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WADC TECHNICAL REPORT 52-283
PART 2

AIR PERMEABILITY OF PARACHUTE CLOTHS

H. W. S. LaVier

Georgia Institute of Technology

August 1953

Materials Laboratory
Contract No. AF 33(038)-15624
RDO No. 612-12

Wright Air Development Center
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

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FOREWORD

This report was prepared by the Georgia Institute of Technology, under USAF Contract No. AF 33(038)-15624. The contract was initiated under Research and Development Order No. 612-12, "Textiles for High Speed Parachutes," and was administered under the direction of the Materials Laboratory, Directorate of Research, Wright Air Development Center, with Mr. Jack Ross acting as project engineer.

This report is the second in a series of reports on the same subject. The first report was published in November 1952 under the basic report number (WADC TR 52-283) only; it should be considered as Part 1 although it was not so marked.

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ABSTRACT

The air permeability of special, woven, nylon, orlon, and dacron, parachute-type fabrics was determined using a sample 6.05 inches in diameter. The permeometer used in this program permitted testing the fabric samples at pressure differentials across the cloth as high as 55 inches of water. The sixty-one experimental cloths woven in the Laboratories of the Georgia Institute of Technology Textile School were subject to this test procedure.

Air permeability data for the Georgia Tech-woven fabrics, Bally Ribbon cloths, and the ten Air Force-furnished fabrics are presented here in graphical form as volumetric flow (cubic feet per minute) versus static pressure differential across the cloth.

The number of ends per inch in warp, and picks per inch in the filling, and denier of yarns was found to affect air permeability of these fabrics. The finishing of the fabrics was found to affect the permeability more than any other of the many variables involved. The tests to determine the effect of variation of the weave pattern failed to show significant differences on this account.

PUBLICATION REVIEW

This report has been reviewed and is approved.

FOR THE COMMANDER:

M. E. SORTE
Colonel, USAF
Chief, Materials Laboratory
Directorate of Research

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I. INTRODUCTION

A. Statement of the Problem

The work presented here is a continuation of the study reported in USAF Technical Report No. WADC 52-283. These studies are to determine the air permeability of nylon, orlon, and dacron parachute-type fabrics. The effects of denier and fabric weave geometry on air permeability were the object of the research.

B. Definition of Terms

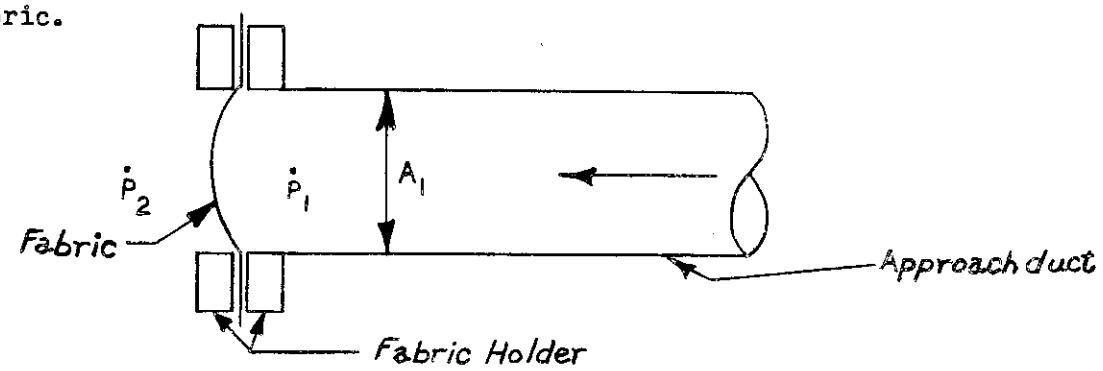
In this report the following definitions of permeability and porosity will be adhered to:

Permeability: the mass rate of flow or the volume rate of air flow per unit projected area of the cloth.

Porosity: the ratio of projected void or interstitial area to total projected area of the cloth sample expressed in per cent (%).

Relative Porosity: arbitrarily defined as the ratio of the velocity of the air upstream of the cloth to the theoretical velocity obtainable because of the pressure drop impressed across the cloth.

The illustrative sketches which follow and the symbols employed serve to implement these definitions. Subscripts 1 and 2 in the sketches indicate, respectively, the flow conditions upstream and downstream relative to the fabric.



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$$\text{Permeability} = \rho_1 V_1 A_1 = G \ \frac{\text{lbs.}}{\text{sec.}}$$

$$\text{or} \quad = V_1 A_1 = Q \ \text{ft.}^3/\text{sec.}$$

$$\text{Porosity} = \frac{A_{void}}{A_{total}} \times 100, \text{ per cent}$$

$$\text{Relative Porosity} = \frac{V_1}{\sqrt{2\left(\frac{P_1 - P_2}{\rho_1}\right)}} \text{ (dimensionless)}$$

II. LITERATURE SURVEY

All available sources of literature are continually searched for information pertinent to the permeability of parachute fabrics including methods and equipment for conducting permeability studies.

The few articles appearing in appropriate trade periodicals are indicative of the lack of general interest in this particular subject. Such literature as has been uncovered recently is authored by persons of the small group actively engaged in parachute design and development. The interest of the garment trade in air permeability of fabrics is recognized. However, it must be remembered that the low flow of air through garment fabric will permit permeability tests of garment fabrics at pressure differentials as low as one-half inch of water.

III. APPARATUS

A. Introduction

Two specially constructed wind tunnels were used as permeometers in conducting the investigations reported herein. One of these will be called the low-pressure permeometer (0-10 inches of water) and the other the high-pressure permeometer (3-55 inches of water). A feature of both wind

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tunnels is that the same fabric sample holder will fit either. This permits conducting low-pressure tests on one tunnel and continuing these studies at higher pressures by merely changing the sample holder to the higher-pressure wind tunnel and without removing the fabric sample from the holder. This provides good correlation of experimental data over the test range of 0-55 inches of water pressure differentials. The permeometers are shown in Figure 1.

B. Low-Pressure Tunnel

The low-pressure tunnel is provided with air from a conventional vacuum cleaner motor and blower. The 2-1/2-inch-diameter ducting is plastic and incorporates special taps and flanges for an orifice meter installation. The outboard (away from the fan) end of the tunnel is expanded into a six-inch-diameter plastic duct. This large duct has a flange to which the sample holder is clamped.

Pressure differentials across the cloth are measured by alcohol micromanometers. Similarly, the pressure differential across the orifice meter is measured by use of another micromanometer. This permits measurement of pressure differentials as low as that equivalent to 0.010 inches of alcohol. Variation of air pressure is obtained by use of a simple plug valve.

C. High-Pressure Tunnel

This tunnel is provided with air by a 7-1/2 HP electric motor driving a Buffalo Forge Company fan. This fan permits pressure differentials across the cloth equivalent to 55 inches of water.

A sheet metal expansion section hooked to the fan outlet increases the duct internal diameter to 5-3/4 inches. A straight section of metallic duct containing an "egg-crate" air-flow-straightening device follows the

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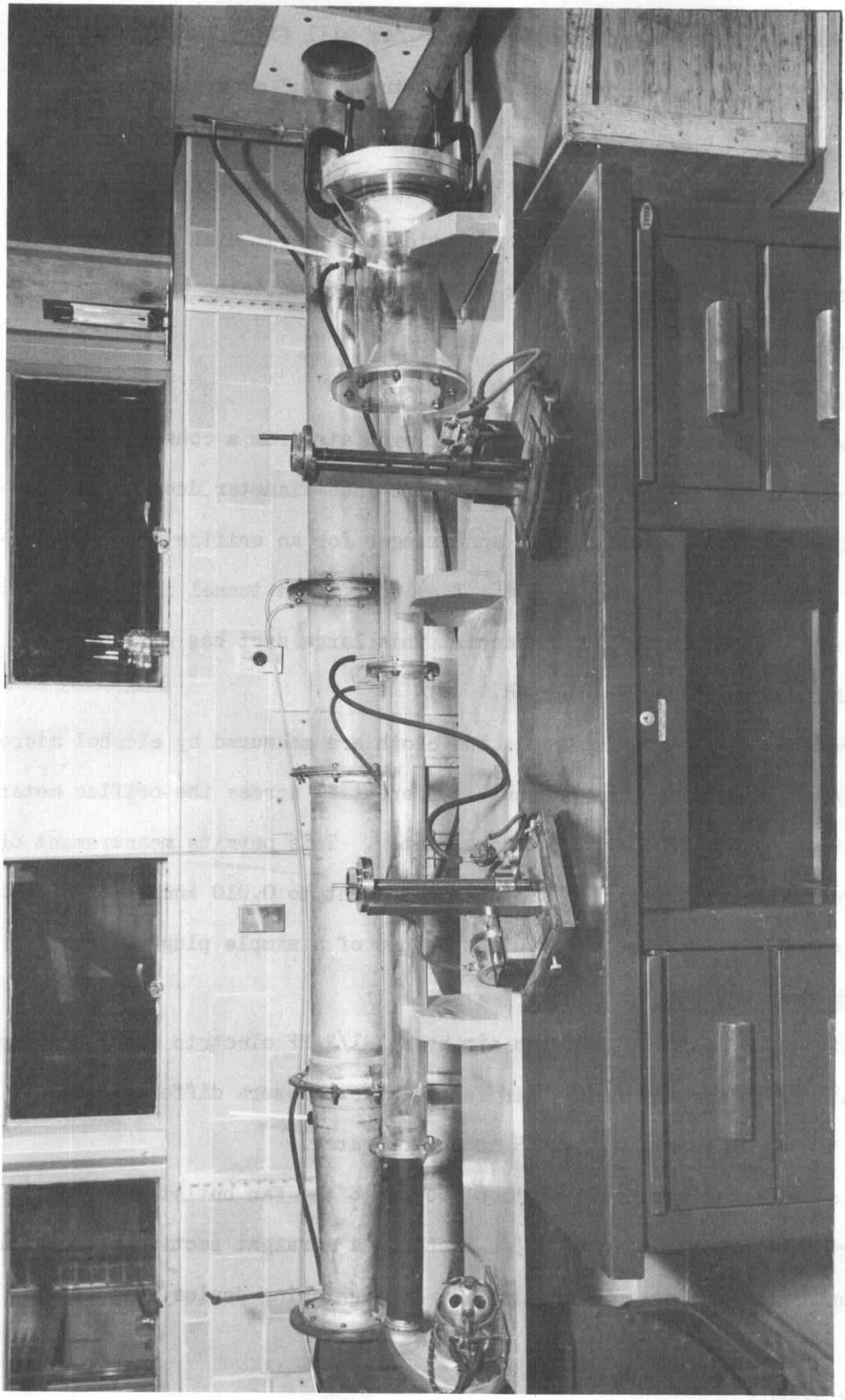

Figure 1. General View of High- and Low-Pressure Permeometers.

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expansion section. The duct material then changes to plastic, and a flanged joint with taps is provided at the station of the orifice meter. After the orifice meter, another "egg-crate" straightener is provided. At the tunnel outlet. a bellmouth expansion section provides for the attachment of the fabric sample holder.

Pressure differentials across the fabric sample are indicated by a large water manometer. This manometer is graduated in 0.10 inches and may be read to an accuracy of 0.050 inches. An alcohol micromanometer is used to measure the pressure differentials across the orifice. The gauge board is shown in Figure 2.

Variation of air pressure is obtained by use of a plug valve inserted at the fan inlet. This valve permits regulation of the pressure down to that equivalent to 3 or 4 inches of water.

Air filters are provided at the fan inlet. These remove the large-scale dust from the air flowing through the wind tunnel.

An insulated chamber ventilated to the "outside air" surrounds the bellmouth and sample holder. This permits the hot air leaving the tunnel to exhaust to the out-of-doors. In this way the inlet air temperature and the room temperature are maintained at approximately 80° F.

The temperature of the air flow is taken at the fan inlet and outlet. Also, the temperature is measured downstream of the sample holder. There is never more than 10° F. difference between the temperature at the fan outlet and that downstream of the sample. Therefore, in computing the test results, the temperature at the fabric sample has been averaged and used to compute the air density.

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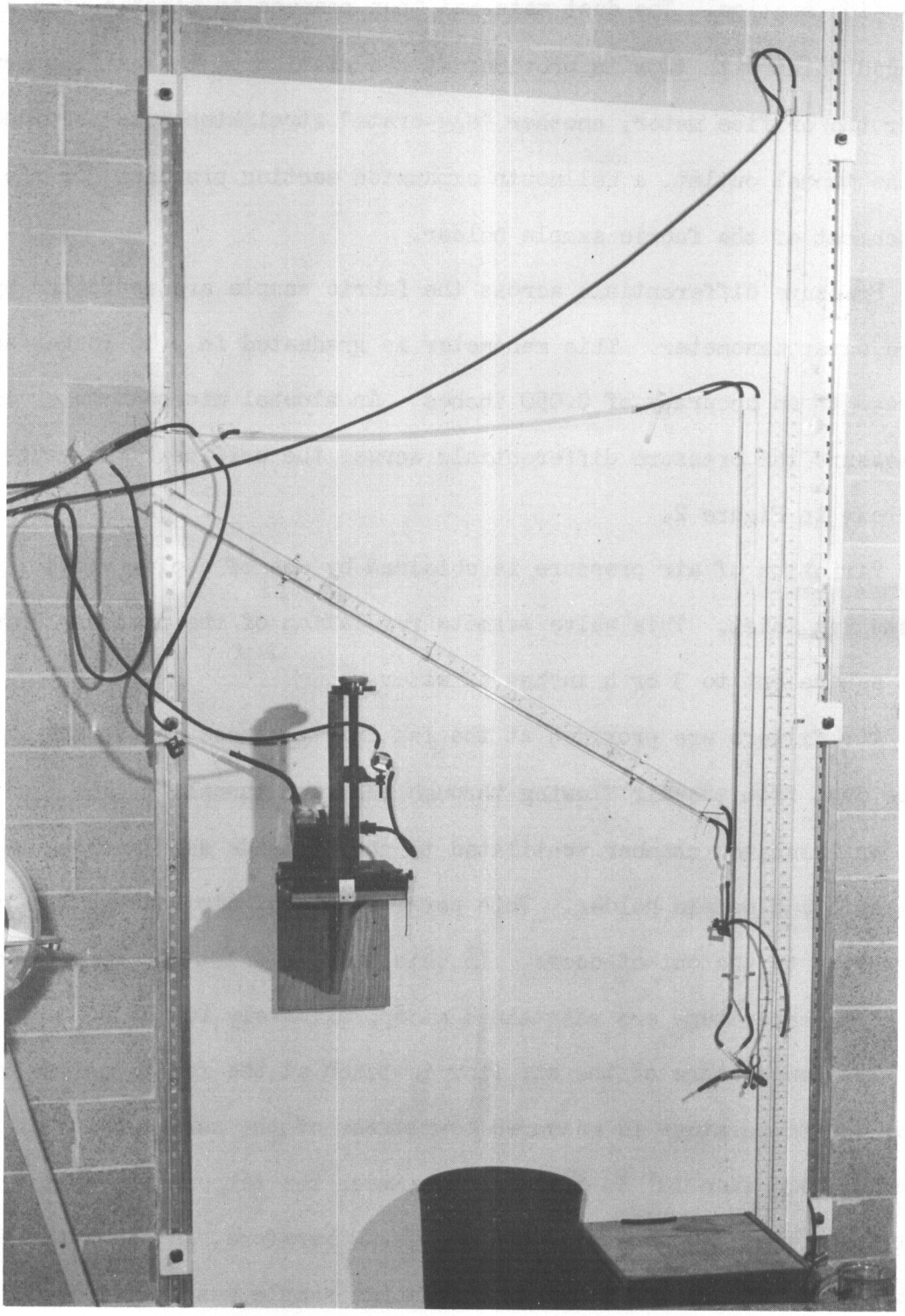

Figure 2. Gauge Board.

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A mercurial barometer and an aneroid barometer are used to determine the atmospheric pressure. Also a Bendix-Freiz recording psychrometer is used to record the temperature and relative humidity of the room. By knowing the quantity of water in a unit weight of air in the room it is then possible, by also knowing the local temperature at any point in the permeometer, to know the relative humidity at that point.

IV. SPECIAL EFFECTS

A. Relative Humidity

The ASTM specifications for textile testing call for an ambient temperature of 70° F. and relative humidity of 65% ± 2%. There were no provisions for controlling the humidity of the laboratory room or of the air going through the permeometer.

The test procedure required a waiting period, after the permeometer was started and before taking air flow readings, until the temperature at the fabric sample was at least 118° F. This resulted in all of the tests' being conducted with fabric temperatures ranging from 118° F. to 130° F. Using the moisture quantity determined by the psychrometer in the laboratory room and the wind tunnel outlet temperatures, relative humidity at the fabric sample ranged from 10 to 28 per cent with about 20 per cent average relative humidity.

Some change was noted in the orifice pressure differential as the outlet temperature increased, while the pressure differential across the fabric sample was maintained constant. It was then determined that this change was a function of the air density's changing with temperature. When the density was corrected for the temperature change, the flow quantity was found to be constant.

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Relative humidity is not expected to have great effect on nylon, orlon, and dacron yarns. This is stated in the various handbooks giving specific properties for these materials. The only way moisture or humidity could affect the fabric sample would be for the fabric to pick up the water from the air flowing through it or for solid particles of water to block the interstitial voids.

The special investigations to determine the effect of relative humidity failed to indicate, conclusively, that relative humidity changes affected the fabric air permeability values at all. This was further evidenced by obtaining almost exact air permeability for the same sample throughout the range of 10 to 30 per cent relative humidity.

It may certainly be concluded that relative humidity within the range of 10 to 30 per cent does not appreciably affect the air permeability of these nylon, orlon, and dacron fabrics. It is further concluded that the tests were conducted in a range of relative humidity wherein any contributing effects due to relative humidity were at least constant.

B. Effect of Time and Aging

It was felt that the air permeability results might be a function of time and aging. To check these, cloth samples were run in the machine one day, the sample holder left in place, and the tests run over again twenty-four hours later. The sample was then filed away in an ordinary filing cabinet with no provision or attempt to maintain a constant temperature or relative humidity. The sample was reinstalled in the sample holder, and the air permeability tests were repeated one year after the sample was first run.

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The effect of time and aging on the air permeability test results were found to be negligible. The differences were all within the confidence level (± 7.5% of the mean 95 per cent of the time) of this program (1). This investigation also shows that the technique of installing the fabric sample in the fabric holder does not affect the air permeability results. The results of this investigation are shown in Figures 3 and 4.

If installation and aging affected the air permeability results, significant difference should have been observed between the air permeability results of the two tests run a year apart.

C. Effect of Stretch

If the fabric yarns stretched as result of the air load, it might be expected that the interstitial voids would increase in area. Such an increase would probably permit more fluid to flow, accompanied by a reduction of the rate of change of resistance.

The curvature of various fabric samples under air load was measured. It was considered that the arc of these curves was an approximation of the extended length of the fabric threads. A statistical study of these measurements revealed that maximum extension of threads, as indicated by the length of arc, was 3 per cent. Although this would indicate some extension of interstitial area, because of the round sample only the center threads would be extended to the maximum.

It is concluded that air loading, caused by pressure differentials equivalent to 50 inches of water, does not cause an appreciable stretch of the fabric and a consequent change of fabric geormetry.

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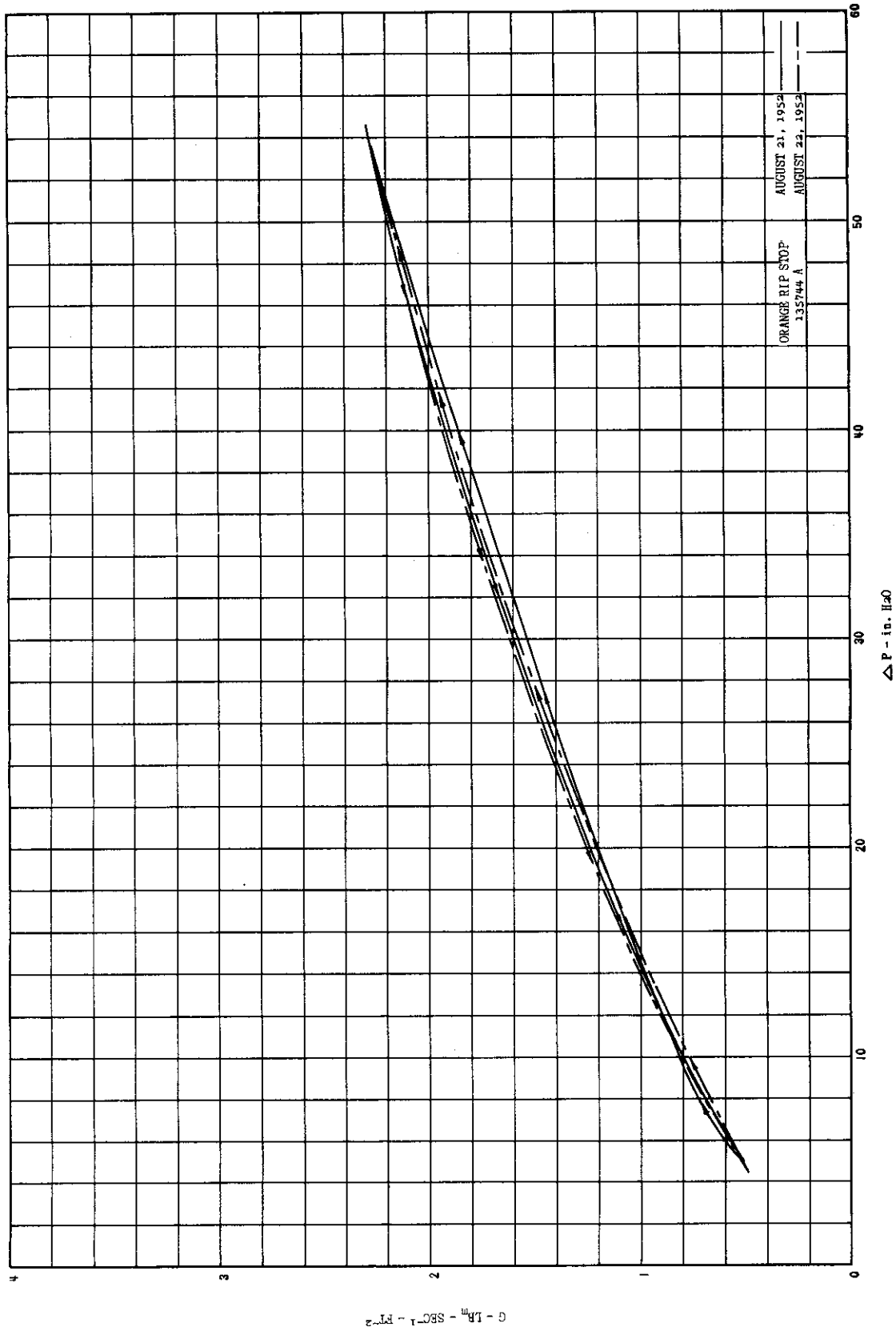

Figure 3. Effect of One Day's Aging on Fabric Permeability.

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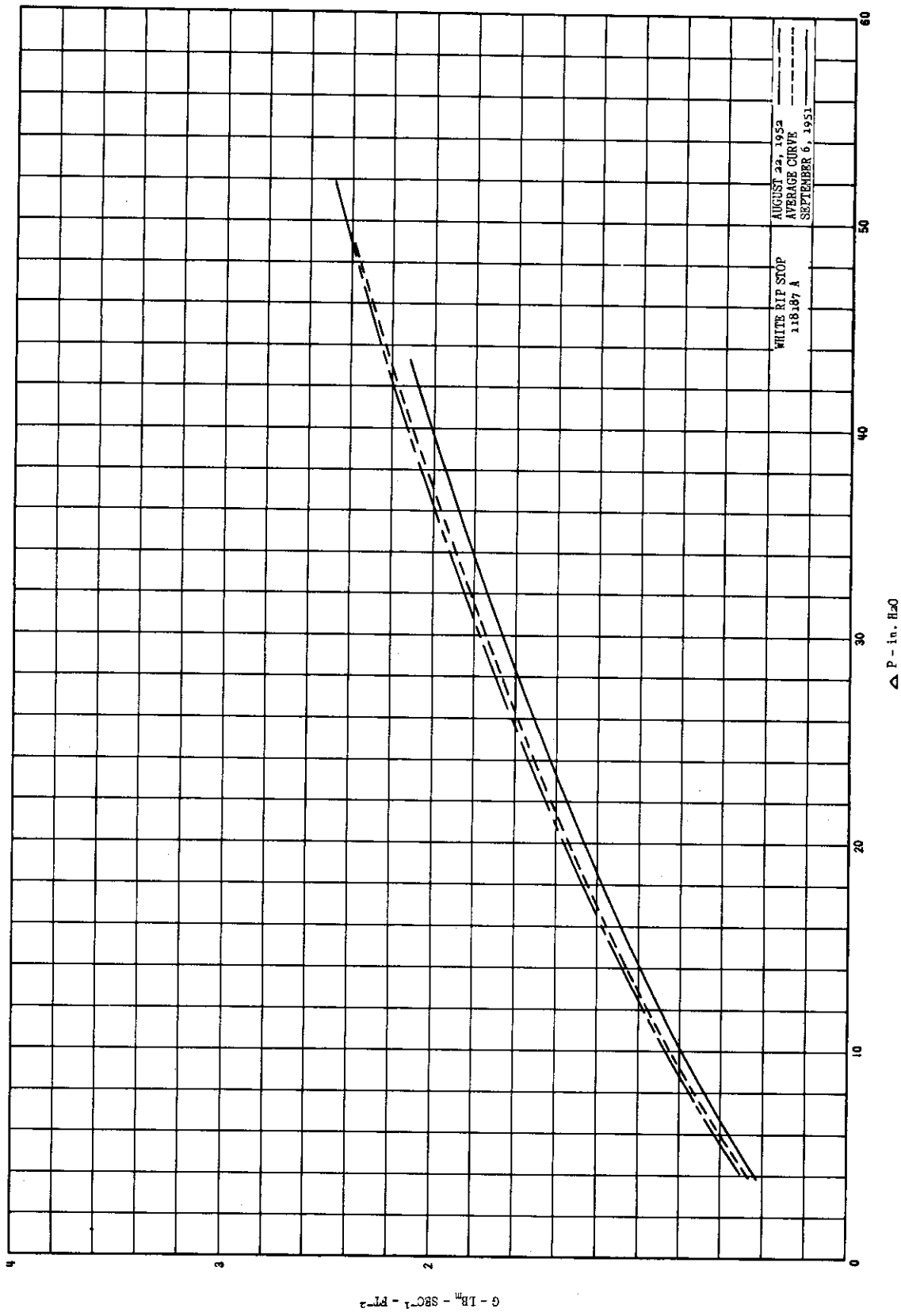

Figure 4. Effect of One Year's Aging on Fabric Permeability.

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D. Effect of Repeated Loading

Several test runs were made to determine the effect of repeated loading on the cloth samples. The procedure involved starting with a high-pressure differential across the cloth, gradually decreasing this until the lowest possible pressure differential is obtained. Then the plug valve was opened wide and the cloth again subjected to the maximum pressure differential (approximately 55 inches of water). Again the pressure differential was lowered until the minimum pressure differential was obtained. Volumetric air permeability data from these runs, when plotted versus pressure differential, indicated insignificant difference well within the confidence level (± 7.5% of the mean 95 per cent of the time) of this program.

When conducting repeated loading of the cloth samples, if the micromanometer readings of the orifice meter only are compared, it would appear that the differences between the successive runs are significant. However, it will also be noted that the air temperature has changed as compared with the previous run. Correcting for temperature or presenting the permeability data in terms of volume flow of air at Standard Conditions versus pressure differential will result in the above mentioned insignificant differences between the repeated runs.

V. TEST PROCEDURE AND METHOD OF HANDLING DATA

A. Selection of Cloth Sample

A statistical study was conducted to determine the number of samples and their position on the yardage from which each cloth sample was taken (1). It was concluded that nine random samples should be taken from as widely separated positions as possible. The same procedure for selecting samples has been followed throughout the program.

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B. Sample Mounting Procedure

The arrangement of the permeometer is such that the sample installed in the sample holder is tested in either of the two available pressure ranges by merely transferring the sample holder from one tunnel to the other. Figure 5 is an exploded view of the sample holder.

A sample, about 9 inches in diameter, is cut from the cloth. This is laid on the upstream half of the sample holder, covering the central hole through the sample holder half. A ring of 1/4-inch rubber tubing is then laid on the cloth in such a manner that, when the halves of the sample holder are assembled, the cloth will be forced into the retaining groove on the inner face of the upstream half of the sample holder. Friction of the ring against the cloth retains the sample uniformly in the sample holder. The sample-holder halves are then bolted together.

The same procedure in mounting the cloth sample has been followed in all tests.

C. Operation of the Permeometer

In the case of the permeometer for the low-pressure range (0-3 inches of water) the blower is started and the plug valve is adjusted to give the desired pressure differential across the cloth sample. Then the machine is allowed to run at that setting until constant or steady flow is obtained; then the orifice meter reading is taken. This procedure is followed for as many points as may be desired in this pressure range.

In the higher-pressure range (3-50 inches of water), the sample holder is installed at the tunnel or permeometer exit, the blower is started and the plug valve opened wide. The permeometer is allowed to run until the temperature at the cloth sample is 118°-120° F. At this

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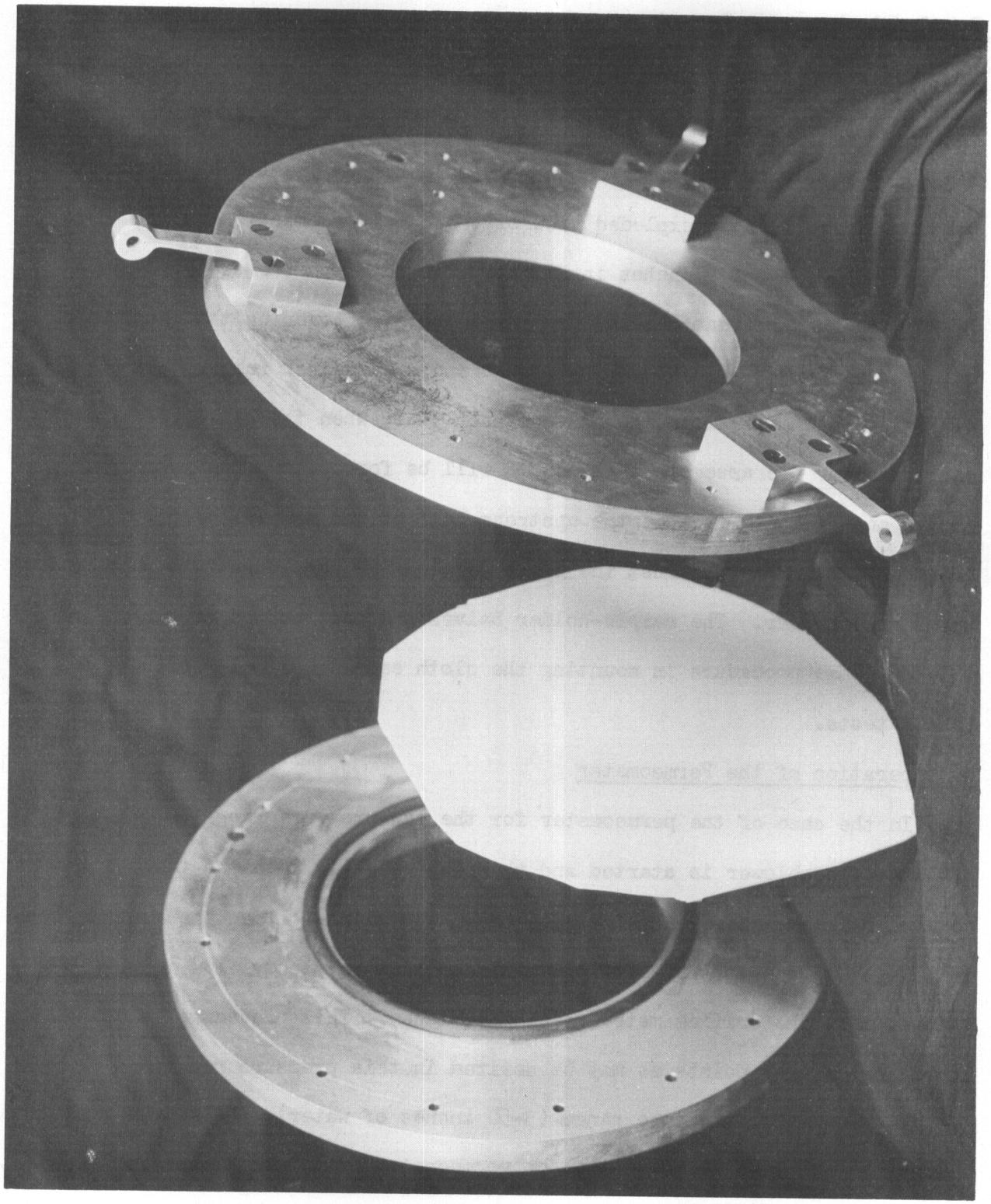

Figure 5. Exploded View of Fabric Sample Holder.

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time the first orifice meter reading is made. Subsequent pressure differentials across the cloth sample are obtained by adjusting the plug valve. During the test period, in which the pressure differential across the sample is dropped successively, the temperature at the sample is found to increase 15 to 20° F. At each pressure differential the temperatures at fan inlet and at the sample holder and the pressure differential across the orifice meter are recorded.

The laboratory room is served by the building's air conditioning system. The permeometer exit and the sample holder are housed in an insulated chamber that is open to the outside air. This prevents the introduction to the laboratory room of the air heated by compressions caused by the fan. Thus, more uniform air temperature conditions are maintained.

D. Handling of Data

For each cloth to be investigated nine samples are run, and a log sheet similar to that of Figure 6 is obtained for each sample. Then plots of orifice meter pressure versus pressure differential across the fabric sample are prepared for each of the nine samples. From these plots, average values of orifice meter pressure differentials for various pressure differentials across the fabric sample are obtained. The average values are used in connection with the formulae presented here as Figure 7, "Master Data and Result Sheet," and the resultant computations are demonstrated by Figure 8, a sample data sheet for a representative cloth. From this, plots of relative porosity (v/V) versus mass velocity (G) may be prepared.

It may be desirable to plot volumetric flow, $ft^3/ft^2/sec.$, at standard conditions versus the pressure drop across the fabric sample expressed

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Run No. ES-1 Page No. 1

LOG SHEET

Project 170-117

Cloth Identification
Style No. 000/100
Fiber Content Nylon
Weave Pattern Plain - 131461A
Color Style White

Remarks: U. S. Air Force

Date 29 August 51

Room Temperatures
Dry Bulb
Wet Blub

Baro 29.23

Test Number	Static Pressure in. W.G.	Orifice Pressure Drop in. W.G.	Temperatures °F Inlet	Outlet
Zero Readings	0.03	0.00	83	83
I	43.02	4.112	90	118
II	40.57	3.826	90	120
III	31.23	3.047	90	120
IV	25.82	2.288	89	121
V	18.52	1.549	88	121
VI	14.97	1.218	89	121
VII	9.87	0.759	89	122
VIII	5.87	0.406	89	122
IX	2.97	0.170	91	124
X	2.37	0.138	95	124
XI	9.65	0.619	88	125
XII	18.60	1.300	89	125
XIII	30.55	2.353	89	124
XIV	43.65	3.546	91	123

Figure 6. Sample Log Sheet For Fabric Permeability Test.

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Figure 7. Master Data and Result Sheet

Item No.		Dimension
1.	Barometer	in. Hg
2.	Barometer (0.491 x item 1)	$lb_f\ in^{-2}$
3.	Static pressure (S.P.)	inches of water
4.	Static pressure (0.0362 x item 3)	$lb_f\ in^{-2}$
5.	Static pressure, P, (item 2 + item 4)	$lb_f\ in^{-2}$ abs.
6.	Inlet air temperature	°F abs.
7.	Outlet air temperature, T,	°F abs.
8.	Psychrometer Data	
	Dry bulb temperature	°F
	Wet Bulb temperature	°F
	Relative humidity	%
9.	Orifice pressure drop, h_w,	inches of water
10.	$\frac{P}{T}$, (item 5 ÷ item 7)	
11.	Air density at cloth, ρ, (0.004672 x item 5)	$lb_m\ ft^{-3}$
12.	$h_w\rho$, (item 9 x item 11)	
13.	$\sqrt{h_w\rho}$, (item 12)$^{1/2}$	
14.	Estimated air flow, M (0.894 x item 13)	$lb_m\ sec^{-1}$
15.	Air viscosity, μ, at temperature of item 7	cp
16.	M ÷ μ (item 14 ÷ item 15)	
17.	Reynolds number at throat, N_{Re} (6179 x $\frac{1}{\mu}$ x item 14)	
18.	Corrected orifice coefficient, K,	
19.	Correct flow, M_c (item 14 x $\frac{\text{item 18}}{0.662}$)	$lb_m\ sec^{-1}$
20.	Mass velocity at cloth, G, ($\frac{\text{item 19}}{0.2*}$)	$lb_m\ sec^{-1} ft^{-2}$
21.	Reynolds number in tube, N_{Re}, (0.64 x item 17)	
22.	$\frac{Mc}{\rho}$ (item 19 ÷ item 11)	
23.	Velocity in duct, V (item 22 ÷ 0.179**)	ft sec^{-1}
24.	ρV^2 [item 11 x (item 23)^2]	
25.	Velocity pressure, V.P., (0.00299 x item 24)	in W.G.
26.	Item 25 ÷ item 3	
27.	Relative porosity (item 26)$^{1/2}$	

*0.2 ft^2 projected area of cloth sample.

**0.179 ft^2 wind tunnel area.

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Figure 8. Sample Data and Result Sheet

Cloth Identification

Style No. 000/100 Color Style White
Fiber Content Nylon Piece No. ES-1
Weave Pattern Plain - 1314614 USAF

Ref: Log Sheet
Run No. ES-1
Page No.
Computed by

Item Number*	Test Number										
1	29.22	29.22	29.22	29.22	29.22	29.22	29.22	29.22	29.22	29.22	29.22
2	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33	14.33
3	3	4	5	6	8	10	15	20	30	40	50
4	.109	.145	.181	.217	.290	.362	.543	.724	1.086	1.448	1.81
5	14.4	14.5	14.5	14.6	14.6	14.7	14.9	15.1	15.4	15.8	16.1
9	.164	.229	.295	.364	.507	.655	1.04	1.45	2.32	3.23	4.17
10	.0248	.0249	.0249	.0251	.025	.025	.0256	.026	.0265	.0271	.028
11	.0671	.0675	.0675	.068	.068	.068	.0694	.0704	.0718	.0734	.075
12	.0110	.01545	.0184	.0247	.0345	.045	.0721	.102	.1665	.237	.313
13	.105	.125	.136	.158	.186	.212	.268	.319	.408	.486	.56
14	.0940	.112	.121	.141	.166	.189	.240	.285	.365	.434	.50
15	.0195	.0195	—	—	—	.0195	—	—	—	—	—
17	29800	35500	38300	44600	52600	60000	76000	90300	116000	138000	158000
18	.700	.694	.692	.687	.683	.680	.676	.674	.672	.671	.67
19	.0996	.118	.127	.147	.1715	.195	.245	.291	.370	.438	.51
20	.498	.59	.635	.735	.857	.975	1.23	1.45	1.85	2.19	2.5
21	19100	22700	24500	28600	33600	38400	48600	57800	74200	88300	101000
22	1.485	1.75	1.885	2.16	2.52	2.84	3.54	4.14	5.16	5.98	6.75
23	8.30	9.78	10.9	12.1	14.1	15.9	19.8	23.15	28.85	33.45	37.8
24	4.62	6.46	8.04	9.92	13.5	17.3	27.2	37.7	59.8	82.0	108
25	.0138	.0193	.0240	.0296	.040	.0517	.08	.112	.179	.245	.32
26	.0046	.00481	.0048	.0049	.005	.00517	.00534	.0056	.0059	.00612	.0065
27	.0678	.0693	.0693	.0702	.0711	.0719	.0731	.0748	.0773	.078	.08

*Item 6, 7 and 8 data were not recorded.
Machine calculation eliminated need for recording Item 16.

