UNIVERSITÀ DI PARMA

SDIA Doctorate School in Engineering and Architecture

DEVELOPMENT OF AN EXPERIMENTAL-BASED COMPUTATIONAL MODEL FOR PREDICTION OF STRESS AND STRAIN FIELDS IN BSM PAVEMENT LAYERS

Supervisors: *Prof. Gabriele Tebaldi, Prof. Elena Romeo*

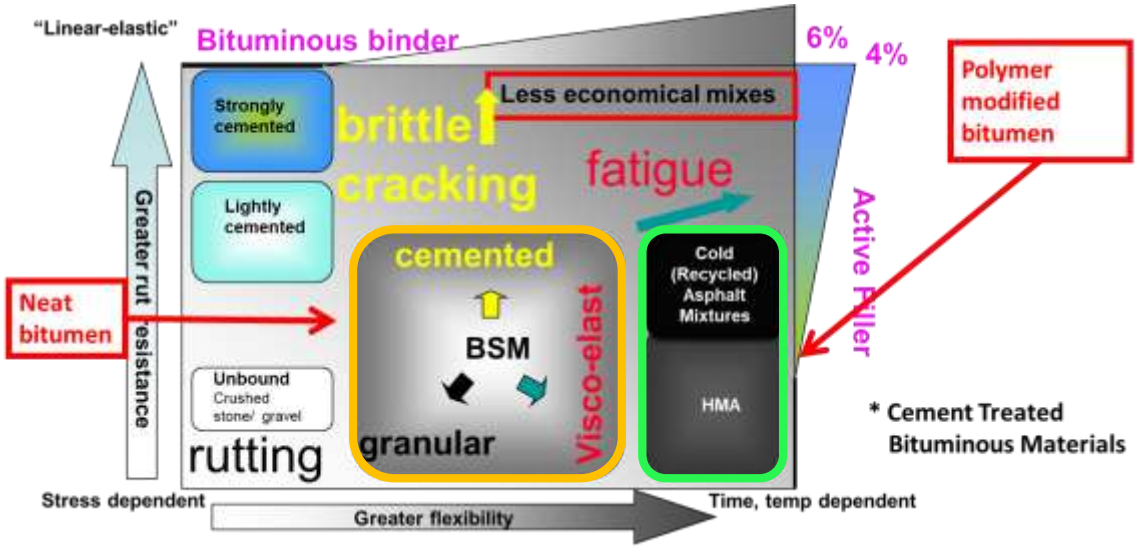
PhD Student: Fausto Bisanti

❖ Introduction

The increasing use of cold recycling techniques for flexible pavement maintenance results in the need to better characterize the properties of cold recycled mixtures composed of aggregate, reclaimed asphalt, active filler and bitumen; this characterization allows the design process to be set on a performance-based approach.

Bituminous Stabilized Materials

Cold recycling techniques are used to produce Bituminous Stabilized Materials (BSMs). BSMs are considered partially bound materials because they have intermediate mechanical properties between fully bound materials, such as Hot-Mix-Asphalt (HMA) or cemented materials, and unbound materials, such as crushed aggregate. BSMs are composed of high amounts of Reclaimed Asphalt Pavement (RAP) and foamed bitumen or bitumen emulsion. As additional binder, ordinary cement is normally used, which acts as an active filler.



Unbound granular material (CGS)

Non-continously bound material (e. g. BSM)

Fully bound material (e.g. Hot mix Asphalt)

❖ Motivations and goals

- The use of cement as an active filler in BSMs involves the need to identify proper mix-design of cold-recycled mixtures and evaluate their mechanical behavior through appropriate testing.

- In current design and analysis methods, the mechanical response of BSM pavement layers is usually assumed to be linear elastic. However, for most cases, the failure of BSMs is due to the accumulation of permanent deformations. Therefore, it is necessary to collect information about the material's response to plasticity.

- Currently, the study of constitutive models for characterizing the behavior of BSMs is quite limited. For this reason, it is necessary to expand the study by considering different conditions, such as the application of different lateral confinement pressures and different temperature scenarios.

3D Elastic-Pefectly Plastic Finite Element Model