e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:02/February-2022 Impact Factor- 6.752 www.irjmets.com

INFLUENCE OF CONCRETE STRENGTH IN THE TENSION ZONE USING PARTIAL BEAM

Sujit B Krishna*1, Senthil Kumar V*2

*1PG Student, Department Of Civil Engineering, Kumaraguru College Of Technology, Coimbatore, Tamilnadu, India.

*2Assistant Professor, Department Of Civil Engineering, Kumaraguru College Of Technology Coimbatore, Tamilnadu, India.

ABSTRACT

The main idea of this review is to evaluate the strength and durability properties of high-strength concrete samples by replacing the aggregate with rubber pads to obtain a partial beam. Concrete is the most widely used construction material in the world. In the beam during the wrong transition period, inherent cracks are created making the concrete less resistant. Since concrete beams are under weak tension, reinforcement is provided at the bottom of the beam cross-section. As the concrete has low tension, reinforcement is provided at the bottom of the beam section. In order to alter the partial beam, the grade of concrete below the neutral axis of the beam is reduced to check the tensile behaviour. Improvement of the compressive and tensile strength of the beam are also observed and studied. In this article the shredded rubber chunks has been collected from wastes and replaced for fine aggregates and is used to study the behaviour of beams.

Keywords: Partial Beam, Neutral Axis, Rubber Chunks, Aggregate Replacement, Tensile Strength.

I. INTRODUCTION

1.1 GENERAL

While taking the building materials, concrete remains as one of the most important building components all over the world. Concrete is a composite material composed of fine and coarse aggregate bonded together with a fluid cement that hardens over time. It is the second most used substance in the world and is the most widely used building material. In the concrete beams, the partial beam can be obtained by improving the tensile properties. In order to improve the tensile properties in beam, the rubber chunks from waste tyres can be used. In recent decades, worldwide growth of automobile industry and increasing use of car as the main means of transport have tremendously boosted tyre production. This has generated massive stockpiles of used tyres. In the early 1990s, extensive research projects were carried out on how to use used tyres in different applications. Scrap tyre is composed of ingredients that are nondegradable in nature at ambient conditions. They usually produce environmental mal effects. One of the methods of using these materials is to use them in concrete and other building products. From a macro perspective, the following issues need to be compared and evaluated when considering the application of such materials to concrete:

1. Collection, processing and transport costs of scrap tyres.
2. Reduction in the environmental costs of landfilling and increase in landfill voids.
3. Saving in the virgin materials used to make concrete, by substituting tyre rubber.

In this research discussion rubber chunks has been replaced instead of fine aggregate at various percentages and used for study of strength properties.

1.1.1 CEMENT

Cement is used as a binding material where the strength and durability are significantly important. Cement can be defined as the bonding material having cohesive and adhesive properties which makes it capable to unite the different construction that forms the compacts assembly. The chief chemical composition of Ordinary Portland Cement is calcium, silica, alumina and iron and the raw materials used for the manufacturing of cement.

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Fig 1: Cement

1.1.2 COARSE AGGREGATE

Aggregates are the important constituents of concrete. They play a major role in the body of concrete, reduce shrinkage and effect economy. Aggregates occupy 70-80 percentage of the volume of concrete and hence their impact on various characteristics and properties of concrete is undoubtedly considered.

Fig 2: Coarse Aggregate

1.1.3 FINE AGGREGATE

Fine aggregates are basically sands won from the land or the marine environment. Fine aggregates generally consist of natural sand or crushed stone with most particles passing through 9.5mm sieve. Sand can also be referred as the naturally occurring granular material composed of finely divided rock and mineral particles.

Fig 3: Fine Aggregate

1.1.4 WATER

Water plays an important role in mixing, laying, and compaction, setting and hardening of concrete. Water influences the strength development and durability of concrete. Ordinary potable water with p H not less than 6 and conforming to the requirements to IS456:2000 was used.

