

Article For “Better Roads” submission

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Maintaining Las Vegas' Heavily Traveled Streets

Las Vegas, Nevada is continuously under construction to create newer and better attractions and accommodations. By repeatedly reinventing itself, this southern Nevada desert city has remained one of the world's premier tourist destinations, accommodating 35 million visitors a year in more hotel rooms than any other city in the world.

With a population of 1.5 million and an influx of 5,000 new residents monthly, Las Vegas is experiencing one of North America's fastest growth rates. The city's strong tourism industry combined with its rapid resident population growth has put significant stresses on Las Vegas' infrastructure.

Las Vegas streets are a vital part of this infrastructure supporting conventions, tourism, and ultimately the economic vitality of the region. Thirty miles of new roads are built every year, and the city budget includes over \$11 million annually for street maintenance; \$7 million is for work under contract, and \$4 million is for the city's own maintenance forces. While private contractors complete large projects that are planned far in advance of the actual work, the day-to-day maintenance of Las Vegas streets falls primarily on the shoulders of city street maintenance forces.

Chris Finberg of Las Vegas, Nevada, Department of Field Operations is one of those shouldering the responsibility for Las Vegas Street maintenance. Like most Las Vegans who live and work in the city, Finberg is not a gambler, but in the same dynamic spirit of the city's growth and progress, he is open to ideas that improve, simplify and lower street maintenance cost. Finberg and Bill Hinkel, Crew Leader, devised a program for simple asphalt repairs that support heavy traffic. For two years Finberg and his crews have repaired heavily traveled asphalt streets quickly and simply with

fewer workers and less equipment while completing more repairs than ever. The new repair system eliminates the grinding or dig-outs normally required before conventional hot-mix repair and no asphalt waste is generated to haul away when repairs are complete.

Arterial streets with their high traffic volume are difficult to maintain and one of Finberg's biggest challenges. "These roads carry more cars. Everybody that lives in a neighborhood goes to one of those to get somewhere. These roads represent a huge investment. Roads were built based on traffic projections, but for everything built in the (Las Vegas) valley the projections have been exceeded many times over."

"Many of Las Vegas Roads are not designed for the traffic loads they now have to carry, and are exhibiting pavement distress. Even though we are in a desert, these roads still need protection from water intrusion which deteriorates the base and leads to structural failure."

"The problem with communities and government is their needs exceed available budgets." Communities and governments must operate within budgets and spending limits. For growth communities, roads are built that may become structurally obsolete when traffic volume exceed projections.

The investment in roads is enormous, and they must be maintained to extend their service life beyond the normal design of 20 years. Rapid deterioration begins by the 15th year under normal conditions. In the Las Vegas climate, with low humidity, year-round sunshine, and high summer temperatures, asphalt quickly loses its flexibility and distress begins. With traffic that exceeds original design limits, rapid pavement deterioration is inevitable. At \$420,000 per centerline mile for asphalt pavement reconstruction on an arterial roadway, maintenance for these heavily traveled streets is a must to delay more expensive reconstruction.

Conventional Full Depth Hot Mix Repairs

On Las Vegas arterial streets, full-depth patching with hot mix is the usual repair for deteriorated pavement sections. When there is sub-base failure, the entire lane width is removed and

the sub base is restored. The asphalt is placed and compacted in lifts. Typical repairs require several tons of asphalt, specialized equipment, truck transport to deliver and remove materials, adequate time to complete the work, and a skilled-labor crew.

With conventional full depth hot mix repairs, a single repair represents a lot of work, materials and equipment, but according to Finberg, "A patch is always inferior to the original pavement because it weakens the surrounding overall structure."

With inferior results from conventional patching compared to new pavement, the notion of simple repairs with no pavement removal was tempting to Finberg. Is it possible to mitigate future pavement distress without pavement removal? This is what Finberg is learning.

Background and System Development

For years, polymer repairs of small surface damage on Las Vegas residential streets have been successful. The repair has been performed using a mix of sand with a thin liquid polymer, "Dopey Soup", supplied by Vern Phillips of Construction Sealants Supply of Las Vegas, Nevada.

In new Las Vegas subdivisions, streets are completed first. This provides easy access for completing home construction. Heavy equipment moving in and out during construction damages streets. A flow-able mix of "Dopey Soup" and sand is used to repair this type of damage.

Before final acceptance, repairs are completed and the entire street is slurry sealed to restore "new" appearance. First repairs on these residential subdivisions began some 10 years ago. These small repairs for new asphalt under light residential traffic perform well in this desert climate.

With the help of Vern Phillips, these residential street repair methods were adapted for repair of heavily traveled arterial streets. The repair composition was improved to simplify larger repairs. Repair kits with a treated sand mixture, "A" and "B" liquids, plus special black topping sand was devised.