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in equivalent inches of water. This may be accomplished by the further processing of data of the type shown in Figure 8, as shown below.

$$Q_s = \frac{G_s}{\rho_s} \qquad \text{and } G_s = C\sqrt{\rho_s h_w}$$

$$Q_\bullet = \frac{G_\bullet}{\rho_\bullet} \qquad \text{and } G_\bullet = C\sqrt{\rho_\bullet h_w}$$

$$\frac{Q_s}{Q_\bullet} = \frac{G_s/\rho_s}{G_\bullet/\rho_\bullet}$$

$$Q_s = Q_\bullet \times \frac{G_s}{\rho_s} \times \frac{\rho_\bullet}{G_\bullet} = Q_\bullet \frac{C\sqrt{\rho_s h_w}}{\rho_s} \times \frac{\rho_\bullet}{C\sqrt{\rho_\bullet h_w}}$$

$$= Q_\bullet \frac{\sqrt{\rho_\bullet}}{\sqrt{\rho_s}} = \frac{G_\bullet}{\rho_\bullet} \times \frac{\sqrt{\rho_\bullet}}{\sqrt{\rho_s}} = \frac{G_\bullet}{\sqrt{\rho_\bullet \rho_s}}$$

where Q = volume flow, $ft^3/ft^2/sec.$

G = mass velocity, $lbs/ft^2/sec.$

ρ = density of air

and subscript s is standard conditions,

$\bullet$ is test conditions.

VI. THEORY

It appears that several flow analogies must be used to describe the mechanics of air flow through a fabric. At low-pressure differentials (probably much less than 50 inches of water) the air flow through the cloth is like that of a viscous flow through a porous media. This flow is a function of the Reynolds number, and some difficulty in choosing a characteristic length (1) is experienced. Several authors such as Rose (2), and Hoerner (3) suggest a dimension in the direction of flow equal to the depth of the porous bed or, in the case of the cloth, the thickness

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of the fabric. However, failing to obtain a precise measurement of this characteristic length, Greene and Duez (4) have developed a procedure that infers the Reynolds number and does not require the measurement of a characteristic length.

At the higher pressure differentials, the air flow through the cloth may be like the air flow through a screen or a grid. Hoerner (3) suggests that the air flow through screen or grid formulae he used should be limited to Reynolds numbers greater than one thousand where the screen thickness is the characteristic length.

When the pressure differentials are still greater, the elastic properties of the cloth predominate. Interstitial openings expand and the rate of increase in air flow versus pressure differential across the cloth decreases. This rate of change is a definite function of the elastic properties of the cloth. It is felt that permeabilities of parachute fabrics under these conditions are functions of number and denier of warp and filling threads and the elastic properties of the cloth and are not a function of the Reynolds number.

At higher-pressure differentials, air compressibility effects will be experienced, and these will also affect the air permeability of the cloth.

Equations and procedures for describing the flow of fluids through porous media have been suggested by Green and Duez (4). These formulae and procedures are discussed, and applications to the problem of fabric permeability are demonstrated in a technical report by Goglia (1). Cecil D. Brown (5) has conducted subsequent investigations on the ways and means of applying these formulae and procedures to the research subject.

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Brown begins with the equation for the pressure gradient (- dp/dx) for the flow of an incompressible fluid.

$$-\frac{dp}{dx} = \alpha\mu V + \beta\rho V^2 \qquad (1)$$

where α and β are flow coefficients defined by Green and Duez (4) and μ is the coefficient of viscosity of the fluid. The mass density of the fluid has the symbol ρ. The velocity of fluid through the porous media is V. For isothermal flow of a gas through a porous bed, the pressure-square gradient may be expressed as

$$\frac{P_1^2 - P_2^2}{L} = \alpha\left(2RT\frac{\mu}{g_c}\right) G + \beta\left(\frac{2RT}{g_c}\right) G^2. \qquad (2)$$

Here P_1 and P_2 are the pressures at the beginning and end of the porous bed. The linear distance L is in the direction of flow through the bed. The mass velocity G of fluid flowing through the bed has the dimensions of lb.-sec.$^{-1}$. The symbol g_c is the gravitational constant in the usual sense. Brown (5) defines a new variable,

$$\psi = \frac{\Delta P^2}{2RTG}.$$

Equation 2 is then modified:

$$\psi = \frac{\Delta P^2}{2RTG} = \alpha L\frac{\mu}{g_c} + \frac{\beta LG}{g_c}. \qquad (3)$$

This results in the dependent variable ψ as a linear function of the independent variable G. It is then to be expected that, if the actual flow is of the type assumed above, the experimental data, reduced as described here, will plot as a straight line. If the experimental data does not plot as a straight line, it is an indication that the actual flow was not of the type presumed.

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Brown (5) utilized fabric permeability data obtained from the experimental phases of the subject research to test the methods and procedures described here. The curve of ψ Figure 9 versus mass velocity (G) for the Bally Ribbon Fabric Number 1 is typical of the fabrics investigated. In comparison, the air permeability data for a 100-mesh screen in terms of ψ versus mass velocity (G) is presented here as Figure 10. In the case of the Bally Ribbon Fabric Number 1, the curve is linear to a point where $\psi = 1.35$ and $G = 2$ lb.-sec.$^{-1}$ft.$^{-2}$. As for the 100-mesh screen, the non-linear portion of the curve was beyond the point defined by $\psi = 0.4$ and $G = 3.0$ lb.-sec.$^{-1}$ft.$^{-2}$.

In the case of the Bally Ribbon Fabric No. 1, the point where the experimental data departs from the theoretical line occurs at a Reynolds number of 43.3 and at a pressure differential, across the fabric, equivalent to approximately seven inches of water. As for the 100-mesh screen, the departure of experimental data from the theoretical line occurs at a Reynolds number of 191 and a pressure drop across the fabric sample equivalent to approximately three inches of water. From this it is concluded that departure of experimental data from the theoretical line is evidence that the properties of the measured flow through the fabric are not as assumed. Also, it is the author's opinion that the point of departure is an indication that the transition has occurred and that the inertial properties of the flow predominate over the viscous contribution.

VII. DISCUSSION OF TEST RESULTS

Numerous samples of parachute-type fabrics of various synthetic materials have been furnished by the Textile Branch during this program.

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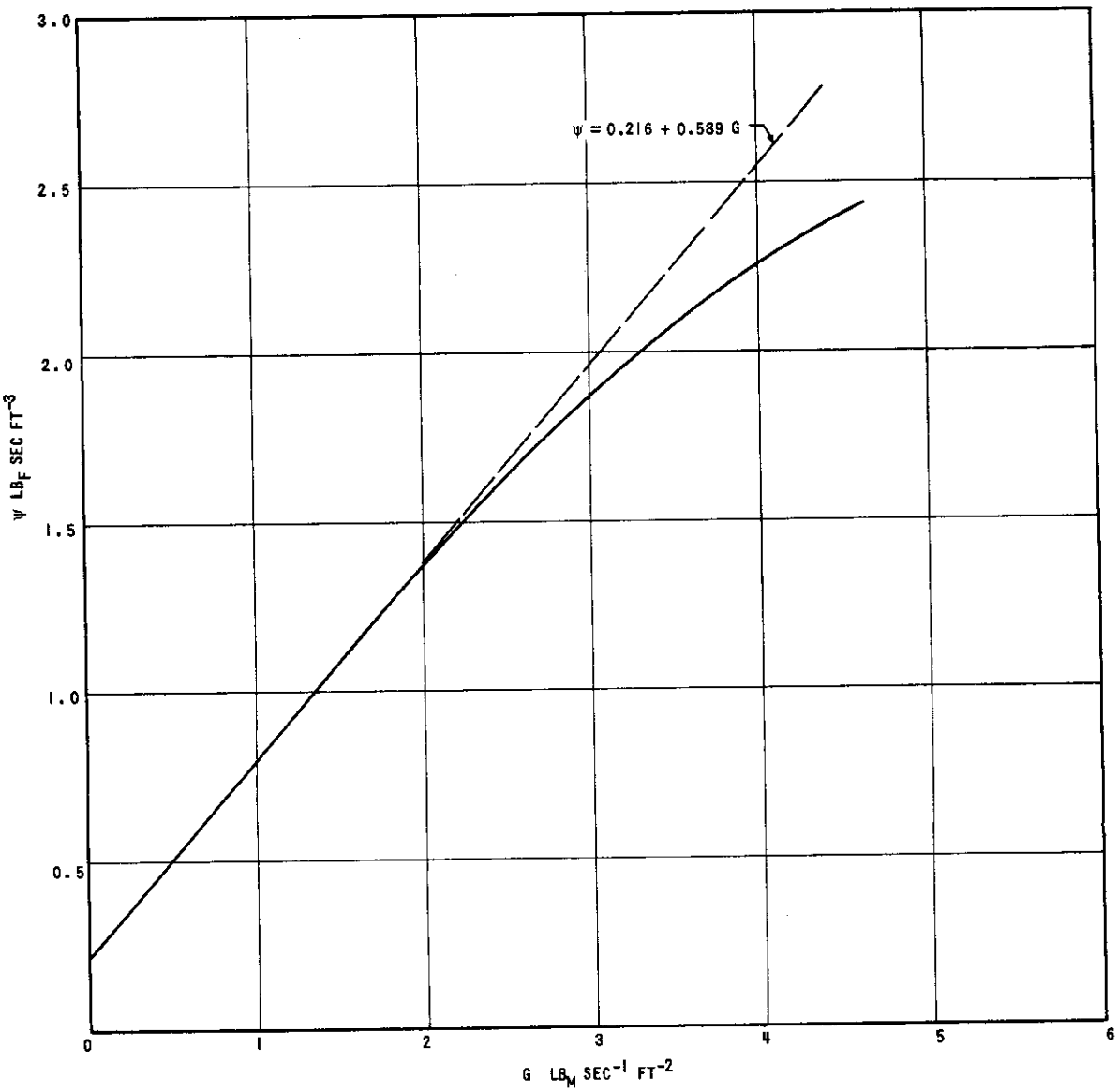

Figure 9. ψ versus Mass Velocity for Bally Ribbon Fabric No. 1.

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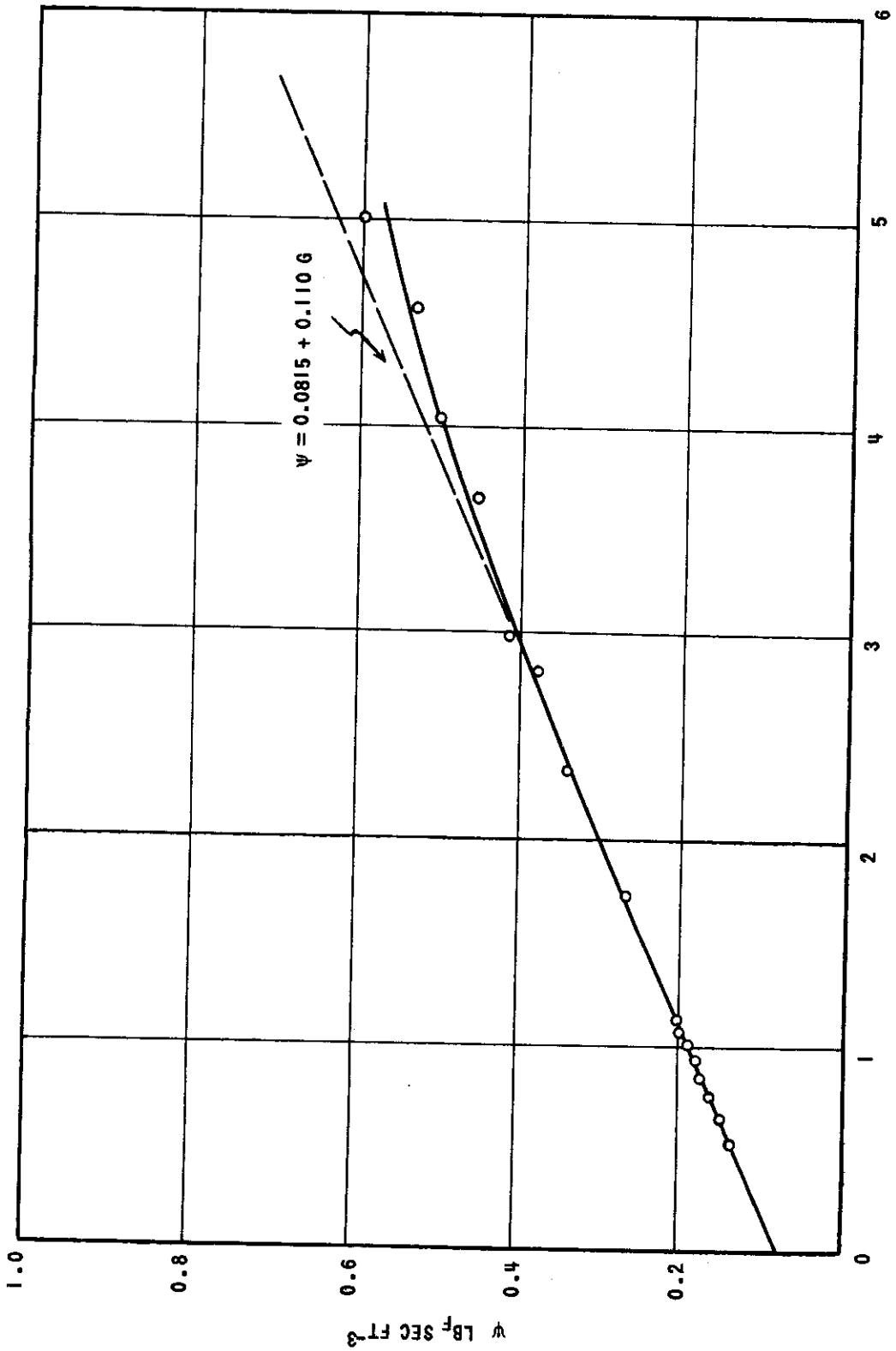

Figure 10. ψ versus Mass Velocity for 100 Mesh Screen.

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In addition, nylon, orlon, and dacron cloths, of several deniers and different construction, have been woven in the textile laboratories at Georgia Tech expecially for use in this program.

The physical properties of the Georgia Tech-woven fabrics are presented in Tables I through III in Appendix II. These data previously appeared in Quarterly Report No. 3 (8). Physical properties of the ten Air Force-furnished and Bally Ribbon cloths were presented in Part I (1) of that report.

Permeability tests were conducted on the Georgia Tech-woven fabrics using the large permeometer. Results of these tests, in terms of relative porosity (v/V) versus mass velocity (G), have been presented in Quarterly Reports Nos. 2 and 3 (7 and 8). However, it was decided that air permeability data for these fabrics would be more generally useful if presented in a form of volumetric flow (c.f.m.) versus pressure drop across the cloth (inches of water) at standard conditions. Table IV of Appendix II contains the summary of test results for the Georgia Tech-woven, Air Force-furnished and Bally Ribbon fabrics. The volumetric air permeability data for the Georgia Tech-woven fabrics are presented in Figures 11 through 23 in Appendix III. Similar data for the ten Air Force-furnished cloths appear in Appendix III, Figures 24 through 25, and the Bally Ribbon fabrics are plotted in Figures 26 through 55.

The effect of varying the number of filling threads per inch on air-permeability data for Georgia Tech-woven fabrics at a pressure differential equivalent to 20 inches of water is presented in Table V. This table indicates that increasing the number of filling threads reduces the amount of air flowing through the cloth.

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Table VI contains a comparison showing the effect of weave pattern variation on air permeability. Here, air permeability data for Georgia Tech-woven fabrics of similar thread count and denier but having plain, twill, and satin weave patterns are compared at 20 inches static pressure. In any group in Table VI, showing the volumetric flow at 20 inches of water, static pressure for any one weave pattern of the group will not be more than 15 per cent greater than the mean value for the group. However, a study of the table fails to indicate any pattern whereby it would be possible to deduce that one weave pattern was more or less permeable than another.

The effect of finish on air permeability of these fabrics is indicated in Table VII. The nylon cloth was subjected to scouring, "light" calendering, and stretching on tenterframe machines. This table comparing permeability data for finished nylon cloth to data for unfinished cloth (as it comes from the loom) indicates that finishing greatly affects the permeability of these fabrics.

VIII. CONCLUSIONS

The variation of denier and thread count in both warp and filling direction seems to have an effect on the permeability of the fabrics studied. This is to be expected since these variations will affect the amount of material blocking the flow.

Variation of the weave pattern was expected to affect the air permeability of the fabrics. The data obtained and presented in Table VI do not indicate significant difference as a result of changing the weave pattern. The lack of consistency, e.g., sometimes the permeability of the satin is

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greater than that of the twill and vice versa, may be an indication that other factors, such as nonuniformity in weaving the different samples, may have caused this lack of consistency.

The finishing of the cloth appears to have the greatest effect on air permeability of any of the many variables involved. This seems to be substantiated by the practice of textile manufacturers to control permeability of cloth by variation of the calendering load.

IX. RECOMMENDATIONS

The effect of elasticity of the fabric at higher-pressure differentials will probably have a marked effect on the air permeability. This will be determined in the experimental part of the high-pressure phase (up to 1400 inches of water) of this program.

It is recommended that a detailed study be made of the effect of varying the calender load on air permeability of these fabrics. This study could be conducted on the high-pressure permeometer used in this program. It would be necessary to have a manufacturer of parachute cloth prepare a single lot of cloth not only subjected to the same scouring and stretching processes, but also subjected to a controlled variation of the calender load per inch.

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APPENDIX I

BIBLIOGRAPHY

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APPENDIX II

TABLES

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TABLE I

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH NYLON CLOTHS

Fabric Number	1	2	3	4	5	6	7	8	9	10
Width (Inches)	32-1/2	33	33	33	33	33	31-1/2	32	32	32
Construction:	Plain	Satin	Satin	Satin	Satin	Satin	Plain	Plain	Plain	Plain
Nominal	70x40	70x80	70x70	70x60	70x50	70x40	70x90	70x80	70x70	70x60
Finished	77x44	75.5x91	75.5x75	76x63.5	76x55	77x43.5	80x94	78x88	78.5x73	78.5x64.5
Warp Yarns:										
Denier	74.73	74.73	74.73	74.73	74.73	74.73	74.73	74.73	74.73	74.73
Filaments	34	34	34	34	34	34	34	34	34	34
Filling Yarns:										
Denier *	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35
Filaments	34	34	34	34	34	34	34	34	34	34
Weight:										
Oz./Sq. Yard	1.23	1.82	1.50	1.42	1.31	1.17	1.75	1.67	1.58	1.45
Oz./Lin. Yard	1.11	1.67	1.37	1.30	1.20	1.07	1.52	1.48	1.40	1.29
Twist (T.P.I.):										
Filling "Z"	.86	.86	.86	.86	.86	.86	.86	.86	.86	.86
Warp "Z"	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4
Elongation (%):										
Filling	30	36.7	35.6	36.0	30	30.6	35	35.3	36.6	32
Warp	34.5	38.3	38	38.3	32	33.3	36.3	35.9	34	35
Tensile:										
Filling	52	97	81	74	61	57	97	81	80	71
Warp	83	81	74	78	71	65	88	81	80	82

(Continued)

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TABLE I (Continued)

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH NYLON CLOTHS

Fabric Number	11	12	13	14	15	16	17	18	19	20
Width (Inches)	32-1/2	34	33-1/2	33-1/2	34	33-1/2	33-1/2	33-1/4	32-1/2	32-1/2
Construction:	Plain	Twill	Twill	Twill	Twill	Twill	Twill	Plain	Plain	Plain
Nominal	70x50	70x40	70x50	70x60	70x70	70x80	70x90	125x40	125x50	125x60
Finished	77x53.5	74x42	74.5x53	74.5x63	74x73	75.5x82.5	75x92	137.0x41	139.25x52	140.0x62
Warp Yarns:										
Denier	74.73	74.73	74.73	74.73	74.73	74.73	74.73	43.61	43.61	43.61
Filaments	34	34	34	34	34	34	34	13	13	13
Filling Yarns:										
Denier*	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35
Filaments	34	34	34	34	34	34	34	34	34	34
Weight:										
Oz./Sq. Yard	1.33	1.12	1.29	1.36	1.46	1.57	1.73	1.109	1.317	1.423
Oz./Lin. Yard	1.20	1.06	1.20	1.27	1.38	1.46	1.61	1.024	1.189	1.285
Twist (T.P.I.):										
Filling "Z"	.86	.86	.86	.86	.86	.86	.86	.86	.86	.86
Warp "Z"	15.4	15.4	15.4	15.4	15.4	15.4	15.4	9.8	9.8	9.8
Elongation (%):										
Filling	34.6	30	33.3	32.3	32.6	34.5	37	32.0	31.6	33.6
Warp	34.3	36	34.3	36.6	34.3	35.2	37.6	31.6	30	30
Tensile:										
Filling	61	53	69	80	99	117	117	43	54	72
Warp	85	79	80	81	88	87	84	72	74	74

(Continued)

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TABLE I (Continued)

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH NYLON CLOTHS

Fabric Number	21	22	23	24	25	26
Width (Inches)	32-1/4	32-1/2	33	33	33	33
Construction:	Plain	Plain	Satin	Satin	Satin	Satin
Nominal	125x70	125x80	125x80	125x70	125x60	125x50
Finished	141.5x73.25	142.25x82.25	139.5x84.5	138.75x74.75	139x64	138.25x53
Warp Yarns:						
Denier	43.61	43.61	43.61	43.61	43.61	43.61
Filaments	13	13	13	13	13	13
Filling Yarns:						
Denier *	80.35	80.35	80.35	80.35	80.35	80.35
Filaments	34	34	34	34	34	34
Weight:						
Oz./Sq. Yard	1.566	1.679	1.651	1.546	1.443	1.326
Oz./Lin. Yard	1.403	1.516	1.514	1.418	1.323	1.216
Twist (T.P.I.):						
Filling "Z"	.86	.86	.86	.86	.86	.86
Warp "Z"	9.8	9.8	9.8	9.8	9.8	9.8
Elongation (%):						
Filling	35	37.3	36	34	33.6	35
Warp	28.3	30.3	33.3	33.3	33.3	33.3
Tensile:						
Filling	83	100	105	93	81	67
Warp	74	73	83	82	87	82

(Continued)

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TABLE I (Continued)

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH NYLON CLOTHS

Fabric Number	27	28	29	30	31	32
Width (Inches)	33	32-1/2	32-1/2	32-1/2	32-1/2	32-1/2
Construction:	Satin	Twill	Twill	Twill	Twill	Twill
Nominal	125x40	125x40	125x50	125x60	125x70	125x80
Finished	137.5x42.5	139.5x42	140.0x52	141.5x63.75	141.5x72.25	143.5x83.5
Warp Yarns:						
Denier	43.61	43.61	43.61	43.61	43.61	43.61
Filaments	13	13	13	13	13	13
Filling Yarns:						
Denier *	80.35	80.35	80.35	80.35	80.35	80.35
Filaments	34	34	34	34	34	34
Weight:						
Oz./Sq. Yard	1.210	1.231	1.337	1.446	1.577	1.697
Oz./Lin. Yard	1.110	1.112	1.207	1.306	1.424	1.532
Twist (T.P.I.):						
Filling "Z"	.86	.86	.86	.86	.86	.86
Warp "Z"	9.8	9.8	9.8	9.8	9.8	9.8
Elongation (%):						
Filling	30	33.3	34	36.6	35	33.3
Warp	33.3	34.0	34.0	33.3	33.6	33.3
Tensile:						
Filling	48	52	66	81	87	94
Warp	80	83	83	86	92	89

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TABLE IA

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH UNFINISHED NYLON CLOTHS

Fabric Number	57	58	59	60	61
Width (Inches)	35-3/8	36-1/4	35-7/8	36-5/8	36-3/8
Construction:	Plain	Plain	Plain	Plain	Plain
Nominal	125x40	125x50	125x60	125x70	125x80
Actual	128x41	125x50	126x61	126x71	126x83
Warp Yarns:					
Denier	45.28	45.28	45.28	45.28	45.28
Filaments	13	13	13	13	13
Filling Yarns:					
Denier**	73.92	73.92	73.92	73.92	73.92
Filaments	34	34	34	34	34
Weight:					
Oz./Sq. Yard	1.124	1.205	1.328	1.390	1.530
Oz./Lin. Yard	1.109	1.213	1.323	1.415	1.546
Twist (T.P.I.):					
Filling "Z"	1.3	1.3	1.3	1.3	1.3
Warp "Z"	7.8	7.8	7.8	7.8	7.8
Elongation (%):					
Filling	19.5	19.5	22.3	24.1	21.4
Warp	20.5	20.4	21.7	21.1	22.8
Tensile:					
Filling	38.2	52.3	62.8	77.2	80.4
Warp	46.8	46.0	45.4	45.7	44.4

*Yarn measured 80.35 denier after finishing and at the time physical tests were made.

**Yarn measured 73.92 denier at the time physical tests were made.

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TABLE II

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH ORLON CLOTHS

Fabric Number	33	34	35	36	37	38	39	40	41	42	43	44
Width (Inches)	34-3/4	34-5/8	34-1/4	34-1/4	34-7/8	35	34-7/8	34-3/4	35	34-7/8	35-1/8	35
Construction:	Plain	Plain	Plain	Plain	Twill	Twill	Twill	Twill	Satin	Satin	Satin	Satin
Nominal	100x40	100x50	100x60	100x70	100x40	100x50	100x60	100x70	100x40	100x50	100x60	100x70
Finished	102x41	102x51	104x61	103x70	102x40	102x51	103x61	103x70	102x40.5	100x52	101x60	102x70
Warp Yarns:												
Denier	79.55	79.55	79.55	79.55	79.55	79.55	79.55	79.55	79.55	79.55	79.55	79.55
Filaments	30	30	30	30	30	30	30	30	30	30	30	30
Filling Yarns:												
Denier	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35	80.35
Filaments	30	30	30	30	30	30	30	30	30	30	30	30
Weight:												
Oz/Sq.Yard	1.442	1.554	1.668	1.751	1.440	1.525	1.611	1.748	1.397	1.548	1.637	1.751
Oz/Lin.Yard	1.392	1.494	1.587	1.666	1.395	1.482	1.560	1.687	1.358	1.499	1.597	1.702
Twist (T.P.I.):												
Filling "Z"	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Warp "Z"	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Elongation (%):												
Filling	14	13.3	13.6	16	13.6	15.6	15	16.3	14.3	15	13.6	15
Warp	11.6	12.3	11.6	12.6	12	12	12	12.3	11.6	11.6	12	12
Tensile:												
Filling	31.3	36	40.2	36.4	25.4	34.8	38.5	41.5	22.2	30.2	39.3	43.8
Warp	51.9	46.5	53.4	49.2	48.3	53.1	50.2	52.6	46	50.4	56.2	52.1

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TABLE III

PHYSICAL AND TEXTILE PROPERTIES OF
GEORGIA TECH DACRON CLOTHS

Fabric Number	45	46	47	48	49	50	51	52	53	54	55	56
Width (Inches)	32-1/16	32	32-1/8	32	32-1/16	32	32	32	32-1/2	32-1/4	32	32
Construction:	Plain	Plain	Plain	Plain	Twill	Twill	Twill	Twill	Satin	Satin	Satin	Satin
Nominal	110x40	110x50	110x60	110x70	110x40	110x50	110x60	110x70	110x40	110x50	110x60	110x70
Finished	121x43.5	123x53	122x64	122x75	122x43	123x54	123x66	123x77	122x44	122x56	123x66	123x78
Warp Yarns:												
Denier	77.12	77.12	77.12	77.12	77.12	77.12	77.12	77.12	77.12	77.12	77.12	77.12
Filaments	34	34	34	34	34	34	34	34	34	34	34	34
Filling Yarns:												
Denier	80.78	80.78	80.78	80.78	80.78	80.78	80.78	80.78	80.78	80.78	80.78	80.78
Filaments	34	34	34	34	34	34	34	34	34	34	34	34
Weight:												
Oz./Sq. Yard	1.734	1.874	1.971	2.071	1.740	1.846	1.966	2.100	1.726	1.817	1.983	2.134
Oz./Lin. Yard	1.545	1.666	1.759	1.840	1.550	1.641	1.747	1.867	1.558	1.628	1.762	1.897
Twist (T.P.I.):												
Filling "Z"	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Warp "Z"	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
Elongation (%):												
Filling	37.3	34	28.8	25	34	30.66	33.9	31.66	29.3	34	36.6	35.3
Warp	27.3	22.6	23.1	23.6	33.3	37	30.66	34	27	31	29.6	33
Tensile:												
Filling	47.8	56.7	61.9	70.3	45	52.4	67	71.8	36.6	56	75.6	83.4
Warp	88.2	91	85.7	78.5	101.1	110.1	96.6	106.9	88	95.4	102.8	108

Contrails

Summary of Experimental Results

In all tests a circular sample of cloth having an area of 0.2 square foot was used in the test apparatus; therefore, in order to calculate air flow through cloth (lbm $sec.^{-1}$) multiply the mass velocity of air upstream of the cloth by 0.2 square foot. The results presented subsequently are the average of nine samples taken from a given bolt of cloth nine inches in from the selvage edge.

TABLE IV

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
GEORGIA TECH WOVEN FABRICS:				
Fabric Number 1 (GT)				
16	.0705	4.68	26.90	3820
13	.0702	4.22	27.00	3454
11	.0696	3.85	26.90	3160
9	.0694	3.46	26.80	2848
7	.0691	3.04	26.70	2505
5	.0688	2.53	26.3	2087
4	.0686	2.23	26.0	1846
3	.0683	1.90	25.7	1577
2	.0683	1.53	25.2	1265
1	.0680	1.07	25.0	885
.5	.0680	.75	24.7	619
Fabric Number 2 (GT)				
55	.0772	2.24	6.63	1744
45	.0753	1.98	6.57	1563
35	.0737	1.70	6.47	1358
30	.0729	1.55	6.38	1241
25	.0721	1.38	6.28	1114
20	.0713	1.21	6.16	979
15	.0705	1.02	6.02	828
10	.0694	.80	5.87	658
7	.0691	.64	5.62	528
5	.0686	.50	5.16	410
3	.0683	.36	4.80	295

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 3 (GT)				
50	.0739	2.99	9.49	2381
40	.0721	2.55	9.16	2055
30	.0704	2.13	8.94	1739
25	.0696	1.89	8.78	1558
20	.0688	1.66	8.65	1372
15	.0680	1.40	8.55	1168
10	.0670	1.12	8.33	934
8	.0668	.98	8.23	826
6	.0664	.84	8.17	708
4	.0661	.67	8.02	569
2	.0658	--	--	--
Fabric Number 4 (GT)				
45	.0737	3.56	11.9	2844
35	.0721	3.05	11.7	2460
30	.0712	2.76	11.5	2238
25	.0704	2.46	11.3	2010
20	.0695	2.17	11.2	1788
15	.0687	1.82	10.9	1500
10	.0679	1.44	10.7	1200
8	.0675	1.27	10.6	1062
6	.0672	1.08	10.4	906
4	.0669	.87	10.3	728
2	.0665	.59	9.90	497
Fabric Number 5 (GT)				
30	.0715	4.42	18.4	3582
25	.0707	3.97	18.2	3234
20	.0699	3.45	17.9	2839
16	.0694	3.03	17.6	2496
14	.0688	2.80	17.4	2316
12	.0686	2.56	17.2	2118
10	.0683	2.31	17.1	1920
8	.0680	2.03	16.8	1692
6	.0675	1.72	16.5	1434
4	.0672	1.37	16.1	1146
2	.0669	.93	15.5	774

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 6 (GT)				
16	.0699	4.51	26.0	3696
14	.0696	4.19	26.0	3444
12	.0694	3.86	25.8	3174
10	.0688	3.47	25.6	2868
8	.0686	3.07	25.3	2538
6	.0683	2.60	24.8	2160
5	.0680	2.35	24.6	1956
4	.0680	2.06	24.1	1716
3	.0678	1.77	23.9	1470
2	.0675	1.43	23.7	1194
1	.0675	1.00	23.5	834
Fabric Number 7 (GT)				
54	.0755	1.02	3.09	804
48	.0745	.942	3.04	750
40	.0732	.832	2.97	666
34	.0721	.745	2.91	600
26	.0708	.623	2.81	508
20	.0698	.523	2.71	429
16	.0691	.440	2.56	363
12	.0684	.367	2.48	304
8	.0678	.278	2.30	232
4	.0672	.187	2.21	157
2	.0668	.120	2.01	101
Fabric Number 8 (GT)				
50	.0754	1.21	3.81	955
45	.0746	1.13	3.77	897
40	.0738	1.05	3.70	838
35	.0729	.955	3.63	767
30	.0721	.865	3.59	698
25	.0712	.765	3.51	621
20	.0703	.665	3.44	544
15	.0695	.555	3.33	457
10	.0687	.417	3.06	345
7	.0681	.333	2.94	277
5	.0678	.282	2.97	238

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 9 (GT)				
50	.0754	1.90	5.97	1500
40	.0738	1.64	5.87	1308
35	.0729	1.56	5.75	1254
30	.0721	1.36	5.74	1098
25	.0712	1.21	5.54	984
20	.0704	1.06	5.46	864
12	.0690	.770	5.18	636
8	.0684	.585	4.84	485
6	.0680	.478	4.58	398
Fabric Number 10 (GT)				
46	.0751	3.95	13.0	3126
40	.0740	3.64	12.9	2898
32	.0727	3.18	12.7	2556
26	.0717	2.81	12.6	2280
20	.0707	2.42	12.4	1974
16	.0700	2.13	12.3	1746
12	.0693	1.82	12.2	1500
8	.0686	1.46	12.0	1206
6	.0683	1.25	11.9	1038
4	.0679	1.01	11.9	840
2	.0676	.699	11.6	583
Fabric Number 11 (GT)				
24	.0706	4.44	20.9	3626
20	.0699	4.01	20.8	3287
16	.0693	3.56	20.7	2935
14	.0690	3.30	20.5	2725
12	.0686	3.04	20.4	2515
10	.0683	2.74	20.2	2273
8	.0679	2.42	20.1	2014
6	.0676	2.07	19.9	1725
4	.0672	1.67	19.6	1396
2	.0669	1.16	19.4	973
1	.0668	.810	19.3	680

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 12 (GT)				
16	.0696	4.73	27.4	3887
14	.0693	4.40	27.3	3626
12	.0689	4.05	27.3	3347
10	.0686	3.68	27.1	3046
8	.0683	3.27	27.0	2714
6	.0679	2.81	26.8	2338
5	.0678	2.54	26.6	2117
4	.0676	2.26	26.5	1883
3	.0674	1.92	26.1	1604
2	.0672	1.56	26.0	1304
1	.0671	1.08	25.5	904
Fabric Number 13 (GT)				
30	.0713	4.59	19.2	3727
25	.0705	4.17	19.1	3404
20	.0696	3.69	19.1	3033
15	.0688	3.16	18.9	2612
10	.0679	2.54	18.8	2114
7	.0674	2.09	18.5	1747
5	.0669	1.74	18.3	1458
4	.0669	1.56	18.4	1307
3	.0668	1.34	18.3	1124
2	.0666	1.09	18.3	916
1	.0665	.755	17.9	635
Fabric Number 14 (GT)				
45	.0743	3.96	13.2	3151
40	.0735	3.70	13.2	2960
35	.0726	3.42	13.1	2750
30	.0718	3.16	13.2	2555
25	.0709	2.82	13.0	2296
20	.0701	2.49	12.8	2038
15	.0693	2.11	12.6	1739
10	.0684	1.69	12.4	1400
5	.0676	1.17	12.3	975
3	.0672	.890	11.8	744
1	.0669	.505	12.0	423

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 15 (GT)				
50	.0754	3.22	10.1	2542
45	.0745	3.02	10.1	2400
40	.0737	2.82	10.0	2253
35	.0728	2.62	10.0	2107
30	.0720	2.40	9.96	1941
25	.0711	2.15	9.86	1748
20	.0703	1.90	9.75	1553
15	.0695	1.60	9.56	1317
10	.0686	1.28	9.42	1060
6	.0680	.975	9.32	811
2	.0673	.555	9.25	464
Fabric Number 16 (GT)				
55	.0761	2.65	8.44	2081
45	.0744	2.37	7.89	1883
35	.0727	2.06	7.87	1657
30	.0719	1.88	7.81	1520
25	.0710	1.70	7.75	1382
20	.0702	1.50	7.71	1228
15	.0693	1.26	7.55	1039
10	.0685	.995	7.38	824
7	.0680	.815	7.21	678
5	.0677	.660	6.93	550
3	.0673	.505	6.86	422
Fabric Number 17 (GT)				
45	.0743	2.40	8.05	1910
40	.0735	2.26	8.05	1808
35	.0726	2.08	7.96	1673
30	.0718	1.89	7.85	1528
25	.0710	1.69	7.75	1374
20	.0701	1.49	7.68	1220
15	.0693	1.27	7.58	1047
10	.0684	1.02	7.52	845
5	.0676	.700	7.39	583
3	.0673	.540	7.33	451
1	.0669	.310	7.31	260

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 18 (GT)				
35	.0732	3.82	14.6	3064
30	.0724	3.52	14.6	2839
25	.0716	3.18	14.5	2578
20	.0707	2.80	14.4	2282
15	.0698	2.37	14.1	1945
10	.0690	1.88	13.8	1552
7	.0685	1.53	13.5	1268
5	.0681	1.26	13.2	1047
3	.0678	.958	13.0	799
2	.0676	.772	12.8	643
1	.0675	.544	12.8	454
Fabric Number 19 (GT)				
50	.0757	3.15	9.85	2480
45	.0749	2.95	9.80	2338
40	.0741	2.74	9.75	2183
35	.0732	2.54	9.70	2038
30	.0724	2.31	9.59	1863
25	.0715	2.07	9.49	1678
20	.0706	1.82	9.38	1486
15	.0698	1.56	9.27	1280
10	.0689	1.23	9.04	1016
5	.0681	.831	8.70	691
2	.0679	.544	9.05	453
Fabric Number 20 (GT)				
55	.0758	2.50	7.47	1969
45	.0741	2.17	7.24	1729
35	.0725	1.87	7.17	1506
25	.0708	1.54	7.07	1255
20	.0699	1.35	6.95	1106
15	.0691	1.13	6.78	932
10	.0682	.895	6.59	744
7	.0677	.730	6.50	608
5	.0674	.605	6.42	506
3	.0670	.472	6.43	395
1	.0667	.245	5.81	206

