

Memorandum

To: JOSEPH PRATT - MS #5
Office of Structure Foundations
Division of Structures and Foundations

Date: June 27, 2000

File: 11-SD-5-KP 51.18
EA: 11-0301U1

Sorrento Viaduct (widen) 11-0301U1
Bridge No. 57-0513R/L

From: DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
Division of Materials Engineering and Testing Services – MS #5
Office of Testing and Technology Services

Subject: **Corrosion Review for Sorrento Viaduct (Widen)**

We have completed our corrosion review of the Sorrento Viaduct (widen) project outlined in a May 8, 2000 memorandum sent to Doug Parks of the Corrosion Technology Branch. Our review is based on corrosion test results of soil samples, summarized information from the Log of test borings, and Caltrans Bridge Design Specifications 8.22 (May 2000 draft).

Project Description

The proposed Sorrento Viaduct (Br. No. 57-0513R/L) Right and Left widenings (both outside widenings and inside sliver widening) are part of the Route 5/805 Freeway improvements in San Diego County. The bridge abutment widening will be supported by plumb, 1.2m (4 ft) diameter, Cast-in-Drilled-Hole (CIDH) Piles. The bent supports will be supported by plumb, 2.4m (8 ft) diameter, Cast-in-Drilled-Hole (CIDH) Piles. It is the understanding of the Corrosion Technology Branch that permanent steel casings 13mm to 25mm thick (1/2 in to 1in) will be used to avoid problems associated with caving of the holes and filling with groundwater due to aquifer conditions. The steel casings will serve as a barrier against corrosive conditions, however, the steel casings will not serve as part of the structural section of the pile.

Corrosion Review

Caltrans defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, has a minimum resistivity of less than 1000 ohm-cm, or a pH of 5.5 or less.

Four soil samples were taken at the Sorrento Viaduct site and tested for pH, minimum resistivity, sulfate concentration, and chloride concentration per CTM 417, CTM 422, and CTM 643. The results of the soil testing are listed below.

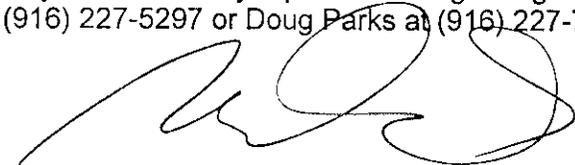
The pH level ranged from 7.67 to 8.41, and the minimum resistivity values ranged from 370 to 678 ohm-cm. The sulfate concentration ranged from 400 ppm to 4000 ppm, and the chloride concentration ranged from 210 ppm to 380 ppm. The soil on-site is corrosive based on high levels of sulfates and/or low minimum resistivity levels.

Corrosion Recommendations

In order to maintain a 75-year design life for the structure, we recommend the following corrosion mitigation measures:

- The minimum requirements for protection of reinforced and unreinforced concrete against acid and sulfate exposure shall be in accordance with Table 8.22.2 of the BDS (May 2000 draft). For CIDH piles (not inside a steel shell), footings, pile caps, and walls, the concrete should contain a minimum cementitious material content of 400 kg per cubic meter. Cementitious material shall consist of 75% by mass Type II modified, or Type V portland cement and 25% by mass mineral admixture conforming to ASTM C618 Type F or N (flyash or natural pozzolans). Also, the water-to-cementitious material ratio shall be a maximum of 0.40.
- For CIDH piles inside a steel shell, no additional concrete corrosion mitigation measures are required. The minimum thickness of the steel shells (13mm) is thick enough to prevent chlorides and sulfates from penetrating the inside of the pile during the 75-year design life for the structure.

If you have any questions regarding our comments, please contact Michael Tolin at (916) 227-5297 or Doug Parks at (916) 227-7007.



MICHAEL TOLIN
Transportation Engineer (Civil)
Corrosion Technology Branch

Reviewed By:



DOUGLAS M. PARKS, Chief
Corrosion Technology Branch

c: Rob Reis, Corrosion Technology Branch
Arron Rambach, Corrosion Technology Branch