

The Kingspan **KoolDuct**® System

TRAINING MANUAL



Manufactured to BS EN ISO 9001: 2000
Certificate No. 388



Low Energy –
Low Carbon Buildings

The Kingspan **KoolDuct**[®] System

Training Manual

Chapter 1

Introduction

The Kingspan KoolDuct® System

Health and Safety

Kingspan **KoolDuct** System is safe to use. Material Safety Data Sheet (MSDS) for the KoolDuct panel and main ancillaries are available from the Kingspan Insulation Marketing Department .

It is recommended that **gloves** be worn when handling and cutting the product: particles of the glass fibre reinforced facings of the KoolDuct panel can be irritating to the skin. Use suitable protective clothing (e.g. long-sleeved garments) when handling.

Please note that the **reflective surface** on this product is designed to enhance its thermal performance. As such, it will reflect light as well as heat, including ultraviolet light. Therefore, if this board is being installed during very bright or sunny weather, it is advisable to wear UV protective sunglasses or goggles, and if the skin is exposed for a significant period of time, to protect the bare skin with a UV block sun cream.

The facing used on this product can be slippery underfoot specially when allowed to get wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.

Do not stand on or otherwise support your weight on KoolDuct panels and fabricated ducts.

When hand tools with **blades** are used to cut the KoolDuct panel, and when saws, Grip Notcher or other cutting tools are used to cut the KoolDuct profiles and ancillaries, please handle the tools following the standard precautions normally required when working with exposed blades.

When the duct assembly is achieved using the special contact **adhesive**, the application should be performed in a well ventilated area, wearing protective gloves.

When using Kingspan approved high performance **silicone**, the working place must be adequately ventilated.

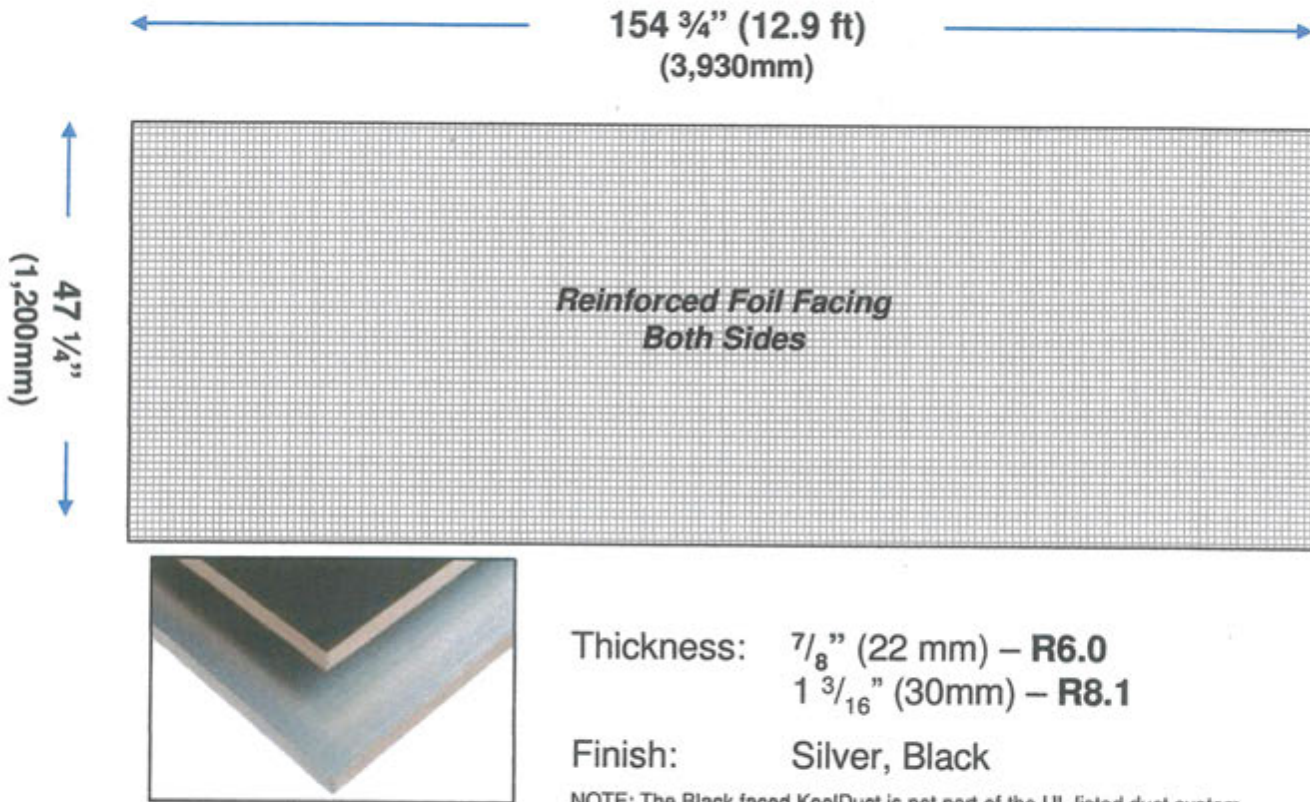
Dust is not normally a hazard unless mechanical cutting is used. In this case, where dust is generated in confined spaces it is recommended that extraction be used. As with all cutting procedures, it is recommended that eye protection and disposable dust mask be worn when appropriate.

When non-mechanical cutting is carried out and the product is cut with a trimming knife, minimise the generation of dust by disposing of the excess material and keeping the place tidy.

We recommend to observe the precautions on the **Material Safety Data Sheet** of the KoolDuct panel, adhesive and silicone.

The Kingspan KoolDuct® System

KoolDuct® Panel Dimensions



NOTE: The Black faced KoolDuct is not part of the UL listed duct system

KoolDuct® System Application and Limitation

- Supply and Return air ductwork for heating, ventilation and air conditioning
- Fresh air intake ducts to plant
- Swimming Pools
- Non Ferrous Applications
- Outdoor applications, provided the specified external finish is applied
- Class 0 or 1 air ducts UL 181 Listed are permitted as vertical ducts serving not more than two adjacent stories in height (per NFPA 90A and 90B)

KoolDuct® System Operational Limits

- Total pressure: -3 in w.g. to +4 in w.g. (-750 to +1000 Pascal max)
- Size: unlimited (as per design manual)
- Temperature: 176°F max (80°C) during continuous operation

Not Applicable

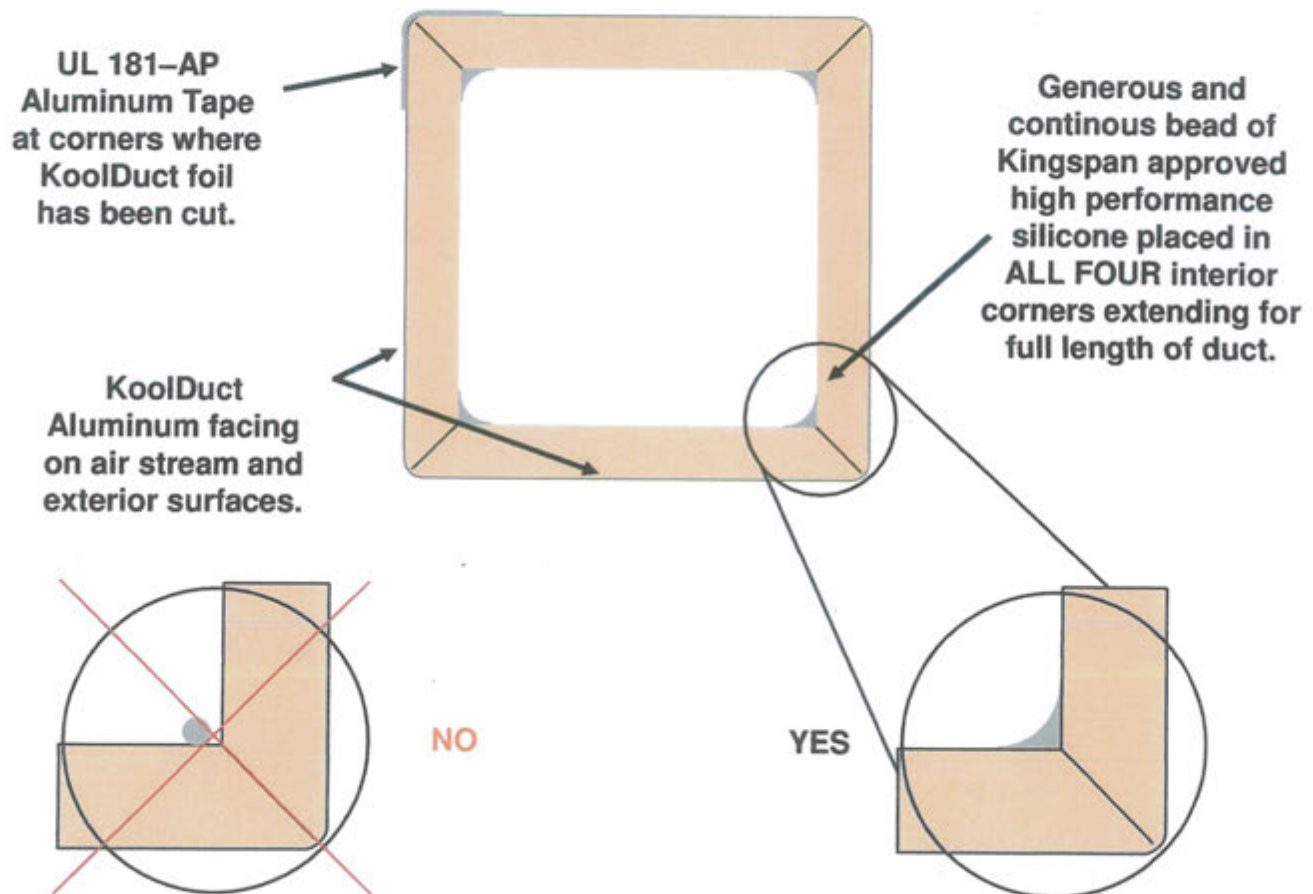
- Kitchen extract ducting
- Conveyance of solid particles
- Chemical or fume exhaust systems (Please check compatibility with KoolDuct)
- For use with extreme heat
- High Pressure systems above 4 in.w.g. (1000 Pascal)
- Outdoor use without additional protection

The Kingspan KoolDuct® System

Basic KoolDuct® Fabrication Procedure

- 1) **TRACING:** Trace the duct outline onto KoolDuct (duct fittings only).
- 2) **CUTTING:** Cut 90° v-grooves or 45° miters at corner locations.
- 3) **ASSEMBLY:**
 - Always apply **Adhesive** at longitudinal joints, unless **Tiger Closures** are used with small ducts, low pressure only.
 - If adhesive is used, wait until it is dry to the touch before folding edges into contact with each other. Use the stiff spatula.
 - Air stream facings are to be carefully aligned to ensure specified internal duct dimensions are achieved.
- 4) **TAPING:** Apply **UL 181-AP Aluminum Tape** at joint, where KoolDuct foil has been cut, using the soft spatula.
- 5) **CONNECTING:** Apply **Flange/Connectors/End cap** as required.
- 6) **REINFORCING:** Apply Reinforcement when required .
- 7) **SEALING:** All four inside corners are always sealed with a continuous bead of Kingspan approved high performance **Silicone sealant**.

KoolDuct® Section – End View



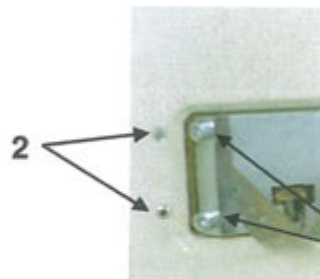
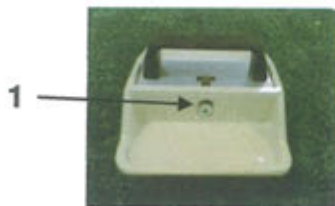
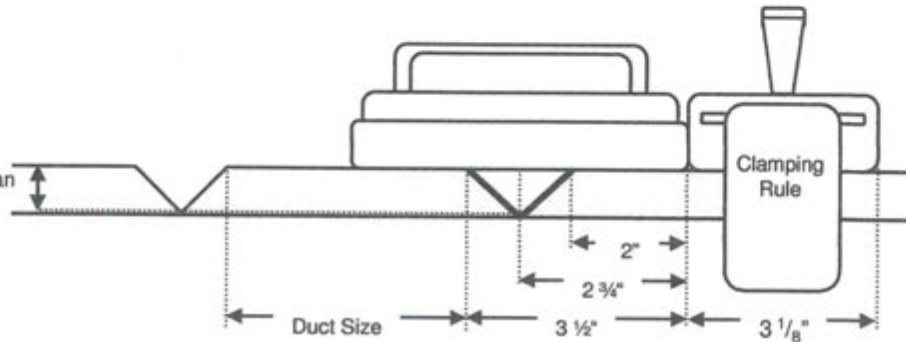
The Kingspan KoolDuct® System

Jack Planes for $\frac{7}{8}$ " (22 mm) Panels, R6

LKDA 511 - Jack Plane, two blades
Adjustable for varying thickness



Blades set $\frac{1}{32}$ " less than
Panel thickness



To Set the Cut Height:

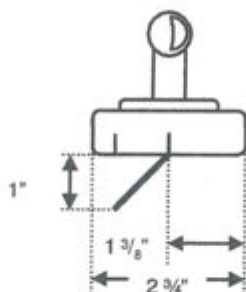
- A) Unloose big screw (1) on the back of Jack Plane
- B) Operate on smaller screws (2) at the bottom of Jack Plane
- C) Tighten big screw (1)

3 To Change Blades:

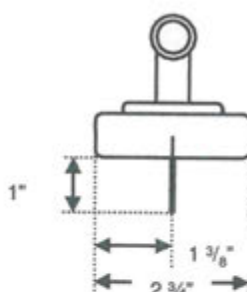
- D) Operate on stopping screws (3) at the bottom of Jack Plane

LKDA 513, 514, 515 - Small Jack Planes, one blade Cut R6 $\frac{7}{8}$ " thickness with Blade ref.741

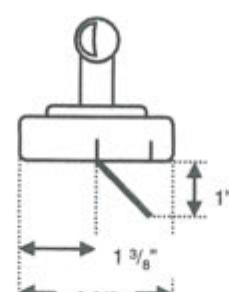
Ref.514 - Small Jack Plane
45 Degrees Left



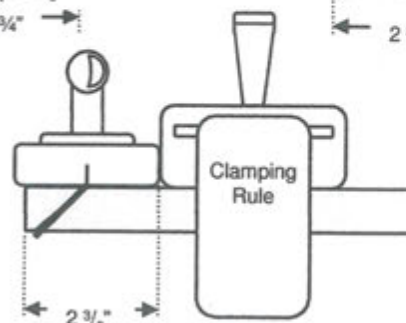
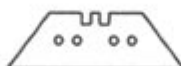
Ref.513 - Small Jack Plane
90 Degrees



Ref.515 - Small Jack Plane
45 Degrees Right



Ref.741 - Blade for R6 $\frac{7}{8}$ " Panel



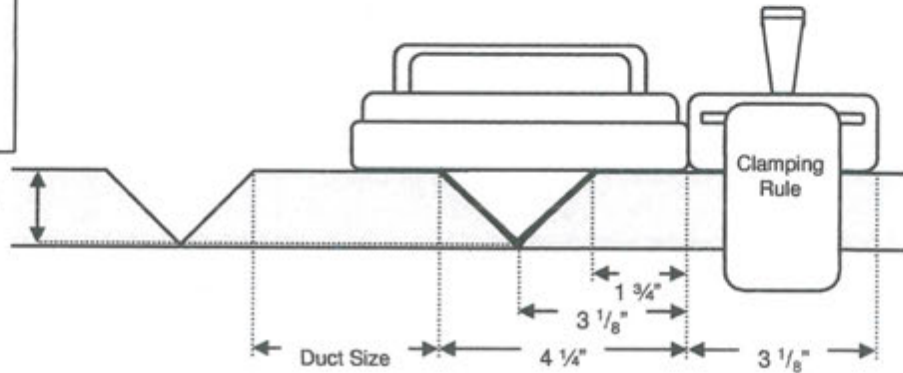
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Jack Planes for 1 $\frac{3}{16}$ " (30 mm) Panels, R8

Ref.516 - Jack Plane, two blades
Adjustable for varying thickness



Blades set $\frac{1}{32}$ " less than
Panel thickness

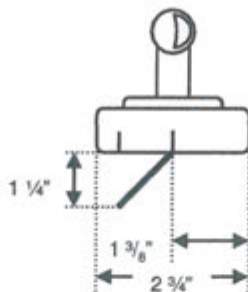


To set Cut Height:
Turn Knob

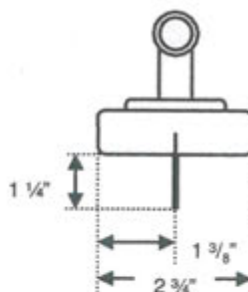
To Change Blades:
Operate on stopping
screws at the bottom of
Jack Plane

Ref.513, 514, 515 - Small Jack Planes, one blade Cut R8 1 $\frac{3}{16}$ " thickness with Blade ref.744

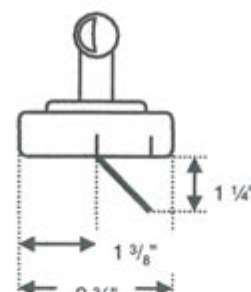
Ref.514 - Small Jack Plane
45 Degrees Left



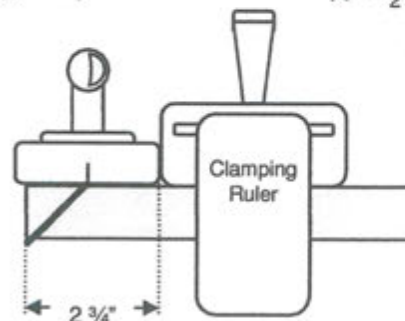
Ref.513 - Small Jack Plane
90 Degrees



Ref.515 - Small Jack Plane
45 Degrees Right



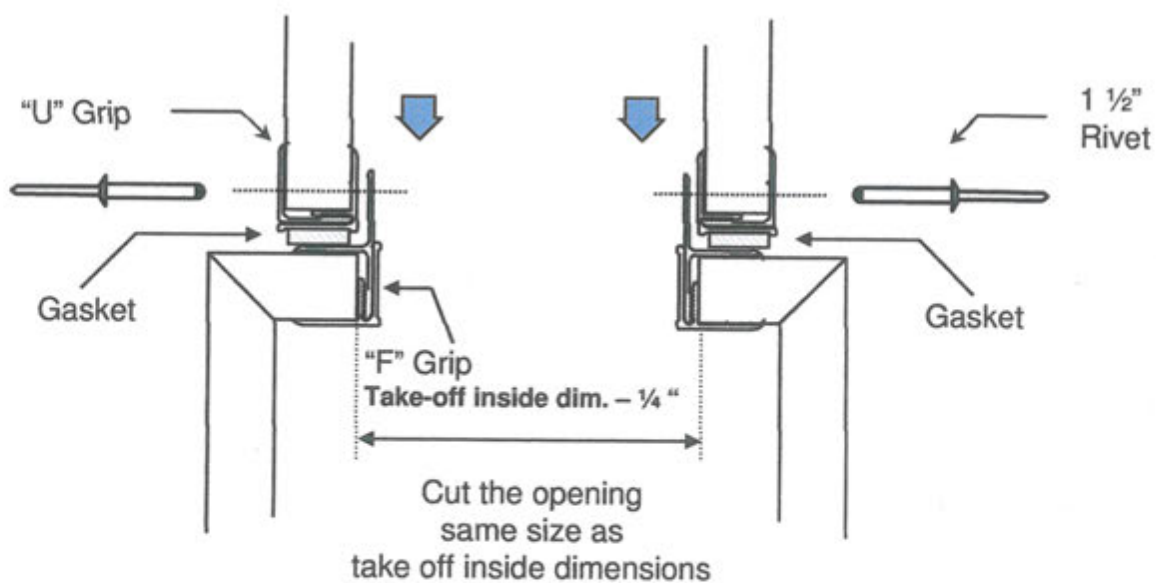
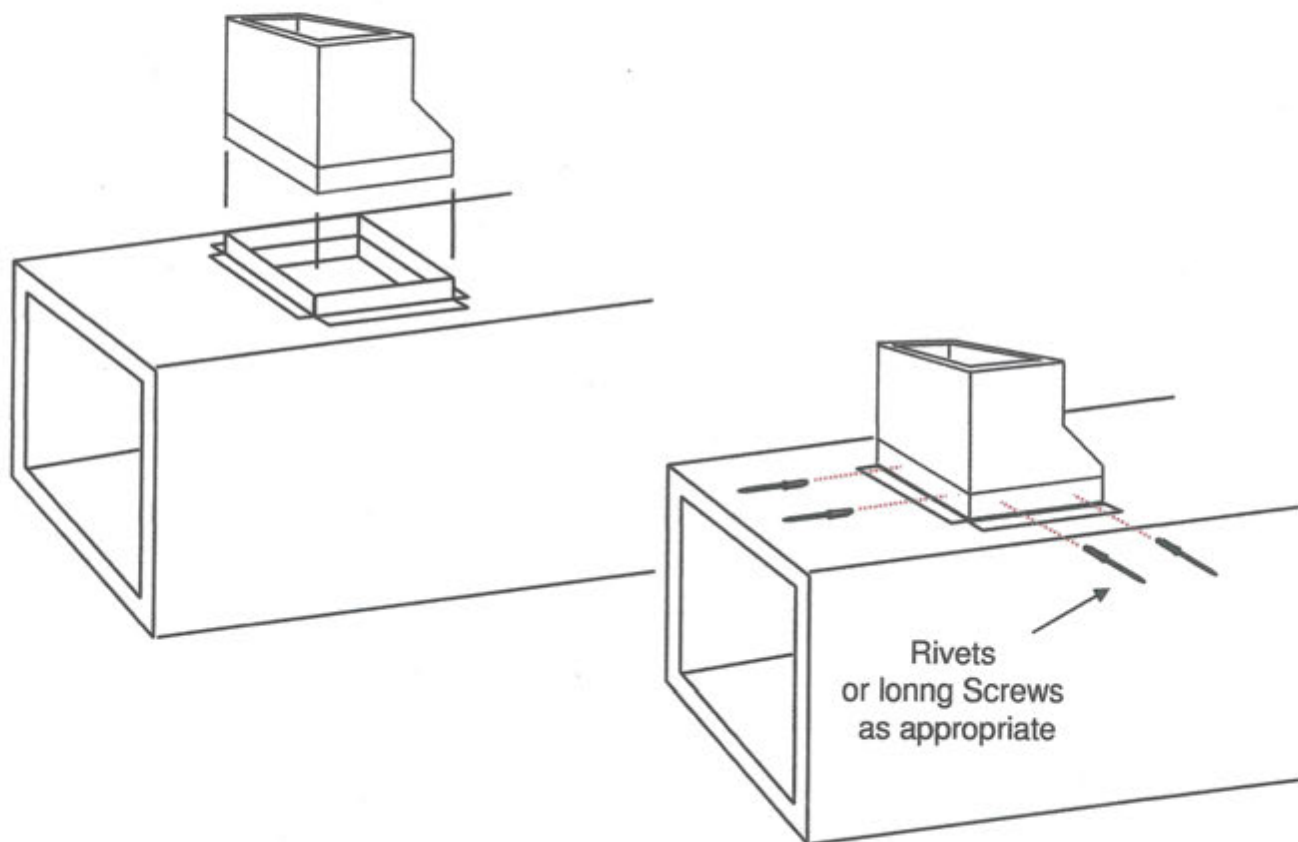
Ref.744 - Blade for R8 1 $\frac{3}{16}$ " Panel



