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Partial Replacement of Fine Aggregate by using Lead Powder and Eggshell Powder

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Abstract: This project about the suitable replacements of fine aggregate as to reduce problems of remedy for Nuclear Radiation emitted areas. Therefore, To create sustainable environment, To provide corrosion resistant to internal reinforcement and reduce emission of CO₂. Thus way cause eco-friendly environment. In India, The waste generated from the Nuclear Power Plant cause environmental problems. Hence the material is the waste material extracted from the Nuclear power plant exhibit some harmful radiation. The lead powder and eggshell powder both of them where partially replacement of fine aggregate. It generate economic benefits and build structures and it leads to global warming due to use of concrete.

Keywords: Lead powder, Egg shell powder, Replacement, Utilization, Waste management

I. INTRODUCTION

Electricity is a basic need for survival, approximately 80% of CO₂ emits in the atmosphere from the thermal power plant due to the burning coal. So, we adopt Renewable and Eco friendly sources such as Solar energy, Wind energy, Nuclear power plant etc. In Nuclear power plant, the structure alone nuclear fuel is called as confinement Structure. In Confinement structure, the width of the wall of structure is about 2 to 3m width however a structure is not safe and cost of construction is high. Among that, cement concrete is an heat emitting material in the form of CO₂ in these conditions ordinary concrete may fail to prevent the heat emission. In such cases, Proportion of concrete was modify the properties of ordinary concrete so as to make it more suitable for any situation. Lead powder is one such admixture.

The metal flows into a gas jet that has been heated to about 2000c and is dispersed into small particles up to a few microns in size. Lead powder is also used as the basis for some corrosion resistant paints. Lead oxides are used in producing fine “crystal glass” and “flint glass” of a high index of refraction for achromatic lenses. However, the lead powder is durable, hard and highly resistant to biological, chemical and physical degradation forces. In 2019, the annual global production of lead was about ten million tonnes, over half of which was from recycling.

Egg shell waste is fundamentally composed of calcium carbonate, and has the potential to be used as raw material in the production of lime. The alternate material in our project used was powdered Eggshell. In the present study, these Eggshell powder is used as a partial replacement of cement and various properties like workability, compressive strength, split tensile strength and flexural strength were determined.

II. LEAD POWDER

Lead is a heavy metal with a high toxicity. Lead is toxic at very low exposure levels and has acute and chronic effects on health and the environment. Lead is not degradable in nature and will thus, once released to the environment, stay in circulation. New releases add to the already existing deposits of lead in the environment. Lead is highly toxic to humans and has no known beneficial effects in the body.

It can effect the nervous system, the reproductive system, and the heart and blood system. Even the lowest doses can impair the nervous system.

Chronic low exposure is of concern. Lead accumulates in the bone structure in humans, and can be released under pregnancy from the bone structure to the blood. In the environment lead is known to be toxic to plants, animals and microorganisms. Lead bio accumulates in the skeleton and wet tissue in mammals and in aquatic algae and invertebrates.

III. EGG SHELL POWDER

A. General

The chemical composition of Eggshell powder and cement were found to be similar. The main component of eggshell was calcium carbonate (around 51%). Eggshell waste been evolved from poultry farms, restaurants and hotels. These wastes are used in animal feeds and in many countries they are thrown off. Such waste are collected and implemented in our project.

B. Processing

The processing of egg shell powder is given in sequence (1) Material collection , (2) Mixing of lead Powder with fine aggregate in optimum proportion, (3) Grinding and powdering of Egg shell, (4) Sieving of Eggshell powder in sieve, (5) Mixing of Eggshell powder with fine aggregate. The sieving of Eggshell powder is done in 75 micron sieve. The residues retained were supplied for fertilizer industries and animal feed production industries.

IV. DESIGN AND TESTS

A. Mix Proportion

Our project is proposed of M20 grade of concrete and the mix design was based on IS 10262-1982 and IS 383 -1970 codal provisions. The mix proportion arrived was 1:1.1:2.33 (cement : fine aggregate : coarse aggregate)

B. Water Absorption Test

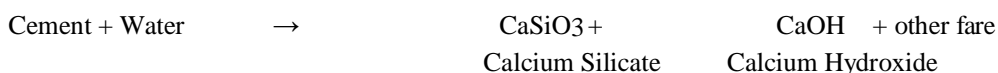
Water absorption test was carried out for 7th day saturated cube specimen and oven dried specimen .The water absorption of the specimen was 7 % to 9% (for several specimens)

C. Compressive Strength Test

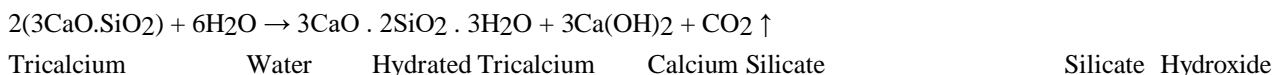
The compressive strength were tested for concrete cubes of dimension 150 x 150 x 150 mm. The test was carried in compressive test machine of capacity 2000KN. In compressive strength test the loading rate was 100KN/s. The compressive test was conducted on 150mm cube specimens at 7thday and also to be done on 28th day.

V. RESULT AND DISCUSSION

A. Chemical Reaction

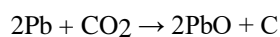


Ex:



Plumbosolvency Reaction

Plumbosolvency is the ability of a solvent, notably water, to dissolve lead.



Reduction

B. Tables

Table 1 Physical Properties of Lead

Description	Value
Moisture Content	207.2
Appearance	Bluish white
Melting Point	327.502 ⁰ c
Boiling point	1740 ⁰ c
Density	11.35 g/cm ³
Electricity	20.648 Ω

Table 2 Chemical Properties of Egg shell powder

	Cement	Eggshell Powder
Al ₂ O ₃	4.8	0.03
SiO ₂	21.8	0.08
Fe ₂ O ₃	3.8	0.02
Cao	63.3	55.85
Other	-	0.62
Specific gravity	3.15	2

Table 3 Compressive Strength Result

Percentage of lead powder and ESP added(%)	Trial No	Comp.strength of 7 th days N/mm ²
10(LP) + 10(ESP)	1	23.44
	2	24.78
	3	25.3
15(LP) + 10(ESP)	1	23.67
	2	24.33
	3	25.09
20(LP) + 10(ESP)	1	24.12
	2	25.26
	3	25.92
30(LP) + 10(ESP)	1	24.2
	2	25.65
	3	26.5

C. Figures



Fig 1. Compression test



Fig 2. Lead Powder



Fig 3. Eggshell Powder

VI. CONCLUSION

The results which came after carrying out all tests found successful which indicates that Lead and eggshell powder can be used as a replacement material for fine aggregate. From the results it is proved that replacement of lead and eggshell powder if about 20 % to 30 % is effective and when we increasing further the percentage of lead and eggshell powder increases the compressive strength.

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