

Use of Steel slag in Bituminous Road Construction

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Abstract - The large amount of industrial wastes as increased year by year and disposal becomes a very serious problem. it is necessary to utilize the steel slag waste affectively with technical development in each field. commonly murrum soil has been used for construction of all categories of roads in our country. although murrum is a good construction material, due to scarcity they increase the construction cost at some parts of the country , several types of murrum soils are found to be unsuitable for road construction in view of higher finer fraction and excessive plasticity properties. such as used industrial material like steel slag in construction of road pavement. its disposal causing severe health and environmental hazards in road construction industries is gradually gaining significant importance in india considering the disposal, environmental problems and gradual depletion of natural resources like soil and aggregates. steel slag is a waste material generated as a by-product during the manufacturing of steel from steel industries. the quantity of generation is around 24 lacs mt per year from (ref.report.crrri-2010) different steel industries in the india. presently, it has no applications and dumped haphazardly on the costly land available near the plants. to improve its geotechnical engineering properties, the steel slag material was mechanically stabilized with locally available soil in the range of 5 – 15%. geotechnical parameters of these stabilized mixes were evaluated to investigate their suitability in the construction of different layers of road technical specification of steel slag is developed for utilization in the construction of embankment, sub grade and sub base layer of flexible pavement amd also as a binder in upper bituminous mix layer.

Keywords — Steel slag, bitumen, ductility test

1. INTRODUCTION

The iron and steel slag that is generated as a by product of iron and steel manufacturing processes can be broadly categorised as blast furnace slag and steel making slag. Blast furnace slag is recovered by melting, separation from blast furnace that produce molten pig iron. It consist of non-ferrous components contained in the iron core together with limestone as an auxiliary materials and ash from coke. Depending on the cooling method used, it is classified either as air-cooled slag or granulated slag. Steel making slag consist of converter slag (basic oxygen furnace slag) that is generated by converter and electric arc furnace steel making process that uses steel scrap as a raw material. In the present study, solid waste which is generated as a buy product which is generated during the melting process of

mixed materials which are steel scrap, pig iron, silico-manganese, sponge iron and al-shots is turned as granulated blast furnace slag. The waste material is neutral and non-hazardous in nature as per Chemical analysis report of CPCB (hazardous waste rules,2008, ref.no-19). The quantity of generation of this slag is around 24 lacs MT per year from different steel industries in India(CRRI,2010).

Presently, this steel slag isn't utilised and is dumped near the costly plants. Study was carried out to utilise the slag in different layers of road construction. Technical specification of slag were developed for utilisation in the construction of embankment, sub-grade, sub-base, upper layers of road pavement.

2. LITERATURE REVIEW

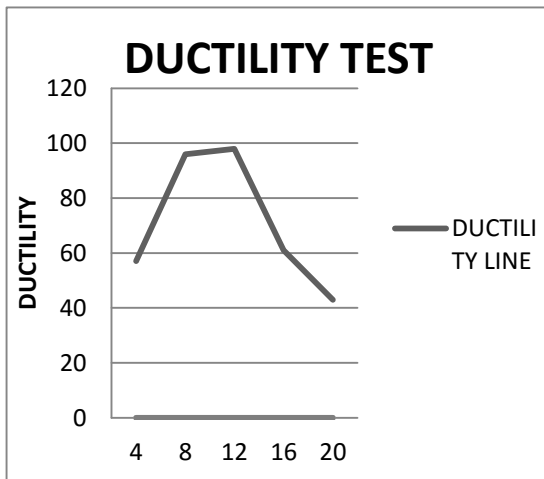
The ductility of bitumen containing steel slag aggregates firstly increases and then decreases with increase in percentage of steel slag aggregates in the mix. The test results showed a significant scope of use of steel slag, along with the bitumen as a binder. Around 8%-12% of steel slag is mixed to attain the ideal properties of the binder material.

3. TESTS

3.1. DUCTILITY TEST

The ductility test was carried out for the bitumen and metal slag mix. The percentage of metal slag in the mix was gradually increased and accordingly readings were noted down.

%of metal slag	Bitumen content	Ductility (mm)
4	100gm	57
8	100gm	96
12	100gm	98
16	100gm	61
20	100gm	43



3.2. SOFTENING POINT TEST

Softening point test was conducted for the bitumen mix with 8% and 12% of metal slag. The results obtained were.

Bitumen content	% of metal slag	Softening temp.
100gm	8%	121
100gm	12%	127

3.3. MOISTURE ABSORPTION TEST

To know the voids in slag, moisture absorption test is carried out as per BIS 2386 Part 3 (1997). Moisture absorption value of Steel Slag was obtained as 10%.

3. CONCLUSIONS

It is feasible to use metal slag as a binder material in the bituminous mix design. The following points were observed

- The 8-12% addition of metal slag gives the maximum value for ductility test.
- Hence, 8-12% is the optimum value.
- The softening point is above 110 which is desirable.

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