Small Duct High Velocity Certification Training

February 26th 2026

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House Keeping

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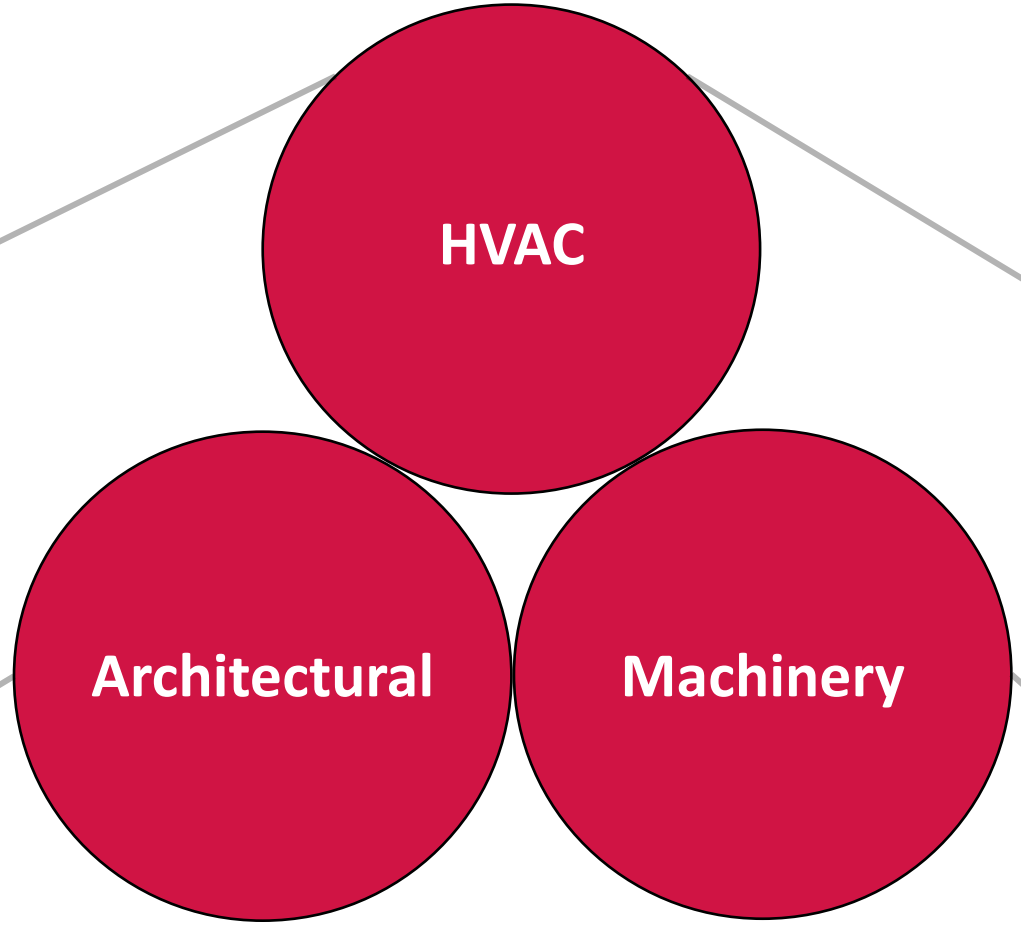
Questions typed into the chat bar will be answered via written reply or by our trainer during the Q&A sessions, or throughout the presentation.

Mestek, Inc

- Established 1946 in Westfield, MA
- Privately owned
- Over 45 companies involved in the HVAC, Architectural, & Metal Forming Machinery & fabrication industries
- Began with founder John Reed and original Fin Tube Radiation in 1946 as Sterling Radiator Company
- 1975 Reed National
- 1986 merger becomes Mestek
- SpacePak joins Mestek family in 1991

Mestek Today

Residential
- Hydronic baseboard
- Hydronic heating fan coils
- Hydronic & gas-fired unit heaters
- Small duct high velocity
- Air to water heat pumps
- Equipment Controls
- Radiant tubing



Commercial
- High-efficiency boilers & water heaters
- Air source and water source heat pumps
- CO2 heat pump water heaters
- Hydronic chilled beams
- Rooftop and makeup air units
- Hydronic baseboard & convectors
- Hydronic & gas-fired unit heaters
- Portable air conditioners

- Monumental glass skylights
- Panel systems
- Ornamental metal products
- Sunshades
- Louvers
- Vision/sunscreens
- Architectural grilles

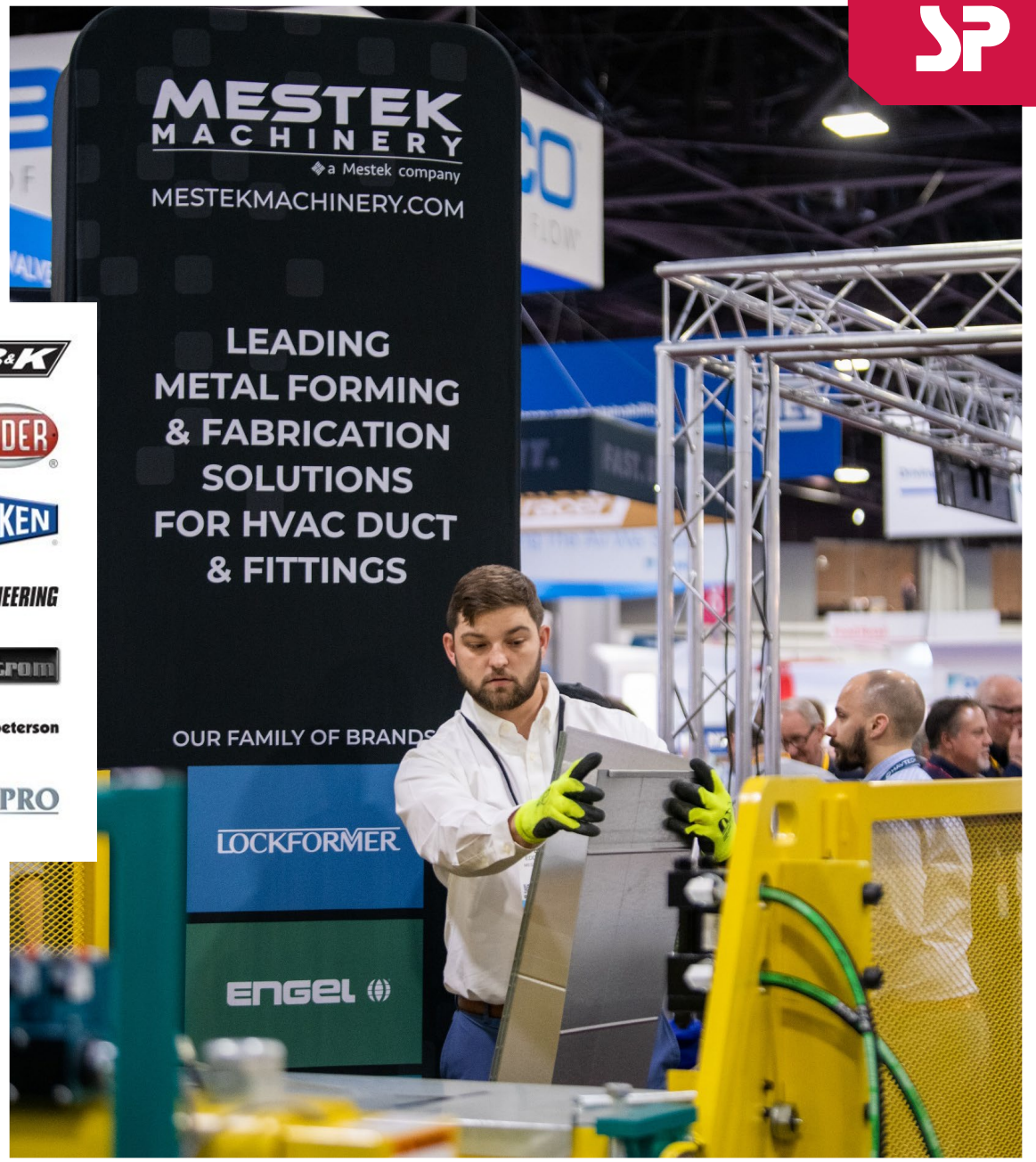
- Sheet metal forming
- Sheet metal cutting
- Coil material handling
- Duct fabrication
- Spiral fitting & tube forming
- Hydraulic sheet metal bending

Architectural

- Monumental glass skylights
- Panel systems
- Ornamental metal products
- Sunshades
- Louvers
- Vision/sunscreens
- Architectural grilles

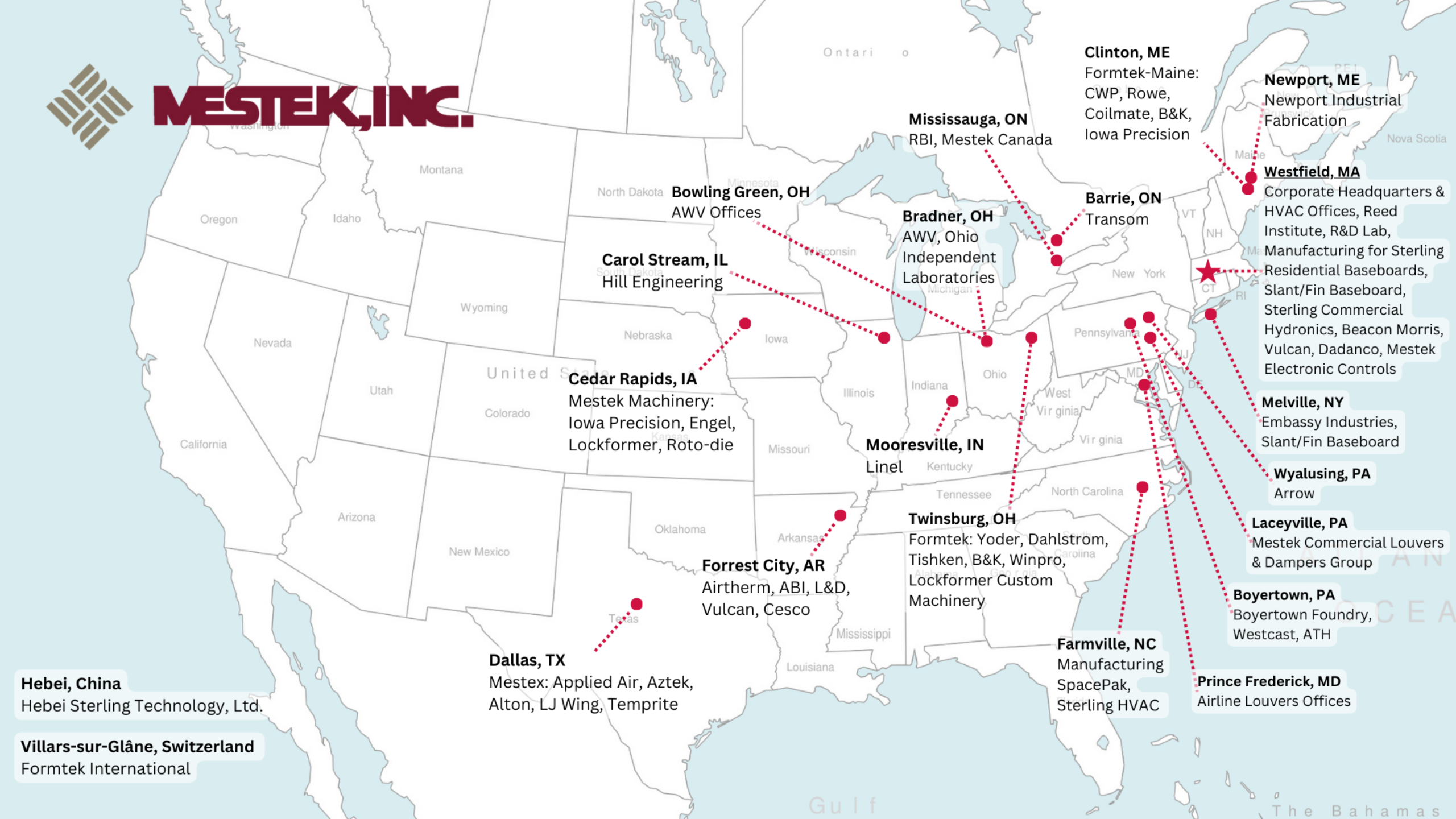
Machinery

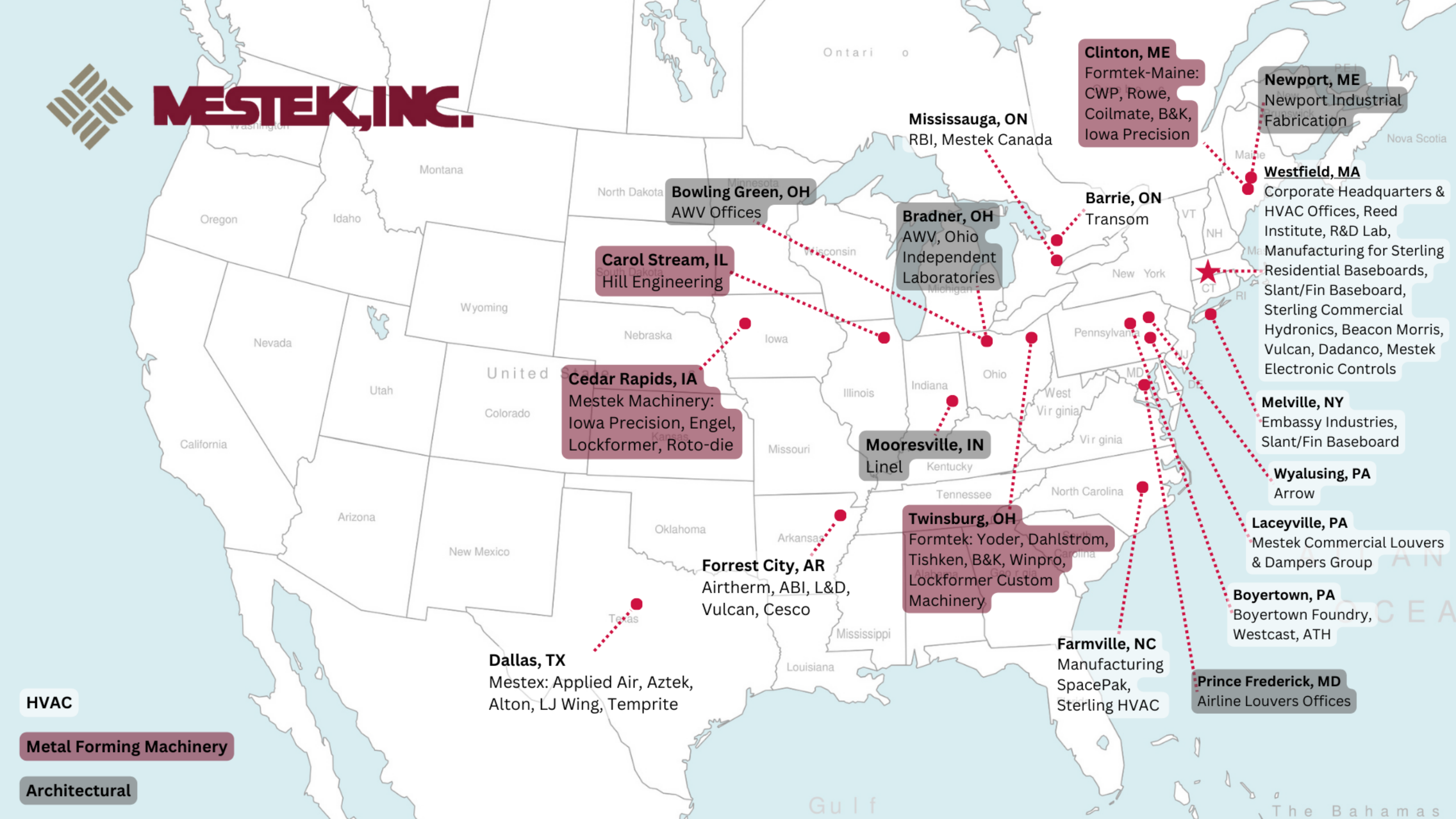
- Sheet metal forming
- Sheet metal cutting
- Coil material handling
- Duct fabrication
- Spiral fitting & tube forming
- Hydraulic sheet metal bending



HVAC (Residential & Commercial)

- Hydronic fin-tub baseboard & convectors
- High-efficiency commercial boilers & water heaters
- Hydronic & gas-fired unit heaters
- Air source and water source heat pumps
- CO2 heat pump water heaters
- Hydronic chilled beams
- Rooftop and makeup air units
- Portable air conditioners
- System control technology


MESTEK, INC.
Clinton, ME
Formtek-Maine: CWP, Rowe, Coilmate, B&K, Iowa Precision
Newport, ME
Newport Industrial Fabrication
Mississauga, ON
RBI, Mestek Canada
Westfield, MA
Corporate Headquarters & HVAC Offices, Reed Institute, R&D Lab, Manufacturing for Sterling Residential Baseboards, Slant/Fin Baseboard, Sterling Commercial Hydronics, Beacon Morris, Vulcan, Dadanco, Mestek Electronic Controls
Barrie, ON
Transom
Bowling Green, OH
AWV Offices
Bradner, OH
AWV, Ohio Independent Laboratories
Carol Stream, IL
Hill Engineering
Cedar Rapids, IA
Mestek Machinery: Iowa Precision, Engel, Lockformer, Roto-die
Mooresville, IN
Linel
Melville, NY
Embassy Industries, Slant/Fin Baseboard
Wyalusing, PA
Arrow
Laceyville, PA
Mestek Commercial Louvers & Dampers Group
Twinsburg, OH
Formtek: Yoder, Dahlstrom, Tishken, B&K, Winpro, Lockformer Custom Machinery
Forrest City, AR
Airtherm, ABI, L&D, Vulcan, Cesco
Boyertown, PA
Boyertown Foundry, Westcast, ATH
Farmville, NC
Manufacturing SpacePak, Sterling HVAC
Prince Frederick, MD
Airline Louvers Offices
Dallas, TX
Mestex: Applied Air, Aztek, Alton, LJ Wing, Temprite
Hebei, China
Hebei Sterling Technology, Ltd.
Villars-sur-Glâne, Switzerland
Formtek International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Dallas, TX
Mestex: Applied Air, Aztek, Alton, LJ Wing, Temprite
HVAC
Metal Forming Machinery
Architectural

Westfield, MA - Mestek Home Base

CORPORATE HEADQUARTER OFFICES

- Product & Engineering
- Sales & Marketing
- Executive Level Management
- Customer & Technical Service
- Accounting & Finance
- Human Resources & Legal
- IT & Technology

RESEARCH & DEVELOPMENT LAB

- New product development
- Product testing
- Performance testing

MANUFACTURING

- All residential baseboard lines
- Beacon Morris unit kickspace heaters
- Sterling Commercial
- Dadanco
- Vulcan
- MTI Controls

TRAINING CENTER & LIVE-FIRE SHOWROOM

- SpacePak
- Commercial Boilers
- Commercial Heat Pumps
- Show room

Jim Bashford

SpacePak National Sales & Training Manager

Jim has been with SpacePak for over 9 years. In addition to his role as National Sales and Training Manager, Jim has used his extensive knowledge of all SpacePak products to continually expand his role within the company, taking on greater responsibility with the training side of the business including instructing our SpacePak Systems and Applications seminars.

Before joining the SpacePak team, Jim was a manufacturer's representative for three years working with a variety of HVAC products. He has over 25 years of experience in the HVAC industry which includes experience as a contractor and business owner where he spent many years selling and installing SpacePak products.

Meet the Team

Jared Stearns
Product Manager

Allyson Moauro
Product Management Assistant

Eric Rainey
Application Engineer / Inside Sales

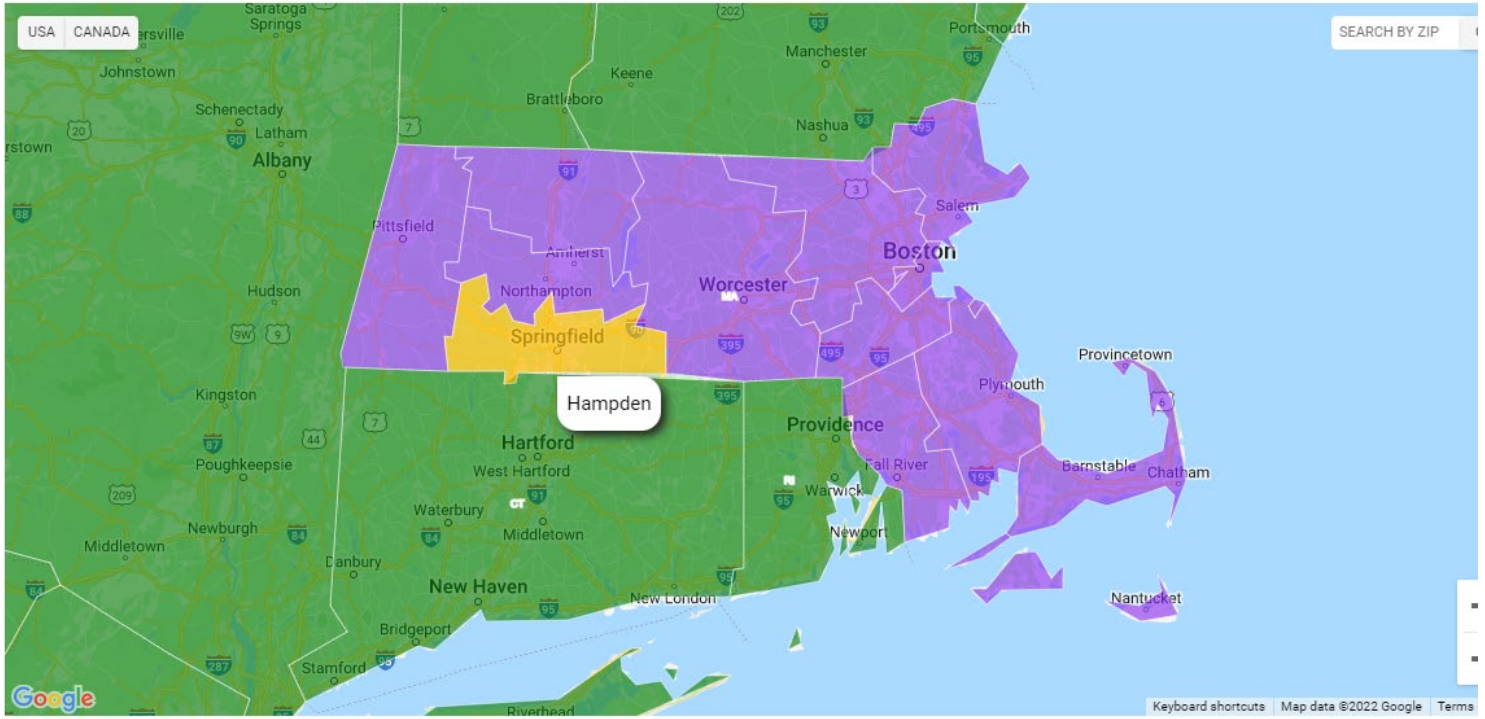
Meagan Harrington
Marketing Manager

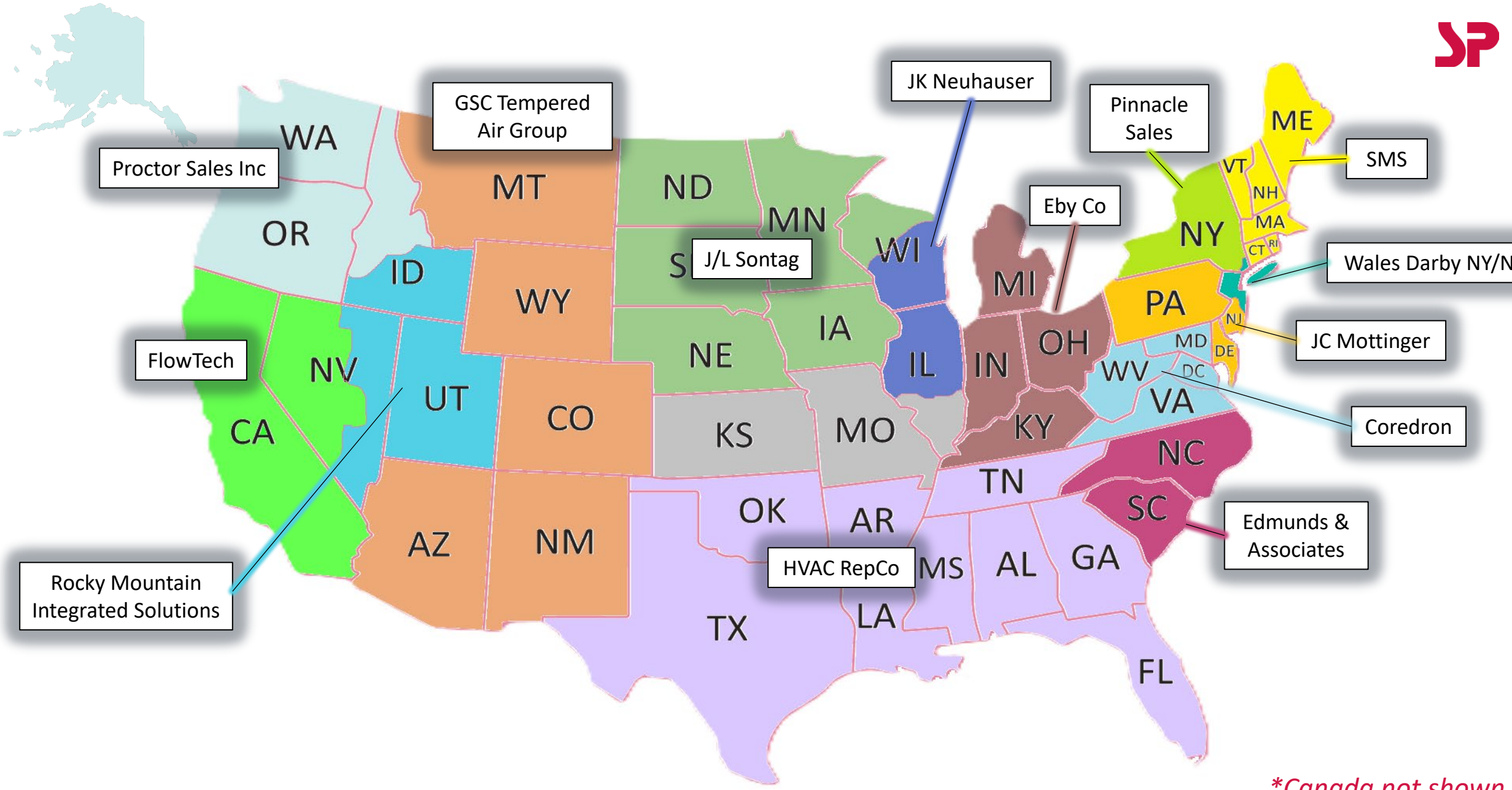
Farmville, NC
Mestek / SpacePak Manufacturing Facility


Westfield, MA
Mestek / SpacePak Corporate Headquarters

Local Representative Support

For all local field support, including **pricing, availability, and project questions**, please contact your local SpacePak Representative. For contact information visit: www.spacepak.com/RepLocator





**Canada not shown*

US Manufacturer Representative Network

Pre-Sale Application Support Team

PreSaleSupport@SpacePak.com

Available to Representatives, Wholesalers and Contractors

- System application support
- Equipment selection
- Load calculation and rough material list

Any questions regarding equipment already shipped should be directed to

TechnicalService@SpacePak.com (413) 564 - 5530

Warranty Program

Small duct high velocity, hydronic fan coils, & associated equipment

Standard Warranty

- 1-year parts

Extended Warranty

- 5-year parts*

Extended Warranty Requirements*

- Must be listed as a SpacePak Certified Contractor at time of installation
- Must register project/equipment via the website
- Must follow warranty process which includes calling technical support to verify proper diagnoses

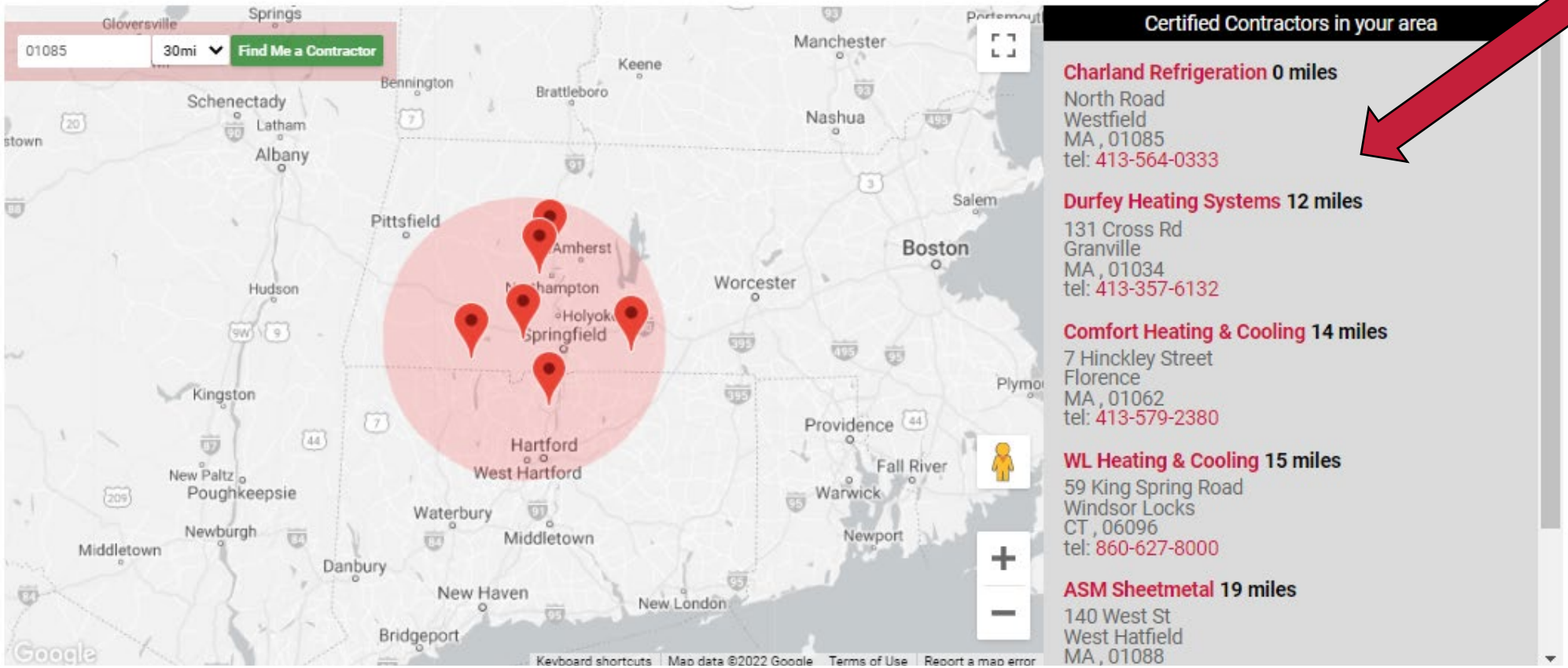
Certified Contractor Program

- Extended warranty*
- Listed on website
- Homeowner leads
- Pre-sale support
- Marketing support – co-op dollars

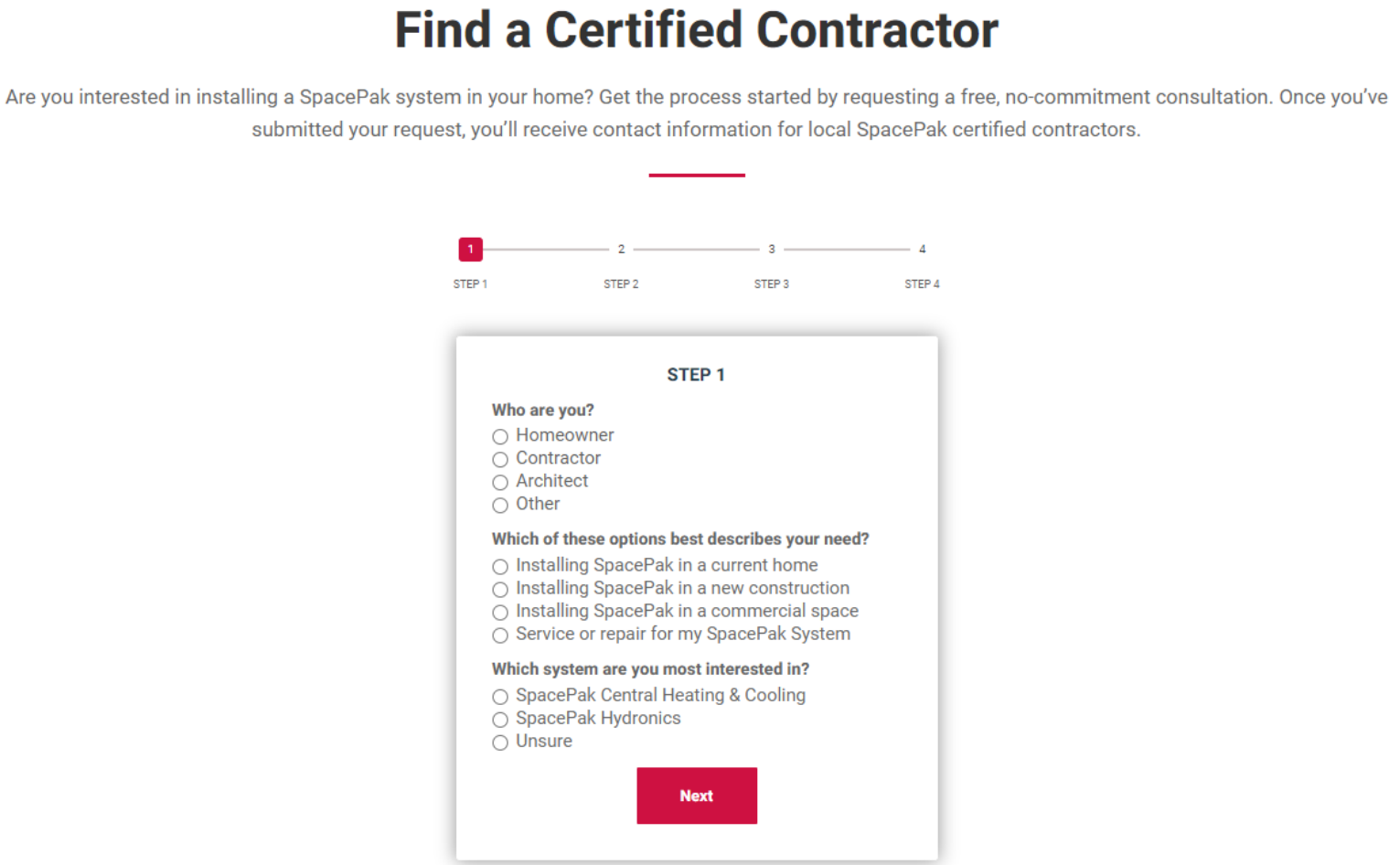
**with project registration*

Contractor Locator Map & Lead Generation

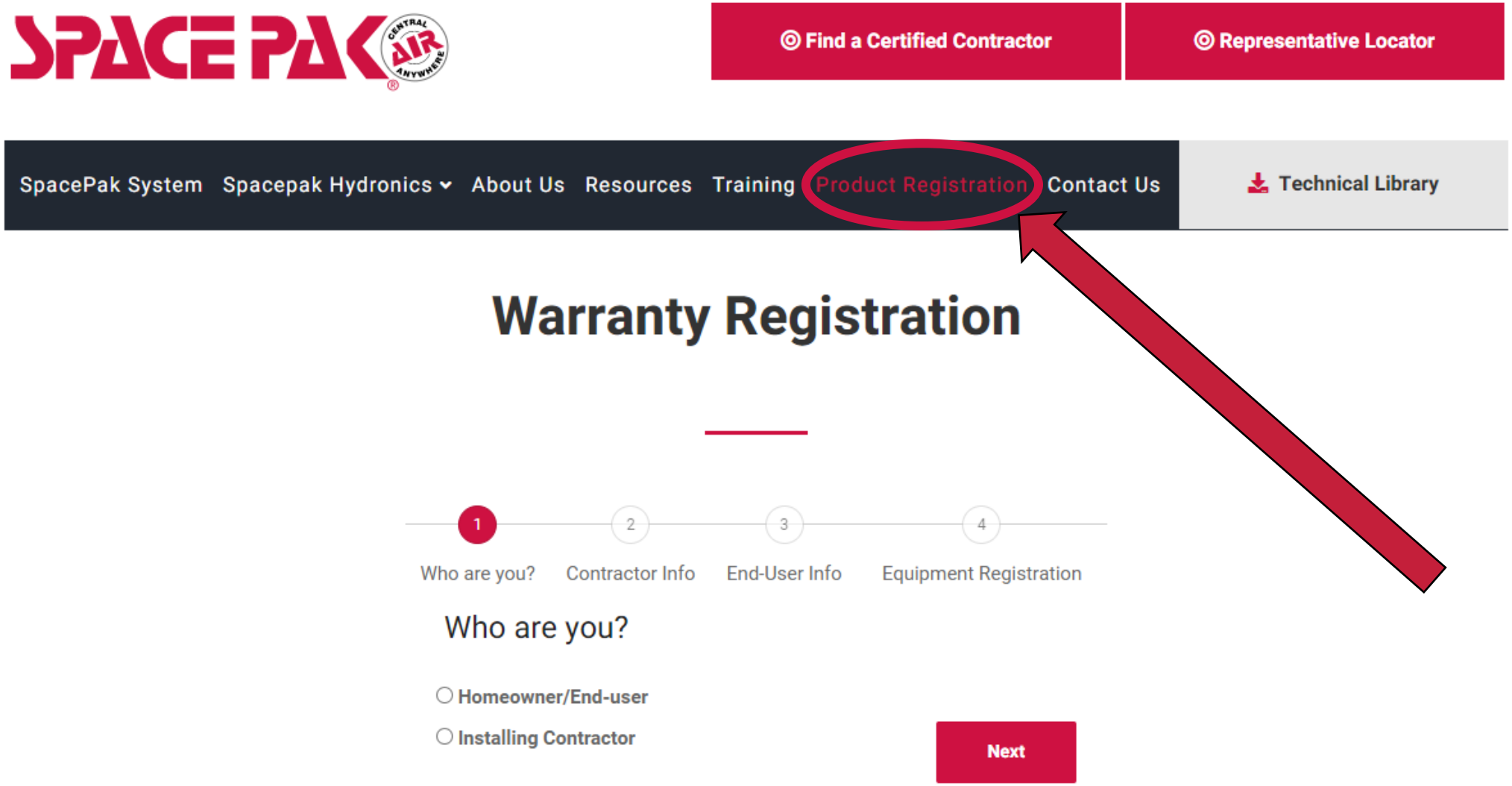
Your Company Here



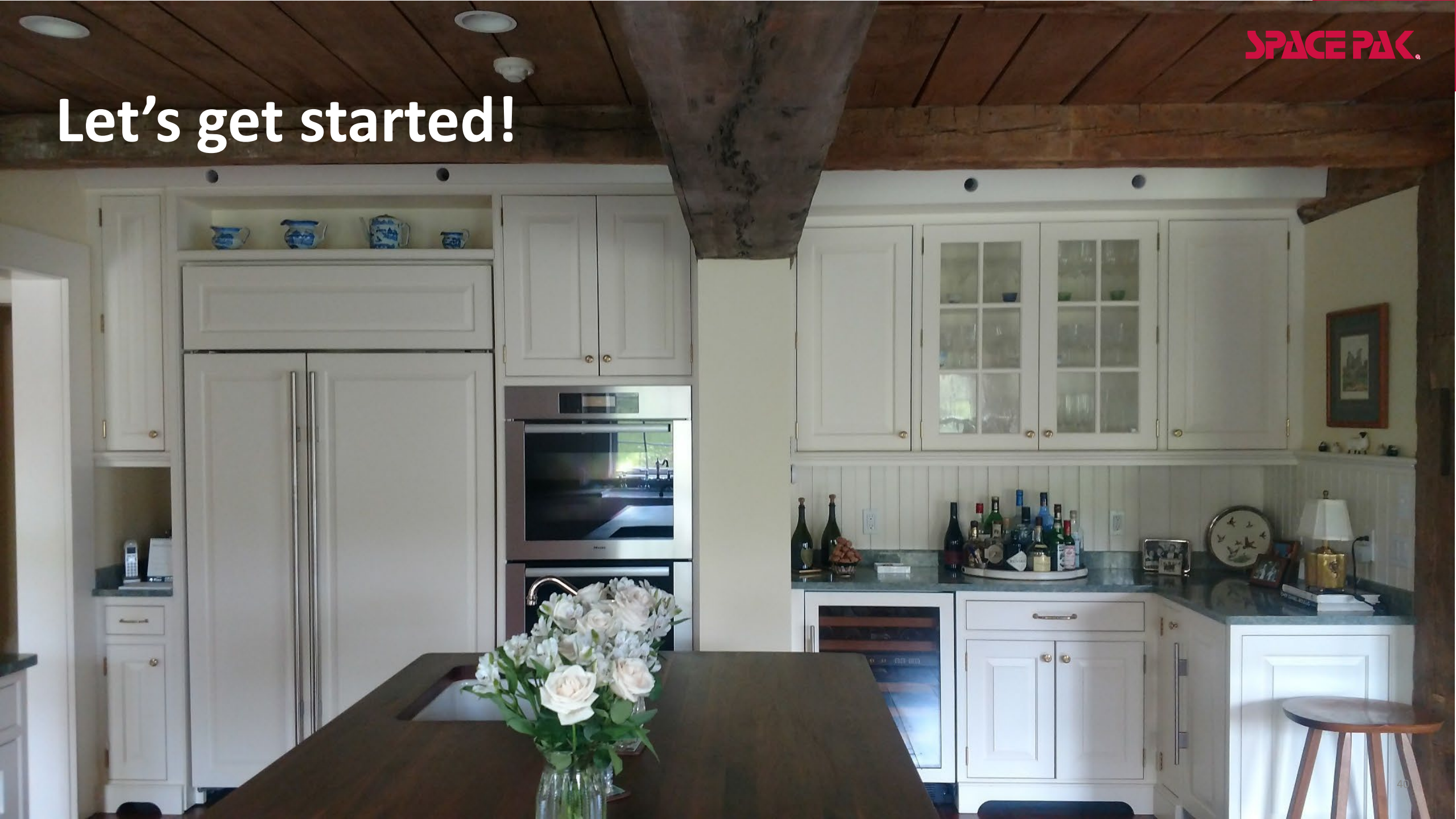
Homeowner Leads Emailed Directly to you



NOTE: Extensive form guarantees only serious inquiries.


