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Concrete with Bottom Ash as a Replacement for Fine Aggregate Fails Mechanical Tests at Coal Washeries

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ABSTRACT- Critical research is focused on the use of a variety of commercial waste products as alternatives to total, such as coal pyrophoric waste, heater slag, fibreglass waste products, elastic waste plastics, work slime pellets, and so on. If waste materials are employed in place of bond mortar and cement in their entirety, the utilisation of waste materials will become more complex. This method of waste material utilisation can address issues with total shortage in various development locations as well as environmental concerns related to total mining and trash transit. Because the totals will effectively manage the characteristics of cement, their characteristics have a phenomenally spectacular significanceSo, before using any waste material as a total in cement, a radical analysis is essential followed by a thorough appraisal. Although several waste products are being investigated as choices for coarse total, this investigation is intended to propose a substitute material returning coal washing, also known as coal washery rejects (CWR), as a unique option for coarse total inside the solid business.

KEYWORDS- Coal Washery Rejects Bottom Ash, Fine Aggregate, Mechanical Properties.

I. INTRODUCTION

For a long time, research has focused on the use of mechanical waste and by-products to enhance the characteristics of cement. The use of industry by-products such fly cinder, silica smoke, ground granulated impact heater slag (GGBFS), glass cullet, and so on has been attempted in recent years. According to their synthetic design and molecular estimation, mechanical by-products in concrete may be used as a partial or halfway replacement for bonds. Due to ecological standards, the work of those materials in cement develops inside of the protected transfer of those by components.

Cement is a substance whose quality and longevity are inextricably linked. It has grown since it is the primary improvement development substance for the century's fundamental necessities. In addition to being strong, cement is typically made and manufactured from readily available components and is thus typically employed in all types of fundamental procedures. The inquiry for the structural building interest is to clearly comprehend reaches out in line with the motivating start of viable improvement, and this involves the use of hotly obtained materials and items created at fair cost with the least amount of natural consequence.

Totals make up around 70–80% of cement's aggregate volume, making them the most important component. They have a direct impact on cement's newly formed and solidified qualities. Due to the enormous development in the Indian development sector, the purchase of spectacular grade totals is gradually becoming more and more expensive. The most important material used on earth, cement, continuously calls for clever totals in large quantities. To meet the long-term development goals of the Indian development sector, it was felt that prospective diverse overall supply sources should be identified.

Critical research is focused on the use of a variety of commercial waste products as alternatives to total, such as coal pyrophoric waste, heater slag, fibreglass waste products, elastic waste plastics, work slime pellets, and so on. If waste materials are employed in place of bond mortar and cement in their entirety, the utilisation of waste materials will become more complex. This method of waste material utilisation can address issues with total shortage in various development locations as well as environmental concerns related to total mining and trash transit. Because the totals will effectively manage the cement's qualities, the totals' characteristics are of phenomenally great relevance. So, before using any waste material as a total in cement, a radical analysis is essential followed by a thorough appraisal.

Although several waste materials are being investigated as choices for coarse total, this investigation is intended to propose a replacement material returning coal washing, also known as coal washery rejects (CWR), as a unique option for coarse total inside the solid business.

Slag from heaters and coal-based powder Two are the coarse, granular, incombustible by-products that can be collected from the bottom side of heaters that burn coal to produce steam, electricity, or both. Although impressive base fiery debris and/or kettle slag are also built from numerous smaller mechanical or institutional coal-let go boilers and from coal-blazing independent fair life generation decisions, coal-let go electrical utility assembling stations produce the majority of these coal by-products. Depending on the sort of heater used to blaze the coal, different by-items (such as base fiery debris or kettle slag) are produced.

Around 80% of the unburned material or flaming residues are entrained in the pipe gas and are captured and recovered as fly cinder when crushed coal is smouldered in a dry, base kettle. The final 20% of the burning waste is dry base cinder, which is a depressingly dark, granular, porous, barely sand-sized material that is gathered in a water-filled container on the back of the furnace [1]. When a sufficient amount of base slag enters the container, it is removed using high-strain water fly and transported via sluiceways to either a transfer lake or a tap bowl for dewatering, product lodging for transfer or usage, and pulverization [2]. The utility project produced 14.5 million metric tonnes (16.1 million tonnes) of base ash in the year 1996 [3]. According to recent research on the use of coal-burning by-products, 30.3 percent of all base cinder produced in 1996 was used in Snow and ice management, as a half-blend in light-weight solid workmanship items, and material of crude food fabric for production of Portland concrete are the leading foundation fiery debris applications. In addition to being used as a street base and subbase total, basic unreasonable fill material, astounding fine total in black-top clearance, and flowable fill, base fiery debris has also been used in these applications [5].

