Title of thesis ： Development of a Rigid Pavement Backcalculation Program -Dense Liquid Foundation

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Abstract: ：

This study focused on the development of a backcalculation program for rigid pavements on the dense liquid foundation and strives to minimize the major limitations and deficiencies of traditional backcalculation procedures by modifying the most widely-used AREA deflection basin concept. A modified closed-form deflection ratio backcalculation procedure was introduced and implemented in a user-friendly computer program (TKUBAK) to expand its applicability for any different NDT loading radius, sensor locations, finite slab sizes, as well as locations of loading plate (i.e., interior, edge, and corner of the slab). The major research approach of this study include:

(1) Theoretical investigations and validations of the closed-form Westergaard and Losberg deflection equations through the use of PowerStation IMSL libraries for the integration of Bessel functions for infinite slab conditions.

(2) The analyses and applications of ILLI-SLAB finite element (F.E.) program to more realistically account for practical slab situations.

(3) The incorporation of dimensional analysis, the identification of dominating mechanistic variables, as well as the development of backcalculation databases through a series of F.E. factorial runs over a wide range of pavement designs.

(4) The application of Projection Pursuit Regression (PPR) technique for the development of prediction models using S-PLUS statistical package.

(5) The development of a user-friendly program (TKUBAK) to facilitate instant modulus backcalculation using the IMSL libraries and Visual Basic 4.0 software package.

(6) Comparisons and verifications of the TKUBAK program with other existing backcalculation procedures.

With the successful development of this computer program, the research findings could be more efficiently and widely applied in many practical pavement backcalculation problems.

Keywords ： Concrete (Rigid) Pavements, Backcalculation, Nondestructive Deflection Testing, Deflection, Finite Element Analysis, Dimensional Analysis