

University of Baghdad	
Department	Civil Engineering
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Thesis Title	Effect of Additives on Moisture Susceptibility of Asphalt Mixtures
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Abstract	<p>Moisture damage in asphalt pavement can be understood as the progressive deterioration of asphalt mixes by loss of adhesion between asphalt binder and aggregate surface and/or loss of adhesion within the binder in the presence of water. Moisture damage is a global issue because it reduces the asphalt pavement performance capacity leading to several modes of distress of interest in pavement design including fatigue cracking, permanent deformation, and thermal cracking.</p> <p>The objective of this work is to improve the asphalt mixes resistance to moisture by using three types of additives hydrated lime, crumb scrap rubber, and fly ash by using two types of asphalt cement binder; asphalt binder grade (40-50) from Al-Daurah refinery and asphalt binder grade (60-70) from Al-Shaiba refinery with one type of aggregate (19mm aggregate nominal maximum size) obtained from Al-Niba'ai and limestone dust from Kerbalaa factory as mineral filler. The procedure of Marshall test was adopted in this work to find the optimum asphalt content for both asphalt binders. The optimum asphalt content was 5% for asphalt cement (40-50) and 4.8% for asphalt cement (60-70).</p> <p>Two tests were performed in this work to evaluate the effect of the three additives on asphalt mixes moisture susceptibility "Index of Retained Strength Test" and "Tensile Strength Ratio Test" as well as "Marshall Test" to evaluate the effect of the three additives on Marshall properties. 300 specimens were the total number of specimens made for this work for both asphalt binders; 60 specimens for Marshall test, 120 specimens for the tensile strength ratio test, and 120 specimens for the index of retained strength test. Hydrated lime was added to the mix using the saturated surface dry method at (1, 1.5, and 2)% by weight of aggregate while the fly ash was added at (1, 3, and 5)% by weight of aggregate using the saturated surface dry method and the crumb rubber was added to the binder at (10, 15, and 20)% by weight of binder. The results of this work lead to several conclusions which mainly refer to the benefit of using hydrated lime and fly ash as moisture resistance improvement additives the contrary to crumb rubber that reduces the asphalt mixture resistance to moisture damage.</p>

	Maximum values for tensile strength ratio and index of retained strength ratio were achieved at 1.5% lime percent and 3% of fly ash with less values for fly ash than lime.
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