ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Comprasion of Compressive Strength of M20 Grade Fly Ash with Rice Husk Ash Concrete

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ABSTRACT:

In the project we are proposed for mix design for M20 grade concrete by adopting Indian standard method IS 10262-82. The design mix concrete is not simple task on account of the widely varying proper ties of the constituent materials the conditions that prevail at the site of the work in particular the exposure condition, and condition that are demanded for a particular work for which the mix is design .Mix design is the process of selecting suitable ingredients of concrete and determining their relative proportions with the object of producing concrete of certain minimum strength and durability as economically as possible. Design of concrete mix requires complete knowledge of the various properties of these constituent materials, the implications in the case of change on these conditions at the site, the impact of properties of plastic concrete on the hardened concrete and the complicated inter relationships between the variables. Design of concrete mix needs not only the knowledge of material properties and properties of concrete in plastic condition; it also needs wide knowledge and experience concreting. In this project we are used the 43 grade of cement, fly ash and rice husk for mix design of concrete compare the strength of concrete with or without rice husk ash. The design calculations are calculated using Indian standard method IS 10262-82.

1. INTRODUTION:

Earlier notion of using high amounts of cement for concrete has now changed on favor of increased use of high amounts of mineral ad-mixtures and super plasticizers with reduced amounts of cement and water in the concrete mixtures.

Energy plays a crucial role in growth of developing countries, like India. In context of low availability of non-recoverable energy sources coupled with requirements of large quantities of energy to materials like cement, steel etc., the importance of industrial wastes as building materials cannot be underestimated. In India about 110 million tones of fly ash has been produced by 68 major thermal power stations and are likely to be doubled within next 10 years. It has been a published fact from research that waste materials like fly ash; rice husk ash etc, through their use as construction materials can be converted into meaningful wealth. Also, a partial replacement of cement with fly ash is desirable, and indeed essential due to a variety of technical, economical and ecological reasons.. A properly proportional fly ash and rice husk ash in concrete mix improves properties of the concrete that may not be achievable through the use of Portland cement alone. The resulting concrete mix becomes strong, durable and economical and also eco-friendly as it utilizes an ecological hazardous material.

One of the main advantageous of high-volume mineral admixtures in high-strength concrete is reducing the cement content, which has not only economic and environmental benefits but also means reducing heat of hydration and increasing durability properties. As a rule of thumb, the total heat of hydration produced by the pozzolanic reactions involving mineral admixtures is considered to be half as much as the average heat produced by the hydration of Portland cement. To achieve high-strength and workability while reducing creep and shrinkage Chang et al. Using super plasticizers and pozzolona materials in the mix designs of high-performance concrete.

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Use of pozzolona materials can decrease the amount of cement required, thus reducing the occurrence of creep and shrinkage in concrete due to the high-cement content. High-volume of mineral powder is a necessity for a proper HVFAC design. For this purpose usually natural and artificial mineral additives such as; limestone powder, fly ash, silica fume, rice husk ash and blast furnace slag are used. In this study, mechanical properties of HVFAC, incorporating 30% Class or class F fly ash, as a cement replacement have been investigated up to 28 days, besides determination of freeze–thaw and chloride ion penetration resistance. The effect of 5% Rice husk ash addition as cement replacement to the FAC has also been investigated.

2. MATERIALS OF CONCRETE:

Coarse aggregate:

Coarse aggregates are particles of gravel or crushed stone retained on the 10 mm sieve and ranging up to 150 mm. The most commonly used maximum aggregate size is 20 mm.

Fine aggregate:

Fine aggregates are particles of natural or synthetic sand passing the 5 mm sieve.

Portland cements A cementing material obtained by pulverizing clinker, consisting essentially of hydraulic calcium silicate that hardens by reacting with water.

Supplementary cementing materials:

Supplementary cementing materials (SCMs) are materials that when used with Portland cement contributes to the properties of the hardened concrete through hydraulic or pozzolanic activity or both. Typical examples are fly ash, ground granulated blast-furnace slag, silica fume and rice husk ash.

