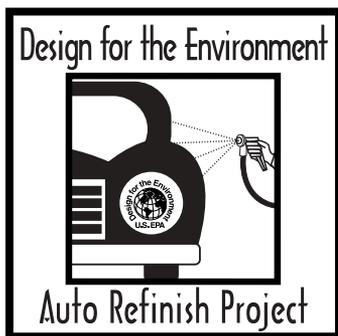


# Breathing Easy...

## Ensuring Proper Ventilation of Paint Mixing Rooms In Auto Refinish Shops



[www.epa.gov/dfe/projects/auto](http://www.epa.gov/dfe/projects/auto)

### Design for the Environment Auto Refinish Project

In its Auto Refinish Project, U.S. EPA's Design for the Environment (DfE) Program works with auto refinishers to identify and encourage safer, cleaner, and more efficient practices and technologies. EPA's project team has uncovered many examples of health and safety improvements that increase efficiency and can help shops save money. If you're interested in participating or would like to learn more about this project, please write Mary Cushmac at [cushmac.mary@epa.gov](mailto:cushmac.mary@epa.gov) or David Di Fiore at [difiore.david@epa.gov](mailto:difiore.david@epa.gov), or visit the DfE Web site at [www.epa.gov/dfe/projects/auto](http://www.epa.gov/dfe/projects/auto).

For a virtual auto body shop experience, filled with helpful health, safety, and efficiency information, visit [www.ccar-greenlink.org/cshops](http://www.ccar-greenlink.org/cshops). The virtual auto body shop is a joint product of DfE and the Coordinating Committee for Auto Repair (CCAR).

### The Auto Refinish Project

Auto refinishers use many potentially harmful chemicals when painting vehicles and auto parts. In particular, shops use solvents, isocyanates, pigments, and other additives in paints and coatings that can present serious risks to human health and the environment. Isocyanates, for example, are the leading cause of occupational asthma in the United States.

To help protect auto refinish workers and neighborhoods from these hazardous chemicals, the U.S. Environmental Protection Agency (EPA) launched the Auto Refinish Project, part of EPA's Design for the Environment (DfE) Program. Through this project, EPA has formed partnerships with Philadelphia-area auto refinish shops to determine which tasks pose the greatest health threats and which procedures and equipment protect workers best. In many cases, these procedures and equipment also increase shop efficiency and help save money on shop materials and waste disposal fees.

### Reducing Risks During Paint Mixing and Cleanup

Spray painting operations may present the greatest potential risks to auto refinishers. Many shops have addressed this risk through the use of ventilated spray booths, respirators, gloves, and coveralls when spray painting.

Two operations—paint mixing and cleanup—are often overlooked when shops are considering safety measures. Many workers perform paint mixing and cleanup in small, enclosed rooms with little or no ventilation or with ventilation that works improperly, often increasing worker exposure.

This fact sheet describes ways shop owners can improve ventilation in paint mixing and cleanup rooms and discusses other steps to better protect workers during paint mixing operations.

### Ventilation Systems— The Basics

Without proper ventilation, paint mixing and cleanup rooms can be unhealthy. Paints, solvents, and reducers all generate hazardous vapors that can build up and remain in a room. Ventilation systems are needed to remove these vapors and provide a healthy working environment.

There are two basic types of ventilation—general exhaust ventilation and local exhaust ventilation.

**General exhaust ventilation** systems typically consist of an exhaust fan, mounted in the ceiling or wall, that pulls air out of the workroom and discharges it outdoors. Replacement air is brought into the work area by either natural means, such as windows and vents, or by a more sophisticated setup that includes a separate make-up air fan, duct work, and air registers that provide clean air to the work space. General exhaust ventilation is also known as "dilution ventilation" because it dilutes vapors by mixing them with cleaner room air.

Since they do not immediately remove the vapors from the work space, general exhaust systems are not recommended as the sole source of ventilation when hazardous vapors are present. (Note, doorways also provide a path for make-up air to enter the workroom; however, fire codes typically require that mixing room doors that open into other areas of the shop remain closed when not in use.)

