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Partial Replacement of Cow Dung With Cement

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Abstract- **This research project presents the result on the study for the use of Cow Dung Ash (CDA) as partial replacement in production of concrete. The experiments were designed to study the effects of adding Cow Dung Ash (CDA) in various percentages by weight (10%, 13%, 16% and 20%) of cement and cure for the periods of 7, 14, and 28 days respectively before testing for the Compressive strengths. It also involves determination of setting time, Bulk Density, and Workability of Cow Dung Ash in various percentages by mixing with Portland cement. The Compressive test results are 22.00 N/mm2, 20.22 N/ mm2, 19.55 N/mm2, 13.78 N/mm2 and 12.13 N/mm2 for 0%, 10%,13%, 16% and 20% replacement of cement with CDA respectively at 28 days. The Workability results gives 112mm, 127mm, 130mm, 72mm and 80mm respectively for 0%, 10%, 13%, 16% and 20% replacement of cement with CDA. Test results indicated that the consistency limits increased up to an optimum content and decreased further with the increase in the % of CDA in cement. CDA has an advantage that offers lightness of weight and low thermal conductivity, Cow Dung Ash concrete is recommended for use only when a thirteen percentage (13%) of Cow Dung Ash is added.**

Keywords **– Compressive Strength, Consistency, Cement, Cow dung ash, cement concrete, Ordinary Portland Cement (OPC), bulk density; workability.**

I. INTRODUCTION

Portland bond is a fundamental element of solid, mortar and most non-claim to fame grout. The most widely recognized use for Portland bond is in the creation of cement. Concrete is a composite material comprising of total (rock and sand), bond, and water. As the interest for concrete as a development material increments, so additionally the interest for Portland bond. It is assessed that the generation of bond will increment from about from 1.5 billion tons in 1995 to 2.2 billion tons in 2010. As a development material, cement can be thrown fit as a fiddle wanted, and once solidified, can turn into an auxiliary (load bearing) component.

Portland concrete might be dim or white. Numerous scientists have utilized diverse materials as interchange to bond in concrete.There is requirement for reasonable structure materials in giving sufficient lodging to the joining masses of the world. The expense of regular structure materials keeps on expanding as most of the populace keeps on falling underneath the destitution line.

In this way, it is important to utilize a beneficial nearby material as option for the development of minimal effort structures in both rustic and urban zones. An immense measure of cement is devoured by the development business. The generation of Portland bond isn't just expensive and vitality serious, however it additionally delivers a lot of carbon outflow. The creation of concrete postures ecological issues because of discharge of vaporous contaminations. Cow excrement is the undigested buildup of plant matter which originates from dairy animals gut. In cow dung nitrogen, calcium, carbon, potassium, and phosphorus have a high substance. Around 10-15 kg dairy animals compost is delivered by a cow in multi day, which contains about 28% water in new state. 34% of dairy animals excrement progresses toward becoming cinder when it is singed. In the present examination, concrete was supplanted by cow dung fiery debris by 10%, 13%, 16%, and 20%.

II. SCOPE AND OBJECTIVES OF THE STUDY

The fundamental extents of the investigation are : • To look at the viability of utilizing CDA as incomplete substitution of concrete by considering quality parameters. • To utilize locally accessible material and to decrease the expense of delivering concrete. • To conquer the issues looked by bond ventures to a little degree. The trial examination was proposed to work out the

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reasonableness of expansion of dairy animals excrement fiery debris as halfway substitution of normal Portland bond in cement with the accompanying destinations :

- To research the compressive quality of cement with CDA to that of typical cement.
- To get ready high quality, eco-accommodating and financially savvy concrete.
- To decrease the measure of warmth vitality and take out hurtful gases discharged because of unnecessary utilization of concrete in development industry.

III. MATERIALS

The materials utilized in this examination included conventional Portland concrete, cow dung, sand, fine total, coarse total, water and lime.

1. Cow Dung - This is gotten from the cow excreta. It was sun-dried and grounded to fine powder structure like concrete. The grounded cow dung particles were sieved through 475microns and utilized for solid generation moving forward without any more treatment. The rate substitutes for bond were fluctuated from 0%, 10%, 13%, 16% and 20%. The cow compost was acquired.

Fig. 1 - Cow Dung Ash

Fig. 2 - Aggregates

2. Cement- Portland cement was utilized for this examination work and it was found to affirm with the prerequisites of IS 10262:(2009).

3. Water- The water utilized for this work is consumable, perfect and free from any unmistakable polluting influences. It affirmed to IS 10262:(2009).

4. Fine Aggregates- The fine totals utilized for this work is stone residue. It was held on a 600microns sifter. The contaminations were expelled and discovered affirmed to the necessities of IS 10262:(2009).

5. Coarse Aggregates- The coarse totals utilized for this work of size 20mm. They are free from flotsam and jetsam and different pollutions. They are precise fit as a fiddle.

IV. CONCRETE MIX DESIGN

The Concrete of M-20 grade was made using Fine and Coarse aggregate with a mix proportion of 1:1.85:3.2 and Water-Cement ratio of 0.5.

V. METHODOLOGY

1. Sieve Analysis Test - Sieve analysis test is the partition of aggregate into portion. Each portion comprises of particles with an explicit point of confinement, these being openings of standard test sieves. The CDA was put in BS sieve which has sieves mount in the edge so they are placed on one over the other with substantial sieve estimate at the top and the littlest at the base. The material is poured from the top and the sieve is given a vivacious shake precisely. After shaking the material held on BS sieve speak to the capacity of the fine aggregate.

