US Units

October 2018

The Kingspan KoolDuct System

Training Manual

Phenolic Ductwork Fabrication

and

Installation Guidelines

Kingspan®

Low Energy –
Low Carbon Buildings

UL® LISTED

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SMACNA

Associate Member

The Kingspan KoolDuct® System

Training Manual - Contents

The Kingspan KoolDuct® System

Training Manual

Chapter 1

Introduction

The Kingspan KoolDuct® System

Notice to User

Kingspan Insulation Ltd provide this publication to Kingspan Insulation's Delivery Partners and KoolDuct fabricators for information purposes as part of their Technical Support Documentation that give broad directions and process recommendations for the design and use of the Kingspan KoolDuct System.

This manual is not to be used as the sole reference material for the fabrication and installation of Kingspan KoolDuct System ductwork; reference should also be made to The Kingspan KoolDuct System Fabrication Manual (latest edition).
For specification details, reference should be made to The Kingspan KoolDuct System Specifier's Guide (latest edition).

All principles and techniques contained in this Training Manual were developed using reliable engineering principles and research, plus consultation with manufacturers, users, testing laboratories, and others having specialised experience.
This manual is subject to revision as further experience and investigation may show is necessary or desirable.

Kingspan Insulation assume no responsibility and accept no liability for the application of the principles or techniques contained in this publication. Authorities considering adoption of any standard contained herein should review all state, local and contract regulation applicable to specific installations.

The Delivery Partner and/or KoolDuct fabricators shall have full regard to Kingspan's Technical Support Documentation for the KoolDuct System and shall ensure that in any design and any erection of using the Kingspan KoolDuct System, the guidelines in the Technical Support Documentation are followed by it and any sub-contractors engaged to design and/or assemble the ductwork.

Notice on the Installation of the KoolDuct System

KoolDuct Delivery Partners and KoolDuct fabricators shall only use reputable contractors for the installation of the Kingspan KoolDuct System. Such contractors shall be reasonably experienced in installing HVAC ductworks and must understand the differences between the Kingspan KoolDuct System and conventional sheet metal ductwork. The Delivery Partner and KoolDuct fabricator is responsible for ensuring that any contractor / other personnel it uses in relation to the Kingspan KoolDuct System have been provided with the appropriate training to enable them to install the Kingspan KoolDuct System according to good installation practice.

In the event of any doubt please do not hesitate to contact us for further assistance.

Kingspan Insulation Limited, Torvale Industrial Estate, Pembridge, Nr. Leominster, Herefordshire HR6 9LA, United Kingdom, Tel: +44 1544 388 601, www.kingspan.com

The Kingspan KoolDuct® System

Health and Safety

Kingspan **KoolDuct** panels are **chemically inert and safe** to use.

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

The **reflective surface** on this product will reflect light as well as heat, including ultraviolet light. If this board is being installed during very bright or sunny weather, wear UV protective sunglasses or goggles, and if the skin is exposed for a significant period of time, 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.

When hand tools with **blades**, saws or other cutting tools are used, please handle the tools with caution.

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

Dust is NOT normally a hazard.
When mechanical cutting is used, dust extraction shall be used (eye protection and disposable dust mask shall be worn when appropriate).
Minimise dust and slipping hazards by disposing of the excess material and keeping the working place tidy.

Safety Data Sheet are available for the adhesive and silicone sealant supplied by Kingspan Insulation
The application of adhesive and sealant shall be performed in a well **ventilated** area, wearing protective gloves.

The Kingspan KoolDuct® System

Storage and Handling

To prevent damage, **care** must be exercised **in the storage, handling and transportation** of both panels and ductwork sections fabricated from the Kingspan KoolDuct System.

Please note that the factory applied **packaging** shall not be considered weatherproof.

Any panels or sections which have been allowed to get **wet** shall not be used.

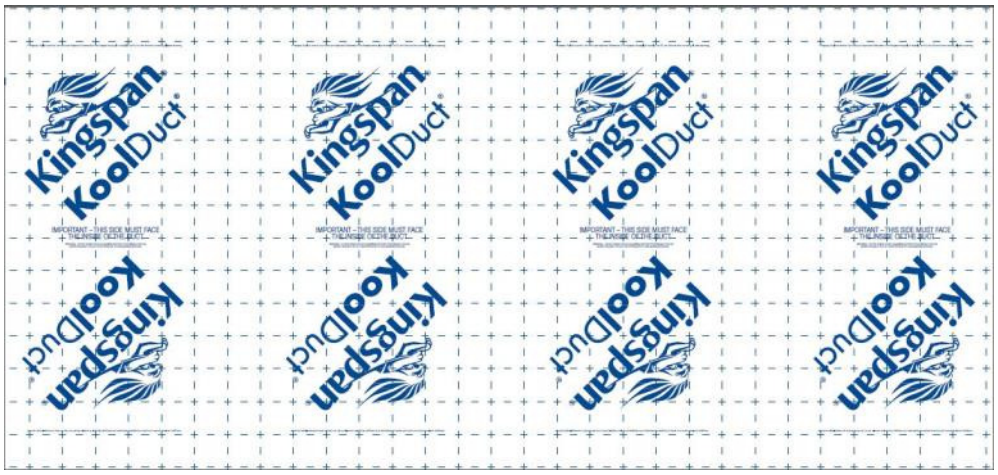
INSIDE STORAGE
Wherever possible, both Kingspan KoolDuct panels and ductwork sections shall be **stored inside**, under cover, and clear of the ground.

Once the duct sealant has fully cured, the **open ends of the ductwork** sections shall be fully **sealed** with a weatherproof sheet to prevent the ingress of foreign matter.

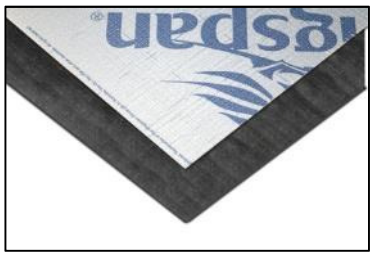
OUTSIDE STORAGE
Where storage inside a building is not possible, Kingspan KoolDuct panels and ductwork sections shall be stored clear of the ground **protected** and secured against all weather, including wind, rain, and sunlight, by an opaque light coloured weatherproof material suitable for the climate in which it is to be stored. As above, the open ends of the ductwork shall be fully sealed with a weatherproof sheet to prevent the ingress of foreign matter.

The Kingspan KoolDuct® System

KoolDuct Panel



Printed foil facing shall be kept <u>inside</u> ductwork



Factory applied aluminum facings
Silver Black (NOTE: The black faced KoolDuct is NOT part of the UL listed duct system)

KoolDuct Panel Dimensions	
USA and North America	$^{7}/_{8}$" x 47 ¼ x 154 ¾ " (R-6) 1 $^{3}/_{16}$" x 47 ¼ x 154 ¾ " (R-8) 1 $^{3}/_{4}$" x 47 ¼ x 154 ¾ " (R-12)
UK / Ireland:	22 x 1200 x 2950 mm 30 x 1200 x 2950 mm
Australia:	20 x 1200 x 3930 mm 30 x 1200 x 3930 mm 42 x 1200 x 3930 mm
Middle East and NA	20 x 1200 x 3930 mm 30 x 1200 x 3930 mm
Rest of the world:	20 x 1200 x 3930 mm 22 x 1200 x 3930 mm 30 x 1200 x 3930 mm

The Kingspan KoolDuct® System

KoolDuct System Operational Limits

Mean Air Velocity	**5000 fpm** (25.4 m/s)
Design Pressure (Max)	Positive: **4 in.w.g.** (1000 Pa) Negative: **3 in.w.g.** (750 Pa)
Temperature	**-15°F** (-26°C) to **+185°F** (+85°C) during continuous operation
Size	Unlimited (provided that Kingspan KoolDuct System fabrication techniques and procedures are observed)

KoolDuct System Application and Limitation

- Supply and Return air ductwork for heating, ventilation and air conditioning
- Fresh air intake ductwork to plant / Make-up air
- 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)

Not Applicable

- Where fire dampers cannot be used and fire rated ductwork must be used:
  - Kitchen extract systems
  - Smoke extractions of products of combustion
  - Enclosed car park extract systems
  - Pressurisation systems for protected staircase, lobby, corridors
- Conveyance of solid particles
- Chemical or fume exhaust systems (please check compatibility with Kingspan)
- For use with extreme heat above 185°F (85°C)
- High Pressure systems above 4.in.w.g. (1000 Pascal) positive
- Outdoor use without additional protection

The UL Listing for KoolDuct

The UL listing requires that ductwork is fabricating using:

- $^{25}/_{32}$"-1 $^{25}/_{32}$ " (20-45 mm) Kingspan **KoolDuct panels**, faced with silver aluminum foil on both sides and displaying the UL Listed Mark
- the 4-bolt, aluminum grip and / or Tiger Clip **coupling systems**;
- 2 1/2" (63 mm) wide (minimum) aluminum foil vapor barrier **tape that is UL 181 A–P Listed** to Standard for Safety UL 181 A; and
- **Kingspan** High Performance Silicone **Sealant** / Caulk.

The Kingspan KoolDuct® System

Information Required for Fabrication and Installation

Information to be provided by the designer for the fabrication and installation of KoolDuct pre-insulated ductwork

Comprehensive ductwork layout drawings indicating:
GENERAL

- **Ductwork sizes**
- **Routing of the ductwork system**
- **Types of fittings to be used** (i.e., square bends versus radius bends, concentrical transitions versus eccentrical transitions, etc.)
- **Pressure classification** (the higher among design, commissioning and testing pressure shall be used as the reference for ductwork reinforcement)

STANDARDS

- Insulation panel thickness
- Special requirements (if any)

OTHER COMPONENTS OF THE DUCTWORK SYSTEM

- Details of offsets required to route ductwork around obstructions (columns, beams, etc.)
- Inspection/servicing/cleaning access openings: number and location of access openings, number and location of test holes
- Regulating Dampers: location and connection type (flange/spigotted connection)
- Smoke damper, smoke/fire dampers: location and connection type (flanged/spigotted connection)
- Round Flexible ducts: location
- Flexible joint connections: location

PARTICULAR REQUIREMENTS

- Air leakage testing: leakage classification required and testing pressure
- Protective finishes (i.e. indoor / outdoor installation, etc.)
- Special supports (if any)
- Attachment to building structure: specific requirements for the junction of ductwork to building openings
- Air terminal units: location
- Other requirements

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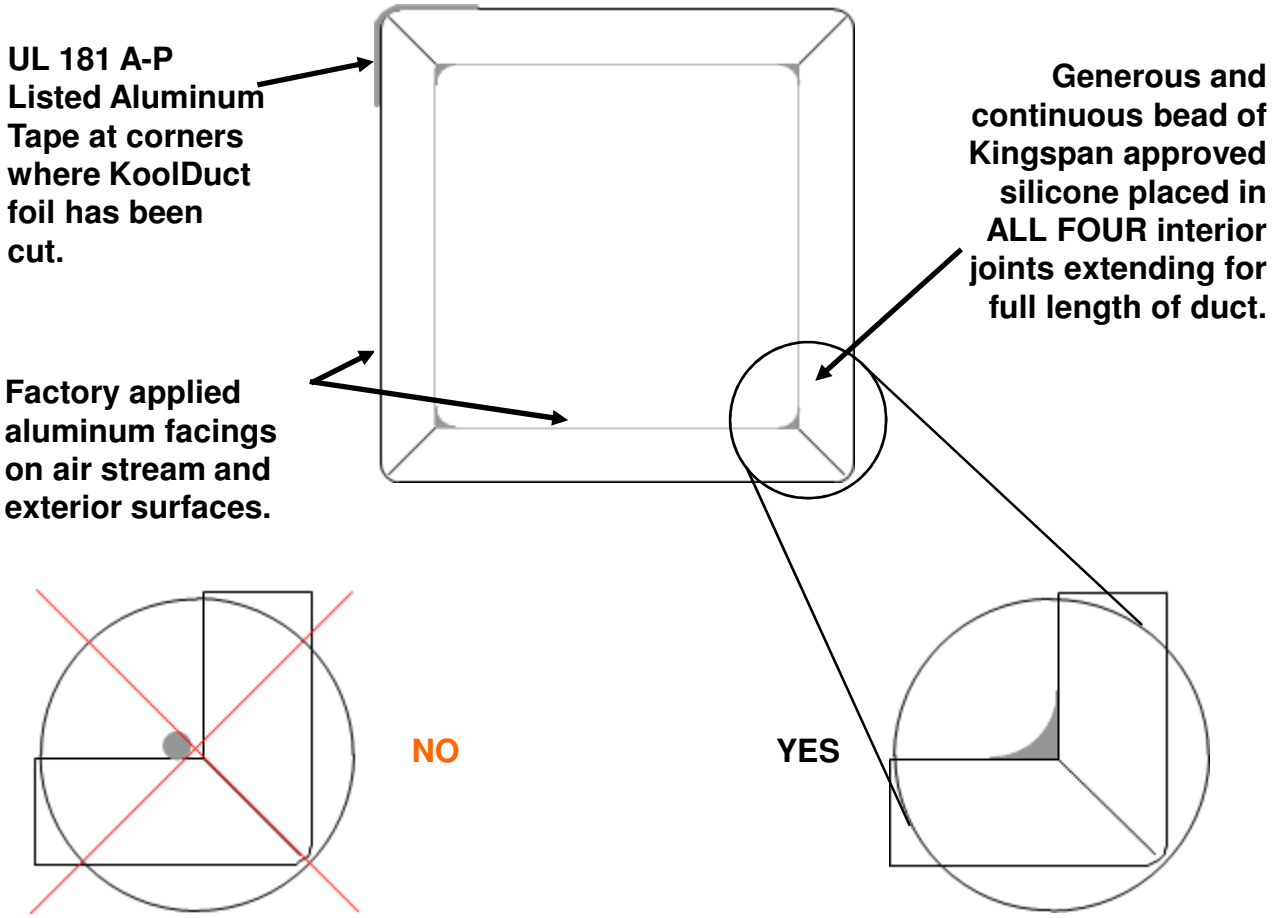
Basic KoolDuct Fabrication Procedure

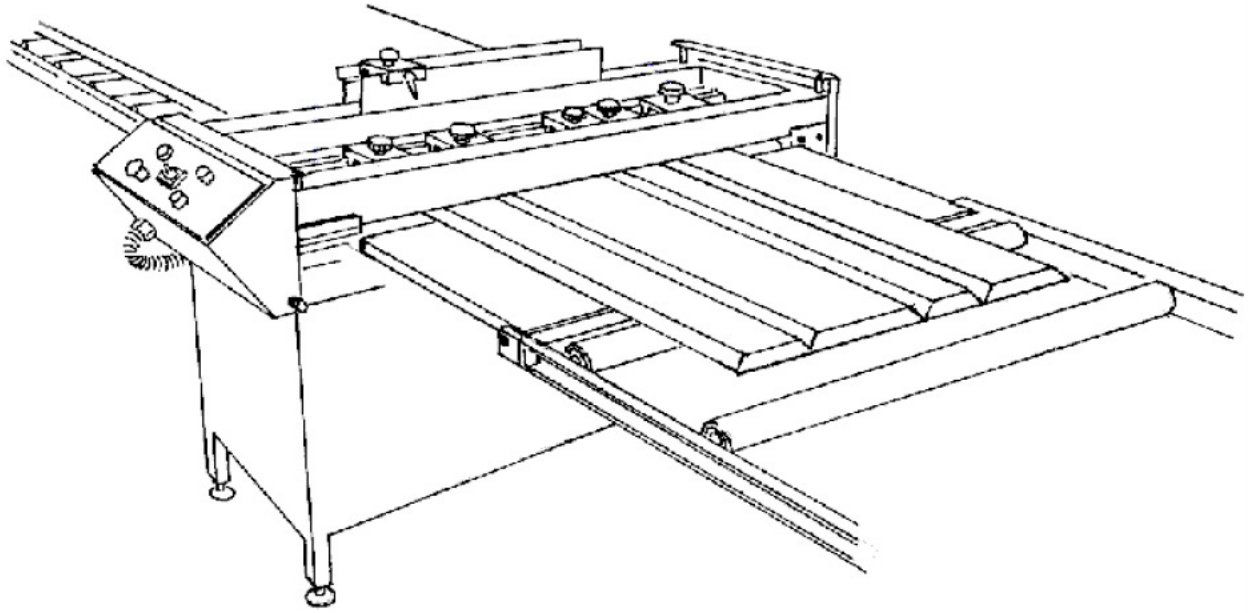
1. TRACING
2. CUTTING
3. ASSEMBLY:
   - with **Tiger Clips** (for pressure classes up to **1000 Pascal**) or
   - with **Adhesive** (for pressure classes up to **750 Pascal**)
4. TAPING
5. REINFORCING
6. COUPLING/JOINING
7. SEALING: with **KoolDuct Silicone sealant.**
8. FABRICATION INSPECTION

KoolDuct Section – End View



Machine Cutting

Specific training to be provided by the manufacturer of the machine



Straight cutting machine

CNC machine

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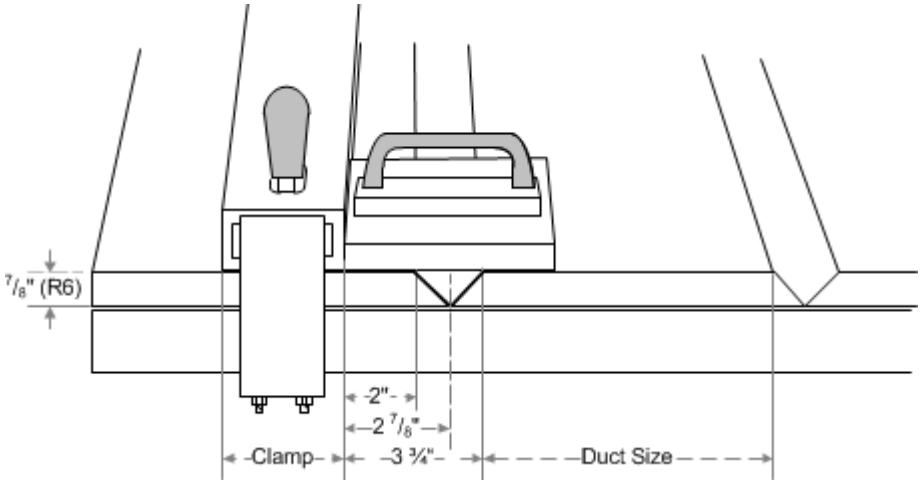
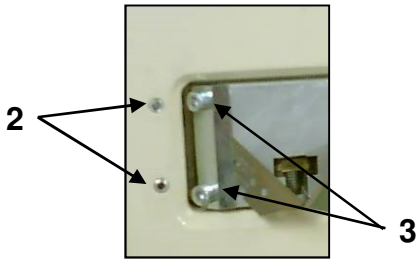
Cutting - Jack Planes for 7/8" (22 mm) Panels, R-6

511 - Jack Plane, two blades at 45°

Blades set 1/32" less than Panel thickness



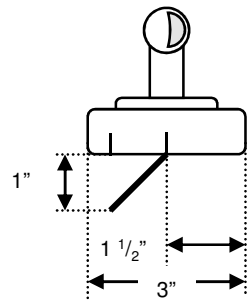


To Set the Cut Height:
A) Unloose big screw (1) on the back
B) Operate on smaller screws (2) at the bottom of Jack Plane
C) Tighten big screw (1)

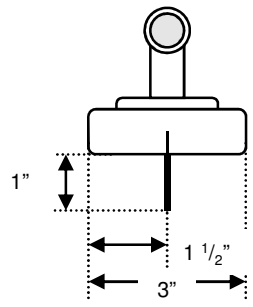
To Change Blades:
D) Operate on stopping screws (3) at the bottom of Jack Plane

513U, 514U, 515U - Small Jack Planes, one blade
Cut 7/8" thickness R-6 with Blade # 741

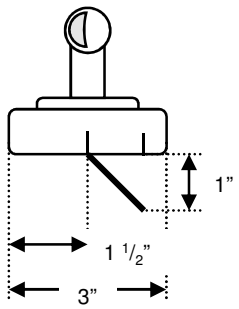
Ref.514U - Small Jack Plane
45 Degrees Left



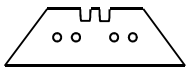
Ref.513U - Small Jack Plane
90 Degrees

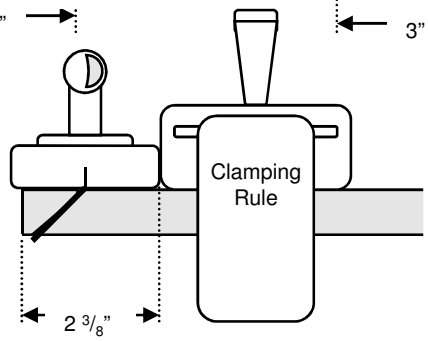


Ref.515U - Small Jack Plane
45 Degrees Right



741 – Blade for 7/8" Panel, R-6





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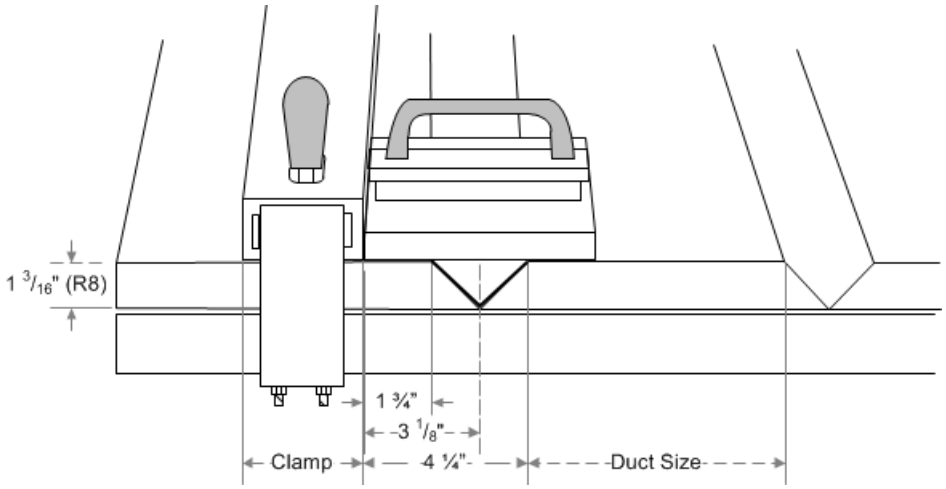
Cutting - Jack Planes for 1 3/16" (30 mm) Panels, R-8

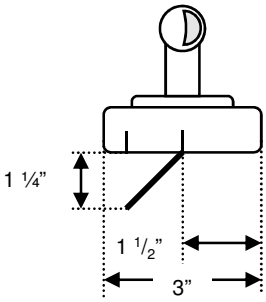
516 - Jack Plane, two blades

Blades set 1/32" less than Panel thickness

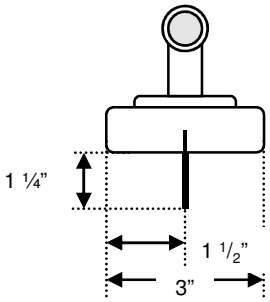


513U, 514U, 515U - Small Jack Planes, one blade
Cut 1 3/16" thickness R-8 with Blade # 744

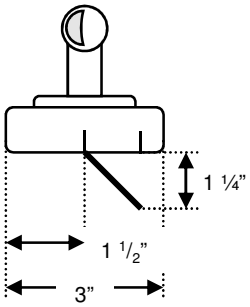
Ref.514U - Small Jack Plane
45 Degrees Left



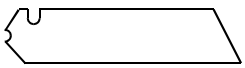
Ref.513U - Small Jack Plane
90 Degrees

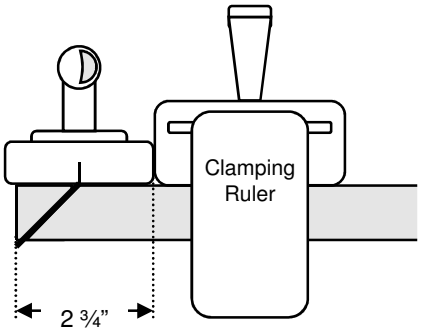


Ref.515U - Small Jack Plane
45 Degrees Right



Ref.744 – Blade for 1 3/16" Panel, R-8





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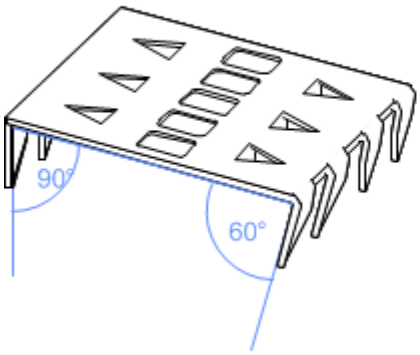
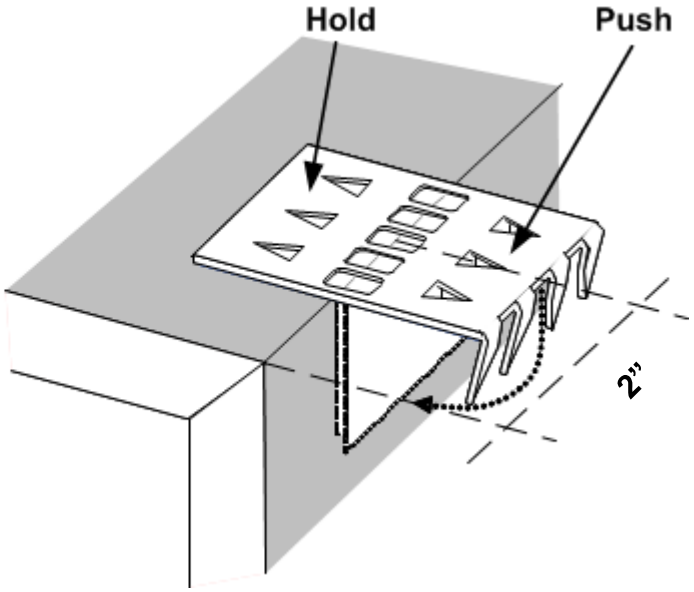
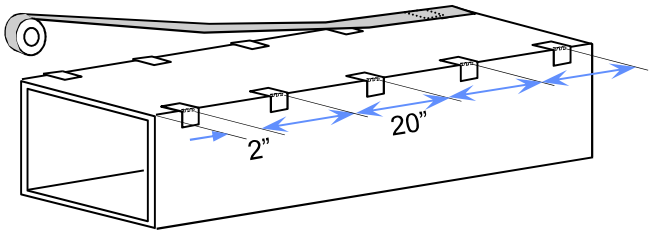
Assembly option 1 - Tiger Clips # 364

ALL duct sections MUST be assembled with Tiger Clips or Adhesive

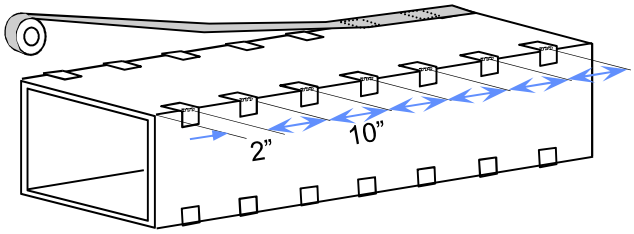






Example 1: Duct 18” x 12”, at 2 in.w.g.

T. Closures only on the open mitred joints
Max spacing: 20”



Example 2: Duct 18” x 12”, at 4 in.w.g.

T. Closures on ALL the mitred joints
Max spacing: 10”

MAXIMUM TIGER CLIPS SPACING			
Pressure	**Straight Duct Size**	**Max Spacing**	**Application**
0 – 2 in.w.g. (0 - 500 Pa)	Any size	20 inches (500 mm)	Longitudinal Seams Only
>2 – 4 in.w.g (501 - 1000 Pa)	Any size	10 inches (250 mm)	Longitudinal Seams Only

Tiger Clips on folded mitre joints ONLY required if the alum. facing has cut or tears

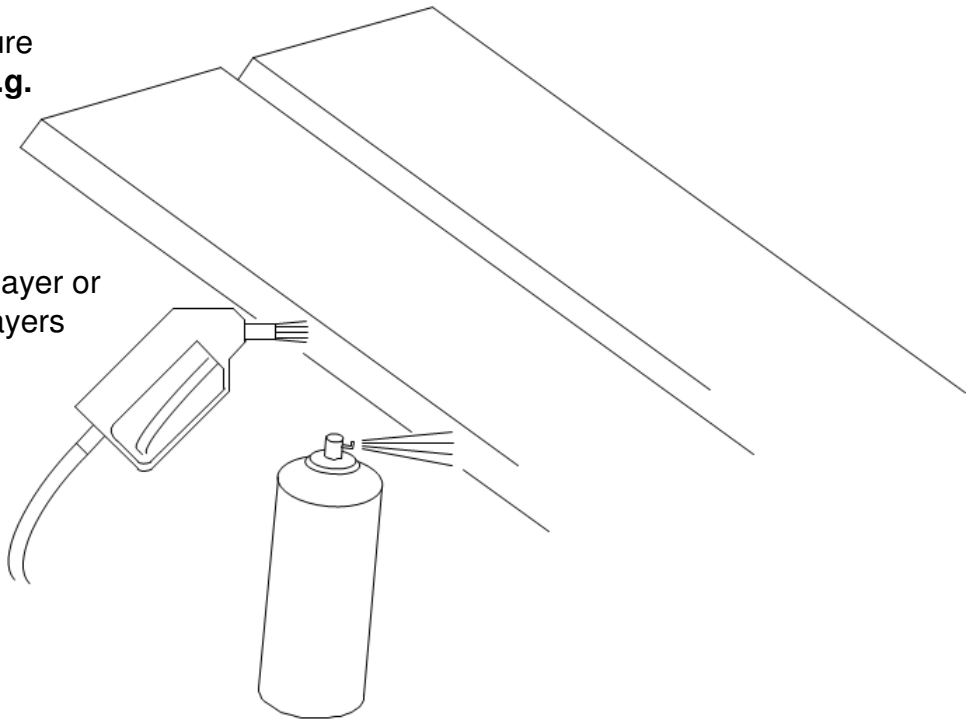
The Kingspan KoolDuct® System

Assembly option 2 – Adhesive # 212 (or spray)

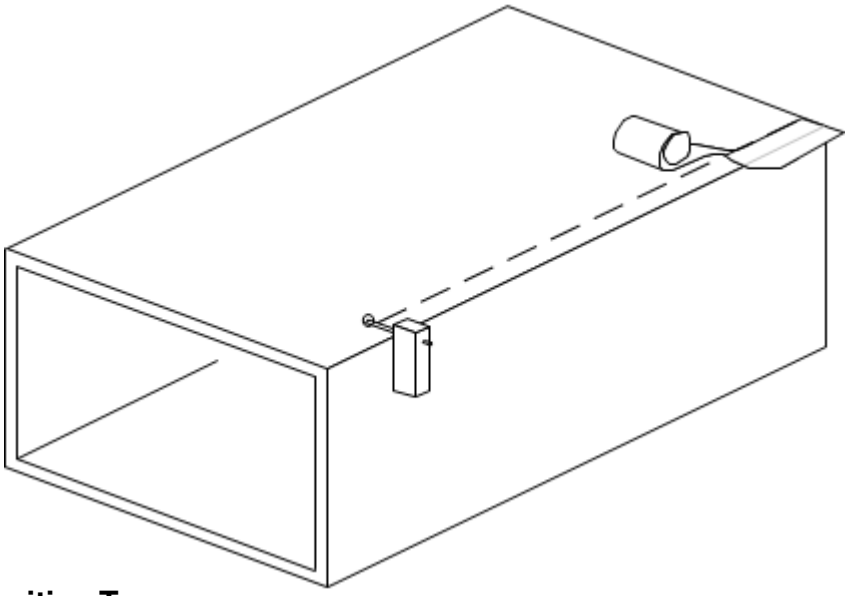
ALL duct sections MUST be assembled with adhesive or Tiger Clips

Adhesive for pressure classes up to **3 in.w.g.**

- Shake well
- Protect board from over spray
- Apply by brush 1 layer or spray 2 or more layers
- Let cure
- Assembly
- Use Rigid spatula # 526



Taping – Aluminum Tape UL Listed 181 A-P



Pressure Sensitive Tape

- Surface preparation: free of oils, dust and dirt.
- Clean surface if required (Typical cleaning solvent Isopropyl alcohol - IPA).
- Use Tape marker #521. Press tape firmly with the adhesive face on the ductwork facing.
- Wipe tape firmly with the Soft spatula # 525

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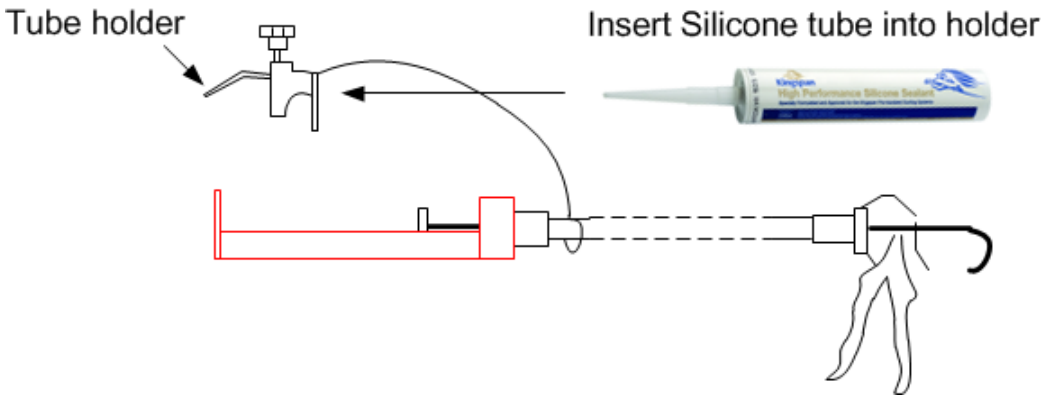
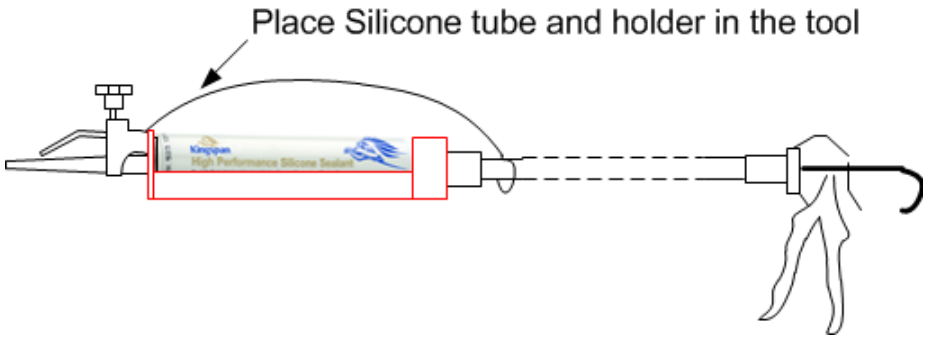
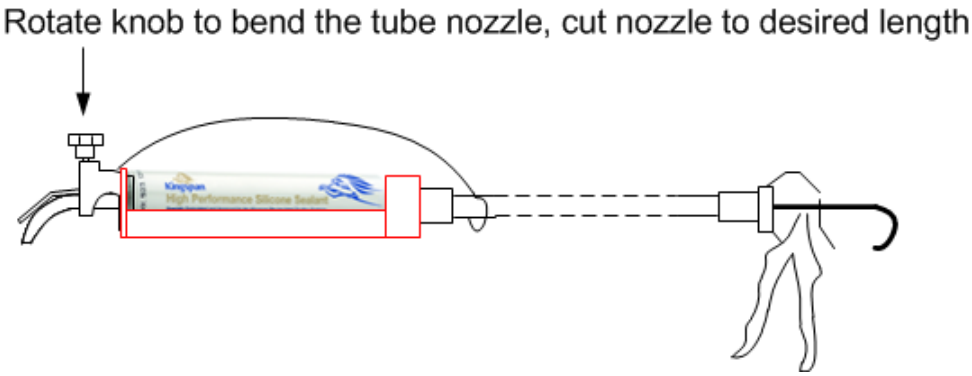
Sealing – Extended Silicone Tool # 444

ALL ductwork sections MUST be sealed with sealant
compliant with the UL Listed KoolDuct System







Suggested silicone coverage and application

- For **low pressure** applications up to 2 in.w.g. (500 Pa): **Minimum** $^{3}/_{16}$" (4 mm) diameter bead (prior to tooling), approx. 66 linear feet (20 m) per tube of 10.5 oz. (310ml)
- For **medium pressure** applications up to 4 in.w.g. (1000 Pa): **Minimum** $^{1}/_{4}$" (6 mm) diameter bead (prior to tooling), approx. 12 linear meter per tube of 10.5 oz. (310ml)
- Silicone application temperature: +5°C +40°C (+41°F +104°F)

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Training Manual

Chapter 2

Rectangular Duct Construction

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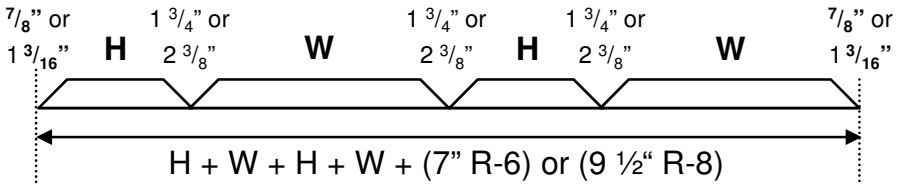
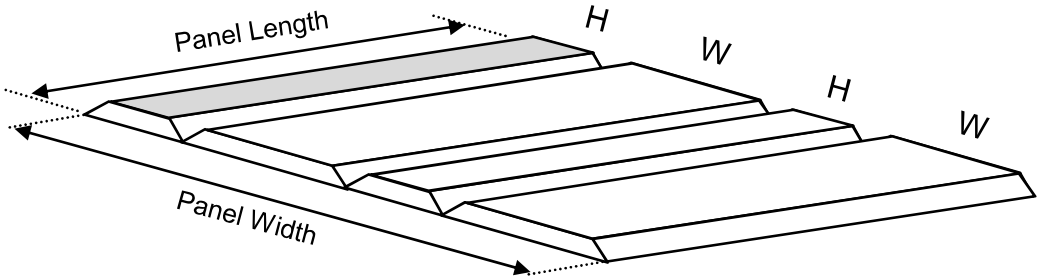
Straight Duct - Cutting METHOD 1

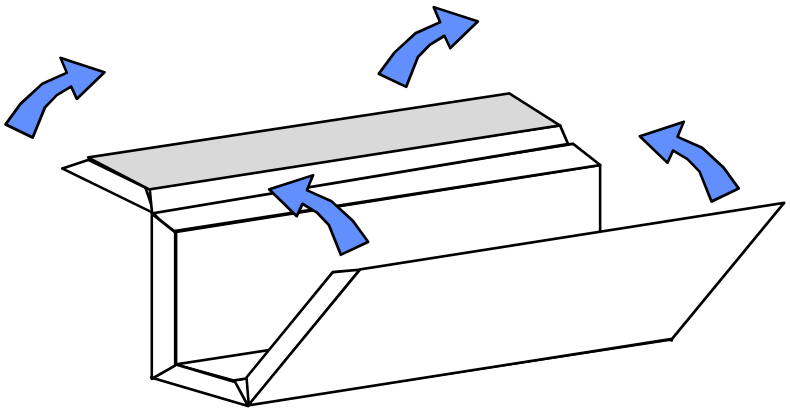
Cutting along the panel length



- 7/8" R-6: The sum of 4 internal sides less than 40 ¼" (2H + 2W)
- 1 3/16" R-8: The sum of 4 sides less than 37 ¾" (2H + 2W)



SEQUENCE OF ASSEMBLY



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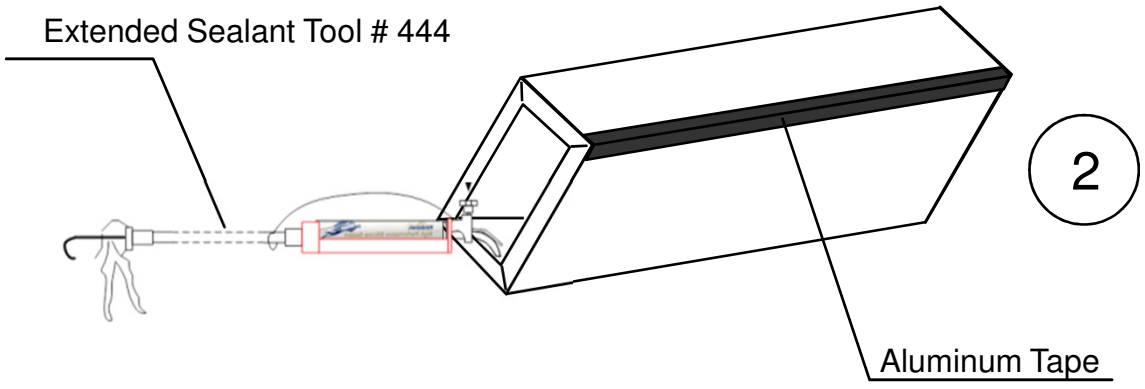

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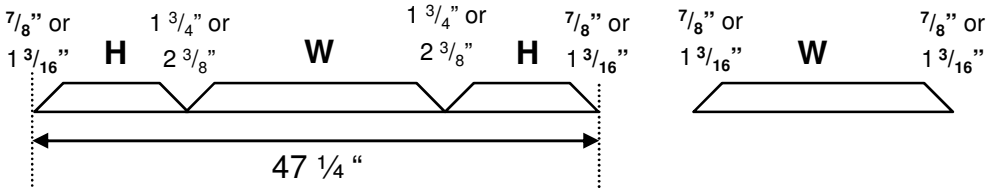
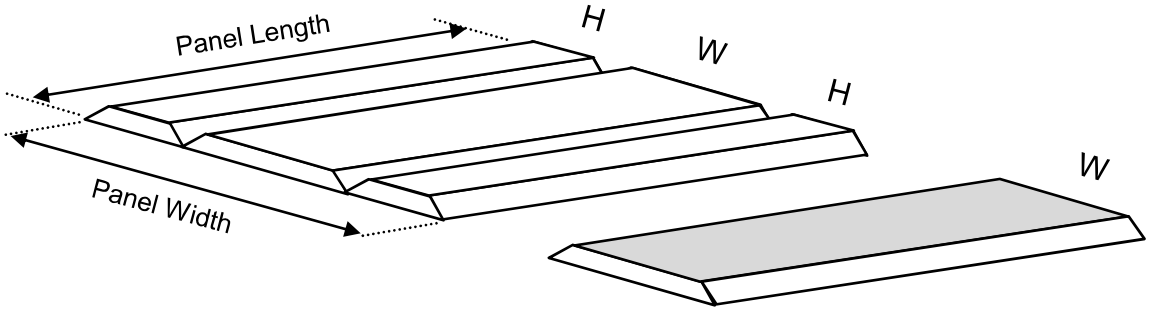
The Kingspan KoolDuct® System

Straight Duct - Cutting METHOD 2

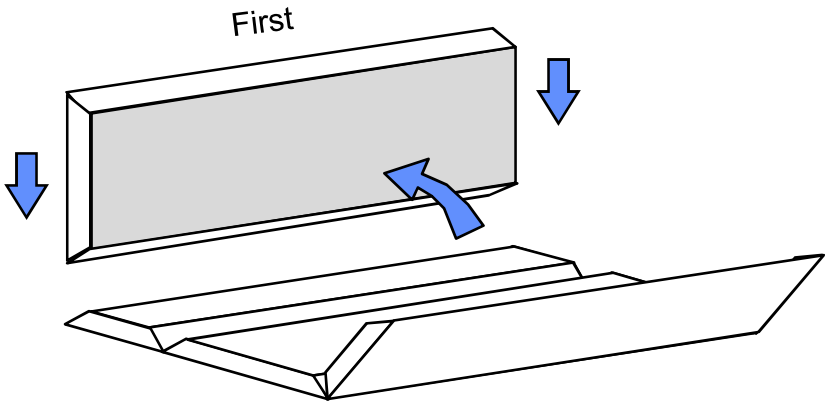
Cutting along the panel length



- 7/8" R-6: The sum of 3 sides less than 42" (2H + W or 2W + H)
- 1 3/16" R-8: The sum of 3 sides less than 40 1/8 " (2H + W or 2W + H)



