TO DETERMINE RELATION AMONG LABORATORY AND IN-SITUSTRENGTH OF CONCRETE

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Abstract - *High strength concrete (HSC) has been frequently used in civil engineering structures to reduce the size of structural elements, i.e. beams and columns of high rise buildings. High strength concrete (HSC) is defined as a concrete with a characteristic strength between 60 - 100 MPa, although strengths higher than 100MPa have already been achieved and used. Generally, super plasticizers natural pozzolana silica fume, etc., are used to achieve high-strength in concrete by keeping water binder ratio at lower level.*

Waste foundry slag is a byproduct produced from steel and iron manufacturing industry. Since these waste by product materials are not useful and hence dumped near the industry. Unprocessed waste by product can create many environmental problems and disposal of this waste in the landfills may become a major issue. The efficient use of this waste by product material can resolve the environmental issue and can also have an effect on the economy of production of concrete.

1. INTRODUCTION

Concrete is chief, strong, durable, economical and most frequently used civil engineering material in the field of construction. As the demand of cement concrete is increasing day by day, the demand of its constituent materials such as cement and aggregate etc is also increasing. The consumption of the natural aggregates is increasing at a far exceeding rate than the growth of the construction industry. Aggregates manufactured artificially are expansive and continued mining of natural aggregate affecting the environment. This may give the way to utilize the industrial waste by product as a replacement of aggregate which will solve the problem of dumping industrial waste and help a lot in saving the environment.

1.1 Types of waste foundry Slag

Iron slag, steel slag, cupola furnace slag, induction furnace slag, blast furnace slag, electric arc furnace slag are some common types of foundry slags. The types of slag depend upon the composition of raw material and the type of furnace used during the manufacturing process of pig iron and steel.

Table 1.1: Typical Physical Properties of Waste

Physical Property	Blast FurnaceSlag	Steel Slag	
	Rock Slag	Electric arc Furnace slag	Basic oxygen furnace slag
Particle density (kg/m^3)	2450-2650	3300-3400	3300-3450
Water absorption (%)	4-7	2-4	2-4
Los angels‟ abrasion value	37-47	16	12-18
Soundness		< 4	< 4

1.2. High Strength Concrete

High strength concrete (HSC) has been frequently used in civil engineering structures to reduce the size of structural elements, i.e. beams and columns of high rise buildings. Concrete is called as “high-strength concrete” on the basis of its 28 days compressive strength. High strength concrete (HSC) is defined as a concrete with a characteristic strength between 60 - 100 MPa, although strengths higher than 100MPa have already been achieved and used. Compressive strength levels of 80MPa and more can be used for both precast and in-situ concrete work. As per ACI 363[2] concrete having 28days compressive strength of more than 41 MPa is considered as high- strength concrete. Generally, super plasticizers natural pozzolana silica fume, etc., are used to achieve high-strength in concrete by keeping water binder ratio at lower level

1.3 OBJECTIVES

Objectives of the present research, described in brief are as follows:

1. To investigated the effect of waste foundry slag as partialreplacement of fine aggregate (sand) along

with Alccofine in addition to and as partial substitute of PPC on the properties of M60 grade of concrete.

2. To determine optimum dose of Alccofine in addition to and as partial substitute of PPC on the properties of M60 grade of concrete.

3. To investigate various strength parameters like Compressive Strength, Splitting Tensile Strength and Flexural Strength of modified mixes with variable percentages (10, 20,30,40.45& 50%)of foundry slag.

2. RESULT

Table2.1: Variation in Strength of different Mix, with variable %age ofAlccofine after 28 days of Curing

Test specimens with varying percentages of Alccofine (0% - 20%) were casted and tested for Compressive Strength, Split Tensile Strength and Flexural Strength after 28 days of curing and as per ISspecifications. Maximum Compressive Strength, Split Tensile Strength and Flexural Strengthwere obtained at 15% replacement of PPC with Alccofine, defining optimum dosage of Alccofine as 15%.

Table 2.2: Variation of Compressive Strength with Variable % of FoundrySlag and Age

Foundry slag content	Compressive Strength (Mpa)		
FD(%)	7 days	14 days	28 days
CTR	36.22	9.44	69.88
F10	37.56	1.22	71.60
F20	38.33	2.11	72.49
F30	38.95	3.22	73.80
F40	39.66	4.05	74.62
F45	40.25	4.90	75.72
F50	39.33	3.33	74.20

3. CONCLUSIONS

The present work investigated the effect of waste foundry slag as partial replacement of fine aggregate (sand) along with Alccofine in addition to and as partial substitute of PPC on the properties of M60grade of concrete. Following conclusions were drawn from the present investigation.

1. Test results reported that there is rise in Compressive Strength, Splitting Tensile Strength and Flexural Strength for M60 grade of concrete mix with inclusion of waste foundry slag up to 45% replacement and 15% Alccofine in addition to PPC.

2. Compressive Strength, Splitting Tensile Strength and Flexural Strength of all concrete mixes showed a normal progression in strength with increase in curing age which signifies that there wasno adverse effect of substituting fine aggregate with foundry slag.

3. Reduction in strength values of concrete at 50 % replacement of foundry slag was recorded but it can still be used in concreting.

4. As the percentage of foundry slag is increased, slump value is also increased. The maximum slump (165mm) was recorded at 50% replacement of foundry slag.

5. Inclusion of waste foundry slag as a partial replacement of fine aggregate in concrete along with Alccofine in addition and partial substitute to PPC improved the mechanical and durability properties of high strength concrete.

6. Concrete made with 45% replacement of natural fine aggregate with Foundry Slag could suitably be used for making structural concrete.

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