



COMPARING THE STANDARD OF COARSE AGGREGATES IN DAKSHINA KANNADA WITH MORTH SPECIFICATIONS FOR BC AND DBM

Dr. Sowmya NJ

Professor, Vivekananda College of Engg & Technology, Puttur. D K., Karnataka

Abstract

The primary function of a pavement is to transmit loads to the base, sub base and underlying soil. The properties of aggregates of used in pavement is depends on gradation and type. In this study the information about the quarries available in the Dakshina Kannada district are collected from the Mining department, Mangalore. Every quarry site was inspected and its locations are identified using GPS. The samples are collected from Sullia, Puttur, Bantawala and Belthangadi taluks of Dakshina Kannada district and tested to find its properties. The properties of coarse aggregates available in the district are compared with the standards of Dense Bituminous Macadam and Bituminous Concrete as per MORTH specifications. The mobile application “Quarry Mart” is developed to give all the information about aggregates available and its location for the contractors, engineers and any other customers.

Index Terms: Gradation, BC and DBM

I. INTRODUCTION

Coarse aggregates are an integral part of many construction applications, they used as a granular base placed under a slab or pavement, or as a component in a asphalt or concrete mixtures. Aggregate gradation determines the void content within the structure of aggregate and also the amount of binder that is required to fill the void space. The quality of aggregate and its gradation is to be known to select the material before construction of any project. Dense Bituminous Macadam (DBM) is mainly used as binder

course used for base or sub base layer of roads having much higher number of heavy commercial vehicles. Bituminous Concrete(BC) is a type of construction material used as base and wearing courses in a pavement structure to distribute stresses caused by loading and to protect underlying unbound layers from the effects of water.

Different sizes of aggregates are available at various quarries but the details like which quarry produces what quality and sizes are not known to the customers. Also checking the quality of material from same quarry for different construction works requires much and repeated investment on tests. Hence the study is required to know the quality of aggregate available in the country. A part of that, in this study an attempt is made to know the quality and sizes of aggregate available for DBM and BC in Dakshina Kannada district as per MORTH specification.

II. LITERATURE REVIEW

Akshay and Inchara [1] studied the parameters such as stability, flow, voids filled with bitumen with increase in proportion of combined index aggregates for DBM mixes. The researchers found that parameters such as air voids and voids in mineral aggregate increases with increase in proportion of combined index aggregates of DBM mixes. Flakiness index up to 30% for DBM can be permitted without compromising the specification requirements. Sakthibalan [2] studied the behavior of DBM and SDBC(Semi Dense Bituminous Concrete) mixes with aggregates having different flakiness indices (0%, 20%, 40%, 60%, 80% and 100%) to quantify the effects of flaky aggregates by

removing elongated aggregates. From the results of Marshal Stability test, the researcher found that the flow value, voids filled with bitumen and tensile strength ratio decreases and air voids increases with increases in proportion of flaky aggregates. Haider, et al. [3] evaluated the performance of Dense Bituminous Macadam and Bituminous Concrete mixes with three gradations and two types of binders using Gradation Ratio and found that the performance properties of the bituminous mixes have correlation with aggregate gradation and larger the value of Gradation Ratio.

Chirag et al.[4] studied the effects of aggregate type, size and content on the compressive strength, workability, durability and other properties of fresh as well as hardened concrete of mix M20(1:1.5:3). The researchers observed that the compaction factor test was more sensitive towards the gradation of aggregates and the result showed that gap graded with compaction factor 0.872 has better workability among different grades. Concrete with gap graded aggregate showed higher compressive strength (14 N/mm²) compared to concrete with uniformly graded aggregate (13.5N/mm²) and well graded aggregate (13.1N/mm²). It is summarized that gradation of coarse aggregate affects the strength properties pavement mixes.

III. OBJECTIVES OF THE STUDY

The following are the objectives framed for the study.

- Determining the strength and gradation of coarse aggregates available in Dakshina Kannada district.
- Comparing the standards of aggregates with requirements of Dense Bituminous Macadam and Bituminous Concrete as per MORTH specification.
- To develop a mobile application which is useful for the customers to get the information about number of quarries, its location, sizes and quality of aggregates produced and quarry owner information of Dakshina Kannada district.

IV. STUDY AREA

Dakshina Kannada is a district in the state of Karnataka in India. It is sheltered by the Western Ghats on the east and surrounded by

the Arabian Sea on the west. With population of about 20.9 lakh, of Karnataka, Dakshina Kannada becomes 8th most populous district. As per statistical data 2016, total geographical area of Dakshina Kannada district is 4861 km² and it is the 11th smallest district by area in the state. Population density of the district is 430 persons per km². The district is divided into five taluks such as Mangalore, Bantwala, Puttur, Sullia and Belthangady.

