Johns Manville

The Pocket Installer™

Fiber Glass Duct Board Air Handling Systems

A guide for the installation of SuperDuct® RC and Mat-Faced Micro-Aire® air duct products

$50.00

Table of Contents

Introduction

The Pocket Installer is a guide describing procedures for the installation of air duct systems manufactured from Johns Manville air duct products and accessories.

The Pocket Installer is intended for use by mechanics, foremen, project superintendents, inspectors and other individuals involved in the installation and inspection of fiber glass air handling systems.

Along with simple-fitting fabrication and field-proven installation techniques, **The Pocket Installer** provides fast access to commonly used tables and related reference sources. It also includes an inspection checklist, which is recommended as a means of gaining familiarity with quality standards for fiber glass duct systems.

With its focus on field installation, **The Pocket Installer** provides fabrication details only insofar as they relate to typical jobsite modifications. Comprehensive fabrication information is presented in the "Fibrous Glass Duct Construction Standards" published by NAIMA and SMACNA and other sources.

Combined with proper planning, reasonable care and good workmanship, the information in the following pages will help the installer provide attractive, low leakage and long-lasting fiber glass duct systems.

For more information on products, installation procedures or reference materials, please contact your local Johns Manville Territory Manager or air handling product distributor.

Additional Reference Sources

The facing page lists sources containing information on fiber glass air handling system design, fabrication, and installation specifications. When requesting these sources, use the Johns Manville publication number to ensure correct identification.

Reference Note: The NAIMA Fibrous Glass Duct Construction Standard and the SMACNA Fibrous Glass Duct Construction Standard – 7th Edition are functionally interchangeable. However, the NAIMA Standard contains optional methods of fabrication compared to the SMACNA Standard and will serve as the primary technical reference throughout **The Pocket Installer.**

Duct Construction Standards

NAIMA Fibrous Glass Duct Construction Standard – Current Edition (contact your Johns Manville Regional Sales Office or order directly from NAIMA; contact information is in the Appendix)

SMACNA Fibrous Glass Duct Construction Standard – 7th Edition, or later (order from SMACNA; contact information is in the Appendix)

Mat-Faced Micro-Aire® Duct Board

- Mat-Faced Micro-Aire Duct Board Product Information Page AHS-135
- Mat-Faced Micro-Aire Duct Board UL Fabrication Sheet AHS-30

SuperDuct® RC Air Handling System

- SuperDuct RC Air Duct Board Product Information Page AHS-200
- SuperSeal® Coating Products Product Information Page AHS-202
- SuperDuct RC Air Handling System UL Fabrication Sheet AHS-204
- SuperDuct RC Air Duct System Guide Spec AHS-220

Introduction

The physical and chemical properties of the Air Handling Systems products listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Numerical flame spread and smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Regional Sales Office nearest you to ensure current information. **All Johns Manville products are sold subject to Johns Manville's standard Terms and Conditions including Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville standard Terms and Conditions, Limited Warranty and Limitation of Remedy and information on other Johns Manville thermal insulations and systems, call (800) 654-3103.**

The Pocket Installer is intended as a guide only; actual conditions encountered during installation may vary from jobsite to jobsite. Johns Manville assumes no responsibility for quality of installation, field workmanship or job safety.

Johns Manville Material Safety Data Sheets (MSDS) are available with specific product safety information. For information on other Johns Manville thermal insulations and systems, call the number listed below or visit specJM.com.

North American Sales Office, Insulation Systems

Eastern Region
P.O. Box 158
Defiance, OH 43512
(800) 334-2399
Fax: (419) 784-7866

Western Region and Canada
P.O. Box 5108
Denver, CO 80217
(800) 368-4431
Fax: (303) 978-4661

The installation procedures discussed in this guide apply to rectangular and round systems fabricated from these Johns Manville products:

- SuperDuct RC Air Duct Board
- Mat-Faced Micro-Aire Duct Board
- SuperDuct RC and Mat-Faced Micro-Aire Wide Board™

Fiber Glass Duct Performance Advantages

In comparison with traditional sheet metal duct systems, duct systems fabricated from Johns Manville high-performance fiber glass duct products offer a number of installation and operational benefits when properly utilized.

- Easy to handle and hang
- Easy to modify on the job
- Easy to assemble in sections
- Fewer joints to seal
- High thermal efficiency
- Extremely quiet air delivery
- No duct expansion, contraction or vibration noise

Additional SuperDuct RC Air Handling System Advantages

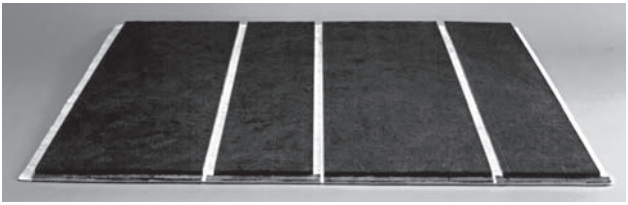
SuperDuct RC Air Handling System offers performance characteristics that allow it to meet or exceed the performance of premium lined, sealed metal duct systems. Manufactured with a tough acrylic polymer coating on the airstream surface, SuperDuct RC Air Handling System products provide:

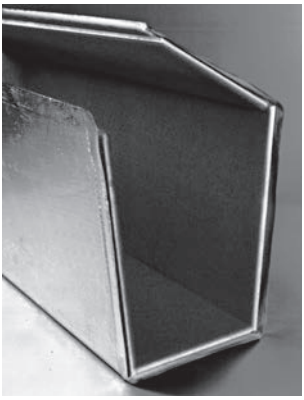
- Improved resistance to microbial contamination
- A fully cleanable airstream surface
- Airstream treatment resists incursion of dust and debris into fiber glass structure
- Enhanced acoustical performance for quiet operation
- Operation limits to 6000 fpm, up to 2" w.c.
- A full “system” approach – JM’s compatible accessory products ensure UL 181, Class 1, performance

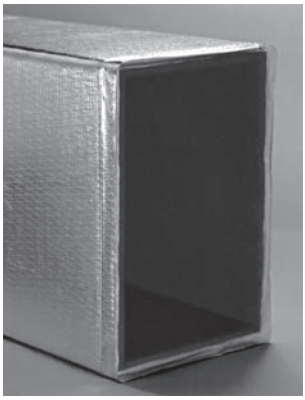
Wide Board

SuperDuct RC Air Handling System and Mat-Faced Micro-Aire Duct Board products are available in Johns Manville's exclusive 96" x 120" x 1" Wide Board size. Wide Board is used to fabricate one-piece duct sections eight feet long, reducing material handling and offering the opportunity to cut costly field joints by half. Duct runs assembled from Wide Board may be hung at eight-foot intervals for any duct span, reducing hanging cost.

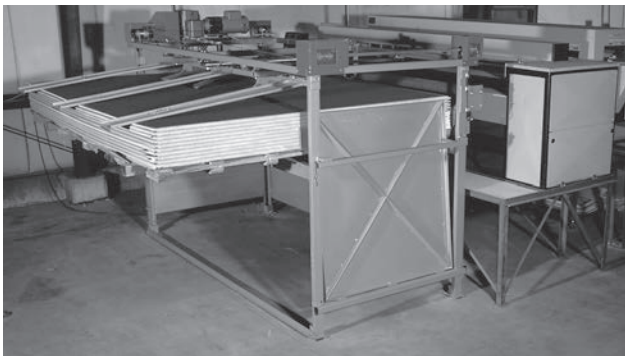
Mat-Faced Micro-Aire Duct Board







A flat, rigid board used to fabricate rectangular duct sections. Made from resin-bonded glass fibers and faced with foil-scrim-kraft (FSK). The airstream surface is coated with thermosetting black acrylic polymer formulated with an EPA-registered, antimicrobial agent.



Duct Board Loaders are available from Glass Master Corporation; please see the Appendix for contact information.

Mat-Faced Micro-Aire Duct Board General Properties

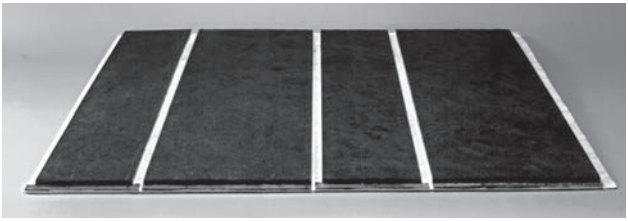
Thickness	1", 1½", 2"
R-value (75°F mean temp.)	4.3 (1"), 6.5 (1½"), 8.3 (2")
Air Velocity (Max.)	5000 fpm
Operating Temperature	250°F max. continuous
Operating Pressure	-2" w.c. to +2" w.c.
Application	HVAC air duct systems

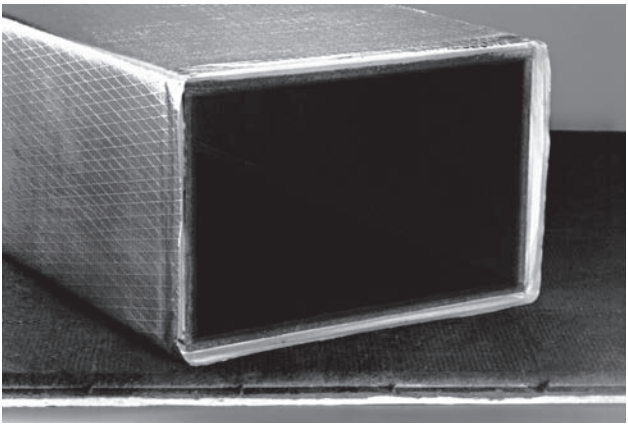
The following table provides information on standard package availability for male/female Mat-Faced Micro-Aire Duct Board. Butt-edge (BE) products and other nonstandard configurations are also available; however, restrictions may apply. Please contact your local Johns Manville distributor or the nearest Regional Sales Office for more information.

Mat-Faced Micro-Aire Duct Board Availability

			Boards Per:	
Thickness	Type	Size	Carton	Pallet
1"	475	48" x 120"	6	44
		48" x 96"	6	44
	475 WB	96" x 120"	NA	44
	800	48" x 120"	6	44
1½"	800	48" x 120"	4	30
2"	800	48" x 120"	3	22

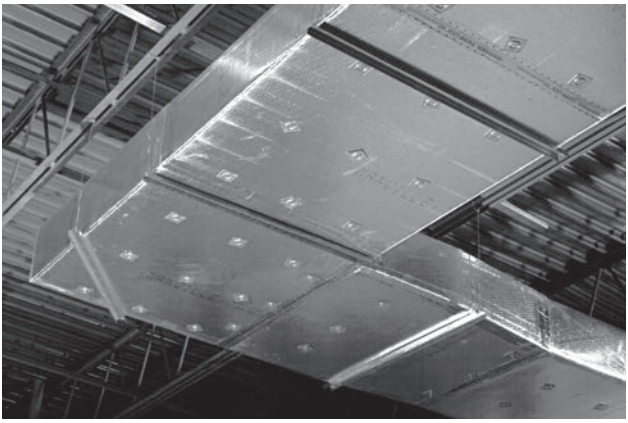
SuperDuct RC Air Handling System





A flat, rigid board used to fabricate rectangular duct sections. Made from resin-bonded glass fibers and faced with foil-scrim-kraft (FSK). The airstream surface is coated with thermosetting black acrylic polymer formulated with an EPA-registered, antimicrobial agent. System components include:

- SuperDuct RC Air Duct Board
- SuperSeal Coating Products



SuperDuct RC Air Handling System General Properties

Thickness	1", 1½", 2"
R-value (75°F mean temp.)	4.3 (1"), 6.5 (1½"), 8.3 (2")
Air Velocity	6000 fpm
Service Temperature	250°F max. continuous
Operating Pressure	-2" w.c. to +2" w.c.
Application	All HVAC air distribution applications where maximum IAQ and system performance are required

Johns Manville Fiber Glass Duct System Performance Schedule

JM fiber glass air duct products are suitable for all normal HVAC applications, including:

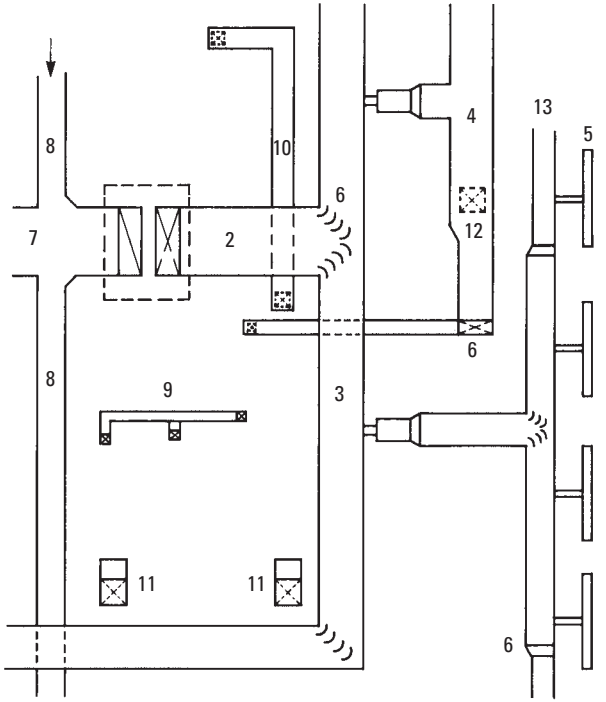
- Operating velocities to 6000 fpm for SuperDuct RC systems
- Operating velocities to 5000 fpm for Mat-Faced Micro-Aire rectangular duct
- Operating pressures to 2" w.c.
- Operating pressures to negative 2" w.c. for return air duct*
- Evaporative cooling system ducts
- Exhaust ducts for noncorrosive, noncombustible air

Note: Information on tested safety margins above specified operating conditions is available upon request.

*With proper reinforcement.

Good Practice Recommendations

1. When detailing the job, use Modular Duct Construction principles rather than standard sheet metal procedures (see page 20).
2. Utilize appropriate fiber glass fabrication tools for best results (see page 51).
3. Take reasonable care in the unloading, handling and storage of duct to avoid damage.
4. Ducts ready for installation should be stored vertically, on the female end, off the floor, in a dry area to avoid water absorption. Pallets are useful for this purpose. It may also be advantageous to band the duct sections together to prevent them from being knocked down or blown over (see pages 30–32).
5. Prior to hanging, preassemble as many sections as can be conveniently raised.
6. Where field modifications of fittings are necessary, use a straight edge to guide your knife for straight and smooth cuts. Note that scrim may not be parallel with duct section ends.
7. Do not neglect reinforcing of straight duct and fittings. Where shop-reinforced fittings are modified in the field, reinforcement must be reinstalled to ensure proper performance.
8. Check the operating pressure design and the probability of surges to ensure the right reinforcing schedule. If severe surges greater than 125% of the specified reinforcement are anticipated, consider using a relief damper or higher-pressure reinforcement schedule.
9. Properly selected and applied closures are absolutely essential for a long-lasting installation. Closures bearing the UL 181A listing must be used, and application must comply with the tape manufacturer's instructions. See pages 36–41 for detailed information on closures.
10. Repair all tears and punctures (see pages 100–102).



Some Places to Use Fiber Glass Duct

1. Vertical risers if not serving more than two floors
2. Large duct up to 150" span
3. Johns Manville fiber glass air duct board
4. Low pressure mains and branches
5. Slot diffusers
6. Simple or complex fittings
7. Fresh air duct except for 6' adjacent to the outside air inlet grill
8. Return air duct
9. Toilet exhaust
10. Transfer duct
11. Return sound traps
12. Drops
13. Duct supplying indoor swimming pool areas

Limitations of Use

Fiber glass ductwork should not be used in the following applications:

- For vertical risers serving more than two floors
- In air duct systems operating normally above 250°F
- For kitchen or corrosive fume exhaust ducts
- To convey solids or corrosive gases
- To build casings or housings
- Not closer than 2" to electric heating coils
- In systems supplying hospital-sensitive areas such as surgical suites, maternity wards, intensive care units and isolation areas
- In equipment rooms where severe mechanical abuse can occur
- In low-clearance garages
- Outdoors
- For velocities or pressures beyond recommendations
- Within 6' of fresh air intakes or outside grills
- Bathroom exhaust exposed to subfreezing temperatures

The above list of limitations is based on published code restrictions and good engineering practice.

Johns Manville

Notes

Modular Duct Construction

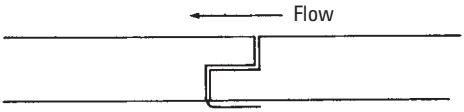
Modular Duct Construction (MDC) is a concept that represents one of the most basic differences between fiber glass ductwork and sheet metal ductwork. The practice of MDC incorporates design, layout, detailing, fabrication and installation.

Shiplap Note: Modular Duct Construction requires the use of shiplap duct grooving equipment. MDC practice is not compatible with vee-groove cutting.

The recommendations that follow can help you achieve the versatility, simplicity and other advantages available through Modular Duct Construction. Additional information about MDC is available through Johns Manville training programs. Please contact your nearest Johns Manville Regional Sales Office for training availability.

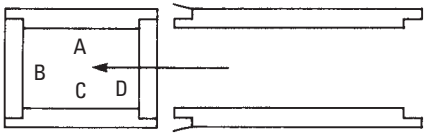
1. Female end of the duct (without staple flap) is always installed away from the unit.

Note: As opposed to sheet metal practice, fiber glass duct systems have no interior “lap" requiring airflow consideration.

