International Journal of Research Publication and Reviews, Vol (5), Issue (9), September (2024), Page – 113-124

WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

"STRENGTH BEHAVIOUR OF M20 CONCRETE MIXES USING PET BOTTLE AND BURNT CLAY BRICKS AS AN ALTERNATIVE FOR COARSE AGGREGATES: AN EXPERIMENTAL INVESTIGATION

[1]Utkarsh Kumar Pandey ,[2]Rajesh Misra,[2]AshutoshUdeniyan

[1]M.techscholar ,Lakshmi Narain College of Technology, Bhopal

[2]Assistant professor ,Lakshmi Narain College of Technology, Bhopal

Abstract:

The behavior of concrete created by partially substituting PET bottles for ordinary aggregate and over-burnt brick aggregate (jhama brick) with replacement percentages of 0%, 25%, 50%, and 75% over M20 Grade of concrete is the focus of this work. It was established what effect split tensile strength, flexural strength, and compressive strength had. The compaction factors that were obtained are 0.915, 0.88, 0.878, and 0.867, corresponding to different percentages of PET bottles (0%, 25%, 50%, and 75%), and Jhama class bricks. The purpose of the current investigation was to determine whether crushed PET bottles and burned bricks would provide suitable substitute coarse aggregates for concrete.In order to investigate and assess the various qualities of concrete using pet bottles and crushed over-burnt bricks as an alternative material, compressive strength, split tensile strength, and flexural strength were measured using the concrete cube, beams, and cylinders of M20 grade. The outcome demonstrates that, compared to conventional concrete, the aggregate in concrete made from over-burnt bricks has a comparatively higher strength up to a specific percentage before declining. Regarding Beams Based on Load Carrying Capacity:Standard Beams:-All three specimens failed the bending test for flexure.With 25% Replacement: The average load on the 25% replacement beam is 16.1% lower than that of the standard beam. With 50% Replacement: The average load on the 50% replacement beam is 34.2% lower than that of the standard beam.With 75% Replacement: The average load on the 75% replacement beam is 54.4% lower than that of the standard beam. Therefore, using a beam with a 75% replacement is not advised.ECONOMICAL BASIS: Rate analysis indicates that a normal beam costs more than a beam with a 25% replacement, and that the cost decreases as the replacement percentage increases. The least expensive replacement has a 75% replacement rate.On The Basis Of Weight: Normal weight is heavier than other weights. Furthermore, the beam with 75% is the lightest of all. And when the replacement % rises, the weight continues to decrease.

I. INTRODUCTION

In the present World of speedy and high rise construction, materials have played role in structural application. Using different materials have revolutionized traditional design concept and made possible an unparallel range of new exciting possibilities. Numerous different structural systems are used today to meet performance or functional requirement in structures. Light weight structures are widely used in the high rise structures, with advantage of providing the similar strength. Light weight eco friendly concrete is the environment friendly with reduction in amount of its weight

Lightweight aggregate concrete can be produced using a variety of light weight aggregates. Lightweight aggregates originate from either:

The goods can be made from natural materials like volcanic pumice
from industrial by-products like fly ash, or Lytag

- to natural raw materials like clay, slate, or shale that have been thermally treated. Industrial refuse, such as PET bottles.

2. OBJECTIVES OF THE PRESENT STUDY

- To study the property of fresh concrete.
- To study The Compressive strength, flexural strength, tensile strength of concrete by replacing coarse aggregate with over burnt bricks.
- Cost analysis of concrete with over burnt brick will be studied.
- As partial substitute for the fine aggregate in concrete composites by plastic fibres.
- As partial replacement of coarse aggregate by burnt bricks in concrete composites.

3. LITERATURE REVIEW

Based on the past researcher following literature review can be done for the present investigation

