SPRAYBOOTH "101"

Section 1… Categories of spray booths

All Paint Spray Booths can be categorized 3 different ways:

1. By cabin (booth) design: closed face (w/ doors), open face (w/o doors).

2. By airflow design: down draft, cross draft, side draft.

3. By air pressure: negative, positive.

Your choice, or combination of choices, depends largely on the item being painted, the type of materials (paints) being applied, the quality level and production schedule required, and the physical shop space available for the installation.

Cabin (booth) Design: Closed face, open face

Closed face…The cabin is completely closed in on all four sides and the ceiling, a free standing room, with an entry door for the product and an entry door for the painter. This is the most popular design when "High Quality" finishes are the desired result. A sub-category of this design would be by product entry door layout. A "drive in, back out " , a drive-thru (or pass-thru) with doors at both ends, and a cabin designed with product entry doors on the side of the cabin. Open faced…The cabin is comprised of three (3) walls and a ceiling. There are no doors, the front of the booth is open.

Airflow Design: Down draft, cross draft, side draft.

Down draft…Air enters the booth from the ceiling, thru a filtering system, and moves downwards, vertically, (working with gravity) and is then exhausted in either of three (3) ways;

Downdraft Exhaust Pit Design	(Requires Pit)
Downdraft Exhaust Side-Wall Design	(No Pit)
Downdraft Exhaust Rear-Wall Design	(No Pit)

Down draft, air coming in thru the ceiling, is the most popular airflow design when "High Quality" is the desired end result. All three exhaust designs will perform relatively the same with a down draft. Your choice will depend more on the shop layout space available as to which exhaust design you use. We suggest you contact one of our design engineers to assist you in choosing the best design for your project.

EXAMPLE: If you're adding a new addition or constructing a new building, forming a

"pit" when the concrete floor is being poured is inexpensive. However, cutting an existing floor and forming new pit may coast as much as $5,000 - $7,000.

CAUTION: In a downdraft **"Side-Wall Exhaust"** design, lower side-wall exhaust boxes located on either side of the cabin may be a viable option when cutting a pit in the concrete is not an possible. In a **"Pit Exhaust"** design, the depth of the pit (approx. 36") is critical because the air must flow thru to an engineered depth. In this way, the pit has sufficient depth to allow the air to "follow thru" after it has passed thru the exhaust filters. The depth of the pit and filter design will insure even air-flow from one end of the cabin to the other. A downdraft "Side-Wall Exhaust" works on the same principle. However, you have to design the exhaust boxes wide enough (36") to accomplish an even air-flow from the front of the cabin to the back. Approximately the same 36" in width that the pit is deep. Caution should be taken not to lessen the width (to 12" - 14") as this will constrict "follow thru", reducing the booths capabilities, and will not produce good airflow in the front or rear of the cabin, only in the center. Note should be taken that the "Side Wall" design can significantly widen the booths foot print and reduce "lower side wall" lighting. The **"Rear Wall Exhaust"** design works equally as well, but the exhaust filters are located in the rear (opposite end from the entry doors) of the cabin. Our exclusive "Slanted Rear Wall Exhaust" design offers excellent airflow without sacrificing valuable floor space and offers the best lighting. From a cost vs. quality standpoint, the "Rear Wall Exhaust" design is the most popular.

Cross draft…Air enters the cabin thru filters in the doors or "corner columns"and is exhausted at the opposite end of the cabin. This is a horizontal air flow and does not work in conjunction with gravity. Caution should be taken, in longer cabin lengths, "Quality and Cleanliness" of the paint will lessen with this design.

Side draft…Air enters the cabin thru filters on one side and is exhausted thru filters directly opposite on the other side of the cabin.

Air Pressure: Negative, Positive

Negative…means the relationship between the air pressure inside the cabin is less than the air pressure outside the cabin. This occurs when there is only an exhaust fan on the booth and the air is extracted from the inside, creating a lower or "negative" pressure in relationship to the air pressure on the outside of the booth. Therefore, the air outside the booth is drawn into the booth by the "pressure differential". A vacuum cleaner works on the same principle. The "vacuum inside the booth will draw shop air (sometimes contaminated) towards the booth and thru the intake filters. This design will require a constant monitoring and frequent replacement of the intake filters. Also, particular attention should be paid to the quality and design of the gaskets on the booth cabin, as the filters become clogged and less air can pass thru them, the lower air pressure in the booth will literally cause the air to be "sucked" past low grade gaskets and allow contamination into the booth.

Positive…means the air pressure inside the cabin is more than the air pressure outside

the cabin. This is accomplished by adding an **"Air Make-up"** (AMU) to the system to replace the air being exhausted by the exhaust fan. In most cases this air is brought in from outside the building and therefore, in most climates, must be tempered (heated).

Note: While "negative" air pressure provides an excellent airflow over the item being painted, air forced into a booth cabin, via an AMU, must be controlled and regulated as to not over pressurize the booth. "Over pressurization" of a booth cabin is the #1 cause of paint contamination. A spray booth design engineer should be contacted to discuss the problem.

For further information on AMU click on **AMU 101**

Section 2…Important features

Construction material (steel)…There are basically three(3) types of steel that a cabin is constructed in:

Cold rolled steel…which is the same material car fenders are constructed in, this material has poor rust prevention and must be painted.
Galvanized steel…This material is designed to resist rust. It is smooth and shiny, and does not take a finish well. It is used for things like heat and air conditioning ducting.
Galvanealed steel…This material has the same rust prevention characteristics of galvanized steel but is better suited for a finish to be applied (better adhesion).