Base powder is a component of the ignition's non-combustible accumulation in a terrible chamber incinerator. It typically refers to coal igniting in a mechanical connection and contains clues of combustibles established in framing clinkers and adhering to hot feature side allotments dividers of a coal-blazing heater for the duration of its activity. On the other side, fly slag is referred to as the component of the burning debris that escapes up the chimney or stack. The clinkers cool by falling into the bottom container of a coal-smoldering chamber. The highest point of the powder is also referred to as the base fiery debris [4].

A. Coal Washery Rejects

In an Asian nation, coal is used to generate about 67% of the electricity. The total estimated global coal reserves are estimated to be 6,641,200 million tonnes, and India's reserves are estimated to be 106,260 million tonnes. In light of the rise in the price of raw petroleum and regular petrol, it is anticipated that the interest in coal will increase more quickly than it did in the past. Over the course of a specific century, the interest in coal remained largely constant, and it is now increasing in this century [6]. It is the very beneficial relationship influence with warm power plants, railway trains, the manure industry, bonds, steel, power vitality, and a certain type vitality, and a variety of unique enterprises [7]

With its annual production, it ranks as the sixth largest producer of coal with over 100 million tonnes. When compared to high positioning coal, such as anthracite and coking coals, the stocks of low positioning hydrocarbon and lignite coals are greater. The interest in high intemperate rank coals, on the other hand, is mainly for metallurgical use and for use as fuel [1].

Coal is a brittle, solid, sedimentary, flammable rock formed from plant detritus that has through a variety of physical, chemical, and biological changes over the course of an incredibly long period of many years [8]. It contains vital carbon in particular. With regard to rank, peat coal differs from wood coal, wooden coal from hydro carbon, hydro carbon from semi-anthracite, and coal itself from semi-anthracite [9].

Given that it comes from mines, coal contains a variety of debasements like magnesium sulphate, fire mud, sulfur-containing pyrites, and slate. Because these pollutants have a higher specific gravity than pure coal, cleaning the coal before use requires a coal washing procedure. Immaculate coal has a particular gravity between 1.2 and 1.7, while sullied coal has a particular gravity between 1.7 and 4.9. As a result, coal needs to be sized and then washed down using jigging or an overpowering media division [10]. When interest grows, society anticipates cleaner energy with reduced air pollution along with a growing emphasis on natural resources. The coal industry is aware that, in order to continue serving as a source of energy in the future, it must fulfil the requirements of the test of natural property and, specifically, must reduce its nursery discharges. Prior to its widespread and appropriate usage in the most exceptional entirely special commercial companies, the properties of coal should be best assessed [11].

Due to the discrepancy in specific gravities between coal and pollution, the frequent coal-washing practises lead to a separation between the two. The use of the raw coal blend detaching from coal and immersing so as to pollute influence it in an extremely terrible choice with middle of the road particular gravity between that of coal and contamination has long been a regular practice. in discovering the potential outcomes of washing so as to make enhancements to a nature of coal [12]. The example's particularly weighted portion, but not that of the solution, coasts, while the arrangement's particularly weighted portion sinks. Clean coal is connected to the water's flow guide over a weir, and any contamination sinks to the bottom. Periodically, decline is removed from the washer and stored in emergency supplies. Coal washery rejects (CWR) is the term used to describe this refuse that is stored in emergency storage [13].

2.44 Mt of washery rejects were estimated to have been produced by Coal India Limited (CIL) in 2004–05. 18.15Mt of washery rejects have been collected as of March 2005, according to an old record. The main natural hazard problem with the coal washing system is the coal washery rejects (CWR) [14]. Transferring this enormously risky number of rejects in a friendly way for the domain is a serious problem. The remnants from the washery were once again employed by smouldering them in a fluidized sleeping cushion-based kettle to generate steam for the Power period. In various locations, CIL has installed seven 10 MW warm power plants based on the FBC technology [15]. As a result of these plants operating and being insured in disconnection mode at low PLF, the emphasis measure changes from Rs. 2.5 to Rs. 3.5 per kWh. Reusing leftovers could prevent the need to utilise 0.2 Mt of crude coal per year [16].