Find a Certified Contractor
Representative Locator
SpacePak System
Spacepak Hydronics
About Us
Resources
Training
Product Registration
Contact Us
Technical Library
Warranty Registration
1
2
3
4
Who are you?
Contractor Info
End-User Info
Equipment Registration
Who are you?
Homeowner/End-user
Installing Contractor
Next

Let’s get started!



Small Duct High Velocity (SDHV) Heating & Cooling

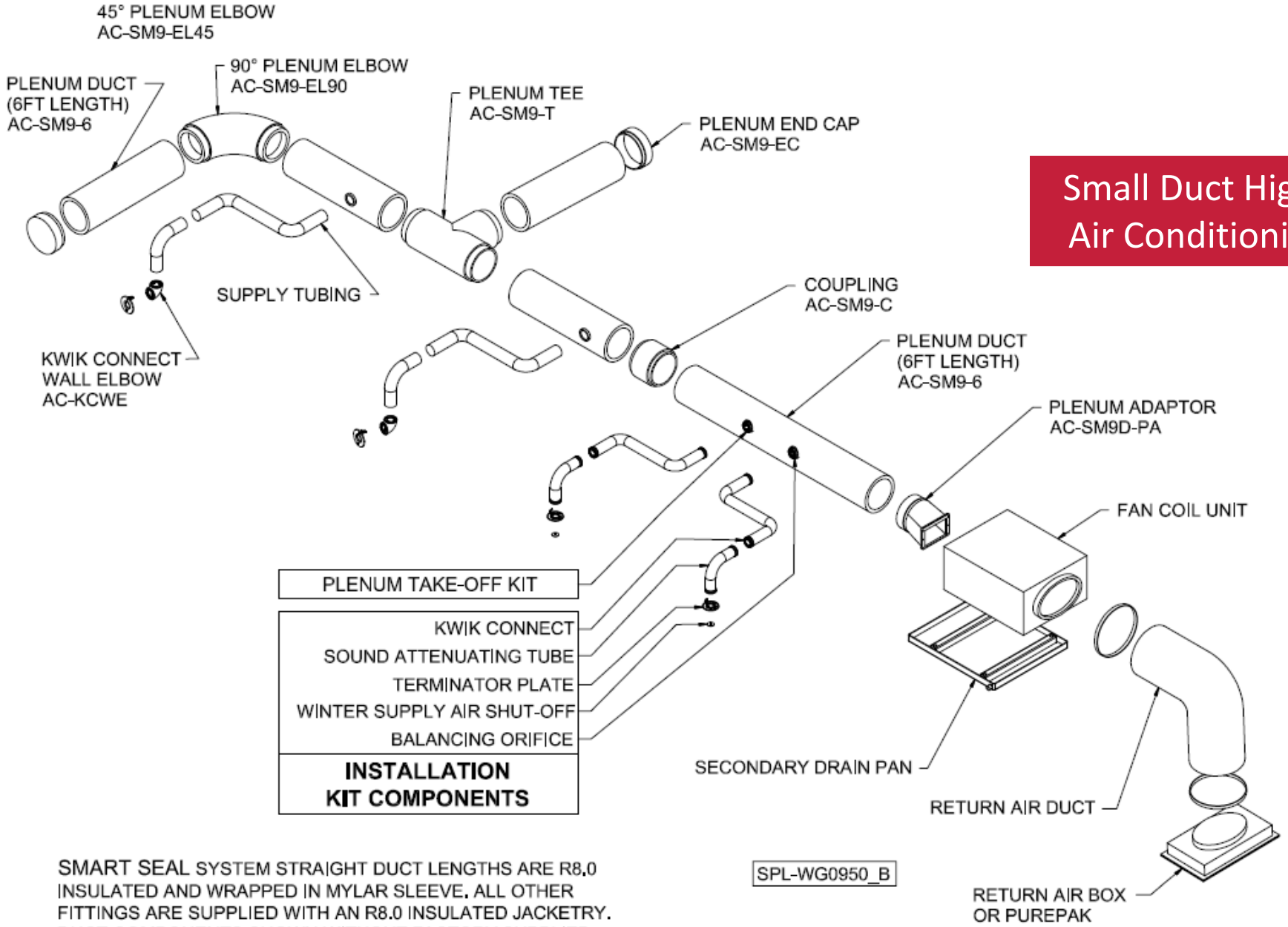
- Delivers uniform, year-round comfort, with fewer of the unwanted challenges common to other central heating and air-conditioning systems. Makes sure there are:
  - **No** Major Renovations
  - **No** Loss of Usable Floor Space
  - **No** High Energy Bills
  - **No** Unsightly Components

- Simply quiet, cost-effective comfort for virtually any home or building, regardless of the structure's design, age, size, or construction type.

- An air distribution system that uses a principle known as aspiration - as the air stream enters the room, it creates a gentle mixing of air in the room to provide thorough, comfortable draft-free air circulation.

- Eliminates stratification with a minimum floor-to-ceiling temperature difference.

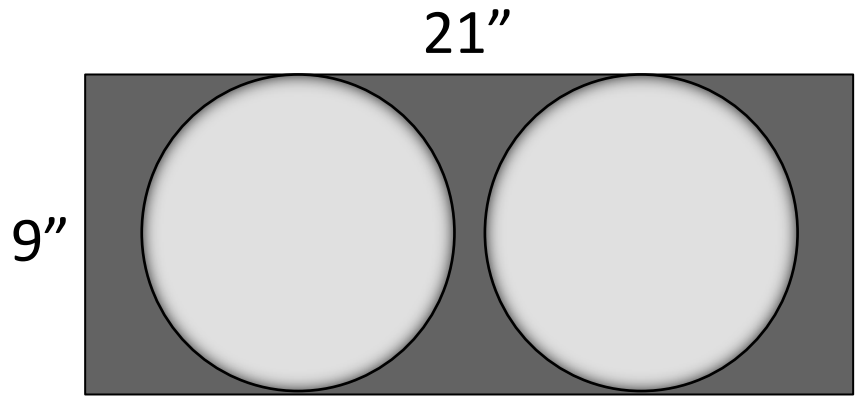
Small Duct High Velocity Heating and Air Conditioning Distribution System



SMART SEAL SYSTEM STRAIGHT DUCT LENGTHS ARE R8.0 INSULATED AND WRAPPED IN MYLAR SLEEVE. ALL OTHER FITTINGS ARE SUPPLIED WITH AN R8.0 INSULATED JACKETRY. DUCT COMPONENTS SHOWN WITHOUT FACTORY SUPPLIED R8.0 INSULATED JACKETRY.

Comparing Conventional Duct Space Vs. Small Duct Space

When space and efficiency counts

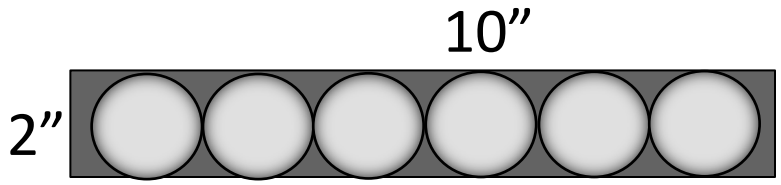


1 CONVENTIONAL TRUNK
60,000 Btu Cooling
90-120,000 Btu Heating

=

2 SDHV MAIN TRUNK SIZE
120,000 Btu

SAME SPACE. MORE BTU’s.



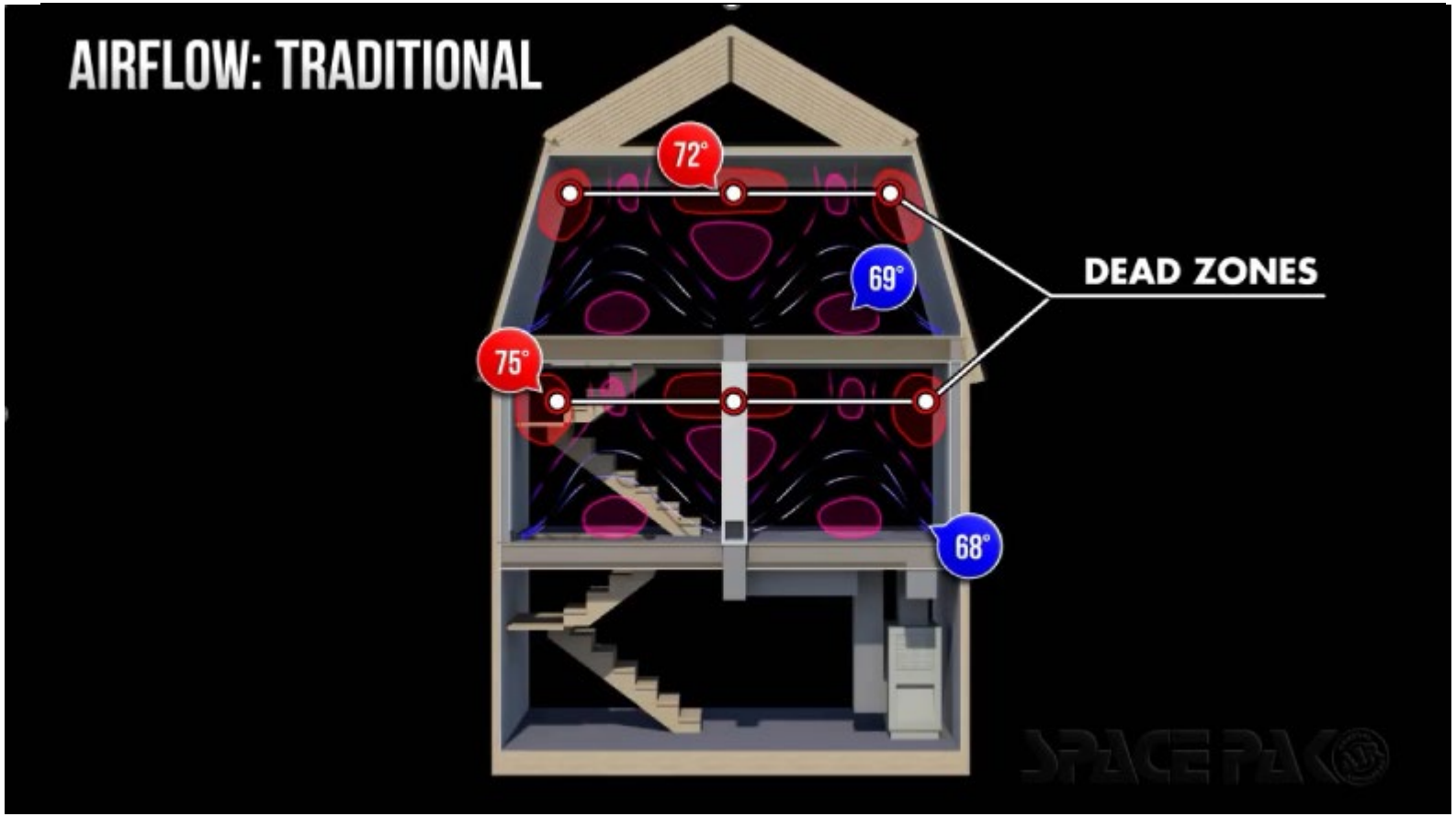
1 CONVENTIONAL DUCT
2,000 Btu cooling
3,000+ Btu Heating

=

6 SDHV DUCTS
12,000 Btu

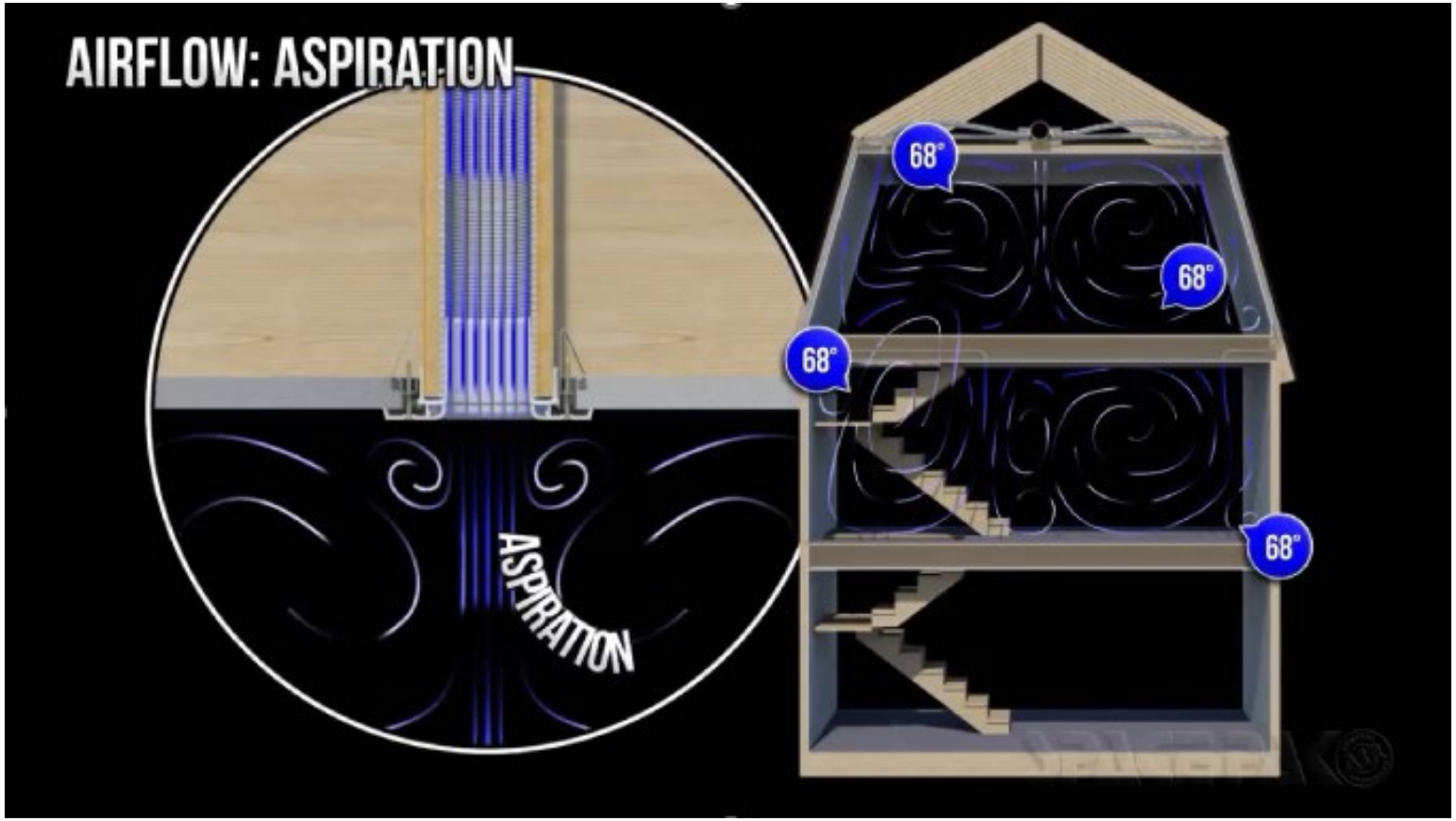
Conventional Air Distribution

- Diffusion, throw, & return
- Conventional units generally need individual returns for every room
- Needs complete air change
- Works for and is generally designed for heating or cooling applications. NOT BOTH.

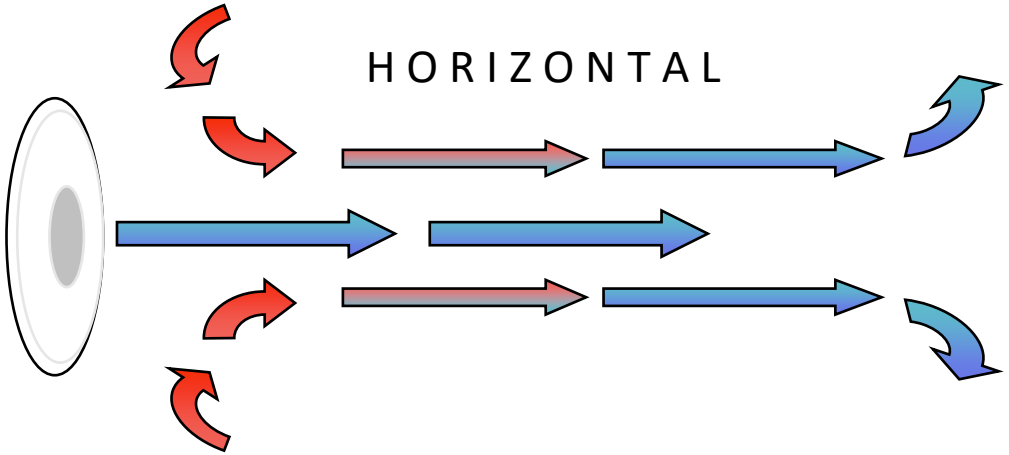


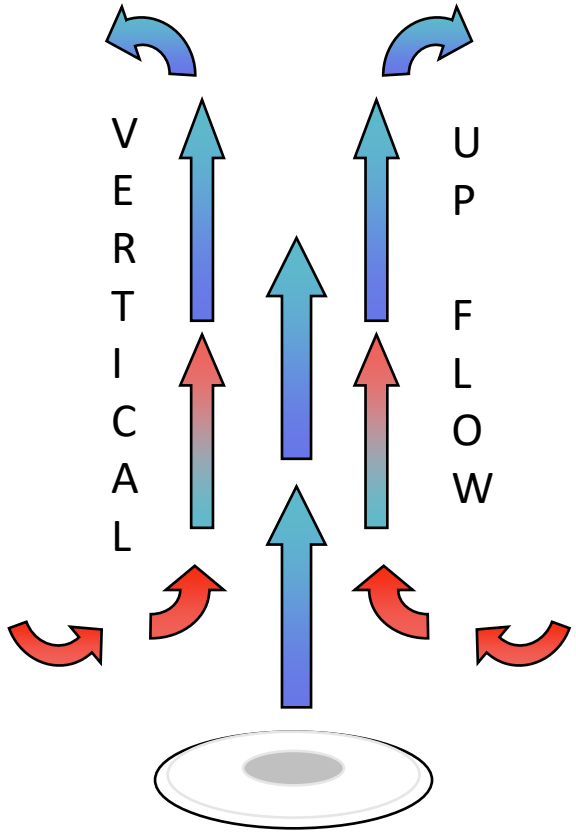
Uniform, Draft-Free Comfort

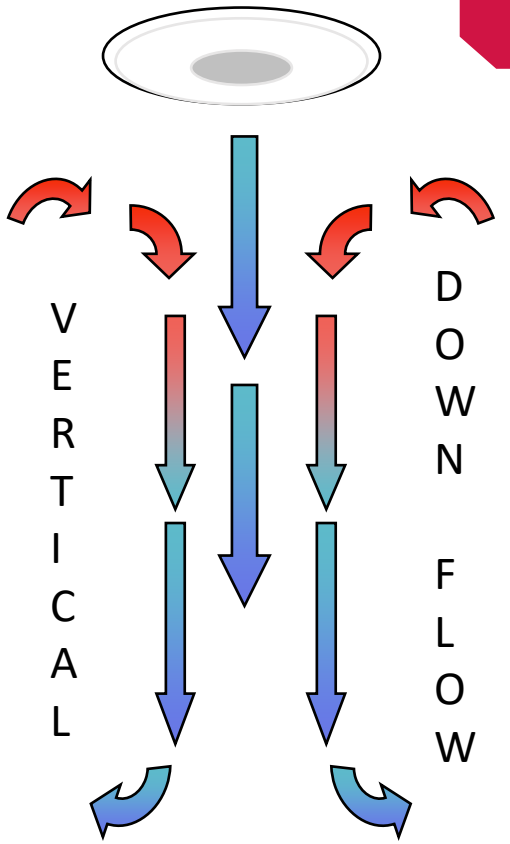
- The SDHV air distribution system utilizes a principle known as **aspiration.**
- As the air stream enters the room, it gently and continuously mixes air to provide uniform, draft-free air circulation.
- Eliminates stratification with a less than 2°F floor-to-ceiling temperature differential.



Outlet Orientation



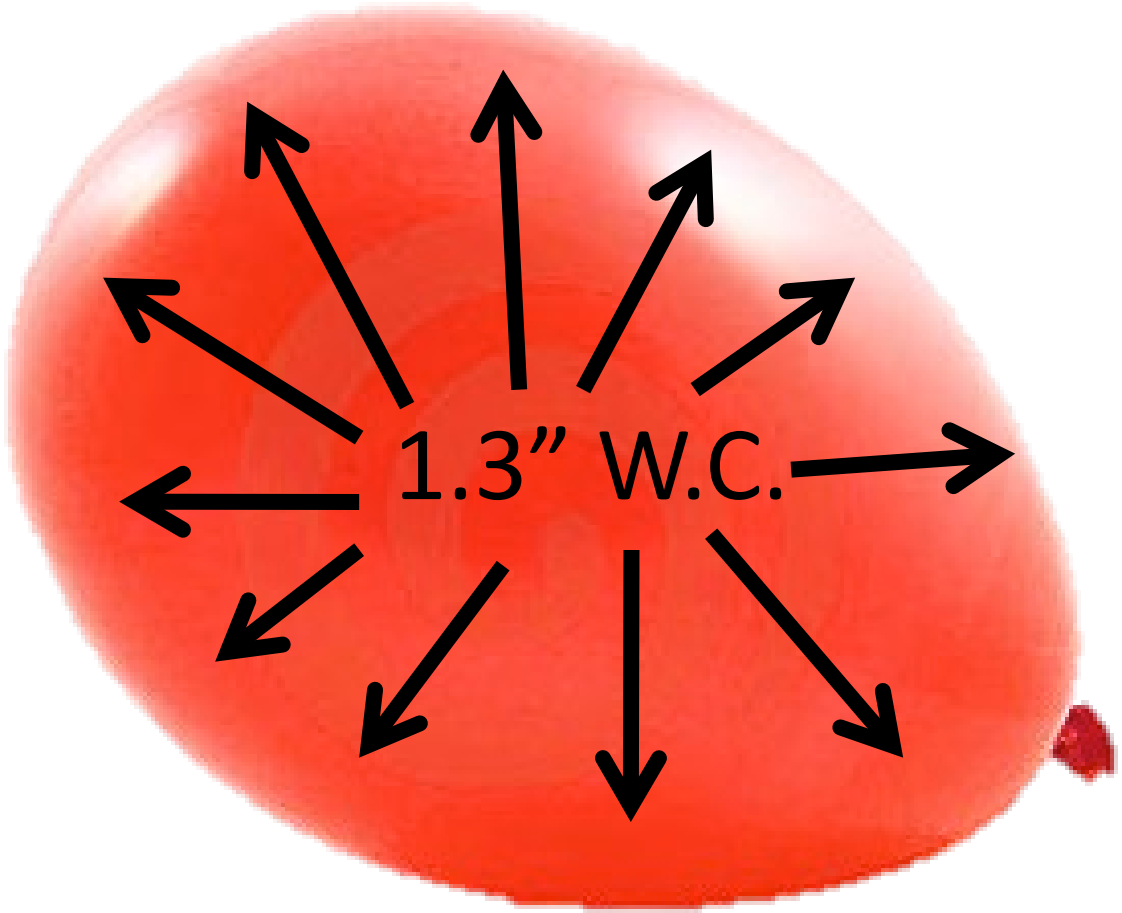




Motor & Blower

SPACEPAK	CONVENTIONAL
1.2 - 1.8 + INCHES WC STATIC PRESSURE	**.5 INCHES** WC STATIC PRESSURE
220 TO 250 CFM PER NOMINAL TON	**350 TO 400 CFM** PER NOMINAL TON

Static = Equal pressure on all inside surfaces



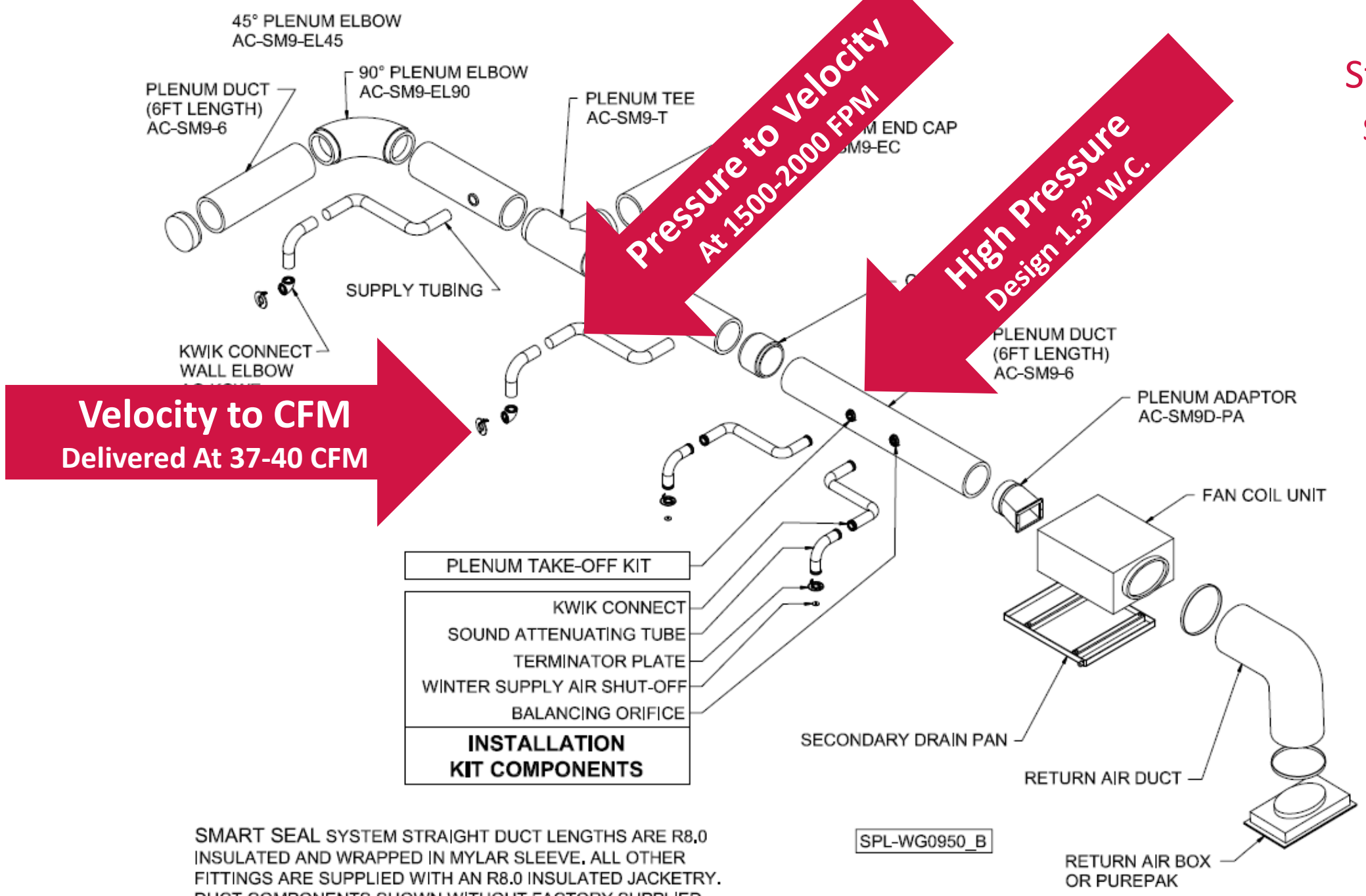
The Process of Static Regain

(It's about the pressure)

MAIN PLENUM

Static Regain

System layout and target pressures



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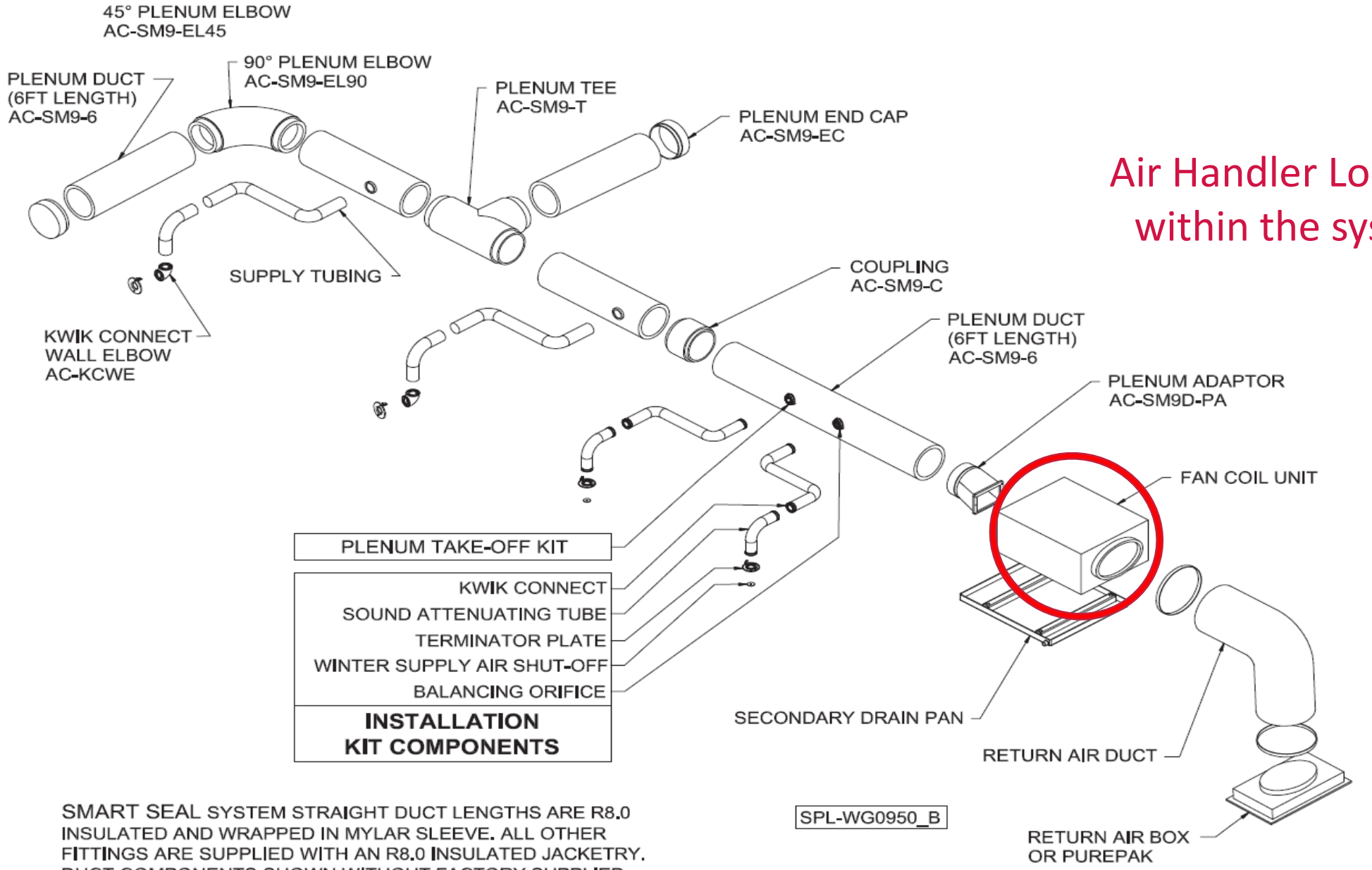
Questions

Air Handler Location within the system



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R-32 and R-454B Approved Units

K Series

ESP-K
DX Horizontal

ESP-KV
DX Vertical

Horizontal Fan Coil Unit Dimensions

Model	Height	Width	Length	Ship Wt.
ESP2430K	14-1/8" (359 mm)	24-1/4" (616 mm)	29-3/8" (747 mm)	105 lbs (47.6 kg)
ESP3642K		33-1/4" (845 mm)		123 lbs (55.8 kg)
ESP4860K		43-1/4" (1099 mm)		144 lbs (65.3 kg)

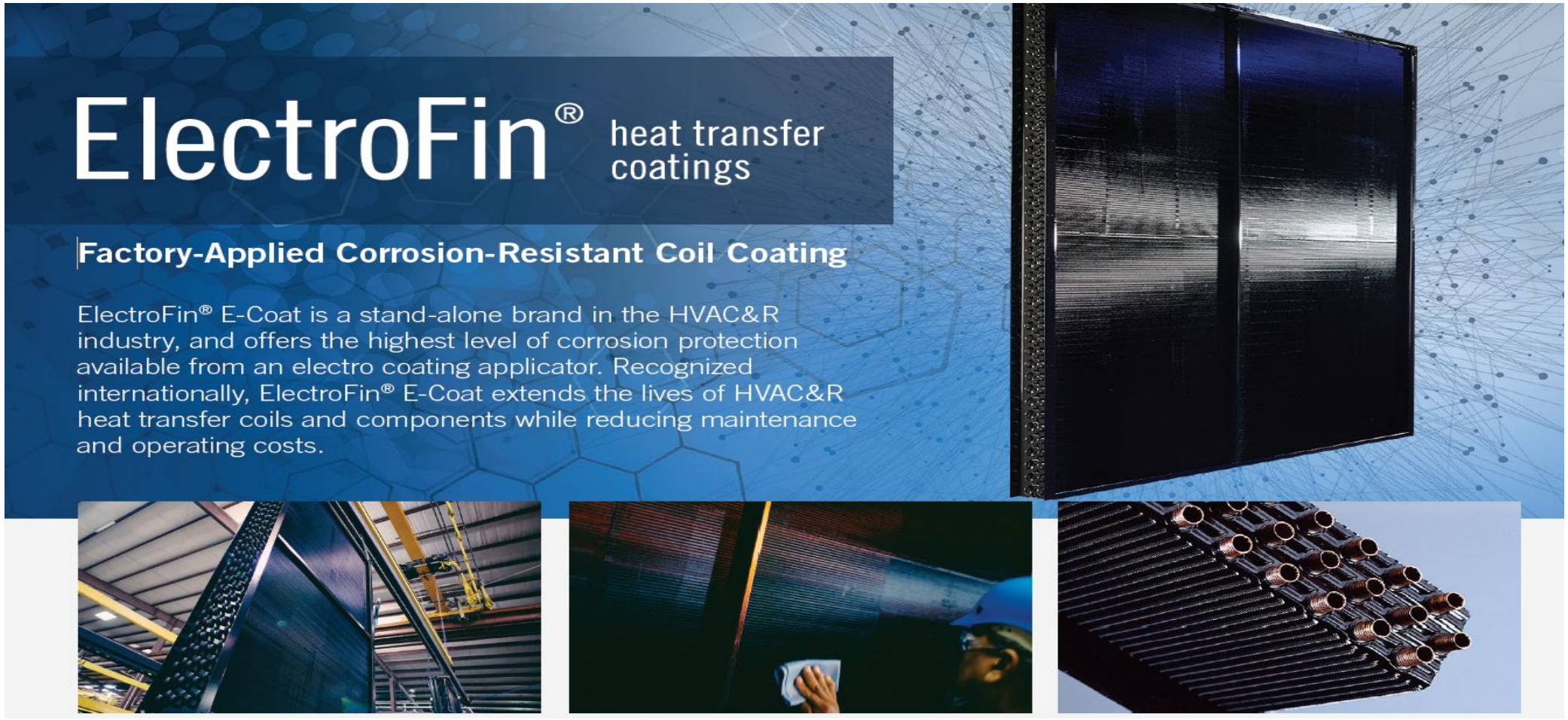
Vertical Fan Coil Unit Dimensions

Model	Height	Width	Length	Ship Wt.
ESP2430KV	33" (838mm)	24" (610 mm)	16-1/8" (410 mm)	135 lbs (61.2 kg)
ESP3642KV		33" (838 mm)		170 lbs (77.1 kg)
ESP4860KV		43" (1093 mm)		210 lbs (95.3 kg)

