iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** III **Month of publication:** March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3338

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

Use of Waste Foundry Sand in Flexible Pavement

Swastik S Shinde[1], Amir M Sayyad[2], Aakash B Bhalodia[3], Abhishek R Bhasme[4], Vishal G Jadhav[5], Vikas D Hodage[6]
[1]*Assistant Professor, Department of Civil Engineering, Sanjay Ghodawat Institutes, Atigre-416118, India*
[2, 3, 4, 5, 6,] *Student, Department of Civil Engineering, Sanjay Ghodawat Institutes, Atigre-416118, India*

Abstract: ***Rural roads are essentially low cost roads, the specifications for pavement materials in various layers should be as economical as possible, consistent with the traffic expected to use the road and the climatic condition. In this angle, the local materials which are cheaper and involve minimum haulage should be used to maximum extent feasible. In present scenario safe disposal of different wastes produced from Industries is a great problem. These materials cause environmental pollution in the vicinity because many of them are non-biodegradable. In recent years, industrial wastes have been utilized in road construction in developing countries.***
The two types of pavement structures generally used are I) Flexible II) Rigid. Wastes from different sources can be collected and the materials such as foundry sand, iron slag, steel slag, glass waste, ceramic waste etc., can be used. The necessary specifications should be formulated and attempts are to be made to maximize the use of solid wastes in different layers of the road pavement. The possible use of these materials should be developed for construction of low volume roads (Rural roads) in different parts of our country.
This study promotes use of waste foundry sand in flexible pavements as replacement to filler material used in flexible pavements. Various mix proportions were prepared and tested by MARSHALL STABILITY for varying percentage replacement of Filler material by Waste foundry sand.
Keywords*:* ***Waste Foundry Sand, Highway Engineering, MARSHALL STABILITY, Flexible Pavement, Industrial Waste***

I. INTRODUCTION

In recent years, industrial wastes have been utilized in road construction in developing countries. The use of these materials in road making is based on technical, economic, and ecological criteria. The lack of traditional road materials and the protection of the environment make it imperative to investigate the possible use of these materials carefully. India has a large network of industries located in different parts of the country and many more are planned for the near future. Several million metric tons industrial wastes are produced in these establishments.

Traditionally soil, stone aggregates, sand, bitumen, cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. Concerned about this, the scientists are looking for alternative materials for highway construction, and industrial wastes product is one such category.

Metal foundries use large amounts of the metal casting process. Foundries successfully recycle and reuse the sand many times in a foundry and the remaining sand that is termed as foundry sand is removed from foundry. This study presents the information about the civil engineering applications of foundry sand, which is technically sound and is environmentally safe. Use of foundry sand in various engineering applications can solve the problem of disposal of foundry sand and other purposes. Foundry sand consists primarily of silica sand, coated with a thin film of burnt carbon, residual binder and dust. Foundry sand can be used in concrete to improve its strength and other durability factors. Foundry Sand can be used as a partial replacement of cement or as a partial replacement of fine aggregates to achieve different properties of Bituminous Concrete.

If these materials can be suitably utilized in highway construction, the pollution and disposal problems may be partly reduced. In the absence of other outlets, these solid wastes have occupied several acres of land around plants throughout the country. Keeping in mind the need for bulk use of these solid wastes in India, it was thought convenient to test these materials and to develop specifications to enhance the use of these industrial wastes in road making, in which higher rate of returns may be possible. Various mix proportions were prepared and tested by MARSHALL STABILITY for varying percentage replacement of Filler material by Waste foundry sand.

II. AIM AND OBJECTIVE

Post construction pavement performance studies are done for these waste materials for construction of low volume roads with twofold benefits:

A. An experimental work has been done to improve the properties of bituminous concrete pavement using WFS.

B. Optimum bitumen percentage replacement in the BC mixes.

C. This study promotes the usage of industrial wastes to reduce the cost of construction of flexible pavements and helps in preserving the natural reserves.

D. This study presents a review of available information on the WFS (Waste Foundry Sand), their generation process including molding and casting processes, potential variables, environmental concerns and beneficial uses of waste foundry sand.

III. MATERIALS

A. Materials used in the present study are the following:

1) Waste Foundry sand

2) Aggregates

3) Bitumen

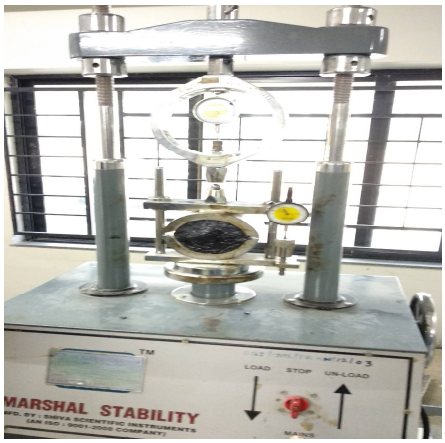
IV. METHODOLOGY

A. The various mixes were made according to Marshall Mix designs.

B. A specimen is prepared according to MORTH specifications Section 500.The principle of this test is that Marshall Stability is the resistance to plastic flow of cylindrical specimen of a bituminous mixture loaded on lateral surface.