SEQUENCE OF ASSEMBLY



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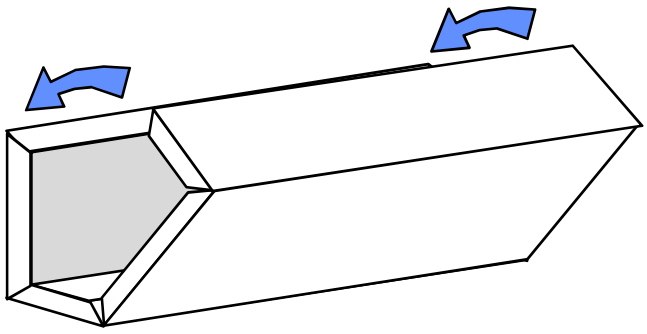
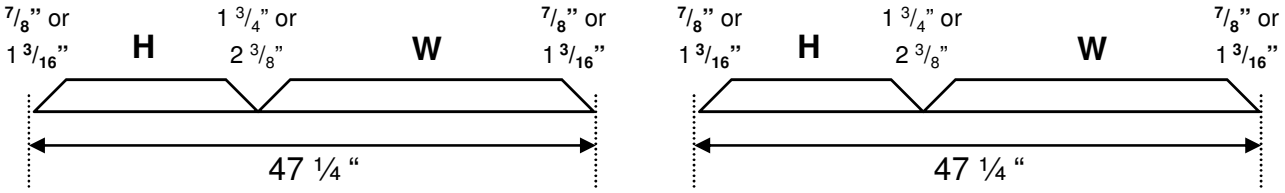


2

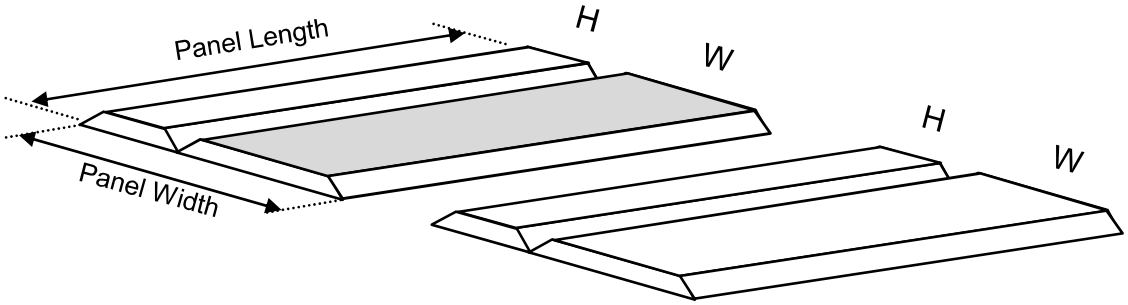
The Kingspan KoolDuct® System

Straight Duct - Cutting METHOD 3

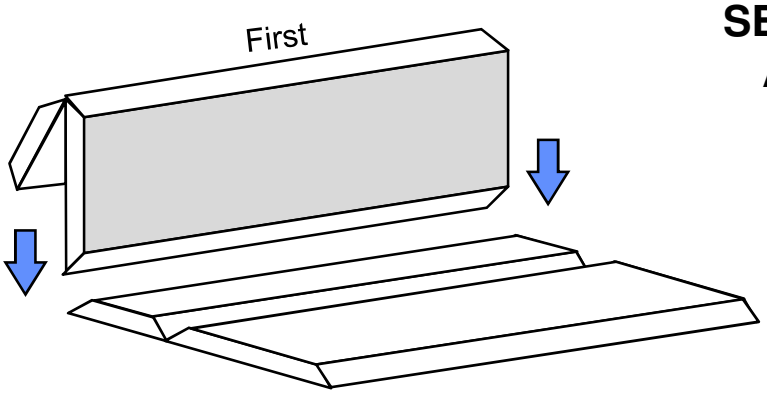
Cutting along the panel length



- $^{7}/_{8}$" R-6: The sum of 2 sides less than 43 ¾" (W + H)
- 1 $^{3}/_{16}$" R-8: The sum of 2 sides less than 42 ½" (W + H)



SEQUENCE OF ASSEMBLY



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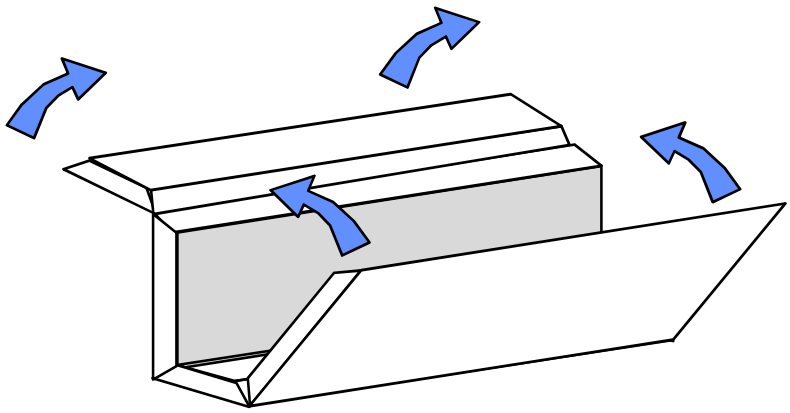
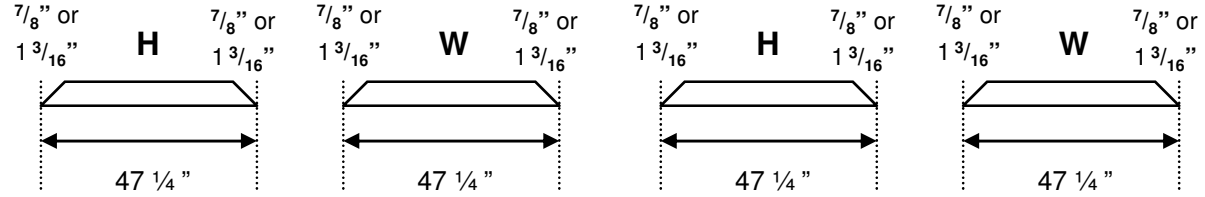


2

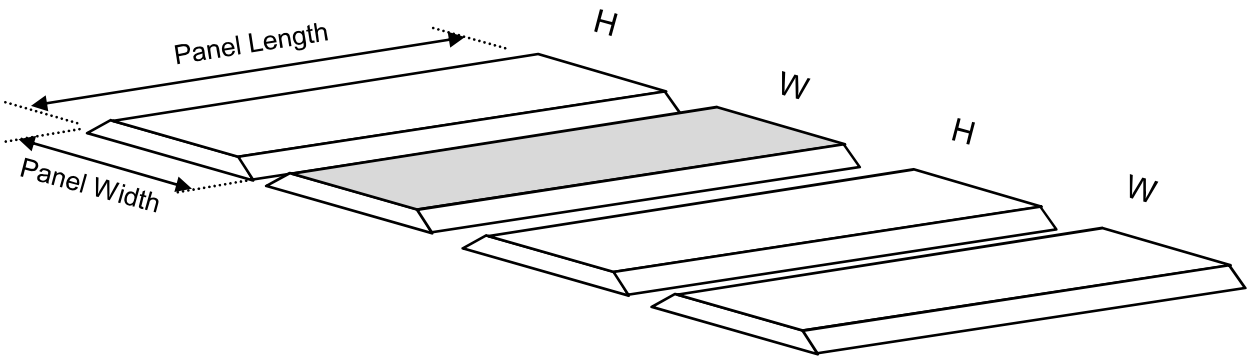
The Kingspan KoolDuct® System

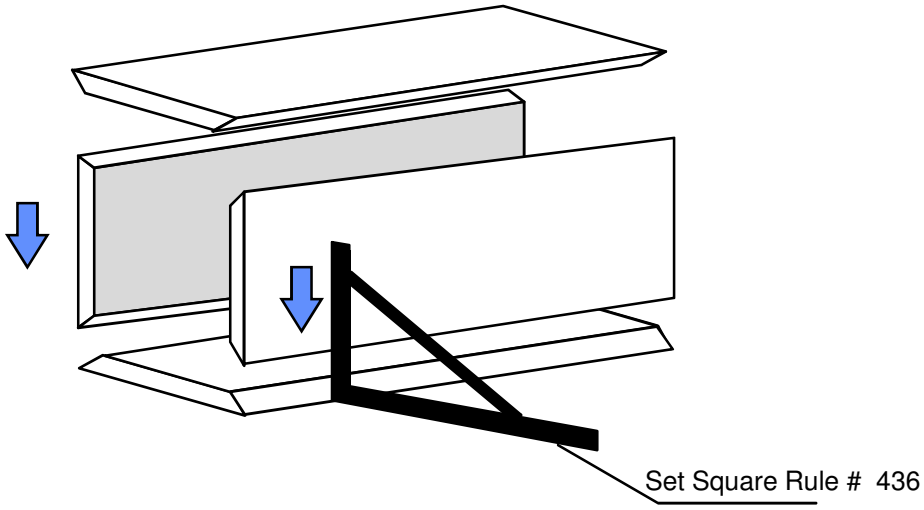
Straight Duct - Cutting METHOD 4

Cutting along the panel length



- $^{7}/_{8}$" R-6: Each side less than 45 ½ "
- 1 $^{3}/_{16}$" R-8: Each side less than 44 $^{7}/_{8}$ "





NOTE

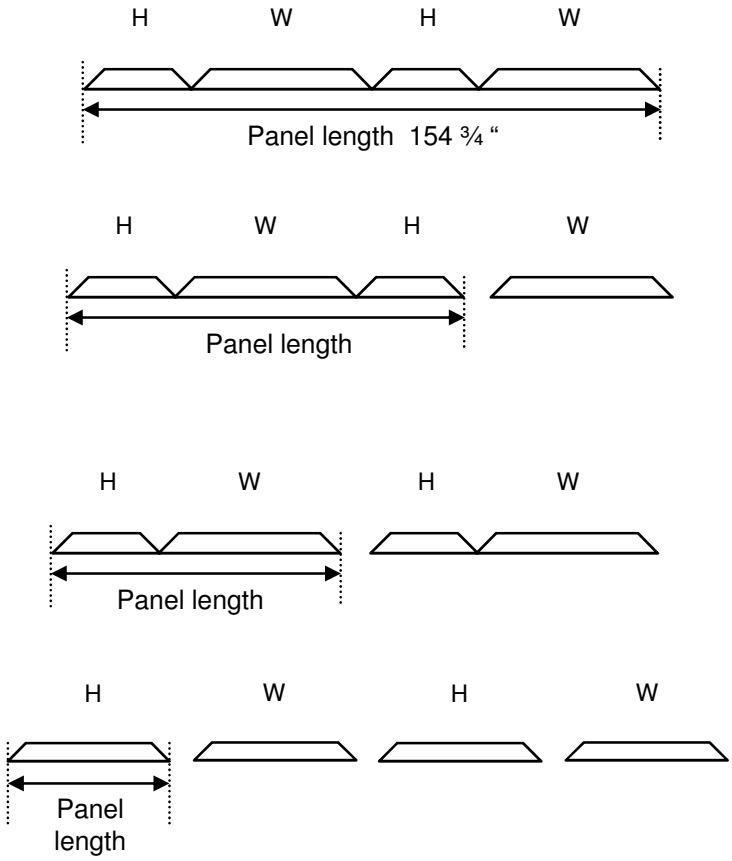
- When assembling the four sides, the duct should be checked (with the T square rule) and held in position

The Kingspan KoolDuct® System

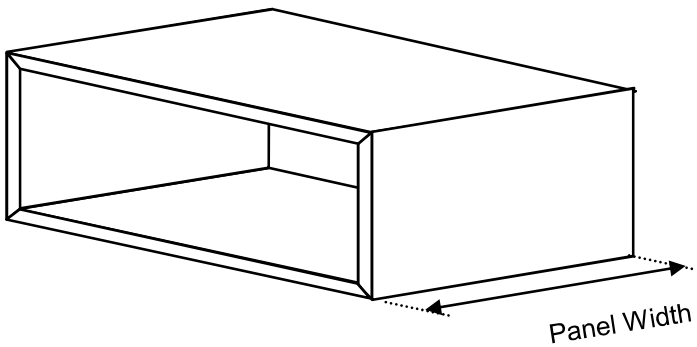
Straight Duct - Cutting METHODS 5-8

Cutting along the panel width

- $^{7}/_{8}$" R-6: Width or Height more than 45 ½ "
- 1 $^{3}/_{16}$" R-8: Width or Height more than 44 $^{7}/_{8}$ "

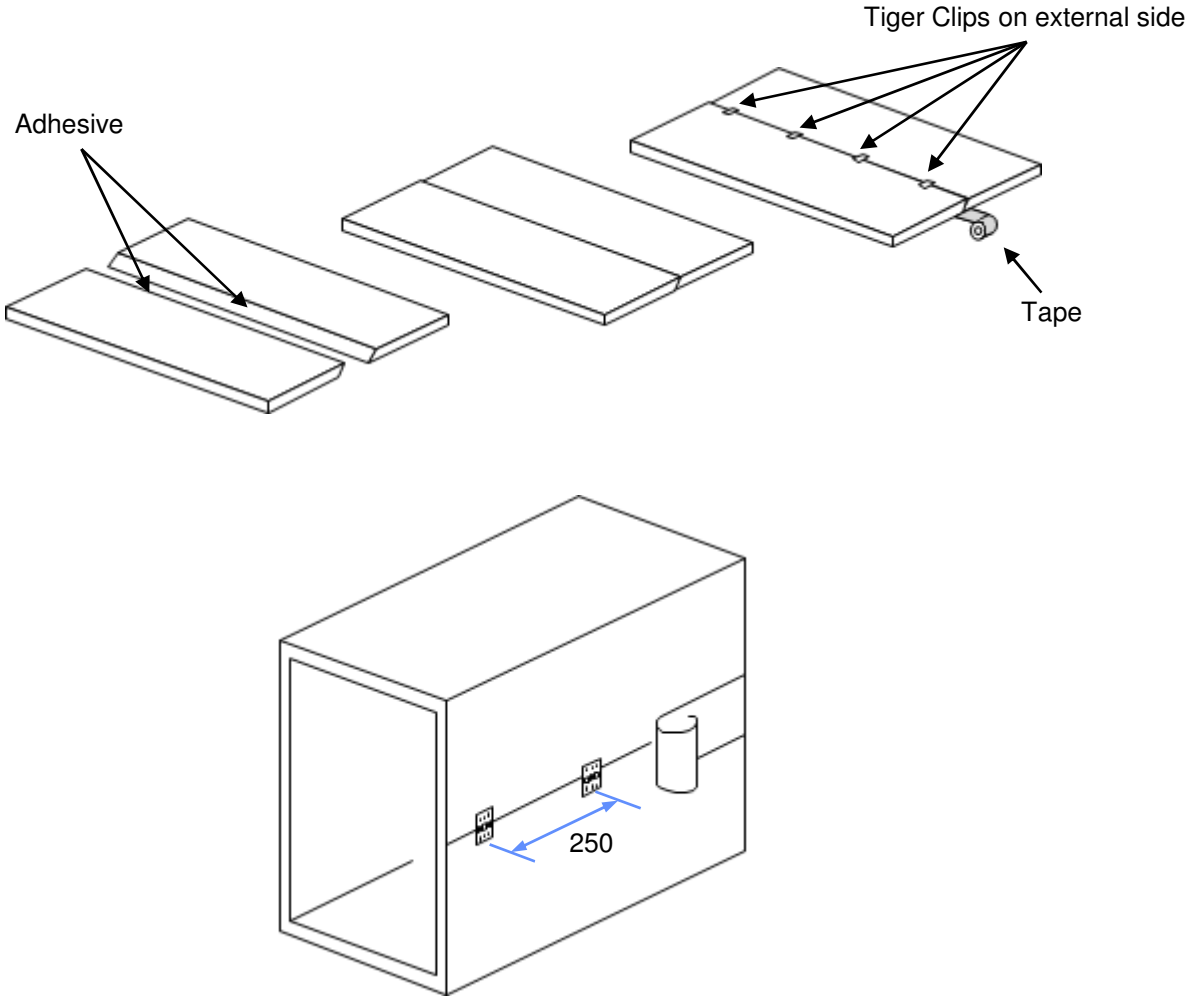


- Cutting along the panel width
- Duct Length limited to 47 ¼ "



The Kingspan KoolDuct® System

Panel joint

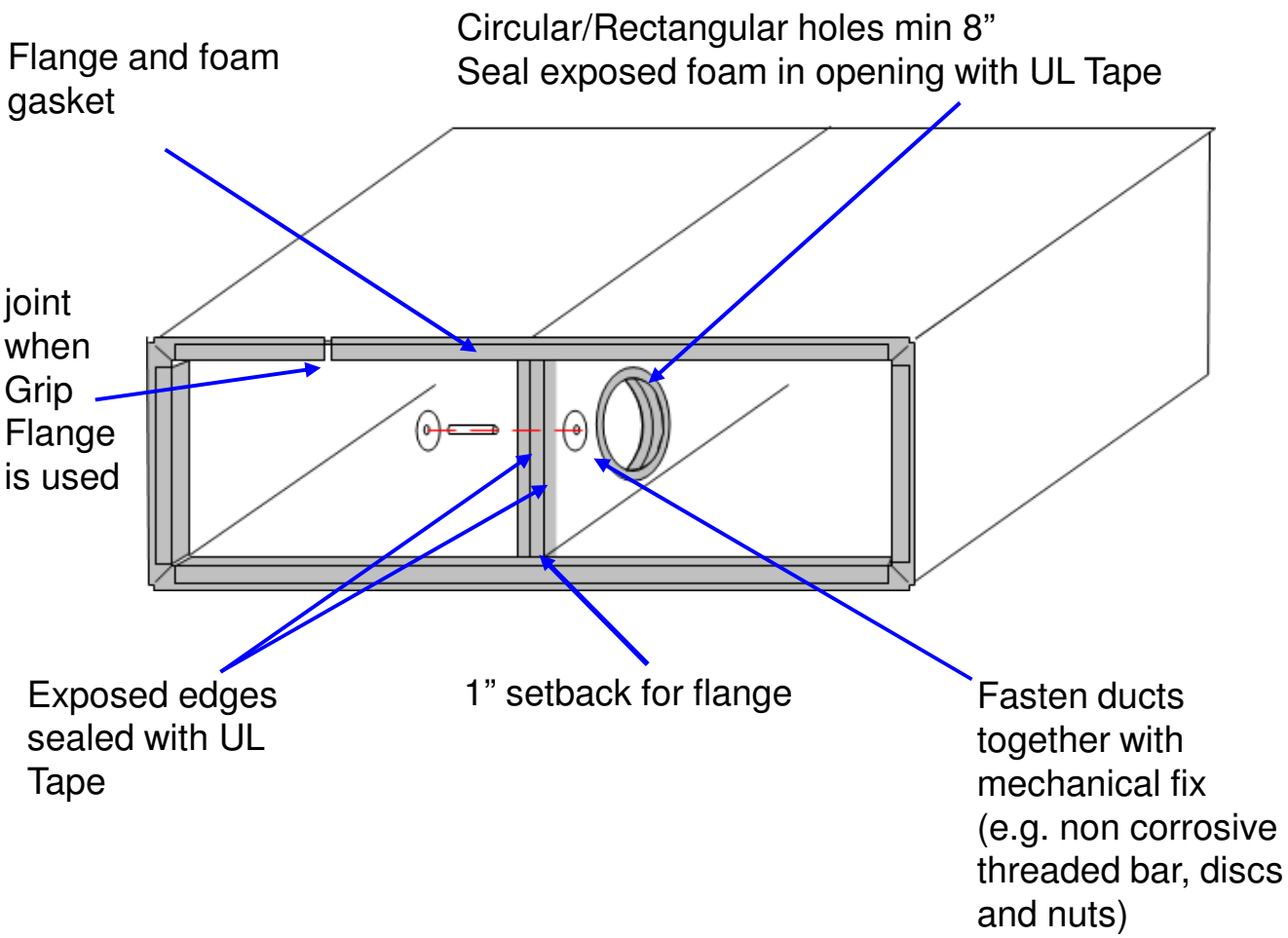


- Bevelled edges of the two panels to be jointed
- Adhesive on all bevel joints
- Tiger clips at a maximum of 10” centres, along the external side
- Tiger clips and panel joint are covered with UL tape on both sides
- When reinforcement is required:
    - install extra reinforcement along the joint in addition to the standard reinforcement.
    - 1 reinforcing bar installed at the same centres as the standard reinforcement

The Kingspan KoolDuct® System

Multiple Duct Design

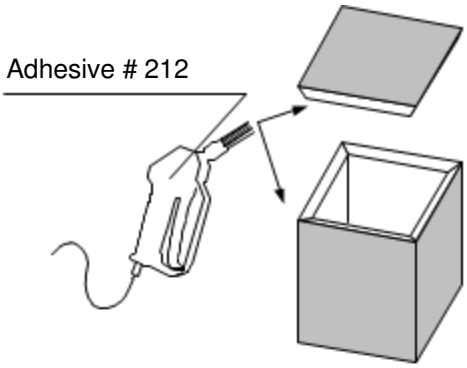
Application: Alternative fabrication method for large ductwork with w and or h >1200mm. Likely to require less reinforcement than Methods 5-8.



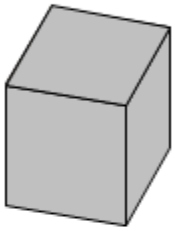
The Kingspan KoolDuct® System

End Cap

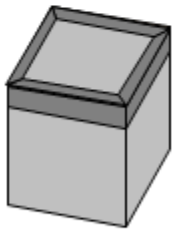
Option 1: Short Duct or Plenum



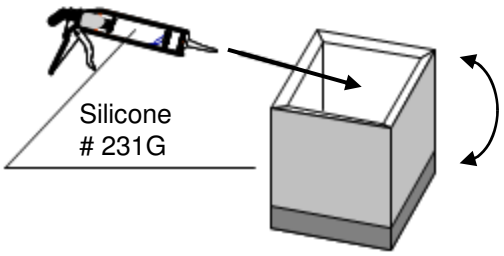
Cut End Cap at 45 Degrees.
Assembly with Adhesive or Tiger Clips



Fix End Cap to duct end

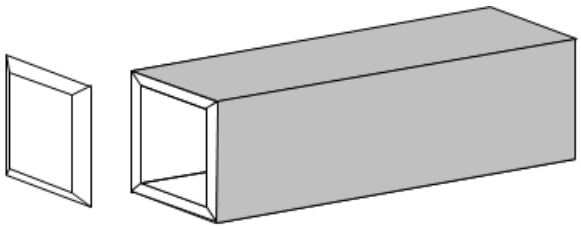


Apply tape around End Cap

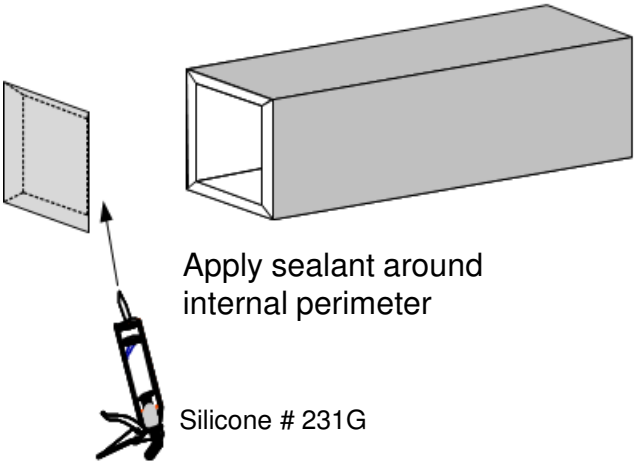


Seal with silicone inside duct and End Cap

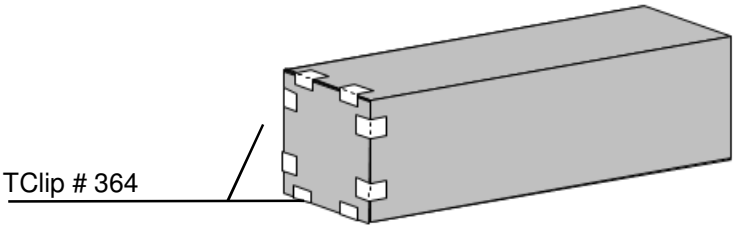
Option 2: Long Duct > 40”



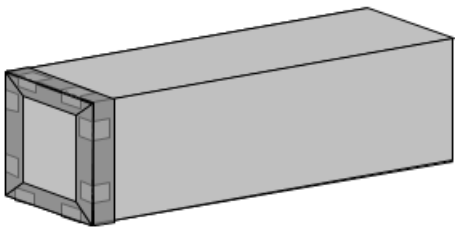
Cut End Cap at 45 degrees



Apply sealant around
internal perimeter



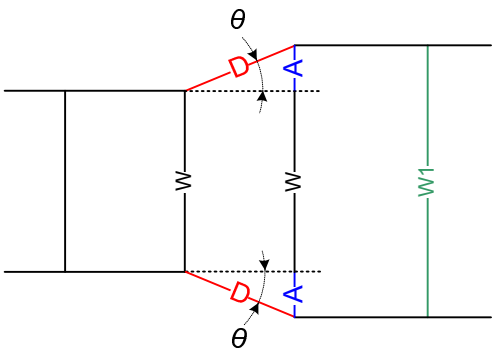
Fix End Cap to duct end
Tiger Clips Max spacing: 10”



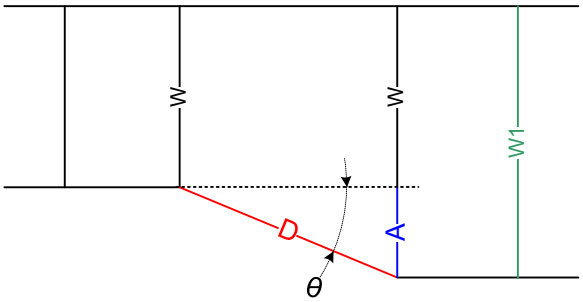
Apply UL tape around End-Cap

The Kingspan KoolDuct® System

Transition



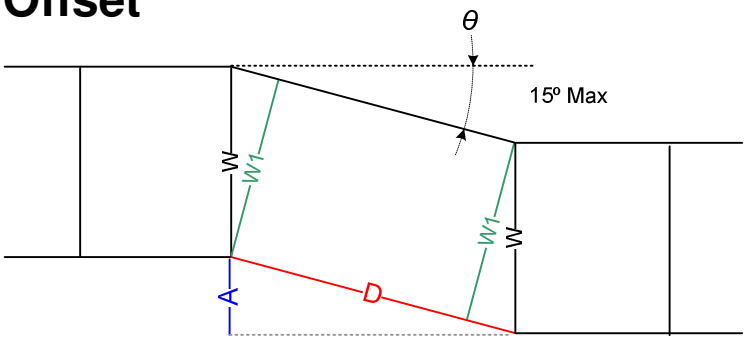
Concentric transition
θ max. 22.5° (D ≥ 2.5 x A)



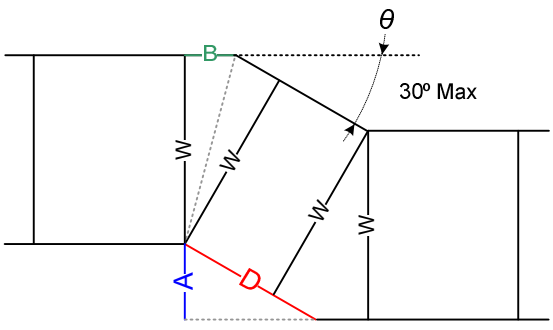
Eccentric transition
θ max. 22.5° (D ≥ 2.5 x A)

Splitters are required for angles greater than 22.5°.
Note: SMACNA recommended max. angles for diverging/converging transitions are acceptable

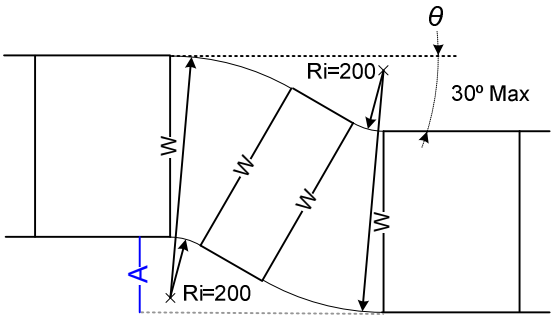
Offset



Angled Offset
θ max. 15° (D ≥ 4 x A)



Mitred Offset
θ max. 30° (D ≥ 2 x A)
(B = 0.27 x W)

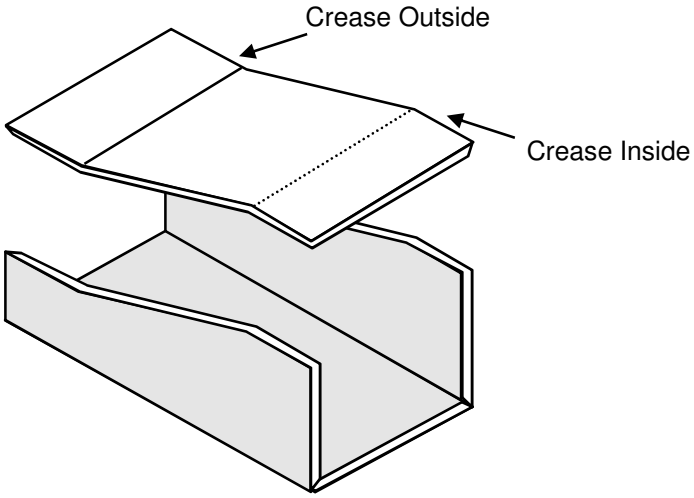


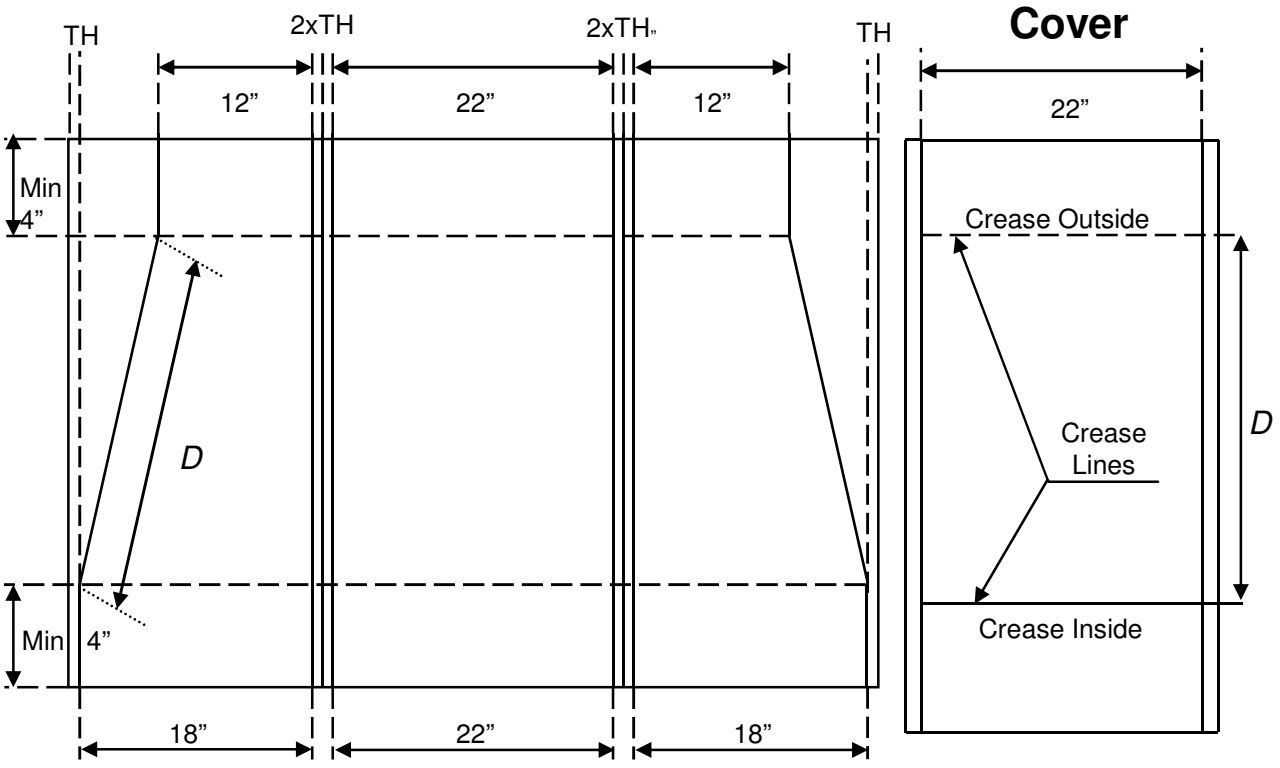
Radius Offset
θ max. 30°
(200mm Radius minimum)

The Kingspan KoolDuct® System

Eccentric Transition

Minimum Neck size: 100 mm



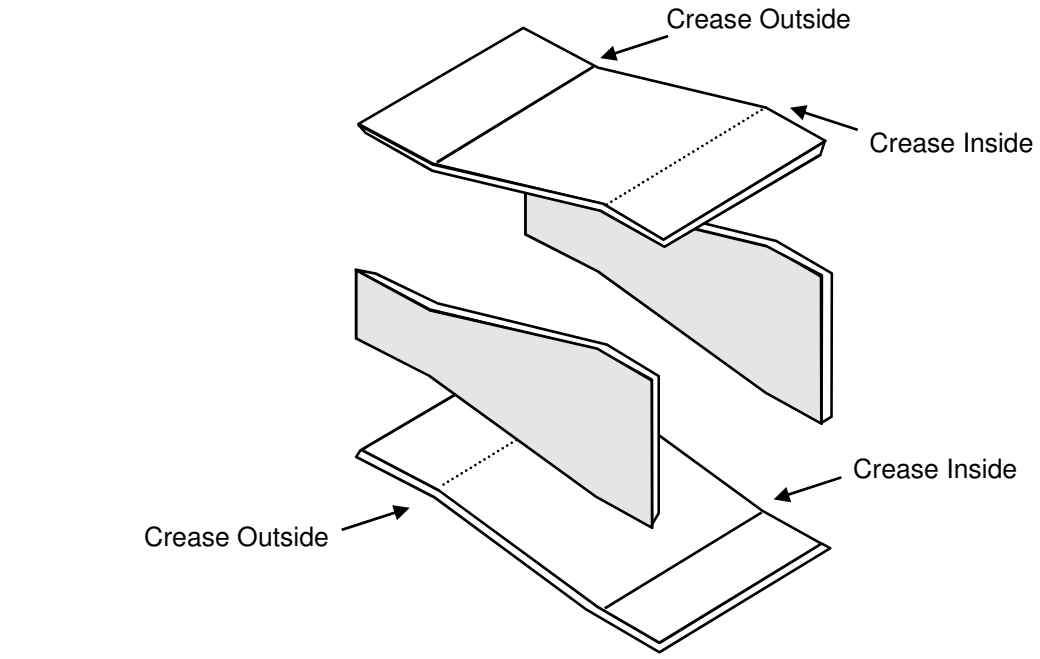


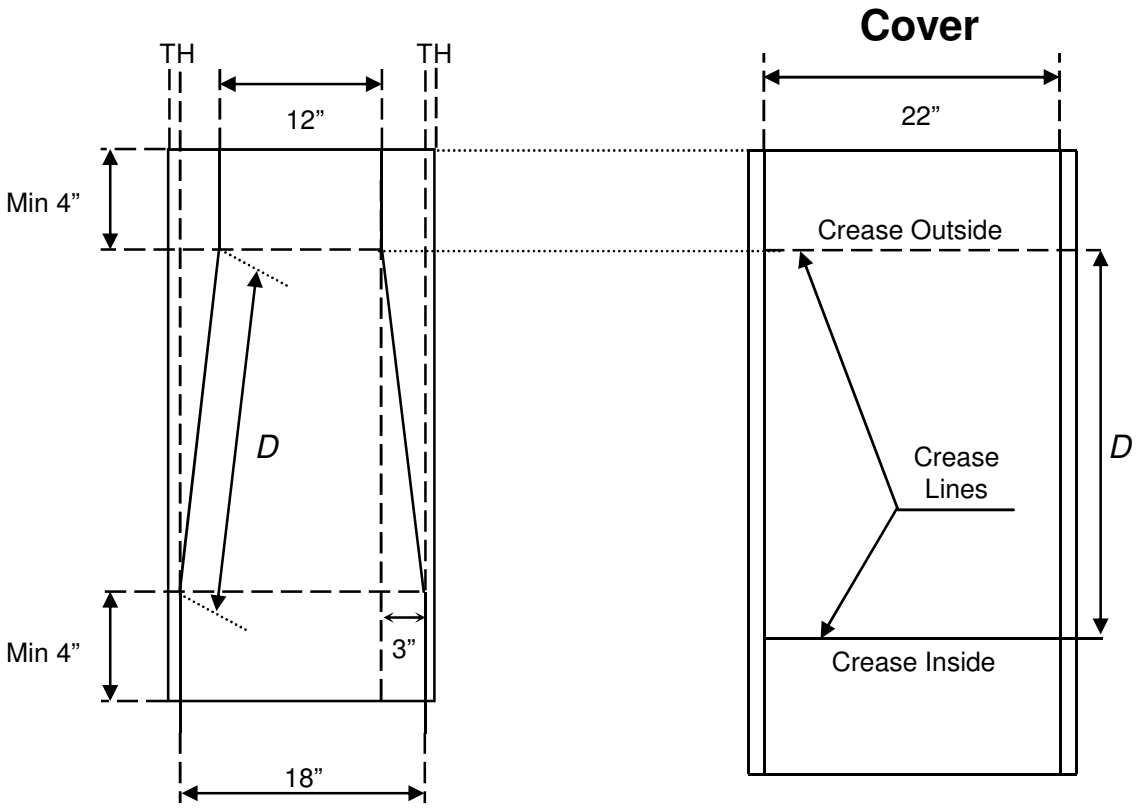
- Dimensions in inches
- D minimum = 2.5 x (18”-12”) = 2.5 x 6” = 15”

The Kingspan KoolDuct® System

Concentric Transition

Minimum Neck size: 100 mm



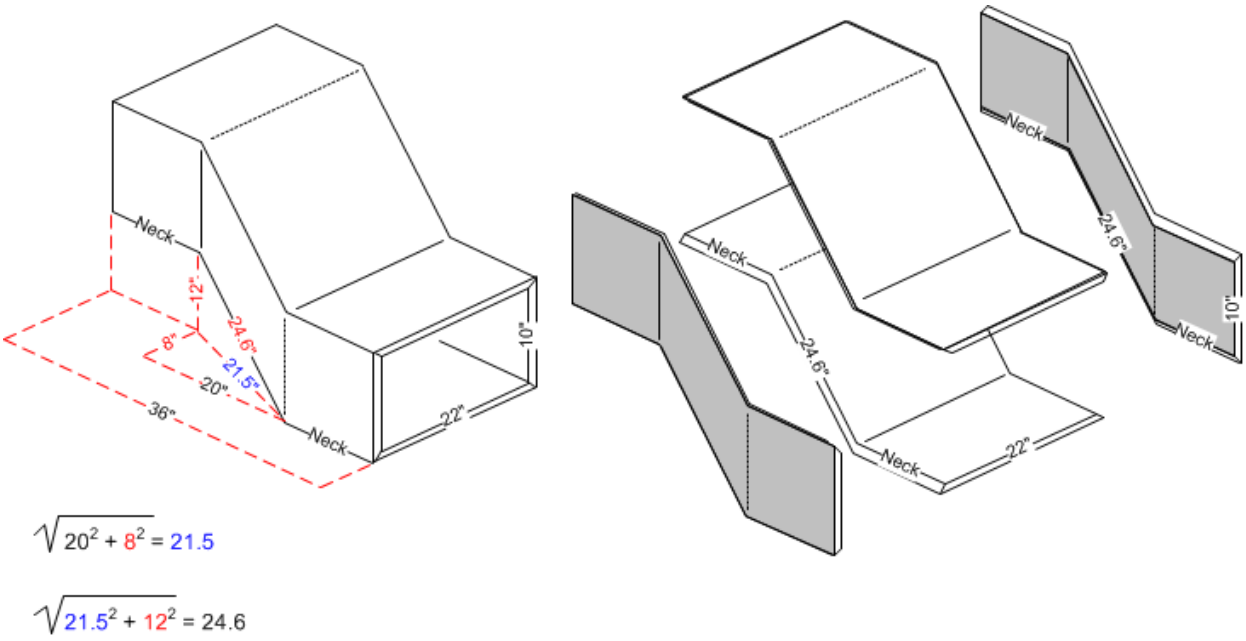


- Dimensions in inches
- D minimum = 2.5 x 3” = 7 ½ ”

The Kingspan KoolDuct® System

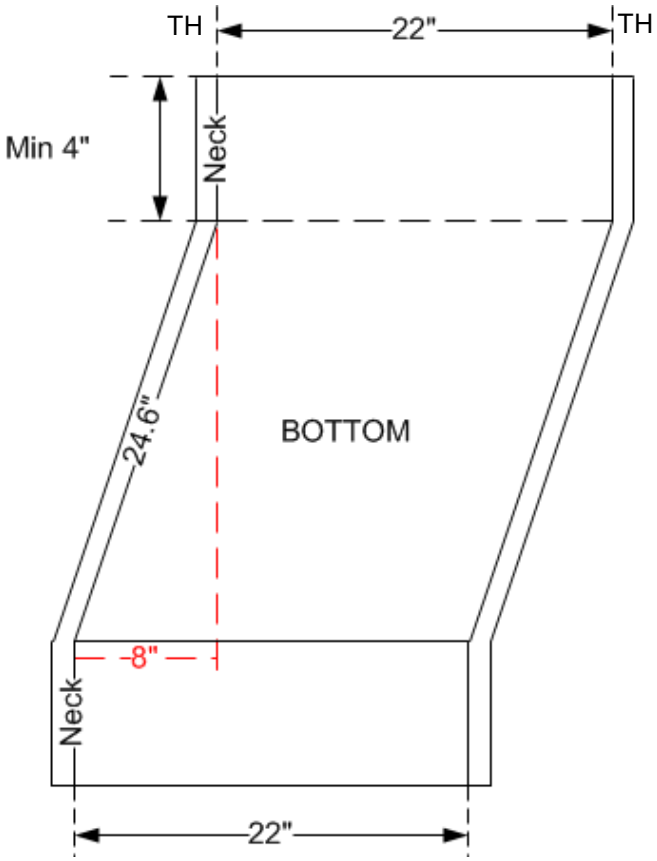
Double Offset

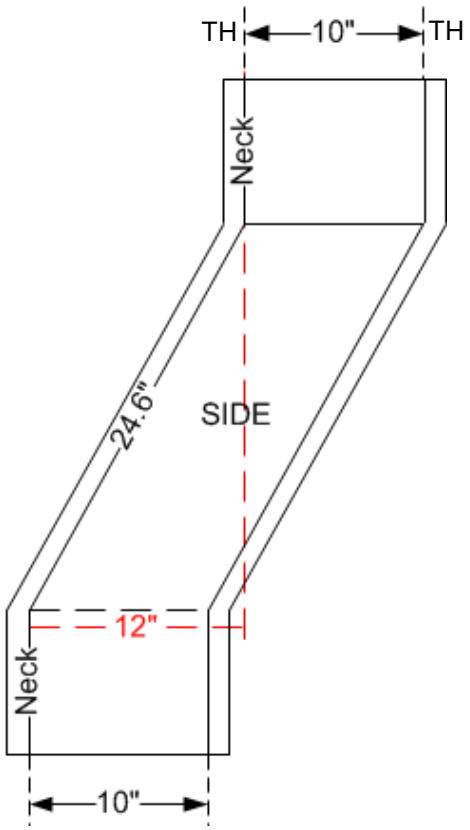
Minimum Neck size: 4”



