



***This month ... Design and Construction of Streets & Local Roads.***

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***Next month ... ACPA revisits sound at the tire/pavement interface.***

## **Concrete Pavement Answers Funding Challenges**

By **Scott Haislip**

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Increasingly, state and local governments are facing the challenges of securing and managing funding for street construction and improvement. Deteriorating transportation infrastructure and cyclical application of short-term resurfacing puts enormous pressure on budgets and is forcing administrators to use asset management strategies to meet GASB 34 requirements ([Ref 1](#)).

Concrete pavements can help meet those funding challenges. With innovative techniques and a range of solutions, concrete pavements are competitive with asphalt pavements. Extended pavement life, lower life cycle costs, innovative techniques and products, and reliable performance contribute to a greater long-term value. Agencies on the hunt for roadway dollars can use these benefits to create a convincing argument for funding.

### **Asset Management**

Within the scope of asset management, pavement management includes evaluating the existing pavement network and balancing construction improvement activities. The goal is to maintain pavements and even out the expenditure flow by employing long-term concrete solutions with short-term asphalt resurfacing.



The extended life, lower life cycle costs, and reliable performance of concrete pavements contribute to a greater long-term value over asphalt.

## **Life Cycle Cost Analysis**

To determine the cost effectiveness of individual projects, many agencies use life cycle cost analysis (LCCA) to examine the economic benefits of competing alternatives. The process takes into account the cost and value of a particular asset over a period of time, and then enables agencies to make the best pavement decision.

According to the Federal Highway Administration's Office of Asset Management, there are five steps of a successful life cycle cost analysis. They are: establish design alternatives; determine activity timing; estimate costs (agency and user); compute life-cycle costs; and analyze the results.

## **Remaining Service Life**

Remaining service life is an important component of life cycle cost analysis. It involves measuring the longevity of a competing alternative after the life cycle period ends. Remaining service life evaluations are very telling about the intrinsic value of concrete pavements, as this will typically show concrete lasting years after asphalt pavements fail.

The addition of concrete pavements can dramatically increase the life of the overall network of roads, decreasing the required maintenance cycle. Concrete pavements cut the amount of annual repairs by spreading them out over longer time periods ultimately lowering the maintenance expenditures and budget.

## **Mix of Fixes**

Pavement networks can be optimized with concrete through a variety of methods. They include: regular maintenance; concrete pavement restoration; resurfacing with overlays; full-depth reconstruction; and fast track paving.

Innovative techniques and a variety of flexible solutions make concrete pavements a solid long-term choice, offering excellent service, safety, and value for end users. These benefits create a convincing argument for funding, even in today's challenging economy.

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## **Endnotes**

(1) A policy enacted by the Government Accounting Standards Board (GASB) in 1999, called GASB 34, requires that government agencies promote responsible asset management policies and strategies, treating infrastructure components like pavements, bridges, and airports as assets.

## ***A Practical Approach to Designing City Streets***

A practical way to design city streets involves establishing a street classification system. Comprehensive traffic studies made within city boundaries show that streets of similar character have essentially the same traffic densities and axle load intensities.

A street classification system can provide an axle load distribution for the various categories of streets. There are six street classifications discussed here:

**Light Residential** streets are typically short and found in subdivisions, as well as other residential areas. They may have dead ends or turn-arounds. They serve traffic to approximately 20 to 30 lots or houses with low traffic volumes. They are also characterized by:

- \* VPD ([Ref 1](#)) - Less than 200/day
- \* ADTT ([Ref 2](#)) - 2 to 4/day
- \* Maximum loads ([Ref 3](#)) - 18 kip single axles/36 kip tandem axles.

**Residential** streets carry similar traffic as light residential (except more of it), plus an occasional heavy truck. On a grid-type street system, these streets carry traffic serving up to 300 homes as well as collecting all light residential traffic within the area and distributing it into the major street system. They are also characterized by:

- \* VPD - 200 to 1000/day
- \* ADTT - 10 to 50/day
- \* Maximum loads - 22 kip single axles/36 kip tandem axles.

**Collector** streets collect traffic from several areas and maybe several miles long. They may be bus routes and serve truck movements to and from an area, although they are generally not considered through-routes. It's also characterized by:

- \* VPD - 1000 to 8000/day
- \* ADTT - 50 to 500/day
- \* Maximum loads - 26 kip single axles/44 kip tandem axles.

**Business** streets provide access to carry traffic through central business districts. Business streets are frequently congested and speeds are slow

because of high traffic volumes, but with a low truck traffic percentage. They are also characterized by:

- \* VPD - 11,000 to 17,000/day
- \* ADTT - 400 to 700/day
- \* Maximum loads - 26 kip single axles/44 kip tandem axles.

