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Use of Reclaimed Asphalt Pavement (RAP) in Cement Concrete under Different Environmental Conditions for Rigid Pavement Application

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Abstract: ***The inappropriate use of Reclaimed Asphalt Pavement (RAP) leads to deterioration of environment and waste of money. Research studies show that RAP can be reused helping in sustaining environment along with saving a huge amount of budget. This study circulates around using RAP as a replacement of coarse aggregate in Concrete and then investigating RAP-Concrete under different temperatures. The mix design of concrete was done for 4000 psi. Concrete specimens were tested for physical as well as mechanical properties. Results showed that all the properties decrease with the increase in the replacement level of RAP in concrete specimens.***

Keywords: Reclaimed Asphalt Pavement, Coarse Aggregate, Concrete, Rigid Pavement, Temperature

I. INTRODUCTION

Road pavements are considered as backbone for the development of a region. Rigid pavements have an upper hand over flexible pavements because of long life span and less maintenance works. Coarse aggregate is the main component in both types of the pavements as it occupies a large volume of the structures. Population of the world increases so constructing roads and buildings are increasing which is leading towards scarcity of coarse aggregate. Studies have been done to cope up with this problem, so different types of materials have been started to use instead of coarse aggregate. Reclaimed Asphalt Pavement is the most recycled material in United States [1]. It is produced due to the maintenance and rehabilitation of flexible pavement. Using RAP as a replacement of coarse aggregate in rigid pavement is a viable option as it would save a lot money and will sustain environment. RAP constitutes of 93 to 97 percent mineral aggregates by weight [2]. It was observed that RAP-Concrete mixes did not fail suddenly like the control mix [3]. A huge amount of RAP has been obtained during maintenance and repair works of roads in Pakistan, but a very small amount has been recycled for construction related purposes. Laboratory results reveal that mechanical properties decreased with increasing amount of RAP in concrete mixtures [4]**.** Study by Hossiney et al. [2012] included concrete with 20, 40, 70, and 100 percent RAP as coarse aggregate were produced and their mechanical properties were brought into comparison with the control mix. [5]. Despite of all these studies, RAP in concrete under different temperatures has not been investigated yet.

II. RESULTS

The compressive strength of concrete specimens were obtained and calculated from universal testing machine. Test sample had no RAP, while 25% RAP-Concrete contained RAP replacing coarse aggregate by twenty-five percent.

Temperature (°C)	Test Sample (psi)	25% RAP-Concrete (psi)
0	2810	2540
60	2050	1920

The flexural test of concrete was too carried out with UTM. The temperature of the environment in which concrete specimens were placed were 0 and 60 degree centigrade.

