INTRODUCTION

Problem Statement

Several important issues concerning the effect of slab support on concrete pavement performance were studied in a National Cooperative Highway Research Program (NCHRP 1-30), "Support Under Concrete Pavements." The objectives of NCHRP 1-30 were to produce practical guidelines for the selection of appropriate k-values, consideration of loss of slab support, and consideration of other support factors in the design of concrete pavements and overlays. The scope of NCHRP 1-30 encompassed support characterization needs for two purposes: improvement of the guidelines for support parameters in the current American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures (AASHTO Guide) design methodology, and development of improved guidelines for characterizing support in a mechanistic design methodology. The three major products of NCHRP 1-30 were:

- Detailed guidelines for selection of subgrade k-values for design.
- An improved equation for computing concrete slab stress due to load and curling.
- An improved concrete pavement performance model for use in the AASHTO Guide.

The data that were available for analysis in NCHRP 1-30 were limited. For example, the small Long-Term Pavement Performance (LTPP) data set examined included only a portion of the General Pavement Section 3 (GPS-3) (jointed plain concrete pavement) and GPS-4 (jointed reinforced concrete pavement) sections, and subgrade soil type data were missing for many of the sections at that time. This limitation substantially reduced the number of sections for which k-value vs. soil type comparisons could be made. In addition, the pavement performance data set used to assess the predictive capability of the proposed improved AASHTO performance model was limited as well. The data set had initial and terminal serviceability data for some sections (the American Association of State Highway Officials (AASHO) and extended AASHO Road Test sections); however, initial serviceability data were unavailable for the larger portion of the data and had to be estimated. The comparison of predicted versus actual equivalent single-axle loads (ESALs) for a given serviceability loss is very approximate unless the serviceability is well defined by known beginning and ending values.

Objectives

This study was conducted to field-verify the improved support guidelines proposed in NCHRP 1-30, using the LTPP database, in order to establish their practicality and appropriateness for use in concrete pavement design nationwide. The study had the following specific objectives:

1. To field-verify the improved guidelines for selection of design k-values, to the fullest extent possible, using the design, materials, deflection, plate load, and climate data available in the LTPP database.

2. To field-verify the proposed improved AASHTO performance model, to the fullest extent possible, using the design, materials, climate, traffic, and performance data available in the LTPP database for GPS-3, GPS-4, and GPS-5 (continuously reinforced concrete pavement).

Key Products of This Research

The NCHRP 1-30 guidelines, revised on the basis of the results of this field verification study, are presented in the appendix in the form of a proposed addendum to the AASHTO Guide. The documentation of these field verification efforts, using the LTPP database, is provided in this report.