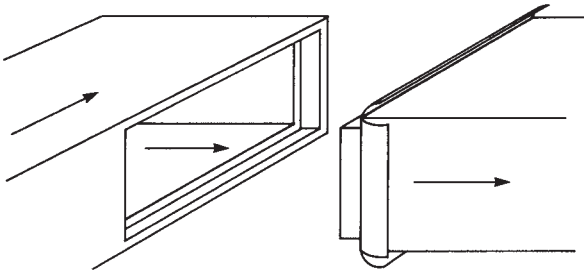


2. MDC utilizes the shiplap grooving method to facilitate fitting assembly with no insulation voids.

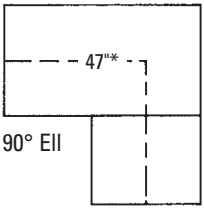
When tapping into a side panel, the top (A) and bottom (C) duct panels have a shiplap joint, which allows the insertion of the male end of the next duct section.



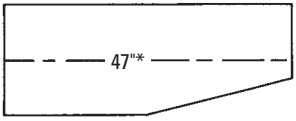
Note normal airflow for shiplap construction.



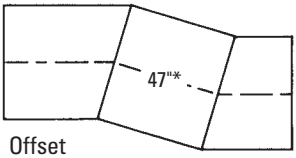
3. Make fittings from a full 4' or 8' Wide Board section. Almost all fittings can be made from a full section (or from two or more full sections for very large fittings) achieving a 47"* or 95" centerline fitting length for ells, transitions and offsets.



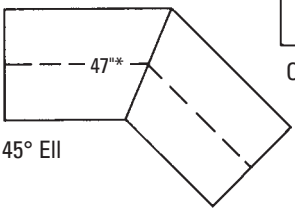
90° Ell



Transition

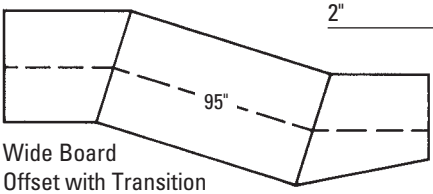


Offset



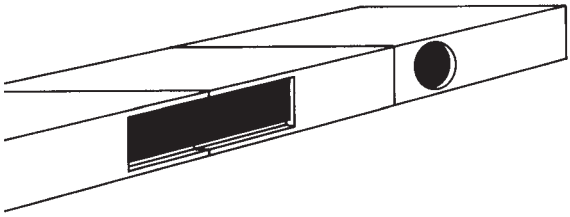
45° Ell

Board Thickness	*Fitting Length
1"	47"
1½"	46½"
2"	46"

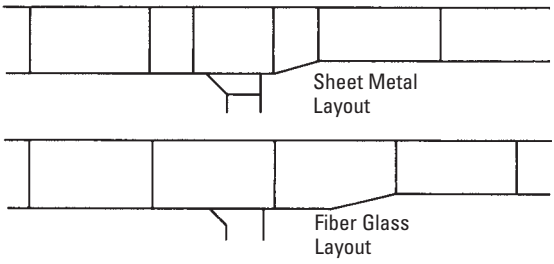


Wide Board
Offset with Transition

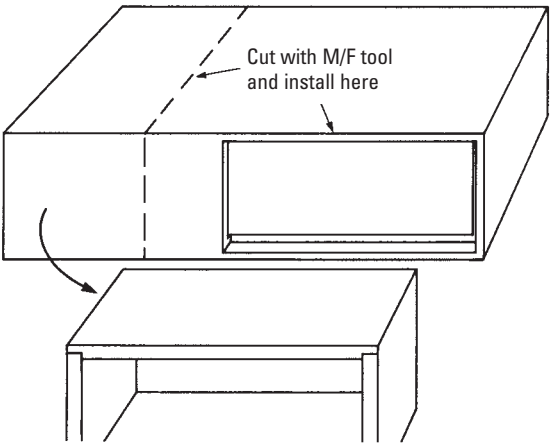
4. Holes for branch connections are frequently cut in the field. If necessary, they may be cut through a circumferential joint to maintain the advantage of full-length sections.



5. Transitions should be made part of the next full section downstream from the branch.



6. Tees and 90° ells are often shipped throatless to the field for final cutting and assembly.



When a throatless ell must be installed at other than its full 47"* or 95" length:

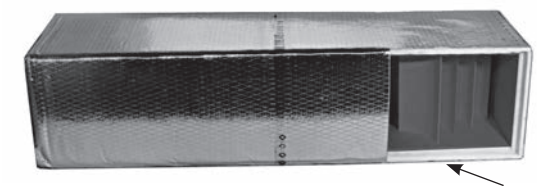
- Cut off the upstream end of the throatless ell with a Cuts-All (male/female) tool and add the cut-off piece on the downstream end of the ell (if required for overall length).
- Or add a partial section of straight duct upstream of the ell (using the Cuts-All tool) and add the remaining piece to the downstream opening of the ell.

*See page 22 for fitting lengths for various board thicknesses.

Basic Fiber Glass Fittings

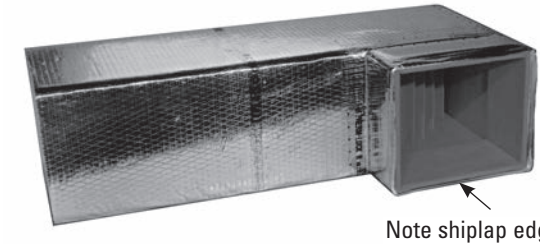
The following illustrations represent common fiber glass fittings. In addition, almost any sheet metal style fitting can be fabricated from duct board. Where joints are properly made and correct reinforcement provided, the fitting is suitable for use.

Throatless Ell with Vanes



Note shiplap edges.

4' Throated Ell with Vanes



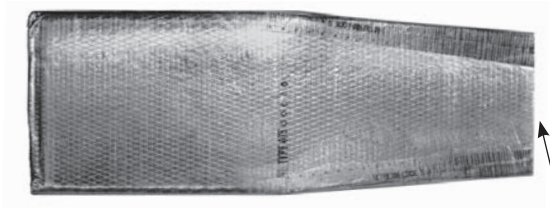
Note shiplap edges.

Throatless Tee with Adjustable Splitter

Note large washer assembly to control rod.

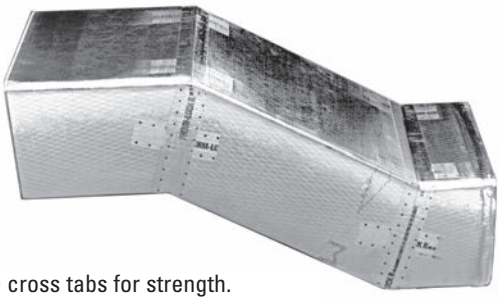
Basic Fiber Glass Fittings

Transition



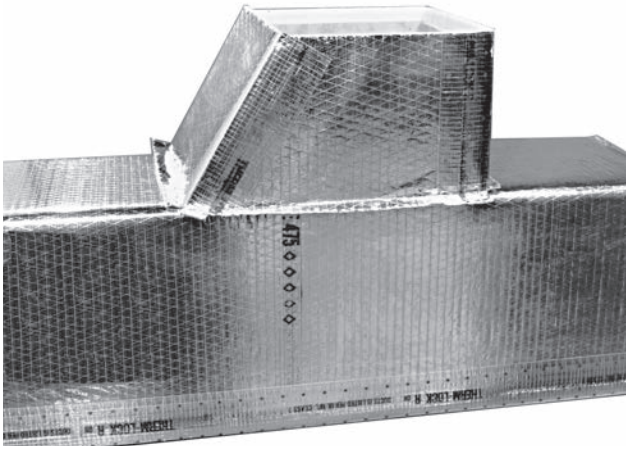
Note edges trimmed flush, female joint restored.

Offset



Note cross tabs for strength.

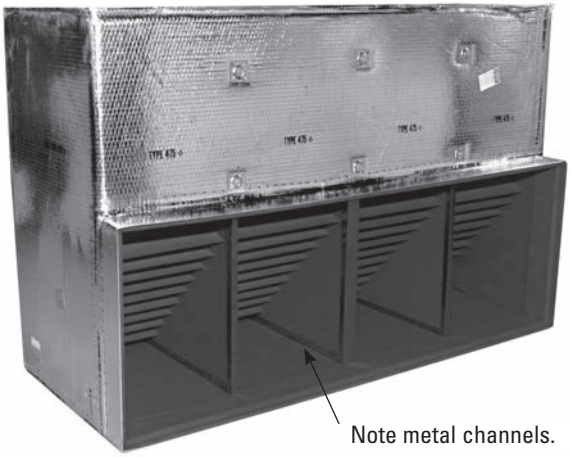
Branch Tap



Note staple flaps for stapling and taping branch to main duct.

Other Fiber Glass Fittings

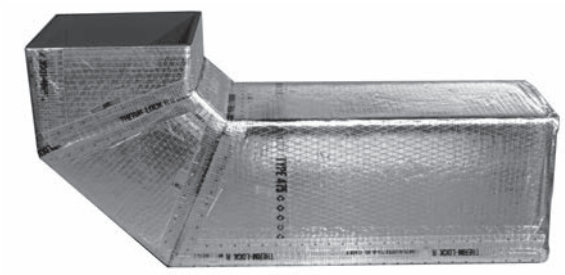
Large Ell with Center Cheek



Rectangular to Round Transition

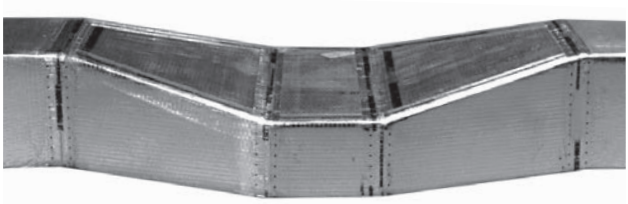
Other Fiber Glass Fittings

3 Gore Rectangular Ell



For low-velocity application.

Beam Clearance Transition



Offsetting Transition

Johns Manville

Notes

Fiber glass duct systems offer high performance and easier installation, but since they are lightweight, they have different jobsite handling requirements when compared to bare sheet metal duct systems. Material handling, spotting and protection of products at the jobsite should be carefully planned to reduce exposure to other trades and to minimize extra handling. The result can be less damage and subsequently lower costs. This section presents information that will help in the critical area of storage and handling.

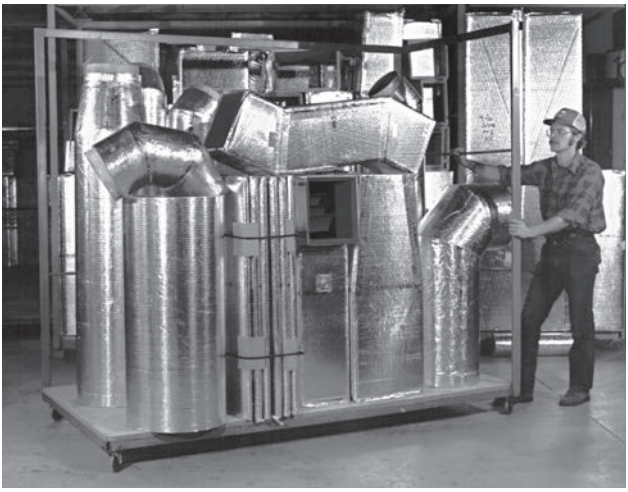
Compression Packaging

Straight duct sections, in which the smaller dimension is 12" or greater, can be compression-packaged for shipment to the jobsite. Compression packaging significantly reduces the volume of the product to ease transportation, handling and site spotting.

Compression-packaged duct should be unpacked immediately after it is spotted on the jobsite. Duct that is kept in compressed form for more than seven days may require diagonal tie-wires to restore the rectangular shape. (See Installation Tips, page 48, for details.)

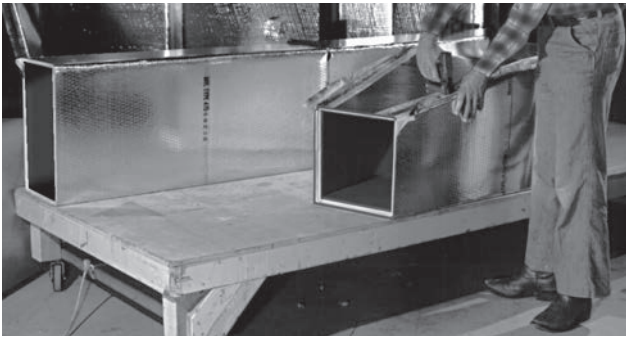
Carts

Use of carts is an efficient means for handling several duct sections or bundles of compression-packaged duct at one time. Carts can help protect the duct, keep it off wet and dirty floors and save on costly material handling.



While carts may vary in size and type, good ones share certain common characteristics:

- They usually can be made by shop personnel with available materials.
- They feature good industrial-quality casters with a brake.
- Carts serve the dual purpose of providing transport as well as a work surface for closure, assembly, reinforcement or other installation procedures.

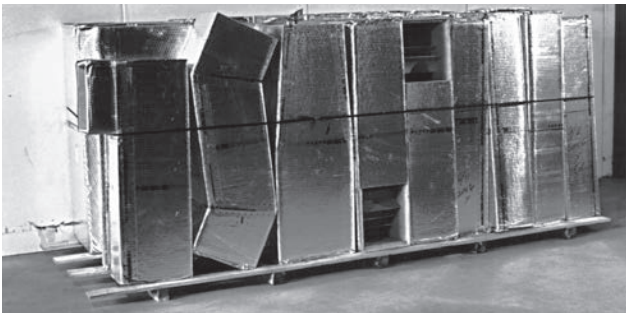


Moisture and Wind Protection

Proper attention to storage of fiber glass air duct products, whether fabricated or in the flat, is essential to prevent damage.

Indoor Storage. Indoor storage is highly recommended and universally preferred.

- Store duct in protected area. Near the center of the structure is usually best.
- Store duct off floor or where water cannot collect.
- Tie down duct sections to columns or similar structure, or put strapping around large quantities of duct sections to secure against high winds.



Outdoor Storage. Outdoor storage is not recommended. In cases where it is unavoidable, the following minimum precautions must be observed:

- Store duct off ground.
- Shield from wind as much as possible and tie down duct sections to a fixed point or put strapping around duct to keep individual sections from blowing away.
- Completely cover all of the duct (not just the open ends) with plastic sheeting and/or other waterproof materials. Secure water shields against wind.

Abuse

In the event that the material is damaged as a result of handling, storage or any other abuse, it must be properly repaired or replaced.

Minor External Damage. Jobsite conditions, including abuse from other trades, contribute to minor punctures or tears in the duct board facing. This type of damage is easily repaired using approved UL 181A closure materials. (See Repairs, pages 100–102, for details.)

Minor Internal Damage. Tears or punctures to the airstream surface of Mat-Faced Micro-Aire duct board should be "buttered" with Johns Manville SuperSeal HV coating. Tears or punctures to the internal coating of SuperDuct RC Air Handling Systems should be recoated with SuperSeal coating products to ensure system integrity.

More extensive damage to fiber glass duct sections from abusive contact or prolonged contact with standing water may require panel or complete section replacement. (See Repairs, pages 100–102, for details, and Exposure to Water below.)

Exposure to Water

Exposure to rain, snow or standing water may cause structural damage to fiber glass duct insulation products, including duct liner and duct wrap. Whether or not physical damage occurs is determined by the duration and frequency of exposure. Elements include: (1) quantity of water involved, (2) exposure period and (3) number of exposures. The greater the exposure to the elements above, the higher the likelihood of damage.

The typical physical failure mode that results from water damage is the delamination of the facing from the fiber glass wool. Saturation of the kraft backing on the FSK duct facing is an immediate cause for rejection of a duct section.

A secondary water exposure risk is microbial contamination. Note that this can occur in any material exhibiting accumulated moisture (liquid water), including bare metal. It is a known fact that fungal spores and other microbiological contaminants require water for growth. Removal of the water source and subsequent drying of the insulation can prevent microbial growth.

However, in cases with long water exposure duration, the presence of water may lead to microbial growth.

In case of either physical or microbial damage due to water saturation, the duct sections should be discarded and replaced with new dry sections.

Determining Water Damage

Prior to Installation. If water damage is suspected, stand duct section(s) in question, female end down, on a clean, dry floor. If water drains visibly from the section, it has been saturated and should not be installed. Also, if a duct section exhibits physical "softness" when compared to a section that was not exposed to water, it should be replaced.

Any evidence of facing delamination, such as bubbling or wrinkling near the center of any flat panel of a duct section, also indicates saturation and is a cause for rejection.

Installed Ductwork. In rare instances, roof damage, blowing snow, rain or plumbing failures may expose installed fiber glass ductwork to a large volume of water. To test for saturation, make an incision in the bottom center of the duct run. If water appears from the incision, the exposed duct run should be replaced.

Evidence of facing delamination, as described above, also indicates need for duct run replacement.

Closures and Code Compliance

Strong permanent closures are absolutely essential for the proper performance and longevity of a fiber glass duct system. The use of unapproved closure material can result in duct system failure.

North American building codes require a minimum Class 1 duct system rating. Duct systems fabricated from fiber glass duct board products are listed with Underwriters Laboratories under Standard UL 181 to obtain a Class 1 rating, when used with closure systems listed under Standard UL 181A. Use of non-UL 181A closure materials, regardless of experience or specification, voids the Class 1 rating and the Johns Manville product warranties.

In other words, failure to use a UL 181A closure means the system does not comply with North American building code requirements.