- **Akçaözoğlu et al. (2010)** The utilization of crushed, wasted Poly-ethylene Terephthalate (PET) bottle grains as a low-weight mortar aggregate was investigated in this study. Two sets of mortar samples—one produced entirely of PET aggregates and the other with PET and sand aggregates combined—were used in the investigation. In order to save money and minimise the quantity of cement used, blast-furnace slag was also utilised as a mass replacement for cement at a replacement ratio of 50%. In the mixtures, the water-binder (w/b) and PET-binder (PET/b) ratios were 0.45 and 0.50, respectively. The shredded PET granules used in mortar mixture preparation ranged in size from 0 to 4 mm. Based on the results of the testing and laboratory study, mortars with only PET aggregate, mortars with PET and sand aggregate, and mortars modified with slag in place of cement can all be classified as structural lightweight concrete in terms of strength and unit weight. Thus, it was determined that there might be a chance to employ waste PET granules that have been shredded as aggregate in the creation of structurally lightweight concrete. Shredded waste PET granules are utilized to lessen the unit weight of concrete, hence lowering the death weight of a structural concrete element of a building, due to their low unit weight. Understanding a building's death weight can assist reduce its seismic risk because earthquake pressures are linearly related to the building's dead weight. Furthermore, it was found that incorporating industrial wastes like PET granules and blast-furnace slag into concrete provides a number of advantages, including reducing the demand for natural resources, getting rid of garbage, avoiding environmental contamination, and saving energy.
- **Apebo et al. (2013)**
  The study's goal was to find out whether burned brick waste could be used as coarse aggregate in structural concrete. In trial mixes, only shattered, overburned bricks known as "brick bats" were utilized as coarse aggregates. To find the compressive strength of concrete, cubes were created and tested. Based on the findings, concrete containing brick bats as particles is classified as medium-light weight concrete with a density of 2000–2200 kg/m3. To get the same workability as concrete with ordinary gravel particles, concrete containing brick aggregates requires a proportionately higher amount of water. Using broken and burned bricks as coarse aggregate in structural concrete is recommended when natural aggregate is hard to come by and high concrete strength is not required.
- **Akinyele et al. (2020)**
  Effect of PET waste on the structural properties of burned bricks. Plastic packaging is commonly made of polyethylene terephthalate (PET), which is resistant to both chemical and environmental degradation. However, disposing of this nonbiodegradable material properly has proven to be a significant difficulty. In order to explore the potential of this material as an additive to clay in burnt bricks, this study mixed PET at 0, 5, 10, 15, and 20% with lateritic clay. After the bricks were burned in a kiln for 48 hours at about 900 °C, the samples were tested for water absorption, density, and mechanical properties. The results demonstrated that while the brick samples from the lower percentage samples exhibited edge deformation, the brick samples from the 15% and 20% samples crumbled at high temperatures. The modulus of rupture values for the0,5, and 10% samples are 13.20, 11.96, and 8.53 N/mm2, respectively, whereas the compressive strength results are 5.15, 2.30, and 0.85 N/mm2, respectively. The three samples' respective water absorption percentages were 10.29, 9.43, and 6.57%; all of these are within allowable bounds. This study found that, under regulated circumstances, less than 5% PET may be utilised in burnt bricks.
- **Jahidul and Shahjalal (2021)** Impact of polypropylene plastic on concrete characteristics when used in place of some stone and brick aggregate. In the concrete industry, the use of waste materials in concrete is becoming more and more common since it can lower associated costs and environmental effects. The goal of this study is to determine how concrete performs when burnt clay brick aggregate (BA) and natural stone aggregate (SA) are partially replaced with polypropylene (PP) plastic, which is made from waste plastic products. The percentages of PP aggregate (PPA) at 0%, 10%, 20%, and 30%, the water-to-cement ratio at 0.45 and 0.55, and the aggregate types (SA and BA) are the primary factors. The workability, hardened density, compressive, tensile, modulus of rupture, modulus of elasticity (MoE), ultrasonic pulse velocity (UPV), and cost analysis of the results are presented. Additionally, concrete qualities are predicted using empirical formulae; in particular, compressive strengths are predicted using UPV values. The slump value rose as the percentage of PPA grew, according to the results. The modulus of rupture, splitting tensile strengths, and compressive strength of concrete containing 10% PPA were all greater than those of the control concrete containing brick aggregate (BAC) and stone aggregate (SAC). The PPA content and aggregate kinds had an impact on the UPV results. As the proportion of PPA increased from 10 to 30, both the compressive strength and the UPV values declined. Moreover, SAC had greater compressive strength and UPV values compared to BAC. For concrete containing PPA, a strong association was seen between the UPV values and the compressive strength. In comparison to the control and other PPA concrete, concrete with a 10% PP content had the highest strength over cost ratio, according to the cost sensitivity analysis. For structural concrete, it is therefore advised to utilise up to 10% PPA

in combination with either brick or stone aggregate. Last but not least, this research will create new prospects for making green concrete from non-biodegradable waste plastic materials.

