EXTRACTS FROM:

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PHOTOGRAPHS OF SMOKE TESTS DEMONSTRATING AIR FLOW CHARACTERISTICS WITH DIFFERENT SPACING OF TURNING VANES.

TYPE "Y" IS TWO-INCH RADIUS "HOLLOW" VANE

TYPE "V" IS FOUR-INCH RADIUS "HOLLOW" VANE

TITUS MANUFACTURING CORPORATION

WATERLOO, IOWA

PROJECT NO. R-D-8.1

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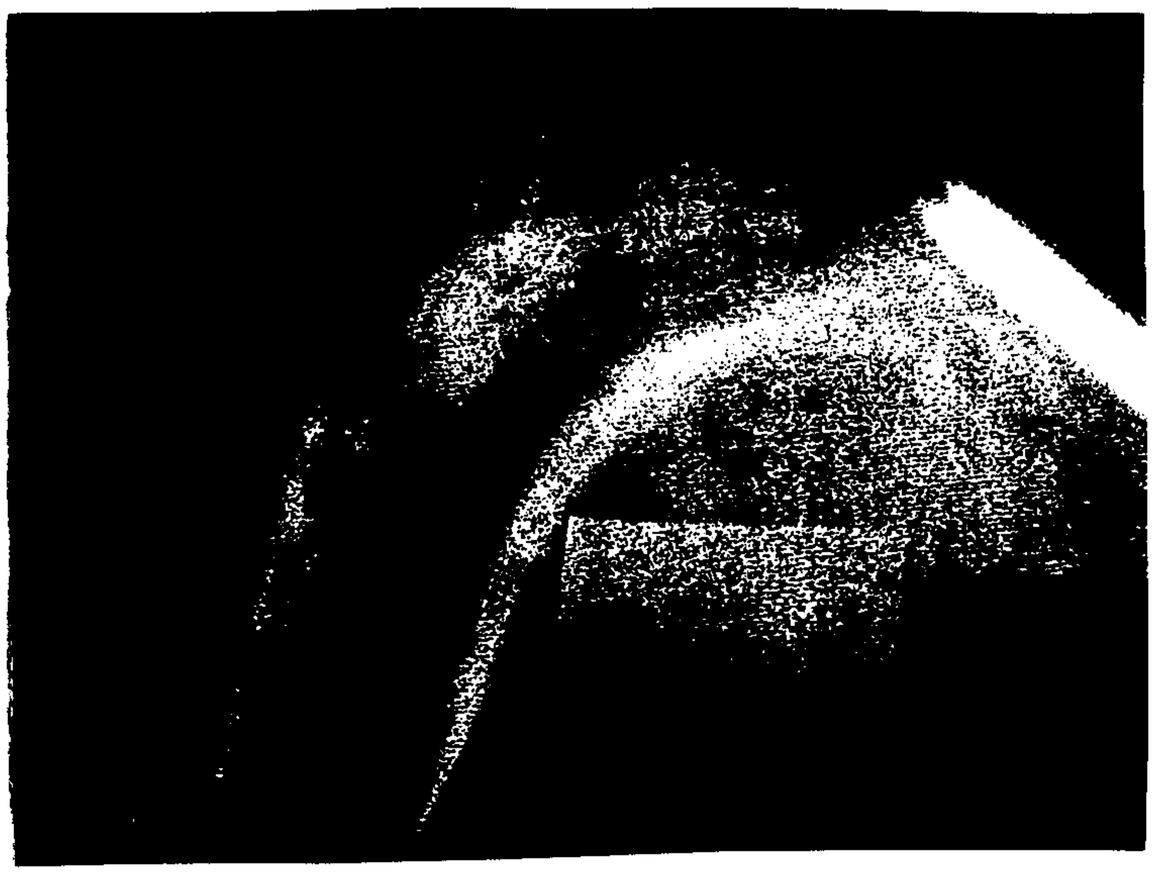
The purpose of this report is to show the air flow patterns of the Titus Z and Y turning vanes with standard and double spacing. the photographs shown in this report were taken at the Titus Research Laboratory under actual flow conditions.