The reuse of CWR in solid venture organisations is arguably the most logical application for deciding the transfer of a significant proportion of coal washery rejects. As a result, it is realistically anticipated that this study would use the CWR as a coarse blend mix of total substitution in cement and learn about cement's qualities [17].

B. Bottom Ash

The coarser material, known as base fiery remnants, makes up about 20% of the total cinder material of the coal fed into the boilers of modern, expanding heated power plants. It falls into the base of the heater. It is made up of non-buildup materials and is the residual space after family unit and similar rubbish was burned [18]. A granular fabric material known as "crude material base fiery remains" contains a mixture of latent materials, such as sand and stone, Glass, porcelain, metals, and smouldering material powder [19]. When used on a large scale, the use of coal slag in conventional quality cement will improve the construction industry by lowering the rate of development and reducing the amount of fiery debris. This is a brand-new level in solid mix design. Given that research on the use of base fiery debris has been urgently needed, this study provides an analysis of more than a few test examinations that were conducted by technique for certain analysts to understand the impact of using base slag as a substitute for sand [20].

II. MATERILAS AND METHODOLOGY

A. Materials

The qualities of cement can be affected by the constituent materials used to produce it. The basic ingredients used to build both cement based on regular solids (CC) and coal washery rejects (CWR) are discussed in the sections below. This part shows the composition and physical characteristics of the constituent materials.

- **Cement**

Common Portland Cement 53 grade (Penna) was utilized comparing to IS 12269 (1987). The concoction properties of the concrete as acquired by the producer are exhibited in the Table 1.

Table 1: Chemical composition of cement

Particulars	Test Result	Requirement as per IS:12269-1987
Chemical Composition		
% Silica(SiO_2)	19.79	
% Alumina(Al_2O_3)	5.67	
% Iron Oxide(Fe_2O_3)	4.68	
% Lime(CaO)	61.81	
% Magnesia(MgO)	0.84	Not more Than 6.0%
% Sulphuric Anhydride (SO_3)	2.48	Max.3.0%whenC_3A>5.0 Max. 2.5% when C_3A<5.0
% Chloride content	0.003	Max. 0.1%
Lime Saturation Factor $CaO-0.7SO_3/2.8SiO_2+1.2Al_2O_3+0.65Fe_2O_3$	0.92	0.80 to 1.02
Ratio of Alumina/Iron Oxide	1.21	Min. 0.66

Rundown of physical properties and different tests directed on concrete according to IS 4031(1988) are exhibited in the Table 2.

Table 2: Physical Properties of Cement

Physical properties	Test result	Test method/ Remarks	Requirement as per IS 12269 (1987)
Specific gravity	3.15	IS 4031(1988) – part 11	-
Fineness (m^2/Kg)	311.5	Manufacturer data	Min.225 m^2/kg
Normal consistency	30%	IS 4031 (1988)- part 4	-
Initial setting time (min)	90	IS 4031 (1988)- part 5	Min. 30 min
Final setting time (min)	220	IS 4031 (1988)- part 5	Max. 600 min
Soundness Lech atelier Expansion (mm) Autoclave Expansion (%)	0.8 0.01	Manufacturer data	Max. 10 mm Max. 0.8%
Compressive strength (MPa) 3 days 7 days 28 days	25 39 57	IS 4031 (1988)- part 6	27 MPa 37 MPa 53 Pa

Coarse aggregate

As coarse total, 20 mm and 10 mm smashed rock stones are used. According to IS 2386 (Part III, 1963), the predominant part specific particular gravity in grill dry condition and water intake of the coarse blend of 20 mm and 10mm are, respectively, 2.6 and 0.3%. Estimates for the 20 mm mass thickness, sway quality, and pulverising quality are 1580 kg/m3, 17.9%, and 22.8%, respectively. Figs. 1 and 2 show the reviewing bends of the coarse totals according to IS 383 (1970).