2. Bulk Density - The CDA aggregates are delicately brought into the metal mould to overflow and after that dimension rolling a pole over the top to level it. Care is taken beyond what many would consider possible isolation of the extent of the example is compacted. The net load of the aggregate in the form is used to decide the density in kg/m3. The bulk density by this technique is free or uncompacted density.

3. Water Absorption Test - Specific Gravity is the proportion of the heaviness of a given volume of aggregate to the heaviness of an equivalent volume of water. It is the proportion of strength or nature of the particular material. Aggregates having low specific gravity are commonly flimsier than those with higher specific gravity esteems.

4. Workability Test - Characterizes workability as the simplicity with which concrete mix can be handled from the mixer to it's at last compacted shape. Estimation of workability can be through slump test, compacting factor test, veebe time test, for this exploration, slump test was received on the grounds that it is the most reasonable for quality control reason.

The slump cone was held down against it base with the little opening at the top. It was loaded up with the new concrete in the three layers being altered 25 times with the assistance of a standard 16mm distance across steel bar adjusted at the base end. The highest point of the cone was hit off with a trowel and the spilt concrete around the base of the cone was cleaned up. The cone was lifted gradually, the decrease in stature (slump) between the cone form and conveyed concrete shape were estimated.

5. Compressive Strength Test - Steel shape of cast iron of measurement 150mm x 150mm x 150mm is utilized for casting an aggregate of 15 concrete cubes of 0%, 10%, 13%, 16% and 20% supplanting of cement with CDA individually. The form and its based are unbendingly clasped together in order to decrease spillage amid casting. The sides of cubes are meagrely oiled before casting in order to anticipate the advancement of bond between the concrete and the form. Stipulates that the cubes ought to be filled in three layers is compacted by 25 strokes of 25mm square

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inches steel. The smashing is done proficiently to guarantee full compaction. The cubes are cleaned of abundance concrete by passing an iron in a sawing movement over the highest point of the cubes. The free surface is get done by utilizing hand trowel.

The cubes are put away 24 hours undisturbed at temperature 18 oC to 22 oC and relative mugginess of at the very least 90%. The shape is peeled off following 24 hours and the cubes are to be put away in water for restoring in a relieving tank at 19 oC to 21 oC. Toward the finish of the test, the cubes are pulverized with the pounded faces in contact with the platens of the testing machine.

States that the heap on the cubes can be connected at the rate of 15 N/mm2/min. The rate of increment in strain is dynamically expanded as disappointment is drawn nearer. This is expected to the non-linearity of the pressure strain relationship for the concrete at high pressure. The quality at disappointment is accounted for to the closest 0.5 N/mm2.

FIG. 3 - SPECIMENS

VI. RESULTS

1. Sieve Analysis Test

Table 1. Sieve Analysis

Sieve Size	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % Weight Retained	Cumulative % Passing
4.75	16	16	3.2	96.8
2.36	65	81	16.2	83.8
1.18	155	236	47.2	52.8
600	136	372	74.4	25.6
300	98	470	94	6
150	20	490	98	2
Pan	10	500	100	0

2. Bulk Density

Table 2 Bulk Density

Sr. No.	Material	Sand	Natural Aggregate	
			10 mm (M_1)	20mm (M_2)
1	Weight of material +Mould (Kg)	9.942	35.555	36.4
2	Weight of Mould (Kg)	4.450	12	12
3	Weight of material (Kg)	5.492	23.555	24.4
4	Volume of mould (m^3)	0.003	0.01473	0.01473
5	Bulk Density (Kg / m^3) = (Weight of material) ÷ (Volume of mould)	1830.67	1599.11	1622.53

3. Water Absorption Test

Table 3 Water Absorption Test

Sr.No.	Material	Sand	Natural Aggregate	
			10 mm (M_1)	20mm (M_2)
a	Weight of material +Water + Jar (Kg)	3.406	3.296	3.276
b	Weight of Water + Jar (Kg)	2.694	2.694	2.694
c	Surface Dry Weight of material (Kg)	1.144	0.956	0.920
d	Oven Dry Weight of material (Kg)	1.138	0.926	0.896
	Specific gravity = d/c-(a-b)	2.634	2.615	2.65
	Water Absorption (%) = (c ÷ d)×100	0.527	0.7	0.8

4. Workability Test

Table 4 Workability Test

% of CDA	Slump (mm)	Slump Type
0	112	True Slump
10	127	True Slump
13	130	True Slump
16	72	True Slump
20	80	True Slump

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5. Compressive Strength Test

Table 5 Obtained Compressive Strength Test

% of Replacement of Cement With CDA	Compressive strength after 7 days (N/mm^2)	Compressive strength after 14 days (N/mm^2)	Compressive strength after 28 days (N/mm^2)
0	14.22	18.00	22.00
10	13.56	17.47	20.22
13	12.89	15.78	19.55
16	10.44	12.00	13.78
20	8.22	10.44	12.13

VII. CONCLUSION

CDA concrete is prescribed for utilizing just when a ten rate (10%) of CDA is included. While the concrete is reasonable for use on certain floor and wall that won't be exposed to heavy load or structures that are of transitory use.

- Cow Dung Ash remains concrete isn't to be used in water amassed zone or for structures that are identified with water.
- Cow Dung Ash remains concrete of high rate over 10% is not reasonable for concrete creation because of the expansion in the powder content.
- The Cow Dung Powder has leverage that offers the delicacy of weight that makes it valuable development material.
- It has genuine restrictions that must be comprehended before it is put to utilize. Inside these restrictions, the benefits of cow dung fiery remains concrete offers the softness of weight, and low warm conductivity makes it a helpful development material.
- This paper chiefly features the hugeness and need of utilization of these waste materials for the assembling of supportable concrete for development of green structures in future.

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