1.1.5 CLASSIFIACTION OF SCRAP TYRES

Tyres may be divided into two types: car and truck tyres. Car tyres are different from truck tyres with regard to constituent materials, especially natural and synthetic rubber contents (Table 1). Considering the high production volume of car tyres as compared to truck tyres, the former is usually of more interest to researchers.

Table 1: Typical constituent materials of tyres [1]

Composition weight (%)	Car tyre	Truck tyre
Natural rubber	14	27
Synthetic rubber	27	14
Black carbon	28	28
Fabric, filler accelerators, and antiozonants	16–17	16–17
Steel	14–15	14–15

Most studies conducted have typically considered three broad categories of service-life tire rubber, including: B. Chip, brittle, ground rubber:

(1) Shredded or chipped rubber for replacing gravel. To make this rubber, the tire needs to be shredded in two steps. At the end of the first stage, the rubber has a length of 300-430 mm and a width of 100-230 mm. In the second stage, by cutting, its dimensions change from 100 to 150 mm. Continued crushing produces particles with a size of approximately 13-76 mm called "crushed particles".

(2) Crumb rubber, which is used to substitute sand, is made in special mills where large rubbers are broken down into smaller ripped pieces. Depending on the type of mills used and the temperature generated, different sizes of rubber particles may be produced. Particles with a high irregularity in the range of 0.425–4.75 mm are created using a simple approach.

(3) Ground rubber that could be used to replace cement is depending on the size reduction equipment. Magnetic separation and screening are commonly performed in two steps on worn tyres. In increasingly complicated techniques, different size percentages of rubber are recovered. The particles produced in the micromilling process range in size from 0.075 to 0.475 mm.

1.1.6 TYRE RUBBERS IN CONCRETE

The properties of concrete using old tyre rubbers have been reported by a number of writers. Their findings show that the size, proportion, and surface roughness of rubber particles in concrete have an impact on the strength of used tyre rubber. While a complete replacement of aggregates with shredded rubber is not practicable due to the significant reduction in concrete strength, a partial replacement of up to 20% is recommended..

1.1.7 APPLICATION OF TYRE RUBBERS IN CONCRETE

This mixture reduces drying shrinkage as well as brittleness while enhancing the elastic module, extending the service life of such blends [5]. Because strength is crucial, and any drop in compressive strength might be fatal, rubber mix concrete should not be utilised for loading parts such as columns or beans. Rubber mix concrete, on the other hand, can be used for slab work, flooring, parking and driveways, compound building, and so forth.

1.1.8 SHREDDING OF RUBBER

Rubber shredding into fine particles is critical since larger pieces have less bonding with cement paste, resulting in a weaker mix [7]. Albano et al. [8] report on a study that combined rubber aggregate with Portland cement, coarse and fine aggregates, sand and water, superplasticizers, and admixtures. When heated to 50 degrees Celsius, these additives have variances in the viscous component, which improves the time of workability.

II. OBJECTIVE AND SCOPE

2.1. OBJECTIVE

- The objective of the present investigation is to study the potential application of rubber mesh to improve the flexural strength of concrete beam after comparing with conventional concrete beam.
- To study the properties of partial beam.
- To study the use of shredded rubber mesh that improve the performance of concrete.
- To study the action of replacing the grade of concrete near neutral axis and performing flexural test on

beams.

- To study the concrete when full strength at neutral axis is achieved.
- To study how the finely meshed rubber will make an impact in the strength properties of the structural member(beam).

2.2. SCOPE

- This study is proved to be Eco-friendly, and it can bring a wide revolution in the future.
- It basically prevents the cracks in concrete at early stage so this can be used in large scale construction projects such as pavements, bridges, dams, etc. with increased strength and durability.
- This study also shows that the corrosion of steel is reduced and thus improves the durability of steel reinforced concrete.
- Future scope of study shows that heavy metal toxicity in cement can be reduced by the introduction of bacteria.

