



# Duct Cover Insulation

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Product performance for covering / wrapping HVAC ducts





## ABOUT K-FLEX USA



Youngsville, NC Headquarters



**K-FLEX USA IS A LEADING MANUFACTURER** of closed cell flexible elastomeric foam insulation products for mechanical piping, air handling units and vessels.

Designed for ease of installation and reliable performance, K-FLEX products provide excellent thermal and acoustical performance, including inherent resistance to moisture intrusion.

K-FLEX USA prides itself on being responsive to the market, providing dependable service to customers throughout North America, bringing an innovative approach to product offerings, and having products that are 3rd party tested and certified.

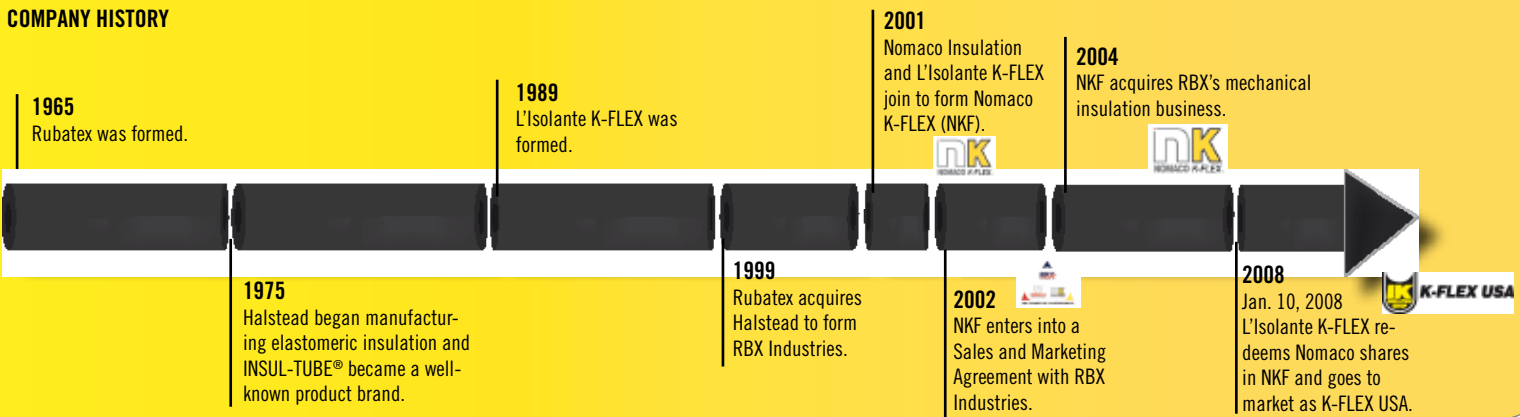
In April 2012, K-FLEX USA was awarded with ISO 9001:2008 certification by FM Approvals. The independent certification demonstrates the company's commitment to quality.

K-FLEX products have proven performance in the Plumbing, HVAC/R, Commercial/Industrial, Marine, Oil & Gas, Acoustic and OEM Markets.

As a member of the IK Insulation Group, K-Flex USA delivers state-of-the-art levels of technical knowledge and customer support to the global mechanical insulation market.



### COMPANY HISTORY



### K-FLEX USA BENEFITS

- Designed for lasting performance:  
K-Value: 0.245 @ 75°F & Permeability: 0.03 perm-in
- Responsive to market
- Industry & Product expertise
- 3rd Party Tested & Certified Products
- Broad size range: 25/50-rated up to 2" thick
- Systems Approach
- Factory-applied PSA & Cladding
- Full line of accessories