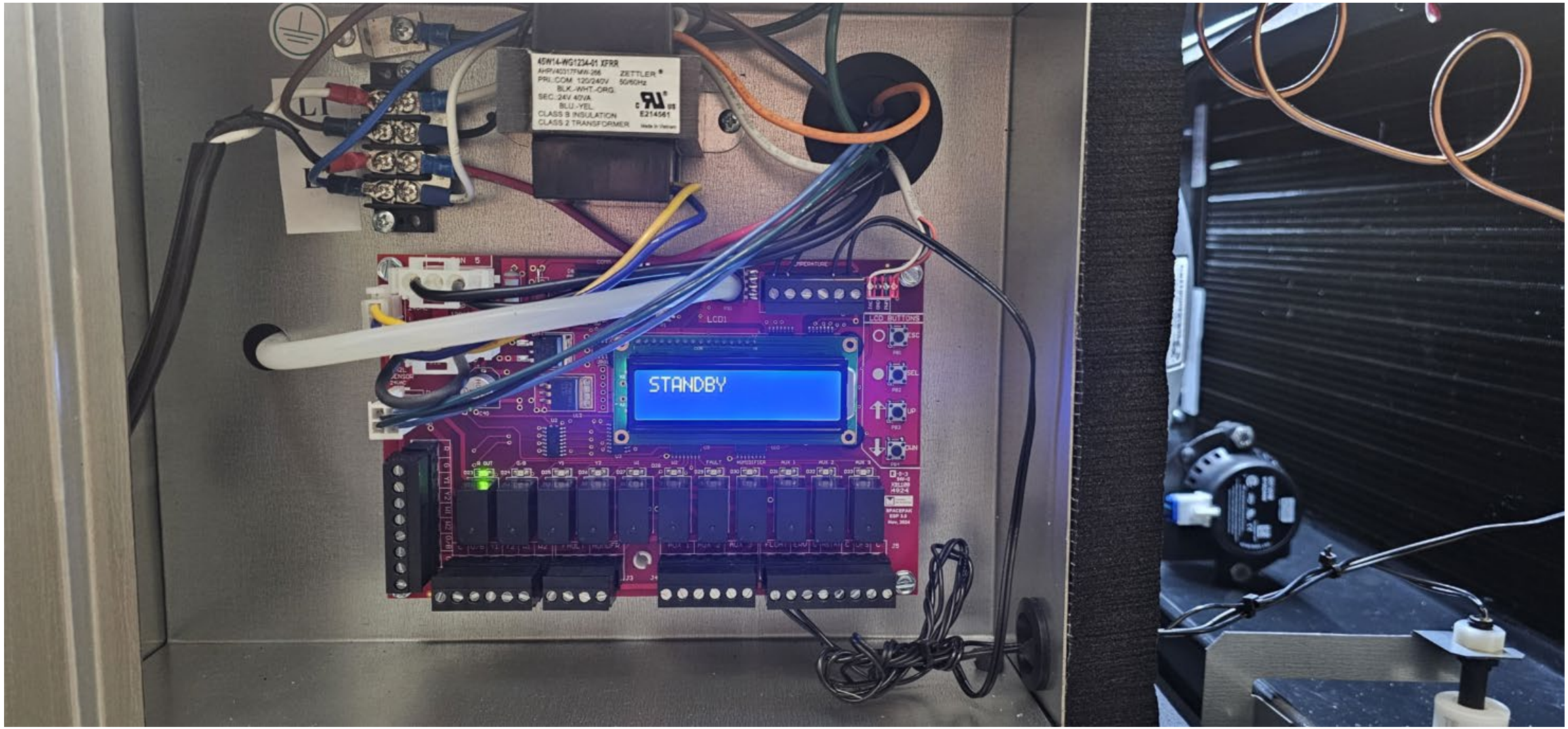
Specifications

Model	Nominal System Capacity		Std. CFM @ 1.2" W.C.	Std. m³/hr @ 299 Pa	F.L. Amps (115V/230V)	Motor HP	Connections	
	Nom. Tons	Cool MBH (kW)					Suction Line	Liquid Line
ESP2430K/V	2	24 (7.03)	440	748	5.6/2.8	3/4	7/8"	3/8"
	2-1/2	30 (8.79)	550	935				
ESP3642K/V	3	36 (10.55)	660	1121	7.6/3.8	3/4	7/8"	3/8"
	3-1/2	42 (12.31)	850	1444				
ESP4860K/V	4	48 (14.07)	880	1495	10.6/5.3	3/4	7/8"	3/8"
	5	60 (17.58)	1150	1954				

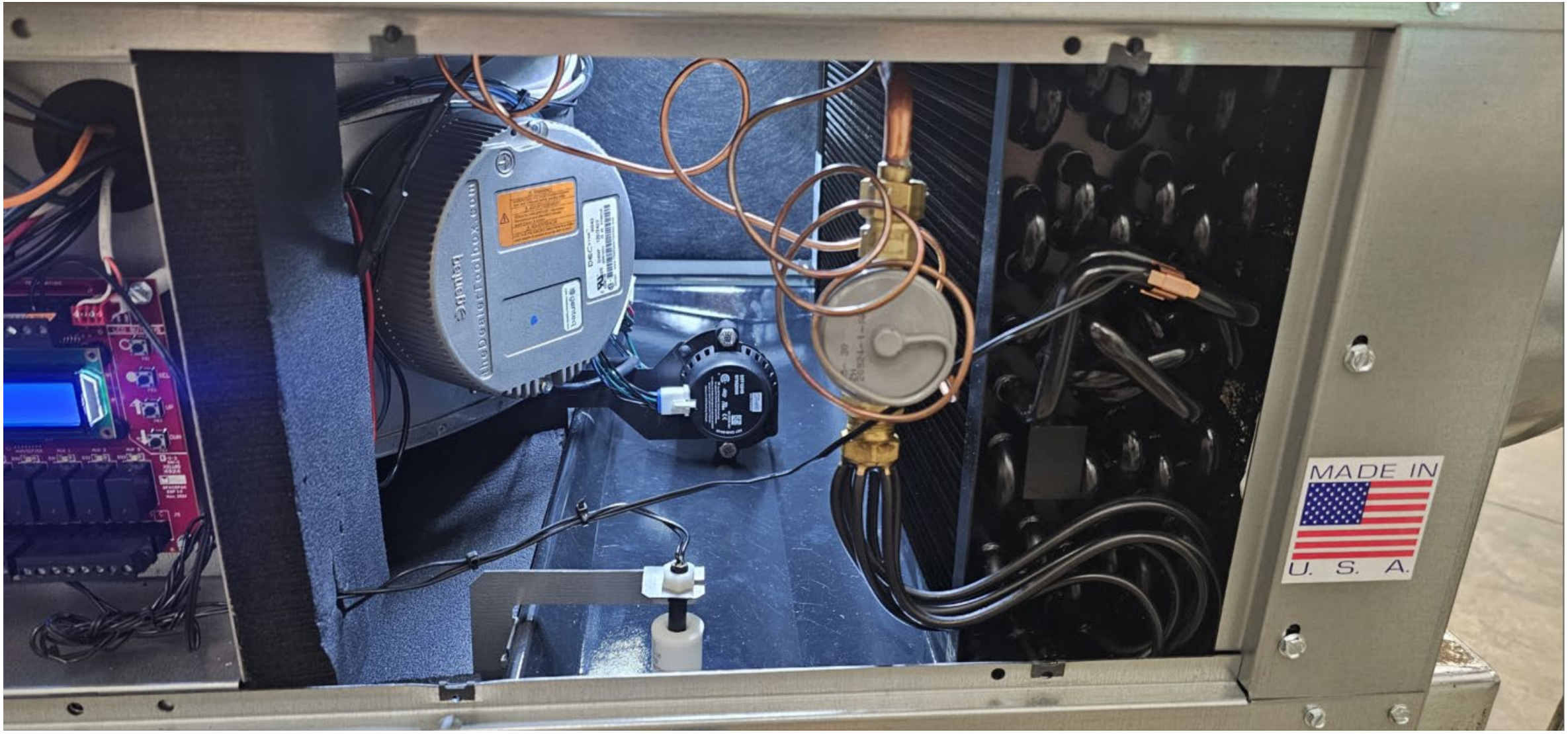
Coated Replacement Coils (On all K Series Units and replacement coils)



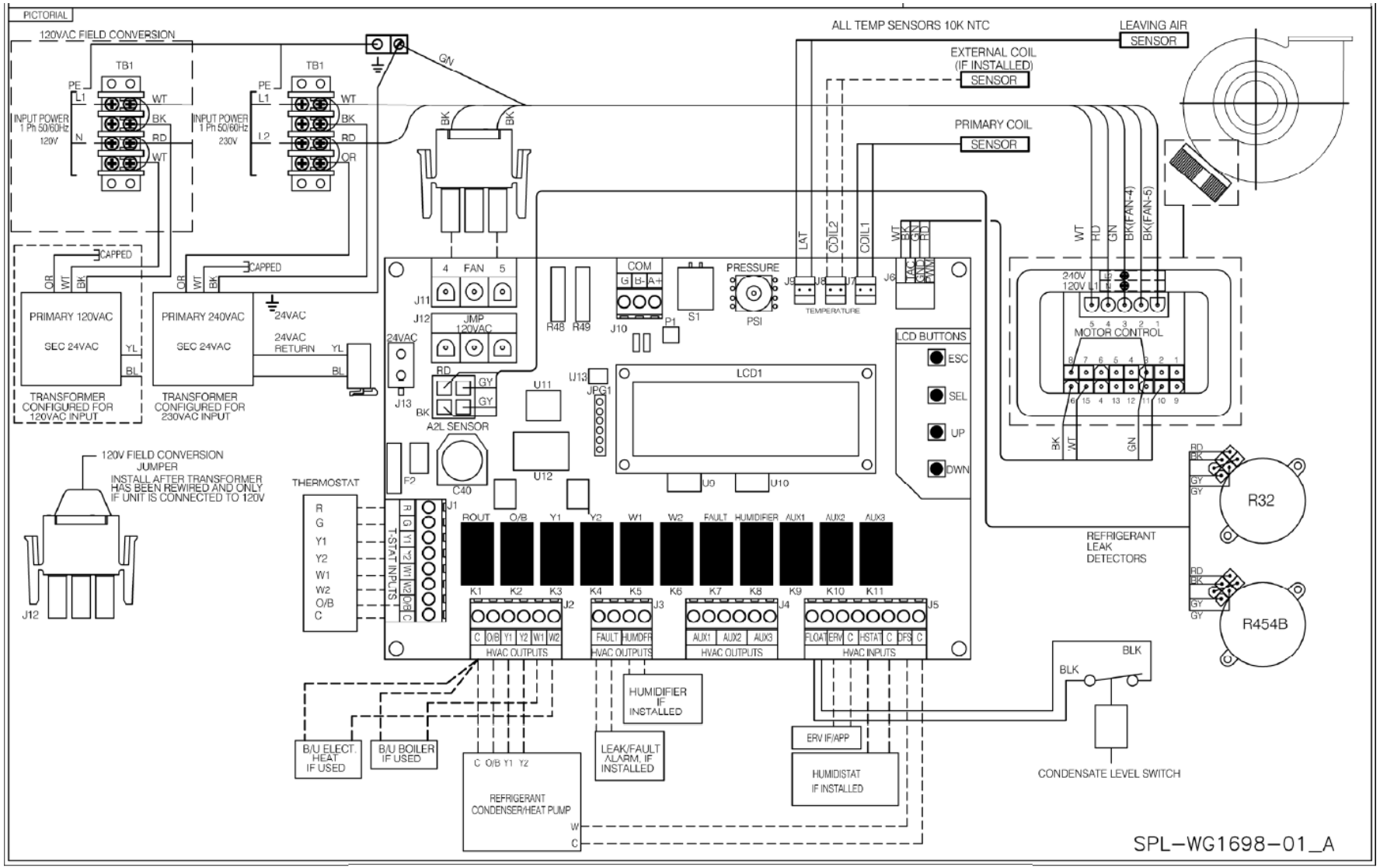
K Series Units will have a RED control Board



Independent R32 and 454B Sensors (Coated Coil Shown)



K Series Wiring Diagram



System Charging Basics

Follow Outdoor Condenser Manufacturer Instructions For

- All charging procedures
- Temperature and Pressure charts

ESP- K Series DX Horizontal Air Handler

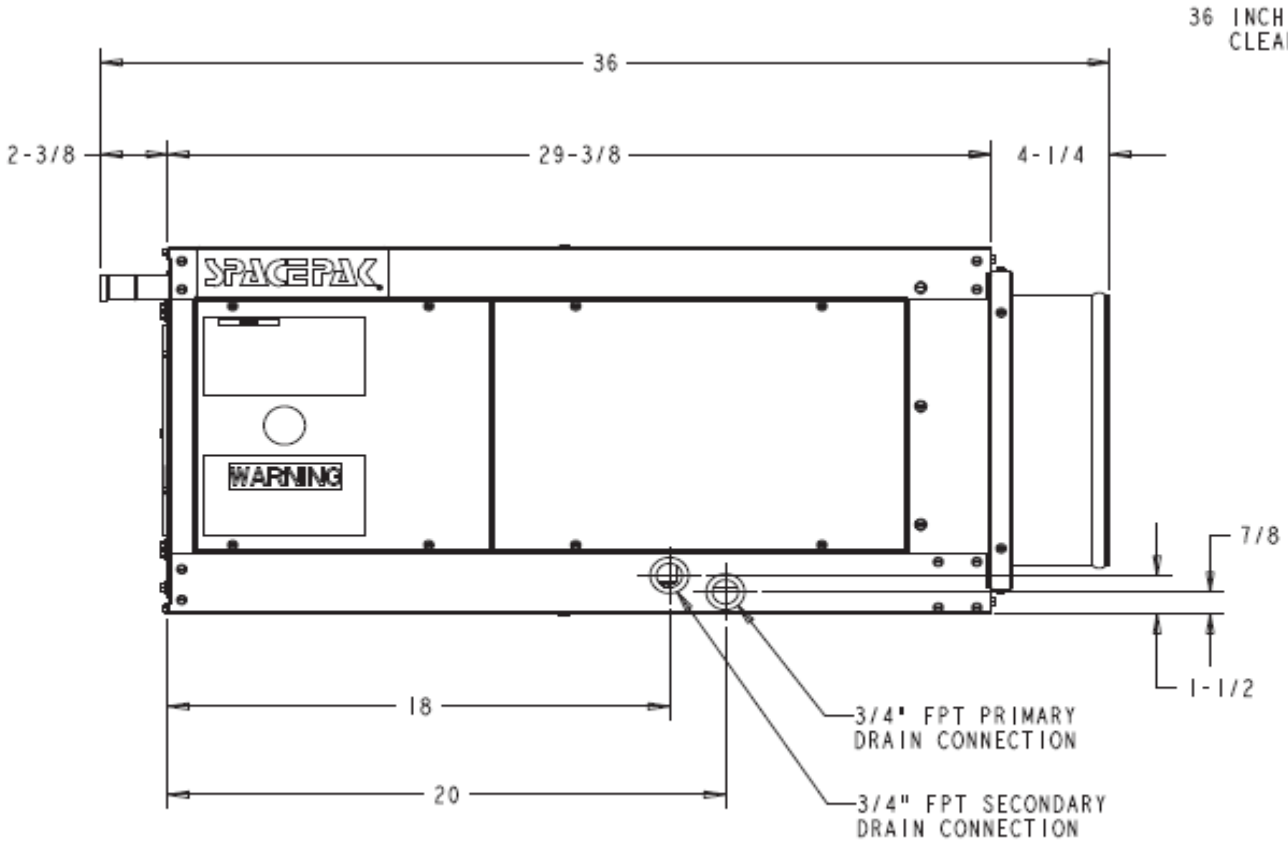
SpacePak is in the AHRI Heat Pump Program with certified matches that include variable speed outside condensers

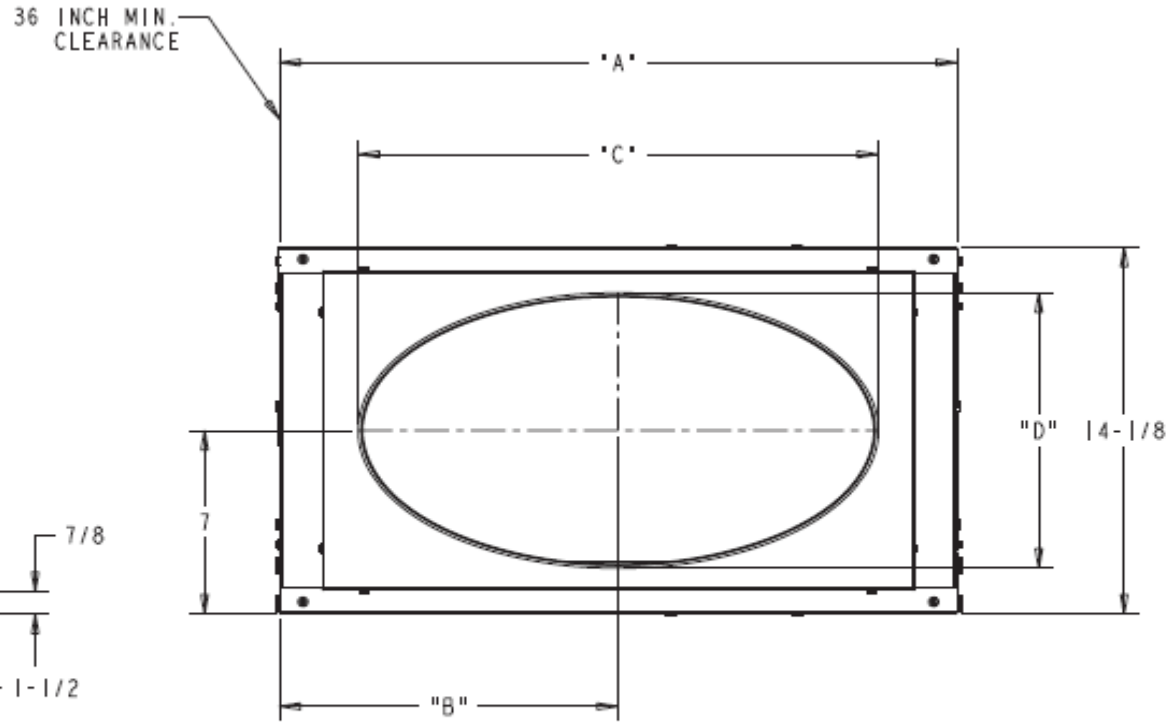
Visit AHRI website frequently to see the growing list of certified matches

Steps For How to Find SpacePak Match Ups on AHRI Directory: https://www.spacepak.com/AHRI-Search

SCAN ME

ESP- K Series DX Horizontal Dimensions

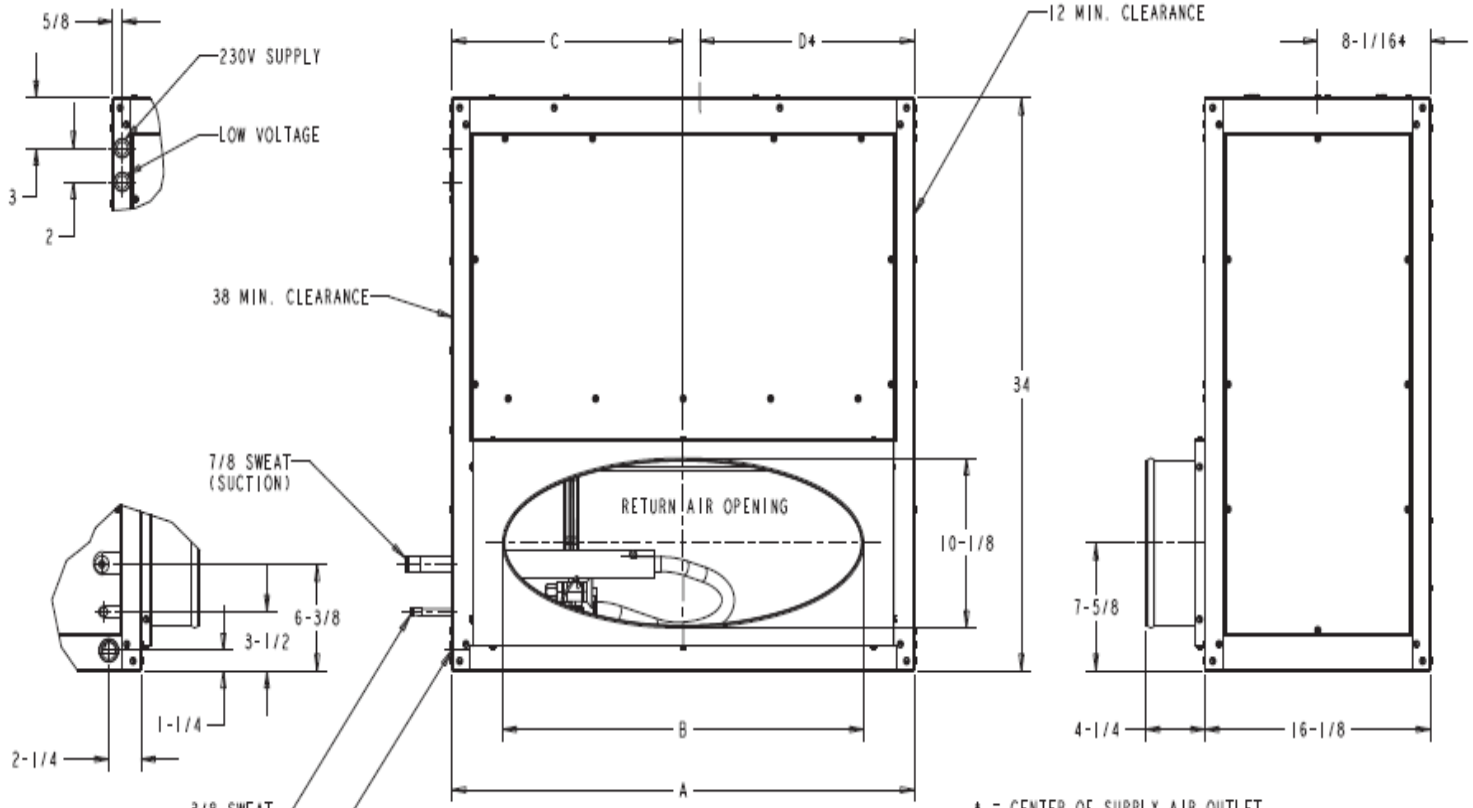




MODEL	A	B	C	D
2430J	24-1/4	12	18-1/2	10-1/2
3642J	33-1/4	16-1/2	25-3/4	10
4860J	43-1/4	21-1/2	34-1/4	10-1/4

SPL-WG0958_A

ESP- K Series DX Vertical Dimensions



ESP-3642JV SHOWN

MODEL	A	B	C	D
ESP-2430JV	24	18-5/8	12	10-7/8
ESP-3642JV	33	25-7/8	16-1/2	15-3/8
ESP-4860JV	43	34-1/4	21-1/2	20-3/8

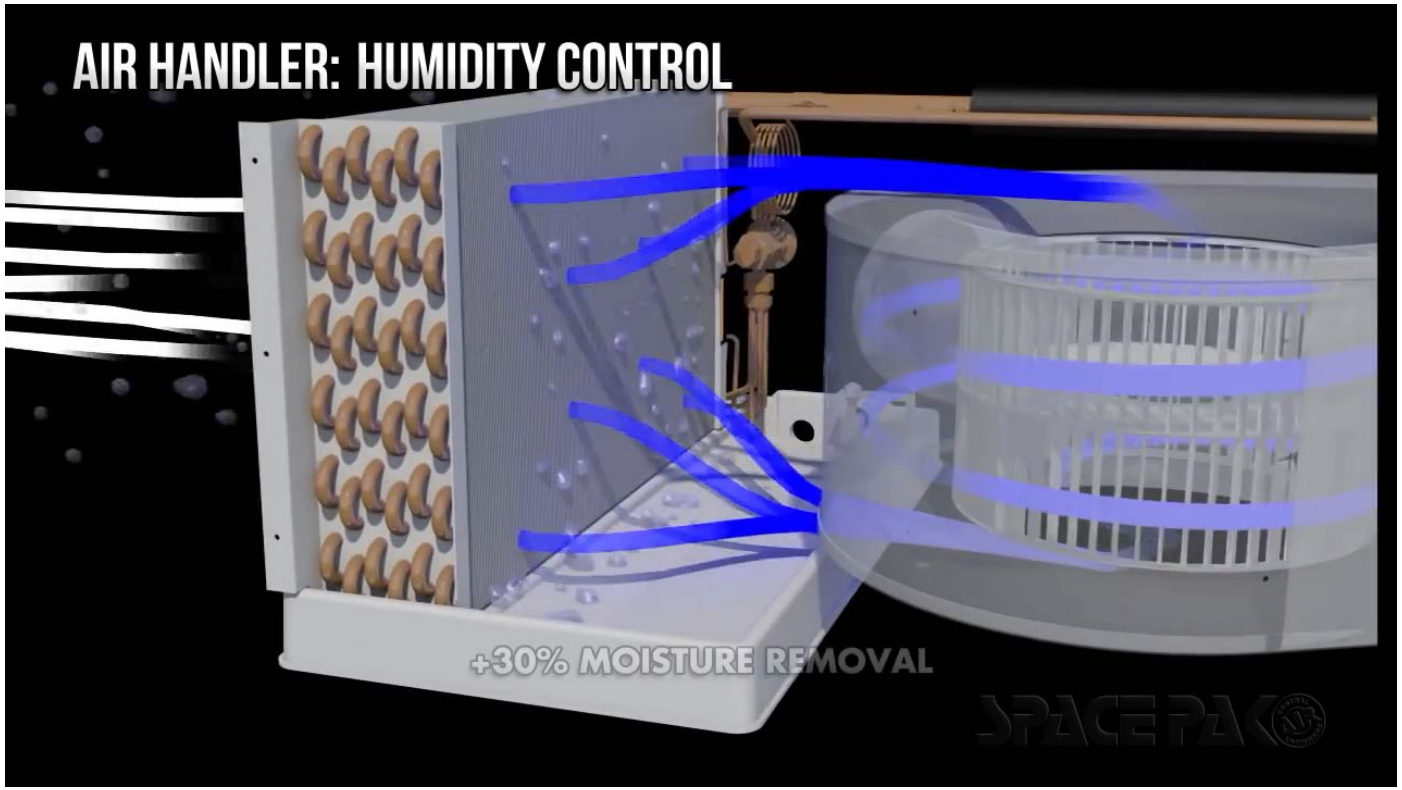
SPL-WG0985_A


SPACE PAK


SPACE PAK

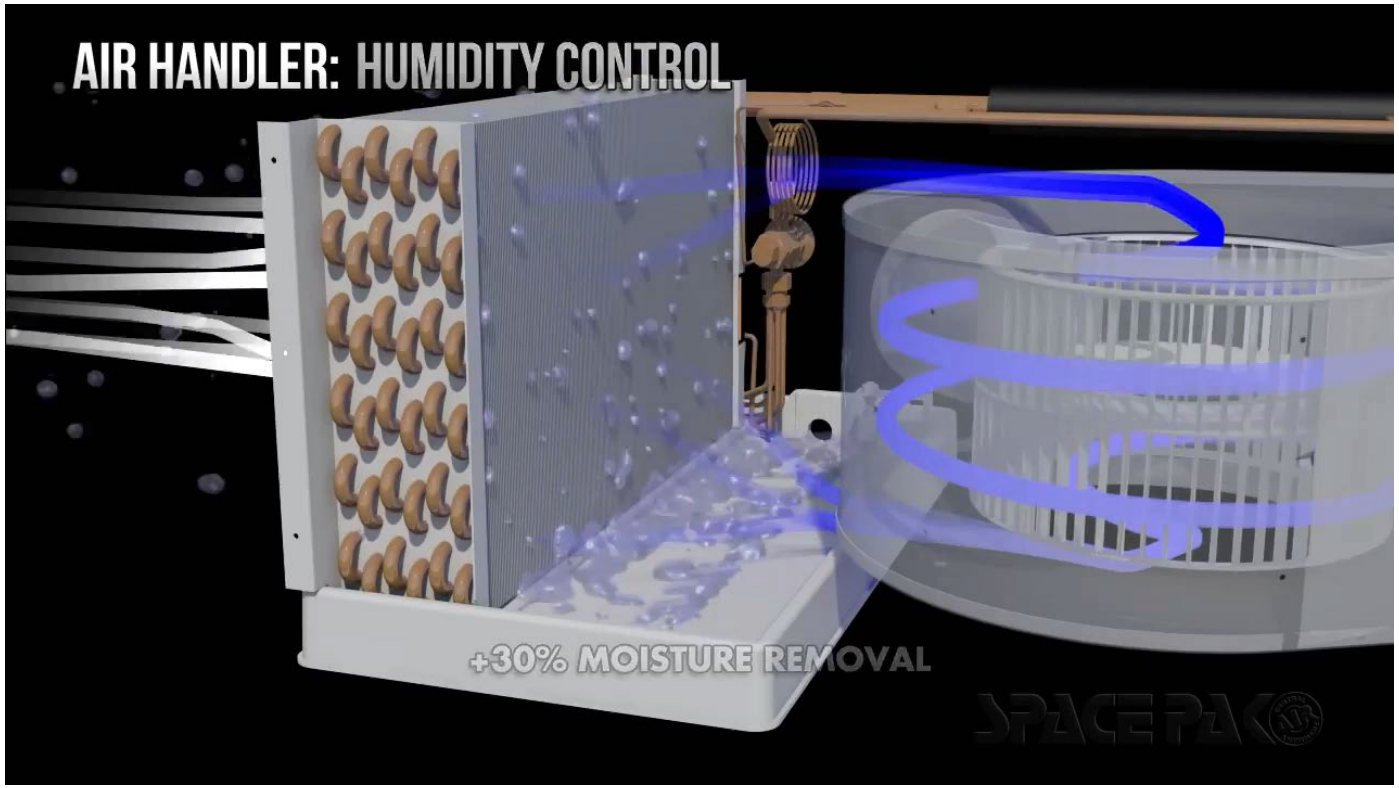
SUPERIOR COIL

- 6-row copper coil
- More coil surface = greater humidity removal
- 30% more moisture removed
- More Btus at lower CFMs
- Up to a 28°F air delta across the coil
- Colder discharge allows for lower volumes of air movement
- Suitable for R-32 and R-454B refrigerants

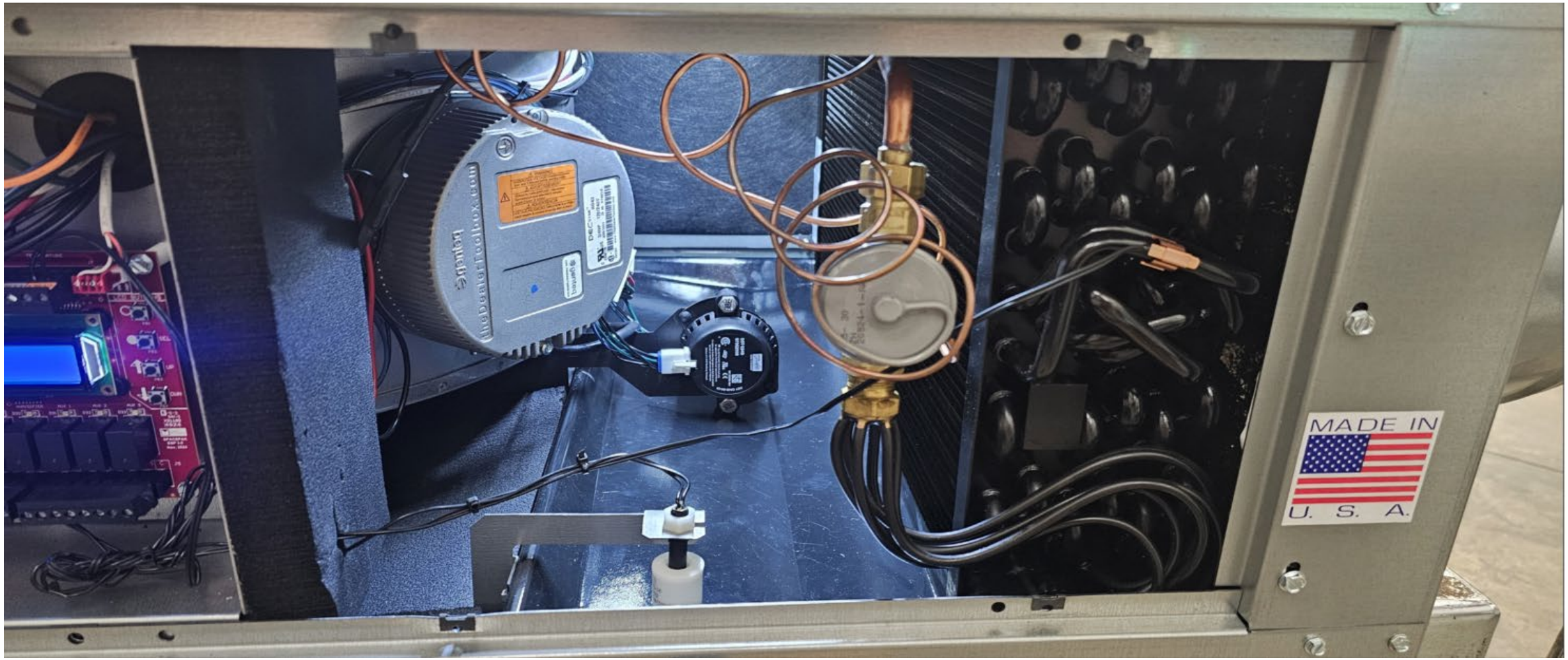


SUPERIOR DEHUMIDIFICATION

- With more moisture removed a higher temperature set point will *feel cooler*



K Series TXV: R-32 and R-454B refrigerant approved

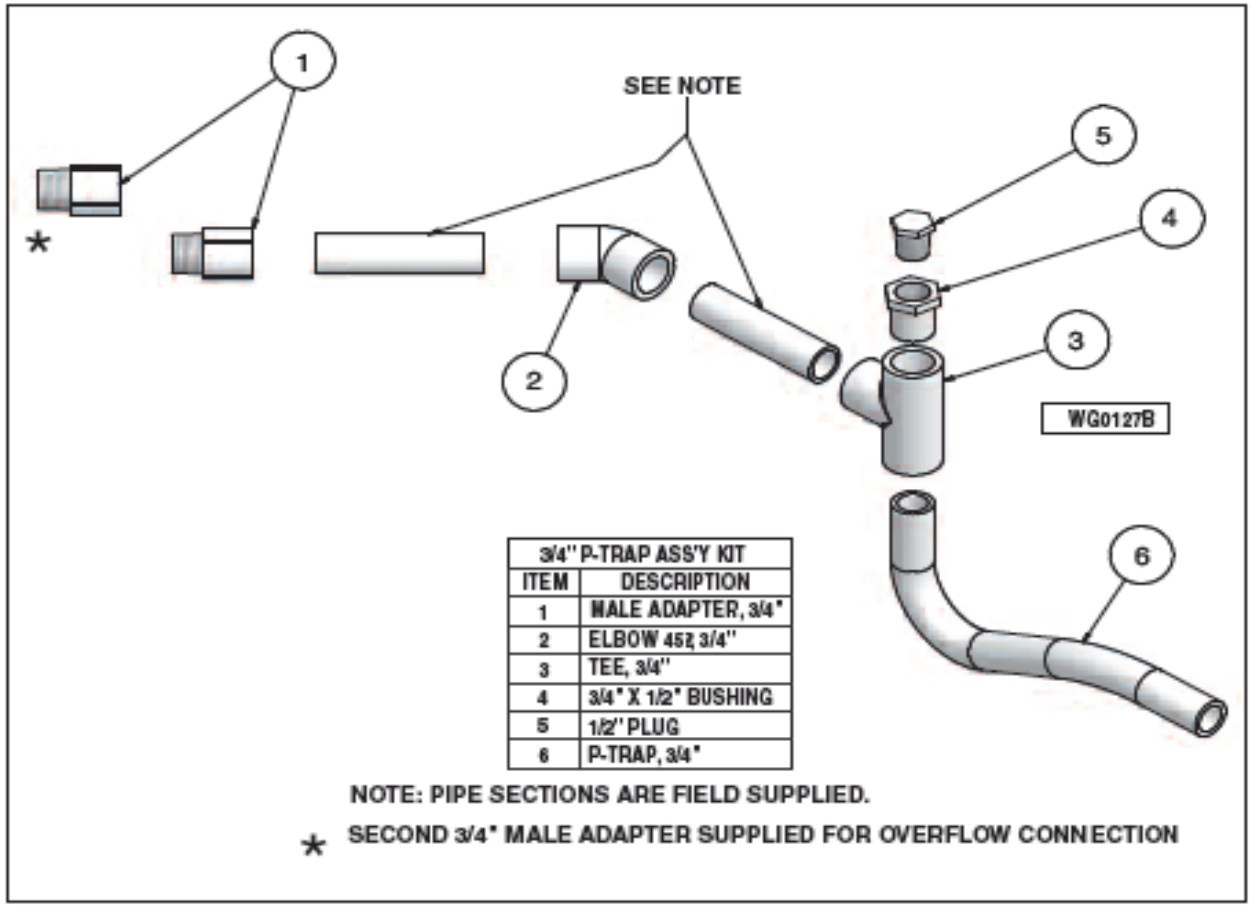


Note: Our current chatleff TXV has NO internal check valves, so it is suitable for use in air-to-air heat pump applications.

Additional Heating & Cooling

Condensate Trap Assembly

- The proper installation of the trap is critical to the correct operation of the system!
- Supplied by SpacePak



3/4" P-TRAP ASS'Y KIT	
ITEM	DESCRIPTION
1	MALE ADAPTER, 3/4"
2	ELBOW 45º 3/4"
3	TEE, 3/4"
4	3/4" X 1/2" BUSHING
5	1/2" PLUG
6	P-TRAP, 3/4"

NOTE: PIPE SECTIONS ARE FIELD SUPPLIED.