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Take-Off – Flanged Connection

Duct side $\geq 24"$, and/or Medium Pressure ≥ 2 in.w.g and ≤ 4 in.w.g

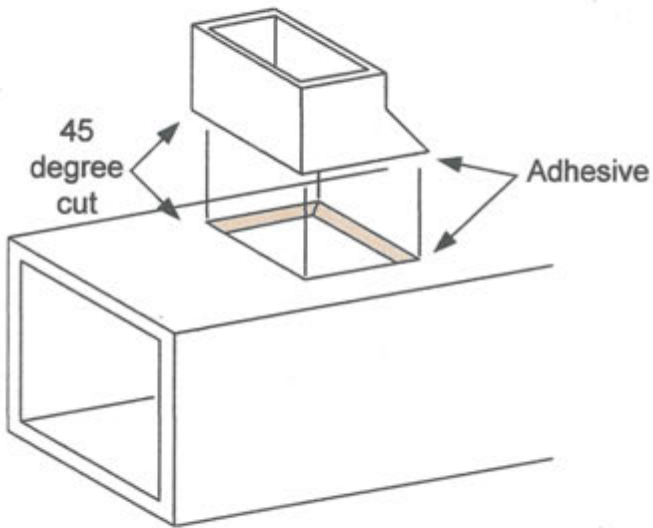


The Kingspan KoolDuct® System

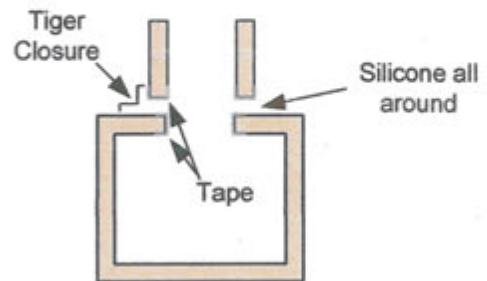
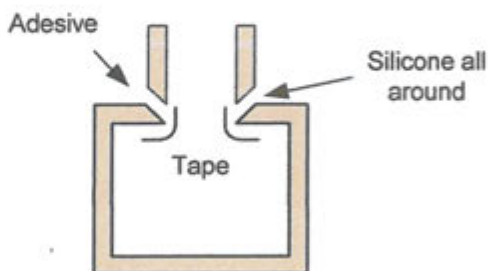
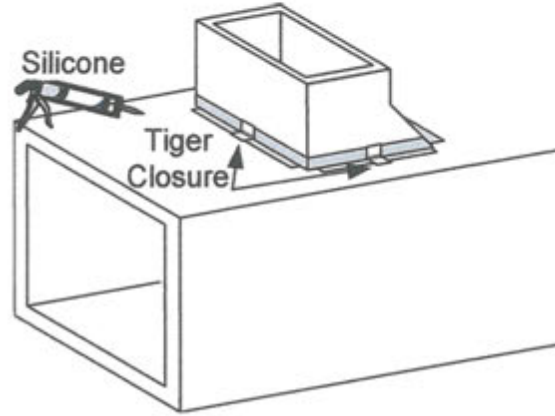
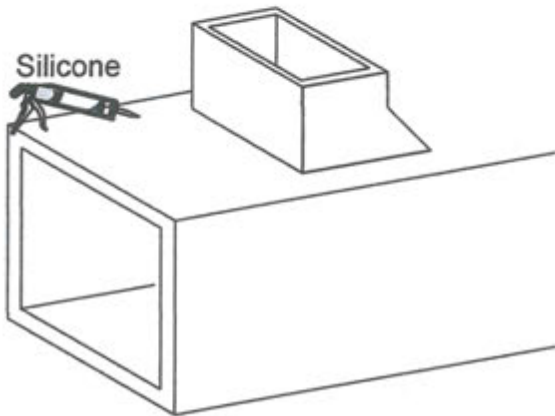
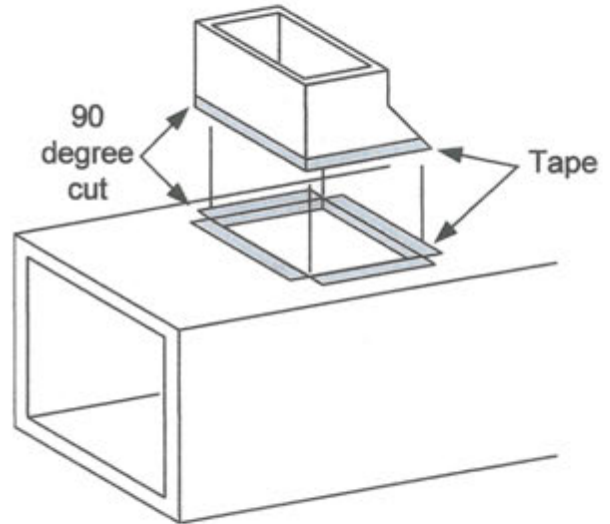
Small Take-Off – Un-flanged Connection

Duct side less than 24", and Low Pressure less than 2 in.w.g.

Option 1



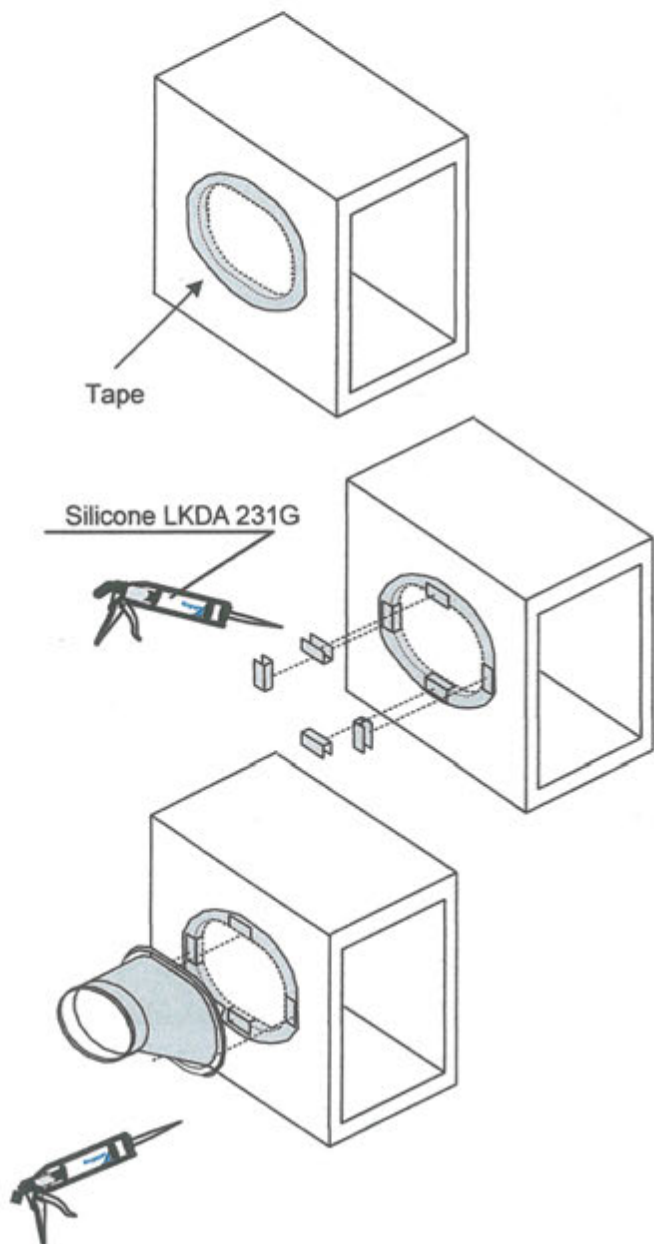
Option 2



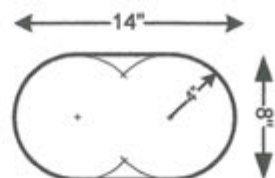
The Kingspan KoolDuct® System

Shoe Branch Fitting – Mechanical fixing

Mechanical Fix required for diam. larger than 300mm and/or Pressure > 500 Pascal

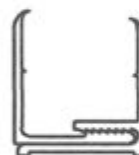
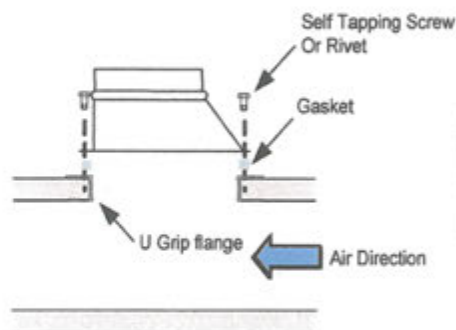


- 1) Cut a hole in the main duct to suit the internal dimensions of the metal shoe.



Example:

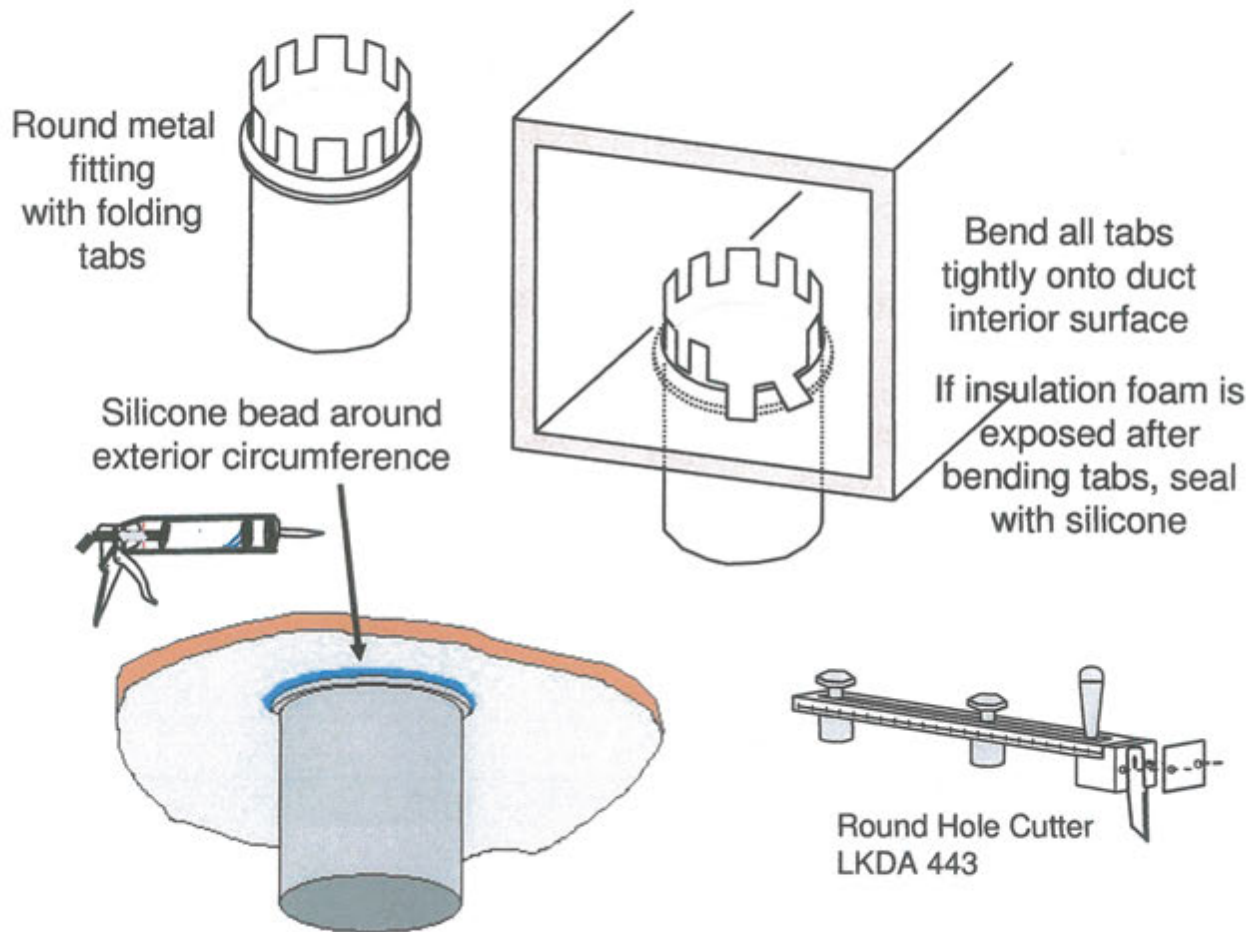
- 2) Cover insulation with **UL 181-AP** aluminum tape
- 3) Cut 4 pieces of U Grip Ref.311+315, 1 ½" long, and secure them inside the duct
- 4) Apply **gasket** to the bottom of the metal shoe
- 5) Secure the metal shoe fitting to the duct using rivets or screws as appropriate.
- 6) Seal with silicone around the fitting



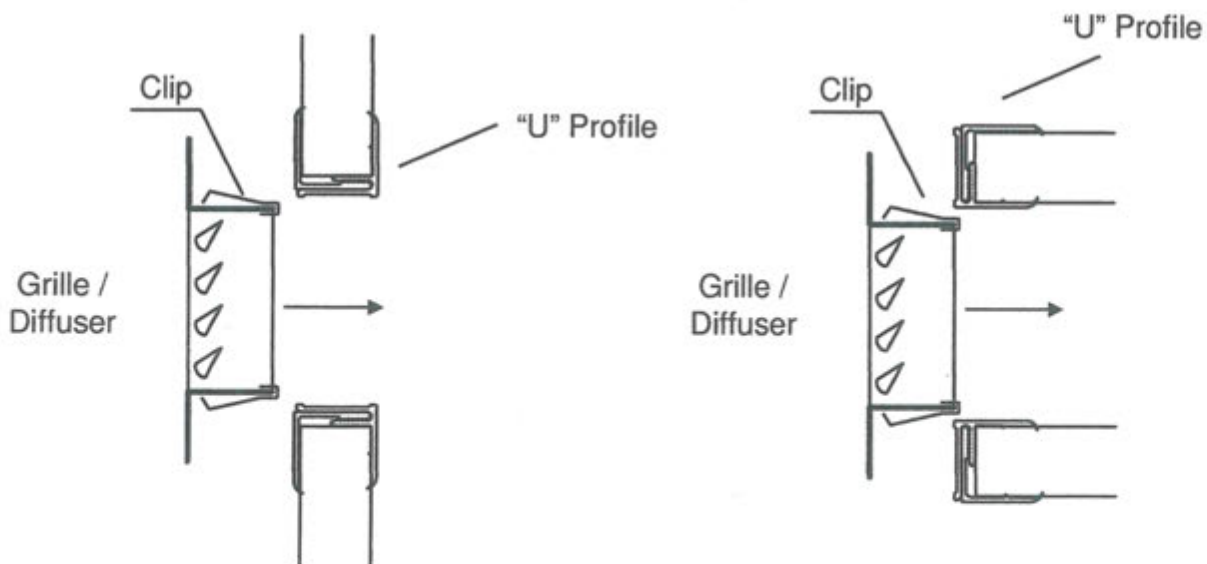
U Grip
Ref.311+315

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Round Fitting for Round Diffusers and Flexible Ducts



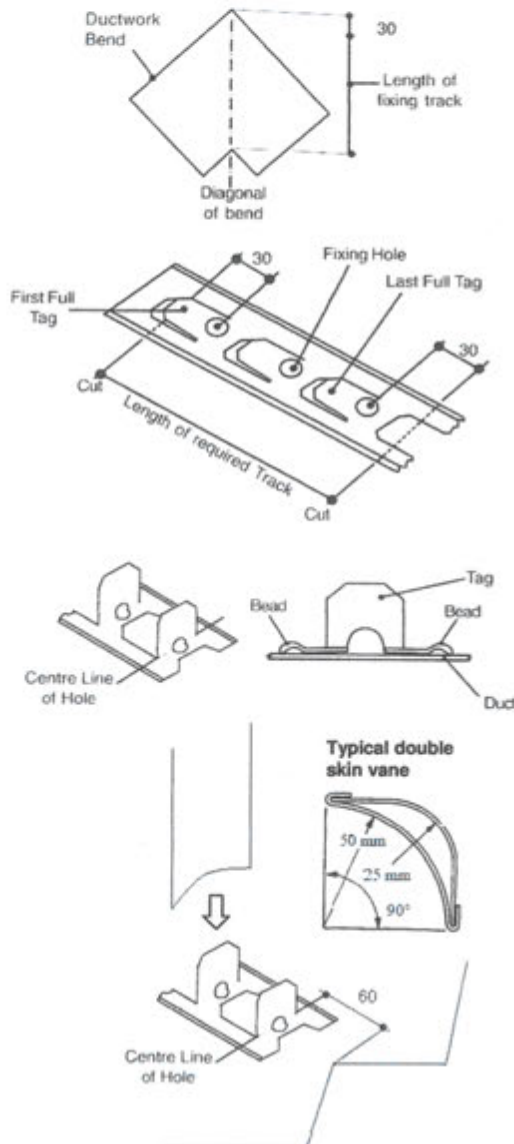
Grille / Diffuser Installation with Aluminum Profile



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Square Elbow With Turning Vanes

Turning Vanes required when either duct dimension greater than 8"



1) The elbow top and bottom sides are cut in a 90° "L" shape

2) For the Turning Vane assembly, please follow the manufacturer recommendations.

3) Assembly Example:

- Measure the diagonal of the square elbow less 1 1/4" (30 mm): it will be the length of the fixing Track.

- Bend the tags 90 degrees on the fixing holes centre line, in the same direction as the bead of the Track.

- Push all the vanes onto one Track with the curve as shown in the picture.

- Beginning at one end, enter all the vanes onto the second Track.

- Using a mallet, tap the tags into the Vane until all the tags are fully entered

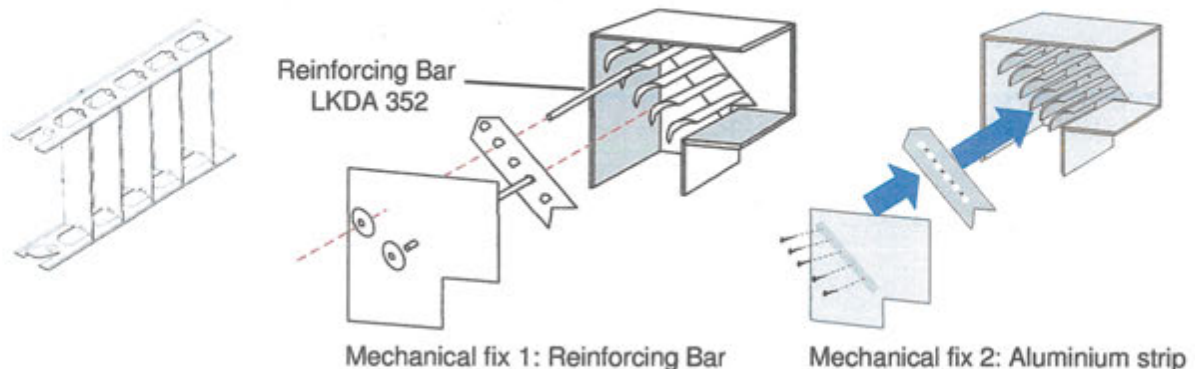
- Fit the completed turning vane assembly into the duct with the first turning vane set at 2 3/8" (60 mm) from the inside throat of the elbow

- Fix the Tracks on the square elbow using **silicone**

- Secure permanently the Turning Vane Track via Reinforcing Bars or aluminium strips positioned on the outer surface of the elbow