UL 181A Closure Test

Approved closures meet the requirements of UL 181A, a companion standard to the duct board standard. Closures for fiber glass duct board products, including Johns Manville SuperDuct RC Air Handling Systems and Mat-Faced Micro-Aire Duct Boards, must be imprinted with verification of UL 181A compliance.

UL 181A closures comprise three distinct types:

- UL 181A, Part I (P) Pressure-sensitive tapes
- UL 181A, Part II (H) Heat-applied tapes (thermal)
- UL 181A, Part III (M) Glass fabric and mastic closure

Note: Closures tested to UL 181B requirements are not acceptable for air duct board systems.

Closure Selection Guide

Johns Manville includes a basic fabrication instruction page in each package of duct board. The three UL 181A closure types are identified and simple application instructions are outlined.

While all three types of UL 181A closures offer similar performance when properly applied, each has different performance ranges, advantages and disadvantages. A duct board closure system selection chart is printed below for your convenience.

Complete closure application instructions are available in the NAIMA Fibrous Glass Duct Construction Standards Manual. For product-specific, detailed installation recommendations and restrictions, please contact the tape or mastic manufacturer directly.

Duct Board Closure System Selection Guide

Heat Activated UL 181A-H	Pressure Sensitive UL 181A-P	Glass Fabric and Mastic UL 181A-M
Serves as duct board closure only	Serves as duct board closure and equipment connection seal to 1" w.c.	Serves as duct board closure and equipment connection seal to 2" w.c.
Not sensitive to foil-facing contamination	Foil facing must be clean and dry	Not sensitive to foil-facing contamination
Application at any temperature	Cannot be applied to foil surface below 50°F	Does not dry well in cold or humid environments; must not freeze before fully cured
Joint fully cured when tape cools to touch	Joint cures over time; may be handled after application	Joint cure time varies; should not be handled until mastic is dry
ABI dots verify bond	No visual bond verification	No visual bond verification
Unlimited shelf life	Limited shelf life (temperature dependent)	Limited mastic shelf life (container seal and temperature dependent)
Low waste; not tacky until heated	Higher waste due to self-stick or twisting	Low waste with careful application
No release paper or cleanup mess	Release paper poses waste and slipping problem	Normally messy application and cleanup
Requires 500°F to 650°F heat iron for cost-effective application	Applied with a squeegee	Applied with brush, spatula, hand, rags or a combination of these

Limitation of Liability

Proper closure is critical for code compliance and system longevity. If the closure system used is not UL 181A listed and if application is not in accordance with the tape manufacturer's stated procedures, the UL 181 air duct rating and all Johns Manville product warranties are void.

Staples

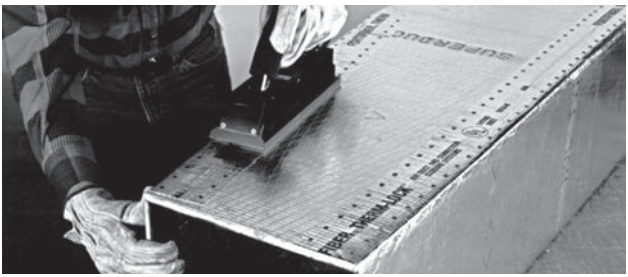
½" or 9⁄16" outward-clinch steel staples are required to secure all joints prior to closure tape or mastic application. Staples must be firmly seated against the facing and spaced at approximately 2" intervals.

In certain applications, cross tabs may be substituted for staples, as shown in this guide. Refer to the NAIMA Fibrous Glass Duct Construction Standards Manual for detailed information.

UL 181A Closure Summary

UL 181A-H

Heat-activated Closure Description. Any heat-activated closures that bear the UL 181A-H imprint may be used. These 3" wide, heat-applied, chemically bonded closures are recommended for all round or rectangular ductwork except where making connections from fiber glass to metal duct or equipment. Heat-activated (also known as heat-seal or thermal) closures feature Automatic Bond Indicator (ABI) dots, which darken when sufficient heat and pressure have been applied to make the closure.



Heat-activated Closure Application. The iron used to apply thermally activated closure systems should be UL 181A-H approved and be capable of maintaining a surface temperature of 550°F to 650°F. Heat and pressure should be applied until the green ABI dots have darkened. After heating the closure, use the surface of the iron, a leather glove or other heat-resistant tool to press the closure into the duct-facing scrim pattern. Use a combination of heat and pressure to rub the closure into the facing for best results.

Several types of irons are available for shop and field application of UL 181A-H closure. Please contact your Johns Manville distributor for more information.

Note: Open flame must not be used on heat seal closures. Heat alone is not sufficient to provide a good bond; physical pressure (typically applied by a smearing action) is also necessary.

UL 181A-P

Pressure-sensitive Tape Description. Any pressure-sensitive tape imprinted with the UL 181A-P label may be used. Follow the manufacturer's installation instructions to ensure compliance with all warranties.

Pressure-sensitive Tape Application. The following general information applies only to pressure-sensitive tapes. For specific storage, installation and warranty information, refer to the data sheets provided by the tape manufacturer.

Shelf Life. Pressure-sensitive tapes often have storage requirements and shelf-life limitations. The installer should verify that these conditions have not been exceeded prior to use.

Note: A general rule for shelf life is two years. Exposure to high heat may accelerate aging. Consult the tape manufacturer for more detailed shelf-life information.

Surface Preparation. In order to obtain satisfactory adhesion and bonding, the surface on which the closure will be applied must be clean and dry. Dust, dirt, oil, grease, moisture and similar substances may result in adhesion and bonding failure when present. Often, wiping the application surface with a clean, oil-free, lint-free rag or paper towel is sufficient. However, for the best results on contaminated or questionable surfaces, the cleaning recommendations of the tape manufacturer should be consulted.

Application Above 50°F. Using 3" wide (minimum) tape, position the tape along the edge of the flap in a manner that will allow 1" minimum overlap on adjacent surfaces. While holding the tape taut, press in place taking care to avoid wrinkles and folds. Rub tape firmly with a plastic squeegee until the facing reinforcement (scrim pattern) shows through the tape. Avoid excessive pressure on the squeegee that could cause the tape to be punctured at staple locations.

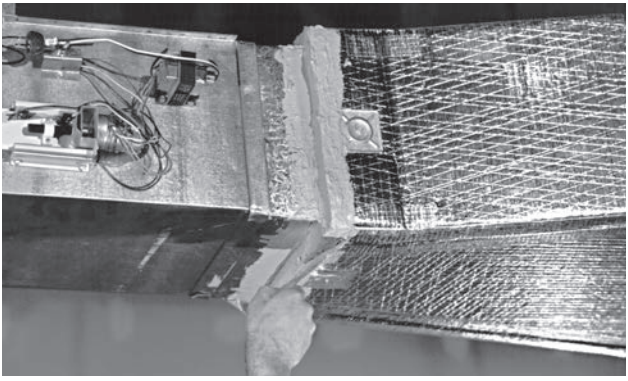
Application Below 50°F. If tape has been stored at temperatures less that 50°F, it should be conditioned prior to use by placement in a warm environment in order to improve the initial tack.

Using any suitable heating iron with the plate temperature set at 400°F (±25°F), preheat the area to be taped. Quickly position the tape on the preheated area and press in place. Pass the iron two or three times over the taped surface using a rapid “ironing" motion.

Complete the bond by rubbing the tape firmly with the plastic squeegee until the facing reinforcement shows through the tape.

UL 181A-M

Glass Fabric and Mastic Description. Required for sealing equipment connections where pressure will exceed 1" w.c.; glass fabric and mastic also serves as a general closure.



Glass Fabric and Mastic Application. Apply a thin, even coat of mastic approximately 3" wide over the center of the joint. Press the 3" wide glass fabric into the wet mastic.

Apply a second coat of mastic, using care to fill the scrim pattern in the glass fabric.

Note: Glass fabric and mastic joints should not be stressed until the mastic has dried. Temperature and humidity affect the speed of cure; consult the mastic manufacturer's information.

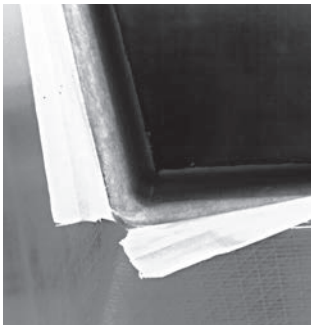
Field Assembly

1. To prepare joint for field assembly:

- Slit the staple flap corner.

- Fold back staple flaps.

- Trim the corner diagonally (using care not to cut into the airstream surface) to allow easy joining of sections.



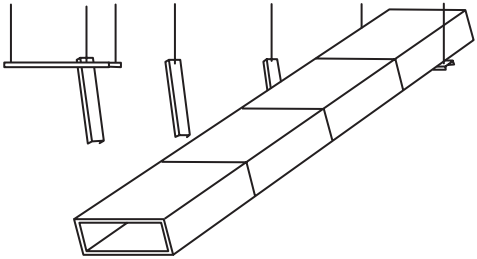
- Corner ready for sectionalizing.

2. It will save time and trouble if a clean work surface is available to assemble the duct. Preparation can be as simple as sweeping the floor. Do not place the duct on abrasive work surfaces that will damage or contaminate the facing.

3. Assemble as many sections of duct as practical before hanging. Preassembly is best accomplished by temporarily stacking sections with the male joint down to ensure tight joints. This procedure can generally be carried out on up to three standard 4' sections.

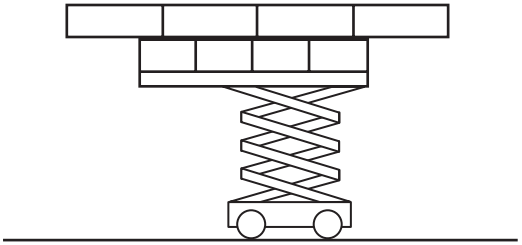
4. When assembling sections horizontally, angle the duct sections together to staple and tape one side. Then adhere the tape to one section, use the roll as a handle and pull the duct sections tightly together, leaving the tape piece as a cross tab. Staple and tape together to finish the connection.

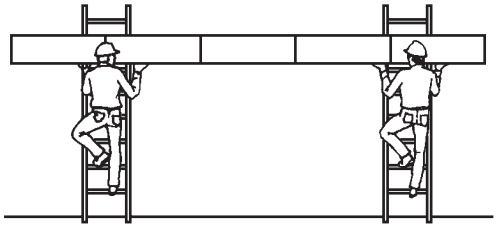
5. In some circumstances, it is possible to fasten trapeze hangers on one side only to facilitate the installation of long runs with minimum labor (see page 78 for hanger detail).

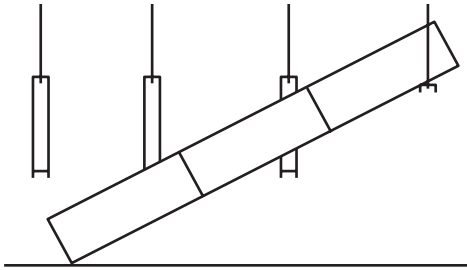


6. When connecting duct in the air, the use of tape tabs, illustrated in item No. four, can be very helpful, particularly on large size ducts. With a single hoist, three or four preassembled duct sections can be lifted. With two hoists, eight or more preassembled sections can be lifted.
7. Reinforcement is preferable prior to hanging.

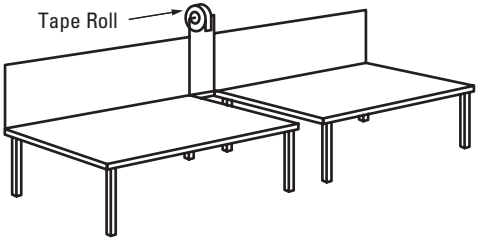
Lifting Options







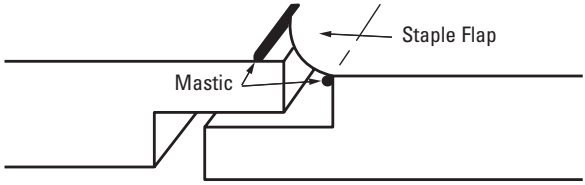
Sectionalizing Table



Tight Clearance Connections

Where joints must be sealed after hanging and where the clearance is minimal, use one of the following options:

- Leave the hanger wires or straps long on one side until the joint is sealed, then pull the duct up into position by raising the hanger channels until it is level.
- Apply a bead of Johns Manville SuperSeal HV sealant or approved water-based duct sealant to the inside of the male just under the staple flap, and a second bead approximately ½" back from the female end. Push the two duct sections together and press the staple flap down in the tight clearance areas. Staple and tape the accessible sides in the usual manner.



Johns Manville

Notes

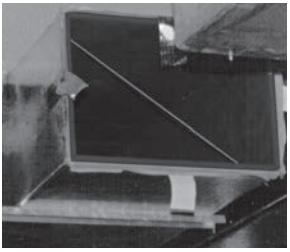
Installation Tips and Tools

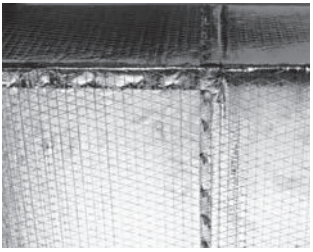
The right tools and proper job organization combine with good work practices to result in durable, attractive duct systems. The following lists of tips and tools can help to improve both quality and productivity.

For additional installation details, refer to sections on Recommended Closures (see page 36) and Field Assembly (see page 42).

1. Provide each work crew with drawings and detail sheets indicating which duct sections and fittings were fabricated for each zone or air handling unit.
2. Make certain that installers understand the principles of Modular Duct Construction, especially if the original blueprint was drawn with sheet metal-style layout rather than MDC layout (see page 20).
3. Provide all supplies required for proper installation to prevent field substitution, including:
   - Closure staples, tapes and mastics as needed
   - Approved wire, washers, channel and installation tools for reinforcement and hanging
   - Equipment connection, fire dampers, collars and other accessories designed for use with fiber glass duct systems
4. Be sure installations crews:
   - Limit damage and properly repair any damaged duct sections (see pages 100–102)
   - Properly store fiber glass duct (see pages 30–32)
   - Assure tight joints in assembled duct
   - Assemble the practical maximum number of duct sections for hanging
   - Hang and support ducts in proper intervals
   - See “Job Inspection Checklist" on page 104 and “Field Fabrication Tools and Materials" on page 51
5. All seams should be in line. Alternating seams will not normally correct duct run; twisting or rotation of the duct run is an indication that it was not grooved square with the male/female edges or was improperly aligned during closing

6. If the duct is racked over at an angle and can't be straightened with the hangers, use a diagonal tie rod every two to four sections to hold the duct square.





7. When stapling is required, the staples should be parallel or slightly angled with the seam.

8. During hanging, fasten trapeze hangers on one side only to facilitate the installation of long runs with minimum labor (see page 43 for details).

9. To install branch duct flat at top or bottom, measure I.D. plus 1½"* for depth of opening (see Figure 1). For branch installation in center, cut hole dimension equal to branch I.D. plus 1"** (see Figure 2). In all cases, longitudinal cut is branch I.D. width plus 1."**

Figure 1

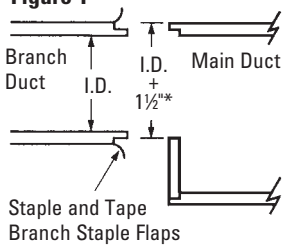
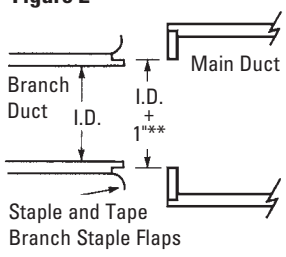


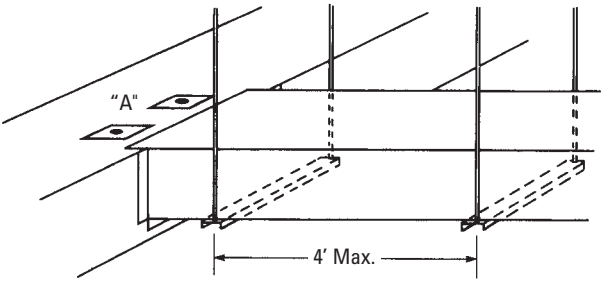
Figure 2



Board Thickness	*Measure I.D. Plus:
1"	1½"
1½"	2¼"
2"	3"

Board Thickness	**Measure I.D. Plus:
1"	1"
1½"	1½"
2"	2"

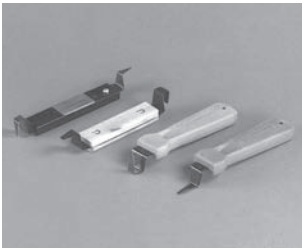
10. For large branch ducts (over 30") provide two hangers within the first four feet of the branch run to eliminate strain where the branch connects to the main duct.



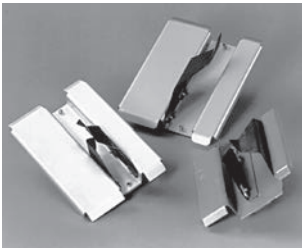
Note: Tie rods are required (as shown in Example "A") where branch opening exceeds unreinforced spans as shown in table on page 54.

11. On throatless ells, cut to length and attach leftover piece (or next full section) to throat before hanging (see page 95).
12. Make certain that the fiber glass duct is properly closed and correctly reinforced. Repair any punctures and tears in the facing material by using the approved closure system (see page 100).

