



Insulated thermal test chamber showing overhead air supply with and unducted return

CoolZone

Energy Saving and Improved Thermal Comfort

Three individual tests (conducted as part of BSRIA job number 55749 and reported in BSRIA report 55749/1) by BSRIA Ltd (Building Services Research and Information Association) using three types of air conditioning systems – displacement ventilation, overhead air and overhead air ducted return - in a 16m² insulated thermal test chamber at the organisation’s independent Laboratories in Bracknell, Berkshire, showed:

Test Conditions

Structure:	Insulated Thermal Test Chamber
HVAC System:	1.Displacement ventilation; 2.Overhead air; 3.Overhead air ducted return
Location:	BSRIA Bracknell, UK
Room Size:	16 m ²
Ceiling Coverage with CoolZone:	0, 30, 57 %
Thermal Storage:	0, 662, 1,260Wh
Applied Cooling Load:	30, 60 W/m ²
Air Circulation Rate:	2.5, 4.1, 11.1 l/s m ²
Purge Temperature:	14, 18 °C

Results

1. PCM tiles provided useful energy storage with 30%-50% ceiling coverage, more coverage allowing for greater thermal storage.

In this first test, 0%, 30% and 57% PCM coverage gave 0Wh, 662Wh and 1,260Wh of thermal storage respectively. Adding 662Wh of thermal storage delayed the operation of the air conditioner by 1:20 hours with a 30 W/m² load in the displacement ventilation configuration while 1,260Wh delayed this by 4:27 hours. The PCM tiles typically reduced temperature variations on the ceiling to +/- 1°C.

2. It was possible to discharge the accumulated heat using airflow rates typical in HVAC systems.

This test, with 0% and 30% coverage, showed PCM can be successfully purged with airflow rates typically used with overhead air and unducted return systems. Purge times are affected by the amount of energy stored in the ceiling (662Wh), purge air temperature and purge air velocity. The key result was that lowering the purge temperature from 18°C to 14°C decreased the purge time by 3:07 hours.

3. Selection and design of HVAC played a key role in ensuring optimal efficiency of PCM ceilings.

Again with 0% and 30% coverage, the test showed thermal mass is used most effectively in displacement ventilation types of systems which typically feature low airflow rates and greater amounts of stratification. Ceiling-based thermal mass also worked well in “well mixed” overhead air systems although the storage does not last as long as in displacement ventilation systems.

For further information, please e mail sales-support@armstrong.com or contact Armstrong Technical Sales on 0800 371839(UK) and 1800 409002 (ROI).