**Industrial** - Industrial streets provide access to industrial areas or parks. Total traffic volumes may be low, but the percentage of trucks is high. They are also characterized by:

- \* VPD - 2000 to 4000/day
- \* ADTT - 300 to 800/day
- \* Maximum loads - 30 kip single axles/52 kip tandem axles.

**Arterials** - Arterials bring traffic to and from expressways and serve major movements within and through metropolitan areas not served by expressways. Arterials typically carry truck and bus routes. For design purposes, arterials are divided into major and minor arterials depending on traffic capacity and type. Minor arterials are characterized by:

- \* VPD - 4000 to 15,000/day
- \* ADTT - 300 to 600/day
- \* Maximum loads - 26 kip single axles/44 kip tandem axles.

Major arterials are characterized by:

- \* VPD - 4000 to 30,000/day
- \* ADTT - 700 to 1500/day
- \* Maximum loads - 30 kip single axles/52 kip tandem axles.



*Main Street in the Village of Little Chute, Wis., is a collector street. It features traditional concrete pavement, colored and stamped concrete pavements; and colored and imprinted sidewalks. The recent reconstruction project was recognized by ACPA with an "Excellence in Concrete Pavement" award.*

## Endnotes

(1) VPD - Vehicles per day.

(2) ADTT - Average daily truck traffic and axle-load distributions. This design method uses the average daily truck traffic in *both* directions to model the loads on the concrete pavement. For design purposes, this traffic is assumed to be equally distributed in each of the two directions (i.e., 50 percent each way). The ADTT value includes only trucks with six tires or more and does not include panel and pickup trucks or other four-tire trucks.

3) kip - One kip is a unit of measure equal to 1,000 pounds.

## ***Read more about the design of concrete pavement for city streets***

*Design of Concrete Pavement for City Streets* (IS184P) discusses the design of concrete pavements for long life and economy.

The 8-page publication also discusses concrete quality, subgrade strength, thickness design, traffic volume and design life. It contains simplified thickness design tables as well.

The cost of this publication is \$5 (non-members). To order IS184P, visit [www.pavement.com](http://www.pavement.com) or call toll-free 1-800-868-6733.



## ***Tech Tip***

# **Sampling Fresh Concrete**

## ***Tips to ensure accurate, representative samples***

On almost every concrete paving project, the contractor or concrete supplier must demonstrate that a quality product is being supplied and delivered to the construction site. This typically requires the contractor to sample fresh concrete.

Improper handling or sampling may result in inaccurate strength, air, slump, or temperature measurements. Here are a few tips on sampling fresh concrete:

- 1. Sample Size** - Obtain at least 1 cubic foot (0.03 cubic meter) of concrete for strength tests. If combining tests (e.g., air, slump, and strength from same batch), sample enough concrete to fill about two thirds of a standard wheelbarrow.
- 2. Handling** - Use a scoop or shovel, wheelbarrow, or plastic sheet. Remember that other equipment is needed for the appropriate tests, such as beam or cylinder molds, slump cone, rod, air pot, etc. Transport the sample to where the fresh concrete tests are to be performed, remix as needed, and cover it with a plastic sheet to prevent evaporation.
- 3. Precautions** - Make the sample as representative as possible. Do not restrict flow from mixers. Guard against segregation of concrete during sampling.

Taking samples differs based on whether it comes from a mixer, truck, or container. Here are some considerations keyed to each type:

**Paving Mixers** - Collect samples from five different places in the pile (i.e., end dump truck) after discharge of the mixer.

**Other Stationary Mixers, Revolving-Drum Truck Mixers, or Agitators** - Sample at two or more regular intervals at about the middle portion of the batch. Either pass a receptacle through the entire discharge stream or divert the stream completely.

**Open Top Mixers or Containers** - Use either method above, whichever is more applicable.

For more information on sampling fresh concrete, see Portland Cement Association (PCA) publication PA015.05. To order, visit PCA's website, [www.cement.org](http://www.cement.org). Contact [Steve Waalkes](#) at 847-966-2272 if you have any questions about this article.

## ***A Look Back*** ***The Federal Aid Road Act of 1916***

The Federal Aid Road Act was signed into law by President Woodrow Wilson in 1916.

The Federal Aid Road Act of 1916 is considered to be the forerunner of the current Federal-aid highway program.

Funding for the first year of the program was \$5 million, but was jeopardized briefly when the United States entered World War I in 1917.

The 1916 Act required each state to have a highway agency with engineering professionals to carry out the federal-aid projects. It also served the social function of enhancing life in rural United States by focusing on rural post roads rather than the long-distance roads.