- **Hilal and Nahla (2021)** Enhancement of environmentally friendly self-compacting concrete production by extensive waste material recycling. The rising expense of landfills and the scarcity of naturally occurring big aggregates are factors that influence the desire to use waste resources to make mortar and concrete. Recycling plastic garbage and broken ceramic debris lowers the cost of using natural aggregates while also saving landfill space. Second, a significant quantity of trash is produced by tea, which is the second most consumed beverage worldwide. This article thus adds plastic garbage, tea waste, and broken ceramics in an attempt to establish the proper properties of self-compacting concrete (SCC). While the amount of crushed ceramic and tea waste remained constant, the fresh and hardened properties of the SCC were examined to study the addition of waste plastic. The findings showed that the addition of plastic waste resulted in a decrease in SFD, L-Box, segregation, and fresh density; the maximum values obtained for PP5 and RP5 were 765 mm, 0.94, 19, and 2382 kg/m3, respectively. On the other hand, T500 and V-funnel flow gradually increased as the amount of waste plastic increased; the maximum values obtained for RP25 and PP+RP25 were 3.44 and 16, respectively. Additionally, as waste plastic content increased, compressive and flexural strengths fell. At 28 days, the maximum values for PP5 and PP+RP5 were 55 MPa and 6.5 MPa, respectively. The outcomes demonstrated that plastic trash, tea waste, and crushed ceramics could all be used in SCC.
- **Karthik and Mangala (2021)** Analyse the behaviour of concrete mixtures by substituting waste plastic for coarse aggregates.In place of natural coarse particles in M20 mix concrete, this study suggests using waste plastics, namely high density polyethylene (HDPE), low density polyethylene (LDPE), and polypropylene ethylene (PPE). Examining specimens made by substituting recycled waste plastic coarse aggregates (RPCA) produced through a semi-mechanized process with a conventional mix, the study examined the plastic aggregates' behaviour at high temperatures as well as their workability, compressive strength, flexural strength, and split tensile strength. Using HDPE, LDPE, and PPE plastic wastes, three distinct sets of plastic aggregates were created. It was shown that the workability of concrete mixtures decreased as the percentage of plastic waste aggregates increased. Because of the weak Interfacial Transition Zone (ITZ) between the plastic aggregates and paste, the compressive and flexural strengths were lowered. Because of its aggregate characteristic, the inclusion of waste plastic aggregates boosted the tensile strength. Concrete specimens exposed to higher temperatures exhibited favourable behaviour in terms of strength measures. It is possible to replace 10%–20% of RPCA without compromising durability and strength standards.
- **Ijaz and Ansari (2022)** lightweight concrete from the standpoint of environmentally friendly recycling of waste materials. Effective alternatives to traditional waste management programmes are needed since they present a number of environmental, social, and economic issues. In addition to requiring enhanced qualities of concrete with low density, the manufacture of concrete requires a significant quantity of natural resources, which has an adverse effect on the environment. As a result, the concept of lightweight concrete, or LWC, has become more well-known. LWC offers a plethora of opportunities for the practical use of waste byproducts from its diverse industries, making it a viable option for sustainable waste management. Numerous waste byproducts have been extensively studied for their potential applications in LWC as aggregate, cementing agent, admixture, and combinations thereof. This study examines the present state of research on the utilisation of waste byproducts from different sectors in LWC, as well as any gaps, difficulties, and solutions. Waste byproducts can be used in LWC for a variety of purposes, including material, admixture, or both. The acceptability of using any waste material in LWC can be determined based on these regulating variables. The study dimensions that require more focus, despite the great number of conducted studies, include characterisation of more waste material for use in LWC, assessment and mitigation of harmful impacts of waste byproducts in LWC, durability, and life cycle assessment of waste-based LWC. The purpose of this study is to assist related scholars and practitioners in the building, waste management, and sustainable development domains.
- **Lamba and Kaur (2022)** Scientists and researchers are searching for creative and sustainable ways to reuse or recycle plastic garbage in order to lessen its detrimental effects on the environment, as a result of the exponential increase in plastic production and the ensuing spike in plastic waste. Among the industries where waste plastic is showing promise are construction material, household items, clothes, fabric, and fuel conversion. Of these, the construction material that has been altered to include plastic trash has attracted the most interest. There are two benefits to modifying building materials with plastic trash. By decreasing the quantity of plastic trash that ends up in litter or landfills, as well as the amount of mined materials used in building, it helps to mitigate the damaging effects of the construction industry on the environment. This essay provides an overview of the advancements made in the field of using plastic waste as a building material. A thorough analysis has been conducted on the use of plastic waste as a binder, aggregate, fine aggregate,

modifier, or replacement for cement and sand in the production of bricks, tiles, concrete, and roadways. Additionally, a lot of discussion has been had regarding the impact of adding plastic trash on durability, water absorption, strength qualities, etc. The research works that were taken into consideration for this evaluation were divided into groups according to whether or not they addressed the usage of plastic waste in concrete for building roads or in bricks and tiles.

- **Gaur and Sharma (2022)** Concrete: Using Plastic Waste to Replace Some of the Coarse Aggregates. Given the volume of medical plastic waste created in India each year, using recycled plastic as a component in concrete can help cut down on the amount of waste that is disposed of. The Covid-19 epidemic has also led to an increase in the amount of waste made of polypropylene (PP). Utilising plastic waste in concrete will assist to protect the environment and public health because medical plastic wastes are detrimental to both. Prior until now, several studies were conducted to determine practical and safe ways for the ejection of plastic trash; however, due to limited land resources and the environmental harm that plastic waste poses, we have had to step back and consider safe measures for its safe re-utilization. Using plastic in the production of concrete is one such strategy. Concrete has a much longer service life than plastic, thus it can serve as a safe area to use plastic. In this study, the effects of using plastic waste in place of coarse aggregate are examined. Plastic trash is used as coarse aggregate in concrete in different amounts, and its appropriateness is assessed. The investigation of the plastic inclusion effect of concrete includes a discussion of many experimental studies in this study. The current study was conducted on M30 grade concrete, with medical PP plastic waste substituted for coarse aggregate in varying quantities (20%, 40%, 60%, 80%, and 100%). A comparative analysis of the mechanical and physical qualities was conducted, and the replacement value was optimised. The properties of both fresh and hardened concrete were evaluated, and the optimal replacement value for coarse aggregate in concrete was determined to be 40% natural coarse aggregate partially replaced with PP plastic. Qualities of both fresh and hardened concrete were examined and assessed.
- **Sau et al. (2023)** Impact on mechanical and durability aspects of using plastic waste in place of natural aggregates in sustainable concrete. The study describes the mechanical and long-term characteristics of concrete composed of waste-polyethylene-terephthalate (PET) and recycled waste-polyethylene-based aggregate, respectively, in place of natural fine and coarse aggregate. Compressive strength, sorptivity, water permeability, impact resistance, aggressive exposure in acid, base, marine, and wastewater, abrasion loss (including surface and Cantabro), gas permeability, elevated temperature, and microplastic leachability test were all carried out for this purpose. The experimental work was done for varying curing durations and volumetric substitution (0–40%) of natural fine and coarse aggregates with PET- and PE-made aggregates, respectively. The experiment's findings showed that concrete made with PE had the lowest sorptivity. The water permeability coefficient showed that water permeability rose as the amount of PET increased. The percentage of residual mass and residual strength for all replacements in the aggressive exposure test dropped as the exposure period increased. Additionally, the impact resistance test result showed that as the percentages of PE and PET grew, so did the energy absorption. The weight loss trends for cantabro and surface abrasion were similar. Strength reduced when percentages of PE and PET were raised when exposed to CO_2, as indicated by a rise in carbonation depth. The findings of the RCPT test showed that chloride ion penetrability decreased as PE and PET percentages increased. The compressive strength of all mix proportions was found to be unaffected by increased temperatures below 100 °C. Furthermore, a leachability test on the PET-based concrete revealed no microplastic presence.
- **Natarajan and Thilagam (2023)** Utilise leftover plastic to make new construction materials to improve sustainability. The use of plastic has expanded significantly in recent years, which could result in the release of tonnes of plastic garbage into the environment. One practical way to control plastic waste was to recycle the discarded plastic and use it as an alternative aggregate for building materials like concrete, mortar and bricks. It also helps to lessen the amount of minerals mined for raw materials in the building sector, which could improve sustainability. To use plastic trash as an aggregate commercially, we need to understand the strength, weakness, opportunity, and threat (SWOT Analysis) of plastic-induced construction material with reference to their socio-economic benefit and strength qualities. Numerous studies have been conducted or are now in progress to assess the strength properties of building materials that incorporate several forms of plastic trash as an aggregate. This study provides an overview of these studies by analysing the materials' mechanical, physical, and durability characteristics as well as their resistance to alkali conditions. Different sections covered fire resistance. In addition, the study is visually depicted and examines the link between the various strength attributes. The review analysis shows that while different writers produced diverse outcomes, most of them met the standards, while other authors did not meet the requirements at all. The evaluation comes to the conclusion that using plastic trash in small amounts (10–20%) aids in achieving the intended outcomes and makes many