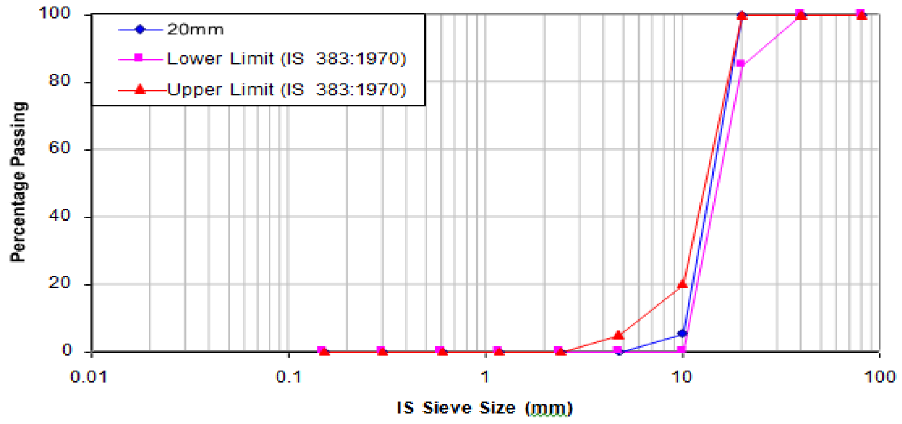

Figure 1: Grading Curve of 20 mm Coarse Aggregate

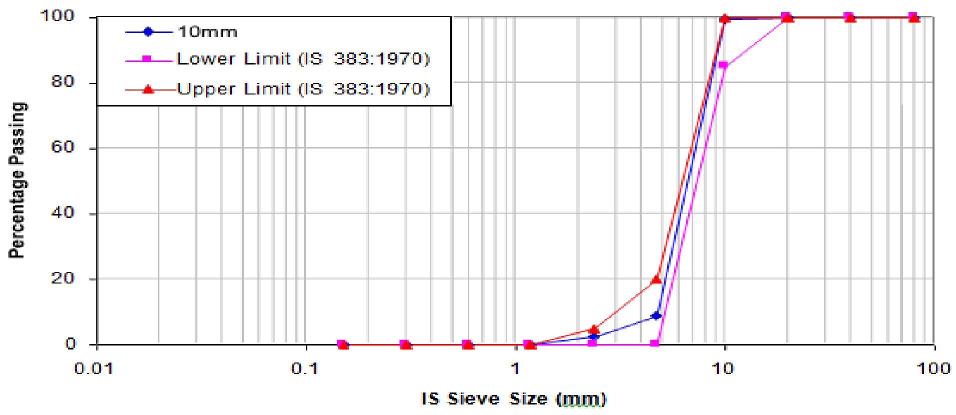

Figure 2: Grading Curve of 10 mm Coarse Aggregate

A.3 Coal Washery Rejects

20 mm Coal Washery Rejects (CWR) are used as a fractional replacement for coarse total. According to IS 2386 (Part III, 1963), the CWR's water intake and mass particular gravity in dry grill conditions are 2.06 and 0.48%, respectively. Estimates for CWR's mass thickness, sway quality, and hammering quality are 1431 kg/m3, 19.5%, and 26.8%, respectively.

A.4 Fine Aggregate

The fine total is typically stream sand. According to IS 2386 (Part III, 1963), the predominant part specific gravity in stove dry conditions and the water retention of the sand are 2.6 and 1%, respectively. According to IS 383 (1970), sifter examination determined the sand's degree, which is shown in fig 3.

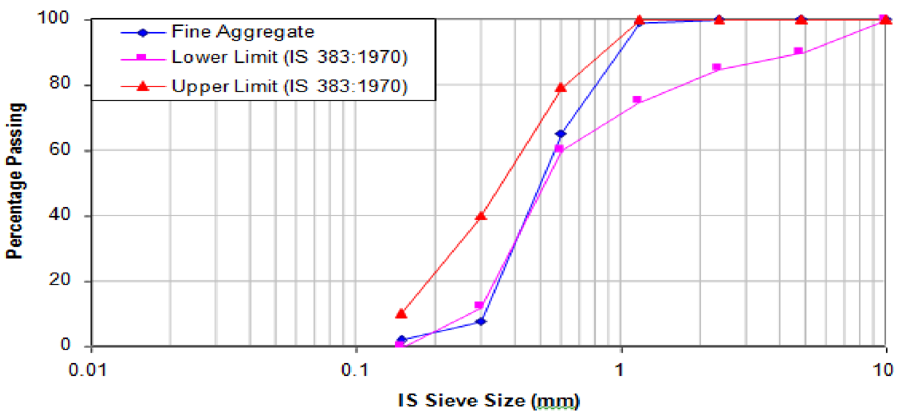

Figure 3: Grading Curve of Fine Aggregate

A.5 Water Water that is suitable for drinking is generally desirable for usage in cement. Water that may contain sewage, mine water, or waste from manufacturing plants or canneries may not be used as a component of cement until tests show that it is acceptable. Avoiding water from these sources is advised.

