EMC SQUARED®

Arizona Public Works Department Solves Major Road Problem

COUNTY OF YUMA
ARIZONA

The County of Yuma is located in the southwestern corner of the State of Arizona where it connects to the eastern side of the Colorado River and to the US/Mexico border on it's southern limits. This setting of wide open desert terrain is a locale where the federal government operates two large military bases in addition to two equally spacious National Wildlife Refuges. In the areas where silt and clay soil deposits were made by the Colorado and other rivers, Yuma County provides an excellent setting for farming. These farm areas are typically irrigated and highly productive, bringing a steady stream of income to the county from sales of agricultural products. Thanks to the warm desert climate and its extended growing season, shipping of farm products and related activities puts a major burden on the county's road infrastructure. County roads see high volumes of loaded truck traffic during seasonal harvest cycles. The pounding of produce truck traffic is a particularly severe problem where it is focused onto arterial roads.

The subject of this report is County 14th Street, between State Highway 95 and Avenue C, a farm to market arterial road on the southwestern outskirts of the City of Yuma. County 14th Street becomes one of the County's busiest roads for agricultural truck traffic during harvest operations. County 14th Street serves as the main arterial road connecting the Yuma Valley to the City of Yuma. During the months when crops are being harvested, a large volume of heavy truck traffic travels over this road to deliver produce from the region's fields to lettuce coolers. According to Jason Phipps, Highway Construction Supervisor for Yuma County, this section of County 14th Street required annual reconstruction and repair. It has historically been the single worst segment of road that they maintain. The farm fields adjacent to the road are used to grow lettuce and other crops and the soils are heavily watered by sprinkler and flood irrigation during the growing season. The persistent presence of this irrigation water, combined with heavy and high frequency traffic in an area of saturated unstable clay soils, created a worst case scenario that the county needed to solve.

The solution began with a geotechnical investigation of the road that included core sampling and soils analysis

by Geotechnical Testing Services (GTS). The report from GTS showed that the road consisted of some 4.5 inches of distressed asphalt over approximately 8 inches of contaminated gravel. The pavement and base layers were situated over a layer of clay soils that varied from 2 to 4 feet in depth.

Reconstruction and stabilization work began in the fall of 2001. It started with ripping and processing the upper 12 inches of asphalt and base materials. As soon as the pavement and gravel materials had been removed for processing by motor graders and an agricultural disc, high ground water conditions were discovered in the 800 feet of road at the westernmost end of the project. The distressed asphalt and base materials were crushed in place and then windrowed to one side. The subgrade soils under the intersections at the two ends of the project were excavated as deep as four feet and replaced with truckloads of 12 to 16 inch diameter stone. A six inch depth of the clay subgrade for the length of the road between the intersections was mixed and treated with EMC SQUARED® Stabilizer (1000) and compacted. Once the clay layer was stabilized, additional aggregate base course materials were hauled to the site and blended with pulverized asphalt pavement materials to further elevate the road's structural section. The 12 inches of gravel and asphalt materials were treated with EMC SQUARED Stabilizer, rolled back into place in six inch lifts and compacted to form the stabilized base layer. The entire project was paved 2 to 3 inches deep with cold mix asphalt surface course. Four months later a 3/8 inch minus chip seal was applied to complete the project.

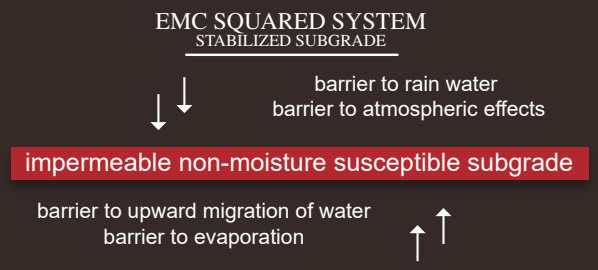
After over eight full years of use, Jason Phipps reports that this road that was once a nightmare for the county is now trouble free. What was once the worst stretch of road in Yuma County is now one of it's best examples of a sustainable farm to market arterial road, one that keeps the road maintenance budget for Yuma County under control while supporting the region's farm economy with an efficient and smooth running road. The combination of increased structural section and stabilization have proven highly effective in solving a challenging problem.

THE EMC SQUARED® STABILIZER TECHNOLOGY

The EMC SQUARED System (EMC^2) Stabilizer Technology — Clean. Green. Low Cost. Concentrated power to improve stability of aggregates and soils. Applied with pre-established engineering controls and construction procedures during the moisture conditioning and compaction process. Preconditioning silts to behave more like siltstone, aggregates to become more like conglomerates, and clays to become more like clay stone, making them more stable in moisture content and more naturally cemented. Supported by SSPCo staff who have participated in problem solving for thousands of projects and interacted with designers on stabilization challenges on every continent, from arctic to desert and tropical climates, working on every sort of application from containment of hazardous and radioactive wastes to projects accessing nature preserves, and from remote oilfield access roads to airport and freeway projects.

When cement and lime are utilized for soil stabilization treatment, they typically create rigid soil layers that provide strength without necessarily reducing moisture flow through the layer. Rigid layers are subject to cracking, similar to concrete pavements, which must be constructed with expansion joints to compensate for natural shrinkage phenomenon that otherwise propagate random cracking. In soil and base course stabilization there is no way to provide expansion joints, so cracking is an expected side effect of cement and lime treatment. This reduces their overall effectiveness and often subjects pavements above to reflective cracking generated from below.

EMC SQUARED® System treatments, on the other hand, typically create layers with improved flexural stiffness, more similar to the properties of hot mix asphalt, a flexible pavement. The EMC SQUARED System layer supports loads without a tendency to cracking. Equally important, it ordinarily reduces the rate of moisture flow through the layer, shedding water off the surface and impeding the upward capillary flow of moisture from groundwater sources below. This ability to function in this manner as a moisture barrier is a revolutionary and fundamental advance in stabilization technology. The stabilized layer itself is not only stiffened, but it also impacts the stability of native soils below the constructed layers by promoting a more consistent and stable moisture distribution. Stabilization in this manner is largely achieved by stabilizing moisture content in the constructed layers and soils below, rather than by constructing a single rigid layer with cement and lime treatment that remains susceptible to moisture flow moving through the layer. As evidenced in field monitoring of freeway projects, this ability of EMC SQUARED System treatments to beneficially influence stability at a deeper level is resulting in smoother running roads and highways with extended service life. This is the multiplier effect, the exponential power of the EMC SQUARED System (EMC^2) Stabilizer Technology. It promotes greater stability in soils below as well as within the treated layer.



EMC SQUARED System products are unique and uniquely effective. The moisture barrier aspect separates them from cement and lime. Their ability to beneficially improve soils with organic and high sulfate contents, and their capacity to stabilize gravel-surfaced roads sets the EMC SQUARED System products apart from cement and lime. The facility to cost-effectively treat such a broad spectrum of aggregate and soil materials differentiates the EMC SQUARED System from any other form of soil stabilization treatment.

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