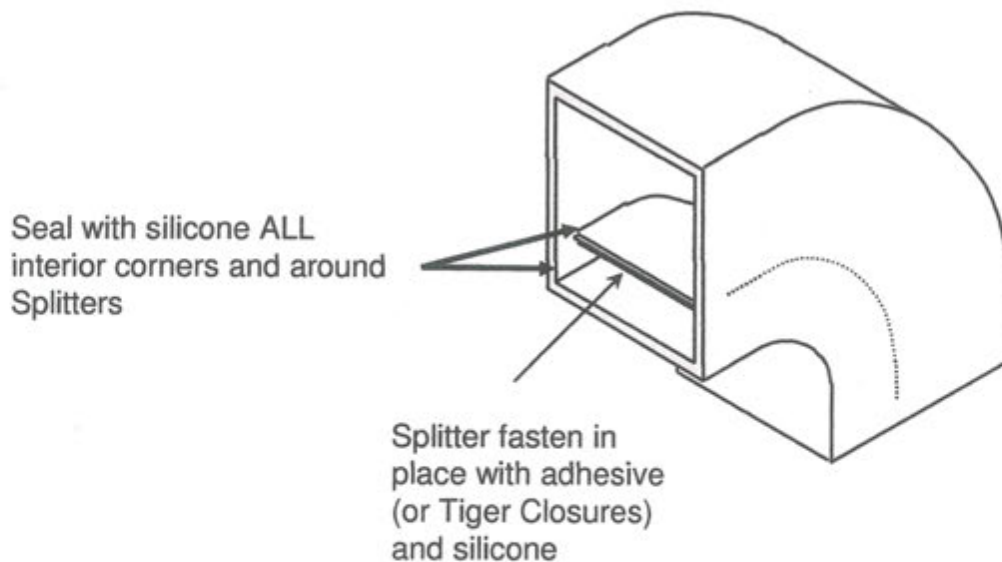
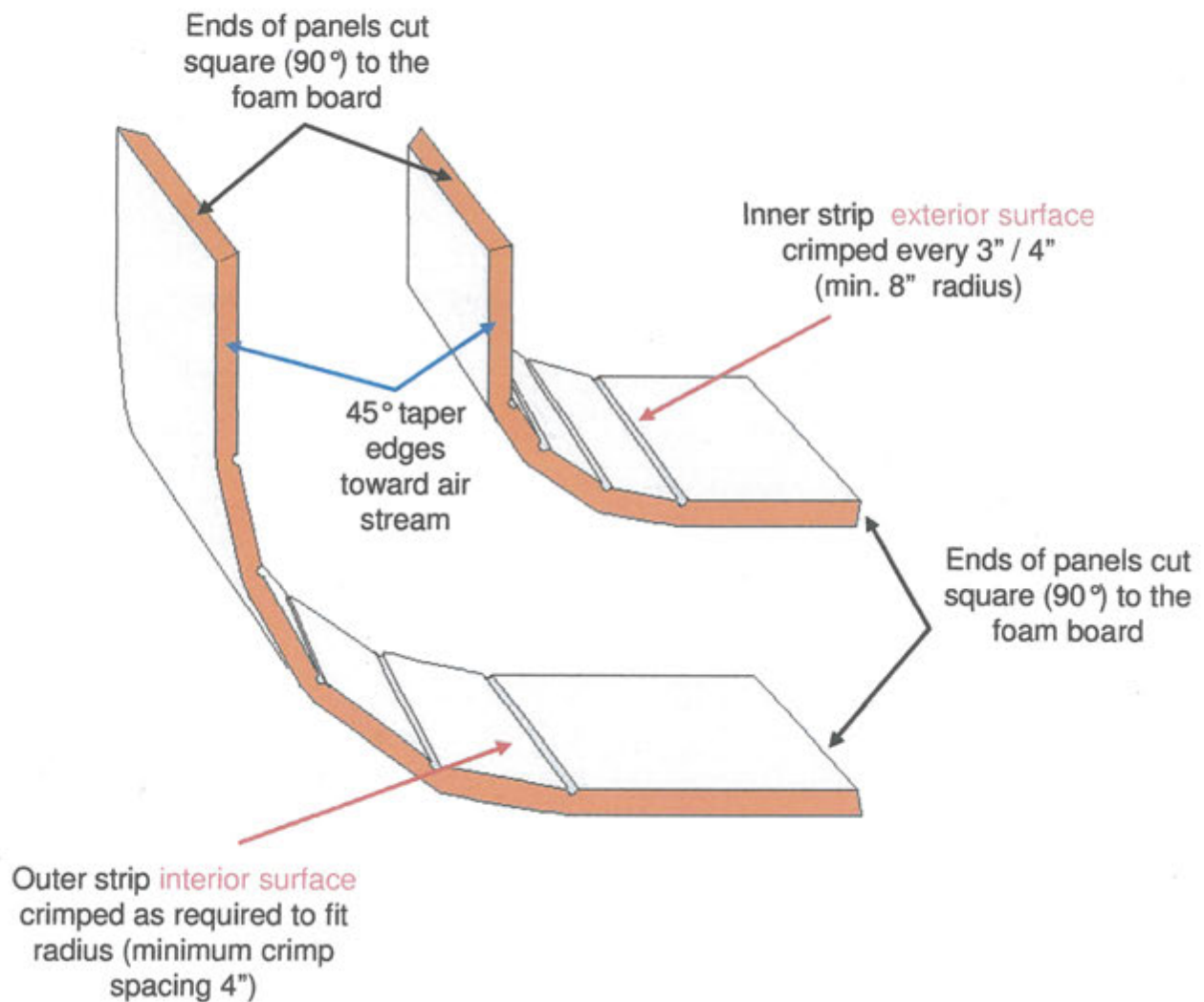
- Mechanical fix **NOT required** for duct size less than 24" and low pressure less than 2 in .w.g.

NOTE: **Minimum Bend Neck: 4"**



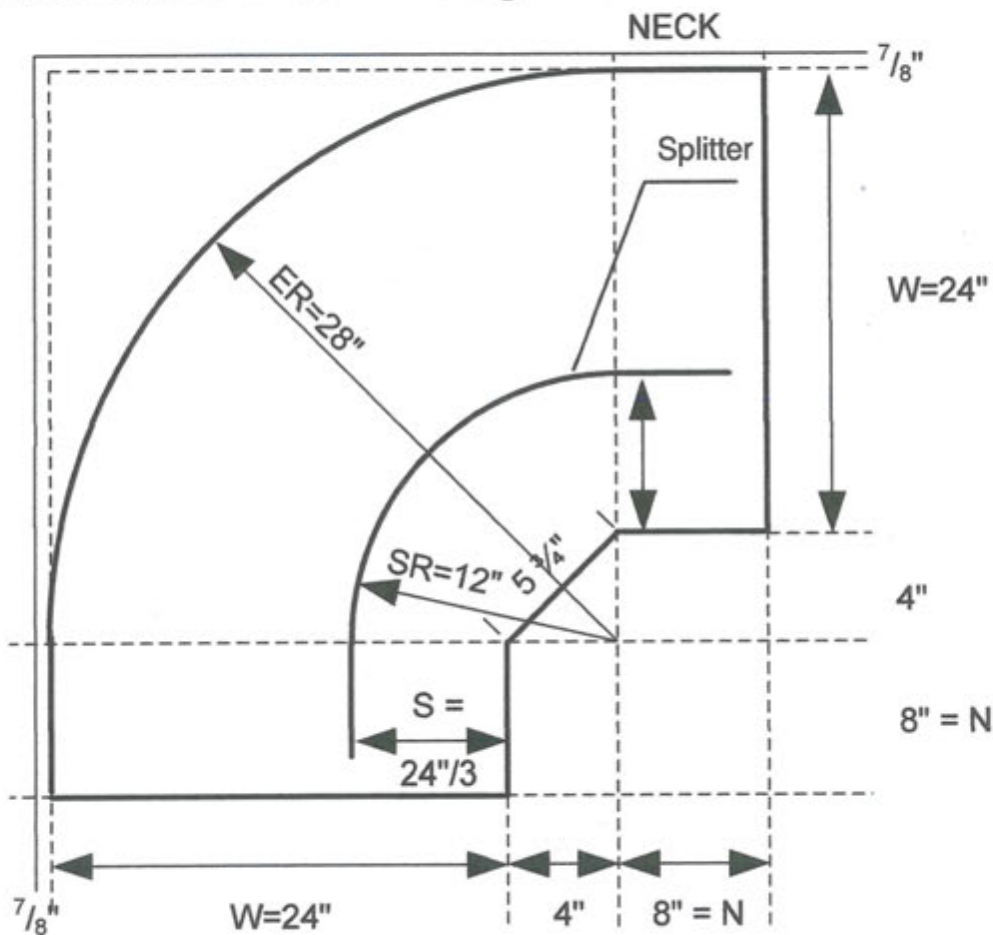
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Symmetric/Asymmetric Elbow - $7/8"$ (22mm), R6



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Elbow, 45 Deg Throat, Radius Heel - $\frac{7}{8}$ " (22mm), R6 Alternative Elbow Design*



* NOTE:
The total pressure losses for this elbow would need to be compared to the losses for the elbow it is replacing.

SPLITTER

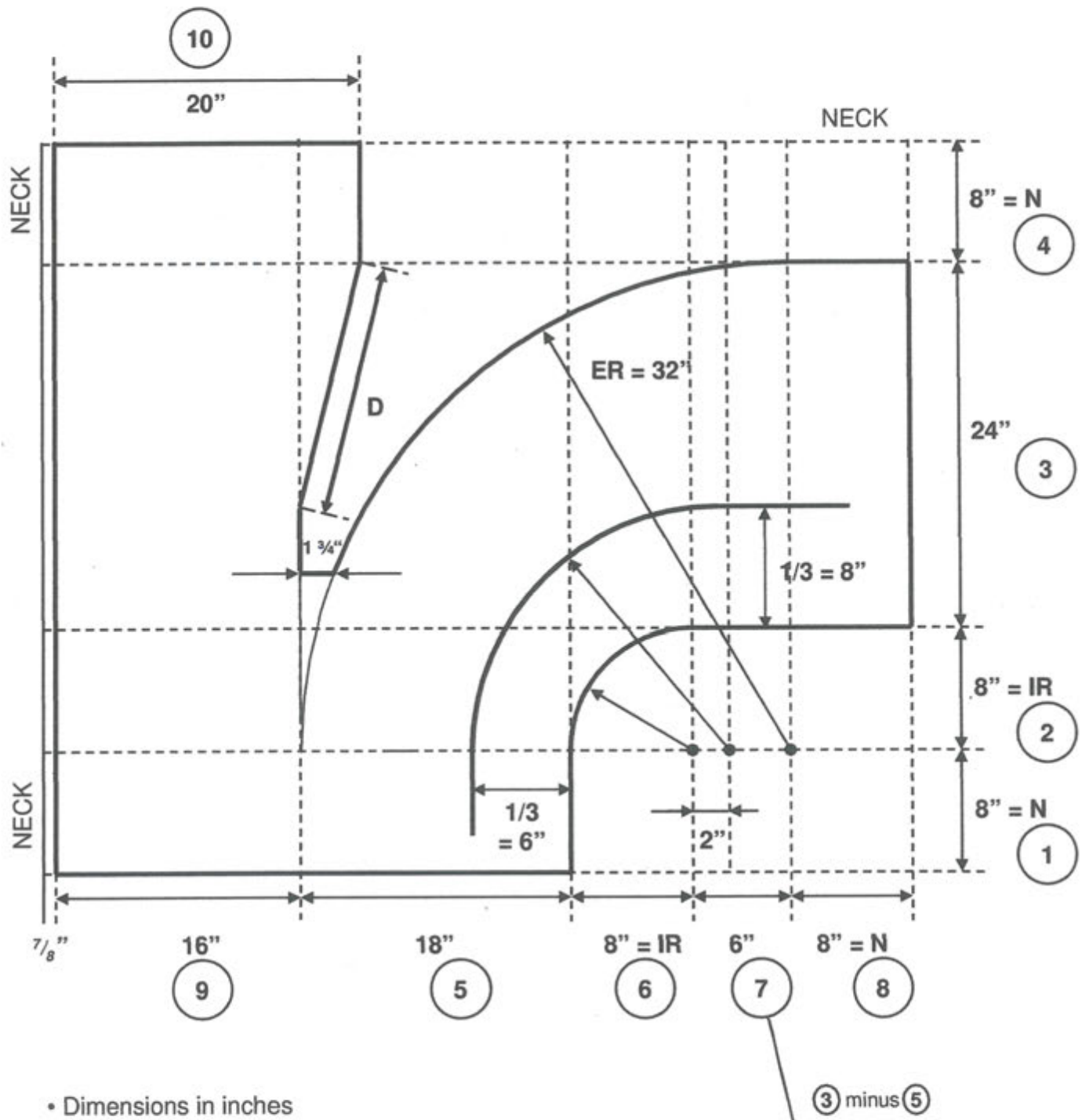
Elbow side (mm)	Splitters	Position
0 – 20"	0	-
20" – 32"	1	W/3
32" – 64"	2	W/4 W/2
Over 64"	3	W/8 W/3 W/2

Splitter not required in angles less than 45°.

SMACNA vane selection is also acceptable

The Kingspan KoolDuct® System

Dynamic Branch - $\frac{7}{8}$ " (22mm), R6

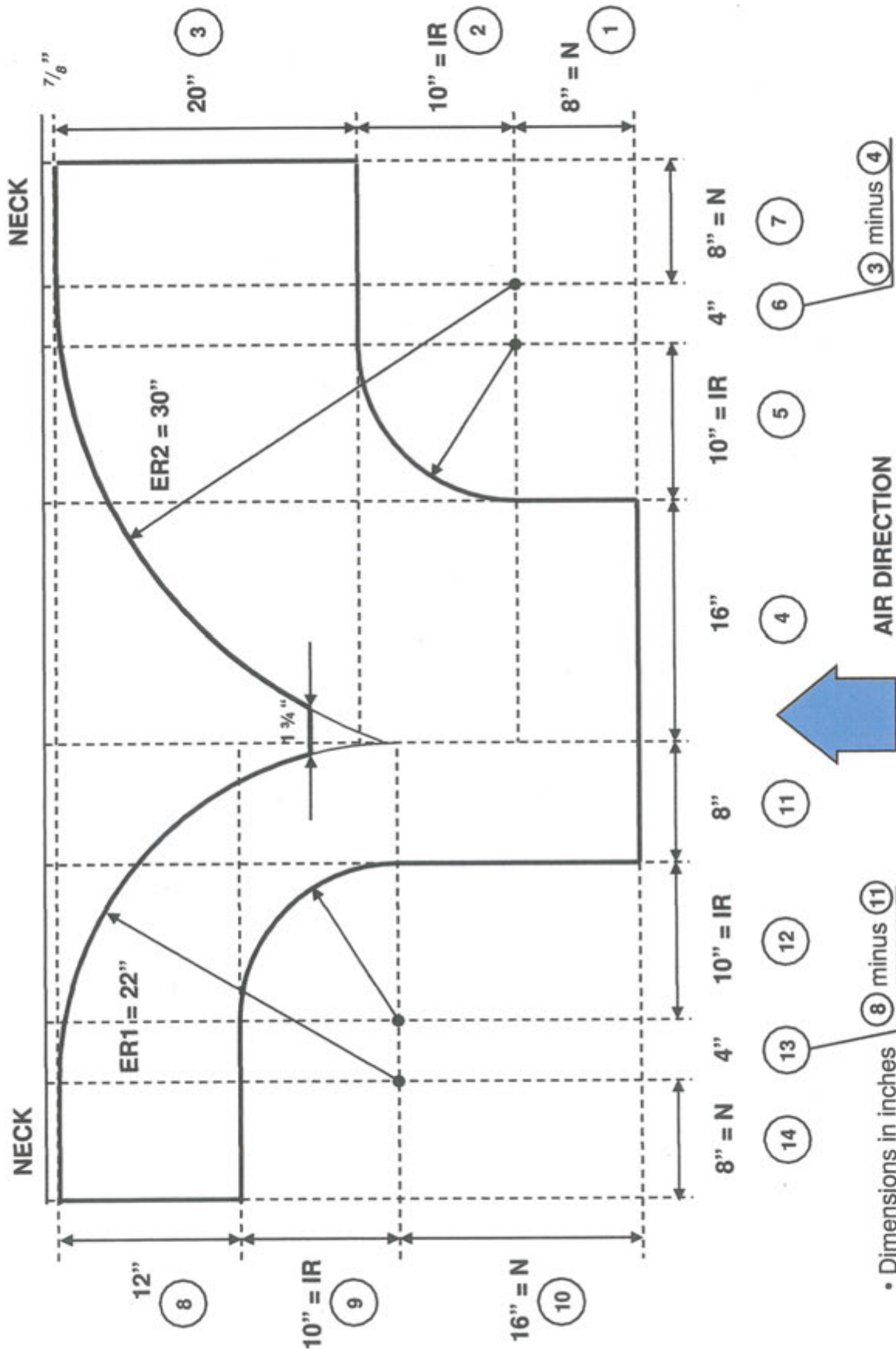


- Dimensions in inches
- Numbers in the hoop show suggested tracing procedure
- D suggested = $4 \times (20'' - 16'') = 16''$; D minimum = $2.5 \times (20'' - 16'') = 10''$

NOTE: Minimum Bend Radius: 8"
Minimum Neck: 4"

The Kingspan KoolDuct® System

Tee Branch (external sides flushed)



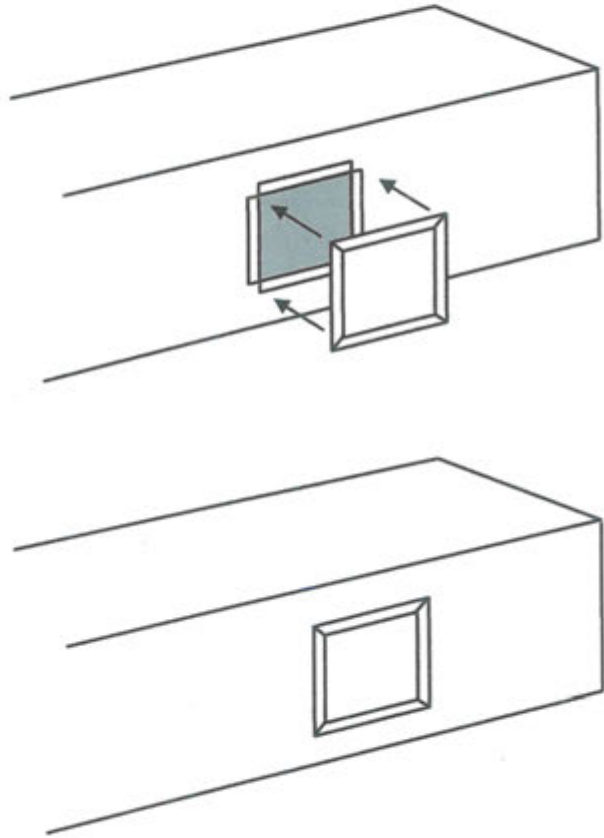
- Dimensions in inches
- Numbers in the hoop show suggested tracing procedure

NOTE: Minimum Bend Radius: 8"
Minimum Neck: 4"

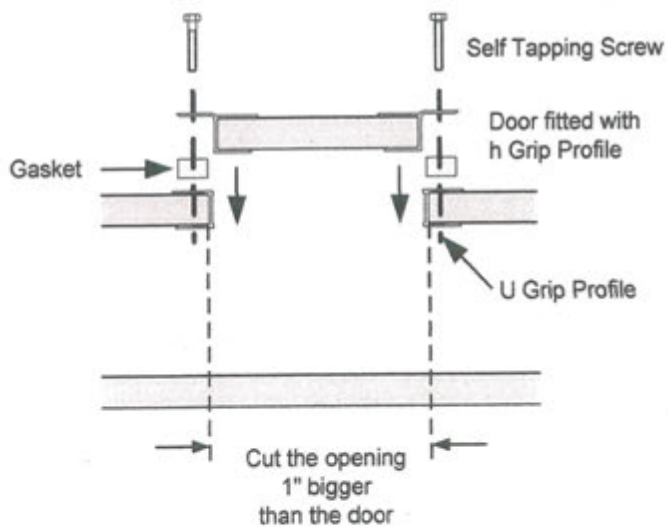
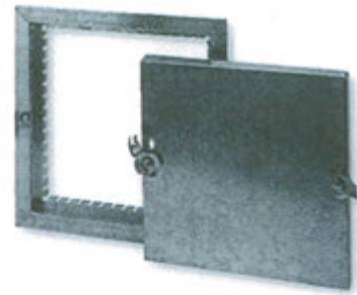
The Kingspan KoolDuct® System