III. MIX DESIGN

Regarding a strong enough bond with the support in the construction structures, coarse total particles with estimation sizes of 20 mm and 10 mm have been used. The aggregate total weight was divided 60:40 between coarse total particles measuring 20 mm and 10 mm. At 0%, 20%, 30%, 40%, and 50%, 20 mm CWR was modified to 20 mm coarse total. According to IS 10262:2009 [19] and IS 456:2000 [20], M 25 evaluation of routine solid (CC) was created. Table 6 shows the blend aggregate extents of the constituent chemicals.

Table 6: Mix Proportions of Constituent Materials of Concrete Mixes

	Cement kg/m	Water l/m^3	20 mm kg/m^3	10 mm kg/m^3		m^3
25)	384	192	683	456		
CWR_20	384	192	546	456	137	636
CWR_30	384	192	478	456	205	636
CWR_40	384	192	410	456	273	636
CWR_50	384	192	341	456	341	636

IV. RESULTS AND DISCUSSION

The test results are presented and evaluated in this Chapter. The test results demonstrated the concrete's strength qualities when CWR was used as a fractional replacement for coarse total (0%, 20%,30-40% and 50%). CWR substitution at the optimal level was discovered. cement produced at the ideal CWR level. Coal base fiery remnants (CBA) were substituted for the waterway sand in this solid area at values of 0%, 20%, 30%, and 40%.Compressive, splitting tractable, and flexural quality of cement at different curing times are among the quality qualities.

A. Compressive Strength of CWR Based Concrete

In this section, we discuss the compressive properties of cement mixtures based on CC and CWR at various curing times. The compressive quality estimates of cement with fractional CWR substitution are shown in Table 3.

Table 3: Compressive strength of CWR concrete

Mechanical property	Age (days)	Mix type				
		CWR _0	CWR _20	CWR _30	CWR _40	CWR _50
Compressive strength,$f'c$ (MPa)	7	23.20	22.76	22.18	20.02	18.56
	28	33.06	32.20	31.14	28.53	25.37
	56	35.84	34.68	33.39	30.81	27.94

From the outcomes it is seen that the solid blends with partial substitution of CWR have achieved lower estimations of compressive quality at all ages when contrasted with that of ordinary cement (CWR_0) as appeared in Fig.4.1.

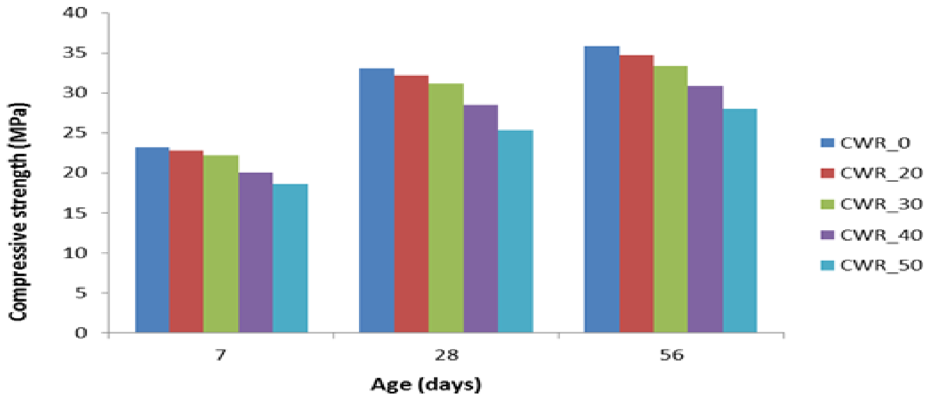

Figure 4: Compressive Strength Versus Age

It is plainly seen that the compressive quality attributes are detected to be declining when CWR substitution increased from 20% to 50%. When compared to those of coarse total, it is evident from the total properties that CWR has lower benefits of smashing and effect quality. The falling compressive quality of cement blends based on CWR is mostly responsible for the reduced advantage of smashing and effect quality of CWR. It is interesting to note that the solid mixes CWR_20 and CWR_30 have barely lost any of their compressive quality attributes. The solid blends CWR_20 and CWR_30's 28-day compressive quality is nearly equal to that of CC's M-25 evaluation. The additional CWR substitution decreased the compressive quality values mostly because of the dense mixes CWR_40 and CWR_50. In order to obtain the desired 28-day quality of CC, it can be advised to use CWR at a 30% fractional substitution of coarse total.