research recommendations that will aid in the future development of commercialization efforts for these plastic-induced building materials.

- **Sau et al. (2023)** Concrete is one of the most widely used building materials due to its accessibility, affordability, long lifespan, and ability to withstand damage from adverse weather conditions. Nevertheless, an enormous amount of priceless natural resources are being depleted in order to produce concrete. Furthermore, the amount of plastic consumed and waste produced is growing daily, making waste management extremely difficult because plastic is not biodegradable and pollutes the environment in several ways. Therefore, using plastic trash to partially replace natural aggregates in the construction industry may help to lessen the issues. Nine M30 grade concrete mixtures comprising plastic waste polyethylene (RPE) and plastic waste polyethylene-terephthalate (WPET) were made for the current investigation in order to substitute both natural coarse particles in a fractional volumetric manner (NCA) and fine aggregates (NFA). The replacement levels were as follows: the water-to-cement ratio (0.37) was maintained at 0%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, and 40%.Several fresh and hardened parameters, such as slump, dry density, compressive strength (CS), flexural strength (FS), split tensile strength (STS), and ultrasonic pulse velocity, were used to evaluate the use of waste plastic aggregates in the construction of concrete. The test findings support the idea that as waste plastic aggregate (PA) replacement in concrete grew in percentage, the slump increased as well. Additionally, at 40% mix percentage, the addition of WPET and RPE to concrete decreased its dry density by 10.59%.
- **Rebeca Sánchez-Vázquez et al.(2024)** The amount of garbage generated by the building industry has increased significantly in recent years, thus it is critical that we find alternatives to this waste if we are to protect ecosystems and the environment. Numerous studies show that utilizing this waste along with other wastes like wood, ashes, and plastics in the building industry is a viable option. An overview of studies that have used leftover materials in the building industry is provided in this article. A total of 35 publications that were published in English-speaking journals between 2015 and 2023 were reviewed in order to meet this goal. • This review demonstrates that while there have been significant efforts in recent years to apply waste materials in the construction industry, more work needs to be done to understand how these residual materials behave, including how they emit greenhouse gases and how important it is to pretreat residual materials to ensure compatibility with other components. Another significant point is that, in the building industry, the majority of research focus only on environmental factors, ignoring the social and economic implications of those factors.

4.METHODOLOGY

- To collect the PET bottles and burnt bricks needed for research.
- To arrange the equipments and the materials needed.
- Shredding the waste bottles into pieces and crushing of the burnt bricks into aggregates to small size.
- Granulating the plastic pieces to smaller size as that of sand.
- Casting and curing of the basic test specimens(cubes) for determination of strength.
- Casting and curing of the structural elements.
- To test the structural models (RC beams with various percentage of plastic waste and burnt bricks) for the results.

In present investigation used beam of size **150mm x 150mm x 700mm**

Therefore,

Effective depth (d) = 150-20-(10/2)

= 125mm

Here clear cover = 20mm

Diameter of Steel bar = 10mm

As per IS-**456:2000**(clause 26.5.1.1)

$$A_{st}\ min = \frac{0.85 \times bd}{fy}$$

$$= \frac{0.85 \times 150 \times 415}{415}$$

= 38.40 mm^2

Astmax = 0.04 x b x D

= 0.04 x 150 x 150

= 900mm^2

Where Ast = Area of steel in tension

For all four types of beams , keeping the cross sectional area and percentage of steel same . So that, can compare the results of all types of beams.