$\sqrt{20^2 + 8^2} = 21.5$

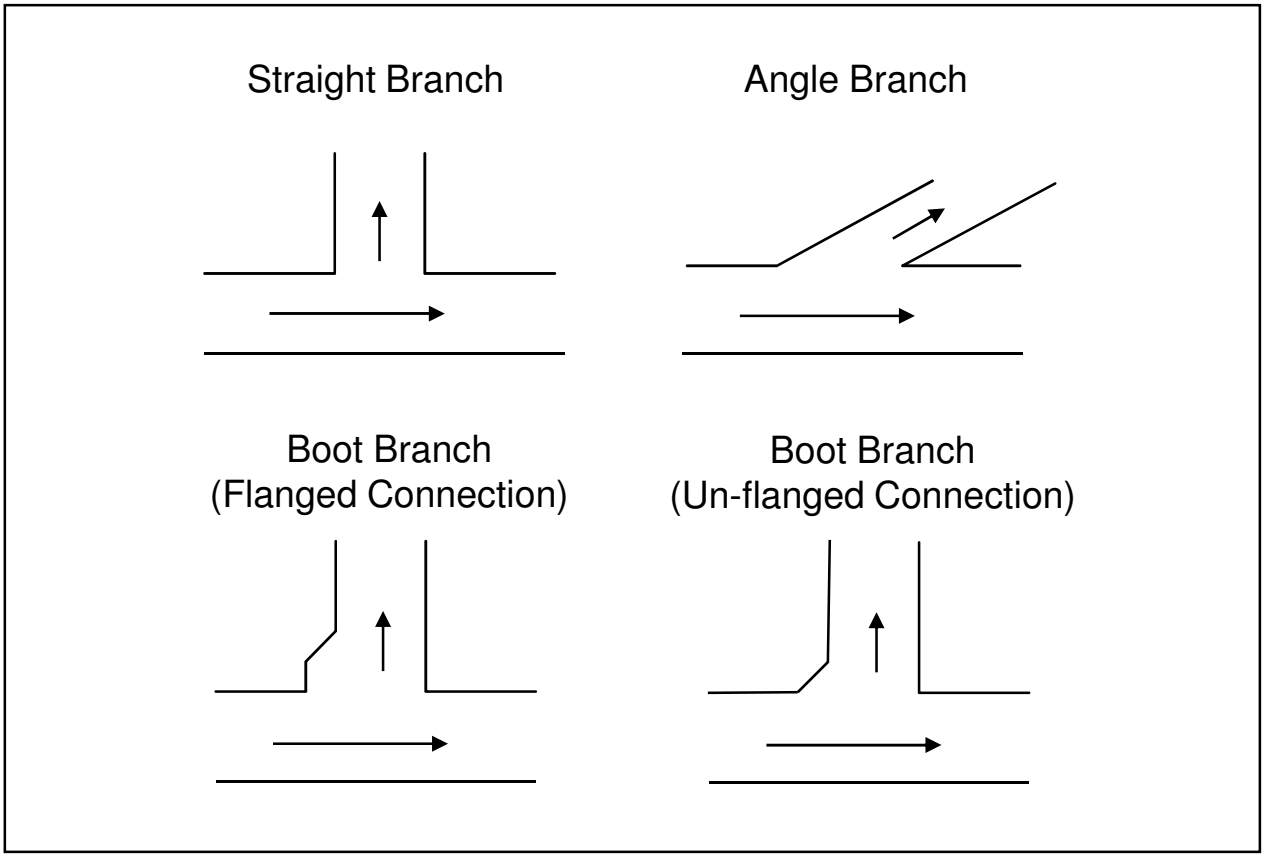
$\sqrt{21.5^2 + 12^2} = 24.6$



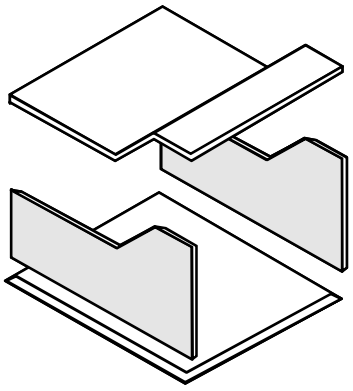


The Kingspan KoolDuct® System

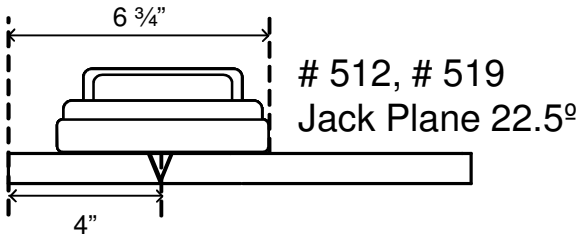
Take-Off

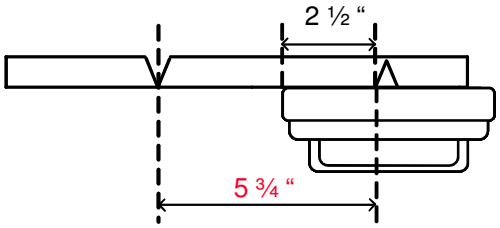


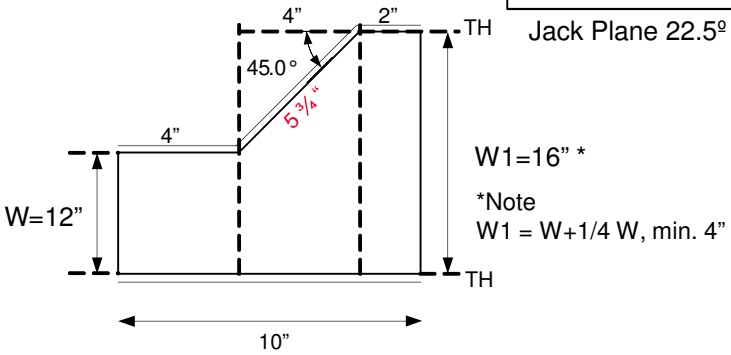
Boot Branch

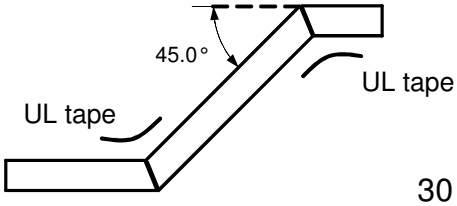


Jack Plane 22.5º







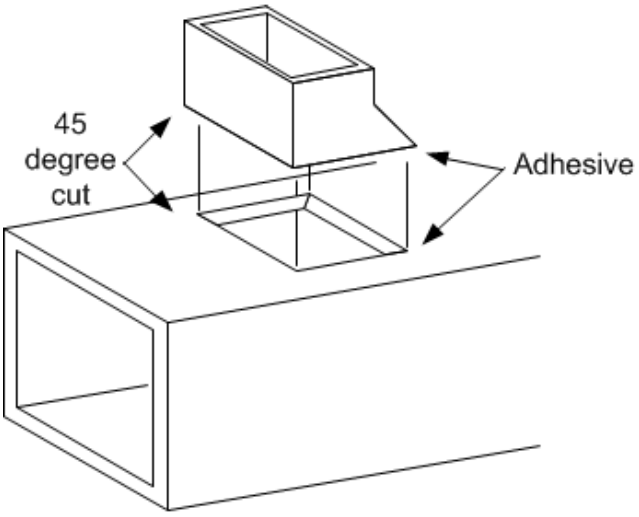


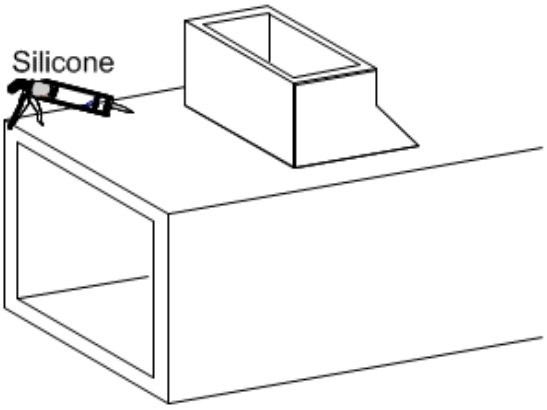
The Kingspan KoolDuct® System

Small Take-Off – Un-flanged Connection

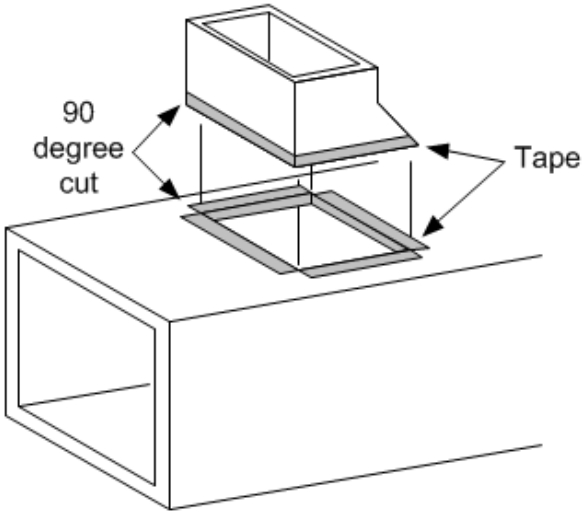
Duct side up to 24”, and Low Pressure up to 2 in.w.g.

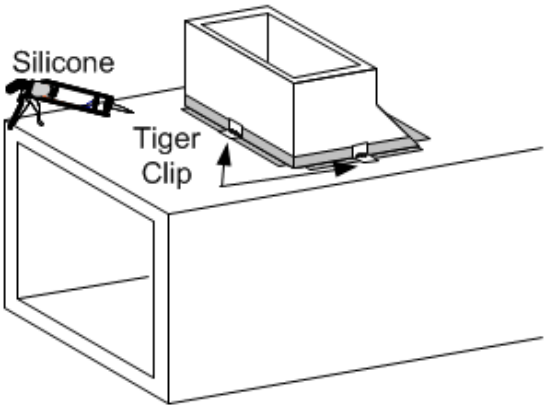
Option 1

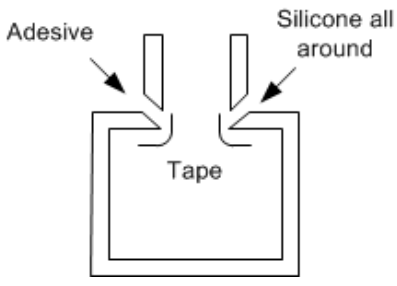




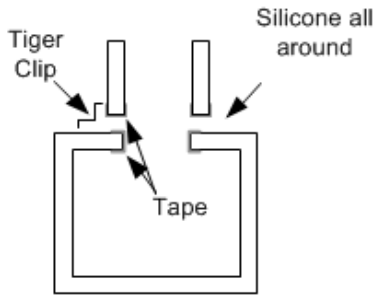
Option 2







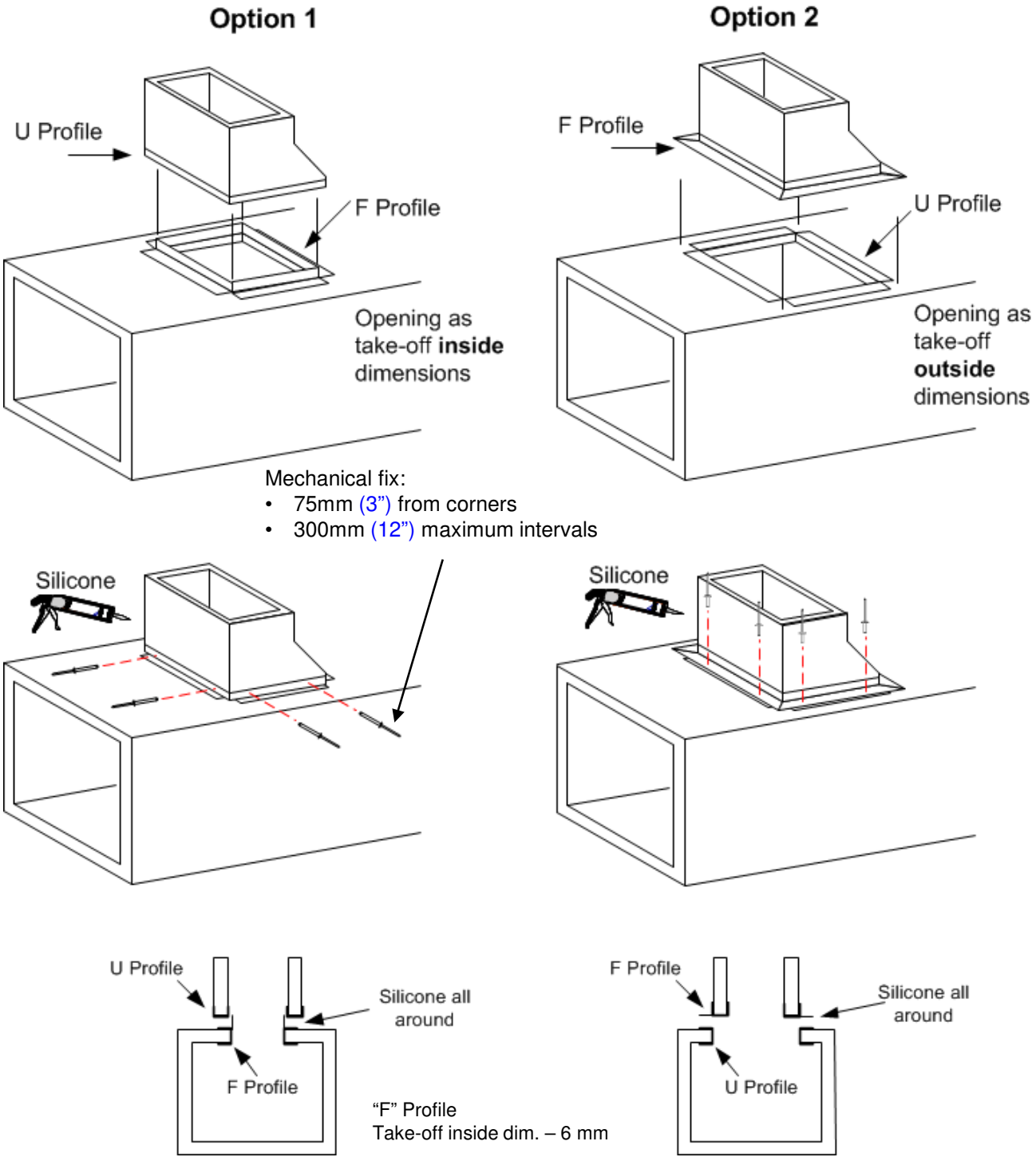
SUGGESTED TIGER CLIP PLACEMEMENT	
Opening w or h	**No. Tiger Clip per Side**
4”-6”	1
7”-12”	2
13”-20”	3
21”-24”	4



The Kingspan KoolDuct® System

Large Take-Off – Flanged Connection

Duct side larger than 24”, Pressure up to 4 in.w.g.

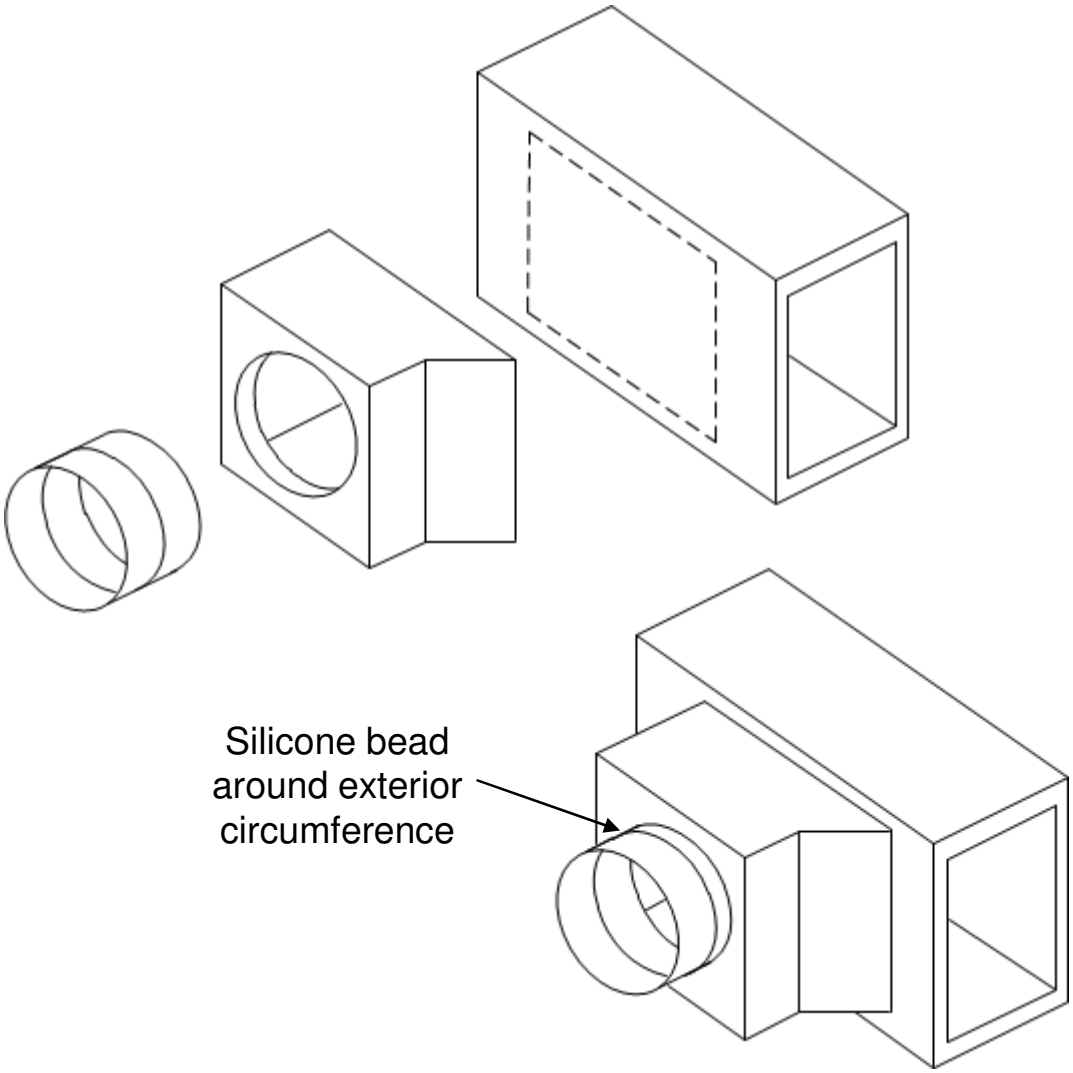


Screws/rivets: minimum 2 per side, located at 300mm (12”) max spacing
Suggested blind rivets with aluminum body:

- Minimum diameter 4.0mm (5/32”)
- Through flange only: rivet grip range 3-8mm (1/8" to 5/16“)
- Through flange and panel:
  - For 22mm KoolDuct: rivet with grip range 25-30mm (1" to 1 3/16“)
  - For 30mm KoolDuct: rivet with grip range 33-38mm (1 5/16" to 1 1/2")

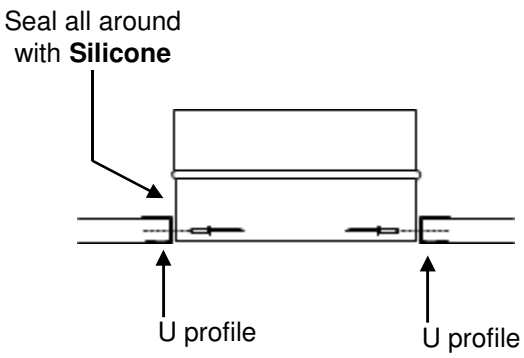
The Kingspan KoolDuct® System

Boot Branch with round fitting



Large round fitting – Flanged Connection

Mechanical Fix required for diam. larger than 12” and/or Pressure > 2 in.w.g.

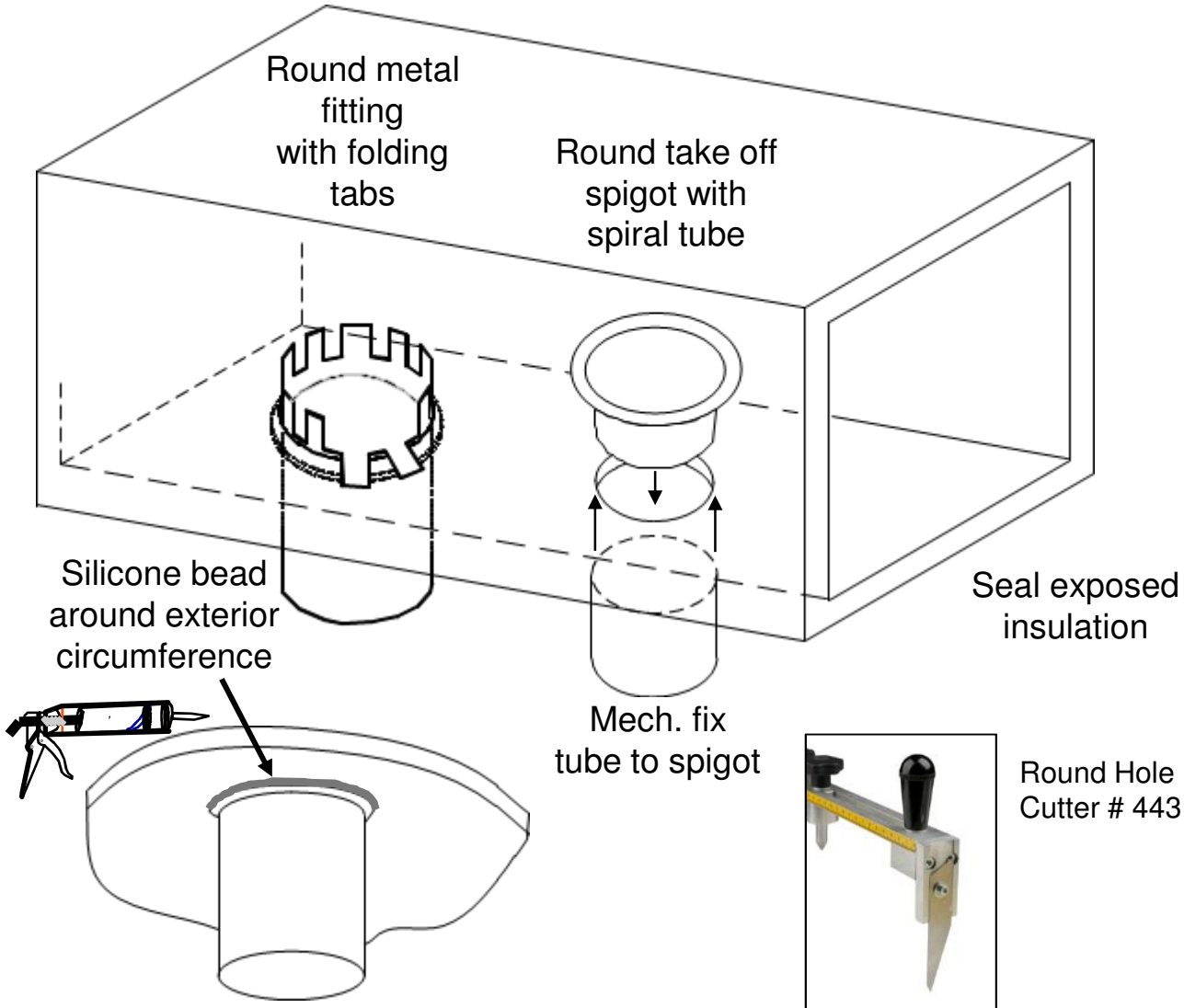


Mechanical Fix
for diam. larger than 12”
and/or Pressure > 2 in.w.g.

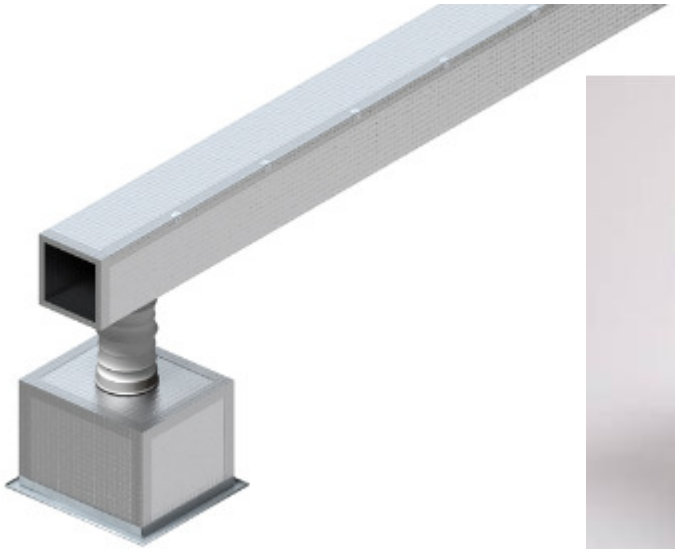
The Kingspan KoolDuct® System

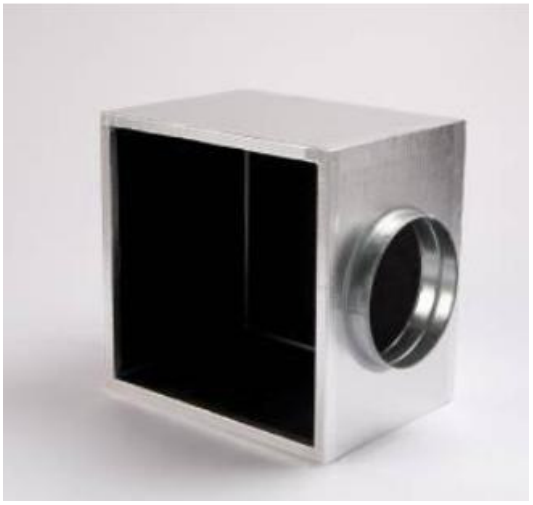
Round Fitting for Round Diffusers and Flexible Ducts

Mechanical Fix required for diam. larger than 12" and/or Pressure > 2 in.w.g.



Round Hole Cutter # 443

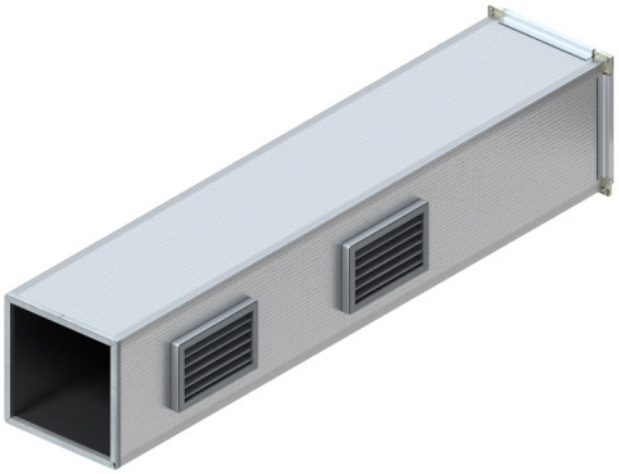


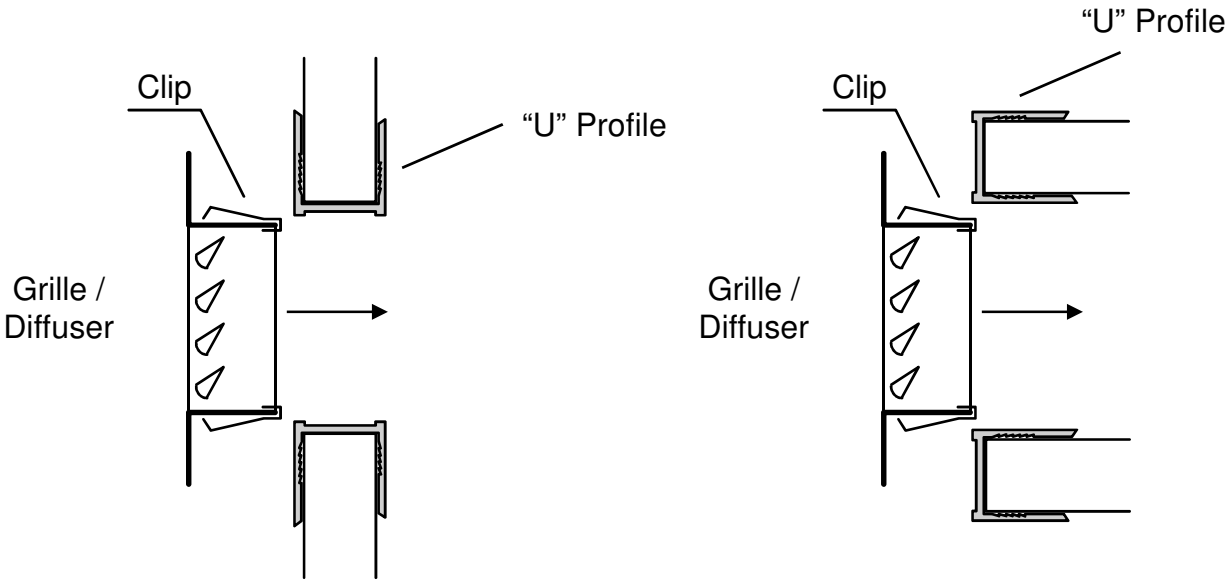


The Kingspan KoolDuct® System

Grille / Register / Diffuser Installation

with Aluminum Profile

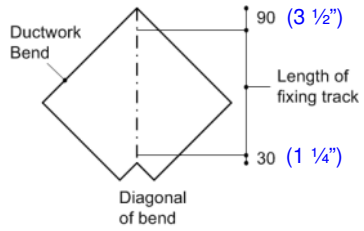


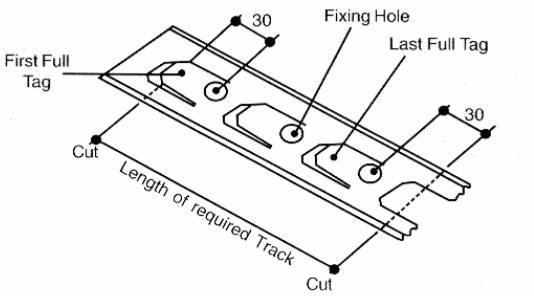


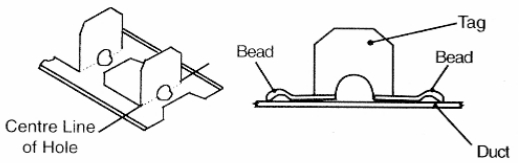
The Kingspan KoolDuct® System

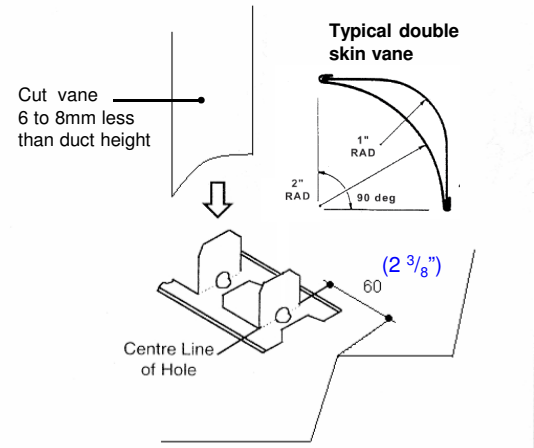
Square Elbow With Turning Vanes

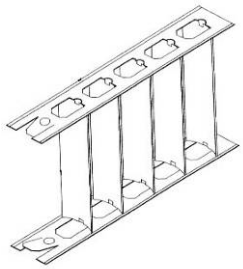
Turning Vanes required when either duct dimension greater than 8”











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

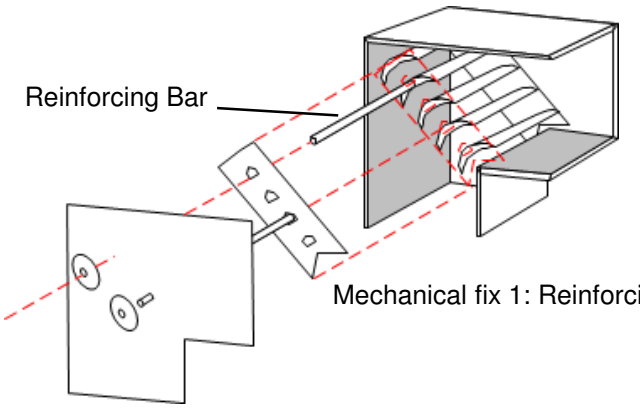
2) For the Turning Vane assembly, please follow the manufacturer recommendations.

3) Fit the completed turning vane assembly into the duct with the first turning vane set at **2 3/8”** from the inside throat of the elbow

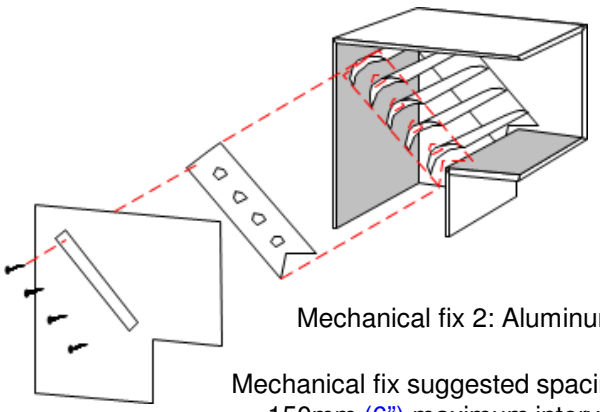
4) Secure permanently the turning vanes:

- for elbow size less than 24” and low pressure less than 2 in.w.g. **only silicone** sealant required
- For larger or higher pressure elbow mechanical fix **is required** (Reinforcing Bars or aluminum strips positioned on the outer surface of the elbow)

NOTE: **Minimum Bend Neck: 4”**



Mechanical fix 1: Reinforcing Bar



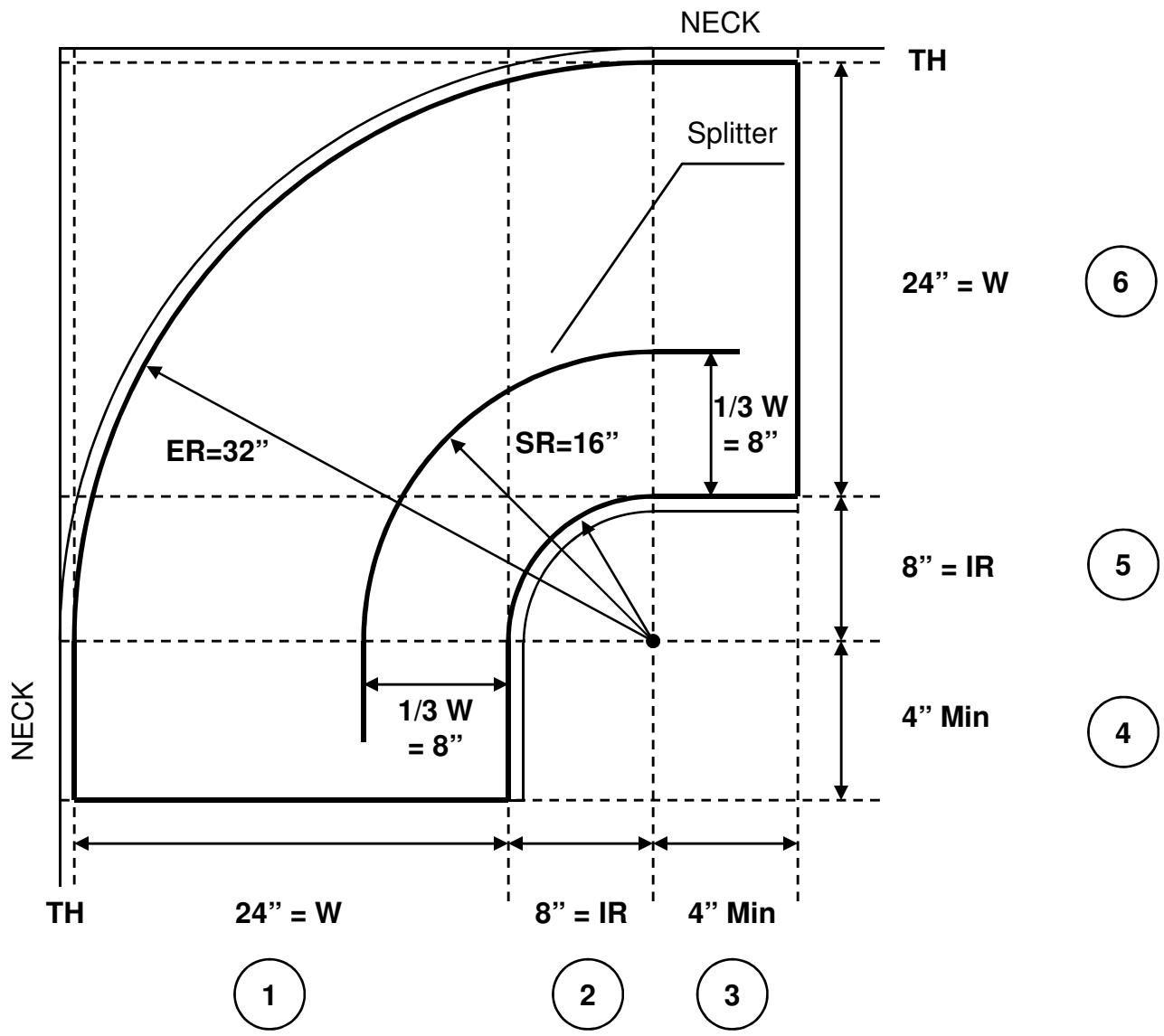
Mechanical fix 2: Aluminum strip

Mechanical fix suggested spacing:

- 150mm (6”) maximum intervals

The Kingspan KoolDuct® System

Symmetric Radius Elbow



LEGEND

TH = Panel Thickness
ER = External Radius
IR = Internal Radius (min 8")
SR = Splitter Radius

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

SPLITTER for Short radius elbows

Elbow side (inches)	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

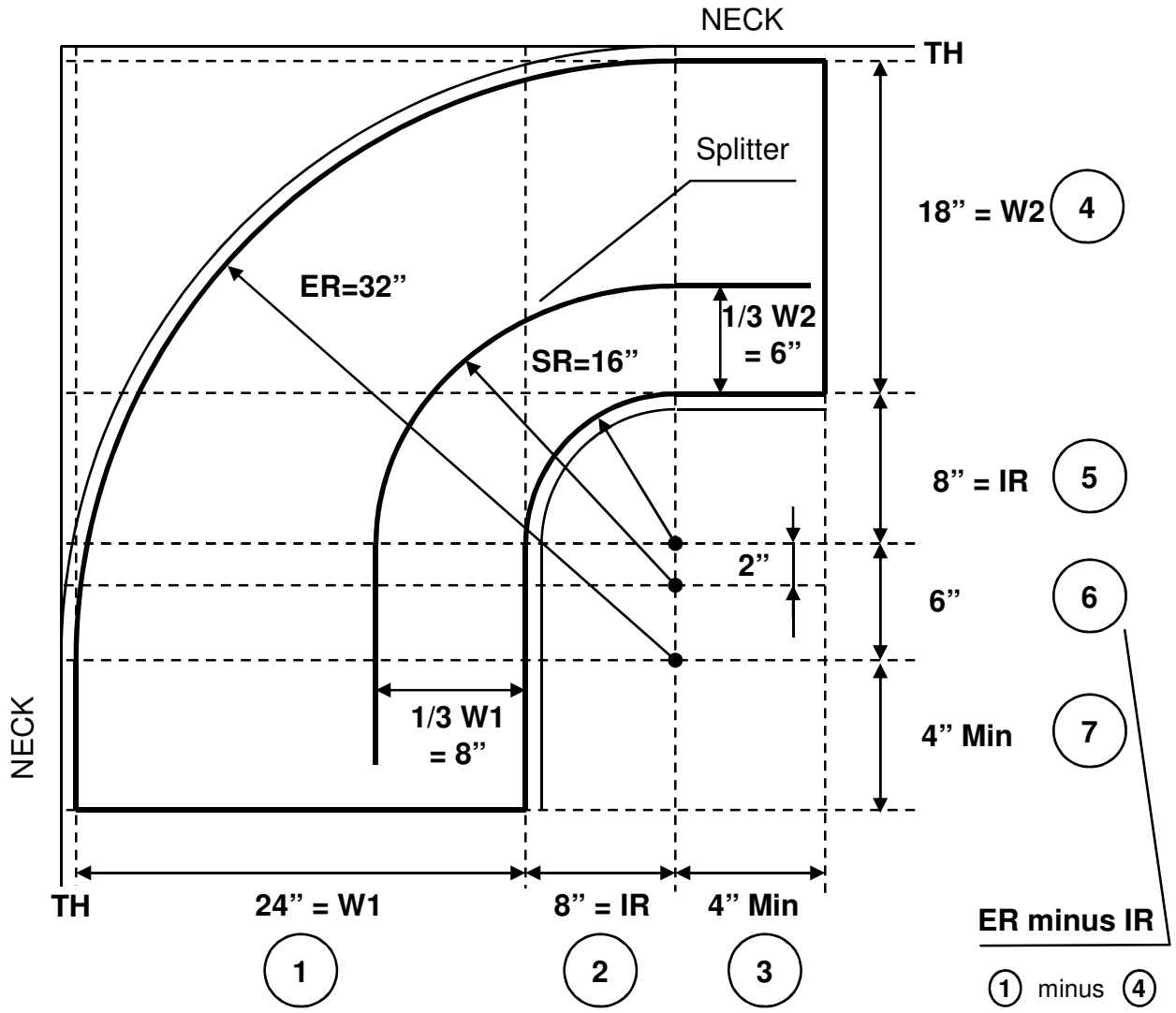
Splitter not required in angles less than 45°:

SMACNA number of short radius vane selection is also acceptable

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

The Kingspan KoolDuct® System

Asymmetric Radius Elbow



LEGEND
TH = Panel Thickness
ER = External Radius
IR = Internal Radius (minimum 8")
SR = Splitter Radius

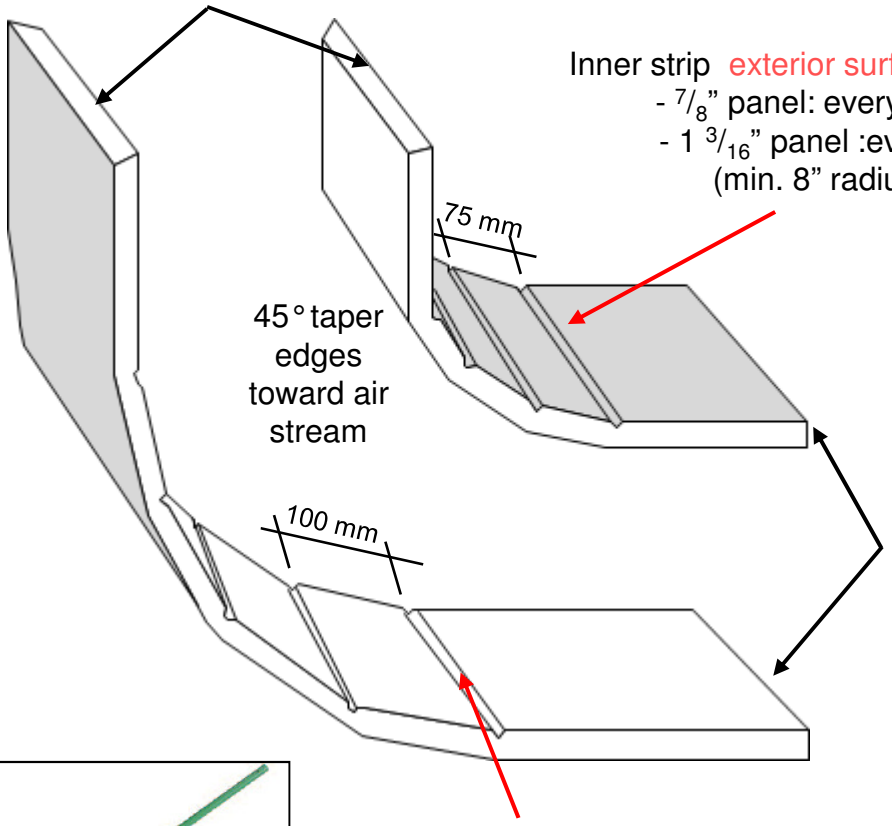
- Dimensions in inches
- Numbers in the hoop show suggested tracing procedure

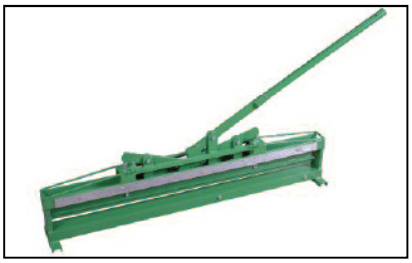
NOTE: Minimum Bend Radius: 8"
Minimum Neck: 4"

The Kingspan KoolDuct® System

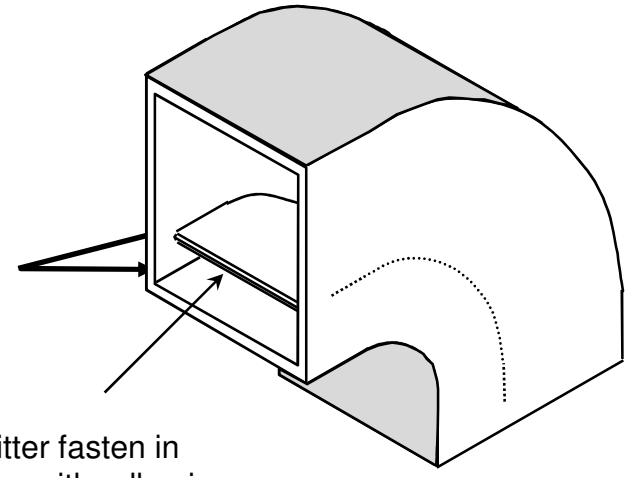
Symmetric/Asymmetric Radius Elbow

Ends of panels cut square (90°)