* SECOND 3/4" MALE ADAPTER SUPPLIED FOR OVERFLOW CONNECTION

EEH Direct Mount Electric Heater

6 Sizes Available

2kw

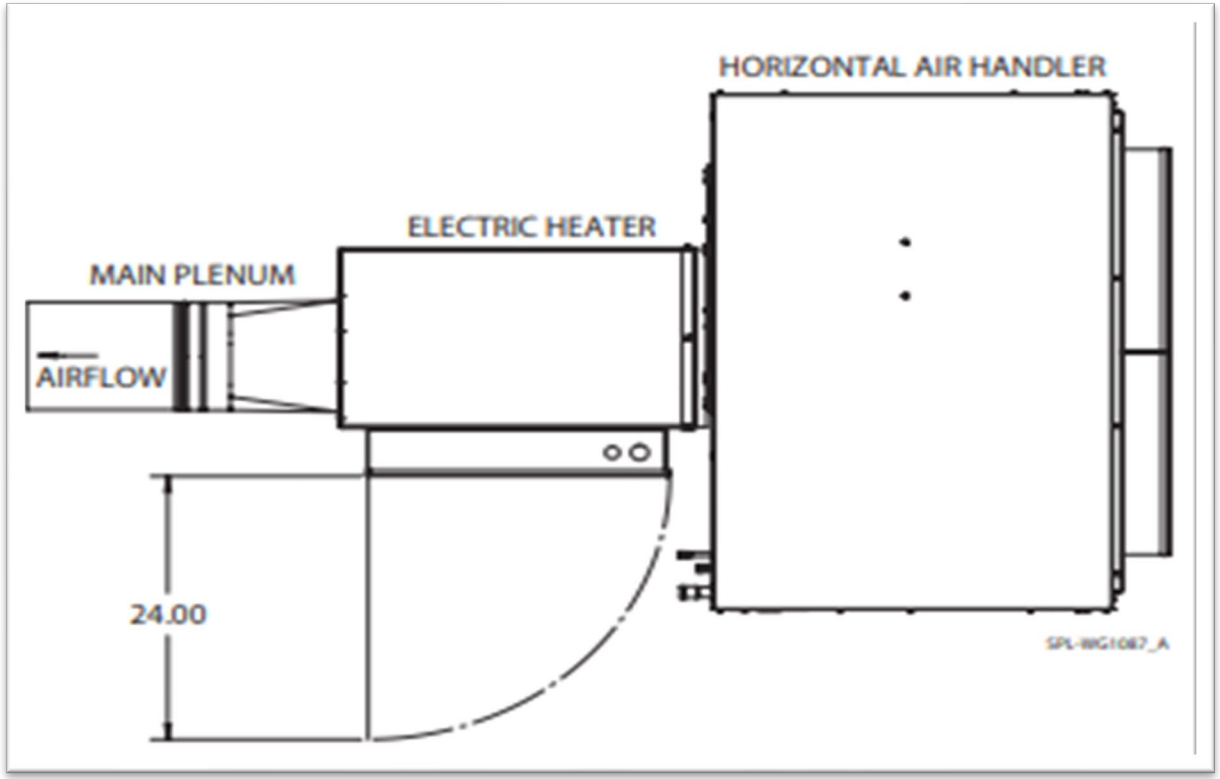
5kw

7.5kw

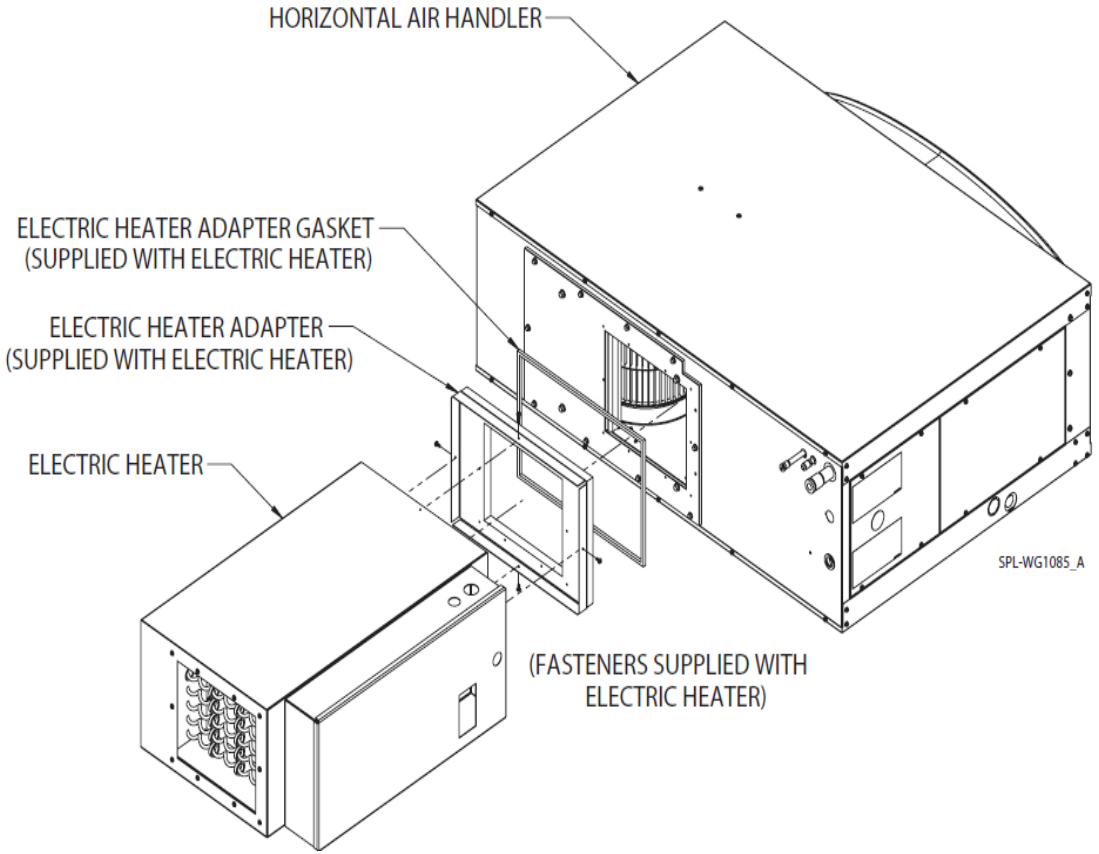
10kw

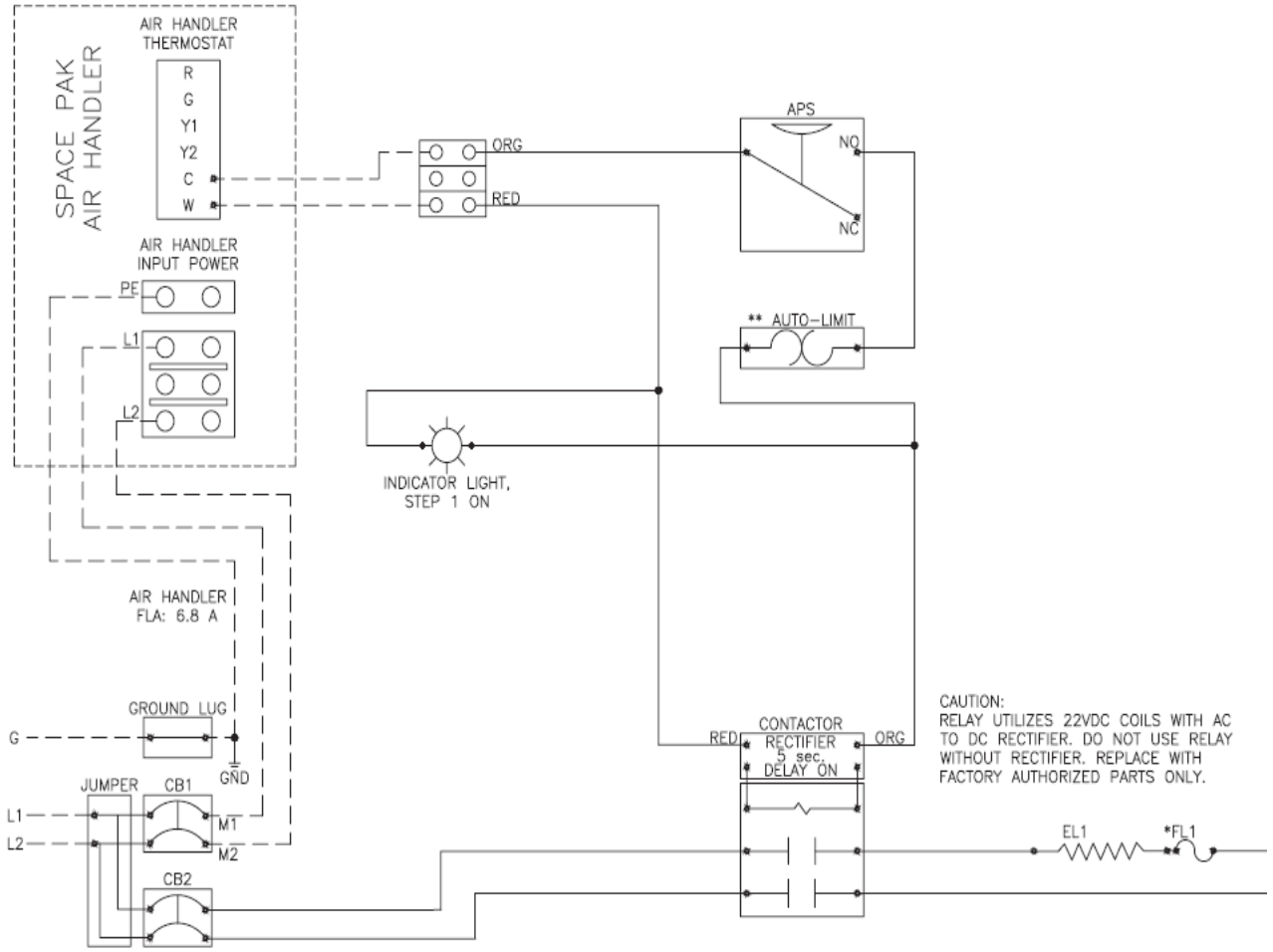
15kw

20kw

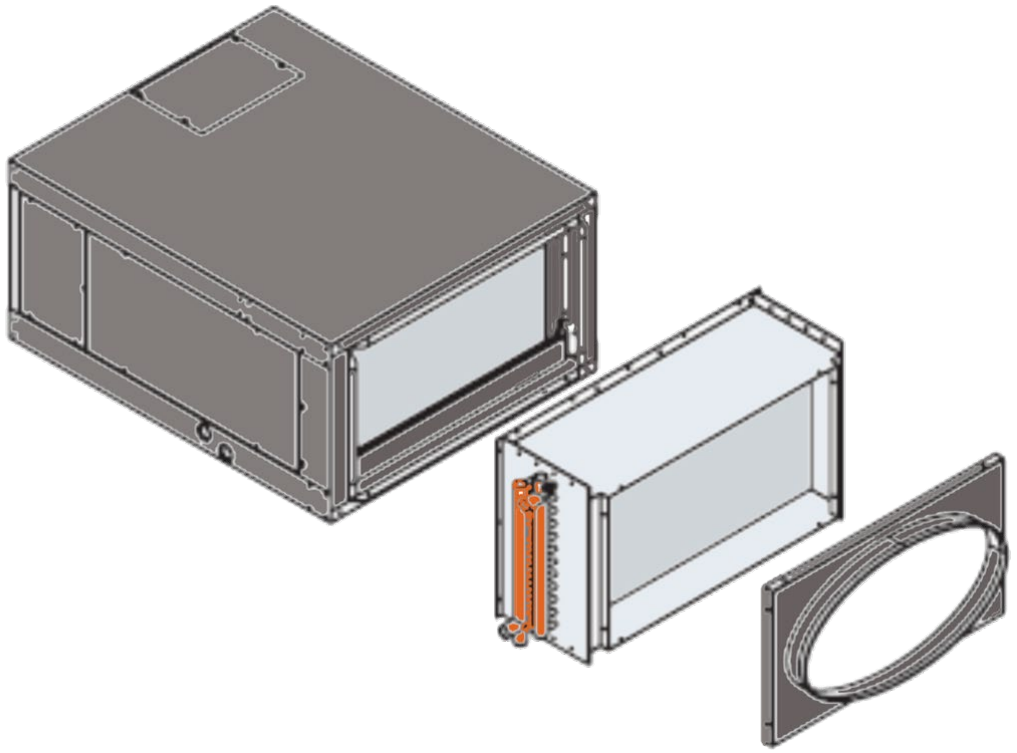


EEH Electric Heating Mounting & Wiring





Hot Water Coil (K Series Compatible)



Model AC-WPAK-60 for ESP 2430

	Entering Water Temperature °F				
GPM	120	140	160	180	200
2	20.5	30.0	39.1	48.1	57.2
4	25.2	35.6	46.1	56.6	67.1
6	26.6	37.4	48.3	59.2	70.2
8	27.2	38.2	49.3	60.4	71.6
10	27.5	38.7	49.9	61.1	72.3

At 550 CFM and 70°F Entering Air Temperature*

Model AC-WPAK-90 for ESP 3642

	Entering Water Temperature °F				
GPM	120	140	160	180	200
2	28.8	39.2	51.6	63.4	75.2
4	36.0	50.8	65.7	80.8	95.8
6	39.0	54.9	70.9	87.0	103.1
8	40.4	56.8	73.3	89.9	106.5
10	41.2	57.9	74.7	91.5	108.4

At 850 CFM and 70°F Entering Air Temperature*

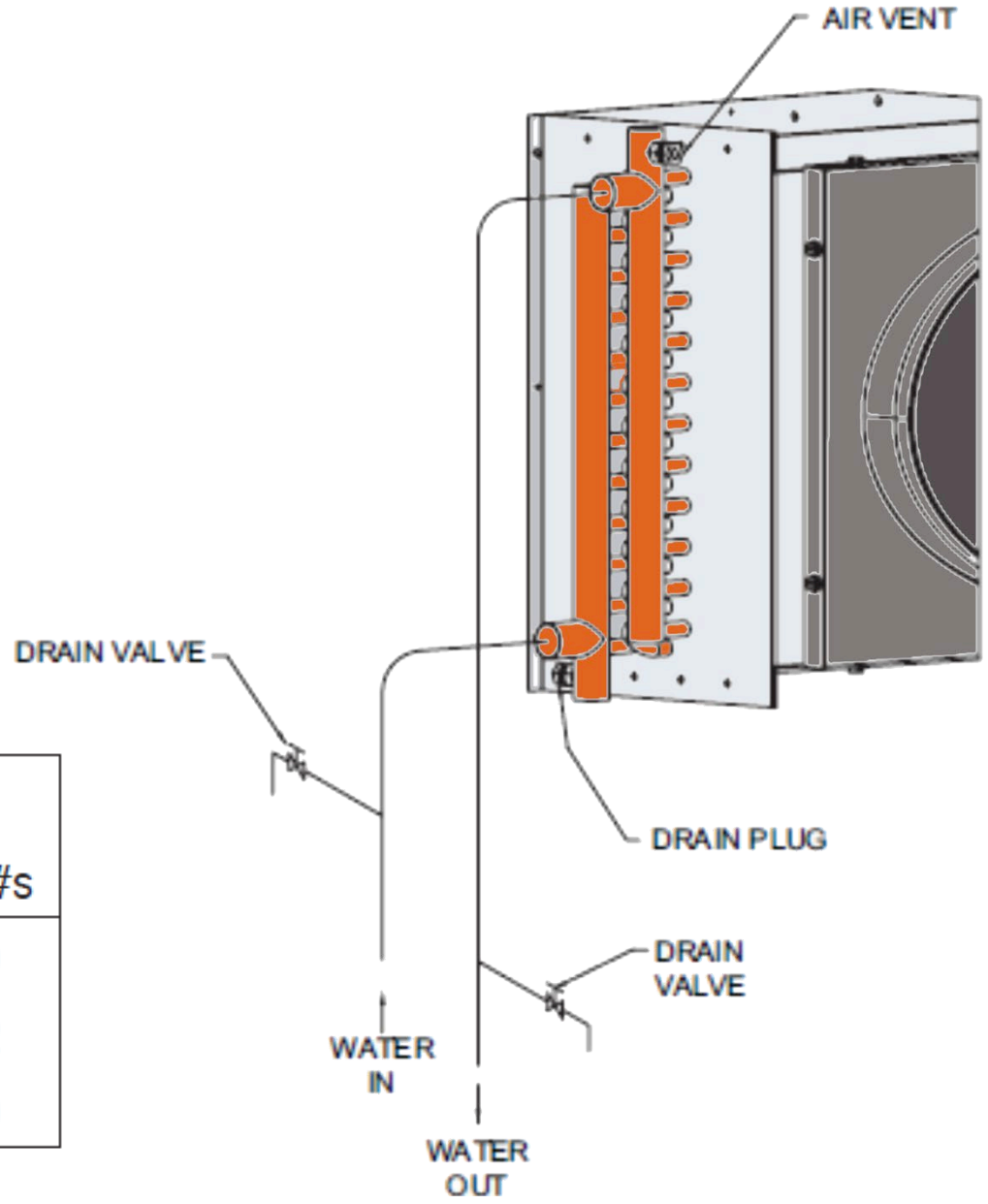
Model AC-WPAK-120 for ESP 4860

	Entering Water Temperature °F				
GPM	120	140	160	180	200
2	31.7	46.2	61.2	75.1	89.0
4	45.6	64.2	83.0	102.0	120.9
6	50.6	71.2	92.0	112.9	133.8
8	53.1	74.7	96.4	118.2	140.1
10	54.6	76.7	98.9	121.2	143.6

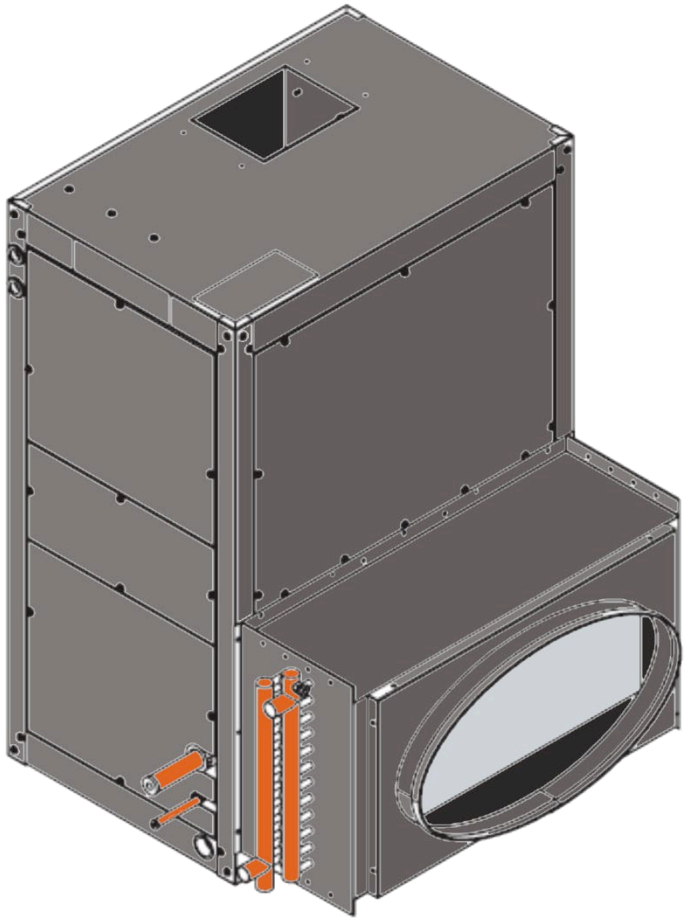
At 1150 CFM and 70°F Entering Air Temperature*

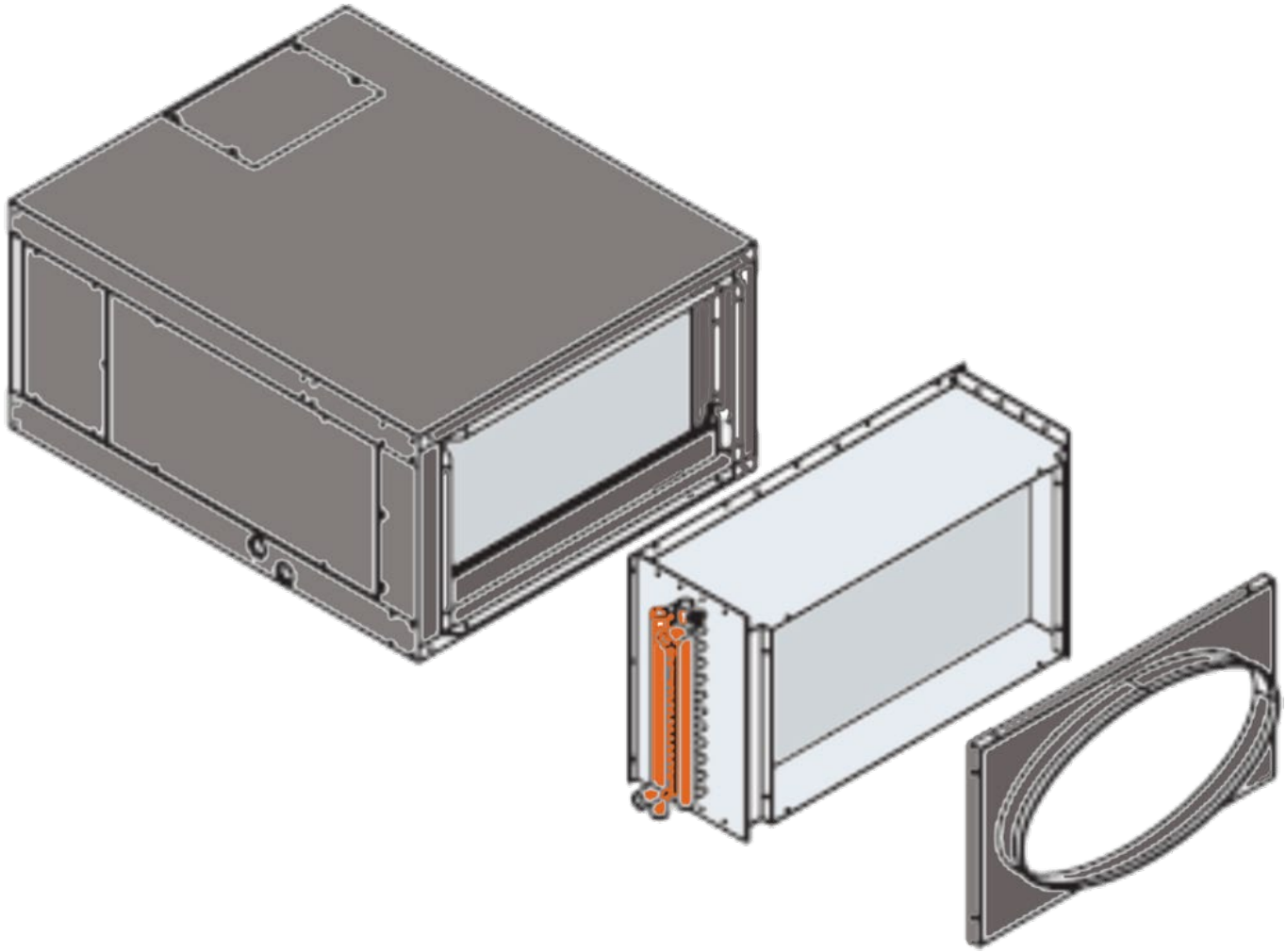
Hot Water Coil Installation

Hot Water Coil Model #	BTUH Capacity (Nominal)	Return Air Duct Adaptor* Model #	Fan Coil Unit Model #s
AC-WPAK-60	60,000	AC-WRDA-60	ESP-2430
AC-WPAK-90	90,000	AC-WRDA-90	ESP-3642
AC-WPAK-120	120,000	AC-WRDA-120	ESP-4860



Hot Water Coil Installation Location

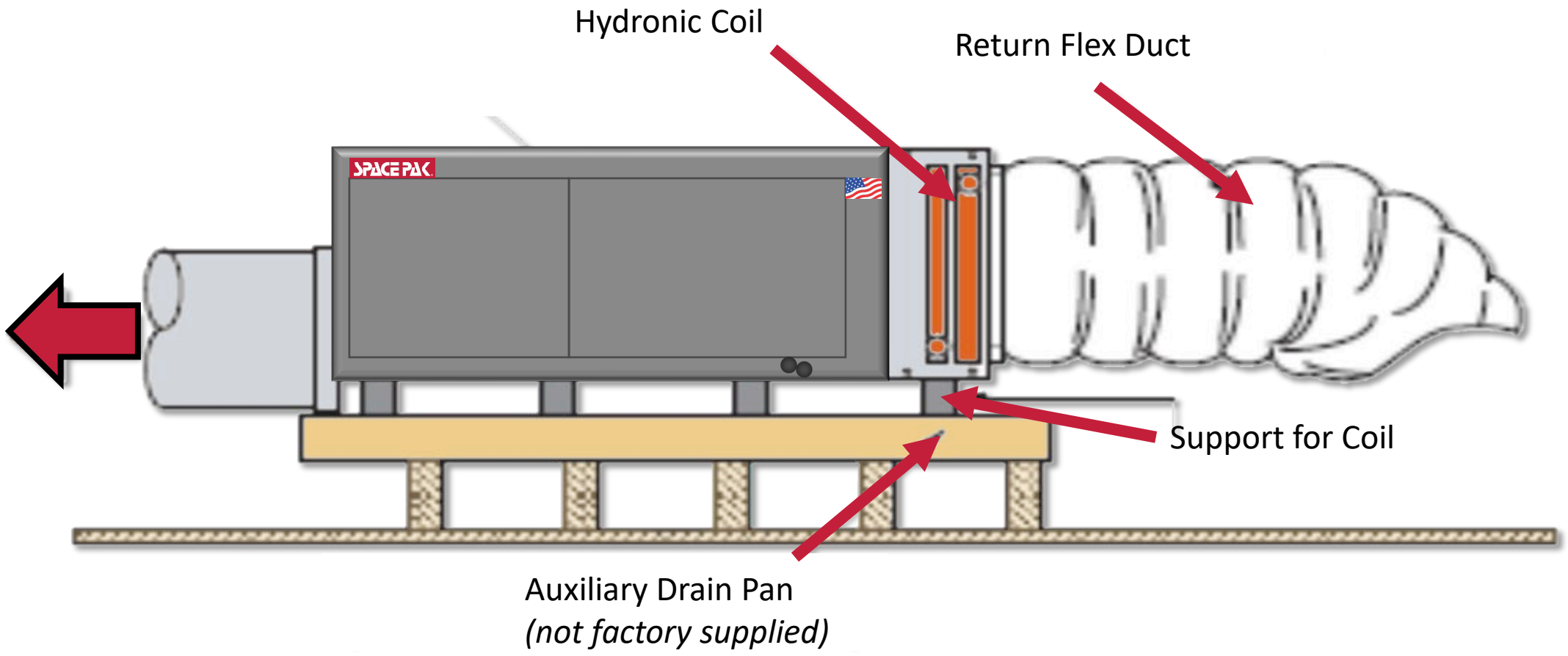




BasePak Secondary Drain Pans for Horizontal Fan Coils

- Durable polyethylene will not rust
- Resistant to mold growth
- UL recognized material
- Integral, multi-function support channels
- Supports unit when suspended with threaded rod
- Fits through hole-cut used for Return Air Box
- Threaded ¾’’ drain connection
- Meets international mechanical code 307.2.3

Hot Water Installation with Drain Pan



Note: Be sure that the drain pan installed is large enough to protect anything that may drip, this is cheap insurance!

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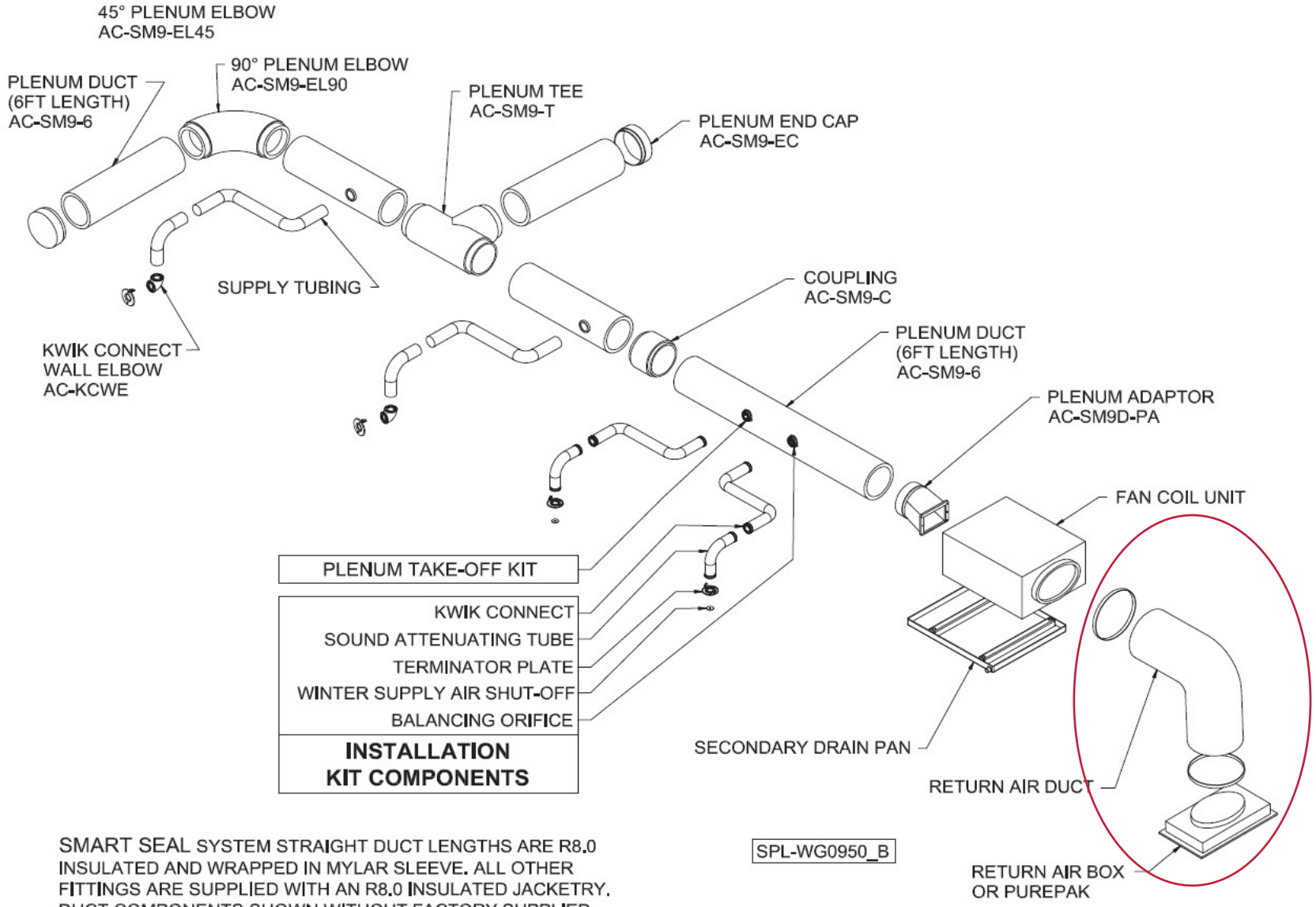
Questions

The Return

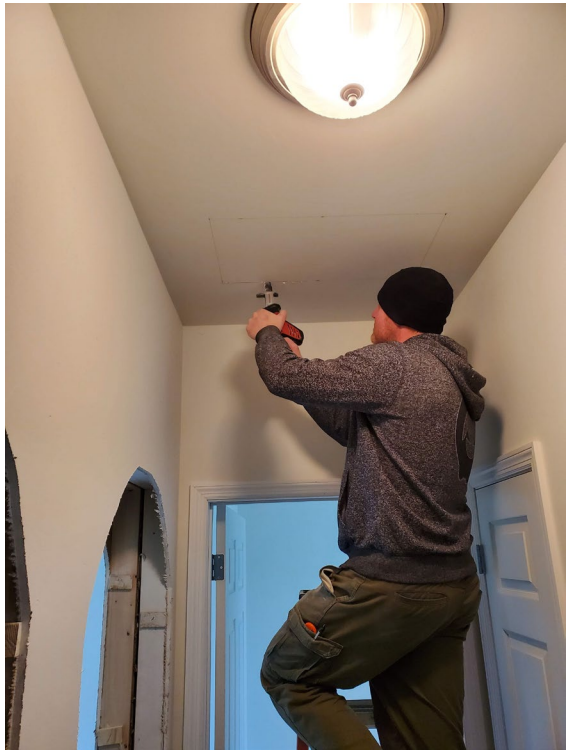
Option of Central or Multiple Returns

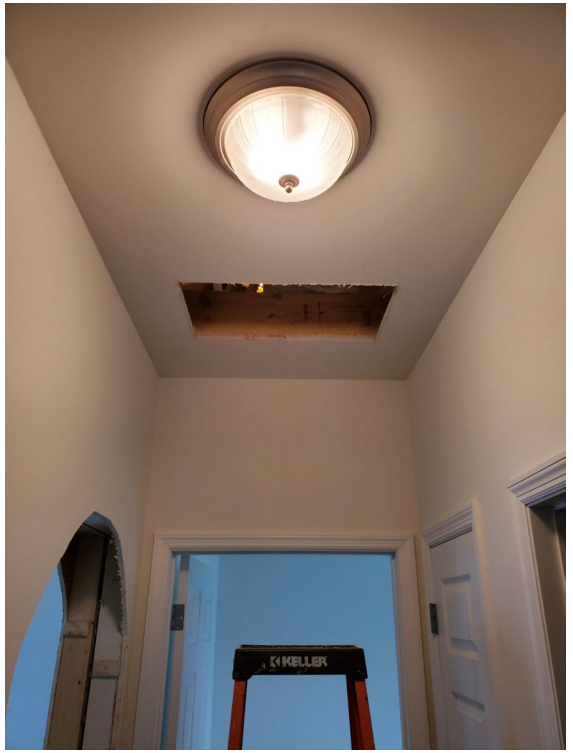


SMART SEAL SYSTEM STRAIGHT DUCT LENGTHS ARE R8.0 INSULATED AND WRAPPED IN MYLAR SLEEVE. ALL OTHER FITTINGS ARE SUPPLIED WITH AN R8.0 INSULATED JACKETRY. DUCT COMPONENTS SHOWN WITHOUT FACTORY SUPPLIED R8.0 INSULATED JACKETRY.

Locate and Roughing in the Return

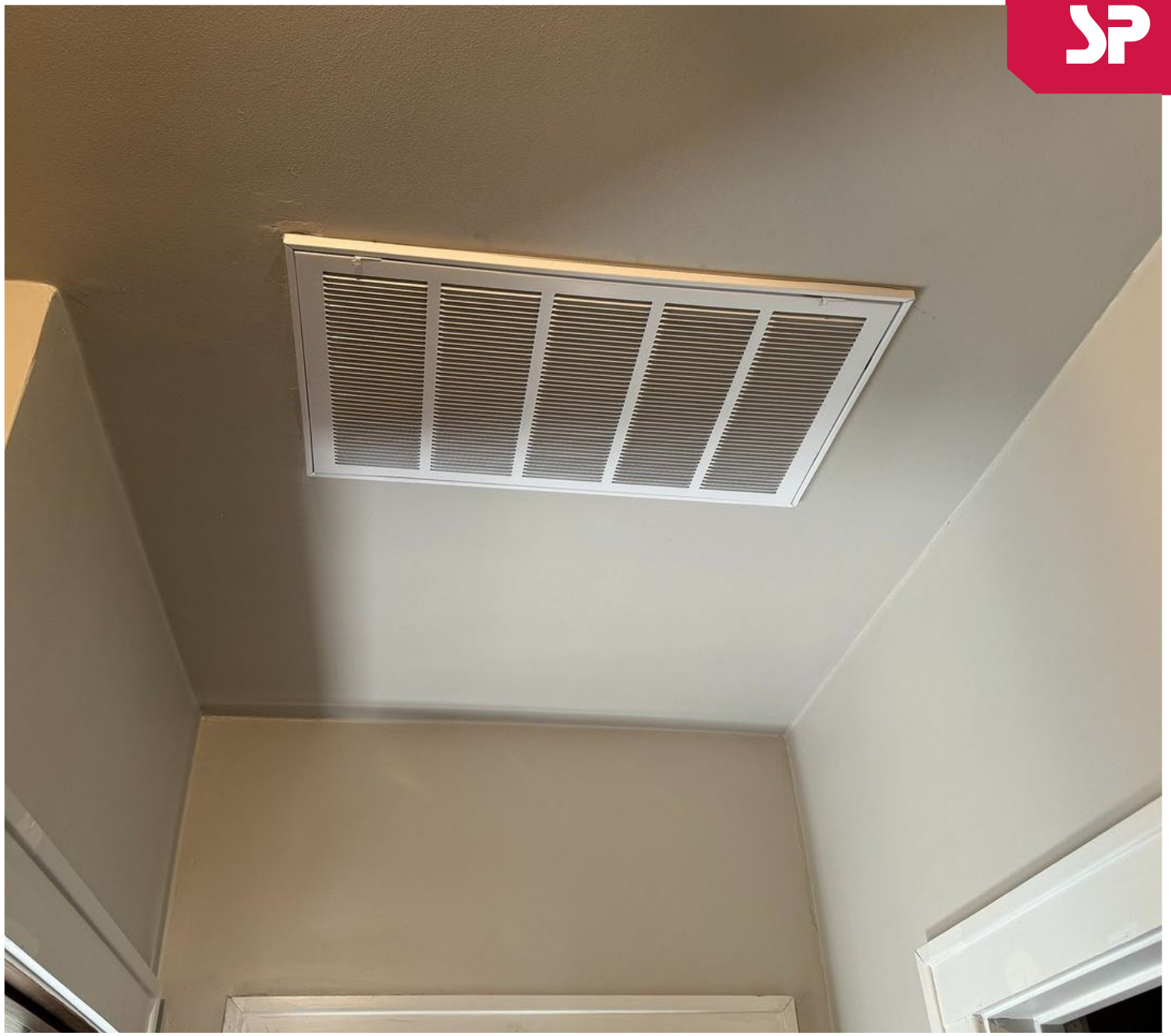
- Central Location (Hallway/Foyer)
- All Equipment Can Fit through the Return Hole Cut Including the Air Handler
- Be Sure to Have More than Enough Return Air for the System
- Do Not “Skimp” On Return. You cannot have too much.





Return Basics

- Air Mixing vs. Air Change
- Less Return Air Volume
- Cooling And Heating By Temperature, Not Volume
- One Central Return Is Sufficient
- Multiple Returns Are Okay
- Smaller Return Air Duct Than Conventional
- **You can never have too much return air!!!!**

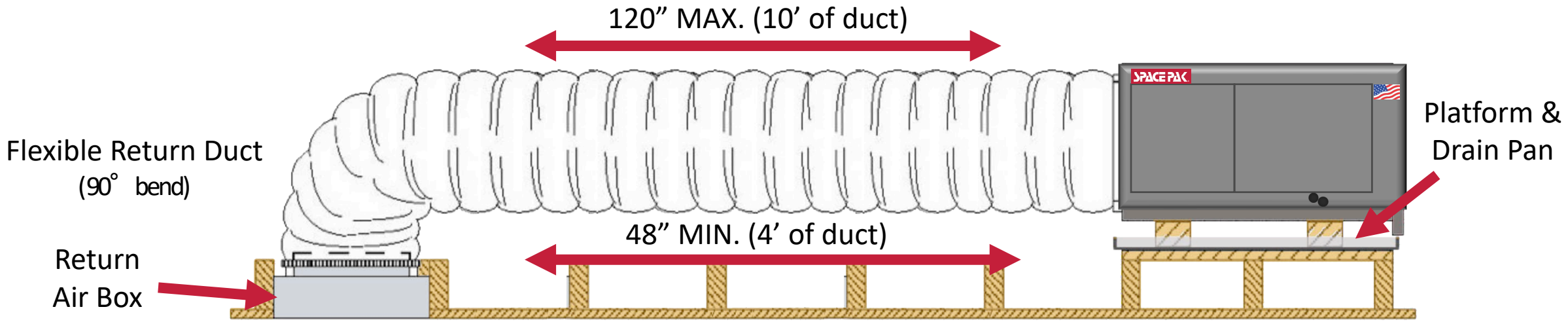


Return Basics

- Size Return in each location for less than 500 FPM (similar to conventional)
- Size Return in each location for a total -.25” static or less including the filter
- Install at least One 90-degree elbow (this will aid in the abatement of unwanted noise)
- Return Box must be lined with sound attenuation material (also for noise abatement)
- Size transfer grills for the CFM and Free Area (use standard duct sizing chart)

Note: If return creates to much “suction” over -.5”wc this suggests the lack of return air and creates the potential to cause issues with proper condensate draining resulting in faults or water damage.

