

EFFECT OF COPPER SLAG AS A FINE AGGREGATE ON PROPERTIES OF CONCRETE

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ABSTRACT

An investigation concerning the impact of copper slag as a fine mixture has been administered to seek out the strength, workability and sturdiness. Copper slag is associate industrial by-product material created from the method of producing copper. For, 2.2 tonnes of copper slag is generated at each ton of copper production within the world of copper trade, it's around 26.6 million a lot of copper slag are generated. Copper slag as a substitute for typical fine mixture with partial or full victimization M20 grade concrete. During this paper, the impact of victimization copper slag as a fine mixture on properties of concrete mixtures were ready with completely different properties of copper slag 10 & 20%. Concrete cubes were ready and tested for strength when 7 & 28 days of hardening.

INTRODUCTION:

Copper slag may be a industrial product obtained throughout the matte smelting and purification of copper. Within the work copper slag used hence it's associate degree industrial by product profusely offered close to copper manufacturing industries having similar physical & chemical; properties of sand, through about as another to the stream sand. Copper slag possesses physical mechanical and chemical characteristics that qualify the fabric to be utilized in concrete as a partial replacement for cement or as a substitute for fine aggregate. As an example, copper slag encompasses a variety of

favorable mechanical properties foe mixture use like wonderful soundness characteristics, sensible abrasion resistance and good stability reportable by (Gloria et al). Copper slag additionally show pozzolonic properties since it ingredient low Cao beneath activation with NaOH, it will show building material property, used as partial or full replacement for cement. The usage of copper slag for applications like cement replacement in concrete, or as stuff has the advantage of lowering the value of the concrete and facilitate in protective the setting. During this work, an intensive study victimization

copper slag has been distributed to analyze strength, workability and sturdiness. The try is created to prove all told respect the usefulness, sturdiness and economy in experimental study is structurally satisfactory. The tactic adopted has relevancy to real social wants that are accessible, reasonable and empowering. It results to save lots of natural resources.

MATERIALS:

CEMENT

Portland cement (often named as OPC) is that the commonest forms of cement normally use round the world as a result of it's a basic ingredient of concrete, mortar, stucco and most non specially grout. It's a fine powder made by grinding cement clinker (which controls the set time) and up to five minor constituents. Cement clinker may be a hydraulic material that shall consists of a minimum of simple fraction by mass of metallic element silicates (3CaO , SiO_2 and $2\text{CaO}\cdot\text{SiO}_2$), the consisting of Al and iron containing clinker phases and alternative compounds. The magnitude relation of cao to sin, shall not be but a pair of 0.0 the atomic number 12 content (Mg) shall not exceed 5.0% by mass.

COPPER SLAG:

Copper slag may be a industrial product obtained throughout the matte smelting and purification of copper. Within the work copper slag used hence it's associate degree industrial by product profusely offered close to copper manufacturing industries having similar physical & chemical; properties of

Sand, thought-about as another to the stream sand.

Copper slag possesses physical mechanical and chemical characteristics that qualify the fabric to be utilized in concrete as a partial replacement for cement or as a substitute for fine aggregate.



AGGREGATES:

Aggregate, or just "aggregate", may be a broad class of coarse particulate material utilized in construction, together with sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates. Aggregates are the foremost mined materials with in the world. Aggregates are a part of materials like concrete and asphalt concrete; the combination is reinforcement to feature strength to the composite material.

GRADE OF CONCRETE:

Among several properties of concrete, the compressive strength of concrete is that the commonest performance live employed by the engineer in style buildings and structures. Compressive strength check results are primarily wont to verify that the concrete mixture as delivered meets the necessities of the required strength with in

the job specification. IS-456 of 2000 has given some grades M5, M7.5, M10, M15, M20, M25, M30, M35, etc. In the designation of concrete combine, letter M refers to combine and therefore the variety adjacent to that refers to the required characteristic compressive strength of 150 mm cube at 28 days in N/mm^2 .

WATER:

Compared to alternative ingredient of concrete the standard of water typically receives less attention. Potable water is usually thought about satisfactory for mixture concrete. significantly in remote areas or wherever water comes from sources, not usually used for domestic functions, such water ought to be nested, the permissible limits for solids and impurities for commixture and action water as per specification together with IS 456-1978 are in far more than the necessities of potable water.

TEST ON FINE MIXTURE

Specific gravity:

Pycnometer is that the equipment used for determinant the precise gravity check.

