**Analysis of stress and strain in flexible pavement structures comprised of conventional and high modulus asphalt using viscoelastic theory**

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**Abstract**

Permanent deformation has become a persistent issue to be solved in Vietnam because of hot climatic conditions and high traffic volume. In order to deal with the problem, many attempts have been made by the local authorities, researchers and practitioners, e.g. modification of the mixture gradation, improving bitumen rheology and high-quality control of manufacturing and construction of asphalt concrete (AC). SBS-modified bitumen or polymer modified bitumen (PMB) has been applied in Vietnam for more than 7 years and very good results in preventing rutting distress has been gained. However, in very high trafficked road and slow-speed area like intersection, PMB did not perform very well. Recently, high modulus asphalt concrete (HMAC) has been considered to be used as an alternative for PMB asphalt concrete. HMAC is recognised by its high stiffness compared to conventional asphalt mixtures as well as its high resistance to rutting. Since the thickness of flexible pavement structures in Vietnam is normally very small, ranging from 12 to 15 cm in asphalt layers, while HMAC is 2-3 times stiffer than conventional AC, there are still concerns about the fatigue life of pavement structures comprised of HMAC. The aim of this study is to analyse the stress and strain occurring in asphalt structures comprised of several layers of asphalt having large difference in stiffness using viscoelastic theory to demonstrate it possible use in Vietnam.

*Keywords:* high modulus asphalt concrete; viscoelastic behaviour; stress-strain analysis; flexible pavement

# Research contents

The specific objectives of this work are those below

- viscoelastic characterization of HMAC and conventional AC;

- modelling the viscoelastic behaviour of HMAC and AC using Huet-Sayegh or 2S2P1D model;

- analysing the stress and strain of common flexible pavement structures in Vietnam using a homemade finite element method programme;

- predicting the fatigue life of flexible pavements comprised of HMAC to evaluate its resistance to fatigue cracking and comparing its fatigue life to that of conventional asphalt pavement.

