California’s building code has been amended to set standards for new and replacement duct systems. Berkeley Lab researchers estimate that by 2020 more than half of the new homes built in the U.S. will incorporate an improved duct design that minimizes leakage. Ducts sealed over the years from 2000 to 2020 will save billions of dollars in energy bills annually.

Building 50A Plugging Leaks, Saving Energy

Leaky heating and cooling ductwork allows as much as 30 percent of heated or cooled air passing through them to escape, wasting astonishingly large amounts of energy. To deliver air through leaky ductwork, fans must work harder and longer, requiring more energy. Berkeley Lab scientists addressed the problem by developing an aerosolized duct sealant that can close off the leaks, much as a self-sealing tire can plug a puncture. This homegrown process, which has been licensed to private industry, has been put to the test at Berkeley Lab itself, resulting in a nearly 60 percent reduction in the energy needed to power associated heating and air conditioning fans in Building 50A.

Finely divided particles of sealant are blown into ductwork after supply and return air diffusers and registers have been temporarily plugged. As the particles escape through leaks in the ducts, the change in pressure and direction causes them to clump into a paste that quickly blocks the leak. The process was invented by Berkeley Lab scientist Mark Modera, who formed his own company in 1998 to market it for residential home duct sealing. His firm was eventually acquired by a world-leading air conditioner manufacturer, which four years later also licensed additional Berkeley Lab technology that made the process suitable for large commercial structures.

The HVAC duct system of Building 50A, which houses computer scientists, theoretical physicists, and the offices of the Lab Directorate, was sealed in 2006. The system was designed to circulate 63,000 cubic feet of air per minute — about 60 times the size of a home heating and cooling system. The aerosolized particles sealed 89 percent of the measured leakage. That boost in efficiency reduced the fan flow by 30 percent, cutting by an estimated 58 percent the power required to run those fans. Among the other sites that have undergone duct sealing are two additional wings of the Building 50 complex, Berkeley Lab’s largest facility, laboratory building 70, and Building 90, where the technique was developed.