R&T UPDATE
Concrete Pavement Research & Technology

Life- Cycle Cost Studies—Determining The Real Facts

Concrete and asphalt highways have been in service for many years under a variety of traffic and environmental conditions. Which pavement type has performed better? Which has lasted longer before rehabilitation? How do the actual life-cycle costs compare? To answer these questions, a series of research studies of pavement performance and costs on rural Interstate corridors is underway in 5 states (Tenn., Utah, Okla., Georgia, and S. Dak.). In the next year or so, studies in three additional states are planned.

An initial task was to identify a candidate corridor of about 100 miles in each state where approximately half of the sections were concrete and half asphalt, 20 years of age or older, and carrying similar amounts of truck traffic, with similar subgrades and climate. With these criteria, direct comparisons of performance are valid. Actual historical data on pavement performance, costs, rehabilitation, and service life are obtained from records of the state highway agency.

The results of these studies will be used to identify the most cost-effective pavement sections in each corridor. This information will be of interest to pavement engineers, decision makers, and others in state highway agencies (SHAs) when designing and planning pavement projects and when allocating their limited highway funding.

The use of life-cycle cost procedures to determine the whole-life cost of pavement alternatives is a well-established concept. The American Association of State Highway and Transportation Official's (AASHTO) *Guide for the Design of Pavement Structures* (1993) states:

"It is essential in economic evaluation that all costs occurring during the life of the facility be included. This has not always been practiced or understood by pavement designers because comparisons were often made over a fixed, equal design period. Thus, designers assumed that first-cost comparisons were adequate for economic studies. This is not true, and, in order to emphasize the need for a complete cost analysis, the term 'life-cycle cost' was coined about 1970 for use with pavements."

For the research study in each state, a comprehensive report will be available giving the details of the pavement sections, service lives, initial and rehabilitation costs, and life-cycle cost analysis. ACPA will then produce a Special Report summarizing the findings of each study. The first has been completed and is published as "A Comparison of Pavement Performance and Costs, Interstate 40, Tennessee" (publication Code No. SR 991P available from Order Processing Department). **It shows the following advantages for concrete: 2.1 to 2.5 times longer service life, 13 to 21% lower life-cycle cost, and 11 to 21% better benefit/cost ratio.**

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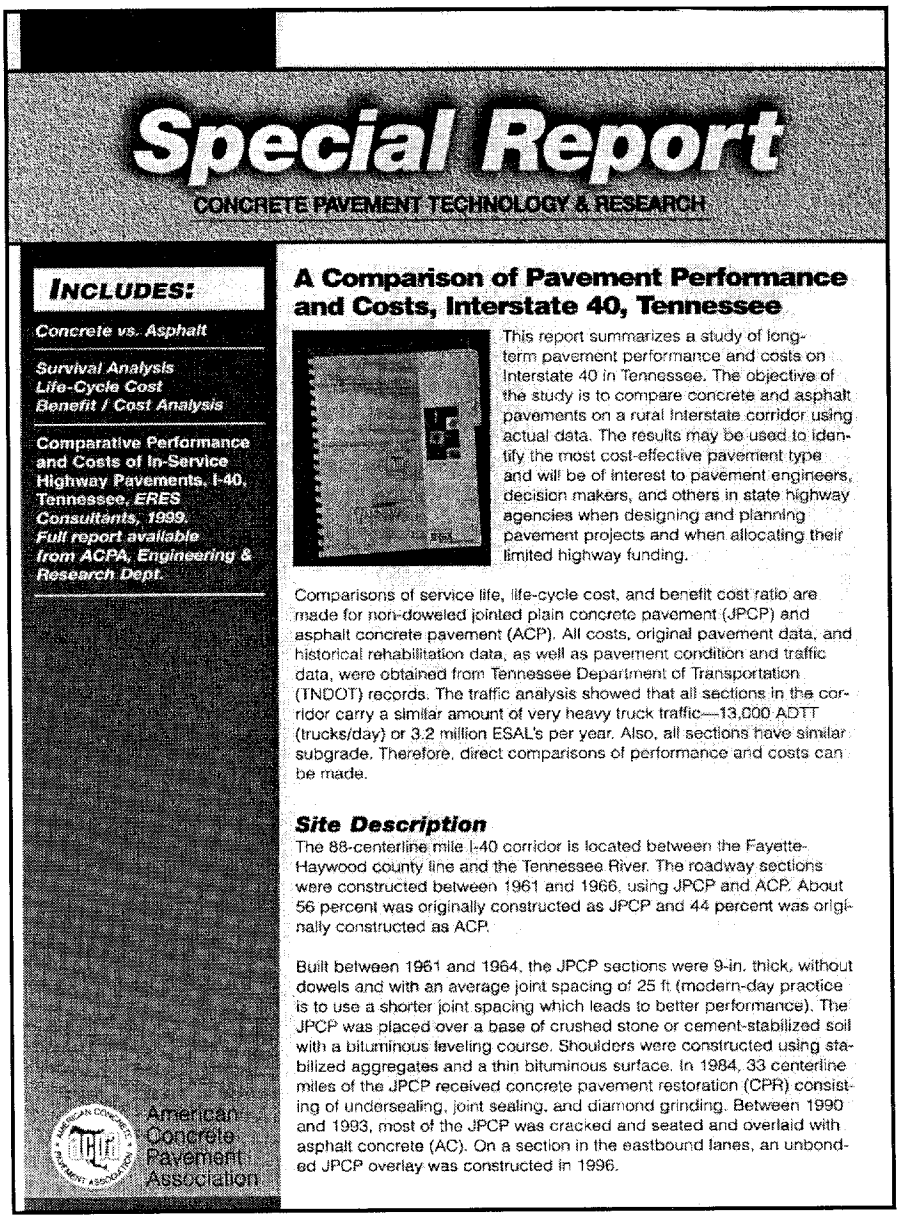

