INSTALLATION QUICK-START GUIDE: RESPA®

TIPS AND BEST PRACTICES FOR MOUNTING SY-KLONE CAB AIR QUALITY SYSTEMS

A good mounting design is essential to get the most benefit from Sy-Klone systems. Improper mounting can reduce the system's efficiency. This guide includes tips and best practices to help you save time and increase satisfaction.

GENERAL GUIDELINES FOR CAB AIR QUALITY SYSTEM INSTALLATIONS:

- **Planning an efficient route from the Sy-Klone system to the HVAC fresh-air port (or directly to mixing plenum) is critical.**
  - The longer the plumbing and the more bends, the more the airflow is restricted. Try for the shortest possible runs with the fewest number of bends.
  - Hard-pipe installations are more durable than flex-hose installations. Flex hose installations should be inspected periodically for damage.
- **Allow for filter clearance:** Clearance is needed at the filter end to allow for filter replacement. This amount varies depending on model and length.
- **Systems can be mounted vertically or horizontally.**
  - If mounted vertically, keep the rain-cap end up, as this will prevent dirt from the filter falling into the clean-air side of the system during filter changes.
  - Allow enough clearance at filter end for filter replacement.
  - If mounting the filter end up (for reasons of filter clearance or filter accessibility) remove the rain cap, to avoid collected water sucking into the system when powered on.
- **Verify enough power is available from the alternator.**
  - Inadequate power or improper fusing can lead to motor failure.
  - If installing multiple units, such as a fresh air and recirculated air system, each should be fused separately and must be grounded properly.
- When planning installations, be sure to **consult any Standard Operating Procedures (SOP)** and the machine's operator. Considerations include:
  - Safety and convenience of accessing filters
  - Line of sight issues
  - Operator preferences regarding system or monitor placement.

SY-KLONE'S UNIVERSAL INSTALLATION KITS

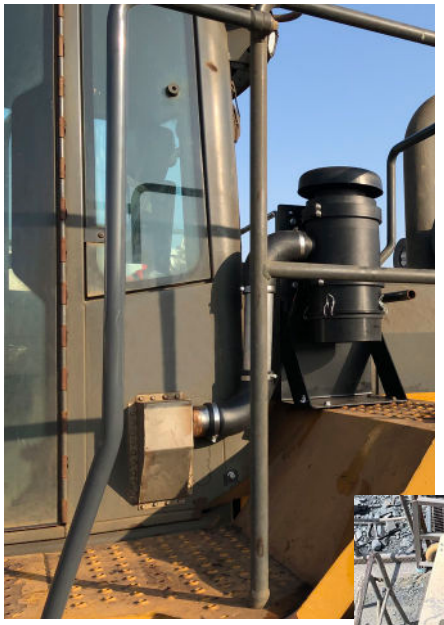
RESPA CF2 Universal Installation Adaptation Kit GK015, above.

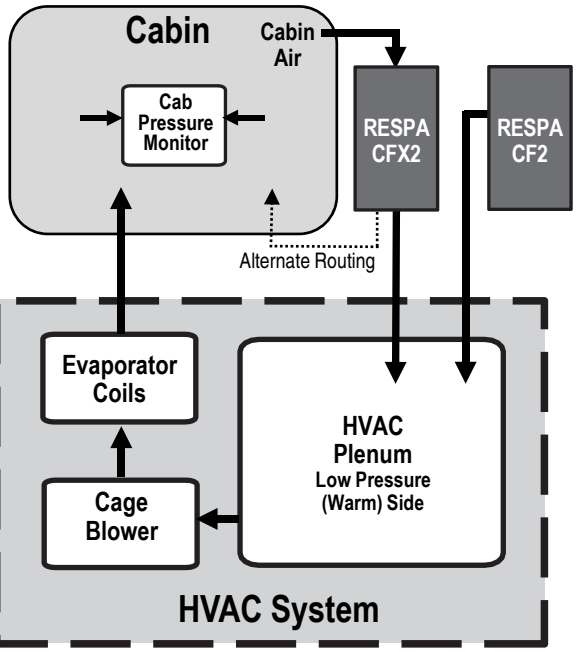
Sy-Klone offers adaptation kits for RESPA systems (system not included). Be sure to add the wiring kit, RCF2915. The basic kit is shown above; see the **enhanced kit**, which includes hard pipe and magnets, detailed on page 8.