The sand was coated black to match the appearance of asphalt and to eliminate silica sand's affinity to moisture that could be detrimental to its bond to the polymer binder. The treated sand is

hydrophobic, does not wet out with water, and forms a high strength, flexible polymer concrete when combined with the liquid polymer. These pre-weighed repair kits are complete and simple to use. With no measuring or weighing required, reliable results are easily achieved.

Las Vegas City Street Maintenance Forces further developed application methods suited to the larger scale repairs for the heavily traveled arterial streets. To perform the repair, the asphalt pavement is air swept using compressed air from a high-pressure tow-able compressor. Dirt and debris are removed from cracks, potholes, and raveled surfaces by directing a high-pressure air stream slowly over the damaged areas. A rapidly curing, flow-able sand/polymer composition named FloMix™, is applied, cold, over the deteriorated pavement. The composition fills cracks, ruts, and potholes to quickly restore the pavement to original grade. With no pavement removal, material volume for repairs is small. Application is quick. The repair material is leveled smooth to grade with an asphalt rake and hand trowels. For pavement depressions, deep ruts, wide cracks, and potholes, clean, dry crushed gravel is added to the mixture for higher strength with reduced cost.

Advantages

Shorter and Fewer Lane Closures- Since the repairs are quick, they can be performed within short time frames of low traffic volumes. A full depth hot mix asphalt repair requires about three to four hours to complete, and may require an extra lane in the closure to move equipment in and out of the repair. In contrast, the same repair with the new process is finished in less than an hour and without the need for an extra lane in the closure. The repair is traffic ready in one to three hours. Most of the time saving comes from eliminating the laborious removal and hauling of the existing pavement. With the new process only the lane under repair is closed to traffic, so impact on traffic flow is significantly reduced.

Many repair projects are scheduled on Las Vegas' lightest traffic day, Sunday. A single lane, closure is set up at 7 A.M. with all other lanes remaining open to traffic. The closure is reopened to traffic at 3:00 P.M. The necessary work is completed with a minimum disruption to traffic flow.

Less equipment and manpower - Unlike conventional hot mix repairs which required costly equipment and a four man skilled crew the FloMix repairs are completed with just three workers in one pickup truck, using a compressor, a generator, a mixer, asphalt rake, and two trowels.

Increased Production - A FloMix crew can complete twice the number of repairs in an 8 hour work shift than a hot-mix repair crew

Emergency repairs - But the benefit of the system is not so much the speed of repairs as the ability to respond to repairs with minimal delay. The process eliminates the need for obtaining hot mix and requires only a minimal, semi-skilled crew and limited equipment. This simplifies scheduling work during off-peak traffic. The FloMix™ can be inventoried for repairs as needed, 24/7. By eliminating dependence on a hot mix plant schedule, repairs are placed easily as needed in hot or cold weather year round.

Simple to Use - To Chris Finberg, "It's the simplicity as much as anything that is having us use this material. The simplicity means entry-level employees can perform the work. It's our ability to use all levels of skill within our current staff (that makes it appealing). Our department workload includes essential tasks, which require various degrees of skill. When you can perform work that traditionally requires a high skill level and complete the task with less skilled workers, that's ideal." The ability to do repairs in house also eliminates the administrative costs of managing outside contracts and the delays associated with the bid process.

Promotions and turnover are a big problem with skill work like hot mix patching. Training entry-level workers for skilled work takes time. This is not a problem with the new repairs according to Bill Hinkle, lead worker. "I may be the only person next year still doing (these repairs). Everybody else may be new. They've all moved on to other places within the city on to bigger and better things, but I can continue with entry level people"

Summary

Las Vegas city street maintenance workers, with their broad range of maintenance responsibilities, are more effective by utilizing the polymer concrete repair kits which can be applied at any time with minimal advance planning. Repairs are suited to virtually all small damage and early pavement distress. The mixture has also been placed over wide cracks and large potholes.

Finberg's low labor, rapid repair methods simplify maintenance with the ability to schedule repairs at any time, day or night, year around. Lanes are closed to traffic for short times to create safe work zones for placing repairs on arterial streets during off-peak travel times. Often, only the lane needing repair has to be closed. The rapid repairs substantially reduce the time needed for closures. The application rate is two to three times faster than the rate of hot mix asphalt repairs allowing more repairs to be completed within the closure period.

The repairs can be installed with a minimum of equipment and without the need for skilled labor. This makes the technique well suited for maintenance crews that have many responsibilities other than road repair.

But How Does It Perform Under Traffic?

The new repairs have been under heavy Las Vegas arterial traffic for only two years. The performance is still under evaluation. Finberg states, "Two years is not enough time to fully evaluate the performance of the polymer repairs we have installed. I will feel more confident in its performance after we evaluate it after 3 to 5 years. However, I will be proceeding to use it even though there are certain risks associated with using a new product and technique. This is the second year we have installed the material, and its potential advantages make it well worth our investment. I would have never started using this material if I didn't know think that it has the ability to perform at an acceptable level."