2.3. METHODOLOGY

1) Material Preparation: The materials used in the work are cement, coarse aggregate (jelly), fine aggregate (sand), shredded rubber and steel.
2) Material testing: Specific gravity test using Le-chatelier's apparatus, normal consistency test, initial and final setting time test for the cement were conducted and many general tests to be taken before casting.
3) Reinforcement Cage Preparation: With the concept of minimum reinforcement for the beam i.e 0.2%bD the steel was procured from the local vendor.
4) Mix Design Calculation for Concrete and casting beam: For partial beam, sand is completely replaced with the shredded rubber with varied proportion.
5) Strength tests and results: Compressive strength and flexure are two of the main tests to be conducted.

III. LITERATURE REVIEW

The rubber residue from the tire retreading process was used in partial substitution of the fine aggregate (sand) in the percentages of 7.5%, 15% and 30% with respect to the mass of the sand.

Compressive strength: It was observed that the compressive strength decreased with the increasing percentage of rubber replacement for sand. For 30% substitution, the decrease in compressive strength at 28 days was 54.8%. However, with up to 15% replacement the concrete presented resistance above 50 Mpa.

Flexural tensile strength: The flexural tensile strength, as well as the compressive strength, decreased with the increase of the substitution of the sand by rubber, and with a 30% substitution, there was a decrease of 48.8%. However, with 7.5% of substitution, there was no decrease in tensile strength in flexion and with 15% replacement, the fall was 17.7%.

The characteristics of the HPC with tire rubber insertion it can be highlighted that:

i) the rubber caused a decrease in the workability and consistency of the concrete, a fact observed by the decrease of abatement, especially in the case of high performance concrete.

ii) with the increase of the substitution of the sand by rubber, there was a decrease in mechanical resistance for the compressive strength at 28 days, the decrease in relation to the concrete without rubber was 21.8%, 36.7%, and 51.7%, respectively, for 7.5%, 15%, and 30% replacement; for tensile strength in flexion, there was not decrease with 7.5% of substitution and for 15% and 30% the decrease was, respectively, 17.7% and 48.9%; for the modulus of elasticity the decrease was 1.5%, 12.9%, and 32.5%

iii) it was verified that with the increase of the amount of rubber in the concrete there was an increase in the water absorption and voids index and a decrease in the density of the concrete

iv) the microscopy analysis emphasized the weakening of the concrete matrix with rubber insertion, mainly in the transition zone between rubber-paste aggregate

v) with up to 15% replacement of the sand by rubber the concrete mixture proved to be with good strength.

So, my conclusion from all the literature review is that to use 15 percent of Rubber chunks as partial replacement for the aggregate in concrete. Other research has found that fine aggregates can be partially substituted with crumb rubber. Although a higher percentage of crumb rubber reduces concrete strength, which may not be desirable, rubber-based concrete is resistant and deformable. As a result, this type of concrete may be utilised in constructions where toughness and deformability are more important than strength (such as road foundations and bridge barriers).

So, based on this research, it is preferable to use rubber chunks as a replacement in small quantities where toughness and durability are equally necessary. Another research project used rubber particles as a partial cement replacement. Control specimens made of concrete with 0% rubber as a cement substitution had a compressive strength of 33MPa at 28 days. As shown in the diagram, replacing 3% rubber in cement reduces the strength to 27MPa, but as more rubber is put in the cement, the strength improves. For a 28-day concrete age, 9 percent rubber outperforms all other concrete cubes.

The outcome of splitting the tensile strength of a concrete cylinder including rubber as a cement replacement is the same. The tensile strength of the control specimen (2.7 MPa at 28 days) is compared to that of other concrete containing rubber particles. When 3 percent and 6 percent rubber is replaced in the cement, the tensile strength is reduced.

After then, when more rubber is substituted in the cement, the tensile strength improves. Tensile strength differences range from 6% (concrete with 12% rubber) to 21% (concrete with 12% rubber) (concrete with 6 percent rubber). When most concrete was tested at 56 days, it showed an improvement in strength. This research looks at the impact of using rubber as a cement replacement in concrete on the concrete's compressive and tensile strength.