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 21 (GT)				
55	.0759	1.71	5.12	1345
45	.0742	1.52	5.08	1210
35	.0725	1.30	5.00	1047
30	.0717	1.18	4.92	955
25	.0708	1.05	4.83	856
20	.0700	.925	4.75	758
15	.0691	.775	4.65	640
10	.0683	.605	4.47	502
7	.0678	.493	4.36	411
5	.0675	.405	4.25	338
3	.0671	.309	4.20	259
Fabric Number 22 (GT)				
54	.0763	1.48	4.45	1162
47	.0751	1.35	4.37	1069
40	.0739	1.21	4.30	965
34	.0729	1.09	4.23	875
28	.0719	.965	4.16	781
22	.0708	.825	4.04	673
17	.0700	.705	3.95	578
13	.0693	.610	3.92	503
9	.0687	.491	3.82	406
6	.0681	.399	3.81	332
3	.0676	.291	3.45	243
Fabric Number 23 (GT)				
55	.0767	1.19	3.52	931
50	.0758	1.04	3.26	819
45	.0750	.970	3.25	768
40	.0741	.890	3.15	709
35	.0733	.805	3.08	645
30	.0725	.720	2.98	580
25	.0716	.640	2.90	519
20	.0707	.540	2.79	440
10	.0691	.348	2.51	287
5	.0682	.235	2.40	195
3	.0680	.180	2.40	150

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 24 (GT)				
55	.0766	1.63	4.86	1277
45	.0749	1.42	4.70	1126
40	.0740	1.30	4.60	1037
35	.0732	1.19	4.53	955
30	.0724	1.07	4.40	863
25	.0715	.945	4.30	766
20	.0707	.820	4.22	668
15	.0698	.675	4.02	554
10	.0690	.520	3.83	429
7	.0685	.410	3.62	340
5	.0682	.335	3.51	278
Fabric Number 25 (GT)				
55	.0768	2.58	7.66	2018
45	.0750	2.27	7.53	1797
35	.0734	1.93	7.33	1544
30	.0725	1.74	7.21	1402
25	.0717	1.56	7.10	1263
20	.0708	1.35	6.89	1100
15	.0700	1.11	6.61	910
10	.0691	.855	6.28	706
7	.0686	.670	5.91	554
5	.0683	.535	5.60	444
3	.0680	.389	5.24	324
Fabric Number 26 (GT)				
45	.0753	3.61	12.0	2850
40	.0744	3.33	11.8	2647
35	.0736	3.03	11.5	2421
30	.0727	2.74	11.3	2204
25	.0719	2.43	11.1	1965
20	.0711	2.10	10.8	1708
15	.0702	1.76	10.5	1441
10	.0694	1.38	10.2	1136
5	.0685	.922	9.65	764
3	.0682	.706	9.54	587
1	.0679	.410	9.49	341

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 27 (GT)				
30	.0725	4.40	18.2	3544
26	.0718	4.02	18.0	3251
22	.0711	3.63	17.7	2951
18	.0704	3.21	17.4	2624
14	.0698	2.76	17.1	2266
10	.0691	2.27	16.6	1873
8	.0687	1.99	16.4	1647
6	.0684	1.69	16.1	1400
4	.0681	1.36	15.8	1130
2	.0677	.942	15.6	785
1	.0676	.661	15.5	551
Fabric Number 28 (GT)				
34	.0733	4.08	15.8	3268
28	.0723	3.63	15.6	2927
24	.0717	3.30	15.4	2672
20	.0709	2.96	15.2	2410
16	.0703	2.59	14.9	2117
12	.0696	2.20	14.7	1806
10	.0693	1.97	14.5	1624
8	.0689	1.74	14.3	1438
6	.0686	1.48	14.1	1225
4	.0683	1.20	13.9	996
2	.0679	.835	13.4	695
Fabric Number 29 (GT)				
50	.0762	3.39	10.6	2662
45	.0752	3.15	10.5	2490
40	.0744	2.94	10.4	2336
35	.0736	2.71	10.3	2165
30	.0727	2.45	10.1	1970
25	.0719	2.19	9.96	1771
20	.0711	1.91	9.77	1553
15	.0702	1.61	9.76	1318
10	.0694	1.29	9.42	1062
5	.0685	.890	9.30	737
3	.0682	.690	9.31	573

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 30 (GT)				
55	.0765	2.31	6.88	1810
45	.0748	2.04	6.78	1617
35	.0731	1.75	6.66	1404
30	.0723	1.58	6.58	1274
25	.0714	1.42	6.45	1151
20	.0706	1.24	6.36	1012
15	.0698	1.02	6.07	837
10	.0689	.795	5.87	657
7	.0684	.645	5.74	535
5	.0681	.520	5.46	432
3	.0677	.394	5.32	328
Fabric Number 31 (GT)				
50	.0757	1.70	5.35	1340
45	.0749	1.59	5.28	1260
40	.0741	1.47	5.23	1175
35	.0732	1.35	5.15	1083
30	.0724	1.21	5.02	977
25	.0715	1.07	4.91	871
20	.0707	.946	4.86	771
15	.0698	.789	4.71	647
12	.0693	.692	4.64	570
8	.0686	.548	4.54	454
4	.0680	.381	4.46	317
Fabric Number 32 (GT)				
55	.0764	1.24	3.70	975
50	.0756	1.17	3.66	922
45	.0747	1.08	3.61	860
40	.0739	1.00	3.56	799
35	.0731	.919	3.51	737
30	.0722	.824	3.41	665
25	.0714	.732	3.35	594
20	.0705	.621	3.19	507
15	.0697	.522	3.12	428
10	.0688	.401	2.95	331
5	.0680	.272	2.85	226

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 33 (GT)				
32	.0726	3.90	15.6	3137
28	.0719	3.60	15.5	2911
24	.0712	3.30	15.4	2679
20	.0705	2.97	15.3	2425
16	.0699	2.63	15.2	2166
12	.0692	2.25	15.1	1855
8	.0685	1.82	15.0	1508
4	.0679	1.30	15.3	1082
2	.0675	.930	15.5	776
Fabric Number 34 (GT)				
50	.0752	3.05	9.59	2411
45	.0743	2.87	9.61	2284
35	.0727	2.49	9.56	2003
25	.0710	2.08	9.53	1692
20	.0701	1.84	9.49	1506
15	.0693	1.58	9.45	1302
10	.0684	1.27	9.38	1052
7	.0679	1.06	9.37	882
5	.0676	.890	9.35	742
3	.0673	.690	9.42	577
1	.0670	.409	9.65	342
Fabric Number 35 (GT)				
55	.0774	1.91	5.66	1489
45	.0756	1.70	5.62	1340
35	.0741	1.47	5.58	--
30	.0732	1.35	5.57	1083
25	.0724	1.21	5.50	976
20	.0715	1.07	5.43	868
15	.0707	.895	5.30	730
10	.0698	.715	5.25	587
7	.0693	.575	4.89	474
5	.0690	.495	5.14	408
3	.0687	.377	5.09	312

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 36 (GT)				
55	.0761	1.07	2.81	841
45	.0744	.950	2.83	755
40	.0736	.885	2.88	707
35	.0727	.810	2.93	652
30	.0719	.745	2.99	602
25	.0710	.665	3.03	541
20	.0702	.580	3.10	475
15	.0693	.489	3.12	403
10	.0685	.390	3.14	323
7	.0680	.319	3.16	265
5	.0677	.268	3.19	223
Fabric Number 37 (GT)				
40	.0737	3.51	12.5	2804
35	.0729	3.23	12.4	2594
30	.0720	2.95	12.2	2386
25	.0712	2.66	12.2	2159
20	.0703	2.34	12.1	1913
15	.0695	1.99	11.9	1638
10	.0687	1.60	11.8	1324
7	.0681	1.33	11.7	1105
5	.0678	1.12	11.7	934
3	.0675	.850	11.6	709
1	.0672	.505	11.9	422
Fabric Number 38 (GT)				
50	.0751	2.65	8.33	2098
45	.0742	2.49	8.31	1981
35	.0725	2.14	8.19	1723
30	.0721	1.96	8.12	1583
25	.0708	1.75	8.02	1427
20	.0701	1.53	7.91	1252
15	.0692	1.28	7.69	1055
10	.0683	1.01	7.46	838
7	.0678	.830	7.37	692
5	.0675	.690	7.24	576
3	.0672	.530	7.23	443

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 39 (GT)				
55	.0752	1.70	5.12	1344
45	.0735	1.51	5.08	1208
35	.0718	1.29	4.95	1043
30	.0710	1.18	4.92	959
25	.0702	1.05	4.81	859
20	.0693	.910	4.72	750
15	.0685	.765	4.62	634
10	.0676	.600	4.47	500
7	.0671	.487	4.35	408
5	.0668	.406	4.27	341
3	.0665	.320	4.37	269
Fabric Number 40 (GT)				
55	.0757	1.27	3.79	1000
50	.0749	1.19	3.77	943
45	.0740	1.12	3.73	893
40	.0732	1.03	3.67	826
35	.0724	.955	3.65	770
30	.0715	.870	3.63	706
25	.0707	.780	3.58	636
20	.0699	.675	3.49	553
15	.0690	.560	3.35	462
10	.0682	.438	3.24	364
5	.0673	.278	2.92	232
Fabric Number 41 (GT)				
30	.0720	3.84	16.0	3113
27	.0715	3.62	15.9	2935
24	.0710	3.37	15.8	2748
21	.0705	3.13	15.7	2555
18	.0699	2.86	15.6	2344
15	.0694	2.59	15.5	2132
12	.0689	2.29	15.4	1892
9	.0685	1.96	15.3	1633
6	.0679	1.60	15.3	1331
4	.0676	1.29	15.2	1084
2	.0672	.915	15.2	764

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 42 (GT)				
55	.0757	3.18	9.51	2500
50	.0749	2.96	9.34	2342
45	.0740	2.77	9.28	2210
40	.0732	2.58	9.24	2078
35	.0724	2.30	9.10	1911
30	.0715	2.17	9.06	1759
25	.0707	1.95	8.97	1589
20	.0698	1.72	8.86	1412
15	.0690	1.46	8.79	1213
10	.0682	1.17	8.65	972
5	.0673	.810	8.54	677
Fabric Number 43 (GT)				
55	.0750	2.13	6.40	1686
50	.0742	2.01	6.36	1600
45	.0733	1.89	6.34	1514
40	.0725	1.75	6.28	1409
35	.0717	1.62	6.21	1312
30	.0709	1.48	6.19	1205
25	.0700	1.33	6.14	1090
20	.0692	1.17	6.06	964
15	.0684	.985	5.94	816
10	.0675	.795	5.94	664
5	.0667	.540	5.71	453
Fabric Number 44 (GT)				
55	.0746	1.70	5.14	1349
50	.0738	1.61	5.10	1286
45	.0729	1.51	5.08	1213
40	.0721	1.40	5.05	1130
35	.0713	1.30	5.01	1055
30	.0705	1.18	4.96	963
25	.0696	1.06	4.88	871
20	.0688	.925	4.82	764
15	.0680	.795	4.82	662
10	.0672	.605	4.53	506
5	.0664	.455	4.82	383

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 45 (GT)				
35	.0721	3.95	14.7	3190
30	.0712	3.50	14.6	2842
25	.0705	3.21	14.7	2620
20	.0696	2.84	14.7	2334
15	.0689	2.45	14.6	2025
10	.0680	1.98	14.6	1648
7	.0675	1.65	14.6	1377
3	.0671	1.05	14.2	878
Fabric Number 46 (GT)				
50	.0758	3.20	10.4	2543
45	.0749	3.03	10.3	2410
40	.0748	2.84	10.2	2271
35	.0732	2.65	10.2	2134
30	.0724	2.46	10.2	1994
25	.0715	2.26	10.3	1841
20	.0707	1.97	10.2	1614
15	.0699	1.71	10.2	1410
10	.0690	1.38	10.2	1147
7	.0685	1.15	10.1	970
3	.0679	.760	10.1	641
Fabric Number 47 (GT)				
50	.0758	2.25	7.06	1772
45	.0748	2.13	7.11	1688
40	.0741	2.00	7.11	1594
35	.0732	1.88	7.15	1484
30	.0724	1.71	7.11	1379
25	.0715	1.57	7.18	1273
20	.0707	1.41	7.21	1150
15	.0699	1.21	7.21	992
10	.0690	.980	7.21	809
7	.0685	.825	7.28	684
3	.0679	.550	7.45	458

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm ft.$^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm sec.$^{-1}$ft.$^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm ft.$^{-2}$)
Fabric Number 48 (GT)				
50	.0758	1.57	4.90	1236
45	.0749	1.47	4.88	1165
40	.0741	1.39	4.95	1108
35	.0732	1.28	4.90	1027
30	.0724	1.19	4.94	959
25	.0716	1.08	4.96	876
20	.0706	.965	4.90	788
15	.0698	.831	4.95	682
10	.0689	.675	4.81	558
7	.0684	.565	4.98	468
3	.0678	.379	5.14	316
Fabric Number 49 (GT)				
35	.0732	4.22	16.1	3385
30	.0724	3.88	16.1	3129
25	.0715	3.54	16.1	2870
20	.0706	3.13	16.0	2555
15	.0698	2.69	16.0	2208
10	.0694	2.18	15.9	1794
7	.0684	1.80	15.9	1492
3	.0678	1.15	15.7	958
Fabric Number 50 (GT)				
50	.0771	3.38	10.5	2641
45	.0762	3.19	10.5	2505
40	.0753	2.98	10.5	2353
35	.0745	2.77	10.5	2201
30	.0736	2.56	10.6	2045
25	.0727	2.33	10.6	1874
20	.0719	2.08	10.6	1682
15	.0715	1.79	10.6	1451
10	.0702	1.45	10.6	1187
7	.0696	1.21	10.6	995
3	.0690	.795	10.7	656

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 51 (GT)				
50	.0756	2.26	7.10	1782
45	.0749	2.13	7.07	1688
40	.0740	1.99	7.07	1588
35	.0732	1.86	7.09	1492
30	.0723	1.70	7.07	1371
25	.0715	1.55	7.04	1257
20	.0706	1.38	7.07	1127
15	.0697	1.18	7.00	968
10	.0689	.950	6.98	785
7	.0684	.790	6.98	655
3	.0677	.495	6.71	413
Fabric Number 52 (GT)				
50	.0762	1.37	4.29	1076
45	.0753	1.28	4.25	1010
40	.0745	1.20	4.24	953
35	.0736	1.13	4.29	903
30	.0728	1.04	4.28	836
25	.0719	.935	4.19	756
20	.0711	.835	4.28	679
15	.0702	.720	4.28	589
10	.0694	.580	4.25	477
7	.0689	.477	4.19	394
3	.0682	.319	4.30	265
Fabric Number 53 (GT)				
30	.0737	4.67	19.2	3731
25	.0729	4.20	19.0	3373
20	.0720	3.69	18.8	2987
17	.0714	3.36	18.7	2725
15	.0711	3.14	18.6	2553
13	.0708	2.91	18.5	2372
10	.0703	2.52	18.4	2060
7	.0697	2.08	18.2	1707
5	.0694	1.75	18.1	1441
3	.0691	1.35	18.1	1114

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 54 (GT)				
40	.0751	3.58	12.6	2835
35	.0743	3.30	12.5	2625
30	.0734	3.02	12.4	2418
25	.0725	2.71	12.3	2183
20	.0716	2.40	12.2	1946
15	.0708	2.04	12.2	1662
10	.0700	1.64	12.0	1343
7	.0694	1.36	11.9	1120
3	.0686	.852	11.4	705
Fabric Number 55 (GT)				
50	.0764	2.82	8.82	2210
45	.0756	2.65	8.77	2090
40	.0747	2.46	8.69	1950
35	.0739	2.28	8.67	1820
30	.0730	2.08	8.58	1670
25	.0722	1.89	8.58	1525
20	.0713	1.67	8.51	1357
15	.0704	1.42	8.49	1161
10	.0696	1.15	8.40	945
5	.0688	.810	8.40	669
3	.0684	.620	8.32	514
Fabric Number 56 (GT)				
55	.0771	1.47	4.34	1148
50	.0763	1.38	4.34	1084
45	.0754	1.30	4.31	1025
40	.0746	1.21	4.25	961
35	.0737	1.11	4.22	886
30	.0729	1.02	4.17	819
25	.0720	.920	4.20	744
20	.0711	.810	4.12	659
15	.0703	.690	4.10	564
10	.0694	.560	4.10	461
5	.0686	.394	4.12	326

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 57 (GT)				
18	.0717	4.77	25.6	3860
16	.0714	4.45	25.5	3610
14	.0710	4.14	25.2	3370
12	.0706	3.80	25.3	3105
10	.0703	3.46	25.2	2830
8	.0700	3.07	25.1	2515
6	.0696	2.64	25.1	2170
4	.0693	2.15	24.9	1771
3	.0691	1.86	25.0	1535
2	.0689	1.51	24.8	1246
1	.0688	1.07	24.6	885
Fabric Number 58 (GT)				
30	.0733	4.53	18.7	3630
25	.0725	4.12	18.7	3320
20	.0716	3.67	18.8	2975
15	.0707	3.15	18.7	2568
10	.0699	2.54	18.4	2080
7	.0694	2.12	18.5	1745
3	.0687	1.39	18.6	1150
Fabric Number 59 (GT)				
35	.0737	3.77	14.3	3010
30	.0729	3.46	14.3	2780
25	.0720	3.12	14.2	2525
20	.0711	2.76	14.2	2245
15	.0703	2.37	14.1	1940
10	.0694	1.93	14.1	1590
7	.0689	1.60	14.1	1320
3	.0683	1.10	14.7	913
Fabric Number 60 (GT)				
45	.0755	3.29	10.9	2595
40	.0747	3.06	10.8	2430
35	.0738	2.82	10.7	2250

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 60 (GT) (Continued)				
30	.0730	2.57	10.6	2060
25	.0721	2.30	10.4	1860
20	.0712	2.02	10.4	1640
15	.0704	1.72	10.2	1407
10	.0696	1.50	11.0	1232
7	.0690	1.15	10.5	949
3	.0683	.755	10.1	627
Fabric Number 61 (GT)				
50	.0768	2.50	7.81	1955
45	.0760	2.36	7.77	1858
40	.0751	2.20	7.76	1740
35	.0742	2.04	7.72	1615
30	.0734	1.87	7.70	1497
25	.0725	1.69	7.66	1362
20	.0716	1.49	7.54	1210
15	.0708	1.27	7.54	1035
10	.0699	.965	7.05	791
7	.0694	.816	7.12	673
3	.0687	.444	5.97	367
AIR FORCE FURNISHED FABRICS:				
Fabric Number 1 (ES-1)				
50	.0753	2.44	7.7	1927
40	.0737	2.1	7.5	1678
30	.0721	1.74	7.2	1405
20	.0702	1.34	6.86	1097
15	.0694	1.11	6.64	914
10	.0686	.85	6.3	703
9	.0683	.8	6.23	662
8	.0683	.74	6.10	614
7	.0680	.68	6.04	564
6	.0680	.61	5.88	508
5	.0678	.54	5.68	450
4	.0675	.467	5.47	392

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1}ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 2 (ES-2)				
50	.0756	2.37	7.4	1869
40	.0740	2.04	7.24	1628
30	.0724	1.7	7.04	1371
20	.0707	1.31	6.68	1068
15	.0696	1.08	6.43	888
10	.0688	.84	6.15	690
9	.0688	.725	5.63	603
8	.0686	.72	5.93	596
7	.0685	.655	5.76	546
6	.0683	.60	5.72	498
5	.068	.535	5.51	448
4	.068	.458	5.36	383
Fabric Number 3 (ES-3)				
50	.075	2.53	8.04	2002
40	.0734	2.19	7.82	1752
30	.0718	1.85	7.73	1499
20	.0704	1.45	7.48	1185
15	.0694	1.23	7.31	1013
10	.0685	.975	7.19	812
9	.0685	.923	7.20	762
8	.0680	.858	7.11	716
7	.0680	.80	7.10	666
6	.0680	.735	7.02	616
5	.0675	.635	6.93	534
4	.0675	.590	6.93	492
3	.0671	.498	6.78	419
Fabric Number 4 (ES-4)				
50	.0758	1.83	5.73	1441
40	.0741	1.59	5.61	1267
30	.0724	1.33	5.48	1073
20	.0707	1.05	5.36	856
15	.0698	.880	5.27	722
10	.069	.685	5.04	570
9	.0688	.640	4.97	529
8	.0687	.600	4.95	496

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 4 (ES-4) (Continued)				
7	.0685	.550	4.86	456
6	.0684	.500	4.76	414
5	.0681	.445	4.67	374
4	.068	.390	4.59	325
3	.0678	.337	4.56	283
Fabric Number 5 (ES-5)				
50	.0755	2.11	6.67	1664
40	.0738	1.83	6.52	1463
30	.0721	1.53	6.38	1236
20	.0704	1.21	6.28	989
15	.0695	1.02	6.14	840
10	.0687	.801	5.92	662
9	.0685	.755	5.85	630
8	.0684	.70	5.82	580
7	.0682	.645	5.72	539
6	.068	.585	5.58	491
5	.0678	.524	5.52	433
4	.0677	.465	5.45	392
3	.0675	.393	5.40	325
Fabric Number 6 (ES-6)				
50	.0753	3.77	11.8	2977
40	.0737	3.29	11.7	2629
30	.0721	2.78	11.5	2245
20	.0702	2.20	11.3	1800
15	.0694	1.88	11.3	1548
10	.0686	1.51	11.1	1249
9	.0683	1.42	11.0	1178
8	.0683	1.33	11.0	1104
7	.068	1.24	11.0	1032
6	.068	1.14	10.9	949
5	.0678	1.04	11.0	867
4	.0675	.920	10.9	768
3	.0675	.790	10.7	659
2	.0672	.630	10.5	527
1	.0669	.427	10.1	360

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 7 (ES-7)				
50	.075	2.40	7.58	1899
40	.0734	2.05	7.29	1640
30	.0718	1.72	7.16	1393
20	.0704	1.34	6.88	1095
15	.0694	1.11	6.62	914
10	.0685	.855	6.33	708
9	.0685	.800	6.26	663
8	.068	.745	6.15	621
7	.068	.685	6.03	572
6	.068	.625	6.00	522
5	.0625	.525	5.74	441
4	.0678	.473	5.57	392
3	.0671	.409	5.58	343
Fabric Number 8 (ES-8)				
50	.0754	4.53	14.3	3577
40	.0738	3.93	13.9	3141
30	.0721	3.31	13.8	2673
20	.0703	2.59	14.1	2117
15	.0695	2.19	13.1	1803
10	.0687	1.73	12.7	1431
9	.0685	1.63	12.6	1351
8	.0683	1.52	12.6	1261
7	.0681	1.41	12.5	1180
6	.068	1.29	12.3	1074
5	.0678	1.17	12.2	975
4	.0677	1.02	11.9	850
3	.0675	.87	11.8	726
2	.0673	.685	11.4	577
1	.0672	.461	10.8	384
Fabric Number 9 (ES-9)				
50	.0756	1.90	5.95	1498
40	.0739	1.72	6.09	1373
30	.0723	1.48	6.11	1193

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 9 (ES-9) (Continued)				
20	.0705	1.18	6.10	964
15	.0697	1.02	6.11	837
10	.0688	.815	5.99	677
9	.0687	.765	5.96	637
8	.0685	.715	5.91	597
7	.0683	.660	5.84	548
6	.0682	.600	5.73	499
5	.068	.540	5.68	449
4	.0678	.468	5.51	392
3	.0676	.387	5.23	325
Fabric Number 10 (ES-10)				
50	.0760	2.44	7.63	1919
40	.0743	2.18	7.70	1734
30	.0726	1.86	7.73	1497
20	.0709	1.51	7.75	1229
15	.0701	1.30	7.73	1064
10	.0692	1.06	7.77	874
9	.0691	1.01	7.82	834
8	.0689	.935	7.66	777
7	.0687	.875	7.73	728
6	.0686	.810	7.70	670
5	.0684	.725	7.62	605
4	.0682	.640	7.48	532
3	.068	.540	7.33	449
BALLY RIBBON FABRICS:				
Fabric Number 1 (BR-1)				
30	.0740	4.50	20.1	3593
25	.0715	3.98	18.2	3230
20	.0705	3.48	17.9	2838
15	.0695	3.00	17.9	2470
10	.0688	2.28	16.8	1888
8	.0683	2.00	16.6	1660
6	.0681	1.71	16.4	1421

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 1 (BR-1) (Continued)				
4	.0678	1.37	16.0	1140
3	.0676	1.17	15.9	975
2	.0674	.938	15.6	784
1	.0672	.637	15.0	533
Fabric Number 2 (BR-2)				
30	.0722	4.25	17.6	3435
25	.0713	3.77	17.2	3060
20	.0705	3.29	16.9	2673
15	.0696	2.74	16.1	2250
10	.0687	2.10	15.8	1739
8	.0684	1.90	15.6	1570
6	.0678	1.62	15.5	1350
4	.0677	1.30	15.3	1083
3	.0676	1.12	15.2	939
2	.0673	.912	15.2	570
1	.0672	.637	15.1	533
Fabric Number 3 (BR-3)				
25	.0712	4.78	21.9	3879
20	.0703	4.23	21.6	3460
15	.0693	3.46	20.6	2855
10	.0686	2.68	19.8	2205
8	.0682	2.36	19.6	1960
6	.0679	1.99	19.3	1655
5	.0677	1.80	18.9	1500
4	.0675	1.58	18.8	1322
3	.0673	1.34	18.3	1123
2	.0672	1.09	18.1	909
1	.0668	.742	18.0	622
Fabric Number 4 (BR-4)				
30	.0718	4.31	17.9	3480
25	.0710	3.87	17.8	3140
20	.0702	3.39	17.5	2779
15	.0688	2.85	17.2	2275
10	.0685	2.28	17.3	1891

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 4 (BR-4) (Continued)				
8	.0682	2.01	16.7	1670
6	.0678	1.70	16.2	1420
4	.0674	1.35	16.0	1128
3	.0673	1.14	15.7	956
2	.0671	.916	15.3	767
1	.0669	.630	13.7	527
Fabric Number 5 (BR-5)				
30	.0721	4.58	19.1	3700
25	.0712	4.12	18.9	3340
20	.0703	3.62	18.7	2960
15	.0697	3.08	18.4	2523
10	.0688	2.41	17.8	1995
8	.0678	2.14	17.8	1785
6	.0682	1.82	17.4	1515
4	.0678	1.44	16.9	1205
3	.0677	1.23	16.6	1022
2	.0663	.995	16.7	849
1	.0673	.697	16.5	583
Fabric Number 6 (BR-6)				
30	.0716	3.97	16.6	3220
25	.0708	3.55	16.2	2895
20	.0699	3.12	16.1	2556
15	.0690	2.64	15.8	2180
10	.0682	2.07	15.3	1721
8	.0679	1.85	15.2	1540
6	.0675	1.57	15.1	1311
4	.0672	1.26	14.9	1052
3	.0670	1.09	14.9	914
2	.0668	.885	14.8	743
1	.0667	.620	14.7	521

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 7 (BR-7)				
30	.0716	5.03	21.0	4080
25	.0707	4.60	21.1	3750
20	.0698	4.05	20.9	3320
15	.0679	3.40	21.1	2805
10	.0682	2.73	19.9	2265
8	.0678	2.41	19.8	2005
6	.0675	2.08	19.9	1740
4	.0671	1.65	19.7	1377
3	.0670	1.42	20.2	1186
2	.0668	1.15	19.3	969
1	.0666	.812	19.3	682
Fabric Number 8 (BR-8)				
30	.0723	4.60	19.1	3715
25	.0713	4.12	18.9	3340
20	.0705	3.61	18.6	2950
15	.0695	3.05	18.3	2508
10	.0687	2.44	18.0	2022
8	.0684	2.16	17.8	1790
6	.0680	1.84	17.6	1532
4	.0677	1.48	17.4	1231
3	.0675	1.27	17.2	1058
2	.0673	1.02	17.0	854
1	.0672	.712	16.8	595
Fabric Number 9 (BR-9)				
30	.0718	4.38	18.3	3540
25	.0710	3.93	18.1	3193
20	.0700	3.46	17.7	2839
15	.0693	2.96	17.7	2440
10	.0686	2.37	17.2	1958
8	.0683	2.10	17.2	1740
6	.0678	1.79	17.1	1492
4	.0675	1.45	17.1	1210
3	.0671	1.25	17.0	1049
2	.0659	1.00	16.8	844
1	.0650	.695	16.7	589

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 10 (BR-10)				
30	.0719	4.86	20.2	3935
25	.0711	4.26	19.5	3460
20	.0702	3.73	19.2	3055
15	.0694	3.18	19.0	2620
10	.0686	2.58	19.0	2143
8	.0682	2.28	18.8	1890
6	.0679	1.94	18.6	1621
4	.0675	1.57	18.5	1312
3	.0674	1.36	18.4	1133
2	.0672	1.10	18.3	919
1	.0669	.757	17.9	634
Fabric Number 11 (BR-11)				
30	.0720	4.42	17.8	3560
25	.0712	3.95	17.8	3200
20	.0703	3.49	17.7	2850
15	.0695	2.92	17.4	2405
10	.0682	2.35	17.3	1953
8	.0683	2.09	17.2	1731
6	.0679	1.78	17.0	1482
4	.0676	1.43	16.8	1190
3	.0675	1.23	16.6	1025
2	.0673	.984	16.4	822
1	.0671	.660	15.1	553
Fabric Number 12 (BR-12)				
40	.0733	4.58	15.8	3670
30	.0718	3.81	15.8	3082
25	.0708	3.41	15.7	2780
20	.0700	2.99	15.4	2443
15	.0692	2.54	15.3	2090
10	.0684	2.02	14.9	1670
8	.0680	1.78	14.8	1481
6	.0677	1.53	14.7	1272
4	.0674	1.23	14.5	1028
3	.0673	1.07	14.8	895
2	.0671	.850	14.8	712
1	.0668	.588	13.9	493

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 13 (BR-13)				
40	.0737	3.17	11.3	2533
30	.0720	2.68	11.1	2162
25	.0712	2.40	10.9	1942
20	.0703	2.11	10.9	1725
15	.0695	1.80	10.7	1479
10	.0686	1.44	10.6	1190
8	.0683	1.28	10.6	1059
6	.0679	1.10	10.5	841
4	.0676	.893	10.5	744
3	.0674	.771	10.4	645
2	.0673	.622	10.7	519
1	.0671	.435	10.2	371
Fabric Number 14 (BR-14)				
50	.0755	2.79	8.78	2199
45	.0746	2.58	8.61	2040
40	.0738	2.42	8.59	1930
30	.0721	2.03	8.43	1640
20	.0704	1.60	8.25	1309
10	.0687	1.10	8.08	905
7	.0682	.907	8.02	754
4	.0677	.680	7.98	566
3	.0675	.592	8.03	493
2	.0674	.490	8.15	410
1	.0672	.383	9.03	320
Fabric Number 15 (BR-15)				
50	.0746	3.54	11.2	2805
45	.0738	3.32	11.2	2655
40	.0729	3.09	11.1	2485
30	.0713	2.61	10.9	2115
20	.0696	2.06	10.7	1696
10	.0679	1.41	10.4	1170
7	.0674	1.16	10.3	972
4	.0669	.862	10.2	718
3	.0668	.737	10.1	618
2	.0666	.577	9.64	485
1	.0664	.393	9.30	331

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 16 (BR-16)				
55	.0759	2.72	8.10	2135
50	.0751	2.57	8.10	2035
45	.0743	2.41	8.04	1919
40	.0734	2.24	8.00	1790
30	.0718	1.90	7.91	1540
20	.0699	1.50	7.72	1243
10	.0683	1.02	7.51	850
4	.0672	.609	7.14	510
3	.0669	.520	7.08	436
2	.0669	.385	6.36	323
1	.0666	---	---	--
Fabric Number 17 (BR-17)				
50	.0752	3.70	11.7	2925
45	.0743	3.47	11.6	2760
40	.0735	3.23	11.5	2580
30	.0718	2.73	11.4	2240
20	.0701	2.18	11.3	1788
10	.0685	1.49	11.0	1232
4	.0675	.933	11.0	778
3	.0673	.806	11.0	673
2	.0671	.664	11.1	556
1	.0669	.468	11.3	392
Fabric Number 18 (BR-18)				
55	.0759	2.69	8.05	2118
50	.0751	2.45	7.72	1938
45	.0742	2.29	7.65	1820
40	.0734	2.13	7.58	1700
30	.0717	1.80	7.48	1455
20	.0700	1.43	7.38	1170
10	.0684	.987	7.28	817
4	.0674	.624	7.32	521
3	.0672	.542	7.37	452
2	.0670	.446	7.45	374
1	.0669	.332	7.84	279

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 19 (BR-19)				
50	.0758	3.51	11.0	2760
45	.0749	3.25	10.8	2573
40	.0741	3.07	10.9	2440
30	.0724	2.56	10.8	2065
20	.0707	2.07	10.6	1689
10	.0688	1.42	10.5	1167
7	.0685	1.17	10.4	973
4	.0680	.891	10.5	741
3	.0678	.776	10.5	646
2	.0677	.629	10.5	524
1	.0675	.446	10.5	372
Fabric Number 20 (BR-20)				
50	.0745	2.32	7.33	1842
45	.0736	2.16	7.27	1730
40	.0728	2.03	7.27	1632
30	.0711	1.71	7.16	1391
20	.0695	1.36	7.03	1114
10	.0678	.928	6.88	772
7	.0673	.774	6.88	646
4	.0668	.585	6.92	491
3	.0666	.508	6.93	427
2	.0665	.423	7.08	356
1	.0663	.327	7.75	276
Fabric Number 21 (BR-21)				
25	.0712	4.85	22.2	3930
24	.0711	4.75	22.2	3855
21	.0706	4.42	22.2	3600
18	.0700	4.07	22.2	3335
13	.0692	3.44	22.2	2830
9	.0685	2.83	22.1	2350
7	.0682	2.49	22.0	2069
4	.0677	1.86	21.8	1546
3	.0675	1.60	21.8	1335
2	.0673	1.31	21.8	1097
1	.0672	.917	21.6	766

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 22 (BR-22)				
30	.0718	4.43	18.4	3585
25	.0710	4.03	18.4	3260
21	.0703	3.65	18.4	2985
17	.0696	3.29	18.5	2700
13	.0689	2.84	18.3	2345
10	.0684	2.47	18.3	2043
7	.0679	2.05	18.2	1707
4	.0674	1.54	18.1	1286
3	.0673	1.33	18.1	1110
2	.0671	1.09	18.2	912
1	.0669	.758	17.9	634
Fabric Number 23 (BR-23)				
25	.0716	4.96	22.7	4020
24	.0714	4.86	22.7	3940
21	.0709	4.52	22.6	3673
18	.0704	4.16	22.6	3400
14	.0697	3.65	22.6	2998
10	.0690	3.06	22.5	2530
7	.0685	2.54	22.4	2105
4	.0680	1.88	22.1	1565
3	.0679	1.63	22.0	1352
2	.0677	1.31	21.8	1092
1	.0675	.960	22.6	800
Fabric Number 24 (BR-24)				
27	.0720	4.30	18.8	3470
23	.0713	3.95	18.8	3200
20	.0708	3.65	18.8	2975
15	.0700	3.14	18.7	2568
10	.0691	2.54	18.6	2094
7	.0686	2.09	18.4	1730
5	.0683	1.76	18.4	1456
4	.0681	1.53	17.9	1270
3	.0679	1.35	18.3	1126
2	.0678	1.10	18.3	918
1	.0676	.768	18.0	638

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 29 (BR-29)				
18	.0671	4.84	26.7	4051
15	.0671	4.40	26.7	3683
14	.0671	4.23	26.6	3541
12	.0671	3.91	26.6	3273
10	.0670	3.57	26.6	2992
7	.0670	2.92	26.0	2448
5	.0670	2.49	26.4	2087
4	.0670	2.20	26.0	1844
3	.0670	1.87	25.5	1567
2	.0669	1.57	26.1	1316
1	.0669	1.03	24.2	863
Fabric Number 30 (BR-30)				
22	.0702	4.52	22.3	3699
20	.0699	4.32	22.3	3541
17	.0694	3.94	22.2	3243
13	.0687	3.42	22.1	2830
10	.0682	2.99	22.1	2485
7	.0677	2.48	22.0	2063
5	.0674	2.07	21.8	1730
4	.0672	1.84	21.7	1538
3	.0670	1.59	21.6	1329
2	.0669	1.32	22.0	1102
1	.0667	.895	21.1	751
Fabric Number 31 (BR-31)				
58	.0771	2.50	7.21	1955
50	.0758	2.30	7.21	1813
40	.0741	2.03	7.21	1618
30	.0724	1.73	7.21	1397
20	.0707	1.39	7.14	1133
10	.0690	.955	7.00	788
7	.0685	.787	6.93	652
4	.0680	.586	6.87	488
3	.0678	.502	6.79	418
2	.0677	.411	6.79	343
1	.0675	.316	7.42	264

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 32 (BR-32)				
60	.0779	1.61	4.55	1250
50	.0762	1.45	4.52	1135
40	.0745	1.27	4.47	1010
30	.0728	1.06	4.37	853
20	.0711	.835	4.28	679
15	.0703	.705	4.20	576
10	.0694	.565	4.15	462
7	.0689	.465	4.09	384
4	.0684	.350	4.09	290
2	.0681	.291	4.82	242
1	.0679	.187	4.36	156
Fabric Number 33 (BR-33)				
60	.0777	2.23	6.33	1735
55	.0769	2.13	6.33	1667
50	.0760	2.01	6.33	1581
40	.0743	1.77	6.25	1408
30	.0726	1.52	6.25	1223
20	.0709	1.22	6.25	993
10	.0692	.842	6.17	694
6	.0686	.649	6.17	537
3	.0681	.416	5.66	346
2	.0679	.384	6.25	319
1	.0677	.281	6.56	234
Fabric Number 34 (BR-34)				
60	.0762	1.51	4.31	1186
50	.0743	1.36	4.32	1082
40	.0727	1.20	4.27	966
30	.0710	1.01	4.22	821
20	.0694	.788	4.09	649
15	.0685	.678	4.06	562
10	.0677	.525	3.90	438
7	.0672	.433	3.87	362
5	.0670	.369	3.88	309
3	.0667	.232	3.16	195
1	.0661	---	---	---