### GLOBAL PRESENCE

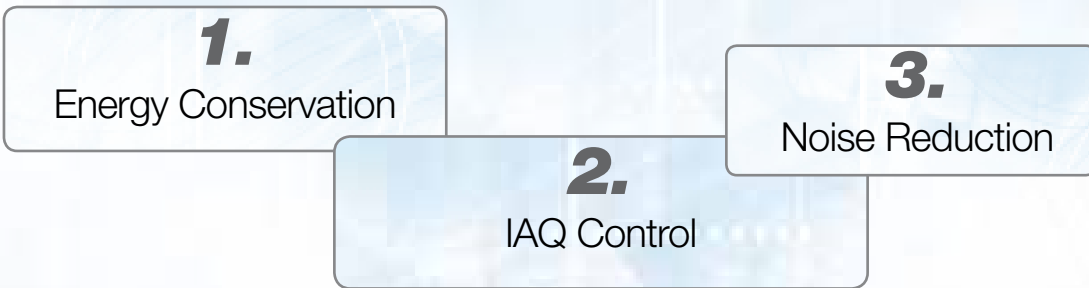
L'ISOLANTE K-FLEX:

- 11 production facilities worldwide
- Commercial distribution in 43 countries
- Headquartered in Italy

# DUCT INSULATION BENEFITS

A key design objective of modern residential, commercial and industrial facilities is energy conservation, as well as occupant comfort and safety. It has been shown that productivity is higher in an environment that features minimal external noise for a quiet atmosphere, comfortable temperatures that prevent chills or overheating, and moisture control to prevent mold growth.

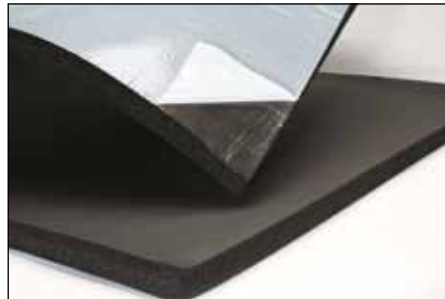
This healthier, more productive and more attractive environment depends in large part on well-designed and properly-insulated HVAC duct systems, which carry air to conditioned spaces inhabited by people, sensitive equipment, or a combination of both. Using the proper insulation material on ducts for thermal, acoustical, and IAQ performance helps maintain the following:



## THERE ARE 2 PRIMARY METHODS FOR INSULATING DUCTS:

### *External Wrapping:*

- Good condensation control & thermal benefit
- Minimum acoustical benefit (reduction in vibration)
- Excellent metal corrosion protection
- Preferred for outdoor ducts



### *Internal Lining:*

- Excellent thermal and acoustical benefit
- Easier to install



## ADVANTAGES OF DUCT WRAP INCLUDE:

- *Improved acoustical values (vibration reduction)*
- *Thermal & condensation control*



# DUCT COVER / WRAP

The purpose of these technical notes is to offer designers and those working in the field a thorough overview of insulation materials commonly used for the purpose

of wrapping ducts of air-conditioning systems. For an understanding of the analysis carried out, we will refer both to the most commonly used materials (table

1) and to the headings and sources of data presented in table 2.

**Table 1**

<b>A</b>	FLEXIBLE CLOSED CELL ELASTOMERIC FOAM ( <b>K-FLEX® SHEET / ROLL / CLAD</b> )
<b>B</b>	FIBROUS

**Table 2**

	TOPIC	SOURCE OF DATA
<b>1</b>	Performance	average values gathered from manufacturer and industry resources
<b>2</b>	Installation	manufacturer and industry recommendations regarding use and installation of product

## TECHNICAL PROPERTIES

### COMPARISON BETWEEN MATERIALS

	<b>K-FLEX®</b> Closed Cell Elastomeric	<b>Fibrous</b>
Closed Cell Structure	Yes	No
Flexible	Yes	Yes
Thermal k (75°F mean)	0.245	0.23
Water Vapor Permeability without jacketing (perm-in)	0.03	75.00
25/50 flammability rating	Yes (2")	Yes
Service Temperature (°F)	-297°F to +220°F	0°F to +250°F
Density (pcf)	3 - 4	1.5 - 3
Available with PSA	Yes	No
Fiber-free	Yes	No
Non-porous	Yes	No
Resists Dirt Accumulation	Yes	No