*The first project completed under the Federal Aid Road Act of 1916 was a 2.55-mile section of the road from Albany to Richmond, Calif. The total cost of the project--federal and state--was \$53,938.85.*



*President Wilson*

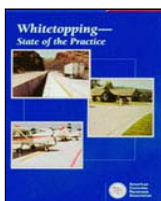
On July 11, 1916, President Wilson signed the bill in a White House ceremony that was attended by members of Congress and representatives of AAA, American Association of State Highway Officials (the forerunner of AASHTO), and farm organizations. It was then that the federal-aid highway program of federal-state cooperation was put into place. (Source: Federal Highway Administration)

## ***ACPA Product Showcase***

With the emphasis on building strong, durable pavements that are also affordable, municipal engineers are turning to overlays (i.e. unbonded, bonded, whitetopping, and ultra-thin whitetopping) for their roadways, intersections, alleys and bus stops. Here are some ACPA technical publications on the design and construction of concrete pavement overlays.

### **Whitetopping**

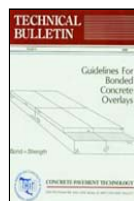
*Whitetopping: State of the Practice* (EB210P) is a 70-page publication that includes comprehensive coverage of all aspects of concrete overlays.



**\$25.00 (non-members)**

### **Bonded**

*Guidelines for Bonded Concrete Overlays* (TB007P), a 16-page technical publication, includes explanations of construction steps, including pre-overlay repair, surface preparation, and jointing.



**\$6.00 (non-members)**

### **Unbonded**

*Guidelines for Unbonded Concrete Overlays* (TB005P), a 16-page publication, includes job-site factors and performance of overlay projects.



**\$6.00 (non-members)**

To order ACPA publications, visit [www.pavement.com](http://www.pavement.com) or call toll-free 1-800-868-6733.

## Concrete Pavement News Digest

### ACPA Announces Airport Pavement Design Seminar

The ACPA Airport Pavement Design Seminar will feature information on the latest research about drainable and stabilized bases, as well as airfield pavement smoothness criteria.

The seminar is aimed at entry-level and project engineers, as well as construction and project managers. The three-day seminar will include:

- > A comparative analysis of the Federal Aviation Administration (FAA), Portland Cement



Association, and military design methods;

- > An explanation of FAA specifications and design requirements,
- > Preparation for construction and construction techniques for pavements, and
- > Concrete mix designs

The seminar will be held October 18 - 20 in [Ayers Hotel & Suites Costa Mesa/Newport Beach](#), Costa Mesa, Calif. Look for registration information in future issues of **CONCRETE PAVEMENT PROGRESS**.

For more information on the seminar, contact [Jim Lafrenz](#) at 785-742-6900. For registration information, contact [Polina Demidova](#) at 847-966-2272.

### ACPA Offers Whitetopping Conference Presentations

ACPA is offering proceedings from the International Conference on Best Practices for Ultra-thin and Thin Whitetopping.

The information, in a book and CD-ROM, features the newest technologies in whitetopping and overlays, including technical information provided by Jerry Voigt, P.E., ACPA's President and CEO, and Steve Waalkes, P.E., ACPA's Managing Director of Technical Services.

There is a **limited supply** of the book and CD, which are available on a **first come, first serve basis**. Order a package containing both for \$30. To order, contact [Gloria Hallman](#) at 847-966-2272.



*Limited quantities of the conference proceedings are available from ACPA.*

## Newest R&T Update Covers Grade Preparation



ACPA released its newest issue of *Research & Technology Update* last week.

"Making the Grade" provides information on subgrades and subbases to ensure the structural capacity and ride quality of concrete pavements. The current issue features the latest information about preparing, constructing, and trimming the subgrade and subbase. It also includes a list of ways to address expansive soils and controlling frost heave. Click [here](#) to view read the latest R&T Update.

Are you getting your free R&T Update? Free subscriptions are available to receive the transportation-construction industry's only periodical that covers technical and research topics related to concrete pavements.

To subscribe or for more information, contact [Steve Waalkes](#) at 847-966-2272. Download past R&T Updates free on the ACPA website, [www.pavement.com](http://www.pavement.com).

## ISCP Sets Final Program for August Conference

The International Society for Concrete Pavements (ISCP) recently announced the final program for its 8th International Conference, scheduled for August 14-18 in Colorado Springs, Colorado.

The ISCP conference is the transportation community's premier opportunity for international technology transfer and sharing experiences. The sponsors expect the attendance at the 8th conference to be well over 500.

The 7th International Conference, attracted about 400 participants, with about 40 percent representing countries from outside the United States.



