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NEW DESIGN METHODOLOGY FOR FLEXIBLE PAVEMENTS

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EXTENDED SUMMARY

The new pavement design methodology was initially developed for the needs of Egnatia road, since there was no up to date Greek pavement design methodology.

The new methodology is an analytical and is based on approved mathematical equations developed by various established institutions. It uses the elastic multilayer theory and the following design criteria: a) the bituminous layers should not crack under the developed tensile strain, b) the subgrade should not deform extensively under developed compressive strain and c) the thickness of the unbound layers must be sufficient so as the construction traffic does not overstress the subgrade.

The elastic modulus of the subgrade was determined from CBR values using the equation developed by TRL[5]. The elastic modulus of the unbound layers was determined in relation to the elastic modulus of the subgrade and the unbound layer thickness[6]. The permissible compressive strain of the subgrade was determined by using the equation developed by TRL[7]. The stiffness of the bituminous layers was determined by the equations developed by Bonnaure et.al.[9] and the effect of air temperature to the stiffness was taken into account by using the theory developed in the Shell pavement design methodology[6]. Finally, for the fatigue of the bituminous layers the tensile strain equation developed by Valkering and Stapel[10] was used.

The typical bituminous mixtures used in the analysis were: dense asphalt concrete, porous asphalt, SMA and the gap graded mixture for thin surfacing.

The methodology uses three design parameters: a) the cumulative number of standard axle over the design period, b) the bearing strength of the subgrade expressed in CBR and c) the mean annual air temperature (MAAT).

Having determined the need and thickness of the capping layer from subgrade's CBR value, the thickness of the subbase/base layer is chosen using the recommendations of Table 1. The thickness of the bituminous layers is determined by using one of the 30 nomographs developed, depending on the MAAT, thickness of the subbase/base layer and type of bitumen used, see Figure 2. The methodology also includes a protocol for choosing the recommended type of asphalt, see Table 2 and gives instruction how the thickness and type of surfacing layer affects the overall thickness determined from the nomograph. The methodology also covers stage construction design.