## Common Paint Mixing Room Ventilation Mistakes

Does your ventilation system provide workers with enough protection? Consider the following situations, which describe ventilation scenarios found in many auto refinish shops:

**Scenario:** An exhaust fan is installed in the ceiling of a small paint mixing room, directly above the paint mixing bench.

**Issue:** The fan is installed too far from the mixing operations to capture the vapors and, thus, is allowing them to mix with general room air before being exhausted. **In addition, many of the hazardous vapors emitted in the paint mixing room are heavier than air and tend to collect at floor level.** Exhaust fans at the ceiling level do little to capture and remove these low-lying vapors.

**Scenario:** An exhaust fan is installed in a paint mixing room at floor level on the wall just opposite from the work bench. Make-up air vents are located about 2 feet above the surface of the work bench, directly in front of the workers' faces. (See Figure 1.)

**Issue:** While this system provides for the removal of low-lying vapors, it creates a new problem. The air supplied to the room through the make-up air vents passes over the work bench and mixes with solvent vapors emitted during the mixing process. Because the exhaust fan is on the opposite wall, behind the workers, the contaminated air travels past the workers' faces before being exhausted from the room.

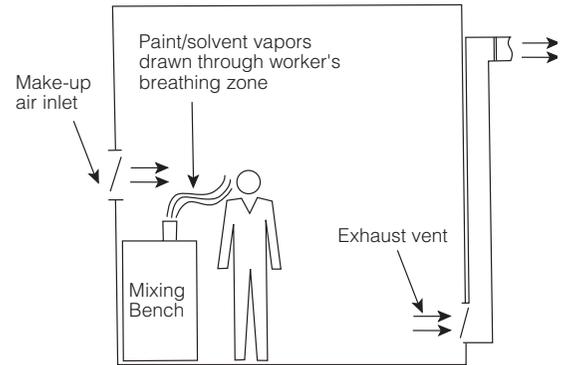


Figure 1. Poor Ventilation Design

**Local exhaust ventilation** systems remove chemicals and other contaminants at their source. These systems are recommended for controlling hazardous vapors because, if designed properly, they remove the vapors before workers are exposed to them. Local exhaust ventilation systems always consists of three basic components:

- A hood (exhaust vent or special duct end) installed as close as possible to where work is performed, to capture the vapors;
- Ductwork to transport the vapors from the hood to outside the building; and
- A fan located downstream of the hood to draw air away from the work area, through the hood and ductwork, and discharge it from the building.

## Combination Systems: An Effective Solution

The most effective way to ventilate your paint mixing rooms is to use both local and general exhaust ventilation systems in combination. A local exhaust system installed at the work bench as close to the mixing operation as possible will capture most hazardous vapors before they can escape into the room air and be inhaled by workers. A general ventilation system for the room with floor level exhaust vents will remove low-lying vapors that are not captured by the local exhaust system or are generated from other sources of vapor in the room, including trash cans containing solvent-laden rags; gun cleaners or other equipment; and open solvent, paint, and waste containers.

With a combined system, it is only necessary to turn on the local exhaust ventilation during actual mixing or cleaning operations. The general exhaust ventilation, however, should remain on throughout the workday to maintain constant air circulation in the room. A combined system actually can help reduce energy costs because the local exhaust ventilation system, which operates for only a small portion of the work day, can remove the majority of the vapors from the room while only exhausting a small amount of air. This lowers the concentration of vapors in the room and allows you to operate the general ventilation system at a lower flow rate, thus reducing the amount of heated (or air-conditioned) air exhausted from the building throughout the day.