To review the final program, click [here](#) or go to the ISCP website at [www.concretepavements.org](http://www.concretepavements.org). The program also provides hotel and conference registration information. ACPA, along with the Federal Highway Administration and CTLGroup, are among the sponsors.

For additional information, about the conference, contact [Shiraz Tayabji](#), PhD, P.E., CTLGroup at 410-997-0400.

For more information about the ISCP, contact Dr. Tayabji or contact [Mike Ayers](#), PhD, or [Jerry Voigt](#), P.E., at 847-966-2272.

## Urban Road Travel Increases, Pavement Conditions Worsen

One in four miles of the nation's major metropolitan roads have pavements in substandard condition, according to a new report released recently by [The Road Information Program](#) (TRIP). The result is rough rides and costs to motorists of \$400 annually in added vehicle operating costs.

TRIP's study, "Rough Ride Ahead: Metro Areas with the Roughest Rides and Strategies to Make Our Roads Smoother," also reports that the pavement conditions have worsened in recent years, from 22 percent in poor condition in 1998, to 26 percent in 2003.

Overall travel on urban roads increased by 41 percent from 1990 to 2003 and is expected to increase by another 40 percent by 2020. Other significant findings include:

States increasingly are using better pavements, that last longer and which will reduce the need for traffic-delaying road repairs. Pavement materials and designs are being tailored to withstand various climates and traffic loads.

New pavement designs and materials can result in smoother, more durable pavements. This is expected to increase the lifespan of roads and highways, thereby extending the time between major repairs. This is consistent with a national public opinion poll.

Click [here](#) to view the complete report.



*Travel on urban roads increased by 41 percent from 1990 to 2003, costing motorists \$400 annually.*

## Report Findings Support Transportation Investment

Current revenues devoted to transportation investments at all levels of government are not sufficient to maintain or improve the nation's highways and transit systems, according to a study released recently by the National Chamber Foundation.

The findings are the first of a two-phased study to identify funding mechanisms to meet national highway and transit investment needs. The first phase focuses on short-term funding for 2005 - 2015. Other key findings are as follows:

- To *maintain* current conditions, \$222 billion is needed this year, with a projected \$295 billion by 2015.
- To *improve* conditions, an expenditure of \$271 billion is needed in 2005 and \$356 billion

by 2015.

- With revenues from all sources are estimated at \$180 billion for 2005; current revenues fall short of these targets. This is \$42 billion short of the \$222 billion needed to maintain and \$91 billion short of the \$271 billion to improve conditions.

The study was commissioned by the U.S. Chamber of Commerce through the National Chamber Foundation. The second phase will address long-term funding mechanisms, including alternative to the current fuel tax-based system. Click [here](#) to view an executive summary of the study or visit [www.a-t-m.org](http://www.a-t-m.org).

## Blastrac Releases Literature for Milling Machine

Blastrac/ISP released a new brochure that describes the features and benefits of the BMP 6000 electric milling machine.

The machine features different milling cutter configurations for concrete pavements and other applications.

The BMP 6000 cuts a 14-in. wide path at depths ranging from 1/8-in. to several inches, depending on application.

The depth of cut is controlled in 1/8-in. increments using a precise, screw-down control that locks to maintain consistency. Three different cutter drums (coarse, fine, and flat) allow for a range of removal capabilities and finishes.

Equipment and application training is available at the Blastrac Surface Preparation Academic Resource Center. For more information, call 800-256-3440 or visit [www.blastrac.com](http://www.blastrac.com).



## Multiquip Unveils Boom-Mounted Compactors

Rammax's new RAV Series boom-mounted compactors from Multiquip are said to be designed for efficient and trouble-free mobile and crawler excavation.

The compactors, capable of generating centrifugal force up to 24,750 pounds, and are designed for a number of applications, including slope and hillside compaction, structure backfill, and work in confined spaces such as shaft compaction.



Multiquip Inc. is a leading supplier of compaction equipment, welders, generators, concrete and masonry cutting, placing and finishing products, dewatering pumps, and other construction equipment. For more information, call 800-421-1244 or visit [www.multiquip.com](http://www.multiquip.com).

## SemGroup Completes Purchase of Koch's Asphalt Businesses

SemGroup announced the completion of its acquisition from Koch Materials Company of asphalt operations and assets located in the United States and Mexico.

SemGroup said the U.S. assets will operate as SemMaterials, L.P., while those in Mexico will be named SemMexico Materials HC, S. de R.L. de C.V. The acquisition includes 47 asphalt terminals in 24 states in the U.S. And 13 asphalt terminals in Mexico; five regional technical centers; and patents. Frank Panzer has been named SemMaterials president and chief operating officer.

Koch is ranked #2 on Forbes' list of privately-held companies in America; SemGroup is ranked #14.

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