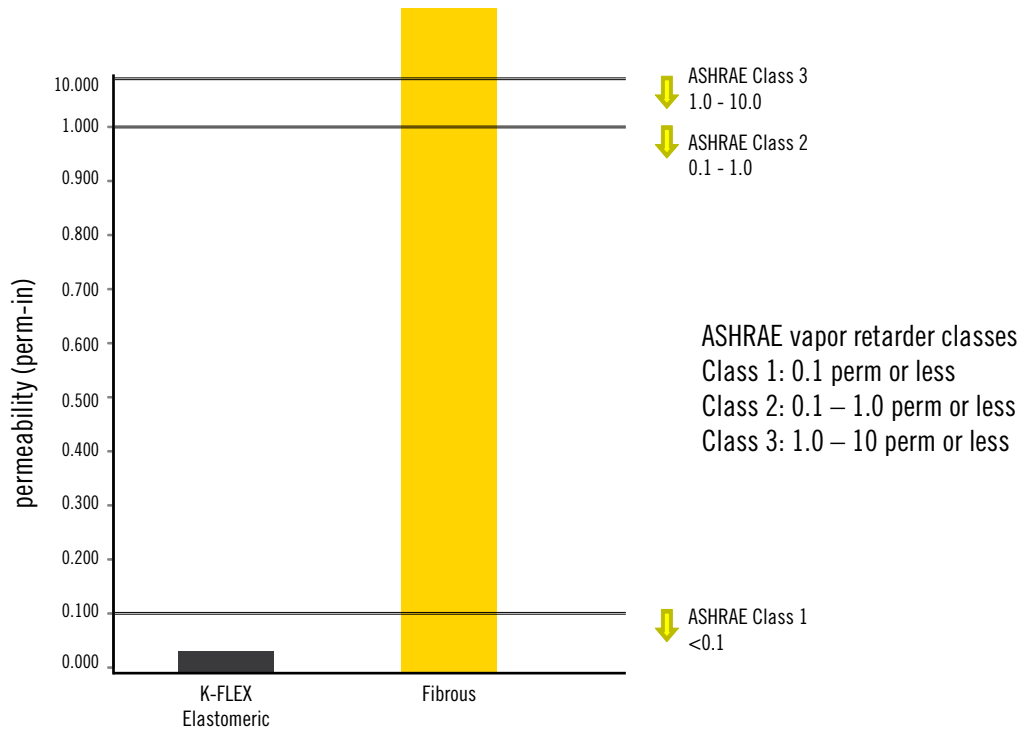
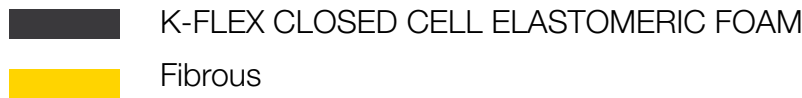
# WATER VAPOR PERMEABILITY

Given the detrimental effects of water vapor intrusion, the water vapor permeability of an insulation material is a critical component of its performance. If the insulation material is vapor permeable, as indicated by a high permeability (perm-in) value, moisture

can move through the insulation to reach areas where the temperature is low enough to form condensation, even if the surface temperature of the insulation is high enough to prevent surface condensation. An insulation material with low permeability would prevent

this situation from occurring. The chart below shows the water vapor permeability values for commonly used insulation materials in duct cover applications. As the chart indicates, elastomeric is the only unjacketed material that is classified as a Class 1 vapor retarder as defined by ASHRAE.

## Permeability Comparison



	Permeability (perm-in)
Fibrous*	75.00
K-FLEX Elastomeric	0.03

\* Taken from manufacturer's published data.



# ENERGY CONSERVATION

Studies show that commercial buildings spend more than 1/2 of their energy use on maintaining a conditioned temperature. To control this, thermal insulation is commonly used to reduce energy consumption of HVAC systems and equipment.

A potential source of energy waste is heat loss through duct walls if the duct is not insulated. Another critical issue

is moisture intrusion into the interior structure of the insulation as a result of direct moisture contact (rain) or condensation formation.

