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To Study Experimental work on Waste Sand Material in Concrete

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ABSTRACT: Sand provides volume at low cost, comprising 25 percent to 30 percent of the concrete. With increasing concern over the excessive exploitation of natural and quality sand, the sand produced from industrial wastes being viable new source for building material. This study was carried out to determine the possibilities of using Boiler Waste Sand as Fine Aggregate in Concrete. Utilizing boiler sand as fine aggregate in concrete production not only solves the problem of disposing this solid waste but also helps conserve natural resources. In this paper, the physical properties boiler sand of aggregate are presented. The fresh concrete properties such as 28-day compressive strength of a concrete made with boiler sand as fine aggregate also presented. The findings indicated that water absorption of boiler sand aggregate is about 6 % . The average fresh concrete density and 28-day cube compressive strength of the concrete using boiler sand were 31.1 N/mm² respectively. It is concluded that boiler sand are suitable when it is used as substitute for conventional sand in lightweight concrete production.

KEYWORDS: Boiler waste sand, plane concrete, Concrete Cube etc..

I. INTRODUCTION

Research concerning the use of by-products to augment the properties of concrete has been going on for many years. in the recent decades, the efforts have been made to use industry by-products such as fly ash, silica fume, ground granulated blast furnace slag, glass cullet, etc. in civil construction. the potential application of industry by- products in concrete are as partial sand replacement or as partial cement replacement, depending on their chemical composition and grain size. the use of materials in concrete comes from the environmental constraints in the safe disposal of these products.

Big attention is being focus on the environmental and safeguarding of natural resources and recycling of waste materials. Actually many industries are producing a significant number of products which incorporate scrap. in the last 20 years a lot of work concerning the use of several kinds of urban waste in building materials industries process have been published. many research have been extended to study new kinds of waste to investigate deeply particular aspects. the addition of waste apart from the environmental benefits, also produces good effects on the properties of final products.

One of the new waste materials used in the concrete industry is boiler sand. For solving the disposal of large amount of boiler sand, reuse of sand in concrete industry is considered as the most feasible application. sand can be used as the fine aggregate in concrete. However, it is important underline that re-using of waste is not yet economically advantageous, due to the high costs of transport and its effects on the total costs of production.

Concrete the most broadly used construction material aggregate makes 70% of its volume is the principal component material in concrete production and consumes globally 8–12 million tons of natural aggregate annually The aggregate classifications used are course aggregate with 4.75 mm particle size or more and fine aggregate with 4.75 mm particle size or less.

II. RELATED WORK

BOILER WASTE SAND SPECIAL CHARACTERISTICS

- Accurately Screened Material Free From Dust and Fines
- Perfect Particle Size Distribution
- No Over Sized Particles



- Resistant Against Clinker Formation
- Perfect in Obtaining Smooth Fluidization
- Exceptional Chemical Purity
- High I.D.T (Initial Deformation Temperature)
- Very Low Alkali Contents
- No Free Iron Particles – Processed Through Magnetic Separators
- Perfectly Controlled Material Density

PERFORMANCE

Zero Wastage – Low Consumption

Fully Screened Material and Perfect Particle Size Distribution, Free from fines, dust and Over size particles eliminate wastage and reduce Consumption of material including no free flow or wastage in air during operation.

Uniform Heat

Intermediate Particle Distribution of the product in required percentage as per boiler size, height and design leads to perfect conductivity of heat in the boiler.

Resistant against Clinker Formation

The Low ferric chemical property and High Initial Deformation Temperature (PCE value) makes it highly resistant to abrasion and an ideal product against clinker formation at high temperatures.

Safest Product for Boiler Tubes

Exceptional Chemical Purity, low alkalis and moderate alumina contents of the material make it neutral in chemical nature having no chemical reaction with boiler tubes and carbon fuel. These special chemical properties increase efficiency and life span of boiler tubes as well as refractory lining.

Economy of Product

- The product is excellent in operational properties and performance.
- It is highly economical in use in comparison to materials processed from low temp. Ceramic waste.
- Parth Minerals bed material offer phenomenal saving of over 40-50% on account of perfect size, low wastage, chemical purity, high refractoriness and heat conductivity.
- The smooth operational properties and extensive particle life of the material results in low downtime.
- The material is most suitable for recycling in certain conditions on account of its very special feature of refractoriness.