Finally, when cement is replaced with a reasonable percentage of rubber, concrete with acceptable compressive and tensile strength can be produced, as opposed to regular concrete. This is because, when compared to conventional concrete, the range of strength reduction is just 6-21 percent. As a result of this research, we can conclude that just 6-21 percent is suitable for studying strength attributes. To change the surface of the particles and improve adhesion between the cement paste and the rubber particles, the tyre utilised for replacement was prepared with a saturated sodium hydroxide solution. The recycling tyre particles were pretreated by soaking them in a NaOH solution for 20 minutes, then washing them under running water and letting them air dry at room temperature. As a result, rubber preparation will help with adherence. The results demonstrate that the mix proportions of 5% and 10% have 90 percent of their usual strength. As a result, it is preferable to employ these proportions. In another study, it was shown that replacing coarse aggregate with rubber tyre by 5 to 10% yielded the best results, which may be employed in low-cost structural elements and heavy concrete constructions under dynamic loads. Thus, the rubber chunks replaced concrete even in heavy dynamic loading structures can be used.

IV. MATERIAL PROPERTIES

Materials are the important criteria to produce a product. The materials should be easily available and eco-friendly. In this project different construction materials were used along with the addition of bacteria from a bacillus family.

The following materials were used in this project study:

- Cement
- Coarse Aggregate
- Fine Aggregate (M-Sand)
- Fly Ash
- Silica Fume
- Water
- Conplast SP430
- Bacteria

The characteristics of these materials are as follows,

4.1 CEMENT

Cement is made by burning a mixture of calcareous and argillaceous minerals at a very high temperature. The proportions of the elements should be right and the mixture should be intimate. Clinker is the product's name. A little amount of gypsum is added to the clinker, which is then pulverised into a very fine product called cement.

Depending on whether the mixing and grinding of raw materials is done in wet or dry circumstances, there are two processes known as wet and dry processes. Because of the momentum with the current development of the technology of dry mixing powder materials using compressed air, the wet process has remained popular for many years.

Cement's qualities are entirely determined by its composition, burning and grinding. The important properties of cement are as follows.

4.1.1 Strength

After seven days, the compressive strength of cubical blocks of Ordinary Portland Cement and Sand (1:3) should be at least 175 kg/cm2..

4.1.2 Fineness

The quality of cement depends upon its fineness property. The fineness of cement maybe determined by a sieve test. It can also be checked by the smoothness by touching.

4.1.3 Soundness

Cement of various sorts expands to varying degrees, depending on the composition, correct burning, and grinding of the cement. After setting, a good quality cement should not have a significant volume change. After setting, it should not crack or disintegrate.

4.2 COARSE AGGREGATE

Concrete is made with coarse aggregates, which are irregular shattered stones or naturally occurring round gravels. Broken stones of hard rock, such as granite and limestone, or river gravels make up coarse aggregates for structural concrete. Coarse aggregates are those that are greater than 4.75 mm in size. These aggregates range in size from 4.75 mm to 80 mm and are obtained from stone quarries and stone crushers.

The size, form, and other significant elements all influence the properties of coarse aggregate. The following are some of the most important characteristics of coarse aggregate.

4.2.1 Size

The coarse aggregate size is determined by the intended usage of the concrete. Large aggregates of 80 mm, 40 mm, and 20 mm are utilised for large-scale concreting operations without sophisticated reinforcements.

Table 2: Types of Coarse aggregates and its size.

COARSE AGGREGATE	SIZE
Fine gravel	4mm – 8mm
Medium gravel	8mm – 16mm
Coarse gravel	16mm – 64mm
Cobbles	64mm – 256mm
Boulders	>256mm

4.2.2 Shape

The structure of the aggregate is important since it influences the concrete's workability and strength. For round and smooth settings, the angular aggregate is preferred for the following reasons:

o The angular aggregate has a superior interlocking effect, making the concrete stronger.

o Because the overall surface area of a rough angular set is bigger than that of a smooth circular set, bond formation is stronger.

o A rough surface provides more surface area for bonding with cement paste and increases strength, but it is less practical and rigid where workability is essential.

o A spherical aggregate with a flat surface requires less cement paste, resulting in a higher yield per bag.

o Overall rough textured aggregates should be preferred over textured textures, but according to need the use of smooth textured aggregates for unimportant work.