This shows the typical velocity profile of the turning effect in a duct without turning vanes. Notice the high velocity air stream on the top portion of the duct. A void can be seen in the lower right portion of the duct as the air stream passes around the corner.

The loss of effective area in a turn such as this increases the pressure loss. (1)

(1) Superscript numerals indicate the references listed at the end of the report.

Figure 2 shows that the Z type turning vane on double spacing. Notice that the void area still exists, but has decreased in size compared with Figure No. 1.

Figure 2

Figure 3 shows the Z style turning vane with normal spacing. Notice the marked improvement of flow as compared to the double spaced arrangement shown in Figure 2. The standard spacing of the Z styled turning vane is 3¼" tip to tip

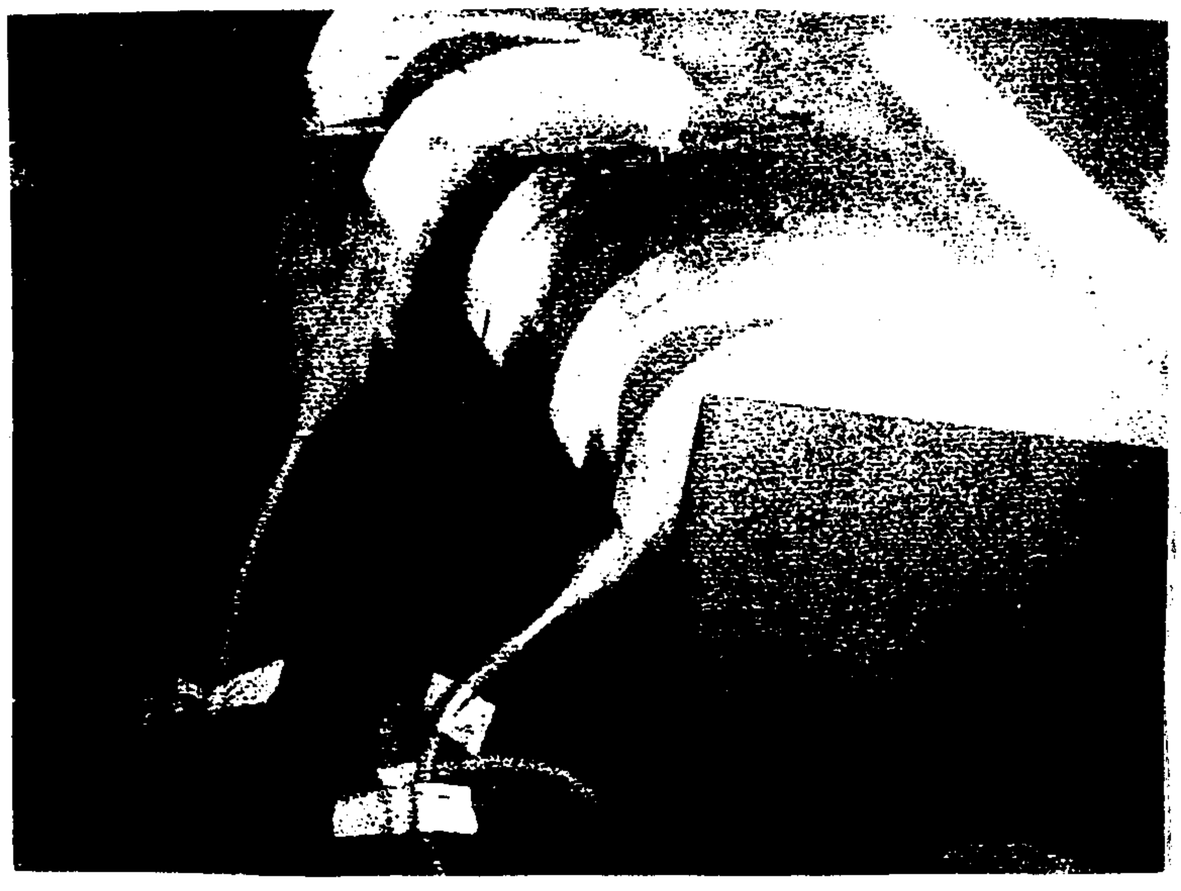


Figure 3

This shows the Y type turning vane with double spacing. Notice the difference in effective area between the Y and Z style vanes (Figure 2 and 4). The smaller Y turning vane does not seem to have as much effect in turning the air and filling the duct as the Z style vane. (2)

Figure 4

The Y style turning vanes placed on standard spacing of 1 3/4" are shown here. This picture shows a marked improvement of air flow as compared to Figure 4.