3. EXPERIMENTAL METHOD

3.1 Mix Design Procedure for m20 Grade Concrete Design Stipulations:

1.Characteristic compressive strength of required in the field at 28 days = 20 N/mm2
2.Maximum size of aggregates = 20mm
3.Degree of workability = 0.91
4.Degree of quality control = Good
5.Type of exposure = Mild

TEST DATA FOR MATERIALS:

Cement used – ordinary Portland cement specifying the requirements of IS 269-1976

Specific gravity of cement = 3.15

Specific gravity of fine aggregates = 2.7

Specific gravity of coarse aggregates = 2.7

Step 1: Target mean strength:

fck = fck + 1.65*t = 20+1.65*4.6 (from IS Code 10262, table 1, t=4.6) = 27.6 N/mm2

Step 2: Selection of water cement ratio:

Water cement ratio for target mean strength of 27.6 N/mm2 is 0.50 (from IS code 10262, 3.1 fig 1)

Step 3: Selection of water and sand content:

From IS code 10262, table 4, for 20mm aggregate & Zone-II sand

Water = 186 & sand content =35%

After adjustment absolute volume of sand= 35-3.5=31.5%

Water content = 186 + (186*3)/100 =186+5.58=191.6 l/m3

Step 4: Determination of cement content:

Water cement ratio = 0.50

Water = 191.6 lit

Cement = 191.6/0.5 =383 kg/m3

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Step 5: Determination of coarse & fine aggregate:

From IS code 10262, table 3, the equation from 3.5.1

$$V=\left(w+\frac{c}{s_c}+\frac{1}{p}\frac{f_a}{s_{fa}}\right)*\frac{1}{1000}$$

For 20mm aggregate volume is 2% entrapped air

$$0.98=\left(191.6+\frac{383}{3.15}+\frac{1}{0.315}*\frac{f_a}{2.70}\right)*\frac{1}{1000}$$

f_a=567.1242 kg/m^3

$$v=\left(w+\frac{c}{s_c}+\frac{1}{1-p}\frac{c_a}{s_{ca}}\right)*\frac{1}{1000}$$

$$0.98=\left(191.6+\frac{383}{3.15}+\frac{1}{3.15}*\frac{c_a}{2.70}\right)*\frac{1}{1000}$$

C_a = 1233.27 kg/m^3

The mix proportion becomes is

Water	Cement	Fine aggregate	Coarse aggregate
191.6	383	567.12	1233.27
0.5	1	1.48	3.22

The Volume of cube = 15cm * 15cm * 15cm= 0.15*0.15*0.15m = 3.375 * 10-3m

Mix Proportion One Cube Of Concrete:

Water content for cube= 191.6 * 3.375 * 10-3 = 0.647 ml

Cement content for cube= 383 * 3.375 *10-3= 1.293 kgs

Fine aggregate content for cube= 567.12 * 3.375 * 10-3 = 1.91 kgs

Coarse aggregate content for cube= 1233.27 * 3.375 * 10-3= 4.16 kgs

In addition to 20% increase these values for better workability

∴ Water content for cube= 0.647 + 0.2 * 0.64= 0.78 ml

∴ Cement content for cube=1.293 +0.2 *1.293= 1.55 kgs

∴ Fine aggregate content for cube=1.91 + 1.91*0.2 = 2.292 kgs

∴ Coarse aggregate content for cube = 4.16 +0.2*4.16 = 4.99 kgs

4. TEST RESULTS:

4.1 Compressive Strength of M20 Grade Fly Ash Concrete:

The compressive strength of M20 grade fly ash concrete can be calculated for 3 days, 7days, 14days and 28 days. The strength values can be given below table.

S no	Days	Sample	Load (KN)	Area(mm2)	Strength	Average strength
1.	3 days	Sample 1	194	22500	8.62	
		Sample 2	226	22500	10.04	9.27
		Sample 3	204	22500	9.15	
2.	7 days	Sample 1	324	22500	14.4	
		Sample 2	350	22500	15.5	15.03
		Sample 3	342	22500	15.2	
3.	14 days	Sample 1	430	22500	19.11	
		Sample 2	444	22500	19.73	19.72

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		Sample 3	456	22500	20.27	
4.	28 days	Sample 1	540	22500	24	
		Sample 2	580	22500	25.7	24.93
		Sample 3	565	22500	25.11	

4.2 Compressive Strength of M20 Grade Fly Ash With Rice Husk Ash Concrete

The compressive strength of M20 grade fly ash with rice husk ash concrete can be calculated for 3 days, 7days, 14days and 28 days. The strength values can be given below table.

S no	Days	Sample	Load (KN)	Area(mm2)	Strength	Average strength
1.	3 days	Sample 1	226	22500	10.04	
		Sample 2	278	22500	12.35	11.01
		Sample 3	240	22500	10.66	
2.	7 days	Sample 1	378	22500	16.8	
		Sample 2	418	22500	18.57	17.15
		Sample 3	362	22500	16.08	
3.	14 days	Sample 1	540	22500	24	
		Sample 2	580	22500	25.77	24.36
		Sample 3	525	22500	23.33	
4.	28 days	Sample 1	630	22500	28	
		Sample 2	650	22500	28.88	28.88
		Sample 3	670	22500	29.77	

4.3 Compressive Strength Of M20 Grade Ordinary Portland Concrete

The compressive strength of M20 grade ordinary Portland concrete can be calculated for 3 days, 7days, 14days and 28 days. The strength values can be given below table.