4.2.3 Specific Gravity

It's the weight of an equal volume of water divided by the dry weight of aggregate. As defined in IS 2386 Part III 1963, the specific gravity of aggregate is determined along with the water absorption.

4.2.4 Water Absorption

The percentage increase in weight of an oven dried pattern after being immersed in water for 24 hours is used to determine water absorption of coarse aggregates. Because water absorption reduces the amount of water in the concrete, a higher water/cement ratio is required. Water absorption is determined by the porosity of the aggregate; the more the water absorption, the less workable and durable the concrete becomes.

4.3 FINE AGGREGATE (SAND)

Crushed sand is sometimes known as M-Sand, or manufactured sand. It is used in building as a substitute for river sand. It is made in a factory or quarry by crushing rocks, quarry stones, or bigger aggregate pieces into sand size particles. The morphology of crushed sand is cubical and angular. Its diameter is less than 4.75 mm. M-Sand has the following characteristics.

4.3.1 Greater Durability

M Sand has balanced physical and chemical qualities and can tolerate any extreme environmental conditions. It can address faults in concrete such as segregation, honeycombing, reinforcement steel corrosion, voids, capillary, bleeding, and so on.

4.3.2 Higher Strength

Because it is formed with a VSI shaping machine, M-Sand has a smooth surface texture and is free of elongated and flaky particles. Concrete is more durable, stronger, and has a longer life because of the cubicle-shaped particles.

4.3.3 Greater Workability

The cubical shape and suitable gradation (particles should be 150m to 4.75mm in proper proportion) provide the mortar great workability and flexibility.

4.3.4 Eco-Friendly

By substituting M-Sand for river sand, environmental disasters such as groundwater depletion, water scarcity, and a threat to natural life are avoided. Environmental protection is becoming increasingly important. The finest alternative to river sand is M-Sand.

4.4 MIX CALCULATIONS:

The dimensions of the beam test specimen are 350*100*100 mm.

The total volume of concrete required for the experiment is 0.0105 m3.

Consider creating 0.02 m3 of concrete while accounting for waste.

In this experiment, M25 concrete is used.

Rubber chunks are added to the concrete in place of coarse aggregates (20mm) in percentages of 10%, 20%, and 30%.A volume of 0.0067 m3 of concrete with 10% rubber fragments replacement is made.

In the same way, replacement rubber pieces of 20% and 30% are made with the same volume.

Individual beams (total of 3) of each mix are casted with concrete.

However, the slump test is performed prior to casting, and the concrete is cast and cured for 28 days in three beams with varied percentages of rubber chunks.

V. RESULTS AND DISCUSSION

Compressive strength test is a mechanical test that determines how much compressive load a material can withstand before cracking. A gradually applied load compresses the test component, which is normally in the form of a cube, between the platens of a compression-testing machine. The splitting tensile strength test involves applying a diametric compressive load down the whole length of the specimen until it fails. Tensile stresses are induced in the plane containing the applied load, while compressive stresses are induced in the

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area surrounding the applied force. Flexural testing is performed to determine a material's flex or bending qualities. A sample is placed between two points or supports and a load is applied using a third point or two points, which is sometimes referred to as a transverse beam test.

The following is a summary of the work completed:

• The concrete mix was prepared using precise measurements based on all of the mean results from the literature review.

(Concrete design M25)

• Following this procedure, the materials required for this project (particularly Rubber chunks/Rubber mesh) were obtained and utilised optimally in three categories (10 percent , 20 percent , 30 percent)

• Rubber pieces of varying sizes were employed as a replacement in the concrete.

• Materials used in the casting include coarse aggregate (jelly), fine aggregate (M sand), OPC cement, and water.

• After that, the beam curing procedure began.