More options are shown on the following pages.

RESPA CAB AIR QUALITY SYSTEM - INSTALLATION TIPS

- **The cab must be sealed and able to hold pressure.**
  - See ***RESPA: "Sealing a Cab"*** on pages 11-12 for details.
- **Fresh Air System Installations**
  - If plumbing directly into the plenum, as opposed to the HVAC fresh-air port, always plumb into warm-air (low-pressure) side of HVAC mixing plenum.
  - **The RESPA CF2 filter replaces the HVAC fresh air filter.**
    - In all cases, the factory HVAC fresh air filter should be removed.
    - If the RESPA CF2 is plumbed directly into the HVAC mixing plenum, the HVAC fresh-air port should be blocked.
    - Adapting the HVAC fresh-air port to receive plumbing from the RESPA CF2 may be easier than plumbing directly into plenum.
- **Metal Fabrication:** The ability to create custom metal parts, or having a relationship with a metal fabricator, solves many problems.
  - **Custom mounting brackets** help simplify a complex installation.
  - **Adapting the HVAC fresh-air port (**by replacing it with a custom flanged plate ready to receive RESPA plumbing) simplifies getting air to the HVAC mixing plenum and does not require cutting large holes into the machine.
- **Recirculation System installations**
  - Insert a clean, new, factory recirculation filter; **do not remove or block the factory recirculation filter.**
  - If installing a RESPA CFX2 outside the cab, it can be plumbed into the warm air side of the HVAC mixing plenum (ideal), or, if space is not available, It can be plumbed back into the cab directly (bypass mode, see alternate routing in diagram, right).
  - Unidirectional airflow is optimal, with clean air coming in near operator's head, and dirty air going back to recirc unit from near operator's feet.
  - The powered RESPA PFX requires no plumbing and is installed inside the cab; use a step-down voltage converter to reduce noise. Put near the floor of cab with clean air outflow directed upward.





OVERCOMING OBSTACLES

WHAT TO DO WHEN THE USUAL MOUNTING METHODS WON'T WORK

Normally, cab air quality systems are mounted on the roof or side of the cab, or possibly the hood deck if far away from the exhaust stack. For various reasons, these locations may not be available, or if available, traditional mounting methods may not work.

MOUNTING WITH MAGNETS

Magnets work well when there are restrictions from putting holes in the machine. This method saves time and is removable. Larger magnets, shown above, have a 77 lb. pull capacity.

- Magnets require a flat, clean surface.
- This method only works with horizontal mounting only where the system is sitting on its mounting feet.
- Magnets can be used with P-clamps to affix plumbing to cab, and smaller magnets for monitor devices.
- If used to affix plumbing, stickers should be used cautioning against using the plumbing as a handrail.

Magnet and shim attachment to metal roof

MOUNTING ON ROPS

There are often existing threaded bushings or holes in the Roll-Over Protection Structure (ROPS) or Fall-On Protection Structure (FOPS). These can provide attachment points for a mounting plate. **Never** drill into FOPS or ROPS; use existing mounting points only.

Metal plate mounted to ROPS using existing holes

PLASTIC CANOPY ON CAB

Some cabs have a plastic canopy over the roof's metal substructure. In this case, adhering a metal plate to the canopy then allows for the magnet-mounting method, above.

