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REVIEW ON USE OF KOTA STONE WASTE IN FLEXIBLE PAVEMENT

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Abstract: India is developing faster day by day. Also road networks are growing larger as well. So to catch up with the demand of the materials we might need a alternative. So in this paper we are going to study about the results obtained by adding different forms of stone in different proportions in to the flexible pavement .After studying all these papers we can see that mixing stone waste into the flexible pavement shows differentiable change. Now will test that if we add coarser form of kota stone to the sub base of the flexible pavement does it shows secern changes in the strength of the flexible pavement. First of all we will perform each and every important test which is required to be done for every material which we are going to use. After that we will make a mould (sample). And will carry out the marshal stability test for the same and will analyze the results obtained from it.

Keywords: Flexible pavement, Kota stone, bitumen, crushed stone, aggregate.

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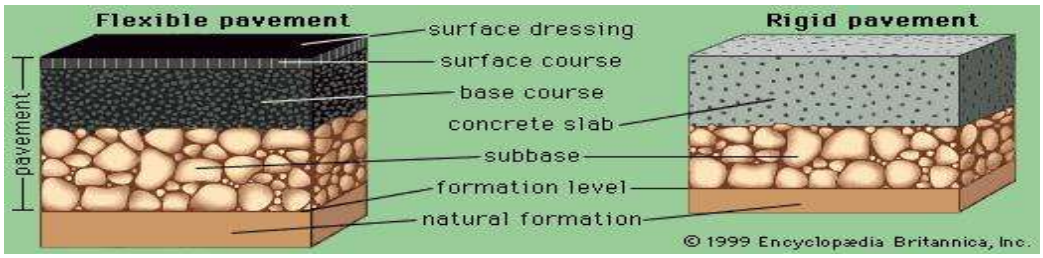
INTRODUCTION

As the world population grows, so do the amount and type of waste being generated. Many of the wastes produced today will remain in the environment for hundreds, perhaps thousands, of years. The creation of non-decaying waste materials, combined with a growing consumer population, has resulted in a waste disposal crisis. One solution to this crisis lies in recycling waste into useful products.[3] **(Bhavin K Vaghadia, 2016)** If the quality of roads is good then, it can give boast to transportation and ultimately it will increase the economy of the country. As per our observation, the condition of roads in our country is not much favorable for quick transportation of goods. Basically there are two types of pavement one is rigid and another is flexible. In rigid pavement RCC is used for the formation of the pavement and in flexible pavement bitumen and aggregates are the main components. Generally flexible pavement is used more in our country because it is cost effective. Rigid pavement is not used that much because its cost is higher. Materials used in flexible pavement are bitumen, fine aggregate and coarse aggregate. Kota stone is a natural lime stone which is easily available in abundance in India and the waste generated I is also very high and the waste affects the environment in various ways. The waste generated after the cutting of kota stone can be used in the sub base layer of the flexible pavement to increase the strength of the road. It can be used as an alternate material of coarse aggregate.



Source: 1999 Encyclopedia Britannica, Inc.

Source:-
http://www.flexiblepavements.org/sites/www.flexiblepavements.org/files/imagecache/awards_interior/awards/project_2-_sr_6_erie.jpg

During monsoon season, the condition of road further deteriorates due to water logging issues. Rutting of roads and formation of potholes takes place due to logging of water on embankments. So if by adding any form of the Kota stone i.e. in coarse form in the sub layer or by adding its powder form to the bituminous mix which can provide the desirable strength to the pavement. Kota stone is basically a type of lime stone. It is a natural stone as well as its lower in cost and durable so it is available easily. So we are aiming to add any form of Kota stone to the bituminous mixer so that we can achieve the strength which may increase the life span of the flexible pavement. Also may create non-water absorbent layer on the pavement. It's used throughout India especially at railway stations and government offices. It's a tough and non-porous material.

SCOPE & OBJECTIVES

The objective of the present study is to explore the possibility of utilizing Kota stone waste for the construction of unpaved roads and embankments. To reduce the cost of maintenance required for resurfacing of roads. To reduce the amount of bitumen thereby reducing cost of construction. To provide stability to embankment material. To hold the sub-grade material in position. To provide drainage to the water this gets accumulated on road mostly during rainy season. To stop the soil erosion from sides of road. To decrease maintenance cost of road using this material .To increase life year of road.

MATERIALS use in our research work

Aggregate

Aggregates are one of the most important materials when it comes to road construction as it is the material which provides the strength to the road. Basically they are classified into different types based on their shapes that are rounded, cubical, angular, flaky and elongated particles. While construction of the road, basic parameter is to withstand the impact exerted on the road; so for flaky and elongated types it is difficult to attain the kind of strength that can with stand the impact of heavy vehicles for a longer duration. So use of flaky or elongated type of aggregate is avoided as much as possible.