Compressive Strength Test

Compressive strength, or compression strength, is a material's or structure's ability to endure stresses that cause it to shrink in size, as opposed to tensile strength, which withstands loads that cause it to lengthen. Compressive strength is frequently tested on a universal testing machine, which can range in size from a tiny table-top unit to one with a capacity of over 53 MN. The test method and measurement conditions have an impact on compressive strength measurements. Compressive strengths are typically expressed in terms of a technical standard. The typical compressive strength of 150 mm size cubes tested at 28 days is used to determine concrete's compressive strength (fck). The typical strength of concrete is defined as the strength below which not more than 5% of the concrete test results falls.For design purposes, this compressive strength value is restricted by dividing with a factor of safety, whose value depends on the design philosophy used.

The obtained compressive strength are as follows:

Table 3: compressive Strength(N/mm^3)

S.NO	DAYS	CONVENTIONAL CONCRETE (0%) (N/mm^2)	CRUMB RUBBER CONCRETE (10%) (N/mm^2)	CRUMB RUBBER CONCRETE (20%) (N/mm^2)	CRUMB RUBBER CONCRETE (30%) (N/mm^2)
1.	7	32.45	31.05	28.65	10.58
		32.55	33.26	27.98	12.28
		33.47	32.23	28.32	11.45
2.	14	43.42	41.25	39.56	12.38
		42.79	43.25	41.68	11.98
		44.56	45.21	40.23	13.78
3.	28	48.09	49.00	44.25	14.52
		50.45	51.25	45.89	14.75
		51.10	52.22	47.36	14.01

When rubber was utilised in concrete, the reasons for the drop in compressive strength were more related to the different properties of rubber particles and aggregates. These elements include:

1. Because hardened cement paste with rubber particles surrounding the aggregates is significantly softer than hardened cement paste without rubber, cracks would form quickly around the rubber particles during loading, extend swiftly throughout the matrix, and eventually cause accelerated concrete rupture.

2. A continuous and integrated matrix against applied loads is not available due to a lack of adequate bonding

between rubber particles and the cement paste (in comparison to cement paste and aggregates). As a result, applied stresses are not evenly distributed throughout the paste. The aggregate-cement interface is cracking as a result of this.

3. Because rubber particles replace some of the cement and/or aggregates, their volume will be reduced. Concrete's compressive strength, on the other hand, is determined by the physical and mechanical qualities of the ingredients (which have some superiority over rubber). As a result, a drop in concrete's compressive strength is likely.

4. Rubber particles tend to travel toward the top surface of the mould during casting and vibrating test specimens, resulting in a high concentration of rubber particles at the top layer of the specimens. This is due to the rubber particles' lower specific gravity and the lack of connection between the rubber particles and the concrete mass. In the second blend, this issue is more pronounced. Non-homogeneous samples are produced by a non-uniform distribution of rubber particles on the top surface, which leads to a drop in concrete strength in those places, resulting in failure at lower stresses.

5. The second mixture's lower strength is attributable to a reduction in the amount of cement employed as an adhesive when compared to the first mixture.(i.e., cementing) materials.

6. Because rubber is less stiff than aggregates, the presence of rubber particles in concrete diminishes the mass stiffness of the concrete and affects its load bearing capacity. The minor increase in compressive strength of the sample containing 5% chipped rubber could be attributed to better grading of coarse and fine particles.

Split Tensile Strength Test

It is the usual indirect test for determining the tensile strength of concrete. Between the loading surfaces of the compression testing equipment, a typical test cylinder of concrete specimen (300mm150mm diameter) is put horizontally. The compression force is applied diametrically and uniformly along the length of the cylinder until the vertical diameter of the cylinder fails. Strips of plywood are inserted between the specimen and the loading plates of the testing machine to allow for a uniform distribution of the applied load and to limit the magnitude of high compressive stress near the points of application of this load. Due to indirect tensile stress created by Poisson's effect, a concrete cylinder broke into two pieces along this vertical plane. Assuming concrete specimen behave as an elastic body, a uniform lateral tensile stress of Ft acting along the vertical plane causes the failure of specimen, which can be calculated as-

$$Ft = 2P/\pi DL$$

where, P = compressive load at failure ,D = diameter of cylinder , L = length of cylinder.