HANDRAILS

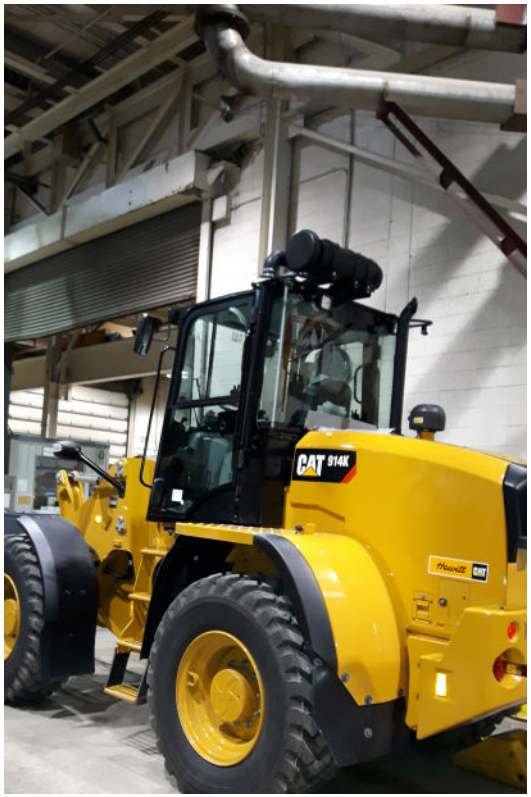
U-bolts allow attachment of a mounting plate in the vertical position to handrails. The system can then be bolted to the steel mounting plate. Magnets are not suitable for vertical installations.

Mounting plate bolted to handrail with U-bolts

OVERCOMING OBSTACLES, CONTINUED

CUSTOM METAL FABRICATION OF MOUNTING BRACKETS AND HVAC FRESH-AIR PORT ADAPTATION

Custom brackets make mounting possible in places where there is no space available on the cab roof, sidewalls, or hood. Adapting the HVAC fresh-air port simplifies plumbing into the HVAC mixing plenum.



Examples of custom mounting brackets, left, right, and below. Top-right bracket also includes fall-on protection for the RESPA-CF2 on this forestry machine.

Examples of HVAC fresh-air port adaptation. The original HVAC fresh air filter has been removed, and the louvered door has been adapted to block fresh-air entry except through the metal flange adapter, which is plumbed to the RESPA-CF2.

EXAMPLES OF WELL-DESIGNED INSTALLATIONS

DECK MOUNTED, HVAC FRESH-AIR PORT ADAPTED

- When mounting on hood deck, take care to position away from the exhaust stack.
- Fabricate mount to secure plumbing to machine.
- Use rubber adapters to provide a soft connection when installing across different vibratory planes (crossing from hood deck to cab.)

30040
3-inch OD Pipe

90CB30
90° Rubber Cobra with Worm-Gear Clamps

AD0246
Aluminum Composite Plate (and a flange)

90L30
90° Rubber Elbow with Worm-Gear Clamps

EXAMPLES OF WELL-DESIGNED INSTALLATIONS

HAND-RAIL MOUNTED, HVAC FRESH-AIR PORT ADAPTED

- Use rubber adapters to provide a soft connection when installing across different vibratory planes (crossing from hood deck to cab.)

EXAMPLES OF WELL-DESIGNED INSTALLATIONS

MAGNET MOUNTED, HVAC FRESH-AIR PORT ADAPTED

UNIVERSAL INSTALLATION ADAPTATION KIT WITH HARD PIPING (ENHANCED KIT)

As a convenience, Sy-Klone offers an enhanced kit including hard pipe, cobra fitting, and magnets. The installation examples on the three previous pages used this kit. **Remember to add RCF2915 wiring kit**, one per powered system. Items with part numbers are also available separately. This gives you more options than the standard kit for various mounting and plumbing methods.

KIT PART NUMBER RCF2727

Enhanced kit contains:

