

# Using FDR with Cement

## County building all-weather roads

**F**ull-Depth Reclamation (FDR) of failed asphalt pavements using cement provides many advantages over other methods of road rehabilitation, and Spokane County in Northeastern Washington State has been using the advantages to full benefit. The county first used FDR with cement in the late 1990s and is currently maintaining a steady program of five to six miles of FDR construction per year. According to County Engineer Ross Kelley, the county's reclamation program allows it to gradually improve the quality of its road network at a reasonable cost.

Located in the foothills of the Rocky Mountains, and only 100 miles from the Canadian border, Spokane County experiences the type of weather that can cause serious pavement damage. In the spring, the warmer weather brings melting conditions that can cause serious road deterioration. This causes



*First, Spokane County pulverizes the road ...*

truck restrictions on rural roads that are not built to handle heavy loads during the spring conditions. The road restrictions cause interruptions for commerce and industry that can affect the local economy.

The FDR process results in a reconstructed cement-treated base, which greatly increases the strength of the pavement structure, and does not weaken during seasonal changes. For example, in areas with frost conditions, the cement-treated base will not experience moisture movement. For frost in the subgrade, the stabilized base tends to raise and lower as a platform, reducing the effects of frost heaves. Spokane County has not noticed any frost problems with roads that have been reconstructed with the FDR process. In fact, the county is programming the FDR work to build routes of cement stabilized all-weather roads that will not have to undergo spring load restrictions.

### Effective Pavement Design

The county developed an effective pavement design that incorporates 8 to 10 in. of cement-treated base. The typical design for the base is 400 psi compressive strength in seven days, usually requiring about four percent cement. In situations where the soil conditions are



*... which is then shaped and readied for ...*



... the placement of cement ...

poor, the county prefers to keep the strength of the base unchanged, and increase the thickness from 8 to 10 in.

To complete the pavement structure, a 1- to 3-in. layer of crushed stone is used on top of the base for leveling and as a mat for the surface, which consists of a “triple-shot” bituminous surface treatment. This surface treatment is constructed by placing three light bituminous surface treatments. The leveling course also acts as an effective “stress relief” layer, to prevent reflective cracks in the pavement surface. The county is currently evaluating the thickness of the leveling course, and recently built some sections with 1-, 2-, and 3-in. thicknesses and will monitor their performance. They are also considering the use of a paved asphalt concrete surface (instead of the triple surface treatment) for roads that carry high levels of traffic.

## Preserving the Road Template

Conventional design methods, such as using an additional 8 to 10 in. of stone base, require changing the road cross-section, because the additional road elevation must be accompanied by building up the shoulder slope. This can be expensive because of the additional material and construction required to change the cross-section. Using FDR provides the capability of “building the pavement down;” strengthening the existing pavement using the materials already there, and eliminating the need for changing the road elevation.

## Partnering the Construction Process

On all of their FDR projects, Spokane County has been involved as a

partner in the construction process, thereby reducing costs and having more control over the final product. The county will typically contract out the pulverization of the existing pavement, placement of cement, and mixing of the base

materials, and will complete the grading, compaction, and surfacing with county forces.

The all-inclusive cost (including contingencies and engineering) of a typical

FDR project in Spokane County is around \$140,000 per mile, including the surfacing. The portion of the project spent on just the FDR process (pulverization and cement stabilization to build the cement treated base) is about one-fourth to one-third of the total, typically in the range of \$3 to \$4 per sq yd. “We’re real happy with the results of the process,” says Howard Hamby, pavement manager for Spokane County’s Public Works Department. The county does a thorough evaluation of the costs of pavement design alternatives and believes that the substantial increase in pavement strength from FDR with cement will lead to much better long-term pavement performance. **GE**

*Courtesy of the Portland Cement Association (www.cement.org).*



... that is mixed and subsequently ...



... finished with a layer of crushed stone and bituminous surface treatment.