CPR – REBUILT TO LAST

Caltrans Research on State Route 58 Proves that Diamond Grinding is a Quiet Solution

>>> DIAMOND GRINDING

STATE ROUTE 58 (SR 58) is an east-west highway in California that travels across the southern San Joaquin Valley, the Tehachapi Mountains and the Mojave Desert. The City of Mojave is located 50 miles east of Bakersfield and has a population of more than 4,000. In 2003, Caltrans constructed a new section of concrete pavement on SR 58 to bypass the City of Mojave in Kern County. The location was chosen to evaluate both concrete pavement surface textures and one bridge deck texture technique. The newly constructed four-lane concrete pavement was selected as a test bed for concrete pavement research in California.

At the time of construction, three concrete pavement surface textures were created consisting of a Caltrans standard longitudinal tined section, a burlap drag texture and a longitudinal broomed texture. For the bridge deck research, a skewed (30 degrees) transverse broomed texture was constructed to compare against the Caltrans standard transverse tined bridge deck texture. Upon completion, it was decided to create eight additional test sections consisting of diamond ground and grooved textures. The diamond grinding and grooving sections were constructed within the three original texture test areas providing a total of eleven concrete pavement test sections at the Mojave site.

To evaluate the research from the test sites, Caltran's Bruce Rymer, PE, Senior Engineer with the Division of Environmental Analysis, contracted with Illingworth and Rodkin, Inc. to conduct tire-pavement noise research in March 2003. Prior to opening the roadway to actual traffic, Paul Donavan of Illingworth and Rodkin, Inc. used several techniques to evalute the sections. On Board Sound Intensity (OBSI) was used to evaluate the tire noise produced by each surface type. Additionally, wayside measurements were obtained by driving a reference vehicle past microphones positioned alongside the roadway. Caltrans also contracted with the Volpe Center Acoustics Facility to conduct additional passby testing with multiple vehicles on the originally constructed three concrete surface textures.

To date, five reports by Caltrans and Illingworth & Rodkin, Inc. have been prepared on the Mojave test site. The OBSI results found that the conventional diamond ground surface with 0.105-inch spacers resulted in noise levels lower than any of the 11 test sections. For the longitudinal grooved surfaces, the greater the cross sectional area of the groove, the greater the increase in noise. The longitudinal tined sections, representing the Caltrans standard practice, resulted in the noisiest texture. The short segment of bridge deck evaluated in the study (skewed transverse broom texture) was determined to be approximately 4 to 6 dBA quieter than transverse tined textures that were tested.

The test results have been extremely useful to the industry as they have been utilized to supplement additional research efforts in regards to joint slap effects and acoustic longevity of concrete pavement textures.

"Experiments conducted at the site have provided a fundamental understanding of surface texture acoustics and joint impulse noise. The acoustic data collected there has had immediate application for quieter pavement strategies and it has provided valuable information for specifying quieter, longer lasting pavements," said Rymer. The team continues to test and monitor the site and the project also initiated a new bridge deck texturing specification.

Periodic testing, conducted by Illingworth and Rodkin, Inc. indicates the acoustic longevity of the 0.105-inch spacers diamond ground surface has changed less than 1 dBA in the five years since construction.

TEAM MEMBERS

- Caltrans (Owner)
- Illingworth and Rodkin, Inc. (Tire pavement noise research)
- Volpe Center Acoustics Facility (Drive-by testing)
- Penhall Company (Diamond grinding contractor)