Part Number	Quantity	Description
31532	2	RTV BLACK 315 WITH TIP
30040	3	3IN X 40IN LONG PIPE - PAINTED BLACK
3H3	1	3IN TO 3IN HUMP HOSE WITH WORM GEAR CLAMPS
45L30	2	3 INCH EDPM 45 DEG ELBOW WITH WORM GEAR CLAMPS
4H3	1	4IN TO 3IN HUMP HOSE WITH WORM GEAR CLAMPS
90CB30	1	3 INCH EDPM COBRA HEAD 90 DEG WITH WORM GEAR CLAMPS
90L30	3	90 DEGREE ELBOW 3 INCH WITH WORM GEAR CLAMPS
90L40R30	1	90 DEG 4 TO 3 INCH REDUCING ELBOW WITH WORM GEAR CLAMPS
S300X300	1	3 INCH I.D. STRAIGHT SLEEVE WITH WORM GEAR CLAMPS
AD0240	1	UNIVERSAL BLOCKING - MOUNTING PLATE - STEEL 12X20
AD0241	1	3IN UNIVERSAL FLANGE ADAPTER - EXTENDED
AD0246	1	UNIVERSAL ADAPTER PLATE - 3MM ALUMINUM COMPOSITE
-	10	SELF TAPPING SCREW #10X0.75 - BLACK
-	12	NO.12 X 1 SELF TAPPING SCREW ZINC
-	12	M10 WASHER
-	4	M8 X 1.25 X 20 CP SCRW CL 10.9
-	4	M8 WASHER
-	10	M8 LOCK WASHER
-	12	M8 OVERSIZED WASHER
-	6	M8 X 1.25 X 35MM BOLT
-	6	HEX CAP SCREW M10 X 1.5 X 35
-	6	M10 X 1.5 LOCKNUT
-	4	3IN CUSHIONED P-CLAMP
-	10	ENCASED MAGNET WITH M8 THREADED HOLE

Hump hose

Cobra-head 90-degree rubber elbow

45-degree rubber elbow

Straight sleeve

Hard pipe

90-degree rubber elbow

Extended flange adapter

90-degree rubber reducing elbow, 4-inch to 3-inch

LOCALLY-AVAILABLE ALTERNATIVES TO THE UNIVERSAL REGULAR AND ENHANCED INSTALLATION ADAPTATION KITS

Most of the following materials are included in RCF2727 Enhanced Kit and RCF2915 Wiring Kit. Many items are also available individually from Sy-Klone, but all can be sourced from local or online suppliers, such as McMaster Carr or Grainger.

Plumbing	Mounting Hardware	Electrical - alternative to RCF2915
1x Sy-Klone 90L40R30 4-inch to 3-inch 90° Rubber Elbow	8x 3506K62 Encased Neodymium Magnet with Threaded Stud, 0.2760-inch thick, 0.787-inch OD*	25-foot 14-gauge TW 600v Red & Black Loomed Wire
1x Sy-Klone 4H3 4-inch to 3-inch Rubber Hump Hose (straight)	8x 5819K63 Encased Ceramic Magnet with Threaded Hole, Zinc-plated Steel case, 14mm thick, 63mm OD*	2x 5670051 Espar Fuse Holder with 15-amp Fuse
3x Sy-Klone 90L30 3-inch to 3-inch 90° Rubber Elbow	2x 3-inch P Clamp for securing pipe to machine	1x 2-pack 84-24712 Way Male Plug (Deutsch DT)
2x P105608 3-inch to 3-inch Rubber Hump Hose (straight)	1x 20-inch by 20-inch by 3mm Aluminum Composite Panel	1x 10-pack 84-246716 14-gauge Terminal
1x P547694 3-inch to 3-inch Rubber Cobra	1x 12-inch by 20-inch by 1/8-inch-thick Steel Plate, Powder-coated Black	4x Uninsulated 14-gauge 3/8-inch Hole Bat Terminal
2x Sy-Klone 45L40 3-inch to 3-inch 45° Rubber Elbow	20x Zip Ties (rated to -40°C if arctic conditions)	4x Uninsulated 14-gauge 1/2-inch Hole
3x Sy-Klone 30048 3-inch OD, 48-inch long Black-painted Metal Pipe	Bolting Hardware for magnets, including shims (washers)	4x Uninsulated 14-gauge 3/8-inch Hole
2x CT500L Breeze Constant Torque Clamp 4 1/5-inch to 5 1/8-inch	10x Black Robertson 2 1-inch Screw	4x Uninsulated 14-gauge 1/4-inch Hole
12x CT500L Breeze Constant Torque Clamp 2 3/4-inch to 3 5/8-inch	10x Self-Tapping 1-inch Screw	4x Blue Shrink Union
1x Metal Flange 3-inch OD by 12-inch length or Sy-Klone AD0021 3-inch Universal Flange Bracket	1x Tube of Black Silicone Sealant	4x Yellow Shrink Union

*In some cases, it may be necessary to drill out the RESPA feet to fit threaded section of magnet; it is a little tall, so use a washer as a shim so it can be tightened snuggly with bolt.