Temperature (°C)	Test Sample (psi)	25% RAP-Concrete (psi)
0	745	525
60	510	355

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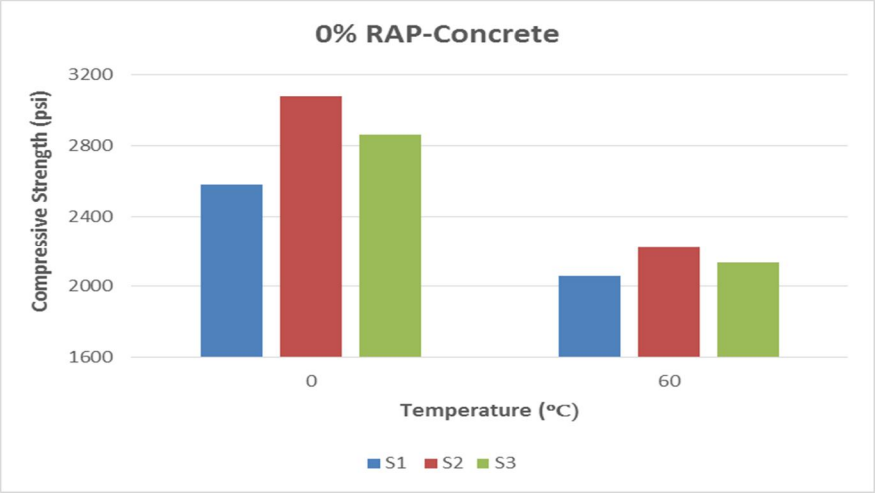
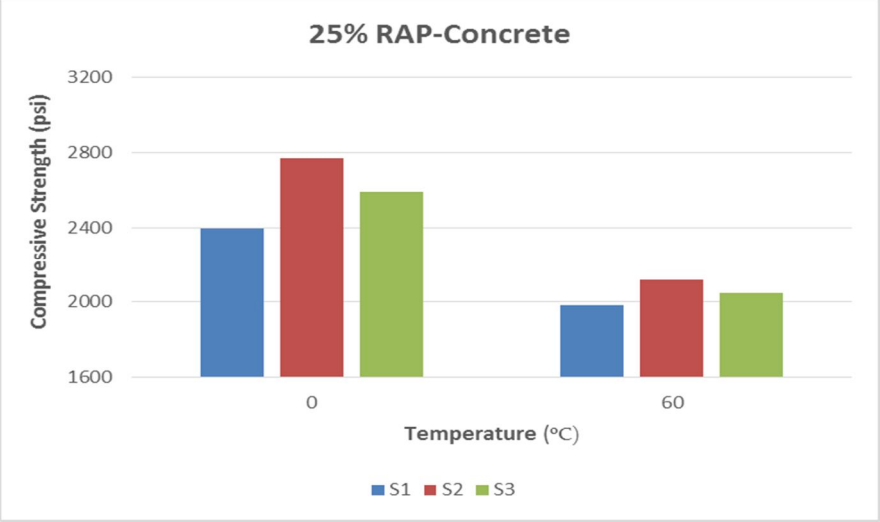
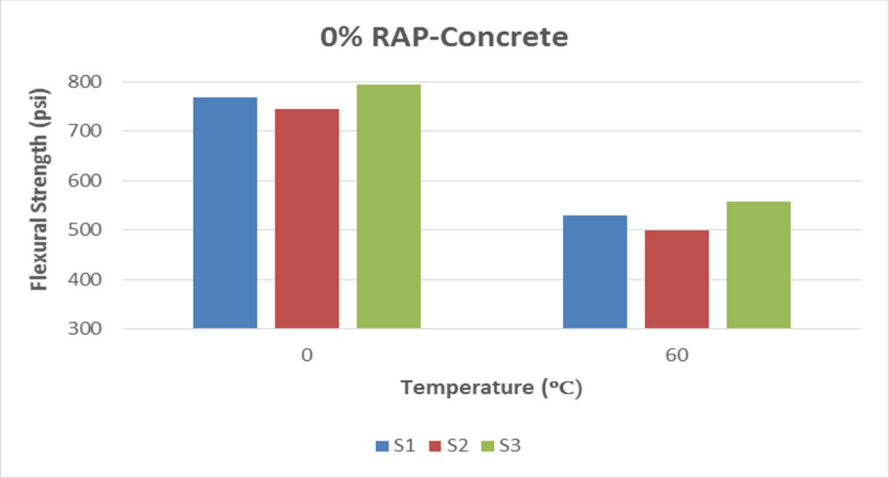
The below bar graphs show that compressive strength of concrete decreases as the replacement level increases, also compressive strength decreased with the increase in temperature.





Like compressive strength, the flexural strength of concrete also decreased with increase in replacement level of RAP and temperature.



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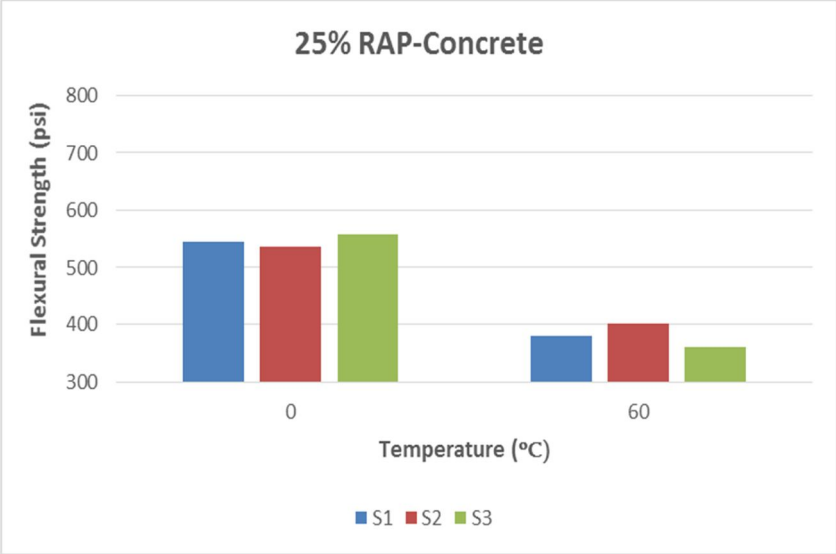

