

Improving Pavement Friction for Safety at a Florida Signalized Intersection

Project Case Study

HFST Increases Friction to Reduce Intersection Crashes

The Tampa region of Florida Department of Transportation (FDOT) has a long history of using Road Safety Audits (RSAs) to assess potential safety enhancements at intersections. As part of a recent RSA, FDOT included continuous pavement friction measurement (CPFM) data. With friction and crash data in hand, the RSA team was able to more closely examine pavement-related factors that could explain higher-than-average crashes at this intersection. In particular, the resolution of the CPFM¹ data allowed the RSA team to posit that lower pavement friction when compared to the surrounding pavement was likely a significant factor under both wet and dry conditions at the critical approaches to the intersection stop line and crosswalk. In response, FDOT initiated a project to apply High Friction Surface Treatment (HFST) to the intersection approaches and within the intersection itself.



HFST on Hillsborough Ave. at Central Ave.
(Source: Florida DOT)



Application of HFST to Hillsborough Ave. using fully-automated installation. (Source: Florida DOT)

and Central Ave. in Tampa, Florida. From 2015-2020 there were approximately 13.5 crashes per year at this intersection, with the vast majority (86 percent) being dry pavement crashes and the predominant crash type (68 percent) being rear-end crashes. Just over 2,700 square yards of HFST were applied to the left-turn lane and two thru lanes during two consecutive nighttime installation operations, minimizing disruption to the traveling public. Friction testing after completion of the installation revealed that HFST more than doubled pavement friction at the intersection approach.

HFST is a proven safety countermeasure used specifically to reduce or prevent friction-related crashes. HFST significantly enhances pavement friction to reduce both wet and dry pavement skidding crashes at locations with high friction demand. While the benefits of HFST for horizontal curve and ramp applications are well-documented², intersection applications have seen comparatively limited use to date in the United States. However, since HFST shortens stopping distance, it can reduce or prevent rear-end crashes at intersection approaches³ and potentially angle crashes within an intersection. FDOT is one State highway agency taking steps towards validating the use of HFST for intersection applications, and in July of 2020 installed HFST at the intersection of SR 580 (Hillsborough Ave.)

HFST more than doubled pavement friction at Central Ave.

Before HFST: FN40R = 37
After HFST: FN40R = 79

¹ Federal Highway Administration. "Continuous Pavement Friction Measurement". 2021.

https://safety.fhwa.dot.gov/roadway_dept/pavement_friction/cpfm/

² Merritt, D. K., Lyon, C. A., Persaud, B. N., and Torres, H. N. Developing Crash-Modification Factors for High-Friction Surface Treatments, Federal Highway Administration FHWA Research Report FHWA-HRT-20-061. McLean, VA. 2020.

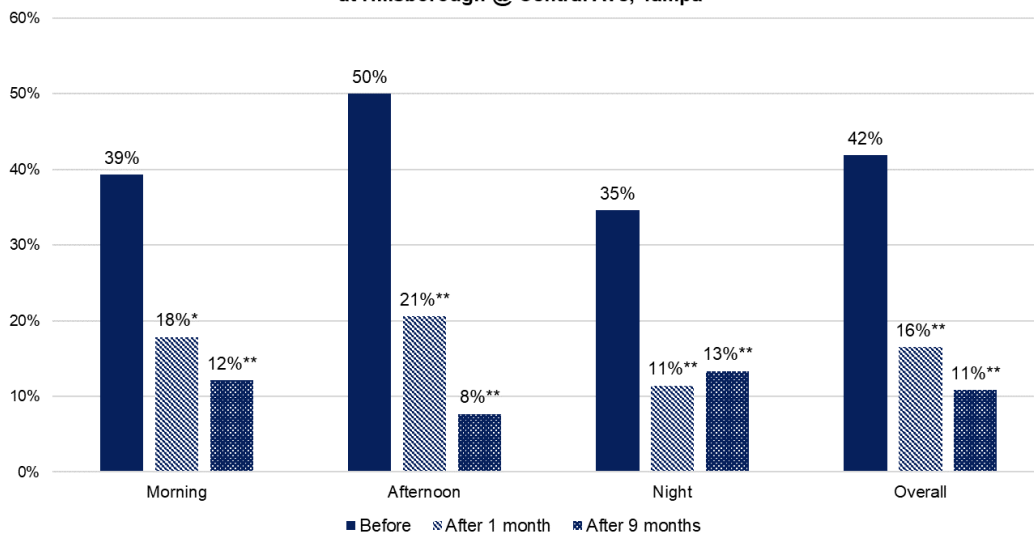
³ FHWA. High Friction Surface Treatment at Intersections. Federal Highway Administration FHWA-SA-20-012. Washington, D.C. 2020.

Increased Friction Improves Stopping Behavior at Intersections

While the original intent was to reduce friction-related crashes at this intersection, HFST has demonstrated potential safety benefits to pedestrians by reducing crosswalk incursions through improvement in stopping behavior. The Center for Urban Transportation Research (CUTR) at the University of South Florida analyzed stopping behavior through a review of video captured at the intersection. Specifically, the researchers documented crosswalk incursions while the traffic light was red at three different periods of the day (morning and afternoon rush hour and late night). Stopping behavior was analyzed prior to HFST application, then at one month and nine months after application. This analysis revealed a 26-percent overall reduction in improper stopping behavior one month after HFST application and 31 percent reduction nine months after application. While crash reduction benefits have not yet been quantified for this intersection, a reduction in crosswalk incursions demonstrates another important safety benefit of HFST for intersection applications. A holistic approach to CPFM —which for this case study included starting with continuous pavement friction measurement, incorporating friction data into safety assessments, and implementing friction improvements—can benefit all users.

Crosswalk incursions decreased 31 percent after HFST application.

Comparison of Improper Stopping Behavior Rate at Hillsborough @ Central Ave, Tampa



** significant at a 95% confidence level
* significant at a 90% confidence level

Results from analysis of stopping behavior at Central Ave. intersection before and after HFST application. (Source: CUTR)

Additional Resources

- FHWA Every Day Counts, Frequently Asked Questions – High Friction Surface Treatments 2021. https://www.fhwa.dot.gov/innovation/everydaycounts/edc-2/pdfs/hfst_fags.pdf
- FHWA Every Day Counts, A Road Surface Treatment for Critical Safety Spot Locations that Helps Vehicles Stay in Their Lane. https://www.fhwa.dot.gov/innovation/everydaycounts/edc-2/pdfs/hfst_brochure.pdf
- High Friction Surface Treatments (HFST) website: https://safety.fhwa.dot.gov/roadway_dept/pavement_friction/high_friction/