COMPUTERIZED METHOD OF PROJECTING REHABILITATION AND MAINTENANCE REQUIREMENTS DUE TO VEHICLE LOADINGS

SUMMARY REPORT 298/312-1(S)

SUMMARY OF
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VOLUME 4
USER MANUAL FOR RENU PROGRAM

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Computerized Method of Projecting Rehabilitation and Maintenance Requirements Due to Vehicle Loadings

Summary of Volume 4: User Manual for the RENU Program

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This volume contains the user instructions for program RENU. The program provides a methodology for determining the effects of changes in truck size, weight, and configuration on pavement performance and for relating these effects to pavement maintenance and rehabilitation needs and costs. The procedure was developed for the Texas State Department of Highways and Public Transportation in Project 298/312, "Computerized Method of Projecting Rehabilitation and Maintenance Requirements Due to Vehicle Loadings," and is documented in the project final report (Volume 5F').

Objectives

The objectives of this manual are three-fold:

1. To provide a summary description of the evaluation procedure.
2. To present descriptions of all necessary input parameters and guides to data sources.
3. To trace program RENU usage with a detailed user input guide and illustrative examples of program inputs and outputs.

Scope of the Procedure

The procedure evaluates the effect of legal load limit changes on the life cycle costs of flexible, rigid, and/or composite pavements. Eighty representative design sections can be grouped by system (Interstate, US, State, FM) classifications of highways. The procedure allows a maximum of ten different truck types along with various axle and tire configurations, such as single and tandem axles. While truck axle weight and config-

uration are the major variables considered, new trucks, such as triple trailer units, can be included in the procedure. The procedure contains a computerized gross vehicle weight and axle load distribution shifting procedure to assess the impact of changes in current legal load limits. The user may select different maintenance and rehabilitation cost models to be used for different representative sections. The procedure uses a separate age/lane-mile distribution for each representative section thereby allowing the evaluation of a small road network, a district, or a state. The user may elect to use either AASHO performance equations or Texas performance equations to describe pavement deterioration within the program.

Evaluation Concepts

The evaluation procedure estimates total costs associated with changes in routine maintenance and rehabilitation requirements which result from changes in the legal load limits. There are five primary steps:

1. Read in input data.
2. Calculate proposed traffic load distributions and estimate the traffic rates for present and proposed legal load limits.
3. Determine the expected life cycles for all representative sections.
4. Predict maintenance, rehabilitation, and salvage value costs associated with each life cycle developed.
5. Output predicted cost ratios, cost differences, and remaining life information in terms of 18-kip (80-kN) equivalent single axle loads (ESAL) for present and proposed legal limits.

A brief conceptual flow diagram of the evaluation procedure is presented in Figure 1.

Development of input data requires the cooperation of diverse highway agency departments including administration, construction, finance, design, maintenance, traffic, and transportation planning sections. Data needed include serviceability index and distress criteria, pavement structural characteristics, highway functional classifications, traffic data (both present and future), age/lane-mile distributions for representative existing highway sections, beginning of the analysis period, and rate of loss of pavement value. The amount of input data required is a function of the extent to which the user subdivides the highway network into classifications and representative sections.

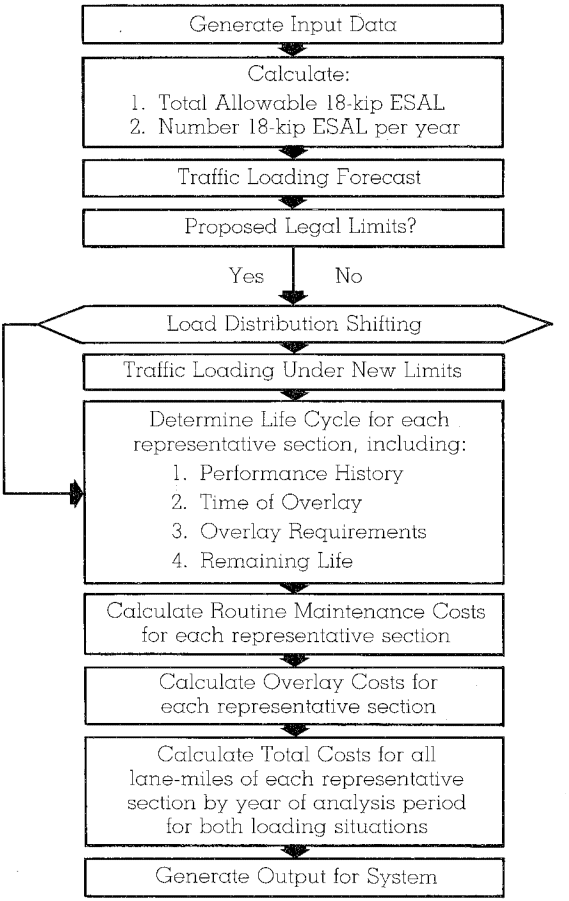

Figure 1. Basic Methodology of RENU

Typical Run

A typical run of the RENU program involves the specification of the following items. At least one computer card is needed for each of these items:

1. *Run Parameters:* number of years in the analysis period, annual growth rate of increase for ESALs, interest rate, highway cost index for surfacing and maintenance.
2. *System title:* highway system identification.
3. *Description of Typical Section:* flexible or rigid pavement.
4. *Age Distribution:* for the typical pavement section.
5. *Truck and Axle Information:* types of trucks, truck distributions, load distributions for each type of axle.
6. *Load Limits:* for present and proposed legal axle load limits.
7. *Performance Data:* initial and terminal PSI values, and overlay design life.
8. *Miscellaneous Roadway Data:* percent paved shoulders, average paved shoulder width per lane, average granular shoulder width per lane, cost and density data for AC and granular material.
9. *Maintenance Information:* cost data for either historical maintenance or for patching, crack sealing and base/surface repair work units (input for EAROMAR Equations).
10. *Option for Critical Pavements:* rehabilitation option for those pavements older than terminal serviceability (POTTS) at the beginning of the planning horizon.
11. *Type of Output:* which results are desired in the output of the computer run, concerning rehabilitation and maintenance cost differences and ratios between present and proposed limits.

The published version of this report may be obtained by addressing your request as follows:

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