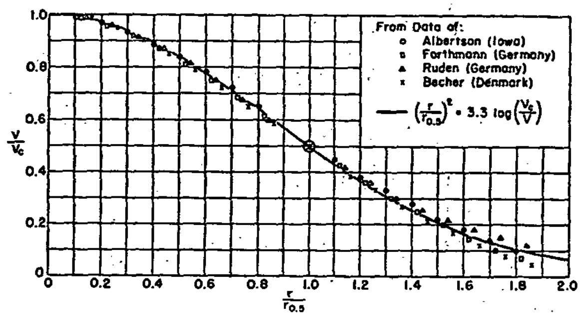

FIG. 4. CROSS-SECTIONAL VELOCITY PROFILES FOR STRAIGHTFLOW TURBULENT JETS

$r_{0.5}$ = the radial distance in the same cross-sectional plane from the axis to the point where the velocity is half the centerline velocity. ($V = 0.5\ V_x$).

V_x = the centerline velocity in the same cross-sectional plane, feet per minute.

V = the actual velocity at the point being considered, feet per minute.

Experiments show that the conical angle for 0.5 V_x and $r_{0.5}$ is approximately one-half of the total angle of divergence of a jet. The velocity profile curve for one-half of a straight-flow turbulent jet (the other half being a symmetrical duplicate) is shown in Fig. 4. For multiple-opening outlets, such as grilles, or perforated panels, the velocity profiles are similar, but the angles of divergence are smaller.

Radial Jets

In the radial jet (diagram B in Fig. 1) the cross-sectional area at any distance from the outlet varies as the square of this distance, the same as for an axial jet. Experiments have shown that the centerline velocity gradients and the cross-sectional velocity profiles are similar to those of Zone 3 of axial jets and that the angles of divergence are about the same. In using Fig. 3, X/H should be used as abscissa instead of $X/\sqrt{A}$.

Jets from ceiling plaques (diagram C in Fig. 1) have the same form as one-half of a free radial jet. The jet is wider and longer than a free jet, with the maximum velocity close to the wall. This is demonstrated in Fig. 5 which also indicates that under the conditions shown the width of the slot between ceiling and plaque has little effect on the jet pattern or velocities at some distance from the plaque.[2]

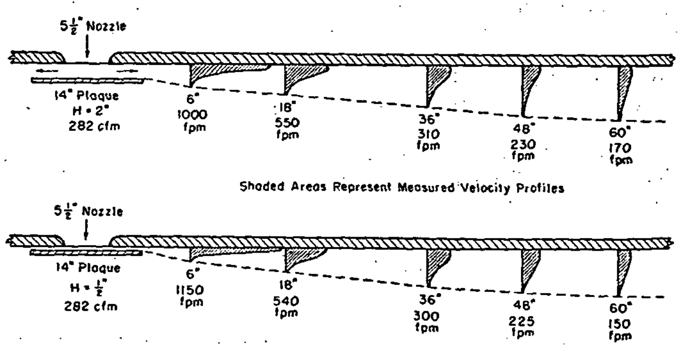

FIG. 5. AIR JETS FROM A 14-IN. CEILING PLAQUE FOR TWO SLOT WIDTHS WITH SAME RATE OF FLOW

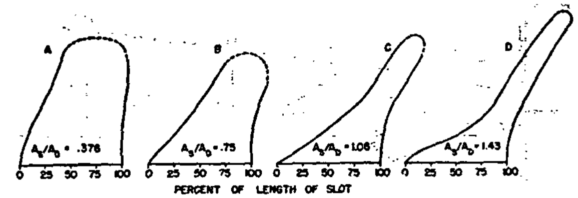

FIG. 6. SHAPE OF AIR-STREAM ENVELOPES AS SLOT AREA IS INCREASED

Discharge from a Long Slot

When a long slot receives its air supply from one end only, the important design factor is the ratio of the area of the slot to the area of the supply duct, and both the air stream profiles and the duct pressure requirements are determined by this ratio.[6] Fig. 6 shows the changing profile as the slot area is increased for a rounded entrance slot ($C_d = 0.93$) with constant duct cross section.

The air discharge from a slot in a tapered duct will be uniform (Fig. 7) for a relationship between discharge angle and slot-duct dimensions[7]

$$\cot \theta = \frac{A_s C_d}{A_d} \quad (6)$$

where

θ = discharge angle, degrees.

A_s = slot area, square feet.

A_d = duct cross-sectional area at upstream end, square feet.

C_d = coefficient of discharge.

Perforated Panels

When air is discharged from perforated panels of relatively large sizes, the constant velocity core formed by the coalescence of the individual jets extends a considerable distance from the panel face. In this Zone 1 region the proportionality constants K and K' do not apply. Therefore, the proportionality constants given in Table 1 should be used only when the ratio (Distance from panel/$\sqrt{\text{Panel area}}$) is larger than 5. When the ratio is less than 5, the equation

$$V_x = V_0 \cdot 1.2\sqrt{C_d \times R_{fa}} \quad (7)$$

should be used for estimating centerline velocities.[8]

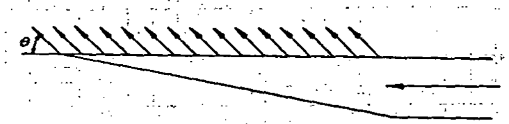

FIG. 7. UNIFORM AIR FLOW FROM A SLOT SUPPLIED BY A TAPERED DUCT