WHEN THINGS GO WRONG: COMMON MISTAKES AND HOW TO AVOID THEM

REVERSED POLARITY / VARIABLE POWER SOURCE

Symptom: Weak airflow

For fresh air system (CF2), check the ejection port airflow. For recirculation system, check the air exiting the system (PFX, CFX2 in bypass mode), or the airflow from the HVAC vents. The airflow should be strong.

If airflow is weak, check the polarity of the connection. If the polarity is reversed, reconnect to correct polarity wires.

Check the power source. Is it variable or constant? If variable, a constant power source must be found.

POWER SOURCE NOT KEYED TO IGNITION

Symptom: RESPA units do not power on when machine is in use.

The RESPA units must power on when the machine is in use. When the operator turns the machine on, the RESPA units should power on regardless of the HVAC being on or off. This way the operator is protected regardless of HVAC settings.

If not, a different power source must be used.

SUDDEN DROP IN CAB PRESSURE AFTER INSTALLATION

Common causes include:

Wrong filter: An ejective or louvered filter used in RESPA CFX2 will drop pressure and introduce dust. Use a closed recirculation filter instead.

HVAC running in full recirculation mode: This will block off pressurized airflow from the RESPA CF2 fresh air unit. Do not run HVAC in full recirculation mode.

Time for filter change: If everything is correct, doors and windows are closed, and pressure gradually drops, this indicates that the filter(s) are getting loaded. It's time to change the RESPA filter when the cab air quality system cannot maintain positive pressure above 20 Pa.

CAB PRESSURE TOO LOW

If the cab pressure never reaches 50 Pa (0.20 inches of water column) at high HVAC fan speed, the cabin sealing should be improved. See pages 11-12.

NOTE:
With HVAC system off and RESPA CF2 operating, cab pressure should be greater than zero.

Increasing the HVAC fan speed should increase the pressure.

Ideal pressure, after RESPA installation, with new filters installed, should reach 20 Pa (0.08 inches of water column) with the HVAC off and exceed 50 Pa (0.20 inches of water column) at high HVAC fan speed. ISO 23875 requires 20-200 Pa.

PRECLEANING EFFICIENCY LOST / RESPA CF2 FILTER LOADING TOO QUICKLY

Wrong filter: If a closed (recirculation) filter is used in the fresh air system, it lacks the precleaner ejection slots and the filter could load very quickly. Always use the correct filter type. RESPA CF2 filters all have ejection slots.

FILTER TYPES

RESPA CF2 *fresh air filters always have ejection slots.*

RESPA CFX2 *recirculation filters are closed; no openings in filter cap.*

RESPA PFX *recirculation filters are louvered.*

RESPA FFX2 *uses closed or louvered recirculation filters depending on configuration.*

RESPA: SEALING A CAB TO HOLD PRESSURE

Maintaining positive air pressure in the cab is the best way to keep dirt out, preventing dirty air that may contain harmful respirable particulate from entering the cab. A well-sealed cab combined with a Sy-Klone RESPA cab air quality system will create positive pressure in the cab.

The goal is to generate a minimum of 20 Pascals within the cab when the HVAC is off, and not to exceed 200 Pa when HVAC fan is on. See comments on next page.

DOES THE CAB NEED SEALING?

Some cabs hold pressure without additional steps, although most need additional sealing to reach 20 Pa with the HVAC off.

Sy-Klone recommends testing the cab pressure prior to the RESPA installation by following these steps:

1. Install a new recirculation filter.
2. Remove the factory fresh air filter.
3. Test the cab's pressure at all HVAC fan speeds with a Sy-Klone pressure monitor or manometer. See *Test Devices* below.

