

# FLY ASH

## How we save water & energy, reduce gas emissions & more through cement replacement

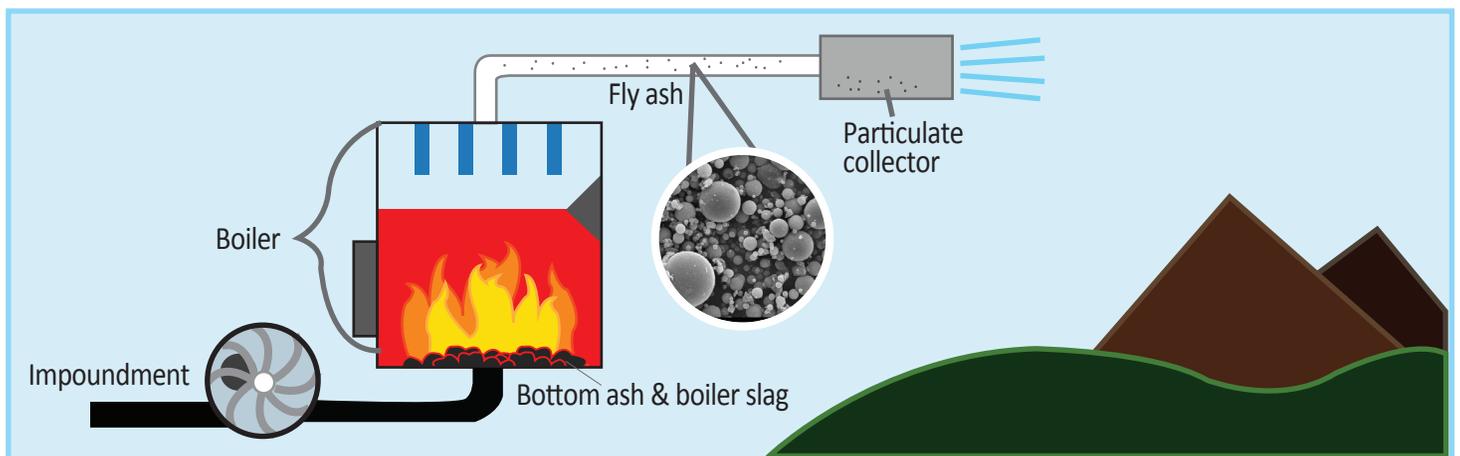


As you might imagine, a lot of concrete is required in construction – for foundations, walls, pavements, bridges, parking structures, and footings, to name a few. Concrete is a composite material, meaning it is made from two or more materials with significantly different physical or chemical properties. At least one of the materials must have binding properties (like a glue), and traditionally this material is cement.

However, in the new SMMUSD construction and modernization projects, 25% of the composite materials in our concrete is made of the more sustainable binding material *fly ash*, rather than cement.

Fly ash (sometimes known as flue-ash) is a particle generated in combustion, usually of coal. In the past, fly ash was generally released into the atmosphere. Nowadays, it is captured prior to release to prevent air pollution. About 43% of the amount captured is recycled, and a majority of that is used as a composite material in the more sustainable form of concrete that we are using in our new school construction projects!

Here's a simplified diagram of how fly ash is captured by particulate collectors:



Benefits of replacing a portion of the cement with fly ash:

- It contains a compound which increases the strength of the concrete.
- Reduces the heat of hydration, which is the heat generated by the chemical reactions that allow the concrete to expand & shrink.
- Reduced shrinking of the concrete
- Water savings. Fly ash is made up of tiny glassy beads that create a lubricating effect when mixed with concrete, which requires 10% less water -- at John Adams, this **saved over 11,000 gallons of water!**
- Reduces the need for cement production, which in turn reduces energy use and greenhouse gas emissions. For every ton of fly ash used instead of cement, enough energy is saved to provide electricity to an average American home for 24 hours. Also, the reduction in CO2 emissions is equivalent to the emission from an automobile for 2 full months!
- Utilizing fly ash also keeps excess coal out of landfills. For every ton of fly ash used instead of concrete, we save the same amount of landfill space that would be taken up by 455 days of waste production by the average American.



Working with recycled materials minimizes the District's carbon footprint by reducing water and energy use and saving landfill space. Utilizing fly ash in the construction process is just one way the District is working towards providing a more sustainable campus and contributing to a more environmentally friendly world!