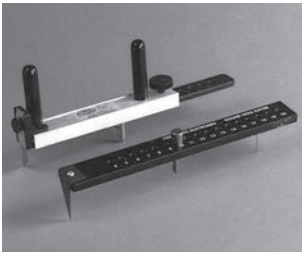
Field Fabrication Tools and Materials



Cuts-All Tool



Hand-grooving Tools

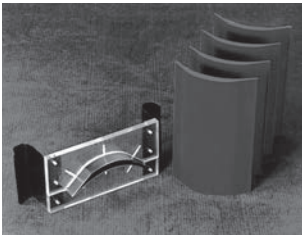


Round-hole Cutters

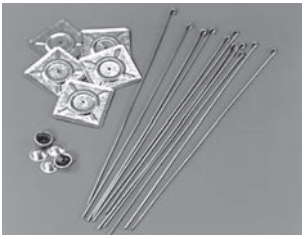
Staple Gun

UL 181A-H Closure Irons

JM-tested Duct Adhesives

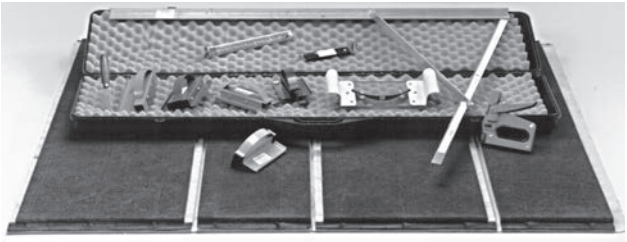


Air Turning Vane Cutter



Reinforcing Hardware

Field Fabrication Tools and Materials



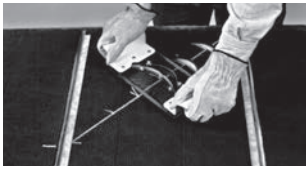
Complete hand fabrication tool kits are available from Glass Master, Malco and Amcraft (shown).

SuperDuct RC System Accessories

JM SuperSeal Edge Treatment and SuperSeal HV sealant for repairs and fitting fabrication

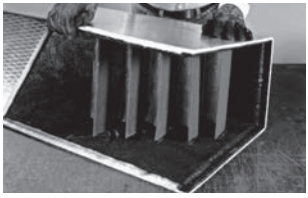
Air Turning Vane Installation in Open Ells

Marking elbow miter line at 3" intervals from throat



Using air turning vane cutter to make cutouts in elbow cheek

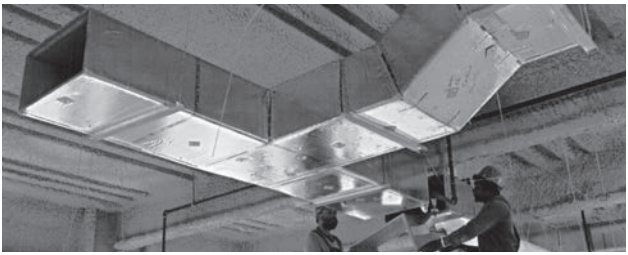
Inserting precut air turning vane lengths



Finishing air turning vane installation

General Information

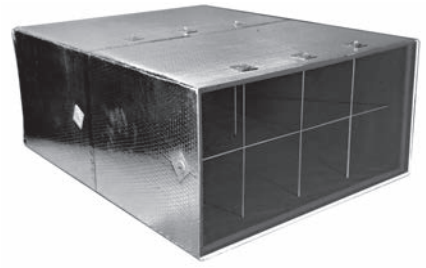
Proper system reinforcement is critical to the longevity and performance of fiber glass ducts. Johns Manville experience indicates that reinforcement is installed most efficiently in the fabrication shop. In situations where shipping considerations make full shop reinforcement impractical, consider reinforcing fittings in the shop and straight duct sections in the field. **Any field reinforcement or fitting modifications requiring reinforcement changes must be in compliance with NAIMA or Johns Manville reinforcement tables.**



Reinforcement is always required when pressures and spans (maximum inside duct dimensions) exceed those listed below. For comprehensive reinforcing information, refer to the NAIMA Fibrous Glass Duct Construction Standard.

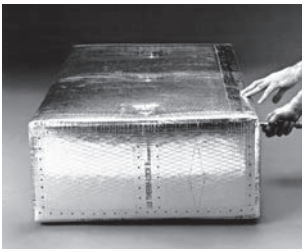
	Maximum Unreinforced Span	
Pressure (w.c.)	**Type 475**	**Type 800**
0–½"	36"	36"
½–1"	24"	24"
1–2"	15"	18"

Note: In some cases, both the width and depth of the duct must be reinforced, as illustrated below. (Tie rod method shown.)



Failure to reinforce properly can create excessive deflection of the duct, resulting in extra stress on the existing reinforcement and closure system.

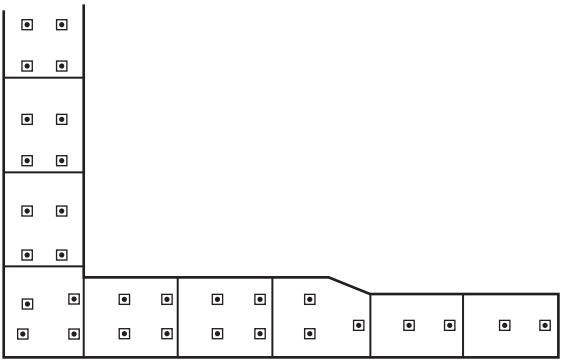
Proper Reinforcement



Improper Reinforcement

Reinforcement requirements are based on duct size (span) and internal static pressure. All duct sections and fittings that fall within the span/pressure conditions shown on the tables contained in this section must be reinforced.

Note that fittings are considered to be duct sections *and require reinforcement whenever the straight duct is reinforced.* See pages 68–76 for common field-fitting reinforcement details.



Tie Rod Reinforcement

The most commonly used reinforcement system utilizes internal wires to limit deflection of the duct surfaces (see photo, page 55). Cost effective and reliable when correctly installed, the tie rod system is easily modified or installed in duct or fittings. Components of this system are listed below.

Tie rod. 12 gauge (0.105") galvanized steel wire

Washers. 2.5" x 2.5" galvanized steel with beveled edges, 0.028" thick and center hole diameter that varies with termination

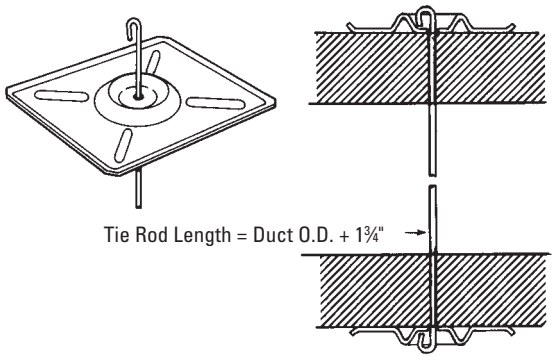
Termination. The following methods may be used to secure the tie rods:

1. Wire loop, such as Fasloop™
2. Blind rivet sleeve
3. Spring locking caps

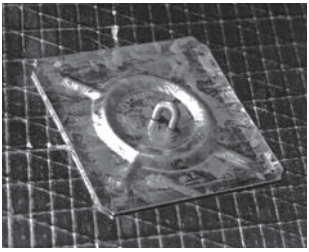
1. Wire Loop. The Fasloop bending tool, or tool with equivalent performance, is used to make the 190º loop. Washers must be 0.028" minimum thickness with volcano-type centers and 9 gauge (0.150") center holes.

Cautions:

1. No other loop configuration or washer type is acceptable.
2. Cut required wire lengths from bundled straight wire; coiled wire is very difficult and time consuming to straighten adequately.
3. The wire must not be a friction fit in the center hole of the washer; the washer must move freely on the wire.



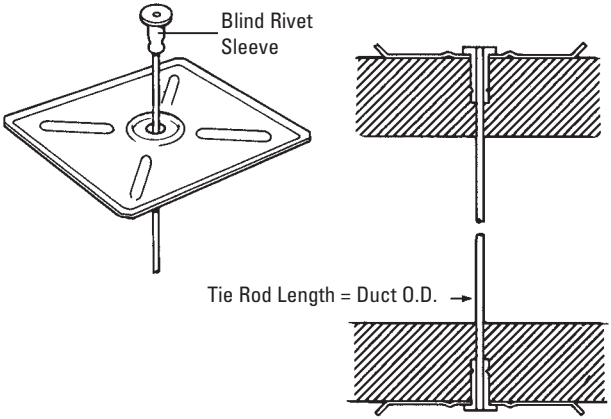
Wire Loop Termination



2. **Blind Rivet Sleeve.** Steel blind rivet sleeves are an acceptable alternate termination method *only if the sleeves are properly crushed onto the wire!* Duct systems using sleeve termination must be static-pressure tested following installation to determine adequate crimp pressure.

   No tool is available for this type of termination, and for this reason Johns Manville does not recommend the sleeves for static pressures exceeding 1" w.c. Washers must be 0.028" minimum thickness with 7/32" diameter center holes.

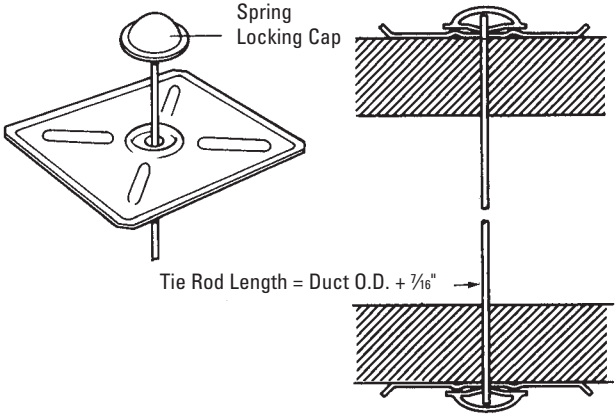
Cautions:
1. NEVER use aluminum sleeves.
2. Extreme care must be taken to ensure a complete crimp.
3. To ensure secure sleeve crimps, each duct run must be pressure tested after installation.



3. Spring Locking Caps. Locking caps (or "buttons") must be ⅞" diameter with spring steel or stainless steel locks, and may be used in systems operating at static pressures of 1" w.c. or less. Washers must be 0.028" minimum thickness, with 9 gauge (0.150") center holes.

Cautions:

1. NEVER use caps with aluminum or mild steel springs.
2. Extreme care must be taken to ensure correct wire length.
3. The caps must be pressed completely onto the wire.
4. Spring locking caps are not suitable for use on sloped panels, such as transitions or reducers.



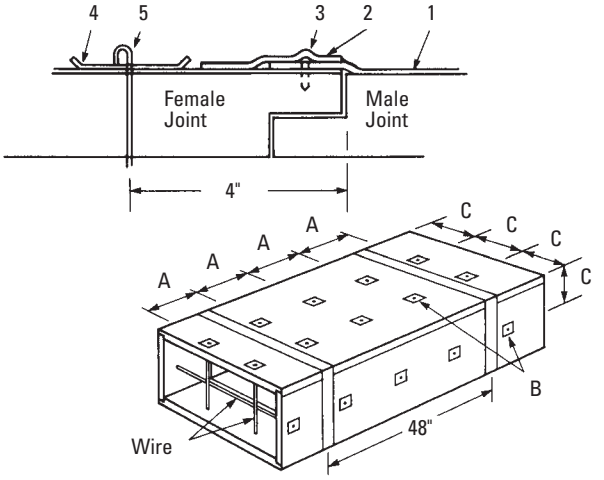
Reinforcement of Rectangular Fiber Glass Air Ducts
Spacing shown is applicable to both positive (supply) and negative (return) pressure duct systems.

Static Pressure (in. w.c.)	Maximum Inside Duct Dimension (I.D.) (in.)	Number of Tie Rods Across Duct Dimension (space 16" on center; refer to dimension "C" on page 60)	Maximum Longitudinal Spacing Between Tie Rods (refer to dimension "A" on page 60)	
			Type 475	Type 800
0 thru ½"	0–36	—	Not Required	Not Required
	37–42	2	24"	48"
	43–48	2	↓	↓
	49–60	3	↓	↓
Anti-sag Support over 48"	61–64	3	↓	24"
	65–80	4	↓	↓
	81–96	5	↓	↓
Over ½" thru 1"	0–24	—	Not Required	Not Required
	25–30	1	24"	48"
	31–32	1	↓	24"
	33–36	2	↓	↓
	37–48	2	↓	↓
Anti-sag Support over 48"	49–64	3	↓	↓
	65–80	4	↓	↓
	81–96	5	↓	↓
Over 1" thru 2"	0–15	—	Not Required	Not Required
	16–18	1	24"	Not Required
	19–24	1	24"	24"
	25–32	1	16"	↓
	33–48	2	↓	↓
Anti-sag Support over 48"	49–60	3	↓	↓
	61–64	3	↓	16"
	65–80	4	↓	↓
	81–96	5	↓	↓

Basic Positioning of Tie Rods

Positive Pressure Ducts

Figure 1
Basic Tie Rod Detail (not to scale)

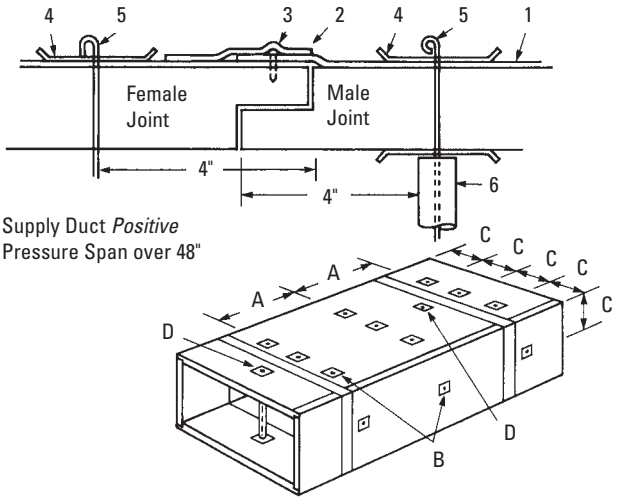


Where tie rods are required, as indicated in the tie rod reinforcement table, the first rows of tie rod (for positive pressure duct) shall be placed 4" from the female edge of the transverse joint (at Point "A" in Figures 1 and 2). Subsequent location of rows of tie rods, either 48", 24" or 16" apart as required by the reinforcement table, shall be determined by measuring from this point.

1. **Facing:** This must be lapped over the facing on the female shiplap and stapled approximately 2" on center.
2. **Tape:** Refer to Closure and Assembly tab for recommendations.
3. **Staple:** Outward-clinch type ½" or 9/16" steel staples approximately 2" on centers, placed along stapling flap at the joint as required.
4. **Washer:** 2½" x 2½" square, 0.028" minimum thickness galvanized steel with beveled edge, beaded reinforcing crater and 0.150" hole. Beveled edge of washer turned away from the duct board facing.
5. **Wire:** 12-gauge (0.105") galvanized steel.

6. Anti-Sag Assembly: Large duct spans experience natural sag when not pressurized. To minimize this, an anti-sag assembly is installed on duct spans over 48" I.D. Conduit should be ½" diameter (minimum) galvanized steel (EMT), cut to the same length as the inside duct dimension, with additional washers placed between the conduit ends and the duct interior. See detail in Figure 2 with anti-sag assembly located 4" from male end of duct. **Note:** NAIMA Standard calls for anti-sag support beginning at 48" I.D.; the difference from Figure 2 is not a structural issue and may be optionally used.

Figure 2
Basic Anti-sag Tie Rod Detail (not to scale)



A. Maximum longitudinal spacing between rows of tie rods if required by tie rod reinforcement table to be 16", 24" or 48".

B. Tie rods must be no more than 16" on centers across duct dimension.

C. 12-gauge (0.105") wire with 2½" square washer.

D. 12-gauge (0.105") wire with ½" conduit (EMT). See Figure 2 for details.

Note: Proper-fitting reinforcement may require channel and/or metal angles in combination with tie rods. Refer to current NAIMA Standard for complete details.

Negative Tie Rod Duct Reinforcement

Johns Manville Mat-Faced Micro-Aire Duct Board or SuperDuct RC systems that will be subject to negative pressure may be reinforced with the same tie rod schedule as shown on page 59, with the modifications listed below.

IF THERE IS THE POSSIBILITY OF SURGES, REINFORCE TO THE EXPECTED SURGE PRESSURE ON NEGATIVE DUCT APPLICATIONS.

- Longitudinal spacing of tie rods starts 4" from the male edge, as shown in Figure 3.
- All tie rods used to reinforce negative pressure duct require 12-gauge (0.105") wire, ½" conduit and four-washer assembly as shown in Figure 3.
- Ductwork reinforced for negative pressure does not require anti-sag supports.

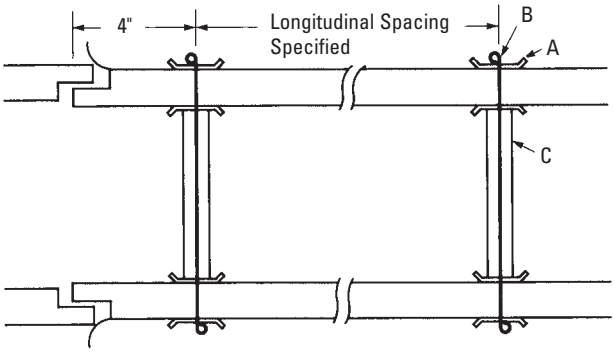
Materials

A. Washer: 2½" x 2½" square, 0.028" minimum thickness galvanized steel with beveled edges and 0.150" diameter hole; beveled edge of washer turned away from the duct board.