Profiles for Inspection Doors

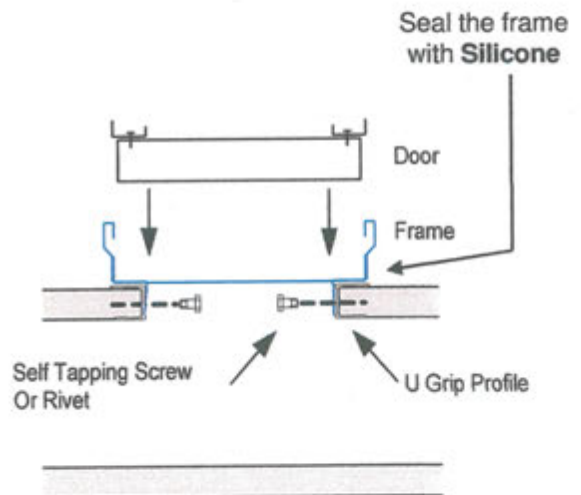
Option 1: KoolDuct door



Option 2: Pre fabricated door



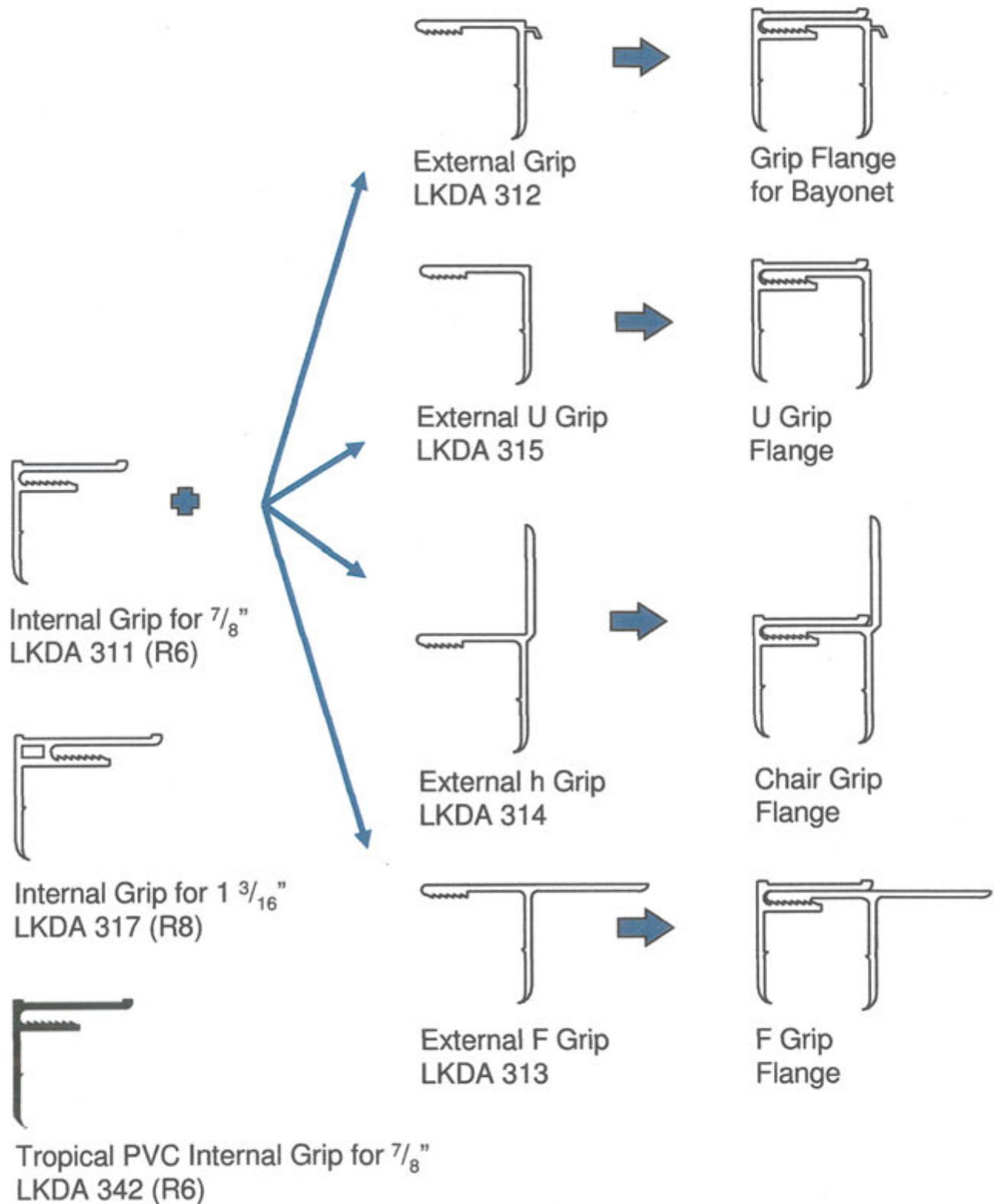
KoolDuct Door



Pre Fabricated Door

The Kingspan KoolDuct® System

Aluminum Grip Flange System

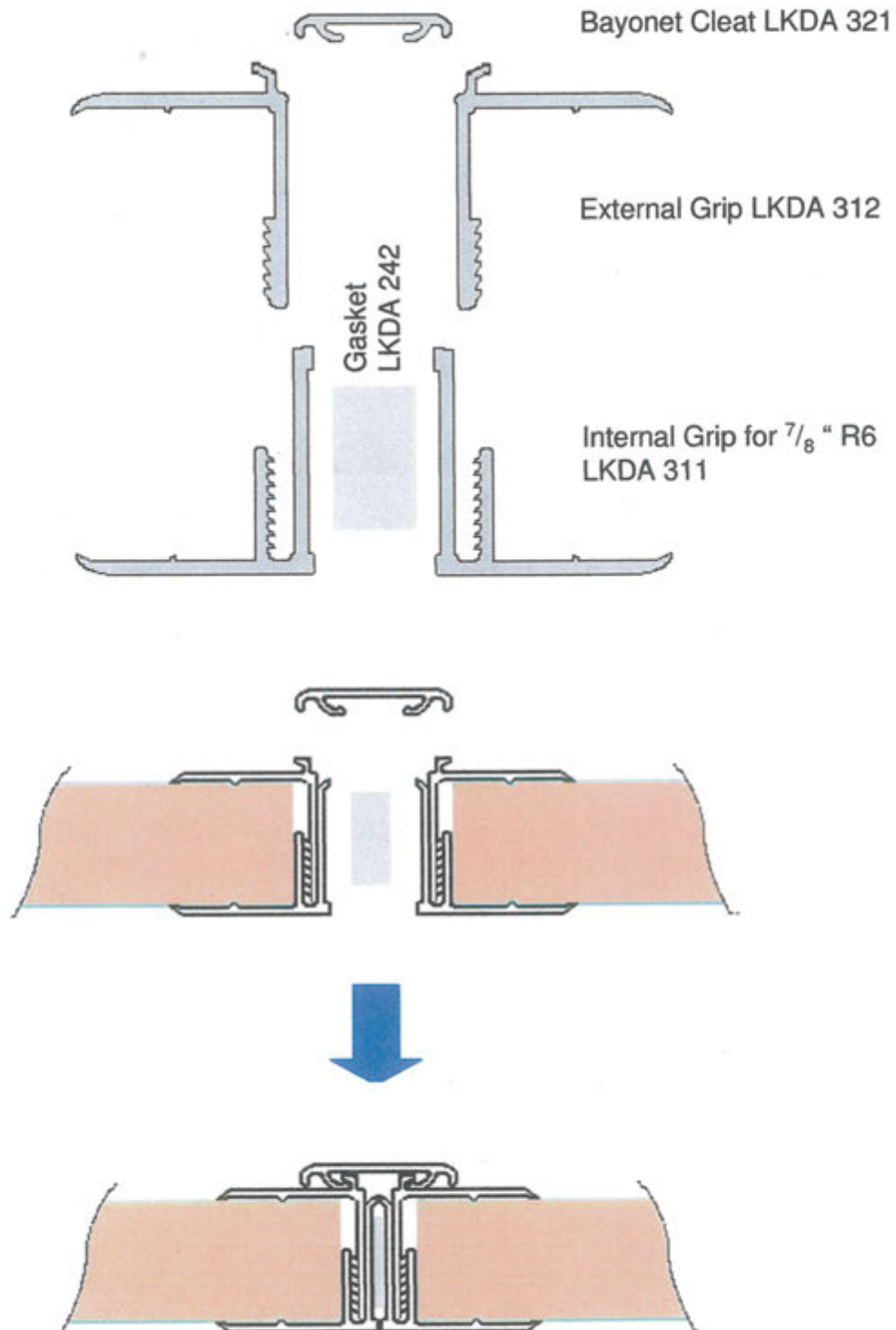


The Kingspan KoolDuct® System

Grip Flange System – $\frac{7}{8}$ " (22mm), R6

May be used with pressure up to 2 in.w.g. (or Tiger Connector when possible)

Must be used with static pressure > 2 in.w.g.

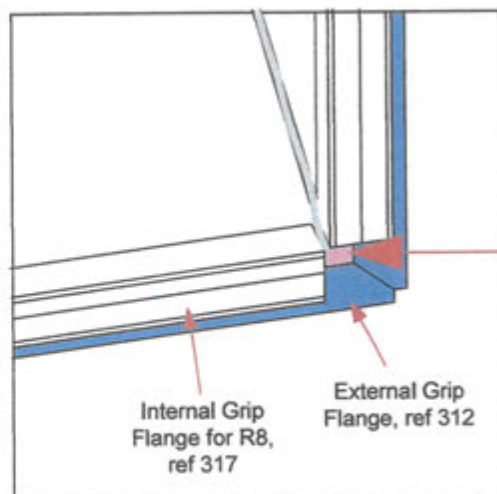
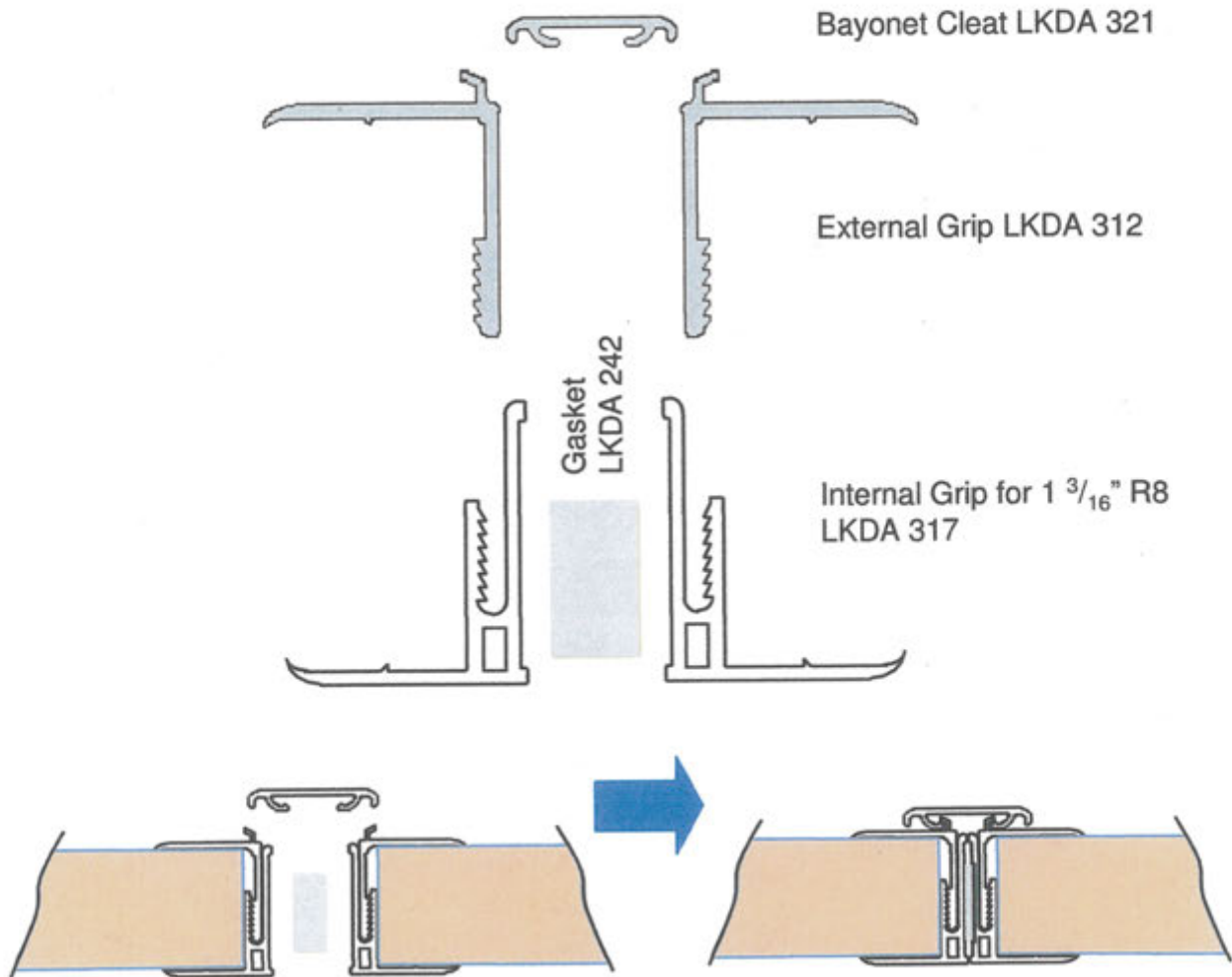


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Grip Flange System – 1 $\frac{3}{16}$ " (30 mm) R8

May be used with pressure up to 2 in.w.g. (or Tiger Connector when possible)

Must be used with static pressure > 2 in.w.g.



EXPOSED INSULATION

Prior to insertion of the R8 Grip flange, the ends of the duct section (or just the corners) should be covered with **Aluminum Tape** to seal the exposed insulation.

The Kingspan KoolDuct® System

Grip Flange Assembly

Features:

- Positive air-tight joint on panels of varying thickness (20 to 24 mm and 30 to 33 mm)
- No need of adhesive or rivets.
- Strengthen the ends of the duct
- Aerodynamic

External Grip Profile:

Mark notching points: see the **Appendix**

Each dimension mark represents the centre line of a "V" 90° cut.

Fold the external male flange section at each cut to form a rectangular shape.

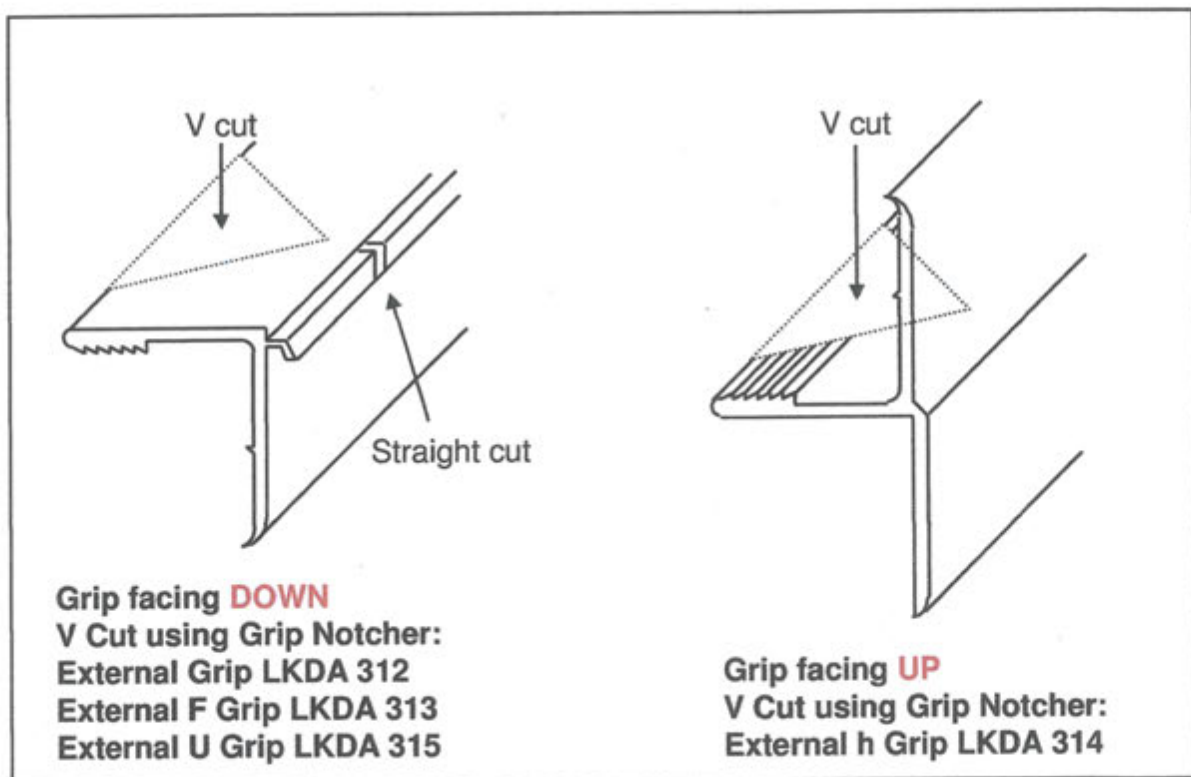
Internal Grip Profile:

A. Two sections of internal (female) flange are square cut to a dimension equal to the internal duct width less $\frac{1}{8}"$.

B. Two sections are square cut to a dimension equal to the internal duct height less $\frac{1}{8}"$.

Installation:

All internal Grip (female) pieces are applied with light pressure until the total flange assembly is formed. Only when one piece is properly engaged and correctly positioned, it should be forced into the final locking grip using a rubber mallet.




INSULATION

29th October 2012

Subject: **Steel 4-Bolt flange (USA – UL listed)**

TO WHOM IT MAY CONCERN

The proposed 4-bolt flange utilises special 4-bolt steel profiles and 4-bolt steel corners designed for the KoolDuct System, in conjunction with commercially available mechanical fixings (bolts and clamps/clips). The items supplied by Kingspan are illustrated below:

	380. 4-Bolt Flange for R6 (22mm)		258. 4-Bolt Flange Corner piece for R6 (22mm)
	383. 4-Bolt Flange for R8 (KS 30mm)		268. 4-Bolt Flange Corner piece for R8 (KS 30mm)

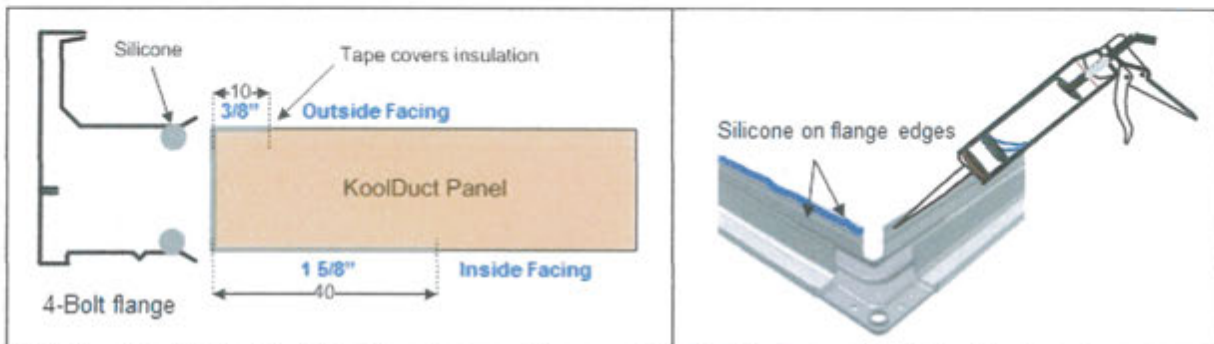
Fabrication details (for the R6 - 22mm version)

Prior to insertion of the 4-Bolt Flange, the ends of the duct section should be sealed with UL listed aluminium tape and then gently tapered with the black Rigid Spatula

The four pieces of 4-Bolt Flange are cut to the internal dimension of the corresponding side of the duct less 3/4" (19mm). Cut edges of the 4-Bolt flange should be treated to prevent corrosion (e.g. with zinc spray).

The 4-Bolt Flange uses pressed steel corners. First, the four pieces of flange and corners are assembled together to form a frame, then a bead of Kingspan approved high performance silicone is applied inside the flange, on both the internal edges of the flange.

Finally, the whole frame is fitted onto the edge of the duct.



NOTE: a 2" wide UL listed aluminium tape can be used instead of the conventional 3" wide tape, the purpose is to protect the insulation while fitting the 4-bolt flange.

After the flange has been fully attached, a strip of self-adhesive gasket should be applied. Note that it is only applied on one of the two duct sections being joined together.

Four bolts are used to join the two duct sections together. Additional fixing clamps/clips are required at approx. 3" (75 mm) from the corners, further clamps/clips are required along the flange so that the join is kept closed without gaps - maximum 12" (300mm) centres recommended.

Kind regards,



Roberto Bernabo'
Ducting Technical Manager (Overseas)

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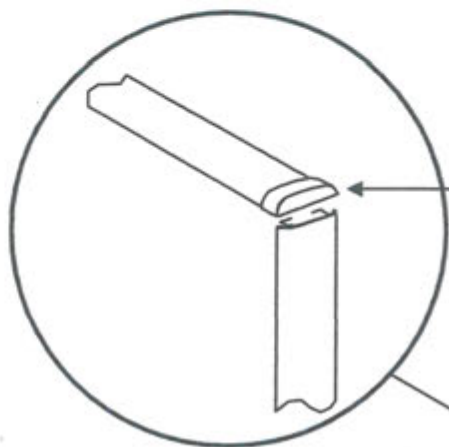
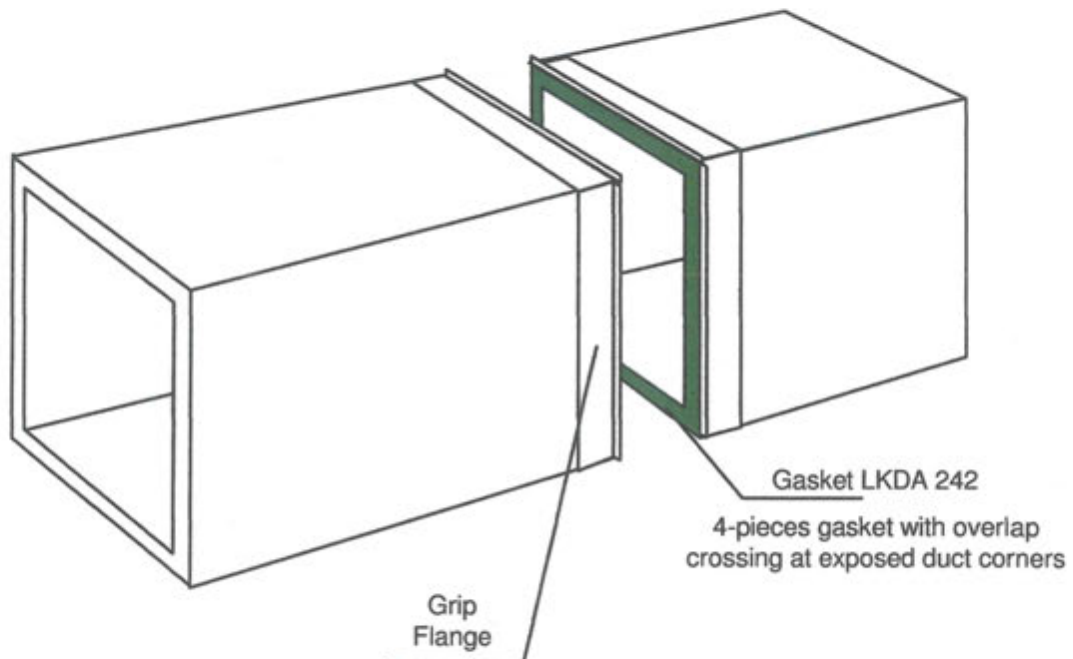
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Registered Office: Pembroke, Leominster
Herefordshire HR6 9LA, UK
VAT GB428602456

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Bayonet Installation

1

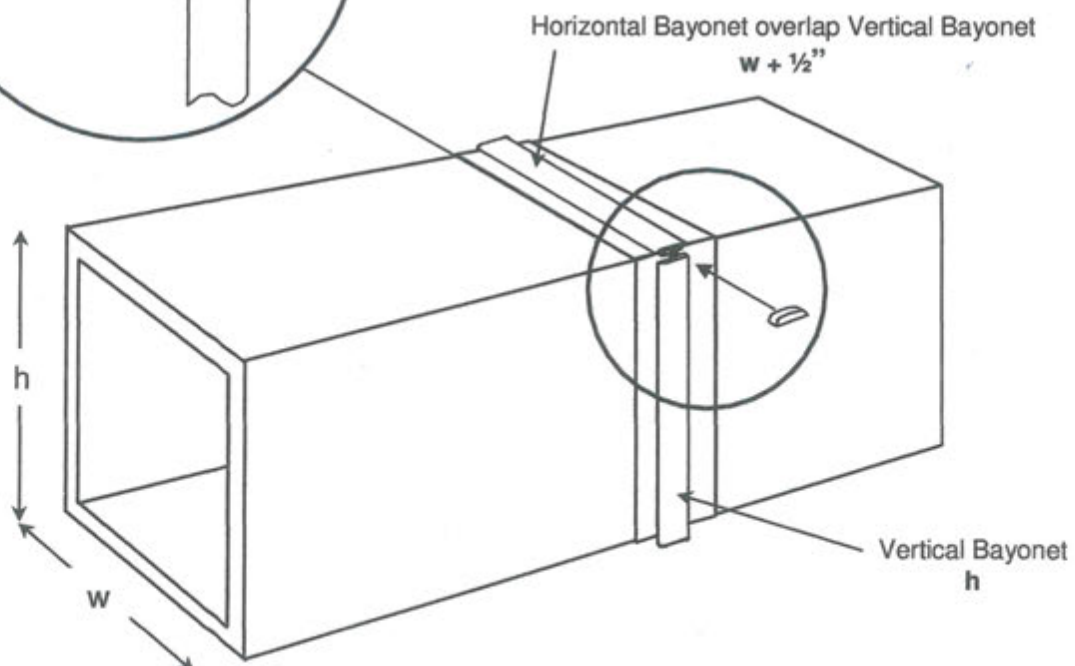


Nylon Cap LKDA 281 for visibly mounted installations (optional)



Note: Kool Clamp LKDA 453 and WD-40 can assist with Bayonet application.

