

## KoldLok® Grommets Are the Superior Sealing Solution for Existing Facilities and New Construction of Any Size

Studies have shown that 60 percent of the available cooling airflow volume in a typical data center flows through unsealed openings, rather than through perforated floor tiles. This wasted air, called bypass airflow, results in damaging hotspots, increased operating costs, and reduced cooling capacity.

KoldLok® grommets provide a virtually perfect seal for cable cutouts and other openings in the raised floor to instantly reduce bypass airflow and increase the underfloor static pressure. Previously lost airflow is recaptured and forced to flow to the perforated floor tiles located at the computer cabinet intakes, delivering increased conditioned airflow where it is most needed.

Installing KoldLok® grommets instead of competing products offers a financial payback in just a few short months by decreasing cooling costs and increasing efficiency. With KoldLok®, you're not just plugging holes, you're controlling the high costs of cooling, reducing the carbon footprint of your facility and enabling installation of higher density IT equipment.

### Two studies demonstrate the energy saving capabilities of KoldLok® Grommets in Existing Facilities and New Construction

#### University of New Mexico Uses KoldLok Grommets to Reduce Cooling Costs and Increase Cooling Capacity Before Adding More Servers

The data center at UNM's Albuquerque campus supports over 6,000 employees, 25,000 students, a hospital, and a complete medical campus. As demands were growing for this 900ft<sup>2</sup> facility, UNM approved the purchase of 60 new servers. However, its data center was already showing signs of stress.

"Heating and cooling contractors were telling us that we had adequate cooling power, but 60 percent of the air was going to the wrong places," said Kelly Leshner, Manager of the Enterprise Command Center at UNM. "In some cases we had equipment with air intakes of more than 90° F."

The data center staff attempted to improve cooling efficiency by plugging floor holes with foam, keeping doors closed, and adding up to 10 fans on the floor. When these steps failed, UNM chose to invest in Upsite professional services to seal cable openings and tune the cooling systems. Immediately after installation of 50 KoldLok® Grommets to seal tile cutouts, the data center showed significant gains in cooling efficiency.

Before, 29 percent of racks had intake temperatures over UNM's desired maximum of 74° F. After KoldLok®, all racks measured within ASHRAE recommended ranges.

The average static pressure of the raised-floor plenum nearly tripled. In addition, the airflow from perforated tiles increased by an average of 175 percent.

#### Financial Impact Study of Installing KoldLok® Grommets in a Newly Built Data Center

This analysis examined a newly built data center with KoldLok® Integral Grommets installed during construction. Without sealing the cable cutouts, it is calculated that 30 percent of available cold air would have bypassed the perforated floor tiles through cable cutouts. It is calculated that 16 cooling units would be required to meet airflow demand for the 10,000ft<sup>2</sup> facility, and return air would have an average temperature of 70° F.

The superior sealing provided by KoldLok® results in a significant decrease in bypass airflow and only 13 cooling units are required to meet airflow demand for the new facility.

A full Return on Investment was achieved on the KoldLok® Grommets in less than three months, and five year total savings were \$311,480. The total savings from the installation of KoldLok® in this new facility include capital cost savings from installing 3 fewer cooling units, electrical energy savings from running fewer units, energy savings from increased cooling efficiency, and savings on latent cooling penalty and maintenance. For complete study details, see the back of this page.

Actual Temperatures in the UNM Data Center

Before KoldLok®



After KoldLok®



# Financial Impact Study of Installing KoldLok® Grommets in a Newly Built Data Center

This analysis examines a newly built data center with KoldLok® Integral Raised Floor Grommets installed during construction. This analysis calculates the reduced number of cooling units required based on sealing unmanaged openings that waste cooled air. Using the calculations, data centers can easily determine the financial impact to their business. This same calculation can also be used in data centers that operate with chilled water systems. By sealing cable cutouts, data centers can reduce the number of cooling units in operation. This number can be determined using simple calculations involving bypass airflow and thermal cooling demand. Previously lost bypass air is recovered and forced to flow to the perforated floor tiles that should be located at the computer cabinet air intakes, thus delivering increased airflow where it is needed most.