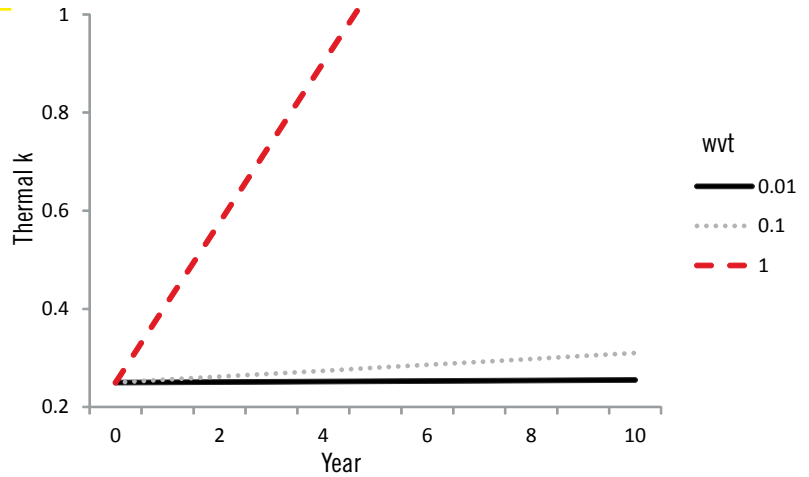
Since water is a very good conductor, the capability of an insulation material to slow water vapor from penetrating into its interior structure is fundamental for the long-term efficiency of the application.

An important factor to consider is moisture intrusion: *For every 1% moisture gain, the insulation effectiveness drops 7.5%.* The relationship between moisture gain and thermal k is highlighted in the below charts. If the water vapor permeability of the insulation is less than 0.10 perm-in, there will be minimal long-term effects on the k-value.

	k-value (75°F mean)	Permeability (perm-in) unjacketed
Closed Cell Elastomeric	0.245	0.03
Fibrous	0.23	75.00

## Thermal k performance over time with moisture gain (10 years)

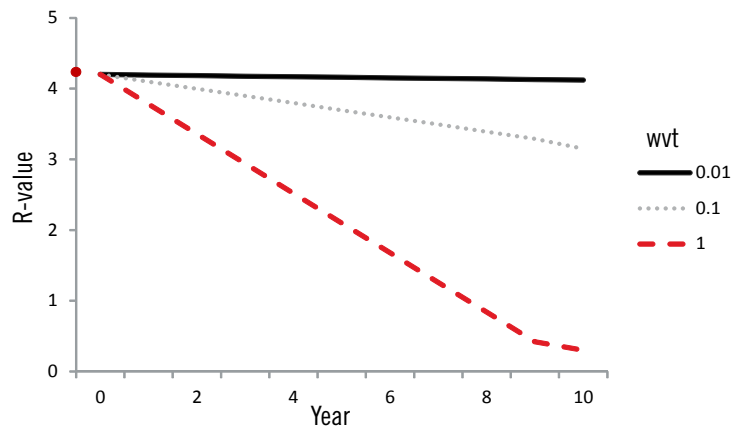
wvt (perm-in)	.01	.10	1.00
k-value (start)	.250	.250	.250
k-value (10 years)	.255	.310	1.88



## R value performance over time with moisture gain (10 years)

An R-value of 4.2 is required by IECC, ASHRAE and nearly every state building code.

wvt (perm-in)	.01	.10	1.00
R-value (start)	4.2	4.2	4.2
R-value (10 years)	4.12	3.15	0.55





# IAQ CONTROL MOLD RESISTANCE / LOW VOC / NON-FIBROUS

For an insulation material to defend against indoor air quality (IAQ) problems, it must resist condensation and moisture intrusion that can lead to mold growth. The formation of condensation on the surface of the insulating material or within it is a negative factor.

Condensation forms as a result of the direct contact of warm humid air with a cold surface. If the temperature of the surface is lower than the Dew Point of the humid air, condensation will form. The surface temperature of a duct and of the insulation depends on the application conditions and the R-value of the insulation material. If the insulation material is vapor permeable, moisture can move inside the insulation to reach areas where the temperature is low enough to have condensation, even if the

surface temperature of the insulation is high enough to prevent surface condensation. An insulation material with low permeability would prevent this situation from occurring.

K-FLEX® elastomeric insulation has tested as mold resistant to ASTM G 21 standards. This is a result of a closed cell structure that inherently resists moisture and wicking, an added antimicrobial agent, a smooth surface skin that resists dirt accumulation, and a fiber-free composition that makes it non-particulating and non-eroding.