2



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Tiger Connector – LKDA 361

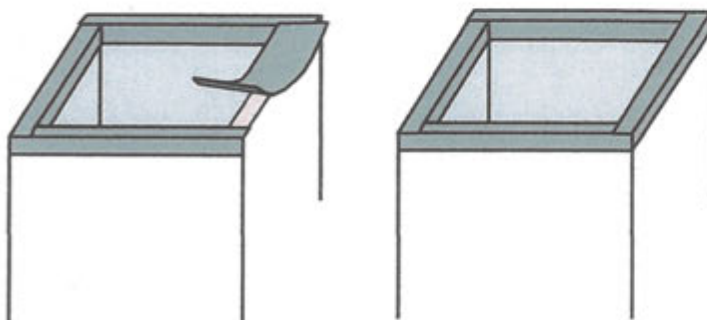
LIMITATIONS:

- Low Pressure applications only (below 2 in.w.g - 500 Pa)
- Max duct size 24"



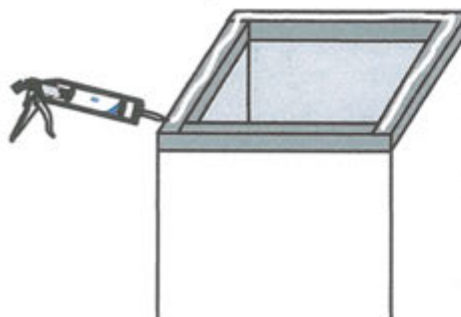
STEP 1

Both ends of the Koolduct duct must be flat and perfectly squared. Aluminum tape is applied on both ends of the duct segments.



STEP 2

Apply a continuous bead of Kingspan approved silicone to one end of one segment.

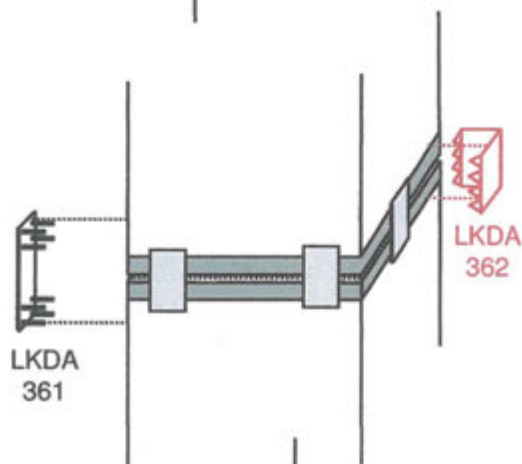


STEP 3

The two duct segments are joined together. **Tiger Closures (LKDA 362)** are placed on all four corners of the duct.

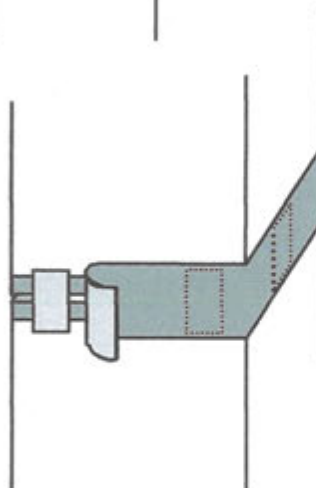
Tiger Connectors are placed on all four sides of the duct.

Int. Duct Width or Height	No. of Tiger Conn. per side
4" – 11"	1
12" – 24"	2



STEP 4

Apply aluminum tape around the connection of the two duct segments.



The Kingspan KoolDuct® System

“Invisible” Flange

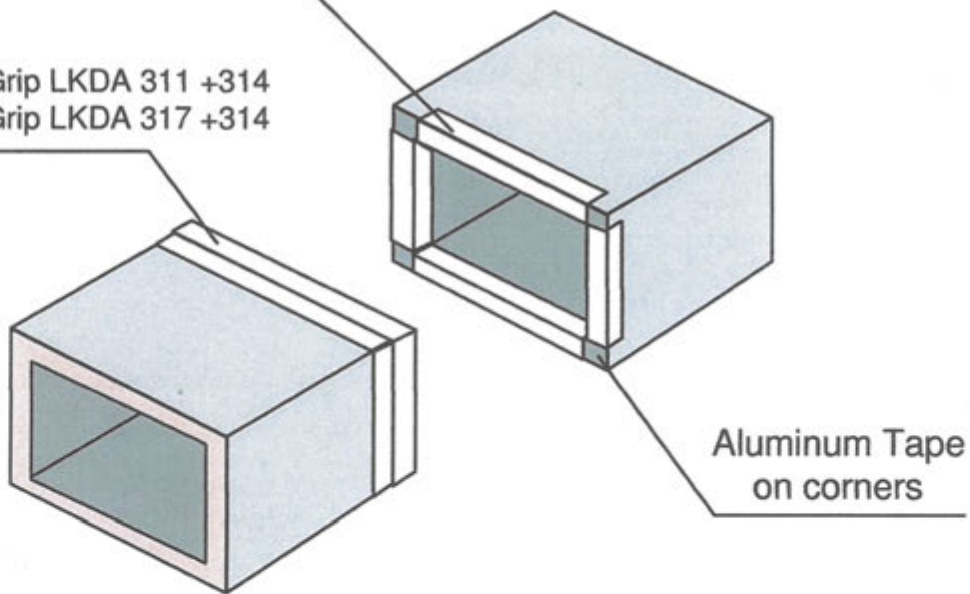
Alternative joint method to the grip flange with bayonet cleat, specially for limited access areas, where there is no space to slide the bayonet cleat

R6: “U” Grip LKDA.311 + 315

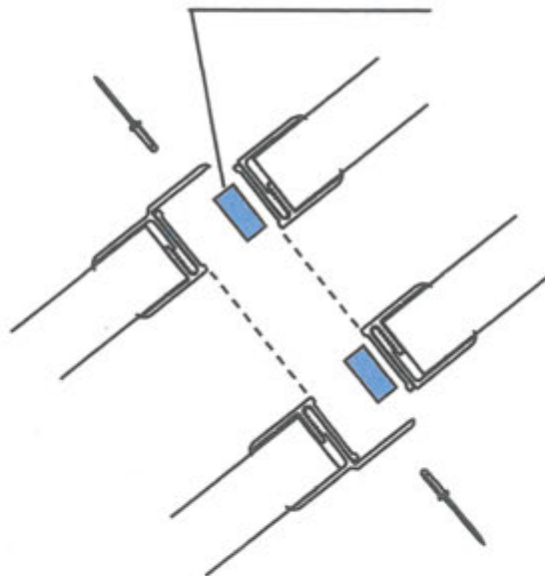
R8: “U” Grip LKDA 317 + 315

R6: “h” Grip LKDA 311 + 314

R8: “h” Grip LKDA 317 + 314

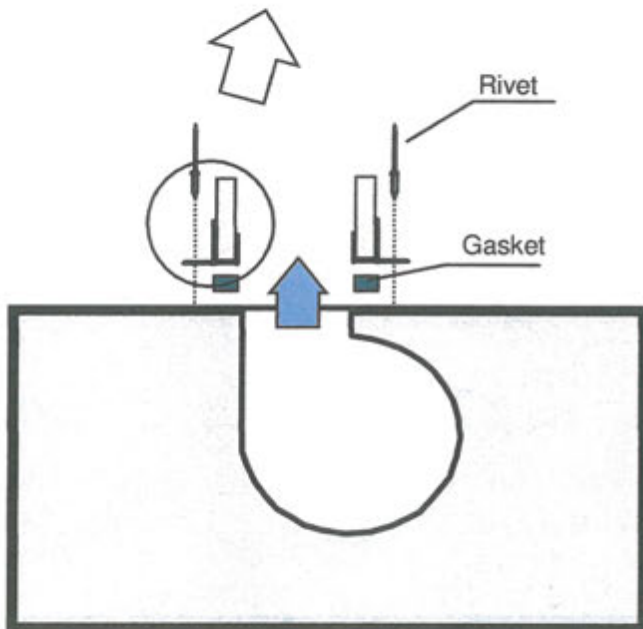
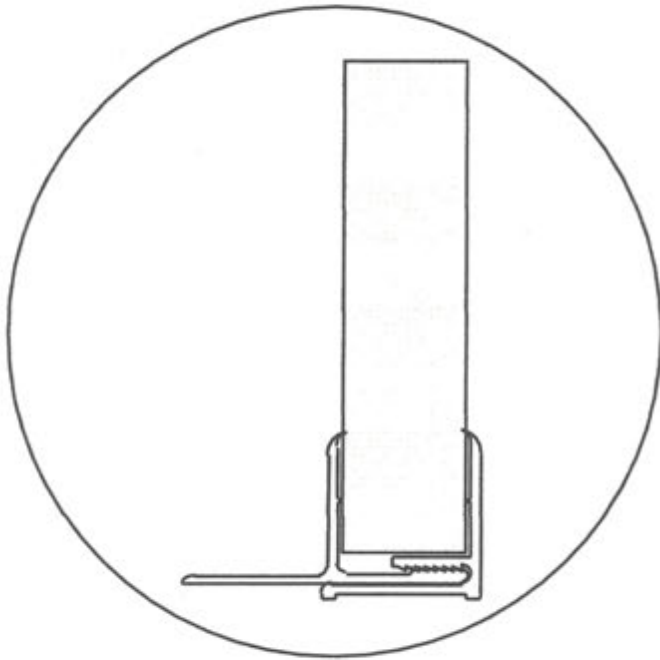


Gasket LKDA 242

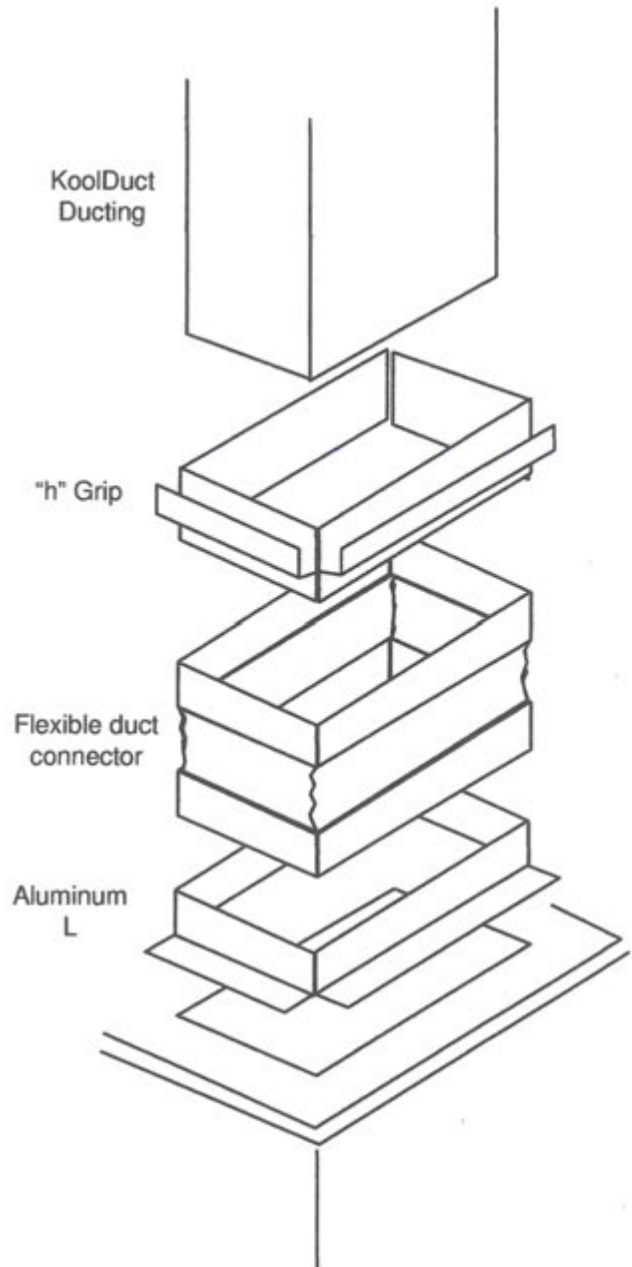


The Kingspan KoolDuct® System

Profile in Aluminum For Flush Connections To Machines



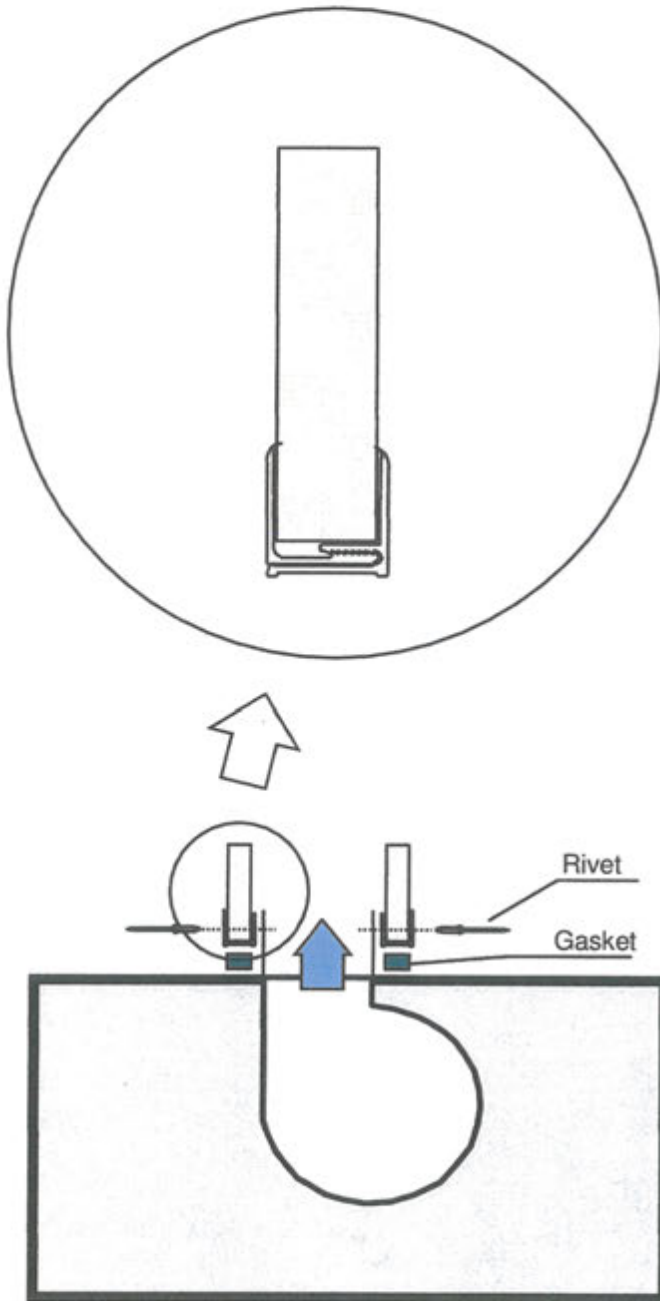
**direct connection
using "F" profile**



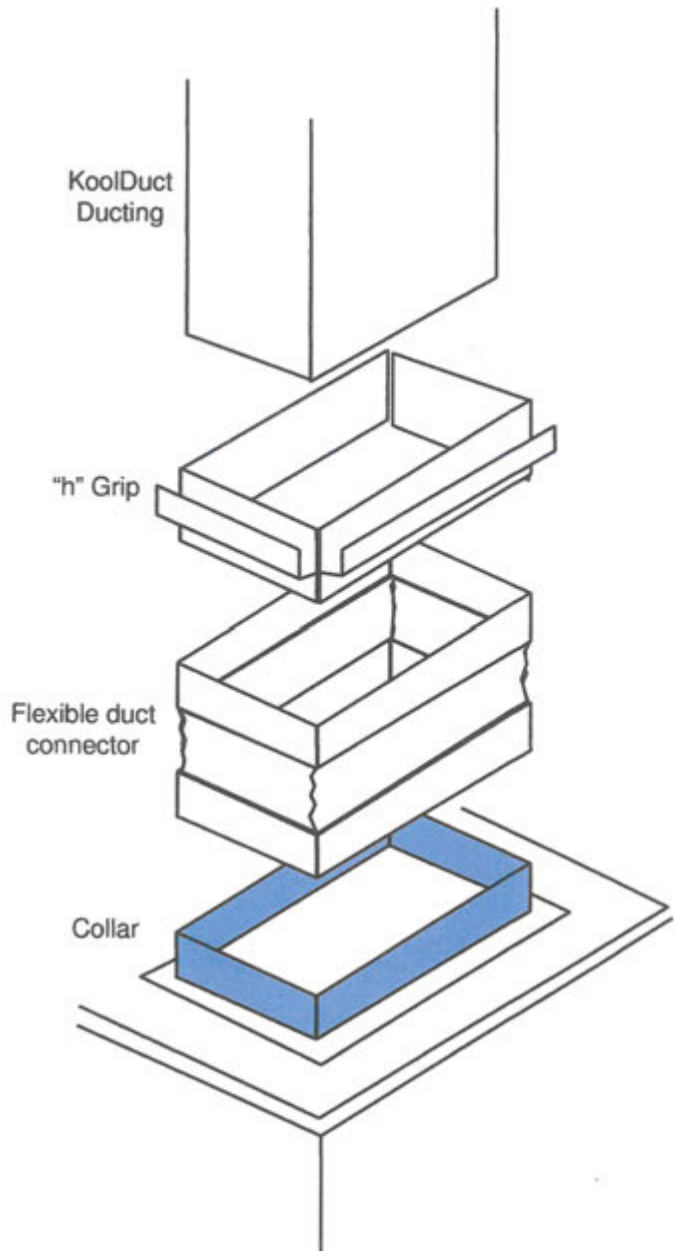
**with flexible duct
connector using
"h" profile**

The Kingspan KoolDuct® System

Profile in Aluminum For Connections To Machines With Collar



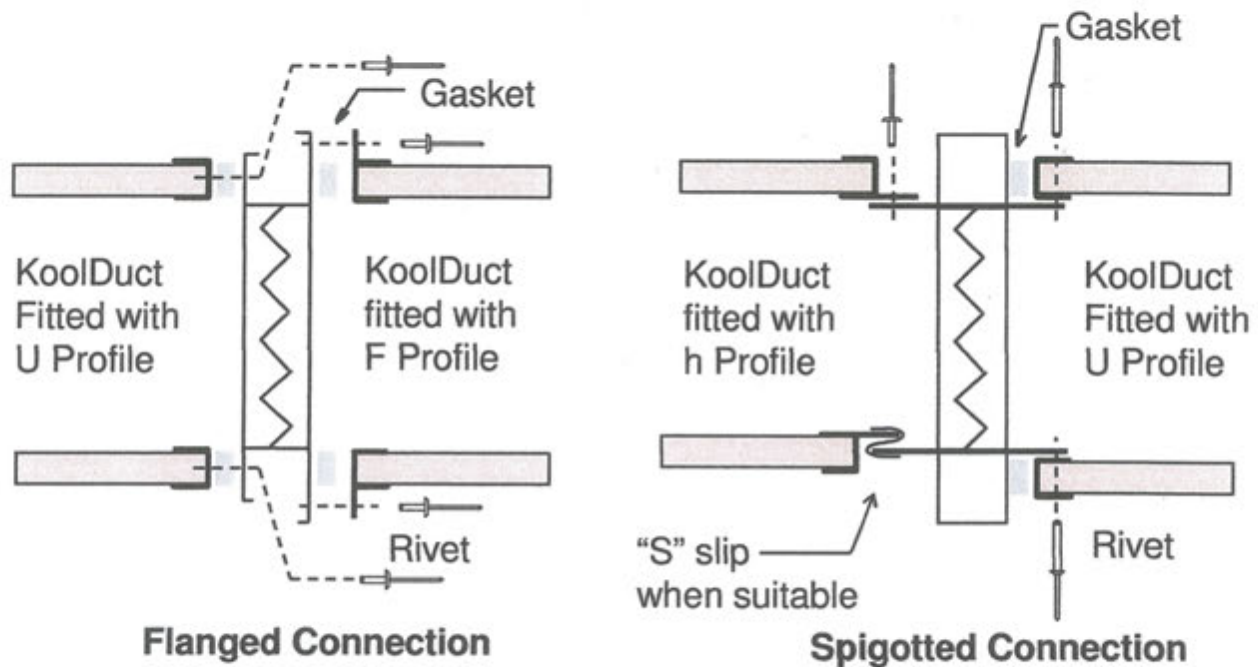
direct connection
using "U" profile



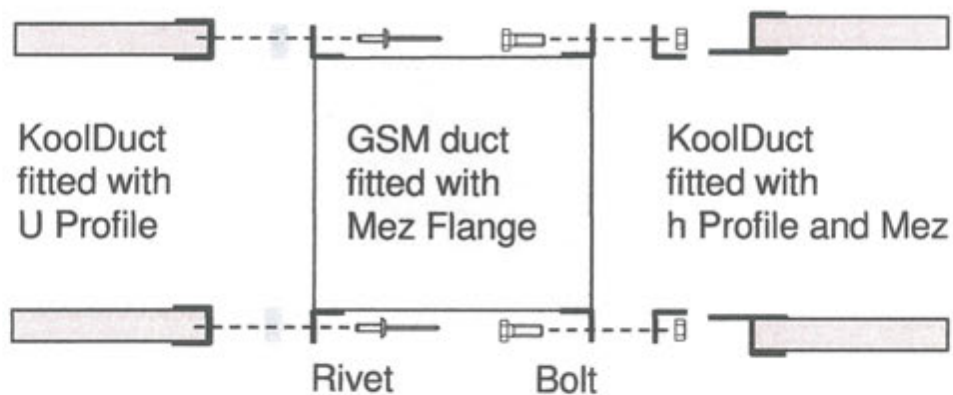
with flexible duct
connector using
"h" profile

