Effect of Polymer SBR on Strength Reduction in Concrete Immersed in Drainage and Ground Water

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Concrete structures suffer from the impact of many harmful attacking materials that affect the properties of the main material in them, which is concrete. These structures are also, exposed to the negative impact of many hostile environments such as soils containing harmful salts and harmful acids. A number of precautions should be considered in order to protect the concrete used in such structures. Adding polymer to concrete components as a percentages weight of cement is one of the methods for producing polymer-modified concrete, which has low permeability, better mechanical properties and is more resistant to the negative effects of harmful environmental factors. The utilization of polymers could help in protecting structures and enhancing concrete strength. In this study, concrete mixes were prepared with inclusion of styrene butadiene rubber (SBR) polymer at four percentages (0%, 5%, 7% and 10% by cement weight). Co-polymers of butidine with styrene (styrene-butadine rubber (SBR)), are a group of large-volume synthetic rubbers. High adhesion occurs between the polymer films that form and cement hydrates. This action gives improves the properties of concrete such as flexural and compressive strength and gives also a higher durability. The investigation was extended to evaluate the compressive strength of the SBR concrete mixes immersed in three types of waters: tap, drainage and ground water, at three different ages. The results showed that SBR polymer enhanced the compressive strength of concrete significantly. A comparison between reduction in strength of concretes immersed in these

three types of waters was also presented. Moreover, the presence of SBR polymer led to reduced loss in strength of concrete specimens immersed in drainage and ground water. A proposed model to determine the compressive strength of concrete specimens immersed in drainage and ground waters was deduced. This model could be a helpful tool for rapid and easy estimation of the strength of concrete specimens immersed in drainage and ground water at different contents of SBR polymer. The results showed the highest improve in compressive strength to be associated with 7% SBR mixes at the three tested ages. The increases in this strength at days 7, 28 and 56 with inclusion of 7% SBR polymer were 112.8%, 113.9% and 116%, respectively, compared to OPC mix.