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 35 (BR-35)				
55	.0766	1.99	5.92	1559
40	.0741	1.62	5.74	1293
30	.0724	1.36	5.62	1097
25	.0716	1.22	5.55	986
20	.0707	1.04	5.36	850
15	.0699	.906	5.40	743
10	.0691	.726	5.34	599
7	.0685	.612	5.39	507
5	.0682	.518	5.42	430
3	.0678	.409	5.53	341
1	.0675	.259	6.08	216
Fabric Number 36 (BR-36)				
60	.0771	1.44	4.10	1125
50	.0754	1.29	4.11	1019
40	.0737	1.12	4.00	899
30	.0720	.941	3.91	761
20	.0703	.734	3.79	600
15	.0695	.618	3.70	509
7	.0681	.395	3.49	328
5	.0678	.330	3.46	275
3	.0674	.256	3.46	214
2	.0673	.205	3.42	171
1	.0671	---	--	--
Fabric Number 37 (BR-37)				
42	.0732	3.47	12.1	2784
35	.0720	3.12	12.0	2487
25	.0704	2.59	12.0	2120
20	.0695	2.29	11.9	1893
15	.0687	1.97	12.3	1663
10	.0679	1.60	11.8	1323
7	.0674	1.29	11.5	1036
5	.0671	1.13	11.9	947
3	.0667	.835	12.1	741
2	.0666	.725	12.2	618
1	.0664	.540	12.8	444

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 38 (BR-38)				
55	.0748	2.63	7.94	2085
50	.0740	2.49	7.92	1987
40	.0724	2.20	7.89	1774
30	.0707	1.88	7.89	1533
20	.0691	1.52	7.87	1255
10	.0675	1.05	7.77	876
7	.0669	.865	7.77	725
4	.0664	.645	7.60	543
3	.0661	.560	7.66	473
2	.0661	.456	7.68	385
1	.0659	.329	7.75	278
Fabric Number 39 (BR-39)				
50	.0752	3.09	9.65	2444
40	.0735	2.69	9.59	2151
30	.0718	2.28	9.49	1847
20	.0701	1.82	9.39	1489
16	.0695	1.61	9.33	1325
12	.0688	1.38	9.27	1140
8	.0681	1.12	9.22	928
6	.0678	.965	9.22	804
4	.0675	.793	9.33	662
3	.0673	.695	9.43	581
2	.0671	.555	9.33	465
Fabric Number 40 (BR-40)				
55	.0759	1.96	5.86	1542
45	.0742	1.74	5.81	1384
35	.0726	1.51	5.80	1215
25	.0709	1.26	5.76	1026
20	.0700	1.13	5.81	926
15	.0692	.955	5.73	787
10	.0683	.765	5.66	635
5	.0675	.543	5.71	453
3	.0672	.410	5.57	343
2	.0670	.365	6.13	306
1	.0668	.251	5.94	211

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 45 (BR-45)				
50	.0755	3.28	10.3	2586
40	.0739	2.87	10.2	2290
30	.0723	2.44	10.1	1968
20	.0706	1.96	10.1	1599
15	.0696	1.68	10.0	1381
10	.0688	1.36	10.0	1124
7	.0683	1.14	10.1	946
5	.0679	.960	10.1	799
3	.0676	.750	10.2	625
2	.0674	.615	10.2	514
1	.0673	.445	10.5	372
Fabric Number 46 (BR-46)				
60	.0775	2.39	6.78	1860
50	.0759	2.15	6.71	1691
40	.0743	1.89	6.71	1504
30	.0724	1.60	6.63	1290
20	.0707	1.28	6.56	1044
15	.0699	1.09	6.56	893
10	.0691	.882	6.48	728
5	.0683	.609	6.40	505
3	.0680	.480	6.48	399
2	.0678	.391	6.48	326
1	.0675	.279	6.56	233
Fabric Number 49 (BR-49)				
50	.0735	.164	.523	131
45	.0727	.150	.508	121
40	.0718	.136	.498	110
35	.0710	.119	.459	96.7
30	.0702	.109	.458	89.2
25	.0694	.094	.437	77.4
20	.0686	.079	.414	65.4
15	.0677	.063	.382	52.5
10	.0670	---	---	---
5	.0662	---	---	---

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 50 (BR-50)				
60	.0761	.161	.470	126
55	.0753	.150	.450	118
50	.0745	.138	.440	110
40	.0726	.114	.410	91.7
30	.0710	.089	.380	72.4
20	.0688	.065	.340	53.7
15	.0686	.053	.320	43.4
10	.0677	---	---	---
5	.0669	---	---	---
Fabric Number 51 (BR-51)				
50	.0735	.305	.972	244
45	.0725	.279	.941	225
40	.0718	.256	.907	207
35	.0710	.225	.872	183
30	.0701	.202	.849	165
25	.0694	.176	.846	145
20	.0682	.150	.781	125
15	.0677	.123	.742	103
10	.0669	.0940	.701	78.8
5	.0661	.0635	.671	53.6
Fabric Number 52 (BR-52)				
50	.0736	.294	.938	235
45	.0729	.267	.901	215
40	.0718	.242	.869	196
35	.0710	.217	.838	176
30	.0702	.194	.817	159
25	.0694	.169	.785	139
20	.0688	.145	.765	120
15	.0677	.119	.716	99.2
10	.0669	.092	.683	76.7
5	.0664	.064	.671	53.5

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth ($lbm\ ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth ($lbm\ sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity ($cfm\ ft.^{-2}$)
Fabric Number 53 (BR-53)				
50	.0753	.579	1.81	458
45	.0744	.531	1.77	422
40	.0736	.490	1.75	392
35	.0727	.445	1.71	358
30	.0719	.403	1.67	326
25	.0710	.357	1.64	290
20	.0702	.310	1.60	254
15	.0693	.258	1.54	213
10	.0685	.200	1.42	166
5	.0676	.135	1.41	113
Fabric Number 54 (BR-54)				
50	.0752	.665	2.08	526
45	.0744	.620	2.07	493
40	.0735	.565	2.01	452
35	.0727	.520	1.99	418
30	.0718	.464	1.93	375
25	.0710	.413	1.89	336
20	.0701	.359	1.85	294
15	.0693	.300	1.80	247
10	.0684	.237	1.75	196
5	.0676	.160	1.68	133
Fabric Number 55 (BR-55)				
50	.0754	.881	2.77	696
45	.0747	.817	2.72	649
40	.0738	.753	2.68	602
35	.0730	.692	2.65	556
30	.0721	.623	2.60	503
25	.0712	.556	2.55	451
20	.0703	.482	2.49	394
15	.0695	.403	2.41	332
10	.0687	.314	2.32	260
5	.0678	.211	2.21	176

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 56 (BR-56)				
50	.0759	.803	2.53	632
45	.0751	.747	2.49	591
40	.0743	.687	2.43	547
35	.0734	.630	2.41	504
30	.0726	.569	2.35	458
25	.0717	.506	2.30	410
20	.0709	.440	2.26	358
15	.0695	.367	2.19	302
10	.0687	.289	2.12	239
5	.0678	.194	2.03	162
Fabric Number 57 (BR-57)				
50	.0766	.154	.480	121
45	.0749	.140	.466	111
40	.0741	.127	.451	101
35	.0732	.114	.425	91.5
30	.0724	.101	.418	81.4
25	.0715	.088	.405	70.9
20	.0707	.074	.378	59.9
15	.0698	.060	.359	49.2
10	.0690	---	---	---
7	.0685	---	---	---
5	.0682	---	---	---
Fabric Number 58 (BR-58)				
54	.0768	.159	.475	124
50	.0762	.144	.451	113
45	.0753	.131	.434	103
40	.0745	.117	.414	93.0
35	.0736	.105	.397	83.9
30	.0728	.092	.378	73.6
25	.0719	.080	.362	64.3
20	.0711	.067	.342	54.4
15	.0702	---	---	---
10	.0694	---	---	---

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 59 (BR-59)				
50	.0728	.287	.919	231
45	.0718	.258	.879	209
40	.0710	.234	.838	190
35	.0701	.209	.812	171
30	.0693	.186	.785	153
25	.0685	.163	.759	135
20	.0678	.139	.725	116
15	.0670	.114	.694	95.6
10	.0661	.088	.663	74.3
5	.0652	.061	.645	51.8
Fabric Number 60 (BR-60)				
50	.0759	.285	.895	224
45	.0751	.256	.849	203
40	.0742	.230	.819	183
35	.0734	.208	.795	166
30	.0726	.182	.755	146
25	.0718	.162	.735	131
20	.0709	.140	.721	114
15	.0701	.112	.664	91.7
10	.0692	.080	.592	65.9
5	.0684	---	---	---
Fabric Number 61 (BR-61)				
50	.0759	.213	.665	168
45	.0743	.194	.648	154
40	.0734	.177	.628	142
35	.0726	.159	.609	128
30	.0717	.143	.594	116
25	.0709	.124	.569	101
20	.0700	.105	.543	86.1
15	.0692	.084	.505	69.2
10	.0683	.063	.465	52.3
5	.0675	---	---	---

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 62 (BR-62)				
50	.0755	.183	.573	144
40	.0739	.152	.539	121
30	.0727	.117	.486	94.5
25	.0713	.104	.476	84.4
20	.0705	.088	.451	71.4
15	.0696	.070	.418	57.5
10	.0688	---	---	---
6	.0681	---	---	---
4	.0677	---	---	---
2	.0674	---	---	---
Fabric Number 63 (BR-63)				
45	.0750	.474	1.58	375
40	.0742	.422	1.50	336
35	.0733	.373	1.40	299
30	.0724	.332	1.38	268
25	.0715	.287	1.31	233
20	.0707	.261	1.35	213
15	.0699	.198	1.19	162
10	.0690	.151	1.11	125
5	.0682	.099	1.03	81.9
Fabric Number 64 (BR-64)				
45	.0751	.388	1.29	307
40	.0742	.353	1.25	281
35	.0734	.319	1.21	255
30	.0725	.283	1.17	228
25	.0717	.248	1.13	201
20	.0708	.210	1.08	171
15	.0695	.171	1.02	141
10	.0691	.127	.934	105
7	.0686	.101	.886	83.6
5	.0683	.081	.846	67.2

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 65 (BR-65)				
48	.0757	.380	1.23	299
44	.0750	.360	1.21	285
40	.0743	.335	1.19	267
35	.0735	.302	1.15	242
30	.0726	.268	1.11	216
25	.0718	.234	1.06	189
20	.0709	.198	1.01	161
15	.0701	.161	.952	132
10	.0692	.122	.892	101
5	.0684	.078	.826	64.2
Fabric Number 66 (BR-66)				
50	.0759	.338	1.06	266
45	.0751	.310	1.03	245
40	.0742	.282	1.00	224
35	.0734	.251	.954	201
30	.0726	.235	.964	189
25	.0717	.196	.894	159
20	.0708	.167	.866	136
15	.0700	.136	.806	111
10	.0692	.099	.721	81.2
7	.0687	.069	.600	56.7
Fabric Number 67 (BR-67)				
55	.0751	1.06	3.16	840
50	.0745	1.00	3.16	797
45	.0735	.939	3.16	751
40	.0726	.870	3.16	695
30	.0710	.728	3.00	592
20	.0694	.574	3.00	473
10	.0678	.369	2.83	308
5	.0670	.252	2.65	211

(Continued)

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Contrails

TABLE IV (Continued)

SUMMARY OF EXPERIMENTAL RESULTS

Static Pressure Upstream of Cloth (Inches Water)	Air Density Upstream of Cloth (lbm $ft.^{-3}$)	Mass Velocity of Air Upstream of Cloth (lbm $sec.^{-1} ft.^{-2}$)	Relative Porosity of Cloth (Per Cent)	Volumetric Velocity (cfm $ft.^{-2}$)
Fabric Number 68 (BR-68)				
55	.0748	.935	2.83	741
45	.0732	.815	2.75	654
40	.0723	.755	2.72	609
35	.0715	.690	2.67	559
30	.0707	.630	2.64	514
25	.0699	.565	2.62	463
20	.0690	.500	2.60	413
15	.0682	.422	2.55	351
10	.0674	.343	2.56	287
7	.0669	.285	2.55	239
5	.0666	.243	2.58	204
Fabric Number 69 (BR-69)				
55	.0744	.940	2.84	747
45	.0729	.830	2.79	667
40	.0718	.760	2.72	615
35	.0710	.700	2.69	569
30	.0702	.625	2.63	512
25	.0694	.555	2.57	457
20	.0685	.480	2.50	398
15	.0677	.400	2.42	333
10	.0672	.303	2.26	253
7	.0662	.236	2.12	199
5	.0660	.198	2.08	167
Fabric Number 70 (BR-70)				
55	.0737	.820	2.48	655
45	.0721	.720	2.41	581
40	.0714	.650	2.36	527
35	.0705	.590	2.29	482
30	.0696	.535	2.27	440
25	.0689	.466	2.16	385
20	.0682	.404	2.12	336
15	.0674	.328	1.99	274
10	.0666	.244	1.82	205
7	.0660	.190	1.71	160
5	.0658	.163	1.73	138

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Contrails

TABLE V

THE EFFECT OF FILLING THREAD COUNT
VARIATION ON FABRIC PERMEABILITY

Volumetric Velocity (cfm./ft.^{2}) (20 Inches Water)	Item Number	Thread Count Per Inch		Weave
		Warp	Filling	
NYLON CLOTH:				
979	GT-2	75.50	91.00	Satin
1372	GT-3	75.50	75.00	"
1788	GT-4	76.00	63.50	"
2839	GT-5	76.00	55.00	"
--	GT-6	77.00	43.50	"
429	GT-7	80.00	94.00	Plain
544	GT-8	78.00	88.00	"
864	GT-9	78.50	73.00	"
1974	GT-10	78.50	64.50	"
3287	GT-11	77.00	53.50	"
--	GT-1	77.00	44.00	"
1047	GT-17	75.00	92.00	Twill
1228	GT-16	75.50	82.50	"
1553	GT-15	74.00	73.00	"
2038	GT-14	74.50	63.00	"
3033	GT-13	74.50	53.00	"
--	GT-12	74.00	42.00	"
620	GT-22	142.25	82.25	Plain
758	GT-21	141.50	73.25	"
1106	GT-20	140.00	62.00	"
1486	GT-19	139.25	52.00	"
2282	GT-18	137.00	41.00	"
440	GT-23	139.50	84.50	Satin
668	GT-24	138.80	74.75	"
1100	GT-25	139.00	64.00	"
1708	GT-26	138.00	53.00	"
2787	GT-27	137.50	42.50	"
507	GT-32	143.50	83.50	Twill
771	GT-31	141.50	72.25	"
1012	GT-30	141.50	63.75	"
1553	GT-29	140.00	52.00	"
2410	GT-28	139.50	42.00	"

(Continued)

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TABLE V (Continued)

THE EFFECT OF FILLING THREAD COUNT
VARIATION ON FABRIC PERMEABILITY

Volumetric Velocity (cfm./ft.^{2}) (20 Inches Water)	Item Number	Thread Count Per Inch		Weave
		Warp	Filling	
ORLON:				
475	GT-36	103.00	70.00	Plain
868	GT-35	104.00	61.00	"
1506	GT-34	102.00	51.00	"
2425	GT-33	102.00	41.00	"
553	GT-40	103.00	70.00	Twill
750	GT-39	103.00	61.00	"
1252	GT-38	102.00	51.00	"
1913	GT-37	102.00	40.00	"
764	GT-44	102.00	70.00	Satin
964	GT-43	101.00	60.00	"
1412	GT-42	100.00	52.00	"
2484	GT-41	102.00	40.50	"
DACRON:				
788	GT-48	122.00	75.00	Plain
1150	GT-47	122.00	64.00	"
1614	GT-46	123.00	53.00	"
2334	GT-45	121.00	43.50	"
679	GT-52	123.00	77.00	Twill
1127	GT-51	123.00	66.00	"
1682	GT-50	122.00	54.00	"
2555	GT-49	122.00	43.00	"
657	GT-56	123.00	78.00	Satin
1357	GT-55	123.00	66.00	"
1946	GT-54	122.00	56.00	"
2987	GT-53	122.00	44.00	"
UNFINISHED NYLON:				
1210	GT-61	126.00	83.00	Plain
1640	GT-60	126.00	71.00	"
2245	GT-59	126.00	61.00	"
2975	GT-58	125.00	50.00	"
--	GT-57	128.00	41.00	"

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TABLE VI

THE EFFECT OF WEAVE VARIATION
ON POROSITY

Volumetric Velocity (cfm./ft.^{2}) (20 Inches Water)	Item Number	Thread Count Per Inch		Material	Weave
		Warp	Filling		
788	GT-48	122.00	70.00	Dacron	Plain
679	GT-52	123.00	77.00	"	Twill
659	GT-56	123.00	78.00	"	Satin
1150	GT-47	122.00	64.00	"	Plain
1127	GT-51	123.00	66.00	"	Twill
1357	GT-55	123.00	66.00	"	Satin
1614	GT-46	123.00	53.00	"	Plain
1682	GT-50	123.00	54.00	"	Twill
1946	GT-54	122.00	56.00	"	Satin
2334	GT-45	121.00	43.50	"	Plain
2555	GT-49	122.00	43.00	"	Twill
2987	GT-53	122.00	44.00	"	Satin
475	GT-36	103.00	70.00	Orlon	Plain
553	GT-40	103.00	70.00	"	Twill
764	GT-44	102.00	70.00	"	Satin
868	GT-35	104.00	61.00	"	Plain
750	GT-39	103.00	61.00	"	Twill
964	GT-43	101.00	60.00	"	Satin
1506	GT-34	102.00	51.00	"	Plain
1252	GT-38	102.00	51.00	"	Twill
1412	GT-42	100.00	52.00	"	Satin
2425	GT-33	102.00	41.00	"	Plain
1913	GT-37	102.00	40.00	"	Twill
2485	GT-41	102.00	40.00	"	Satin
728	GT-22	142.25	82.25	Nylon	Plain
507	GT-32	143.50	83.50	"	Twill
440	GT-23	139.50	84.50	"	Satin
758	GT-21	141.50	73.25	"	Plain
771	GT-31	141.50	72.25	"	Twill
668	GT-24	138.75	74.75	"	Satin

(Continued)

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Contrails

TABLE VI (Continued)

THE EFFECT OF WEAVE VARIATION
ON POROSITY

Volumetric Velocity (cfm./ft.^{2}) (20 Inches Water)	Item Number	Thread Count Per Inch		Material	Weave
		Warp	Filling		
1106	GT-20	140.00	62.00	Nylon	Plain
1012	GT-30	141.50	62.75	"	Twill
1100	GT-25	139.00	64.00	"	Satin
1486	GT-19	139.25	52.00	"	Plain
1553	GT-29	140.00	52.00	"	Twill
1708	GT-26	138.25	53.00	"	Satin
2282	GT-18	137.00	41.00	"	Plain
2400	GT-28	139.50	42.00	"	Twill
2787	GT-27	137.50	42.50	"	Satin
544	GT-8	78.00	88.00	"	Plain
1228	GT-16	75.50	82.50	"	Twill
828	GT-2	75.50	91.00	"	Satin
864	GT-9	78.50	73.00	"	Plain
1553	GT-15	74.00	73.00	"	Twill
1372	GT-3	75.50	75.00	"	Satin
1974	GT-10	78.50	64.50	"	Plain
2038	GT-14	74.50	63.00	"	Twill
1788	GT-4	76.00	63.50	"	Satin
3287	GT-11	77.00	53.50	"	Plain
3033	GT-13	74.50	53.00	"	Twill
2839	GT-5	76.00	55.00	"	Satin

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TABLE VII

COMPARISON OF UNFINISHED AND FINISHED PERMEABILITY DATA

Static Pressure (Inches of Water)	Unfinished Mass Velocity (cfm ft.$^{-2}$)	Finished Mass Velocity (cfm ft.$^{-2}$)	Unfinished Relative Porosity	Finished Relative Porosity
Unfinished GT 57 Finished GT 18				
1	885	454	24.9	12.5
3	1535	799	24.9	13.0
5	1970	1047	25.0	13.2
7	2343	1268	25.1	13.5
10	2830	1552	25.3	13.8
15	3490	1945	25.5	14.1
Unfinished GT 58 Finished GT 19				
3	1150	513	18.4	8.6
5	1428	691	18.4	8.8
7	1745	821	18.5	8.9
10	2080	1016	18.6	9.1
15	2568	1280	18.6	9.2
20	2975	1486	18.7	9.4
30	3630	1863	18.8	9.6
Unfinished GT 59 Finished GT 20				
3	913	395	13.9	6.4
5	1117	506	14.0	6.5
7	1320	608	14.1	6.6
10	1590	744	14.1	6.7
15	1940	932	14.2	6.8
20	2245	1106	14.2	7.0
30	2780	1380	14.3	7.1
40	--	1618	14.4	7.3

(Continued)

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TABLE VII (Continued)

COMPARISON OF UNFINISHED AND FINISHED PERMEABILITY DATA

Static Pressure (Inches of Water)	Unfinished Mass Velocity (cfm ft.$^{-2}$)	Finished Mass Velocity (cfm ft.$^{-2}$)	Unfinished Relative Porosity	Finished Relative Porosity
Unfinished GT 60 Finished GT 21				
3	627	259	10.0	4.2
5	788	338	10.0	4.3
7	949	411	10.1	4.4
10	1232	502	10.2	4.5
15	1407	640	10.3	4.6
20	1640	758	10.4	4.7
30	2060	955	10.6	4.9
40	2430	1129	10.7	5.0
50	--	1278	10.9	5.2
Unfinished GT 61 Finished GT 22				
3	367	243	6.9	3.5
5	520	302	7.0	3.7
7	673	357	7.1	3.8
10	791	430	7.2	3.9
15	1035	541	7.4	4.0
20	1210	635	7.5	4.1
30	1497	812	7.6	4.2
40	1740	965	7.8	4.3
50	1955	1109	7.8	4.4

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APPENDIX III

FIGURES 11 thru 55

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Contrails

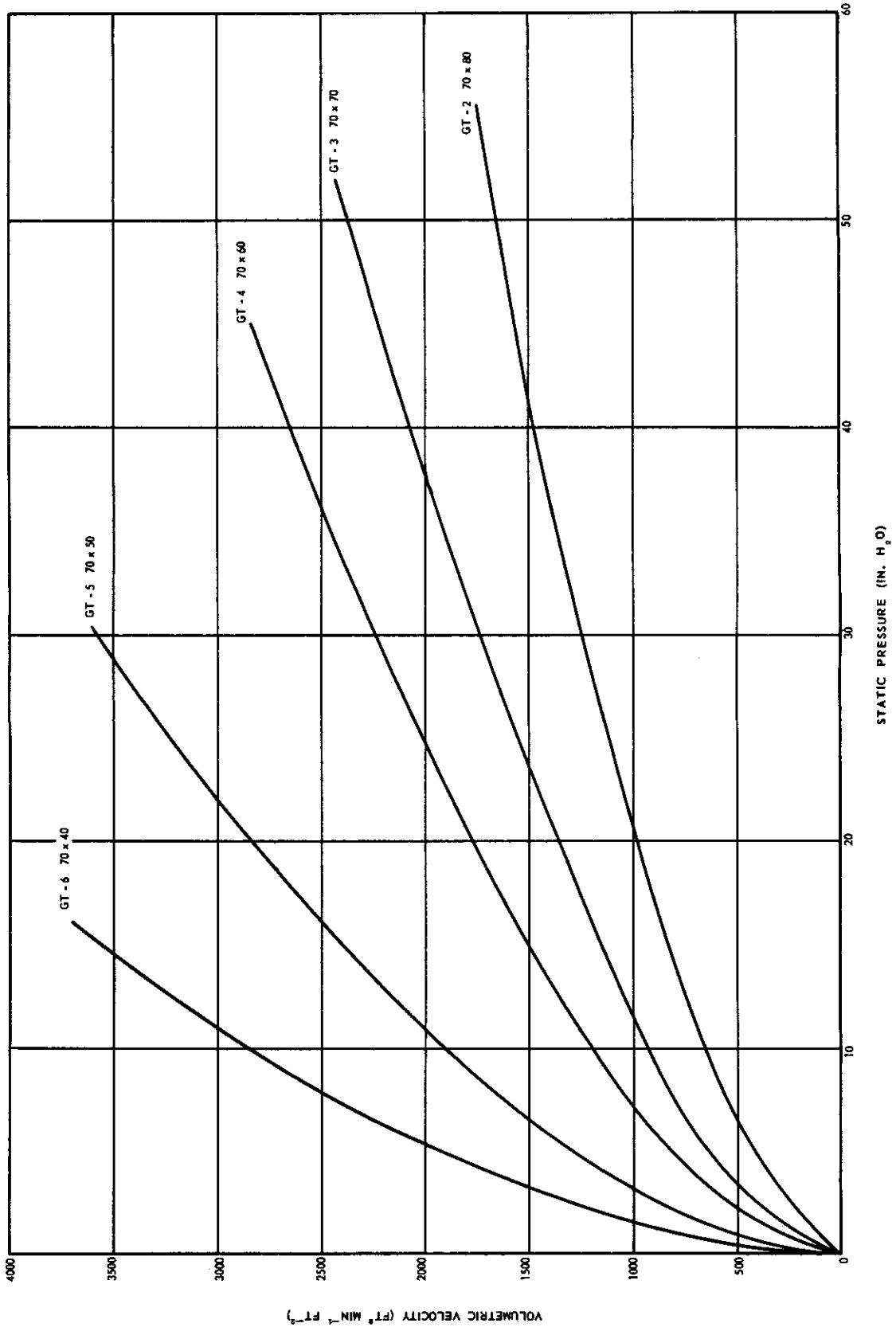

Figure 11. Air Permeability of 70/70 Denier Satin Nylon Cloth.

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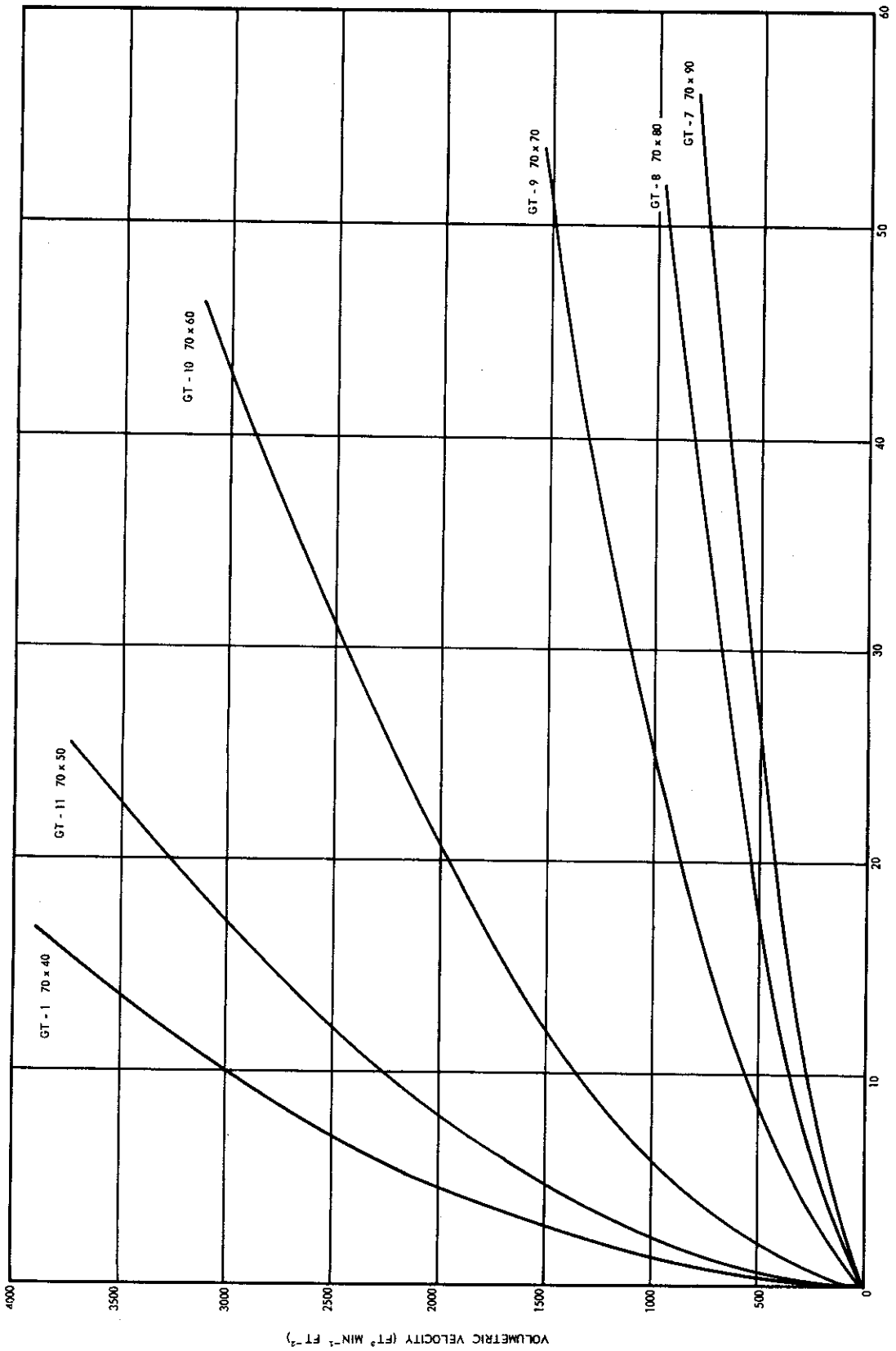

Figure 12. Air Permeability of 70/70 Denier Plain Nylon Cloth.

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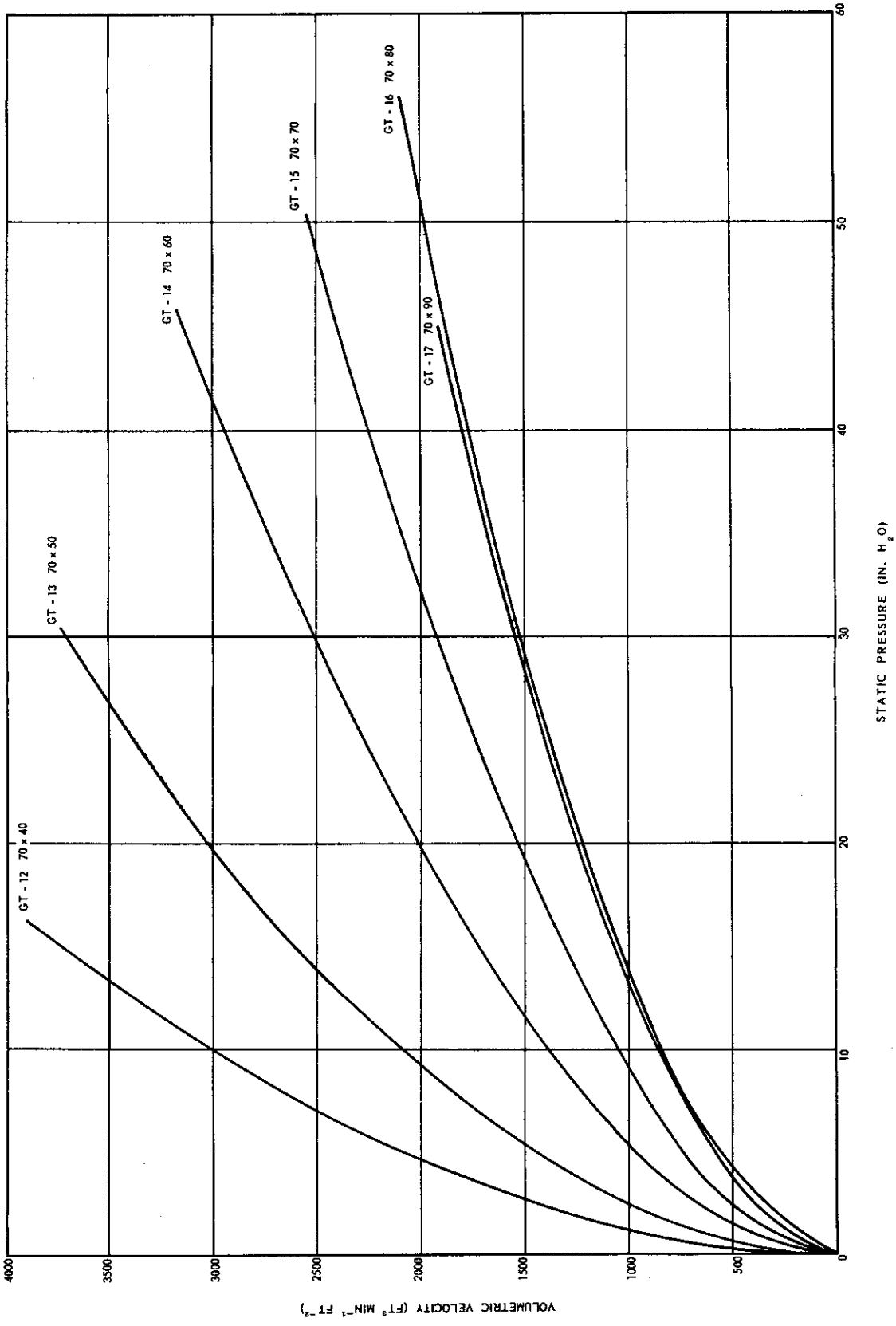

Figure 13. Air Permeability of 70/70 Denier Twill Nylon Cloth.

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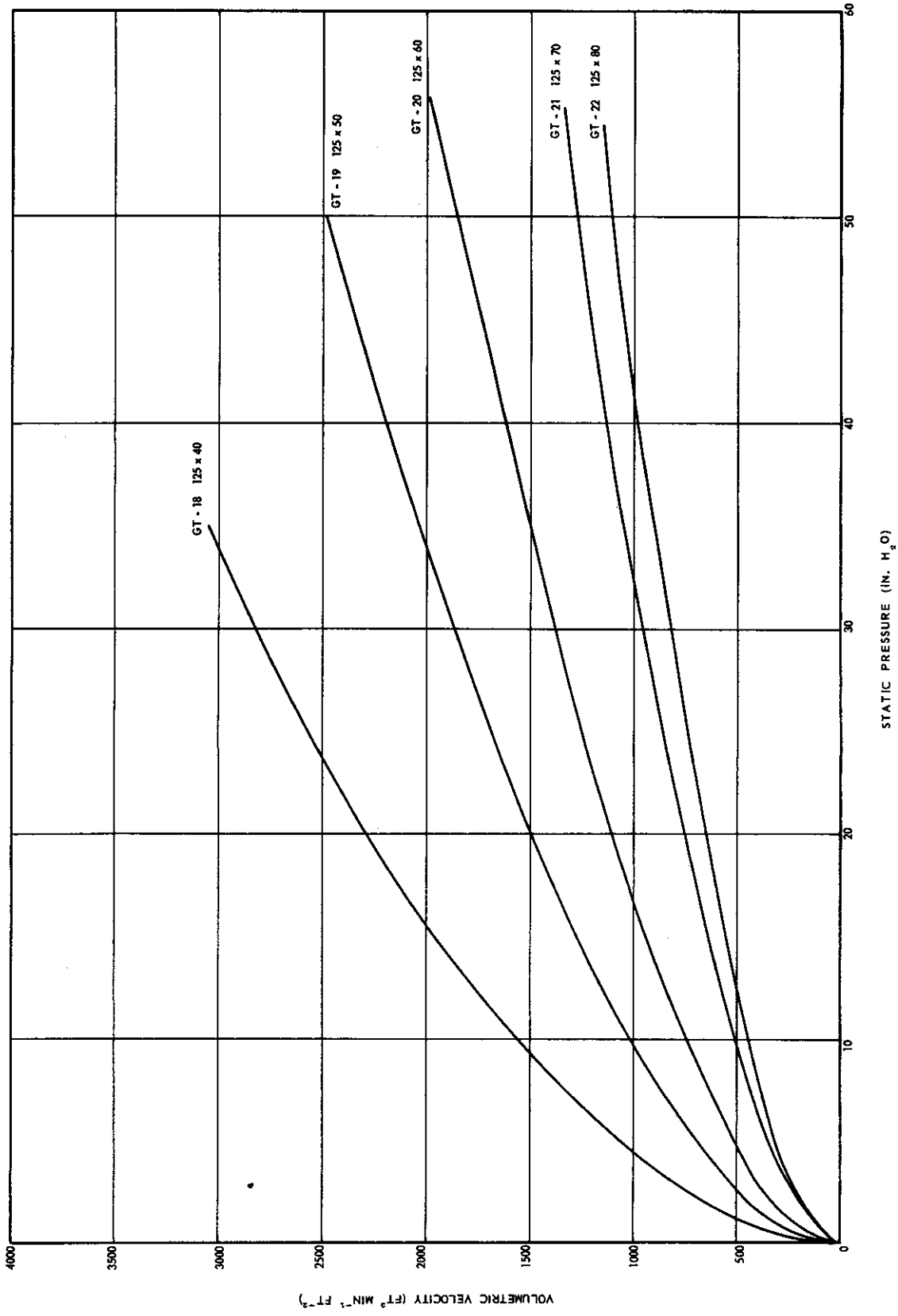

Figure 14. Air Permeability of 40/70 Denier Plain Nylon Cloth.

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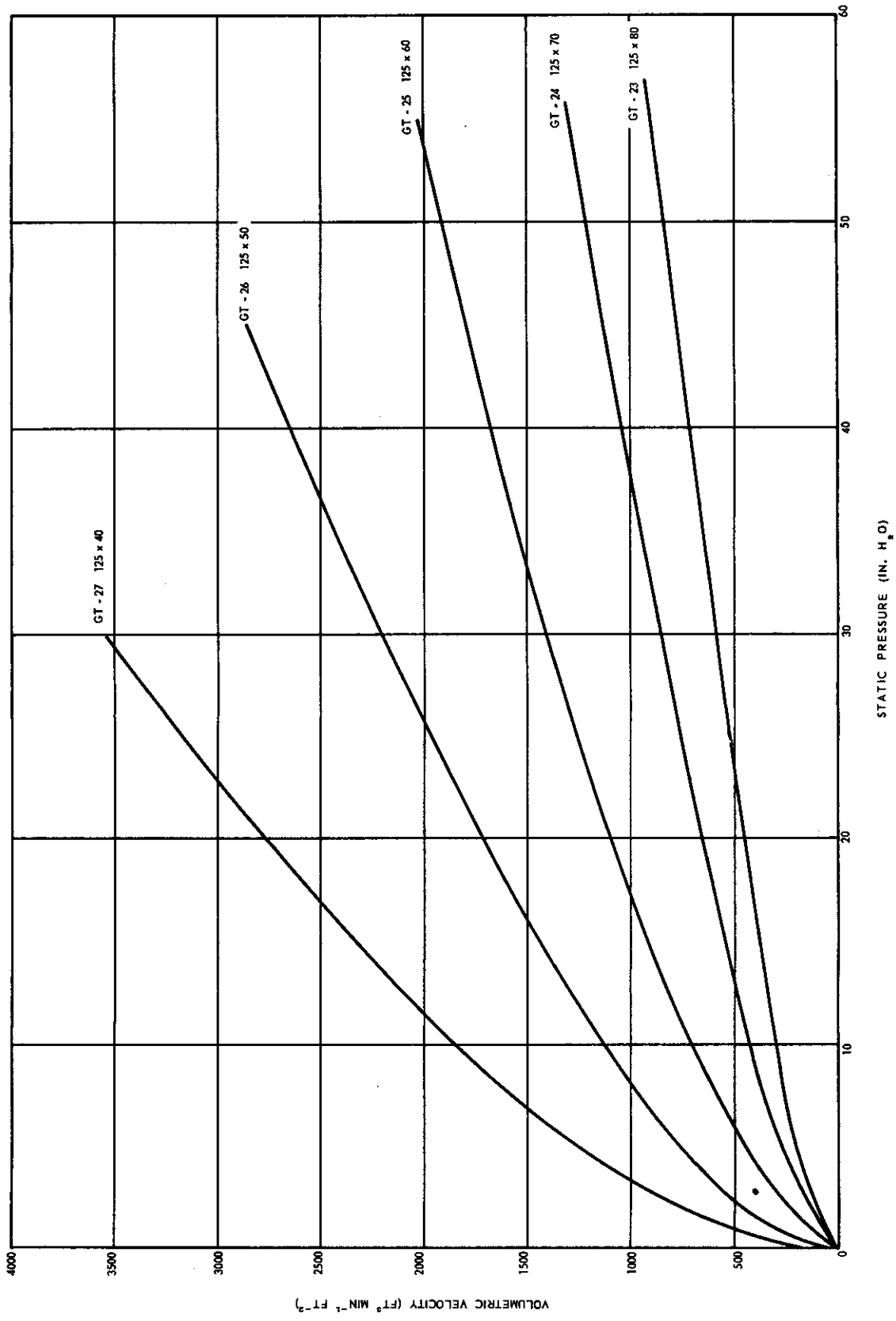

Figure 15. Air Permeability of 40/70 Denier Satin Nylon Cloth.