The Kingspan KoolDuct® System

Connection To Duct System Components



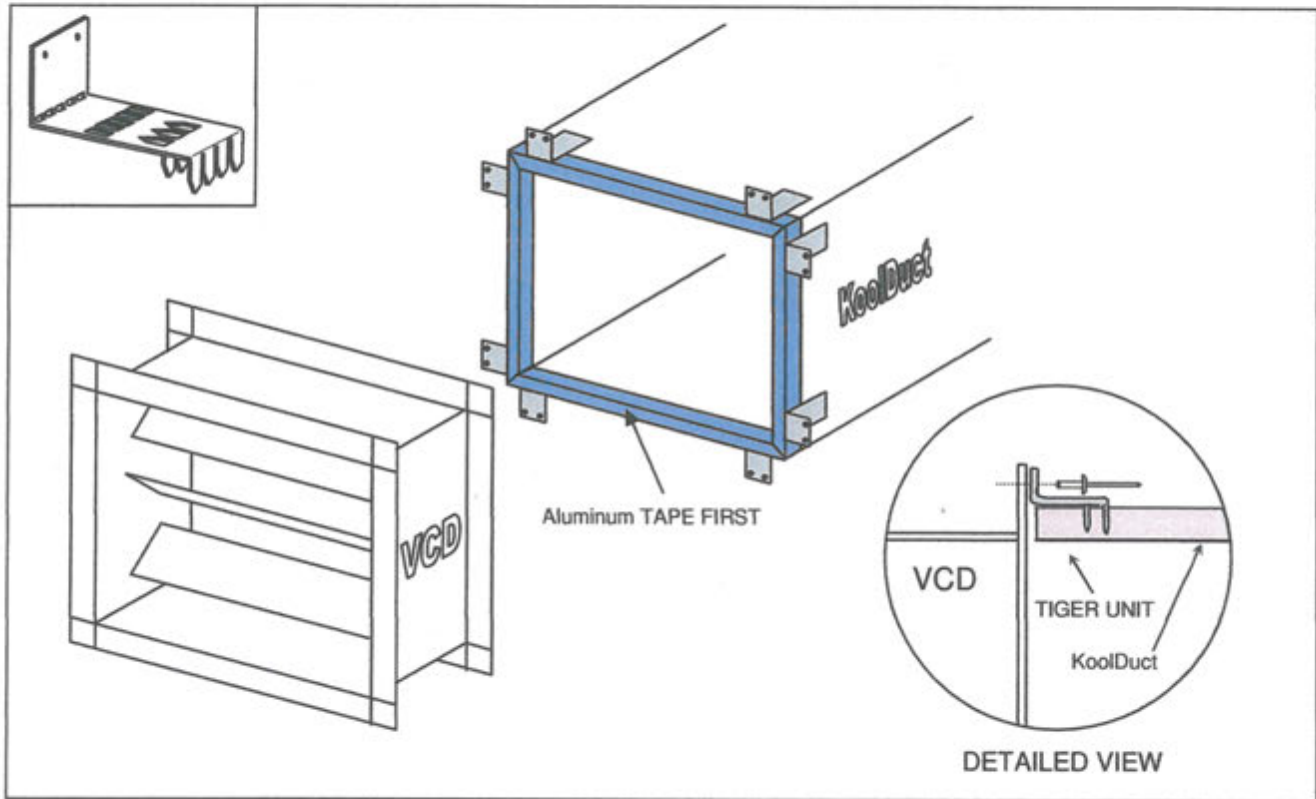
Connection To Sheet Metal Duct



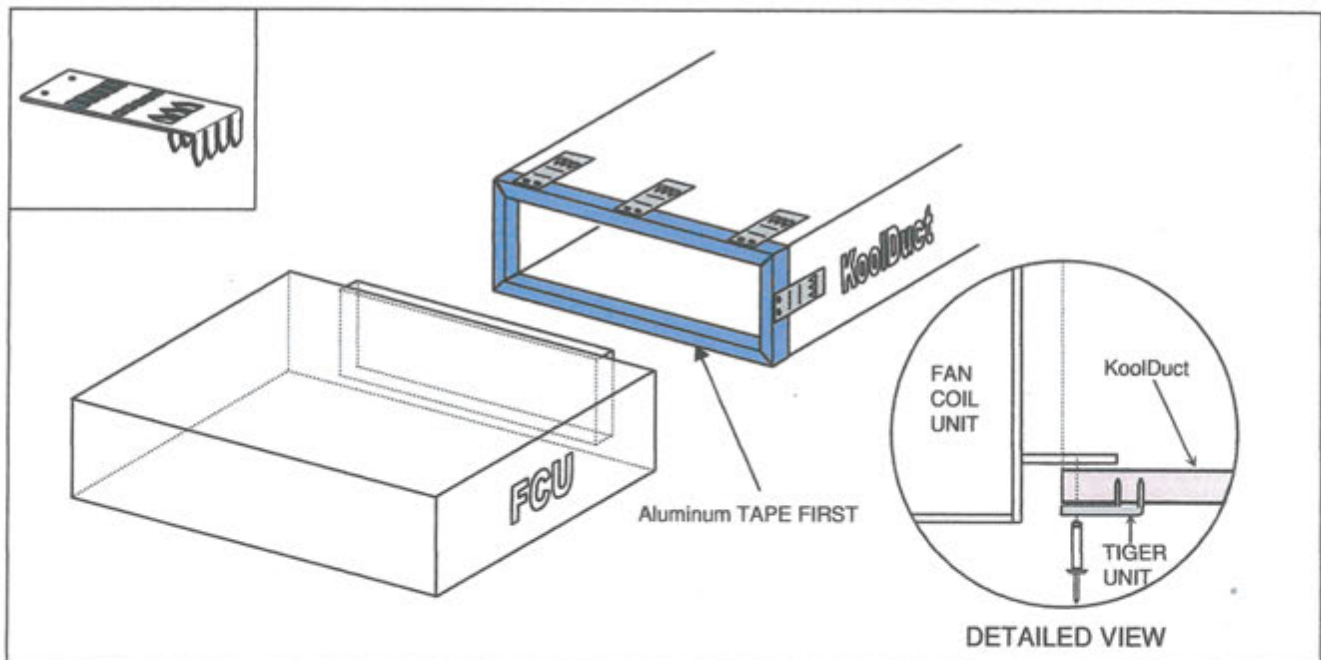
The Kingspan **KoolDuct**® System

Alternative Connection With Tiger Unit LKDA 363

Small Ducting <80" (2m) Perimeter, Low Pressure < 1 in.w.g. (250 Pascal)



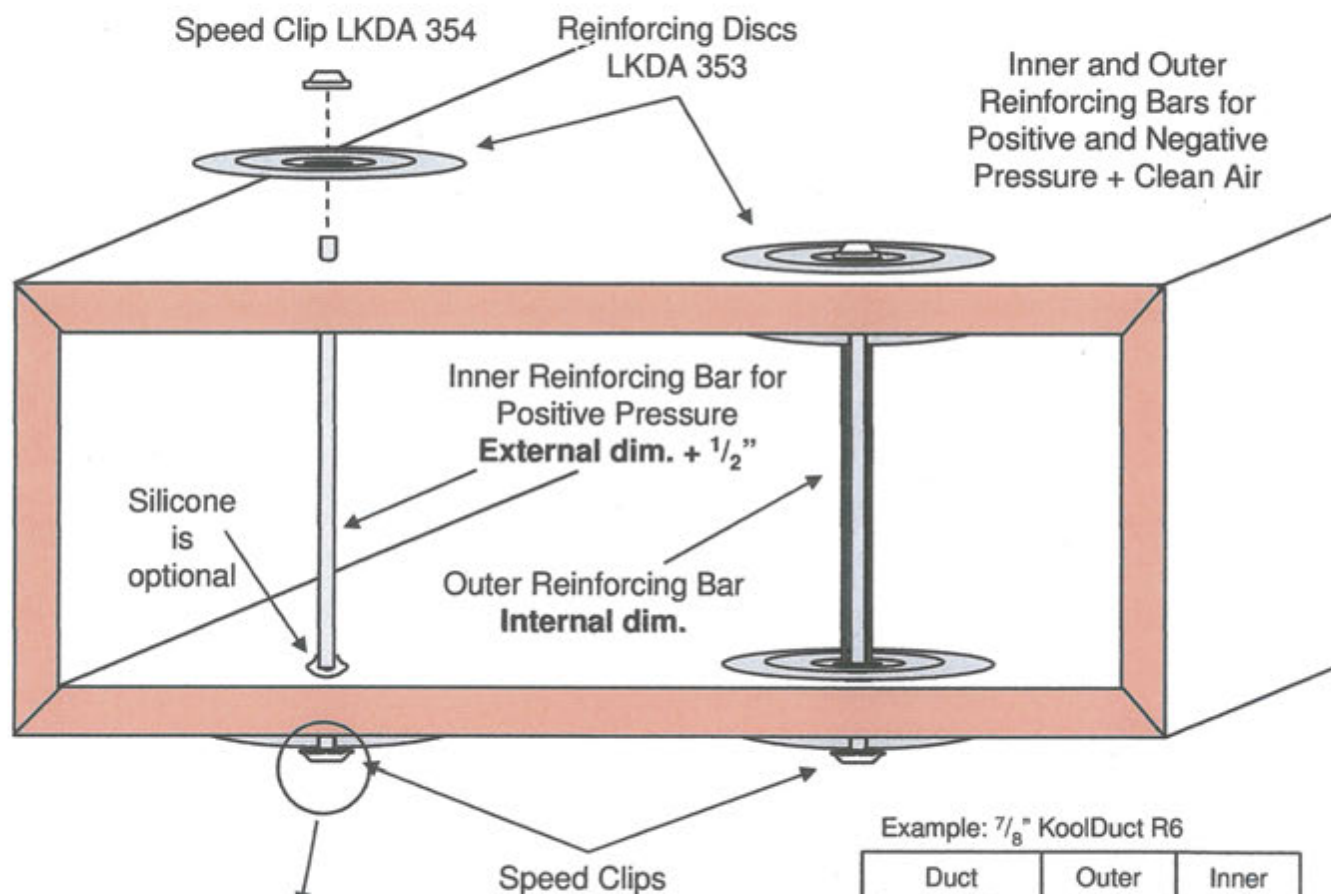
Duct Connection to VCD (Volume Control Damper)



Duct Connection to Fan Coil Unit

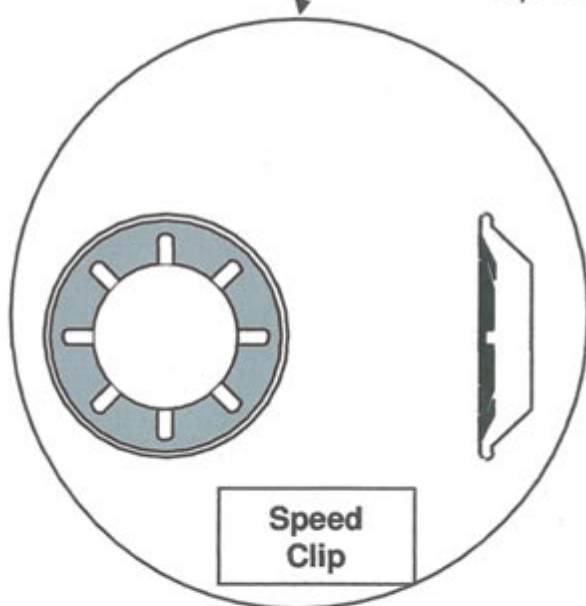
The Kingspan KoolDuct® System

Reinforcement System

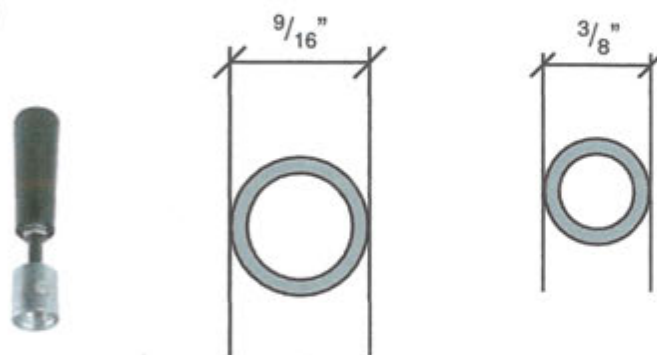


Example: 7/8" KoolDuct R6

Duct internal size (mm)	Outer Bar (mm)	Inner Bar (mm)
12"	12"	14 1/4"
16"	16"	18 1/4"
20"	20"	22 1/4"



Reinforcing Bars Dimensions



NOTE: The inner reinforcing bar can be replaced by an 8mm diameter (minimum) non corrosive **threaded bar**, and the speed clip can be replaced by a threaded nut.

Speed Clip Tool LKDA 452

Outer Bar LKDA 351

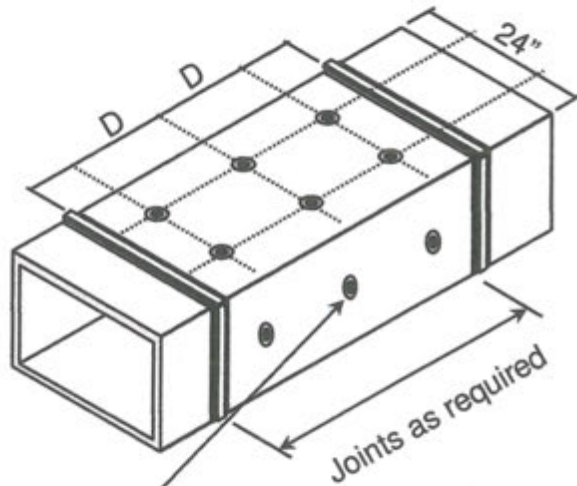
Inner Bar LKDA 352

The Kingspan KoolDuct® System

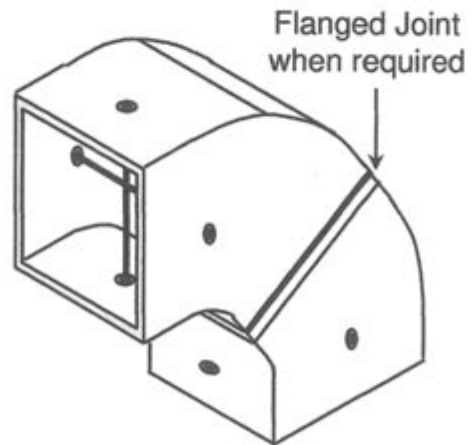
Reinforcement Application

Aluminum Reinforcement

The need for reinforcement must be verified within the KoolDuct Fabrication Manual, based on duct side and pressure.



Reinforcements
on the sides required

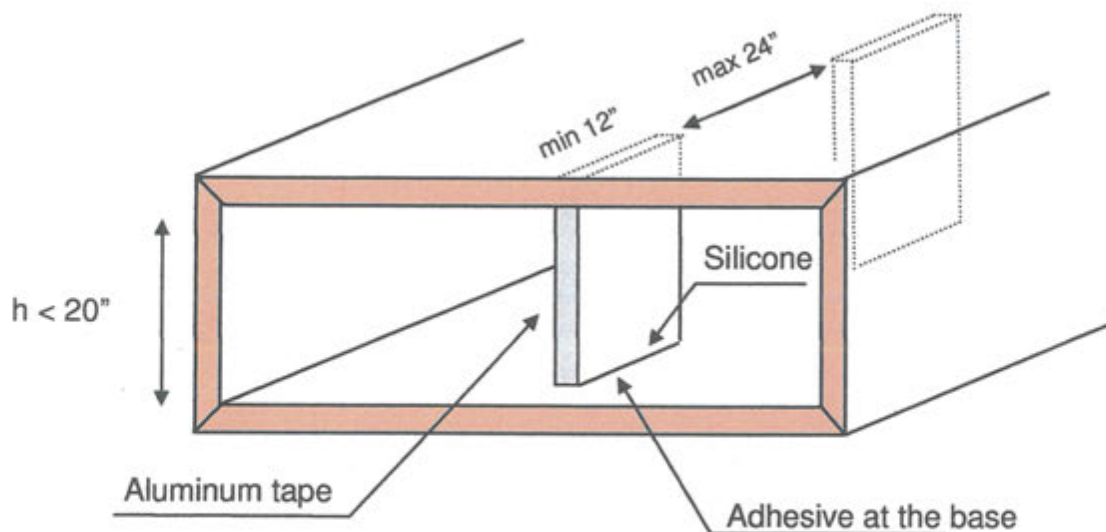


Reinforcements
on elbows, reduction, tee, etc.

D = Recommended Step Interval (see Schedule of Duct Reinforcement)

The use of Panel as reinforcement (negative low pressure only)

In low pressure application it is possible to use the panel as reinforcement against the **negative pressure**: cut panel segments about 12" wide to be glued and sealed inside the duct, spaced every 20". Tape all exposed foam surfaces.



The Kingspan KoolDuct® System

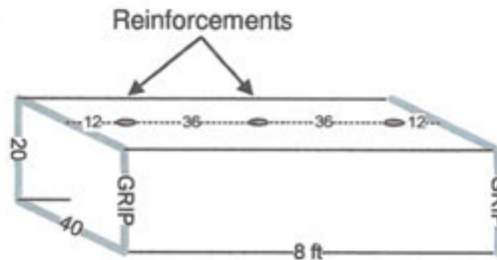
Duct Reinforcement Examples

Example 1:

Ductwork section size: 40" (w) x 20" (h)

Ductwork section length: 8 Feet

Pressure: 1 in.w.g.



With Grip flange and bayonet joint:

Side 40": 1@36", first bar max 18" from joint

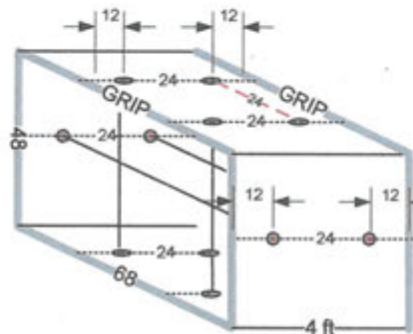
Side 20": No reinforcement

Example 2:

Ductwork section size: 68" (w) x 48" (h)

Ductwork section length: 4 feet

Pressure: 2 in w.g.



With Grip flange and bayonet joint:

Side 68": 2@24", first bar max 12" from joint

Side 48": 1@24", first bar max 12" from joint

Reinforcement – End Caps

Profile reinforcement may be required to withstand the pressure and limit the end cap deflection. Please refer to the schedule of duct reinforcement for duct size and pressure requirements. When end cap reinforcement is required, mechanically fix end cap with flange, screws or rivets as suitable

The Kingspan KoolDuct® System

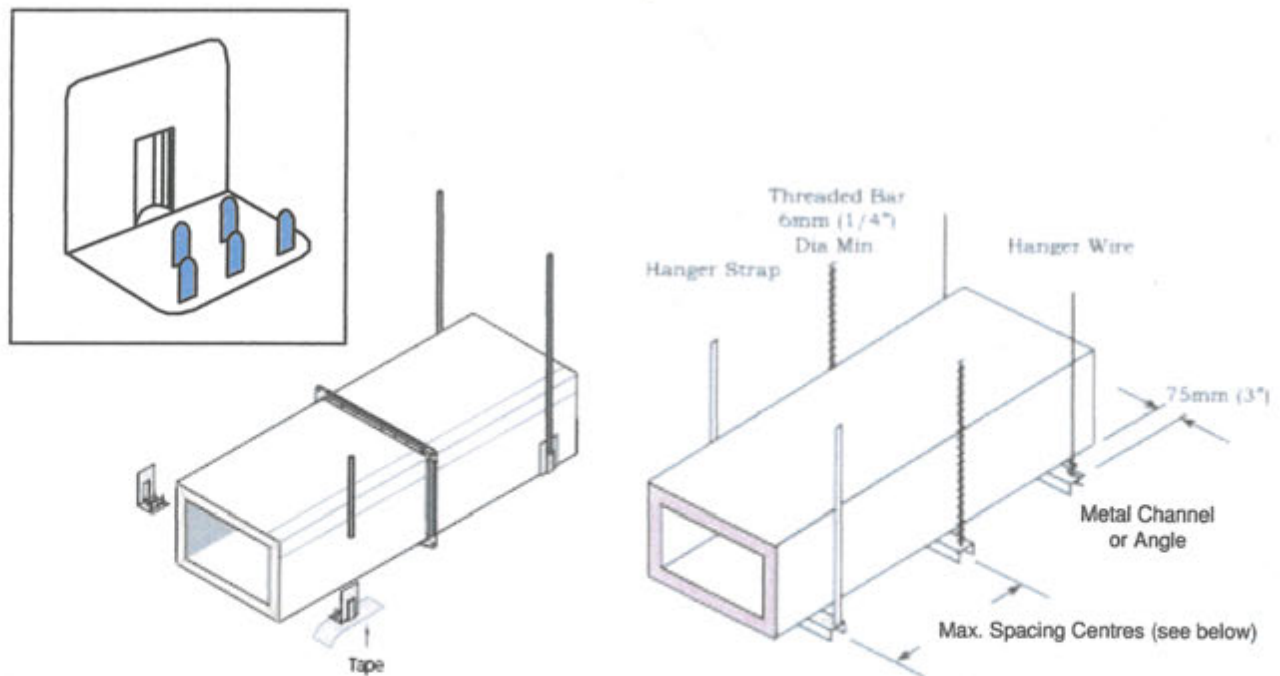
Hangers and Supports

Tiger Support – LKDA266: Designed to support small and medium size ductworks (duct side up to 700 mm) and risers of any size.

Threaded bars max. diam. 6 / 8 mm.

As a finish, apply aluminum tape on the bottom of the Tiger Support.

Conventional Duct Support: Metal Channel or Angle.



Conventional Duct Hanger: Threaded Bar, Hanger Wire or Hanger Strap.

The selection of all **supports** and **hangers** shall be based on the weight of KoolDuct ductwork, according to the recommendations of the support/hanger manufacturer. See tables **Weight of KoolDuct**.

