INVESTIGATION OF CRUSHED ROCK AGGREGATES FOR UNBOUND PAVEMENT FROM ADESHWAR AREA, SITAPILA VDC, KATHMANDU CENTRAL NEPAL

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SHRAWAN KHANAL

IN

PARTIAL FULFILLMENT OF

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Date:

It is certified that **Mr. Shrawan Khanal** has worked satisfactorily for his Master's Degree thesis under my supervision. This dissertation entitled **"INVESTIGATON OF CRUSHED ROCK AGGREGATES FOR UNBOUND PAVEMENT FROM ADESHWAR AREA, SITAPILA VDC, KATHMANDU, CENTRAL NEPAL"** embodies the candidate's own work and I hereby recommend it for approval.

_____

Supervisor
Assoc. Prof. Dr. Naresh Kazi Tamrakar
Central Department of Geology
Tribhuvan University
Kathmandu, Nepal

Date:

This M. Sc. dissertation entitled **"INVESTIGATON OF CRUSHED ROCK AGGREGATES FOR UNBOUND PAVEMENT FROM ADESHWAR AREA, SITAPILA VDC, KATHMANDU, CENTRAL NEPAL"** was submitted and successfully presented by **Mr. Shrawan Khanal** to the Central Department of Geology, Tribhuvan University, Kirtipur, Kathmandu Nepal. We hereby certify that this work fulfills the partial requirements for obtaining the Master Degree of Science in Geology.

_____

Prof. Dr. Megh Raj Dhital

Head of Department

(Central Department of Geology, Kirtipur)

_____ _____

External Examiner

Supervisor

Assoc. Prof. Dr. Naresh Kazi Tamrakar

Central Department of Geology

Tribhuvan University

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Shrawan Khanal

Central Department of Geology, Kirtipur, Kathmandu

Abstract

Road transport is the only affordable mode for mobility next to walking for our country. With the continuous increase in the demand for road transport, it should be realized that good road network has to be developed in most planned way with most reliable qualitative materials. In Nepal, natural gravels and crushed rock aggregates of different rock types are used in construction of different layers of roads with little concern about quality to be used. Because of lack of sufficient concern about the quality of materials most of the roads have been less durable. If quality of the materials to be used is checked roads will be strong and durable. Therefore, present study was carried out to evaluate the crushed rock aggregates of the Chandragiri Formation, one of the largest sources of construction material for unbound pavements on the basis of rock mass characteristics, petrography and other physico–mechanical properties.

Basically this study reveals petrography, chemical composition and methods and results of investigation of crushed rock fragments to determine their overall aggregate properties. Test were carried out to determine overall petrographic properties, their percentage chemical composition, shape, dry density, water absorption value, aggregate crushing value (ACV), aggregate impact value (AIV), los angeles abrasion value (LAA), california bearing ratio (CBR) and sodium soundness value (SSV).

Rocks can be categorized into three classes according to surface texture, grain size and color as light grey course crystalline limestone, medium grained siliceous limestone and fine grained argillaceous limestone in the field but these varieties when classified petrographically on the basis of total carbonate content and grain size in engineering classification can be categorized in to crystalline limestone, calcareous siltstone and siliceous limestone respectively. Weathering grade of the rock of quarry area varies from IB to II which means that the rock is faintly to slightly weathered and can be better for road aggregates. The surface features such as angular shape and rough crystalline texture are the valuable guides relative to the internal frictional properties of an aggregate which resists the movement of aggregates past each other and considered as excellent road aggregates. On the basis of characters such as spacing of joints, persistence (Rock mass strength classification of John 1962 and Bieniawski 1973) the rocks of the study area are sound and medium strength rock mass which can be only extracted by blasting and fracturing

Petrographic variation in the grain size ranging from that of silt to sand and mineralogically diverse chemical constituents such as calcite, quartz grains, feldspar mica, clay and heavy minerals shows that aggregates are of diverse chemical composition. The majority of crushed fractions of aggregates are cube to disc shape having high sphericity, high roughness index (>1), moderate roundness index. Low Flakiness index (FI) and high Elongation index (EI) indicate aggregates possess only some flat grains. These indices show that aggregate has good workability for a road aggregates.

Physical properties such as low water absorption value (< 1%) and average dry density (2.49–2.65 g/cm^3) shows aggregates possesses low effective porosity and average dry density which coincides with the standard average value of ASTM, 1994.

Mechanical properties such as ACV ranges from 20–30% which indicates that rock are strong as crushed fraction is low. AIV 10–20% shows that aggregates are mechanically sound. LAA value ranges from 25–30% which shows that the hardness of the sample is uniform. SSV less than 12% shows that aggregates are resistance against chemical weathering and frost action.

Probable reserve of the deposit in the quarry area is estimated to be 2642213.6 tonnes which when extracted at the rate of 122241.6 tonnes per year. It is estimated to supply the aggregates for 26 years. Also, the distribution of similar rock types along the peripheral parts of the Kathmandu Valley shows that these rocks can be good source of aggregate for future supply.

Overall results shows that crushed rock aggregates are suitable for unbound pavements.

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