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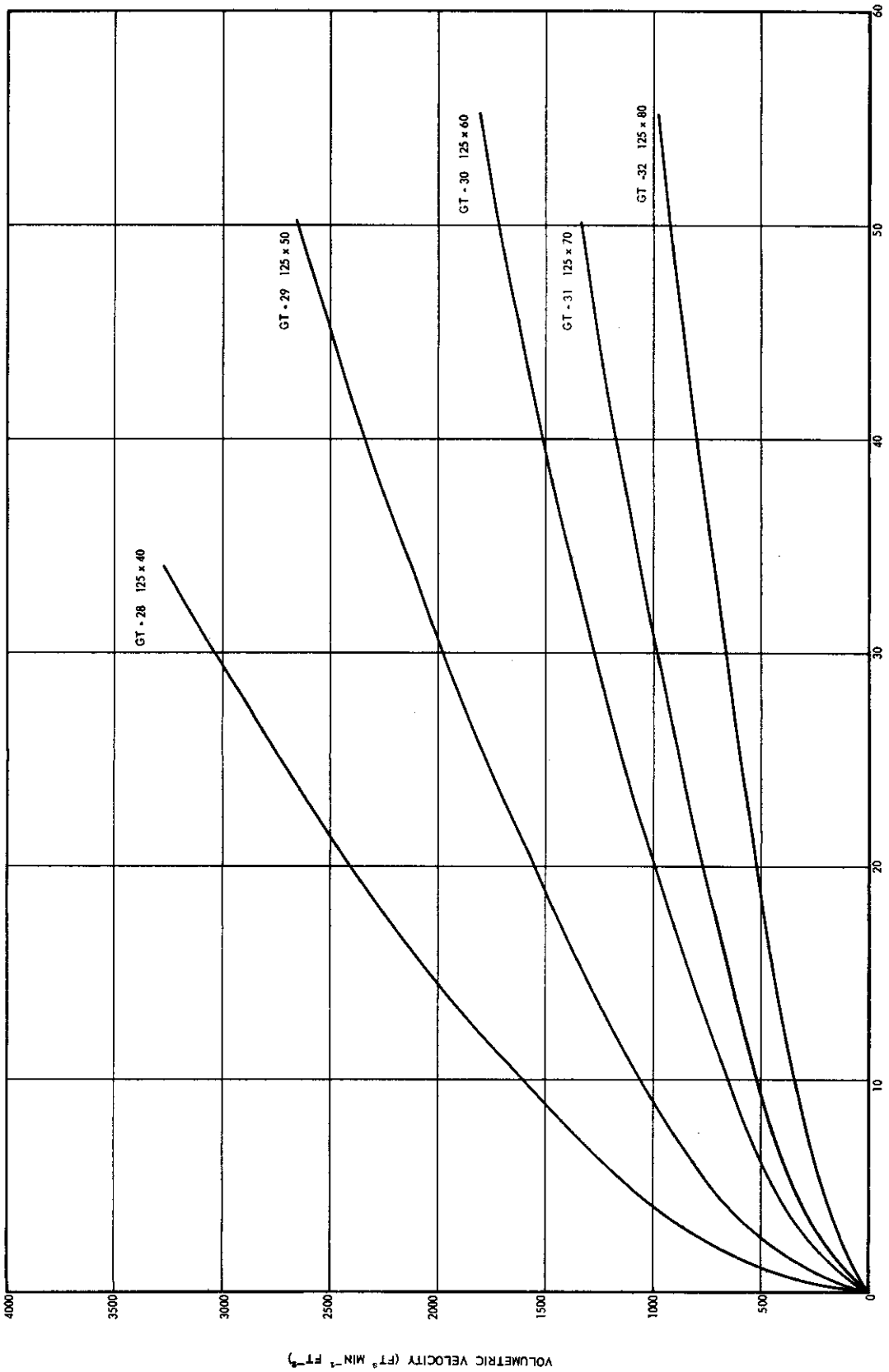

Figure 16. Air Permeability of 40/70 Denier Twill Nylon Cloth.

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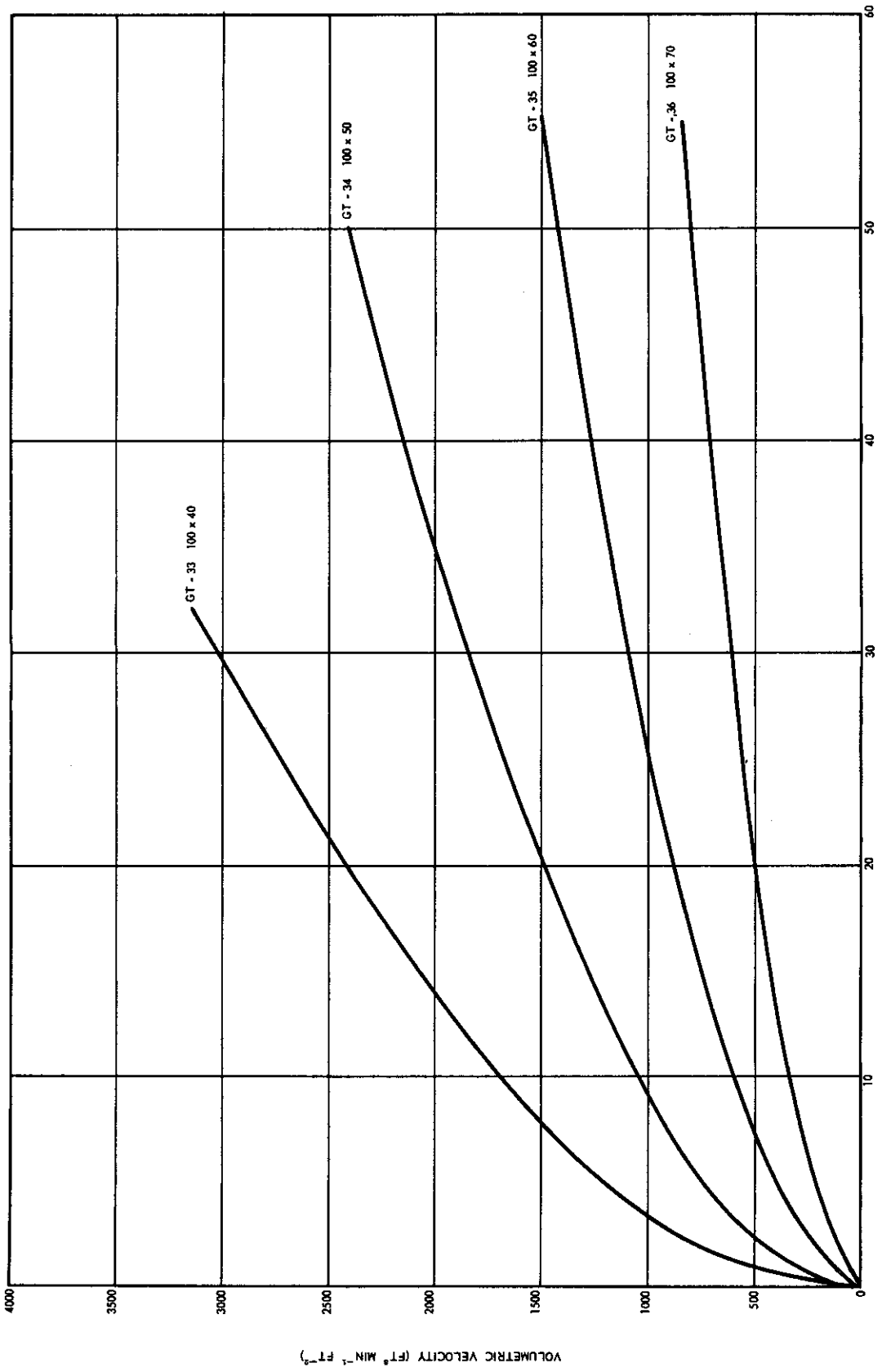

Figure 17. Air Permeability of 75/75 Denier Plain Orlon Cloth.

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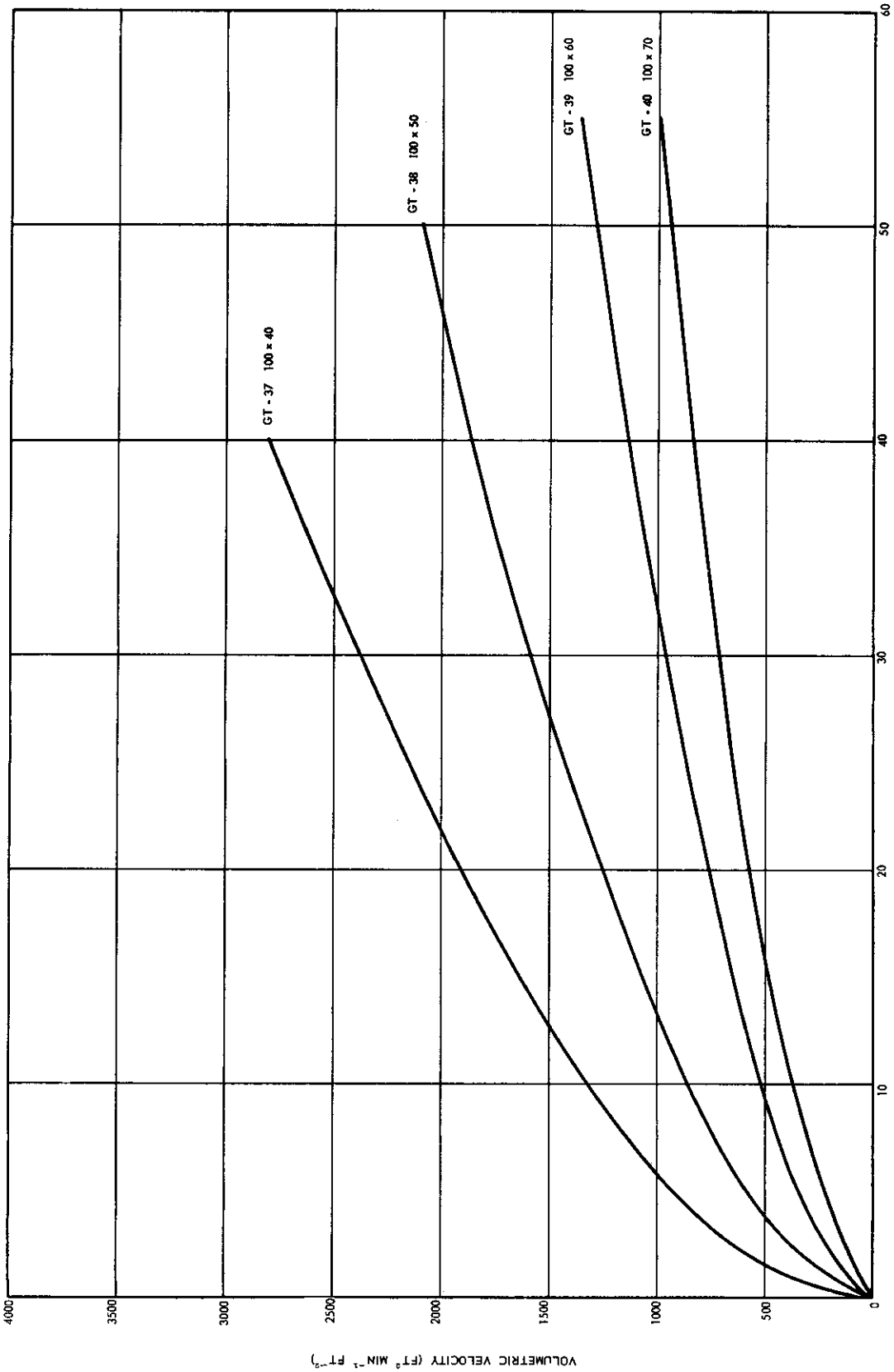

Figure 18. Air Permeability of 75/75 Denier Twill Orlon Cloth.

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Contrails

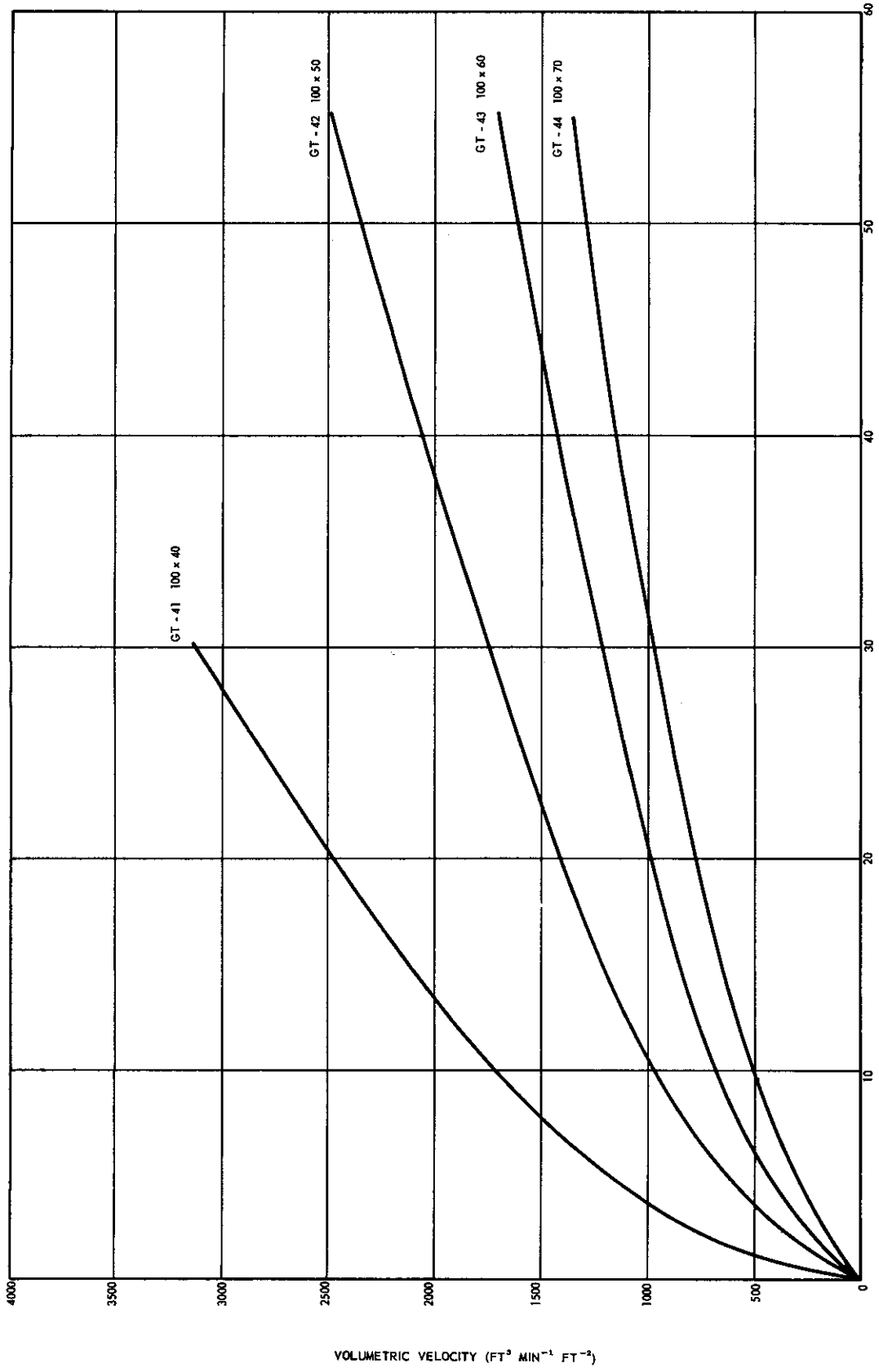

Figure 19. Air Permeability of 75/75 Denier Satin Orlon Cloth.

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Contrails

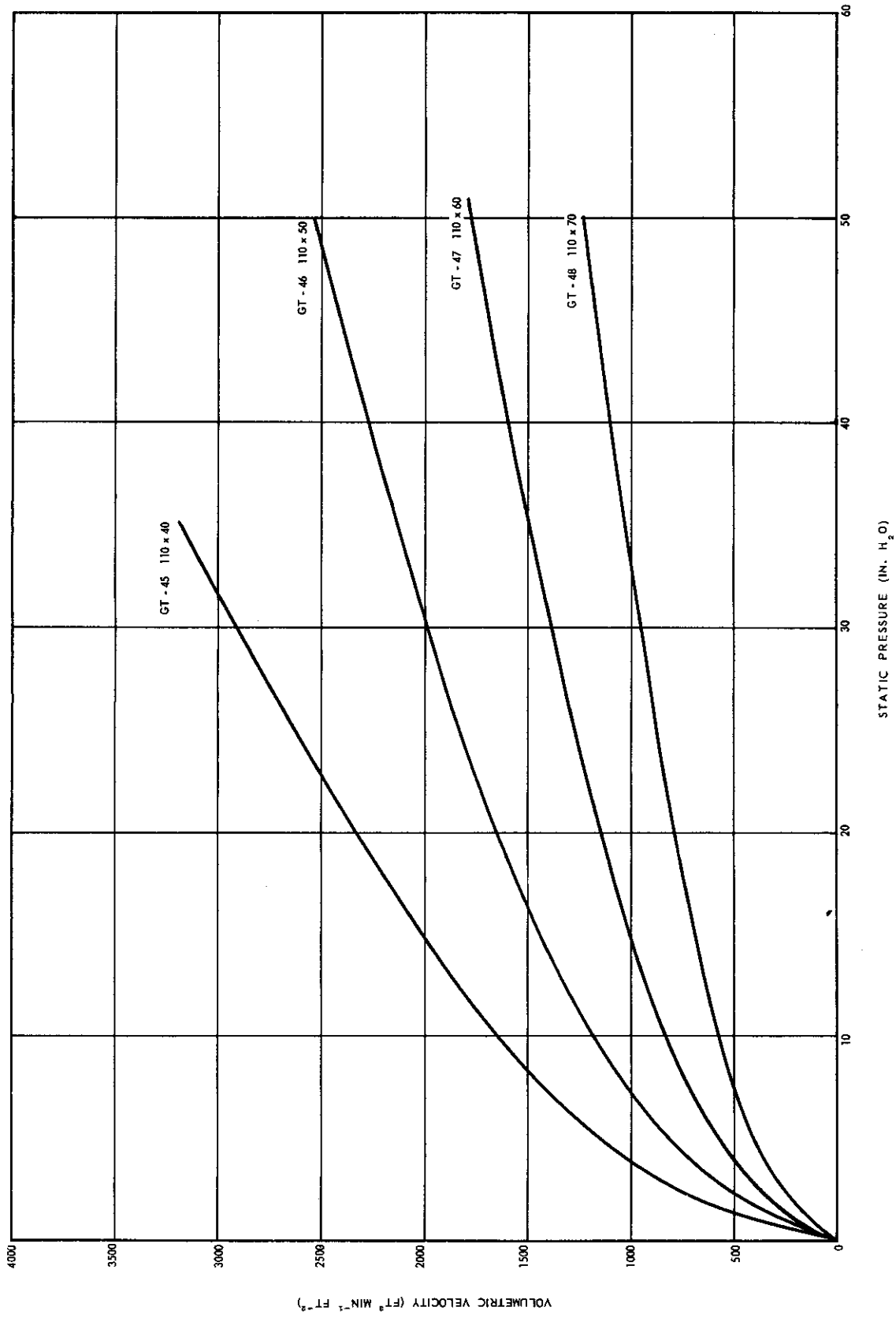

Figure 20. Air Permeability of 70/70 Denier Plain Dacron Cloth.

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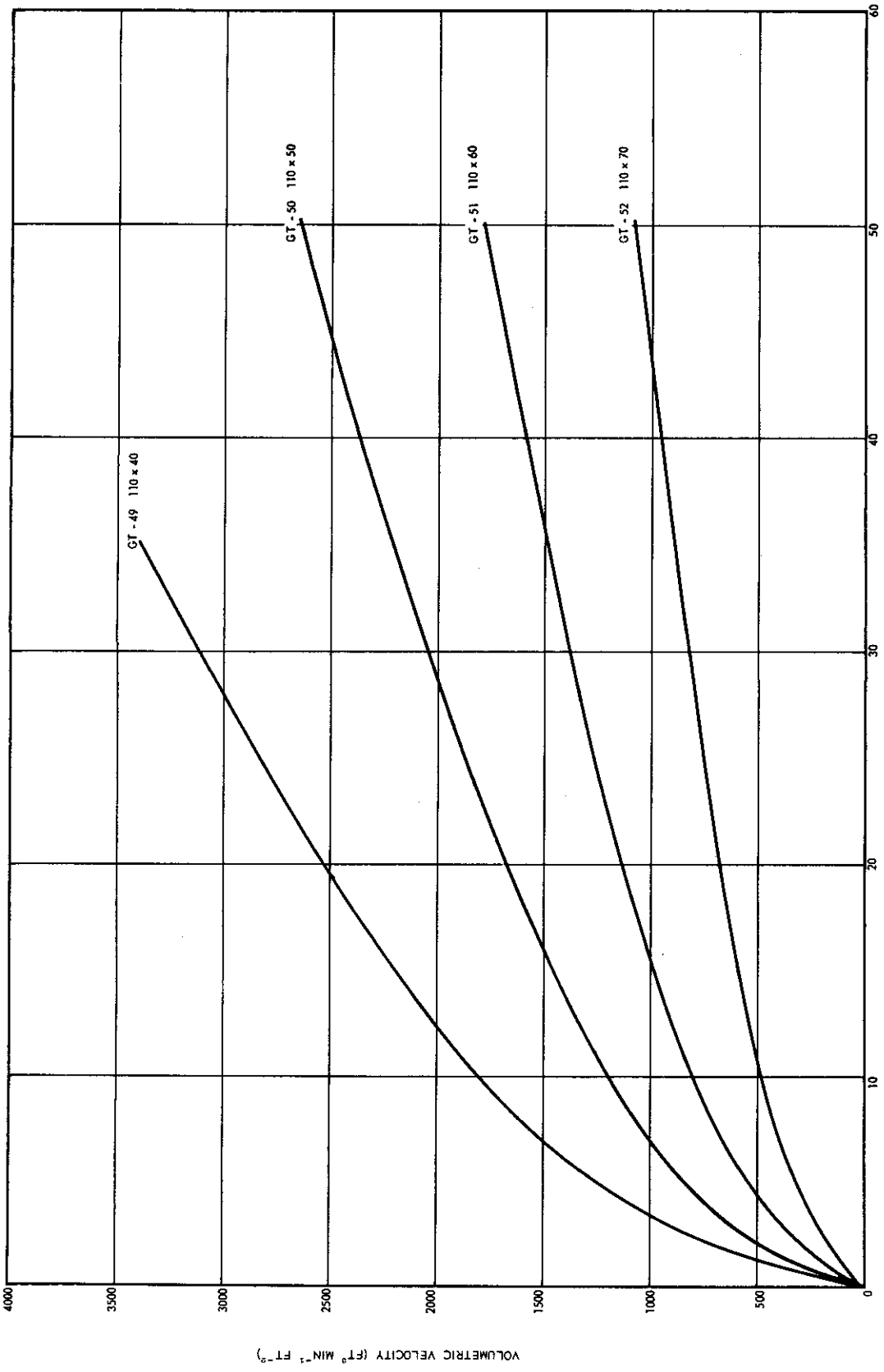

Figure 21. Air Permeability of 70/70 Denier Twill Dacron Cloth.

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Contrails

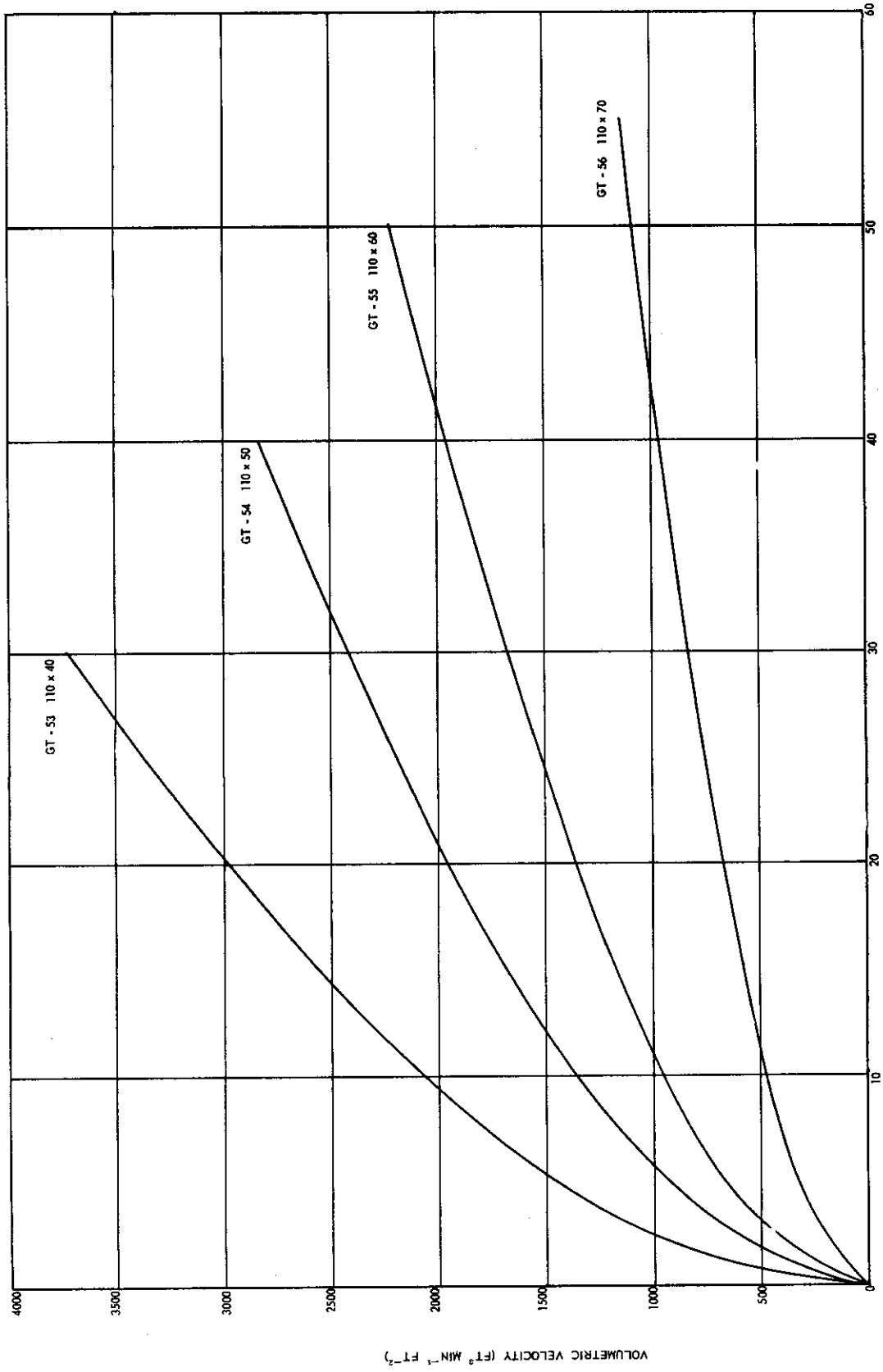

Figure 22. Air Permeability of 70/70 Denier Satin Dacron Cloth.

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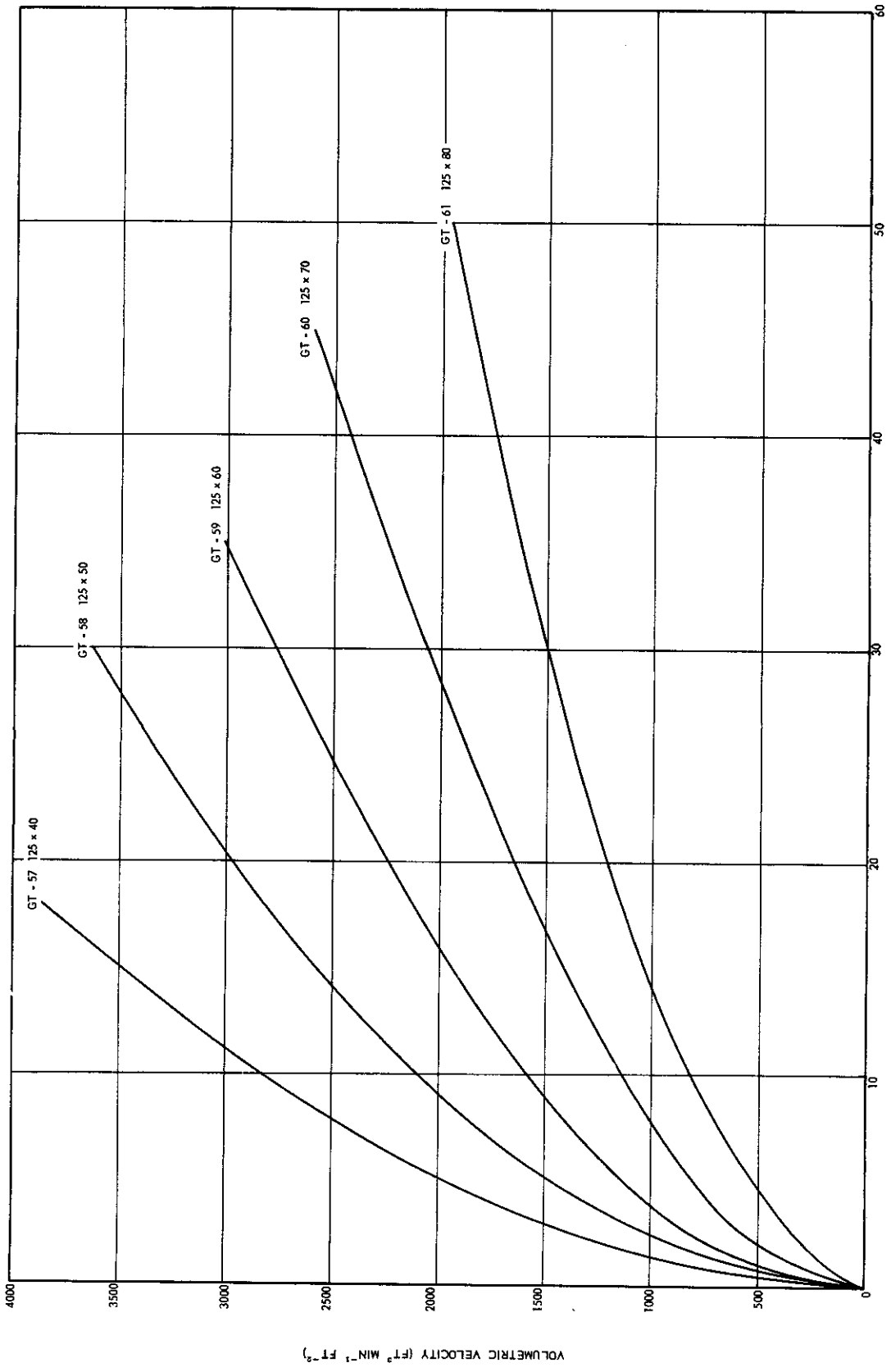

Figure 23. Air Permeability of 40/70 Denier Plain Unfinished Nylon Cloths.

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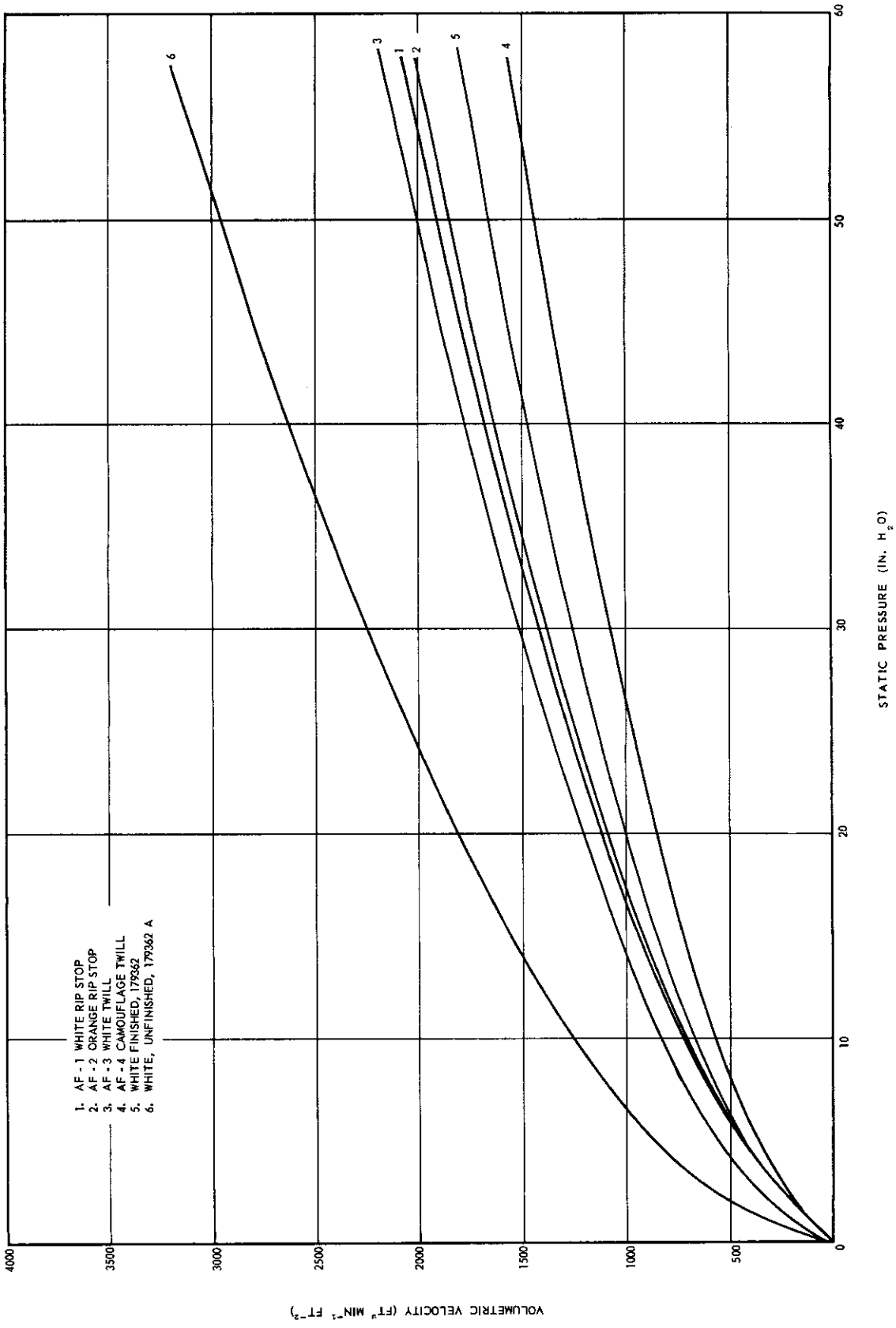

Figure 24. Air Permeability of Air Force-Furnished Cloth ES-1 Through ES-6.

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Contrails

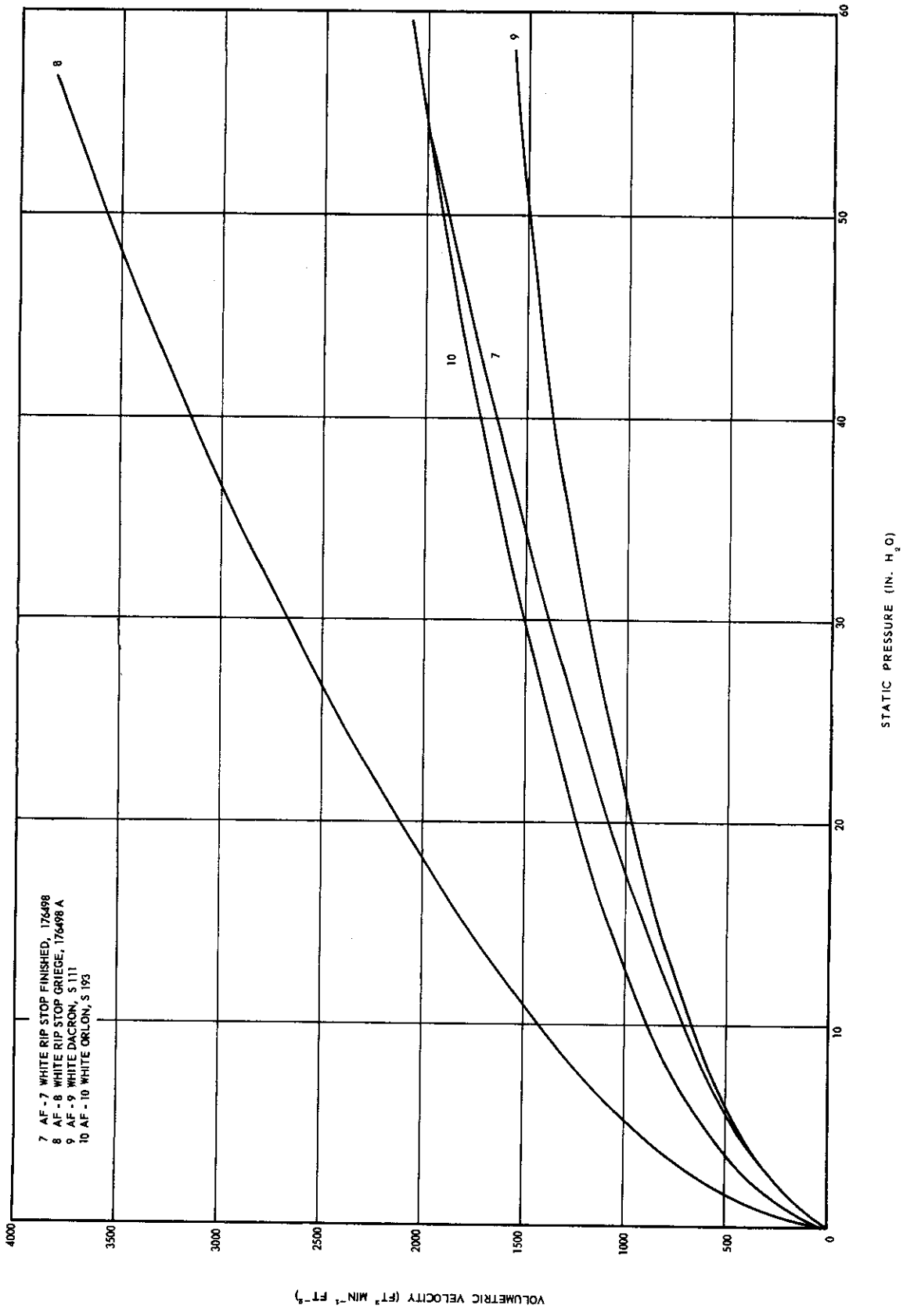

Figure 25. Air Permeability of Air Force-Furnished Cloth ES-7 Through ES-10.