B. Wire: 12-gauge (0.105") galvanized.

C. Conduit: Should be ½" diameter galvanized steel (EMT), cut to the same length as the inside duct dimension. Additional washers must be placed between the conduit ends and the duct with edges turned away from board as shown in Figure 3.

Figure 3



Tie Rod Reinforcement Tips

While fiber glass duct system reinforcement is done most efficiently in the shop environment, situations may arise that call for reinforcement to be installed or modified in the field, such as:

1. Offsets fabricated from straight-duct modules
2. Increase in fan pressure due to system design or equipment changes
3. Duct compression packaged for shipment to job
4. Tap-in requires duct joint to be altered
5. Reinforcement incorrect from the shop

Field Tie Rod Installation. To properly install tie rod reinforcement, observe the following steps:

1. Sweep or clear a work area, preferably near a wall. For fitting reinforcement, a workbench, table or cart is desirable.
2. Select the proper reinforcement schedule from the table on page 59. To do this, you must know:
   - Duct size (inside dimensions)
   - System static pressure expressed in inches of water column (w.c.)
   - Board type, 475 or 800
   - For fittings, the sizes of any openings or duct-size changes

Tip: To avoid confusion and repeated reference to the table, write the number of wires per joint on a separate sheet of paper or make a sketch showing the joint with rods marked.

Example: A duct section has been field fabricated for the trunk line. Duct size is 48" x 20", static pressure (found in pressure arrows or the fan pressure schedule on the blueprints) is +1.2" w.c. and the duct board is Type 475.

A. Referring to the table on page 59 (highlighted below), select the static pressure from Column 1, which will be in the Over 1" through 2" category (third block).

B. Both duct dimensions must be considered independently; for this example, begin with the 48" dimension. Reading from Column 2 (to the right of the selected pressure category), select Line 5 (33–48").

C. Read the number of tie rods required across the selected duct dimension from Column 3.

D. From Column 4, read the maximum longitudinal spacing (refers to the length of the joint, normally 48" or 96" for Johns Manville Wide Board products) between tie rods required for Type 475 duct board.

Over ½"	Anti-sag Support over 48"	37–48	2		
		49–64	3		
		65–80	4		
		81–96	5		

Over 1" thru 2"		0–15	—	Not Required	Not Required
		16–18	1	24"	Not Required
		19–24	1	24"	24"
		25–32	1	16"	
		33–48	2		
	Anti-sag Support over 48"	49–60	3		
		61–64	3		16"
		65–80	4		
		81–96	5		

E. Repeat steps B through D for the 20" duct dimension.

Over ½"	Anti-sag Support over 48"	37–48	2		
		49–64	3		
		65–80	4		
		81–96	5		

Over 1" thru 2"		0–15	—	Not Required	Not Required
		16–18	1	24"	Not Required
		19–24	1	24"	24"
		25–32	1	16"	
		33–48	2		
	Anti-sag Support over 48"	49–60	3		
		61–64	3		16"
		65–80	4		
		81–96	5		

3. Mark the duct section(s) for tie-wire installation.

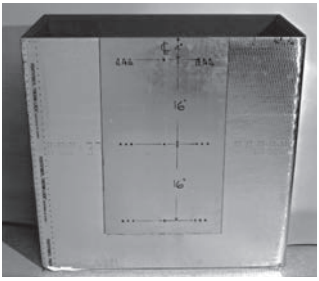
Tip: Position the duct with the female end up on positive pressure (supply) ducts and the male end (with staple flap) up on negative pressure (return) ducts. This will allow reinforcing to begin at 4" from the respective ends.

Example: Using the 48" x 20" duct section from the previous example:

A. Place the duct on the floor with the female end up.

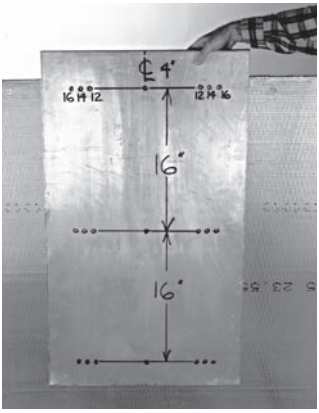
B. Beginning with the 48" side, make a mark on the center line of the panel (24" inside or 25" outside).

C. The table on page 59 shows that two wires will be required across the duct dimension, spaced at 16" (maximum). Page 60, Figure 1 indicates that the two wires will be placed 4" from the female end. Measure 8" on either side of the center line mark and 4" down from the female to establish the marks for the first two wires.



48" duct side showing tie-rod installation template

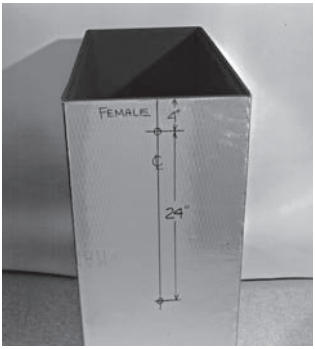
D. The table on page 59 indicates that wires are required at 16" intervals down the length of the cut section. Using the marks at 4" from the female as the base, measure 16" maximum vertical spacing. Repeat marking process for the opposite side of the duct.



Tip: Always use a template and scratch-awl or similar sharp object to punch holes for the wires.

E. The 20" duct dimension will require only one wire on center (10" inside, 11" outside), beginning 4" from the female.

F. The table on page 59 requires the longitudinal interval to be 24". Measure 24" from the mark 4" from the female, using care to mark the hole in the center of the dimension. Repeat the process for the opposite side of the duct.



20" duct side showing tie-rod dimensions

4. Install the wires in the duct section.

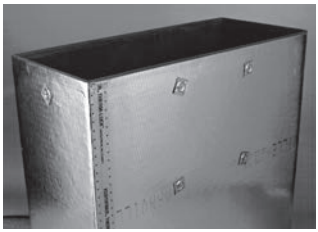
Tip: Cut all wires for the job before reinforcing, using a jig to maintain a consistent length. Clamp a bundle of wire securely and cut with a band or chop saw for large quantities of a common length.

Warning: Wire length should be determined by the formula shown with the drawing on page 56. It is very important that the wire lengths vary by no more than ¼"!

Tip: Using the Fasloop bending tool or tool with equivalent performance, pre-loop all wires on one end, and install one washer with the bevel (and "volcano" cone) toward the loop. Manufacture as many assemblies as possible at one time.

Tip: After inserting the wire assembly through the first side, reach inside the duct and place the wires through the opposite holes (from inside to outside) to ensure straight, parallel wires.

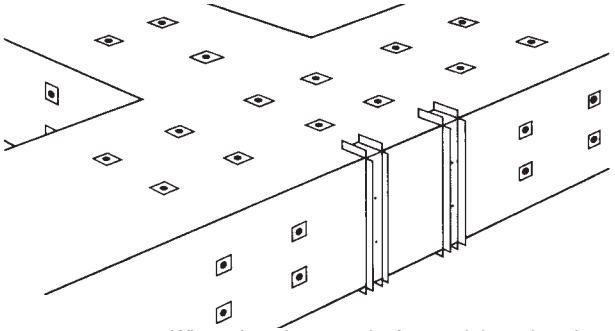
5. Position the duct near a wall so that the installed washers and loops will be firmly in place by the wall. Install washers and use the Fasloop tool to form the loops. Terminate all wire assemblies in this manner.



Finished reinforcement of completed duct section

Channel Reinforcement

An alternative reinforcement method utilizes “U" channel sections made from various galvanized sheet metal gauges applied at specified intervals. For detailed information on standalone channel reinforcement, see the NAIMA Fibrous Glass Duct Construction Standard.



Where tie rods cannot be fastened through to the opposite side, use channels for reinforcing.

See additional fitting reinforcement information.

Fitting Note: Some types and sizes of fittings and lateral branches may require metal “U" channel in addition to tie wire reinforcement method. Refer to pages 70–71 for more information.

Caution: Omission of reinforcement or substitution of reinforcement other than illustrated in this book or the NAIMA or SMACNA Standards will result in a duct system that may not comply with building codes.

Fitting Reinforcement and Assembly

Reinforcement Requirements

Fittings must always be reinforced whenever the straight-duct sections of the same size require reinforcement. In some cases, fittings will require additional or alternative reinforcement as compared to straight duct.

The following pages illustrate Johns Manville-approved options designed to work with the procedures detailed in the NAIMA Fibrous Glass Duct Construction Standard. Use of adhesives does not eliminate the need for tie wires or other reinforcement as called for in the NAIMA manual, except in the cases specifically noted.

NAIMA/SMACNA Recommendations

The introduction of the NAIMA Fibrous Glass Duct Construction Standard in 1989 dramatically changed procedures for fabrication and assembly of duct and fittings in sizes or static pressures requiring reinforcement.

Use of metal corner angles has been mandated on 90° elbows, take-offs and certain other fitting situations to prevent potential long-term leakage of the joints.

Comprehensive information on the use of metal inserts in duct reinforcement and assembly may be found in the current NAIMA and SMACNA Fibrous Glass Duct Construction Standards.

Johns Manville Adhesive Fitting Reinforcement Recommendations

Johns Manville has tested and approved specific construction adhesive applications as an alternative to the NAIMA metal insert requirements. The following pages illustrate the correct use of adhesives on common field fittings and joints. **The use of adhesives is an option on all JM rigid fiber glass duct products. Where adhesives are not used, the fitting reinforcement system described in the NAIMA Fibrous Glass Duct Construction Standard must be followed.**

In accordance with current industry practice, Johns Manville tests and approves only non-solvent based construction adhesives, such as water-based or silicone compounds. These products do not generate flammable vapors during the curing process and will meet the 25/50 flame spread/smoke developed criteria required for most applications.

For a list of Johns Manville-approved adhesives, please contact the Regional Sales Office nearest you or your local Johns Manville Territory Manager.

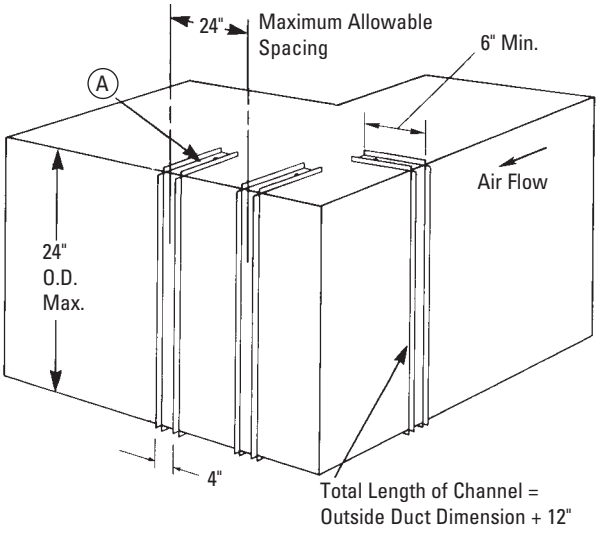
Note: The NAIMA and SMACNA Fibrous Glass Duct Construction Standards recognize the right of individual duct board manufacturers to develop recommendations which supersede those in the NAIMA Standard. The Johns Manville adhesive recommendations are applicable only with SuperDuct RC Air Duct Board and Mat-Faced Micro-Aire Duct Board.

Partial Wrap-around Channel Reinforcement

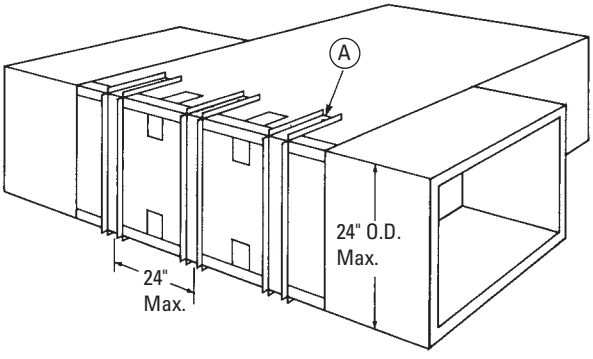
Where reinforcement is required but tie wires cannot be fastened to opposite sides of a duct section or fitting, it is necessary to install formed sheet metal channels that partially wrap around the duct section or fitting at the required locations.

Note: Short-fitting throats are shown for clarity; use of standard MDC practice (see Tab 2) is recommended wherever applicable. Also, tie wires have been omitted from the following drawings for clarity but must be used in actual duct systems as the primary reinforcement.

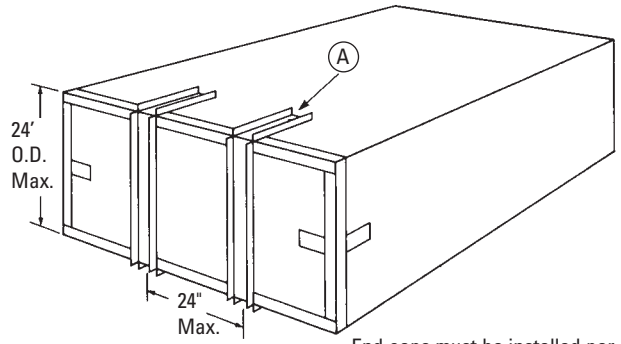
90º Elbow



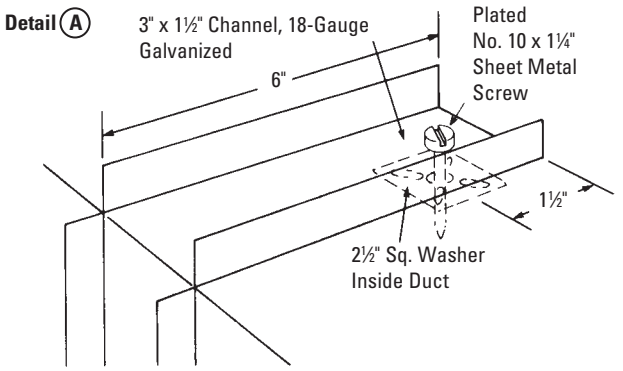
Tees



End Caps



End caps must be installed per NAIMA fabrication instructions.



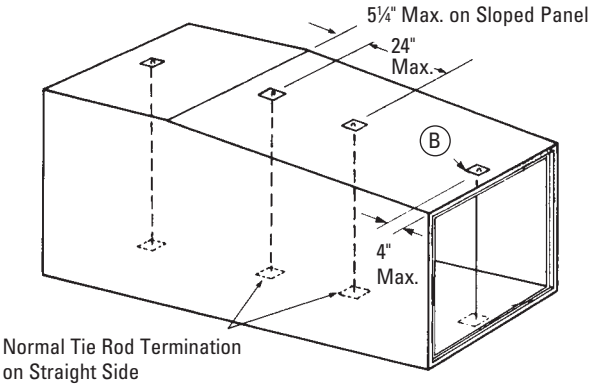
Approved construction adhesive must be applied liberally to the channel legs before installation of the channel. When channel fasteners are tightened, adhesive should seep from under the channel's edge.

Note: Only duct sections that do not exceed an outside dimension (depth or width) of 24" are currently tested and approved for the adhesive method of channel securement. For larger duct sections, refer to the NAIMA Manual.

Transitions

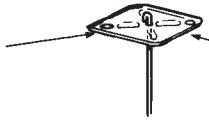
Transitions, or any fitting requiring reinforcement of a sloped panel, must have the sloped panel washers firmly secured. The Johns Manville adhesive method is illustrated.

Transition Reinforcement, Sloping Section



Detail (B)

Must be used on slopes.



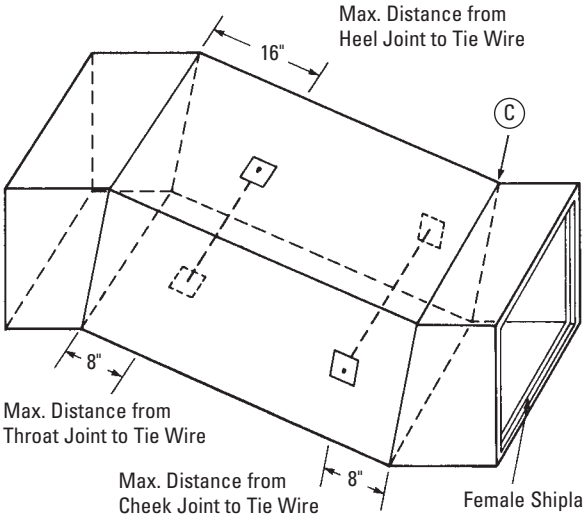
Adhesive must be applied to the underside of the washer prior to installation on sloped panels.

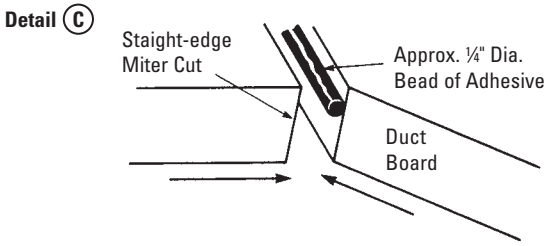
Offsets

Fabrication of offsets in the field is a common practice. Where static pressure and duct size require reinforcement of offsets in the field, tie wires are often required in addition to those called for in the table on page 59. The following precautions should be taken:

1. The offset should be carefully measured and cut with a straight edge to ensure a tight joint.
2. Flush or butt-edge joints should be used.
3. Approved construction adhesive should be applied to the entire perimeter of one side of the cut joint. Upon assembly of the joint, the adhesive should be firmly in contact with both sides of the cut.

