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Chip Sealing in Colorado

Salt Lake City's Legacy Parkway

Focus: Asphalt

Chip Sealing *in Colorado*

The Street Systems Division of the Grand Junction, CO, Department of Public Works chip seals a residential street.

Grand Junction Slices Six Weeks from Two-Month Pavement Preservation Job

Story by Paul Fournier

Using its own forces and the right materials and equipment, the western Colorado city of Grand Junction recently set a record for itself when it cut six weeks from a scheduled eight-week chip sealing project.

The project was part of a program launched in the 1990s to ensure that each street and arterial periodically undergo this surface maintenance treatment. Grand Junction has actually employed chip sealing for decades, years before the formal program was established and long before the practice was recognized as a pavement preservation approach to protecting its roads.

Within the past few years, a number of non-structural maintenance applications have increasingly been referred to as "Pavement Preservation" approaches to protecting and extending service life of engineered road pavements. This growing awareness of pavement preservation is due largely to the cooperative promotional efforts of the Federal Highway Administration, the American Association of State Highway and Transportation Officials, National Center for Pavement Preservation and the regional partnerships of government, academia and industry representatives supported by NCPP.

While the Pavement Preservation umbrella is fairly new, as is the "green and sustainable" label being applied to the practices, some of them have actually been around for a very long time. Asphalt emulsion binders used in pavement preservation applications have long been noted for their low-temperature manufacturing, low- to no-VOC emissions and low-temperature application temperatures.

Thrifty Chip Sealing

Chip sealing is one such treatment, and a compelling testimony to its long, successful history is clearly visible in the well-kept roads of Grand Junction, located in Colorado's Grand Valley.

"We've been using chip sealing as our primary pavement maintenance surface treatment for about 40 years," said David Van Wagoner, supervisor of Street Systems in the city of Grand Junction.

A division of the Department of Public Works, headed by Director Greg Trainor, Street Systems maintains about 1,100 lane-miles of roads that serve not only this municipality of 53,000 people, but also an additional 100,000 residents in neighboring valley communities.

Carved from the earth by the Colorado and Gunnison rivers eons ago,

this ancient valley experiences road-punishing temperature extremes. Colorado National Monument's towering monoliths and Grand Mesa, the world's largest flat-top mountain, form a spectacular backdrop.

"In a typical year, we'll see temperatures ranging from 5 below zero to 105 degrees," said Van Wagoner. The department long ago turned to chip sealing to protect the valley's roads and streets in this challenging climate.

"We learned chip sealing was the most cost-effective pavement surface treatment here. It really works for us," he said. The economics of employing this pavement preservation approach are enhanced by the fact that Street Systems performs the work itself, he noted.

"We can do the work for much less than it would cost to contract it out," he said, adding that the sheer volume of chip sealing the crew performs each year has made them experts at the task and proud of their precision work.

Each Road Every Decade

Based on the demonstrated service life of this treatment, Street Systems has divided its lane miles into 10 maintenance sections, each undergoing chip sealing every year to ensure no section goes without pavement preservation for more than 10 years. This systematic approach was launched in 1994, said Van Wagoner, pointing out the successful program is now four years into its second cycle.

In 2008, the crew completed section eight, which encompassed about 400,000 square yards.

"This is one of the smaller sections," explained the supervisor. "Some of them run between 750,000 to a million square yards."

With a total force of between 15 and 30 workers depending on the season, Street Systems occasionally borrows employees from other DPW divisions to ensure that a full complement is available to handle other responsibilities while the chip sealing crew performs its specialty. Usually, this work takes place over an eight-week period in July and August, but this year's program had to be compressed into one quarter of that time.

"We weren't even sure we could do it, but our asphalt emulsion supplier warned us that prices were going way up, so we needed to get the work done in just two weeks in July," he pointed out.

Street Systems' crew prepared the pavements for chip sealing by filling cracks, patching potholes, and leveling off low spots with hot mix asphalt using the division's own Lee Boy 700 paving machine. In a "best practice" maintenance move to protect the environment, the crew also placed long, sand-filled tubes to block debris and asphalt from entering catch basins and other openings to the city's storm water collection system and ultimately flowing into area watercourses. DPW's Traffic Division pitched in, marking manhole locations

Above left: With Grand Mesa, world's largest flat-top mountain in background, HYPAC rollers compact chip seal application in a residential area.

Above right: In a "best practice" move to protect the environment, city crew placed sand-filled tubes to block debris and asphalt from entering catch basins.

Bottom left: One of the city's Mack trucks deposits 1/4-inch stone into hopper of Etnyre QUAD chip spreader.

Above left: In a commercial area, the chip spreader broadcasts 3/8-inch stone and is immediately followed by three rubber-tired rollers.

Above right: The distributor sprays rapid-setting CRS-2R cationic emulsion at up to .30 gallons per square yard in commercial area.

Right: Observing the chip sealing are, from left: Doug Martin, COBITCO sales manager, with Scott Norton, foreman, and Dave Van Wagoner, supervisor, Grand Junction Street Systems.

with bright orange traffic tabs so the thin covering of chip seal could be removed later to expose the structures.

Different Stone, Different Rate

Asphalt binder applied by Street Systems for its chip sealing operations is a polymer-modified cationic emulsion manufactured and distributed by COBITCO Inc., headquartered in Denver. COBITCO uses BASF polymers in their products. The crew applies the rapid-setting CRS-2R emulsion at different rates for different sized stone depending on the job, according to Van Wagoner.

"In residential areas we use 1/4-inch stone with an emulsion application rate of .25 gallons per square yard, but on high-traffic arterials, for example, we switch to a 3/8-inch stone with an emulsion application rate of .28 to .30 gallons per square yard," he said.

Since time for completing the entire maintenance section was limited, the crew assigned two asphalt distributor trucks to the operation – one of its own, and one on loan from the Colorado Department of Transportation. COBITCO moved its asphalt tanker truck to different strategic locations as needed to supply the distributor trucks.

Adding impetus to job progress was the use of rapid-setting emulsion, said the supervisor.

"In the old days, the department used kerosene cutback asphalt. Later we changed to high-float anionic emulsions, and finally to rapid-setting cationic after conducting a side-by-side field comparison of both types of emulsions. With cationic emulsion we learned that we can place the stone sooner, put traffic on the road sooner, and sweep away loose stone sooner without tearing up the chip seal surface," he said.

As part of its services for Street Systems, COBITCO analyzed the stone for compatibility with cationic emulsion before the job, according to Doug Martin, the company's sales manager.

"We've found that cationic emulsion works with a greater variety of aggregate because SBR polymer forms a matrix that grabs the stones," Martin observed.

A Lesson Learned

For the maintenance section operation, the division employed its Etnyre QUAD chip spreader to broadcast stone over the asphalt. Provided by Whitewater Building Materials, a local supplier, the stone was a hard (LA Hardness 22) aggregate excavated from old river beds and crushed to produce fractured faces.

City dump trucks delivered the aggregate to the chip spreader, which is equipped with an extended hopper and is capable of expanding from a 10-foot width to 20 feet, speeding production. And compaction was expedited by the use of three HYPAC rubber-tire rollers.

"Originally, we used one steel drum compactor and one rubber-tire roller, then added a second rubber-tire roller, and most recently we used three rubber-tire rollers to get the high-production that we needed," said Van Wagoner.

The experience of having to compress an eight-week chip sealing job into just two weeks has been educational, noted Van Wagoner.

"It taught us that we can move a lot faster than we thought using the right materials and equipment." ■

Paul Fournier is the retired editor of New England Construction magazine, an ACP publication.