIONS

V.I Compressive strength (M40):

- In 5% granite waste replacement by cement 7 days strength increases by 1.2% and 28 days strength decreases by 8.36% when compared to 0% replacement.
- In 10% granite waste replacement by cement 7 days strength increases by 2.75% and 28 days strength decreases by 8.8% when compared to 0% replacement.
- In 15% granite waste replacement by cement 7 days strength increases by 3.9% and 28 days strength decreases by 4.36% when compared to 0% replacement.
- In granite waste concrete higher strength obtained at 15% replacement among 5%,10%,15% replacements.
- In 2% plastic waste replacement by coarse aggregates 7 days strength decreases by 14% and 28 days strength decreases by 12.58% when compared to 0% replacement.
- In 3% plastic waste replacement by coarse aggregates 7 days strength decreases by 16.8% and 28 days strength decreases by 13% when compared to 0% replacement.
- In 5% plastic waste replacement by coarse aggregates 7 days strength decreases by 17.8% and 28 days strength decreases by 13.5% when compared to 0% replacement.

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- In plastic waste concrete higher strength obtained at 2% replacement among 2%,3%,5% replacements.

V.II Tensile strength (M40):

- In 5% granite waste replacement by cement 7 days strength decreases by 2.5% and 28 days strength decreases by 3% when compared to 0% replacement.
- In 10% granite waste replacement by cement 7 days strength decreases by 2.51% and 28 days strength decreases by 3.1% when compared to 0% replacement.
- In 15% granite waste replacement by cement 7 days strength decreases by 2.44% and 28 days strength decreases by 2.97% when compared to 0% replacement.
- In granite waste concrete higher strength obtained at 15% replacement among 5%,10%,15% replacements.
- In 2% plastic waste replacement by coarse aggregates 7 days strength decreases by 2.72% and 28 days strength decreases by 3.2% when compared to 0% replacement.
- In 3% plastic waste replacement by coarse aggregates 7 days strength decreases by 2.8% and 28 days strength decreases by 3.28% when compared to 0% replacement.
- In 5% plastic waste replacement by coarse aggregates 7 days strength decreases by 2.92% and 28 days strength decreases by 3.41% when compared to 0% replacement.
- In plastic waste concrete higher strength obtained at 2% replacement among 2%,3%,5% replacements.

V.III Compressive strength:

- In 2% plastic waste replacement by coarse aggregates and 15% granite waste replacement by cement 7 days strength increases by 2.99% and 28 days strength decreases by 0.5% when compared to 0% replacement.
- In 3% plastic waste replacement by coarse aggregates and 15% granite waste replacement by cement 7 days strength increases by 2.66% and 28 days strength decreases by 1.5% when compared to 0% replacement.
- In 5% plastic waste replacement by coarse aggregates and 15% granite waste replacement by cement 7 days strength increases by 1.5% and 28 days strength decreases by 3% when compared to 0% replacement.

VI. CONCLUSION

- Granite waste replacement in concrete by cement high early strength achieved because of more amount of silica is present in granite waste than concrete.
- So GW concrete is suitable for irrigation structures such as canals, culverts and not suitable for buildings.
- PW concrete can be used for patches repairs in pavements where roughness index is greater than 2500-3200 mm/km.
- Plastic waste replacement gives better results in low grades.
- Plastic waste can be replaced in concrete used in parks and gardens for walk way.

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