Visible leaks can be temporarily sealed with painter's tape for pressure testing. See *How to Find Leaks in the Cab* at right.

A cab that generates any pressure at a medium fan speed, without RESPA-CF2 assistance, may require little to no sealing to achieve sufficient pressure.

A cab with no pressure at any fan speed may require significant materials and time to seal properly.

TEST DEVICES

A Sy-Klone RESPA Advisor or RESPA Advisor+ is suggested with any RESPA cab air system installation and can be used to test cab pressure.

To qualify multiple cabs, a handheld manometer (0 to 4" WC range is recommended) can be used to test cab pressure quickly and easily. Connect a tube the to negative port and route the tube out of the cab. Note: Door seals usually have enough compression to allow the tube to be closed in the door frame.

HOW TO FIND LEAKS IN THE CAB

VISUAL INSPECTION

- ❑ Are door and window seals intact and window glass unbroken?
- ❑ Are there missing access panels in floor?
- ❑ Are there missing grommets or gaskets around entry points for wires or levers?
- ❑ Are there poorly welded seams?
- ❑ Does the door have drain holes?

FOG MACHINE

Ideally, work in an indoor area or on a non-windy day so you can see the fog

We use AC powered 400W machine with an output of 2000 cu.ft/min, sold for disco use online or through music stores.

You will need a glycerin-based solution to create the aerosol. **NOTE: Do not use the glycol-based solutions. Exposure to glycol vapors can cause respiratory discomfort.**

The fog contains respirable particulate; wear appropriate personal protection masks while testing.

Fill the cab with fog. Once the cab is filled with fog, close the door, and note where the fog is coming out of the cab. Mark leak points with painter's tape.

Alternate method: Fog the outside of the cab while a person inside the cab marks the leak points.

Smoke pens can be used but generate minimal smoke, making small leaks difficult to identify. Smoke pellets generate a significant volume of smoke but leave a temporary odor in the cab.

HOW TO FIX LEAKS IN THE CAB

SMALL LEAKS

RTV silicone sealant can be used to fill gaps in grommets, welded seams, etc.

Gaskets can be created to limit leakage through door latches, control levers, wire harnesses, etc.

For drain holes, make them smaller by inserting a grommet.

LARGE LEAKS

Broken windows or torn door/window seals may need to be replaced.

Sliding windows need to be closed and possibly sealed.

Missing access panels in floor may need to be replaced. Fix in place with sealant so future access is possible.

Closed-cell foam can be used for larger gaps, such as created by a false floor. Foam can be made more permanent by spraying with Flex Seal (FSC20).

Expanding spray foam can be used to fill large leaks/cavities. Note: Do not use spray foam in areas where future access is needed.

