

Advancements In Design And Product Technology Reduce Requirements For Road Materials And Deliver Revolutionary Cost Savings On Expressway Rehabilitation Project



City of Clovis, California Shepherd Avenue Project

Summary from Project Owner:

“A one-mile roadway composed of 3 lane miles of expressway in the City of Clovis, California was constructed using non-conventional techniques. This first time project resulted in \$250K cost savings, improved long term maintenance performance and reduced constructed related air pollution by 15%. Conventional methods typically include placement of asphalt surfacing over layered sections of imported/compacted aggregate base (AB) and compaction to 95% 2.5 feet below finish grade. Instead, the City pre-conditioned the Developer to employ a Mechanistic-Empirical (M-E) design approach using FHWA design criteria. The final

design eliminated the traditional base course requiring 16,000 tons of Class 2 AB (640 truck loads) and replacing this section with a stabilized treatment of on-site subgrade soils and a stabilized 4-inch base layer comprised of recycled asphalt pavement (RAP) from the original roadway. This new approach to road design/construction allowed the City of Clovis to achieve increased quality features for the expressway when comparisons were made with Falling Weight Deflectometer (FWD) testing of the recently completed traditional constructed 1-mile pavement structural section of Shepherd Avenue adjacent to this project.”



**reduction of air pollution
related to road construction**

15%

**reduction in road
construction costs**

25%

**improvement in road
strength and stiffness**

60%

**tons of aggregate
base rock eliminated**

16,000

Project Report from City of Clovis

Because of a development and construction boom experienced in Fresno County, California, resources for road construction were in short supply during the Summer and Fall of 2005. The City of Clovis conditioned the developer of adjacent property to reconstruct of Shepherd Avenue (Expressway) from Temperance Avenue to DeWolf Avenue (1-mile in length). During late Spring 2005, City of Clovis officials were inquiring about a non-traditional approach to design methods for highway pavement structural sections (PSS). Through discussions with Lloyd Crask, G.E., a city consultant, proposed the use of a Mechanistic-Emperical (M-E) design approach by FHWA in lieu of the Emperical design approach by Caltrans. The M-E procedures incorporated resilient

modulus testing of the soils in lieu of R-Value testing procedures. The final PSS design eliminated 16,000 tons of Class 2 aggregate base material by using instead the environmentally safe EMC Squared stabilization method of treating the subgrade soils and recycled pavement from the original surfacing for this project. The new PSS design would require Quality Control/Quality Assurance (QC/QA) procedures during the construction operations. The QC/QA procedures employed testing by the average area method for sublots of daily construction operations. The reconstruction of Shepherd Avenue project from Temperance Avenue to DeWolf Avenue was completed in November, 2005.



Benefits to the City of Clovis and Lessons Learned

Utilized resilient modulus testing (dynamic method) v. R-Value testing (static method) to assess the strength qualities of the subgrade soils: Resilient Modulus testing identified the subgrade soils with poor engineering qualities, where R-Value testing identified the subgrade soils with strength qualities of an aggregate subbase material. Additional laboratory classification testing confirmed poorer quality characteristics of the subgrade soils;

- Design pavement layer utilized Caltrans Specification $\frac{3}{4}$ " Type 'B' max medium w 15% recycled aggregate pavement, Asphalt Cement – AR8000 in lieu of the traditional $\frac{1}{2}$ " Type 'B', Asphalt Cement – AR4000;
- Resulting in strength improvement of 13% in the pavement layer;
- By using on-site materials, removed the need for using 640 truck and trailer rigs from traveling to the project site: not using a diminishing resource of aggregate base, reducing traffic congestion, wear and tear on the city streets, improving air quality during construction phase;
- Employed QC/QA testing/inspection procedures v. Method specification: road sections met or exceeded design

Benefits of the EMC SQUARED® System

The net savings reduced overall construction costs for the one mile long expressway project by approximately \$250,000.00. Like many other areas throughout California and the nation, aggregate materials in the project area are mined from quarries and riverbed deposits that are rapidly being exhausted in the nearby area. Since the construction of this project, round trip hauls for aggregate have gone from 20 to 30 miles out to 125 to 175 miles per load, so the savings today would be closer to \$400,000.00. The cost advantages of EMC SQUARED System treatment become even more attractive. Then factor in the savings in the road wear by eliminating 640 truck trips averaging 150 miles per trip to build just one mile of new roadway.

City, county and state taxpayers have subsidized the construction of new roads by providing the paved road network being destroyed by lengthy aggregate hauls, a terrible waste of public resources. As the transportation costs, the air pollution and road wear associated with these long hauls mount up, the built-in demand for proven stabilization treatment becomes apparent. This project was constructed in the San Joaquin Valley, an air basin with extreme air pollution problems. The city reported that the replacement of imported aggregate base rock materials by in-place stabilization of asphalt millings and native soils reduced project related air pollution by fifteen percent.



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