Structural integrity…There two (2) types of design for the "load bearing" strength of a booth cabin.

Panel load bearing…In this design the sheet metal panels (usually vertical) are required to bear the entire weight of the cabin ceiling.

Structural steel member load bearing…In this design, heavy gauge, vertical steel beams act as the load bearing members for the ceiling. The cabin panels themselves carry no load. This design allows horizontal panel construction and therefore horizontal lighting. This design is the same design used for pre-fabricated steel buildings.

Note…Structural steel beams require "nut and bolt" assembly while panel to panel fastening (which has no load bearing requirements) is accomplished with mechanical fasteners (self-taping screws) usually 6" to 9" on center.

Doors and Seals…Product entry doors are of three (3) basic designs. Barn doors, 2 big swing doors… tri-fold, 3 doors…and Bi-fold, 4 doors. Barn doors are the heaviest and have a greater tendency to twist and sag. Bi-fold (4) have more hinges and cause

less fatigue on the" door to frame" mounted hinges. Also bi-fold doors, when swung open require less floor space to function. Hinges themselves are strongest if they are a "drop pin" design rather than a "knuckle hinge" design. "Drop pin" hinges also ride on a brass bushing for a smoother operation and won't ware out as fast as nylon washers. Hinges that are welded to the door frame are unable to sag, which is one of the common problems of a bolted on hinge.

The best door design is that of a pre-hung door assembly, where the doors and the frame are placed into a jig, mounted, measured, and locked in place to assure exact alignment…than all components, hinges and doors, are welded in place and the assembly is shipped complete as a per-hung door.

The seals (gaskets) are the most important defense against dirt contamination into a booth. The best gasket system is one where the gasket mounts on the frame of the door. Just like in a submarine, the seal mounts on the bulkhead not on the door. The best seal is when the gasket is of tubular design, like on the trunk of a car. The gasket should be one piece and run a full 360° around the frame. Most important is in the design of the door frame…if a door gasket is going to leak, chances are it will leak at a square corner. The gasket rarely leaks down the straight side. It is critically important that the door frame has a "radiused" corner. There are no square corners on a submarine.

Cabin Finish or Coating…Again, basically three (3) types of coatings.

Pre-coated steel…Cold rolled steel is used here , whereby the steel producer supplies the booth manufacturer with material that has been pre-coated with either paint or a vinyl finish. The booth manufacturer is then required to "pop rivet" all his connections as welding connections will burn the finish.
Wet painted finish…Again, cold rolled steel is used here, and sometimes galvanized steel (but we have discussed the problems with that technique).By using this finish. It allows the manufactured to weld his connections.
Powder Coating…This is, by far, the premier finish to be applied…and, galvanealed steel is the premier material to apply it to. Adhesion is best obtained when the subsurface (the steel) is as clean as possible. That is why before a part is powder coated it goes thru a 3 stage "wash" process. The part is first subjected to an Iron Sulfate wash to remove impurities from the steel. Than a clear water wash, to neutralize the Iron Sulfate. Thirdly, a "sting" wash opens the pours of the steel (you can see where the smooth and shiny, galvanized steel would have problem here) for better adhesion.

Powder Coating is an "electrostatic" process whereby the part being powdered is charged with a "negative" electric current. The powder applicator (gun) is charged with a "positive" charge. This "negative attracting positive" relationship means the powder is attracted to the part via an electrical charge and held there until to part is baked in a high temp. curing oven.
The powder coated panel than passes thru an oven preset at 425°. The

powder literally “melts” onto, and into, the pours of the steel. Again, you can see the benefits of galvanealed steel over the smooth and shiny, galvanized. The resulting finish is sometimes referred to as “porcelain like”.

Note…Future Cure is proud to have been the first paint booth company to offer a powder coated finish, and is equally proud to see so many paint booth companies follow suit.

Lighting…Unequivocally, **THE** most important feature in a paint booth.

Light fixtures, most often fluorescent, can be mounted in two (2) configurations; horizontal and vertical. Either, 2,4,or 6 tubes each and usually mounted outside the booth cabin separated by 1/4“ tempered safety glass. By mounting outside the cabin no “explosion proof” rating is required.

Vertical lighting…What usually mandates the installation configuration (vertical or horizontal) of the lights is the configuration of the booth cabin panels. If the booth design calls for vertical panels it will have vertical lights. If the panels are of a horizontal design the lights can be horizontal. With the vertical design, if the painter steps in front of the vertical light he will block the light and cast his own shadow on the item being painted.

Horizontal lighting…Obliviously, horizontal lighting is the most preferred as even with the painter in front of the light, enough light will pass around him that shadows are not a factor.

Note…Cabins designed with horizontal panels are more expensive to produce but, the ability to have horizontal lighting is well worth the investment.

“Hip” lighting…Light fixtures mounted in the upper corners (“hips”) of the booth cabin offer superior light “wash” over the item being painted. This “wash” distributes light evenly across the top of the item as well as the sides.

Tube placement…The florescent tubes mounted in the light fixture are best located a minimum of 6” apart. In this way each tube will cast its own “light line”. Most new car auto manufacturing assembly lines have an “paint inspection room” directly after the robotic paint line where human inspectors will view the paint work for imperfections. The ”Inspection Grade Lighting” in these rooms is made up of florescent tubes 6” apart to cast as many “light lines” as possible. Looking at the “light line” is the best way to see imperfections in the paint.