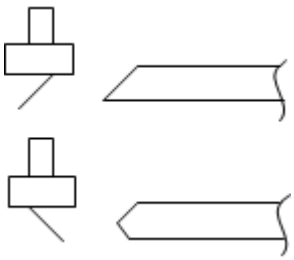




Bending Machine # 441



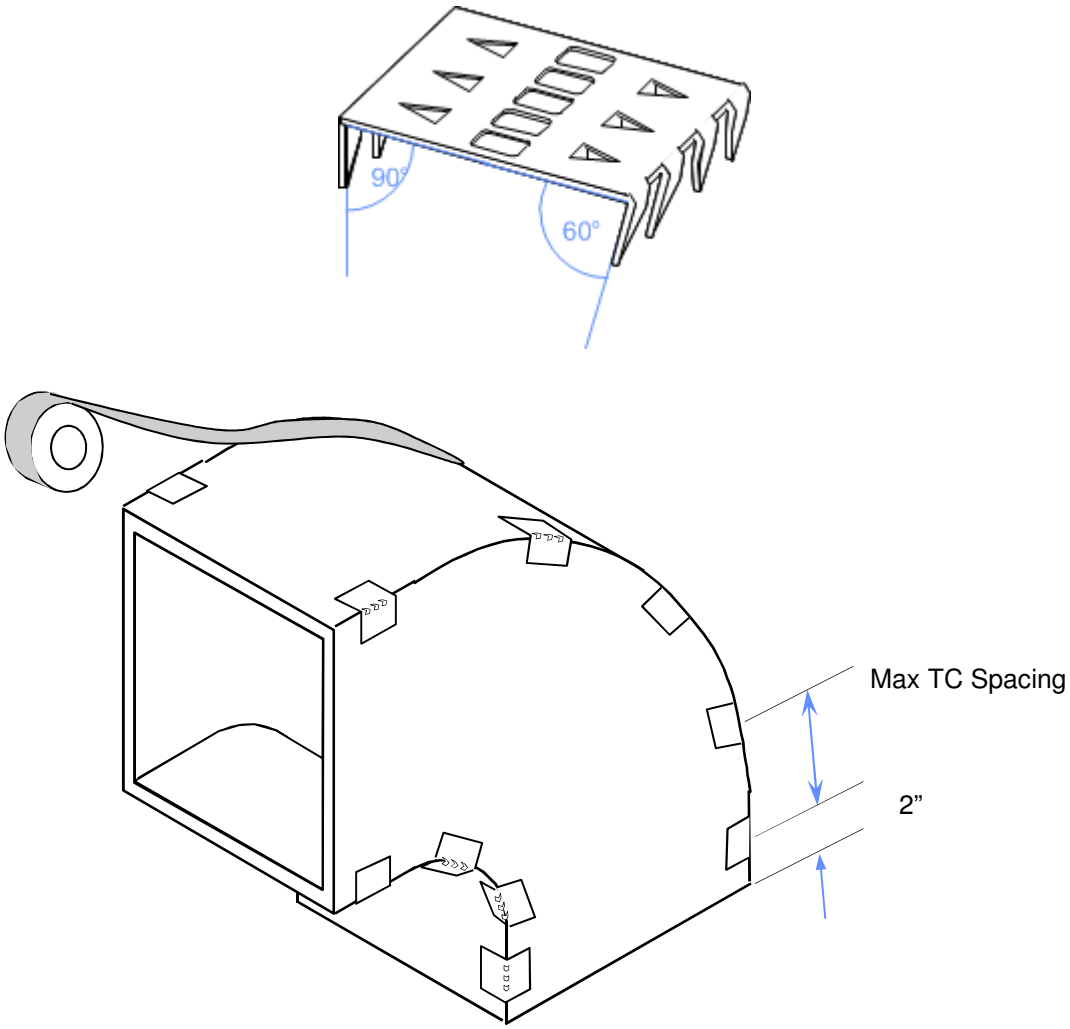
Seal with silicone ALL interior corners and around Splitters



Splitter fasten in place with adhesive (or Tiger Clips) and silicone

The Kingspan KoolDuct® System

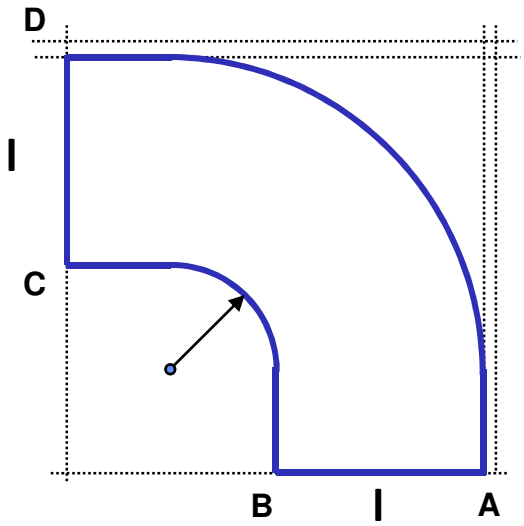
Elbow assembly with Tiger Clips – # 364
Can be used instead of the Adhesive for duct assembly



MAXIMUM TIGER CLIPS SPACING			
Pressure	**Duct Size (Elbow, Tee, etc.)**	**Max Spacing**	**Application**
0 to 4 in.w.g.	Any Size	4” (Internal Radius)	All mitre joints
0 to 4 in.w.g.	Any Size	10” (External Radius)	All mitre joints

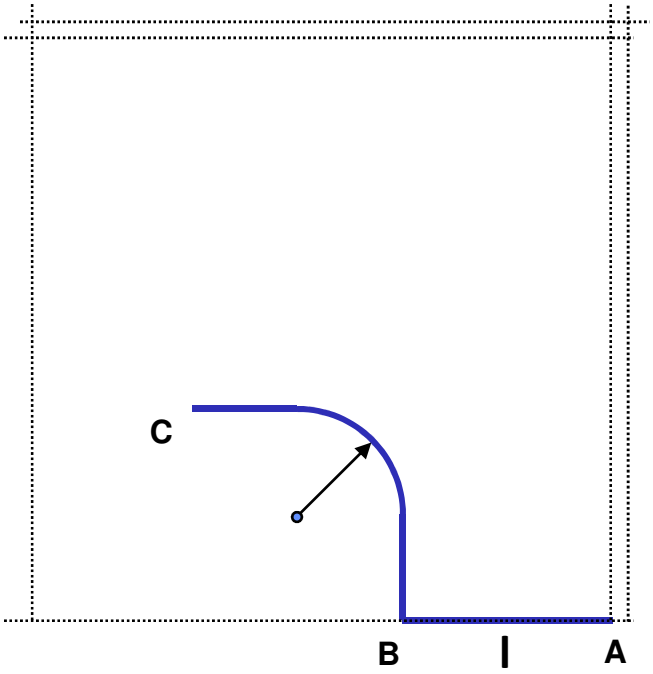
The Kingspan KoolDuct® System

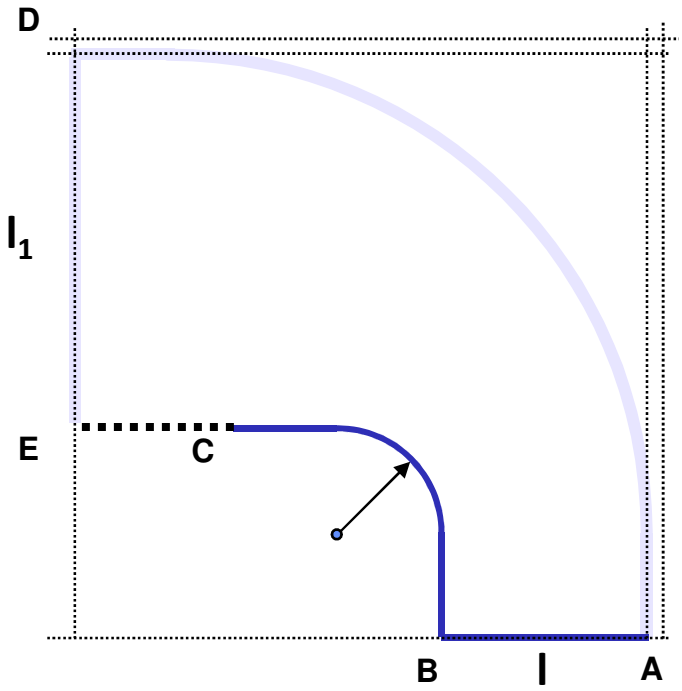
Symmetric Elbow with Templates



Use the Elbow Template with side **l** required

Asymmetric Elbow with Templates





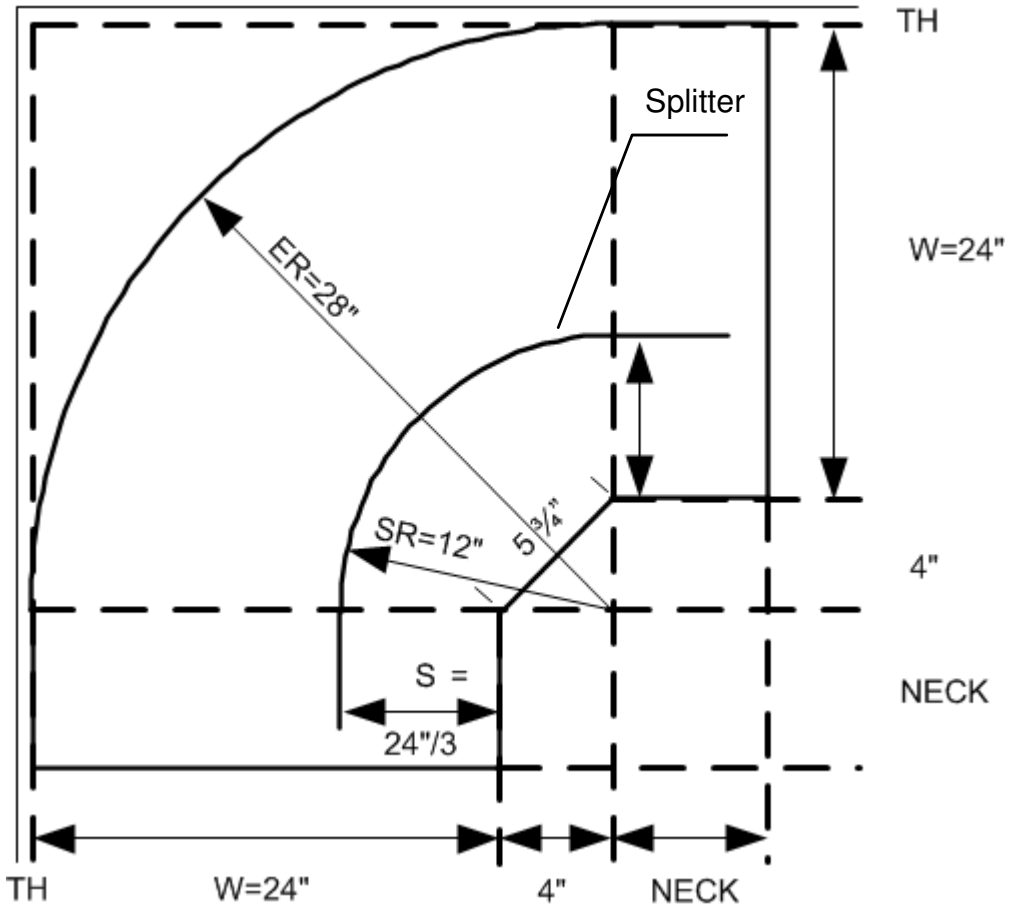
1 - Use the Elbow Template with smaller side **l** to trace the lines AB and BC

2 - Use the Elbow Template with bigger side l_1 to trace the lines AD and DE

3 - Use a ruler to trace the segment EC

The Kingspan KoolDuct® System

Elbow, 45 Deg Throat, Radius Heel
Alternative Elbow Design*



SPLITTER

Elbow side (inches)	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

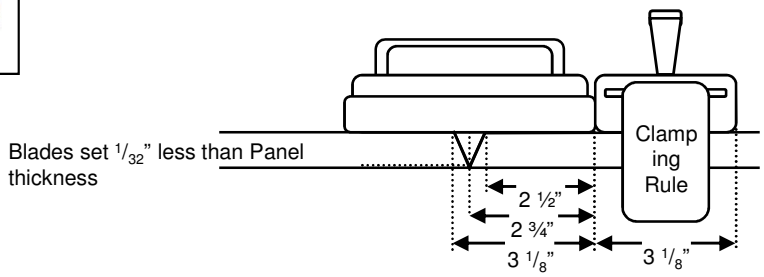
Splitter not required in angles less than 45°:

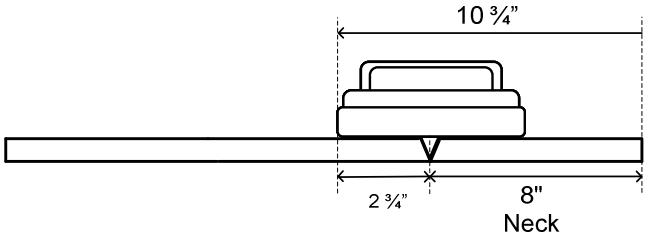
SMACNA vane selection is also acceptable

The Kingspan KoolDuct® System

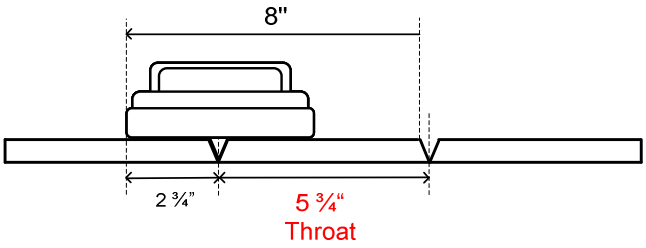
Elbow, 45 Deg Throat, Radius Heel
Alternative Elbow Design

512, 519 Jack Plane 22.5 degrees

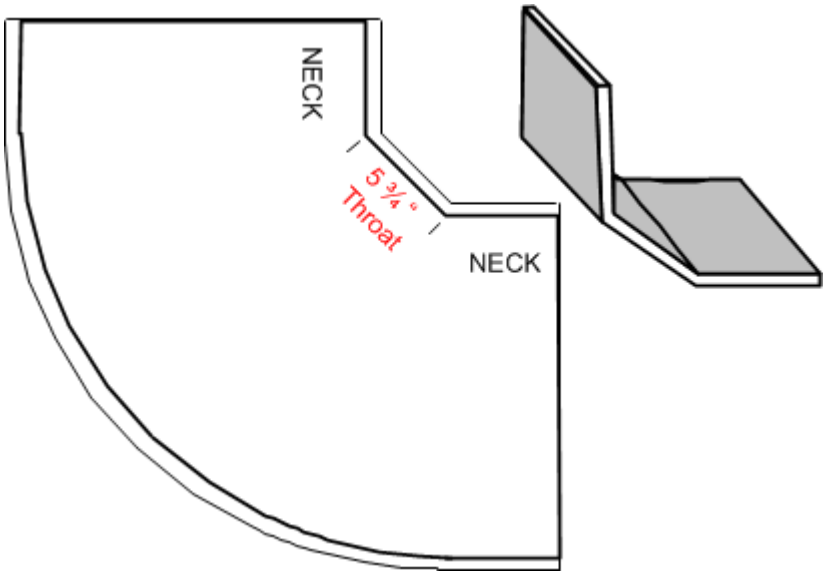




Cut 1:
Setup tool
Neck size +2 ¾“
from panel end

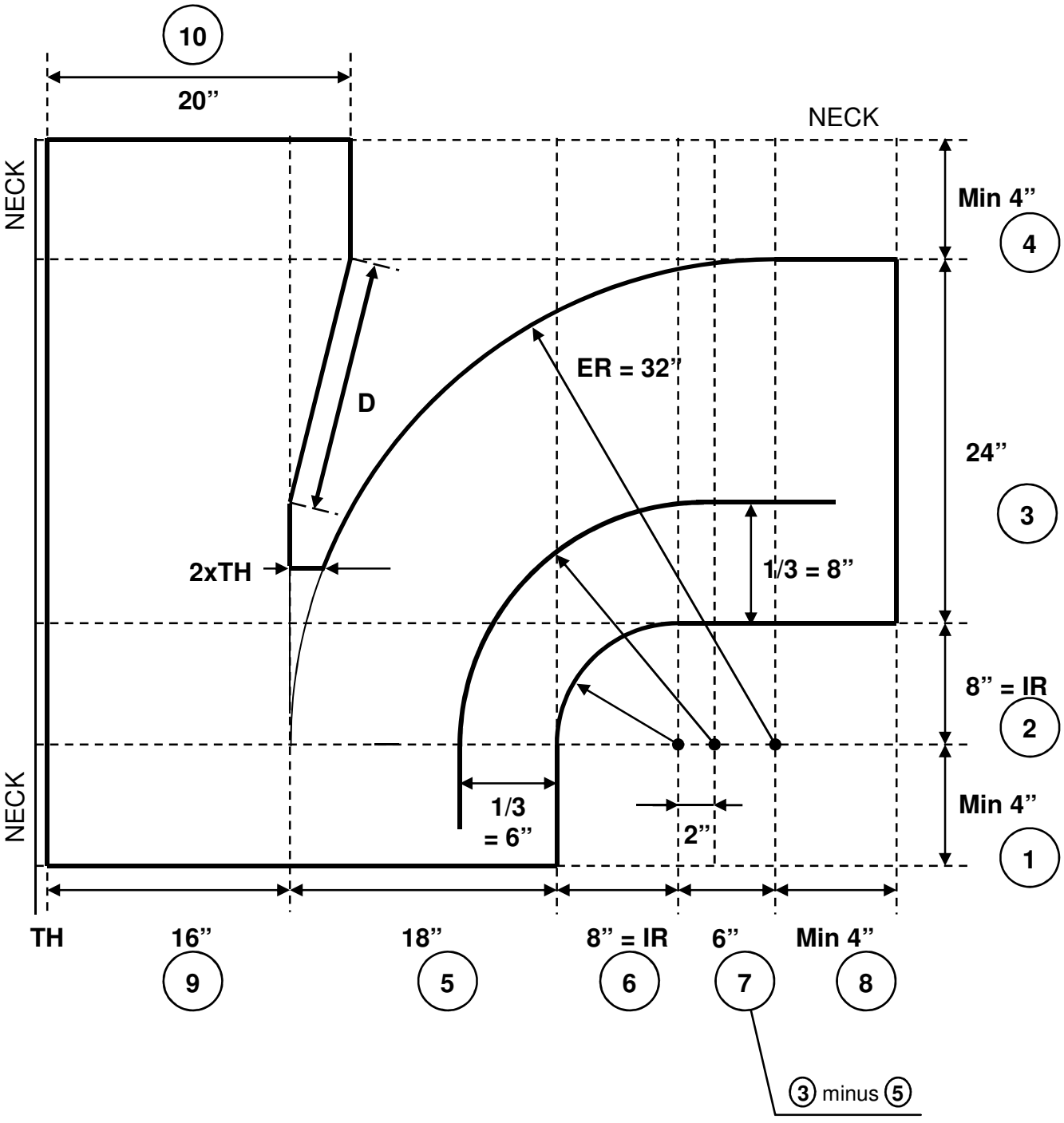


Cut 2
Setup tool
Throat size +2 ¾“ from cut 1 centre



The Kingspan KoolDuct® System

Dynamic Branch – "Y" branch with radius elbow

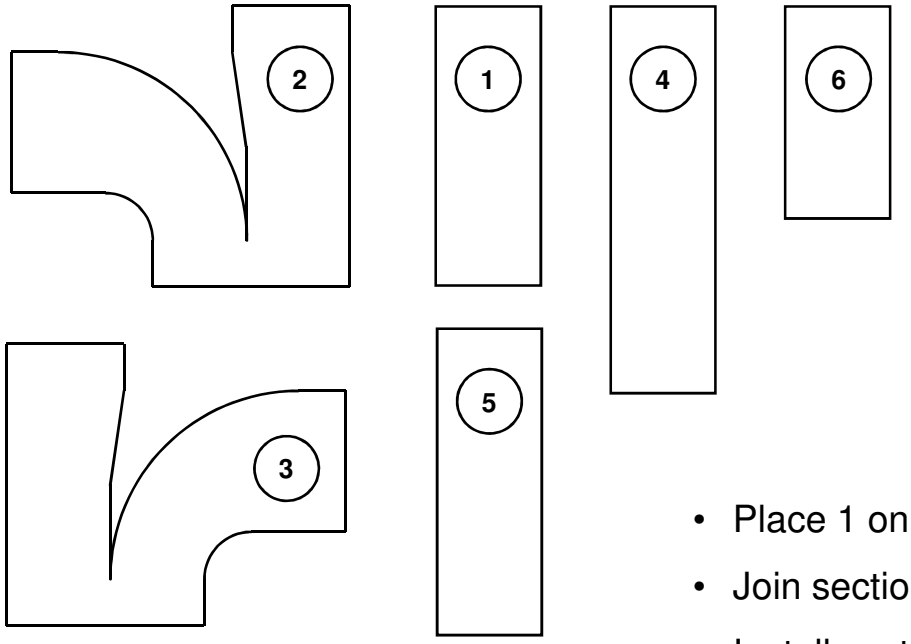


- Dimensions in inches
- Numbers in the hoop show suggested tracing procedure
- D minimum = 2.5 x (20"-16") = 10"

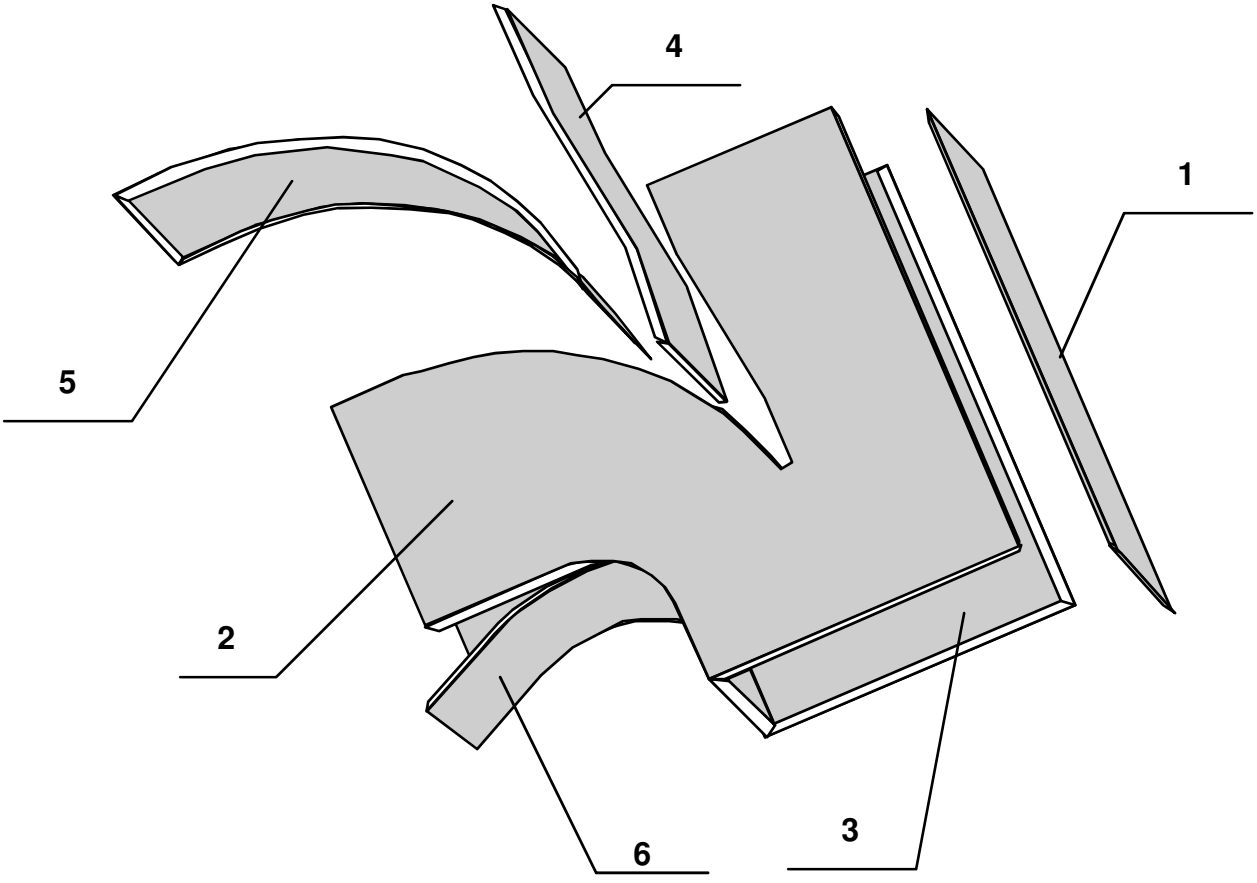
NOTE: Minimum Bend Radius: 8"
Minimum Neck: 4"

The Kingspan KoolDuct® System

Assembly Procedure

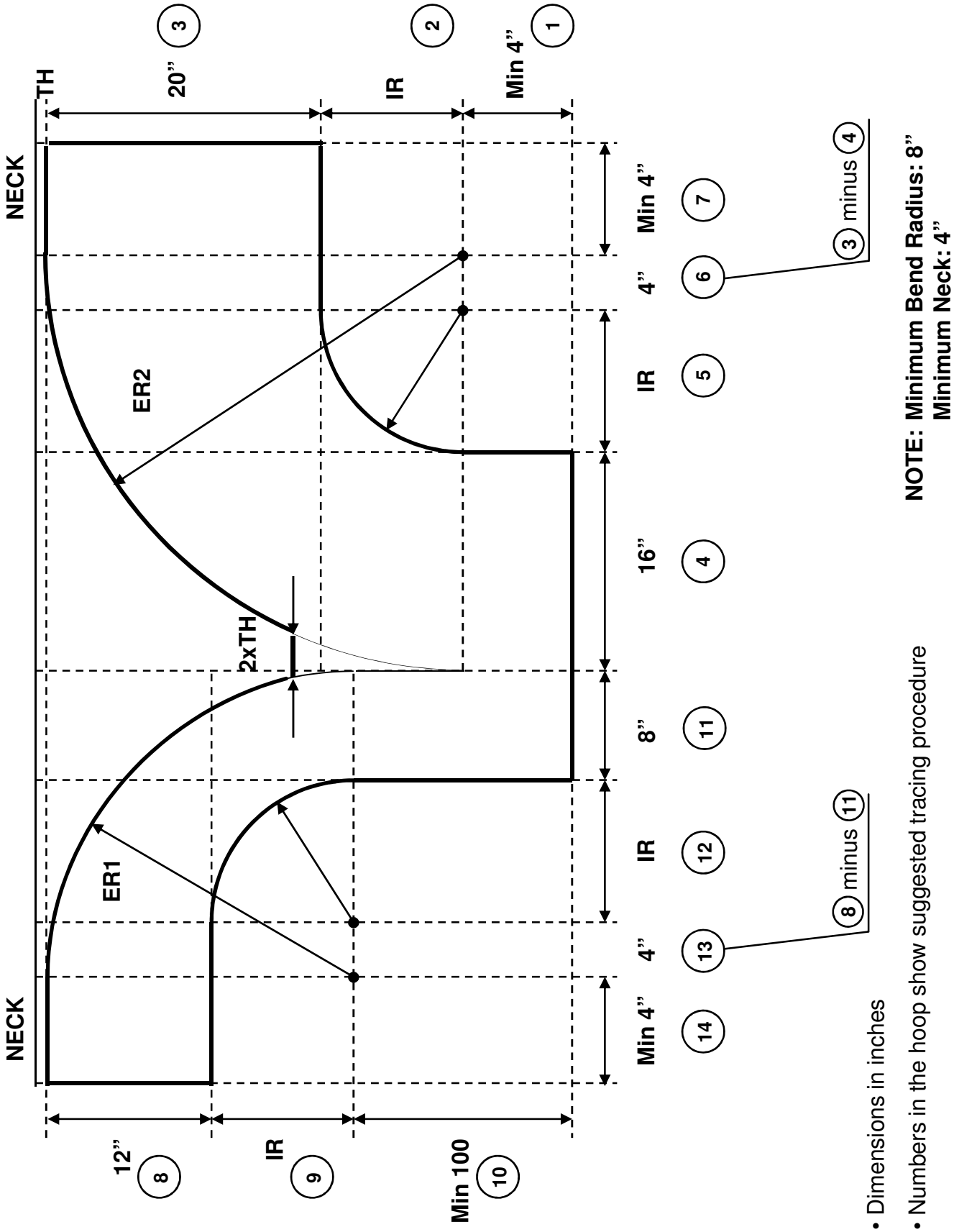


- Place 1 on the table
- Join section 2 and section 3 to 1
- Install section 4
- Install section 5
- Install section 6



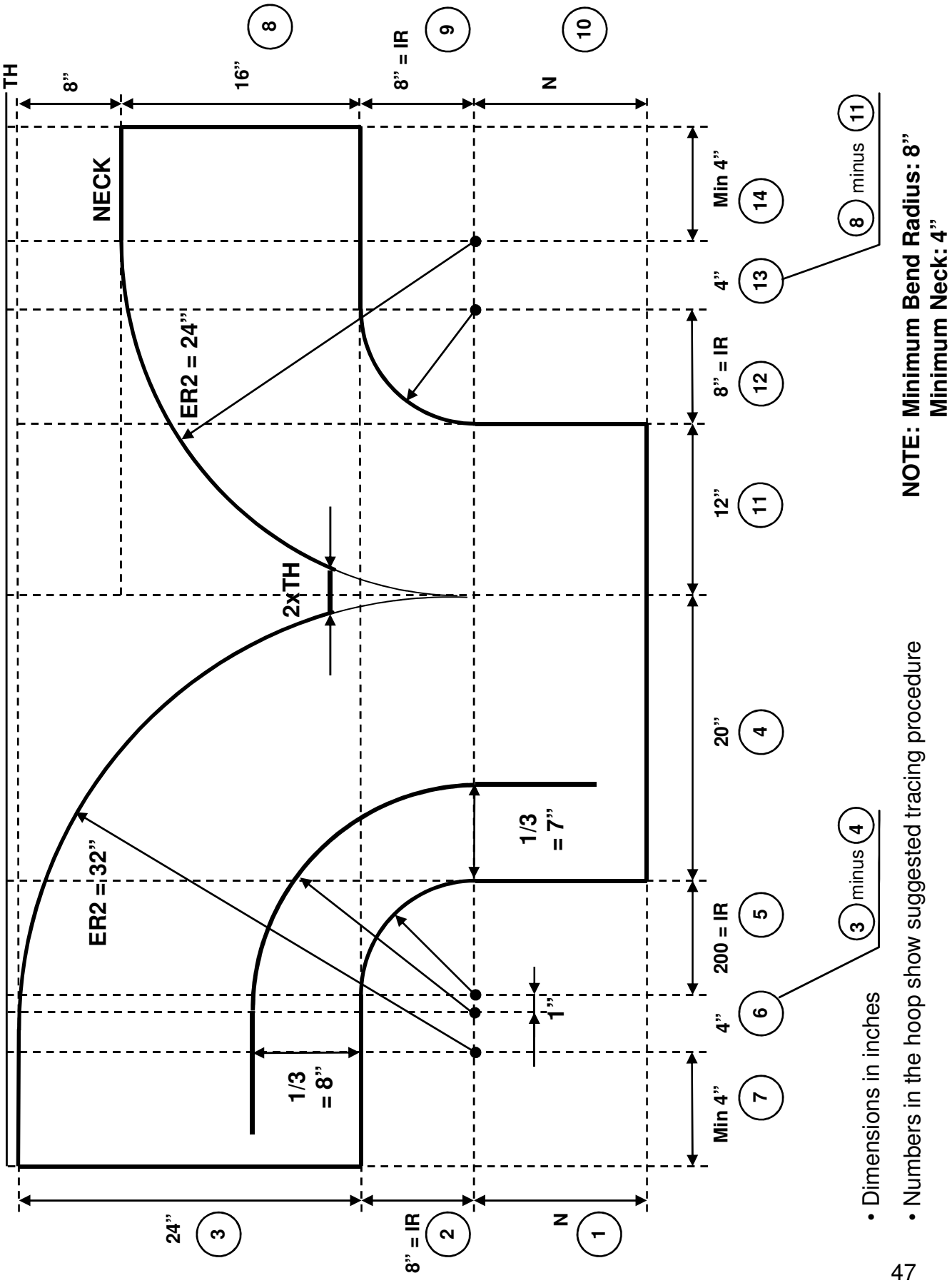
The Kingspan KoolDuct® System

Dynamic Branch – Tee Branch (external sides flushed)

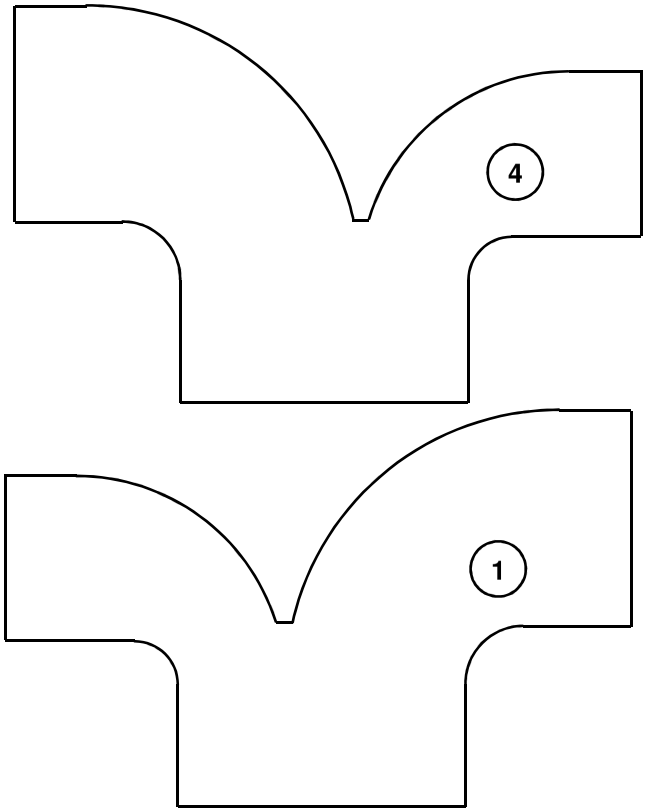


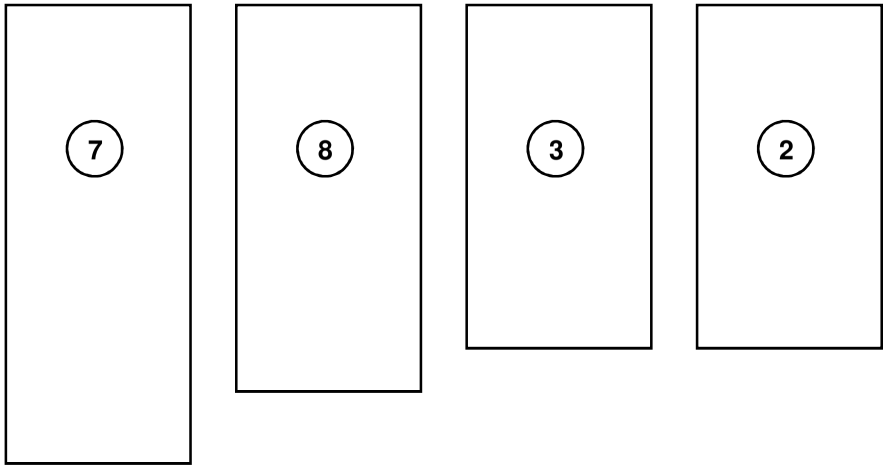
The Kingspan KoolDuct® System

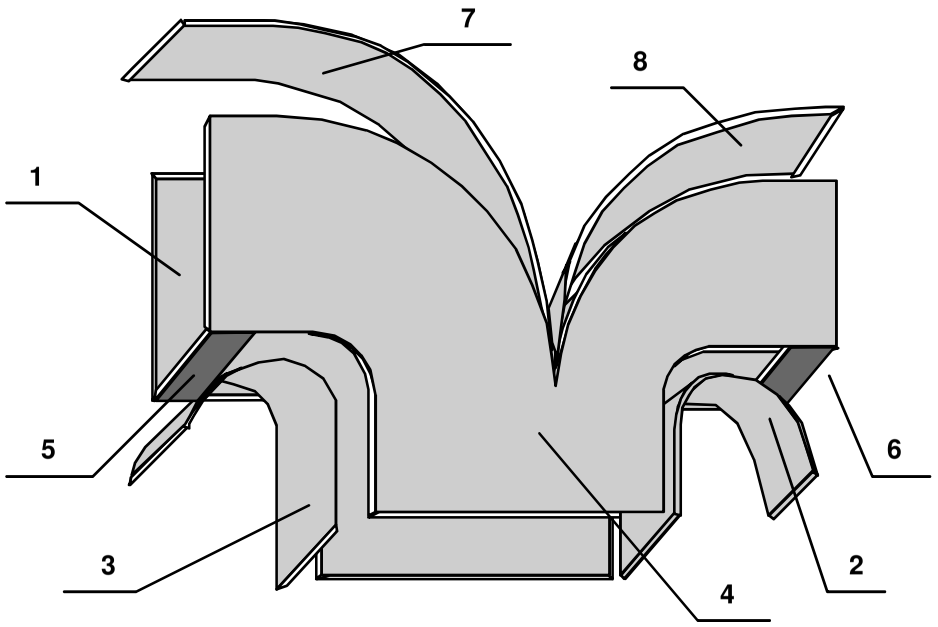
Dynamic Branch – Tee Branch (internal sides flushed)



ASSEMBLY PROCEDURE







- Place section 1 on the table
- join section 2 and 3 only the neck section
- Option: add holder pieces 5 e 6 with tape only
- install bigger circumference section with cover 7
- install section 8
- remove section 5 and adhesive section 3
- remove section 6 and adhesive section 2

The Kingspan KoolDuct® System

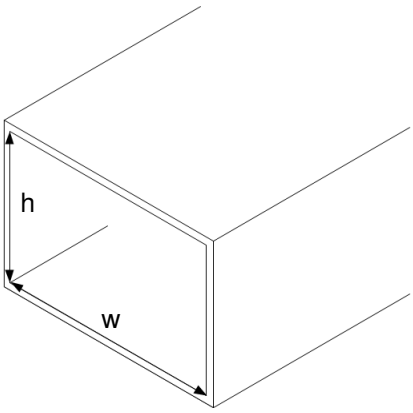
Training Manual

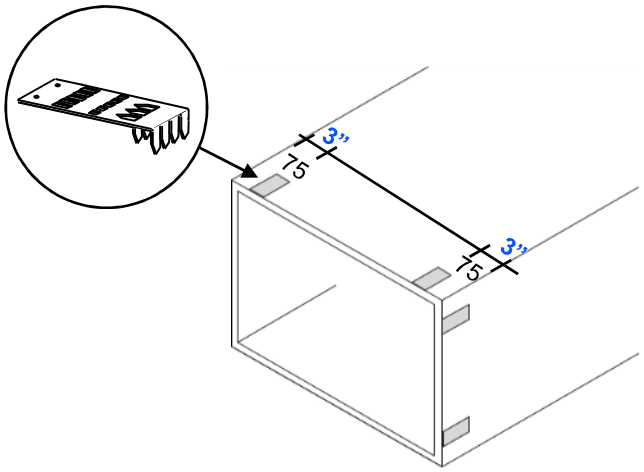
Chapter 3

Coupling Systems
for joining ductwork sections

The Kingspan KoolDuct® System

4-Bolt Flange – # 380-385
Assembly

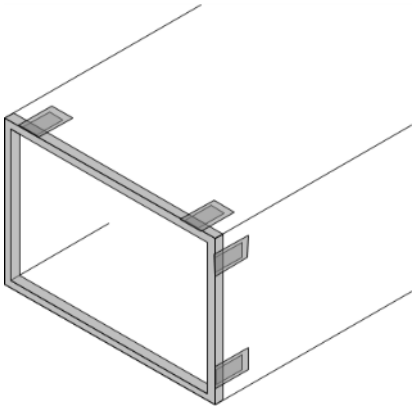




1) Cut **flange** 20mm (¾ “) short of the duct internal dimensions:

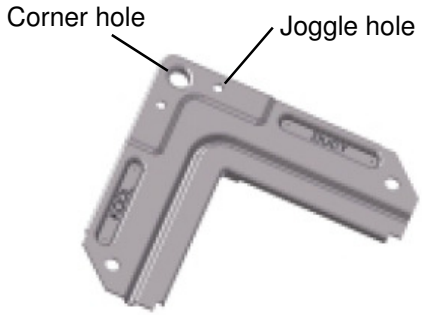
i.e. h - 20 mm (h – ¾ “)
w - 20mm (w – ¾ “)

2) For any Duct size: Add **Tiger Units**, one each side of each corner,
Total no.8 Tiger Units



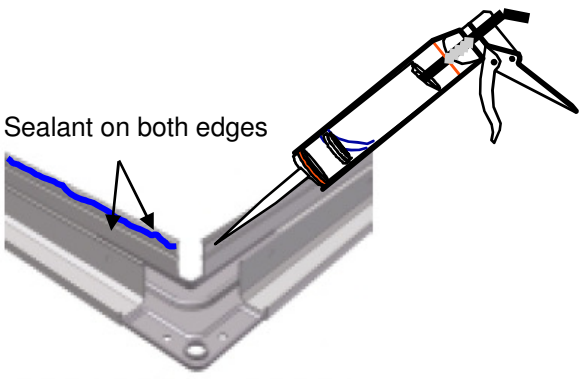
3) **Tape**
NOTE: **50 mm** (2”) wide tape acceptable

Gently **taper** the ends of the duct section with the black Rigid Spatula #526

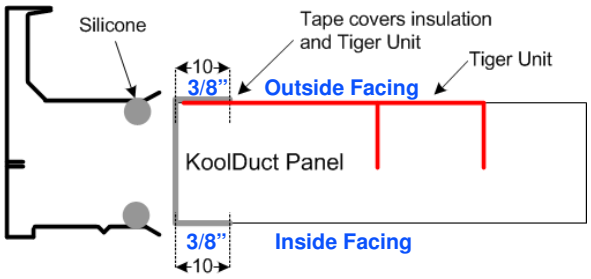


4) Fit **corner pieces** into the flange to make up the full rectangular shape.

#258 (259) Corner Piece for (22mm) ($^{7}/_{8}$ “) Panel
#268 (269) Corner Piece for 30mm (1 $^{3}/_{16}$”) Panel

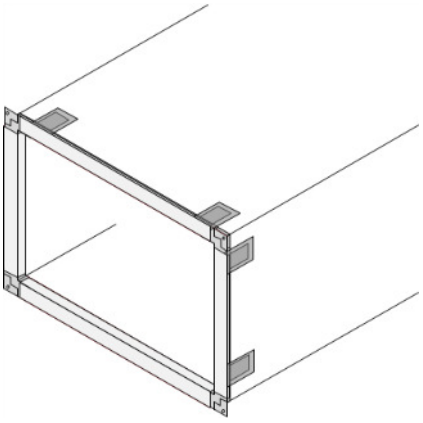


5) Apply **sealant** inside the flange at both edges.

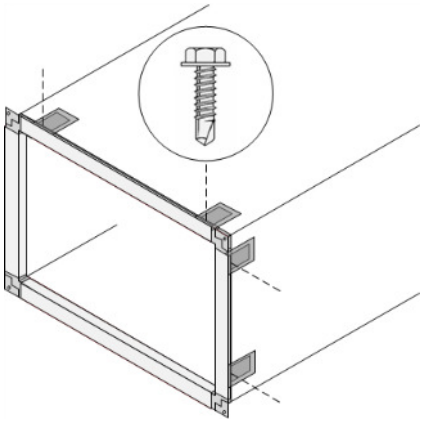


The Kingspan KoolDuct® System

4-Bolt Flange – # 380-385
Assembly

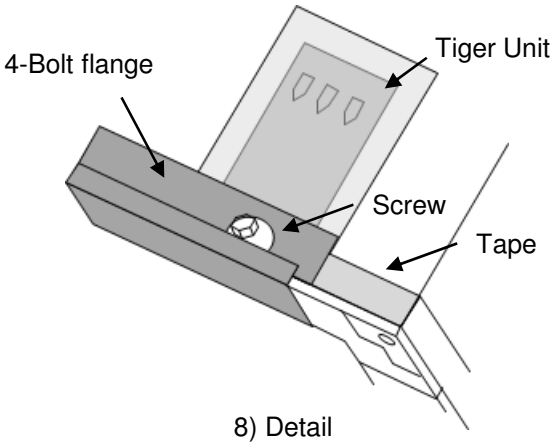


6) **4-Bolt flange** bonded to the duct.
Use mallet to carefully apply the flange in its final position.