B. *Mechanical properties of coal bottom ash based concrete*

The mechanical characteristics of coal base cinder (CBA) based cement are discussed in this section. CBA based cement was created using 30% CWR as coarse total substitution and 0%, 20%, 30%, and 40% with coal base fiery remains as sand substitution because 30% CWR substitution level was considered to be the optimal substitution in coarse total. The mechanical characteristics of CC and CBA-based cement were compared.

C. *Compressive Strength of CBA Based Concrete*

This section examined the compressive strength of concrete mixtures based on CC and CBA at various curing times. The compressive strength values of concrete produced with CBA that has been partially replaced are shown in Table 4.2.

Table 4: Compressive strength of CBA based concrete

Mechanical property	Age (days)	Mix type				
		CC	CBA_0	CBA_20	CBA_30	CBA _40
Compressive strength, $f'c$(MPa)	7	23.20	22.18	22.08	21.02	20.34
	28	33.06	31.14	30.52	30.18	28.37
	90	42.01	41.89	40.82	40.70	38.42
	180	46.20	45.24	44.64	43.63	41.14

Base powder solid blends CBA_20, CBA_30, and CBA_40 achieved compressive quality qualities of 22.08 MPa, 21.02 MPa, and 20.34 MPa, respectively, lower than CC and CBA_0 cement blends, at an early curing age of 7 days. The above-base flammable debris solid blends CBA_20, CBA_30, and CBA_40 achieved compressive quality estimates of 30.52 MPa, 30.18 MPa, and 28.37 MPa, respectively, lower than CC and CBA_0 cement blends at 28 days of curing age. Lower free water-bond proportion at the proper curing age may have helped to reduce the detrimental effects of coal base fiery debris on the compressive quality of cement. Additionally, various componentsThe moderate hydration caused by the expansion of coal base powder in cement, for instance, could also be a possible explanation for the poorer compressive quality of base fiery waste solid mixes, as could the replacement of more dense material with weaker material. The base powder solid blends CBA_20, CBA_30, and CBA_40 attained compressive quality estimates of 40.82 MPa, 40.70 MPa, and 38.42 MPa, respectively, after 90 days of curing age, which were lower than those of the CC and CBA_0 cement blends. The basic cement blends CBA_20, CBA_30, and CBA_40 achieved compressive quality estimates of 44.64 MPa, 43.63 MPa, and 41.14 MPa, respectively, after 180 days of curing age, which were all lower than those of the CC and CBA_0 cement blends. From the facts above, it is obvious that base slag cement's compressive quality increases steadily and significantly as curing age increases.

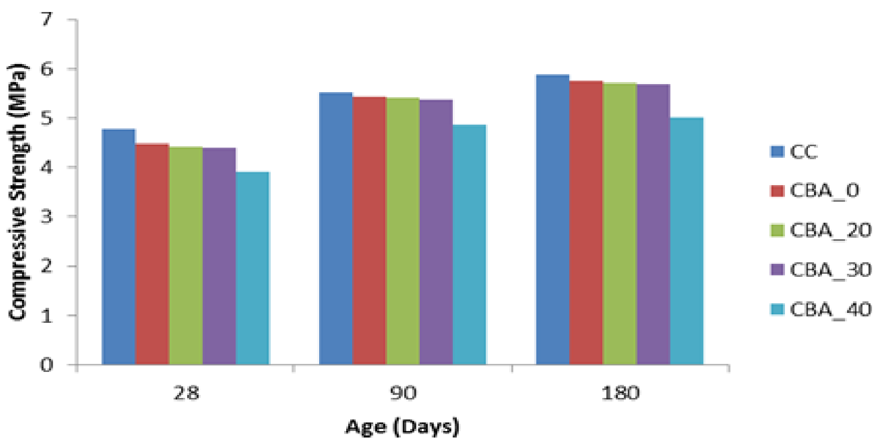

Figure 4.1: Compressive quality of CBA blends

Estimates of CBA_30's compressive quality are comparable to those of M 25's evaluations of CC and CBA_0 at all ages. Because of the solid mix CBA_40, the additional CBA substitution decreased the compressive quality values overall. In order to attain the desired 28-day quality of CC and CBA_0, it may be advised to use CBA at a 30% partial substitution of the fine total.