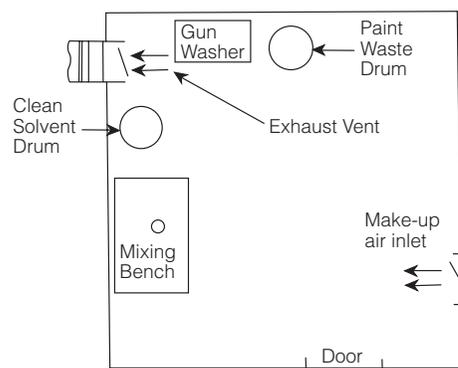
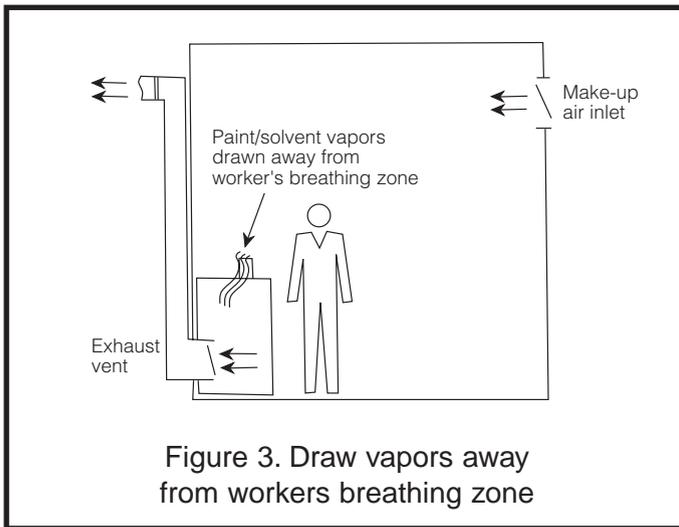


Figure 2. Top view of room—  
Locate exhaust vent near vapor sources



- Position exhaust vents as close to the source of hazardous vapors as possible to reduce the spread of vapors in the room (see Figure 2).
- Situate exhaust vents and sources of make-up air so that hazardous vapors are not drawn past the worker on the way to the exhaust vent (see Figure 3).
- Ensure continual movement of air within the paint mixing room to prevent hazardous vapors from accumulating.
- Conserve energy by installing a fan that operates at two speeds: a higher speed for greater air movement when workers are in the area, and a lower speed for reduced air flow when workers are not present.
- Place exhaust vents at or near floor level to remove low-lying vapors.
- Locate exhaust vents and sources of make-up air on opposite sides of the room to ensure that air flows through the entire room (see Figure 4).

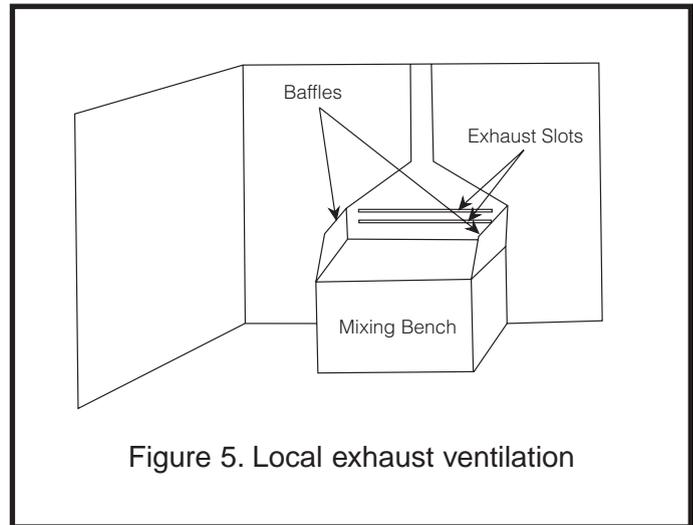
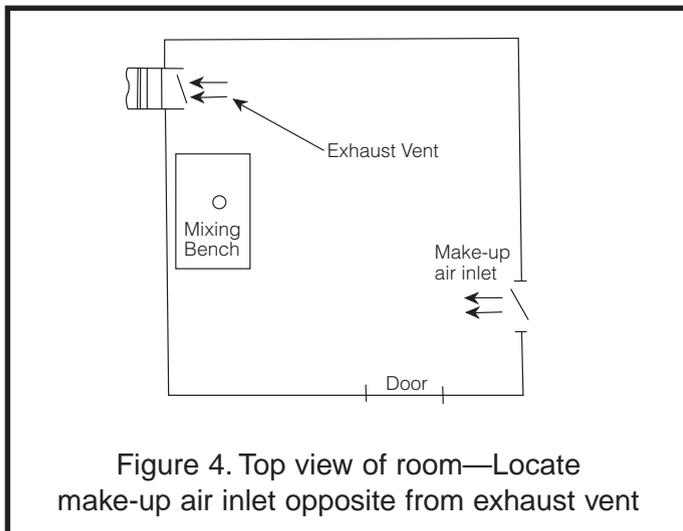
## Make Informed Decisions

