

PROJECT PROFILE

Title	TII268 Lot 8 Bio-binder: Bio-based Asphalt Pavement Binder and Rejuvenator
Contractor	Ove Arup & Partners Ireland Ltd t/a Arup
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Start date	Nov-21
End date	Oct-24
Status	Complete
Type of project	TII Research Project
Project reference	TII268 Lot 8

Description	This research project involved the assessment of the viability of select bio-based, non-fossil fuel based binders used in bituminous mixtures. The selected bio-binders were considered in the context of Irish bituminous material specification and production. The performance of the selected bio-binders were evaluated in the laboratory. The first project task involved a literature review, collating the latest research and developments related to bio-binders. This information provided guidance on the development of the experimental plan for this project. Based on the initial literature review two biobased materials were evaluated namely: 1. Biophalt - bio-binder produced by EIFFAGE 2. Lignin - partial bitumen binder replacement Biophalt is a bio sourced binder, derived from forestry and co-products of the paper industry, which replaces all the petroleum-based bitumen normally used within a bituminous mixture. The evaluation of the Biophalt mixture was carried out by EIFFAGE. A typical Irish Asphalt Concrete (AC) bituminous mixture, with a maximum aggregate size of 20mm, complying with TII specification for bituminous mixtures, was developed and its performance evaluated. The AC20 mixtures also incorporated a proportion of Reclaimed Asphalt (RA). Lignin was incorporated, as a bitumen binder replacement, within a typical Irish Stone Mastic Asphalt (SMA) bituminous mixture, with a maximum aggregate size of 14mm complying with TII specifications for bituminous mixtures. SMA14 mixtures were developed in the laboratory and their performance evaluated by TNO. For the bio-binders evaluated, both the properties and performance characteristics of the binder and the combined mixture was evaluated. Binder performance was evaluated by methods which included penetration, softening point, Dynamic Shear Rheometer and Elasticometer. Mixture performance characteristics were evaluated through test methods which included Indirect Tensile Strength (ITS), triaxial determination of mixture stiffness and resistance to deformation. 
Objectives	The objectives of this project were as follows: 1. Collate the latest information and research related to bio-binders. 2. Develop typical bituminous mixtures, incorporating bio binder, which comply with TII specifications for bituminous materials. 3. Laboratory evaluation of the performance characteristics of bituminous mixtures incorporating bio binders.

Benefits	The benefits of this project include: 1. This project will provided insight into the technical viability of a sustainable pavement technology, reducing the carbon footprint of pavement materials by reducing the use of fossil fuel based bitumen binders. 2. This project supports TII initiatives e.g. the TII Sustainability Implementation Plan (SIP) in promoting sustainability in the development and management of TII's pavement assets. 3. Promotion of innovation and the development of new ideas within TII and the road pavement industry.
Outputs	The outputs from this research project are: 1. Literature review documenting bio binders in bituminous mixture latest developments and research. 2. Documented mix design and laboratory performance evaluation of bituminous mixtures incorporating bio binders complying with TII specifications for bituminous materials (CC-SPW-00900).