In the 1980s, the French Road Administration, Labatoire Centrale des ponts et Chaussées, (LCPC) developed high modulus asphalt mixtures, Enrobé à Module Élevé (EME), by using hard binder grade. The aim of this new mixture was to present a good resistance to moisture damage and to improve the mechanical properties of asphalt concrete which include high modulus, good fatigue behaviour and excellent resistance to rutting. In Iraq, this type of mixture has not been used yet.

The main objective of this research is to evaluate the performance of high modulus mixtures (EME) and compare them with the conventional mixture by using EME aggregate grading for base course. To achieve this objective, local aggregate and two types of asphalt binders were used, the first one with penetration grade (40-50), was obtained from Daurah refinery and the second one with penetration grade (20-30) from Jordan. The optimum asphalt content of each type of mixtures was determined using Marshall mix design. Physical tests on asphalt binder and aggregate, indirect tensile strength, repeated load permanent deformation and repeated third point flexural beam fatigue tests were carried out in the laboratory of Baghdad University. The variables used for rutting test were three temperatures (20, 40 and 60 °C), three asphalt content (optimum asphalt content, optimum asphalt content ± 0.6) and two applied stresses (0.138 and 0.207 Mpa). On the other hand, the variables used for fatigue test were two temperature (10 and 20 °C) and three asphalt contents (optimum asphalt content, optimum asphalt content ± 0.6).

Based on minimum Richness factor (K) equation, the high modulus asphalt concrete mixture (HMAC) for this study is EME Class 1 with minimum binder content of 4 percent.
The results of indirect tensile strength test (Modified Lottman test) showed that the high modulus mixture has a resistance to moisture damage more than the conventional mixture by 9.3 percent so the HMAC passes the requirement of EME specification for durability performance. The rut depth for HMAC at 30,000 cycles is approximately 1.6 percent lower than that specified in the French specification whereas, the conventional mixture collapses after 2000 cycle, when using high modulus mixture instead of conventional mixture. The resilient modulus (Mr) for the optimum asphalt content at 60°C increased by 63 and 30 percent for stress level 0.138 and 0.207 Mpa, respectively. As a result, the HMAC mixture presents excellent resistance to permanent deformation than conventional mixture. At 10°C, the fatigue life for high modulus asphalt mixture was more than that of conventional mixture while at 20°C fatigue life has an opposite behavior.

VESYS 5W software was also used as a part of the objective of this work to predict the pavement performance with design life of 20 years. The drop in serviceability index value for the pavement section with EME mixes is less than 1 whereas for conventional mixes the corresponding value is 2.5. With this result in view, the use of EME mixes has been added to local knowledge to increase the ability to produce more durable asphalt concrete mixtures with better serviceability.