Return Considerations



Model	Return Duct
ESP-2430	15”
ESP-3642	19”
ESP-4860	24”

NOTE: When return lengths of longer than 10ft exist, using a standard return duct sizing chart at 500 FPM and no more than -0.25’’ WC may be necessary for proper upsizing.

Central Floor Return

This was a central return for (1) 5-ton heating and cooling system. (approx. 30” x 30”)

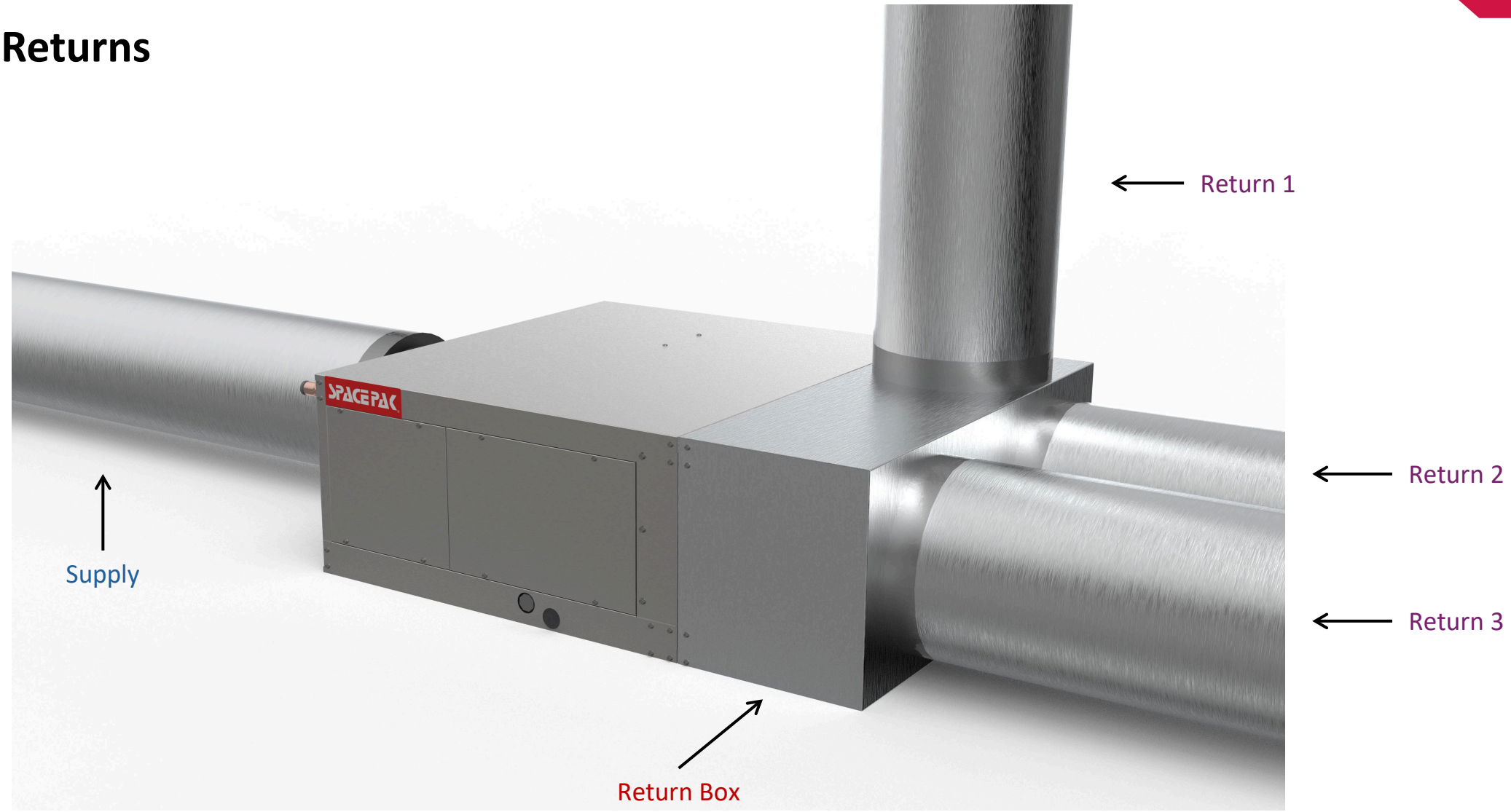
Best Practices for Multiple Returns

MULTIPLE RETURN ACCEPTABLE DUCT SIZE BY TONNAGE

ROUND DUCT SIZE, THESE SIZES WILL INSURE A QUIET AIR SPEED OF LESS THAN 500 FPM

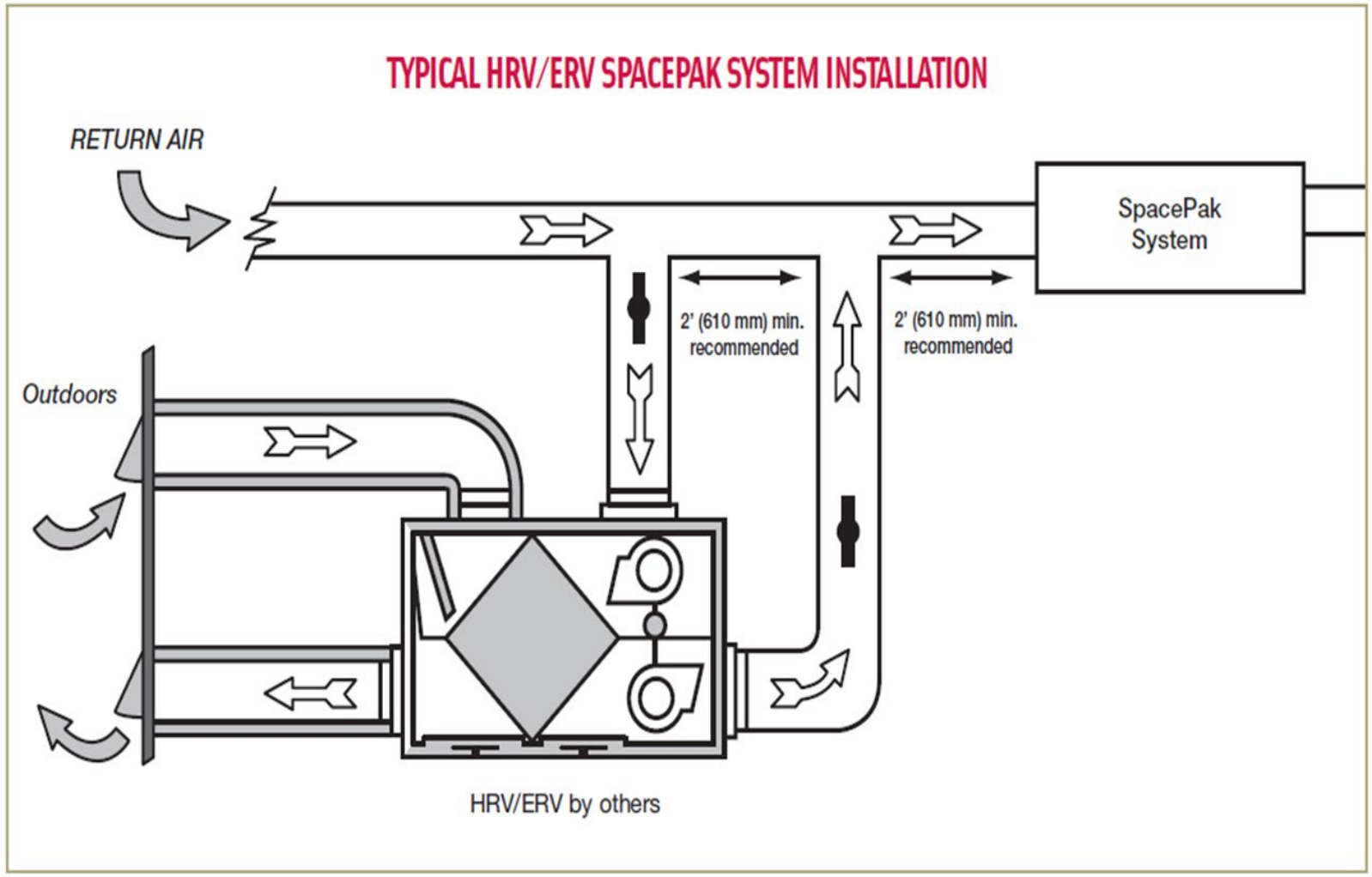
	2 TON	2.5 TON	3 TON	3.5 TON	4 TON	5 TON
AIR FLOW	440	550	660	770	880	1100
			2 RETURNS			
10' OR LESS	9”	10”	11”	12”	13”	15”
10' TO 20'	10”	11”	12”	13”	13”	15”
30' TO 40'	11”	12”	13”	13”	14”	16”
			3 RETURNS			
10' OR LESS	8”	9”	9”	10”	12”	12”
10' TO 20'	8”	9”	10”	11”	12”	12”
30' TO 40'	9”	10”	11”	12”	13”	13”

Multiple Returns



(not supplied by SpacePak, contractor must build)

IAQ Options (K Series + Control Board)



Note: Aftermarket air cleaning solutions are okay to use, but please be sure that the correct amount of return air is maintained, and that the third-party product is certified for use with SDHV.

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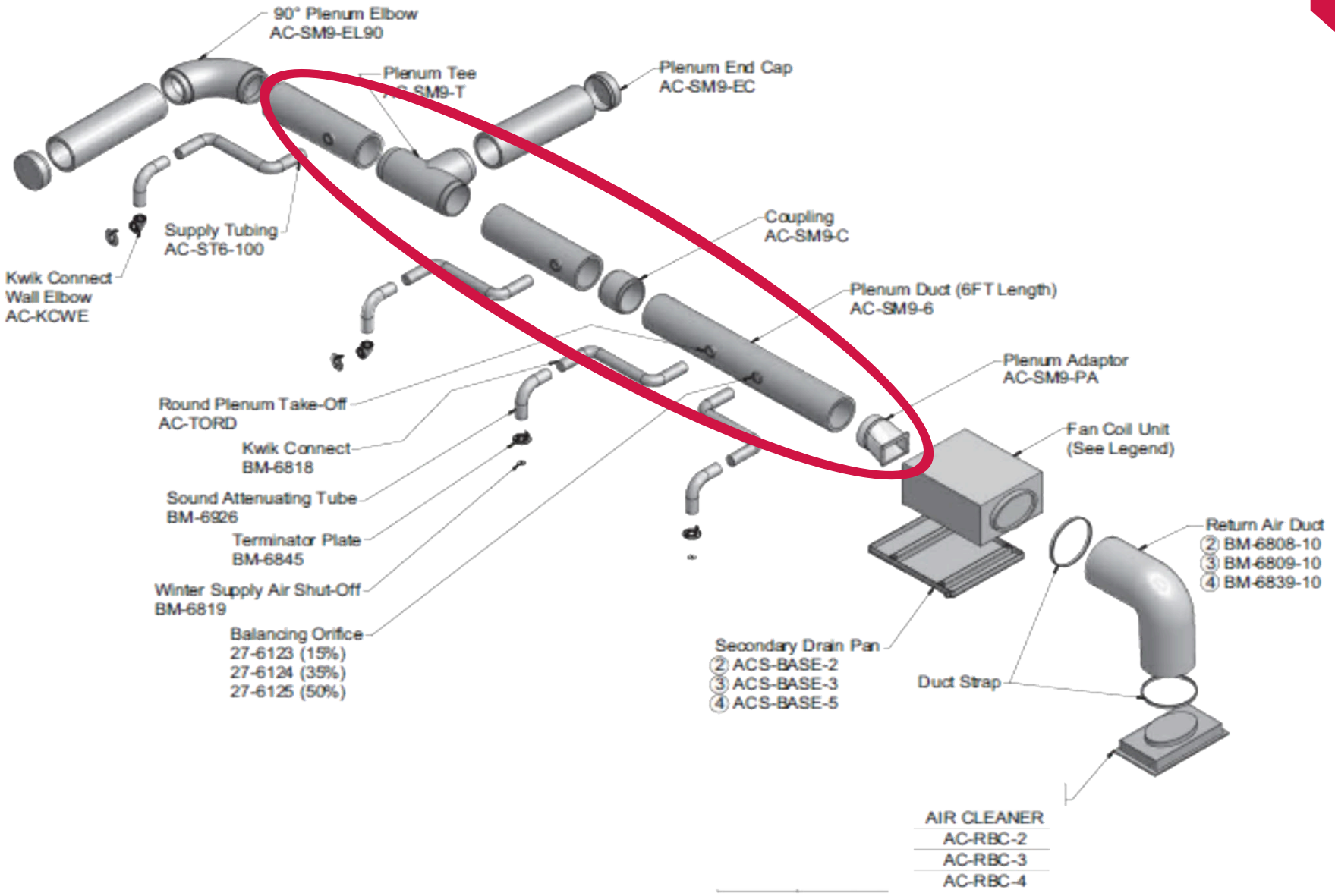
Questions

Main Trunk


90° Plenum Elbow
AC-SM9-EL90
Plenum Tee
Plenum End Cap
AC-SM9-EC
Supply Tubing
AC-ST6-100
Kwik Connect
Wall Elbow
AC-KCWE
Coupling
AC-SM9-C
Plenum Duct (6FT Length)
AC-SM9-6
Plenum Adaptor
AC-SM9-PA
Fan Coil Unit
(See Legend)
Round Plenum Take-Off
AC-TORD
Kwik Connect
BM-6818
Sound Attenuating Tube
BM-6926
Terminator Plate
BM-6845
Winter Supply Air Shut-Off
BM-6819
Balancing Orifice
27-6123 (15%)
27-6124 (35%)
27-6125 (50%)
Return Air Duct
② BM-6808-10
③ BM-6809-10
④ BM-6839-10
Secondary Drain Pan
② ACS-BASE-2
③ ACS-BASE-3
④ ACS-BASE-5
Duct Strap
AIR CLEANER
AC-RBC-2
AC-RBC-3
AC-RBC-4

Maximum Allowable Plenum Length

250 ft (or equivalent) at 9” Round IF:

- All fittings are long radius
- The system is sealed to stop duct leakage “**completely**”
- Fittings reduce length by:
  - 30 ft for Tees
  - 15 ft for Elbows

Main Trunk Line “Topics”

- Static Regain replaces Static Reduction
- Allows simpler rules for design
- Easier installation practices
- Less energy loss
- More plenum/Less duct=$$

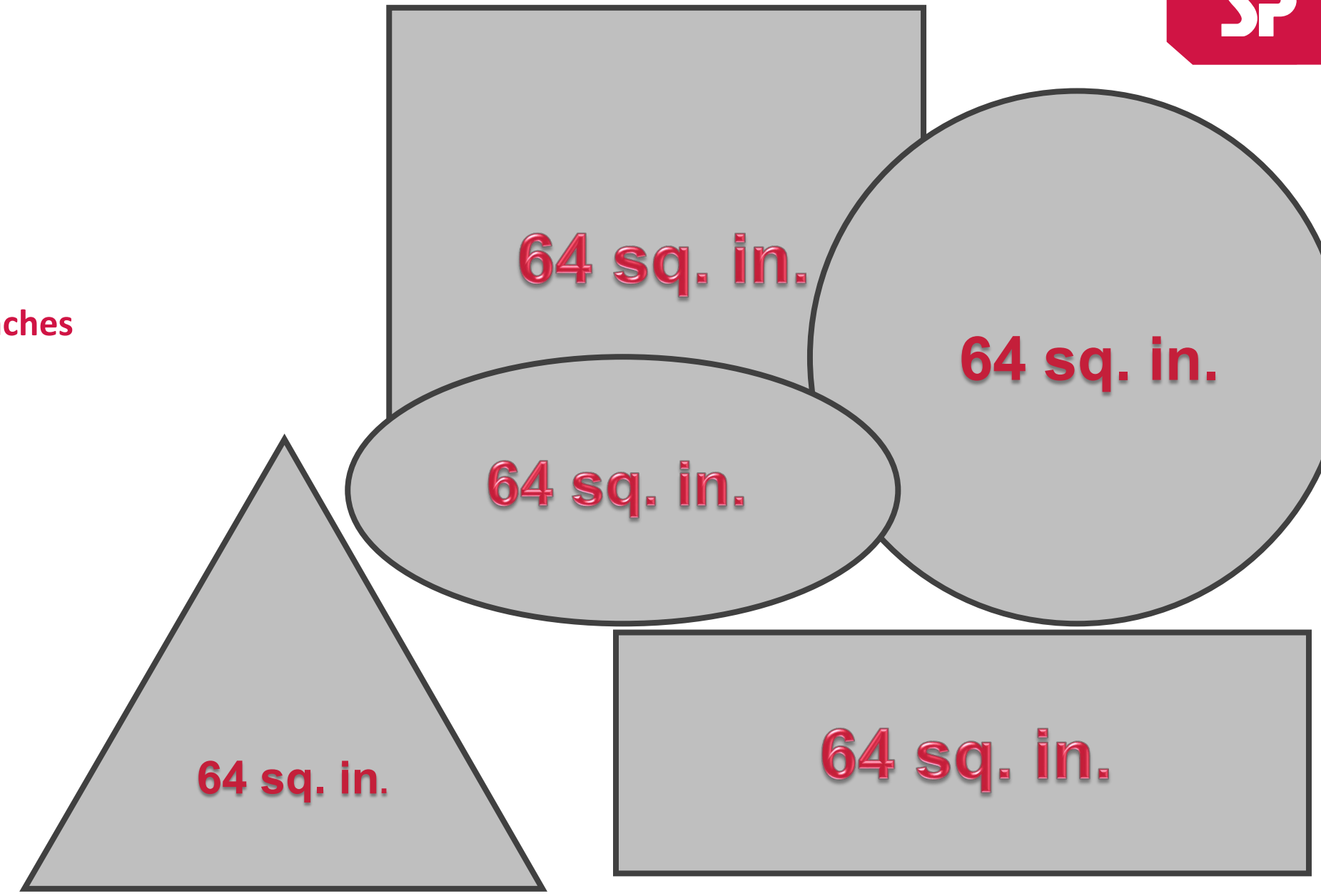
Plenum Rules & Topics

- Plenum requirements and allowances
- Round, Rectangular and Square will work
- Minimum and Maximum allowable run lengths
- Fittings (tees, elbows, couplings and endcaps)
- Most Common Mistakes

Plenum Size

9-inch round = 64 square inches

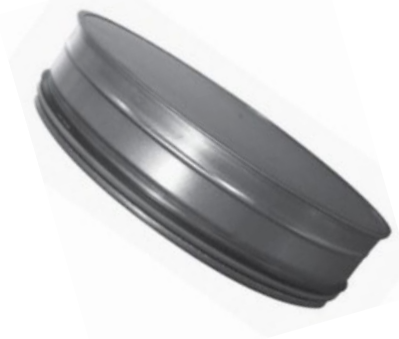
- 8 X 8-inch square
- 7 X 9 rectangular
- 6 X 11 rectangular
- 5 X 13 rectangular
- 4 X 16 rectangular
- 3 X 21 rectangular



SmartSeal Pipe & Fittings

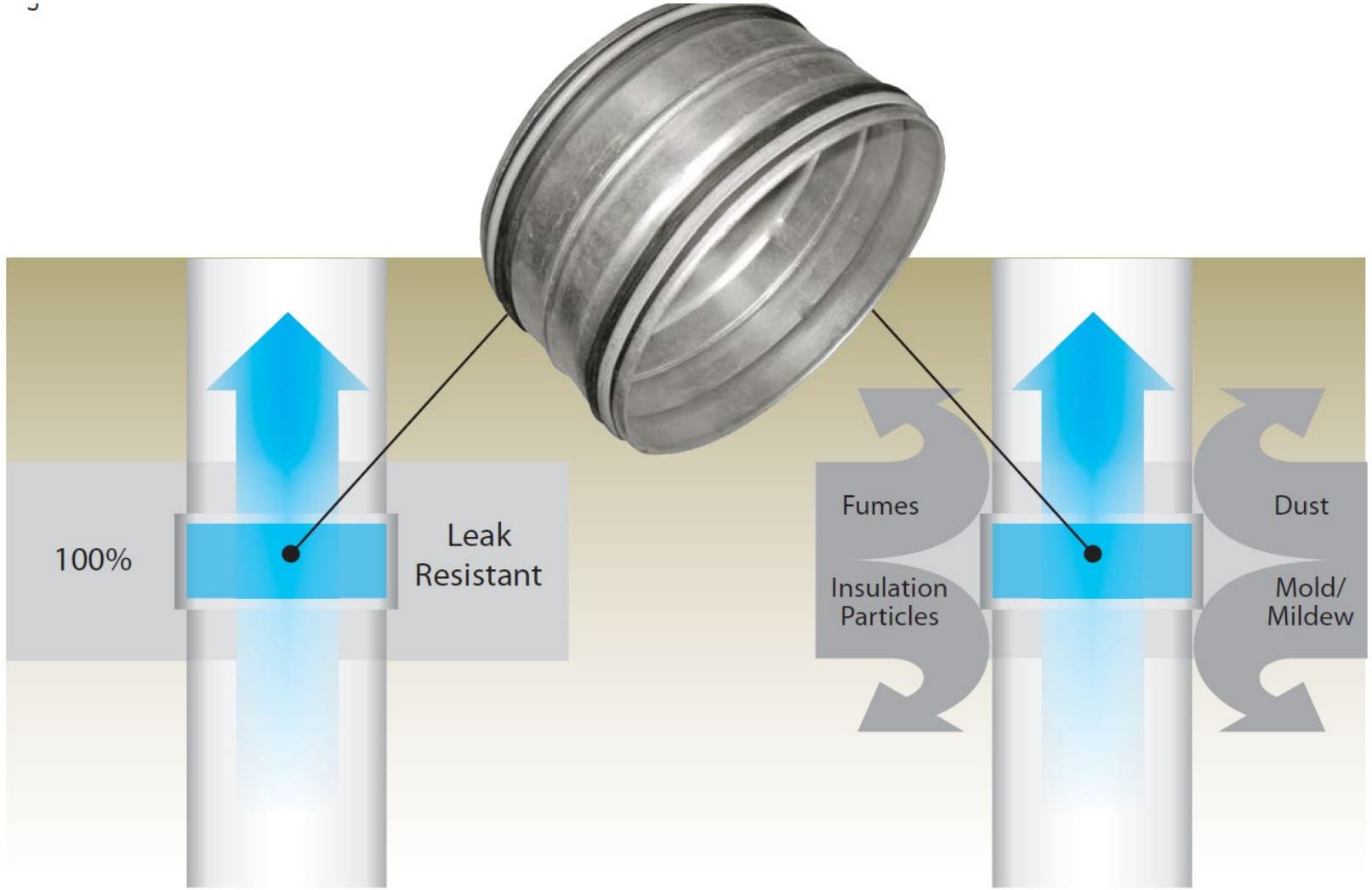
Standard Smart Seal System Duct Features

- Approved to SMACNA Duct Construction Standards and Leakage Class 3
- 100% Leak Resistant (to 10" W.C.)
- Fittings & Couplings Have Factory Installed Gasket
- Operating Temperature Range -20°F to 212°F
- Gasket is on the Leading Edge of Fittings, Allowing Substantial Space for Screw Insertion
- Recyclable Material
- Contains up to 58% Recycled Materials
- Eligible for LEED Points
- Significantly Reduced Installation Time



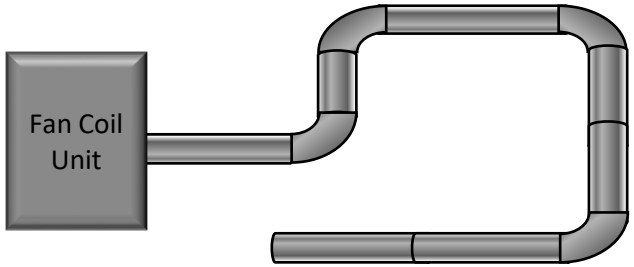
SmartSeal

Keeps pressure IN &
keeps contaminants OUT

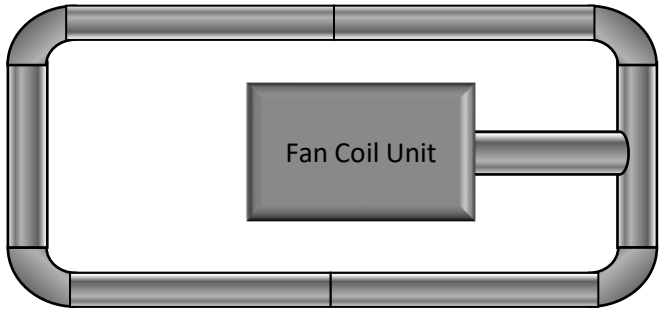


4 Main Plenum Configurations

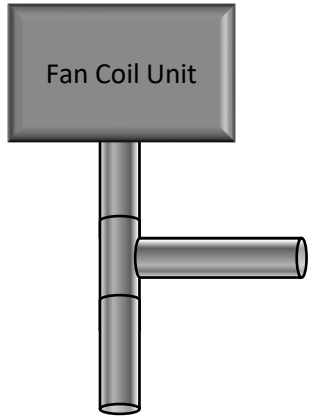
Shotgun



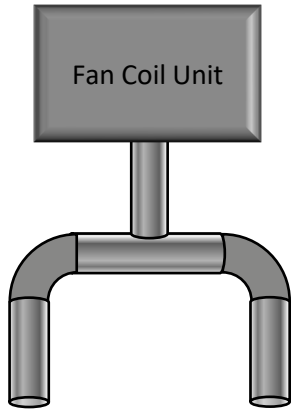
Perimeter Loop



Side Branch



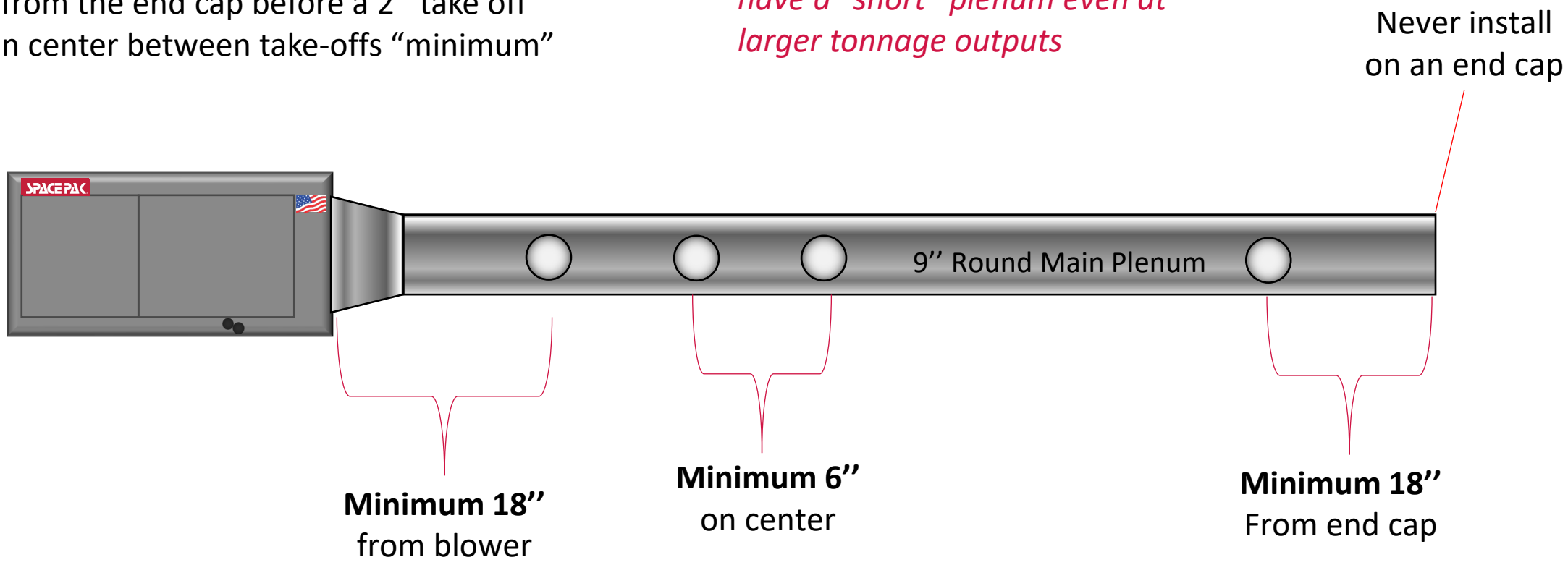
Horseshoe



Minimum Plenum Length Determined By

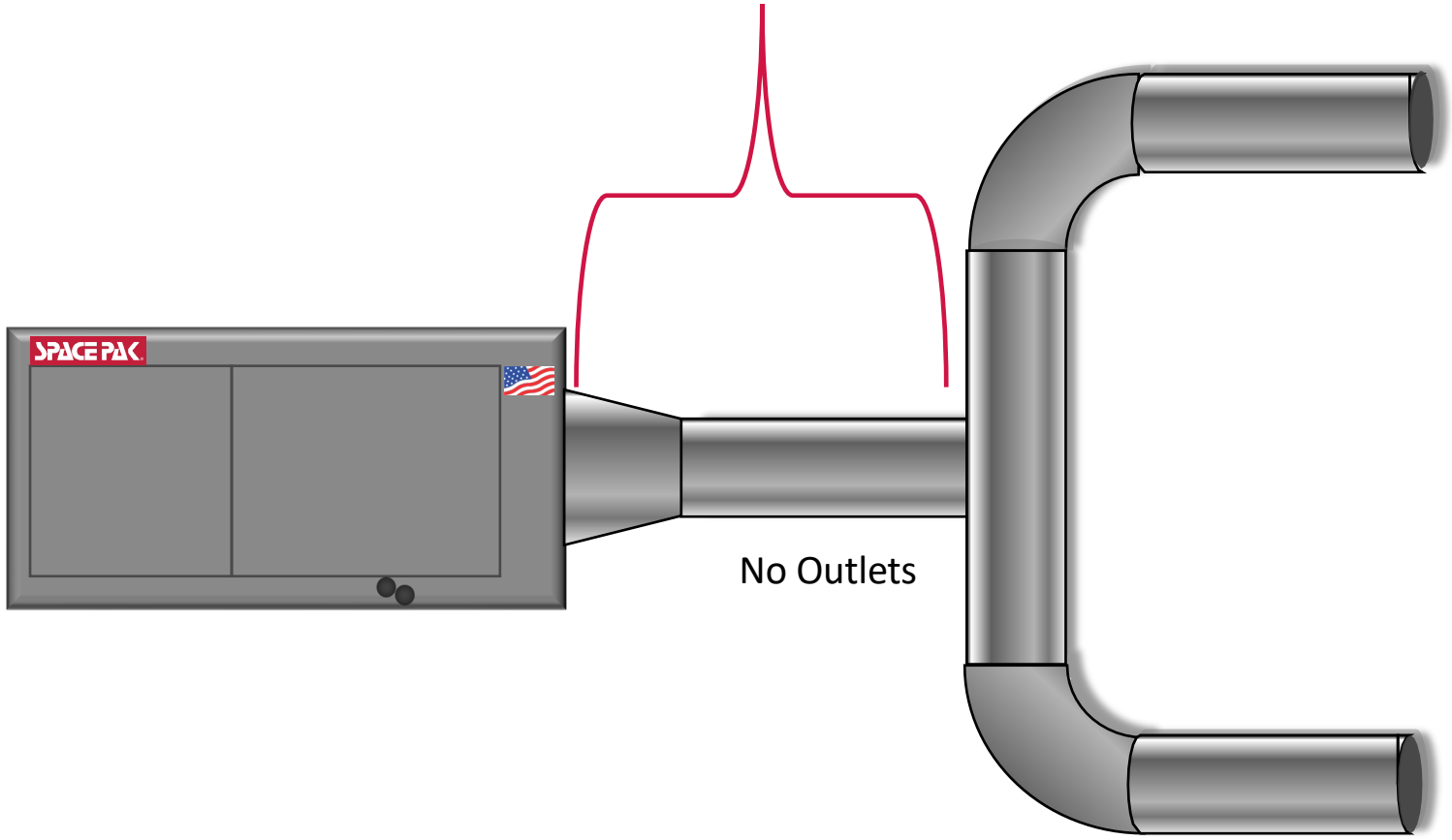
- 18’’ from blower before a 2’’ take off
- 18’’ from a fitting before a 2’’ take off
- 18’’ from the end cap before a 2’’ take off
- 6’’ on center between take-offs “minimum”

So, with straight pipe you can have a “short” plenum even at larger tonnage outputs



