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Light Weight Aggrigates Of Cinder Mix Concrete With Compressive Strength

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ABSTRACT

To prepare homogeneous concrete by using waste material like cinder. We make concrete by replacing coarse aggregate with cinder of different percentages like 20%, 40%, 60%, 80% and 100% with curing of 7.15 and 28 days. And determine the compressive strength of concrete for above cinder replacement levels and conclude the better one.

Cinder is a waste material obtained from steel manufacturing units. It is being used as a filler material for sunken slabs and also being used for structural purposes wherever necessary (In massive structures (Bridges) to reduce the self weight). In this study an investigation has been made to understand the behavior of conventional aggregate concrete in which normal aggregate is replaced with cinder in volume percentages of 20, 40, 60, 80 and 100.

The conventional aggregate concrete mix has been designed for M20 grade concrete using ISI method. In this investigation cubes of standard size 150 x 150 mm specimens have been cast and tested after four different curing periods. Three specimens have been cast for each variable and thus totally 36 specimens are tested. From the study it is concluded that 60 percent replacement of conventional aggregate with cinder by volume by weight yields the target mean strength. It worth noted that there is a slight increase in strength and other properties due to extended curing periods and the unit weight of the cinder concrete is varying from 2.51 gms/mm3 to 2.03gms/mm3 with different percentages of cinder. It is also noted that there is a decrease in density after extended curing periods.

Key words : Light weight aggregates concretes, cinder and compressive strength

I. INTRODUCTION

Cinder aggregates are of the type of aggregates used in certain places where natural aggregates are not available or costly or recycling of the industrial wastes is aimed at or where the dead weight of a structure is to be reduced have done experimental investigation using cinder as a light weight aggregate with discreet steel fibers with an aspect ratio of 50. Have observed that the rate of slump loss in concrete can be reduced by the use of higher volume fraction of light weight aggregate in the mix have stated that Flow ability of self consolidating concrete with light weight aggregate was observed to improve with the reduction in density of aggregate but there is a decrease in the segregation resistance ability.

Light weight concrete can be simply defined as follows “These are the concretes which are much lighter than the conventional concrete, due to different constituents and methods used in manufacturing process”. Density of conventional concrete varies from 2400-2500 Kg/m3. But the density of light weight concrete is in between 300-1900 Kg/m3. How great difference !!!. as per RILEM, the light weight concrete committee “The LWC is a concrete capable of hardening, to a mass having oven dry density not more than 1800 Kg/m3”. As per ACI, “Concretes have a 28 days compressive strength in excess of 175 Kg/m3 and 28 day air dried unit weight not exceeding 1850 Kg/m3.

OBJECTIVES

- It is very permeable in nature
- It is highly porous in nature
- CM cannot be used with water proofing, thus it is difficult to avoid rain penetration
- It will fail when the loadings are more
- Water absorption capability increases
- Fully compacted concrete
- Partially compacted concrete
- No fines concrete
- Micro cellular concrete
- Aerated concrete by physical process

FUTURE SCOPE

- We had conducted project on cinder by different percentages i.e. 20%, 40%, 60%, 80% and 100%. Instead of cinder alternative material are used like pumice, saw dust etc.
- Cinders used as aggregates are residues from high temperature combustion of coal or coke in industrial furnaces.
- Cinder is pyroclastic material cinders are extrusive igneous rocks.
- Ciners are similar to pumice, which has so many cavities and is such low density that it can float on water.
- It is cheaply available construction material used in sunken slabs.

II. OBSERVATIONS AND RESULTS

COMPRESSIVE STRENGTH TEST RESULTS

The test performed on the cubes of size 70.6mm X 70.6 mm X 70.6 mm in the compressive strength testing machine for the 3 days, 7 days, 28 days gives the compressive strength. Compressive Strength = $\frac{\text{Failure load (KN)}}{\text{Area of the cube (mm2)}}$

Table 1: Conventional Concrete Cubes

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	21/1/13	22/1/13	29/1/13	7	24.64	24.22
	21/1/13	22/1/13	29/1/13	7	22.26	
	21/1/13	22/1/13	29/1/13	7	25.76	
2	21/1/13	22/1/13	19/2/13	28	37.95	42
	21/1/13	22/1/13	19/2/13	28	43.02	
	21/1/13	22/1/13	19/2/13	28	46.33	

Table 2 REPLACEMENT WITH 20% CINDER :

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	26/1/13	27/1/13	3/2/13	7	23.5	22.9
	26/1/13	27/1/13	3/2/13	7	22.8	
	26/1/13	27/1/13	3/2/13	7	22.5	
2	26/1/13	27/1/13	24/2/13	28	30.8	30.3
	26/1/13	27/1/13	24/2/13	28	31.5	
	26/1/13	27/1/13	24/2/13	28	28.7	

Table 3 REPLACEMENT WITH 40% CINDER :

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	29/1/13	30/1/13	06/2/13	7	22.1	22.2
	29/1/13	30/1/13	06/2/13	7	22.8	
	29/1/13	30/1/13	06/2/13	7	21.9	
2	29/1/13	30/1/13	27/2/13	28	25.3	27.2
	29/1/13	30/1/13	27/2/13	28	25.7	
	29/1/13	30/1/13	27/2/13	28	30.7	

Table.4 REPLACEMENT WITH 60% CINDER :