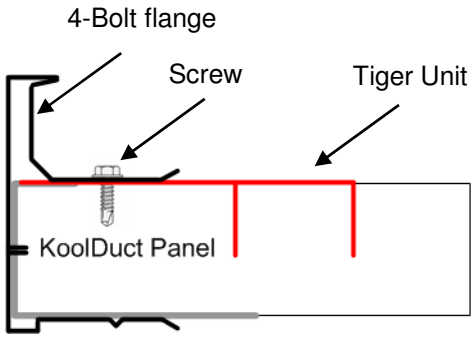


7) **Screws**

Suggested screws:
- Diameter 4mm ($^{5}/_{32}$")

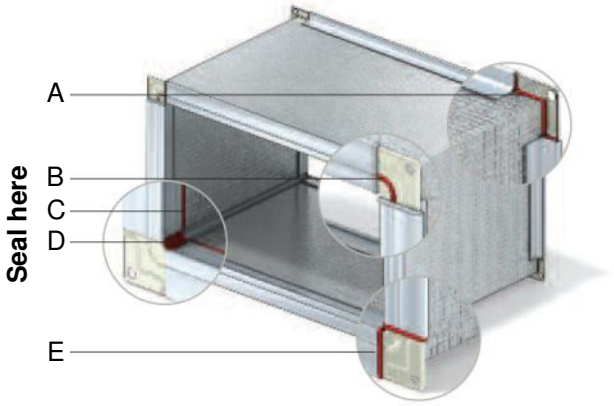


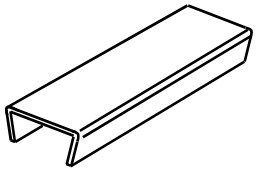
8) Detail



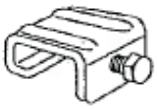
The Kingspan KoolDuct® System

4 Bolt Flange – # 380-385 Coupling



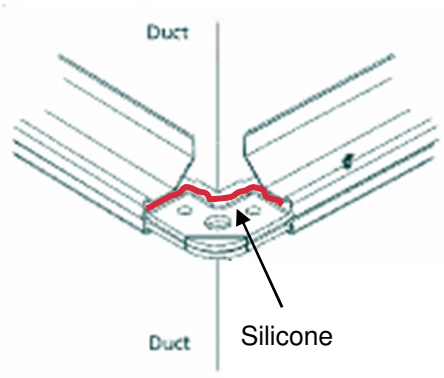


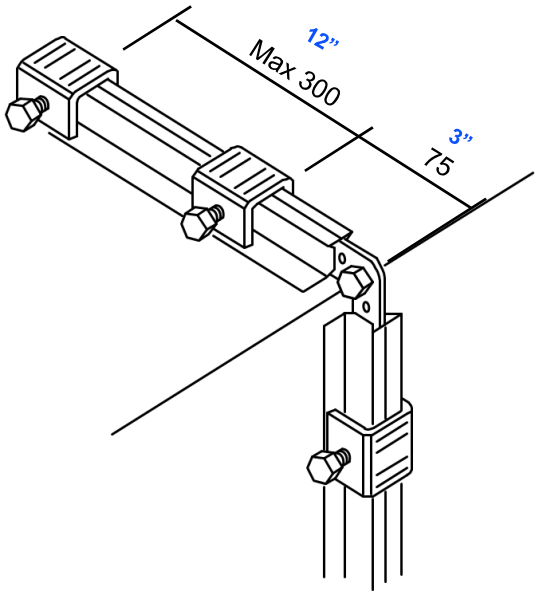
Clip (not supplied by Kingspan)



G-Clamp (not supplied by Kingspan)

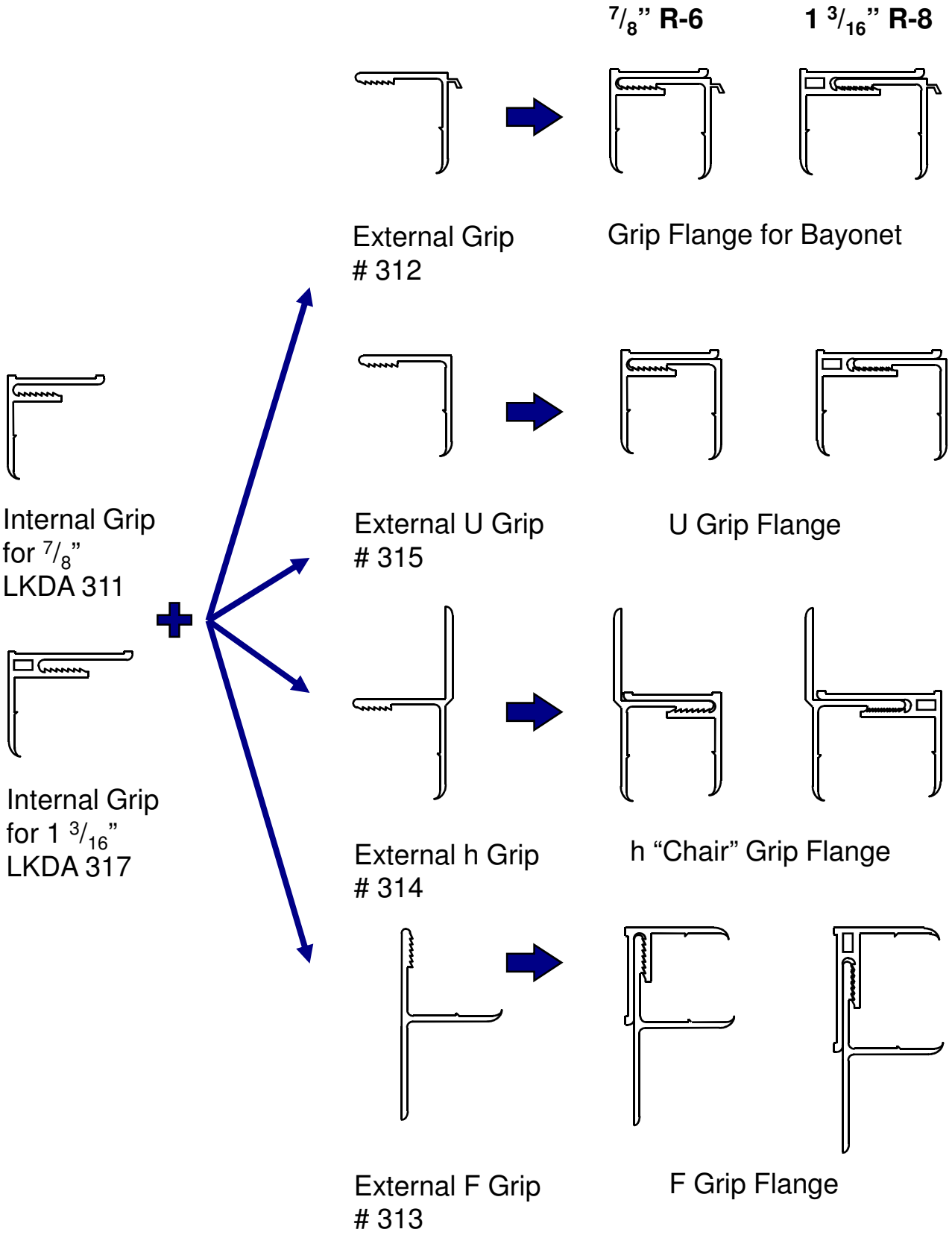
- Attach **gasket** to one flange face. Attach in one piece working around the corners.
- The preferred gasket shall be # 242 polyurethane $^{5}/_{8}$" wide and $^{5}/_{8}$" thick (15mm)
- Apply silicone to exposed corner edges
- Fit **Bolts** into the corner holes (loose bolts)
- If necessary align the corner holes by use of the Joggle holes
- Insert **Clamps** or **Clips** in sufficient numbers to ensure that there are no gaps in the seam
- Tighten **Clamps** or **Clips -** Suggested: at max **12"** centres (300mm) about **3"** (75 mm) from corners
- Finally tighten the bolts





The Kingspan KoolDuct® System

Aluminum Grip Flange System

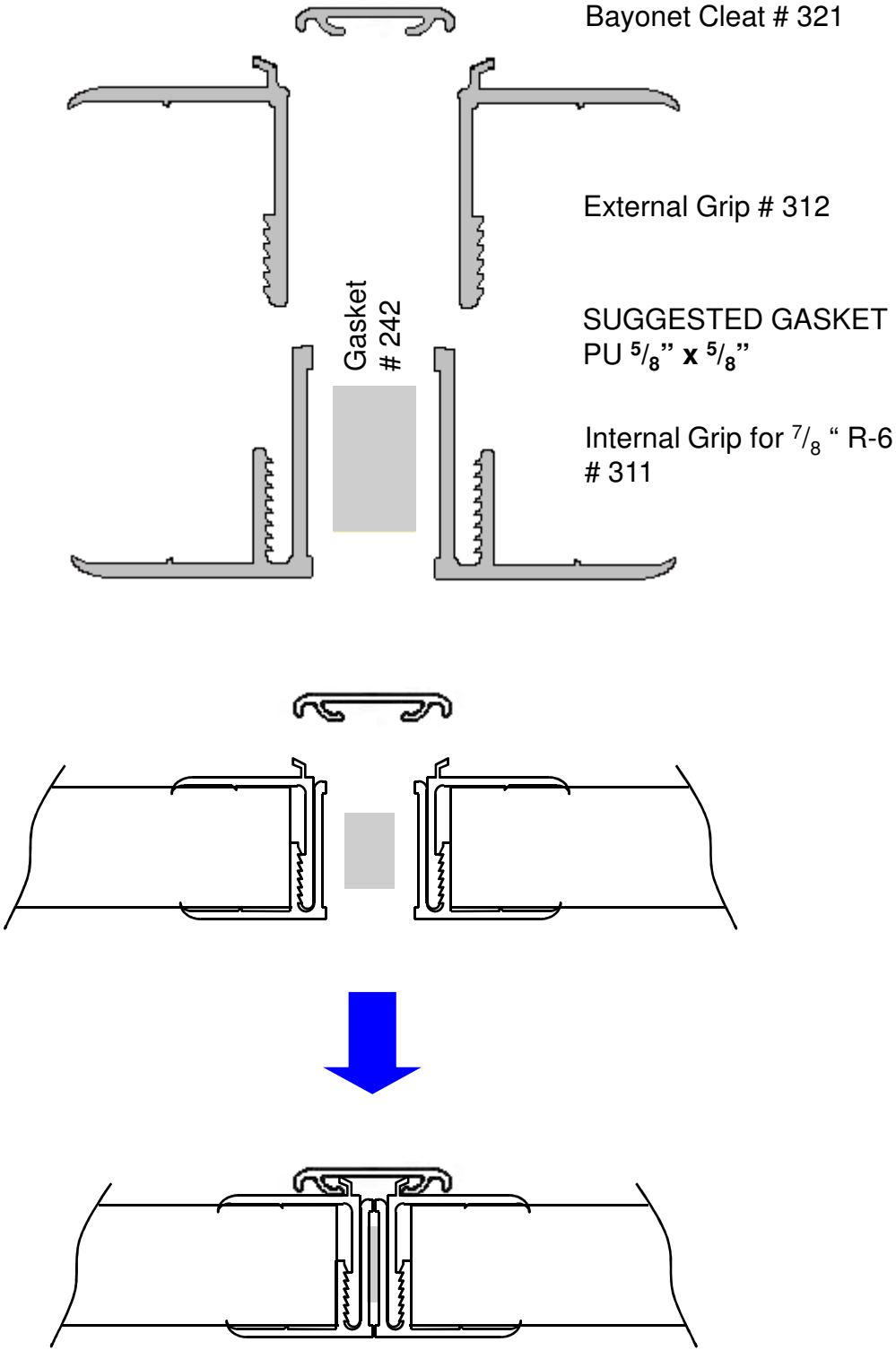


The Kingspan KoolDuct® System

Grip Flange System – $^{7}/_{8}$" (22mm), R-6

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

Must be used with static pressure > 2 in.w.g. (or 4-Bolt flange)

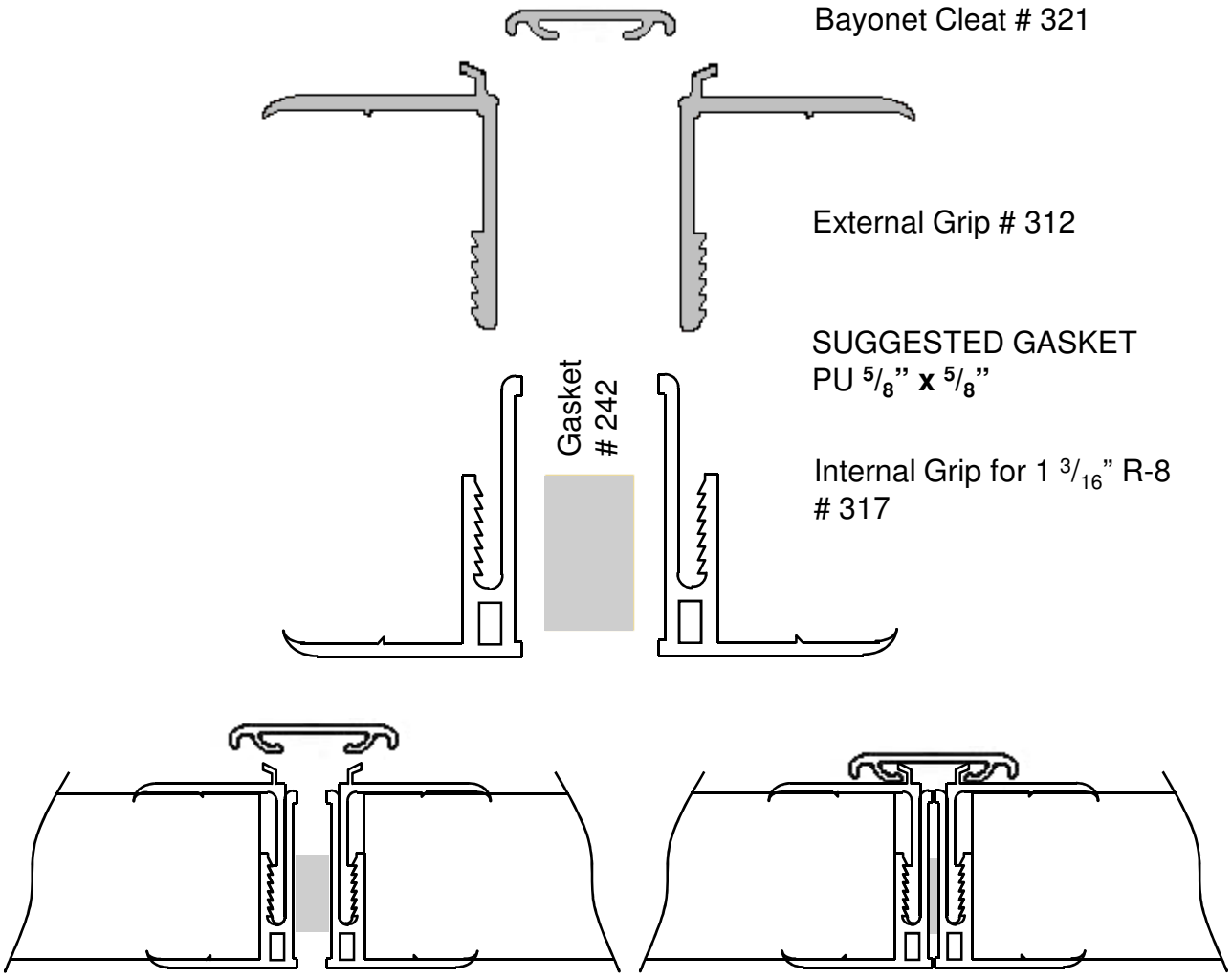


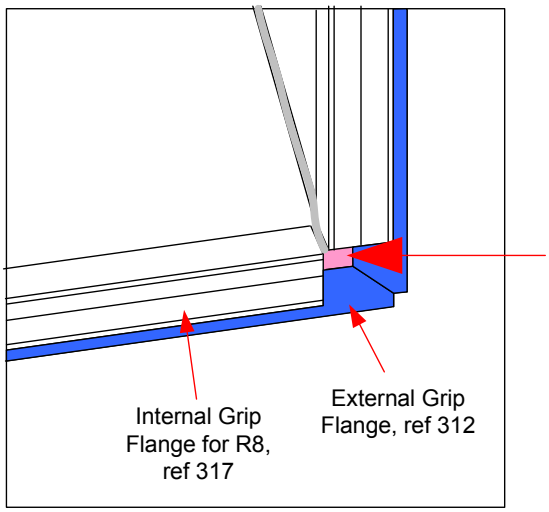
The Kingspan KoolDuct® System

Grip Flange System – 1 $^{3}/_{16}$" (30 mm), **R-8**

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

Must be used with static pressure > 2 in.w.g. (or 4-Bolt flange)





EXPOSED INSULATION
Prior to insertion of the **R-8** Grip flange, the ends of the duct section (or just the corners) should be covered with **UL tape** to seal the exposed insulation**.**

The Kingspan KoolDuct® System

Grip Flange Assembly

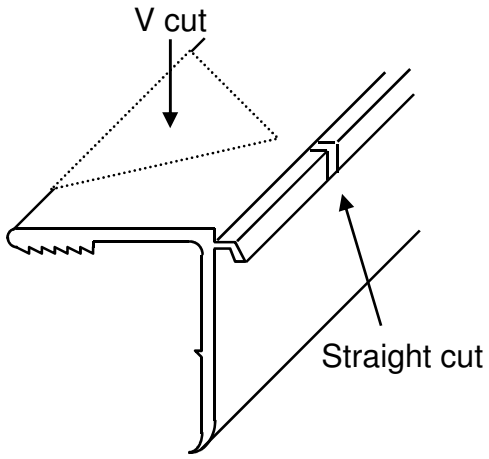
Features:
- Positive air-tight joint on panels of varying thickness (¾" to 1" and 1 3/16" to 1 5/16")
- No need of adhesive or rivets.
- Strengthen the ends of the duct
- Aerodynamic

External Grip Profile:
Mark notching points: see the **Appendix**

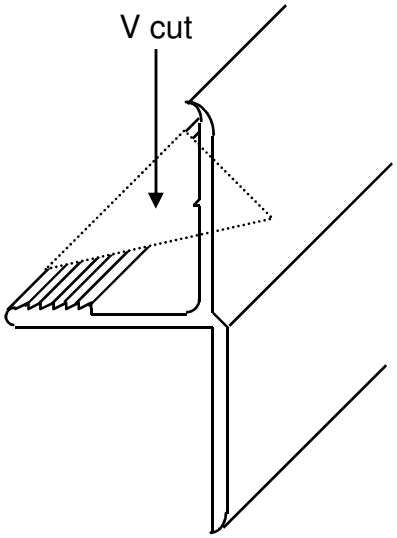
Each dimension mark represents the centre line of a "V" 90° cut.
Fold the external male flange section at each cut to form a rectangular shape.

Internal Grip Profile:
A. Two sections of internal (female) flange are square cut to a dimension equal to the internal duct width less 1/8" .
B. Two sections are square cut to a dimension equal to the internal duct height l less 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.



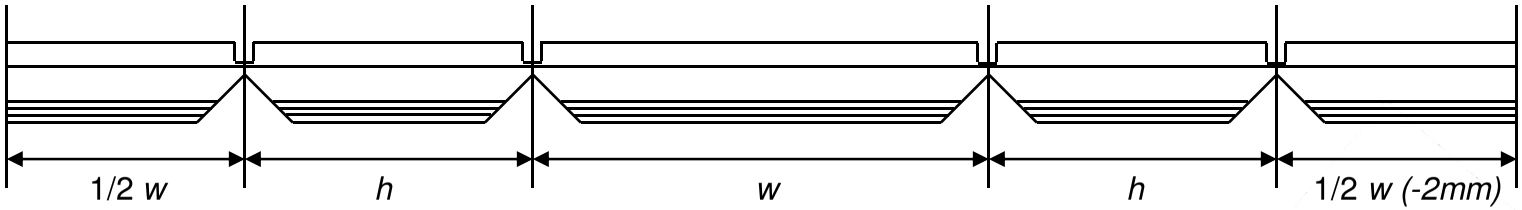
Grip FACING DOWN
V Cut using Grip Notcher:
External Grip # 312
External F Grip # 313
External U Grip # 315



Grip FACING UP
V Cut using Grip Notcher:
External h Grip # 314

Grip Flange Cuts

External Grip Flange Profile (see the Appendix at the end of this Manual for the Notches position)

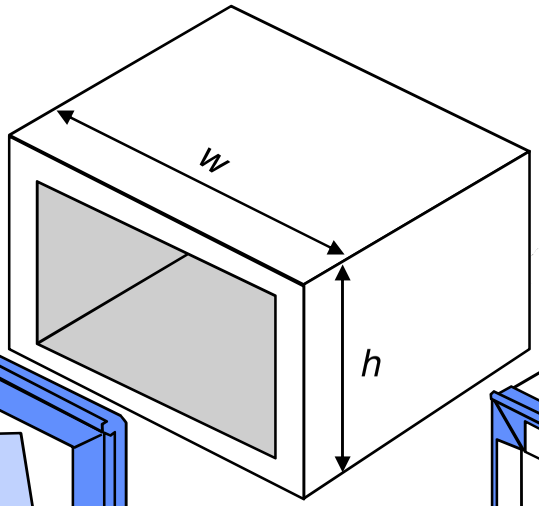


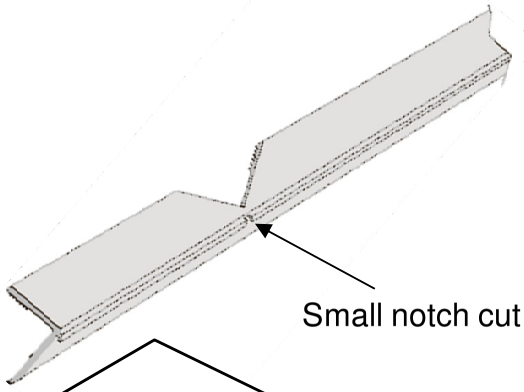
w = External Duct Width

h = External Duct Height

Grip Notcher
451

External joint
about centre of duct

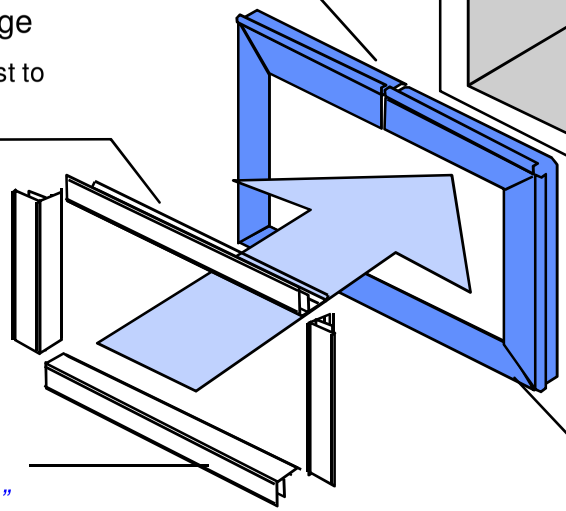




Small notch cut

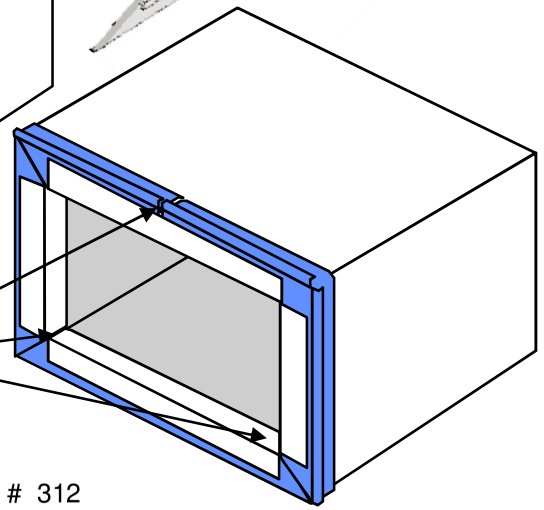
Internal Grip Flange

This should be the last to
be installed



Internal Grip # 311
Internal dim. – *– 1/8"*

Silicone



External Grip Flange # 312

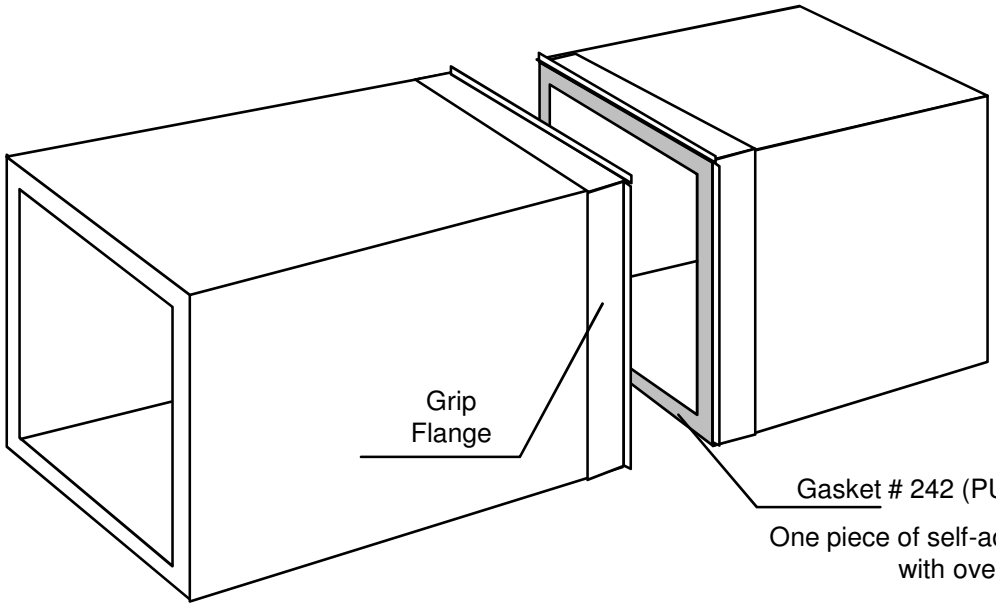
Complete Grip Flange
applied on the duct

The Kingspan KoolDuct® System

Duct-to-Duct Coupling

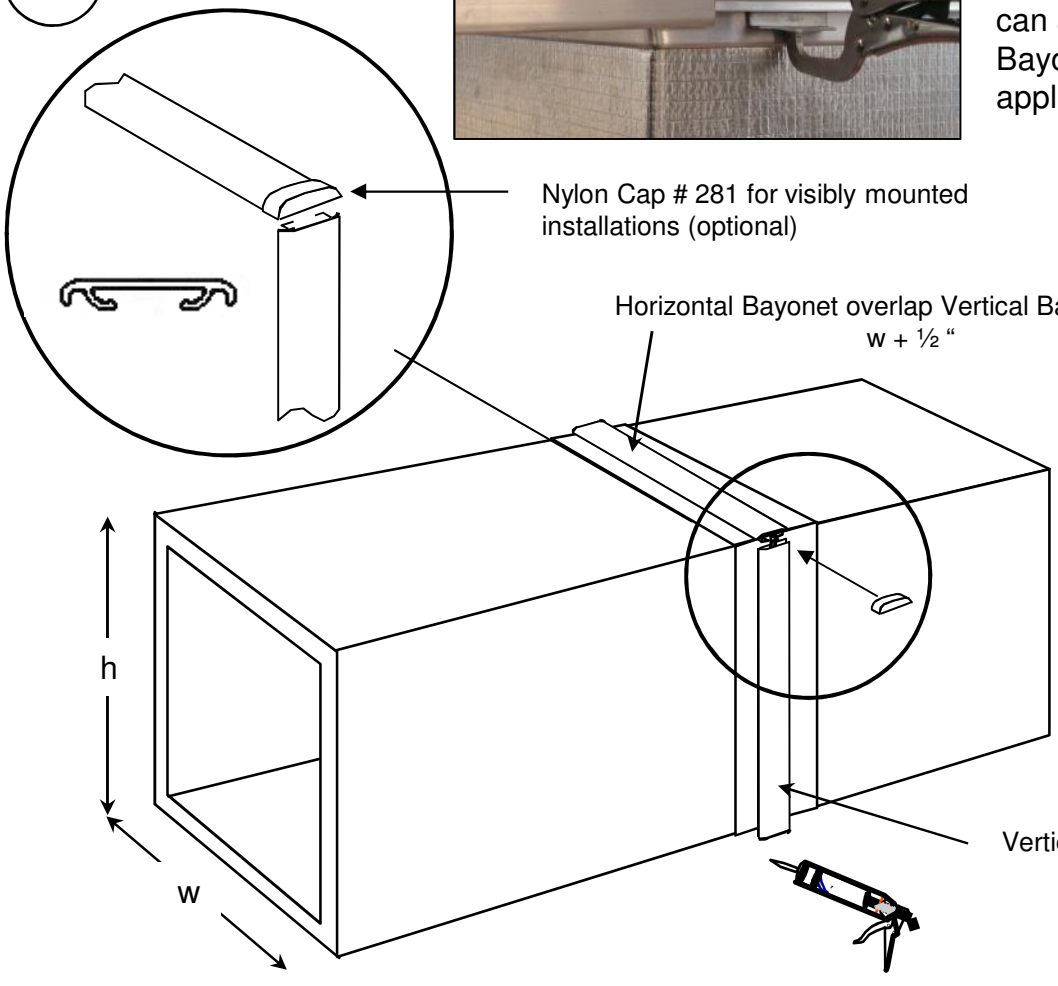
Aluminum Grip with Bayonet Cleat

1



2

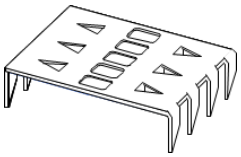
Note: Kool Clamp # 453 and WD-40 can assist with Bayonet application.



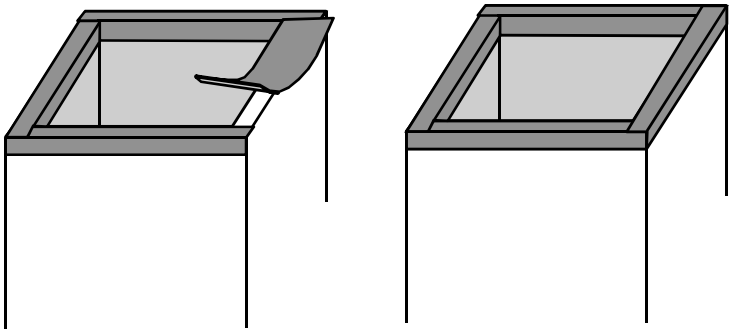
The Kingspan KoolDuct® System

Tiger Clip Coupling – # 364

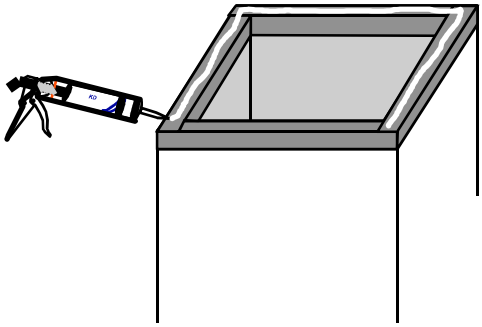
LIMITATIONS:
• Low Pressure applications only (below 2 in.w.g)



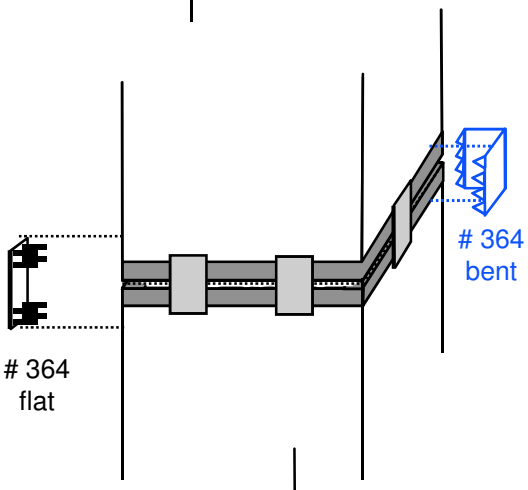
STEP 1
Both ends of the KoolDuct duct must be flat and perfectly squared
Aluminum tape is applied on both ends of the duct segments.



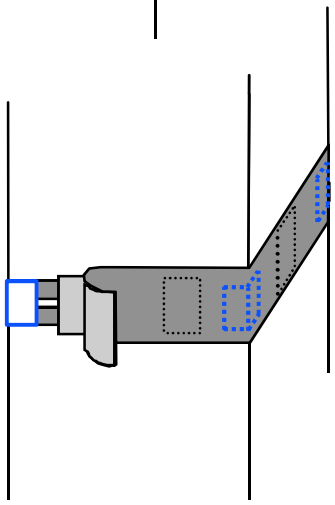
STEP 2
Apply a continuous bead of Kingspan approved silicone to one end of one segment.



STEP 3
The two duct segments are joined together.
Tiger Clips (# 364) are placed on all four corners of the duct
Tiger Clips (# 364) are placed on all four sides of the duct.



w or h (inches)	No. Tiger Clips per side in addition to those at corners	Max pressure (in.w.g.)
4” – 5”	0	2”
6” – 11”	1	2”
12” – 19”	2	2”
20” – 39”	3	2”
40” – 45”	4	2”
46” – 49”	4	1”
50” – 60”	5	1”



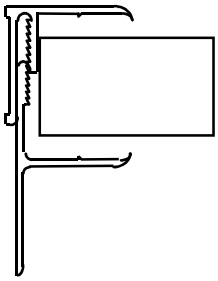
STEP 4
Apply aluminum tape around the connection of the two duct segments

The Kingspan KoolDuct® System

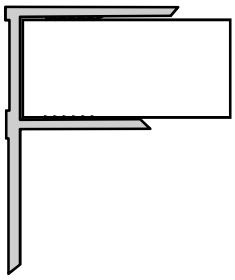
Aluminum Flange Profiles

for Connection To Duct System Components

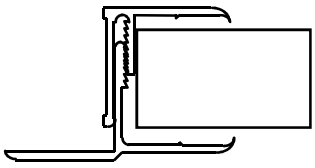
"F" GRIP FLANGE # 311 + 313



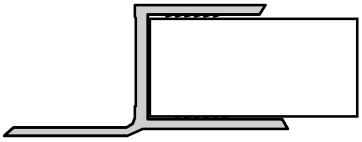
"F" STRUCTURAL FLANGE # 332



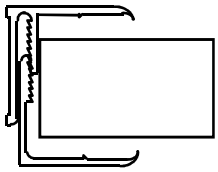
"h" GRIP FLANGE # 311 + 314



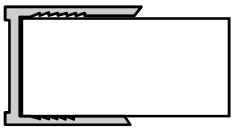
"h" STRUCTURAL FLANGE # 333

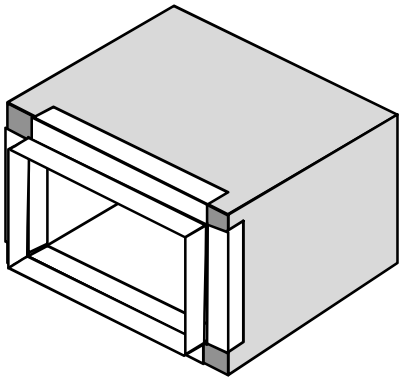


"U" GRIP FLANGE # 311 + 315



"U" STRUCTURAL FLANGE # 334

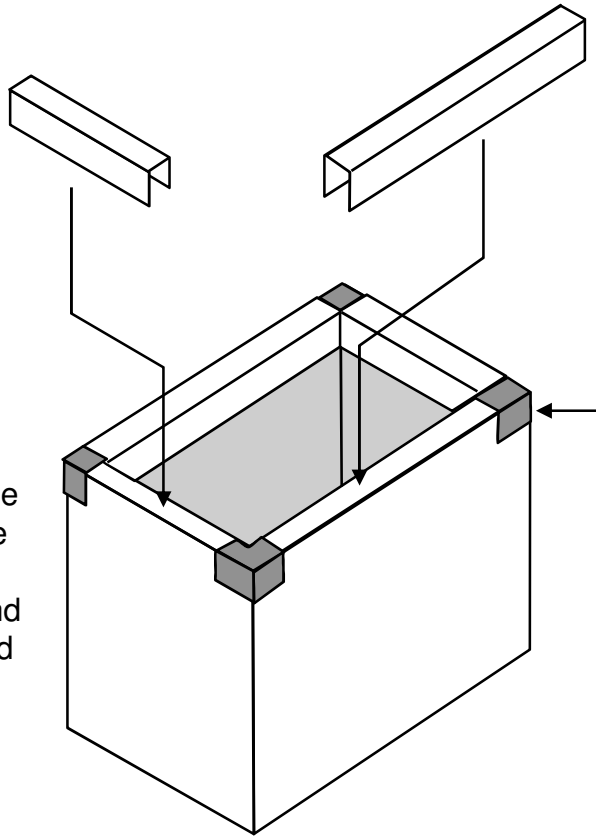




Example: h flange

The Kingspan KoolDuct® System

Structural Aluminum Profiles
(Alternative to Grip for 7/8” R-6 KoolDuct only)



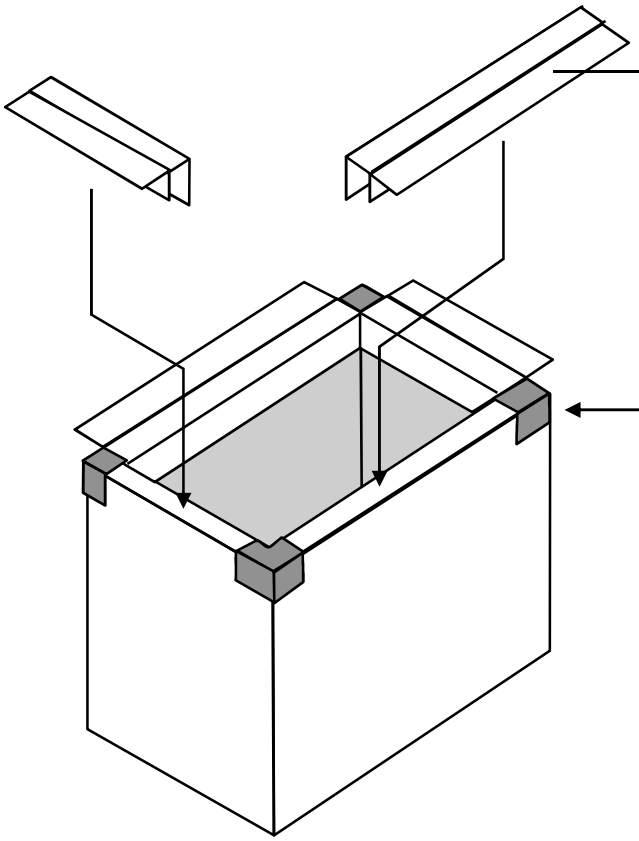
Structural U Profile # 334
Internal dim. – 1/8”

Adhesive inside each profile

EXAMPLE: STRUCTURAL FLANGE

Aluminum Tape on corners

Prior to insertion of the Structural flanges, the ends of the duct section (both inner and outer surfaces) should be gently **tapered with the black Rigid Spatula**



Structural F # 332
Internal dim. – 1/8”

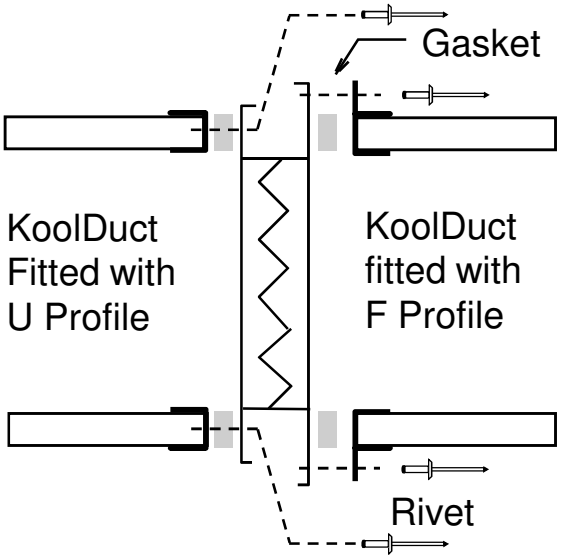
Adhesive inside each profile

EXAMPLE: “F” STRUCTURAL FLANGE

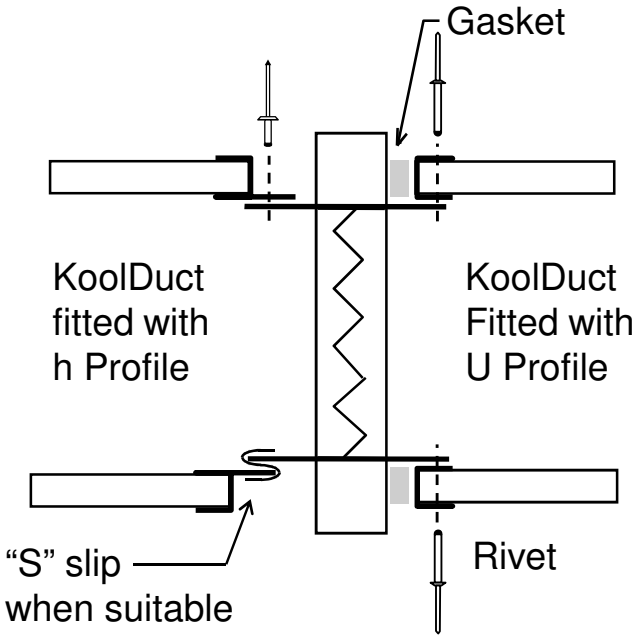
Aluminum Tape on corners

The Kingspan KoolDuct® System

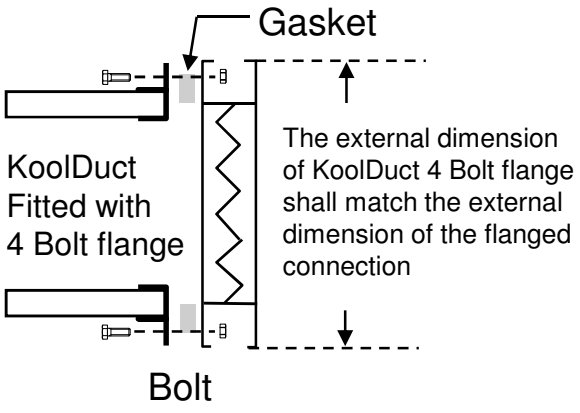
Connection To Duct System Components



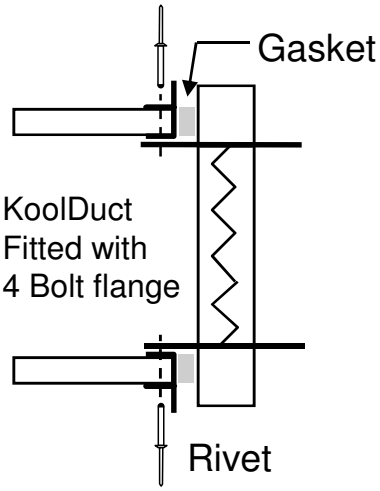
Flanged Connection



Spigotted Connection



Flanged Connection using The 4 Bolt flange

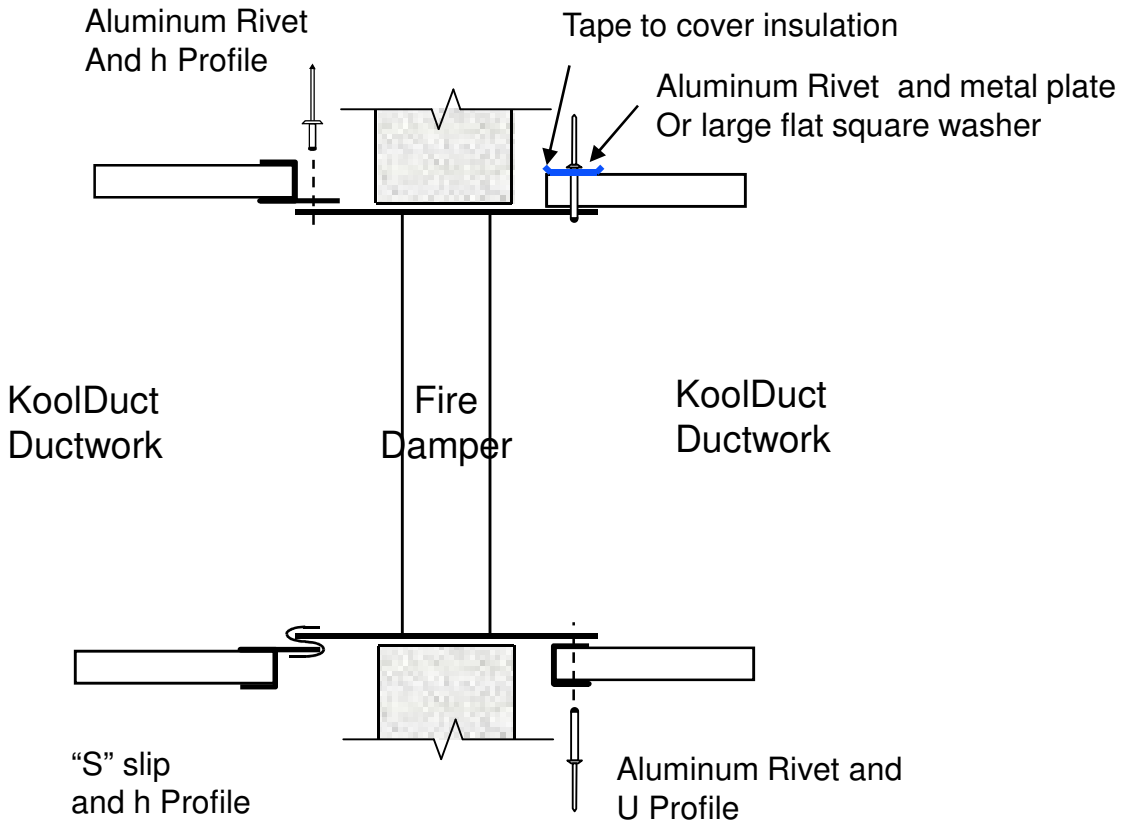


Spigotted Connection using The 4 Bolt flange

Screws/rivets: minimum 2 per side, located at 300mm (12") max spacing.