Special Report

CONCRETE PAVEMENT TECHNOLOGY & RESEARCH

INCLUDES:

Concrete vs. Asphalt

Survival Analysis
Life-Cycle Cost
Benefit / Cost Analysis

Comparative Performance and Costs of In-Service Highway Pavements, I-40, Tennessee, ERES Consultants, 1999. Full report available from ACPA, Engineering & Research Dept.

American Concrete Pavement Association

A Comparison of Pavement Performance and Costs, Interstate 40, Tennessee

This report summarizes a study of long-term pavement performance and costs on Interstate 40 in Tennessee. The objective of the study is to compare concrete and asphalt pavements on a rural Interstate corridor using actual data. The results may be used to identify the most cost-effective pavement type and will be of interest to pavement engineers, decision makers, and others in state highway agencies when designing and planning pavement projects and when allocating their limited highway funding.

Comparisons of service life, life-cycle cost, and benefit cost ratio are made for non-doweled jointed plain concrete pavement (JPCP) and asphalt concrete pavement (ACP). All costs, original pavement data, and historical rehabilitation data, as well as pavement condition and traffic data, were obtained from Tennessee Department of Transportation (TNDOT) records. The traffic analysis showed that all sections in the corridor carry a similar amount of very heavy truck traffic—13,000 ADTT (trucks/day) or 3.2 million ESAL's per year. Also, all sections have similar subgrade. Therefore, direct comparisons of performance and costs can be made.

Site Description

The 88-centerline mile I-40 corridor is located between the Fayette-Haywood county line and the Tennessee River. The roadway sections were constructed between 1961 and 1966, using JPCP and ACP. About 56 percent was originally constructed as JPCP and 44 percent was originally constructed as ACP.

Built between 1961 and 1964, the JPCP sections were 9-in. thick, without dowels and with an average joint spacing of 25 ft (modern-day practice is to use a shorter joint spacing which leads to better performance). The JPCP was placed over a base of crushed stone or cement-stabilized soil with a bituminous leveling course. Shoulders were constructed using stabilized aggregates and a thin bituminous surface. In 1984, 33 centerline miles of the JPCP received concrete pavement restoration (CPR) consisting of undersealing, joint sealing, and diamond grinding. Between 1990 and 1993, most of the JPCP was cracked and seated and overlaid with asphalt concrete (AC). On a section in the eastbound lanes, an unbonded JPCP overlay was constructed in 1996.

"A Comparison of Pavement Performance and Costs, Interstate 40, Tennessee" Special Report can now be ordered by calling 1-800-868-6733. Ask for the Order Processing Department and request publication number SR991P. The publication's price is $1.50 for ACPA members, $6.00 for nonmembers.