K-FLEX® elastomeric insulation is GREENGUARD® certified as a low VOC material, meeting the requirements of the "Children & Schools" and "Indoor Air Quality" classifications.

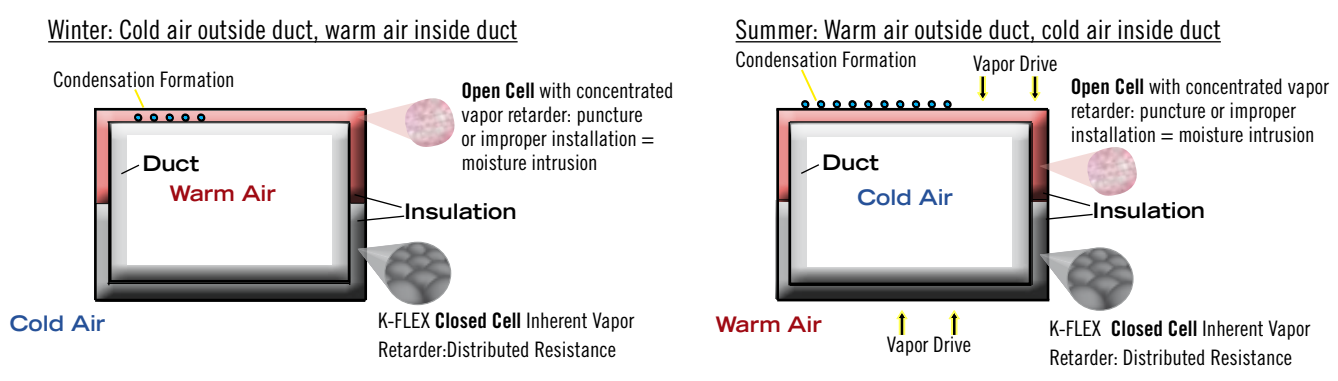
In contrast, fibrous or open cell liners

rely on a concentrated moisture vapor barrier (surface-applied coating). If the barrier is damaged (even a pinhole) or the edges are not properly sealed, they are susceptible to moisture intrusion and subsequent mold growth.

Once moisture penetrates, it can wick and involve large areas in the mold growth process. The EPA & NAIMA recommend the immediate removal of wet fiberglass to prevent mold.

**Mold remediation, even for small elementary schools, can cost around \$200k.**

Elastomeric closed cell insulation materials have a history of more than 25 years of successful use as a duct wrap/cover material with no known product-related problems.



Result w/ Fibrous: Mold growth on ceiling from water drip or corrosion of duct







# PERFORMANCE: K-FLEX® Elastomeric Insulation & CLAD®

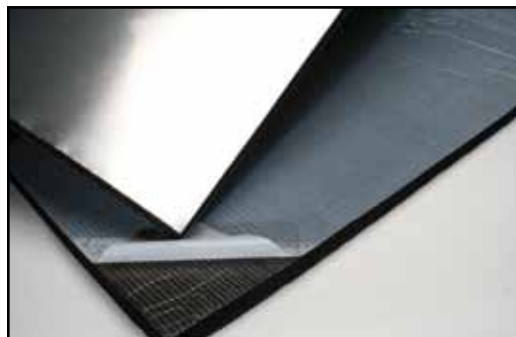
## ***Analysis of main features***

- Proven Reliable Performance
- Low perm (0.03 perm-in) without jacketing  
For indoor applications: No vapor barrier facing / edge treatment needed  
For outdoor (exterior) applications: Factory-applied Cladding (AL & WT)
- Fiber-free & Low VOC = IAQ
- Inherently high mold & mildew resistance
- GREENGUARD® Certified - Children & Schools™ Classification for low VOC  
Microbial Resistance Listing
- Contains an EPA-registered antimicrobial agent for added protection
- Available with PSA for easy installation
- Sustainable: Lasts the life of the system

