



# ENHANCED DELINEATION AND HIGH-FRICTION SURFACE TREATMENT FOR HORIZONTAL CURVES

## WHAT IS THE COUNTERMEASURE?

Pavement friction is critical for changing vehicle direction and ensuring the vehicle remains in its lane. High-friction surface treatments (HFST) should be considered for curves with numerous wet weather crashes or severe curves with higher operating speeds.

Horizontal curves are a change in roadway alignment that creates a more demanding environment for the driver, vehicle, and pavement. The challenges associated with safe navigation of horizontal curves compound with the addition of a nighttime driving environment or inclement weather. Recent data analysis shows that 28 percent of all fatal crashes occur on horizontal curves. Furthermore, about three times as many crashes occur on curves as on tangential sections of roadways. These statistics make horizontal curves prime sites for safety improvements.

There are a variety of high-friction surface treatments available. While they typically have a higher unit cost than traditional friction courses, they can often be applied at the specific curve location for a relatively low cost. Additionally, where cross-section problems such as lack of appropriate superelevation exist, this can be a low-cost alternative to address a problem in the short-term until further improvements can be made.

Safety benefits for HFST are not yet readily available, but preliminary studies have shown very positive results with reduction in crashes of between 24-86 percent.

### HFST Texture



## WHAT HAVE WE DONE SO FAR?

The FHWA California Division, in conjunction with Caltrans Headquarters, has provided presentations and technical assistance to over 350 State and local stakeholders to date. This includes two open house/demos, one in San Bernardino County and one in the City of Sacramento. There are approximately 45 locations that HFST has been applied and another 90 in development on the state highway system.

State Route 94 Demo in San Diego County  
(January 2014)



## WHERE DO WE WANT TO GO? – SUCCESSFUL PRACTICES, LESSONS LEARNED, POINTERS FOR IMPLEMENTATION

In 2015, we hope to have a specification in existence for 1 year with every Caltrans district having multiple locations. In addition, we hope to have 250+ HFST locations (state and local) completed by end of 2015.

Caltrans districts are trying to lump HFST locations into one project to provide for a quicker, more streamlined process that will reduce the preliminary engineering timeline for projects as well as reducing the total cost per sq. yd. of HFST due to the larger quantity. Likewise, more locals are considering HFST for the rural areas. Currently, Placer County has a HFST project in construction that includes 18 locations.

Most complications of HFST occur with the application process. Typically smaller applications (< 200 sq. yd.) are done by hand. If the epoxy is not mixed correctly, spread evenly or the aggregate is not distributed/embedded correctly, the HFST surface may not hold. In addition, the surface that HFST is applied to needs to be clean, dry, and free of major cracking and potholes.