Figure 5

## EFFECTS OF VELOCITY

The following photographs show the effect of velocity. The arrangements shown in Figures 6,7 and 8 are the same set of turning vanes as shown in Figure 4. The velocity shown with each figure represents the average duct velocity.

Figure 6 Velocity 250 FPM

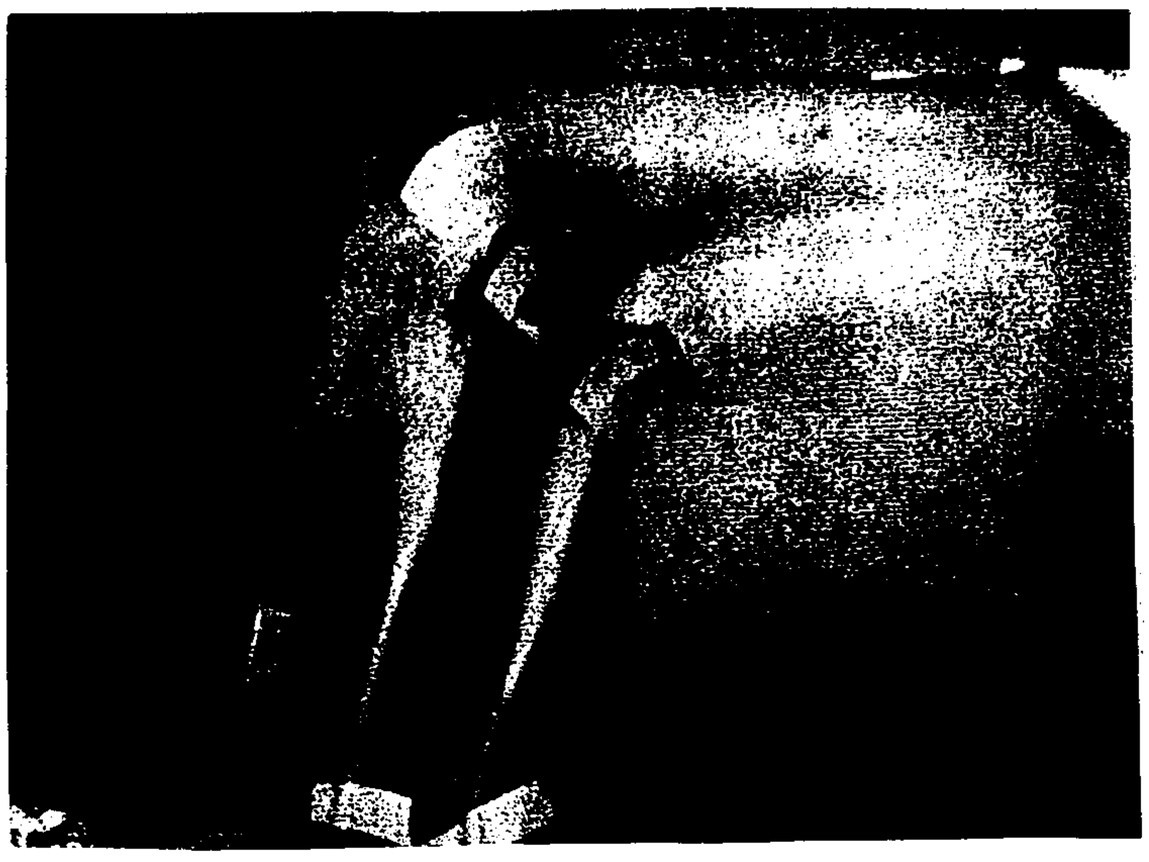


Figure 7 Velocity 500 FPM

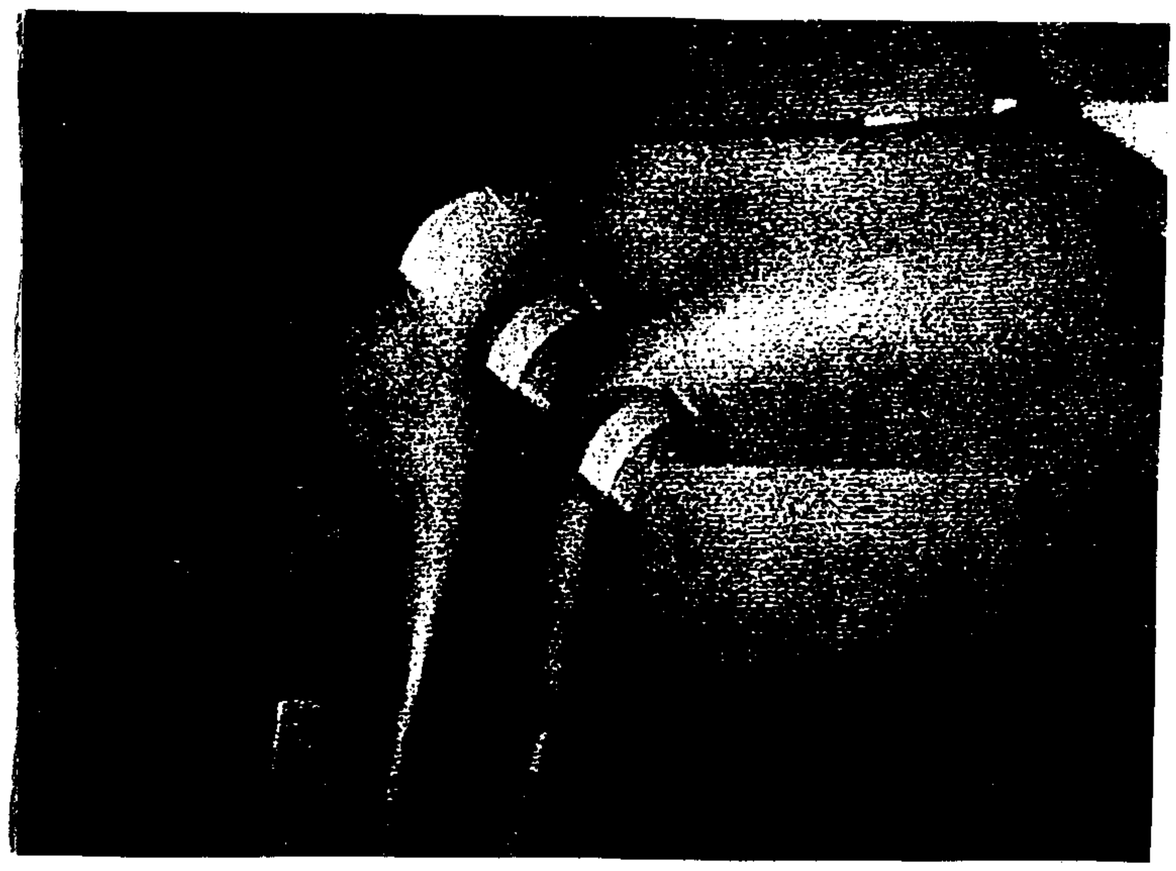


Figure 8 Velocity 1000 FPM

The void region at the inside of the elbow in Figures 6,7 and 8 is fairly constant in cross-sectional area which indicates that velocity has little effect on the performance of the turning vanes. With a velocity of 250 FPM the air was nearly stagnent in the void region. As the velocity increased, air in the void region began a slow circulation between the moving air and duct wall.

## CONCLUSIONS

The rusults of this study show that the larger Z type vanes are more effective than the Y type vanes. Either type of vane is more effective if used with normal rather than double spacing.

(1) Chapter 7 and 12,1963 ASHRAE Guide and Data Book
(2)ASH&VE Transactions, Volume 48,1942, Pages 409-424