<i>K-FLEX® Elastomeric Insulation</i>		
PROPERTY	RATING	CRITERIA
Operating Temperature Range (°F)	-297°F to +220°F	
Water Vapor Permeability	K-FLEX® Elastomeric: 0.03 perm-in Clad®: 0.001 perms	ASTM E 96
Water Absorption % (volume change)	0	ASTM C 209
Thermal k (75 °F mean)	0.245 (Btu-in/h-ft <sup>2</sup> -°F)	ASTM C 177 & C 518
Fire Rating	25/50 up to 2" thick Pass	ASTM E 84 NFPA 90 A / 90 B
Density	3 - 4 pcf	ASTM D 1622
Mold Resistance	Pass	UL 181 & ASTM G 21
Energy Rating	Complies	ASHRAE 90.1 & 189.1
UV Weather Resistance	Pass	QUV Chamber Test



K-FLEX® Elastomeric Insulation Sheet



K-FLEX Clad® AL with PSA



# INSTALLATION & MAINTENANCE

## ***Analysis of main features***

- Easy to fabricate, cut & install
- Flexible: non-rigid, non-breakable
- No protective clothing required during installation
- Safe: Non-dusting, Non-wicking, Non-abrasive, Non-itching
- Low Maintenance
- Easy to Clean – Smooth and Durable Surface, Resists Tearing
- Available with factory-applied pressure sensitive adhesive (PSA)





# INSTALLATION GUIDE

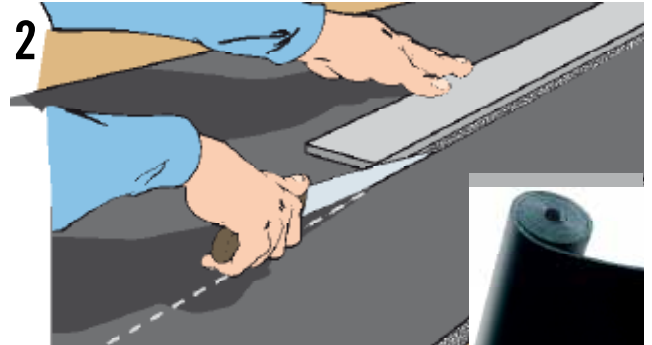
Below process for rectangular ductwork. Consult K-FLEX Installation Manual for round ductwork installation process.

1



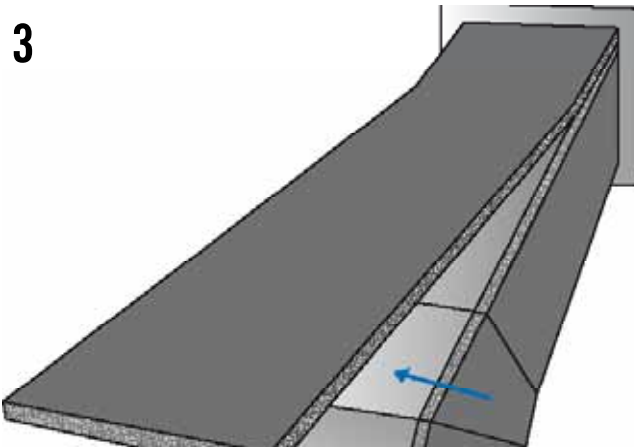
Thoroughly clean the surface to be insulated. Insulation is not recommended where there is incrustation or other flaws that could prevent the sheet from sticking perfectly.

2

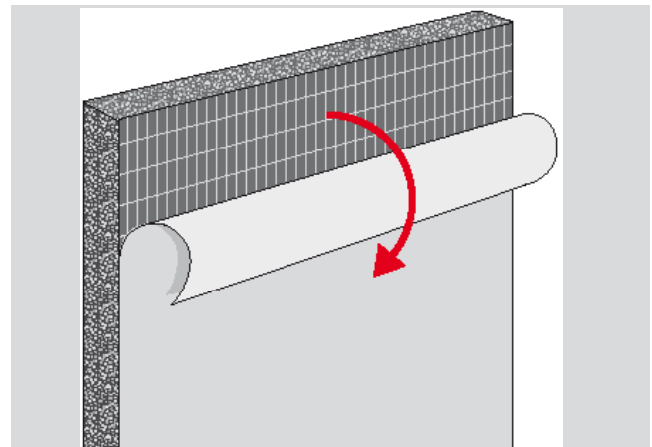


Mark the measurements of the surface to be insulated on the sheet and cut the required size out of the roll.