4.1 Normal Reinforced Beam

Taking main reinforcement as 4#8

A_{st}= 4 x 50.26

= 201.06 mm^2

Percentage steel (p_t) = Ast x 100

bd

= 201.06 x 100 150

x 125

= 1.07%

4.2 Required cubes & beams specimen:-

- Size of cube :- 150mmx150mmx150mm
- Size of beam:- 700mmx150mmx150mm

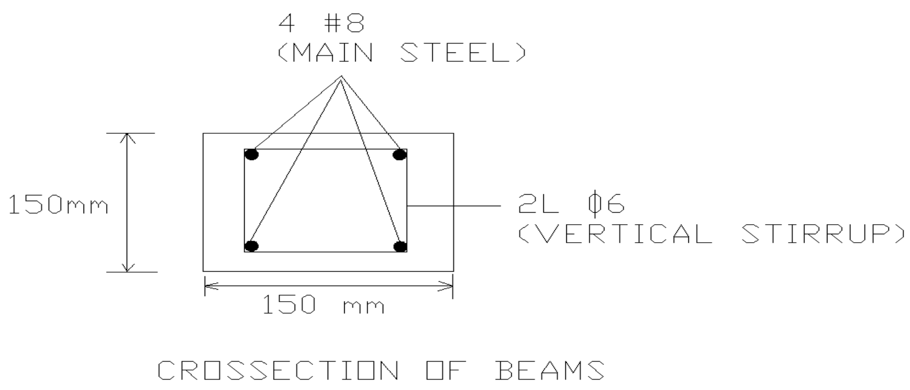


Figure 3.7 Cross section of beams used in present investigation

4.3PREPARATION OF CONCRETE

- Normal concreting without any use of PET bottles and burnt bricks.
- In second stage, 4% of fine aggregates will be replaced by the PET bottles and the 25% of course aggregate will be replaced by the burnt bricks.
- In third stage, 4% of fine aggregates will be replaced by the PET bottles and the 50% of course aggregate will be replaced by the burnt bricks.
- In fourth stage, 4% of fine aggregates will be replaced by the PET bottles and the 75% OF course aggregate will be replaced by the burnt bricks.

Figure 1 moulds prepared used in present investigation

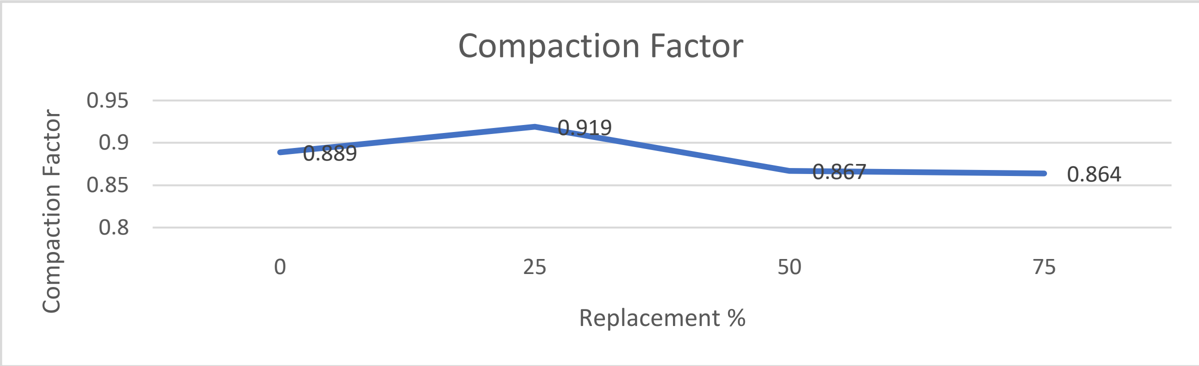
Figure 2 Compression Testing Machine used in present investigation

Figure 3 Compression Testing Machine used in present investigation Testing Of Beams

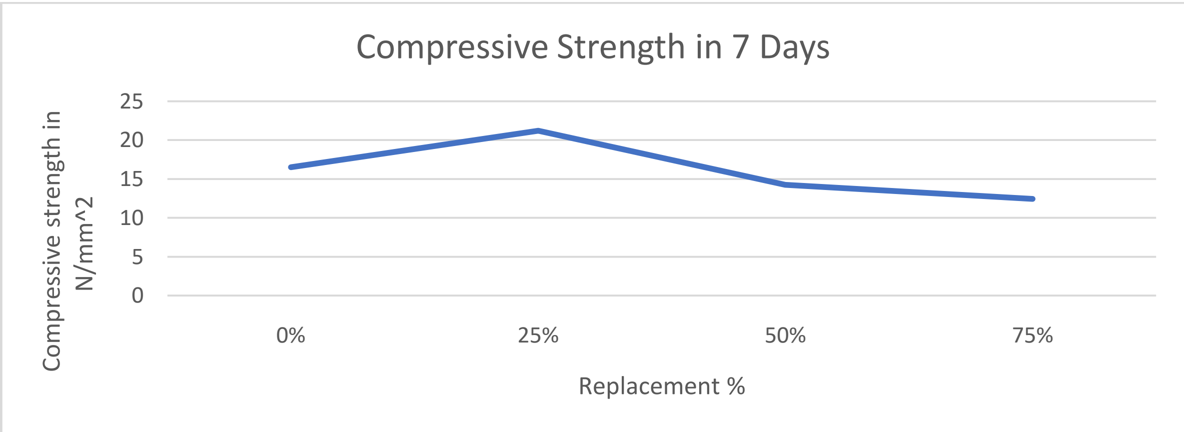
Table 1 Required materials for cubes & beams specimen

