



Converse Consultants

Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

April 5, 2017

Ms. Linda Sandusky
Project Director/Associate
David Evans and Associates, Inc.
17782 17th Street, Suite 200
Tustin, CA 92780

Subject: **PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS USING CEMENT STABILIZED SUBGRADE**

Parking Lots 4, 7 and 8 Reconstruction at Fullerton College Campus

321 East Chapman Avenue

City of Fullerton, Orange County, California

Converse Project No. 15-81-177-01

Dear Ms. Sandusky:

We understand that David Evans is considering cement stabilized subgrade (CSS) as a rehabilitation method for Parking Lots 4, 7, and 8 within the Fullerton College Campus. The following recommendations are provided for CSS. These recommendations may need to be modified based on actual field conditions during construction.

CEMENT STABILIZED SUBGRADE (CSS) PAVEMENT STRUCTURAL SECTIONS

CSS consists of removing the existing AC layer and stabilizing the underlying aggregate base (if present) and subgrade materials by adding cement, compacting it to create a CSS layer, and overlaying it with a new HMA layer.

The recommended CSS pavement section was calculated in accordance with the Caltrans Highway Design Manual Chapter 630 and 660. The CSS layer and new asphalt layer should combine to meet the total gravel equivalence required. The gravel equivalence required is determined by the R-value of the subgrade material and the traffic index of the roadway (Caltrans Highway Design Manual, Chapter 630). The gravel equivalence of the CSS layer is determined from the unconfined compression strength (UCS) of the CSS layer. The Caltrans Highway Design Manual, Chapter 660 states that the UCS of a CSS layer should range from 300 to 800 psi. The Caltrans Full Depth Reclamation Using Cement Manual states that designers should use a UCS value on the lower end of the range due to concerns that cracking may reflect through the CSS layer to the HMA layer. We have used an UCS of 300 and 400 psi for the design of the CSS layer. The Highway Design Manual also states that the CSS layer should be a minimum of 8 inches thick. The gravel equivalence of the HMA layer is determined in accordance with the Caltrans Highway Design Manual, Chapter 633. The following table provides the pavements section utilizing a CSS layer that meets the required gravel equivalence in accordance with the Caltrans Highway Design Manual,

Chapter 633.

Table No. 1, Recommended FDR-C Pavement Section

Parking Lot No.	R-value	Design TI	Asphalt Concrete over CSS Section Thickness			
			AC (inches)	CSS (inches)	AC (inches)	CSS (inches)
			UCS of 300 psi		UCS of 400 psi	
4	10	4	3.0	8.0	3.0	8.0
		5	3.0	8.5	3.0	8.0
		6	3.5	10.5	3.5	10.0
		7	4.0	13.0	4.0	12.0
		8	4.5	15.5	4.5	15.0
7	13	4	3.0	8.0	3.0	8.0
		5	3.0	8.0	3.0	8.0
		6	3.5	10.0	3.5	9.5
		7	4.0	12.5	4.0	11.5
		8	4.5	15.0	4.5	14.0
8	13	4	3.0	8.0	3.0	8.0
		5	3.0	8.0	3.0	8.0
		6	3.5	10.0	3.5	9.5
		7	4.0	12.5	4.0	11.5
		8	4.5	15.0	4.5	14.0

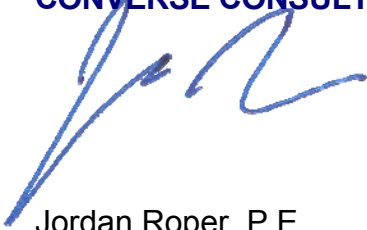
AC-Asphalt Concrete
 CSS – Cement Stabilized Subgrade
 UCS – Unconfined Compression Strength

The contractor should determine the percentage of cement required to obtain the CSS layer’s design UCS. The contractor’s mix design should be verified by the project geotechnical consultant before and during construction.

The cement stabilized subgrade should be constructed (spreading, mixing, compacting, and finishing) in accordance with Section 301-3.2 “Soil Cement” of the 2015 Standard Specifications for Public Works Construction. The CSS layer should be compacted to 95 percent of the laboratory maximum dry density as determined by the ASTM D1557 test method. Microcracking should be performed on the CSS in accordance with Section 301-3.4.13 “Micro-Cracking” of the 2015 Standard Specifications for Public Works Construction.

We appreciate this opportunity to be of continued service to David Evans and Associates, Inc. If you have any questions, or if we may be of further assistance, please do not hesitate to contact us.

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Jordan Roper, P.E.
Project Engineer

Dist.: 1/Addressee

