

Experimental Study on use of Electric ARC Furnace Slag in Pavement Construction

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Abstract— A good pavement is one of the basic need of us. For pavement construction the mainly used materials are coarse aggregates and bitumen. Our environment is get destroyed by taking a bulk amount of aggregate from rock bed for different types of construction. One of the major problems faced by our society is industrial waste management and its disposal. So in our work we studied the usage of electric arc furnace slag, which is an industrial waste, in the pavement construction. For finding the properties of electric arc furnace slag we conducted crushing value test, impact test, specific gravity test, water absorption test and angularity test.

Keywords — *Electric arc furnace slag, Pavements, Aggregate crushing value, Impact value, Specific gravity, water absorption, angularity number*

I. INTRODUCTION

Due to industrialization many manufacturing industries were get started working in our country. Many of these industries were produced some by products and the termed as industrial waste. One of the major problems was the disposal the industrial waste. Many industrial waste materials can be getting recycled and can be used for some construction purposes. The materials used for pavement construction was coarse aggregate, soil and bitumen. In our study we use electric arc furnace slag as coarse aggregate for pavement construction. Electric arc furnace slag (EAFS) is a co-product of steel making process. Desirable properties of road aggregates are its strength, hardness, toughness, durability, shape of aggregate and adhesion with bitumen. In this experiment property such as strength, toughness, specific gravity water absorption and angularity of furnace slag were find out.

II. EXPERIMENTAL INVESTIGATION

The electric arc furnace slags were collected from an industry working at Palakkad. Electric arc furnace slag (EAFS) is a co-product of steel making process. The collected slags were broken down into small sizes. The tests conducted are aggregate crushing test, impact test, specific gravity test, water absorption test and angularity test.



Fig. 1 Electric arc furnace slag

A. Aggregate crushing test

The aggregate crushing value gives a relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load. The compressive strength of the EAFC can be finding out by conducting this test. Size of slag used for conducting this test was between 12.5mm and 10mm. Aggregate crushing value is the percentage of the crushed material passing through 2.36mm sieve in terms of original weight of the sample taken. The crushing value of the EAFC was found as 27.45%, the value is below 30% and 40%. Therefore EAFC can be satisfactorily used in both the base course and surface course of a pavement.



Fig. 2 Test setup for crushing value test

B. Impact test

Impact test is done to find out the toughness of the furnace slag. For conducting this test also the size of the sample taken was between 12.5mm and 10 mm. Aggregate impact values is the percentage of the crushed material

passing through 2.36mm sieve in terms of original weight of the sample taken. The impact value of the EAFS was found as 28.95%. According to Indian standards the impact value of materials used for pavement construction should be below 30%. So EAFS can be satisfactorily used for road construction.

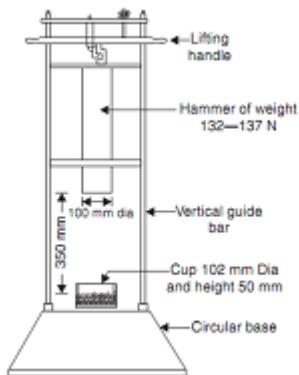


Fig. 3 Impact Test Setup

C. Specific gravity and water absorption of EAFS

Specific gravity test for pavement materials was done using wire basket. Specific gravity test was done to specify the strength or quality of the aggregate. After conducting this test we get a value of 2.56 as specific gravity of EAFS. The obtained value is between 2.5 to 3, therefore the EAFS can be used for pavement construction.

Water absorption of an aggregate is accepted as a measure of porosity. Water absorption ranges from 0.1 to 2% for aggregates, normally used in road construction. The value

obtained for EAFS was 1.01%, so it can be used for pavement construction.

D. Angularity Number Test

The angularity number of EAFS was obtained as 8. Therefore the EAFS was angular in nature so it can be used in pavement construction.

III. CONCLUSION

The experimental results shows that all these test results are within the desirable limits. Hence the electric arc furnace slag can be used in pavement construction.

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