



## Effect of PolyPhosphoric Acid on Rutting Resistance of Asphalt Concrete Mixture

Hussein Burhan <sup>a\*</sup>, Mohammed Qadir Ismael <sup>b</sup>

<sup>a</sup> M.Sc. Student, Department of Civil Engineering, College of Engineering, University of Baghdad, Iraq.

<sup>b</sup> Assistant Professor, Department of Civil Engineering, College of Engineering, University of Baghdad, Iraq.

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### Abstract

The action of high repeated trucks load associated with dramatically elevated ambient temperatures leads to the most harmful distress in asphalt pavements occurred in Iraq known as rutting. Essentially, it is produced from the accumulation of irrecoverable strains, which mainly occurred in the asphalt layers. That visually demonstrated as a longitudinal depression in the wheel paths as well as small upheavals to the sides. Poly Phosphoric Acid (PPA) has been used as a means of producing modified asphalt binders and the interest to use it has increased in recent years. The PPA provides modified asphalt binder, which is relatively cheaply produced compared to polymer-modified asphalt. In this paper, PPA was used by three-percentages 1, 2 and 3 % of the weight of asphalt binder. Two asphalt binder grades were used in this study, 40-50 and 60 -70. The evaluation process based on conducting Marshall Test, Compressive strength test and the Wheel Tracking test. The optimum asphalt content was determined for eight asphalt mixture. The results of the index of retained strength of modified asphalt were slightly increased compared with conventional mixtures. The rut depth was determined by using wheel tracking device at different temperature (45 and 55 °C) for each asphalt mixture under 10000 cycles and the results showed that modified asphalt with PPA produced mixtures with more rutting resistance than conventional asphalt mixture. Moreover, the effect of PPA on rutting resistance for asphalt grade 60-70 was higher than asphalt grade 40-50.

*Keywords:* Asphalt, Rutting, Poly Phosphoric Acid, Modified Asphalt, Wheel Tracking Test.

### 1. Introduction

Asphalt pavement is a durable surface material laid down on the ground surface meant to sustain vehicular traffic loading. Flexible pavements are immensely adopted in Iraq as it provides ease in construction, operating and maintenance, the summer in Iraq is very hot where temperature raised to more than 50 °C. It persists for a long time, nearly for five to six months. Therefore, all roads situated in this area suffer from the phenomenon of rutting, and absence of control of the higher axial loads in preceding years. Overloading and high pavement temperatures are most widely on many roads in the Iraq. Modified binders have been used for construction of top surface courses of the flexible pavement for quite some time to achieve improved pavement performance. To improve the quality of the binder, it is essential to identify the proper parameter of the asphalt that controls the rutting in the flexible pavement [1].

Several attempts to develop pavement materials that assisted to earn longer serviceability. Most of these attempts were pointing to improving the design of asphalt binder mix through modified asphalt binders [2]. Asphalt mixture has been modified by adding a different type of additives, the addition of additives typically excesses the stiffness of the

\* Corresponding author: [hbrmac1@gmail.com](mailto:hbrmac1@gmail.com)

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