

FDR with Cement of a County Road

A client perspective.

By Miguel Villarreal, P.E.

Barton Creek Boulevard/Travis Cook Road is a two-lane county road located in southwest Travis County, TX. A portion of this road, about 3,400 ft, was scheduled for a Travis County road improvement project to include widening from two to three lanes, shoulder widening of the remaining two lane section, ditch reshaping, curve flattening of the road alignment for improved safety site distance, and relocation of a City of Austin waterline.

Although the posted speed limit for this road is 30 mph, it has been observed that most vehicles travel on this road at speeds substantially above the posted speed limit. Peak traffic volumes occur in the morning and afternoon. During non-peak hours traffic is light, but vehicles do consistently travel above the speed limit. Although this road does not have pedestrian traffic, it was observed that seasoned bicyclists frequently travel on this road. Given

these observations, the county was concerned about how to safely maintain traffic during construction without causing significant traffic delays. (Note: during the construction phase a vehicle was ticketed by the police for doing 80 mph on Barton Creek Boulevard in the construction zone.)

Based on input from local community leaders, it was requested that paving operations begin after the end of school in May and be completed before the start of school in late August. Two schools are located close to the project limits and Barton Creek Boulevard is a main road leading to both. Restoration work, drainage work, and other non-paving activities could be completed after August. A longer work day was permitted to meet the summer paving operations deadline.

It was agreed that day time only closures of one lane would be performed during construction with both lanes open to traffic in the evening at the end

of each construction day. Road closure during construction with a traffic detour was prohibited.

Given the community's desire to have the road paved before August, full depth reclamation (FDR) with cement was mentioned as a possible alternative pavement method for this

project. The project pavement section included a top course of two in. of hot mix asphalt and 13 in. of flexible (aggregate) base. This section would be placed on the existing subgrade. Existing subgrade was rock and/or rocky soil. The proposed alternate paving section included FDR with cement as the base course with a two-in. layer of hot mix asphalt as the riding surface.

The assumed advantages of FDR with cement:

- Lower cost or the same cost as the "traditional" pavement section of flexible base and hot mix pavement section.
- FDR can be completed within the desired, shorter paving period.
- Hauling off of spoils and delivery of new construction materials is reduced, enhancing construction zone traffic safety.
- Existing pavement materials are recycled and reduce the need for new pavement materials, making the project more "green."

Given these advantages, community project support, and the county's desire to have viable alternative to tradition paving methods, the project was revised to include FDR along with its cost savings of over \$15,000 in the project.

Process and Observations

The objective was to perform and complete the entire FDR operation for a given lane of the road in the morning and then open the newly created FDR lane to traffic in the afternoon. When FDR was performed, a reclaimer pulverized old asphalt and/or base materials depending on the reclamation depth.



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The pavement, asphalt, flexible base, and in some areas chip seal material, was pulverized, shaped, mixed with cement, and compacted by rolling. Flexible base was brought to the project site for the areas of widening needed for the additional lane. In areas of lane widening, new flexible base along with the pulverized material was processed and mixed with cement. The entire pavement section, including the existing lane widths and the widened areas, received cement to ensure uniformity of the new pavement section. Water was added to the pulverized materials to reach the optimal moisture content needed for compaction, and cement at six percent was added for stabilization. A reclaimer was used again to mix all the materials. After shaping and grading, the new FDR base was compacted using a vibratory steel drum roller and a pneumatic tire roller for compaction of the FDR to produce a strong, durable base for the asphalt. The rolling operation was referred to as “micro cracking” in the field.

It's a given that if FDR is performed, the contractor has experience performing this pavement technique, the proper equipment is being utilized and available, the contractor is familiar with the FDR specifications, appropriate testing is performed, and the subgrade is suitable for FDR. A concern was initially raised about the teeth spacing on the drum of the reclamation machine.

Prior to paving with hot mix asphalt, the FDR surface was exposed to traffic for almost a week. Based on visual observations, vehicles had sufficient skid resistance when driving the posted speed limit or below the posted speed limit on the newly created FDR base. No damage to the FDR base was observed due to direct contact with traffic for a week. Bicyclists were able to safely ride their bicycles on the FDR surface without a drastic reduction in speed.

Dust was observed during the reclamation process; however, dust quickly dissipated and was not observed to cause long term delays in traffic control. The dust dissipation was aided by a slight wind. There were no rain events during the reclamation process; initially a concern was raised about sediment in the storm runoff if reclamation was inter-

rupted by a storm. Barton Creek/ Travis Cook Road has open ditches instead of an enclosed drainage system. Sediment observed in the drainage system did not appear to originate from the FDR process.


The FDR project specification required the processed materials to have a particle distribution of 100 percent passing the three-in. sieve, 80 percent passing the two-in. sieve, and at least 40 percent passing the No. 4 sieve. Sieve tests performed indicated the processed material met the specified sieve requirements.

The FDR base received a top course of two in. of hot mix asphalt. The hot mix asphalt was also tested to ensure the entire pavement section, not just the FDR, was built according to specifications. Prior to the hot mix asphalt paving operation, emulsion was applied to the FDR surface, but the rate of application appeared to be less than the rate used with traditional paving operations.

This method recycles and reuses the existing pavement section materials onsite, therefore there is no need to haul off spoils material. Construction truck traffic is then reduced. The FDR process can be done under traffic with one lane traffic operations with flag operators,

making this process more convenient for local residents and other frequent users such as school buses and emergency vehicles. Detours are not needed.

FDR with cement could save money and may preserve resources by using existing materials and reducing the need for new road materials. The existing pavement materials are “re-used” and strengthened to become the new base layer. The re-use of existing pavement materials, a shorter paving schedule, the ability to maintain two-way traffic without detours, and the community perception that re-use of existing materials is a more green approach than conventional paving methods, was key for obtaining stakeholder approval. If FDR is performed correctly, it is anticipated that the road will have a stronger, more stable pavement section with only a modest maintenance schedule needed to last for many years.

It is expected that the FDR will continue to adequately support the Barton Creek Boulevard and Travis Cook Road hot mix asphalt driving surface for many years to come. 

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