Spacing Between Supports

Duct Section length	Largest Duct Side	Max. Spacing Centres
154 3/4"	Less than 47"	13 feet max
47 1/4"	Up to 80"	8 feet max

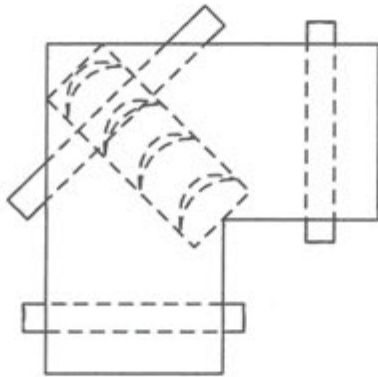
Note: Closer spacing may be required due to limitations of the building structure or to achieve the necessary duct rigidity

The Kingspan KoolDuct® System

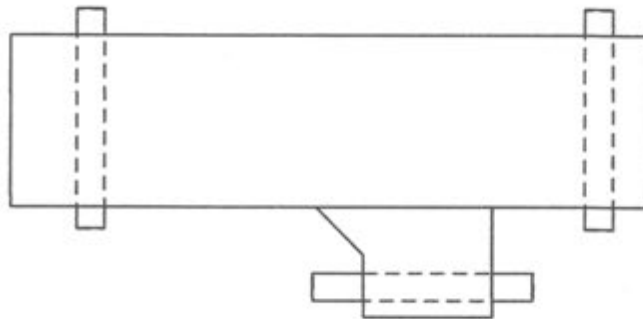
Hangers and Supports – Hanging Duct Fittings

The KoolDuct System is light weight, so duct support and hangers do not have to be as robust nor as numerous as with sheet metal ducts.

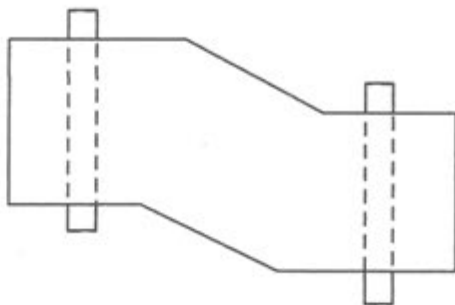
It is the responsibility of the registered fabricator/installer to determine both spacing and placement of supports. Ductwork shall be supported at branch connections, tee fittings and at changes of direction as necessary.



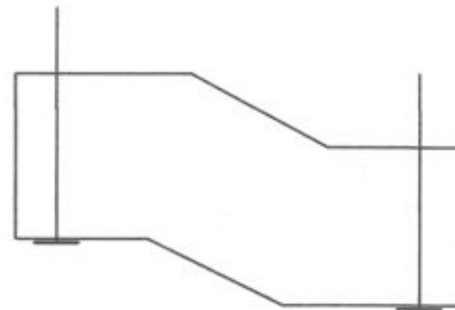
Square Elbow suggested support
TOP VIEW



Take-off suggested support
TOP VIEW



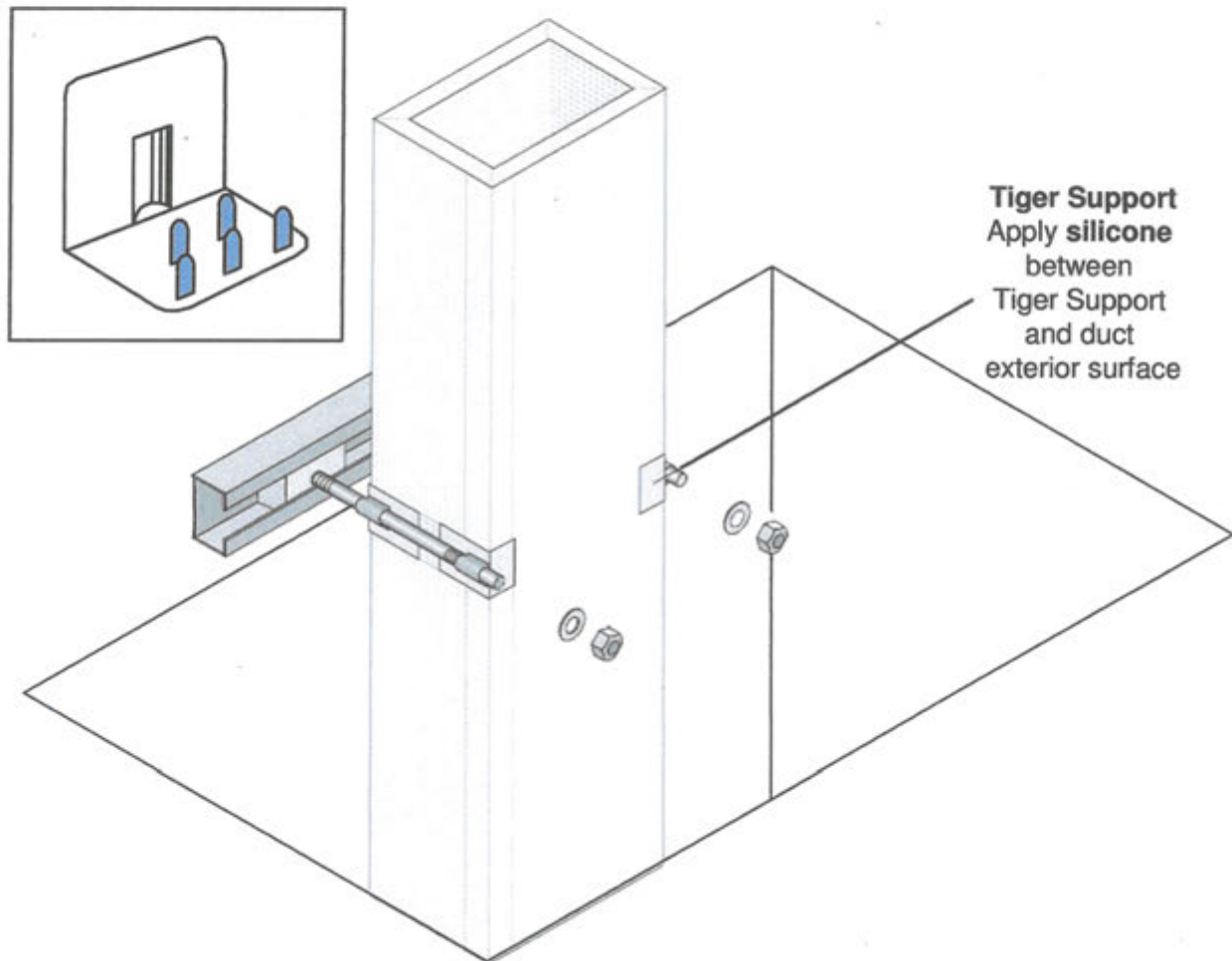
Offset suggested support (bottom flat)
TOP VIEW



Offset suggested support
(bottom inclined)
SIDE VIEW

The Kingspan KoolDuct® System

Hangers and Supports – Vertical Riser



In vertically oriented ductwork (risers), four Tiger Supports can be fitted into the four side of the ductwork of any size at each support centre

NOTE: Class 0 or 1 air ducts UL 181 Listed are permitted as vertical ducts serving not more than two adjacent stories in height (per NFPA 90A and 90B).

The Kingspan KoolDuct® System

Cleaning KoolDuct

Dry Cleaning methods only, restricted to the following :

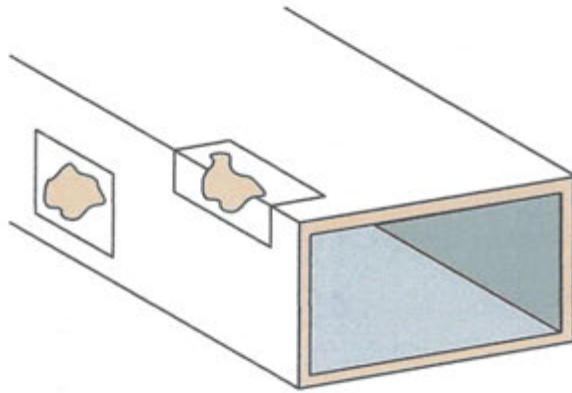
1. Air Whip/Skipper Ball using low volume compressed air (A)
2. Air Lance using low volume compressed air (A)
3. Air Nozzle using high volume compressed air (A) - plastic ball only
4. Manual Hand Wiping
5. Manual Hand brushing – super soft brush only
6. Electrical/Manual Hand Vacuum
7. Mechanical Brushing (A) - super soft brush only

Where Note (A) appears, particulates should be collected using an air movement and containment machine with appropriate filtration for contaminants.

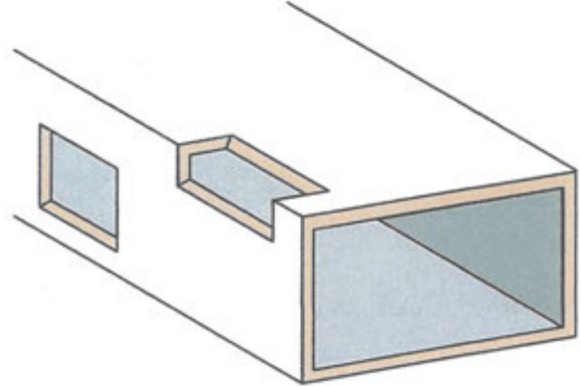
KoolDuct is unsuitable for Wet Cleaning methods and any techniques considered to be abrasive such as hard brushing, scraping or compressed air systems using metal ball.

The Kingspan KoolDuct® System

Damage Repair

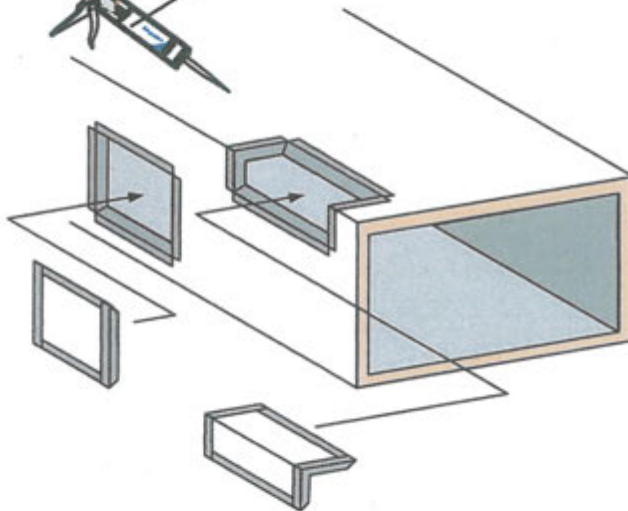


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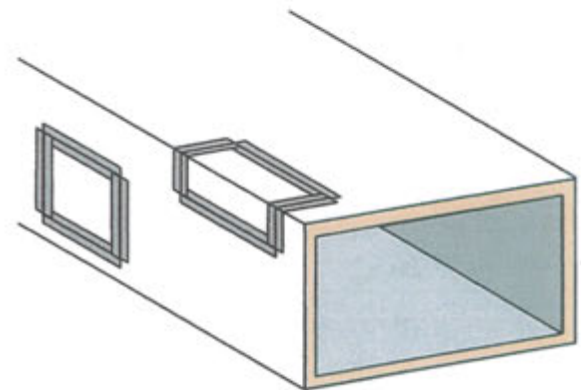


2

Silicone LKDA 231G



3



4

The Kingspan KoolDuct® System

Protective treatment and External ductwork

Internal Installation

No special treatment required for conventional internal installations

External Installation

Ductwork subjected to the elements **must be** weather proofed.

Systems available and approved by Kingspan Insulation Ltd to give a protective and weather proof finish:

- a) Cladding
- b) Fibre Reinforced Plastic FRP (e.g. Fiba Tech Industries Ltd "Fibaroll" or equivalent);
- c) Self Adhesive laminate (e.g. Venture Tape Corp. "VentureClad" or equivalent)

Note that all external flanged joints **must be** fully sealed.

Painting

Kingspan KoolDuct System can be painted for decorative purposes with paint that it is compatible with aluminum.

Please bear in mind the project specification with regards to **fire performance** requirements of the duct when selecting the paint.

Note: that paint is not an acceptable weatherproof solution for external installations

Duct Section Length	Largest Duct Side	Max Spacing Centers
154 3/16"	Less than 47"	13" Max
47 1/16"	Up to 80"	8" Max

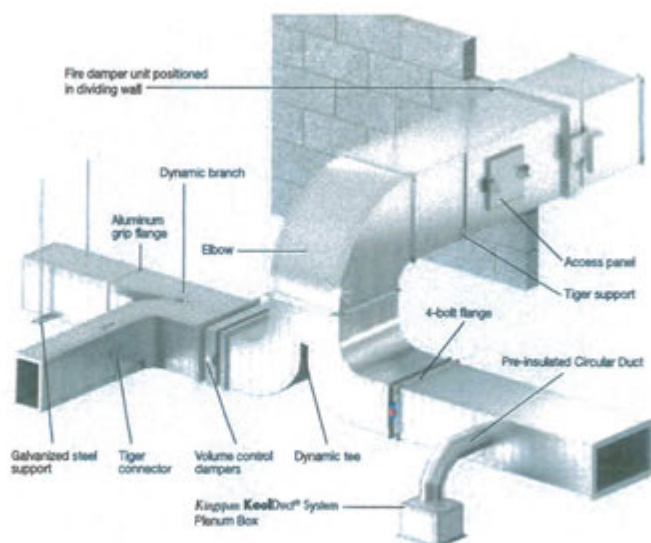
The Kingspan KoolDuct® System

SUBMITTAL SHEET - USA

Introduction

The **Kingspan KoolDuct®** System is an advanced and innovative system of pre-insulated air-distribution ductwork. Ductwork is fabricated using premium performance rigid insulation panels in sections up to 13' long and can provide the optimum energy saving and environmental solution in comparison with other types of ductwork.

Premium performance **Kingspan KoolDuct®** panels, fabrication methods, jointing systems and a complete line of accessories produce a System where air leakage can be reduced to a fraction of that typical of sheet metal ductwork. This can yield significant electrical consumption savings because of reduced heating and cooling loads.



Applications

The **Kingspan KoolDuct®** System is designed for use in Building Services / HVAC applications and is suitable for both new build and refurbishment projects in the residential, commercial, institutional, industrial and leisure sectors.

Ductwork fabricated from the **Kingspan KoolDuct®** System is particularly suitable for use on high specification projects in the food, beverage and pharmaceutical industries, clean air and hygiene controlled environments, high humidity environments, swimming pools, and sterile areas of hospitals and communication / server rooms in data centers where non-fibrous insulation materials may be preferred.

Kingspan KoolDuct® System ductwork can be installed internally, externally, concealed above a false ceiling or visibly mounted. Furthermore, its versatility enables individual system components such as plenums, risers and straight sections to be integrated with traditional sheet metal ductwork.

Fabrication & Installation

To insure that uniform quality standards are maintained, **Kingspan KoolDuct®** System ductwork is fabricated and installed only by specially trained fabricators and installers that have attended a specialized training program.

Due to the lightweight nature of the product two individuals can quickly and easily install substantially sized ductwork sections. Specialized mechanical handling and lifting equipment for heavy loads is generally not required.

All ductwork should be fabricated and installed in strict accordance with methods approved by Kingspan Insulation Ltd.

Application Recommendations & Limitations

It is recommended that **Kingspan KoolDuct®** System ductwork be used for operation as supply, return, fresh and exhaust air ductwork for heating, ventilation and air-conditioning systems within the following limits:

Mean Air Velocity (Maximum)	4000 fpm
Design Pressure (Maximum)	Positive: 4 in.w.g. Negative: 3 in.w.g.
Temperature	Internal air temperature of -4°F to +176°F during continuous operation
Size	Unlimited (provided that recommended Kingspan KoolDuct® System fabrication techniques and installation procedures are strictly observed)

NB 'Mean Air Velocity' refers to the design air flow rate related to the cross sectional area of the ductwork. 'Design Pressure' relates to the actual total pressure of the relevant section of ductwork and not the fan static pressure. 'Total Pressure' is a combination of both static and dynamic pressures.

Ductwork fabricated from the **Kingspan KoolDuct®** System should not be used in the following applications:

- kitchen / grease hood exhaust systems;
- conveyance of solids;
- conveyance of hot air with temperatures in excess of 176°F;
- chemical, fume or smoke exhaust systems;
- with equipment of any type that does not include automatic maximum temperature controls;
- adjacent to any mechanical / electrical source of extreme heat; and
- outdoor use without additional weather and / or mechanical protection.

Air Leakage

The air leakage rate of **Kingspan KoolDuct®** System ductwork can be a fraction of that of insulated sheet metal ductwork and can easily meet the requirements of SMACNA Class 3. The graph below (Figure 1) shows the maximum allowable air leakage for each leakage class over a range of pressures from 0.1 to 4 in.w.g.

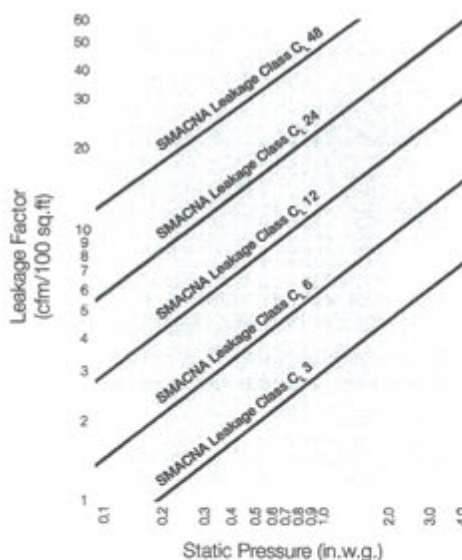


Figure 1 Based on SMACNA (HVAC Air Duct Leakage Test Manual First Edition 1985) Figure 4-1 'Duct Leakage Classification'

NB This document only provides a summary of the **Kingspan KoolDuct®** System and should not be used as the sole basis of an actual specification. Reference must be made to 'The **Kingspan KoolDuct®** System Global Specification Manual' (latest edition) for specification details. Please contact the Kingspan Insulation Marketing Department (see rear cover) for a copy.

Recommended Finishes

Internal & Exposed to View Ductwork

The external factory applied reinforced aluminum foil vapor barrier facing constitutes the standard finish. Additional finishes include: aluminum or stainless steel sheet; aluminum-zinc alloy coated steel sheet; vapor retarder self-adhesive jacketing systems; and a paint finish which must not compromise the aluminum foil facing, insulation, thermal performance or fire classification.

Internal Ductwork in Plant Rooms, Boiler Houses or Service Areas

Kingspan KoolDuct® System ductwork must be protected against mechanical damage. Finishes include: aluminum or stainless steel sheet and aluminum-zinc alloy coated steel sheet.

External Ductwork

Kingspan KoolDuct® System ductwork installed outdoors must be protected against the elements. Weatherproof finishes include: aluminum or stainless steel sheet; aluminum-zinc alloy coated steel sheet; vapor retarder self-adhesive jacketing systems; UV resistant glass reinforced plastic (GRP) cladding systems; and a reinforcing membrane embedded between two full coats of a protective fire resistive vapor barrier coating.

Product Data

Description

The panels from which Kingspan KoolDuct® System ductwork is fabricated, comprise a non-fibrous premium performance rigid thermoset modified resin insulation core, faced on both sides with an extremely durable and protective low vapor permeability 1 mil aluminum foil reinforced with a 0.2" glass scrim. Both facings are autohesively bonded to the insulation core during manufacture.

Kingspan KoolDuct® panels are CFC/HCFC-free and are manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).



Availability

- Insulation panel dimensions: 12.89' x 3.94'.
- Insulation panel thicknesses: 7/8", 1 3/8" & 1 5/8".

Nominal Density Range

3.43-3.75 pcf at 10% compression.

Minimum Compressive Strength

29 psi (BS EN 826: 1996).

Specific Heat Capacity

0.45 Btu/lb-°F.

Operating Temperature Limits

-4°F to +176°F.

Moisture Resistance

The insulation core of Kingspan KoolDuct® panels has 90% (or greater) closed cell structure, which means that they are non-wicking and highly resistant to moisture penetration. In addition, the risk of moisture absorption into the core is effectively eliminated as the factory applied aluminum foil facings provide a high performance and impervious vapor barrier.

The panels have a water vapor transmission of 0.34 grains/hr-ft² (ASTM E 96).

Indoor Air Quality

Distributed air flows over sealed aluminum surfaces, minimizing any risk of loose fibers entering the air handling system. In addition, Kingspan KoolDuct® panels have a non-fibrous insulation core, are non-deleterious, odorless and non-tainting. They will resist attack from mold and microbial growth and do not provide any food value to rodents or vermin.

Thermal Performance

The thermal conductivity (k-value) of Kingspan KoolDuct® panels is 0.146 Btu-in/hr-ft²-°F at 50°F (ASTM C 518), the lowest of any commonly used insulation material. A low thermal conductivity allows thinner insulation to achieve the required thermal performance.

The installed material thermal resistances (R-values) for the range of panel thicknesses are shown in the table below:

Thickness	R-value
7/8"	6.0 ft²-hr-°F/Btu
1 3/8"	8.1 ft²-hr-°F/Btu
1 5/8"	8.8 ft²-hr-°F/Btu

Fire & Smoke Performance

Kingspan KoolDuct® panels have a resistance to burning and spread of flame far superior to that of rigid polyurethane (PUR) or rigid polyisocyanurate (PIR) insulants. In addition, there is an almost complete absence of smoke when the panels are subjected to a flame source.

The insulation core of the panels is thermoset and unlike thermoplastic materials it does not melt, drip or produce flaming droplets.

The panels successfully pass the Burning Test (UL 181) and do not exceed flame spread / smoke developed indices 25/50 (ASTM E 84 / UL 723).

Code Compliance & Approvals

Ductwork fabricated from the Kingspan KoolDuct® System:

- satisfies the requirements of ANSI / ASHRAE / IESNA 90.1: 2007, IECC 2003, 2006 & 2009, IMC 2009 and other major national specifications;
- complies with the requirements of NFPA Standards 90A & 90B; and
- is UL Listed as a Class 1 Air Duct to Standard for Safety UL 181 when fabricated using: Kingspan KoolDuct® panels faced on both sides with factory applied silver aluminum foil; the aluminum grip flange and / or tiger jointing systems; and an aluminum foil vapor barrier tape that is UL Listed to Standard for Safety UL 181 A-P.



Kingspan KoolDuct® panels are manufactured to the highest standards under a management system certified to:

- BS EN ISO 9001: 2008 (Quality management systems. Requirements);
- BS EN ISO 14001: 2004 (Environmental management systems. Requirements); and
- BS OHSAS 18001: 2007 (Health and safety management systems. Requirements).

Kingspan Insulation Ltd reserves the right to amend product specifications without prior notice. Product thicknesses shown in this document should not be taken as being available ex-stock and reference should be made to the current Kingspan Insulation Ltd price list or advice sought directly from Kingspan Insulation Ltd. The information, technical details and fixing instructions etc. included in this literature are given in good faith and apply to uses described herein. Recommendations for use should be verified as to the suitability and compliance with actual requirements, specifications and any applicable codes, laws and regulations. For other applications or conditions of use, Kingspan Insulation Ltd offers a Technical Advisory Service, the advice of which should be sought for uses of Kingspan Insulation Ltd products that are not specifically described herein. The fire tests referenced in this literature and the assigned results are not intended to reflect hazards presented by the materials and products described herein under actual fire conditions. For detailed information please contact Kingspan Insulation Ltd for a copy of "The Kingspan KoolDuct® System Global Specification Manual" (latest edition). Please check that your copy of the literature is current by contacting Kingspan Insulation Ltd.