C. It has the load carrying capacity of the mix at 60 °*C* and is measured in kg.

Fig: Marshall Testing Apparatus



V. RESULTS OBTAINED.

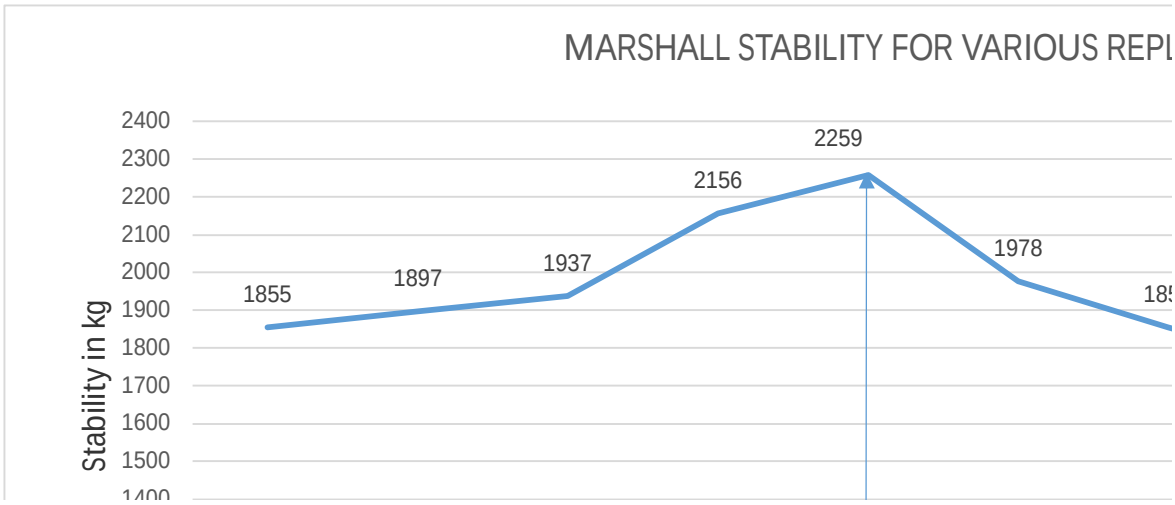
TABLE 1
OPTIMUM BITUMEN CONTENT

BITUMEN PERCENTAGE	STABILITY (in Kg)	FLOW VALUE (in cm)
4.0 %	1150	2.12
4.5 %	1240	2.45
5.0 %	1332	2.84
5.5 %	1634	3.7
6.0 %	1855	3.5
6.5 %	1561	4.4

Table 2
Marshall stability values for % replacement

PERCENTAGE REPLACEMENT	STABILITY (in Kg)	FLOW VALUE (in cm)
0%	1855	3.56
10%	1897	3.81
20%	1937	4.17
30%	2156	4.8
40%	2259	3.58
50%	1978	3.97
60%	1854	3.87
70%	1745	3.7
80%	1720	4.08
90%	1687	3.8
100%	1677	3.9

Graph 1
Marshal stability **vs.** percentage replacement of foundry sand



VI. CONCLUSION

A. From the result and analysis of various properties of foundry sand it is found that these materials can be used as fine aggregates as replacement for natural sand and can be used as filler material as replacement for stone dust in bituminous mix.
B. The Optimum replacement percentage of foundry sand as filler material is 40% of traditional mix.
C. Bituminous mixes prepared using conventional mix at different bitumen content gives the optimum bitumen content as 6.0%.
D. By using foundry sand in bituminous mix environmental effects from wastes and disposal problems of waste can be reduced.