The Kingspan KoolDuct® System

Connection To a Fire Damper with break-away joint



NOTE: The installation of **fire dampers** and their connection to ductwork fabricated from the Kingspan KoolDuct system should always be in accordance with the building regulations

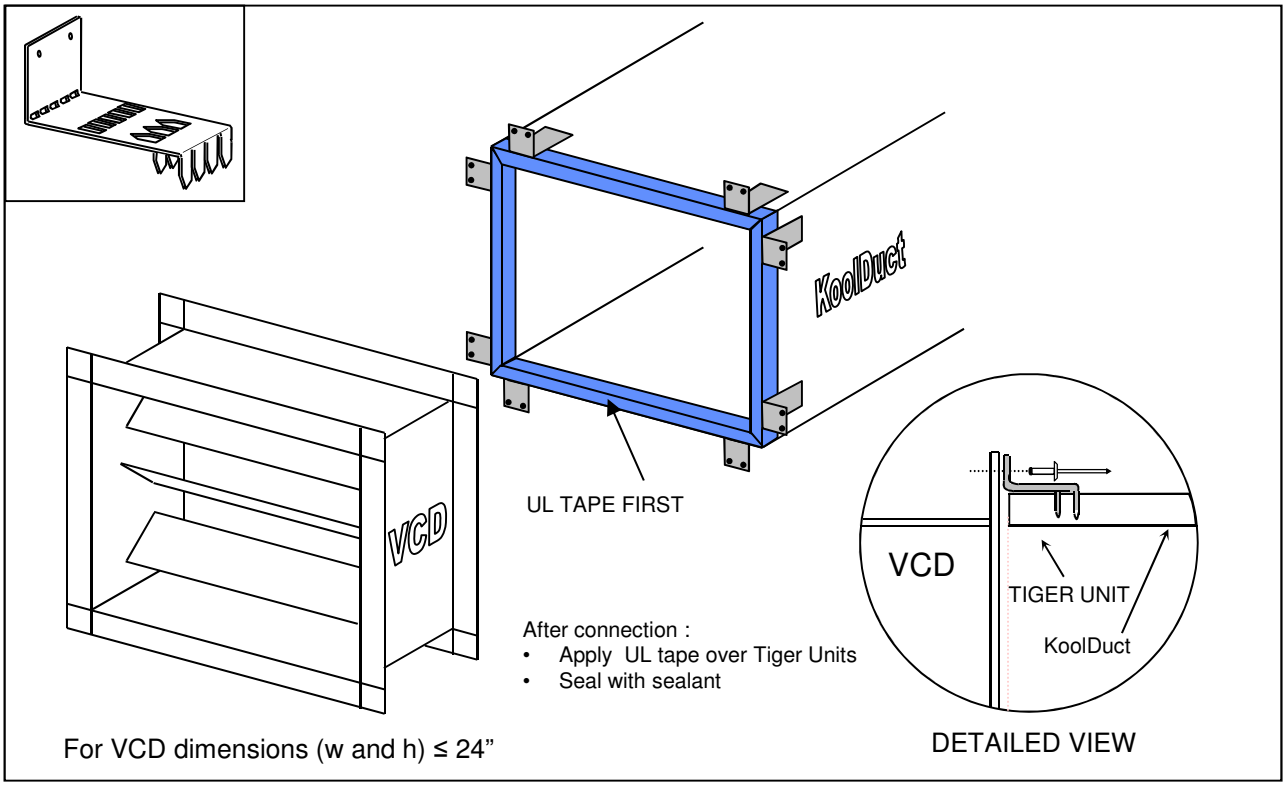
Rivets: minimum 2 per side, located at 300mm (12”) max spacing
Suggested blind rivets with aluminum body:

- Minimum diameter 4.0mm (5/32”)
- Through flange only: rivet grip range 3-8mm (1/8" to 5/16“)
- Through flange and panel:
    - For 22mm KoolDuct: rivet with grip range 25-30mm (1" to 1 3/16“)
    - For 30mm KoolDuct: rivet with grip range 33-38mm (1 5/16" to 1 1/2")

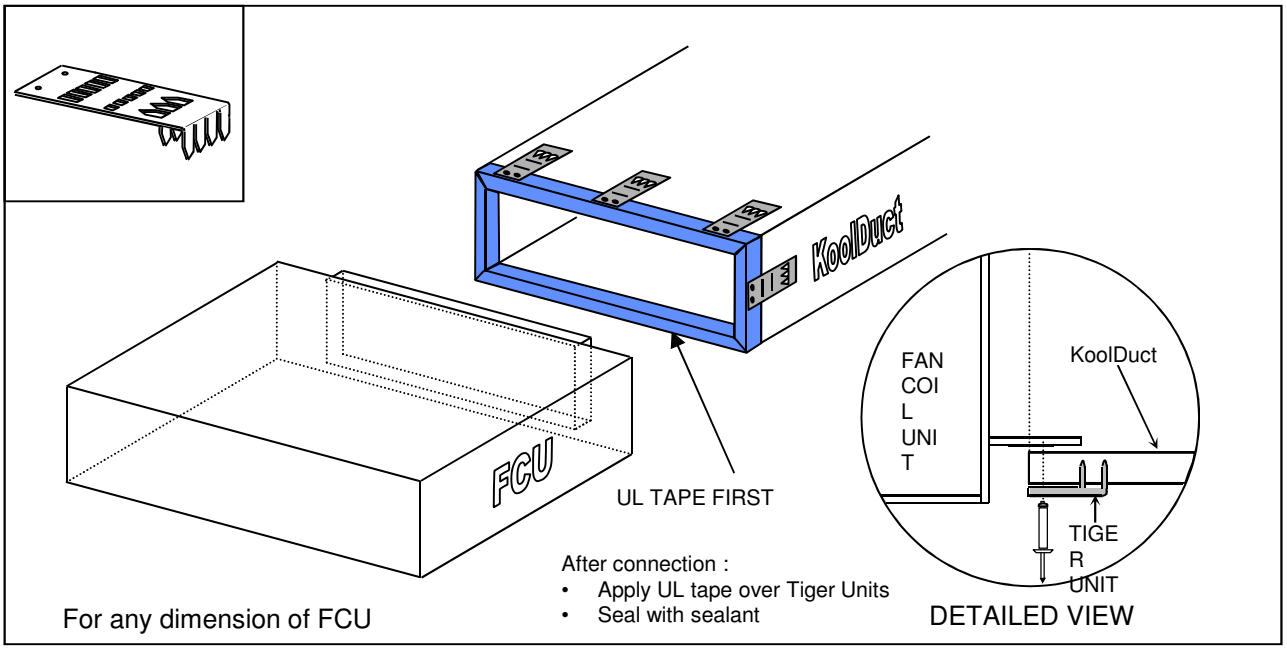
The Kingspan KoolDuct® System

Alternative Connection With Tiger Unit # 363

Low Pressure only ≤1 in.w.g.



Duct Connection to VCD (Volume Control Damper)



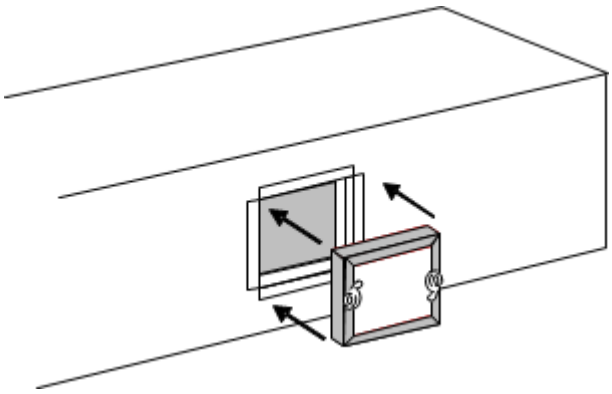
Duct Connection to Fan Coil Unit

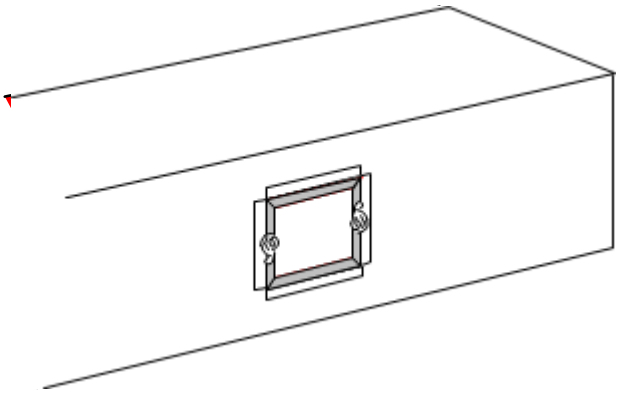
Suggested Tiger Unit spacing at **12“** (300mm) maximum intervals

The Kingspan KoolDuct® System

Connection of Inspection Doors

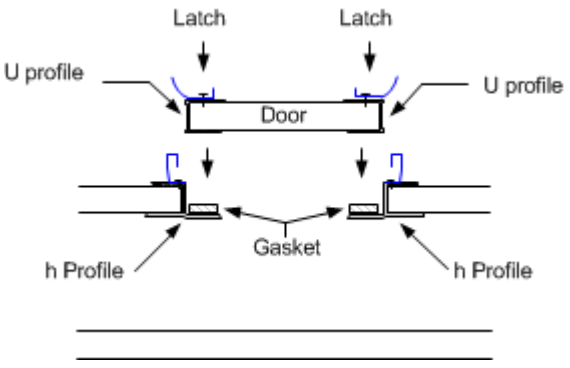
Option 1: KoolDuct door



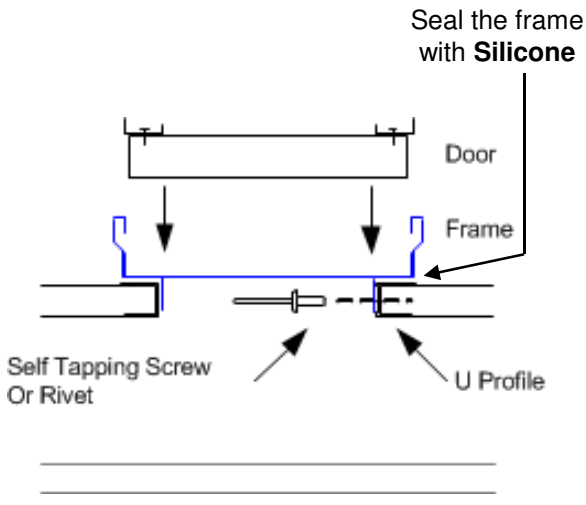


Option 2: Pre fabricated door

Connect safety restraints to access panels located in riser ducts.



KoolDuct Door



Pre Fabricated Door

The Kingspan KoolDuct® System

Training Manual

Chapter 4

Duct Reinforcement

The Kingspan KoolDuct® System

Duct Reinforcement

It is required to ensure that the true rectangular cross section of the duct is maintained.

Reinforcement Requirements
The ductwork may require reinforcement, check the following:
- Duct Size (both width and height must be evaluated)
- System Pressure inside ductwork (static plus dynamic)

Refer to the following Schedule.

Installation of Duct Reinforcement
- Reinforcing bars, both Positive and Negative Pressure, any duct side
- Panel as reinforcement, Negative Pressure ONLY, duct side less than 24”.

Reinforcement for all Ductwork shapes

Both straight ductwork and fittings (e.g. elbows, transitions, etc.) shall be included in the reinforcement procedure

Areas where over pressure may exceed design pressure

Where occasional inadmissible over pressure would exceed design pressure and would compromise the integrity of the ductwork, a **Pressure Relief Damper** and bypass duct is recommended.

Large Ductwork

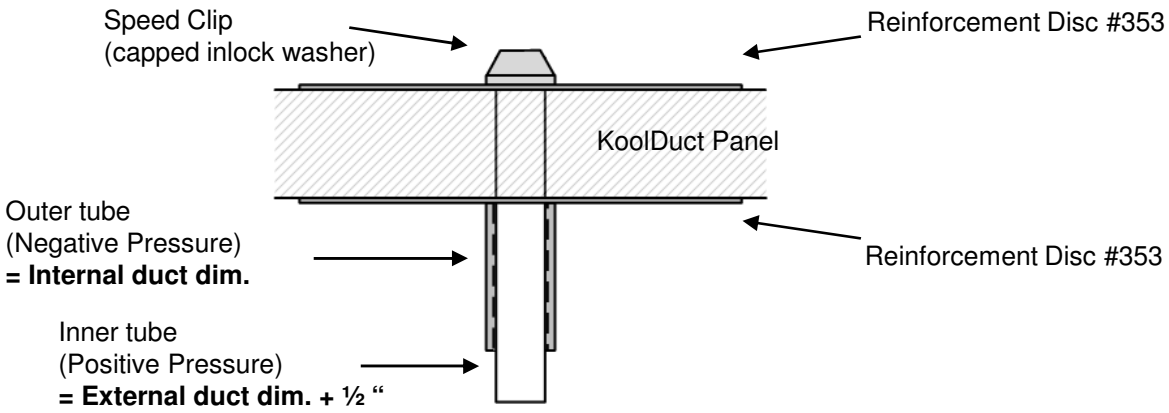
For ductworks larger than those covered by the **Schedule of duct reinforcement** in this manual, the Multiple Duct method of construction can be used, in this case each one of the multiple smaller ductworks shall be reinforced independently.

Alternatively, reinforcements shall be designed to suit the applications, please contact Kingspan Insulation for details

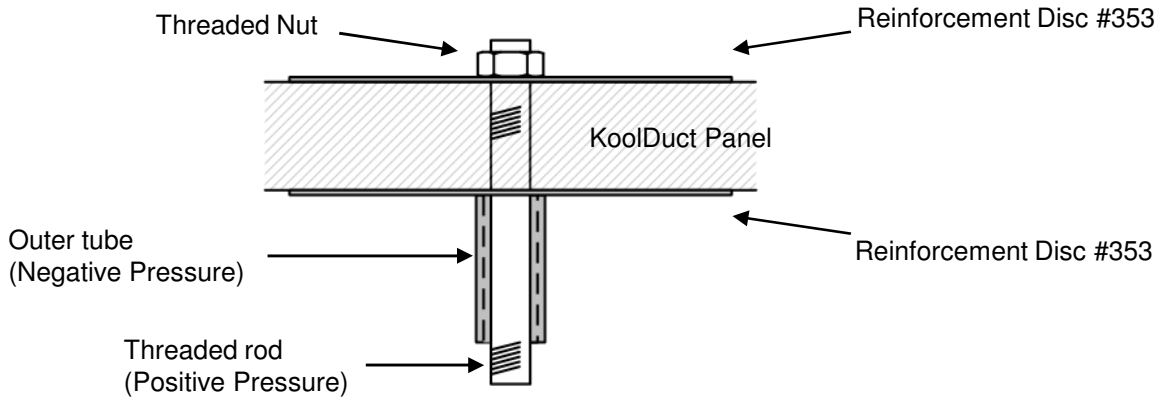
The Kingspan KoolDuct® System

Reinforcement System

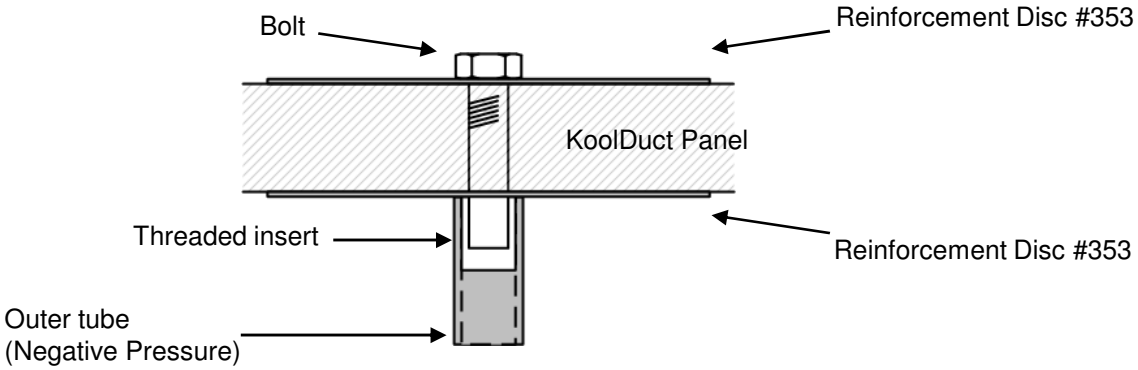
Always install reinforcement for both Positive and Negative Pressure



1) Aluminum Reinforcement – Tube encased Tube with Discs and Speed Clips (capped inlock washers)



2) Tubing encased threaded rod with Discs and Threaded Nuts



3) Tubing and Threaded Inserts with Discs and Bolts

The Kingspan KoolDuct® System

Reinforcement System

Always install reinforcement for both Positive and Negative Pressure

REINFORCING BARS SELECTION – POSITIVE PRESSURE	
Aluminum Tube	**Max Length**
10 mm (3/8”) OD	2134 mm (84”)

Threaded Rod	Max Length
8 mm (5/16”)	2134 mm (84”)

REINFORCING BARS SELECTION – NEGATIVE PRESSURE				
Alu Tube	**O.D mm**	**I.D. mm**	**Thickness mm**	**Max Length mm**
9/16"	14	11	1.5	914
1/2"	17.9	15.8	1.07	1168
3/4"	23.4	20.9	1.25	1527
1"	29.5	26.6	1.45	1880
1 1/4"	38.4	35.1	1.65	2591

Rigid Conduit	O.D mm	I.D. mm	Thickness mm	Max Length mm
1/2"	21.3	16.1	2.65	1320
3/4"	26.7	21.2	2.72	1676
1"	33.4	27.0	3.20	2134

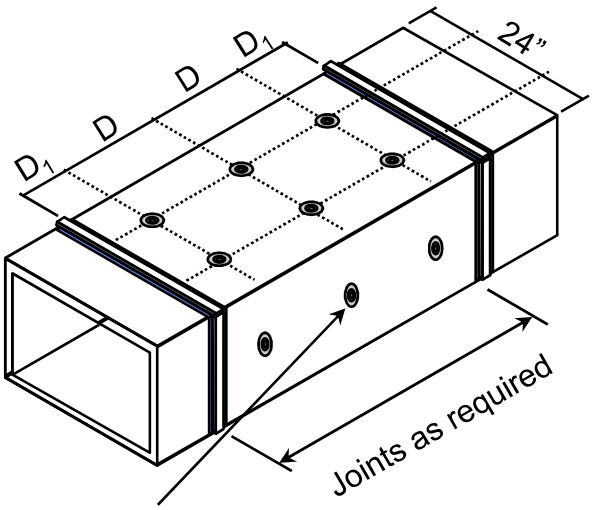
Note on Reinforcing Bars for Negative Pressure: Max Length (L) established to limit the compression stress to that associated with a Max Ratio of 200 L/r_g
r_g = Radius of Gyration

The Kingspan KoolDuct® System

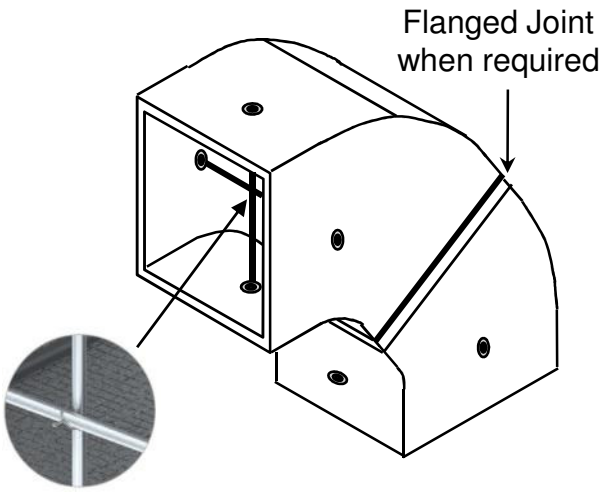
Reinforcement Application

Reinforcing Bars

Add reinforcement for each duct segment, based on duct size and pressure. Both straight ductwork and fittings (e.g. elbows, transitions, etc.) shall be included in the reinforcement procedure.



Reinforcements
on the sides required



Reinforcements
on elbows, transition, tee, etc.

D = Recommended Step Interval (see Schedule of Duct Reinforcement)
D_1 = See the notes bottom of the graphs for max distance from ductwork ends

The Kingspan KoolDuct® System

KoolDuct $^{7}/_{8}$" (R-6) - Schedule of Duct Reinforcement

Grip flange and Bayonet Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
inches	inches	1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"					
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"				1@36"	1@36"
25 - 28	154 3/4"				1@36"	1@36"
29 - 32	154 3/4"			1@36"	1@36"	1@24"
33 - 36	154 3/4"			1@36"	1@36"	2@24"
37 - 40	154 3/4"		1@36"	1@36"	1@24"	2@24"
41 - 45	154 3/4"		1@36"	1@36"	1@24"	2@24"
46 - 48	47 1/4"			1@24"	1@24"	2@24"
49 - 52	47 1/4"			1@24"	2@24"	2@24"
53 - 56	47 1/4"		1 BAR CENTERED	1@24"	2@24"	2@24"
57 - 60	47 1/4"		1 BAR CENTERED	1@24"	2@24"	3@24"
61 - 64	47 1/4"		1 BAR CENTERED	2@24"	2@24"	3@24"
65 - 68	47 1/4"		1 BAR CENTERED	2@24"	2@24"	3@24"
69 - 72	47 1/4"		1@24"	2@24"	2@24"	3@24"
73 - 76	47 1/4"	1 BAR CENTERED	1@24"	2@24"	3@24"	3@24"
79 - 80	47 1/4"	1 BAR CENTERED	1@24"	2@24"	3@24"	3@24"
Over 2000		Consult with Kingspan				

NOTES

1@36" — Reinforcing Bars shall be placed at a maximum of 36" centers, and
Aluminium Grip: FIRST and LAST bar at MAX 18" FROM JOINT

1 BAR CENTERED — One Reinforcing Bar centered equal distance between joints

1@24" — Reinforcing Bars shall be placed at a maximum of 24" centers, and
Aluminium Grip: FIRST and LAST bar at MAX 12" FROM JOINT

2@24" — Reinforcing Bars shall be placed as a pair at a maximum of 24" centers, and
Aluminium Grip: FIRST and LAST pairs at MAX 12" FROM JOINT

3@24" — Reinforcing Bars shall be placed as a trio at a maximum of 24" centers, and
Aluminium Grip: FIRST and LAST trio at MAX 12" FROM JOINT

The Kingspan KoolDuct® System

KoolDuct $^{7}/_{8}$" (R-6) - Schedule of Duct Reinforcement

4-Bolt Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
		1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"					
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"				1@36"	1@36"
25 - 28	154 3/4"				1@36"	1@36"
29 - 32	154 3/4"			1@36"	1@36"	1@24"
33 - 36	154 3/4"			1@36"	1@36"	2@24"
37 - 40	154 3/4"		1@36"	1@36"	1@24"	2@24"
41 - 45	154 3/4"		1@36"	1@36"	1@24"	2@24"
46 - 48	47 1/4"			1 BAR CENTERED	2 BARS CENTERED	2@24"
49 - 52	47 1/4"			1 BAR CENTERED	2 BARS CENTERED	2@24"
53 - 56	47 1/4"			1 BAR CENTERED	2@24"	2@24"
57 - 60	47 1/4"			1 BAR CENTERED	2@24"	3@24"
61 - 64	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
65 - 68	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
69 - 72	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
73 - 76	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	3@24"	3@24"
79 - 80	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	3@24"	3@24"
Over 2000		Consult with Kingspan				

NOTES

1@36"	Reinforcing Bars shall be placed at a maximum of 36" centers, and 4-Bolt Flange: FIRST and LAST bar at MAX 36" FROM JOINT
1 BAR CENTERED	One Reinforcing Bar centered equal distance between joints
2 BARS CENTERED	Two Reinforcing Bars centered equal distance between joints
1@24"	Reinforcing Bars shall be placed at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST bar at MAX 24" FROM JOINT
2@24"	Reinforcing Bars shall be placed as a pair at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST pairs at MAX 12" FROM JOINT
3@24"	Reinforcing Bars shall be placed as a trio at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST trio at MAX 12" FROM JOINT

The Kingspan KoolDuct® System

KoolDuct $^{7}/_{8}$" (R-6) - Schedule of Duct Reinforcement

Tiger Clip Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
		1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"				NOT APPLICABLE	
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"			1@Joint		
25 - 28	154 3/4"		1@Joint	1@Joint		
29 - 32	154 3/4"	1@Joint	1@Joint	1@36"		
33 - 36	154 3/4"	1@Joint	1@Joint	1@36"		
37 - 40	154 3/4"	1@Joint	1@36"	1@36"		
41 - 45	154 3/4"	1@Joint	1@36"	1@36"		
46 - 48	47 1/4"	1@24"	1@24"			
49 - 52	47 1/4"	1@24"	1@24"			
53 - 56	47 1/4"	1@24"	1@24"			
57 - 60	47 1/4"	1@24"	1@24"			
61 - 64	47 1/4"					
65 - 68	47 1/4"					
69 - 72	47 1/4"			NOT APPLICABLE		
73 - 76	47 1/4"					
79 - 80	47 1/4"					
Over 2000						

NOTES

1@Joint	Reinforcing Bars shall be placed at Joint only, and Tiger Clip: Reinfoircing bar at MAX 12" FROM JOINT, on both sides of the joint
1@36"	Reinforcing Bars shall be placed at a maximum of 36" centers, and Tiger Clip: FIRST and LAST bar at MAX 12" FROM JOINT
1@24"	Reinforcing Bars shall be placed at a maximum of 24" centers, and Tiger Clip: FIRST and LAST bar at MAX 12" FROM JOINT

The Kingspan KoolDuct® System

KoolDuct 1 3/16" (R-8) - Schedule of Duct Reinforcement

Grip flange and Bayonet Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
		1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"					
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"				1@36"	1@36"
25 - 28	154 3/4"				1@36"	1@36"
29 - 32	154 3/4"			1@36"	1@36"	1@24"
33 - 36	154 3/4"			1@36"	1@36"	1@24"
37 - 40	154 3/4"		1@36"	1@36"	1@36"	1@24"
41 - 45	154 3/4"		1@36"	1@36"	1@36"	1@24"
46 - 48	47 1/4"			1 BAR CENTERED	1@24"	2@24"
49 - 52	47 1/4"			1 BAR CENTERED	1@24"	2@24"
53 - 56	47 1/4"		1 BAR CENTERED	1 BAR CENTERED	2@24"	2@24"
57 - 60	47 1/4"		1 BAR CENTERED	1@24"	2@24"	2@24"
61 - 64	47 1/4"		1 BAR CENTERED	1@24"	2@24"	2@24"
65 - 68	47 1/4"		1 BAR CENTERED	2@24"	2@24"	2@24"
69 - 72	47 1/4"		1 BAR CENTERED	2@24"	2@24"	3@24"
73 - 76	47 1/4"	1 BAR CENTERED	1@24"	2@24"	2@24"	3@24"
79 - 80	47 1/4"	1 BAR CENTERED	1@24"	2@24"	2@24"	3@24"
Over 2000		Consult with Kingspan				

NOTES

1@36"	Reinforcing Bars shall be placed at a maximum of 36" centers, and Aluminium Grip: FIRST and LAST bar at MAX 18" FROM JOINT
1 BAR CENTERED	One Reinforcing Bar centered equal distance between joints
1@24"	Reinforcing Bars shall be placed at a maximum of 24" centers, and Aluminium Grip: FIRST and LAST bar at MAX 12" FROM JOINT
2@24"	Reinforcing Bars shall be placed as a pair at a maximum of 24" centers, and Aluminium Grip: FIRST and LAST pairs at MAX 12" FROM JOINT
3@24"	Reinforcing Bars shall be placed as a trio at a maximum of 24" centers, and Aluminium Grip: FIRST and LAST trio at MAX 12" FROM JOINT

The Kingspan KoolDuct® System

KoolDuct 1 3/16" (R-8) - Schedule of Duct Reinforcement

4-Bolt Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
inches	inches	1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"					
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"				1@36"	1@36"
25 - 28	154 3/4"				1@36"	1@36"
29 - 32	154 3/4"			1@36"	1@36"	1@24"
33 - 36	154 3/4"			1@36"	1@36"	1@24"
37 - 40	154 3/4"		1@36"	1@36"	1@36"	1@24"
41 - 45	154 3/4"		1@36"	1@36"	1@36"	1@24"
46 - 48	47 1/4"			1 BAR CENTERED	1 BAR CENTERED	2 BARS CENTERED
49 - 52	47 1/4"			1 BAR CENTERED	1 BAR CENTERED	2@24"
53 - 56	47 1/4"			1 BAR CENTERED	2 BARS CENTERED	2@24"
57 - 60	47 1/4"			1 BAR CENTERED	2 BARS CENTERED	2@24"
61 - 64	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2 BARS CENTERED	2@24"
65 - 68	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2 BARS CENTERED	2@24"
69 - 72	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
73 - 76	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
79 - 80	47 1/4"		1 BAR CENTERED	2 BARS CENTERED	2@24"	3@24"
Over 2000		Consult with Kingspan				

NOTES

1@36"	Reinforcing Bars shall be placed at a maximum of 36" centers, and 4-Bolt Flange: FIRST and LAST bar at MAX 36" FROM JOINT
1 BAR CENTERED	One Reinforcing Bar centered equal distance between joints
2 BARS CENTERED	Two Reinforcing Bars centered equal distance between joints
1@24"	Reinforcing Bars shall be placed at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST bar at MAX 12" FROM JOINT
2@24"	Reinforcing Bars shall be placed as a pair at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST pairs at MAX 12" FROM JOINT
3@24"	Reinforcing Bars shall be placed as a trio at a maximum of 24" centers, and 4-Bolt Flange: FIRST and LAST trio at MAX 12" FROM JOINT

The Kingspan KoolDuct® System

KoolDuct 1 3/16" (R-8) - Schedule of Duct Reinforcement

Tiger Clip Coupling

Duct Dimension	Max Duct segment length	Static Pressure Positive and Negative				Pos Pressure only
		1/2 in.w.g.	1 in.w.g.	2 in.w.g.	3 in.w.g.	4 in.w.g.
4 - 8	154 3/4"				NOT APPLICABLE	
9 - 12	154 3/4"	NO REINFORCEMENT				
13 - 16	154 3/4"					
19 - 20	154 3/4"					
21 - 24	154 3/4"					
25 - 28	154 3/4"			1@Joint		
29 - 32	154 3/4"		1@Joint	1@36"		
33 - 36	154 3/4"		1@Joint	1@36"		
37 - 40	154 3/4"	1@Joint	1@36"	1@36"		
41 - 45	154 3/4"	1@Joint	1@36"	1@36"		
46 - 48	47 1/4"	1@24"	1@24"			
49 - 52	47 1/4"	1@24"	1@24"			
53 - 56	47 1/4"	1@24"	1@24"			
57 - 60	47 1/4"	1@24"	1@24"			
61 - 64	47 1/4"					
65 - 68	47 1/4"					
69 - 72	47 1/4"			NOT APPLICABLE		
73 - 76	47 1/4"					
79 - 80	47 1/4"					
Over 2000						

NOTES

1@Joint — Reinforcing Bars shall be placed at Joint only, and
Tiger Clip: Reinfoircing bar at MAX 12" FROM JOINT, on both sides of the joint

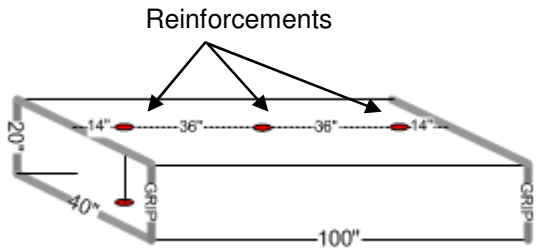
1@36" — Reinforcing Bars shall be placed at a maximum of 36" centers, and
Tiger Clip: FIRST and LAST bar at MAX 12" FROM JOINT

1@24" — Reinforcing Bars shall be placed at a maximum of 24" centers, and
Tiger Clip: FIRST and LAST bar at MAX 12" FROM JOINT

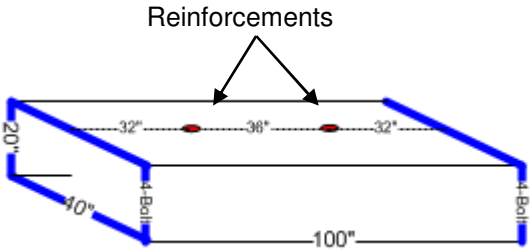
The Kingspan KoolDuct® System

Duct Reinforcement Examples

Example A: $^{7}/_{8}$", R-6 KoolDuct
Ductwork section size: 40" (w) x 20" (h)
Ductwork section length: 100"
Pressure: 1 in.w.g.

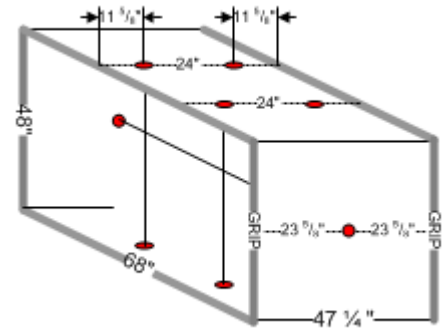


R-6 with Grip flange and bayonet joint:
Side 40": 1@36", bar max 18" from flange
Side 20": No reinforcement

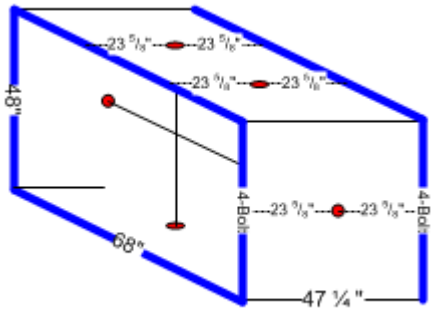


R-6 with 4-Bolt flange :
Side 40": 1@36", bar max 36" from flange
Side 20": No reinforcement

Example B: 1 $^{3}/_{16}$", R-8 KoolDuct
Ductwork section size: 68" (w) x 48" (h)
Ductwork section length: 47 ¼ "
Pressure: 2 in.w.g.



R-8 with Grip flange and bayonet joint:
Side 68": 2@24", bar max 12" from flange
Side 48": 1 Centered



R-8 with 4-Bolt flange
Side 68": 2 Centered
Side 48": 1 Centered

The Kingspan KoolDuct® System

Non-standard reinforcement

Where the standard reinforcing bars cannot be installed:

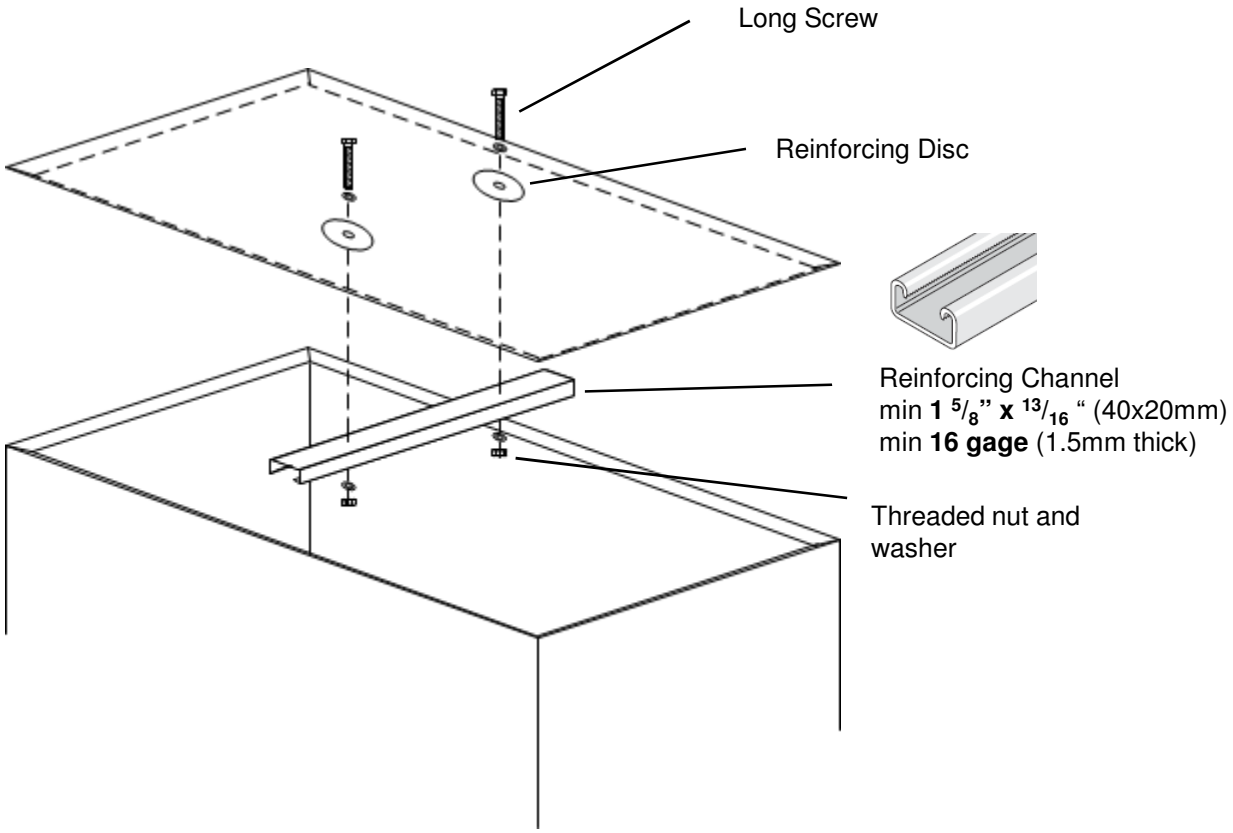
- top of a large square elbow
- where a large branch takes off from a large duct
- large end cap.

Non-standard reinforcement options :

- Duct fabrication using the dual or multiple duct design
- Angle profiles or reinforcing channels mechanically fixed inside/outside ductwork
- Single duct design reinforced with “Bent” reinforcing bars that suit the shape of the ductwork.

Reinforcement – End Caps

- Reinforcement required whenever the schedule of reinforcement for straight duct of the same dimension shows reinforcement is required.
- Reference is the SMALLEST size of the end cap. E.g. end cap size 56” x 40”: check the schedule of duct reinforcement for 40”
- Specifically designed reinforcement, e.g. channel profiles **1 $^{5}/_{8}$” x $^{13}/_{16}$ “, 16 gage** (40x20mm, min 1.5mm thick)



The Kingspan KoolDuct® System

Training Manual

Chapter 5

Hangers and Supports

The Kingspan KoolDuct® System

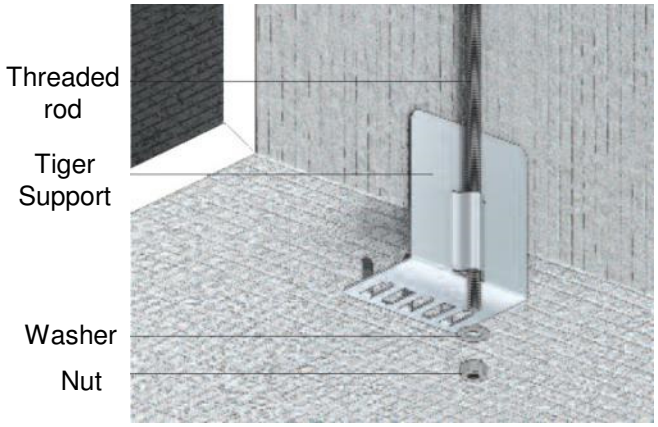
Hangers and Supports - Ductwork

KoolDuct ductwork installed according to the principals of **HVCA DW/144** Chapter 6 or **SMACNA** HVAC Duct Construction Standard Chapter 5

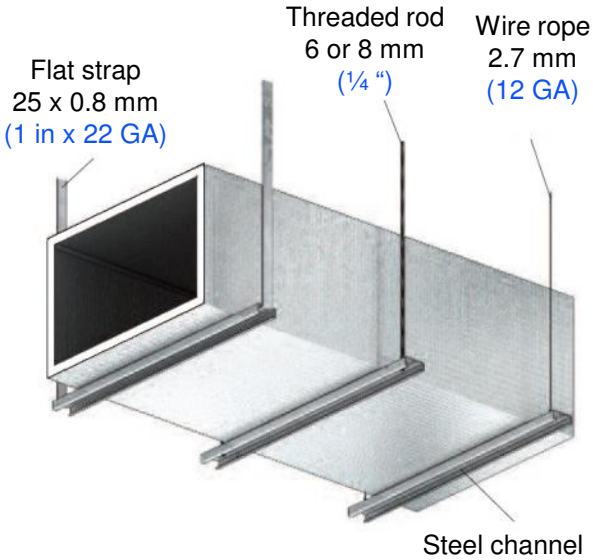
Suitable Duct Support: Metal Channel, Angle, Tiger Support

Tiger Support #266:
- for small and medium size horizontal ductworks (duct side up to 700 x 700 mm)
- for risers of any size.

Suitable Hanger: Threaded rod, Wire rope, Flat strap



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



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.**

Hangers and Supports – Components

All components, such as volume control dampers, flexible ducts etc. should be fully and independently supported, with their weight neutralised by supports and not loading the KoolDuct system

The Kingspan KoolDuct® System

Horizontal Ductwork - Max Spacing Between Supports

Ductwork Longer Inside Dimension - w or h (inches)	Maximum Spacing Between Supports
<47”	13 feet
from 47” to 80”	6 feet
>80”	Special Analysis Required

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

Horizontal Ductwork – Hanger Minimum Size

Hanger Type	Largest Duct Side (mm)	Hanger Minimum Size (mm)		
		Pair at 3930 mm spacing	Pair at 1800 mm spacing	Pair at 1200 mm spacing
Rod	100 - 1150	6.4	6.4	6.4
Rod	1151 - 2000	n.a.	6.4	6.4
Strap	100 - 1150	25.4 x 0.85	25.4 x 0.85	25.4 x 0.85
Strap	1151 - 2000	n.a.	25.4 x 0.85	25.4 x 0.85
Wire	100 - 900	2.7	2.7	2.7
Wire	901 - 1150	3.2	2.7	2.7
Wire	1151 - 1500	n.a.	2.7	2.7
Wire	1501 - 2000	n.a.	3.2	2.7

Single Hanger Maimum Allowable Load		
Rod	**Strap**	**Wire**
6.4 – 122 kg	25.4 x 0.85 – 118 kg	2.7 – 36 kg 3.2 – 54 kg

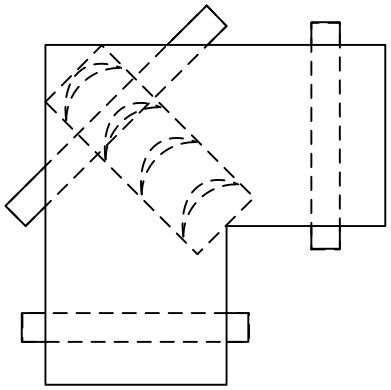
Note: When available, please follow the specific recommendations of the **hanger Manufacturer**

The Kingspan KoolDuct® System

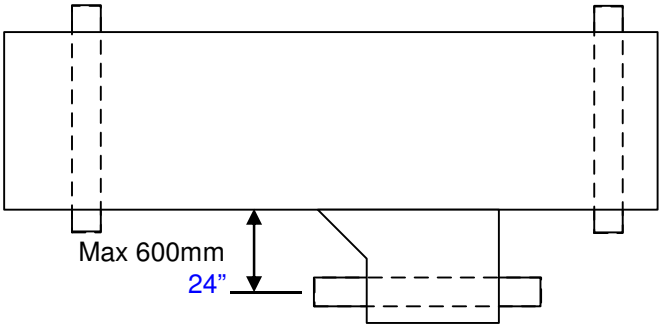
Hangers and Supports – Hanging Duct Fittings

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.