- **Splitting Tensile Strength of Cba Based Concrete**

This section examined the splitting tensile strength of concrete mixtures based on CC and CBA at various curing times. The values for the splitting tensile strength of concrete produced by partially substituting CBA are shown in Table 4.3.

Table 5: Splitting Tensile Strength of Cba Based Concrete

Mechanicalproperty	Age (days)	Mix type				
		CC	CBA _0	CBA _20	CBA _30	CBA _40
Splitting Tensile Strength (MPa)	28	3.68	3.53	3.49	3.45	3.30
	90	4.19	3.99	3.92	3.88	3.61
	180	4.74	4.65	4.61	4.59	4.38

In comparison to CC and CBA_0 cement blends, the aforementioned base powder solid blends CBA_20, CBA_30, and CBA_40 achieved part elasticity estimates of 3.49 MPa, 3.45 MPa, and 3.30 MPa, respectively, at 28 days of curing age. The component stiffness of base cinder solid mixes increased with ageing more quickly than that of control cement. The base fiery debris solid blends CBA_20, CBA_30, and CBA_40 achieved part elasticity estimates of 3.92 MPa, 3.88 MPa, and 3.61 independently after 90 days of curing age, which were lower than those of the CC and CBA_0 cement blends. after 180 days of legal agethe base cement blends CC and CBA_0 achieved part elasticity estimates of 4.61 MPa, 4.59 MPa, and 4.38, respectively, lower than those of the base cement blends CBA_20, CBA_30, and CBA_40. According to the information above, base fiery debris cement's part stiffness increases steadily and significantly as curing age advances. The pozzolanic action of coal base slag may have contributed more to part elasticity than to compressive quality since the part rigidity is more dependent on the nature of the adhesive than on the compressive quality.

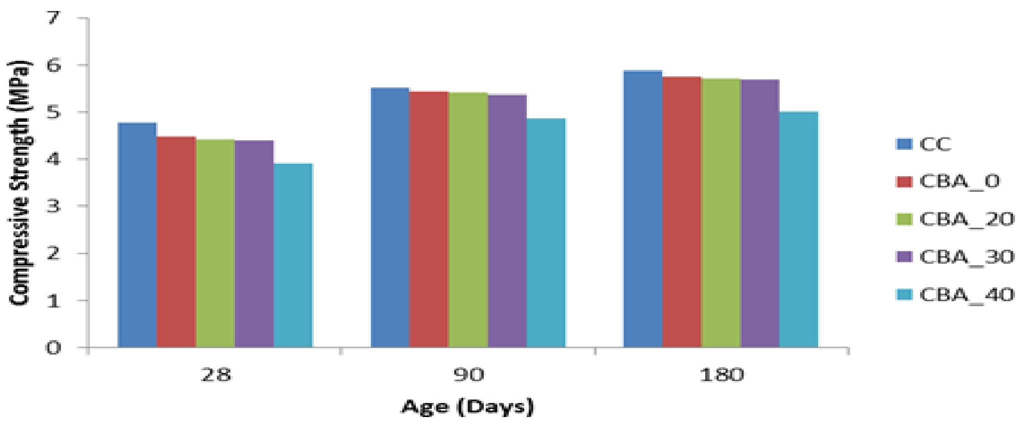

Figure 5: Splitting tensile strength of CBA mixes

- **Flexural Strength of Cba Based Concrete**

This section examined the flexural strength of concrete mixtures based on CC and CBA at various curing times. The flexural strength values of concrete produced with CBA that has been partially replaced are shown in Table 4.4.

Table 6: Flexural Strength of CBA Based Concrete

Mechanicalproperty	Age (days)	Mix type				
		CC	CBA _0	CBA _20	CBA _30	CBA _40
Flexural strength (MPa)	28	4.78	4.48	4.42	4.39	3.92
	90	5.52	5.44	5.41	5.38	4.87
	180	5.87	5.76	5.71	5.68	5.01

The above base powder solid blends CBA_20, CBA_30, and CBA_40 achieved flexural quality estimates of 4.42 MPa, 4.39 MPa, and 3.92 MPa, respectively, at 28 days of curing age, which were lower than those of CC and CBA_0 cement blends. As time went on, base powder solid mixes' flexural quality improved more quickly than control cement's did.