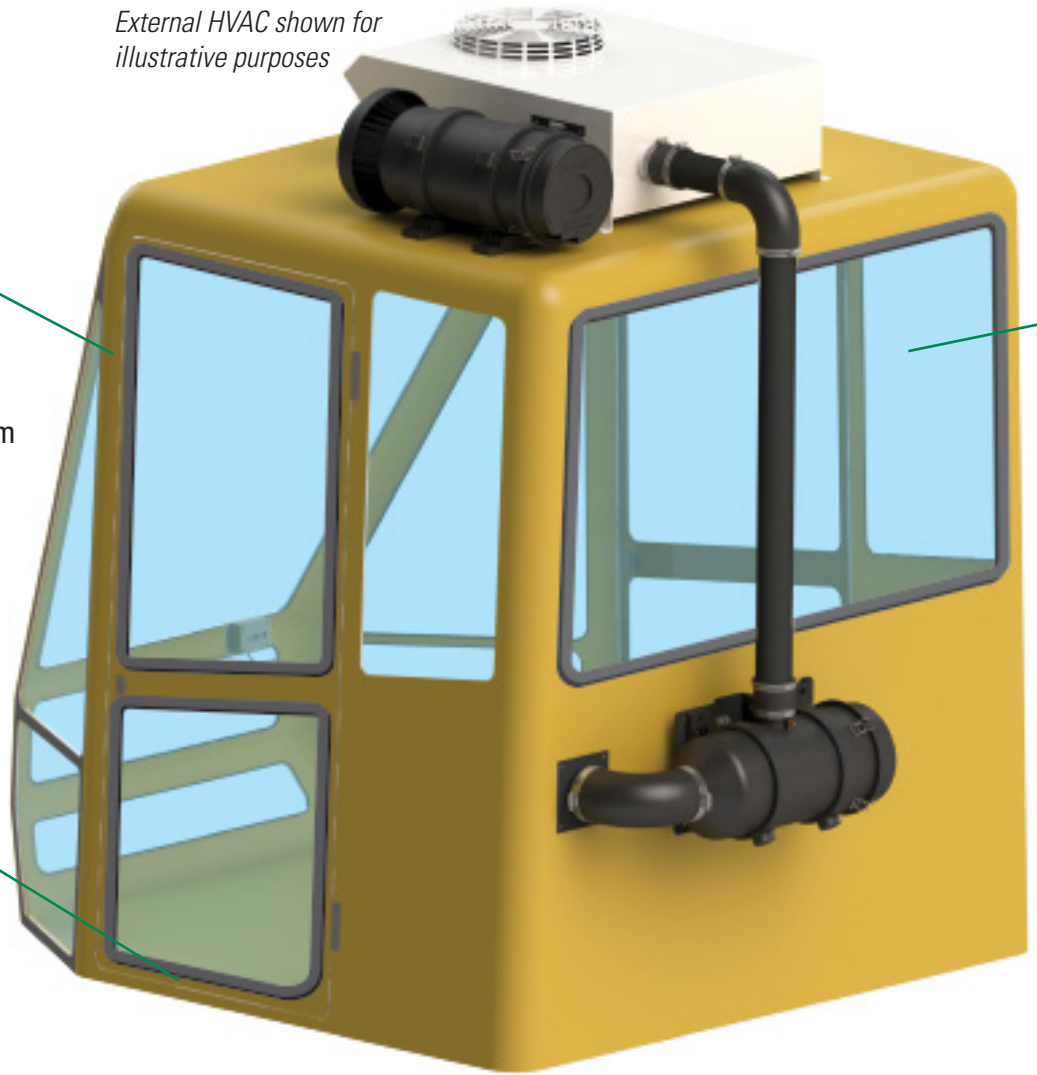
ROPS can be full of leak points. To fill with spray foam, attach an extension tube to spray foam nozzle, insert extension tube into ROPS, gradually withdraw the extension tube while filling the ROPS with foam.

IMPORTANT: ABOUT SEALING PROCESS

The cab must leak some air so fresh air can enter the cab. The goal is 50 to 200 pascal of cab pressure at high fan speed and 20 to ±50 pascal with only the RESPA CF2 running. The difference between RESPA only cab pressure baseline of 20 Pa and 50 Pa will determine the intake air filter life; the higher the pressure within this range, the longer the filter life will be. Therefore, it is recommended to achieve pressure nearer 50 pascal with only the RESPA CF2 running. For further information contact Sy-Klone technical support (support@sy-klone.com).

RESPA: SEALING THE CAB TO HOLD PRESSURE - WHERE TO LOOK FOR LEAKS

External HVAC shown for illustrative purposes



DOOR

Check for:

- Cracked glass
- Drain holes in bottom of door
- Torn or missing door seals
- Gaps in door latch mechanism

FLOOR

Check for:

- Missing access panels
- Gaps below access panels
- Gaps where control levers enter cab

PRESSURE GOALS

- **With RESPA CF2 only** (HVAC fan off) Minimum 20 Pa to 50 Pa
- **With RESPA CF2 and HVAC fan on high** Maximum: 200 Pa

Cab sealing beyond what it takes to get in this range is unnecessary and undesirable.

WINDOWS

Check for:

- Cracked glass
- Torn or missing window seals
- Gaps where sliding windows meet

CAB STRUCTURE

Check for:

- Poorly welded seams
- Missing grommets where wires enter cab
- Leaks where ROPS or FOPS join cab
- False floor