Split Tensile Strength

At the 7th and 28th days, the splitting tensile strength of crumb rubber concrete was detected with different % replacements of crumb rubber by fine aggregate in normal concrete. With increased rubber tyre composition, the trend for both 7th and 28th day tensile strength appears to be diminishing. This decrease in tensile strength is slightly less for 1cm x 1 cm tyre aggregates [figure 7]. This is due to homogeneous tyre aggregate size dimensions in all directions and uniform stress distribution in tyre components.

When rubber was replaced in both combinations, the tensile strength of the concrete was lowered. For smaller percentages of replacements, the percent drop in tensile strength in the first mixture was about twice that of the second mixture. The reduction in tensile strength with 20% replacement was 44% for the first mixture and 24% for the second mixture as compared to the control mixture.

As a soft material, tyre rubber can act as a barrier to the spread of cracks in concrete. As a result, the tensile strength of rubber-containing concrete should be higher than that of the control mixture. The findings, however, contradicted this idea. The following variables may be to blame for this behaviour:

• Due to weak bonding between the two materials, the interface zone between rubber and cement may act as a micro-crack; the weak interface zone promotes concrete collapse.

• Inspections of fractured concrete samples revealed that the chipped rubbers appeared after the concrete specimens were broken in the first batch (figure.4). The explanation for this behaviour is because the imposed tension induces surface segregation between the rubber and the cement paste during crack expansion and when it comes into contact with rubber particles. As a result, it may be claimed that rubber works as a hole and a concentration point, causing concrete to break down quickly.

Fig 4: broken concrete samples

Flexural strength

As expected, replacing rubber reduces flexural strength. Only the rate of loss in flexural strength differed between the two mixes. In the first mixture, there was a 37 percent drop in comparison to the control sample. For the second blend, this figure increased to 29 percent. Flexural pressures exerted on concrete produce tensile stress on one side of the neutral axis and compressive stress on the other, according to a general principle regulating flexure, so that the combined tensile and compressive forces can neutralise the compressive moment.

Because concrete has a low (negligible) tensile strength compared to its compressive strength, failure will occur at lower loads and before the concrete reaches its full strength in the compression region. As a result, the absence of effective bonding between rubber particles and cement paste is the most critical element in lowering flexural and compressive strength. This result was reached after it was discovered that chipped rubber could be easily removed from concrete samples for flexural strength testing. Weak bonding was more visible and weaker in the first mixture, which contained chipped rubber, than in the second mixture, which had powdered rubber..

VI. CONCLUSION

Although the strength of the crumb rubber combination decreases, slump values increase as the crumb rubber concentration increases from 0% to 2%, according to the findings. It means that when compared to regular concrete, crumb rubber mixture is more workable. The introduction of crumb rubber in concrete also reduced the static modulus elasticity, according to the findings. Although the modulus of elasticity is reduced, the deformability of crumb rubber concrete is increased as compared to conventional concrete. The unit weight of crumb rubber concrete was found to be lower than that of ordinary concrete. The reduction was discovered to be related to the amount of crumb rubber present.

The crumb rubber concrete not only had a lower unit weight, but it also had excellent acoustic and thermal qualities. The mechanical parameters of crumb rubber concrete appeared to be lower than plain concrete due to the low strength and stiffness of rubber. With increasing rubber tyre content and varying tyre piece diameters, a plot of compressive strength and tensile strength of concrete specimens at 7th and 28th days is constructed, and the findings are carefully studied.

The findings revealed that while no noteworthy changes in concrete attributes were seen with up to 1% replacement in each set, significant changes were observed with higher replacement ratios. In terms of compressive and tensile strength, the author established a better technique for decomposing non-biodegradable rubber tyre waste and found that used rubber tyre waste pieces of size 1cm x 1cm worked as a better replacement.

The partial beam can thus be obtained with these percentages of replacement. This necessitates additional investigation and analysis on the partial beam problem..

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