III. CONCLUSIONS

A. It was seen that with increasing replacement level of RAP, compressive and flexural strength got decreased.

B. With increase in surrounding temperature, the compressive and flexural strength decreased.

C. RAP is economical to be used for low/medium traffic.

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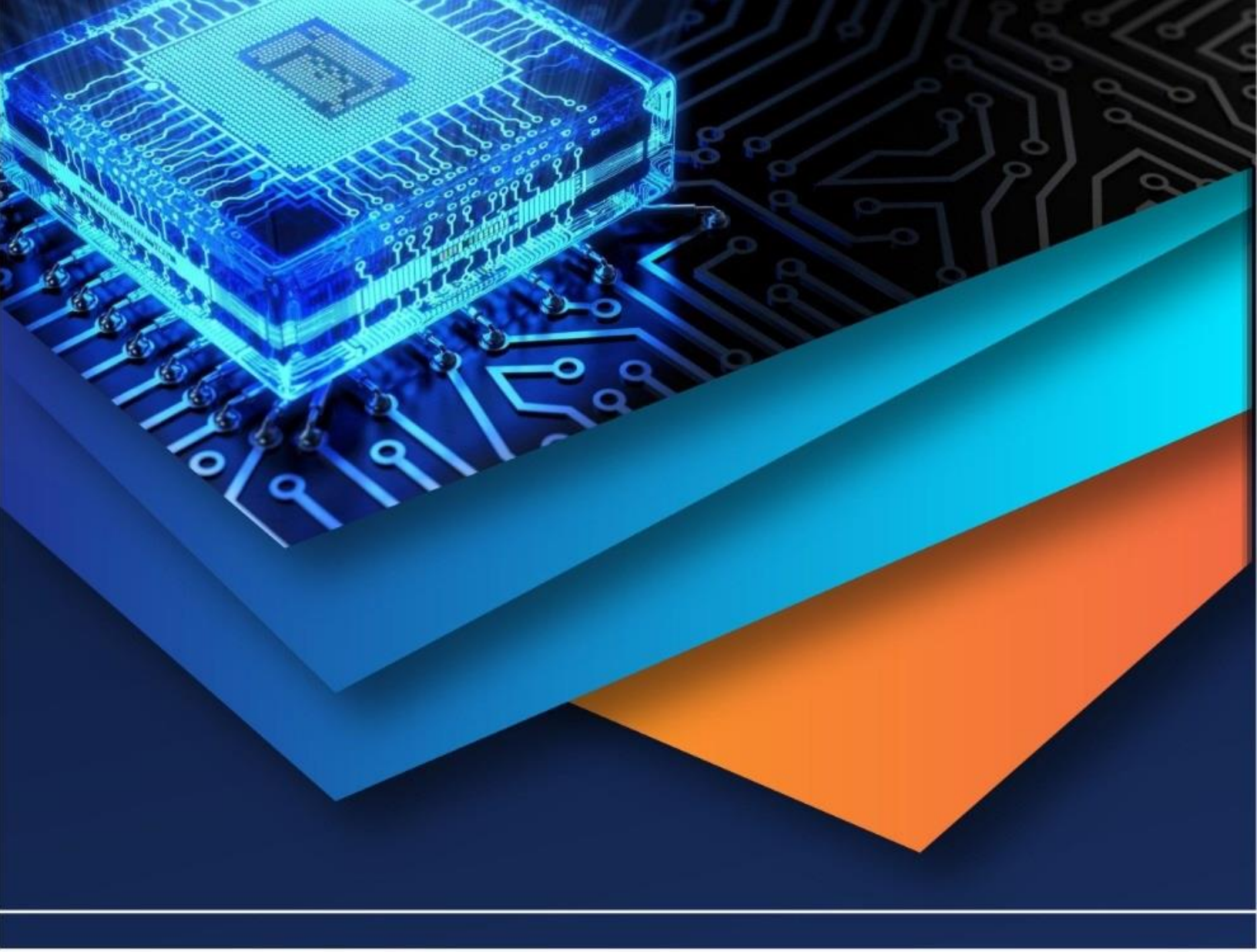

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