



# Phase Change Materials

## What is this Technology?

Phase change materials (PCMs) can be used to stabilize internal building temperatures by storing energy when it isn't needed and releasing it when it is. When a space warms above the PCM's melting point, the PCM absorbs heat as it changes phase from solid to liquid; when the space cools, the PCM releases heat as it freezes back to a solid state. By absorbing and releasing heat as building temperatures rise and fall, PCMs are able to reduce peak loads and the energy consumed by conventional heating and cooling systems. In some cases, phase change materials can store between 5 and 14 times more thermal energy per unit volume than materials such as water or masonry, and can be integrated into wall, roof, ceiling, attic and floor assemblies to improve the thermal performance of the building envelope and reduce air conditioning load. For retrofits, PCMs can be simply installed on top of ceiling tiles. PCMs can melt and solidify at a wide range of temperatures and can be customized for different applications and climates.

## Why is GSA Interested?

PCMs can help maintain comfortable building temperatures while reducing annual energy consumption throughout the US. The technology under evaluation promises to address the environmental impacts of material sourcing typically associated with PCMs by substituting less expensive and safer inorganic materials for the more costly volatile and harmful organic materials used in earlier generations of this technology.



**ENERGY EFFICIENCY** The manufacturer estimates a reduction in heating and cooling of between 20% and 30%. Demand charge savings due to peak load reductions and shifting may result in additional cost savings.



**COST-EFFECTIVENESS** Payback is estimated at between two to five years.



**OCCUPANT SATISFACTION** Occupant comfort may be improved by stabilizing indoor temperatures.



**DEPLOYMENT POTENTIAL** PCMs can be integrated into both new and existing buildings, and are suitable for every climate zone. They will be most cost-effective in facilities that experience significant daily temperature changes due to solar gain, overnight temperature drops, or temperature setbacks.

*The Green Proving Ground program, in association with a federal laboratory, is subjecting phase change materials to real-world measurement and verification in GSA buildings. Results will be published on the GPG website, [www.gsa.gov/gpg](http://www.gsa.gov/gpg).*



The Green Proving Ground program leverages GSA's real estate portfolio to test innovative building technologies. The program helps GSA meet its sustainability goals by providing actionable data that informs investment decisions targeted at energy-use reduction.