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Contrails

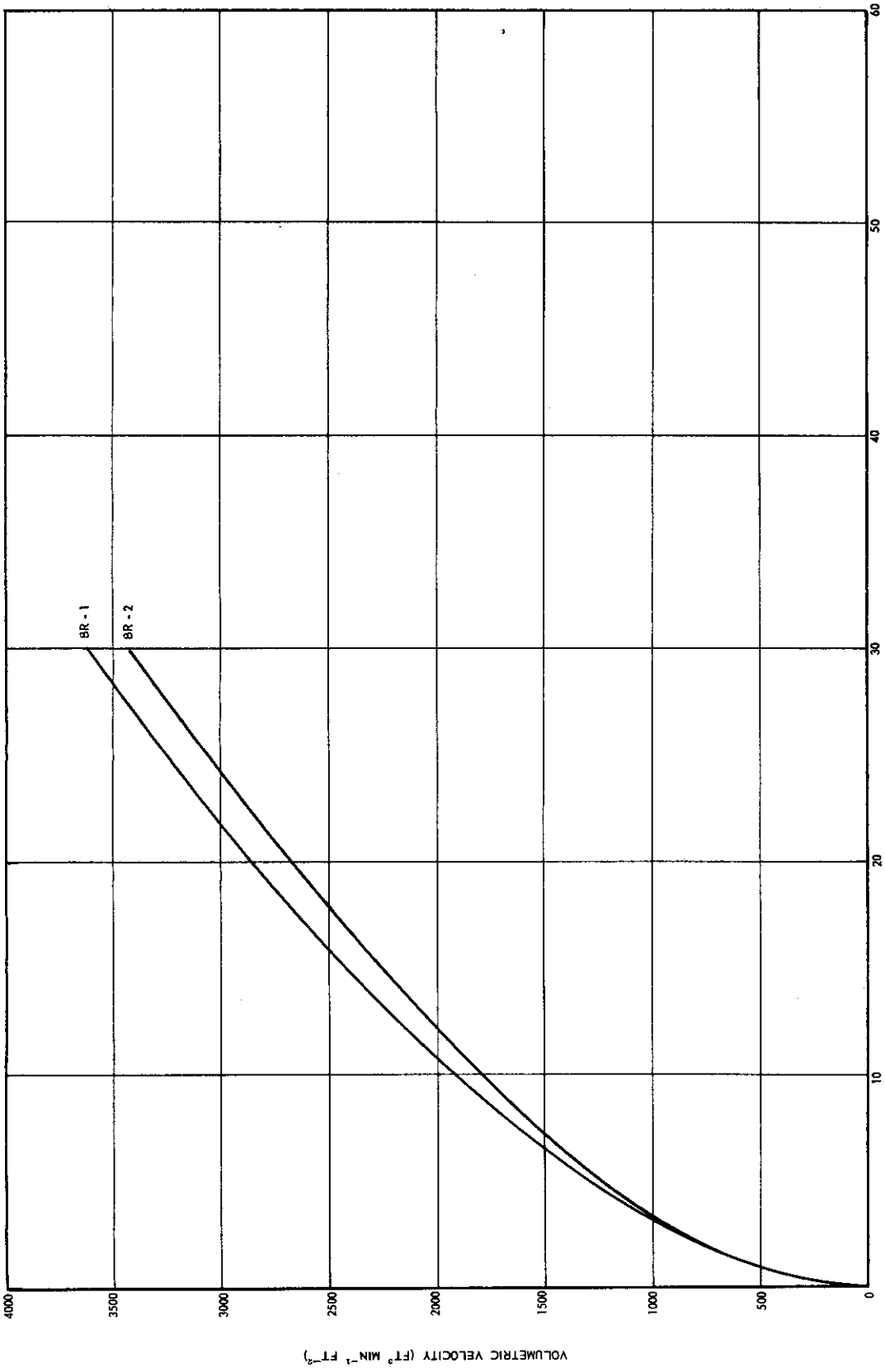

Figure 26. Air Permeability of Bally Ribbon Cloth BR-1 Through BR-2.

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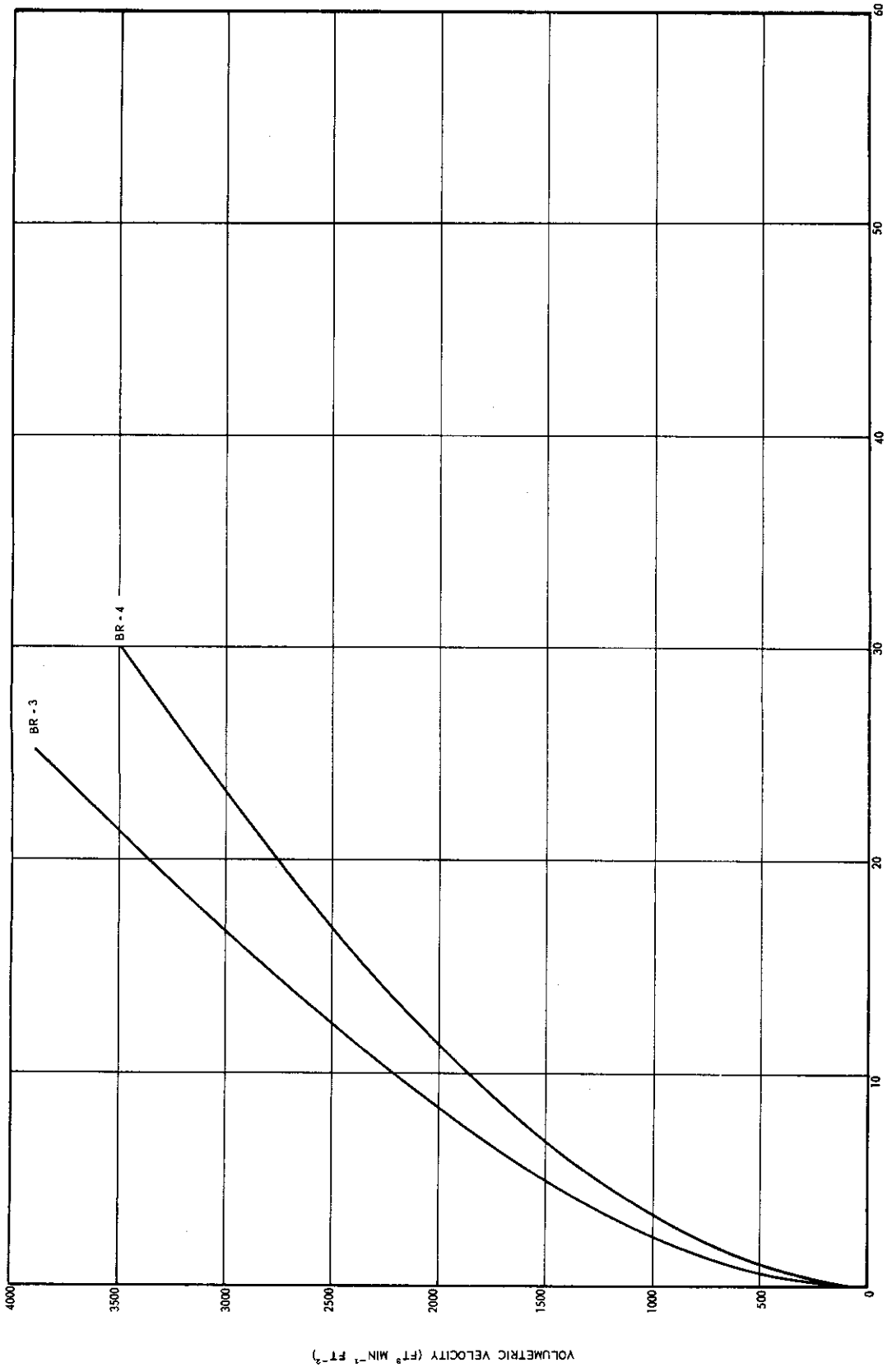

Figure 27. Air Permeability of Bally Ribbon Cloth BR-3 Through BR-4.

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Contrails

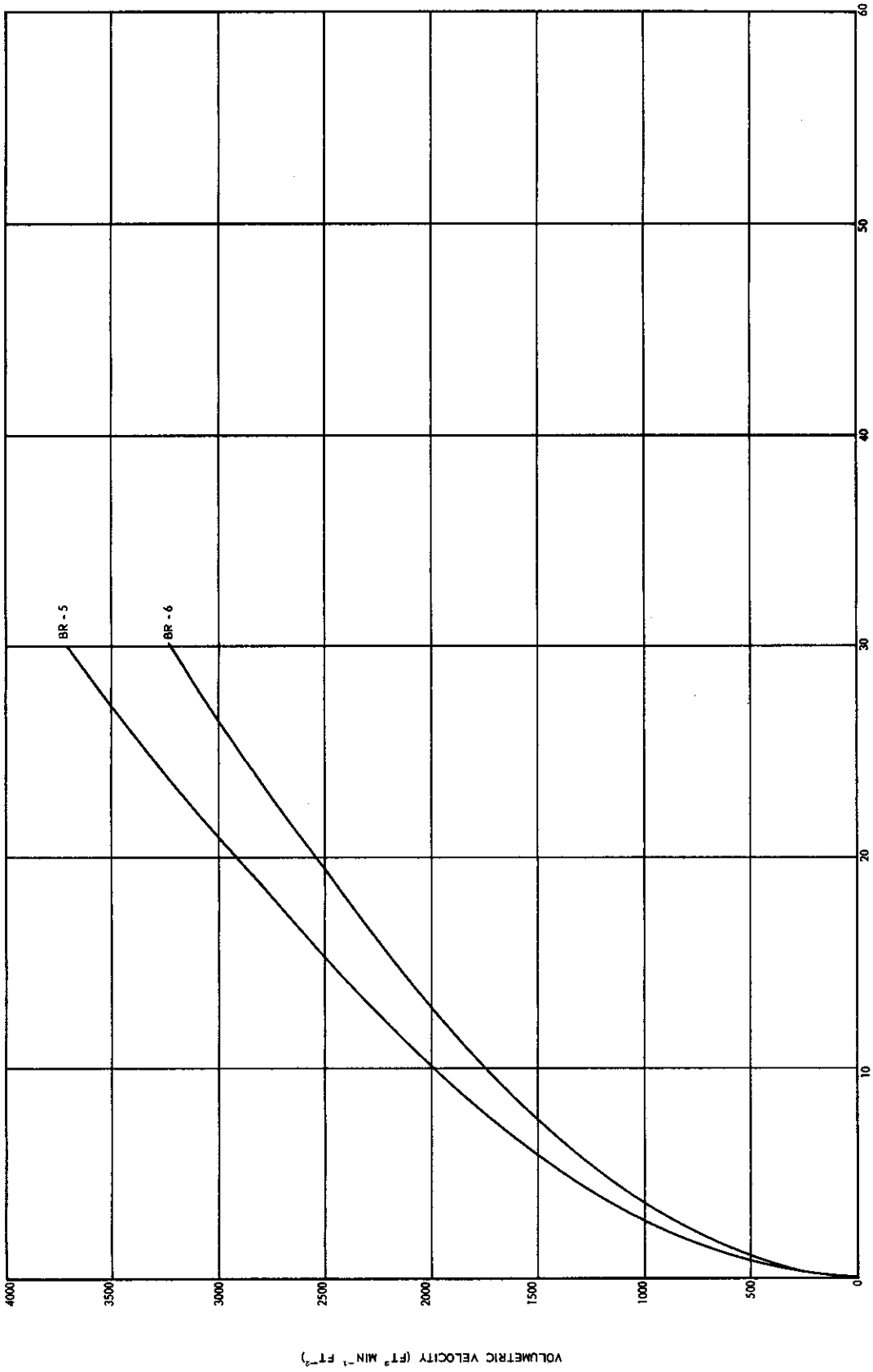

Figure 28. Air Permeability of Bally Ribbon Cloth BR-5 Through BR-6.

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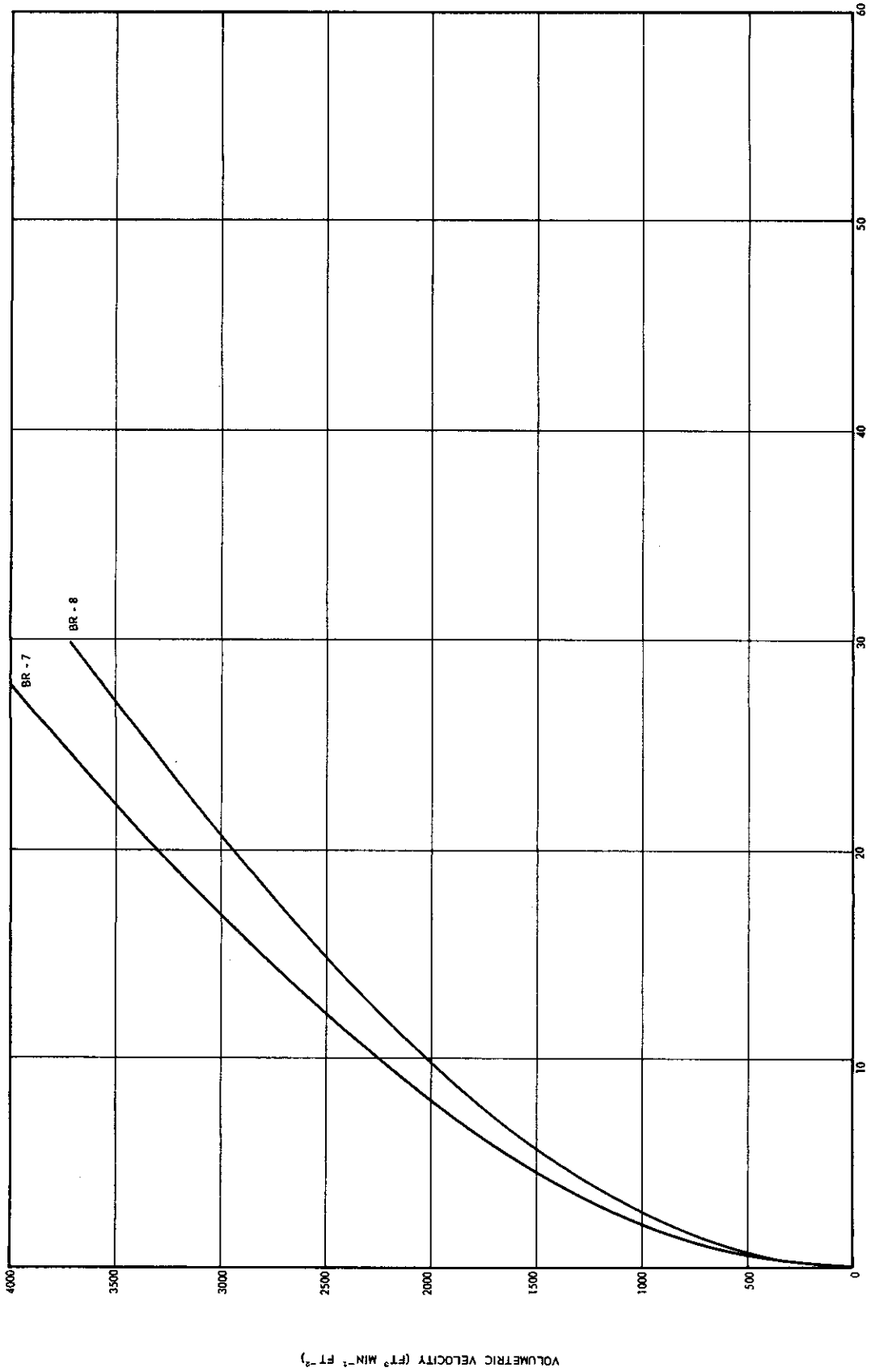

Figure 29. Air Permeability of Bally Ribbon Cloth BR-7 Through BR-8.

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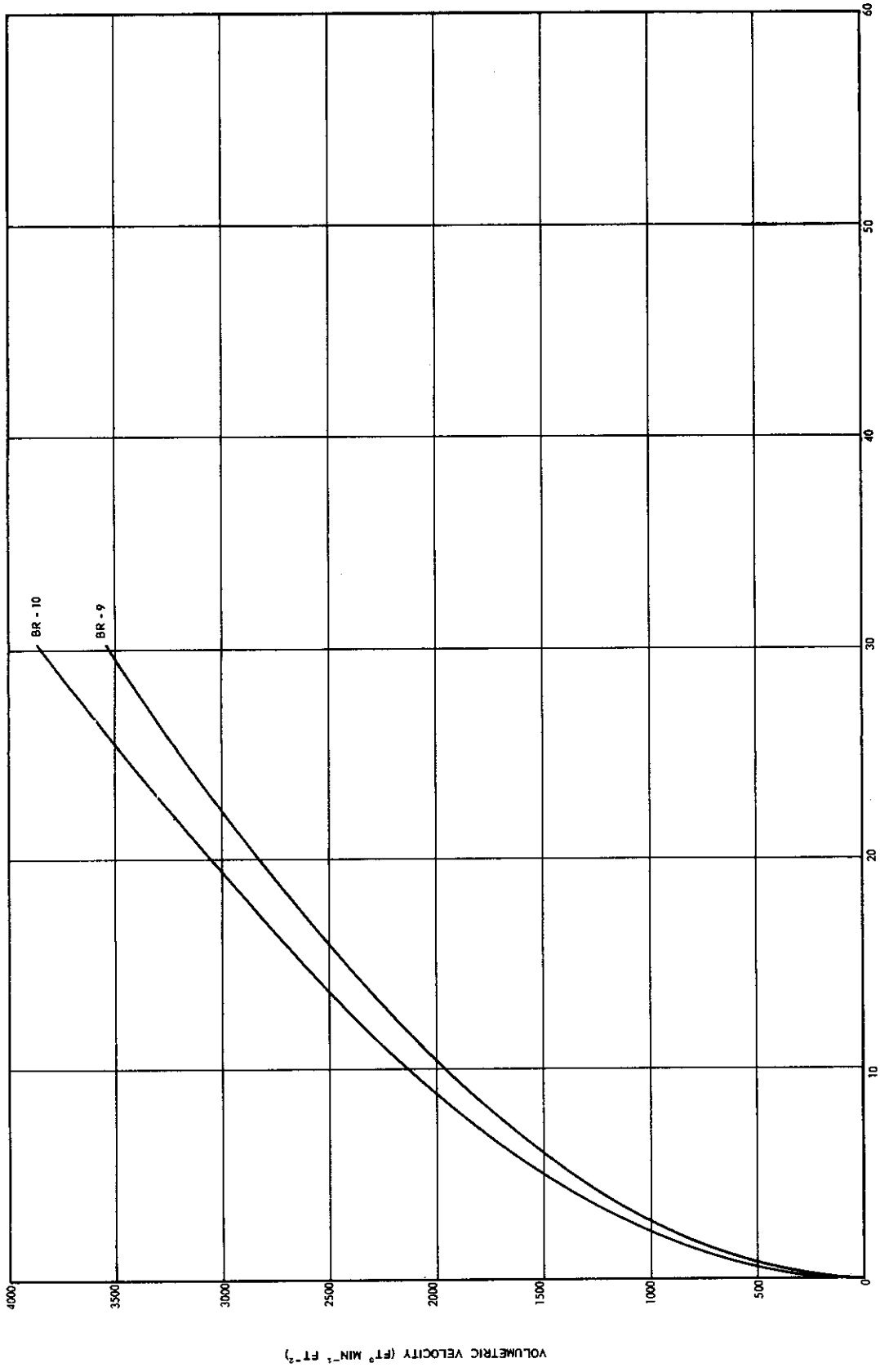

Figure 30. Air Permeability of Bally Ribbon Cloth BR-9 Through BR-10.

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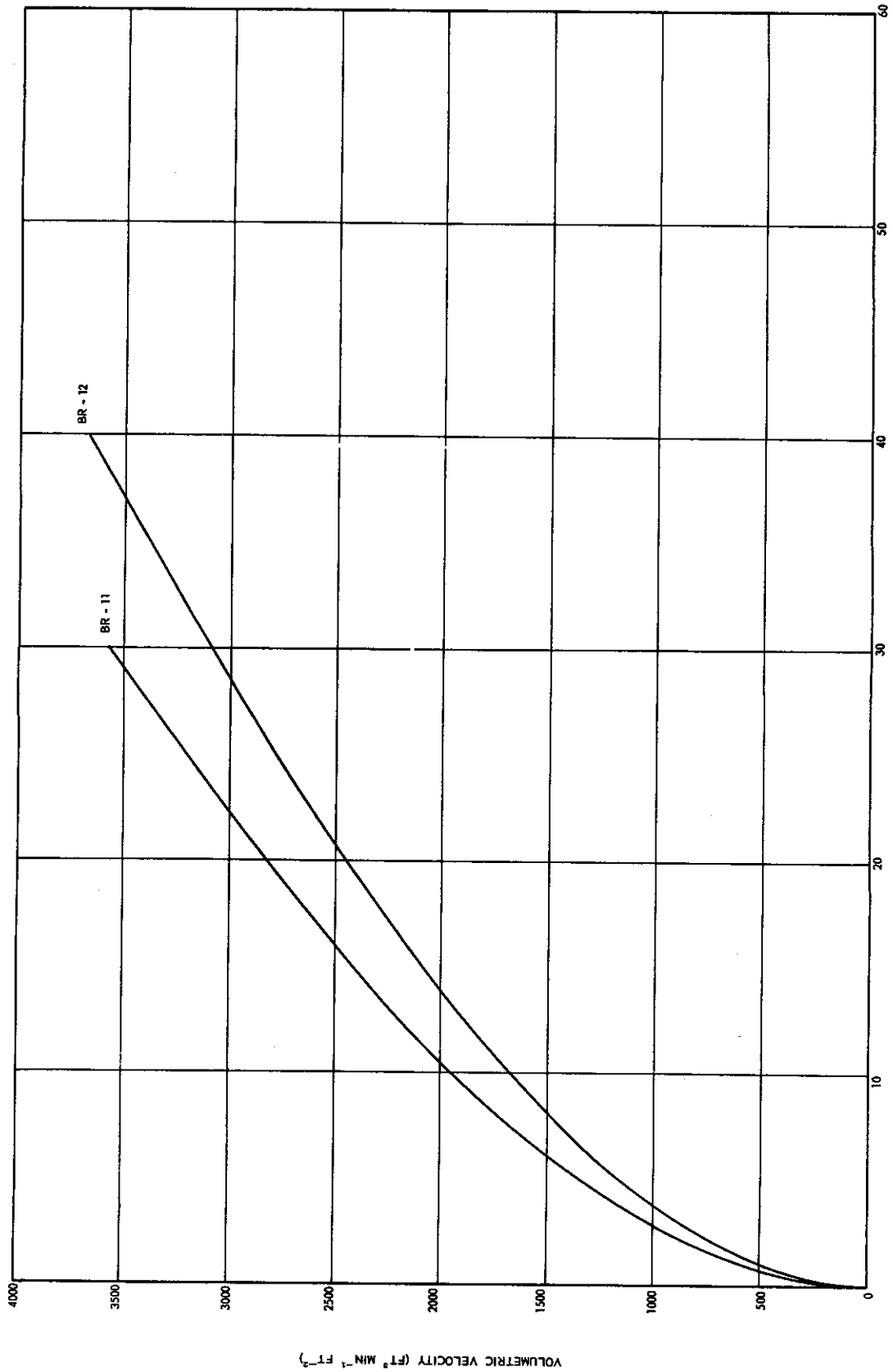

Figure 31. Air Permeability of Bally Ribbon Cloth BR-11 Through BR-12.

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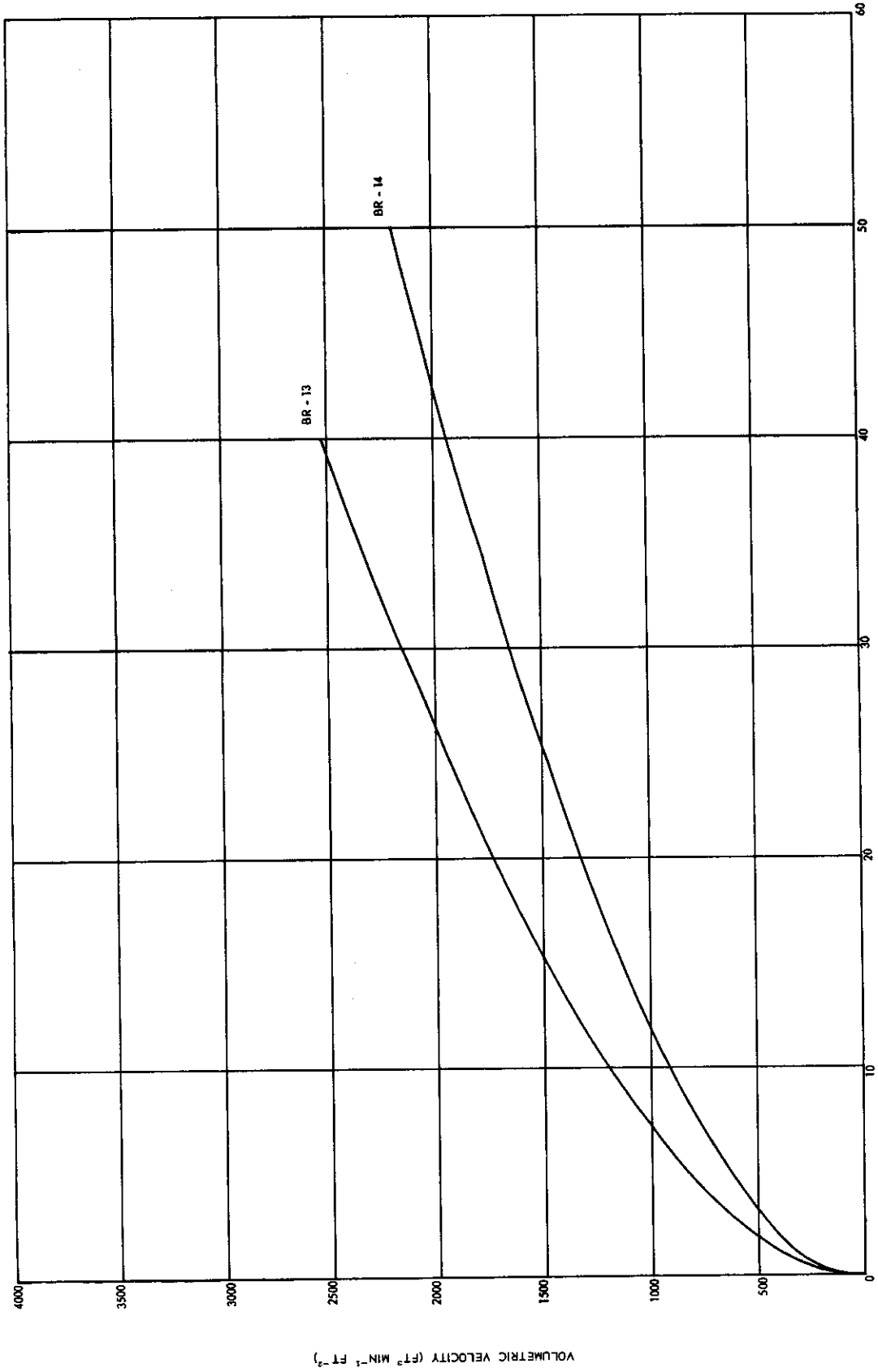

Figure 32. Air Permeability of Bally Ribbon Cloth BR-13 Through BR-14.

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Contrails

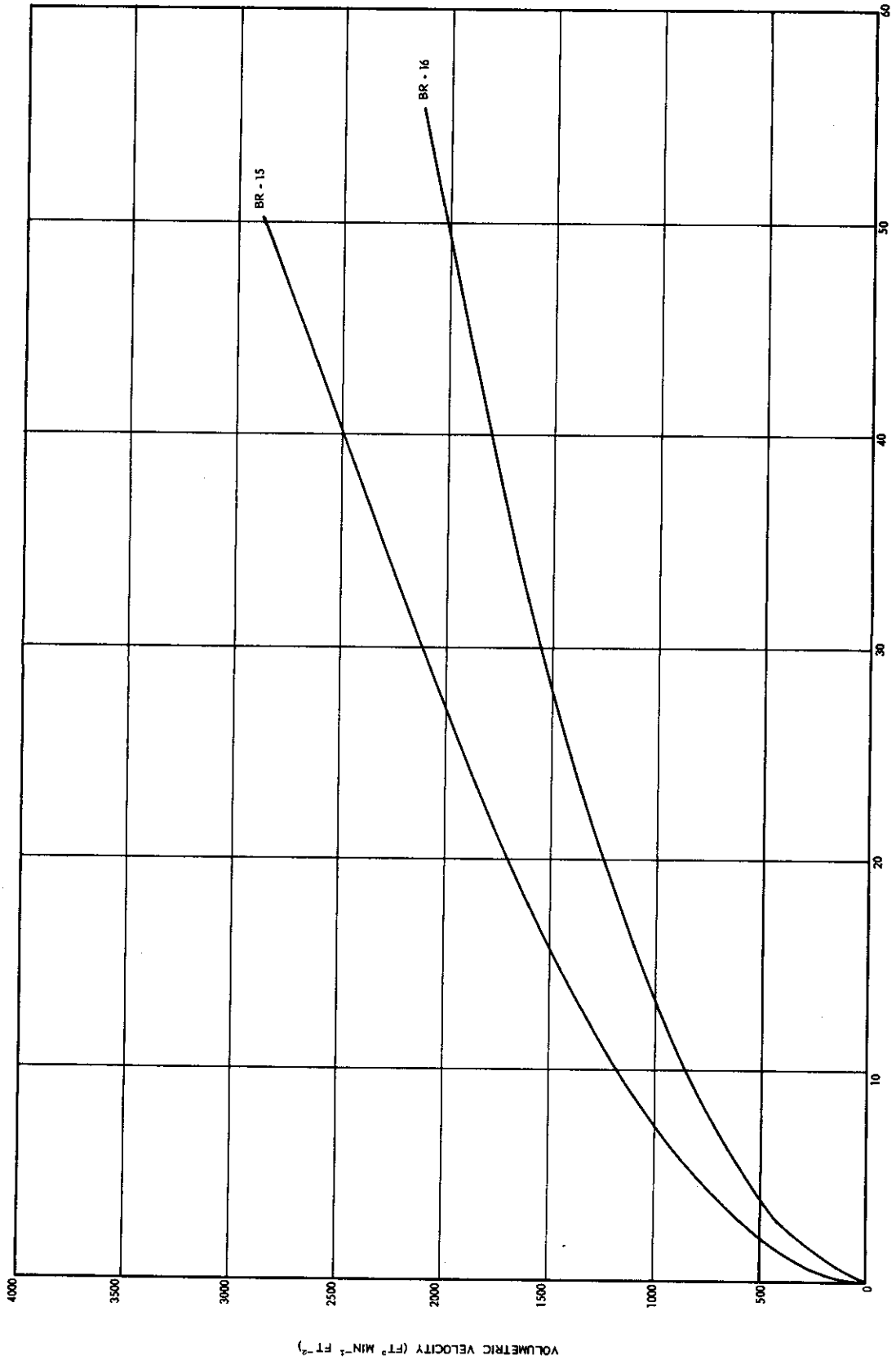

Figure 33. Air Permeability of Bally Ribbon Cloth BR-15 Through BR-16.

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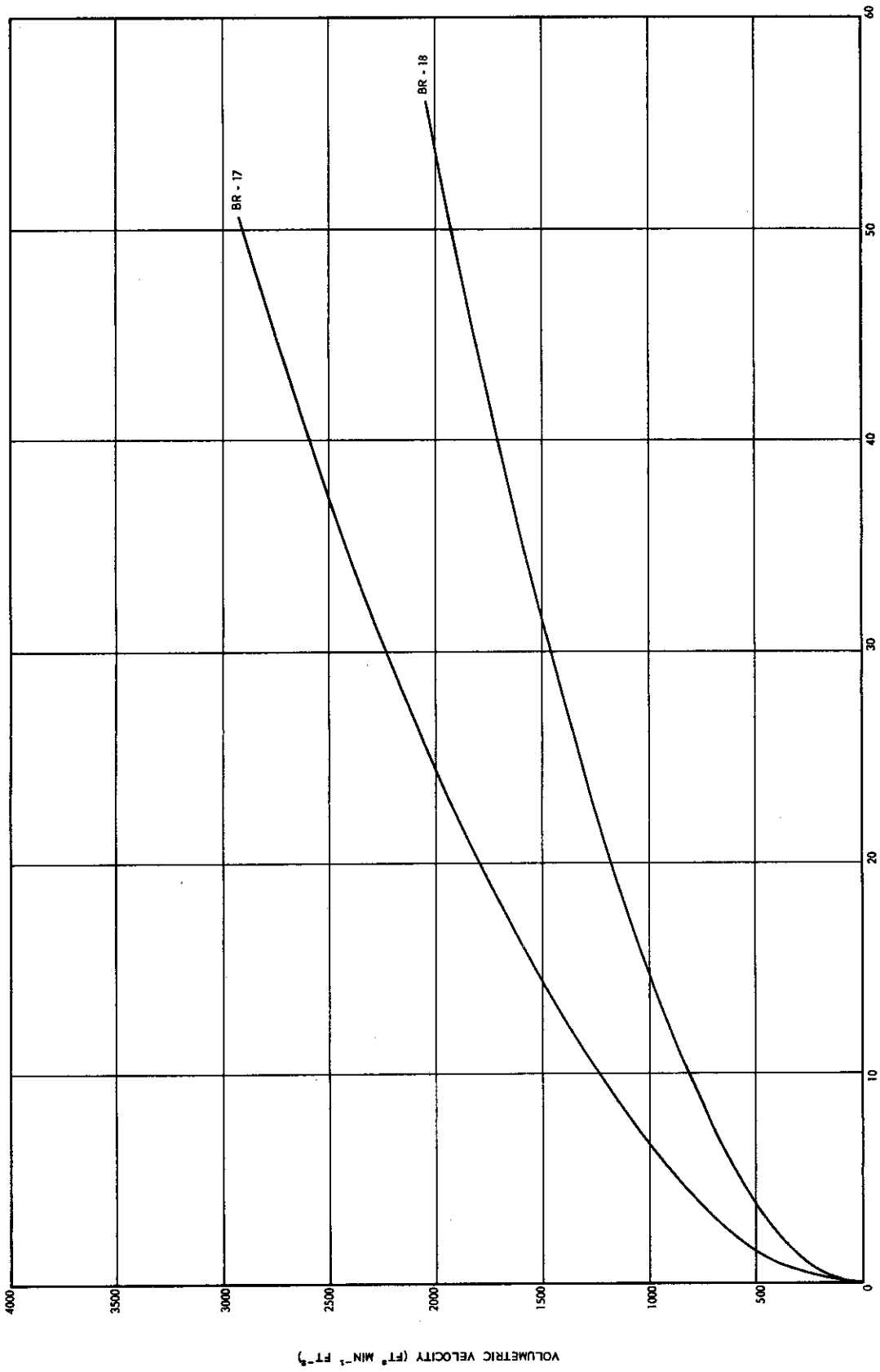

Figure 34. Air Permeability of Bally Ribbon Cloth BR-17 Through BR-18.

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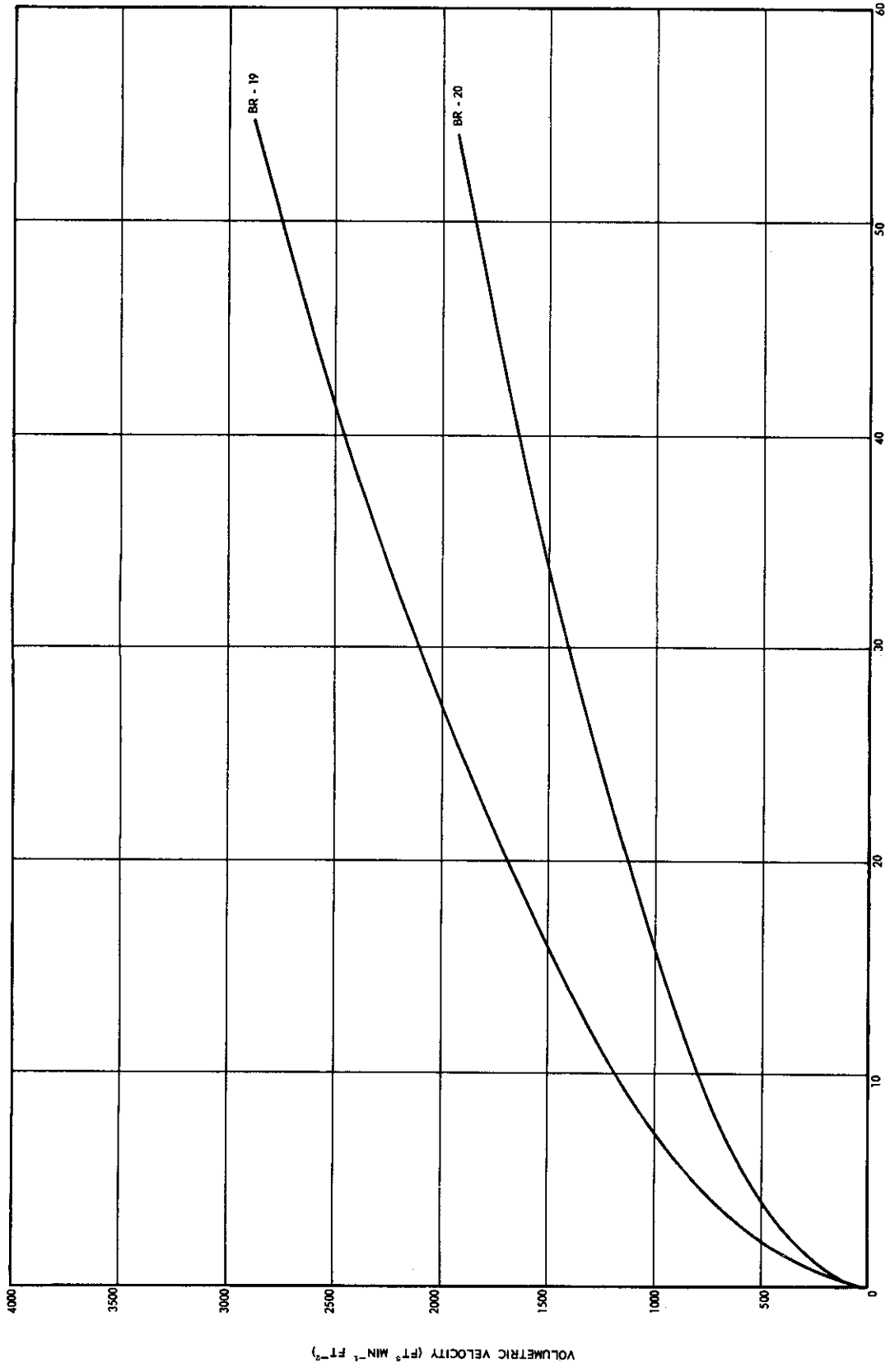

Figure 35. Air Permeability of Bally Ribbon Cloth BR-19 Through BR-20.

