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**EFFECT OF LAYDOWN SITE CONDITIONS,  
ENVIRONMENTAL VARIABLES & LAYER THICKNESS  
ON DEGREE OF COMPACTION OF ASPHALT**

B.P.D.P.P. Bamunuarachchi

209566M

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Name of Supervisor: Prof. W.K.Mamperachchi

Signature of the Supervisor:

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## ABSTRACT

The degree of compaction is crucial for the enduring durability of asphalt pavements, and achieving optimal compaction involves various factors. This research focuses on the impact of laydown site conditions, environmental variables, and layer thickness on asphalt compaction in tropical climates, particularly in Sri Lanka. The research objectives include developing a mathematical model for heat transfer in asphalt layers and determining an optimal layer thickness for enhanced compaction. Degree of compaction depends on the Time Available for Compaction (TAC). A 3D-FEM transient heat transfer model was developed using Abaqus/CAE 6.14 software to simulate asphalt behavior under different site conditions and to explore the heat transfer mechanisms during both day and night times, considering factors like solar radiation, convection, and conduction. Validation of the model was achieved by comparing field data with model results. Mathematical equations for Time Available for Compaction (TAC) were derived using regression analysis, considering laydown temperature, air temperature, wind velocity, base temperature, and layer thickness. These equations, tailored to different base types and time periods, highlight the significant impact of environmental variables on compaction time. The results provide insights into the interplay of these factors and offer equations for predicting TAC, aiding in optimal compaction planning for asphalt construction in diverse conditions. Also, an optimal thickness for asphalt layer was determined considering different scenarios by varying the input environmental parameters and average time required for compaction process.

**Keywords:** Asphalt compaction, Time available for compaction (TAC), Environmental variables, Heat transfer FEM model

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Description</b>
TAC	Time Available for Compaction
FEM	Finite Element Method