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	07/2/13	08/2/13	23/2/13	15	21.8	22
	07/2/13	08/2/13	23/2/13	15	22.4	
	07/2/13	08/2/13	23/2/13	15	21.8	
2	07/2/13	08/2/13	08/3/13	28	24.1	21.8
	07/2/13	08/2/13	08/3/13	28	22	
	07/2/13	08/2/13	08/3/13	28	19.5	

Table.5 REPLACEMENT WITH 80% CINDER

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	07/2/13	08/2/13	23/2/13	15	21.8	21.7
	07/2/13	08/2/13	23/2/13	15	21.9	
	07/2/13	08/2/13	23/2/13	15	21.5	
2	07/2/13	08/2/13	08/3/13	28	18.4	20.3
	07/2/13	08/2/13	08/3/13	28	20.9	
	07/2/13	08/2/13	08/3/13	28	21.8	

Table.6 REPLACEMENT WITH 100% CINDER

Sl No	Date of Casting	Date of Curing	Date of Testing	Age in Days	Compressive Strength in N/MM2	Average
1	11/2/13	12/2/13	26/2/13	15	20.2	20
	11/2/13	12/2/13	26/2/13	15	20	
	11/2/13	12/2/13	26/2/13	15	19.8	
2	11/2/13	12/2/13	12/3/13	28	20.4	20
	11/2/13	12/2/13	12/3/13	28	19	
	11/2/13	12/2/13	12/3/13	28	20.5	

Figure 1: Graph between compressive strength and different % of cider after 7 days.

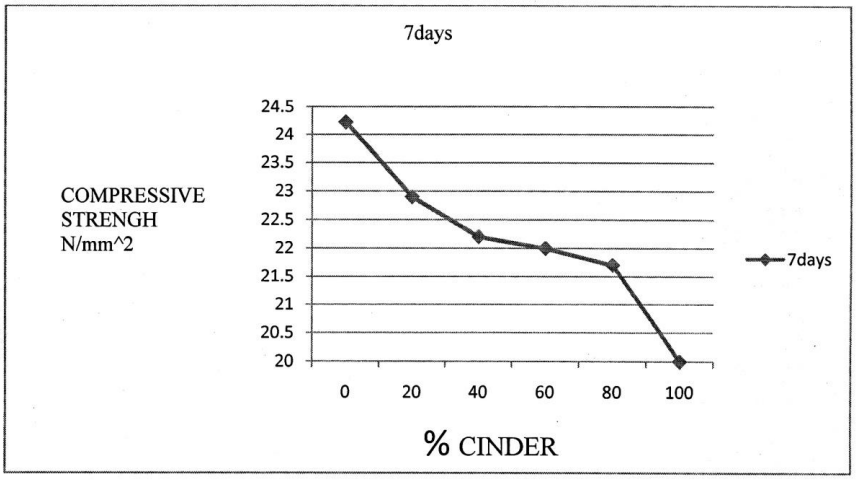
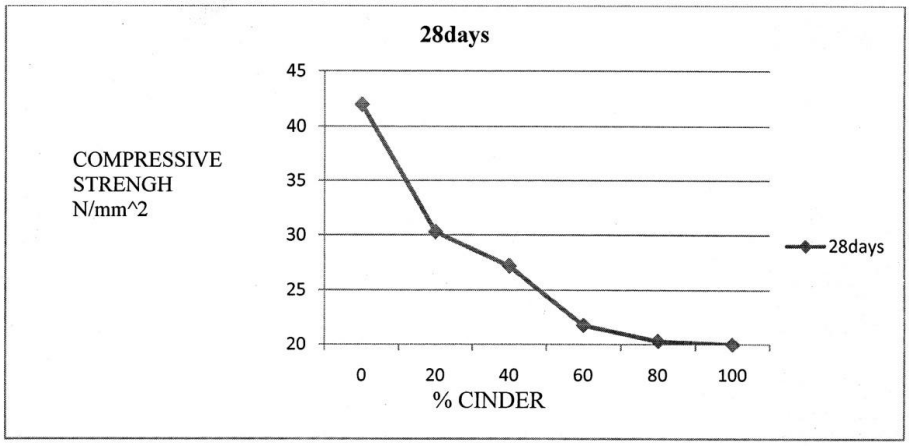


Figure 2 Graph between compressive strength and different % of cider after 28 days



III. CONCLUSION

- It may be concluded that primary tests results indicate the quality of cinder is low in compression with natural rocks.
- These are porous in structure, the compressive strength of concrete made with cinder is relative low in comparison with ordinary cement.
- Also decrease the density of concrete, LWAC is an economically useful for residential buildings.
- The compressive strength of concrete made with cinder is relatively low in comparison with ordinary concrete. However, concrete produced with cinder attained strength higher thanbric etc., masonry, they could be used in places where low strength concrete would be sufficient.
- The variation of split tensile strengths and flexural strengths with respect to 10 percent replacement of cement are found to be more or less same as that for compressive strengths variation.
- The compaction of LWAC has a big influence on the strength of the concrete. Tests, with increased vibrating time and increased frequency, showed that the best compressive strength was yielded when the LWAC was vibrated at a frequency of 50Hz during 120 seconds if plastic moulds (150x 150 x 150mm3) were used. When steel moulds (100x100x500mm3) were used, the best compressive strength was obtained when the frequency was 65Hz and the vibrating time was 180 seconds.

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