In push-pull ventilation, a nozzle pushes a jet of air across the vessel surface into an exhaust hood. Effectiveness of a push jet is a function of its momentum which can be related to the product of the nozzle supply air flow (Q_j) and the nozzle exit velocity(V_j). For a jet used for plating tanks or other open surface vessels, a push supply flow can be determined from:

$$Q_j = 243\sqrt{A_j}$$

Where Q_j = push nozzle supply,cfm per foot of push nozzle plenum length
A_j = nozzle exit area, ft^2/per foot of push nozzle plenum length

Using this approach, a push nozzle design is first selected and the nozzle area(A_j) determined.

The push nozzle manifold may be round, rectangular or square in cross-section. The push nozzle may be 1/8" to 1/4" horizontal slot or 5/32" to 1/4" diameter drilled holes on 3 to 8 diameters spacing.

It is important that the air flow from the nozzle be evenly distributed along the length of the supply plenum. To acheive this, the total nozzle exit area should not exceed 40% of the plenum cross-sectional area. Multiple supply plenum inlets should be used where practical.

The push nozzle manifold should be located as near the vessel edge as possible to minimize the height above the liquid surface. The manifold should be adjustable to optimize the push jet angle. The manifold axis can be angled down a maximum of 20° to permit the jet to clear obstructions and to maintain the jet at the vessel surface. It is essential any opening between the manifold and tank be sealed.

An exhaust flow of 75 cfm/ft^2 of vessel surface area should be used for tank liquid temperatures (t) of 150°F or lower. For tank liquid temperatures greater than 150° F use an exhaust flow of $(0.4t+15) cfm/ft^2$. These flow rates are independent of the "class" used in determining exhaust flow for side draft hoods. "Control velocity" is achieved by the push jet blowing over the tank and will be considerably higher than that which can be achieved by a side draft hood. The purpose of the exhaust hood is to capture and remove the jet--not to provide capture velocity. A flanged hood design is to be used wherever practical. The exhaust hood should be located at the vessel edge so as not to leave a gap between the hood and the vessel.

Design and location of an open surface vessel encompasses a number of variables. In some cases vessel shape, room location, cross-drafts, etc., may create conditions requiring adjustment of the push and/or pull flow rates in order to achieve control. Cross draft velocities over 75 fpm, very wide vessels (8 feet or more), or very large or flat surface parts may require increased push and/or pull flows. To account for the effects of these variables, a flow adjustment of ±20% should be designed into the push and +20% into the pull flow system. Wherever practical, construction and evaluation of a pilot system is recommended. Once designed and installed, push-pull systems can be initially evaluated by use of a visual tracer technique and appropriate flow adjustments can be made as required.

The exhuast hood opening should be sized to assure even flow distribution across the opening. This can be achieved by sizing the slot for 2000 fpm slot velocity.