Type	Cement (Kg)	Sand (Kg)	Coarse Aggregate (Kg)	Pet Bottles (Kg)	Burnt Brick (Kg)
Normal	360	584	1223.6	-	-
4% PET bottles + 25% Burnt Brick(BB)	360	584	868.7	49	305.9
4% PET bottles + 50% Burnt Brick(BB)	360	584	207.9	49	611.8
4% PET bottles + 75% Burnt Brick(BB)	360	584	257.35	9	917.25

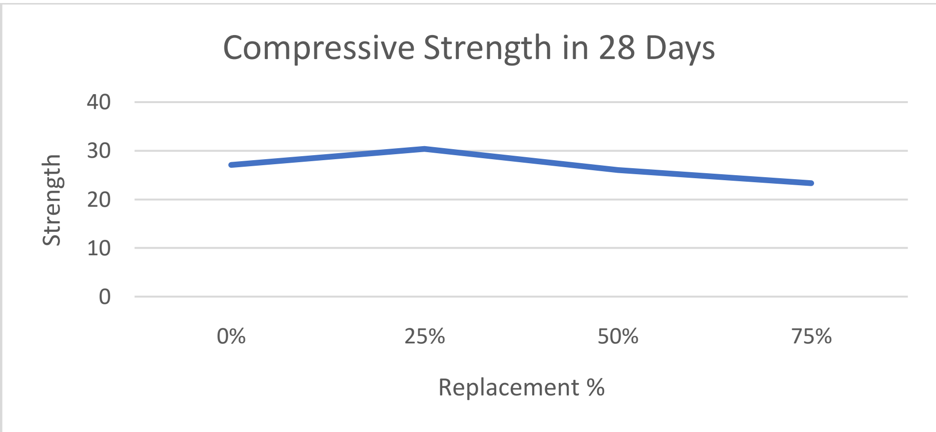
5.DISCUSSION ON RESULTS:



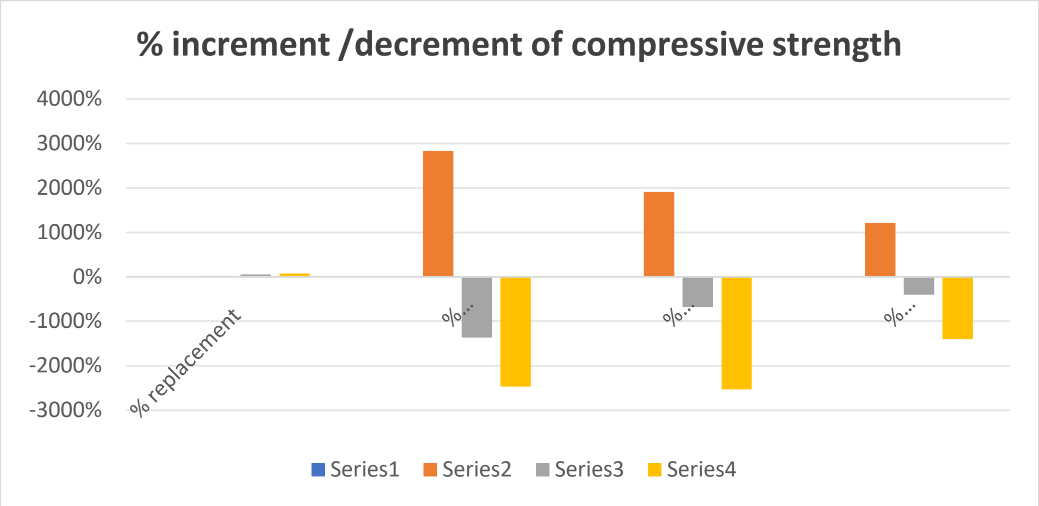
Graph 1 % replacement v/s comaction factor



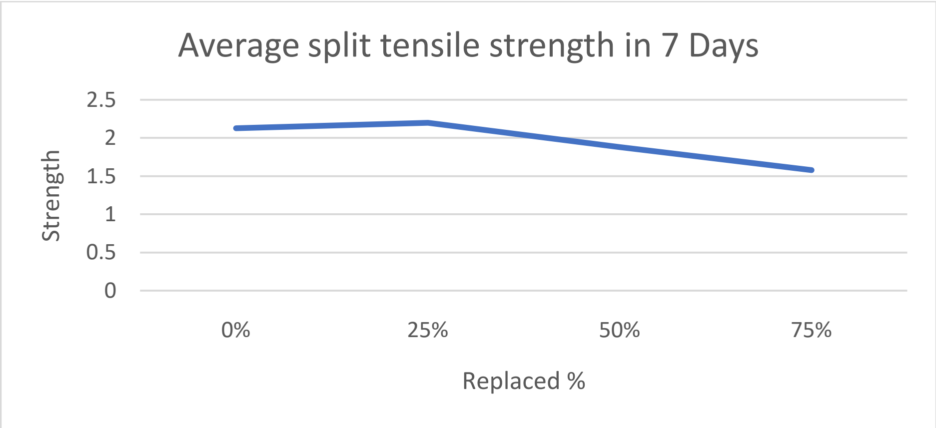
Graph 2 %replacement v/s compressive strength at 7 days



