Beneficial Use Case Study

Missoula Federal Credit Union

Coal Combustion Product Type
Class C Fly Ash

Project Name
Missoula Federal Credit Union

Project Location
Missoula, Montana

Project Participants
MacArthur, Means, and Wells Architects; Missoula Federal Credit Union; Western Transportation Institute at Montana State University; Beaudette Consulting Engineers Inc.

Project Completion Date
2007

Project Summary
In 2007, the Missoula Federal Credit Union partnered with MacArthur, Means, and Wells Architects (MMW) and researchers at Montana State University's Western Transportation Institute to use a pioneering concrete mix in the construction of its Russell Street branch. The project sought to achieve LEED Platinum certification by incorporating locally sourced recycled materials, including Class C fly ash and pulverized glass. The building became one of the first commercial structures in the United States to use 100 percent fly ash concrete with recycled glass aggregate in a structural application.

Project Description
The Missoula Federal Credit Union (MFCU) Russell Street branch project provided an opportunity to test and showcase a new low-carbon building material. With the goal of achieving Platinum LEED certification, architects from MMW approached Montana State University's (MSU's) Western Transportation Institute to help design a concrete mixture that replaced traditional portland cement with locally produced Class C fly ash from the Corette Power Plant in Billings, Montana, and substituted natural aggregate with recycled glass processed by Headwaters Recycling in Helena.

The research team refined the mix to ensure workability, strength, and durability, ultimately developing two trial designs—one using a blend of coarse and fine glass, and one with fine glass only. Laboratory and field testing confirmed that the concrete achieved strength comparable to or greater than conventional mixes, with 28-day strengths above 4,000 psi and long-term strengths exceeding 8,000 psi. Testing also showed the material to be highly resistant to alkali-silica reactivity and freeze-thaw cycles, both of which are critical for long-term durability in Montana's climate.

The project used this innovative concrete for the building's footings, foundation walls, slabs, precast exterior panels, and two interior load-bearing beams. Reinforced beam testing further confirmed that the material behaved predictably and performed within existing design standards.

By incorporating fly ash and recycled glass into a structural building material, the project reduced the carbon footprint of construction while diverting waste glass from landfills. It also advanced research into sustainable concrete applications and demonstrated that 100 percent fly ash concrete can serve as a viable and durable alternative to portland cement-based mixes. The collaboration between MFCU, MMW Architects, and MSU researchers underscored how owners, designers, and engineers can work together to push sustainable building practices forward.

Photo - Missoula Federal Credit Union