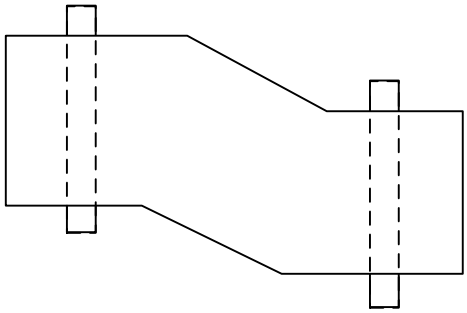
It is the responsibility of the registered fabricator/installer to determine both spacing and placement of supports. Ductwork shall be supported at branch connections, tee fittings and at changes of direction as necessary.



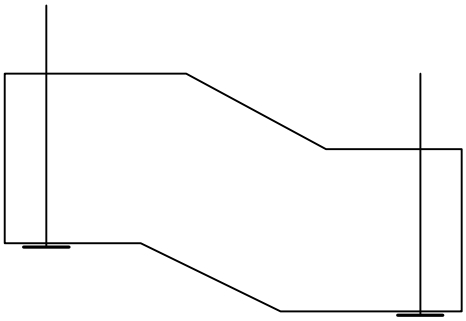
Square Elbow suggested support
TOP VIEW



Take-off suggested support
TOP VIEW



Offset suggested support (bottom flat)
TOP VIEW



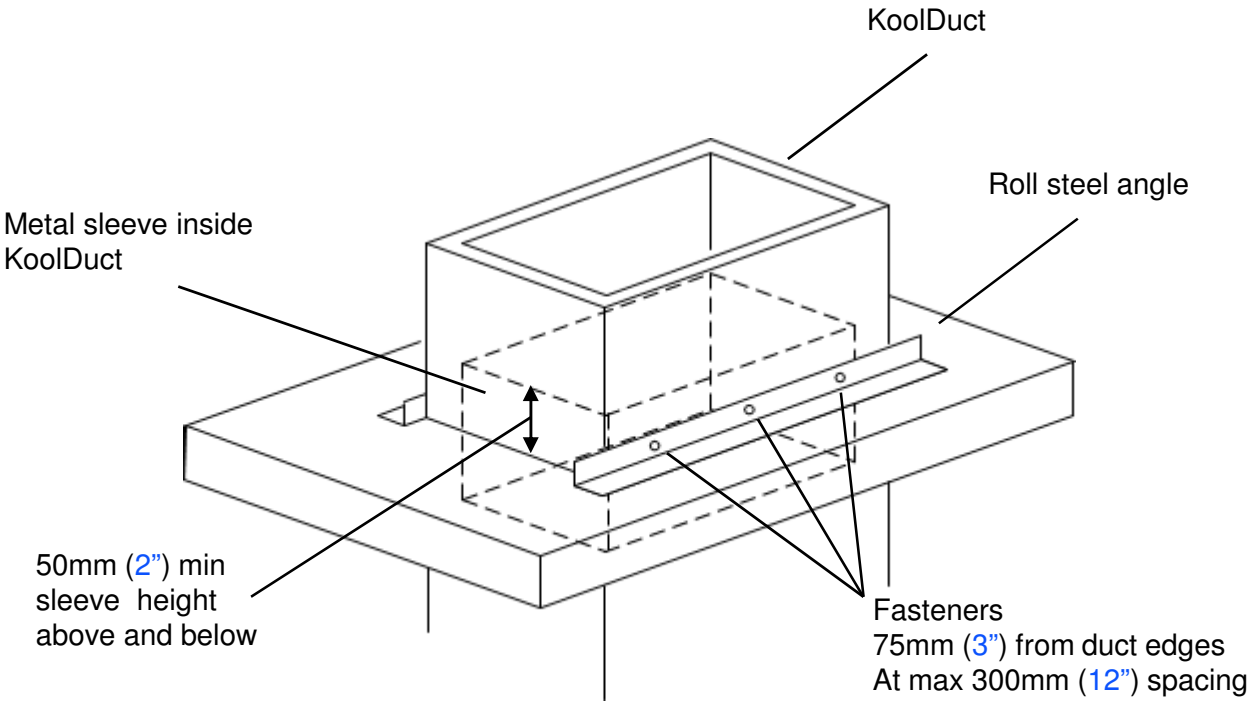
Offset suggested support
(bottom inclined)
SIDE VIEW

NOTE: Caution labels are available

(a) Ductwork and duct supports are **not designed** for man access either inside or on top of the ductwork.
(b) Ductwork and duct supports are **not designed** to accommodate additional loadings from other services.

The Kingspan KoolDuct® System

Hangers and Supports – Vertical Ductwork



Option 1

Option 2

Note that the couplings of ductwork fabricated from the Kingspan KoolDuct system are NOT designed to take the vertical load of ductwork.

The Kingspan KoolDuct® System

Hangers and Supports – Vertical Ductwork

Brackets/supports should be installed to bases of vertically orientated ductwork when possible.

WEIGHT OF KOOLDUCT

The weight of the ductwork section shall always be independently determined by the Trained Fabricator / Installer, and the appropriate gauge of supports and hanger chosen in accordance with the relevant manufacturer's guidelines.

The Kingspan KoolDuct® System

Hangers and Supports – Weight of KoolDuct $^{7}/_{8}$" R-6

7/8" R-6 KoolDuct

Weight in [lbs per foot length] depending on width / height

Duct connecting joint : **4 BOLT FLANGE**

Height (inch) \ Width (inch)	8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.5	1.8	2.0	2.3	2.6	2.8	3.2	3.5	3.8	4.0	5.8	6.2	6.6	7.0	7.4	7.8	8.2	8.5	8.9	8"
12"		2.0	2.3	2.6	2.8	3.1	3.5	3.8	4.0	4.3	6.2	6.6	7.0	7.3	7.8	8.2	8.6	8.9	9.3	12"
16"			2.6	2.8	3.1	3.4	3.8	4.1	4.3	4.6	6.6	7.0	7.4	7.7	8.2	8.6	9.0	9.4	9.7	16"
20"				3.1	3.4	3.7	4.1	4.4	4.6	4.9	7.0	7.4	7.8	8.1	8.6	9.0	9.4	9.8	10.1	20"
24"					3.7	3.9	4.4	4.6	4.9	5.2	7.4	7.8	8.2	8.5	9.0	9.4	9.8	10.2	10.5	24"
28"						4.2	4.7	4.9	5.2	5.5	7.8	8.2	8.5	8.9	9.5	9.8	10.2	10.6	10.9	28"
32"							5.2	5.5	5.7	6.0	8.2	8.6	8.9	9.3	9.9	10.2	10.6	11.0	11.4	32"
36"								5.7	6.0	6.3	8.6	8.9	9.3	9.7	10.3	10.6	11.0	11.4	11.8	36"
40"									6.3	6.6	9.0	9.3	9.7	10.1	10.7	11.0	11.4	11.8	12.2	40"
44"										6.9	9.4	9.7	10.1	10.5	11.1	11.5	11.8	12.2	12.6	44"
											10.0	10.4	10.8	11.2	11.8	12.2	12.6	13.0	13.4	48"
												10.8	11.2	11.6	12.2	12.6	13.0	13.4	13.8	52"
													11.6	11.9	12.6	13.0	13.4	13.8	14.2	56"
														12.3	13.0	13.4	13.8	14.2	14.6	60"
															13.7	14.1	14.6	15.0	15.4	64"
																14.6	15.0	15.4	15.8	68"
																	15.4	15.8	16.2	72"
																		16.2	16.6	76"
																			17.0	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.34 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (2 in.w.g.)

Duct connecting joint : **ALUMINIUM GRIP + BAYONET**

Height (inch) \ Width (inch)	8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.4	1.7	1.9	2.2	2.5	2.7	3.1	3.4	3.6	3.9	5.4	5.7	6.1	6.4	6.9	7.3	7.6	7.9	8.3	8"
12"		1.9	2.2	2.5	2.7	3.0	3.4	3.7	3.9	4.2	5.8	6.1	6.4	6.8	7.3	7.7	8.0	8.3	8.7	12"
16"			2.5	2.7	3.0	3.2	3.7	3.9	4.2	4.5	6.1	6.5	6.8	7.2	7.7	8.1	8.4	8.8	9.1	16"
20"				3.0	3.2	3.5	4.0	4.2	4.5	4.7	6.5	6.8	7.2	7.5	8.1	8.5	8.8	9.2	9.5	20"
24"					3.5	3.8	4.3	4.5	4.8	5.0	6.9	7.2	7.6	7.9	8.5	8.9	9.2	9.6	9.9	24"
28"						4.0	4.5	4.8	5.1	5.3	7.3	7.6	8.0	8.3	9.0	9.3	9.6	10.0	10.3	28"
32"							5.0	5.3	5.5	5.8	7.7	8.0	8.4	8.7	9.4	9.8	10.1	10.4	10.8	32"
36"								5.6	5.8	6.1	8.1	8.4	8.7	9.1	9.8	10.2	10.5	10.8	11.2	36"
40"									6.1	6.4	8.4	8.8	9.1	9.5	10.2	10.6	10.9	11.3	11.6	40"
44"										6.7	8.8	9.2	9.5	9.8	10.6	11.0	11.3	11.7	12.0	44"
											9.2	9.6	9.9	10.3	11.1	11.4	11.8	12.1	12.5	48"
												9.9	10.3	10.6	11.5	11.8	12.2	12.5	12.9	52"
													10.7	11.0	11.9	12.3	12.6	12.9	13.3	56"
														11.4	12.3	12.7	13.0	13.3	13.7	60"
															12.8	13.2	13.5	13.8	14.2	64"
																13.6	13.9	14.2	14.6	68"
																	14.3	14.7	15.0	72"
																		15.1	15.4	76"
																			15.8	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.34 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (2 in.w.g.)

Duct connecting joint : **TIGER CLIP**

Height (inch) \ Width (inch)	8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.3	1.5	1.7	1.9	2.2	2.4	2.7	3.0	3.2	3.4	3.7	4.0	4.2	4.4	n.a.	n.a.	n.a.	n.a.	n.a.	8"
12"		1.7	1.9	2.2	2.4	2.7	3.0	3.2	3.5	3.7	4.0	4.3	4.5	4.7	n.a.	n.a.	n.a.	n.a.	n.a.	12"
16"			2.2	2.4	2.7	2.9	3.3	3.5	3.7	3.9	4.3	4.5	4.7	5.0	n.a.	n.a.	n.a.	n.a.	n.a.	16"
20"				2.6	2.9	3.1	3.5	3.7	4.0	4.2	4.5	4.8	5.0	5.2	n.a.	n.a.	n.a.	n.a.	n.a.	20"
24"					3.2	3.4	3.8	4.0	4.3	4.5	4.8	5.0	5.3	5.5	n.a.	n.a.	n.a.	n.a.	n.a.	24"
28"						3.6	4.1	4.3	4.5	4.8	5.1	5.3	5.5	5.8	n.a.	n.a.	n.a.	n.a.	n.a.	28"
32"							4.5	4.8	5.0	5.3	5.6	5.8	6.1	6.3	n.a.	n.a.	n.a.	n.a.	n.a.	32"
36"								5.0	5.3	5.5	5.9	6.1	6.3	6.6	n.a.	n.a.	n.a.	n.a.	n.a.	36"
40"									5.5	5.8	6.1	6.4	6.6	6.9	n.a.	n.a.	n.a.	n.a.	n.a.	40"
44"										6.0	6.6	6.9	7.2	7.4	n.a.	n.a.	n.a.	n.a.	n.a.	44"
											6.9	7.2	7.4	7.7	n.a.	n.a.	n.a.	n.a.	n.a.	48"
												7.4	7.7	8.0	n.a.	n.a.	n.a.	n.a.	n.a.	52"
													7.9	8.2	n.a.	n.a.	n.a.	n.a.	n.a.	56"
														8.5	n.a.	n.a.	n.a.	n.a.	n.a.	60"
															n.a.	n.a.	n.a.	n.a.	n.a.	64"
																n.a.	n.a.	n.a.	n.a.	68"
																	n.a.	n.a.	n.a.	72"
																		n.a.	n.a.	76"
																			n.a.	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.34 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (1 in.w.g.)

The Kingspan KoolDuct® System

Hangers and Supports – Weight of KoolDuct 1 3/16" R-8

1 3/16" R-8 KoolDuct
Weight in [lbs per foot length] depending on width / height
Duct connecting joint : **4 BOLT FLANGE**

Height (inch)	Width (inch) 8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.9	2.3	2.6	2.9	3.3	3.6	4.0	4.4	4.7	5.1	6.9	7.4	7.8	8.2	8.7	9.2	9.6	10.1	10.5	8"
12"		2.6	2.9	3.3	3.6	3.9	4.4	4.7	5.1	5.4	7.4	7.8	8.3	8.7	9.1	9.7	10.1	10.6	11.0	12"
16"			3.3	3.6	3.9	4.3	4.8	5.1	5.4	5.8	7.8	8.3	8.7	9.2	9.6	10.2	10.6	11.0	11.5	16"
20"				3.9	4.3	4.6	5.1	5.4	5.8	6.1	8.3	8.7	9.2	9.6	10.1	10.6	11.1	11.5	11.9	20"
24"					4.6	5.0	5.5	5.8	6.1	6.5	8.8	9.2	9.6	10.1	10.5	11.1	11.5	12.0	12.4	24"
28"						5.3	5.8	6.2	6.5	6.8	9.2	9.6	10.1	10.5	11.0	11.6	12.0	12.4	12.9	28"
32"							6.4	6.7	7.1	7.5	9.7	10.1	10.5	11.0	11.4	12.0	12.5	12.9	13.3	32"
36"								7.1	7.5	7.8	10.1	10.6	11.0	11.4	11.9	12.5	12.9	13.4	13.8	36"
40"									7.8	8.2	10.6	11.0	11.5	11.9	12.3	13.0	13.4	13.9	14.3	40"
44"										8.5	11.0	11.5	11.9	12.3	12.8	13.4	13.9	14.3	14.8	44"
											11.7	12.2	12.6	13.1	13.5	14.3	14.7	15.2	15.6	48"
												12.6	13.1	13.5	14.0	14.7	15.2	15.6	16.1	52"
													13.5	14.0	14.5	15.2	15.6	16.1	16.6	56"
														14.5	14.9	15.7	16.1	16.6	17.0	60"
															15.4	16.1	16.6	17.0	17.5	64"
																16.9	17.4	17.9	18.4	68"
																	17.9	18.4	18.8	72"
																		18.8	19.3	76"
																			19.8	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.44 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (2 in.w.g.)

Duct connecting joint : **ALUMINIUM GRIP + BAYONET**

Height (inch)	Width (inch) 8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.9	2.2	2.5	2.9	3.2	3.5	4.0	4.3	4.6	5.0	6.4	6.8	7.2	7.7	8.1	8.7	9.1	9.5	9.9	8"
12"		2.5	2.9	3.2	3.5	3.9	4.3	4.7	5.0	5.3	6.8	7.2	7.7	8.2	8.6	9.2	9.6	10.0	10.4	12"
16"			3.2	3.5	3.9	4.2	4.7	5.0	5.4	5.7	7.3	7.7	8.1	8.6	9.0	9.6	10.1	10.5	10.9	16"
20"				3.9	4.2	4.5	5.0	5.4	5.7	6.0	7.7	8.1	8.5	9.0	9.5	10.1	10.5	10.9	11.3	20"
24"					4.5	4.9	5.4	5.7	6.1	6.4	8.1	8.5	8.9	9.5	9.9	10.6	11.0	11.4	11.8	24"
28"						5.2	5.8	6.1	6.4	6.7	8.5	8.9	9.4	9.9	10.3	11.1	11.5	11.9	12.3	28"
32"							6.3	6.6	7.0	7.3	9.0	9.4	9.8	10.4	10.8	11.6	12.0	12.4	12.8	32"
36"								7.0	7.3	7.7	9.4	9.8	10.2	10.8	11.3	12.1	12.5	12.9	13.3	36"
40"									7.7	8.0	9.9	10.3	10.7	11.3	11.7	12.5	12.9	13.3	13.8	40"
44"										8.4	10.3	10.7	11.1	11.7	12.1	13.0	13.4	13.8	14.2	44"
											10.7	11.1	11.5	12.2	12.6	13.5	13.9	14.3	14.7	48"
												11.5	11.9	12.6	13.0	14.0	14.4	14.8	15.2	52"
													12.4	13.1	13.5	14.4	14.8	15.2	15.6	56"
														13.5	13.9	14.9	15.3	15.8	16.2	60"
															14.4	15.4	15.8	16.2	16.6	64"
																16.0	16.4	16.8	17.2	68"
																	16.9	17.3	17.7	72"
																		17.7	18.2	76"
																			18.6	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.44 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (2 in.w.g.)

Duct connecting joint : **TIGER CLIP**

Height (inch)	Width (inch) 8"	12"	16"	20"	24"	28"	32"	36"	40"	44"	48"	52"	56"	60"	64"	68"	72"	76"	80"	Height (inch)
8"	1.7	2.0	2.3	2.6	2.9	3.2	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	n.a.	n.a.	n.a.	n.a.	n.a.	8"
12"		2.3	2.6	2.9	3.2	3.5	3.9	4.2	4.5	4.8	5.2	5.5	5.8	6.1	n.a.	n.a.	n.a.	n.a.	n.a.	12"
16"			2.9	3.2	3.5	3.8	4.2	4.5	4.8	5.1	5.5	5.8	6.1	6.4	n.a.	n.a.	n.a.	n.a.	n.a.	16"
20"				3.5	3.8	4.1	4.5	4.8	5.1	5.4	5.8	6.1	6.4	6.7	n.a.	n.a.	n.a.	n.a.	n.a.	20"
24"					4.0	4.4	4.9	5.1	5.4	5.7	6.2	6.5	6.8	7.1	n.a.	n.a.	n.a.	n.a.	n.a.	24"
28"						4.7	5.2	5.5	5.8	6.1	6.5	6.8	7.1	7.4	n.a.	n.a.	n.a.	n.a.	n.a.	28"
32"							5.8	6.1	6.4	6.7	6.8	7.1	7.4	7.7	n.a.	n.a.	n.a.	n.a.	n.a.	32"
36"								6.4	6.7	7.0	7.4	7.7	8.0	8.3	n.a.	n.a.	n.a.	n.a.	n.a.	36"
40"									7.0	7.3	7.7	8.0	8.3	8.7	n.a.	n.a.	n.a.	n.a.	n.a.	40"
44"										7.6	8.3	8.6	9.0	9.3	n.a.	n.a.	n.a.	n.a.	n.a.	44"
											8.6	9.0	9.3	9.6	n.a.	n.a.	n.a.	n.a.	n.a.	48"
												9.3	9.6	10.0	n.a.	n.a.	n.a.	n.a.	n.a.	52"
													9.9	10.3	n.a.	n.a.	n.a.	n.a.	n.a.	56"
														10.6	n.a.	n.a.	n.a.	n.a.	n.a.	60"
															n.a.	n.a.	n.a.	n.a.	n.a.	64"
																n.a.	n.a.	n.a.	n.a.	68"
																	n.a.	n.a.	n.a.	72"
																		n.a.	n.a.	76"
																			n.a.	80"

Weight based on 12.9 ft long ducts
KoolDuct panel weight 0.44 lbs/ft2
Reinforcement based on low pressure (2 in.w.g Pascal)

Weight based on 4 ft long ducts
Reinforcement based on low pressure (1 in.w.g.)

The Kingspan KoolDuct® System

Training Manual

Chapter 6

Maintenance and External Ductwork

The Kingspan KoolDuct® System

Cleaning KoolDuct

KoolDuct ductwork shall be cleaned in accordance to the Guide of Good Practice HVCA TR/19 or NADCA. **Dry Cleaning and non-abrasive** methods only :

Dry Cleaning Method	Energy Source	Method of Removing Deposit
Mechanical		
Rotary Brushing (A) - soft brush only	Compressed air/Electricity	Brushing the duct surface
Air Whip/Skipper Ball (A) - plastic ball only	Low volume compressed air	Directional jet nozzle on the end of a flexible hose
Air Lance (A)	Low volume compressed air	Air gun with a trigger to direct compressed air locally
Manual		
Hand Wipe	Manual	Wiping of duct surface
Hand brushing –soft brush only	Manual	Sweeping the duct surface with a brush and collection device
Hand Vacuum	Electricity/Manual	Removal of deposit by means of vacuum

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 technique considered to be abrasive such as hard brushing, scraping or high pressure systems.

The Kingspan KoolDuct® System

Building Management Systems

Building Management Systems include sensors / controllers that may need to be installed inside/outside the ductwork to monitor temperature, pressure and other parameter of the HVAC system.

These sensors / controllers typically have a mounting plate with mounting holes and are fixed to steel ductwork using screws.
A hole is also drilled into the ductwork to allow the insertion of the measuring probe.

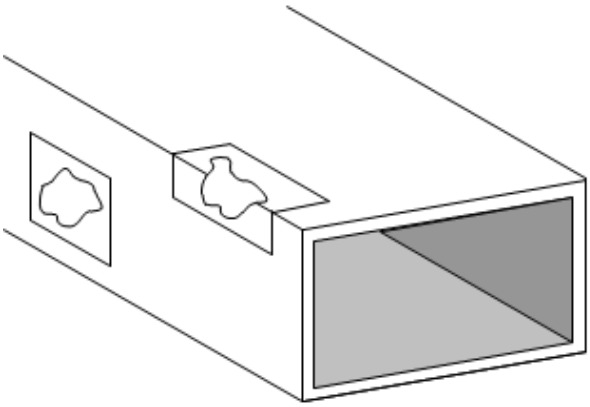
With ductwork fabricated from the KoolDuct system, a protective metal plate needs to be installed inside the ductwork using adhesive/sealant before the sensor / controller is fixed to the outside KoolDuct ductwork wall, so that the insulating panel is protected by the sandwich type of installation - mounting plate outside KoolDuct, metal plate inside KoolDuct.
Once the protective metal plate is installed, standard fixing operation can follow (e.g. drilling, fixing screws).

In case the sensor / controller needs to be installed after the duct is already in place, an access door will be required on KoolDuct, to allow the above mentioned installation.

The Kingspan KoolDuct® System

Damage Repair

Superficial damage can be repaired with **UL tape only**
More substantial damage can be cut out and replaced.



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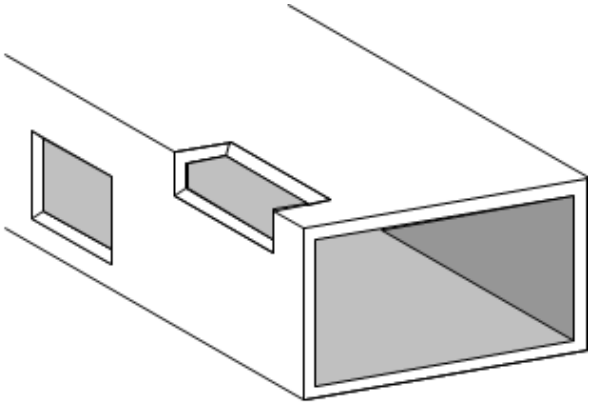

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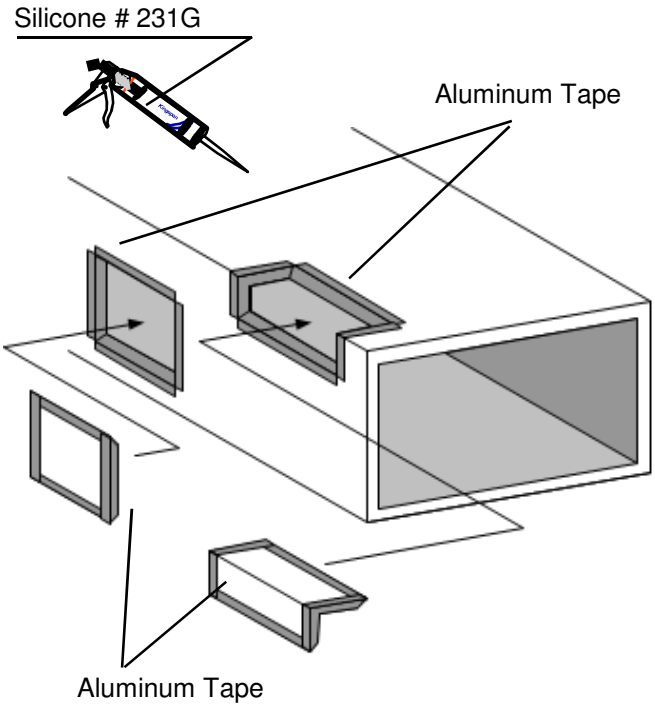

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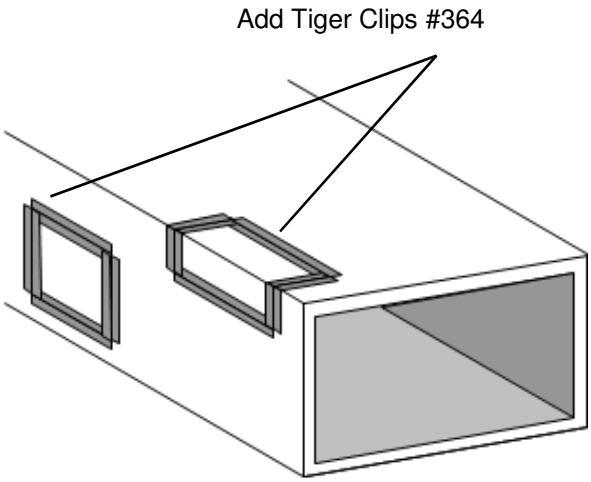

4

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.
Kingspan preferred finishes should be applied in factory controlled conditions and shall be either

a) self-adhesive foil laminate (e.g. Venture Clad by 3M or equivalent) ÷
b) cladding of either aluminum-zinc coated steel sheet **24 gage** (0.7 mm) typical (e.g. Dobel Aluzinc or equivalent); or
c) fibre reinforced plastic (e.g. Fibaroll by FTI or equivalent)

The chosen finish shall be installed in accordance with the manufacturer's instructions
Note that all external couplings **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

The Kingspan KoolDuct® System

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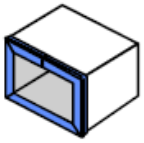
Appendixes

The Kingspan KoolDuct® System

Appendix 1

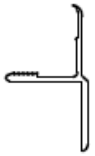
7/8 inch GRIP FLANGE - NOTCHES POSITION



DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
6	x	6	0	3 7/8	11 5/8	19 3/8	27 1/8	30 7/8
8	x	6	0	4 7/8	12 5/8	22 3/8	30 1/8	34 7/8
8	x	8	0	4 7/8	14 5/8	24 3/8	34 1/8	38 7/8
10	x	6	0	5 7/8	13 5/8	25 3/8	33 1/8	38 7/8
10	x	8	0	5 7/8	15 5/8	27 3/8	37 1/8	42 7/8
10	x	10	0	5 7/8	17 5/8	29 3/8	41 1/8	46 7/8
12	x	6	0	6 7/8	14 5/8	28 3/8	36 1/8	42 7/8
12	x	8	0	6 7/8	16 5/8	30 3/8	40 1/8	46 7/8
12	x	10	0	6 7/8	18 5/8	32 3/8	44 1/8	50 7/8
12	x	12	0	6 7/8	20 5/8	34 3/8	48 1/8	54 7/8
14	x	6	0	7 7/8	15 5/8	31 3/8	39 1/8	46 7/8
14	x	8	0	7 7/8	17 5/8	33 3/8	43 1/8	50 7/8
14	x	10	0	7 7/8	19 5/8	35 3/8	47 1/8	54 7/8
14	x	12	0	7 7/8	21 5/8	37 3/8	51 1/8	58 7/8
14	x	14	0	7 7/8	23 5/8	39 3/8	55 1/8	62 7/8
16	x	6	0	8 7/8	16 5/8	34 3/8	42 1/8	50 7/8
16	x	8	0	8 7/8	18 5/8	36 3/8	46 1/8	54 7/8
16	x	10	0	8 7/8	20 5/8	38 3/8	50 1/8	58 7/8
16	x	12	0	8 7/8	22 5/8	40 3/8	54 1/8	62 7/8
16	x	14	0	8 7/8	24 5/8	42 3/8	58 1/8	66 7/8
16	x	16	0	8 7/8	26 5/8	44 3/8	62 1/8	70 7/8
18	x	6	0	9 7/8	17 5/8	37 3/8	45 1/8	54 7/8
18	x	8	0	9 7/8	19 5/8	39 3/8	49 1/8	58 7/8
18	x	10	0	9 7/8	21 5/8	41 3/8	53 1/8	62 7/8
18	x	12	0	9 7/8	23 5/8	43 3/8	57 1/8	66 7/8
18	x	14	0	9 7/8	25 5/8	45 3/8	61 1/8	70 7/8
18	x	16	0	9 7/8	27 5/8	47 3/8	65 1/8	74 7/8
18	x	18	0	9 7/8	29 5/8	49 3/8	69 1/8	78 7/8
20	x	6	0	10 7/8	18 5/8	40 3/8	48 1/8	58 7/8
20	x	8	0	10 7/8	20 5/8	42 3/8	52 1/8	62 7/8
20	x	10	0	10 7/8	22 5/8	44 3/8	56 1/8	66 7/8
20	x	12	0	10 7/8	24 5/8	46 3/8	60 1/8	70 7/8
20	x	14	0	10 7/8	26 5/8	48 3/8	64 1/8	74 7/8
20	x	16	0	10 7/8	28 5/8	50 3/8	68 1/8	78 7/8
20	x	18	0	10 7/8	30 5/8	52 3/8	72 1/8	82 7/8
20	x	20	0	10 7/8	32 5/8	54 3/8	76 1/8	86 7/8
22	x	6	0	11 7/8	19 5/8	43 3/8	51 1/8	62 7/8
22	x	8	0	11 7/8	21 5/8	45 3/8	55 1/8	66 7/8
22	x	10	0	11 7/8	23 5/8	47 3/8	59 1/8	70 7/8
22	x	12	0	11 7/8	25 5/8	49 3/8	63 1/8	74 7/8
22	x	14	0	11 7/8	27 5/8	51 3/8	67 1/8	78 7/8

External Grip
LKDA 312

External U Grip
LKDA 315

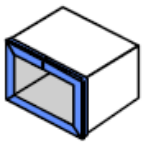


External h Grip
LKDA 314

External F Grip
LKDA 313

The Kingspan KoolDuct® System

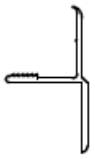
7/8 inch GRIP FLANGE - NOTCHES POSITION



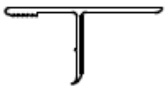
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
22	x	16	0	11 7/8	29 5/8	53 3/8	71 1/8	82 7/8
22	x	18	0	11 7/8	31 5/8	55 3/8	75 1/8	86 7/8
22	x	20	0	11 7/8	33 5/8	57 3/8	79 1/8	90 7/8
22	x	22	0	11 7/8	35 5/8	59 3/8	83 1/8	94 7/8
24	x	6	0	12 7/8	20 5/8	46 3/8	54 1/8	66 7/8
24	x	8	0	12 7/8	22 5/8	48 3/8	58 1/8	70 7/8
24	x	10	0	12 7/8	24 5/8	50 3/8	62 1/8	74 7/8
24	x	12	0	12 7/8	26 5/8	52 3/8	66 1/8	78 7/8
24	x	14	0	12 7/8	28 5/8	54 3/8	70 1/8	82 7/8
24	x	16	0	12 7/8	30 5/8	56 3/8	74 1/8	86 7/8
24	x	18	0	12 7/8	32 5/8	58 3/8	78 1/8	90 7/8
24	x	20	0	12 7/8	34 5/8	60 3/8	82 1/8	94 7/8
24	x	22	0	12 7/8	36 5/8	62 3/8	86 1/8	98 7/8
24	x	24	0	12 7/8	38 5/8	64 3/8	90 1/8	102 7/8
26	x	6	0	13 7/8	21 5/8	49 3/8	57 1/8	70 7/8
26	x	8	0	13 7/8	23 5/8	51 3/8	61 1/8	74 7/8
26	x	10	0	13 7/8	25 5/8	53 3/8	65 1/8	78 7/8
26	x	12	0	13 7/8	27 5/8	55 3/8	69 1/8	82 7/8
26	x	14	0	13 7/8	29 5/8	57 3/8	73 1/8	86 7/8
26	x	16	0	13 7/8	31 5/8	59 3/8	77 1/8	90 7/8
26	x	18	0	13 7/8	33 5/8	61 3/8	81 1/8	94 7/8
26	x	20	0	13 7/8	35 5/8	63 3/8	85 1/8	98 7/8
26	x	22	0	13 7/8	37 5/8	65 3/8	89 1/8	102 7/8
26	x	24	0	13 7/8	39 5/8	67 3/8	93 1/8	106 7/8
26	x	26	0	13 7/8	41 5/8	69 3/8	97 1/8	110 7/8
28	x	6	0	14 7/8	22 5/8	52 3/8	60 1/8	74 7/8
28	x	8	0	14 7/8	24 5/8	54 3/8	64 1/8	78 7/8
28	x	10	0	14 7/8	26 5/8	56 3/8	68 1/8	82 7/8
28	x	12	0	14 7/8	28 5/8	58 3/8	72 1/8	86 7/8
28	x	14	0	14 7/8	30 5/8	60 3/8	76 1/8	90 7/8
28	x	16	0	14 7/8	32 5/8	62 3/8	80 1/8	94 7/8
28	x	18	0	14 7/8	34 5/8	64 3/8	84 1/8	98 7/8
28	x	20	0	14 7/8	36 5/8	66 3/8	88 1/8	102 7/8
28	x	22	0	14 7/8	38 5/8	68 3/8	92 1/8	106 7/8
28	x	24	0	14 7/8	40 5/8	70 3/8	96 1/8	110 7/8
28	x	26	0	14 7/8	42 5/8	72 3/8	100 1/8	114 7/8
28	x	28	0	14 7/8	44 5/8	74 3/8	104 1/8	118 7/8
30	x	6	0	15 7/8	23 5/8	55 3/8	63 1/8	78 7/8
30	x	8	0	15 7/8	25 5/8	57 3/8	67 1/8	82 7/8
30	x	10	0	15 7/8	27 5/8	59 3/8	71 1/8	86 7/8
30	x	12	0	15 7/8	29 5/8	61 3/8	75 1/8	90 7/8
30	x	14	0	15 7/8	31 5/8	63 3/8	79 1/8	94 7/8
30	x	16	0	15 7/8	33 5/8	65 3/8	83 1/8	98 7/8
30	x	18	0	15 7/8	35 5/8	67 3/8	87 1/8	102 7/8

External Grip
LKDA 312

External U Grip
LKDA 315



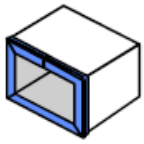
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

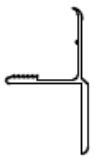
7/8 inch GRIP FLANGE - NOTCHES POSITION



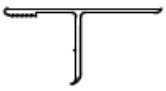
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
30	x	20	0	15 7/8	37 5/8	69 3/8	91 1/8	106 7/8
30	x	22	0	15 7/8	39 5/8	71 3/8	95 1/8	110 7/8
30	x	24	0	15 7/8	41 5/8	73 3/8	99 1/8	114 7/8
30	x	26	0	15 7/8	43 5/8	75 3/8	103 1/8	118 7/8
30	x	28	0	15 7/8	45 5/8	77 3/8	107 1/8	122 7/8
30	x	30	0	15 7/8	47 5/8	79 3/8	111 1/8	126 7/8
32	x	6	0	16 7/8	24 5/8	58 3/8	66 1/8	82 7/8
32	x	8	0	16 7/8	26 5/8	60 3/8	70 1/8	86 7/8
32	x	10	0	16 7/8	28 5/8	62 3/8	74 1/8	90 7/8
32	x	12	0	16 7/8	30 5/8	64 3/8	78 1/8	94 7/8
32	x	14	0	16 7/8	32 5/8	66 3/8	82 1/8	98 7/8
32	x	16	0	16 7/8	34 5/8	68 3/8	86 1/8	102 7/8
32	x	18	0	16 7/8	36 5/8	70 3/8	90 1/8	106 7/8
32	x	20	0	16 7/8	38 5/8	72 3/8	94 1/8	110 7/8
32	x	22	0	16 7/8	40 5/8	74 3/8	98 1/8	114 7/8
32	x	24	0	16 7/8	42 5/8	76 3/8	102 1/8	118 7/8
32	x	26	0	16 7/8	44 5/8	78 3/8	106 1/8	122 7/8
32	x	28	0	16 7/8	46 5/8	80 3/8	110 1/8	126 7/8
32	x	30	0	16 7/8	48 5/8	82 3/8	114 1/8	130 7/8
32	x	32	0	16 7/8	50 5/8	84 3/8	118 1/8	134 7/8
34	x	6	0	17 7/8	25 5/8	61 3/8	69 1/8	86 7/8
34	x	8	0	17 7/8	27 5/8	63 3/8	73 1/8	90 7/8
34	x	10	0	17 7/8	29 5/8	65 3/8	77 1/8	94 7/8
34	x	12	0	17 7/8	31 5/8	67 3/8	81 1/8	98 7/8
34	x	14	0	17 7/8	33 5/8	69 3/8	85 1/8	102 7/8
34	x	16	0	17 7/8	35 5/8	71 3/8	89 1/8	106 7/8
34	x	18	0	17 7/8	37 5/8	73 3/8	93 1/8	110 7/8
34	x	20	0	17 7/8	39 5/8	75 3/8	97 1/8	114 7/8
34	x	22	0	17 7/8	41 5/8	77 3/8	101 1/8	118 7/8
34	x	24	0	17 7/8	43 5/8	79 3/8	105 1/8	122 7/8
34	x	26	0	17 7/8	45 5/8	81 3/8	109 1/8	126 7/8
34	x	28	0	17 7/8	47 5/8	83 3/8	113 1/8	130 7/8
34	x	30	0	17 7/8	49 5/8	85 3/8	117 1/8	134 7/8
34	x	32	0	17 7/8	51 5/8	87 3/8	121 1/8	138 7/8
34	x	34	0	17 7/8	53 5/8	89 3/8	125 1/8	142 7/8
36	x	6	0	18 7/8	26 5/8	64 3/8	72 1/8	90 7/8
36	x	8	0	18 7/8	28 5/8	66 3/8	76 1/8	94 7/8
36	x	10	0	18 7/8	30 5/8	68 3/8	80 1/8	98 7/8
36	x	12	0	18 7/8	32 5/8	70 3/8	84 1/8	102 7/8
36	x	14	0	18 7/8	34 5/8	72 3/8	88 1/8	106 7/8
36	x	16	0	18 7/8	36 5/8	74 3/8	92 1/8	110 7/8
36	x	18	0	18 7/8	38 5/8	76 3/8	96 1/8	114 7/8
36	x	20	0	18 7/8	40 5/8	78 3/8	100 1/8	118 7/8
36	x	22	0	18 7/8	42 5/8	80 3/8	104 1/8	122 7/8
36	x	24	0	18 7/8	44 5/8	82 3/8	108 1/8	126 7/8

External Grip
LKDA 312

External U Grip
LKDA 315



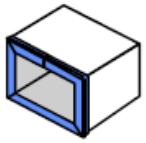
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

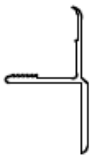
7/8 inch GRIP FLANGE - NOTCHES POSITION



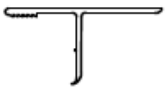
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
36	x	26	0	18 7/8	46 5/8	84 3/8	112 1/8	130 7/8
36	x	28	0	18 7/8	48 5/8	86 3/8	116 1/8	134 7/8
36	x	30	0	18 7/8	50 5/8	88 3/8	120 1/8	138 7/8
36	x	32	0	18 7/8	52 5/8	90 3/8	124 1/8	142 7/8
36	x	34	0	18 7/8	54 5/8	92 3/8	128 1/8	146 7/8
36	x	36	0	18 7/8	56 5/8	94 3/8	132 1/8	150 7/8
38	x	6	0	19 7/8	27 5/8	67 3/8	75 1/8	94 7/8
38	x	8	0	19 7/8	29 5/8	69 3/8	79 1/8	98 7/8
38	x	10	0	19 7/8	31 5/8	71 3/8	83 1/8	102 7/8
38	x	12	0	19 7/8	33 5/8	73 3/8	87 1/8	106 7/8
38	x	14	0	19 7/8	35 5/8	75 3/8	91 1/8	110 7/8
38	x	16	0	19 7/8	37 5/8	77 3/8	95 1/8	114 7/8
38	x	18	0	19 7/8	39 5/8	79 3/8	99 1/8	118 7/8
38	x	20	0	19 7/8	41 5/8	81 3/8	103 1/8	122 7/8
38	x	22	0	19 7/8	43 5/8	83 3/8	107 1/8	126 7/8
38	x	24	0	19 7/8	45 5/8	85 3/8	111 1/8	130 7/8
38	x	26	0	19 7/8	47 5/8	87 3/8	115 1/8	134 7/8
38	x	28	0	19 7/8	49 5/8	89 3/8	119 1/8	138 7/8
38	x	30	0	19 7/8	51 5/8	91 3/8	123 1/8	142 7/8
38	x	32	0	19 7/8	53 5/8	93 3/8	127 1/8	146 7/8
38	x	34	0	19 7/8	55 5/8	95 3/8	131 1/8	150 7/8
38	x	36	0	19 7/8	57 5/8	97 3/8	135 1/8	154 7/8
38	x	38	0	19 7/8	59 5/8	99 3/8	139 1/8	158 7/8
40	x	6	0	20 7/8	28 5/8	70 3/8	78 1/8	98 7/8
40	x	8	0	20 7/8	30 5/8	72 3/8	82 1/8	102 7/8
40	x	10	0	20 7/8	32 5/8	74 3/8	86 1/8	106 7/8
40	x	12	0	20 7/8	34 5/8	76 3/8	90 1/8	110 7/8
40	x	14	0	20 7/8	36 5/8	78 3/8	94 1/8	114 7/8
40	x	16	0	20 7/8	38 5/8	80 3/8	98 1/8	118 7/8
40	x	18	0	20 7/8	40 5/8	82 3/8	102 1/8	122 7/8
40	x	20	0	20 7/8	42 5/8	84 3/8	106 1/8	126 7/8
40	x	22	0	20 7/8	44 5/8	86 3/8	110 1/8	130 7/8
40	x	24	0	20 7/8	46 5/8	88 3/8	114 1/8	134 7/8
40	x	26	0	20 7/8	48 5/8	90 3/8	118 1/8	138 7/8
40	x	28	0	20 7/8	50 5/8	92 3/8	122 1/8	142 7/8
40	x	30	0	20 7/8	52 5/8	94 3/8	126 1/8	146 7/8
40	x	32	0	20 7/8	54 5/8	96 3/8	130 1/8	150 7/8
40	x	34	0	20 7/8	56 5/8	98 3/8	134 1/8	154 7/8
40	x	36	0	20 7/8	58 5/8	100 3/8	138 1/8	158 7/8
40	x	38	0	20 7/8	60 5/8	102 3/8	142 1/8	162 7/8
40	x	40	0	20 7/8	62 5/8	104 3/8	146 1/8	166 7/8
42	x	6	0	21 7/8	29 5/8	73 3/8	81 1/8	102 7/8
42	x	8	0	21 7/8	31 5/8	75 3/8	85 1/8	106 7/8
42	x	10	0	21 7/8	33 5/8	77 3/8	89 1/8	110 7/8
42	x	12	0	21 7/8	35 5/8	79 3/8	93 1/8	114 7/8

External Grip
LKDA 312

External U Grip
LKDA 315



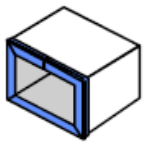
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