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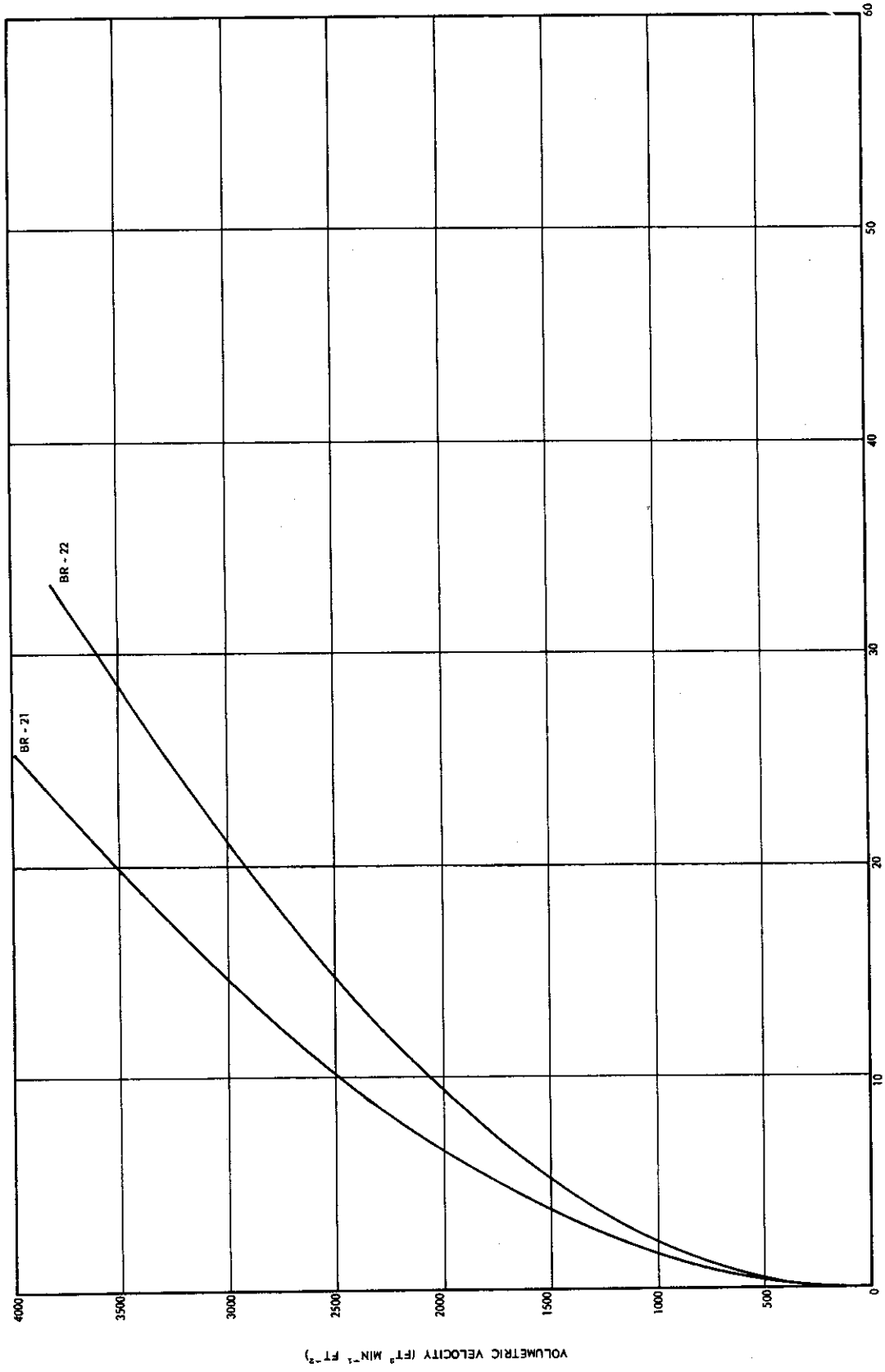

Figure 36. Air Permeability of Bally Ribbon Cloth BR-21 Through BR-22.

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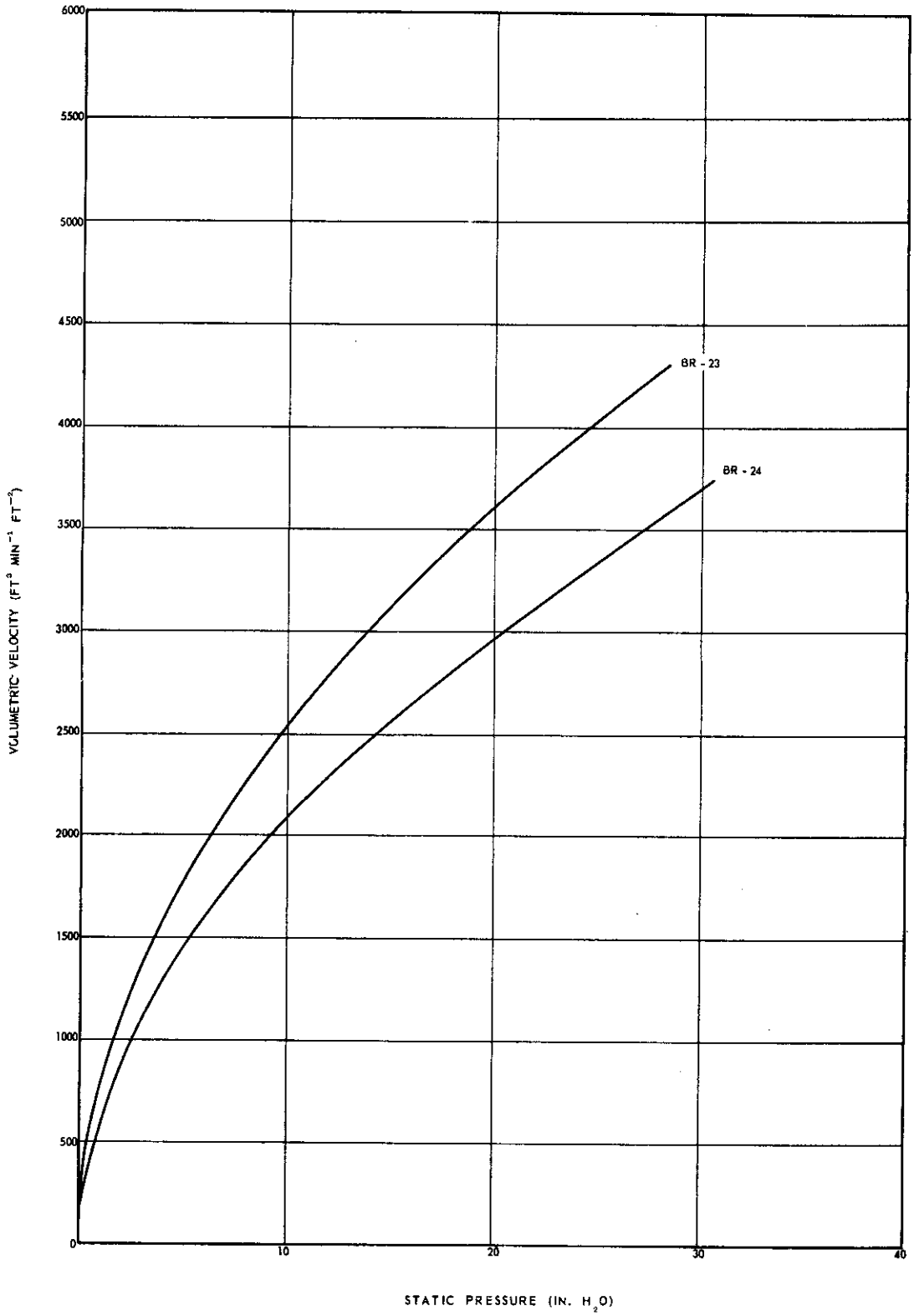

Figure 37. Air Permeability of Bally Ribbon Cloth BR-23 Through BR-24.

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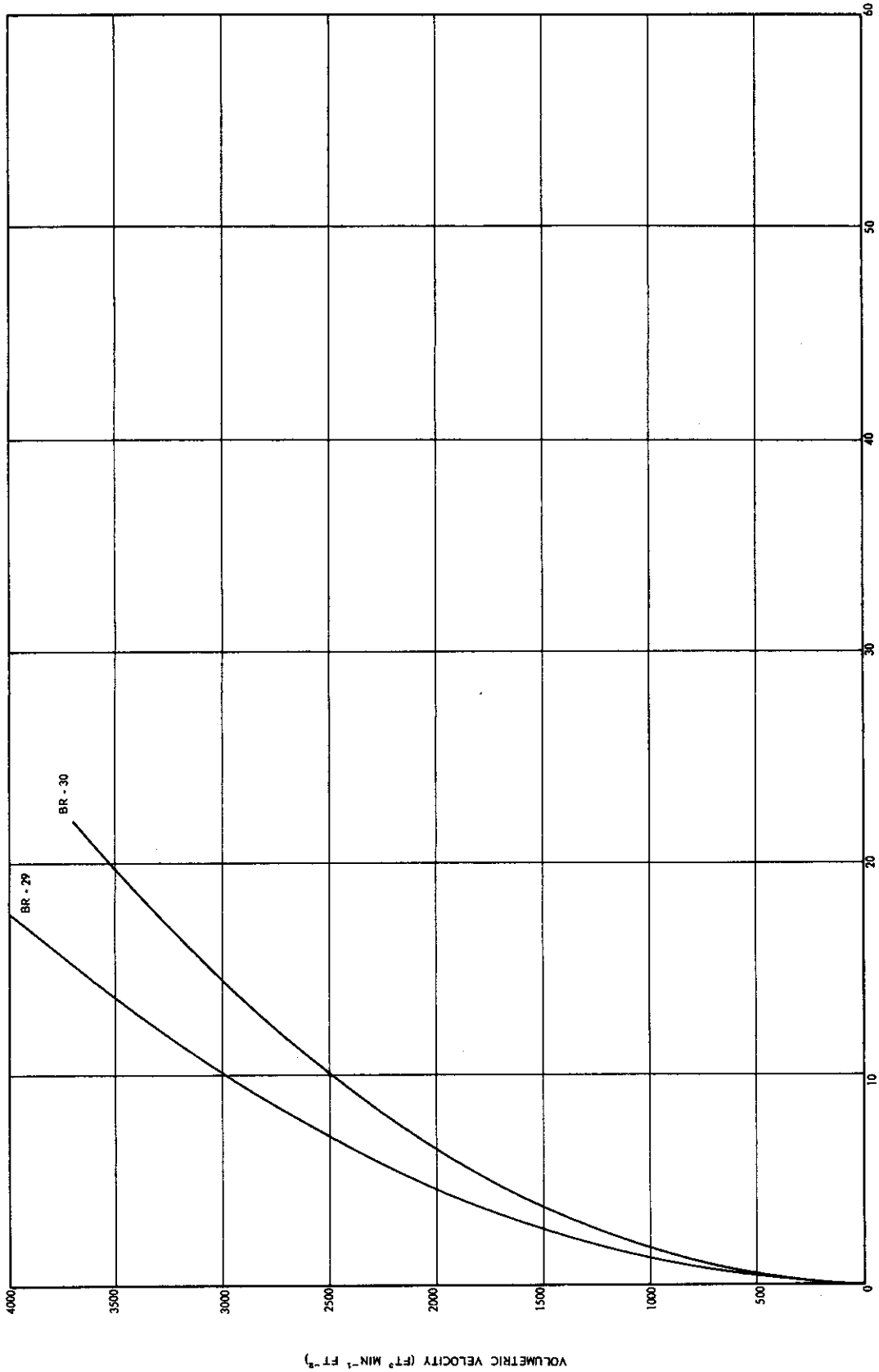

Figure 38. Air Permeability of Bally Ribbon Cloth BR-29 Through BR-30.

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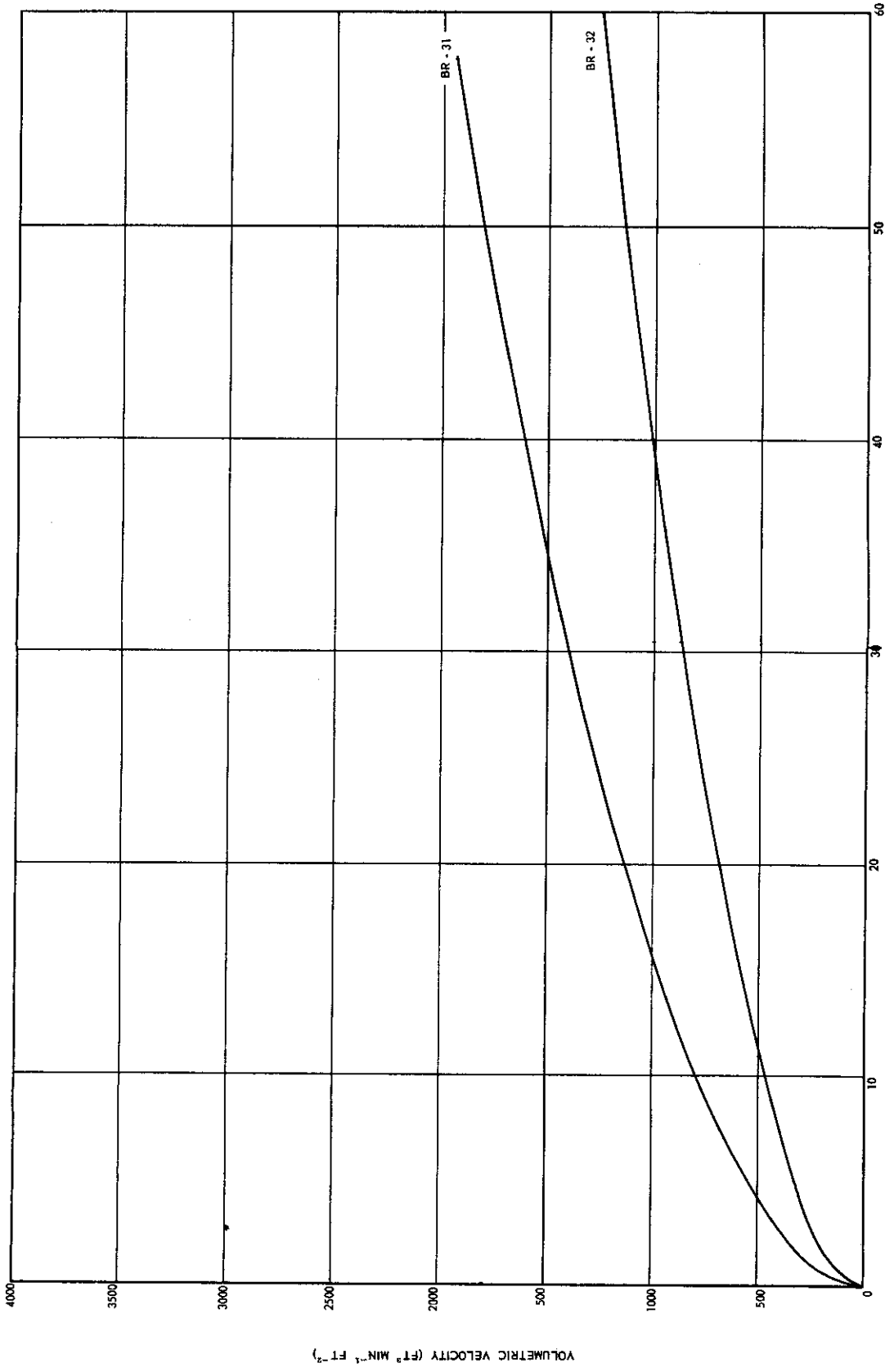

Figure 39. Air Permeability of Bally Ribbon Cloth BR-31 Through BR-32.

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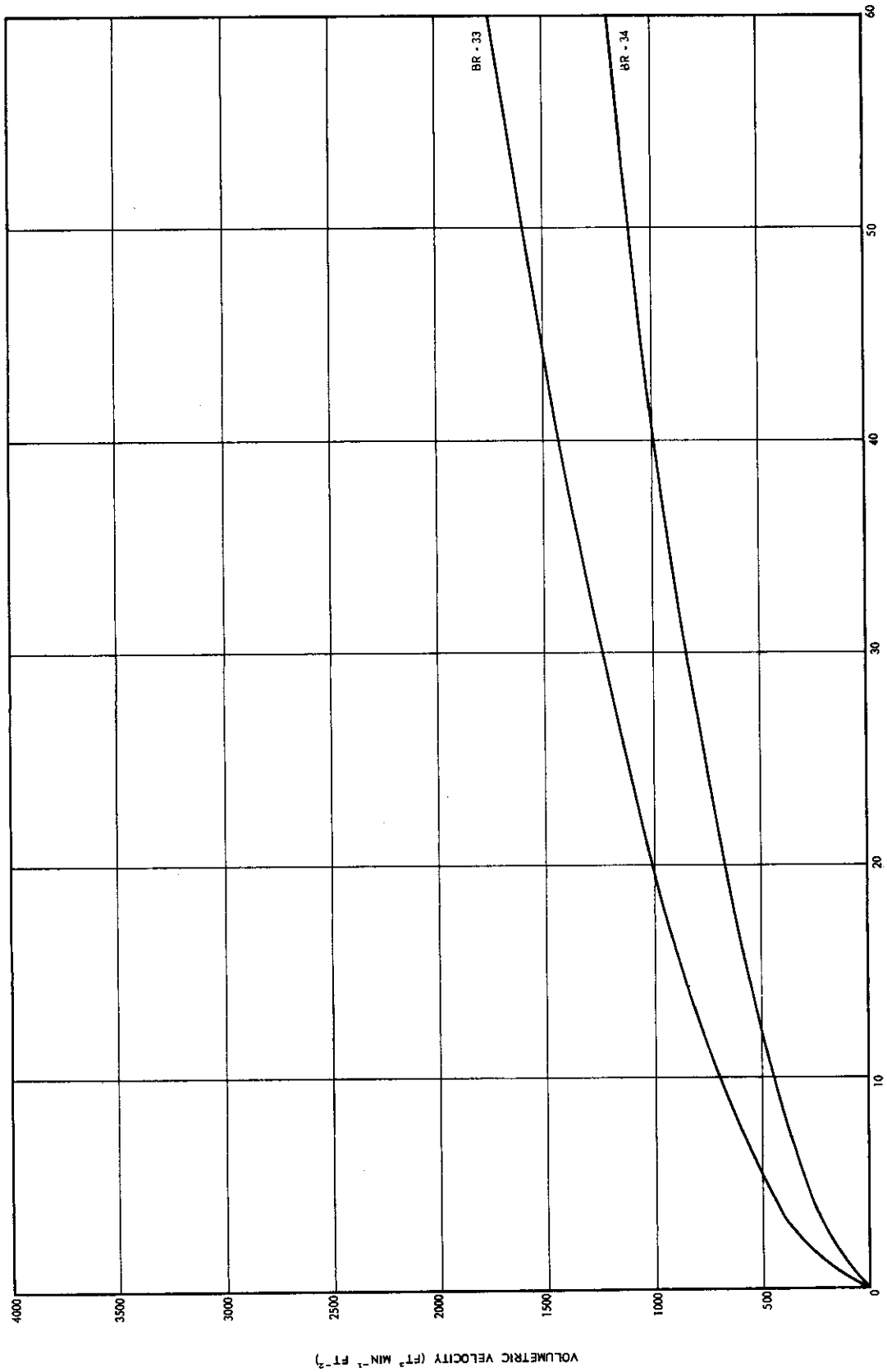

Figure 40. Air Permeability of Bally Ribbon Cloth BR-33 Through BR-34.

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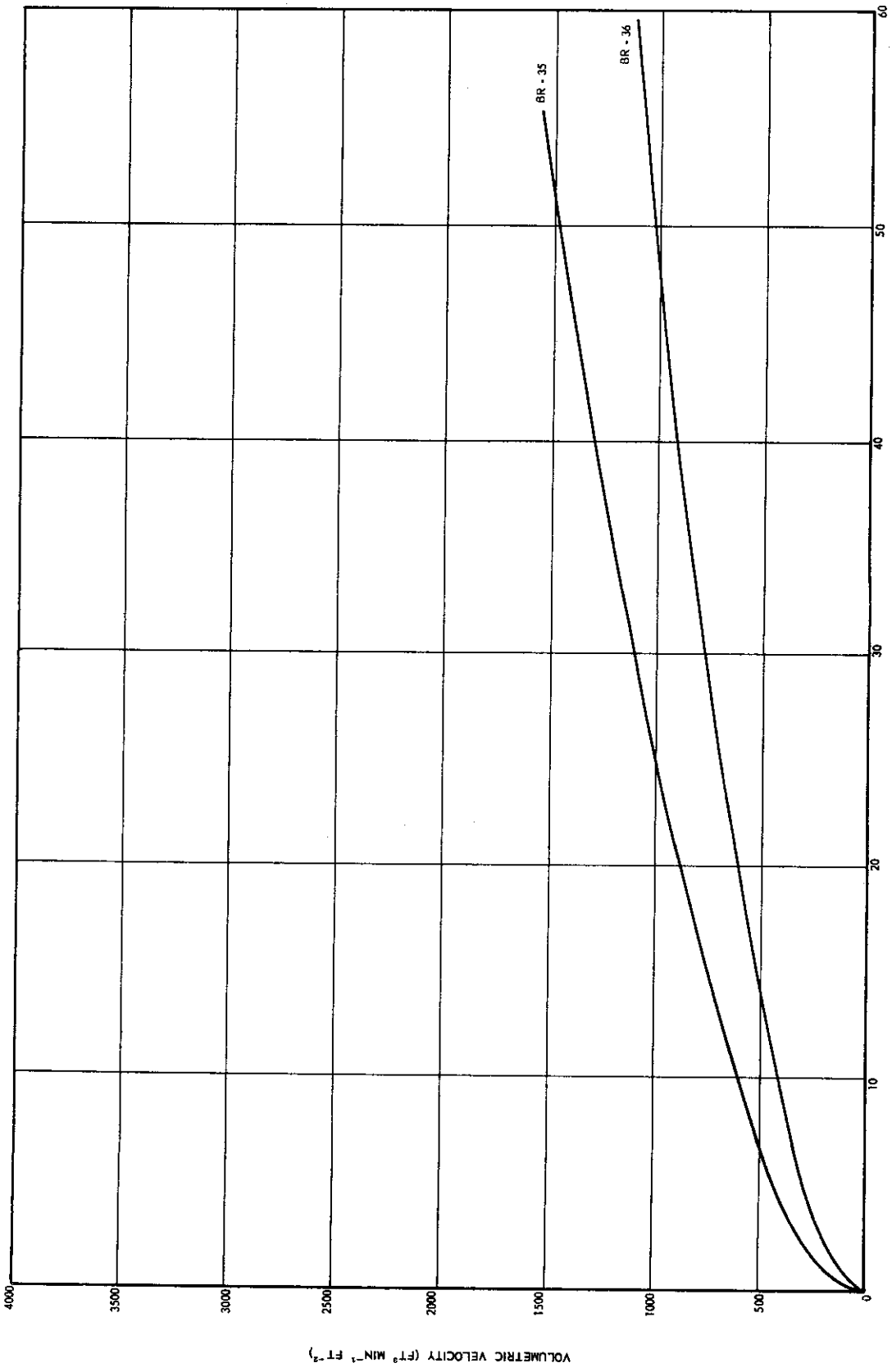

Figure 41. Air Permeability of Bally Ribbon Cloth BR-35 Through BR-36.

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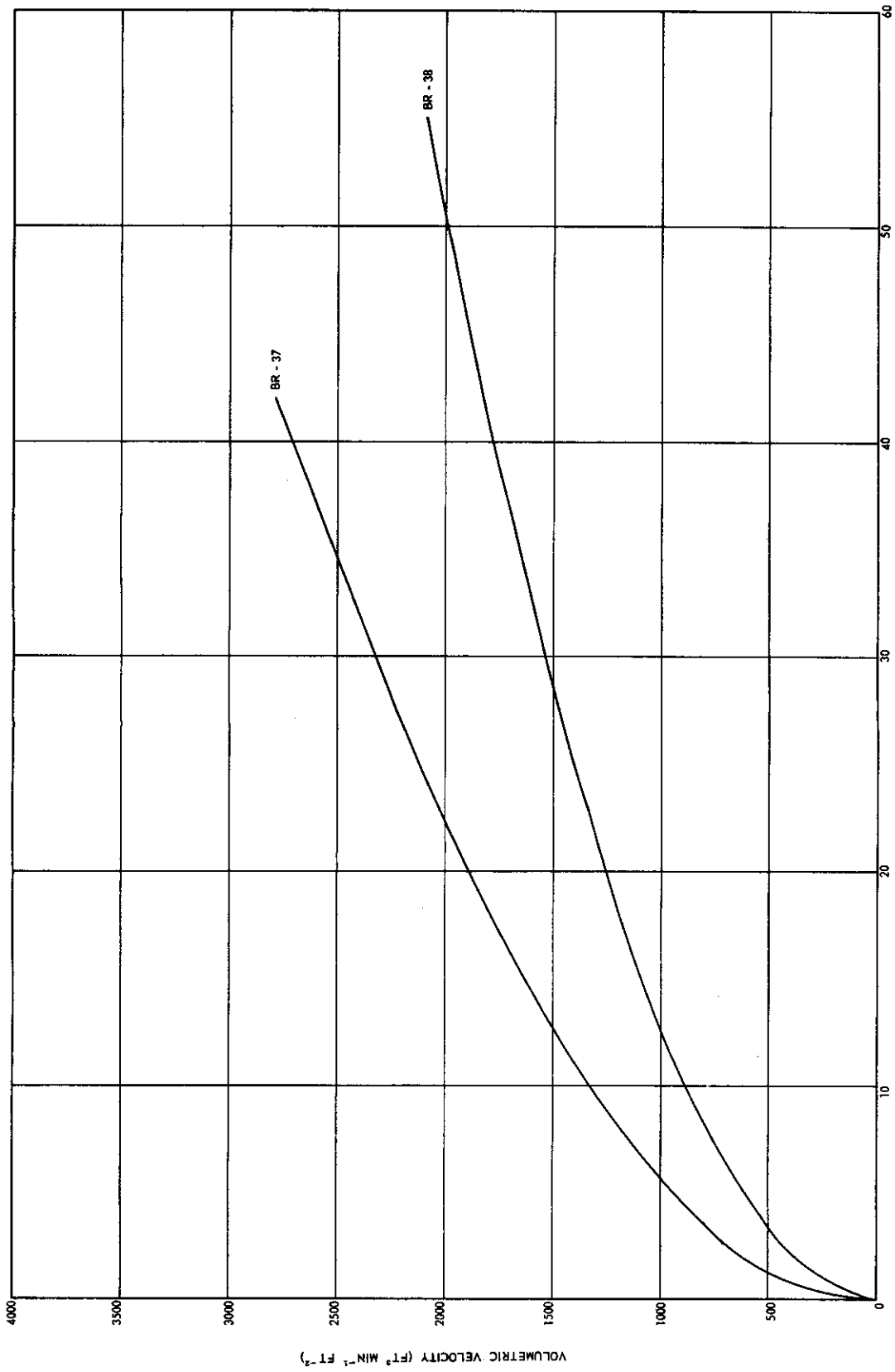

Figure 42. Air Permeability of Bally Ribbon Cloth BR-37 Through BR-38.

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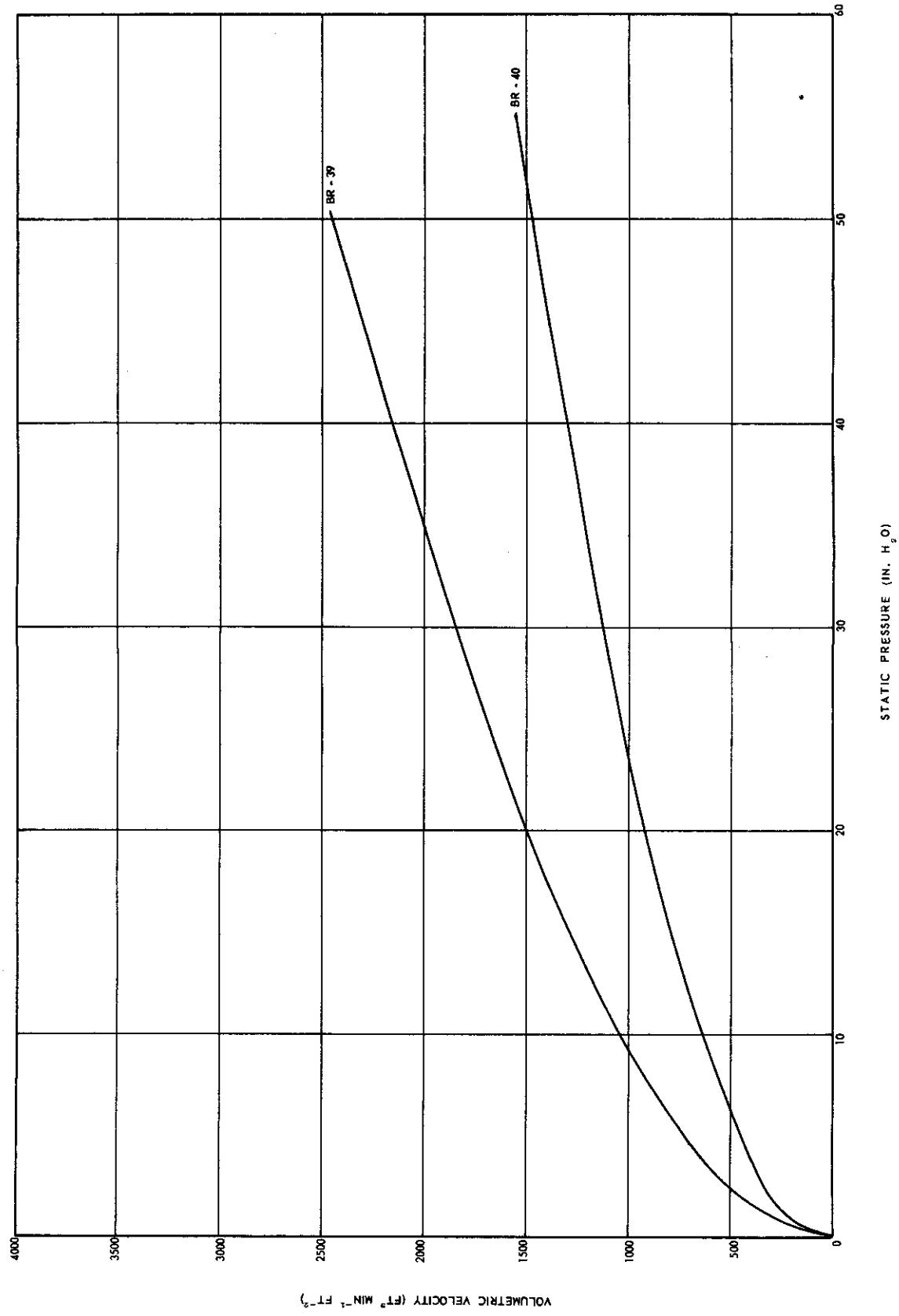

Figure 43. Air Permeability of Bally Ribbon Cloth BR-39 Through BR-40.

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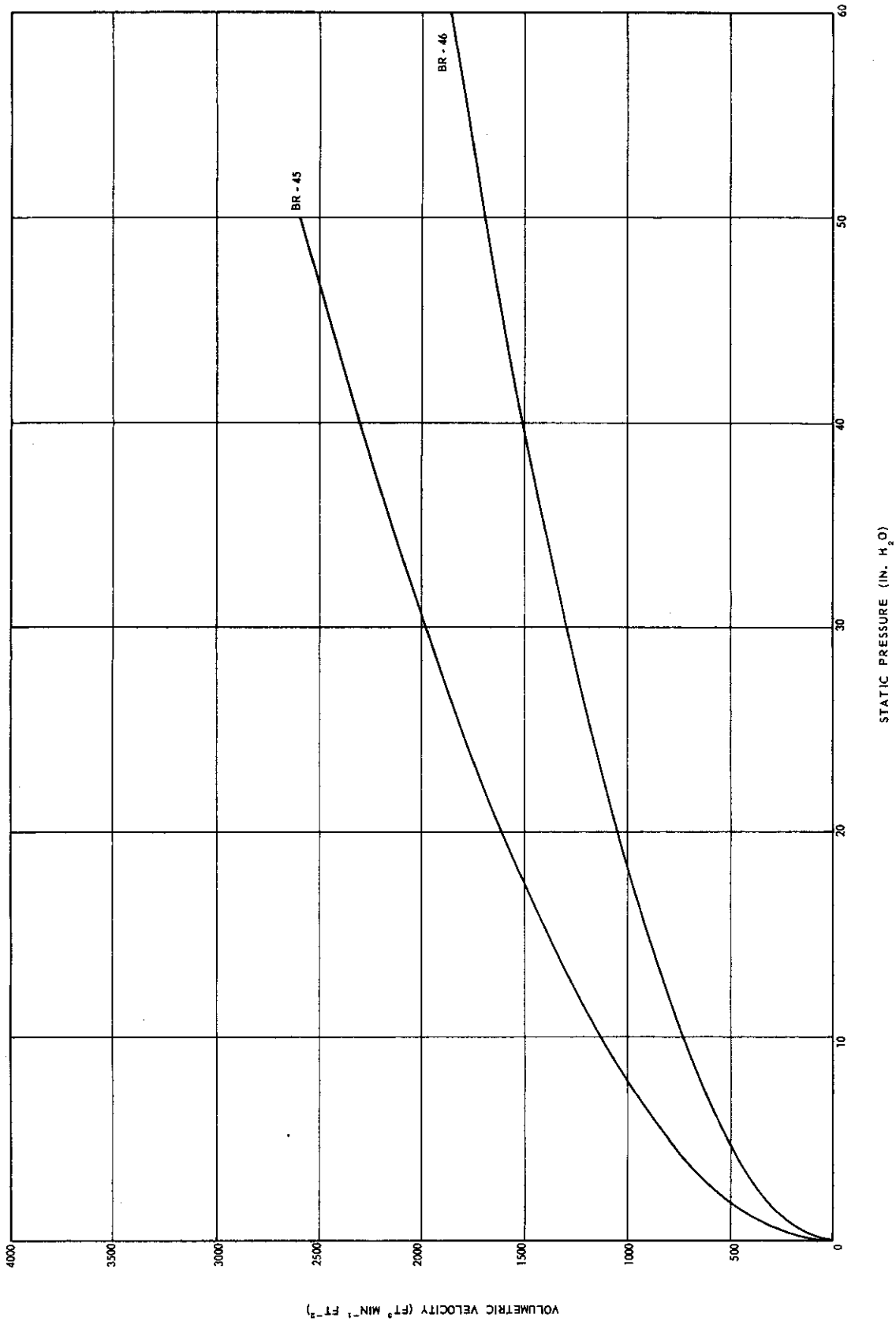

Figure 44. Air Permeability of Bally Ribbon Cloth BR-45 Through BR-46.

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Contrails

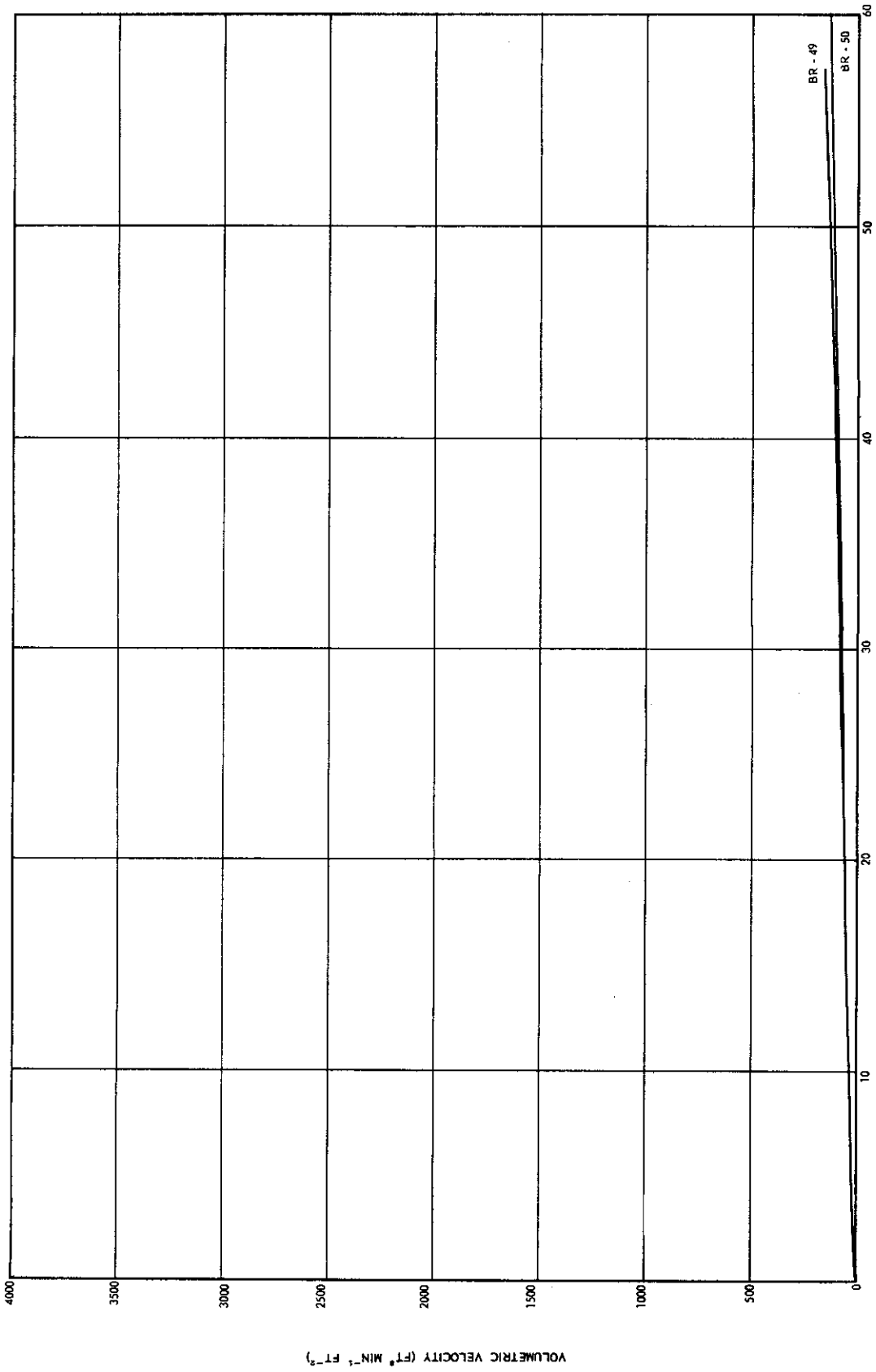

Figure 45. Air Permeability of Bally Ribbon Cloth BR-49 Through BR-50.