3

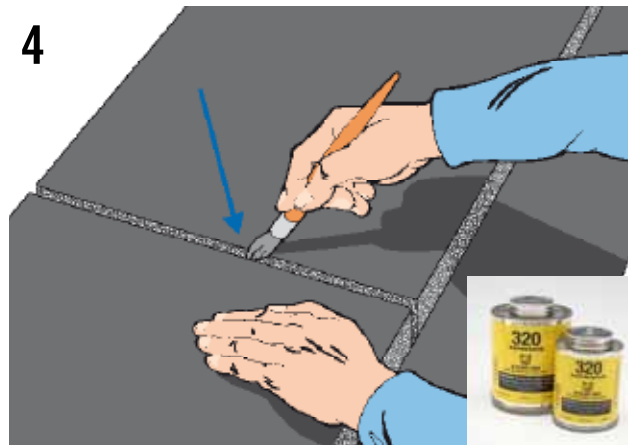


For S2S: Apply K-FLEX® Contact Adhesive to the insulation surface and to the duct surface. In the example given, for the best results we recommend first insulating the lower surface of the duct, then the side walls and lastly the top. This will prevent the penetration of humidity.



For PSA: Remove the backing paper from the adhesive side before sticking it to the duct surface. No K-FLEX® Contact Adhesive is needed for this process.

4



Use K-FLEX® Contact Adhesive to join the edges together.



# PROJECTS

## HOSPITAL COLORADO

Centura Avista Adventist Hospital used K-FLEX Clad® AL for roof-top duct work located on the highest part of the building during an expansion to its surgery wing.

Traditional fiberglass duct board jacketed with aluminum, which can absorb moisture if the jacket is damaged or seams fail, would not withstand the harsh weather conditions of the area, especially given the need for low maintenance and attractive appearance.

K-FLEX Clad® AL was selected for its moisture resistance (to protect the integrity of the thermal insulation's performance), low maintenance and excellent appearance.

Code required that the insulation be 2 inches thick to obtain an R-value of 8. In this case, one layer of 1 inch elastomeric insulation and another layer of K-FLEX Clad® AL with PSA was used, allowing for easy installation and the alternating of seams.

The project consisted of approximately 60 feet of return and supply duct work coming off the air handler. In some cases, two ducts were stacked on top of each other. When this was necessary, insulation was applied between the ducts to separate them and the sides were insulated as if the two were one large duct, which saved on time and materials. The job was completed in less than a week.



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## LARGE MANUFACTURING FACILITY TENNESSEE

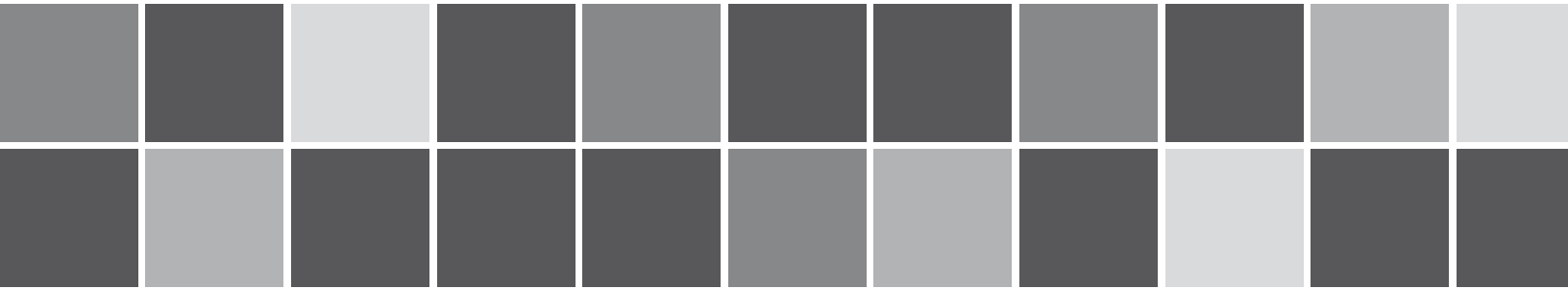


## MAJOR AIRPORT TEXAS





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