別紙様式第 2 号 Form2
(都市イノベーション学府 Graduate School of Urban Innovation)

論 文 要 旨
Summary of Dissertation

専　　攻 Department	都市イノベーション専攻
氏　　名 Name	岩間　将彦
論文題目 Title	Durability Assessment of High RAP Mixture with Rejuvenator using SATS Conditioning
和訳または英訳 Translation (J->E, or E->J)	再生添加剤を併用し再生骨材配合率を高めた再生アスファルト混合物の SATS コンディショニングを用いた耐久性評価

In many countries, and especially in developed countries, assessing the durability of aging infrastructures has become an urgent issue, as the number aging infrastructures failing during their service has been increasing. Meanwhile, increases in torrential rainfalls and heat waves have become apparent worldwide, and might be related to global warming. Therefore, many aging infrastructures will be exposed to more severe environments; accordingly, the possibility of further failures during their service is expected to increase. In particular, the durability of road pavements is a concern because they are directly subjected to heavy rainfall and heat waves while withstanding traffic loading.

In the field of road pavements, the use of reclaimed asphalt pavement (RAP) has increased for asphalt pavements owing to the aim of preserving natural resources, resulting in increased demand for RAP mixture production. Recently, approaches to reusing RAP have been repeatedly implemented. Therefore, providing durability assessments of RAPs is especially important. For this reason, several studies have investigated the effects of moisture on the mechanical and physical properties of RAP mixtures, as moisture plays an important role in the durability of asphalt mixtures. It is known that moisture induces a loss of cohesion in asphalt mixtures, resulting in the loss of stiffness of the mixture. Moisture also leads to stripping in asphalt mixtures during service, owing to the loss of adhesion at the interface between the aggregate and binder. Thus far, the previous results obtained using RAP mixtures have suggested that RAP mixtures have better resistance to moisture than virgin hot mix asphalt (HMA) mixtures.

In terms of environmental concern, warm-mix asphalt (WMA) mixture have been widely used in practice, which has contributed to reduction in carbon dioxide (CO_2) and preservation of natural resource. WMA technology can save energy and prevent bitumen from aging at asphalt mixture production. One of effective measures in the WMA technology is binder modification via wax. Binder viscosity significantly decreases, resulting in the reduction in the temperatures of asphalt mixtures at the production and the layering. Therefore, the application to WMA technology is also examined for RAP mixture.

However, aging caused by thermal degradation and oxidation also appears during the service, i.e., while the moisture attacks the RAP. Despite this fact, few efforts have been made to investigate the combined effects of moisture, heat, and oxidation, referred to as "combined aging," on the durability of RAP mixtures. In recent years, RAP mixtures

with high RAP contents blended with rejuvenator agents have appeared in practice for the repeated use of RAPs. Owing to this situation, there is a need to understand how the performances of RAP mixtures with high RAP contents and rejuvenator agents change when the mixtures are subjected to combined aging. However, there have been no detailed studies on how the durability of such RAP mixtures changes when subjected to combined aging, or how it differs from that of ordinary HMA and WMA mixtures, not only in terms of the mixture, but also in terms of the binder properties.

Therefore, in this study, the mechanical and physical properties of RAP mixtures with 30% and 60% RAP contents blended with two types of rejuvenator agents were experimentally investigated, with and without combined aging. Saturation aging tensile stiffness (SATS) conditioning was used to simulate the combined aging that would occur in the field. The properties of the binders extracted from the mixtures with and without combined aging were also examined. The test results were compared with those of HMA and WMA mixtures. The binder properties as obtained through a two-stage extraction process were also examined. Details of the experimental program and test results are described in this thesis. Based on the obtained test results, certain aspects of the damage mechanisms for RAP mixtures subjected to combined aging are discussed.

4,000 字以内

Must not exceed 4,000 Japanese characters or 1,600 words.

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