Butt-edged Offset Reinforcement





Note: The tie-wire spacings shown are maximum dimensions. Reduced dimensions should be used where applicable to keep the wires perpendicular with the duct surfaces.

Sectionalizing Reinforced Duct and Fittings

When installing duct sections and fittings that contain reinforcement, the NAIMA manual requires that sandwiched metal angles be used in many instances to secure the joints. This is a new requirement and demands alternate installation practices.

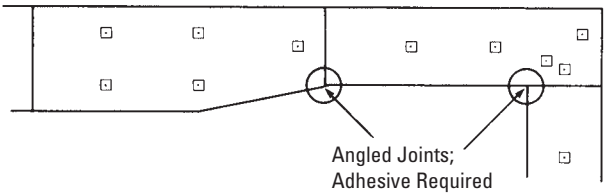
To ease the transition to the new reinforcement standard, Johns Manville has applied adhesive technology to reinforce the joints, eliminating the need for metal accessories in many cases.

Please note the following:

1. The Johns Manville adhesive recommendations apply only to JM rigid fiber glass duct products.
2. **Adhesive use is an option only.** The reinforcement methods detailed in the NAIMA Fibrous Glass Duct Construction Standards Manual are required wherever adhesives are not used.
3. Use of adhesives as recommended does not eliminate the need for use of tie wires or channel as required in the NAIMA manual or other sections of **The Pocket Installer**.

Where Joint Reinforcement is Required

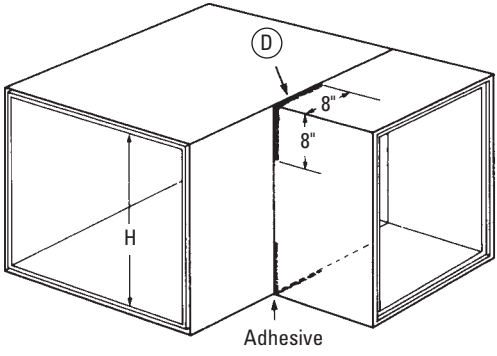
In any situation where a sloped or angled panel joins a flat or straight panel and the duct is of sufficient size or operating pressure to require reinforcement, the joint between those panels will require additional reinforcement.



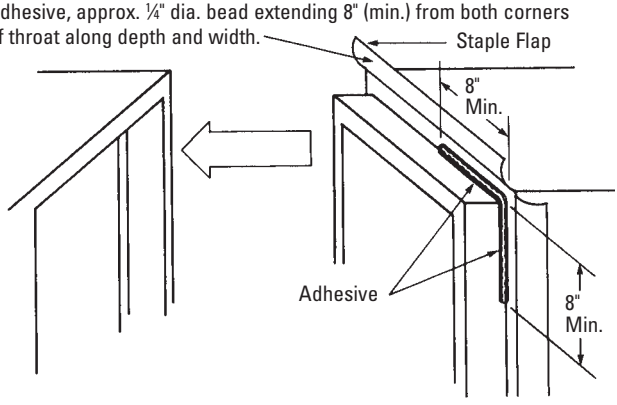
90° Elbow Joint Adhesive Usage

One of the most common field fittings is the 90° elbow. The JM adhesive-reinforcement method illustrated also applies to tees or any other fitting where a perpendicular duct takes off of an existing duct and where joint height is the same.

Adhesive Reinforcement at Throat, 90° Elbows



Detail (D). Throat Reinforcement



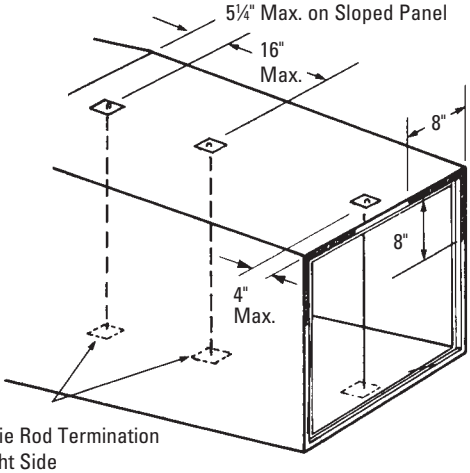
When duct dimension "H" requires reinforcement per reinforcing tables on page 59 (Type 475 or Type 800), adhesive is required as shown in figure above.

Note: Where reinforced duct height differs on take-offs, tap-ins or any 90° elbow, metal reinforcement should be used as detailed in the NAIMA manual. To avoid the added cost and complexity of the metal usage, consider fabricating all lateral (or vertical) runs of the same duct height (or width) and then transitioning to the required size further down the run.

Transition Joint Adhesive Usage

Where the sloped panel of a transition joins with a downstream straight duct section and where the ductwork requires reinforcement, approved adhesives may be used to eliminate some metal reinforcement.

Transition Reinforcement, Sloping Section



Normal Tie Rod Termination
on Straight Side

See Detail (D) on page 75 for proper adhesive application.

Rectangular Duct Hangers

Standard Hangers

Sheet metal channel sections are normally used to support rectangular fiber glass duct and fittings. Standard channel width is 3", with the web depth and metal gauge selected from Table 1, below. Hanger spacing is determined from Table 2, page 79, and varies by duct depth and width.

Note: JM Wide Board duct sections of any depth and width may be supported on 8' centers using 3" hanger channel with web and metal gauge selected in accordance with Table 1.

Table 1. Channel Selection

If Total Extension is Not Greater Than:	Minimum Channel Gauge	Minimum Channel Profile
6"	24	3" x 1.5"
18"	22	3" x 2"
30"	18	3" x 2"

Hanger Spacing and Extension, 3" Wide Channels

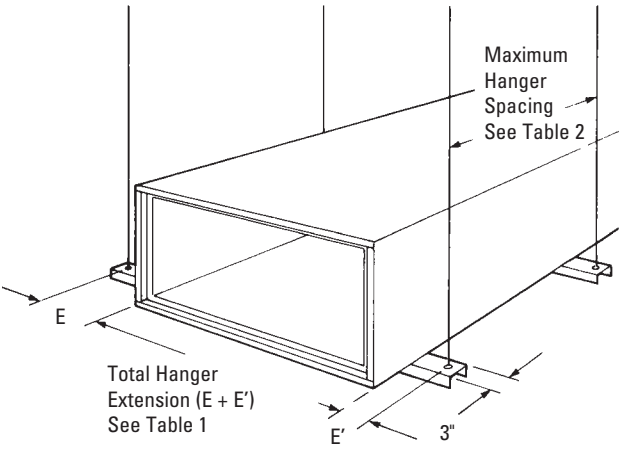


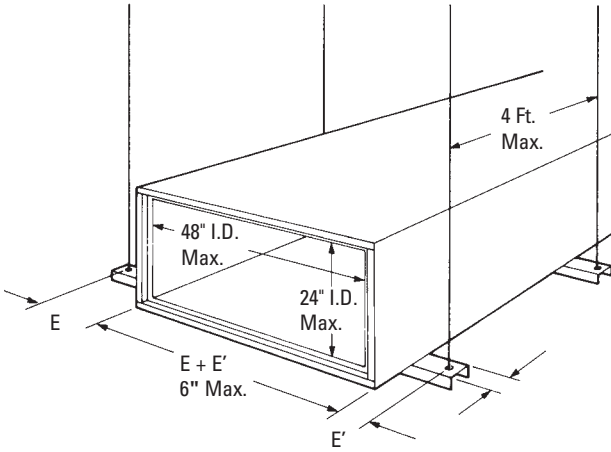
Table 2. Maximum Hanger Spacing by Duct Size, I.D.

Duct Size, Inches	Maximum Hanger Spacing
48" wide or greater	4'
Less than 48" wide and less than 12" deep	6'
Width between 24" and 48" and greater than 24" deep	6'
Less than 48" wide and depth between 12" and 24"	8'
Width 24" or less and depth greater than 12"	8'
Wide Board – any width or depth	8'

Use of 2" Wide Hangers

22-gauge, 2" x 1.5" channel may be substituted for 3" hangers where the duct width (ID) does not exceed 48', and the duct depth (ID) does not exceed 24." Hanger spacing intervals for 2" wide hangers may not exceed 4'.

Use of 2" Wide Hanger Channels



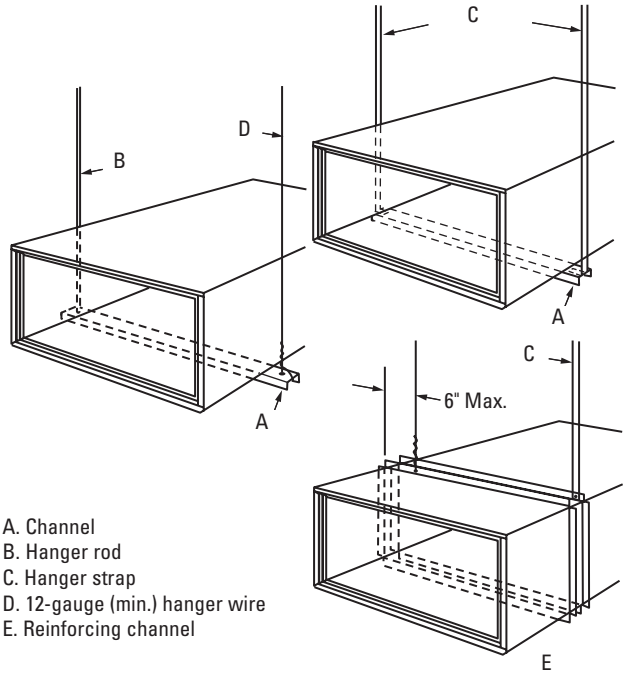
Hanger Supports

Hanger channels may be supported by any of the following systems:

1. 12-gauge (0.105") (minimum) galvanized steel wire (check local codes), secured through holes penetrating the hanger channel ends
2. 1" x 22-gauge (0.030") (minimum) galvanized metal strap securely screwed, riveted or welded to the hanger channel ends
3. ¼" diameter threaded rod secured through holes in the hanger channel ends.

Note: The supports listed above may also be attached to reinforcing channels in lieu of a separate hanger channel where reinforcing channels do not exceed the maximum hanger interval.

Horizontal Supports

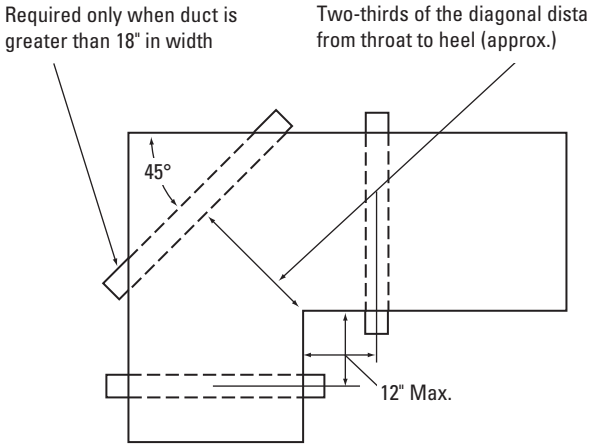


A. Channel
B. Hanger rod
C. Hanger strap
D. 12-gauge (min.) hanger wire
E. Reinforcing channel

Special Hanger Situations

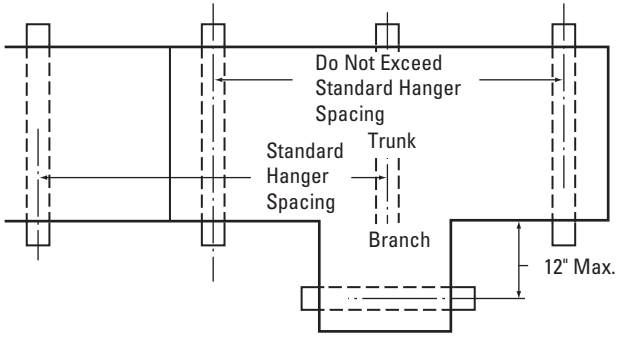
Hanging Fibrous Glass Duct Fittings up to 48" in Width

Elbow Support



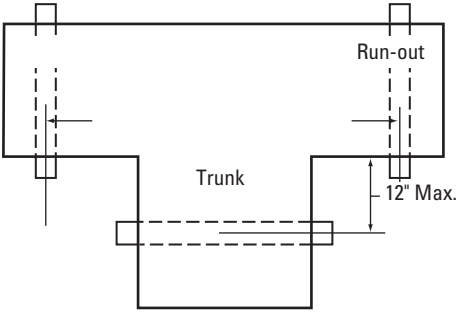
Branch Support

If trunk duct hanger falls where branch duct is located, add trunk hangers on either side of branch duct. Do not exceed maximum hanger spacing (Table 2, page 79).



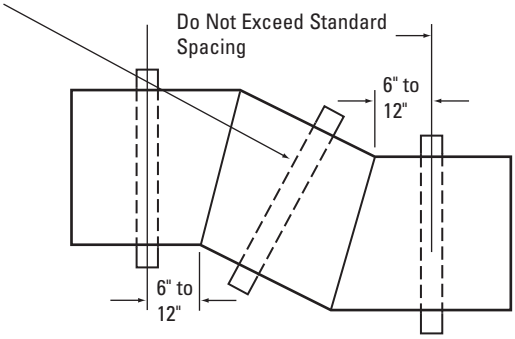
Tee Support

If a tee run-out falls where trunk duct is located, add run-out hangers on either side of trunk. Do not exceed maximum hanger spacing (Table 2, page 79).



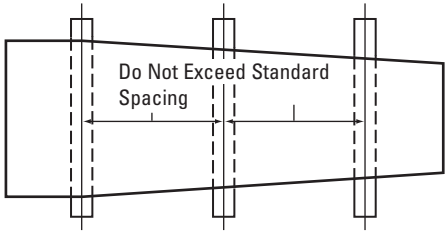
Offset Support (Flat Bottom Surface)

Required only when angled portion of offset is greater than 48" long. Additional hangers may be required to comply with spacing. See Table 2, page 79.



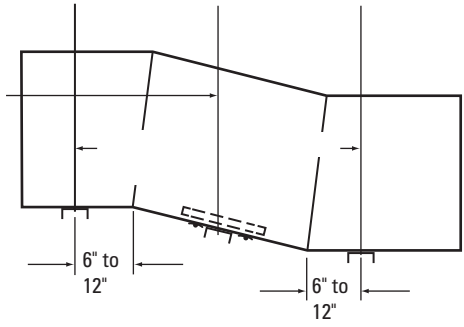
Transition Support (Flat Bottom Surface)

Locate hangers as for straight duct. Note: Hanger spacing may change when transition is from one hanger size to another. Use closest spacing described by Table 2, page 79.

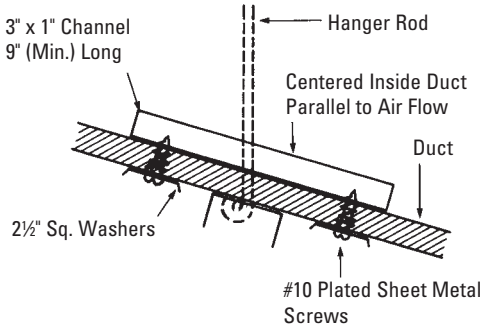


Supporting Offsets and Transitions with Inclined Bottom Surfaces

Required only when inclined portion of duct is greater than 48". Hanger is attached to duct per detail as shown below. Additional hangers may be required to comply with hanger spacing per Table 2, page 79.



Detail of Support at Inclined Bottom Surface

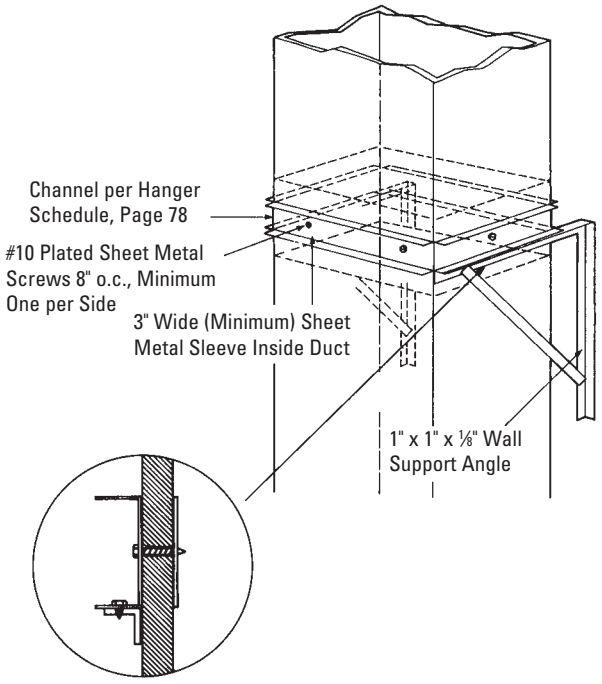


Vertical Riser Supports

Risers in fiber glass duct systems of 8' or longer require special support as shown in the diagram below. The support systems do not substitute for reinforcement required by the Tie Rod Reinforcement Table on page 59. Vertical riser support intervals should not exceed 12' maximum intervals.

An alternate method of riser support which uses floor-mounted attachments is also illustrated. Johns Manville recommends the use of an internal metal sleeve in place of 2½" square washers for ease of field installation. 2½" square galvanized 0.028" minimum thickness washers are also acceptable, minimum one per side, on 8" (max.) centers.

Note: Riser height is limited as stated in NFPA 90A "for vertical risers in air duct systems serving more than two stories."