A.Details of quarries In Dakshina Kannada District

The quarry details (Table I) of study area are collected from the Mining department, Mangalore. This data includes number of quarries available, its owner information and quantity of production.

V. METHODOLOGY

As per the data collected from the Mining department the field survey is conducted.

The quarries are visited to collect the samples along with this, its location, owner information and quantity of production etc are also collected. During the field visit it was noted that many quarries are not in operation, due to several problems, which are listed in Table.II.

Table I Total no .of quarries available in Dakshina Kannada district.

Taluks	Puttur	Sullia	Bantwala	Belthangadi	Mangalore
No. of quarries	2	2	13	9	46

The specific gravity, water absorption, impact value and gradation of aggregates are determined and the results compared with MORTH (Ministry of Road Transport and Highways) specification required for Dense Bituminous Macadam and Bituminous Concrete.

Table II Working condition of quarries in Dakshina Kannada district

Taluks	No .of quarries	
	Working	Not working
Puttur	-	2
Sullia	1	1
Bantwala	12	1
Belthangadi	4	5
Mangalore	38	8

- Quarry details of Sullia taluk* that the aggregate available in Alleti quarry satisfies the strength criteria requirements of BC and DBM as per MORTH specification

Among two quarries of Sullia taluk only Alleti quarry is functioning. It is cleared from Table III

Table III Quarry details of Sullia taluk

Sl no	Place	Name and address	Size of the aggregates	Quantity m ³	Location	Sp.gr	Water absorption	Impact value
1	Alleti	Mohamad Asif Mangalore	20mm	1600	12°32'21.9"N 75°22'32.1"E	2.66	2	20
2	Yenekallu	Rajesh Mangalore	No Production		12°40'27.8"N 75°33'28.0"E	-	-	-
Requirements as per MORTH					BC	-	2	24
					DBM	-	2	27

The gradation of aggregates available in Aletti quarry are matching (Table IV) between 40-26.5mm of Dense Bituminous Macadam requirements and remaining size of aggregates are not matching with both Bituminous Concrete and Dense Bituminous Macadam requirements. Hence it is recommended to crush further as per standards to use these aggregates for Dense Bituminous Macadam and Bituminous Concrete construction.

Table IV Gradation of Aletti Quarry

IS Sieve Size(mm)	% Finer		Aletti quarry
	As per MORTH		
	BC	DBM	
	Nominal aggregate(NAS)		NAS 37.5mm
	19 mm	37.5mm	
40		100	100
37.5		95-100	100
26.5	100	63-93	74.29
20	90-100	-	75.54
13.2	59-79	55-75	6.94
10	52-72	-	1.39
4.75	35-55	38-54	-
2.36	28-44	28-42	-
1.18	20-34	-	-
0.6	15-27	-	-
0.3	10-20	7-21	-
0.075	2-8	2-8	-

Similarly the details of quarries available in Puttur, Belthangadi and Bantwala taluks are

collected and materials tested as per required specification.

- Quarry details of Belthangadi taluk*

Out of nine quarries available in Bantwala Taluk only five quarries are in working condition. Based on the test results it is found that all these aggregates satisfies to impact value and water absorption recommended as per MORTH specification of DBM and BC. The record of Mining department shows that quarries produces 40mm and 20mm size of aggregates but when the site was inspected it is found that at present the quarry is producing either only 40mm or 20mm size of aggregates. The aggregate gradation of quarries Andinje1 and Andinje2, Kukkala1 and Kukkala 2 are matching between 40-13.5 mm of Dense Bituminous Macadam requirements and remaining size of aggregates are not matching with both Bituminous Concrete and Dense Bituminous Macadam requirements.

- Quarry details of Puttur taluk*

At present in Puttur no quarries are functioning and the aggregates for the construction are taken from nearby taluks.

- Quarry details of Bantwala taluk*

Out of thirteen quarries available in Bantwala Taluk, a total of twelve quarries are functioning. Based on the test results it is found that all these aggregates satisfy the impact value and water absorption recommended as per MORTH specification for BC and DBM. In Bantwala

taluk the quarries such as Ananthady, Veerakamba and Ira are owned by different owners but the quarries are located at same site. The aggregate gradation of Veerakamba 1 and Veerakamba 2, Ananthady 1 and Ananthady 2 Ira1 and Ira 2 are matching between 40-26.5mm of Dense Bituminous Macadam requirements and remaining size of aggregates are not matching with Dense Bituminous Macadam requirements.

As per Mining department details, the quarries ThenkaKajera, Balepuni ira, Vitla Mudnuru, Kepu and Vitalakasaba produce 40mm and 20mm size of aggregates but when the site was inspected it found that at present the quarries are producing only 40mm size of aggregates. The aggregate gradation of these quarries not matching with MORTH specification of Dense Bituminous and Bituminous Concrete.

