

# **Stabilization of Road Bases Containing Coal Combustion By-Product Sulfates and Sulfites using High Volume Fly Ash Cement**

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## **INTRODUCTION**

Of all coal combustion by-products produced by electric utilities, FGD material is the least utilized. Unoxidized FGD calcium sulfite material in particular has fewer potential end uses than oxidized FGD gypsum. One promising high-volume use is in road base material in federal, state and local roads and highways. Research has shown that appropriate strength, durability and constructability is achievable with FGD blends.<sup>1</sup> Agencies would benefit through availability of alternative, economical material sources, avoidance of virgin resource depletion, and utilization of recycled materials. The public would benefit due to the cost savings achieved by avoided disposal (lower electric bills) and through lower-cost road construction (fewer tax dollars).

The ability of high volume fly ash (HVFA) cements, especially those containing Class F ashes, to retard sulfate attack has been well established. The exploitation of this benefit to the stabilization of road bases and subgrades containing flue gas desulfurization (FGD) sulfates and sulfites and expansive clays has been the goal of a research program at Texas A&M University.<sup>1</sup> Typical Type I cements have been shown to be incompatible in road bases containing up to 93 percent by weight of FGD by-product calcium sulfate dihydrate. Even sulfate-resistant Type II cements did not significantly retard large scale expansion in these mixtures. The results of volumetric expansion tests (ASTM C845-90) on cements containing a wide range of tri-calcium aluminate revealed that  $C_3A$  contents below 5 percent were required to keep expansion within a reasonable level. For this reason a special Class C, oil sell cement ( $C_3A = 2.5$  percent) produced by Texas Industries, Inc (TXI) in Midlothian, Texas has been used in previous projects to stabilize road base mixtures containing FGD by-products. Since 1991, a series of five such experimental field trials were constructed in which TXI's Class C cement was utilized as the stabilizer.<sup>1</sup> None of these test sections experienced any sulfate-related expansion.

In this paper a series of laboratory tests and an experimental field trial will be discussed in which HVFA cements, incorporating 58 percent Class F fly ash and a Type I cement, were used to stabilize road base mixtures containing FGD by-products.