Horseshoe

Minimum 18’’ after the blower & before a tee, elbow, or 2’’ take-off

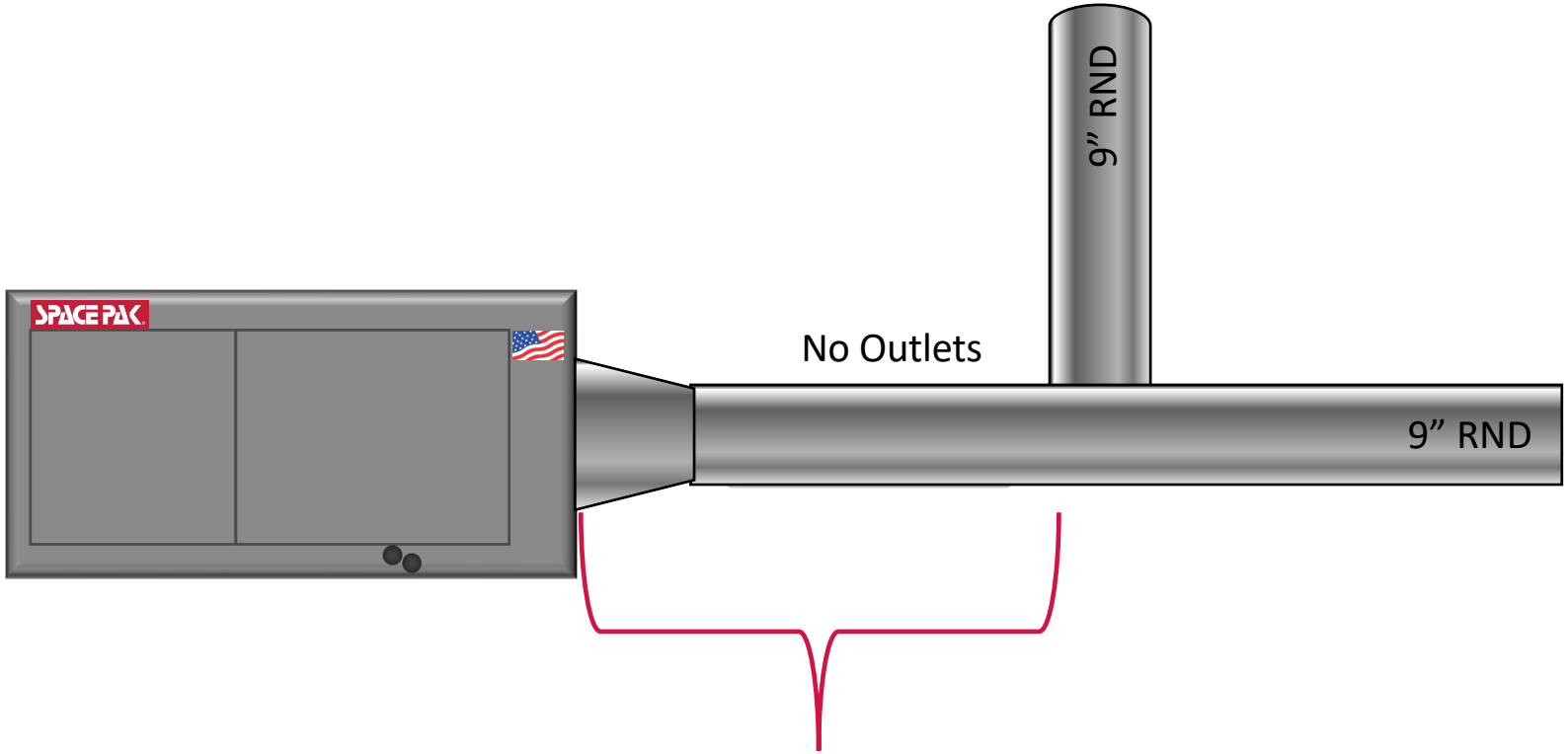


Maximum 40% capacity

Maximum 60% capacity

Side Branch

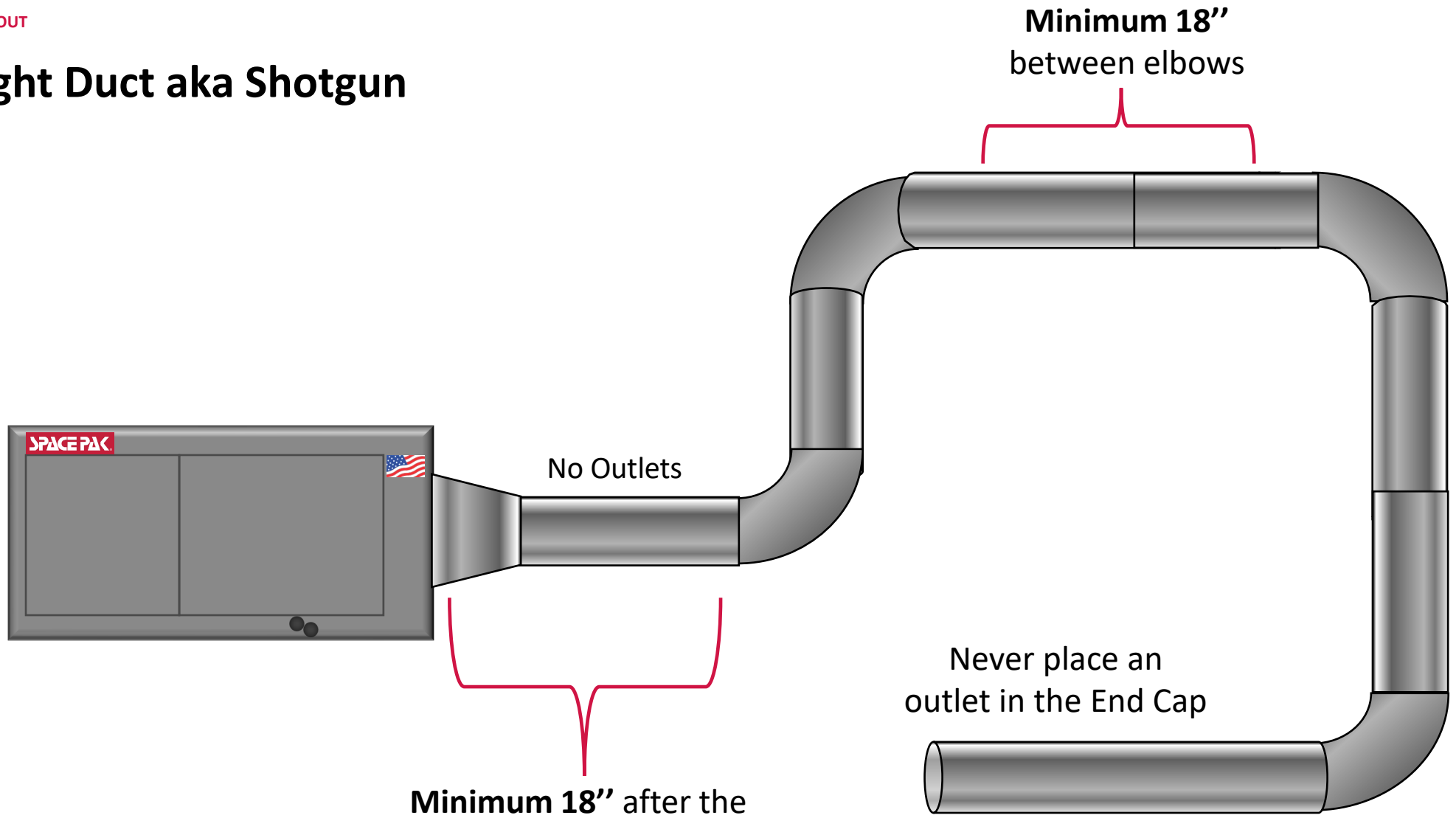
Maximum 30%
capacity



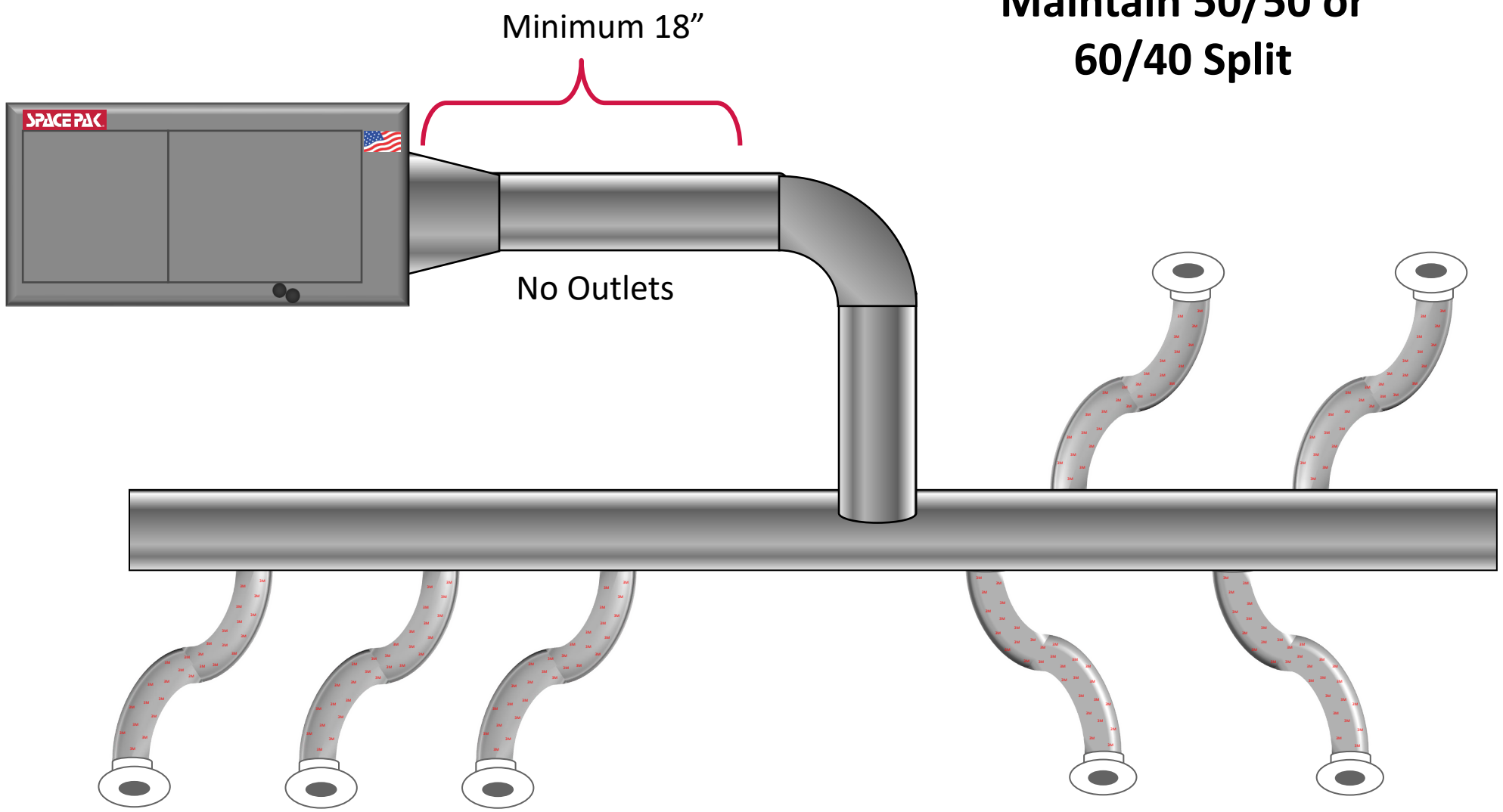
Maximum 70%
capacity

Minimum 18’’ after the blower & before a tee, elbow, or 2’’ take-off

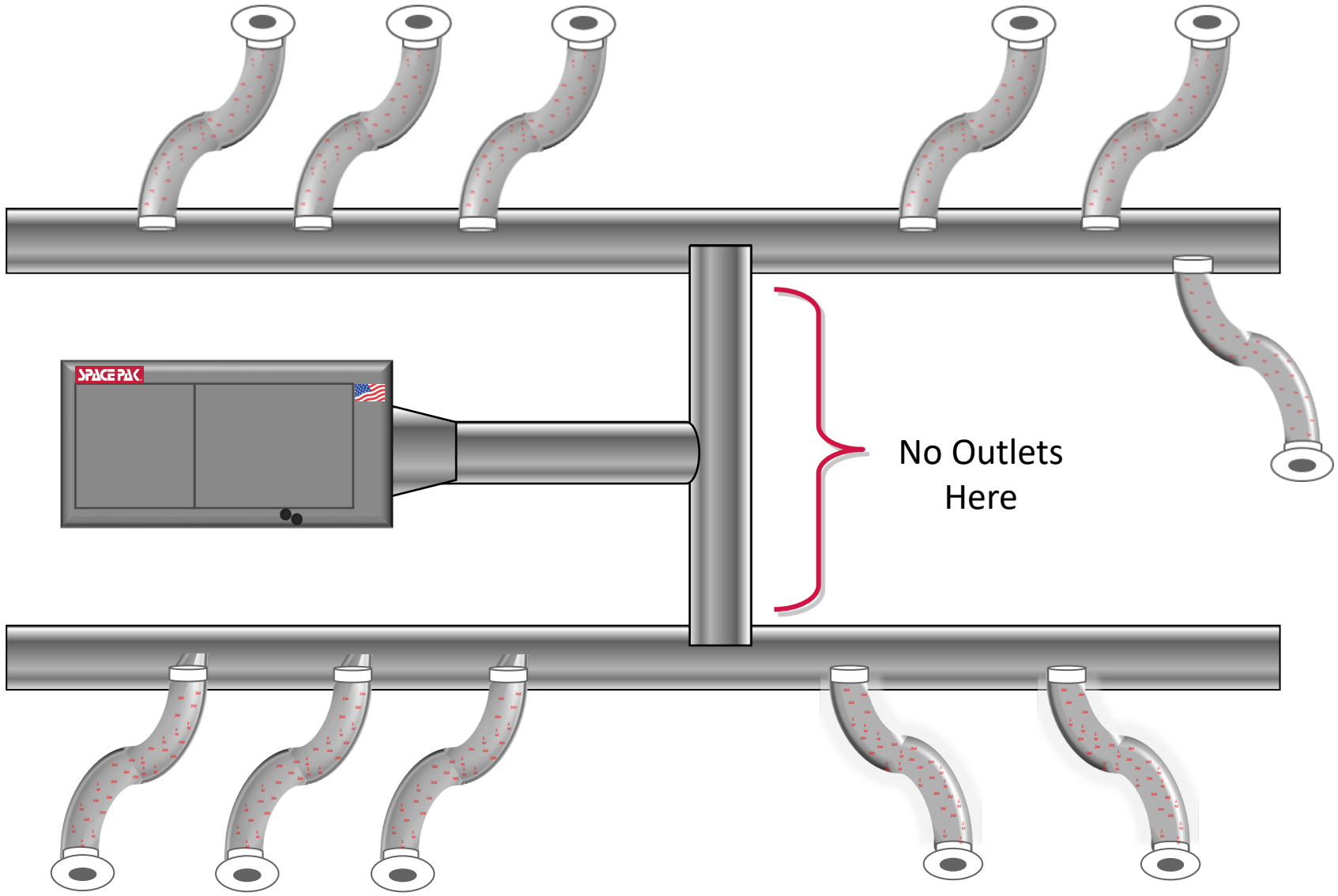
Straight Duct aka Shotgun



Shotgun with a Tee



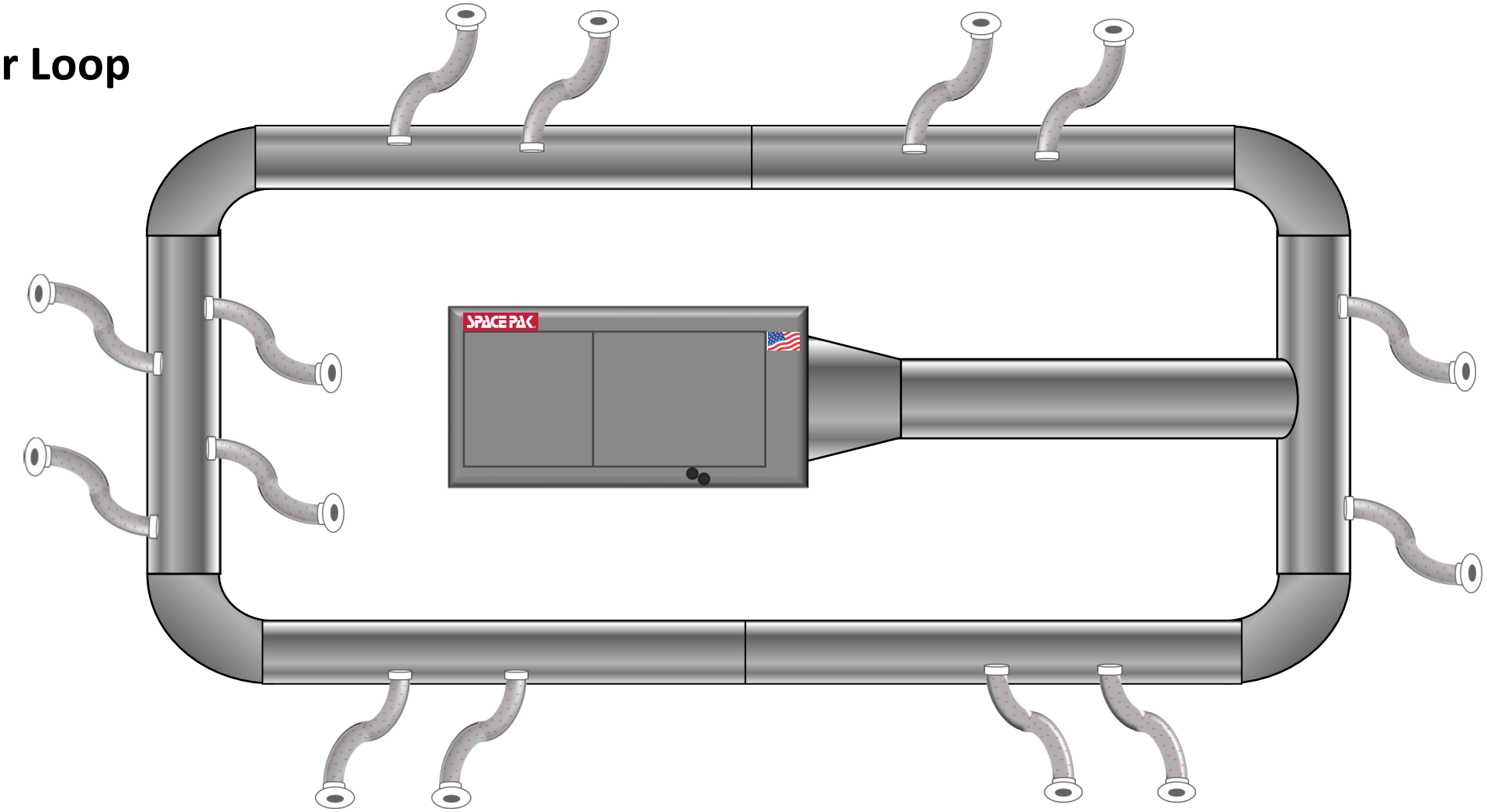
System One
50/50 Split



System Two
60/40 Split

Think of it as Two Systems!

Perimeter Loop



Note: Takeoffs can be evenly spaced or mostly one side or the other, the 50/50 rules do not apply when dealing with a perimeter loop. This set up will balance regardless of the layout.

What do you see wrong?

What do you see wrong?

?

Questions

RETROFIT CONSIDERATIONS!

- Just because a 2-, 3- or 5-ton unit was installed DOES NOT mean the same unit can go back in without looking at the existing system, its layout and available CFM's
- IT IS STILL IMPORTANT TO DO A LOAD CALCULATION. Many times, if a system has been installed for many years there may have been considerable efficiency improvements to the home. Ex.(the house may no longer require 5 tons of cooling due to window, roof and insulation upgrades)
- Count the total existing supply terminations
- If the blower in the existing system runs (even if the condenser does not) turn it on and take CFM readings at ALL outlets. Confirm total available CFMs are equal or greater than the amount required for the new system. (220-250 CFM PER TON)
- Verify, when possible, the main trunk "inside" diameter and overall length
- If the evaluation of the existing system reveals anything that may lead to the new system not operating properly without improvements, please note the specifics on your installation proposal.

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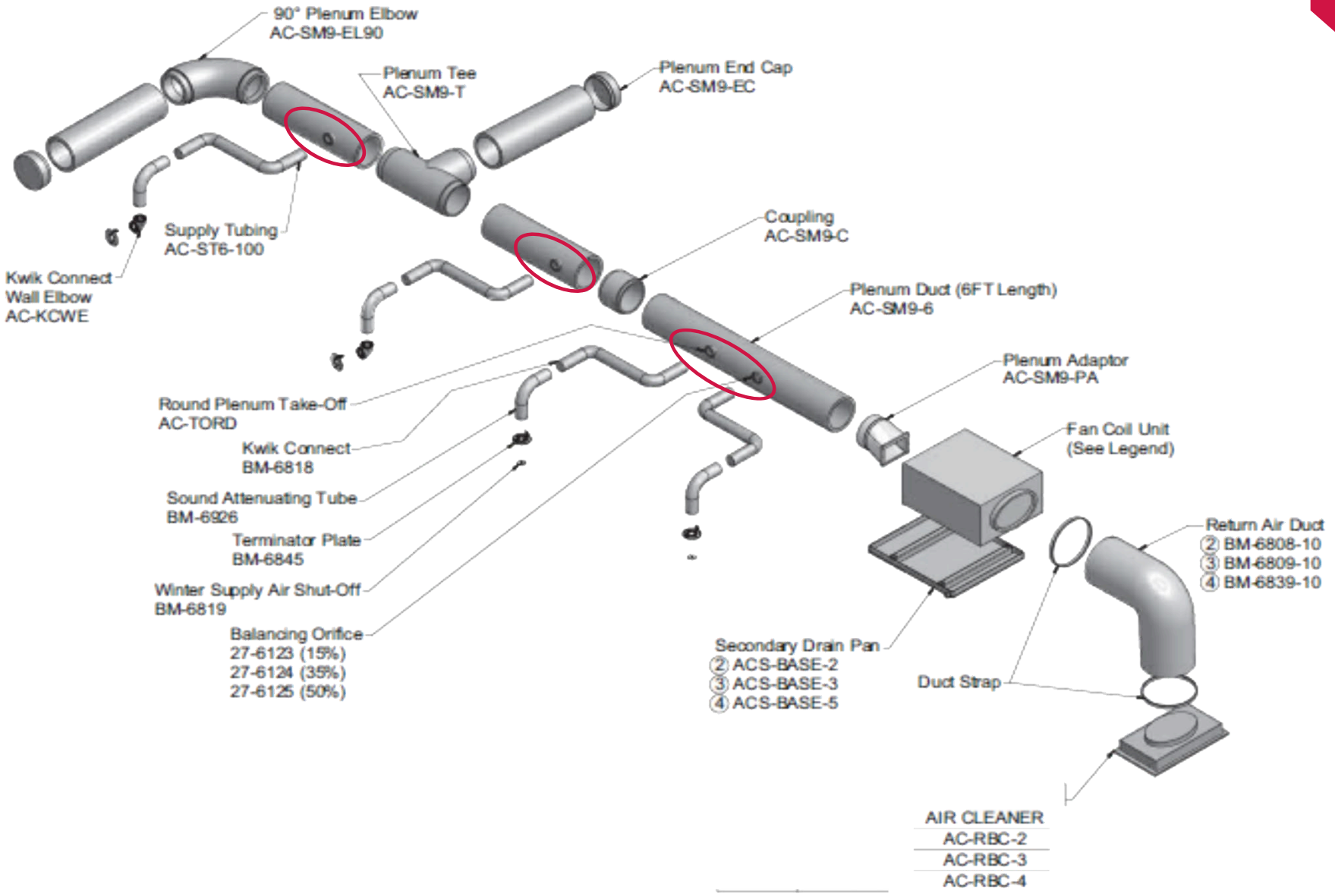
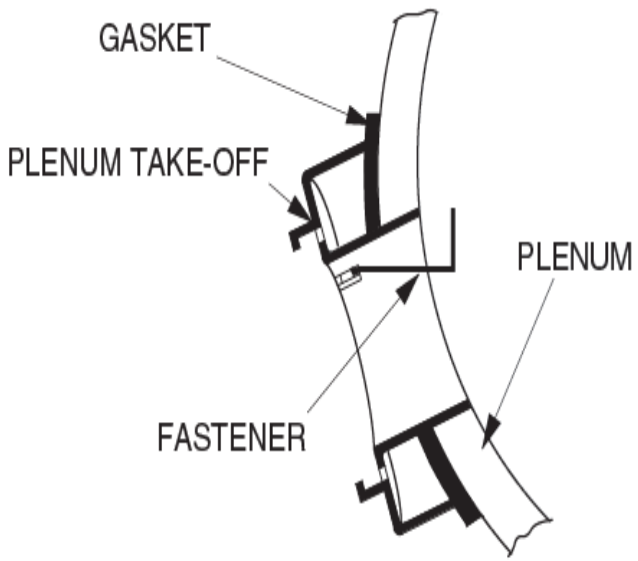
Questions

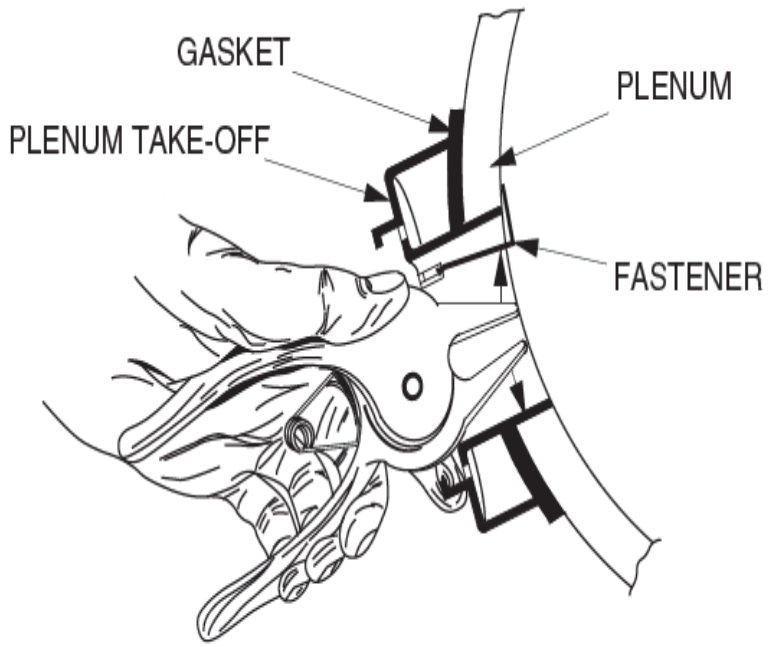
Plenum Take-Offs



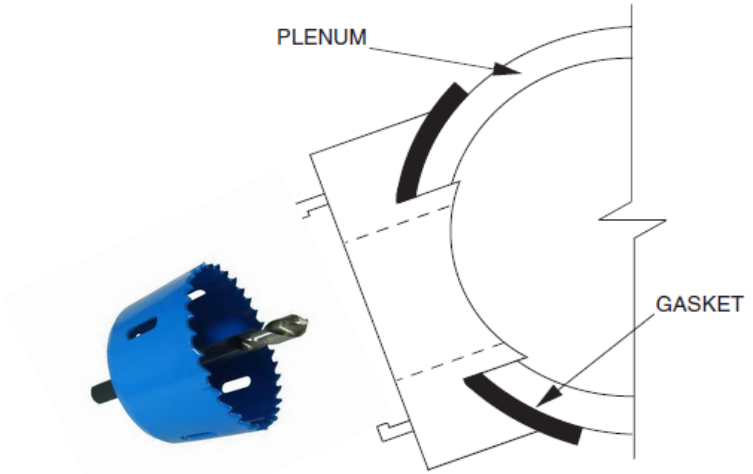
Plenum Take-Off Installation



1. HAND INSERT FASTENER INTO PLENUM TAKE-OFF



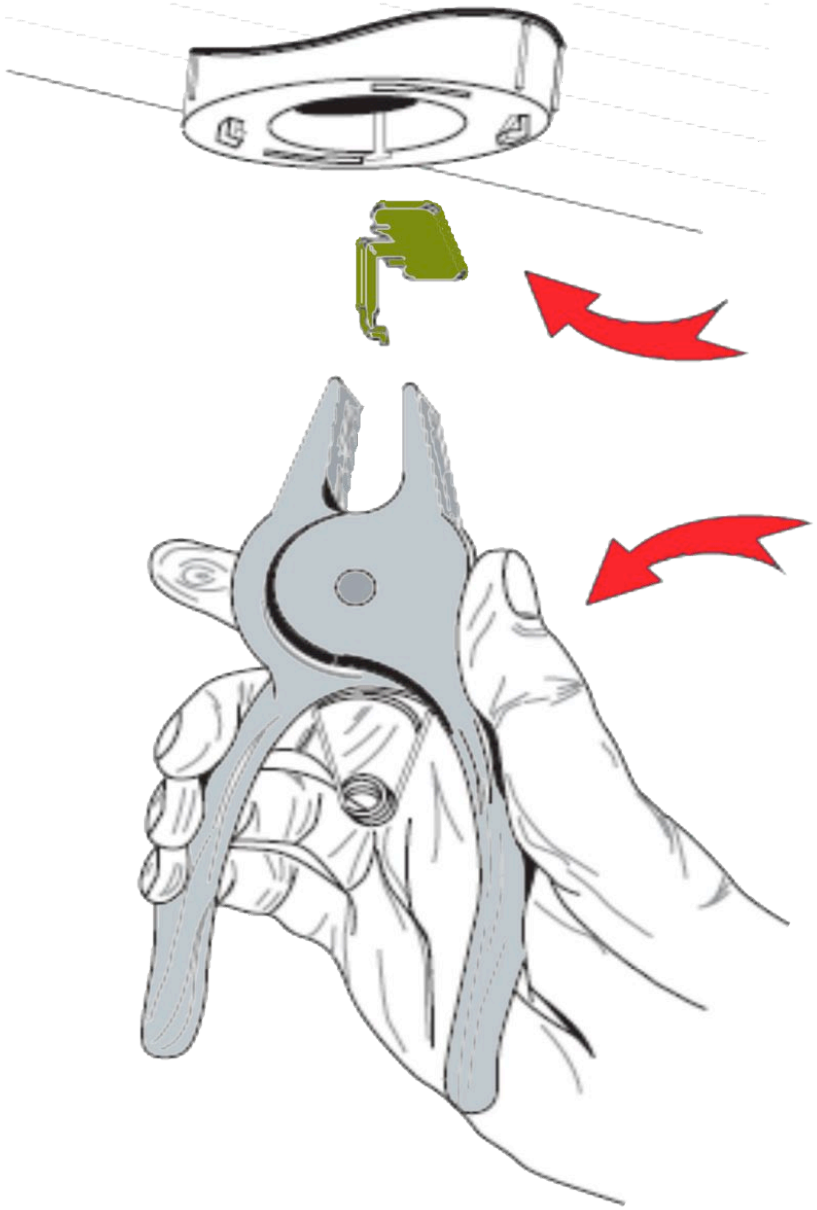
2. WITH PLIERS, SNAP FASTENER INTO PLACE UNTIL IT LOCKS IN PLACE



Pliers

2 and 1/8’’ Hole Saw

Pliers Part #
BM-6998



Note: Be sure to install **ALL** 4 retainer clips on each takeoff to maintain a good seal

Plenum Take-Off Kits

Come in packs of 2 or 5 to match **Installation Kits**

Available for both:

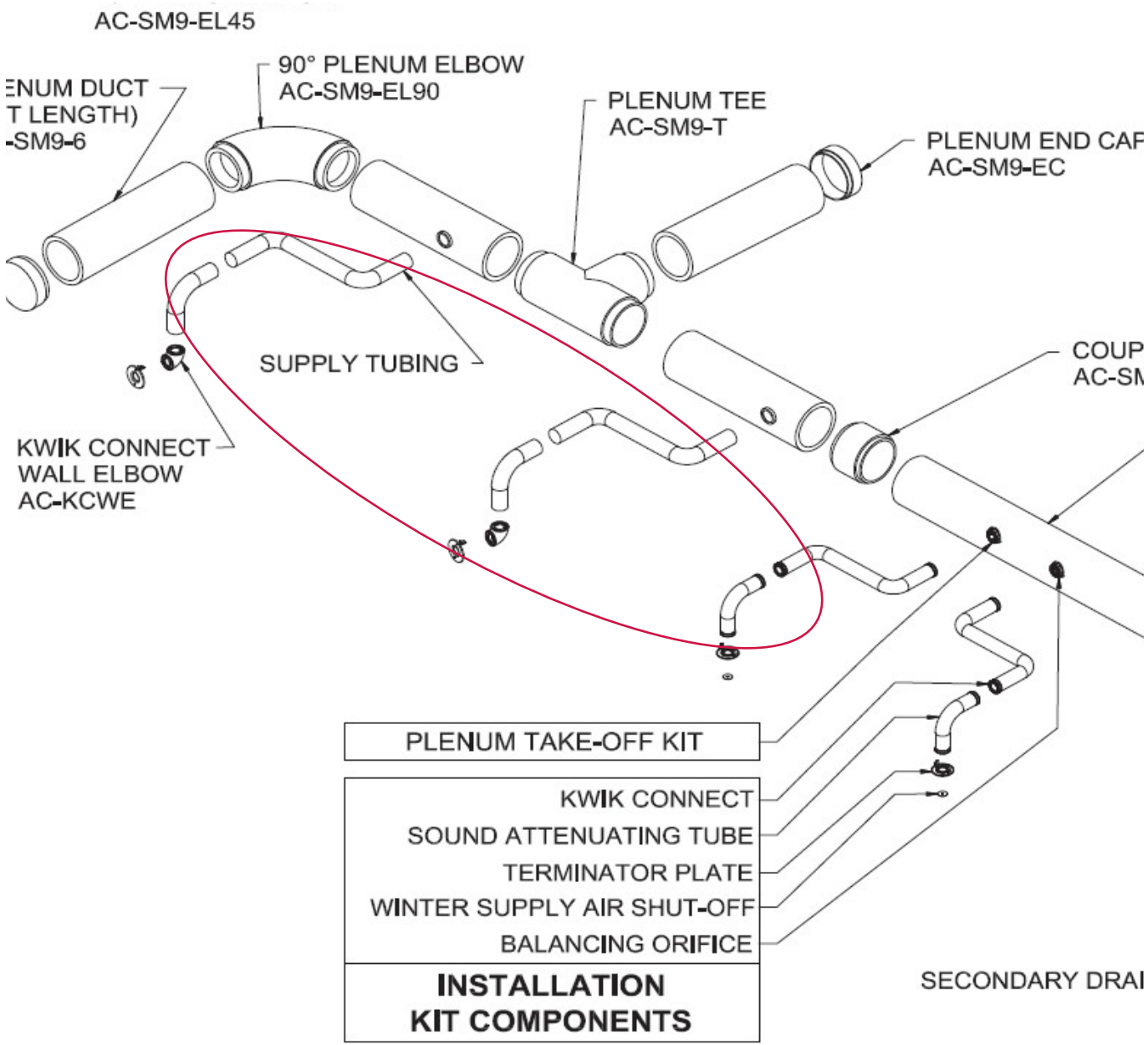
- Round Sheet Metal Duct (MR)
- 1’’ Square Fiberboard Plenum Duct (FS)

Order Codes	FS	MR
2 - Outlets	AC-TKFS-2	AC-TKMR-2
5 - Outlets	AC-TKFS-5	AC-TKMR-5

Note: You will receive these in the box

Example Take-Off Kit for (2) Outlets

Supply Tubing



Small Duct Supply Tubing

Note: Local building codes will be the deciding factor in your R-Value required for installation

R-6

- Boxes of 100 Feet
- Total diameter 3.75’’

R-8

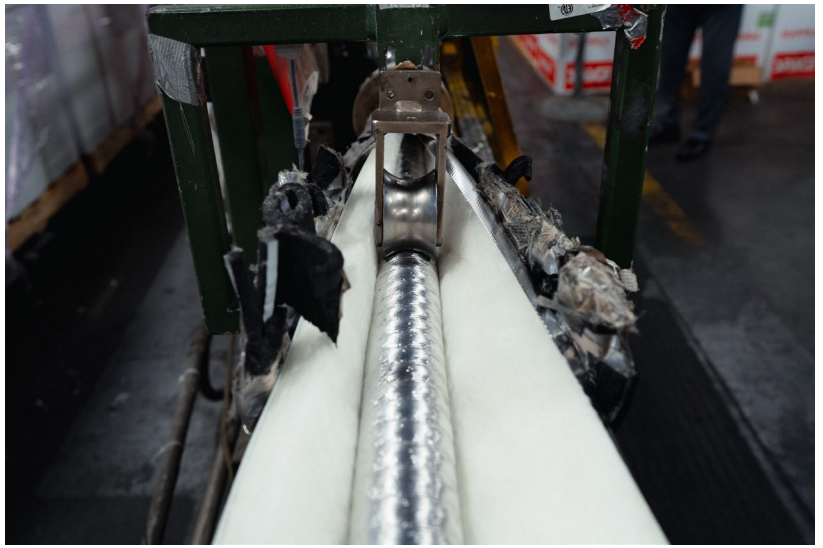
- Boxes of 75 Feet
- Total diameter 7’’

Small Duct Supply Tubing

- Rated pressure 0.0 – 2.5 W.C.
- Resistant to fungi growth
- Class 1, 25/50 flame/smoke spread
- Max operating temperature 250°F
- Duct closure tape min to max temperature range: -37 °F to 260 °F
- Meets surface burning characteristics & limited combustibility per UL 723, NFPA 90A & 90B, ASTM E84, CAN/ULC S102-1188
- Meets Buy American Standard
- SCS Certified for Green Building Recycled Content

Unique Tubing Machine

Farmville, NC



Supply Rules & Topics

- 6-7 outlets minimum per ton on AC-only
- In cooling only above 5,000’ use 8 outlets per ton and above 6,500’ use 9 outlets per ton
- 7-8 outlets minimum per ton on a Heat Pump System (due to higher coil pressures)
- 2,000 BTUs per outlet (fully rated) in Cooling at 37 cfm
- 3,000 BTUs per outlet (fully rated) in Heating at 37 cfm
- Outlet placement considerations
- Room-by-room load calculations to ensure the number of outlets in a room
- Best length of a duct run (includes sound attenuator)
- Maximum length of a duct run (9’ to 15’ includes the 3’ sound attenuator)
- If the termination “hole” is closer to the trunk than 9’ then loosely coil the supply

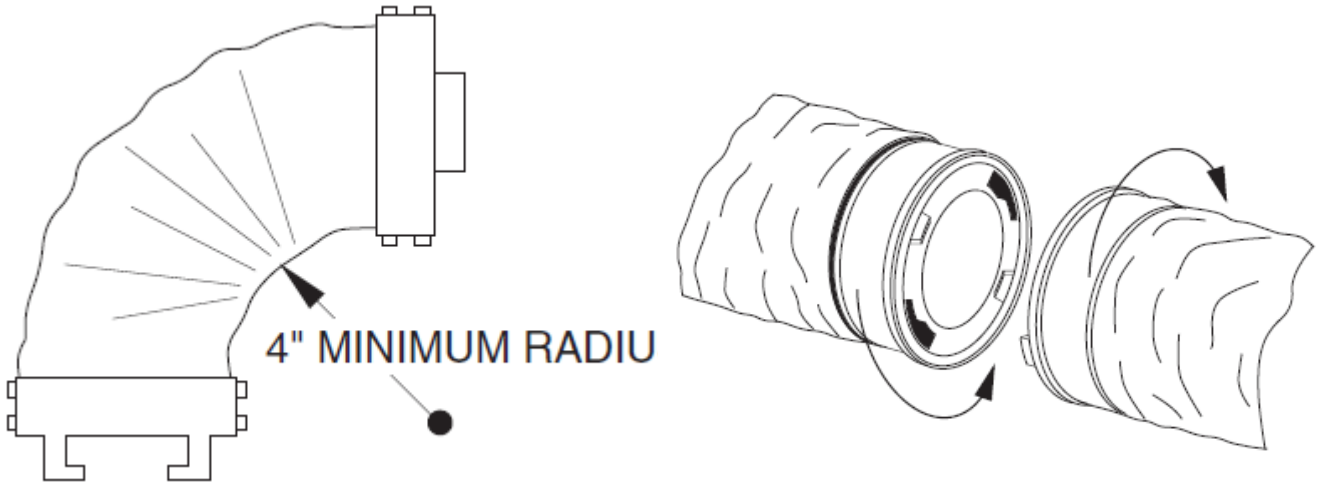
Best Length of Duct Run

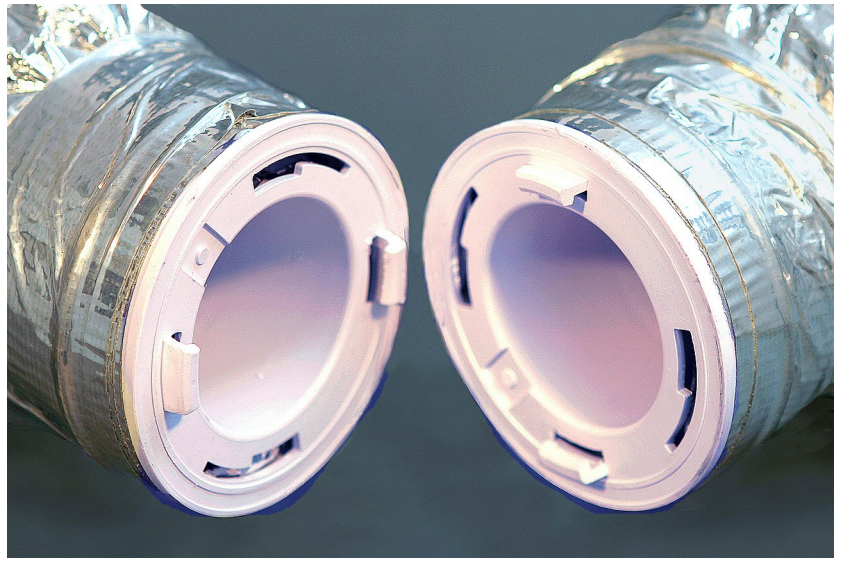
- Best length to balance the outlets run: 9 to 15 feet (with attenuator)
- Shorter than 9 feet work with duct orifice balancers
- Longer runs work if more runs are added to make up for the CFM lost
- 10% rule Loss of CFM and BTUs (after 15’ of supply run you lose 10% for every additional 5’)
- CFMs directly affect the amount of BTU’s delivered

2" SUPPLY TUBING LENGTH ADJUSTMENT FACTOR CHART								
RUN	6'	8'	10'	12'	15'	20'	25'	30'
FACTOR	1.18	1.14	1.11	1.06	1.0	.9	.8	.66

Kwik Connects / Radius

- Minimum 4” radius for tubing
- For tighter radius use ridged elbow
- Tube cuts easily with a bread knife or similar
- “Crunch” down 2” of the aluminum core before twisting in quick connect
- No need to overtighten
- Tuck remaining insulation under twist collar
- Tape connection

