

Assessment of Coarse Aggregate Potential of Arvalli Rocks by Determination of Variation in Concrete Properties

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Candidate- Megha Kalra

Roll no:-16PHDCE008

Enrollment no:- 16- 14899

Supervisor- Prof. Gauhar Mchmood

Department of Civil Engineering, Faculty of Engineering and Technology, JMI.

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The objective of this study was to assess the coarse aggregate potential of Aravalli region with respect to its behavior in concrete. In the first phase field data was collected using the resistivity techniques and in the second phase the properties of concrete in the fresh and hardened state using different type of coarse aggregates were studied.

It was concluded that for apparent resistivity value of less than 1000 Ω -m it can be classified as weathered rock. For value in between 1000 to 1500 Ω -m it will yellowish quartzite, 1500-2000 Ω -m it is reddish quartzite, 2000-2500 Ω -m it is greyish quartzite and for values beyond 2500 Ω -m it is granite.

In the second phase, three different categories of quartz classified according to color composition were used for concrete testing, namely greyish quartz, reddish quartz and yellowish quartz. Gray quartzite, which was metamorphosed directly from granite, was found to have inherited to some extent the strength of granite. However, due to the weathering of the reddish quartzite and yellowish quartzite, it has lost its strength. Also, the presence of ferrous and ferrous material in them disturbed its inactive reaction and became chemically active. This affected the workability of the concrete. However, the reddish quartzite and yellowish quartzite disturbed the w/c ratio due to bleeding. Overall, it was found that gray quartzite can be taken as a reliable coarse aggregate and the required compressive strength was achieved for all the mentioned concrete qualities. While in the case of reddish and yellowish quartz concrete, the strength parameters were affected by the disturbance of w/c ratio and workability. It can be established now that the concrete mix of greyish quartzite can be taken as the standard one since it shows same properties as the normal concrete and all the comparisons have been done in accordance with the greyish mix. Normal bleeding occurs in the greyish concrete, normal refers to a uniform seepage of water over the entire surface. As the water absorption of yellowish aggregate is maximum, it showed least workability for same water cement ratio followed by reddish aggregate concrete and greyish quartzite concrete. It has been determined that gray quartzite can be used directly as a coarse aggregate as no variation in strength of concrete made with gray quartzite aggregate is seen, so the probability of failure is negligible. When using reddish quartz as coarse aggregate, about 10%-12% amount of cement should be increased as variation in compressive strength has been observed. When using yellowish

quartz as coarse aggregate, it is recommended to increase the amount of cement between 12-15%. When using all three types of quartz in the same ratio, the amount of cement should be increased by 5-7% to achieve the required strength.

Since most of the builders and developers use this quartzite as aggregate without its proper segregation, the building design has been affected, which is a very important finding of this paper and requires the attention of relevant engineers and structural engineers. Hence, it is a non-destructive technique which can be used to find the potential of aggregate without disturbing the strata.