

# IMPLEMENTATION OF SEPARATE SENSIBLE AND LATENT COOLING APPLICATIONS: BUILDING ENERGY PERFORMANCE MODELING AND VALIDATION

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## Abstract

The benefits of separate sensible and latent cooling (SSLC) have been demonstrated as a viable methodology for substantial reductions in energy consumption required by cooling, while actively controlling the relative humidity of a space. The use of SSLC technologies can result in improvements to indoor air quality, through removal of excess humidity in a space, caused by either outdoor conditions or building envelope composition. The negative effects of high relative humidity indoors can be mitigated, and improved building energy performance can result.

Studies have shown that SSLC configurations can result in energy savings of greater than 30%, providing a direct pathway for energy reduction across the United States. This study intends to examine the effectiveness of implementing SSLC technology in residential applications, specifically in high-performance homes. A system, comprised of a central, conventional air handler to remove sensible loading, combined with a high-efficiency, direct expansion dehumidifier for removal of the latent load, will be investigated.

The modeling of system components was completed by means of a transient model. Validation was completed through the construction, implementation, and testing of a full-scale, high-efficiency home, as a part of the Department of Energy 2011 Solar Decathlon. The model can be used for analysis of building performance enhancement through retrofit applications, or in new construction, to determine the optimal design for a given scenario, taking into account the indoor air quality of the space and potential energy savings.