of required air-flow rates cannot apply. Furthermore, it would not be econom... to increase the air-flow rate through such a local exhaust hood to bring ... general ventilation volumes because the suction power requirements would ... exorbitant. General ventilation should be provided by low-velocity, low- ... equipment. The warning, then, is *not to overestimate the capability of any ... hood as a general ventilating device.* Special systems of multiple hoods ... simultaneously in small rooms have been observed in some cases to give high ... of air change for the space. This condition is not a property of exhaust hoods ... instead the result of greatly reduced air space per hood.

1. Exhausting vs. Blowing

Figure 4 illustrates the fundamental difference between blowing and exhaust... ing devices. Air blown from a small opening retains its directional effect for a con... siderable distance beyond the plane of the opening. However, if the flow ...

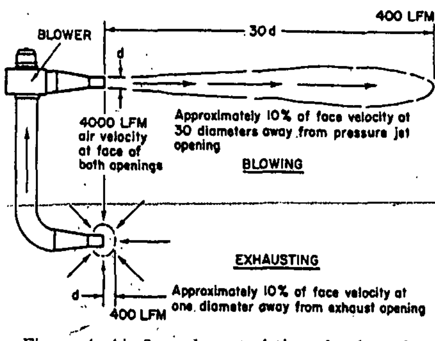

Figure 4. Air-flow characteristics of exhausting and blowing devices.

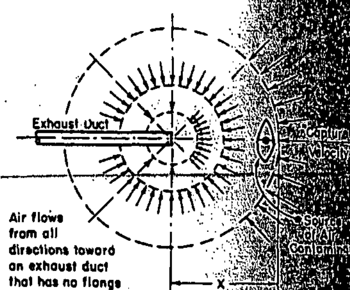

Figure 5. Spherical nature of ... flow into an unflanged and ... exhaust hood.

reversed so that the same opening (or its equivalent in size) now handles the same volume of air by exhaust, the flow becomes almost completely nondirectional and its range of influence is greatly reduced. It is for this reason that local exhaust hoods should not be contemplated for any process that cannot be conducted in the immediate vicinity of the hood.

2. DallaValle's Equation for Unobstructed Hoods

This equation is used to determine the relation between the quantity of ... flowing into an exhaust hood and the resulting air velocity at a distant point ... the hood centerline. The equation applies only when there is no obstruction be... tween the hood opening and the control point in question (see Figure 5) ...

... simplified form of the equation for both round and rectangular hood open... ings ... follows:

$$Q = V\left(\frac{X^2}{b} + A\right)$$

... area of hood opening in square feet, b = a constant that depends upon ... the hood, Q = quantity of air flow in c.f.m., V = centerline air ve... locity ... at X feet from opening, and X = distance in feet from hood open... ing ... control point.

DallaValle's equation is used frequently with a value of 0.1 for constant b, ... simple approximate formula suitable for round or essentially square ... With this constant the equation is given in the convenient form: $Q =$ ... Table 7 lists the constants and equations for hood openings of vari... ous proportions.

3. Flanges and Baffles Increase the Range of Exhaust Hoods

Figure 6 illustrates the beneficial effect of restricting the direction of air flow into an exhaust opening. The diagrams were constructed on the basis of a point source of exhaust which, of course, does not occur in practice. Figure 7 shows the

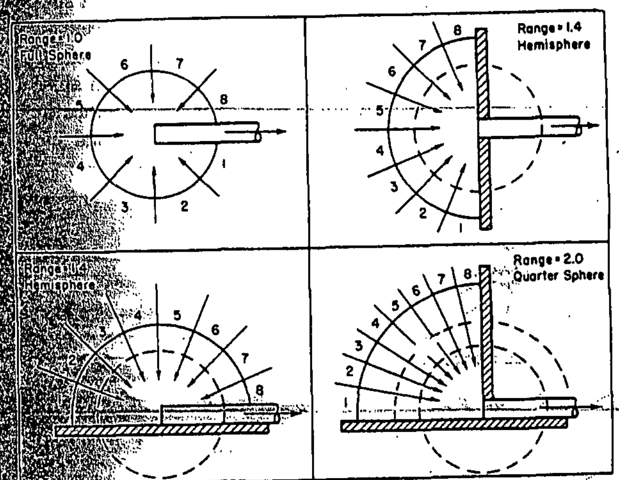

Figure 6. Flanges and baffles increase the range of exhaust openings.

... velocity contours and streamlines for a rectangular hood and indicates the marked deviation from spherical contours at points close to the hood face.[9] Figure ... illustrates a flanged "spot exhaust" hood for arc welding.

[9] J. M. DallaValle, *Exhaust Hoods.* Industrial Press, New York, 1944.