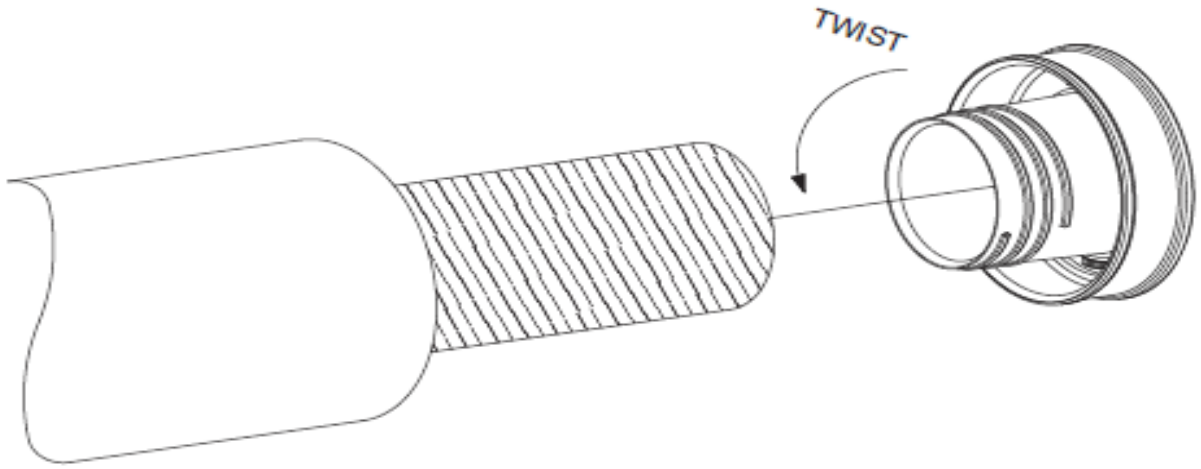




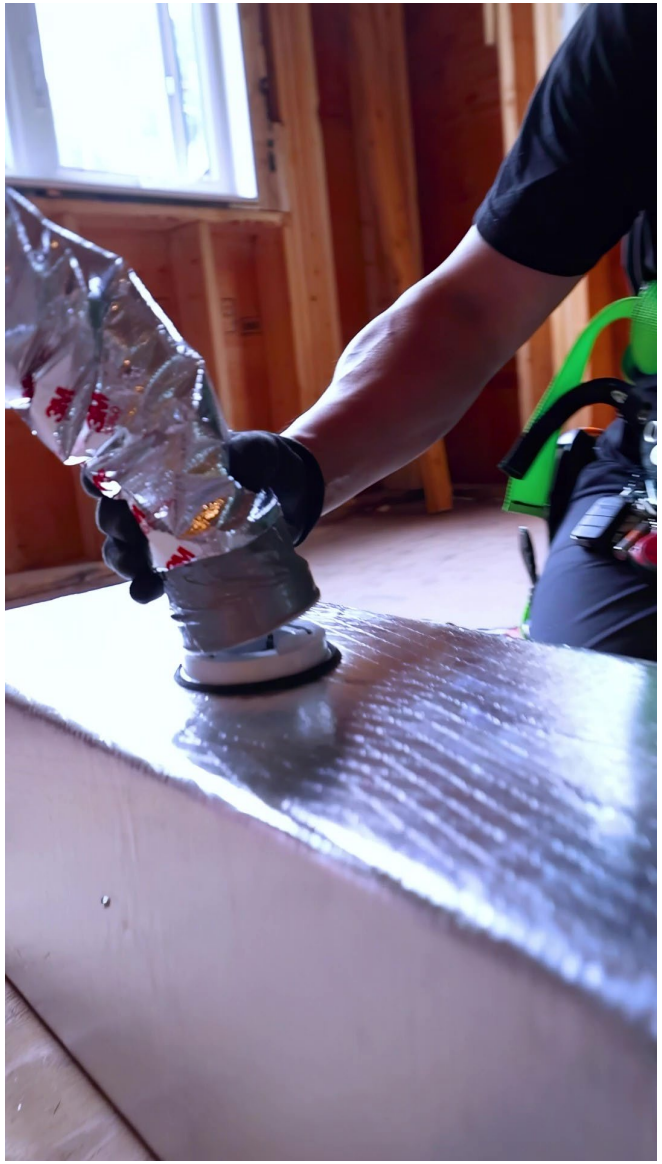
Kwik Connects / Radius

No need to screw or fasten beyond tape

No need to overtighten



SUPPLY TUBING



Sound Attenuator

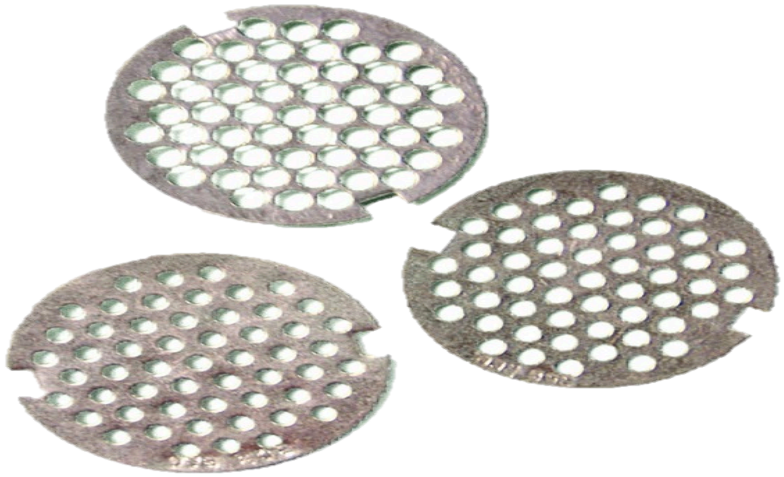
- 3-foot standard section
- Pre-assembled connectors
- Reduces velocity noise/cloth-lined
- End of every run
- Included in the total run length

Installation Kits / Common Parts Box

Used for all duct system types

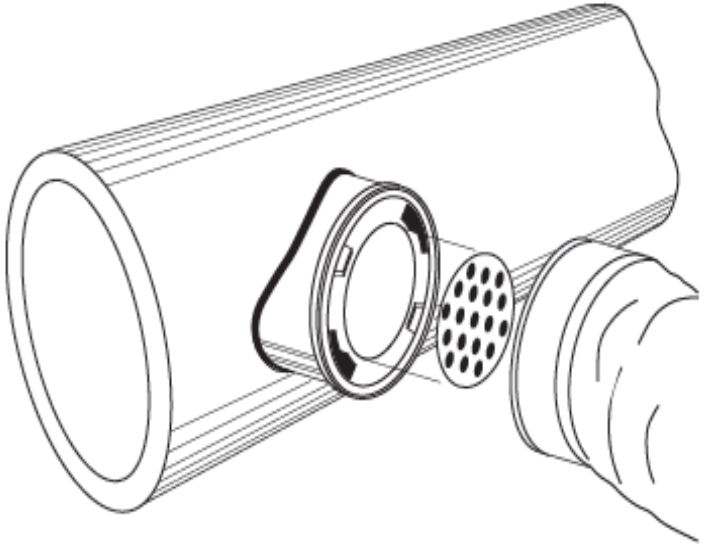
Note: Take-off clips and gaskets supplied in “Take-Off Kits”

Balancing Orifices



Available in 3 sizes 15, 35, 50% (restriction)

- Install ONLY in the plenum
- Do NOT install in the room-side termination
- Only used for balancing or areas that need reduced BTUs
- Most commonly used for small room/ bathroom supplies
- If installed, please mark the plenum and make a note for future service



Balancing Orifices

Cooling Only

- This WILL result in unwanted noise and reduction of output
- These are to only be installed at the plenum and only used for balancing and BTU reduction

NOTE: Use ¼‘” screen for floor installs to prevent the introduction of small objects

6 Fully Rated Outlets Per Ton Minimum

Cooling Only

System Size (in tons)	System CFM	Number of Outlets	Average CFM	COOLING BTUs per outlet	HEATING BTUs per outlet
2	440	12	37	2,000	3,000
2.5	550	15	37	2,000	3,000
3	660	18	37	2,000	3,000
3.5	770	21	37	2,000	3,000
4	880	24	37	2,000	3,000
5	1100	30	37	2,000	3,000

Note: In DX heat pump applications, 7-8 outlets minimum may be needed

10 Outlets Per Ton Maximum

System Size (in tons)	System CFM	Number of Outlets	Average CFM	COOLING BTUs per outlet	HEATING BTUs per outlet
2	440	20	22	1,200	1,800
2.5	550	25	22	1,200	1,800
3	660	30	22	1,200	1,800
3.5	770	35	22	1,200	1,800
4	880	40	22	1,200	1,800
5	1,100	50	22	1,200	1,800

CFM Per Outlet

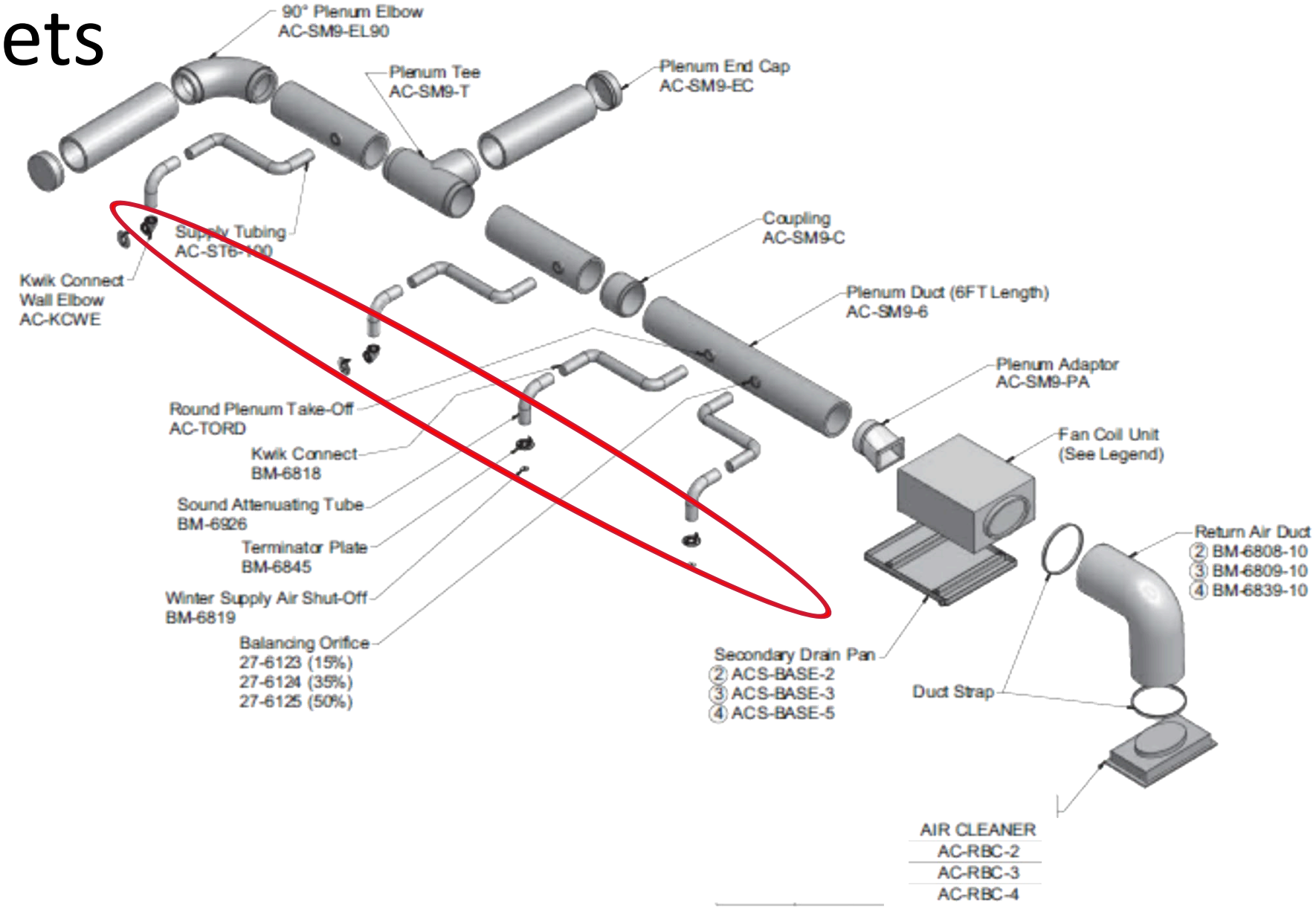
	CFM Per Outlet				
	Plenum Static Pressure "WC				
Supply Tube Length	1.8	1.5	1.2	1	0.5
10	45	40	36	33	22
15	37	33	30	27	18
20	32	28	26	23	15
25	29	25	23	21	14
30	26	23	21	19	13
35	24	22	19	18	12
40	23	20	18	16	11

Note: When delivered CFMs are low additional supplies may have to be added in a room to achieve the required BTUs

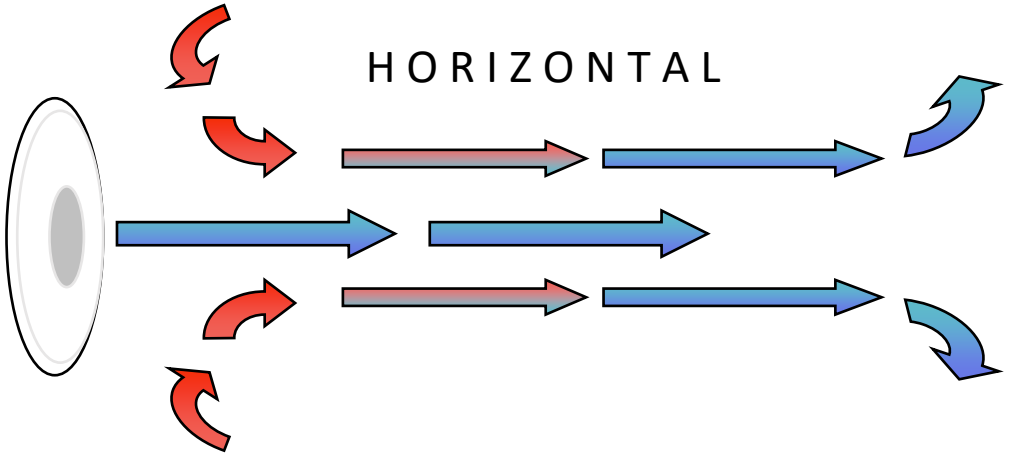
?

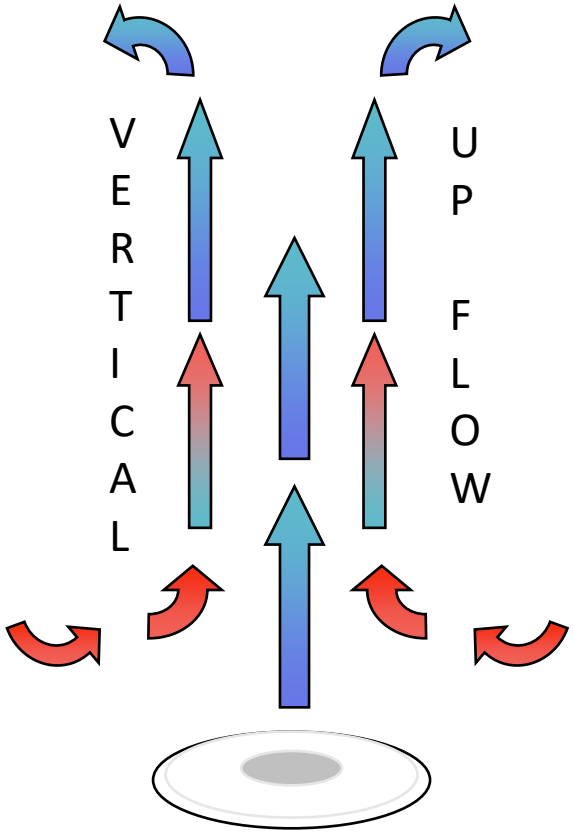
Questions

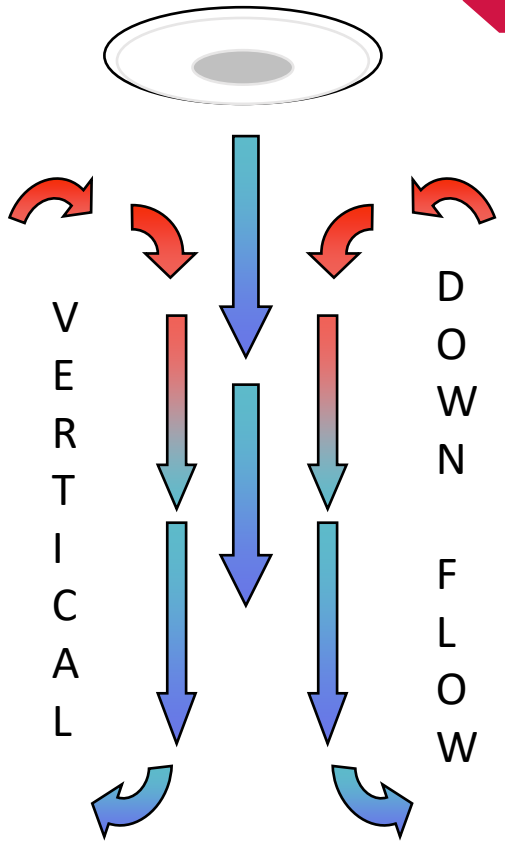
Outlets


90° Plenum Elbow
AC-SM9-EL90
Plenum Tee
AC-SM9-T
Plenum End Cap
AC-SM9-EC
Supply Tubing
AC-ST6-100
Kwik Connect
Wall Elbow
AC-KCWE
Coupling
AC-SM9-C
Plenum Duct (6FT Length)
AC-SM9-6
Plenum Adaptor
AC-SM9-PA
Fan Coil Unit
(See Legend)
Round Plenum Take-Off
AC-TORD
Kwik Connect
BM-6818
Sound Attenuating Tube
BM-6926
Terminator Plate
BM-6845
Winter Supply Air Shut-Off
BM-6819
Balancing Orifice
27-6123 (15%)
27-6124 (35%)
27-6125 (50%)
Secondary Drain Pan
② ACS-BASE-2
③ ACS-BASE-3
④ ACS-BASE-5
Return Air Duct
② BM-6808-10
③ BM-6809-10
④ BM-6839-10
Duct Strap
AIR CLEANER
AC-RBC-2
AC-RBC-3
AC-RBC-4

Outlet Orientation







Outlet Placement Rules

DON'T DO THESE

- Place in traffic patterns *(room ceiling & floor corners, and behind door swings are ideal)*
- where it will blow on someone *(air can travel 15+ Feet)*
- where it will blow on something that will move *(example; curtains)*
- Never block an outlet *(reduction of airflow can reduce system performance)*
- Have at least 6 inches from the center of an outlet to a wall

- If an outlet is mounted in the floor, a ¼" screen can be used to prevent the introduction of foreign objects into the system.

- Ceiling, sidewall, or floor are all ok! ***Aspiration will work anywhere!!!***

The number of outlets in a room is determined by:

- A proper room-by-room load calculation
- The BTUs required in the room based on the load
- CFM per outlet based on the supply run and trunk layout
- Length of the run

Basic System Overview

Residential House in Albany N.Y.

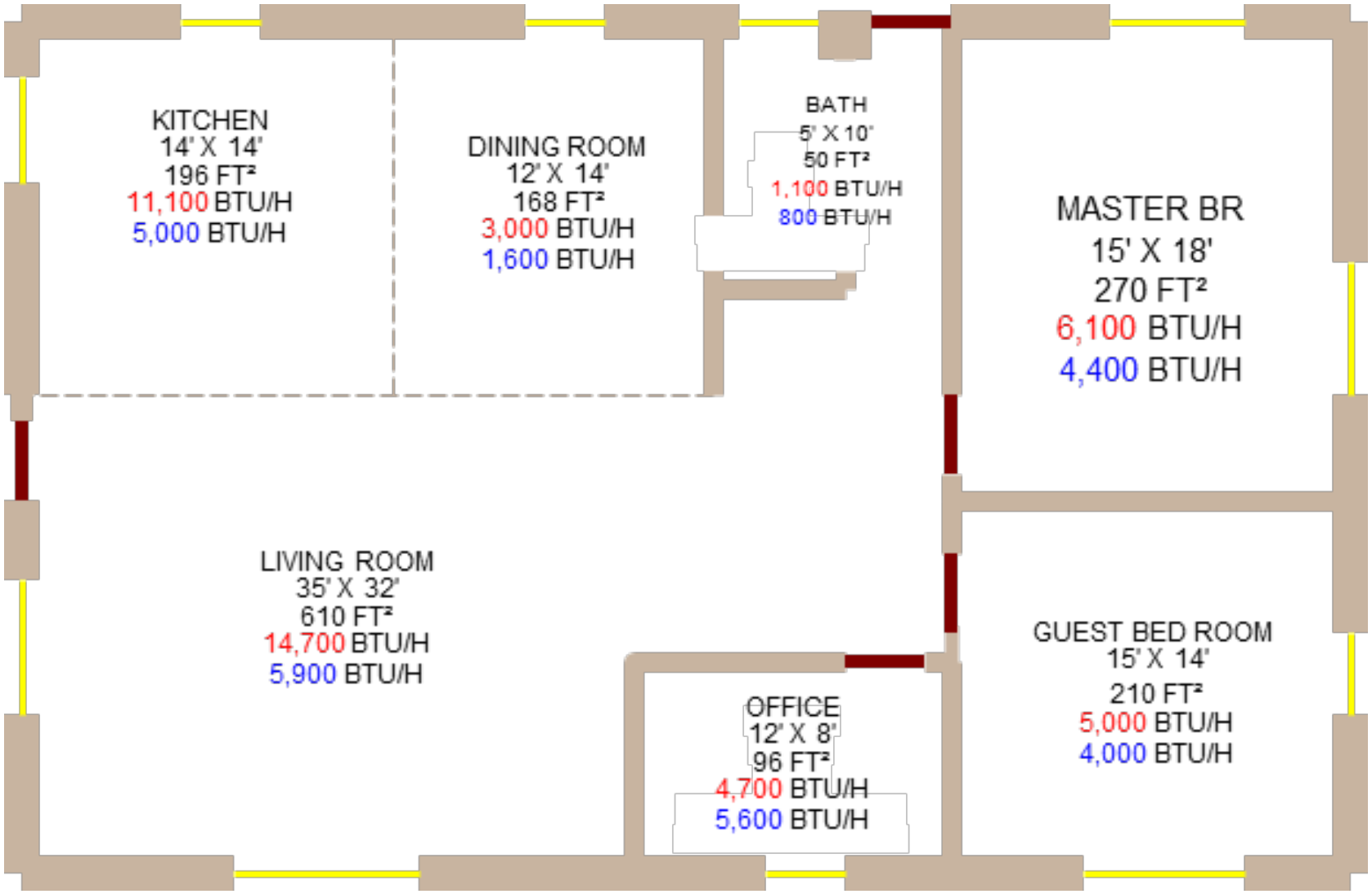
Heating

45,700/ 3000 BTU per full rated outlet = **15.2 outlets minimum**

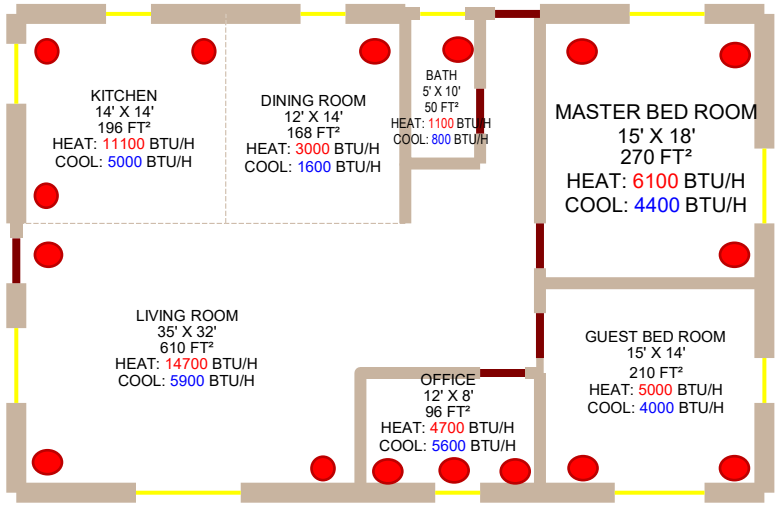
Cooling

27,300/ 2000 BTU per full rated outlet = **13.6 outlets minimum**

Note: This is a good way to get an approximate system size; however, a full room-by-room load calculation should be done to ensure that the individual rooms are supplied properly.



DX Coil Cooling Only



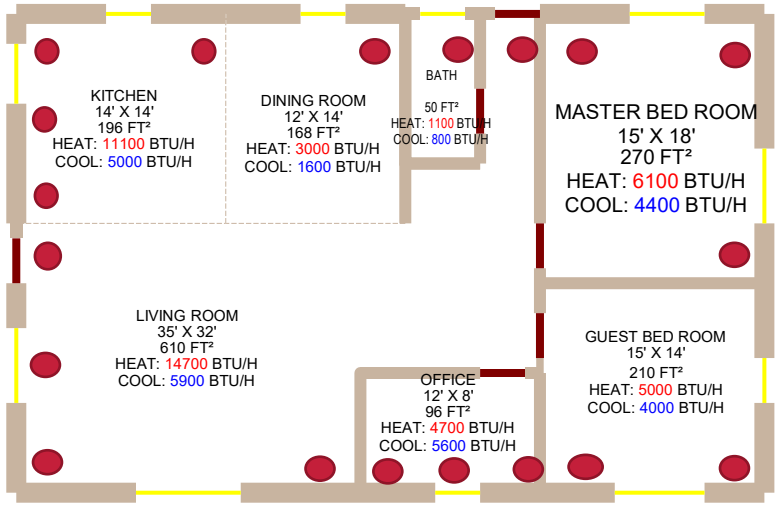
Kitchen
5,000 Btu Cooling
÷ 2,000 = 2.5

How Many outlets?

3 Outlets

- Dining Room 1, Bath Room 1, Master Bed 3, Guest Bed 2, Office 3, Living Room 3
- Our Cooling Load is 27, 300 BTUH ÷ 2000 = 13.65 outlets.
- The unit we would use is an ESP-2430K DX FAN COIL with a 2.5 ton Condenser, 30,000 BTUH ÷ 2000 requires 15 Outlets we have 16 so your good to go !

Dx Coil Option With Hydronic Coil For Heating



Kitchen
11,100 Btuh
Heating
÷ 3,000 = 3.7

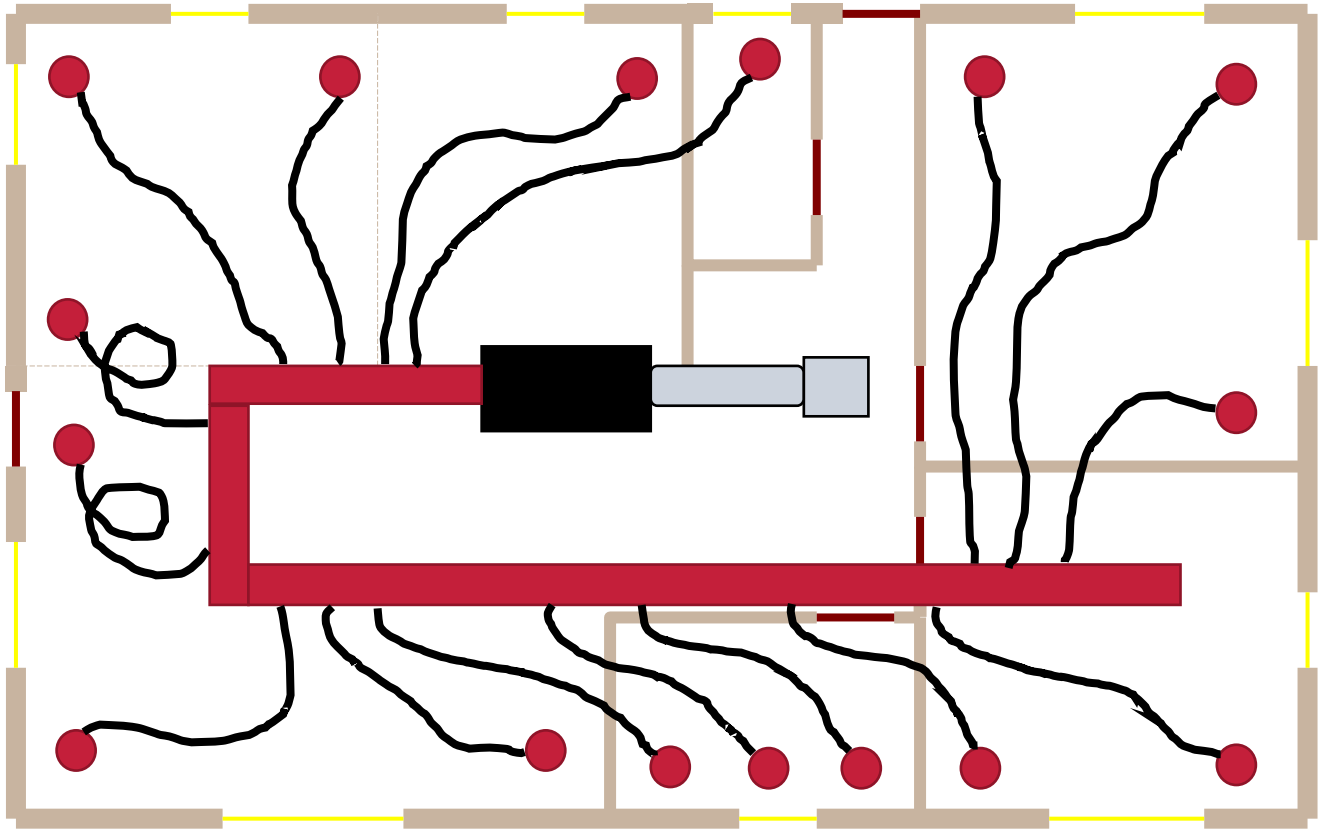
5,000 Btuh Cooling
÷ 2,000 = 2.5

How Many outlets ?

4 Outlets

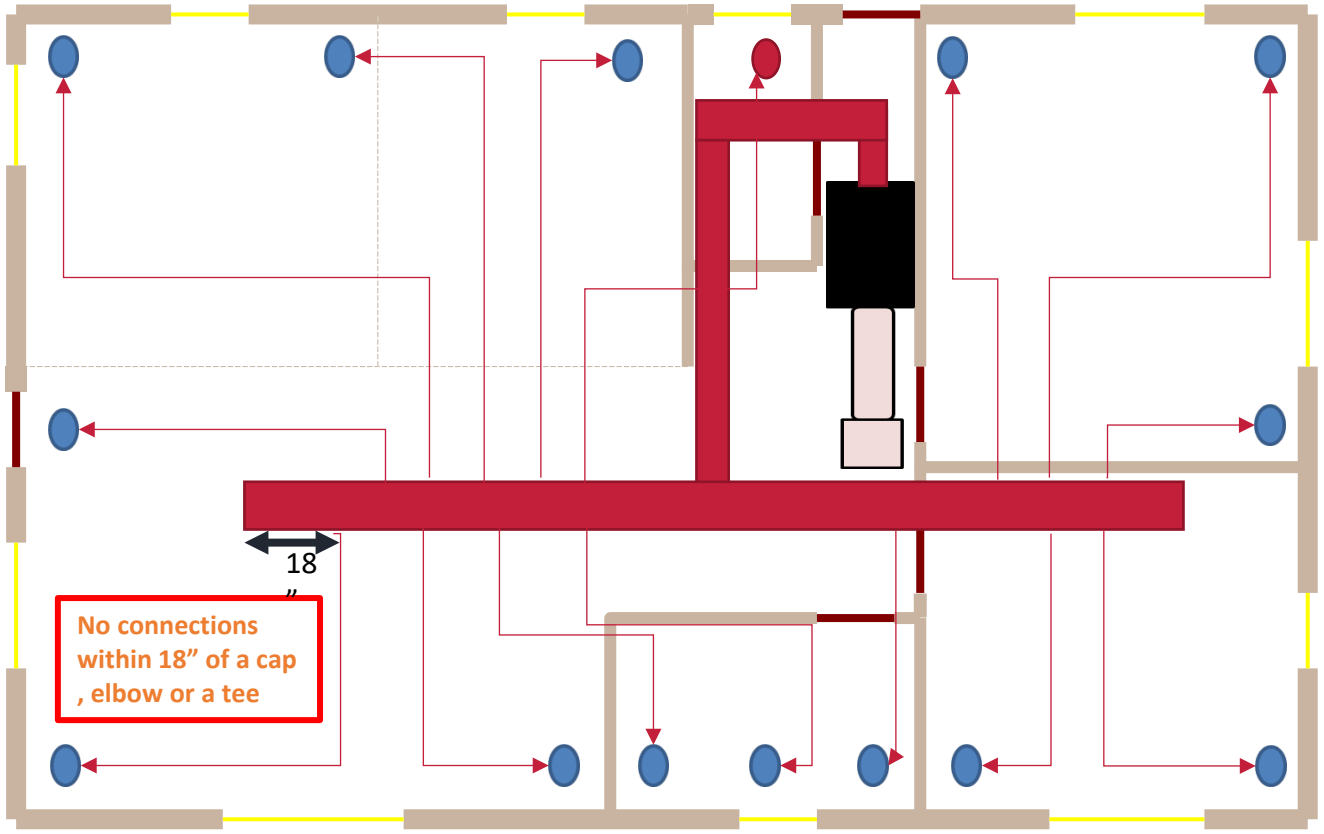
- Dining Room 1, Bathroom 1, Master Bed 3, Guest Bed 2, Office 3, Living Room 5
- Our Largest Load is the Heating Load of 45,700 BTUH ÷ 3000 = 15.2 outlets.
- The unit we would use is an ESP-3642K DX FAN COIL combined with a 2.5-ton Condenser, add an AC-WPAK-90 Hydronic Coil requiring 16 Outlets we have 19 so your good to go !

The Shotgun Duct System

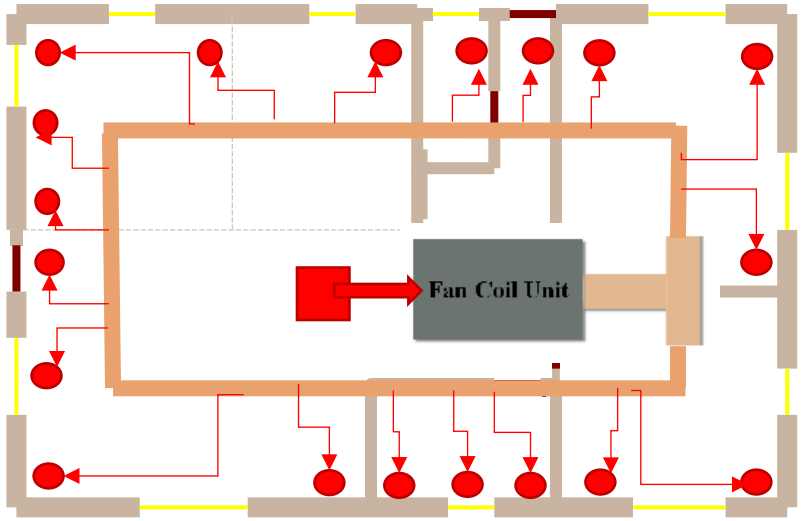


The Shotgun with a Tee

Be sure to follow the “TEE” rules



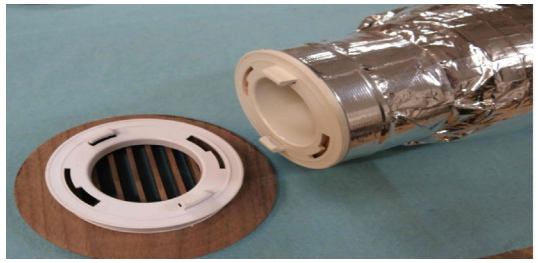
Perimeter Loop

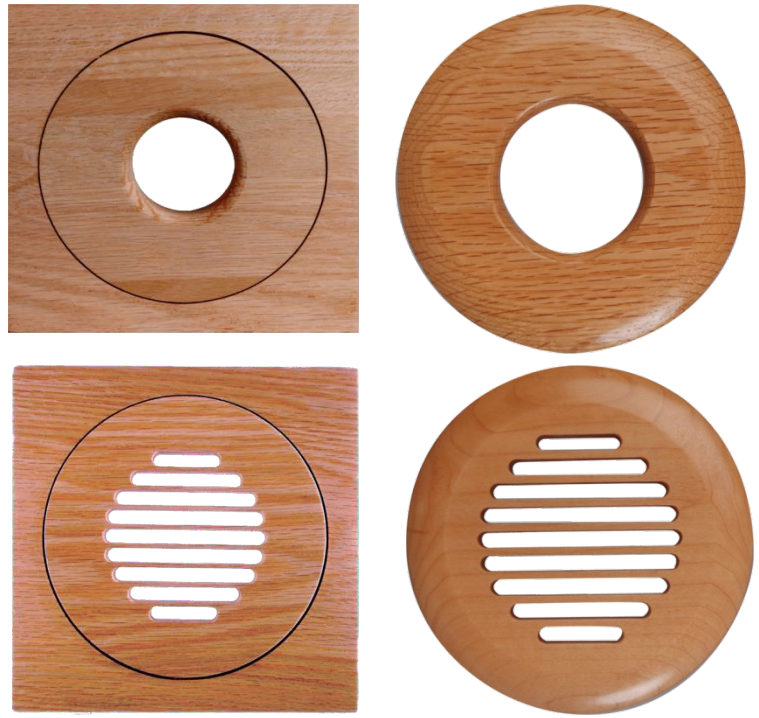


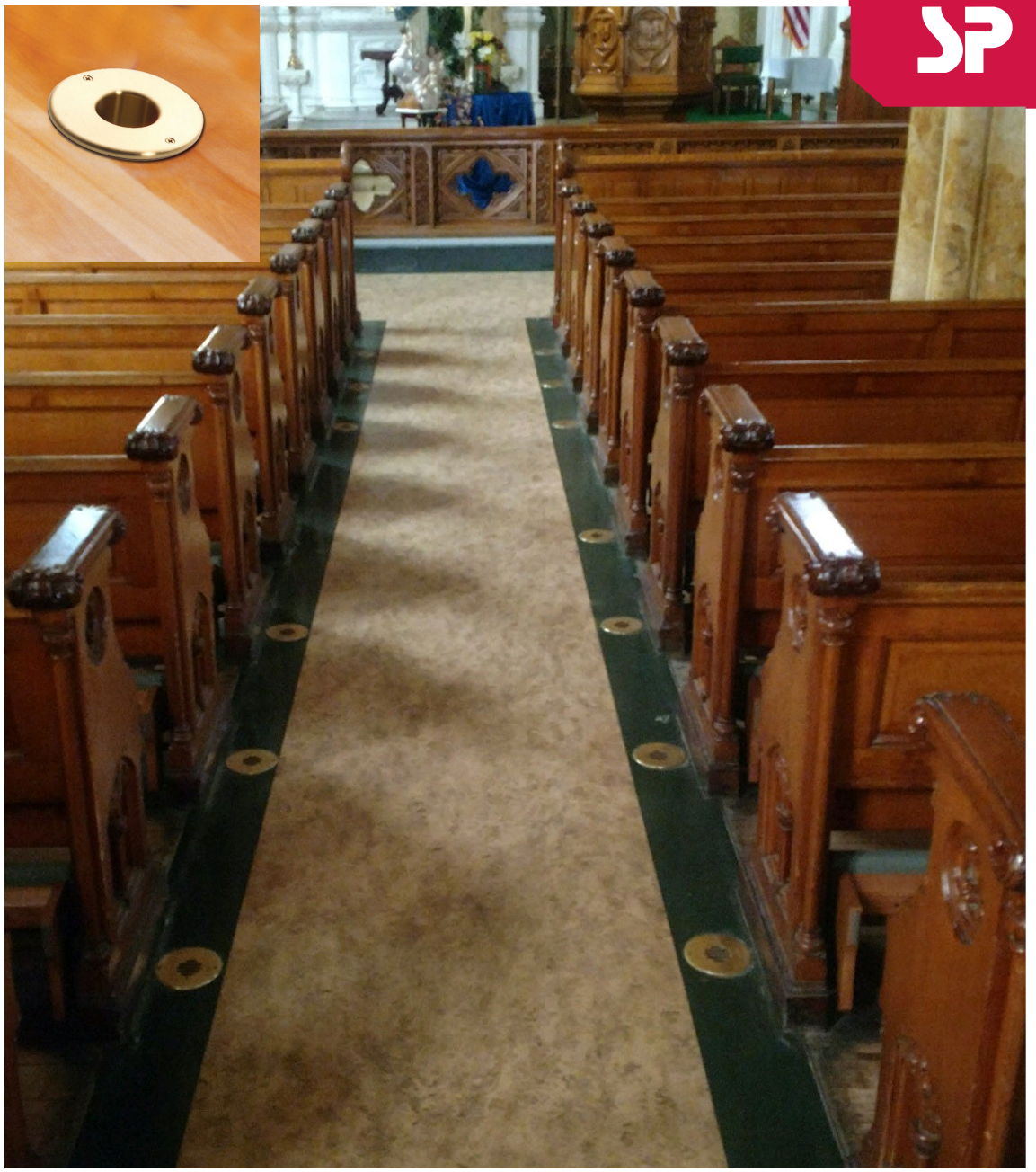
Layout with a centrally located return, this system would need no “extra balancing” based on our load calculations and duct design chosen.

Note: Since this is a heating and cooling system resulting in being slightly oversized for one setting you can use the variable speed blower to ensure the air flow match and btu delivery without the concern of unwanted noise.

