

Interlocking concrete pavement as an alternative to asphalt concrete for Howard Road, Westley, California

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The implementation of interlocking concrete pavement in heavily loaded applications

has gained significant popularity in recent years. From 1993 to 2008, the Port of Oakland completed eight berths with over 6.5 million square feet of concrete pavers for container handling and storage areas. In 2014 Stanislaus County used 170,000 sf of interlocking concrete pavement to replace poorly-performing asphalt on Howard Road in Westley, California. This article provides background to this solution which has broad appeal and decades of applications around the world. This is evidenced by the fact that over three billion square feet are installed annually in Europe for pedestrian, municipal, industrial and port applications.

Background

An early version of interlocking concrete pavement dates back to the Roman Empire when The Appian Way was built from stone paving on an aggregate base in 312 B.C. Used as a main route for military supplies, it connected Rome to Brindisi, Apulia, in southeast Italy. The road is 350 miles long, about 20 feet wide, and has held up for more than 2,000 years. The entire ancient Roman road system servicing their empire was longer than the interstate highway system in the U.S.

Pavement characteristics

The interlocking concrete pavement system offers the advantages of the

high compressive strength of concrete and the flexibility of asphalt pavement. The pavers are attractive and provide a traffic calming effect. Research in the United States and overseas has shown that the combined paver and sand layers stiffen or interlock as they are exposed to greater numbers of traffic loads. The resulting resilient modulus is equivalent to the same thickness of asphalt. In other words, the 3.125 inch (80mm) thick pavers and one-inch thick bedding sand have an AASHTO layer coefficient equivalent to the same thickness of asphalt.

Ripon experience

As City Engineer with the City of Ripon, Matt Machado developed

interlocking concrete pavement as a roadway standard, adopted by City Council for all new roads and for some pavement rehabilitations. With the standard in place the City constructed more than 1.3 million square feet between 2005 and 2008. This total included the high-profile Main Street in historic downtown Ripon with 50,000 sf of interlocking concrete pavement.

Based on a life-cycle cost analysis for Ripon, Calif. streets, concrete pavers are approximately 75% of the cost of asphalt concrete over a 100-year period. Maintenance costs for concrete pavers for the same period are approximately 20% the cost of asphalt



The Appian Way is crowned in the middle for stormwater flow.

concrete. Heavier loaded interlocking concrete pavement streets can have a lower life-cycle cost and shorter return on investment as maintenance is generally higher for roads paved with asphalt concrete.

Howard Road in Westley, California

Located in Westley, Calif. at exit 441 on I-5, Howard Road handles a tremendous amount of heavy truck traffic. The Stanislaus Public Works Department was faced with the challenge of designing a long-term, economical pavement solution for the frontage road. Given that the asphalt pavement had failed, the County looked at interlocking concrete pavers as the innovative solution.

In-house design

Given design parameters of an R-value of <5 for the subgrade soils and a Traffic Index of 11, the Public Works staff designed the pavement section that called for the 80 millimeter thick concrete pavers in a herringbone laying pattern. The pavement section required 14 inches of compacted Caltrans Class 2 aggregate and a layer of biaxial geogrid installed over the compacted subgrade for additional structural support.

Construction

Stanislaus County received six bids ranging from \$4.50 to \$6.00/sf to install the concrete pavers manufactured by Basalite Concrete Products, LLC. Earth Shelter Developers was awarded the concrete paver installation. With businesses such as Denny's, Chevron and Joe's Travel Plaza open 24 hours per day, an extensive traffic control plan was implemented allowing the contractor to maintain open drive aisles to accommodate the truck traffic during construction. The project went smoothly and was completed in fall 2014.



The concrete pavers were machine-set by Earth Shelter Developers.

Follow-up pavement inspection

A follow-up visit conducted by Basalite and Stanislaus County in August 2015 showed that the concrete pavers are performing well, even with the extreme conditions in Westley. In the heat of the summer, it is not unusual for temperatures to reach 110° F. which can weaken asphalt concrete pavement. Truck traffic on

the reconditioned road was non-stop during the site visit.

After finding success in Ripon in lighter load applications, interlocking concrete pavement presents a durable pavement rehabilitation project for Stanislaus County. The innovative pavement is cost effective, attractive and can hold up to even the toughest loading conditions.

Note: Structural design guidance is available in the following national standard: ASCE/ANSI 58-10 *Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways* as well as *Tech Spec 4 Structural Design of Interlocking Concrete Pavements* from the Interlocking Concrete Pavement Institute as well as other technical bulletins on construction and maintenance.

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Typical traffic on Howard Road 24/7