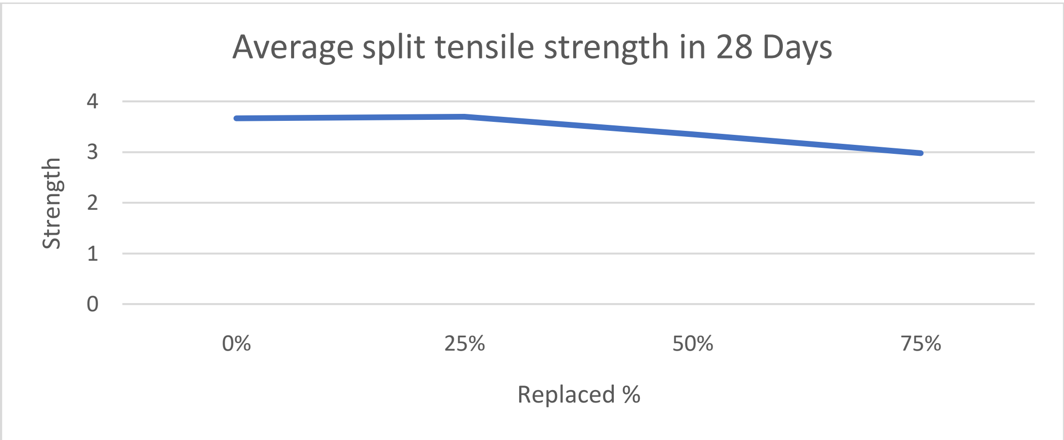
Graph 3 %replacement v/s compressive strength at 28 days



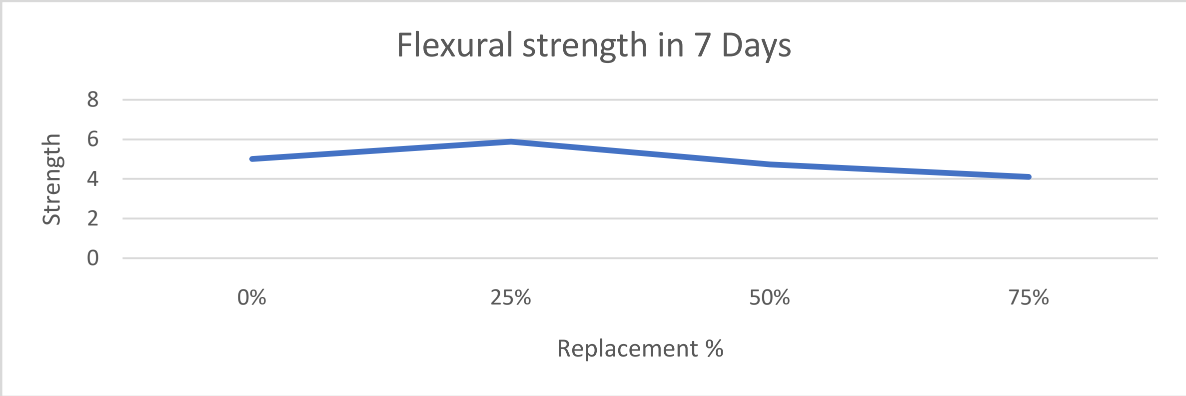
Graph 4 % replacement v/s % increment /decrement of compressive strength at 7 and 28 days



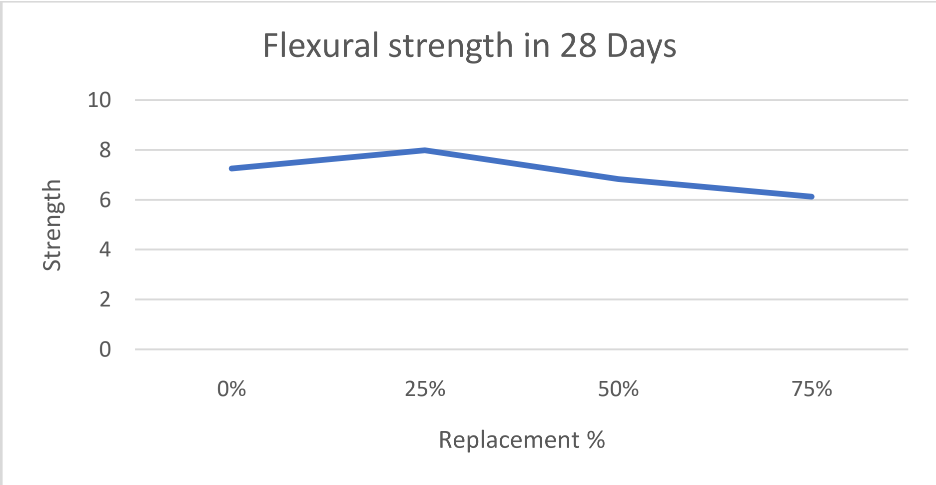
Graph 5 %replacement v/s Average split tensile strength in 7 Days



Graph 6 %replacement v/s Average split tensile strength in 28 Days



Graph 7 %replacement v/s Flexural strength (N/mm2) in 7 Days



Graph 8 %replacement v/s Flexural strength (N/mm^2) in 28 Days

6 . CONCLUSION

Based on results followingconclusionsaredrawnfrom the study:

For Cubes

As per the Design of M20 grade, compressive strength of cubes as:

The compressive strength without fibre the gain in strength for 7 and 28days are 28.25% and 12.13% for 25% replacement of burnt clay bricks.

The split tensile strength strength without fibre at 28days are 3.67mpa,3.7mpa,3.35mpa and 2.98mpa respectively.

The compressive strength of NWAC and LECAC with 0%, 0.5%,0.75% and 1% steel fibers concrete mixes at 28 days are 37.30MPa ,32.50 MPa, 26 & 20.90 MPa respectively.

