

An Indian-Australian research partnership

Project Title: *Evaluating effects of milled asphalt pavement (MAP) materials on mechanical performances of asphalt mixes*

Project Number **IMURA0691**

Monash Main Supervisor
(Name, Email Id, Phone) Professor Jayantha Kodikara
E-mail: jayantha.kodikara@monash.edu *Full name, Email*

Monash Co-supervisor(s)
(Name, Email Id, Phone)

Monash Head of Dept/Centre (Name,Email) Prof. Jeffery Walker,
E-mail: Jeff.Walker@monash.edu *Full name, email*

Monash Department:
Department of Civil Engineering

Monash ADRT
(Name,Email) Prof. Emanuelle Viterbo
E-mail: emanuele.viterbo@monash.edu *Full name, email*

IITB Main Supervisor
(Name, Email Id, Phone) Dr. Dharamveer Singh
E-mail: dvsingh@iitb.ac.in
dvsinghchauhan@gmail.com, *Full name, Email*

IITB Co-supervisor(s)
(Name, Email Id, Phone) *Full name, Email*

IITB Head of Dept
(Name, Email, Phone) Prof. K.V. Krishna Rao,
E-mail: hod@civil.iitb.ac.in, *Full name, email*

IITB Department: Civil Engineering

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng		
8	HSS, Design, Management		

The research problem

Usually the milled asphalt pavement (MAP) materials are dumped along the roadside, which poses environmental and waste management problem. In addition, it is anticipated that in coming years, highway sector may run short of fresh materials (aggregates and bitumen) for building roads. The MAP material contains aggregates and asphalt binder which can be reused for construction of road. The use of MAP materials has been favoured over the virgin materials due to increasing cost of raw materials. Unfortunately use of MAP material is not popular in India despite of numerous national highway-building programs. Some of the major reasons for not using MAP materials are lack of sufficient quality data to prove that addition of milled materials will not adversely impact the performance of a pavement. Many engineers fear that use of MAP material may degrade the quality of a mix thus a poor pavement. Furthermore, a systematic standards and practice or method are not available for design of mixes using milled materials. It is expected that due to aged nature of MAP materials, it may enhance rutting resistant of asphalt mixes. However, many researchers have expressed concerns that addition of aged material can deteriorate fatigue and moisture damage potential of mixes. MAP materials collected from different sources may behave differently. The present research proposal will focus on laboratory performance (rutting, fatigue, and moisture) evaluation of mixes containing milled materials. Further, performance response of materials may be modelled using finite element method. The proposed research work is expected to develop a standard/specification for utilization of milled bituminous materials.

Project aims

The present project aims to bring awareness and develop guidelines about using milled materials for construction of pavements

Objectives:

- Characterization of reclaimed asphalt binders using Superpave test protocols
- Evaluate mechanical performance (rutting and fatigue) of asphalt mixes prepared with different proportions of recycled materials
- Develop FEM model for performance response of asphalt mixes

Expected outcomes

In addition to significant cost and materials saving, the outcome of the study is expected to help engineers and agencies on (1) evaluating quality of milled materials, (2) design of mix with milled materials, (3) management of milled materials on the plant site, (4) selection of a proper grade of bitumen and aggregates, and (5) field construction and performance monitoring of roads using milled materials. The results from this study will lead to a test method/protocol for designing and screening mix with milled materials. The study would generate useful data which would encourage highway engineers and contractors to use milled materials to build longer lasting and better pavements.

How will the project address the Goals of the above Themes?

The proposed work is related to construction of highways using recycled materials, which can provide a sustainable approach for infrastructure developments. The work is expected to provide viable and systematic procedure to characterize recycled materials.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

A student is expected to have

- M.Tech/ME in Transportation Engineering, with focused on pavement engineering, materials.
- Hand on experience working in laboratory for different kind of performance tests on asphalt mixes/binder
- Knowledge of relevant codes and test methods
- Familiarity with FEM/modelling
- Good writing, communication skills

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Professor Jayantha Kodikara, BSc (Eng), PhD, FIEAust, CPEng
Deputy Head of the Department
Department of Civil Engineering
Monash University
Victoria 3800
Australia
E-mail: jayantha.kodikara@monash.edu

Select up to **(4)** keywords from the Academy's approved keyword list (**available at www.iitbmonash.org**) relating to this project to make it easier for the students to apply.

Pavement, recycled asphalt pavement, asphalt mixes, performance