Equipment Connection Details

The following figures illustrate some different equipment connection details for use with fibrous glass duct. Additional equipment connection details may be found in the NAIMA Fibrous Glass Duct Construction Standard.

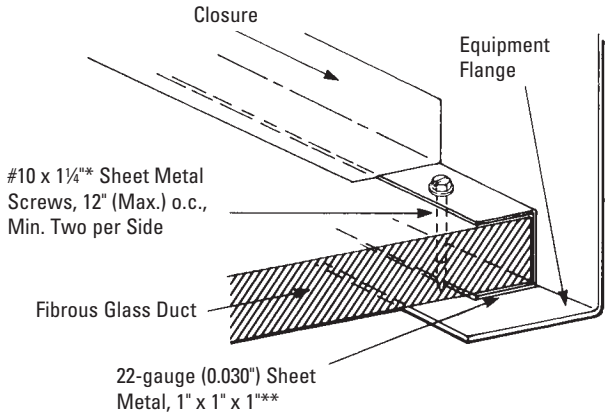
In situations where fiber glass duct is secured over a metal sleeve leaving the fiber glass wool exposed, the installer should seal the duct board facing to the metal to eliminate leakage. Where the duct-system operating pressure is less than 1" w.c., UL 181A-P listed pressure-sensitive tape should be used. Where the duct operating pressure is 1" w.c. or greater, use glass fabric and mastic that meet the requirements of UL 181A-M (refer to Duct Board Closure System Selection Guide, page 37).

The type of equipment determines which detail or details must be applied for the fabrication of connections. Flanges and collars on equipment vary; select the detail that best meets the individual job requirement.

Sheet Metal and Equipment Connection Details

Note: All mechanical connections of fibrous glass duct to equipment must be 12" (max.) on centers.

Figure 1.



Board Thickness	*Sheet Metal Screws
1"	#10 x 1¼"
1½"	#10 x 1¾"
2"	#10 x 2¼"

Board Thickness	**Sheet Metal Channel
1"	1" x 1" x 1"
1½"	1" x 1½" x 1"
2"	1" x 2" x 1"

Figure 2.

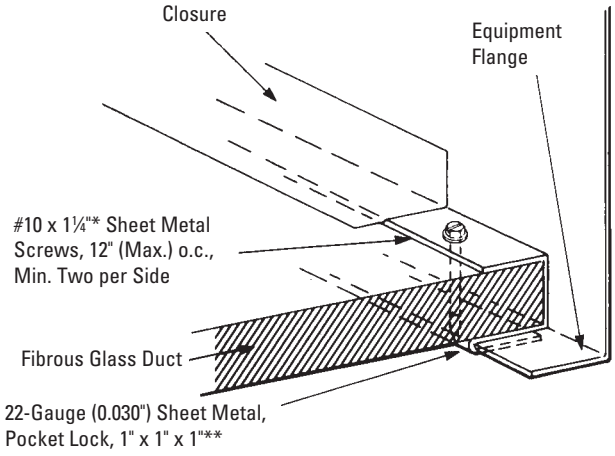
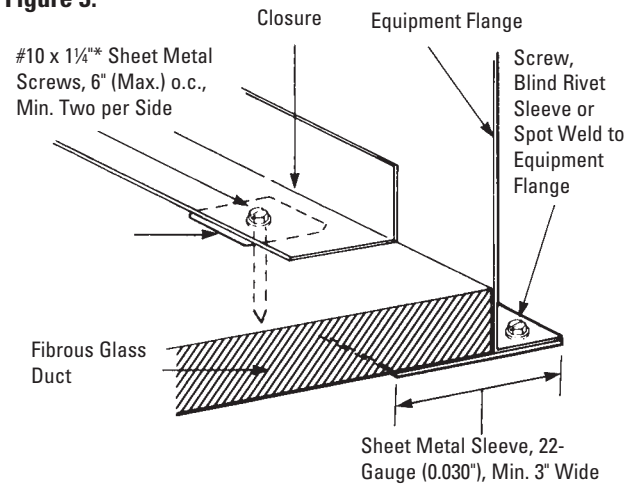


Figure 3.



Board Thickness	*Sheet Metal Screws
1"	#10 x 1¼"
1½"	#10 x 1¾"
2"	#10 x 2¼"

Board Thickness	**Sheet Metal Channel
1"	1" x 1" x 1"
1½"	1" x 1½" x 1"
2"	1" x 2" x 1"

Figure 4.

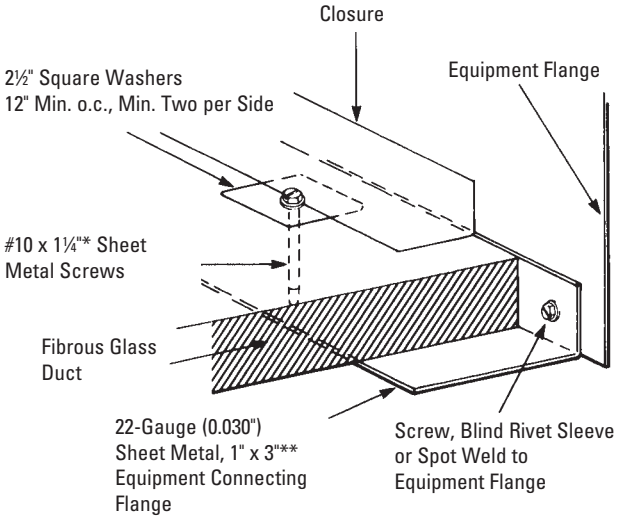
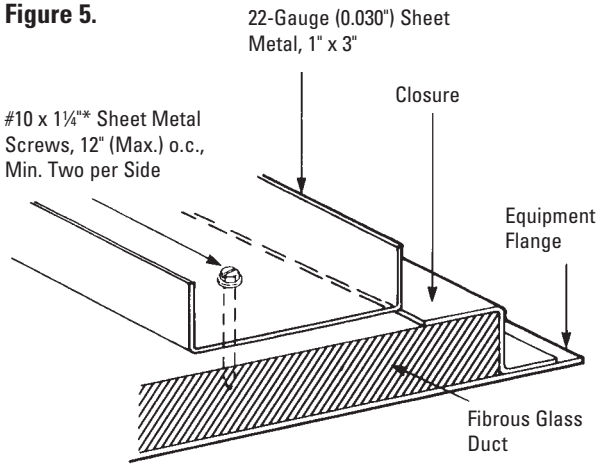


Figure 5.



Use this connection when
duct span is greater than 60" or
static pressure is greater than 1" w.c.

Board Thickness	*Sheet Metal Screws
1"	#10 x 1¼"
1½"	#10 x 1¾"
2"	#10 x 2¼"

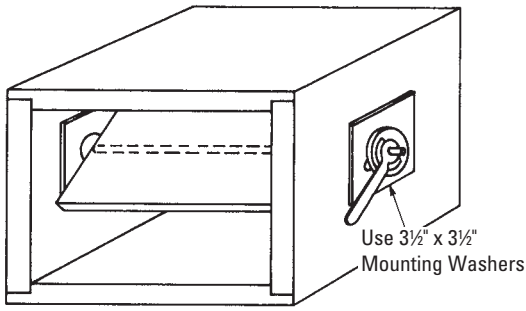
Board Thickness	**Equipment Connecting Flange
1"	1" x 3"
1½"	1½" x 3"
2"	2" x 3"

Accessories

Typical Suggested Connections for Installation of Accessories

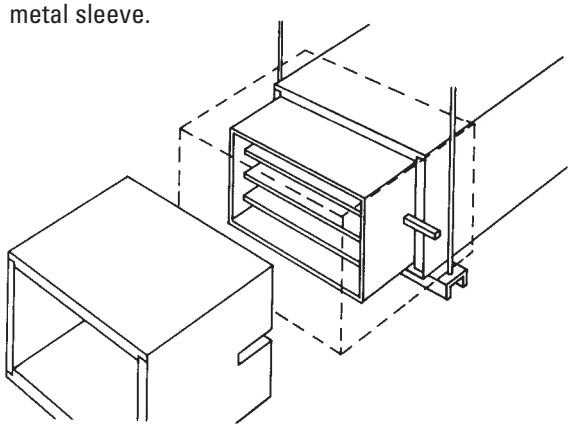
Additional accessory connection details may be found in the NAIMA Fibrous Glass Duct Construction Standard.

Single-blade Volume Damper



Multi-Blade Volume Dampers

1. Insert damper assembly and sleeve inside duct.
2. Put hanger directly under assembly.
3. Where damper motor and operator are used, attach motor and operator to an additional outer sheet metal sleeve.



Fire and Smoke Dampers

Consult the SMACNA Fire Damper Guide and the SMACNA Low-velocity Duct Construction Standard for details governing the construction of fire dampers and placement of fire dampers in walls.

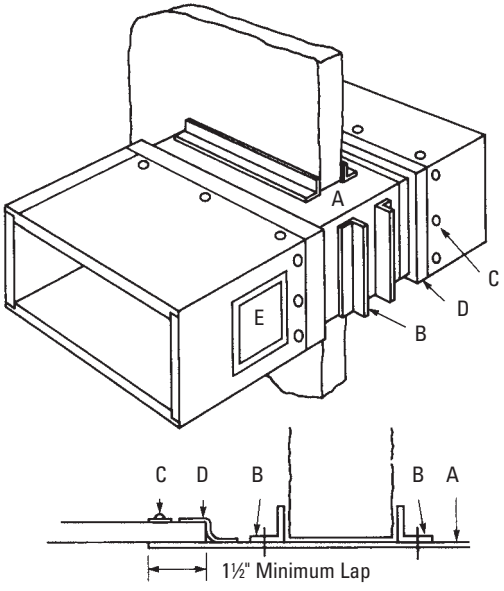
A. Metal sleeve for fire dampers should extend approximately 3" beyond each side of the wall to facilitate attachment of duct sections.

B. Angles attached to sleeve but not to wall. These are used on four sides of the duct and they must lap the wall 1" minimum.

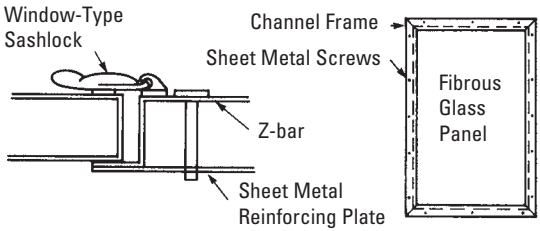
C. #10 sheet metal screw and 2½" square beveled washers, 0.028" minimum thickness. Use at least one per side, with a maximum interval of 12".

D. Tape closure to seal joint between duct and sleeve. If duct operating pressure is less than 1" w.c., use UL 181A-P listed tape. If duct static pressure is 1" w.c. or greater, glass fabric and mastic is required.

E. Access door (see page 91)



Duct Access Doors

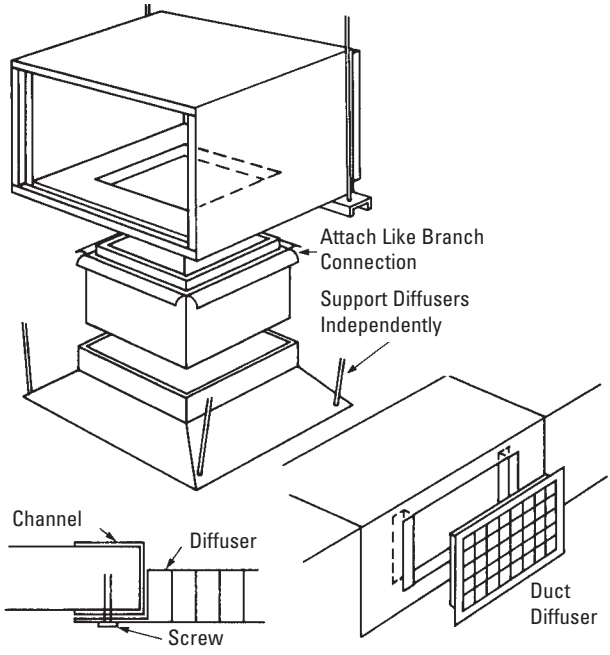


Typical conceptual sketch; commercial access doors are also available.

Mounting Diffuser

Rectangular or square

Where diffusers are less than 150 sq. in. and mounted directly in the wall of the duct, separate support is not required. Refer to the NAIMA manual and Johns Manville UL Fabrication Instructions for other means of diffuser support.



Johns Manville

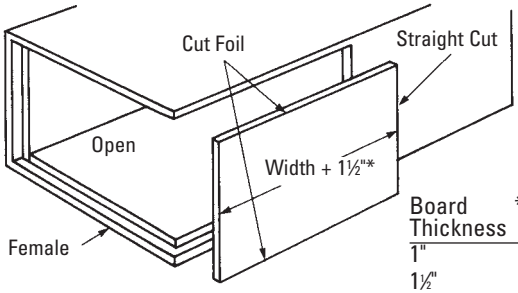
Notes

In general, shop fabrication is substantially more efficient than field fabrication. Field fabrication should be avoided unless adequate, clean and protected space as well as appropriate tools are available. When circumstances require that fittings be made in the field, the following suggestions should be considered.

Ells

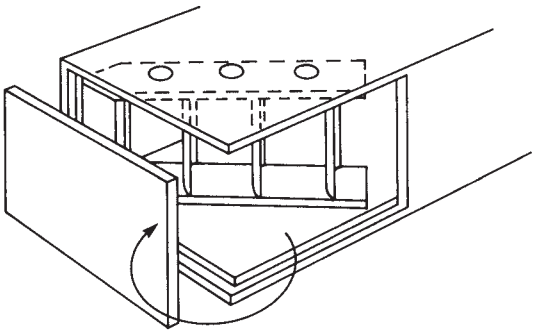
Start with a standard closed 4' or 8' length of duct.

1. Working from the female end, cut the throat rail 1½"* longer than the desired width I.D.

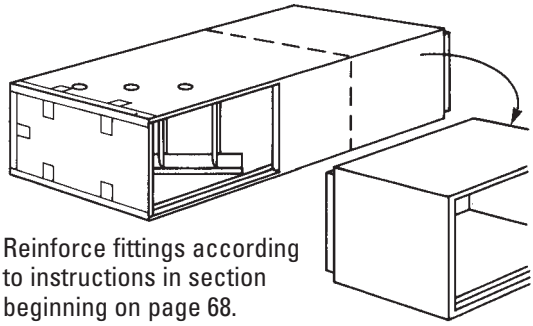


Board Thickness	*Cut Width Plus:
1"	1½"
1½"	2¼"
2"	3"

2. Install preassembled vane assemblies with screws and washers on 12" minimum centers, minimum two screws per side, to hold in place. The cut piece becomes the heel. Fiber glass air turning vanes are recommended in lieu of metal vanes and runners and should be installed by insertion into the cheeks of the ell, not with vane rail assemblies.



3. Place 8" cross tabs on the heel piece on minimum 12" centers (minimum one tab per side). Finish taping the joint. If the upstream throat must be shortened, cut off the male end to provide the required heel length with a male/female tool and attach the leftover piece to the downstream throat of the ell. Throat should be 4" or greater to allow secure closure.



4. Reinforce fittings according to instructions in section beginning on page 68.

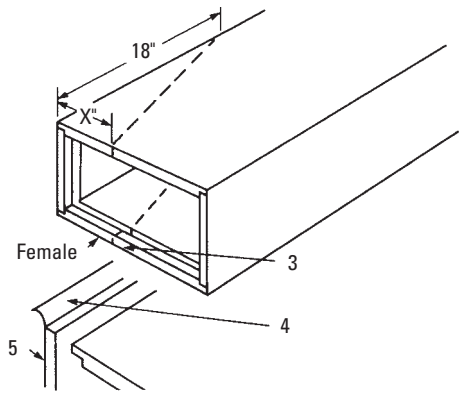
Note: Standard fiber glass air turning vanes (small cross-section) are typically installed 3" on center. One tie rod is required through the miter line for every five vanes even though the reinforcing schedule may not require tie rods for that duct size and static pressure. Air turning vane reinforcement is not a substitute for the duct or fitting reinforcement.

Transitions

Start with a standard closed 4' or 8' length of duct. Reduce size on the female end; use the longest practical length of change to minimize panel loss.

Width Reduction

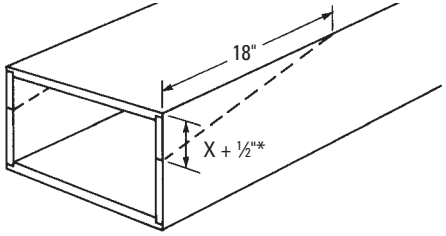
1. For a width reduction, use a transition layout tool or straight-edge ruler to mark off the exact inches to be reduced from the outside of the duct (X").
2. Determine length (L) of cut along duct section. Tip: Standardize transition length cuts (example: always make 2" reduction 18" down duct section, but never less than six times the reduction).
3. Using a straight edge, score the foil with a knife or tip of Cuts-All tool. Complete the cut with the Cuts-All tool making a shiplap cut in the top and bottom panels.



4. Skin glass away from facing and leave facing as a staple flap.
5. Fold in edge and staple flap.
6. Trim the remaining edges to match the rail length and replace the female edge.

Depth Reduction

1. For a depth reduction, mark off the inches to be reduced plus ½"* from the outside of the duct.
2. Determine length (L) of cut along duct section. Tip: Standardize transition length cuts (example: always make 2" reduction 18" down duct section, but never less than six times the reduction).
3. Using a straight edge, make straight knife cuts in the side panels, leaving staple flaps for assembly.
4. Staple and tape.
5. Trim the remaining edges to match the rail length and replace the female edge.