Chemical Properties Of Boiler Sand

- Alumina - 30 -40 %
- Silica 50-60%
- Alkali less than 3%
- Iron less than 3.5%
- Moisture less than 1%

Physical Properties of Boiler Sand

- Bulk density 1500-1800kg/m³
- Initial deformation temperature 300

III. METHODOLOGY

TEST ON BOILER WASTE SAND

- Sieve Analysis
- Specific Gravity
- Water Absorption
- Impurity Test

SIEVE ANALYSIS: Sieve analysis helps to determine the particle size distribution of the coarse and fine aggregates. This is done by sieving the aggregates as per IS: 2386 (Part I) – 1963. In this we use different sieves as standardized by the IS code and then pass aggregates through them and thus collect different sized particles left over different sieves. The size of aggregate particles differs from aggregate to another and for the same aggregate the size is different so in the test we will determine finesse modulus of aggregate the finesse modulus of boiler bed material is 3.28

SPECIFIC GRAVITY: Specific gravity is defined ratio of weight of unit volume of sand to the weight of an equal volume of water specific gravity express the density of the solid fraction of sand in concrete mixes as well as to determine the volume of pores in the mix. The specific gravity of sand is to determine the volume of sand in concrete mix as well as to determine volume of pores in the mix Specific gravity of boiler waste sand is 2.47% Specific gravity is a measure of a material's density (mass per unit volume) as compared to the density of water at 73.4°F (23°C). Therefore, by definition, water at a temperature of 73.4°F (23°C) has a specific gravity of 1. Absorption, which is also determined by the same test procedure, is a measure of the amount of water that an aggregate can absorb into its pore structure. Pores that absorb water are also referred to as "water permeable voids". Specific Gravity is the ratio of the weight of a given volume of aggregate to the weight of an equal volume of water. Water, at a temperature of has a specific gravity of .

Specific Gravity is important for several reasons. Some deleterious particles are lighter than the "good" aggregates. Tracking specific gravity can sometimes indicate a change of material or possible contamination. Differences in specific gravity may be used to separate the deleterious particles from the good using a heavy media liquid. Specific gravity is critical information for the Hot Mix Asphalt Design Engineer. This value is used in calculating air voids, voids in mineral aggregate (VMA), and voids filled by asphalt (VFA). All are critical to a well performing and durable asphalt mix. Water absorption may also be an indicator of asphalt absorption. A highly absorptive aggregate may result in a low durability asphalt mix. In Portland Cement Concrete the specific gravity of the aggregate is used in calculating the percentage of voids and the solid volume of aggregates in computations of yield. The absorption is important in determining the net water-cement ratio in the concrete mix. Knowing the specific gravity of aggregates is also critical to the construction of water filtration systems, slope stabilization projects, railway bedding and many other applications. This test method determines the specific gravity of fine aggregates that have been soaked for a period of 15-19 hrs.

Table no:- 3.1 Comparison Of Nature Sand And Boiler Bed West Material

Aggregate	Sieve analysis	Water absorption	Impurities	Specific gravity
Sand	3.3	6%	7%	2.36
Boiler Waste Sand	3.082	2.66%	6.25%	2.29

PREPARATION OF CONCRETE CUBE

Preparation of standard concrete mould of size 15cmX15cmX15cm of M25 grade concrete and material required for casting of 1 mould is calculated by mix proportion the material requirement is 2kg of cement, 2kg of sand, 4kg of aggregate and water cement ratio 0.5% and mix by hand mixing method and is kept for curing 14 days and 28 days
Five percentage replacement:- preparing of concrete mould by replacing natural sand by boiler waste sand 5% of total volume of natural sand and same 10%,15%,20%,25%,30%,35%,40%

COMPRESSION TEST ON CUBE

Compressive strength is the capacity of a material or structure to withstand loads tending to reduce size, as opposed to tensile strength, which withstands loads tending to elongate. In other words, compressive strength resists compression (being pushed together), whereas tensile strength resists tension (being pulled apart). In the study of strength of materials, tensile strength, compressive strength, and shear strength can be analyzed independently. Some materials fracture at their compressive strength limit; others deform irreversibly, so a given amount of deformation may be considered as the limit for compressive load. Compressive strength is a key value for design of structures.