Empty Wt. of pycnometer (W1) = 0.462 Kg.

Empty Wt. of pycnometer + $1/3^{rd}$ mixture (W2) = 0.844 Kg.

Empty Wt. of pycnometer + $1/3^{rd}$ mixture + $2/3^{rd}$ water (W3) = 1.495 Kg.

Empty Wt. of Pycnometer + water (W4) = 1.268Kg

Specific gravity of fine mixture = 2.46

TESTS ON COPPER SLAG

Specific gravity:

Pycnometer is that the equipment used for determinant the precise gravity check

Empty Wt. of Pycnometer (W1) = zero.460Kg

Empty Wt. of Pycnometer + $1/3^{rd}$ mixture (W2) = zero.700Kg

Empty Wt. of Pycnometer + $1/3^{rd}$ mixture + $2/3^{rd}$ water (W3) = 1.060 Kg

Empty Wt. of Pycnometer + water (W4) = 1.154Kg

Specific gravity of fine mixture = 0.71

MIX PROPORTIONS:

Grade of concrete: M20

Mix proportion: 1:1.5:3

For one cube 10% of copper slag

Cement:1.4kg

Fine aggregate:1.98kg

Copper slag:220grams

Coarse aggregate:4.4kg

For one beam 10% of copper slag

Cement:2.18kg

Fine aggregate:3kg

Copper slag:327grams

Coarse aggregate:6.54kg

For one cylinder 10% of copper slag

Cement:2.18kg

Fine aggregate:3kg

Copper slag:327grams

Coarse aggregate:6.54kg

SLUMP TEST:

It is the foremost normally used technique of mensuration consistency of concrete which might be used either in laboratory or website work. It's not an appropriate technique for terribly wet or dry concrete. It does not live all the factors causative to workability because it continuously representative of the placibility of concrete it's used handily as an impact check and offers on indication of the uniformity of concrete from batch to batch distinction with in the level between the peak of the mould and highest purpose of the subsided concrete is measured. The distinction in millimeter.

COMPRESSIVE STRENGTH:

This check is completed to see the compressive strength of concrete IS 516-1959. It's the foremost common check conducted on hardened concrete, partially as a result of it's a simple check to perform, and partially as a result of most of the fascinating characteristic properties of concrete are qualitatively associated with its compression strength.

Table No 1:M20 Grade of Concrete With Proportions of Copper Slag to the Fine Aggregate:

Cube Size: 0.15*0.15*0.15m

Beam Size: 0.15*0.10*0.10m

Cylinder Size: 0.15m Diameter 0.3m Long

FLEXURAL STRENGTH:

Flexural strength, additionally called modulus of rupture, bend strength, or fracture strength, a mechanical parameter for brittle material is outlined as a material' stability to resist deformation beneath load. The crosswise bending check is most often used, during which a specimen having either a circular or rectangular cross- section is be tillfracture or yielding victimization attest technique. The flexural strength represents the best stress knowledgeable about among the fabric at its moment rupture. it'smeasured in terms of stress, here given the image.

SPLIT TENSILE STRENGTH:

Enduringness is one amongst the essential and vital properties if concrete. A information of its worth is needed for the design if concrete structural components. A technique of determinant the enduringness of concrete employing a cylinder that splits across the vertical diameter it's associate degree.

S.NO	MIX TYPE	COMPRESSIVE STRENGTH (N/mm ²)		FLEXURAL STRENGTH (N/mm ²)		SPLIT TENSILE STRENGTH (N/mm ²)	
		7 days	28 days	7 d4ays	28 days	7 days	28 days
1	10%	33.4	40	2.1	5.4	2.12	3.97

2	20%	36	42.2	2.5	5.7	2.55	3.05
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CONCLUSION:

The subsequent conclusions are drawn concerning the employment of copper slag as a fine mixture in concrete:

For concrete, all mixtures with totally different copper slag proportions yielded comparable or higher compressive strength than the strength of the management mixture. There is 5 increase with in the concrete density, once copper slag was used as a sand replacement, whereas the workability magnified considerably with a

rise in copper slag content. This was attributed to the tide absorption and glassy surface of copper slag.

The compressive, tensile and flexural strength of concrete with partial replacement of copper slag up to fiftieth may be equivalent to the management combine.

It's determined that once increasing proporti on replacement of fine mixture by copper slag the unit weight of concrete is bit by bit will increase.

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