S no	Days	Sample	Load (KN)	Area(mm2)	Strength	Average strength
1.	3 days	Sample 1	196	22500	8.711	
		Sample 2	206	22500	9.15	8.73
		Sample 3	188	22500	8.35	
2.	7 days	Sample 1	330	22500	14.62	
		Sample 2	334	22500	14.84	14.62

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		Sample 3	324	22500	14.4	
3.	14 days	Sample 1	418	22500	18.57	
		Sample 2	420	22500	18.66	18.72
		Sample 3	426	22500	18.93	
4.	28 days	Sample 1	510	22500	22.66	
		Sample 2	520	22500	23.11	23.10
		Sample 3	530	22500	23.55	

4.4 Compression of Compressive Strength Results

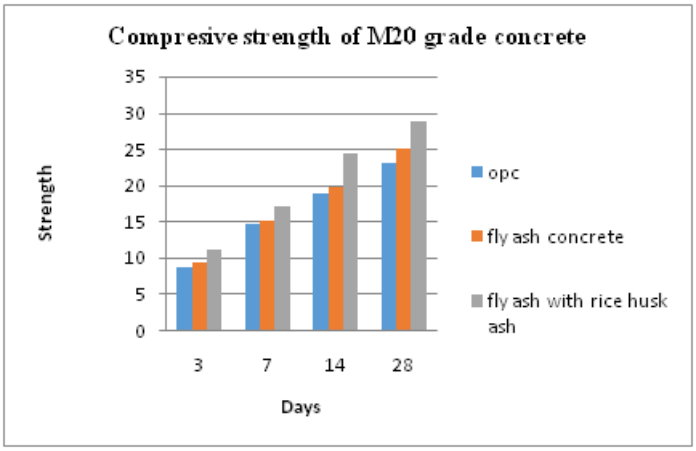
The compressive strength of fly ash concrete and fly ash with rice husk ash concrete and ordinary Portland concrete can be listed below. The compressive strength of fly ash concrete strength concrete higher than the ordinary Portland concrete and the compressive strength of fly ash with rice husk concrete are higher than the fly ash concrete.

Compressive strengths of M20 grade concrete:

S no	Days	Ordinary Portland concrete	Fly ash concrete	Fly ash with rice husk ash concrete
1.	3 days	8.73	9.27	11.01
2.	7 days	14.62	15.03	17.15
3.	14 days	18.72	19.70	24.36
4.	28 days	23.10	24.93	28.88

4.5 Graph:

A graph is plotted between the strength and the respective ages. The comparison between the different materials used in determining the strength is also plotted below in fig



4.5 a.Percentage improvement of high volume fly ash concrete over ordinary concrete

For the age of 28 days the M20 grade of ordinary Portland concrete to fly ash concrete is increased up to 7.45%, the fly ash concrete to fly ash with rice husk ash concrete is up to 13.677% increased and the ordinary Portland concrete to fly ash with rice husk ash concrete is up to 20.01% increase

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5. CONCLUSION:

.The strength of ordinary Portland concrete will be up to 7.45% increased when the fly ash is replaced about 30% of cement for the age of 28 days

• Use of fly ash as a partial replacement for Portland cement is generally limited to Class F fly ashes. It can replace up to 30% by mass of Portland cement, and can add to the concrete's final strength and increase its chemical resistance and durability. Recently concrete mix design for partial cement replacement with High Volume Fly Ash (30 % cement replacement) has been developed

• It has been found that r improve rice husk ash compressive strength, bond strength, and abrasion resistance. The improvements in concrete properties from addition of rice husk ash stem from both the mechanical improvements resulting from addition of a very fine powder to the cement paste mix as well as from pozzolanic reactions between the rice husk ash and free calcium hydroxide in the paste.

REFERENCES:

• Sivasundaram .V, curette. GG. And malhotra .V.M (1990), Long – term strength development of high volume fly ash concrete .cement and concrete composites, 12:263-270.

• IS codes 456-2000, IS 516, IS 383-1970, IS 2386-1963, IS 10262, IS 12269-1987.

• IS: 516-1959, Indian Standard Code of Practice- Methods of Test for Strength of Concrete, Bureau of Indian Standards (BIS), and New Delhi, India.