



**RESEARCH**  
SERVICES SECTION

# INNOVATION UPDATE

July 2010

Minnesota Department of Transportation  
Research Services Section  
MS 330, First Floor  
395 John Ireland Blvd  
St. Paul, MN 55155-1899  
(651) 366-3780  
[www.research.dot.state.mn.us](http://www.research.dot.state.mn.us)



Fly ash was used as a stabilizing agent in the reconstruction of a road in Waseca County



# Fly Ash: Stabilizing the Base

*Research and case study show the benefit of using fly ash in road construction*

## Overview

Many states currently use fly ash to stabilize foundation materials during road construction projects. In Minnesota, the recent implementation of new specifications, tools, and projects at the local level is supporting increased use within the state.

In 1994, the Minnesota Local Road Research Board (LRRB) funded a study that explored the use of several materials, including fly ash, to stabilize soils for road reconstruction projects. The LRRB also supported follow-up studies, including evaluations of several demonstration projects.

## Applications

Fly ash offers advantages in a number of applications – from upgrading gravel roads and rehabilitating existing roads to strengthening the foundation before new construction.

## Construction savings

As a less expensive alternative to using thicker asphalt or hauling more aggregate longer distances, fly ash can reduce the overall cost of road construction projects. Savings are estimated at greater than 50 percent for some applications. In addition, the use of fly ash can provide a more cost-effective choice when considering the decision to either rehabilitate or reconstruct a road.

## Quality

According to research results, fly ash adds strength to the mixture of recycled asphalt, gravel, and soil, producing roads with a lifespan comparable to or exceeding traditional construction practice.

## Use of recycled material

The Minnesota Pollution Control Agency released new rules that govern the beneficial use of waste products, such as fly ash, which offers an alternative to sending them to a landfill. These rules allow coal fly ash generators to apply for permission to allow specific uses of fly ash, including soil stabilization. In addition, the Minnesota Department of Transportation (Mn/DOT) is working on a technical memorandum that will address the use of fly ash on state projects.

## Smother construction

Crews can proceed with construction work on projects that use fly ash even in challenging weather conditions. The road also can remain open during construction, helping reduce traffic challenges.

## National Rule-Making

The Environmental Protection Agency (EPA) is proposing its first-ever national rules to ensure the safe disposal and management of coal ash from coal-fired power plants. "The EPA supports the legitimate beneficial use of coal combustion residuals," says Mathy Stanislaus, assistant administrator for EPA's Office of Solid Waste and Emergency Response. "Environmentally sound beneficial uses of ash conserve resources, reduce greenhouse gas emissions, lessen the need for waste disposal units, and provide significant domestic economic benefits. This proposal will clearly differentiate these uses from coal ash disposal and assume that safe beneficial uses are not restricted and in fact are encouraged."

The impact, if any, of the proposed national rules on the use of fly ash to stabilize soils is not yet clear. For updates, visit, [www.epa.gov/coalashrule](http://www.epa.gov/coalashrule).

## Case Study: Chisago County

About five years ago, Joe Triplett became involved in his first project that included fly ash use – a portion of County Road (CR) 53. The success of that project led to its use on other roads. To

*continued*

*“Fly ash is definitely a tool in the toolbox....It can really pay off, especially now, to take this option under consideration”*

**–Joe Triplett,**  
Chisago County  
Engineer and Public  
Works Director

---

## CONTACTS

*Chisago Case Study*  
Joe Triplett  
Chisago County engineer and public  
works director  
jktripl@co.chisago.mn.us

*Mn/DOT Grading and Base Engineer*  
[http://www.dot.state.mn.us/  
materials/gradingandbase.html](http://www.dot.state.mn.us/materials/gradingandbase.html)

date, Chisago County has completed road reconstruction projects that include the use of fly ash on 13 miles of four different roads: CR53, CR10, CR15, and CR72. Fly ash has worked particularly well with the county's poor soil conditions.

“We never have enough money for roads,” says Triplett, county engineer and public works director for Chisago County. “So when you do have the chance to do a road project, you try to get as much value out of it as you can.”

The county has many rural roads that are lower in traffic volume, but also need to carry heavy loads, says Triplett. Fly ash helped the county reduce its costs while increasing the strength and lifespan. It can cost more than \$1 million a mile to construct a new road, compared to several hundred thousand or less with alternatives, he says. In addition, the roads now can carry 10-ton loads, compared to five- to seven-ton loads.

The roads are performing well and are generating “more bang for the buck,” he says. “Fly ash is definitely a tool in the toolbox,” he says. “It really can pay off, especially now, to take this option under consideration.”

## Research Recap

Several key research and implementation projects have contributed to the innovative use of fly ash in road construction projects:

### ***Use of Fly Ash for Reconstruction of Bituminous Roads (August 2009)***

This study developed a practical method to design local roadways using fly ash as the stabilizing agent added to existing recycled pavement material or existing road surface gravel. The results of this project served as the basis for quantifying the contribution of fly ash to design life estimates. Available at [www.lrrb.org/pdf/200927.pdf](http://www.lrrb.org/pdf/200927.pdf)

### ***Demonstration of Ash Utilization in Low Volume Roads (2007)***

This project involved assessing the effectiveness and environmental suitability of fly ash as a stabilizing agent for recycled pavement material and road surface gravel through two demonstration projects – the reconstruction of a city street in Waseca and the construction of a flexible pavement on a gravel county road in Chisago County. Strength and stiffness increased with both projects. Available at [www.lrrb.org/pdf/200712.pdf](http://www.lrrb.org/pdf/200712.pdf)

### ***2007 Low Volume Road & Farm Loop Cells 33, 34, 35, 77, 78, 79, 83, 84 (April 2008)***

As part of this project, fly ash was used in the construction of test cell 79 at MnROAD. The stabilization provided adequate stiffness in the reclaimed base material and made it possible to pave on when non-stabilized base materials were considerably softer. Available at [www.mrr.dot.state.mn.us/research/pdf/2008mrrdoc020.pdf](http://www.mrr.dot.state.mn.us/research/pdf/2008mrrdoc020.pdf).

## Resources

The following resources are available to assist engineers in designing and constructing roadways that use fly ash.

### ***Screening Tool for Using Waste Materials in Paving Projects***

A software tool that helps engineers with the environmental due diligence when they decide to use one or more waste materials in stabilization or other pavement projects. The software is available for download at [www.dot.state.mn.us/stateaid/flyash.html](http://www.dot.state.mn.us/stateaid/flyash.html). The report on the software tool and user guide is available at [www.lrrb.org/pdf/200503.pdf](http://www.lrrb.org/pdf/200503.pdf)

### ***Minnesota Pollution Control Agency Rules***

This web site [www.pca.state.mn.us/waste/swutil-csbud.html](http://www.pca.state.mn.us/waste/swutil-csbud.html) provides information about the guidelines for case-specific beneficial use and includes a list of authorized suppliers. Before pursuing fly ash as an option, check with the beneficial use coordinator to help ensure environmental compliance.

### ***National Guidance***

The NCHRP document, Recommended Practice for Stabilization of Subgrade Soils and Base Materials, provides guidance for fly ash use in soil stabilization. Available at [www.dot.state.mn.us/materials/pvmt/design/docs/nchrp\\_soil%20stabilization%202009.pdf](http://www.dot.state.mn.us/materials/pvmt/design/docs/nchrp_soil%20stabilization%202009.pdf).