



Phase Change Material (PCM) Ceiling Tile

Technology Overview

Thermal mass is a material's capacity to absorb, store, and release heat. Construction materials with high thermal mass, like brick or concrete, are more resistant to temperature fluctuations. Temperature resistance reduces loads on mechanical systems, saves energy, and improves occupant comfort. Many modern buildings are constructed with low thermal mass materials, including glass and steel. Increasing thermal mass reduces energy use and greenhouse gas emissions.

Phase change material (PCM) ceiling tiles provide an opportunity to add thermal mass to any building. PCMs use the energy absorbed and released during shifts between solid and liquid. During the day, at peak heat gain, the PCM in the ceiling tiles melts, heat is absorbed, and the space is effectively cooled. At night or when temperatures cool, the PCM solidifies and releases heat back into the space.

Why is GSA Interested?

PCM ceiling tiles are a direct replacement for conventional ceiling tiles that offer no thermal storage. The ceiling tiles reduce costs and energy consumption by lessening HVAC loads and shifting operation away from peak hours. Energy loss to the spaces above ceilings is also reduced. The vendor estimates energy savings to be up to 15%. Stabilized temperatures improve occupant comfort and increase resiliency during power outages or extreme weather conditions.

PCM ceiling tiles provide superior acoustical performance compared to conventional ceiling tiles, having better sound-blocking without compromising sound absorption.

Previous iterations of PCMs were challenging to install, had less energy storage density, and had high flammability and costs. PCM ceiling tiles have resolved these issues with minimal added expense.

Deployment Potential

Buildings likely to benefit the most are those with high daytime internal heat gains that disappear at night, for instance, buildings with high solar gains, high occupancy, waste heat from electronics, south-facing windows, or significant envelope infiltration.

Green Proving Ground (GPG), in collaboration with the U.S. Department of Energy, is evaluating the real-world performance of phase change material (PCM) ceiling tiles in federally owned buildings within GSA's inventory. The technology will be provided by Armstrong World Industries and coordinated with other ongoing evaluations of this technology.