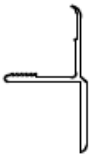
7/8 inch GRIP FLANGE - NOTCHES POSITION



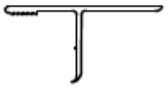
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
42	x	14	0	21 7/8	37 5/8	81 3/8	97 1/8	118 7/8
42	x	16	0	21 7/8	39 5/8	83 3/8	101 1/8	122 7/8
42	x	18	0	21 7/8	41 5/8	85 3/8	105 1/8	126 7/8
42	x	20	0	21 7/8	43 5/8	87 3/8	109 1/8	130 7/8
42	x	22	0	21 7/8	45 5/8	89 3/8	113 1/8	134 7/8
42	x	24	0	21 7/8	47 5/8	91 3/8	117 1/8	138 7/8
42	x	26	0	21 7/8	49 5/8	93 3/8	121 1/8	142 7/8
42	x	28	0	21 7/8	51 5/8	95 3/8	125 1/8	146 7/8
42	x	30	0	21 7/8	53 5/8	97 3/8	129 1/8	150 7/8
42	x	32	0	21 7/8	55 5/8	99 3/8	133 1/8	154 7/8
42	x	34	0	21 7/8	57 5/8	101 3/8	137 1/8	158 7/8
42	x	36	0	21 7/8	59 5/8	103 3/8	141 1/8	162 7/8
42	x	38	0	21 7/8	61 5/8	105 3/8	145 1/8	166 7/8
42	x	40	0	21 7/8	63 5/8	107 3/8	149 1/8	170 7/8
42	x	42	0	21 7/8	65 5/8	109 3/8	153 1/8	174 7/8
44	x	6	0	22 7/8	30 5/8	76 3/8	84 1/8	106 7/8
44	x	8	0	22 7/8	32 5/8	78 3/8	88 1/8	110 7/8
44	x	10	0	22 7/8	34 5/8	80 3/8	92 1/8	114 7/8
44	x	12	0	22 7/8	36 5/8	82 3/8	96 1/8	118 7/8
44	x	14	0	22 7/8	38 5/8	84 3/8	100 1/8	122 7/8
44	x	16	0	22 7/8	40 5/8	86 3/8	104 1/8	126 7/8
44	x	18	0	22 7/8	42 5/8	88 3/8	108 1/8	130 7/8
44	x	20	0	22 7/8	44 5/8	90 3/8	112 1/8	134 7/8
44	x	22	0	22 7/8	46 5/8	92 3/8	116 1/8	138 7/8
44	x	24	0	22 7/8	48 5/8	94 3/8	120 1/8	142 7/8
44	x	26	0	22 7/8	50 5/8	96 3/8	124 1/8	146 7/8
44	x	28	0	22 7/8	52 5/8	98 3/8	128 1/8	150 7/8
44	x	30	0	22 7/8	54 5/8	100 3/8	132 1/8	154 7/8
44	x	32	0	22 7/8	56 5/8	102 3/8	136 1/8	158 7/8
44	x	34	0	22 7/8	58 5/8	104 3/8	140 1/8	162 7/8
44	x	36	0	22 7/8	60 5/8	106 3/8	144 1/8	166 7/8
44	x	38	0	22 7/8	62 5/8	108 3/8	148 1/8	170 7/8
44	x	40	0	22 7/8	64 5/8	110 3/8	152 1/8	174 7/8
44	x	42	0	22 7/8	66 5/8	112 3/8	156 1/8	178 7/8
44	x	44	0	22 7/8	68 5/8	114 3/8	160 1/8	182 7/8
46	x	6	0	23 7/8	31 5/8	79 3/8	87 1/8	110 7/8
46	x	8	0	23 7/8	33 5/8	81 3/8	91 1/8	114 7/8
46	x	10	0	23 7/8	35 5/8	83 3/8	95 1/8	118 7/8
46	x	12	0	23 7/8	37 5/8	85 3/8	99 1/8	122 7/8
46	x	14	0	23 7/8	39 5/8	87 3/8	103 1/8	126 7/8
46	x	16	0	23 7/8	41 5/8	89 3/8	107 1/8	130 7/8
46	x	18	0	23 7/8	43 5/8	91 3/8	111 1/8	134 7/8
46	x	20	0	23 7/8	45 5/8	93 3/8	115 1/8	138 7/8
46	x	22	0	23 7/8	47 5/8	95 3/8	119 1/8	142 7/8
46	x	24	0	23 7/8	49 5/8	97 3/8	123 1/8	146 7/8
46	x	26	0	23 7/8	51 5/8	99 3/8	127 1/8	150 7/8

External Grip
LKDA 312

External U Grip
LKDA 315



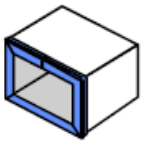
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

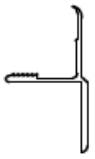
7/8 inch GRIP FLANGE - NOTCHES POSITION



DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
46	x	28	0	23 7/8	53 5/8	101 3/8	131 1/8	154 7/8
46	x	30	0	23 7/8	55 5/8	103 3/8	135 1/8	158 7/8
46	x	32	0	23 7/8	57 5/8	105 3/8	139 1/8	162 7/8
46	x	34	0	23 7/8	59 5/8	107 3/8	143 1/8	166 7/8
46	x	36	0	23 7/8	61 5/8	109 3/8	147 1/8	170 7/8
46	x	38	0	23 7/8	63 5/8	111 3/8	151 1/8	174 7/8
46	x	40	0	23 7/8	65 5/8	113 3/8	155 1/8	178 7/8
46	x	42	0	23 7/8	67 5/8	115 3/8	159 1/8	182 7/8
46	x	44	0	23 7/8	69 5/8	117 3/8	163 1/8	186 7/8
46	x	46	0	23 7/8	71 5/8	119 3/8	167 1/8	190 7/8
48	x	6	0	24 7/8	32 5/8	82 3/8	90 1/8	114 7/8
48	x	8	0	24 7/8	34 5/8	84 3/8	94 1/8	118 7/8
48	x	10	0	24 7/8	36 5/8	86 3/8	98 1/8	122 7/8
48	x	12	0	24 7/8	38 5/8	88 3/8	102 1/8	126 7/8
48	x	14	0	24 7/8	40 5/8	90 3/8	106 1/8	130 7/8
48	x	16	0	24 7/8	42 5/8	92 3/8	110 1/8	134 7/8
48	x	18	0	24 7/8	44 5/8	94 3/8	114 1/8	138 7/8
48	x	20	0	24 7/8	46 5/8	96 3/8	118 1/8	142 7/8
48	x	22	0	24 7/8	48 5/8	98 3/8	122 1/8	146 7/8
48	x	24	0	24 7/8	50 5/8	100 3/8	126 1/8	150 7/8
48	x	26	0	24 7/8	52 5/8	102 3/8	130 1/8	154 7/8
48	x	28	0	24 7/8	54 5/8	104 3/8	134 1/8	158 7/8
48	x	30	0	24 7/8	56 5/8	106 3/8	138 1/8	162 7/8
48	x	32	0	24 7/8	58 5/8	108 3/8	142 1/8	166 7/8
48	x	34	0	24 7/8	60 5/8	110 3/8	146 1/8	170 7/8
48	x	36	0	24 7/8	62 5/8	112 3/8	150 1/8	174 7/8
48	x	38	0	24 7/8	64 5/8	114 3/8	154 1/8	178 7/8
48	x	40	0	24 7/8	66 5/8	116 3/8	158 1/8	182 7/8
48	x	42	0	24 7/8	68 5/8	118 3/8	162 1/8	186 7/8
48	x	44	0	24 7/8	70 5/8	120 3/8	166 1/8	190 7/8
48	x	46	0	24 7/8	72 5/8	122 3/8	170 1/8	194 7/8
48	x	48	0	24 7/8	74 5/8	124 3/8	174 1/8	198 7/8

External Grip
LKDA 312

External U Grip
LKDA 315

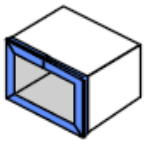


External h Grip
LKDA 314

External F Grip
LKDA 313

The Kingspan KoolDuct® System

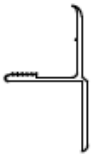
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



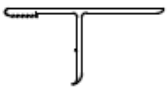
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
6	x	6	0	4 3/16	12 9/16	20 15/16	29 5/16	33 3/8
8	x	6	0	5 3/16	13 9/16	23 15/16	32 5/16	37 3/8
8	x	8	0	5 3/16	15 9/16	25 15/16	36 5/16	41 3/8
10	x	6	0	6 3/16	14 9/16	26 15/16	35 5/16	41 3/8
10	x	8	0	6 3/16	16 9/16	28 15/16	39 5/16	45 3/8
10	x	10	0	6 3/16	18 9/16	30 15/16	43 5/16	49 3/8
12	x	6	0	7 3/16	15 9/16	29 15/16	38 5/16	45 3/8
12	x	8	0	7 3/16	17 9/16	31 15/16	42 5/16	49 3/8
12	x	10	0	7 3/16	19 9/16	33 15/16	46 5/16	53 3/8
12	x	12	0	7 3/16	21 9/16	35 15/16	50 5/16	57 3/8
14	x	6	0	8 3/16	16 9/16	32 15/16	41 5/16	49 3/8
14	x	8	0	8 3/16	18 9/16	34 15/16	45 5/16	53 3/8
14	x	10	0	8 3/16	20 9/16	36 15/16	49 5/16	57 3/8
14	x	12	0	8 3/16	22 9/16	38 15/16	53 5/16	61 3/8
14	x	14	0	8 3/16	24 9/16	40 15/16	57 5/16	65 3/8
16	x	6	0	9 3/16	17 9/16	35 15/16	44 5/16	53 3/8
16	x	8	0	9 3/16	19 9/16	37 15/16	48 5/16	57 3/8
16	x	10	0	9 3/16	21 9/16	39 15/16	52 5/16	61 3/8
16	x	12	0	9 3/16	23 9/16	41 15/16	56 5/16	65 3/8
16	x	14	0	9 3/16	25 9/16	43 15/16	60 5/16	69 3/8
16	x	16	0	9 3/16	27 9/16	45 15/16	64 5/16	73 3/8
18	x	6	0	10 3/16	18 9/16	38 15/16	47 5/16	57 3/8
18	x	8	0	10 3/16	20 9/16	40 15/16	51 5/16	61 3/8
18	x	10	0	10 3/16	22 9/16	42 15/16	55 5/16	65 3/8
18	x	12	0	10 3/16	24 9/16	44 15/16	59 5/16	69 3/8
18	x	14	0	10 3/16	26 9/16	46 15/16	63 5/16	73 3/8
18	x	16	0	10 3/16	28 9/16	48 15/16	67 5/16	77 3/8
18	x	18	0	10 3/16	30 9/16	50 15/16	71 5/16	81 3/8
20	x	6	0	11 3/16	19 9/16	41 15/16	50 5/16	61 3/8
20	x	8	0	11 3/16	21 9/16	43 15/16	54 5/16	65 3/8
20	x	10	0	11 3/16	23 9/16	45 15/16	58 5/16	69 3/8
20	x	12	0	11 3/16	25 9/16	47 15/16	62 5/16	73 3/8
20	x	14	0	11 3/16	27 9/16	49 15/16	66 5/16	77 3/8
20	x	16	0	11 3/16	29 9/16	51 15/16	70 5/16	81 3/8
20	x	18	0	11 3/16	31 9/16	53 15/16	74 5/16	85 3/8
20	x	20	0	11 3/16	33 9/16	55 15/16	78 5/16	89 3/8
22	x	6	0	12 3/16	20 9/16	44 15/16	53 5/16	65 3/8
22	x	8	0	12 3/16	22 9/16	46 15/16	57 5/16	69 3/8
22	x	10	0	12 3/16	24 9/16	48 15/16	61 5/16	73 3/8
22	x	12	0	12 3/16	26 9/16	50 15/16	65 5/16	77 3/8
22	x	14	0	12 3/16	28 9/16	52 15/16	69 5/16	81 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



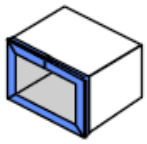
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

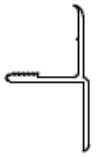
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



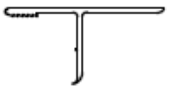
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
22	x	16	0	12 3/16	30 9/16	54 15/16	73 5/16	85 3/8
22	x	18	0	12 3/16	32 9/16	56 15/16	77 5/16	89 3/8
22	x	20	0	12 3/16	34 9/16	58 15/16	81 5/16	93 3/8
22	x	22	0	12 3/16	36 9/16	60 15/16	85 5/16	97 3/8
24	x	6	0	13 3/16	21 9/16	47 15/16	56 5/16	69 3/8
24	x	8	0	13 3/16	23 9/16	49 15/16	60 5/16	73 3/8
24	x	10	0	13 3/16	25 9/16	51 15/16	64 5/16	77 3/8
24	x	12	0	13 3/16	27 9/16	53 15/16	68 5/16	81 3/8
24	x	14	0	13 3/16	29 9/16	55 15/16	72 5/16	85 3/8
24	x	16	0	13 3/16	31 9/16	57 15/16	76 5/16	89 3/8
24	x	18	0	13 3/16	33 9/16	59 15/16	80 5/16	93 3/8
24	x	20	0	13 3/16	35 9/16	61 15/16	84 5/16	97 3/8
24	x	22	0	13 3/16	37 9/16	63 15/16	88 5/16	101 3/8
24	x	24	0	13 3/16	39 9/16	65 15/16	92 5/16	105 3/8
26	x	6	0	14 3/16	22 9/16	50 15/16	59 5/16	73 3/8
26	x	8	0	14 3/16	24 9/16	52 15/16	63 5/16	77 3/8
26	x	10	0	14 3/16	26 9/16	54 15/16	67 5/16	81 3/8
26	x	12	0	14 3/16	28 9/16	56 15/16	71 5/16	85 3/8
26	x	14	0	14 3/16	30 9/16	58 15/16	75 5/16	89 3/8
26	x	16	0	14 3/16	32 9/16	60 15/16	79 5/16	93 3/8
26	x	18	0	14 3/16	34 9/16	62 15/16	83 5/16	97 3/8
26	x	20	0	14 3/16	36 9/16	64 15/16	87 5/16	101 3/8
26	x	22	0	14 3/16	38 9/16	66 15/16	91 5/16	105 3/8
26	x	24	0	14 3/16	40 9/16	68 15/16	95 5/16	109 3/8
26	x	26	0	14 3/16	42 9/16	70 15/16	99 5/16	113 3/8
28	x	6	0	15 3/16	23 9/16	53 15/16	62 5/16	77 3/8
28	x	8	0	15 3/16	25 9/16	55 15/16	66 5/16	81 3/8
28	x	10	0	15 3/16	27 9/16	57 15/16	70 5/16	85 3/8
28	x	12	0	15 3/16	29 9/16	59 15/16	74 5/16	89 3/8
28	x	14	0	15 3/16	31 9/16	61 15/16	78 5/16	93 3/8
28	x	16	0	15 3/16	33 9/16	63 15/16	82 5/16	97 3/8
28	x	18	0	15 3/16	35 9/16	65 15/16	86 5/16	101 3/8
28	x	20	0	15 3/16	37 9/16	67 15/16	90 5/16	105 3/8
28	x	22	0	15 3/16	39 9/16	69 15/16	94 5/16	109 3/8
28	x	24	0	15 3/16	41 9/16	71 15/16	98 5/16	113 3/8
28	x	26	0	15 3/16	43 9/16	73 15/16	102 5/16	117 3/8
28	x	28	0	15 3/16	45 9/16	75 15/16	106 5/16	121 3/8
30	x	6	0	16 3/16	24 9/16	56 15/16	65 5/16	81 3/8
30	x	8	0	16 3/16	26 9/16	58 15/16	69 5/16	85 3/8
30	x	10	0	16 3/16	28 9/16	60 15/16	73 5/16	89 3/8
30	x	12	0	16 3/16	30 9/16	62 15/16	77 5/16	93 3/8
30	x	14	0	16 3/16	32 9/16	64 15/16	81 5/16	97 3/8
30	x	16	0	16 3/16	34 9/16	66 15/16	85 5/16	101 3/8
30	x	18	0	16 3/16	36 9/16	68 15/16	89 5/16	105 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



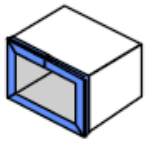
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

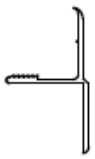
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



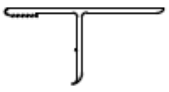
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
30	x	20	0	16 3/16	38 9/16	70 15/16	93 5/16	109 3/8
30	x	22	0	16 3/16	40 9/16	72 15/16	97 5/16	113 3/8
30	x	24	0	16 3/16	42 9/16	74 15/16	101 5/16	117 3/8
30	x	26	0	16 3/16	44 9/16	76 15/16	105 5/16	121 3/8
30	x	28	0	16 3/16	46 9/16	78 15/16	109 5/16	125 3/8
30	x	30	0	16 3/16	48 9/16	80 15/16	113 5/16	129 3/8
32	x	6	0	17 3/16	25 9/16	59 15/16	68 5/16	85 3/8
32	x	8	0	17 3/16	27 9/16	61 15/16	72 5/16	89 3/8
32	x	10	0	17 3/16	29 9/16	63 15/16	76 5/16	93 3/8
32	x	12	0	17 3/16	31 9/16	65 15/16	80 5/16	97 3/8
32	x	14	0	17 3/16	33 9/16	67 15/16	84 5/16	101 3/8
32	x	16	0	17 3/16	35 9/16	69 15/16	88 5/16	105 3/8
32	x	18	0	17 3/16	37 9/16	71 15/16	92 5/16	109 3/8
32	x	20	0	17 3/16	39 9/16	73 15/16	96 5/16	113 3/8
32	x	22	0	17 3/16	41 9/16	75 15/16	100 5/16	117 3/8
32	x	24	0	17 3/16	43 9/16	77 15/16	104 5/16	121 3/8
32	x	26	0	17 3/16	45 9/16	79 15/16	108 5/16	125 3/8
32	x	28	0	17 3/16	47 9/16	81 15/16	112 5/16	129 3/8
32	x	30	0	17 3/16	49 9/16	83 15/16	116 5/16	133 3/8
32	x	32	0	17 3/16	51 9/16	85 15/16	120 5/16	137 3/8
34	x	6	0	18 3/16	26 9/16	62 15/16	71 5/16	89 3/8
34	x	8	0	18 3/16	28 9/16	64 15/16	75 5/16	93 3/8
34	x	10	0	18 3/16	30 9/16	66 15/16	79 5/16	97 3/8
34	x	12	0	18 3/16	32 9/16	68 15/16	83 5/16	101 3/8
34	x	14	0	18 3/16	34 9/16	70 15/16	87 5/16	105 3/8
34	x	16	0	18 3/16	36 9/16	72 15/16	91 5/16	109 3/8
34	x	18	0	18 3/16	38 9/16	74 15/16	95 5/16	113 3/8
34	x	20	0	18 3/16	40 9/16	76 15/16	99 5/16	117 3/8
34	x	22	0	18 3/16	42 9/16	78 15/16	103 5/16	121 3/8
34	x	24	0	18 3/16	44 9/16	80 15/16	107 5/16	125 3/8
34	x	26	0	18 3/16	46 9/16	82 15/16	111 5/16	129 3/8
34	x	28	0	18 3/16	48 9/16	84 15/16	115 5/16	133 3/8
34	x	30	0	18 3/16	50 9/16	86 15/16	119 5/16	137 3/8
34	x	32	0	18 3/16	52 9/16	88 15/16	123 5/16	141 3/8
34	x	34	0	18 3/16	54 9/16	90 15/16	127 5/16	145 3/8
36	x	6	0	19 3/16	27 9/16	65 15/16	74 5/16	93 3/8
36	x	8	0	19 3/16	29 9/16	67 15/16	78 5/16	97 3/8
36	x	10	0	19 3/16	31 9/16	69 15/16	82 5/16	101 3/8
36	x	12	0	19 3/16	33 9/16	71 15/16	86 5/16	105 3/8
36	x	14	0	19 3/16	35 9/16	73 15/16	90 5/16	109 3/8
36	x	16	0	19 3/16	37 9/16	75 15/16	94 5/16	113 3/8
36	x	18	0	19 3/16	39 9/16	77 15/16	98 5/16	117 3/8
36	x	20	0	19 3/16	41 9/16	79 15/16	102 5/16	121 3/8
36	x	22	0	19 3/16	43 9/16	81 15/16	106 5/16	125 3/8
36	x	24	0	19 3/16	45 9/16	83 15/16	110 5/16	129 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



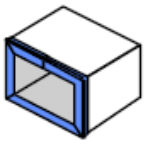
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

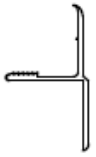
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



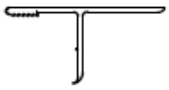
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
36	x	26	0	19 3/16	47 9/16	85 15/16	114 5/16	133 3/8
36	x	28	0	19 3/16	49 9/16	87 15/16	118 5/16	137 3/8
36	x	30	0	19 3/16	51 9/16	89 15/16	122 5/16	141 3/8
36	x	32	0	19 3/16	53 9/16	91 15/16	126 5/16	145 3/8
36	x	34	0	19 3/16	55 9/16	93 15/16	130 5/16	149 3/8
36	x	36	0	19 3/16	57 9/16	95 15/16	134 5/16	153 3/8
38	x	6	0	20 3/16	28 9/16	68 15/16	77 5/16	97 3/8
38	x	8	0	20 3/16	30 9/16	70 15/16	81 5/16	101 3/8
38	x	10	0	20 3/16	32 9/16	72 15/16	85 5/16	105 3/8
38	x	12	0	20 3/16	34 9/16	74 15/16	89 5/16	109 3/8
38	x	14	0	20 3/16	36 9/16	76 15/16	93 5/16	113 3/8
38	x	16	0	20 3/16	38 9/16	78 15/16	97 5/16	117 3/8
38	x	18	0	20 3/16	40 9/16	80 15/16	101 5/16	121 3/8
38	x	20	0	20 3/16	42 9/16	82 15/16	105 5/16	125 3/8
38	x	22	0	20 3/16	44 9/16	84 15/16	109 5/16	129 3/8
38	x	24	0	20 3/16	46 9/16	86 15/16	113 5/16	133 3/8
38	x	26	0	20 3/16	48 9/16	88 15/16	117 5/16	137 3/8
38	x	28	0	20 3/16	50 9/16	90 15/16	121 5/16	141 3/8
38	x	30	0	20 3/16	52 9/16	92 15/16	125 5/16	145 3/8
38	x	32	0	20 3/16	54 9/16	94 15/16	129 5/16	149 3/8
38	x	34	0	20 3/16	56 9/16	96 15/16	133 5/16	153 3/8
38	x	36	0	20 3/16	58 9/16	98 15/16	137 5/16	157 3/8
38	x	38	0	20 3/16	60 9/16	100 15/16	141 5/16	161 3/8
40	x	6	0	21 3/16	29 9/16	71 15/16	80 5/16	101 3/8
40	x	8	0	21 3/16	31 9/16	73 15/16	84 5/16	105 3/8
40	x	10	0	21 3/16	33 9/16	75 15/16	88 5/16	109 3/8
40	x	12	0	21 3/16	35 9/16	77 15/16	92 5/16	113 3/8
40	x	14	0	21 3/16	37 9/16	79 15/16	96 5/16	117 3/8
40	x	16	0	21 3/16	39 9/16	81 15/16	100 5/16	121 3/8
40	x	18	0	21 3/16	41 9/16	83 15/16	104 5/16	125 3/8
40	x	20	0	21 3/16	43 9/16	85 15/16	108 5/16	129 3/8
40	x	22	0	21 3/16	45 9/16	87 15/16	112 5/16	133 3/8
40	x	24	0	21 3/16	47 9/16	89 15/16	116 5/16	137 3/8
40	x	26	0	21 3/16	49 9/16	91 15/16	120 5/16	141 3/8
40	x	28	0	21 3/16	51 9/16	93 15/16	124 5/16	145 3/8
40	x	30	0	21 3/16	53 9/16	95 15/16	128 5/16	149 3/8
40	x	32	0	21 3/16	55 9/16	97 15/16	132 5/16	153 3/8
40	x	34	0	21 3/16	57 9/16	99 15/16	136 5/16	157 3/8
40	x	36	0	21 3/16	59 9/16	101 15/16	140 5/16	161 3/8
40	x	38	0	21 3/16	61 9/16	103 15/16	144 5/16	165 3/8
40	x	40	0	21 3/16	63 9/16	105 15/16	148 5/16	169 3/8
42	x	6	0	22 3/16	30 9/16	74 15/16	83 5/16	105 3/8
42	x	8	0	22 3/16	32 9/16	76 15/16	87 5/16	109 3/8
42	x	10	0	22 3/16	34 9/16	78 15/16	91 5/16	113 3/8
42	x	12	0	22 3/16	36 9/16	80 15/16	95 5/16	117 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



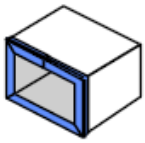
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

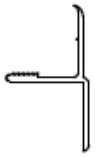
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



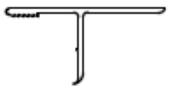
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
42	x	14	0	22 3/16	38 9/16	82 15/16	99 5/16	121 3/8
42	x	16	0	22 3/16	40 9/16	84 15/16	103 5/16	125 3/8
42	x	18	0	22 3/16	42 9/16	86 15/16	107 5/16	129 3/8
42	x	20	0	22 3/16	44 9/16	88 15/16	111 5/16	133 3/8
42	x	22	0	22 3/16	46 9/16	90 15/16	115 5/16	137 3/8
42	x	24	0	22 3/16	48 9/16	92 15/16	119 5/16	141 3/8
42	x	26	0	22 3/16	50 9/16	94 15/16	123 5/16	145 3/8
42	x	28	0	22 3/16	52 9/16	96 15/16	127 5/16	149 3/8
42	x	30	0	22 3/16	54 9/16	98 15/16	131 5/16	153 3/8
42	x	32	0	22 3/16	56 9/16	100 15/16	135 5/16	157 3/8
42	x	34	0	22 3/16	58 9/16	102 15/16	139 5/16	161 3/8
42	x	36	0	22 3/16	60 9/16	104 15/16	143 5/16	165 3/8
42	x	38	0	22 3/16	62 9/16	106 15/16	147 5/16	169 3/8
42	x	40	0	22 3/16	64 9/16	108 15/16	151 5/16	173 3/8
42	x	42	0	22 3/16	66 9/16	110 15/16	155 5/16	177 3/8
44	x	6	0	23 3/16	31 9/16	77 15/16	86 5/16	109 3/8
44	x	8	0	23 3/16	33 9/16	79 15/16	90 5/16	113 3/8
44	x	10	0	23 3/16	35 9/16	81 15/16	94 5/16	117 3/8
44	x	12	0	23 3/16	37 9/16	83 15/16	98 5/16	121 3/8
44	x	14	0	23 3/16	39 9/16	85 15/16	102 5/16	125 3/8
44	x	16	0	23 3/16	41 9/16	87 15/16	106 5/16	129 3/8
44	x	18	0	23 3/16	43 9/16	89 15/16	110 5/16	133 3/8
44	x	20	0	23 3/16	45 9/16	91 15/16	114 5/16	137 3/8
44	x	22	0	23 3/16	47 9/16	93 15/16	118 5/16	141 3/8
44	x	24	0	23 3/16	49 9/16	95 15/16	122 5/16	145 3/8
44	x	26	0	23 3/16	51 9/16	97 15/16	126 5/16	149 3/8
44	x	28	0	23 3/16	53 9/16	99 15/16	130 5/16	153 3/8
44	x	30	0	23 3/16	55 9/16	101 15/16	134 5/16	157 3/8
44	x	32	0	23 3/16	57 9/16	103 15/16	138 5/16	161 3/8
44	x	34	0	23 3/16	59 9/16	105 15/16	142 5/16	165 3/8
44	x	36	0	23 3/16	61 9/16	107 15/16	146 5/16	169 3/8
44	x	38	0	23 3/16	63 9/16	109 15/16	150 5/16	173 3/8
44	x	40	0	23 3/16	65 9/16	111 15/16	154 5/16	177 3/8
44	x	42	0	23 3/16	67 9/16	113 15/16	158 5/16	181 3/8
44	x	44	0	23 3/16	69 9/16	115 15/16	162 5/16	185 3/8
46	x	6	0	24 3/16	32 9/16	80 15/16	89 5/16	113 3/8
46	x	8	0	24 3/16	34 9/16	82 15/16	93 5/16	117 3/8
46	x	10	0	24 3/16	36 9/16	84 15/16	97 5/16	121 3/8
46	x	12	0	24 3/16	38 9/16	86 15/16	101 5/16	125 3/8
46	x	14	0	24 3/16	40 9/16	88 15/16	105 5/16	129 3/8
46	x	16	0	24 3/16	42 9/16	90 15/16	109 5/16	133 3/8
46	x	18	0	24 3/16	44 9/16	92 15/16	113 5/16	137 3/8
46	x	20	0	24 3/16	46 9/16	94 15/16	117 5/16	141 3/8
46	x	22	0	24 3/16	48 9/16	96 15/16	121 5/16	145 3/8
46	x	24	0	24 3/16	50 9/16	98 15/16	125 5/16	149 3/8
46	x	26	0	24 3/16	52 9/16	100 15/16	129 5/16	153 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



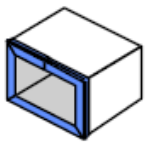
External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

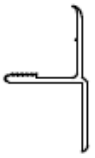
1 3/16 inch GRIP FLANGE - NOTCHES POSITION



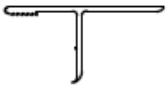
DUCT INTERNAL SIZE Width		Heigth	0 in	Notch 1 in	Notch 2 in	Notch 3 in	Notch 4 in	End in
46	x	28	0	24 3/16	54 9/16	102 15/16	133 5/16	157 3/8
46	x	30	0	24 3/16	56 9/16	104 15/16	137 5/16	161 3/8
46	x	32	0	24 3/16	58 9/16	106 15/16	141 5/16	165 3/8
46	x	34	0	24 3/16	60 9/16	108 15/16	145 5/16	169 3/8
46	x	36	0	24 3/16	62 9/16	110 15/16	149 5/16	173 3/8
46	x	38	0	24 3/16	64 9/16	112 15/16	153 5/16	177 3/8
46	x	40	0	24 3/16	66 9/16	114 15/16	157 5/16	181 3/8
46	x	42	0	24 3/16	68 9/16	116 15/16	161 5/16	185 3/8
46	x	44	0	24 3/16	70 9/16	118 15/16	165 5/16	189 3/8
46	x	46	0	24 3/16	72 9/16	120 15/16	169 5/16	193 3/8
48	x	6	0	25 3/16	33 9/16	83 15/16	92 5/16	117 3/8
48	x	8	0	25 3/16	35 9/16	85 15/16	96 5/16	121 3/8
48	x	10	0	25 3/16	37 9/16	87 15/16	100 5/16	125 3/8
48	x	12	0	25 3/16	39 9/16	89 15/16	104 5/16	129 3/8
48	x	14	0	25 3/16	41 9/16	91 15/16	108 5/16	133 3/8
48	x	16	0	25 3/16	43 9/16	93 15/16	112 5/16	137 3/8
48	x	18	0	25 3/16	45 9/16	95 15/16	116 5/16	141 3/8
48	x	20	0	25 3/16	47 9/16	97 15/16	120 5/16	145 3/8
48	x	22	0	25 3/16	49 9/16	99 15/16	124 5/16	149 3/8
48	x	24	0	25 3/16	51 9/16	101 15/16	128 5/16	153 3/8
48	x	26	0	25 3/16	53 9/16	103 15/16	132 5/16	157 3/8
48	x	28	0	25 3/16	55 9/16	105 15/16	136 5/16	161 3/8
48	x	30	0	25 3/16	57 9/16	107 15/16	140 5/16	165 3/8
48	x	32	0	25 3/16	59 9/16	109 15/16	144 5/16	169 3/8
48	x	34	0	25 3/16	61 9/16	111 15/16	148 5/16	173 3/8
48	x	36	0	25 3/16	63 9/16	113 15/16	152 5/16	177 3/8
48	x	38	0	25 3/16	65 9/16	115 15/16	156 5/16	181 3/8
48	x	40	0	25 3/16	67 9/16	117 15/16	160 5/16	185 3/8
48	x	42	0	25 3/16	69 9/16	119 15/16	164 5/16	189 3/8
48	x	44	0	25 3/16	71 9/16	121 15/16	168 5/16	193 3/8
48	x	46	0	25 3/16	73 9/16	123 15/16	172 5/16	197 3/8
48	x	48	0	25 3/16	75 9/16	125 15/16	176 5/16	201 3/8

External Grip
LKDA 312

External U Grip
LKDA 315



External h Grip
LKDA 314



External F Grip
LKDA 313

The Kingspan KoolDuct® System

Appendix 2

DISCLAIMER: All fabrications and installations should be self-certified by the trained fabricator/installer through the contractual chain

KoolDuct Inspection Checklist

PROJECT: _____ ***AREA:*** _____

FABRICATOR: _____ ***INSTALLER:*** _____

DESIGN PRESSURE: _____ ***DESIGN MAX VELOCITY:*** _____

STANDARDS:
Kingspan KoolDuct Specification Manual, Fabrication Manual and Training Manual
SMACNA Phenolic Duct Construction Standards

FABRICATION CHECKLIST ***KoolDuct PANEL THICKNESS:*** _____

		YES	NO	ACTION
	Panel Thickness			
1	Is the thickness of KoolDuct panel appropriate for the application?	☐	☐	_____
	Duct Design			
2	Has all measuring been performed on the internal side of the duct? (Duct dimensions in the contract drawing are for airflow area)	☐	☐	_____
3	Radius Fittings: Are all internal radiuses of at least 200mm (8") ?	☐	☐	_____
4	Radius Fittings: Are splitters installed in accordance with the Standards? (Number and position of splitters depending on duct sizes)	☐	☐	_____
5	Square Elbows: Are Turning Vanes installed in accordance with the Standards?	☐	☐	_____
6	Tapers/Offsets: Is the angle according to the Standards?	☐	☐	_____
7	Fitting Neck: Are all necks of Tapers, Elbows and Offsets at least 100 mm (4") long?	☐	☐	_____
8	Boot/Shoe Branch: Do they have a 45 degree max. inclination?	☐	☐	_____
	Fabrication			
9	Assembly: Are Tiger Clips used in accordance to the Standards?	☐	☐	_____
10	Assembly: When Adhesive was used, has it been applied to all butted mitre joints?	☐	☐	_____
11	Tape: Has the Kingspan approved aluminium tape been used ? (tape as supplied by Kingspan or UL 181 listed tape)	☐	☐	_____
12	Tape: Is the tape applied anywhere the external surface of the aluminium facing has been cut ?	☐	☐	_____

The Kingspan KoolDuct® System

DISCLAIMER: All fabrications and installations should be self-certified by the trained fabricator/installer through the contractual chain

KoolDuct Inspection Checklist

		YES	NO	ACTION
13	Silicone: Has the Kingspan approved high performance silicone sealant been used?	☐	☐	
14	Silicone: Are ALL ducts sealed inside with generous and continuous silicone bead?	☐	☐	
	Coupling System / Connector			
15	Are all duct ends fitted with the appropriate coupling system?	☐	☐	
16	Are the cut edges of the 4 Bolt steel flange treated with zinc spray or equivalent to prevent corrosion?	☐	☐	
17	Are all coupling points properly sealed for minimum air leakage?	☐	☐	
	End Caps			
18	Are all End Caps fittend and sealed in accordance to the Standards?	☐	☐	
	Reinforcement			
19	Are all ducts fabricated to resist the highest of the design, commissioning and testing pressure?	☐	☐	
20	Is the number of reinforcements in accordance to the Standards? (Depending on Pressure and Duct size)	☐	☐	
21	Is the spacing between reinforcements in accordance to the Standards? (Depending on Pressure and Duct size)	☐	☐	
22	Are all duct sections including tapers, elbows and all fittings properly reinforced?	☐	☐	
	Finish / Weatherproofing			
23	Where ducts are painted, is the paint fit for purpose? (Compatible with aluminium. Also bear in mind the fire performance of the duct	☐	☐	
24	Are ALL ducts subjected to the elements weather proofed?	☐	☐	
	Storage before Installation			
25	Has any completed ductwork been stored in accordance to the Standards?	☐	☐	
	Final checks			
26	Are all ducts free from damage, punctures and tears in the facing?	☐	☐	
27	Do the ducts fabricated demonstrate a good workmanship?	☐	☐	

Fabrication Notes _____

The Kingspan KoolDuct® System

DISCLAIMER: All fabrications and installations should be self-certified by the trained fabricator/installer through the contractual chain

KoolDuct Inspection Checklist

INSTALLATION CHECKLIST

		YES	NO	ACTION
	Visual checks			
28	Are ducts free from visual damage?	☐	☐	_____
29	Are ducts free from sagging and visible misalignment?	☐	☐	_____
	Pressure			
30	Is the Duct system operating within the design pressure limits?	☐	☐	_____
	Duct-to-Duct Couplings			
31	Are all duct-to-duct couplings properly made?	☐	☐	_____
32	Are Tiger Clip couplings used in accordance to the Standards?	☐	☐	_____
	Duct-to-Accessory Couplings			
33	Is the duct correctly coupled to all components (fire dampers, volume dampers, etc.)	☐	☐	_____
	Duct Branch / Take Off			
34	Are small duct branches safely secured with silicone ? (un-flanged connection possible for duct side less than 600 mm (24"), with less than 500 Pascal (<2 in. wg	☐	☐	_____
35	Is mechanical fix used to secure larger take-off and boot branches? (flanged connection recommended for duct side over 600 mm (24"), or pressure over 500 Pascal(>2 in. wg)	☐	☐	_____
	Metal Round Fitting and Shoe Fittings			
36	Are metal fittings sealed with silicone?	☐	☐	_____
37	Are larger metal fittings safely secured with mechanical fix ?	☐	☐	_____
	Access Doors / Inspection Opening			
38	Are access doors installed in accordance to the Standards?	☐	☐	_____
	Hangers and Supports			
39	Is the maximum spacing between supports in accordance to the standards?	☐	☐	_____
40	Is the load of any accessories neutralised by the accessory support?	☐	☐	_____
41	Is the support structure free from vibration that can affect the KoolDuct System?	☐	☐	_____

The Kingspan KoolDuct® System

DISCLAIMER: All fabrications and installations should be self-certified by the trained fabricator/installer through the contractual chain

KoolDuct Inspection Checklist

		YES	NO	ACTION
42	Is the duct aluminium facing in touch with the supports free from damage?	☐	☐	_____
43	Is the support of all duct fittings in accordance to the standards?	☐	☐	_____
44	Notes: Type of Fixing to the building structure (if available):			
	_____			
45	Type of Hangers (e.g. threaded bars 8mm):			
	_____			
46	Type of Support (e.g. Uni Strut 41 x 21 x 1.5mm):			
	_____			
	Vertical Ducts			
47	Are all vertical ducts supported in accordance to the standards?	☐	☐	_____
	Outdoor Ducts			
48	Are all ducts installed externally and subject to the elements properly weather proofed?	☐	☐	_____
	Health & Safety Checks			
49	Have stickers warning personnel not to support their weight, or walk, on ductwork sections been affixed.	☐	☐	_____
	Installation Notes			
	_____			
	_____			

This inspection has been carried out by ..... on.....

This only relates to the ductwork that could be visually inspected and gives an indication of the overall quality of the fabrication and installation of the ductwork fabricated from the Kingspan Koolduct System

Signed.

The Kingspan KoolDuct® System

Appendix 3

Commissioning

The purpose of commissioning an air distribution system is to confirm that its performance is as intended, and that the required internal environmental conditions are attained, with optimum efficiency.

HVAC pre-insulated ductwork manufactured from The *Kingspan* **Kool**Duct® System should be leak tested and commissioned (if required/specified) in line with accepted good practices, for example the "CIBSE Commissioning Code A: Air Distribution System", or equivalent guidance.

Ductwork installation has influence on the accuracy of flow measurement and commissioning of ducted air systems. Therefore, it is normally the installer of the ductwork system that will supply the operatives of the commissioning process with appropriate instructions regarding ductwork manufactured from The *Kingspan* **Kool**Duct® System; this Technical Note must be part of the information supplied.

Important Notice

Over-pressure that might exceed the design pressure may consequently over stress the ductwork system. To prevent this risk, the commissioning specialist should include the following note in the commissioning method statement for the particular project:

> During the commissioning process ductwork pressure shall never exceed the pressure rating to which the ductwork has been designed and fabricated.

Ductwork Pressure and Leakage Testing

Ductwork pressure and leakage testing is normally completed before the regulation of air flow is carried out; it shall be performed as required by the project specification in accordance with the procedures detailed in the appropriate standard, such as:

- BS EN 1507;
- B&ES (HVCA) DW/143 (Building & Engineering Services Association – formerly known as the Heating & Ventilation Contractors Association' – A Practical Guide to Ductwork Leakage Testing, 2000 Edition);
- SMACNA HVAC Air Duct Leakage Test Manual; and
- other equivalent tests approved by the relevant authorities as having jurisdiction.

During ductwork pressure and leakage testing it is important to check the following:

- the pressure class for each ductwork system to be tested shall be known; and
- the actual pressure for safe operation shall be monitored: in any case, pressure must not exceed the maximum pressure rating to which the ductwork has been fabricated, for example:

Medium pressure class: duct with maximum operating pressure 1000 Pa / 4 in.w.g., pressure test shall NOT EXCEED 1000 Pa / 4 in.w.g.

Low pressure class: duct with maximum operating pressure 500 Pa / 2 IN.W.G., pressure test shall NOT EXCEED 500 Pa / 2 in.w.g.

The Kingspan KoolDuct® System

Appendix 3

Preliminary Checks before Initial Start

Before the initial running of a fan, it is important to check the following:

- the pressure class for each ductwork system to be tested shall be known
- instruments shall be in place to record the actual pressure inside the ductwork;
- dampers for volume control and fire dampers throughout the system shall be secured in the correct position and shall not be closed. If that is not possible where other requirements are specified, actions shall be taken to prevent the risk of over–pressure that might exceed the design pressure;
- fan and associated automatic controls shall be programmed correctly and shall not override control functions e.g. the fan shall NOT start with the automatic control damper remaining closed, which could cause excessive pressure at the supply fan inlet or the extract fan outlet (for more details see Guidance Note GN8 "Inverter drives for fans and pumps" from the Comissioning Specialist Association); and
- VAV air handling units shall be adjusted for shutdown not to exceed the duct construction pressure class for each system.

Fan Check

Knowledge of the fan characteristic is required to ensure that excessive suction or delivery pressures are not applied to the ductwork system.

During the balancing and commission procedure of fans it is important to check the following:

- Monitor the duct pressure for safe operation throughout the commissioning process, not to exceed the design pressure. In any case, pressure must not exceed the maximum pressure to which the ductwork has been fabricated.

Pressure Relief Damper

During testing or start–up, an accidental closure of a fire damper or volume control damper, due to a false alarm or a control failure, may create over–pressure that exceeds the design pressure, and consequently may affect the integrity of the ductwork system. In these cases, and in all cases where over–pressure is possible, the installation of a pressure relief damper (PRD) and bypass duct is recommended. During normal operation, the PRD is closed. If the maximum design pressure, to which the ductwork has been fabricated, is exceeded the PRD will open and redirect some of the airflow, thus maintaining the system design pressure inside the ductwork.

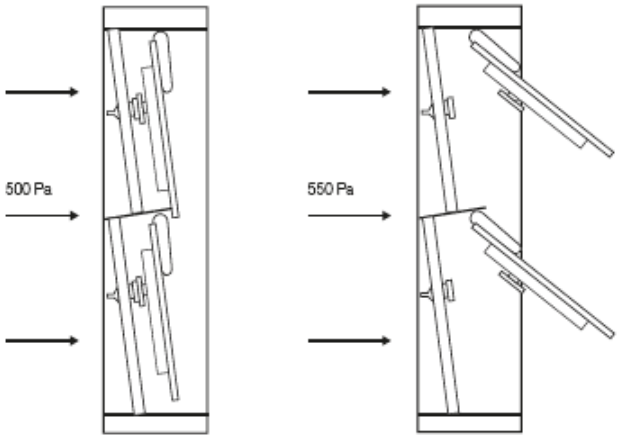


Figure 1 Installation of a Pressure Relief Damper

In-Duct Flow Measurements

Test holes are required in HVAC ductwork for the purpose of air flow measurement, testing and balancing. For The *Kingspan* **Kool**Duct® System, the location of test holes shall be as per current practice valid for conventional steel ductwork.

Temporary test holes for The *Kingspan* **Kool**Duct® System can be made at the location required by drilling through the *Kingspan* **Kool**Duct® panel using a pointed tool of appropriate size; usually, 10mm – 13mm (3/8") test holes are required. Temporary test holes of a small diameter can then be closed and sealed using The *Kingspan* **Kool**Duct® Silicone Sealant.

For permanent test ports, products commonly available in the marketplace can be used with The *Kingspan* **Kool**Duct® system. The metal body of the test ports can be installed using only The *Kingspan* **Kool**Duct® Silicone Sealant. The ports are small and lightweight, so the silicone is normally strong enough to permanently fasten the port to the *Kingspan* **Kool**Duct® panel facing.

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