A properly designed ventilation system can make the mixing room and shop operations cleaner, safer, and more efficient. An improperly designed system, however, will do little to improve current workplace conditions or protect workers. For this reason, it is important to make sure that the system is designed and installed by properly trained individuals, such as a qualified ventilation contractor or an industrial hygienist. As an alternative, prefabricated paint mixing rooms are currently on the market and typically provide spill protection, explosion-proof electrical installation, and general ventilation.

## Tips to Consider

### General Ventilation

When considering general exhaust ventilation systems for your paint mixing room, it is important to:



### Local Ventilation

Local exhaust systems can be more expensive to install initially, but they offer greater worker protection. In addition, operating costs are generally reduced by allowing for a reduced general exhaust flow rate. The following considerations should be taken into account when installing a local exhaust system in your paint mixing room:

- The fan must be sized correctly to move the required amount of air.
- The exhaust hood or vent should be located within 1 to 2 feet of the mixing operation to effectively capture vapors.
- Air velocity at the exhaust hood or vent must be strong enough to overcome potential cross drafts.
- A series of slot exhausts located at the rear of the paint mixing table at about the level that work occurs will most effectively capture vapors generated during paint mixing operations (see Figure 5).
- The use of baffles or other types of enclosures at the sides of the mixing table will help reduce cross drafts and improve the system's ability to capture vapors (see Figure 5).

## Special Design Considerations

No matter what type of ventilation system you choose, keep in mind that the vapors produced in paint mixing rooms are extremely flammable and can produce explosive environments. For this reason, all electrical equipment that you place or install in this room, including ventilation fans, wiring, and switches, must be specifically designed and approved for use in explosive atmospheres. Ventilation equipment manufacturers should be able to tell you what types of environments their equipment can be used in. In addition, electrical equipment approved for use in flammable or explosive environments should bear appropriate labels. For more information about applicable electrical requirements, contact your local Fire Marshall.

## Other Safety Considerations

Proper ventilation systems are a vital part of ensuring a safe work environment. Nevertheless, workers should take additional precautions when mixing paint and cleaning up. Here are some steps workers can take every day to further reduce risks to their health when they perform these operations:

- Use air-purifying respirators and create a respiratory protection program, including fit testing and cartridge change-out schedules. This is especially important when ventilation does not adequately reduce harmful vapors.
- Always wear chemical-protective gloves during paint mixing and gun cleaning activities. Note: latex gloves typically do not hold up well against solvents and isocyanates and can cause allergic reactions. Nitrile gloves would be a more protective choice. Talk to your paint distributor or equipment supplier to determine the most appropriate types of gloves for your operations.
- Close all containers of solvents, paints, and reducers immediately after use to minimize vapor emissions. This not only prevents workers from breathing hazardous vapors, but also saves money by reducing the amount of refinishing and cleaning products lost through evaporation.
- Fit all waste drums with funnel lids. Keep the lids closed when you are not using them. Most safety product distributors sell funnel lids that allow for easy drum access when transferring solvent wastes.
- Keep tight-fitting lids on all trash containers.
- Clean up all spills immediately. Allowing spilled materials to simply evaporate from the work surface can greatly increase the amount of hazardous vapors present in the air.



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