



EMC SQUARED® SYSTEM

INNOVATIVE FOREST SERVICE ROAD PROJECT



EMC SQUARED® Stabilizer application

The Coronado National Forest seems to fit almost precisely into the southeast corner of Arizona, but, up close, this 1.7 million acres of public land is actually a wild mix of hot arid desert juxtaposed with “sky islands,” vaulting mountains rising directly from the desert floor. In less than an hour’s travel, one can pass from hot desert to cool mountain forests - a characteristic of this land which Apache leaders, Cochise and Geronimo, knew well and used repeatedly to escape pursuing cavalry more than a century ago. Within this jumble of landscape managed by the USDA Forest Service, there are ten well developed recreation areas, more than 1,100 miles of trail, and four fishing lakes which provide a wide variety

of recreation opportunities. There are also eight wildernesses, each with its own unique history, wildlife and structure. Over 200 threatened and endangered species frequent the area. The Chiricahua Wilderness occupies 87,700 acres in the Chiricahua Mountains located at the southeastern boundary of the Coronado forest immediately adjacent to the town of Portal. There is a well-developed trail system through the dense brush and timber, steep slopes and precipitous canyons of this one-time Apache hunting ground which makes this historical wilderness area popular with novice hikers as well as devotees. Also, there are many Forest Service campgrounds and picnic areas within hiking distance just outside the wilderness as well as a number of non-forest facilities. As one might expect, this ease of access to a site with considerable historical interest has made the Chiricahua Wilderness extremely popular with visitors. The presence of several world class bird watching sites - within the wilderness and nearby - contributes another measure of popularity and another important reason



Mobile Rock Crusher

for visitors to choose this area. The South Fork Trail and Picnic Area and the Silver Peak Trail provide birding opportunities for over 300 species, including the Elegant Trogons, Blue Throated Hummingbirds, and the Montezuma Quail.

Increasing numbers of visitors and associated traffic has made road maintenance a high priority for the tightly budgeted Forest Service. Roads in this high mountain area (5,000 feet plus) are subjected to snow and rain in the winter and regular summer rains. When it became necessary to rebuild a two mile section of Portal Road, an essential access road for the Chiricahua Wilderness, Cave Creek Canyon, South Fork Trail and neighboring attractions, planners took a hard look at traffic requirements and costs to find a realistic

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compromise. The old road had once been partly paved and partly chip sealed, but even the paved sections were badly potholed. It was clear that major reconstruction was needed. The strategy adopted was one of “incremental construction.” That is, fund and build the road in two stages: (1) realign the road, correct drainage problems and construct a stabilized crushed aggregate surfacing during the first year. (2) Pave over the stabilized base two years later.

Incremental or “staged” construction in itself is not unusual, but the Coronado National Forest engineering and road construction staff brought in two road construction innovations on this project to reduce costs, improve the quality of the road structural section and to provide road users with a safe and functional running surface during the two year increment before the permanent pavement surfacing could be placed. This area is approximately seventy miles “uphill” from the nearest commercial aggregate sources. Creek run gravel with cobbles up to twelve inches in diameter was the only local source practical if the Forest Service was going to avoid the tremendous trucking costs. The oversize creek run material had been used historically in the area to build up the road system. With the population of threatened and endangered species, it was no longer possible to develop nearby borrow pits, so the material resource was limited to the old roadbed, which they ripped up, and oversize material collected from shoulders and ditches. This material was windrowed on the road in adequate quantity after crushing to produce a four inch thick surface course.

What made use of the creek run material feasible was availability of new mobile rock crusher equipment technology. The FAHR Forester C-2000, manufactured in Canada, mounts on the front of large front end loaders. Rocks are crushed between rotating hammers and steel anvils. Materials with up to sixteen inch cobble and boulder rocks, angular or rounded, can be fed in windrow into the mobile crusher to produce crushed aggregate materials with maximum rock size of two inches.

The Coronado Forest rented the mobile rock crusher in 1995 as part of a demonstration project which was written up the following year by the Forest Service’s Technology & Development Center in San Dimas, California, (Forester C-200 Demonstration Project). After eight weeks of operation they calculated their cost for this “crushed-on-the-road” aggregate material at \$3.86 per ton, a very economical cost at this remote site considering commercial sources are more expensive to purchase at the production location with no transportation costs included.

The only complication involved the quality of this aggregate. With fines content (minus #200 sieve) ranging from three percent up to almost twenty percent, much of the aggregate would be highly moisture and frost susceptible and the road would be subject during the interim without paved surfacing to damage and erosion by heavy rains, occasional flooding, and by snow removal operations. A low-cost method to stabilize the aggregate was needed to maintain a functional running surface and protect the adjacent riparian areas from sedimentation. Project engineers selected the EMC

SQUARED® System, a concentrated liquid stabilizer technology from Soil Stabilization Products Company, Inc. (SSPCo), Merced, California. They based their selection upon the product’s history of effectiveness with this range of aggregate material gradation and with its service history in treatment of unpaved roads for the Forest Service and other public agencies projects in severe cold climate areas.

The construction operation included the front end loader/mobile crusher unit, two motor graders, compaction equipment and three water trucks to supply the diluted solution of concentrated liquid stabilizer. The graders ripped the existing road and gathered all available material into two windrows and were then used for spreading and for grading behind the mobile crusher as it progressed down the road. The project was constructed in August. After first being short of water, the construction operation was then hit by the heavy monsoon rains moving up from the Gulf of Mexico which are typical to this area during summer. Compaction equipment also broke down, further compounding the difficulties of working at the remote site. With improvement in the weather and equipment repairs, the aggregate surfacing work was completed.



Road prepared for paving

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