Field measurement of airflow in numerous data centers has determined that 50 to 80 percent of the CFM discharged from cooling units into the underfloor plenum escapes through unsealed openings. Lost air through cable openings can be verified by simple measurements of actual perforated tile and grate openings (ft<sup>2</sup>) compared to measurements of cable cutouts and perimeter penetrations (ft<sup>2</sup>). Air lost through floor, sidewall, or ceiling penetrations can also be verified by simple cross-sectional area measurements. Operating assumptions are outlined below:

- Data center consists of 10,000 ft<sup>2</sup> of raised-floor space with an underfloor cooling plenum of 18" or higher for distributing cooled air.
- Data center has 400 equipment cabinets averaging 2' X 3' X 6'.
- Data center consumes 600 kilowatts (kW) of power for an average of 1.5 kW per rack and 60W/ft<sup>2</sup>.
- Electrical energy, including demand charges, costs \$0.06 per kilowatt hour (kWh).
- Liebert Model VH267W 20-ton cooling units are used to cool the data center. Each cooling unit uses a 5 horsepower (Hp) fan to deliver 10,000 cubic feet per minute (CFM) of airflow and consumes 3.73 kW for airflow demand and 16.7 kW for thermal demand (liebert.com).
- KoldLok Integral Raised Floor Grommets are installed to seal all 400 cable cutouts as the floor tiles are installed.
- Alternating hot-aisle and cold-aisle equipment configurations are implemented.
- Twenty-five percent open perforated floor tiles are installed one per every two racks at the rack air intake for a total of 200 perforated floor tiles.
- All perimeter penetrations in the subfloor, walls, and ceiling are sealed.
- The supply temperature is 57°F, exhaust temperature is 74°F, and the temperature increase of the air as it passes through the computer equipment is an average of 17°F.

Without sealing the cable cutouts, 30 percent of available cold air bypasses the perforated floor tiles through cable cutouts averaging 5" x 6" in size (use of larger openings increases bypass air and its negative environmental effects). Thirty percent bypass air results in a return air temperature of 70°F/48 percent relative humidity (Rh). At this condition, each cooling unit provides 219,700 British Thermal Units per hour (BTU/h) of total cooling, of which 93 percent or 203,400 BTU/h (59.7 kW) is sensible cooling. This yields 16,300 BTU/h (4.8 kW) of latent cooling (capacity data provided by Liebert).

By sealing the cable cutouts, only 10 percent of available cold air bypasses the perforated floor tile openings resulting in a return air temperature increase to 72°F/45 percent Rh. For this return air condition, each cooling unit provides 229,900 BTU/h of total cooling, of which 100 percent or 229,900 BTU/h (67.0 kW) is sensible thermal cooling (capacity data provided by Liebert). There is no latent cooling.

## Savings Summary

- Capital cost savings from installing three fewer cooling units (\$90,000)
- Electrical energy savings due to running three fewer cooling units for airflow (\$5,880 annually)
- Electrical energy savings due to running of 1.2 fewer cooling units for thermal demand (\$10,534 annually)
- Electrical energy savings due to avoiding the latent cooling penalty on 10.1 cooling units (\$25,482 annually)
- Maintenance savings due to running three fewer cooling units (\$9,000 annually)

## Cash Flow Analysis for Installing KoldLok Integral in a 10,000 ft<sup>2</sup> New Data Center

Item	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Reduction of Cooling Units for Airflow Demand	3	3	3	3	3	3	3
Reduction of Cooling Units for Thermal Demand	1.2	1.2	1.2	1.2	1.2	1.2	1.2
KoldLok with Installation (\$82.50 each)	(\$33,000)						(\$33,000)
Cooling Unit Acquisition Cost Saved		\$90,000					\$90,000
Airflow Demand Energy Saved		\$5,880	\$5,880	\$5,880	\$5,880	\$5,880	\$29,400
Thermal Demand Energy Saved		\$10,534	\$10,534	\$10,534	\$10,534	\$10,534	\$52,668
Latent Cooling Penalty Saved		\$25,482	\$25,482	\$25,482	\$25,482	\$25,482	\$127,412
Maintenance Saved		\$9,000	\$9,000	\$9,000	\$9,000	\$9,000	\$45,000
Net Cash Flow	(\$33,000)	\$140,896	\$50,896	\$50,896	\$50,896	\$50,896	\$311,480
Cumulative Cash Flow	(\$33,000)	\$107,896	\$158,792	\$209,688	\$260,584	\$311,480	\$311,480

## Cooling Unit Summary

	Cooling Units Required to Meet Airflow Demand	Cooling Units Required to Meet Thermal Demand
Without KoldLok Products	16	10.1
With KoldLok Products	13	8.9
Cooling Unit Savings	3	1.2