Supply Outlets and Terminations



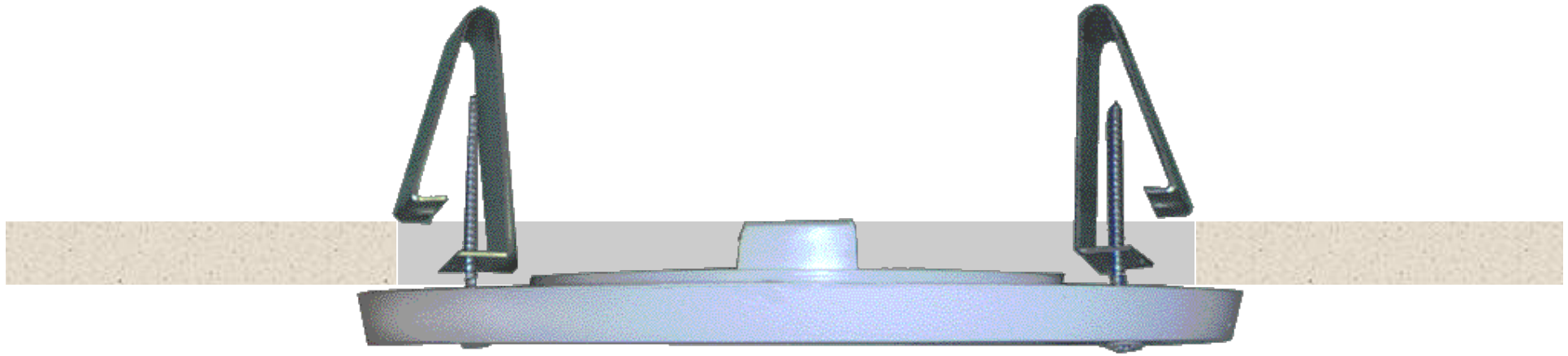




Outlets

When installing in a standard sheetrock ceiling be sure to use a 4” hole saw other ceiling and floor material may require a slightly different installation processes.

Installation of termination plate and mounting clips



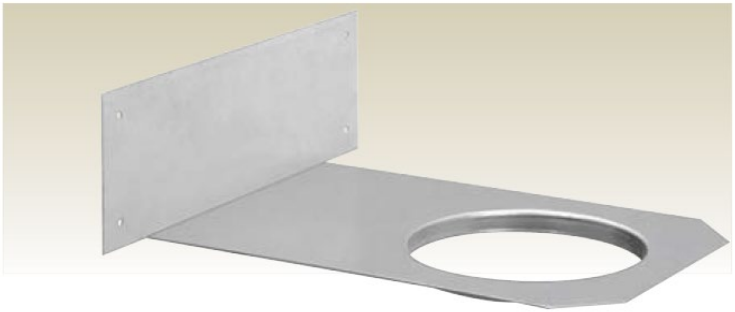
- The sound attenuator is usually attached to the termination plate at this time
- Altering the clips or hole size may be required in some applications for proper fastening as different installations may require adjustments - this is all considered ok as long as you are not restricting air flow (should not have any effect on system performance)

Additional Installation Parts

KWIK CONNECT WALL ELBOW

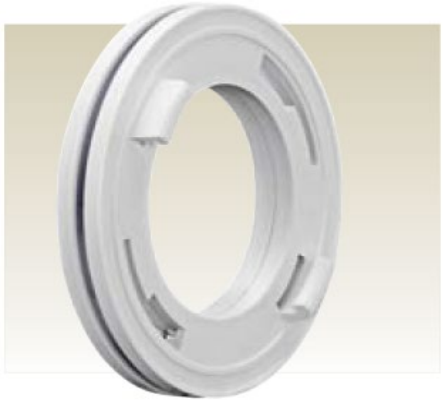
Kwik Connect wall elbows simply snap into place for fast, easy installation.

ROUGH-IN BRACKET



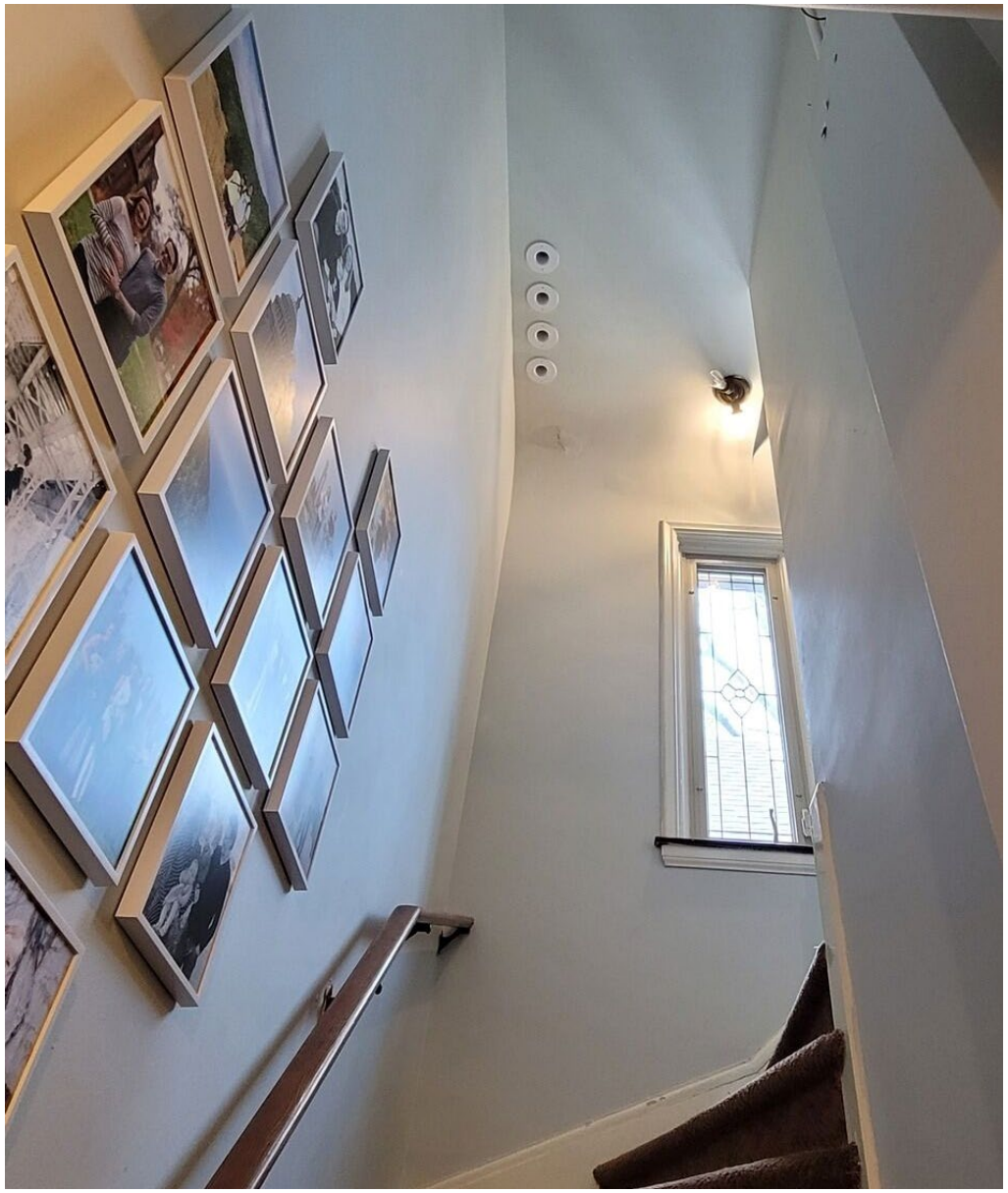
Serves as a reference point for sheetrock outlet locations during the framing portion of new construction.

KWIK CONNECT EXTENSION

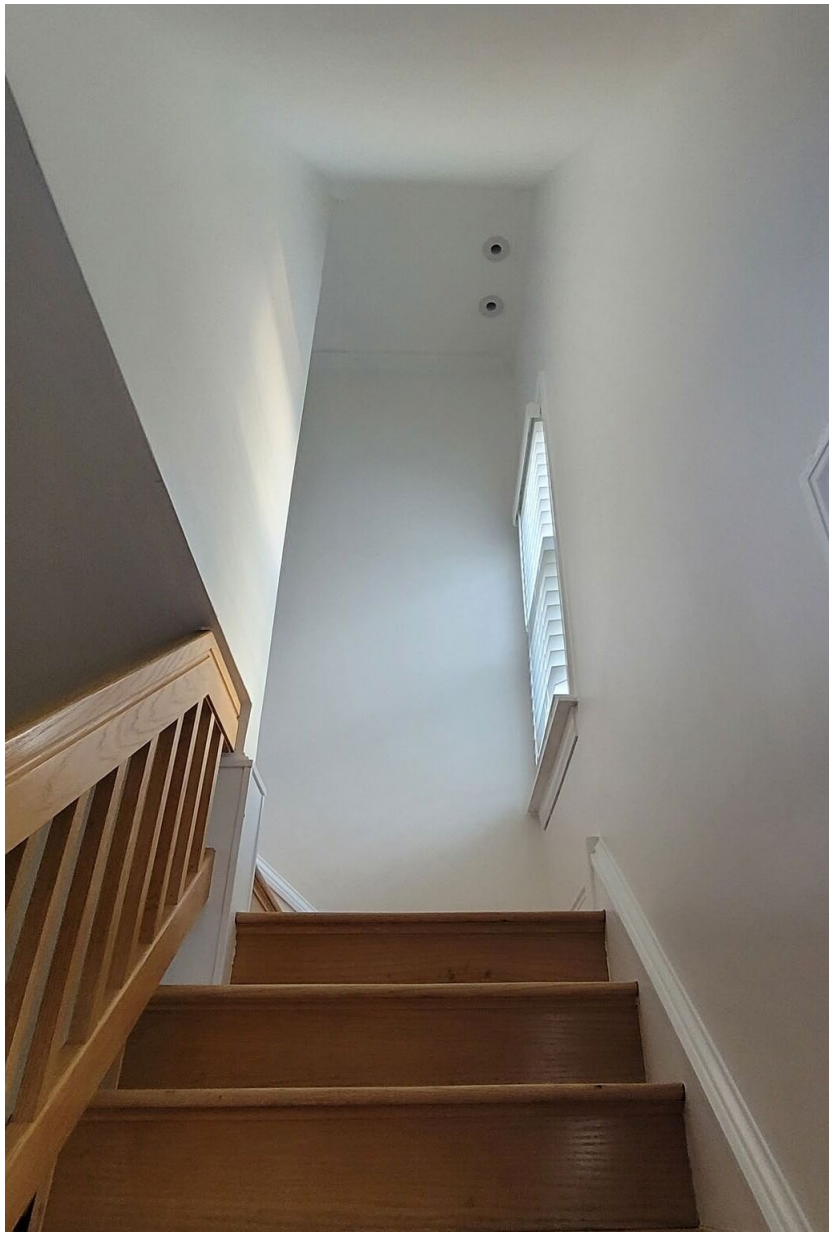


Designed for installations using wall thicknesses above 1/2".

Stairwells

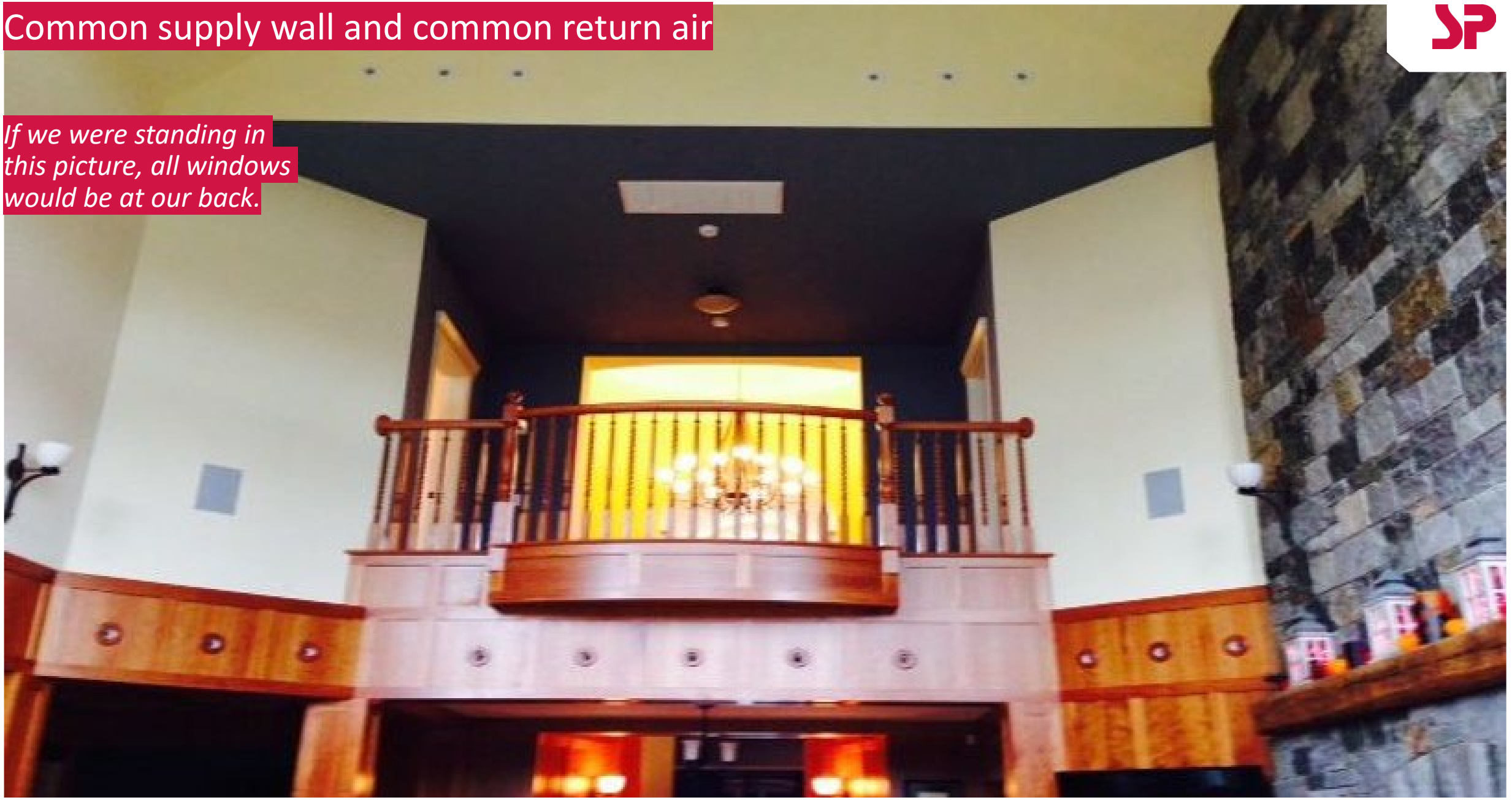


Stairwells



Common supply wall and common return air

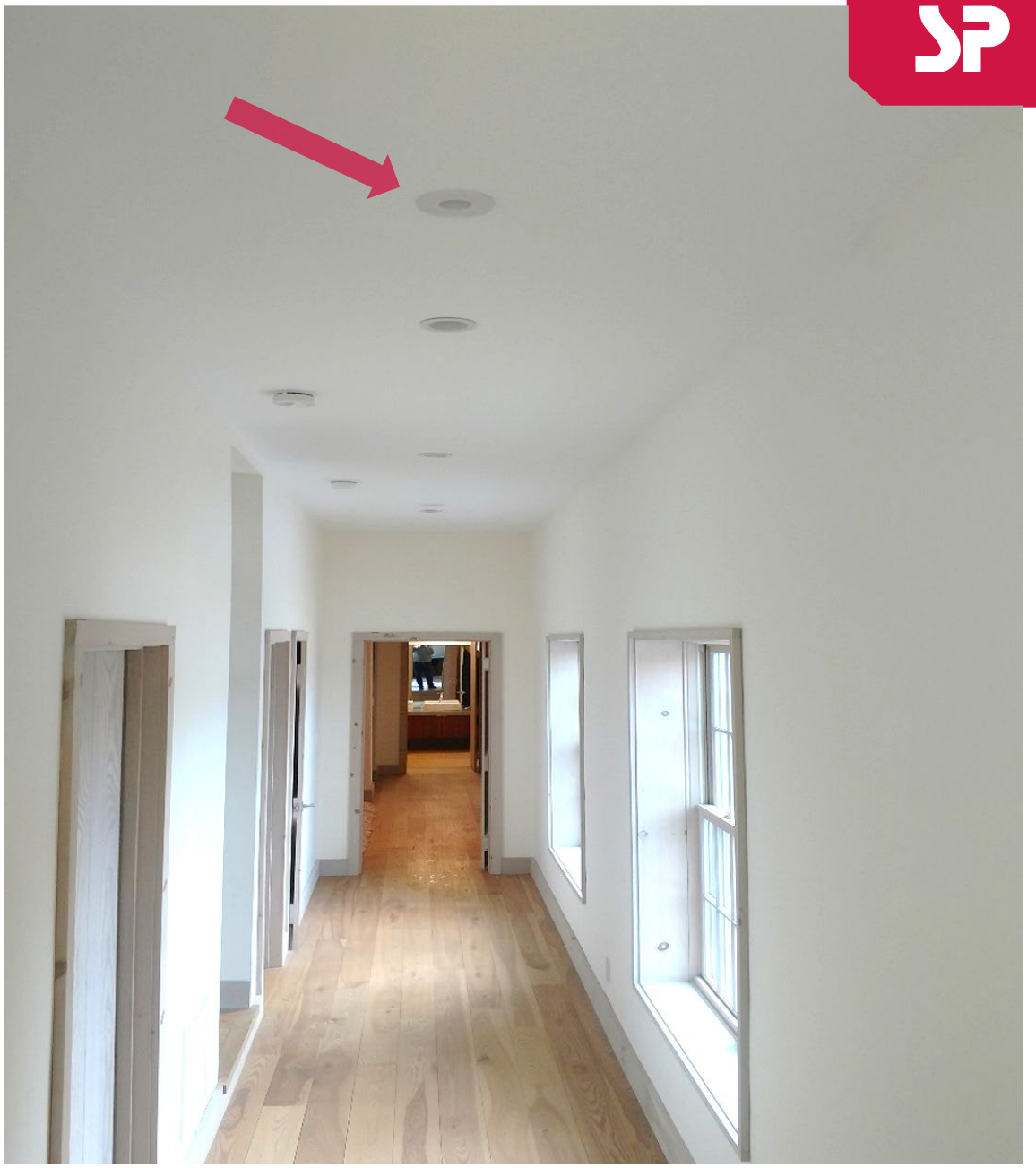
If we were standing in this picture, all windows would be at our back.



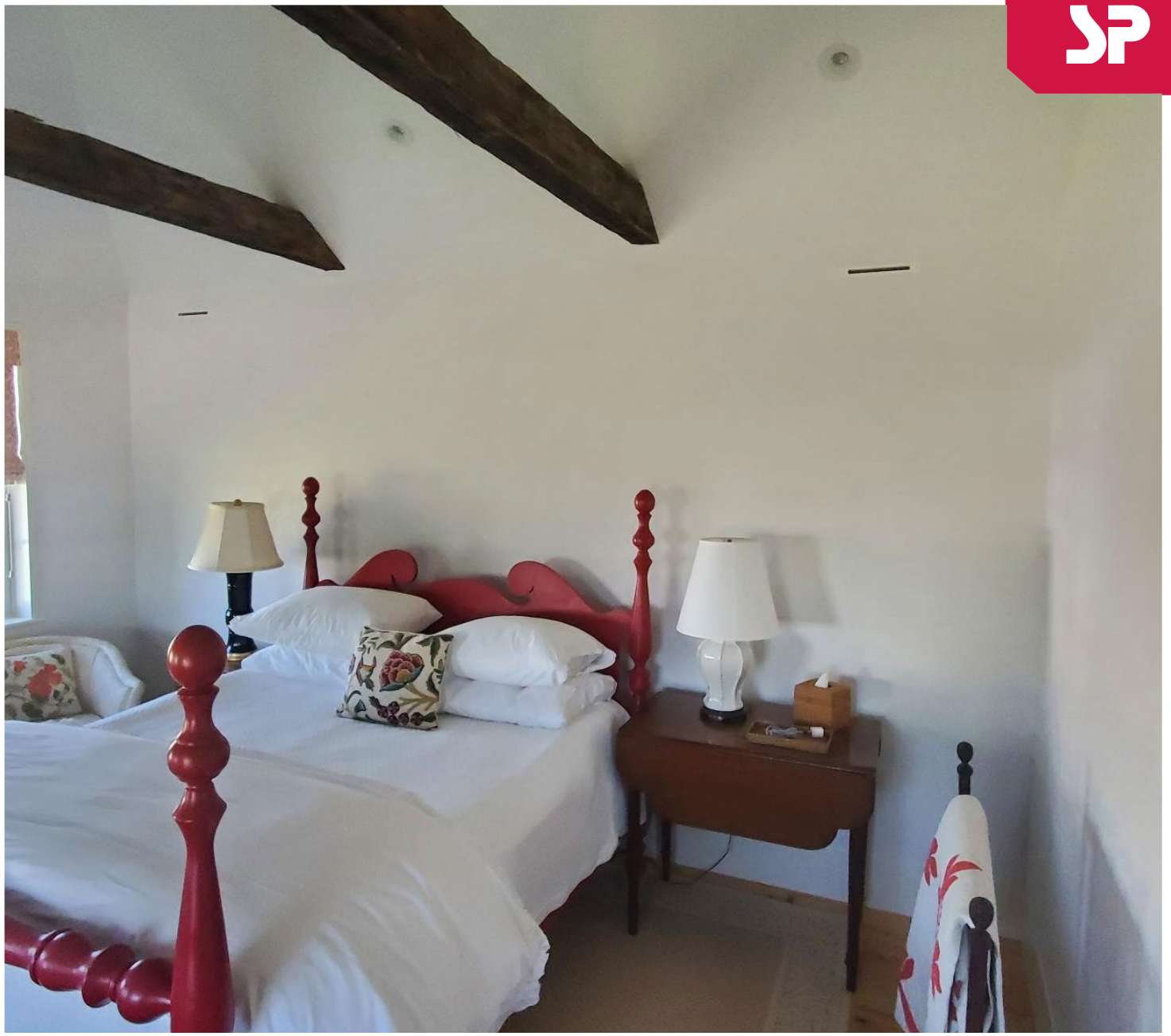
APPLICATION

Hallway Ceiling Installation

- Notice the best place for outlet termination is in the center of the hall
- Rough-in plates were used in this installation to ensure proper locations

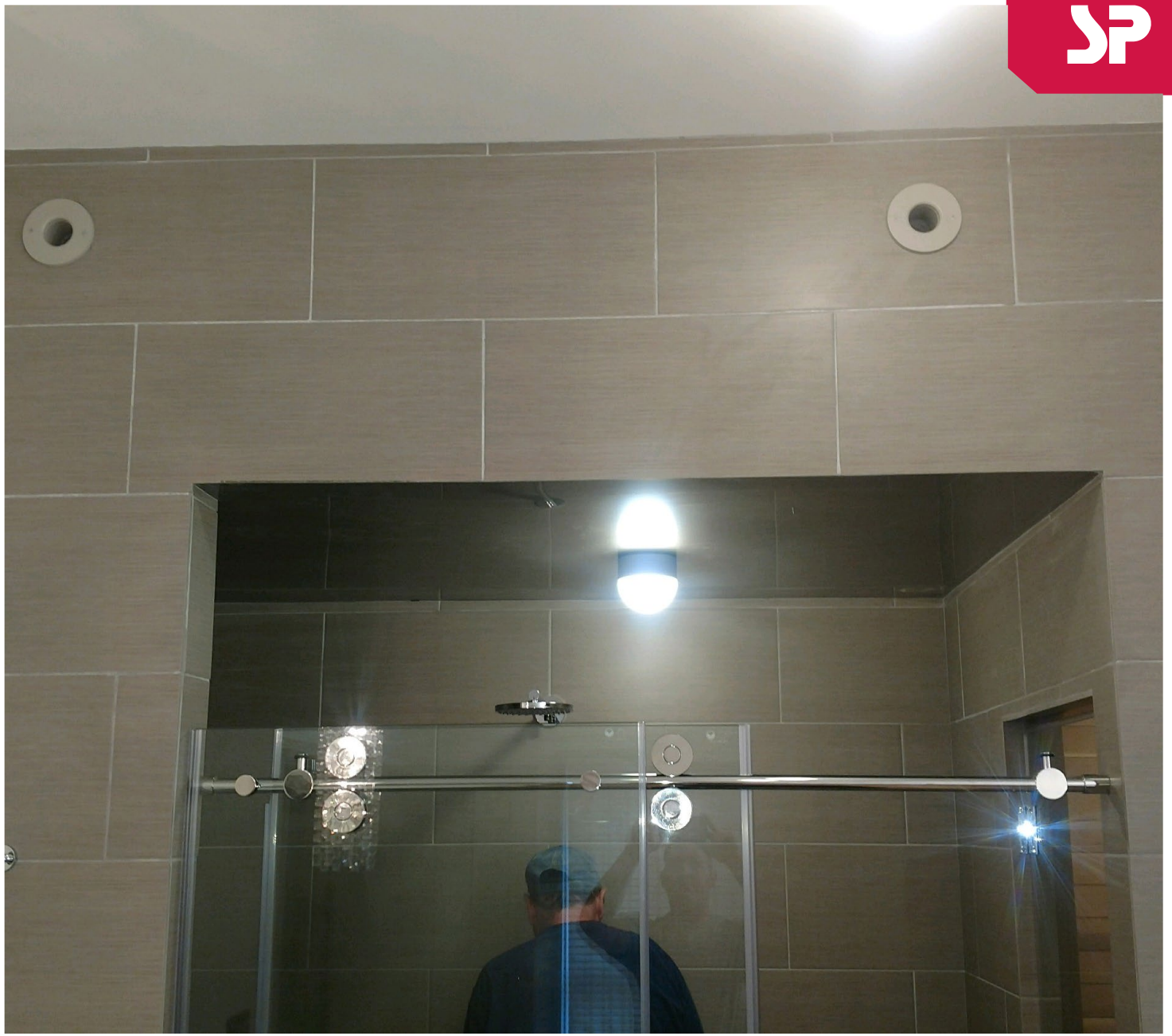


Linear slot



Linear slot

Linear slot



Side Wall

Ceiling

9 - 10 runs per ton

This was done to ensure that air noise would not be an issue due to the lack of natural sound deadening material (full carpets, low ceilings, etc.).

Exterior Side Wall

The main trunk was rectangle and located in the floor.

The supplies were run up the outside walls between the windows and out, creating a thermal curtain.

This rooms cooling load was 42,000 btu.

No termination plates

The cabinet maker made holes, and the contractor attached them to the back of the top plate. Notice the slight angle to the top plate. This will allow the air to travel under the timbers and across the room.

APPLICATION

Spot Conditioning

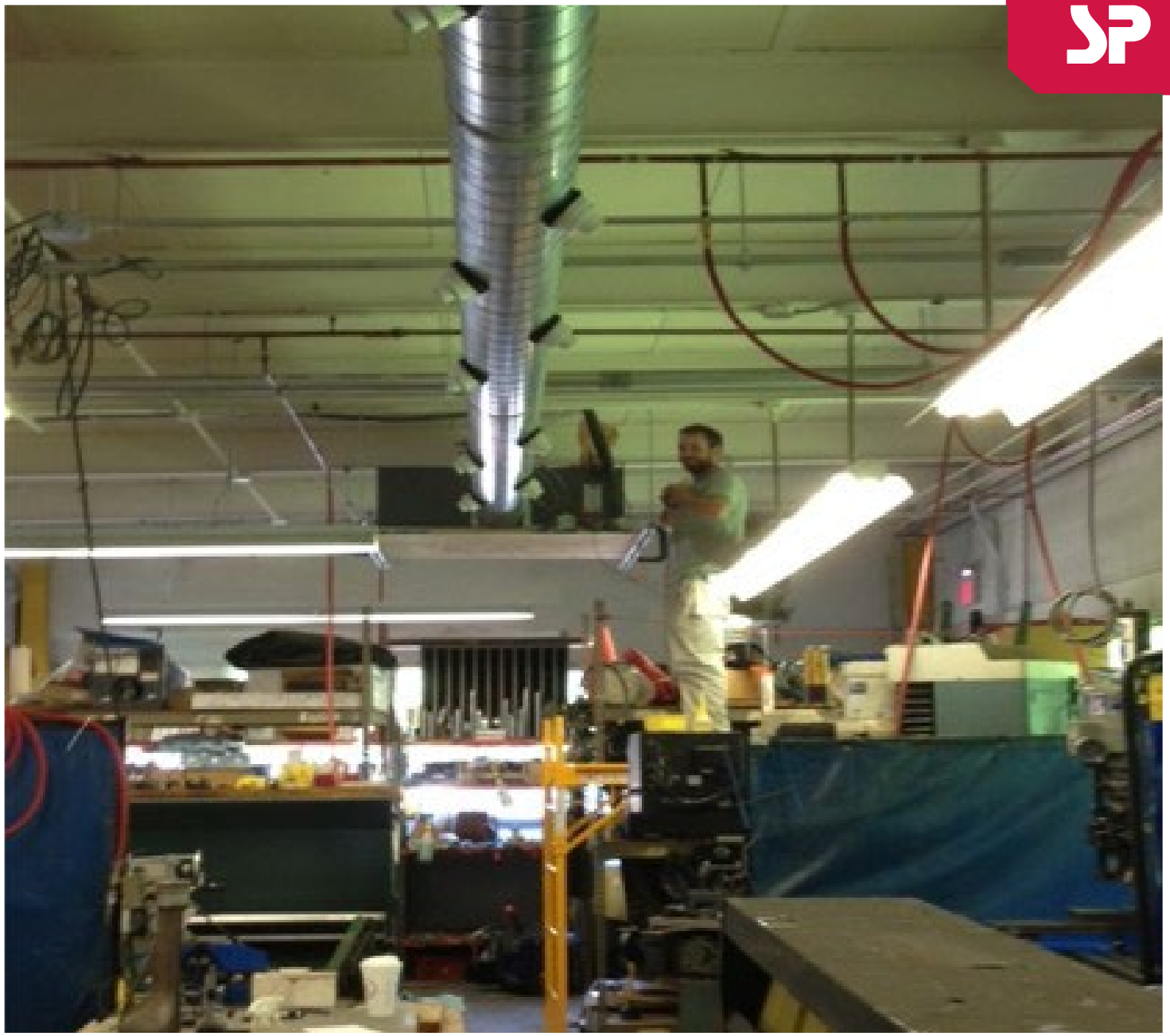
Common Applications

- Areas where it would be financially exhausting to condition the entire space
- Kitchen prep lines
- Assembly lines

Benefits

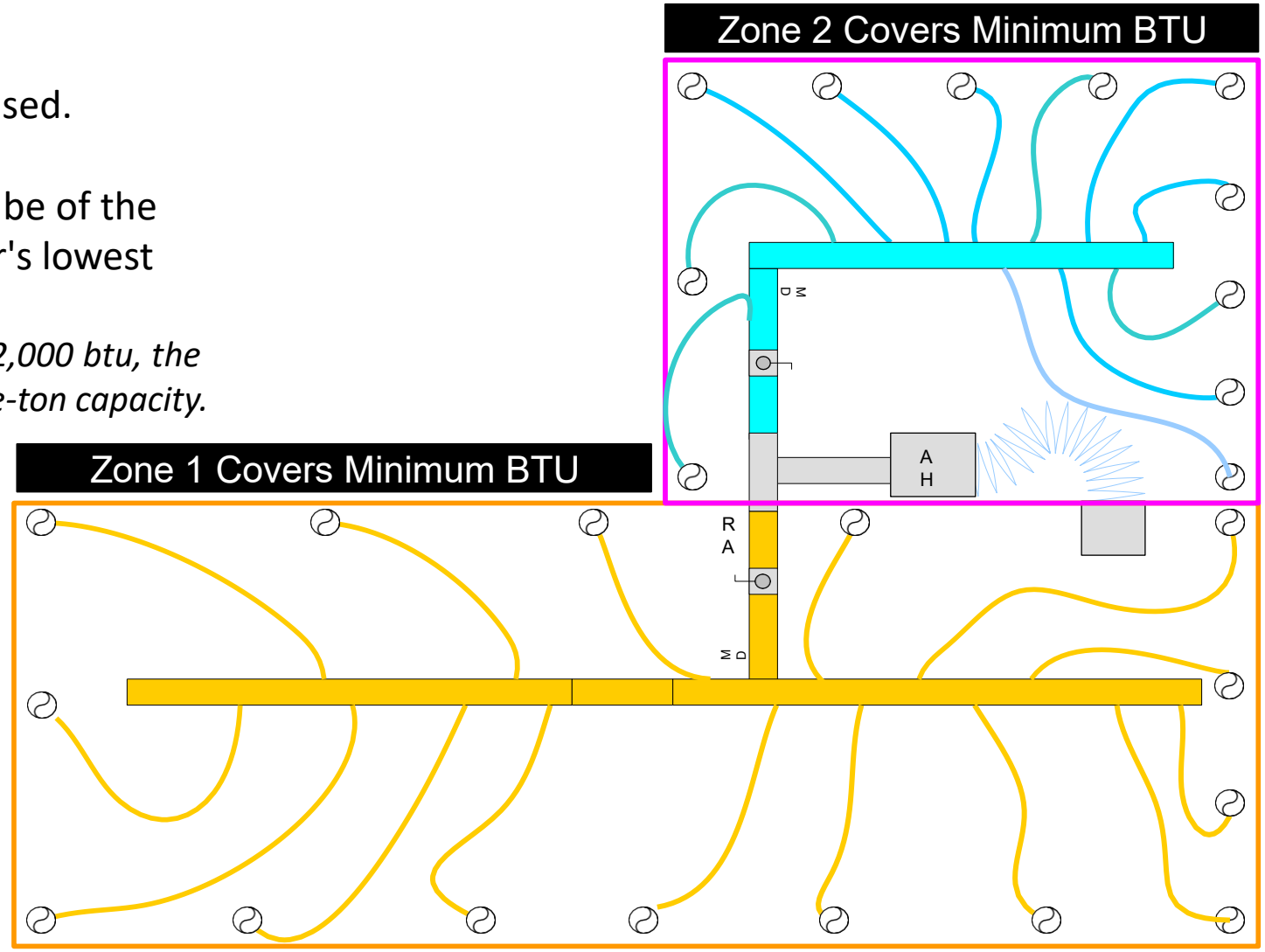
- Great commercial look
- Can run fewer outlets per ton due to the loss of restriction applied by the normally installed supply tubing

Generally, 4-5 outlets per ton is sufficient

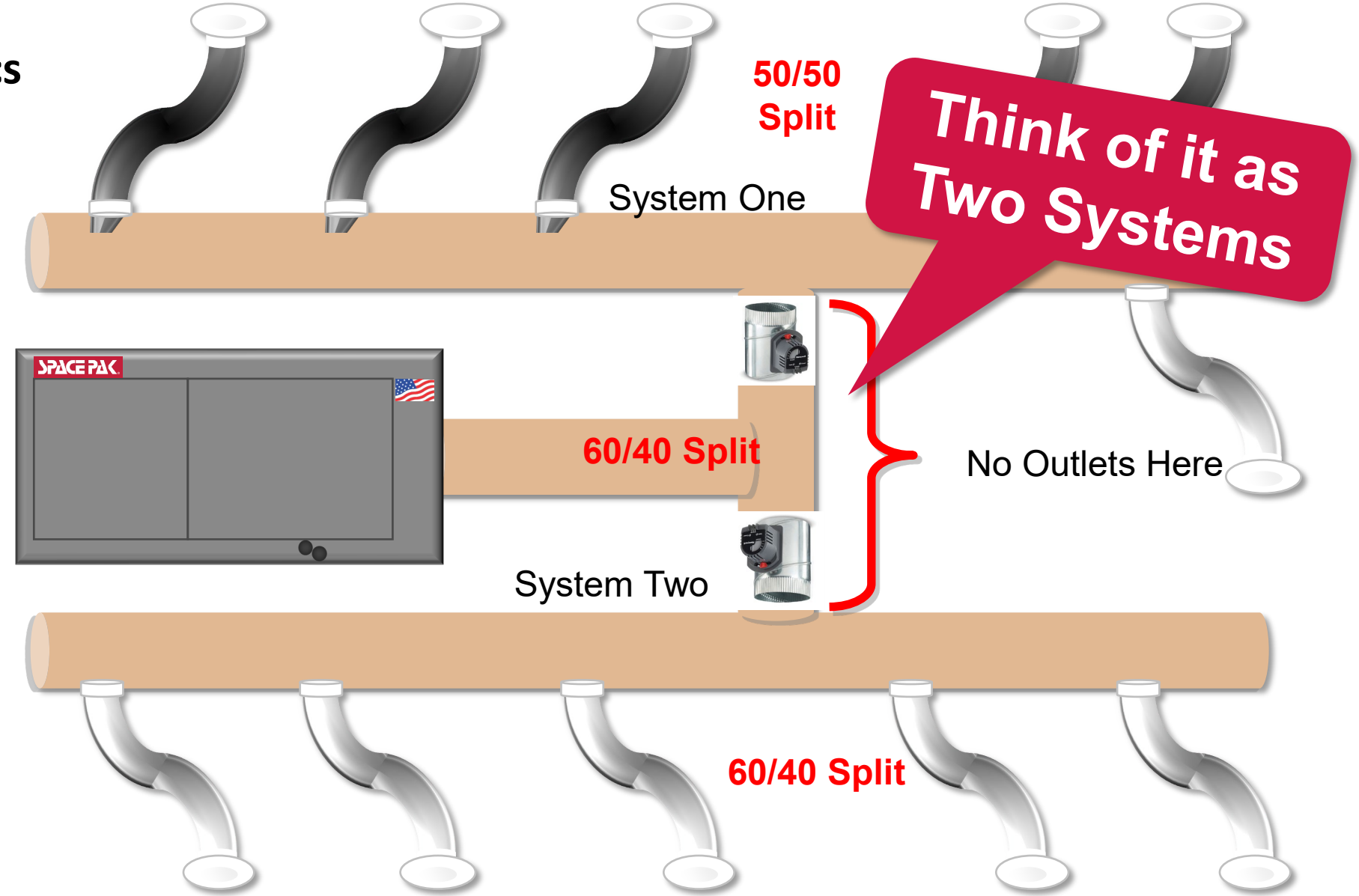


Zoning Basics

- A staged or fully inverter condenser MUST be used.
- In a multi-zone system, the smallest zone must be of the same size or larger output than the compressor's lowest turned-down capacity.
  Example: if the inverter condenser turns down to 12,000 btu, the smallest zone must be capable of handling that one-ton capacity.
- When using multiple zones, the J Plus Control allows you to match airflow to specific system needs.
- Be sure to follow all duct design rules.
- Do not under any circumstances use an air bypass!



Zoning Basics



REMINDER

Pre-Sale Application Support Team

PreSaleSupport@SpacePak.com

Available to Representatives, Wholesalers and Contractors

- System application support
- Equipment selection
- Load calculation and rough material list

Any questions regarding equipment already shipped should be directed to

TechnicalService@SpacePak.com (413) 564 - 5530

Post-Webinar Resources

24 hours from now -

you will receive an email that contains links and downloads for:

- A recording of today's webinar
- PDF copy of today's presentation
- Project Design Form
- SpacePak High-Res Logos
- Contact information
- Links to product documentation resources
- And more

Let’s Connect

@spacepaksystem

@thespacepakjim

let's connect

THANK YOU!

?

Questions

Trainer name: Jim Bashford