

Continued Study on Polyester Polymer Inlays on I-80

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Interstate 80 (I-80) in California faces severe concrete pavement wear due to heavy truck traffic and winter tire chain use, especially through the Sierra Nevada mountain range. This damage, called “wear depth,” differs from typical asphalt rutting, and has been difficult to control with previous repair methods.

In 2023, Caltrans initiated a pilot project near Donner Summit to evaluate polyester polymer concrete (PPC) inlays as a more durable pavement solution for high-wear conditions. These resin-based materials offer high strength, rapid curing, and strong resistance to cracking and extreme weather, making them well-suited for extending concrete pavement life without full reconstruction.

The project consists of multiple test sections, including control sections built with standard materials and experimental sections incorporating alternative formulations. The experimental approaches included the use of bauxite aggregate (selected for its superior hardness and finer aggregate size) blended with standard polyester resin, as well as an epoxy-based material known as Fastrac HPC. Data collection measured pavement wear depth using Face Dipstick Profiler (Figure 1). All sections are being monitored over a three-year period to identify the most effective mix and construction approach to reduce chain-related wear, improve durability, and guide future maintenance strategies for concrete pavement in harsh winter conditions.



Figure 1. Transverse Profile Measurements using a Dipstick



Figure 2. Wear Depth of Control Section

The control sections were constructed using standard polyester concrete (PPC) inlay materials in accordance with Caltrans 41-1.02C Standard Specifications. Over time, these sections showed progressive surface wear, with conditions significantly worsening by 2025. In several areas, the wear became severe enough to expose the underlying concrete pavement (Figure 2). Measured wear depths increased from less than 0.5 inches in 2024 to approximately 0.7–0.8 inches in 2025, indicating substantial material loss. Given that the original PPC inlay thickness was 0.75 inches, these measurements confirm that the polyester concrete layer has been completely worn away in some locations, leaving the older concrete pavement vulnerable to further deterioration.

The bauxite experimental material was produced by combining an extremely hard bauxite aggregate with a conventional polyester polymer concrete (PPC) resin binder. This approach was based on the premise that the superior hardness of bauxite would improve resistance to chain-induced abrasion, while its smaller aggregate size would enhance bonding to the existing concrete surface, even in non-inlay sections where surface pre-grinding was omitted. Results from the second year of monitoring indicate that the material delivered moderate performance improvements compared to the control. However, it did not fully prevent deterioration. Certain sections exhibited advanced wear, including localized areas where the underlying concrete pavement became exposed (Figure 3). These findings suggest that while increased aggregate hardness contributes to improved durability, it may not be sufficient on its own to fully withstand the severe wear conditions present along this corridor.



Figure 3. Experimental Bauxite Material with Underlying Concrete Visible

The epoxy-based material evaluated in this study was Fastrac Hybrid Polymer Concrete (HPC). This system initially demonstrated strong performance overall, with only minimal signs of wear observed in 2024. However, by 2025, more noticeable surface wear had developed. The measured increase in wear depth from the 2024 to 2025 winter season was approximately 0.20 inches, indicating that abrasion is still occurring under sustained chain traffic. Despite this progression, the material continued to perform well, as no area showed exposure of the underlying concrete pavement. This suggests that while the epoxy system is not immune to wear, it provides significantly improved durability and material retention under harsh conditions.

At the time of this report, third-year performance data has not been collected yet, and as such, no final conclusions will be drawn until the full dataset is available and thoroughly analyzed. The completed evaluation will focus on several key factors, including the rate of wear progression over time, the predominant failure modes observed in each test section, edge performance—particularly in non-inlay areas constructed without surface pre-grinding—and the balance between constructability and long-term performance. Additional considerations may include inlay material consistency, maintenance implications, and overall cost-effectiveness.

A comprehensive assessment of these criteria will be necessary to identify the most suitable material and construction approach for mitigating chain-related wear on concrete pavement in high-demand mountain corridor environments.

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