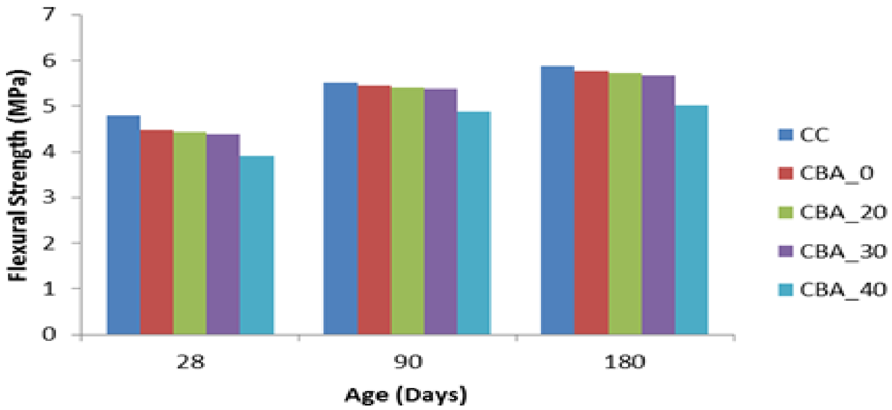

Figure 6: Flexural strength of CBA mixes

The base cement blends CBA_20, CBA_30, and CBA_40 achieved flexural quality estimates of 5.41 MPa, 5.38 MPa, and 4.87 MPa, respectively, after 90 days of curing age, which were all lower than those of the CC and CBA_0 cement blends. The base powder solid blends CBA_20, CBA_30, and CBA_40 achieved flexural quality estimates of 5.71 MPa, 5.68 MPa, and 5.01 independently less than that of the CC and CBA_0 cement blends after 180 days of curing age. From the information above, it is obvious that the improvement in base fiery debris cement's flexural quality with increasing curing time is trustworthy and significant.The findings demonstrate that the mechanical characteristics of CBA_30 and M 25 are nearly equivalentThe mechanical characteristics were substantially reduced by the subsequent increase in CBA substitution due to the solid mix CBA_40. In order to obtain the desired 28-day quality of CC and CBA_0, it might then be advised to use CBA at a 30% halfway substitution of fine total. The assembly of the M 25 evaluation of cement can be justified by suggesting a 30% substitution of CWR in the coarse total and a 30% substitution of CBA in the fine total.

D. Conclusions

This section condenses the general conclusions drawn from the examination of solid utilizing coal base fiery remains as incomplete substitution of fine total.

In light of the test outcomes, the accompanying conclusions are drawn:

- The solid blends CWR_20 and CWR_30's 28-day compressive quality is equivalent to the M 25 evaluation of CC.
- Due to the solid mixes CWR_40 and CWR_50, the additional substitution of CWR completely reduced the qualitative attributes.
- As a result, it might be advised to use CWR at a 30% fractional substitution of coarse total in order to obtain the desired estimates of CC.
- At all ages, the M 25 evaluation of CC and CBA_0 and the compressive quality estimates of CBA_30 are virtually equal.
- The further increment in substitution of CBA diminished the compressive quality values fundamentally as on account of the solid blend CBA_40.
- From the outcomes is seen that the mechanical properties of CBA_30 are tantamount to that of M 25 evaluation of CC and CBA_0 at all ages.
- Hence, it can be prescribed to utilize CBA at 30% fractional substitution of fine total so as to achieve the fancied 28day quality of CC and CBA_0.
- It can be reasoned that 30% substitution of CWR in coarse total and 30% substitution of CBA in fine total can be suggested in the assembling of M 25 evaluation of cement.

E. Future Work

Taking into account the examination of this venture, the future work incorporates:

- Study on sturdiness properties of CBA based cement blends.
- Keeping in perspective of the accessibility of common assets and natural viewpoints, it is prescribed to supplant some rate of sand with CBA and slag in CBA based cement blends and concentrate all solidified and solidness properties.
- Study on small scale level properties of CBA based cement based.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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