Compressive strength of concrete cube test provides an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not. Concrete compressive strength for general construction varies from 15 MPa (2200 psi) to 30 MPa (4400 psi) and higher in commercial and industrial. Compressive strength of concrete depends on many factors such as water-cement ratio, cement strength, quality of concrete material, quality control during production of concrete etc. Test for compressive strength is carried out either on cube or cylinder. Various standard codes recommends concrete cylinder or concrete cube as the standard specimen for the test. American Society for Testing Materials ASTM C39/C39M provides Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

IV. EXPERIMENTAL RESULTS

Table: Result Of Compression Test Conducted On Concrete Cube

Sr. No.	Replacement	Curing Period	Compressive Strength sample (N/mm ²)	Sample 2 (N/mm ²)	Sample 3 (N/mm ²)	Average (N/mm ²)
1	0	14	30	29	27	28
	0	28	34	37.1	36	35
2	5	14	30	29.4	32	30.5
	5	28	36.3	35.9	37	36
3	10	14	30.1	30	31.7	30
	10	28	34	36	37	35
4	15	14	29	28.4	29.4	30
	15	28	31.3	32	30.5	35
5	20	14	29.2	28.1	27.8	28.4
	20	28	30.1	32.1	30.3	30

V. CONCLUSION

The compressive Strength of Concrete increases up to 15 % replacement of sand with Boiler Sand and thereafter compressive strength goes on decreasing for further replacement percentage. The compressive strength of concrete with 15% replacement for 14 days (29 N/mm²) and 28 days (34 N/mm²) more as compared with compressive strength of standard concrete with 0% replacement for 14 days (28 N/mm²) and 28 days (36 N/mm²). Boiler sand is cheaper as compared with Natural Sand and Crushed Sand.

REFERENCES

- [1] D.A.R. Dolage, M.G.S. Dias, C.T. Ariyawansa, Offshore sand as a fine aggregate for concrete, Production 3 (2013) 813–825. E.S. Winkler, A.A. Bol'shakov, Characterization of Foundry Sand Waste, Chelsea, Massachusetts, 2000.
- [2] R. Siddique, G. De Schutter, A. Noumowe, Effect of used-foundry sand on the mechanical properties of concrete, Constr. Build. Mater. 23 (2009)
- [3] S.P. Oudhia, An Overview of Indian Foundry Industry, Metalworld. (2015) R. Siddique, G. Singh, Utilization of waste foundry sand (WFS) in concrete manufacturing, Resour. Conserv. Recycl. 55 (2011)
- [4] R. Siddique, A. Noumowe, Utilization of spent foundry sand in controlled low-strength materials and concrete, Resour. Conserv. Recycl. 53 (2008)



- [5] G. Kaur, R. Siddique, A. Rajor, Influence of fungus on properties of concrete made with waste foundry sand, J. Mater. Civil Eng. 25 (2013)
- [6] T.R. Naik, Foundry industry by-products utilization, (1989). E.A. Dayton, S.D. Whitacre, R.S. Dungan, N.T. Basta, Characterization of physical and chemical properties of spent foundry sands pertinent to beneficial use in manufactured soils, Plant Soil 329 (2010)
- [7] J.M. Khatib, D.J. Ellis, Mechanical properties of concrete containing foundry sand, ACI Spec. Publ. 200 (2001) R. Siddique, Y. Aggarwal, P. Aggarwal, E.H. Kadri, R. Bennacer, Strength, durability, and micro-structural properties of concrete made with, Constr. Build. Mater. 25 (2011)
- [8] Y. Aggarwal, R. Siddique, Microstructure and properties of concrete using bottom ash and waste foundry sand as partial replacement of fine aggregates, Constr. Build. Mater. 54 (2014)
- [9] F.A. Olutoge, S.O.A. Olawale, M.A. Gbadamosi, Strength behavior of concrete produced with foundry sand as fine aggregate replacement, Int. J. Emergency Adv. Eng. 5 (2015)
- [10] T.R. Naik, R.N. Kraus, B.W. Ramme, F. Canpolat, Effects of fly ash and foundry sand on performance of architectural precast concrete, J. Mater. Civil Eng. (2012)



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