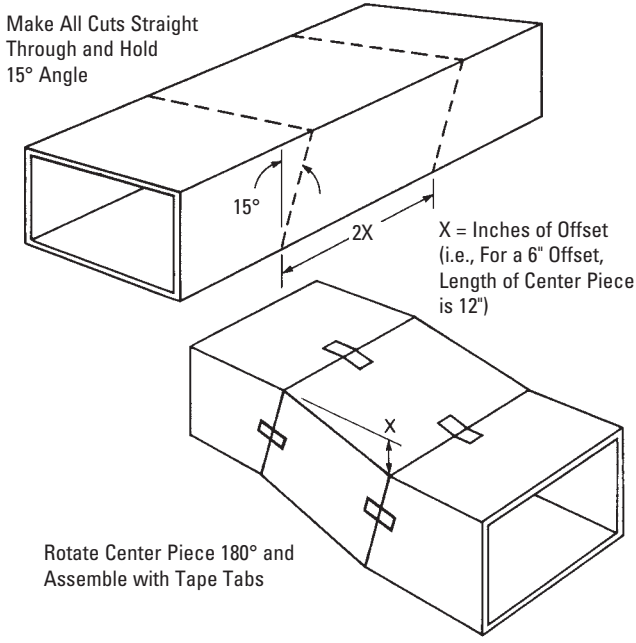
Board Thickness	*Depth Reduction Plus:
1"	½"
1½"	¾"
2"	1"

Offsets

30° One-way Offset

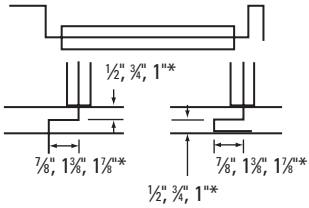
Use a standard closed 4' or 8' length of duct.

1. Mark the desired throat length, allowing at least 4" for closure application.
2. Using a 15° sheet metal template or angle-finder, score the foil across the duct span that will offset. Using a straight edge, score vertical lines on the two adjacent faces of the section. Turn the duct over and join those marks by scoring the opposite span, again using a straight edge.
3. Mark similar lines to produce a center piece twice the length of the offset distance.
4. Using the scored lines to guide your knife, carefully pull the knife through the duct section, maintaining the 15° angle. Avoid a sawing motion for best results.
5. Rotate the center piece 180°. Use cross tabs across the cuts in lieu of staple flaps (8" long, 12" on center, minimum one per side) and tape all joints.



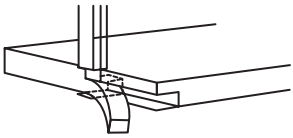
Using the Cuts-All Tool

The versatile Cuts-All male/female (M/F) shiplap hand tool is used to make male or female shiplaps on flat fiber glass board sheets or on closed duct modules. It eliminates butt joints by replacing them with a stronger, tighter shiplap configuration.

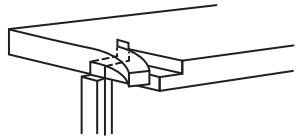


With a closed 4' section of duct, the Cuts-All tool, a straight knife and a straight edge, nearly any standard fitting can be field fabricated. The Cuts-All tool can form the following shiplap cuts:

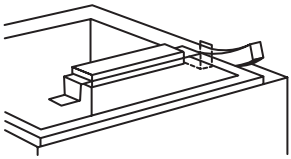
1. Flat Male



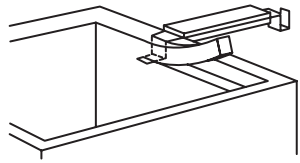
2. Flat Female



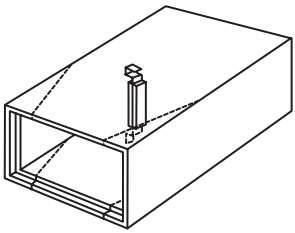
3. Closed Male



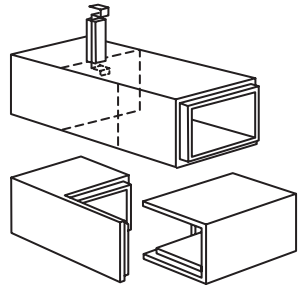
4. Closed Female



5. Closed Transition

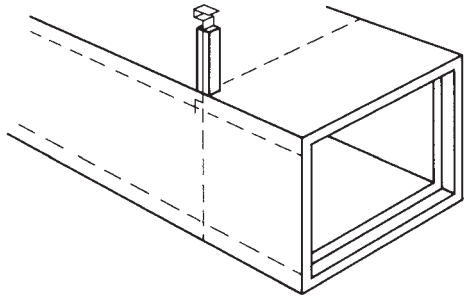


6. In-line Elbows



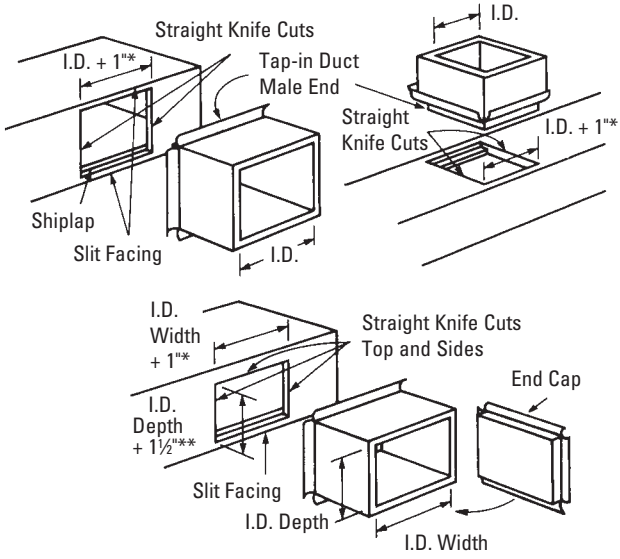
*Dimensions for 1," 1½" and 2" board thicknesses, respectively.

7. Multiple Cut. Use Cuts-All to cut section to length, simultaneously providing male and female ends.



End Joints and Tap-ins

When making straight duct sections or fittings out of board without factory-molded shiplaps (scrap or drop-off pieces), male and female end joints or tap-ins can be shiplapped using the appropriate end of the Cuts-All tool.



Board Thickness	*Cut I.D. Width Plus:
1"	1"
1½"	1½"
2"	2"

Board Thickness	**Cut I.D. Depth Plus:
1"	1½"
1½"	2¼"
2"	3"

Repairs

Accidental punctures or tears in the facing should be repaired to minimize leakage and provide a neat appearance. When patching SuperDuct RC Duct Board, use SuperSeal Edge Treatment (follow directions on container) or SuperSeal HV sealant on interior joints before replacing patch or panel.

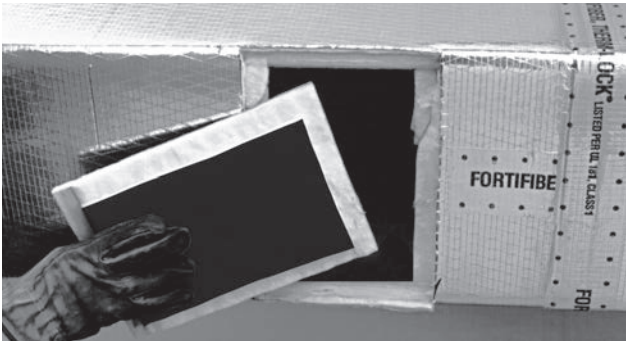
If the damaged area is small, repair with approved closure system. Where larger areas of the facing have been damaged, use the patch method. Significant damage of the facing and duct material may require replacement of the damaged duct wall.

Patch Method. Obtain a suitable piece of facing for use as a patch and apply with a minimum of 1" overlap on all edges. Cement edges down with an approved water-base duct adhesive and then tape over lap with approved closure.

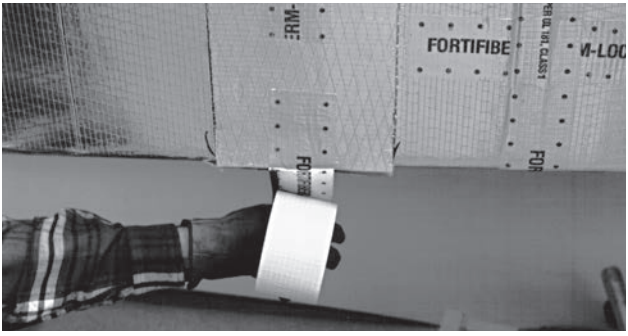
Panel Replacement Method. Large areas of damage to facing and duct wool require replacement of the damaged panel area, as illustrated below.

Damage to duct wall

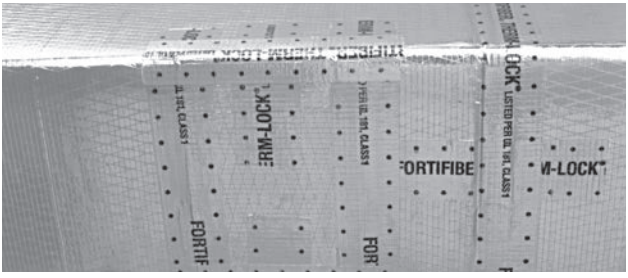
Cut out rectangular panel around damaged areas, utilizing Cuts-All tool to retain female joint.



Remove damaged panel and use as pattern for replacement section.



Insert replacement panel, using adhesive if fit is not snug. (Note: All systems operating at 2" w.c. or greater require adhesive.)



Use approved closure to seal the replacement panel in place.

Johns Manville

Job Inspection Checklist

Materials Needed	YES	NO
__ The Pocket Installer	( )	( )
__ NAIMA Fibrous Glass Duct Construction Standard, latest edition	( )	( )
__ Manufacturer's recommendations, where applicable	( )	( )
__ Submittal drawings	( )	( )
__ Plans and specifications for job	( )	( )
__ Measuring tape	( )	( )
__ Approved closure materials for repair of any openings required for proper inspection. See pages 36–41.	( )	( )

General

__ Is the fiber glass ductwork installed under the conditions permitted on page 16?	( )	( )
__ Is the system operating within the design limitations for which it was reinforced?	( )	( )
__ Have all tears or punctures of duct board facing been repaired in accordance with practices outlined on pages 100–102?	( )	( )
__ Are all sheet metal accessories fabricated of galvanized sheet metal?	( )	( )

Product

__ The type of the board must be identified by printing on the duct board facing. Is the board used in compliance with the engineer's specifications?	( )	( )
__ Check for UL label. Although each fiber glass board is labeled, each duct section may not be since there is only one label per board.	( )	( )

Fabrication and Installation

__ Are air turning vanes installed in accordance with NAIMA standards? (Pressing your hand into the cheek of the elbow will confirm fiber glass vane usage.)	( )	( )
__ When metal parts are attached, are 2½" square (minimum) or JM-approved round washers used on 12" (maximum) centers?	( )	( )

__ When staples can't be used, are 8" cross tabs of approved closure being used in place of the staples? (minimum one per side, on 12" maximum centers) ( ) ( )

__ Is system completely free of tears or punctures in the facing? Any facing and/or glass wool damage is easily repaired using the techniques described on pages 100–102. ( ) ( )

__ Is the system free of areas of excessive closure usage? Check areas with several transverse wraps or large areas of over-lapped tape to determine if they conceal incorrect fabrication or repairs. ( ) ( )

__ Are all system joints tight, free from bulges, with taped joints showing evidence of good workmanship? ( ) ( )

__ Are all fittings fabricated using Modular Duct Construction and displaying evidence of good workmanship? ( ) ( )

__ Have offsets been correctly fabricated and installed to prevent ductwork from bending around obstructions? ( ) ( )

Metal to Glass Connections and Accessories

Duct Heaters: Is interior sleeve present, properly attached with screws and washers on 12" (maximum) centers, with heater assembly separately hung or supported? (See NAIMA Manual, Section II for details.) ( ) ( )

Dampers: Where motorized dampers are used, is the sleeve extended so that the operator is mounted on the same sleeve as the damper? Where manual volume dampers are used, does the quadrant move a full 90°? See page 89 for typical examples. ( ) ( )

Fire Dampers: Is sheet metal sleeve present, with duct properly attached with screws and washers on 12" (maximum) centers? (Fiber glass ducts must not penetrate assemblies that are required to have fire dampers.) See page 90 for a typical example. ( ) ( )

Access Doors: Is installation in accordance with example on page 91 (or NAIMA Manual, Section II)? ( ) ( )

Grills, Diffusers and Registers: Is the extra weight of the item separately supported and not dependent upon the duct system for support? (Exception: Registers not greater than 150 square inches in area may be attached to the duct using metal channel, without additional support.) See page 91 for a typical example. ( ) ( )

Unit Connections: Are sheet metal screws and washers used to secure ductwork to metal sleeve or flange? (Securing the duct without mechanical fasteners is insufficient.) Is the correct closure used to seal the duct board facing to the metal sleeve or flange? See pages 86-88 for specific closure details. ( ) ( )

Closure

__ Are all joints in the system properly sealed? ( ) ( )

__ Are all closure materials labeled to indicate compliance with UL 181A (UL 181A-P for pressure-sensitive taped, UL 181A-H for heat-sealed closures). See pages 36–41 for closure details. ( ) ( )

__ Are all glass fabric and mastic closures utilizing mastics of a type listed on the UL instruction sheet (in each carton or pallet of duct board)? ( ) ( )

__ Are there staples or cross tabs, properly spaced, on the circumferential joints? ( ) ( )

__ Are staples, if used, of the correct type and size and spaced in proper intervals as recommended by the duct board manufacturer? ( ) ( )

__ Are all pressure-sensitive tape closures rubbed down adequately, with staples or scrim in the facing clearly visible through the tape? ( ) ( )

__ If heat-sealable closure was used, was it applied correctly, as evidenced by a darkening of the ABI dot color? ( ) ( )

__ If glass fabric and mastic are used, is the mesh of the glass fabric completely filled with mastic? ( ) ( )

Job Inspection Checklist

Reinforcement

__ Is the reinforcement system a JM (or NAIMA, if low pressure) recommended type? ( ) ( )
__ Is tie-rod wire 12-gauge (or heavier) steel? ( ) ( )
__ Is tie rod spacing correct according to the duct span, board type and static pressure? ( ) ( )
__ Are tie-rod washers 2½" square (or proper diameter round, as specified by JM) and of the correct galvanized steel gauge, 0.028" minimum thickness with edges turned away from duct board facing to prevent cutting into it? ( ) ( )
__ If tie rods are used to reinforce a butt joint, are rods used on both sides of the joint? ( ) ( )
__ Is wire termination of a type documented on pages 56–58? ( ) ( )
__ Do tie rods run straight through the ducts and not at angles? ( ) ( )
__ Are heels of tees, elbows and end caps properly reinforced when required by duct size, board type and static pressure? (Tie wires, formed metal channel and adhesives may be used alone or in combination.) ( ) ( )
__ When adhesive is used, is it the correct type as specified by JM? ( ) ( )
__ When formed metal channel or angle is used, are sheet metal gauges, dimensions and spacing correct?
__ On supply ducts, is reinforcing member installed on the female side of the shiplap? ( ) ( )
__ On return ducts, are sheet metal channel reinforcements attached with screws and 2½" square washers or 2" x 6" metal clips (see NAIMA Manual)? ( ) ( )
__ On return ducts, is the reinforcing member attached to the male shiplap side of the joint? ( ) ( )

__ For the heels of tees, elbows, end caps and any other fittings where a panel faces an opening on the opposite side, is correct reinforcing member (sheet metal channel, tie wires, adhesives or a combination of these) applied? ( ) ( )

Hangers and Supports

__ Are hangers installed in accordance with pages 78–85? ( ) ( )

__ Are hanger designs in accordance with those shown on pages 78–85? ( ) ( )

__ Are accessories that add weight to the duct system separately supported so as not to stress the system? ( ) ( )

__ Are vertical risers limited to systems serving two stories and supported on 12' (maximum) centers? ( ) ( )

__ Are all fittings supported by hangers in accordance with pages 78–85? ( ) ( )

Additional information regarding products contained in **The Pocket Installer** and other Johns Manville thermal insulations and systems is available in a variety of electronic and print media.

717 17th St.
Denver, CO 80202
specJM.com

North American Sales Offices, Insulation Systems

Eastern Region
P.O. Box 158
Defiance, OH 43512
(800) 334-2399
Fax: (419) 784-7866

Western Region and Canada
P.O. Box 5108
Denver, CO 80217
(800) 368-4431
Fax: (303) 978-4661

North American Insulation Manufacturer's Association (NAIMA)

(703) 684-0084
www.naima.org

Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

(703) 803-2980
www.smacna.org

Glass Master

2420 McIver Lane, Suite 101
Carrollton, TX 75006-6500
(800) 874-9135
Fax: (972) 484-5555

Amcraft

P.O. Box 349
5144 Enterprise Blvd.
Toledo, OH 43612
(419) 729-7900 (orders)

Trademarks

SuperDuct® RC Air Handling System, Mat-Faced Micro-Aire® Duct Board and **SuperSeal® Coating Products** are registered trademarks of Johns Manville.

Wide Board™ Duct Board is a trademark of Johns Manville.

Johns Manville

Notes

717 17th St
Denver, CO 80202
(800) 654-3103
specJM.com

JMCOM120130

AHS-3 05/12 (Replaces 04/10)