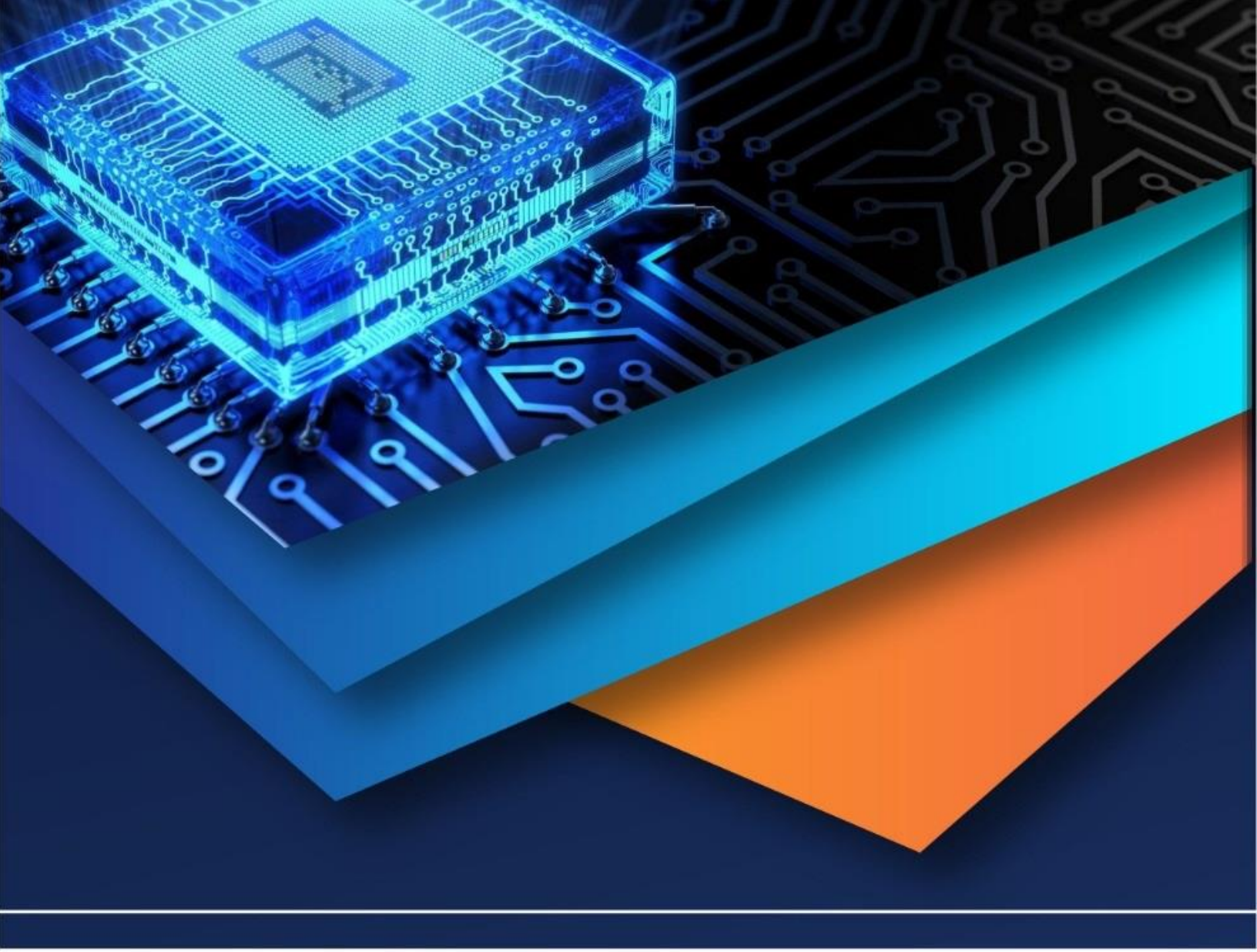
VI. ACKNOWLEDGEMENT

We express our sincere thanks to our H.O.D. Prof. N.K. Patil and our college for providing us with a platform to excel in life. With a sense of regard and gratitude to our project, we would like to thank our guide Mr. Swastik S Shinde for his guidance, interest and constructive suggestion during the study course. This project would not have been possible without his support and help. We thank him for his valuable and immense knowledge and timely help, which made this, project a reality. We would also like to thank

Director Dr. V.V. Kulkarni for his valuable support. We are very thankful to those who helped directly & indirectly to carry out this Project.

REFERENCES

[1] Ann Johnson, (February 2016) "Best Practices Handbook on Asphalt Pavement Maintenance" Minnesota T2/LTAP Program, Center for Transportation Studies, University of Minnesota.
[2] David P. Orr, March (2016), "Pavement Maintenance" Cornell Local Roads Program 416 Riley-Robb Hall Ithaca, New York.
[3] Dr. R. Gary Hicks, (June 2009) "Selecting a Preventive Maintenance Treatment for Flexible Pavements", Foundation for Pavement Preservation Washington pp.3-87.
[4] Dr. S Basak, Dr.A.K.Bhattacharya, (April 2010) "A New Horizon in the Field Of Maintenance and Effective Upkeepment of Bituminous Road Surface", Global Journal of Researches in Engineering, Vol. 10, pp.79-83.
[5] Fiker Alebachew, (April 2005) "Pavement Distresses on Addis Ababa City Arterial Roads, Causes and Maintenance Options", A Thesis Presented to the School of Graduate Studies Addis Ababa University Faculty of Technology, pp.53-107.
[6] G.D. Airey, A.C. Collop And N.H. Thom, "Mechanical Performance Of Asphalt Mixtures Incorporating Slag And Glass Secondary Aggregates", Nottingham Centre For Pavement Engineering. University Of Nottingham, Nottingham, UK.
[7] [7] John Emery, "Steel Slag Utilization in Asphalt Mixes", National Slag Association.
[8] Meena Murmu, "Evaluation of Strength Characteristics of Steel Slag Hydrated Matrix", A Thesis Submitted In Partial Fulfilment of the Requirements for the Degree of Master of Technology in Civil Engineering.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY