Task Order Proposal Request (TOPR)
Contract No. DTFH61-05-D-00017

Enhancement of IntPave

DESCRIPTION OF WORK

Background

Under Pooled Fund Study SPR- 2(205), IntPave was developed at the University of Texas at El Paso. It provides the capacity to calculate pavement distress under any type of traffic load and to make a comparison of the level of distress caused by a standard and a non-standard truck. For flexible pavements, a new stand-alone finite element program with the capacity to load an input file and produce an output file with the pavement distress calculations was developed. For the rigid pavements option, the engine (processor) of JSLAB-2004 is being used to estimate the state of stress and deformation caused by the applied loads

A graphical user interface (GUI) that functions as a pre and post processor for the stand-alone finite element program and JSLAB 2004 was also developed. The input file contains the geometric pavement section information, material properties and their variation as a function of temperature, and traffic loading characteristics. For flexible pavements, the output file contains the rutting calculations for all the pavement layers and fatigue cracking of the surface layer as a function of traffic load repetitions.

A tool was also added to aid in the calculation of the permit fee. Based on the pavement distress models, the potential excess damage due to one pass of a heavy truck is estimated. Based on the pavement structure the number of repetitions to reach a threshold damage considered for rehabilitation is then determined. Through an economic analysis module, the cost of the repair associated with the pass of the heavy truck is estimated. This cost is then assigned as the permit fee.

Problem Statement

While IntPave provides reasonable results, there are opportunities for enhancement. The items that need attention include:

- The input to the pre-processor is comprehensive and cumbersome.
- The output generated from the post-processor is too specific to permitting fee assessment and needs to become more general.
- The library of the trucks and axle configurations are limited and need to be expanded.
- The impact of the smoothness and truck suspension on damage are not considered.
- The algorithm for assessing fees should be expanded to consider any number of trucks as opposed to one pass of a super-heavy load.

Purpose/objective

The objective of the work requested in this task order is to improve the functionality of IntPave by (1) improving the handling of IntPave inputs and results to make it more user-friendly, (2) improving the library of trucks and axle configurations that IntPave can handle, (3) considering

the impact of truck suspensions and smoothness of the road on pavement damage, and (4) expanding the damage assessment and fee allocation tools to consider repeated number of applications of different trucks.

DESCRIPTION OF TASKS

As a minimum, the following work shall be conducted:

Task 1. Conduct an Information Search to document means of considering the impact of the smoothness and truck suspension on damage

Task 2. Develop Strategies for incorporating the impact of impact of the smoothness and truck suspension on damage into IntPave

Task 3. Improve the functionality of the pre- and post-processor of IntPave

Task 4. Expand the library of truck and axle configurations incorporated in IntPave

Task 5. Improve the permit fee module by incorporating a library of rehabilitation costs and to consider more than one passes of a heavy truck.

DELIVERY/PERFORMANCE SCHEDULE

The period of performance is estimated to be twelve months. Effort is expect to begin September 2008.