In Sullia ,Puttur,Belthagadi and Bantwala taluks of Dakshina kannada district many quarries are not producing 20mm size aggregates; hence it is clear that there is shortage of supply of aggregate for Bituminous concrete construction.

Almost the aggregates available at study area are not as per MORTH specification required for DBM and BC and also based on the gradation details it is clear that blending of aggregates is not possible.

VI. DEVELOPMENT OF MOBILE APP

Mobile Application is developed for android mobile use for the needy to give the information about number of quarries, its location, size of aggregates and quality standards of available aggregates in Dakshina Kannada District. Following are the steps followed to develop the app.

1. Android operating system is developed using Java.

2. Android SDK is Downloaded using a link <http://developer.android.com/sdk/index.html>.Android.

3. Latest version of ANDROID STUDIO is downloaded and installed in the mobile system using the link.

<https://www.eclipse.org/downloads/>

4. Android development Tool (ADT) is installed for Eclipse from the Eclipse for market place.

5. The latest SDK tools and plates are downloaded using SDK manages.

6. Android project with Eclipse IDE created includes filling the application name, setting

lowest and highest Android version that the application support and compiling.

7. Configuring the project and running the developed app on an Android emulator is done.

The mobile application is available in play store with the name "QUARRY MART". The front window of "QUARRY MART" is as shown in the Fig 1. It consists of several windows are explained below.

- **About Us:** In this the information about the college name and address and mission of the college is provided.

- **Material Based:** In material based the materials and size of the aggregates available in each quarry of Dakshina Kannada district are provided.

- **Pocket Tools:** Tools like Calculator, Note book, Pedometer, Location, Mortgage, Currency and Stock Market are provided for use of the customers.

- **Map :** Map gives the direction and location of each quarries available in Dakshina Kannada district.

- **Location Based:** In location based gives information of location all the quarries of Dakshina Kannada district with quantity of production.

- **Enquiry :** In enquiry, the customer can enquiry about the aggregate with the App developer. Further App work is to be carried out such a way that customer can directly contact quarry owner.

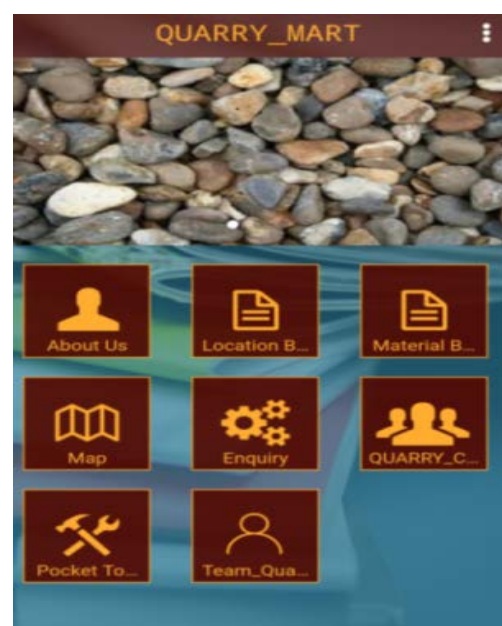


Fig I. Screenshot of Quarry mart

VII. CONCLUSIONS

From the study conducted following are the conclusions drawn.

- Almost all aggregate available in four taluks of Dakshina Kannada satisfies the strength requirements of the aggregates for BC and DBM.
- The majority of aggregate gradations are not as per MORTH requirement for BC and DBM. Also based on present gradation details of available aggregates the blending is not possible.
- The Mobile Application developed "QUARRY MART" will give the information about quarries of coarse aggregates which is handier for the customer to select the aggregate type as per requirement.

REFERENCE

[1] Akshay and Inchara, "Determination of variability of properties of bituminous mixes on variation of shape of the particles", International

research of Journal of Engineering and technology (IRJET), Vol.4, No.06, pp.253-258,2017.

[2] Sakthibalan, "Influence of aggregate flakiness on dense bituminous macadam and semi dense bituminous concrete mixes", International Journal of Engineering and technology, Vol.3, No.14, pp. 25-29, 2009.

[3] Haider HabeebA., N.A Yasir. Kareem, and Satishchandra "Performance of bituminous mixes with different aggregate gradations and binders", International Journal of Engineering and technology, Vol.2, No.11, pp.1802-1812, 2012.

[4] Chirag Pawar, Palak Sharma and AbhyudayTitiksh, "Gradation of aggregates and its effects on properties of concrete", International Journal of Irena in research and development, Vol.3(2), pp.81-84,2016.