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www.kingspaninsulation.us

thermaduct

High Efficiency Outdoor Air Distribution System

Compliance/Testing:

Thermaduct is comprised of a Kingspan KoolDuct fortified cladded duct system in accordance with the requirements of factory-made air ducts. Thermaduct OD is specifically designed for use in outdoor applications where adverse weather conditions will occur. Thermaduct incorporates the following Standards:

UL 723, UL 181, 90A, 90B Interior

ASTM D-638, ASTM D790, ASTM D-256, ASTM D-4226, ASTM D-4216, ASTM D-792

ASTM D-2240, ASTM D-696, ASTM D-648, UL-94 Exterior Cladding

Frictional Properties:

Thermaduct is a factory assembled air distribution system that employs a smooth aluminum surface that has frictional characteristics much like that of galvanized sheet metal. As a result, the frictional pressure drop data for galvanized sheet metal ductwork can be applied when designing and specifying Thermaduct air distribution systems.

Health & Safety:

Thermaduct high efficiency outdoor air distribution systems have a non-fibrous insulation core that is odorless, non-tainting, non-deleterious, chemically inert and safe to use.

Code Compliance:

Thermaduct will meet or exceed the IECC: 2006, 2009 and 2012 energy code and ASHRAE 90.1.2004, 2007 and 2010 Energy Standards for Buildings for both return and supply air ducts for both commercial and residential applications.

Thermaduct OD is designed to meet the needs of outdoor duct applications by employing the assembly of the best technologies available in today's growing levels of energy saving performance. Thermaduct is manufactured under strict guidelines for health and safety in compliance to OSHA CFR29. All manufacturing is compliant to SMACNA duct construction methods employing trained and certified building trade professionals.



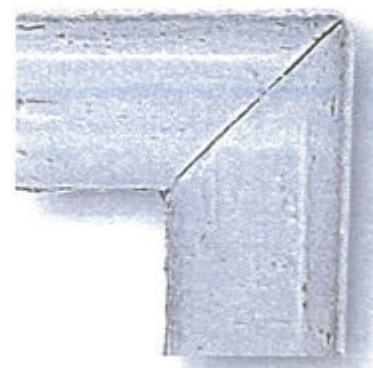
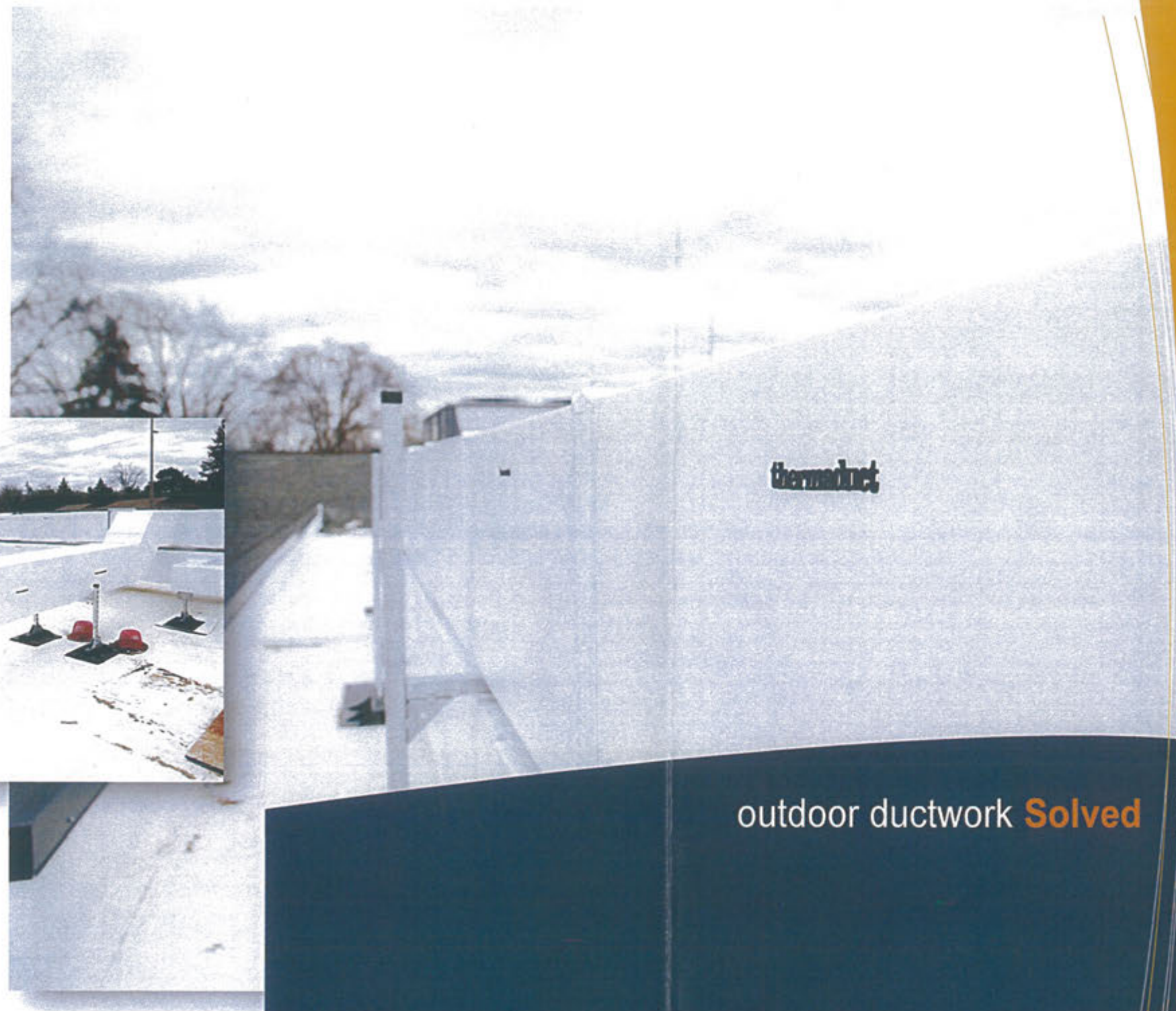
thermaduct

Thermaduct, LLC
26610 Eckel Rd.,
Perrysburg, Ohio 43551
(855) 566-5382
www.thermaduct.com

High-R
Virtually Zero Air Leakage
Water Tight
Closed cell
Zero Fiberglass Insulation
10 Year Warranty

There is simply no duct like it in the world. Thermaduct combines the best of air distribution technology with choice outdoor weather barrier to create a duct that offers the highest R-value and lowest air leakage rates in the industry. Unsurpassed performance was the goal to create a duct that can not only deliver every cubic foot of air it is fed, but to treat the air with the utmost respect by not exposing it to fibrous or volatile organic chemical latent liners.

Indoor, the air passes a smooth aluminum surface that is clad to Kingspan's Kooltherm closed cell rigid thermoset resin insulated core. The outer layers include factory autohesively applied FSK aluminum with a UV stable, 39 mil, titanium infused vinyl that is vacuum pressed and laminated. Air distribution segments are connected together with either aluminum channels OR cohesively bonded vinyl couplings. Once installed...all seams are sealed completely for uncompromising integrity and one of the best outdoor duct warranties in the industry.



thermaduct
Outdoor duct solution

Thermaduct LLC
26610 Eckel Rd.
Perrysburg, Ohio 43551
toll free (855) 566-5382
www.thermaduct.com
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outdoor ductwork **Solved**

High-R
Zero leak
Water tight
Closed cell

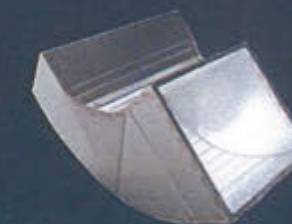


The ugly truth about outdoor duct

WHAT DOES YOUR DUCT DO FOR YOU?

Air distribution is a part of a construction project that is often ignored, yet accounts for up to 30% of the HVAC energy utilized. Building construction has employed thermal transmission reduction initiatives though the emerging energy codes, but most ducting systems in the US have not even achieved the performance of the average windows being installed today. When you combine the thermal performance with air leakage rate experience...your existing duct is letting you down.

More imminent in most duct systems is migration of water into the air passage system. The proof is on the roofs of buildings that employ outdoor ductwork. As duct systems leak, they inflate and deflate the outer protective layer that is intended to provide water integrity. Over time...the performance of the moisture barrier degrades to a point where moisture is allowed in. Moisture reduces the performance of the insulation and augments microbial growth either on, or in, the duct.



COMPLETE DUCT SOLUTIONS

From straight duct to fittings, thermaduct is prefabricated to go to the field ready to install. Field labor is reduced by a system of fittings that are made for each other and compliment the system with male and female companion parts. Sealed for performance!

DUCTING SOLUTIONS

- PATENT PENDING
- UL 181 LISTED KOOLDUCT LINER
- ANTI-MICROBIAL
- CLOSED CELL INSULATION
- HIGHEST R-VALUE SELECTIONS
- PROVEN LOW AIR LEAKAGE
- 10 YEAR LEAKAGE WARRANTY
- UV STABLE, 39 MIL VINYL CLADDING
- OPTIONAL INTERIOR DUCT OPTIONS
- BUILT IN THE USA
- UNION MADE

**A duct
with a
higher
IAQ**

delivering performance while saving energy

A DUCT WITH A HIGHER IAQ

A perfect duct would not promote or harbor the growth of bacteria and would not allow air to leak in or out of the duct. Thermaduct is Kingspan KoolDuct fortified which achieves a UL181 banner. Thermaduct and KoolDuct performance exceed the standards of other duct offerings today. Consistent delivery of air over a non-corrosive aluminum surface with no open fibers over closed cell rigid thermoset resin insulation, UL181 Class I ductwork makes Thermaduct a perfect IAQ solution for your high specification outdoor ducting project.

A CHOICE OF "R"

Thermaduct offerings of industry solutions like no other that meet or exceed the ASHRAE and ICC Energy Codes not only today...but 10 years from now. Choose one of the following or request custom values built to your order:

- R-8
- R-12
- R-14
- R-16
- R-20

LEADERSHIP IN ENERGY EFFICIENT DESIGN

The promotion of Leadership in Energy Efficient Design is a goal to aspire to. No matter what level of achievement you set out to attain...Thermaduct outdoor ducting solutions will help you



zero O.D.P.

meet your goal by providing points for high energy efficient product, zero ozone depletion and innovative product to name just a few. While many will ignore the simple fact that the R-value of most duct systems are less than 1/3rd the value on the roof...all the while the temperature difference can be as much as 2 times more, your choices earn you green, both now and in your future savings.

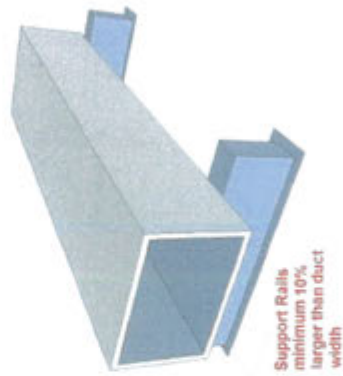
- High efficiency energy saving product.
- Innovative design
- Zero ozone depletion
- Quality Assurance in Process
- Quality Control on Delivery



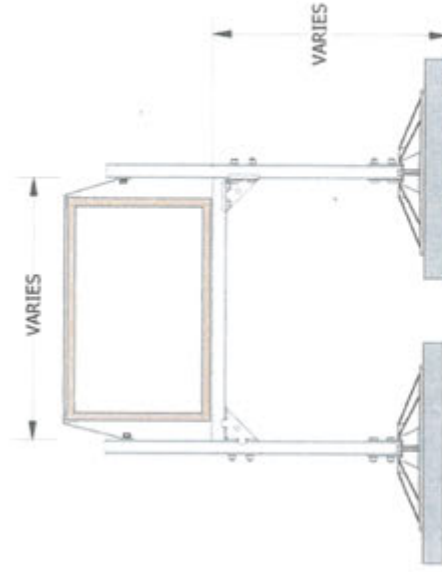
**rain
ready**



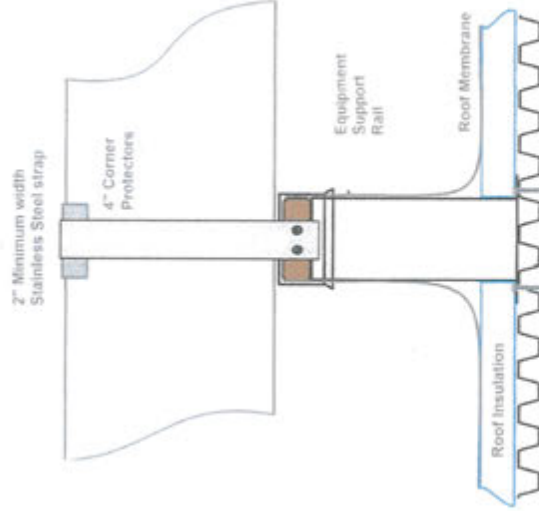
Duct girth ID < 84" spacing 13" maximum
 Duct girth ID > 85" spacing 8" maximum
 On buildings over 20 stories, 8" maximum spacing



Support Rails
 minimum 10%
 larger than duct
 width



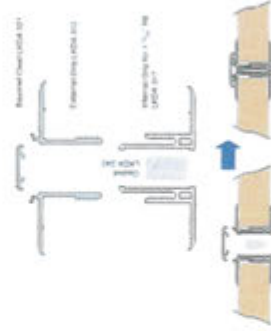
Duct supports by Mikro (or equal) with weighted ballast adhered to the support base can be used as an alternate to roof rails.



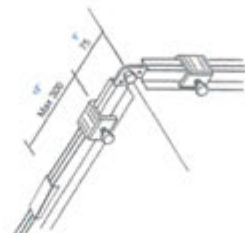
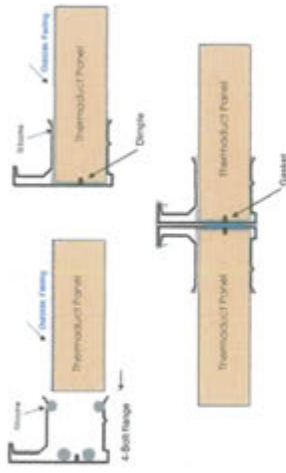
thermaduct

Thermoduct LLC 4/29/13

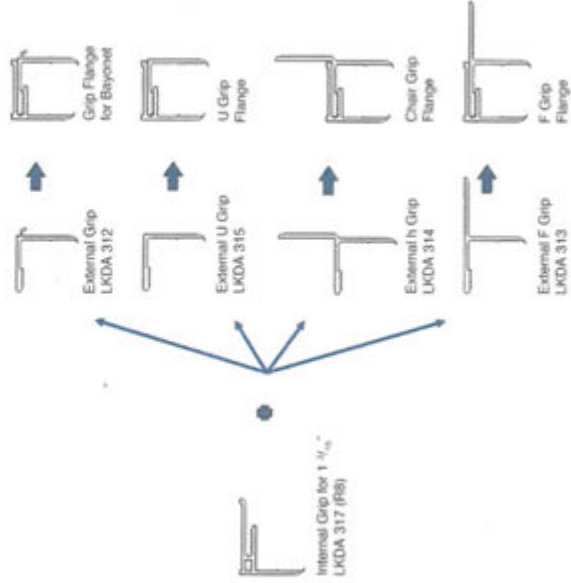
Grip Flange System - 1 1/4" (30 mm) RB
 Max for steel with pressure up to 6 in. H₂O



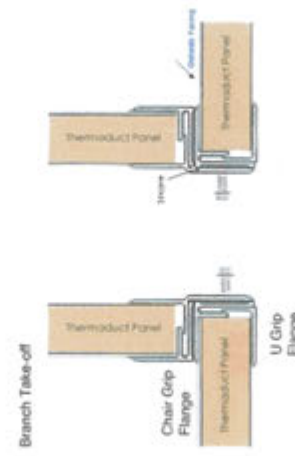
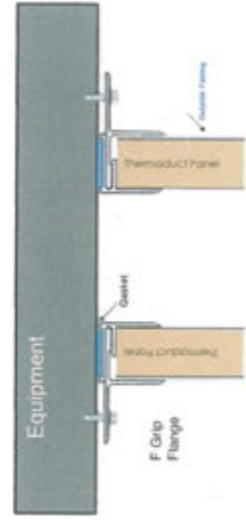
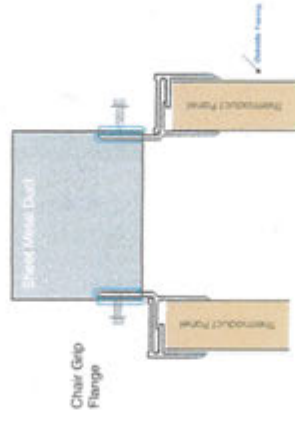
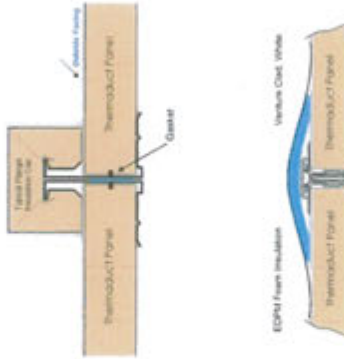
4 - Bolt Flange System - 1 1/4" (30 mm) RB
 Max for steel with pressure up to 6 in. H₂O



Aluminum Grip Flange System



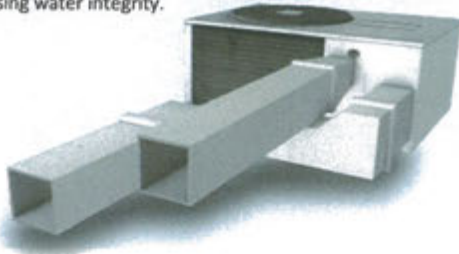
Flange Insulation



Purchaser	P.O. #	Date
Project	Location	
Engineer	Architect	
Submitted by	✓ For Approval	✓ For Review Only

Introduction

ThermaDuct OD is a highly efficient code compliant pre-insulated outdoor air distribution system designed to provide high R-values, increase air delivery, IAQ performance and exceptional water tight integrity that excels in providing high performance healthy air delivery for your HVAC applications. ThermaDuct is a Kingspan KoolDuct Fortified product that offers a fiber-free closed cell foam insulation, factory bonded to a high impact strength UV stable 39 mil exterior vinyl shell. ThermaDuct is highly resistant to punctures, rips, tears and has exceptional rigidity. ThermaDuct's exclusive assembly process (Patent Pending) can virtually eliminate air leakage entirely while at the same time providing uncompromising water integrity.



OD Duct Construction Type

Place an "X" by the duct system that applies:

- | | |
|--------------------------|---|
| <input type="checkbox"/> | R-8.1 ThermaDuct (1x 30mm Panel) |
| <input type="checkbox"/> | R-12 ThermaDuct (2x 22mm Panel) |
| <input type="checkbox"/> | R-14.1 ThermaDuct (1x 30mm Panel, 1 x 22mm Panel) |
| <input type="checkbox"/> | R-16.2 ThermaDuct (2x 30mm Panel) |
| <input type="checkbox"/> | R-20 ThermaDuct (2x 22mm Panel, 1x 30mm Panel) |
| <input type="checkbox"/> | ThermaDuct RS |

_____ " E.S.P.



Standard Features:

- Weather proof outdoor cladding
- High R-value
- Low air leakage
- Water tight
- Closed cell, zero fiber insulation
- Low and medium pressure class
- Sturdy hail and people resistant
- High impact resistance
- Anti-microbial, high IAQ system
- Low thermal expansion
- Standard white color**
- Heat reflective surface
- Fully assembled and factory sealed
- KoolDuct Fortified interior
- Welded & cohesively bonded seams
- LEED point eligible
- 10 year warranty*

* See warranty statement for full warranty details
 ** Other colors are available. Minimum order required.

Operating Recommendations:

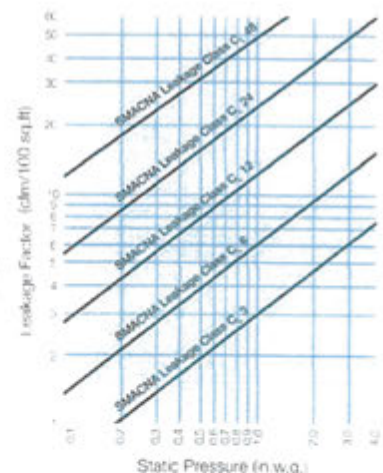
It is recommended that the application of ThermaDuct supplied be utilized for operation as a supply, return, fresh air and exhaust air ductwork applications for heating, ventilation, and air conditioning applications.

Air Velocity (Maximum)	5000 fpm / 25.4 m/s
Design Pressure (Maximum)	Positive and Negative 6 in-w.g. / 1500 Pa
Temperature	Internal; Continuous -4°F to +200°F
Size Limitations	None

Air Leakage

ThermaDuct is designed to withstand a continuous maximum static pressure of 6" inches water gauge / 1500 pa and is designed to have less than a SMACNA Air-Leakage Class 1 duct with the ThermaDuct connection system.

ThermaDuct is designed to provide the lowest air leakage rates in the industry. By combining two layers of an autohesively bonded aluminum foil vapor barrier to the inner and outer closed cell Kooltherm insulation core, all protected with a 39 mil UV stable vinyl clad with both welded and cohesively bonded seams...you simply cannot find a more air and water-tight outdoor duct system anywhere. Combining the best products and techniques to create the finest exterior air distribution product for outdoor ducting applications that we can manufacturer.



This chart is based on SMACNA HVAC Air Duct Leakage Test Manual 1985 Edition found in Figure 4-1 under "Duct Leakage Classification"

Properties:

Color	Polar white with reflective sheen
Density	Shell offers a tensile strength of 6,350 psi
Flammability	Core: Kingspan KoolDuct, 25/50 compliant Shell: V-0 per UL-94
Thermal Conductivity	K = 0.146 BTU/in/ft ² /hr./degree F
Minimum R-value	R-8.1 both out of package and installed
Temperature Limits	Interior; 200°F, Exterior; 165°F
Closed Cell Content	>90%
Vapor Barrier	Autohesively bonded aluminum foil with a zero permeability 39 mil UV stable vinyl
Fire/Smoke Performance	UL 723 Flame spread / smoke development interior <25/50