# Some numerical results

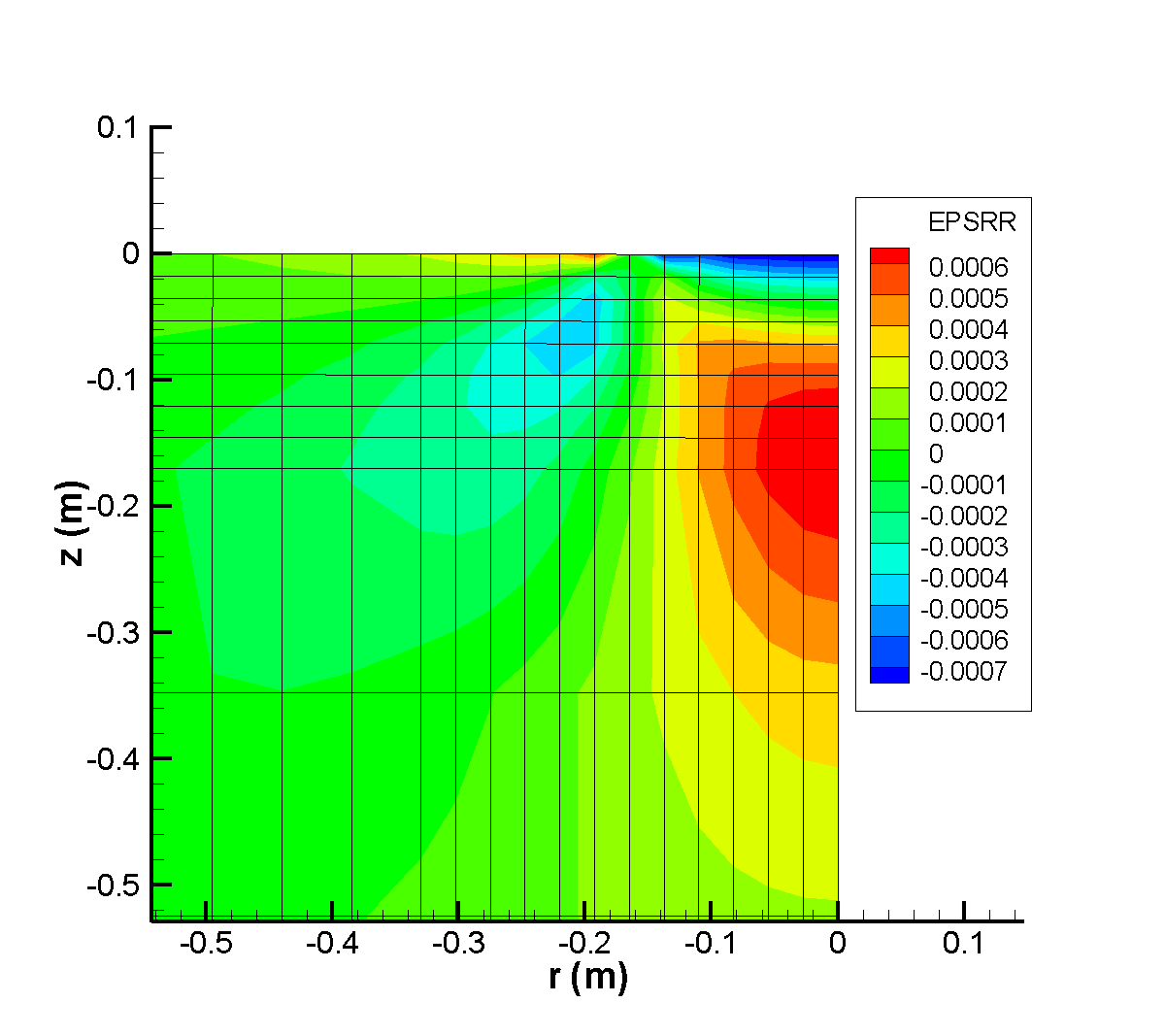
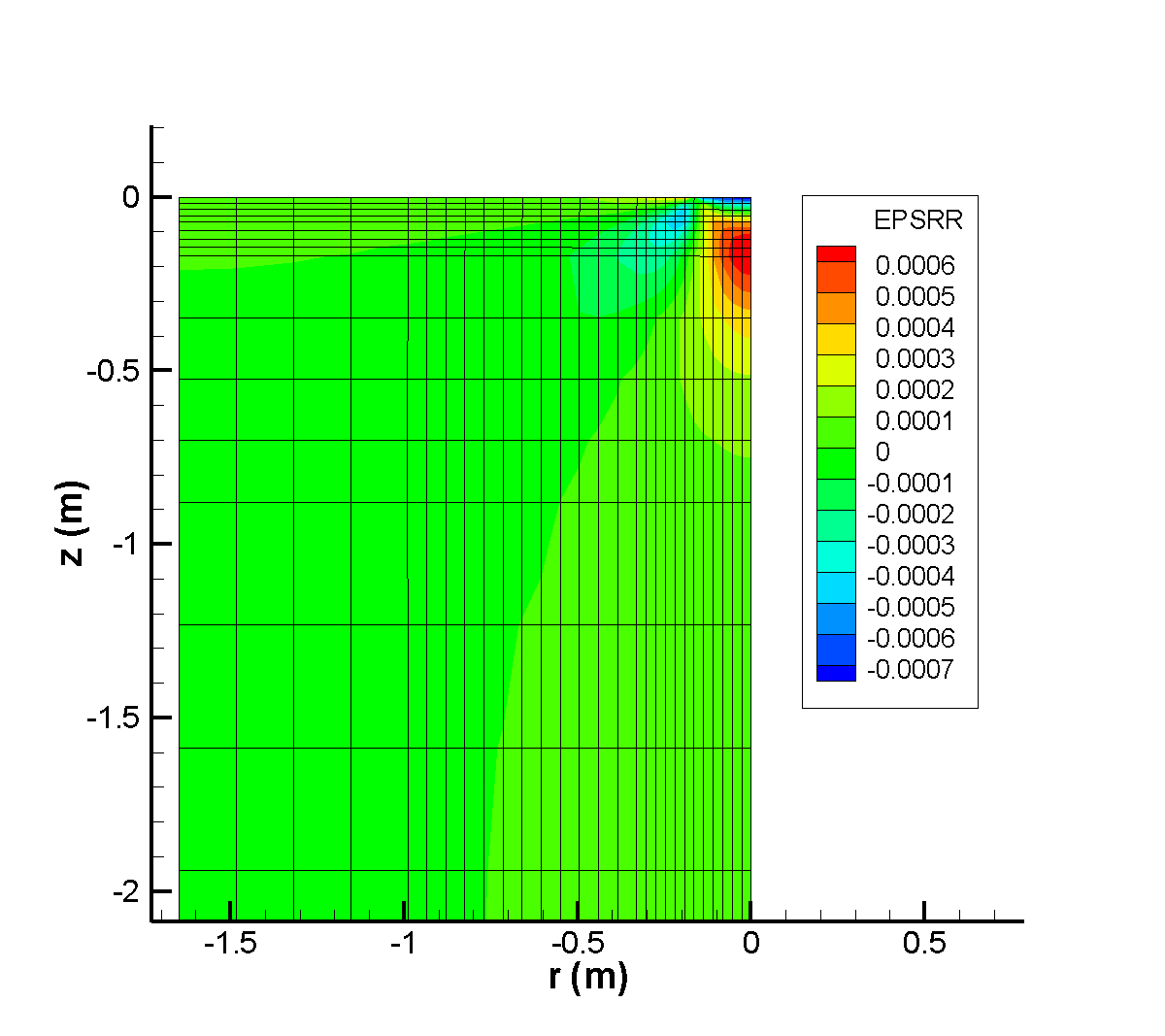


Fig. 1. Distribution of strain in a pavement after 1s of loading. Viscoelastic analysis.