Bitumen

Bitumen is the second most important thing in the construction of flexible pavement after aggregates. It helps the aggregates to stick together and provides the required strength. It acts as the binding material and its adhesive property helps the aggregate to cling together which eventually increases the strength of the road. It is also used because of its water resistance property.

Source: - http://5.imimg.com/data5/MK/BD/MY-3765577/slow-bitumen-emulsion-250x250.jpg

Kota stone

Kota stone is natural lime stone which is used India since past. As it is used on larger scale in construction of buildings etc. Due to higher use of Kota stone the waste generated is also pretty high and it also has an adverse effect on environment. So we are trying to find an alternate way of using the Kota stone in the construction of flexible pavement to increase the strength of the pavement. As the Kota stone is available in India in abundance its waste is easily available.

Source: - http://www.kotadekho.com/images/kota_stone_2_large.jpg

LITERATURE REVIEW

Pradeep Kumar Gautam etal (2017) explained that when KSW was crushed into fines (size smaller than 4.75mm) and were used as full replacement of conventional fines in bituminous mix design of grade 2.Results were evaluated in accordance with the limit suggested by MoRT&H 2013. The test result showed that KSW has the required compressive strength and rigidity. However, increased flow value and VFB showed that friction between aggregate and binder might get compromised if subjected to long term heavy traffic. Hence use of mix

prepared with KSW as fines may be used in low volume roads. His study was only focused on only one parameter which was stability. The study is limited to study behaviour of KSW in terms of marshal stability test parameters only, however to completely asses the performance, it's advised that mix must be further evaluated for moisture susceptibility, rutting and fatigue behaviour. [1]

P.V.V. Satyanarayana etal (2013) explained that sizes of crusher dust grains are mostly of medium to fine sand sizes uniform gradation of particles and of slightly lower specific gravities attained closer packing with respect to crusher stone aggregates resulting higher densities and CBR values can be used as Sub-base base courses in flexible payment constructions. Comparing gradation mixes G1 to G6, with the gradation mixes of MORTH sub-base courses it is identified that at higher percentages of crusher dust these mixes are nearing to Grade-II and Grade-III (Section 400-1) of close graded mixes and at lower percentages of crusher dust these are nearing to Grade-I. It can also seen that the majority of the gradation mixes satisfying the Grades of coarse graded granular sub-base materials (Section 400-2). Hence, the gradation mixes of crusher dust and Crusher stone aggregate with an addition of 20-30% with respect to Crusher stone Aggregate attaining CBR value greater than 50 can be recommended as Base course and Sub-base course materials and the mixes having CBR greater than 30 can be used as Sub-base material.[2]

Bhavin K Vaghadia etal (2016) This Literature review shows that ceramic waste was utilized as filler material in SDBC and ceramic waste partially replace the cement content in cement concrete work while in present study ceramic waste will partially replace as filler as well as aggregate in flexible pavement. Laboratory tests were performed for defining the physical properties of ceramic aggregate and found to be within acceptable limits as per the Indian standards which show that ceramic waste is feasible to utilize as aggregate material in flexible pavement.[3]

Ahmed Ebrahim Abu El-Maaty Behiry (2012) explained that increasing the steel slag percentage (SSP) to the limestone in the blended mix increases the mechanical properties such as maximum dry density, California Bearing Ratio and resilient modulus. The best density and strength for the layer with the least construction costs obtained at a blended mix of 70% steel slag percentage to 30% limestone. Adding steel slag to the limestone aggregates increases the resistance to deflection and vertical strain. While, with increasing the steel slag percentage a little increase in radial stress is achieved. Moreover, the effect of SSP on the vertical stress along the horizontal distance can be neglected. The advantages of steel slag addition are clearly manifested in reducing the rutting and minimizing the rate of deformation
Through about 60 cm from the load impact point.[4]

Rama Krishna T etal (2016) Modified mixes could attain high CBR values to suit as Sub-base course materials as the presence of plastic fines hampers the strength features under

saturation. Addition of 0-3% tire wastes could meet the requirements of MORTH specifications to suit as Sub-base coarse material due to the light weight nature of tire waste. [5]

Test performed for our research work

1) Aggregate test

(a) Los Angeles abrasion test: This test is performed on aggregate is the measures of aggregate toughness and abrasion resistance.

(b) Impact value: This test is performed to determine the impact value of aggregate which we are going to use in road construction.

2) Bituminous Test

(a) Ductility test (IS: 1208-1978): This test is done to measure the ductility or adhesive property of a given sample of bitumen.

(b) Marshall Stability test (IS: 1206-1978): This test helps to get the optimum binder content for the aggregate mix type and traffic intensity.

(c) Penetration test (IS: 1203-1978): This test helps to get the optimum binder content for the aggregate mix type and traffic intensity.

CONCLUSION

As per all the above mentioned results of the research papers we can conclude that by mixing a certain amount of the stone waste to the flexible, it shows differentiable change in the strength of flexible pavement. So use of stone waste can be feasible.

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