The reduction in strength is due to the replacement of fine and the coarse aggregates. And the most feasible is to use the one with the replacement of 50% of aggregates, not below it.

The compressive strength of cylinder for NWAC and LECAC with 0%, 0.5%,0.75% and 1% steel fibers concrete mixes at 28 days are 29.83 MPa, 25 MPa, 19.53 MPa, and 13.64 MPa.

The flexural strength of prisms for NWAC and LECAC with 0%, 0.5%, 0.75% and 1% steel fibers at concrete mixes 28 days are 7.25MPa, 7.99MPa, 6.83 MPa, and 6.12MPa.

The compressive strength of cylinder, split tensile strength of cylinder, and flexural strength of prisms of LECAC without steel fibers is reduced when compared to NWAC, but increased with steel fibers.

The use of steel fibers in Lightweight burnt Clay Aggregate Concrete (LECAC) exhibits improvement in the compressive strength of cubes and cylinders, split tensile strength of cylinders, and flexural strength of prisms compared to NWAC.

For Beams

On The Basis Of Load Carrying Capacity:-

Normal Beams:-When tested for flexure all three specimens failed in bending.

With 25% Replacement:-The beam with 25% replacement shows 16.1% decrease in the average load w.r.t. the normal beam.

With 50% Replacement:-The beam with 50% replacement shows 34.2% decrease in the average load w.r.t. the normal beam.

With 75% Replacement:-The beam with 75% replacement shows 54.4% decrease in the average load w.r.t. the normal beam. Hence, it is not advisable to use beam with 75% replacement .

ON THE BASIS OF ECONOMY:-

On the basis of Rate Analysis , the normal beam is costly as compared to the beam with 25% replacement and the cost goes on decreasing with the increase in the replacement percentages. The replacement with 75% being the least costly.

On The Basis Of Weight:-

On the basis of weight normal is heavier than others. And the beam with 75% is lighter of the all. And the weight goes on decreasing with the increase in the replacement percentage.

7. SCOPE FOR FURTHER STUDY

Study may further be extended by changing the percentage of burnt brick as well as the grade of cement.

Further study may be carried out by changing the percentage of crushed PET bottles , replacing the fine aggregates.

Model studies may be extended for prototype of actual sizes of beams by carrying out dimensional analysis.

To study the Compressive strength and durability properties like % weight loss, % compressive strength loss in HCL, H2SO4 solutions 28 days .

REFERENCES

- M Karthik, V G Ajey Kumar, Mangala Keshava. An investigation on behaviour of concrete mixes using Waste Plastic as an alternative for Coarse Aggregates, Volume 822, Number 1, Pages 012011, https://iopscience.iop.org/article/10.1088/1755-1315/822/1/012011/meta#
- Md Jahidul Islam, Md Shahjalal, Niaz Md Ashraful Haque. An investigation onMechanical and durability properties of concrete with recycled polypropylene waste plastic as a partial replacement of coarse aggregate, Volume 54, 2022, 104597, ISSN 2352-7102, https://doi.org/10.1016/j.jobe.2022.104597
- Md. Jahidul Islam, M D Paul. Comparative study of Concrete with Polypropylene and Polyethylene Terephthalate Waste Plastic as Partial replacement of Coarse Aggregate, Volume 2022 | Article ID 4928065 | https://doi.org/10.1155/2022/4928065
- Md. Jahidul Islam, Md. Shahjalal . Effect of polypropylene plastic on concrete properties as a partial replacement of stone and brick aggregate, Volume 15, December 2021, e00627 , https://www.sciencedirect.com/journal/case-studies-in-construction-materials/vol/15/suppl/C
- Nahla Hilal, Marijana Hadzima Nyarko . Improvement of eco efficient self-compacting cocrete manufacture by recycling high quantity of waste materials , *Environ Sci Pollut Res* **28**, 53282–53297 (2021). https://doi.org/10.1007/s11356-021-14222-9
- Nauman Ijaz, Wajahat Sammer Ansari, Miroslav Cekon. An Investigation on Lightweight Concrete from a perspective of sustainable reuse of waste byproducts, Volume 319, 2022, 126061, ISSN 0950-0618, https://doi.org/10.1016/j.conbuildmat.2021.126061
- NS Apebo, MB Iorwua, JC Agunwamba. An investigation on comparative analysis of the compressive strength of concrete with gravel and crushed over burnt bricks as coarse aggregates, Vol. 32 No. 1 (2013) , ISSN : 2467-8821, https://www.ajol.info/index.php/njt/issue/view/9935
- Pooja Lamba, Dilraj Preet Kaur. An investigation on Recycling/reuse of plastic waste as construction material for sustainable development, *Environ Sci Pollut Res* 29, 86156–86179 (2022). https://doi.org/10.1007/s11356-021-16980-y
- Rebeca Sánchez-Vázquez, Alicia Fernández Rodríguez, Daniel Burgos,Waste-based materials in residential house construction, Procedia Structural Integrity,Volume 55,2024,Pages 80-87,ISSN 2452-3216,https://doi.org/10.1016/j.prostr.2024.02.011.
- Semiha Akçaözoğlu, Cengiz Duran Atiş, Kubilay Akçaözoğlu, An investigation on the use of shredded waste PET bottles as aggregate in lightweight concrete, Waste Management, Volume 30, Issue 2,2010,Pages 285-290,ISSN 0956-53X, https://doi.org/10.1016/j.wasman.2009.09.033.