

Construction process for cold in-place asphalt recycling

CIPAR IS BEING PERFORMED on Iowa's secondary county roads and low volume state highways. The construction process generally consists of eight different phases:

- Planing the existing bituminous road to a predetermined depth which should be sufficient to destroy most existing distresses, while leaving sufficient load bearing capacity to support the construction equipment.
- Screening and sizing of reclaimed asphalt product (RAP) to desired size (typically 1–1.5 inches). During this process water is sprayed onto the RAP for lubrication, emulsion distribution, and dust control.

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The cold in-place asphalt recycled mat prior to compaction.

Performance of cold in-place asphalt recycling on Iowa's secondary roads

By Bryan R. Cawley, Research Assistant, Iowa State University

COLD IN-PLACE ASPHALT RECYCLING (CIPAR) has been performed successfully worldwide. It has been successful because it reuses aggregate and asphalt that already exists within the road. This makes it a "green" process. In Iowa the value associated with using this green process comes from economics.

CIPAR has been in use in Iowa since 1986. Because of this short history, generating pavement performance information in order to predict the expected service life of CIPAR roads is difficult. It was necessary to collect information about the present condition of CIPAR roads with varying ages.

Ascertaining the condition of these roads was performed by surveying a sample of CIPAR secondary roads in Iowa. The survey techniques consisted of a present serviceability index (PSI), a qualitative measure, and a pavement condition index (PCI), a quantitative measure. These two indices were combined, with equal importance, to produce a numeric index that would represent the user's perception of the road's condition and the road's structural condition.

Once the current condition of the roads was obtained, it was then possible to determine the expected life of the roads. Statistical analysis was performed to determine the expected life cycle. Ninety-five percent confidence intervals were used to determine how the average roads were currently

performing and would be expected to perform in the future. These predictions are based on maintaining current variables: maintenance procedures, traffic, truck traffic, weather conditions, etc.

A terminal life index value of 25 was chosen. This is based on the PCI concept of changing from poor to very poor at the index rating of

25. By using this value, an average life expectancy for CIPAR secondary roads was determined to be 15 to 26 years.



Koss Construction's sizing and rejuvenating portion of the old in-place asphalt recycling train. Photos courtesy of Bryan R. Cawley, ISU research assistant.

Interviews with 11 Iowa county engineers and assistants revealed that they expected the service life of a three-inch hot-mix bituminous overlay to be 10 to 22 years. Comparing the two methods of rehabilitation, CIPAR roads, on the average, will last four to five years longer than hot-mix bituminous overlays. These predictions are based on a continuation of the current maintenance programs, traffic loads, weather conditions, and other variables that can and will affect the performance of bituminous roads.

Reviewing CIPAR economic costs showed volatility in the market during the initial introduction of this rehabilitation technique. Since the initial break-in period, the cost of four inches of CIPAR has leveled out to approximately \$15,500 per mile of 22-foot-wide road. The material and construction costs of four inches of CIPAR are approximately equivalent to one inch of hot-mix bituminous overlay.

For a three-inch overlay the initial material and construction costs are approximately equivalent to CIPAR's four inches and an additional two-inch hot-mix bituminous overlay on the CIPAR road. Thus, there is no initial cost benefit for either method based on material and construction.

The economic benefit comes from deterring the occurrence of reflective cracking. The deterrence in cracking increases the duration between maintenance and increases the service life of the road. Mobilization costs are another concern, but were not addressed in this cost comparison.

In the state of Iowa the process of CIPAR secondary roads is economically beneficial. Compared to the alternative of a standard hot-mix bituminous overlay,

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Meetings and a little Monty Python

First in a series about management



AFTER BLUSTERING THROUGH several unsuccessful business meetings, former Monty Pythoner John Cleese learns how to improve his leadership skills in "Meetings, Meetings, Bloody Meetings," a 1994 interactive CD training program by Video Arts, Inc. The program uses humorous scenarios to demonstrate tips in making meetings efficient and productive, while allowing viewers to interact with the material on-screen. Each sketch shows Cleese's hapless businessman, Tim, making a series of meeting mistakes, then learning how to correct his blunders and prevent future problems.

Turning a meeting nightmare into a dream

The video divides its message into four sections: why meetings are important, Tim's meeting "nightmare," the five stages of meetings, and finally, a summary of the entire program. Most of the video is devoted to the five stages for improving communication, saving time, and getting significant results. Among its suggestions:

1. Plan clearly and concisely what the meeting is supposed to achieve, and prepare yourself as to the meeting's goals and priorities.
2. Inform all participants of the meeting's objectives. Write and distribute an agenda that explains what is being discussed, why it's being discussed, and what you hope to accomplish.

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CIPAR provides a longer life expectancy and decreases maintenance. The construction technique and physical characteristics of the resilient material contribute to the benefits. From an environmental perspective, this rehabilitation technique minimizes the quantity of natural resources consumed.

The data was acquired by funding from Iowa Highway Research Board, project HR 392.

For more information about cold in-place asphalt recycling on Iowa roads, contact Bryan Cawley, a research assistant in civil and construction engineering at Iowa State University, 515-294-4590. ■■

3. Prepare for the meetings by prioritizing items. Use time management to move the meeting along quickly; researching agenda items beforehand can streamline the schedule.
4. Structure and control the meeting's progress by stating your proposition, showing evidence to support it, coming to a group consensus, and then collaboratively deciding on the action to take.
5. Summarize and record what has been accomplished, especially how responsibilities and tasks have been allocated.

The bonus of CD-I

"Meetings, Meetings, Bloody Meetings" is available only in CD-I format, an interactive software program that allows the viewer to easily navigate among the various scenes, opt to take short quizzes on meeting strategy, and construct solutions to Tim's management troubles. The viewer becomes an active participant in the video, consequently making its lessons even more effective and memorable.

Although CD-I requires a special CD-I player, CTRE offers both the player and its CD-I collection for loan. Anyone interested in improving meetings while maintaining a sense of humor is encouraged to check out this program.

For more information on this video or others in CTRE's collection, contact Stan Ring, CTRE library coordinator, 515-294-9481. ■■



A productive meeting features a clear agenda and efficient scheduling.

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- Placing and mixing rejuvenating (usually asphalt emulsion) agent into the RAP material (typically 1–2 percent).
- Placing rejuvenated RAP.
- Primary compaction performed by pneumatic roller which must be performed during the curing of the rejuvenator.
- Secondary compaction using steel wheel roller which will remove pneumatic roller marks.
- Final curing of emulsion. This process is generally performed by allowing curing to occur over a two-week period. However, shorter and longer times have been used successfully. Because of the emulsion curing, the most favorable construction period is summer.
- Placing a surface course (typically 2–3 inches of hot-mix bituminous). ■■