Technical Bulletin 13

Fly Ash for Pavement Concrete

THE ROMANS used naturally occurring volcanic ash from Mount Vesuvius to cement the paving stones in their roadways. Many miles of this ancient roadway – although rough by our standards – still exist as useable highway.

Today in Europe, paving stones have been replaced by modern day pavement – but a product almost identical to volcanic ash is still used. In fact, most European highways have been constructed with fly ash in all levels, including the wearing course.

On this side of the Atlantic, it has been only in relatively recent years that we have begun to recognize the value of fly ash in concrete pavements.

Fly ash has been used in road paving for more than 2,000 years.

Many States Use Ash. Roadways and interstate highways in Alabama, California, Georgia, Florida, Nebraska, Utah and approximately 20 other states and Canadian provinces have been successfully constructed with fly ash, many dating back to the early '50s and '60s. These roads are found in every type of climate – from virtually subtropical to sub-zero.

In January of 1974, the Federal Highway Administration encouraged the use of fly ash in concrete pavement with its Notice N 5080.4, which urged states to allow partial substitution of fly ash for cement whenever feasible. The FHWA indicated that "the replacement of cement with fly ash of the order of 10% to 25% can be made giving equal or better concrete strength and durability."[1] In addition, in January 1983, the Environmental Protection Agency published federal procurement guidelines for cement and concrete containing fly ash which encourage the utilization of fly ash and establish compliance deadlines.

Compressive Strengths. Highway departments frequently specify a minimum 14-day flexural strength. These requirements can readily be met through the utilization of proper mix designs incorporating specification fly ash. Equal compressive strengths at all ages can be readily attained provided specification fly ash, properly proportioned, is substituted for up to 25% of the cementitious material.

Some of the reasons that fly ash is used in concrete paving have more to do with the physical characteristics of fly ash than the chemical and strength gain characteristics. With modern construction techniques – such as paving trains using slipform equipment – the fly ash facilitates placement of the concrete at lower slumps while maintaining excellent workability. This means less hand work for the paving contractor and better surface texture and edge characteristics for the design engineers.

Denser Concrete. Using fly ash also results in a denser concrete – one that will have much greater ultimate strength and durability.

Paving contractors are increasingly asking that fly ash be used in their concrete because they are able to place the pavement or curb with less tearing; thus, a smaller finishing crew is required.

- These are other advantages to using fly ash that result in a stronger and more durable pavement:
  - Fly ash concrete pavement will improve the resistance of the concrete to sulfate attack.
- The concrete will be more resistant to road salts and freeze/thaw action as well as reduced alkali/silica reaction.
- In many areas of the country, fly ash also can help keep the initial cost of concrete pavement competitive with asphalt pavements.

[1] "Use of Fly Ash in Portland Cement Concrete and Stabilized Base Construction", Federal Highway Administration (FHWA), Notice N 5080.4, p. 6, January 17, 1974.

For more information or answers to questions about the use of fly ash in specific applications, contact your nearest Headwaters Resources Technical Sales Representative or call 1-888-236-6236.

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