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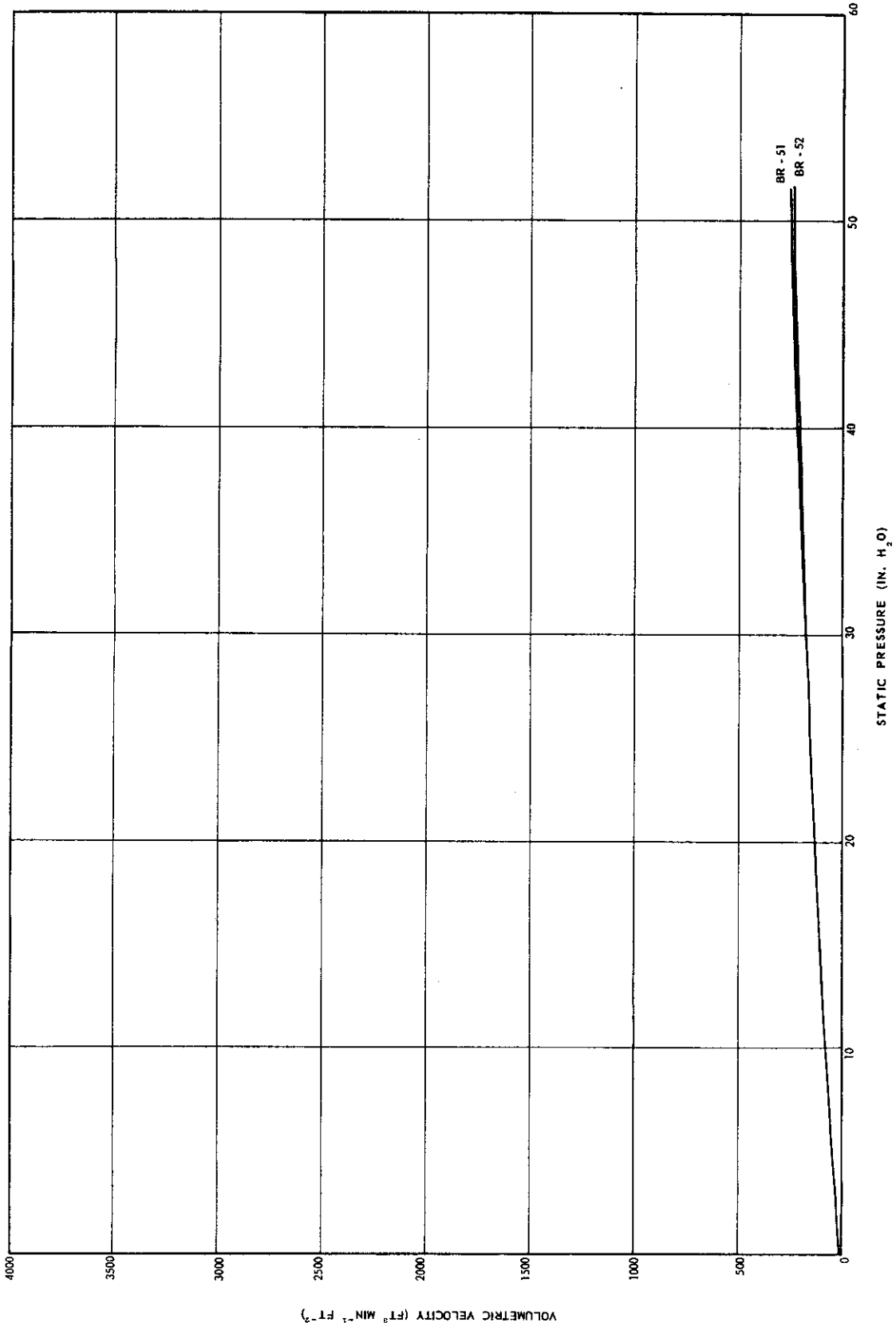

Figure 46. Air Permeability of Bally Ribbon Cloth BR-51 Through BR-52.

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Contrails

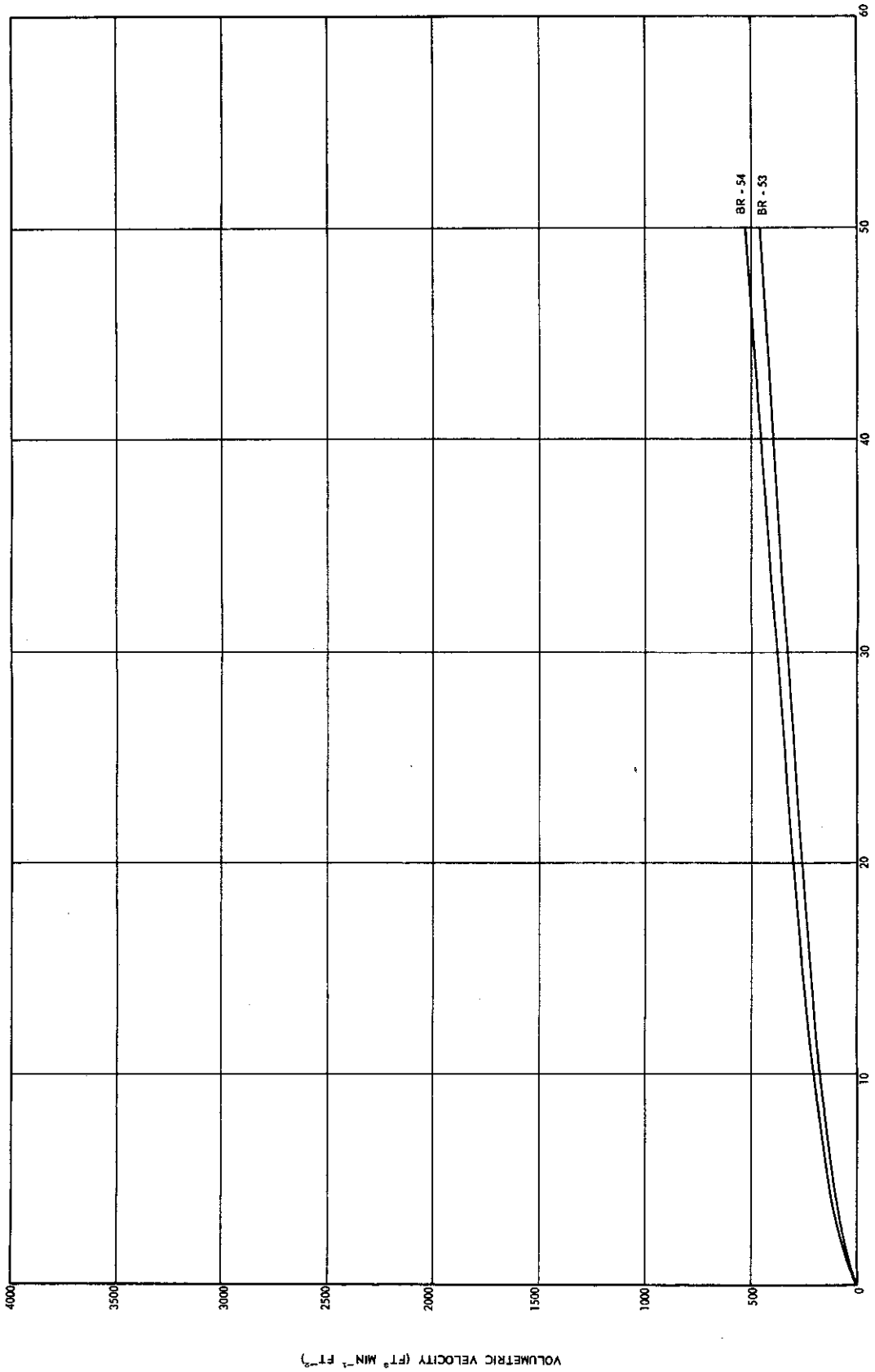

Figure 47. Air Permeability of Bally Ribbon Cloth BR-53 Through BR-54.

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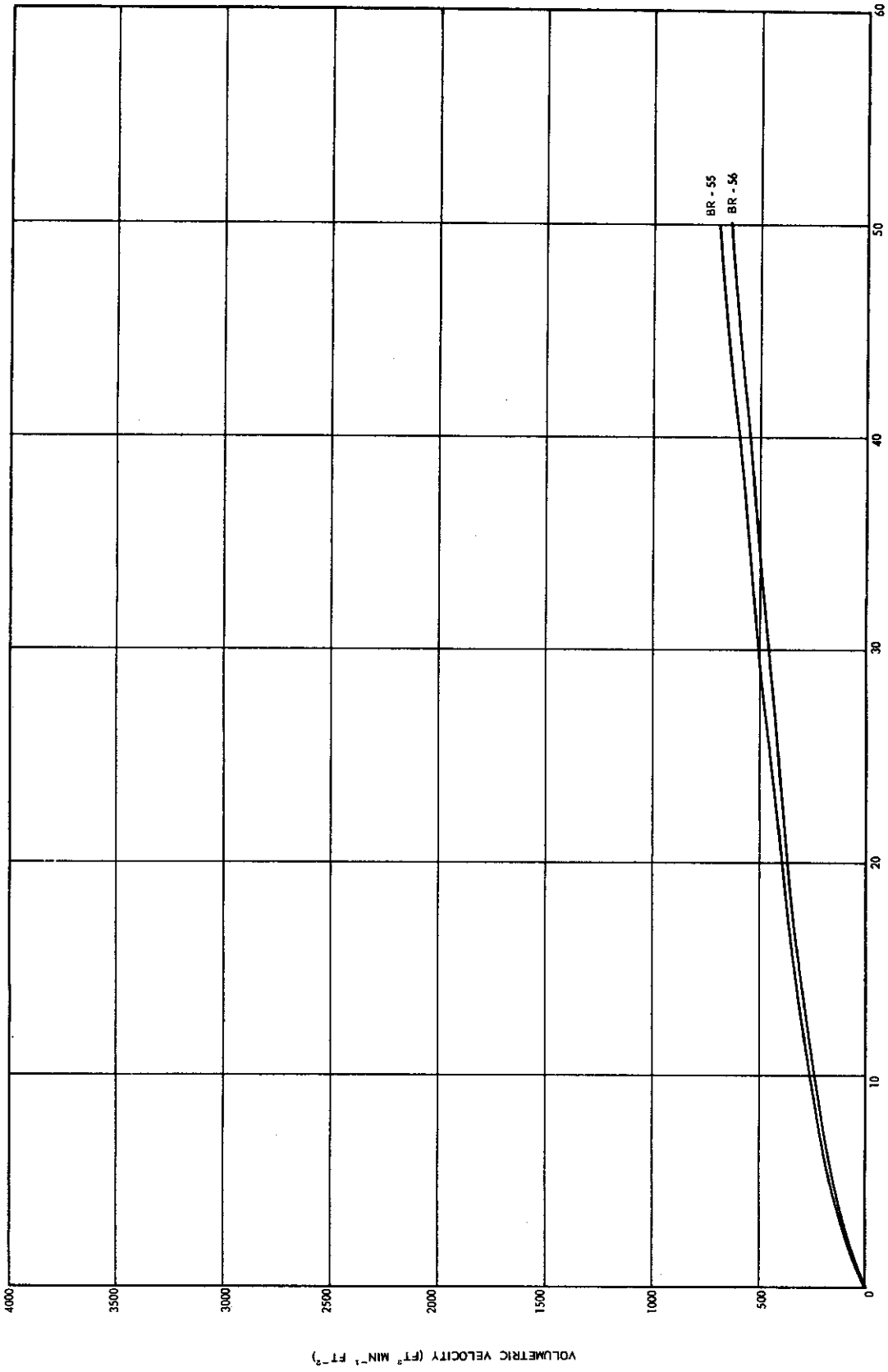

Figure 48. Air Permeability of Bally Ribbon Cloth BR-55 Through BR-56.

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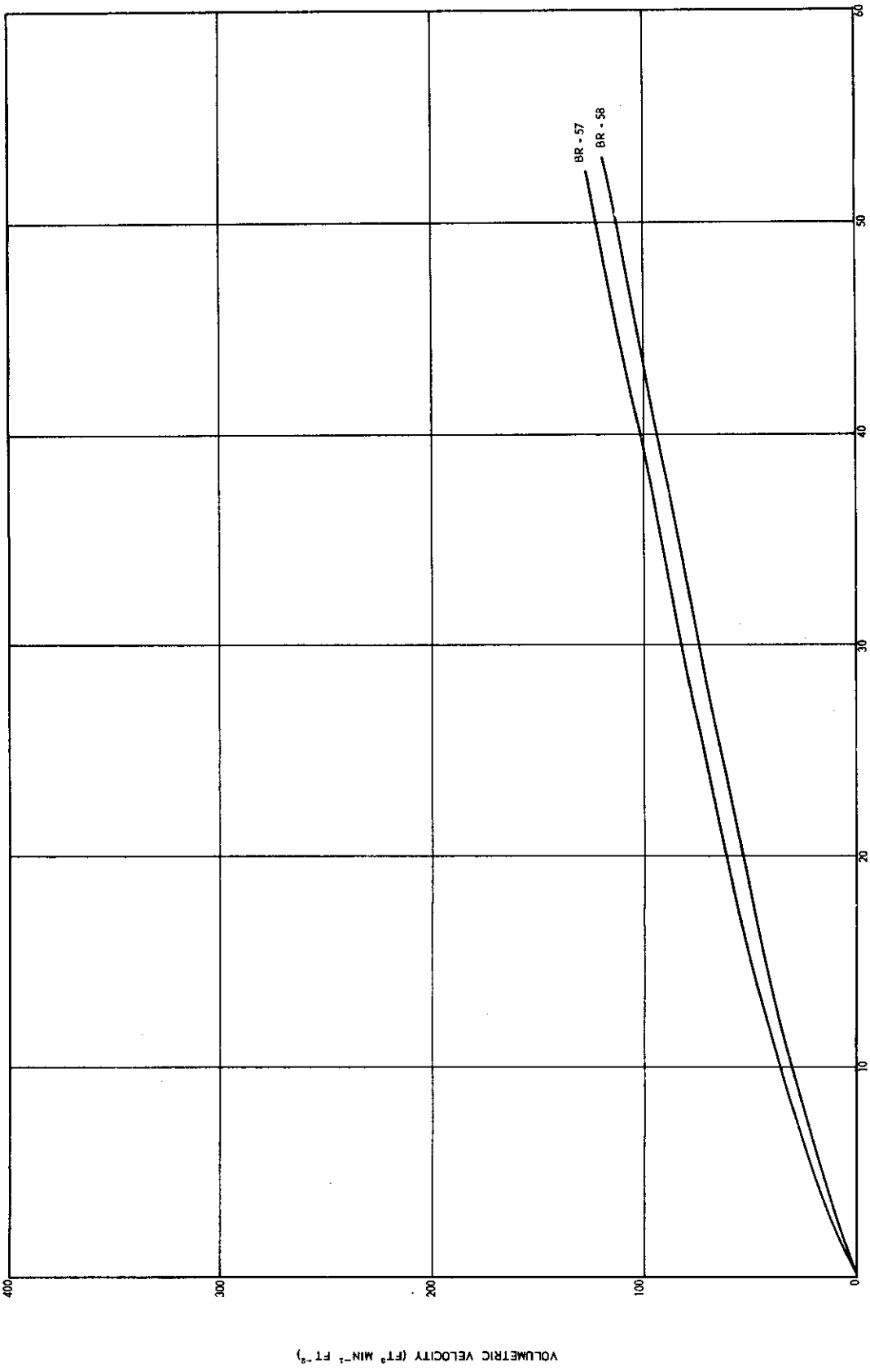

Figure 49. Air Permeability of Bally Ribbon Cloth BR-57 Through BR-58.

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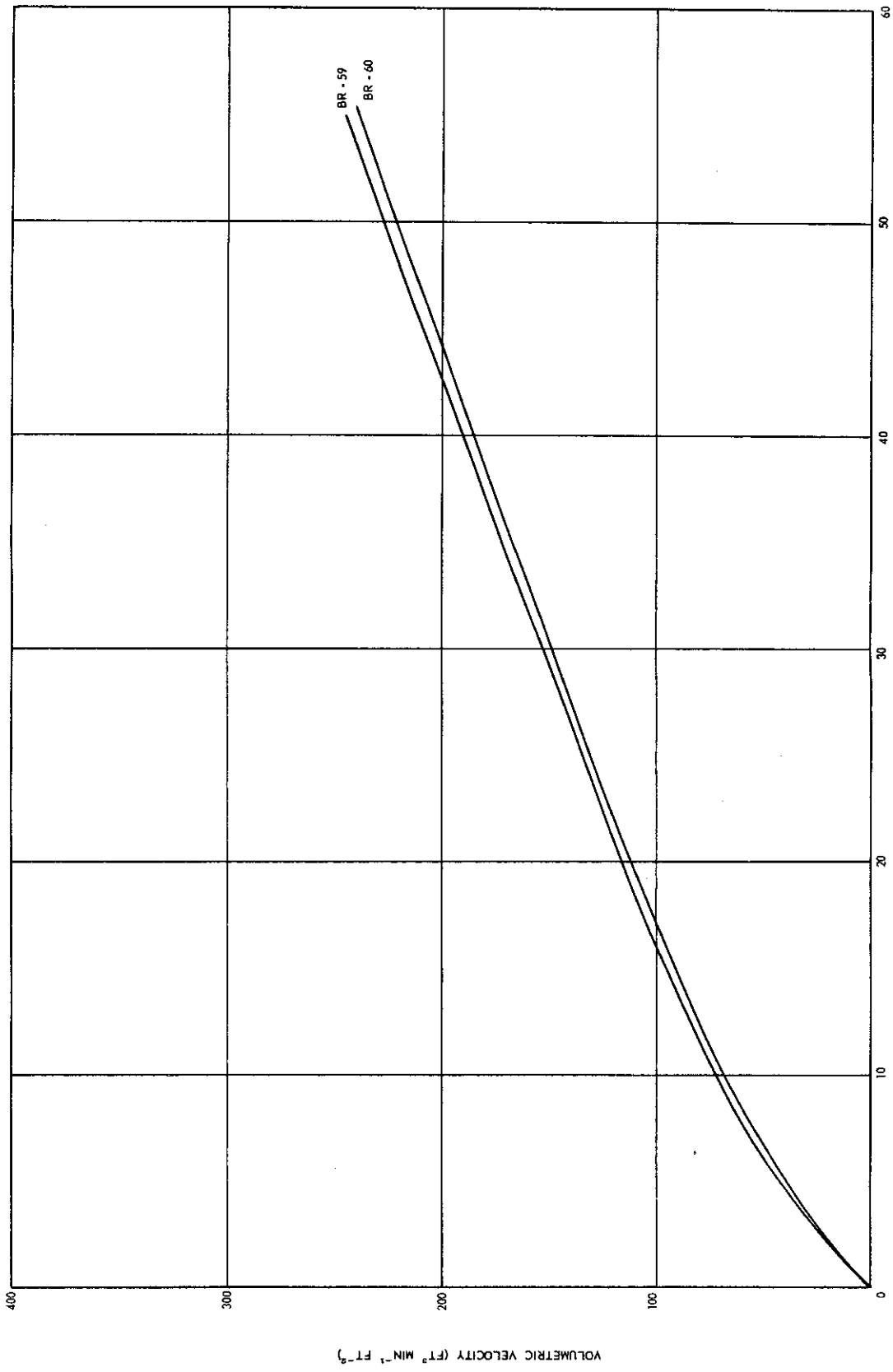

Figure 50. Air Permeability of Bally Ribbon Cloth BR-59 Through BR-60.

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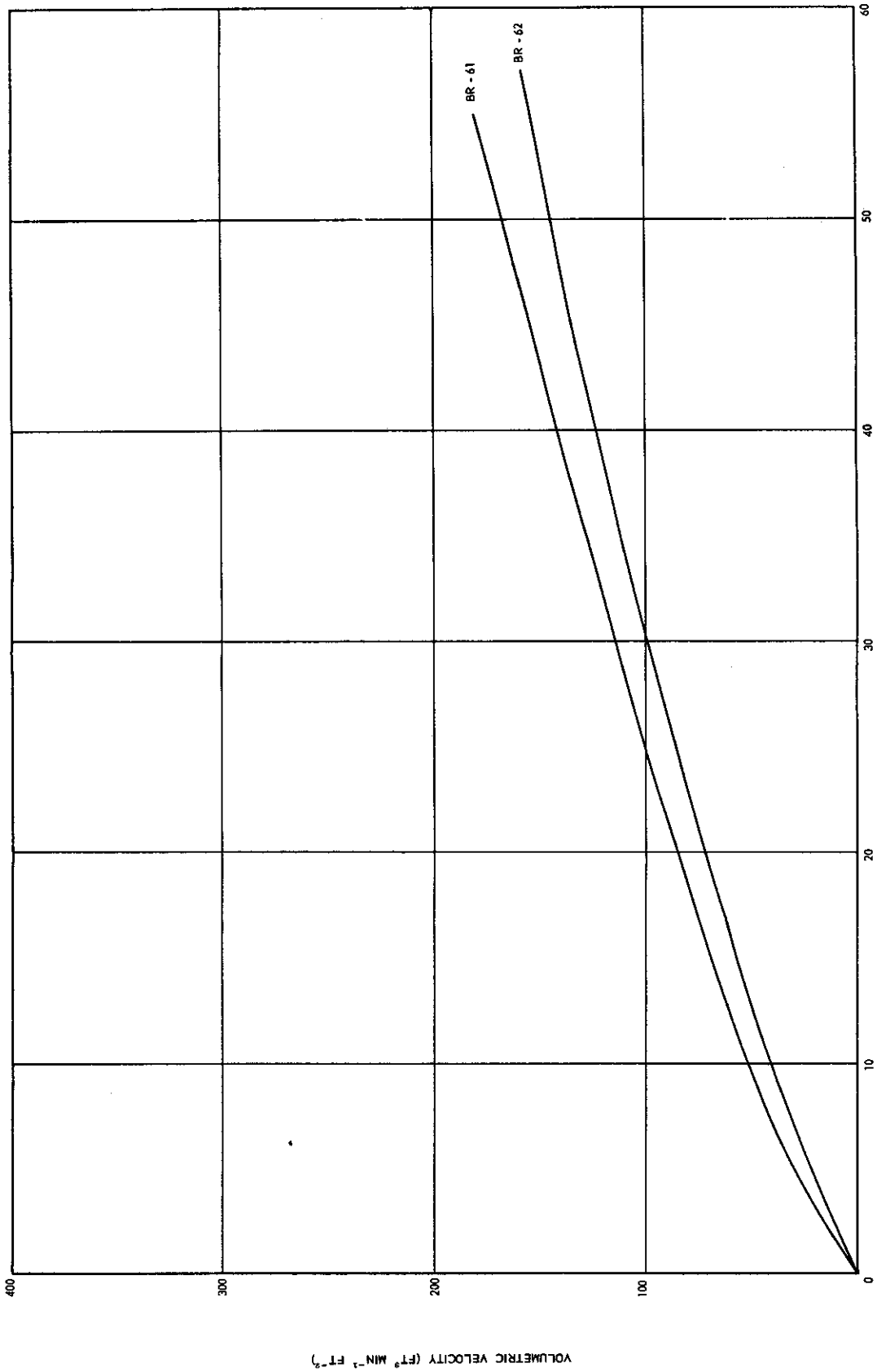

Figure 51. Air Permeability of Bally Ribbon Cloth BR-61 Through BR-62.

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Contrails

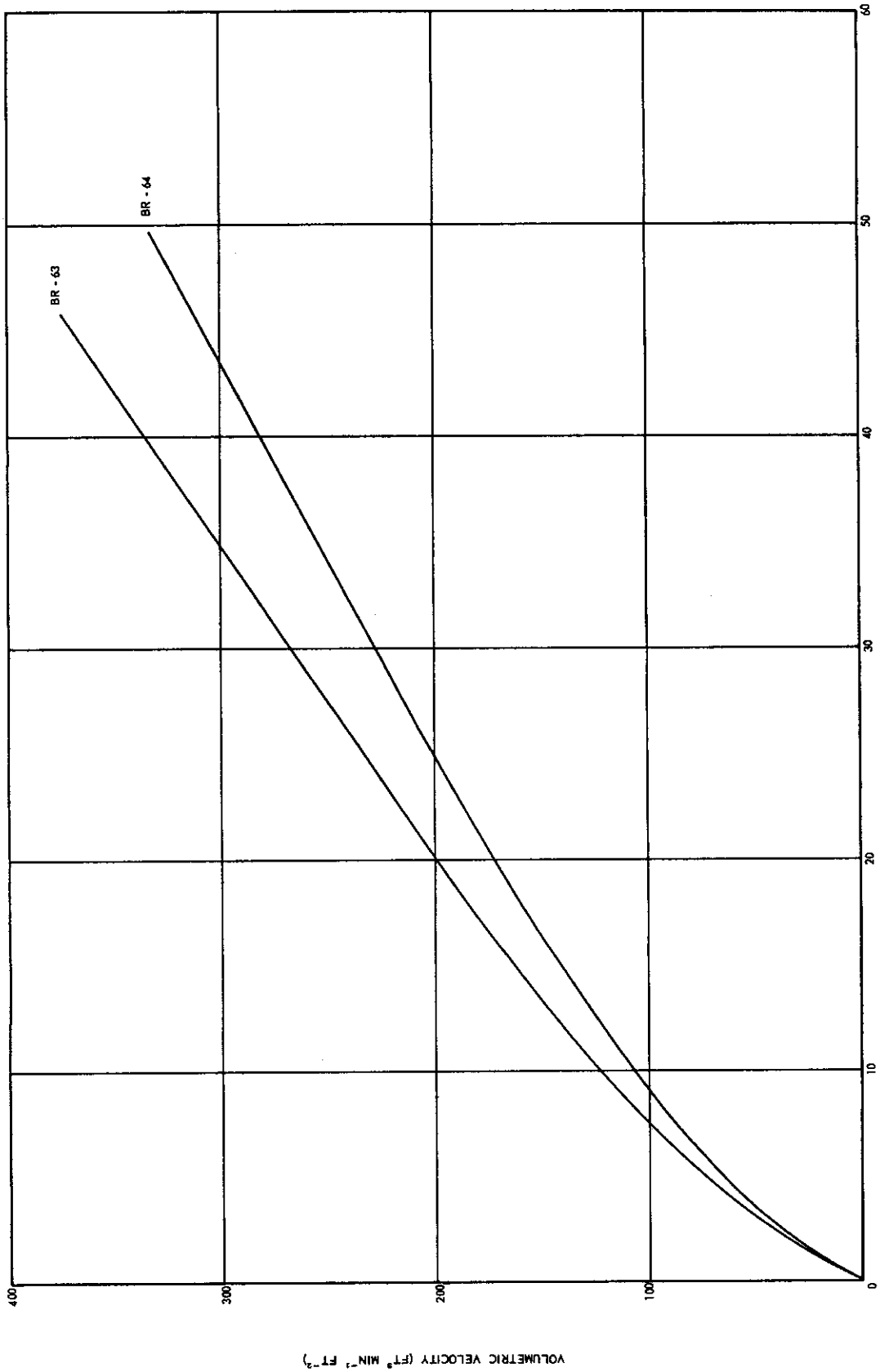

Figure 52. Air Permeability of Bally Ribbon Cloth BR-63 Through BR-64.

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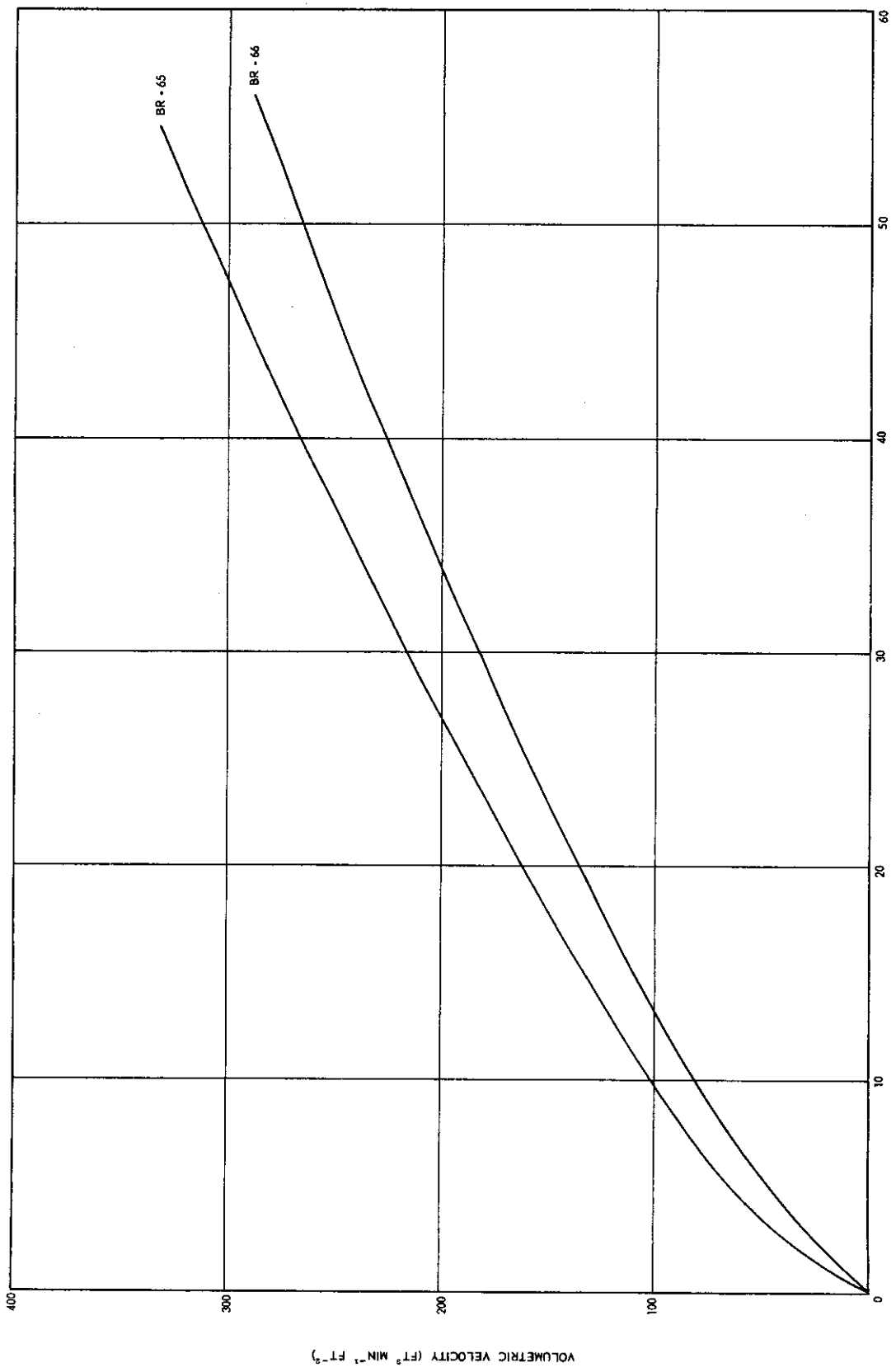

Figure 53. Air Permeability of Bally Ribbon Cloth BR-65 Through BR-66.

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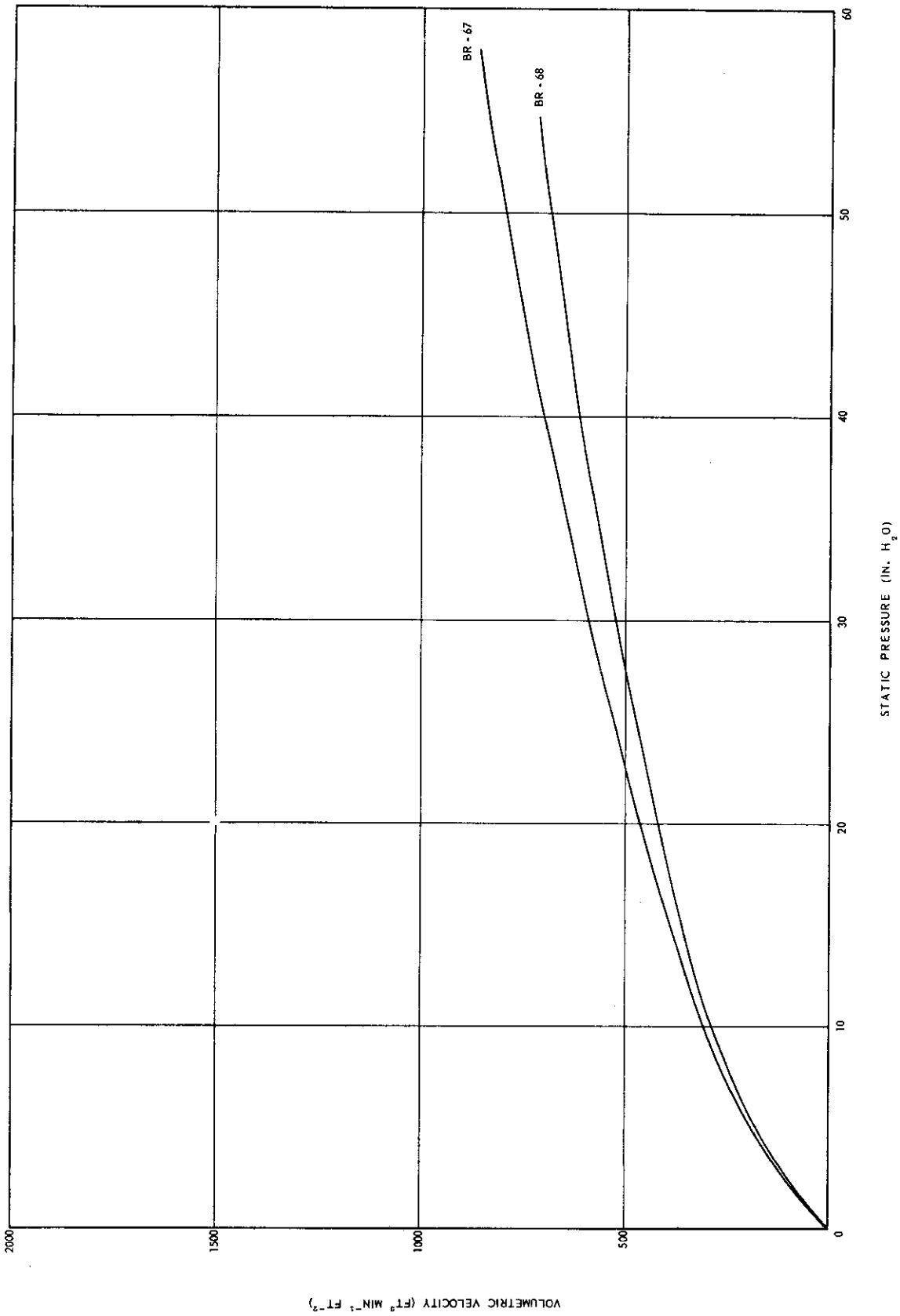

Figure 54. Air Permeability of Bally Ribbon Cloth BR-67 Through BR-68.

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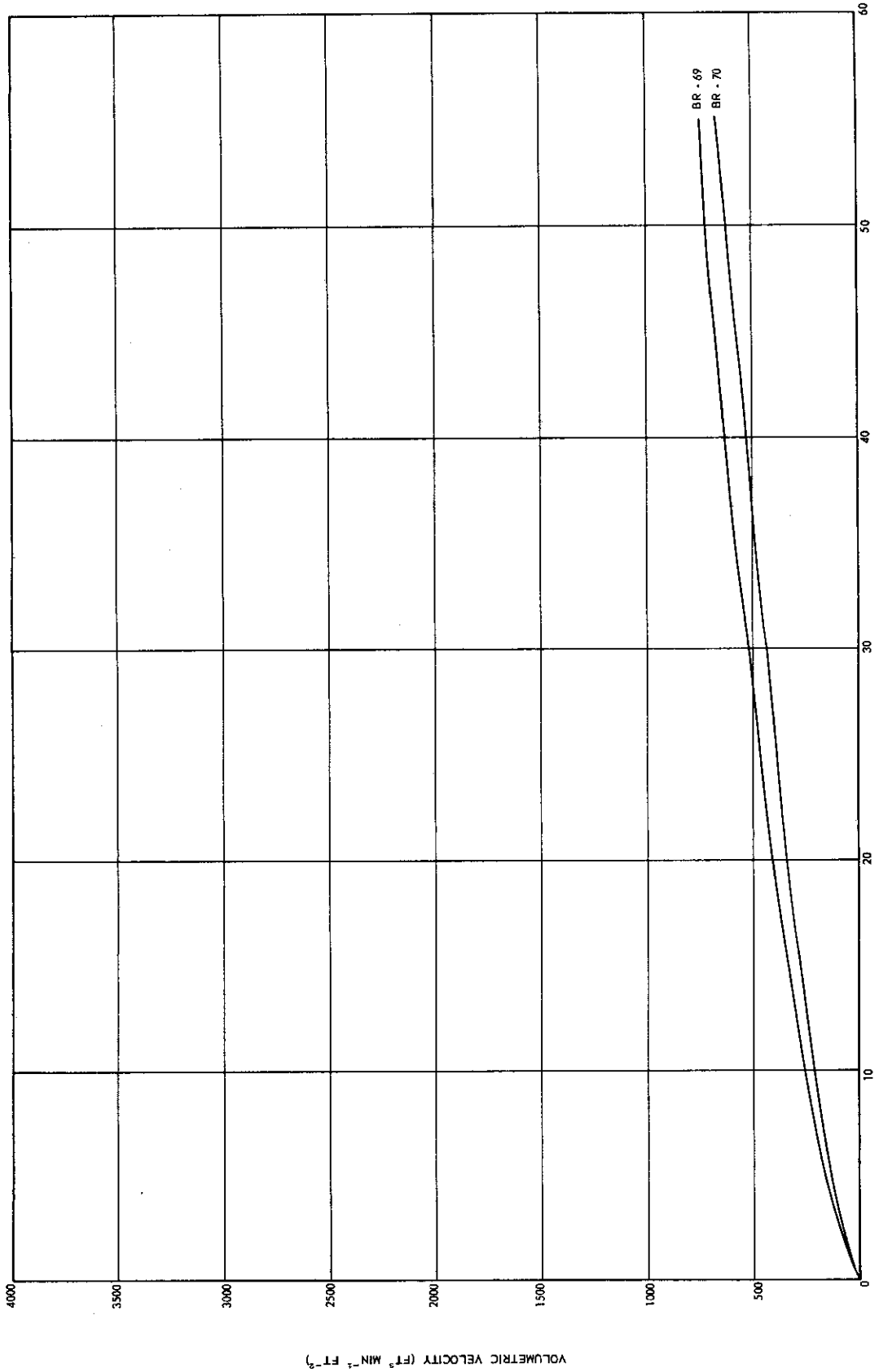

Figure 55. Air Permeability of Bally Ribbon Cloth BR-69 Through BR-70.

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