

A soil/structure interaction problem: Using finite element modelling to assess existing trackway systems that are being used as temporary roads

Karl Phillips  
*Defence Research Agency, Chertsey, UK*

**Abstract:** World-wide Military and Peacekeeping Operations inevitably require the use of terrain that would not normally be hard enough for wheeled and tracked vehicles. The British Armed Forces have a range of rigid structural surfaces to improve vehicle passage over various soil conditions. The advent of heavier vehicles and the need to reduce the weight of trackway systems, will necessitate the next generation of trackway systems to be designed with the aid of Finite Element (FE) techniques. Before this is achieved, existing trackway systems need to be assessed.

The prediction of soil/structure interactions is as much an art as a science. The traditional analytical approach is to use the theory of beams, which can only model simple cases and has limited application. FE techniques allow more complex nonlinear, time dependent modelling to be accomplished. The Finite Element code DIANA (Version 6.1) was used. Two dimensional FE geometric plane strain models were produced to represent the loaded in-service Class 60 Trackway System, on three different soil conditions. Standard aluminium alloy properties were used to model the trackway. Vertical displacement outputs gave an indication of trackway behaviour.

FE modelling allows greater analytical flexibility enabling the material characteristics of the soil and trackway systems to be represented more closely. This ultimately leads to more efficient use of existing trackway systems and to the design of future systems. This study recommends that to model full stress/strain behaviour, three dimensional modelling will be required. The creation of a soil database, which is still in the planning stage, will aid future geotechnical modellers when selecting soil properties.

## 1 Introduction

The soil-structure interaction problem deals with the formulation and analysis of the interactive phenomena between structures and the supporting soil media [1]. A lot of emphasis has been generally directed at the geotechnical study of structural foundations, where the surface soil layer is removed prior to construction. This paper investigates the use of finite element modelling to simulate the behaviour of trackway systems on unprepared soil conditions. It is recognised that the surface topsoil, is usually no more than 500 mm thick, is composed of humus [2], and problematic due to its partially

# Finite Elements in Engineering and Science

*Edited by*

MAX A. N. HENDRIKS

*TNO Building and Construction Research, Delft, Netherlands*

HANS JONGEDIJK

*DIANA Users Association, Arnhem, Netherlands*

IAN G. ROTS

*DIANA Foundation & Delft University of Technology, Netherlands*

WILLEM J. E. VAN SPANJE

*DIANA Analysis bv, Delft, Netherlands*

OFFPRINT

