PLAINTIFF'S EXHIBIT FD-265

Bendix 7129D Composition

				%
			SiO_2 —	16.3
Mg	10.74	$(\times \frac{40.3}{24.3}) =$	MgO —	17.8
Fe	1.75	$(\times \frac{159.7}{111.7}) =$	Fe_2O_3 —	2.5
Al	0.17	$(\times \frac{102}{54}) =$	Al_2O_3 —	0.3
			Asbestos (less water)	36.9
			Asbestos (assuming 13% H_2O)	42.4

$\frac{0.331 \text{ moles}}{0.441 \text{ moles}} = \frac{2}{3.26}$; then $\frac{2}{3}$

Loss on ignition (organic + water in asb)	47.7
Less water in asbestos	5.5
Organic	42.2

Ca 6.17 $(\times \frac{100.1}{40.1}) =$ $CaCO_3$ 15.4 ✓

Asbestos	42.4	40.9
$CaCO_3$	15.4	14.8
Zinc	3.9	3.7
Organic	42.2	41.2
	103.9	

Asbestos (assuming 15% water) 43.4

Loss on ignition	47.7
Less water in asb	6.5
organic	41.2

Asbestos	43.4
$CaCO_3$	15.4
Zinc	3.9
Organic	41.2
	103.9

8000 0173 PQ

81.47

PRODUCED BY FORD

Pyrolysis of 8X 7129D "Pinto Brake"

Wt. of sample + crucible	23.9976
" " "	23.1216
" " "	.8760

sample pyrolyzed 1 hr 800°C

Wt. of sample + crucible	23.5805
" " "	23.1216
" " "	.4589

sample pyrolyzed ½ hr 800°C

Wt. of sample + crucible	23.5796
" " "	23.1216
" " "	.4580

% residue $\frac{.4580}{.8760} \times 100\% = 52.3\%$

% L.O.I. = 47.7 %

B100 0174

81.48

PRODUCED BY FORD

Pyrolysis of BX 71291 Vinto Wrake

Wt. of sample + crucible 23.4470
" " " 23.1434
" " " .3036

sample pyrolyzed 1 hr at 800°C.

Wt. of sample + crucible 23.3019
" " " 23.1434
" " " .1585

sample pyrolyzed additional ½ hr at 800°C

Wt. of sample + crucible 23.3020
" " " 23.1434
" " " .1586

$$\% \text{ residue} = \frac{.1565}{.3036} \times 100\% = 52.3\%$$

PRODUCED BY FORD

Ford Chemical Analysis Request

12-2-70

Submitted by	Phone	Date submitted
Roy L Gealer	31219	12/1/70
Charge no. R-120 / **Dept.** 9340	**Room** 1152	**Date required** 12/8/70

Description of material (sample numbers, nominal composition)

Bendix 7129D brake lining

Analysis required Quantitative analyses for Si, Mg, Fe, Zn, Ba, Al, Ca, Cu

Results

Log book reference 3253

	SiO_2%	Mg%	Fe%	Zn%	Ba%	Al%	Ca%	Cu%
(7129D)-1	16.6	10.86	1.78	3.24	0.02	0.18	6.24	0.01
-2	16.0	10.54	1.85	4.07	0.02	0.17	6.13	0.01
-3	16.4	10.76	1.69	4.15	0.02	0.16	6.28	0.01
-4	16.1	10.80	1.66	3.93	0.02	0.17	6.02	0.01
(7129D) AVE	16.3	10.74	1.75	3.85	0.02	0.17	6.17	0.01

Relatively poor precision indicates sample inhomogeneity

Analysis by J. Butler & D. Locke

Date completed Dec. 16, 1970

Sci Res Aug '70 2598

8000 0176

81.49

PRODUCED BY FORD

Chemical Analysis Request

Submitted by	Phone	Date submitted
M. Weintraub	25518	Oct 22, 1970
Charge no. R 120 / **Dept.** 9340	**Room** E 1151	**Date required**

Description of material (sample numbers, nominal composition)

3031-53 - Pinto brake lining material

Analysis required

quantitative for Mg, Si (AA gravimetric?)

qualitative for metals (spectro)

Results — Log book reference: Chem Vol 5, p. 141

*	SiO_2	18.1%	(18.0, 18.2)	} N.G.					
*	MgO	32.4%	(32.0, 32.8)						
†	Fe	high							
	Zn	"							
	Ba	"							
	Al	"							
	Mg	"							
	Si	"							
	Ca	lt.	Cu	medium					

* duplicates

† spectrographic qual.

Analysis by Westwood — Date completed Nov 2, 1970

Sci Res Aug '70 2598

A000 0177

81.50

PRODUCED BY FORD

ELECTRON AND X-RAY OPTICS INVESTIGATION REQUEST

NAME	DATE	REQUEST NO	
ROY L. GEALER	11/27/70	X70-103	
PROJECT NO. R-120R	TELEPHONE 31219	ROOM NO. 1152	DEPT. NO 9340

INSTRUMENTATION:
- ☐ ELECTRON MICROPROBE
- ☐ SAMPLE PREPARATION
- ☐ X-RAY FLUORESCENCE
- ☐ ELECTRON MICROSCOPE
- ☐ THERMIONIC EMISSION
- ☐ LIGHT MICROSCOPE
- ☒ X-RAY DIFFRACTION
- ☐ OTHER

SPECIMEN INFORMATION: (INCLUDE MATERIAL, COMPOSITION, AND SPECIMEN PREPARATION FOR PROBE WORK)

~~[illegible]~~
BRAKE LINING RASPINGS:
BENDIX 7129D (
3282-7-B-B 45% ASBESTOS STD
3282-7-B-D 35% " "

SAMPLES TO BE RETURNED AFTER ANALYSIS?

DESCRIBE INVESTIGATION REQUIRED: QUANT , SEMI QUANT , QUAL , OTHER
CRYSOTILE ASBESTOS DETERMINATION

TECHNIQUE EMPLOYED FLUOR; Cr Tube 50KV 40ma KAP FLO (16171) B-2
UL-6, ATT-5, RT 0.18, He atmos.
DIFF Cu Tube 45KV 28ma 4° - 1° - 1/4°

RESULTS XRF shows that the Si/Mg ratio is the same (to within 1.5%) in all three samples. This suggests that all the Si + Mg in the unknown is present as clino-crysotile.
XRD shows that clino-crysotile and $CaCO_3$ as major phases and Fe_3O_4 as a minor phase. No $BaSO_4$ was detected (but limit of detection is of the order of 5%). Comparison of the X-Ray diffraction intensity for asbestos + $CaCO_3$ for the 3 samples suggest that the Pinto Production Brake sample $\frac{\text{wt asbestos}}{\text{wt } CaCO_3}$ is approx 5.

DISPOSITION OF SAMPLES returned

WORK BY S. Bonfiglio

DATE COMPLETED 12-3-70

Ford SCI RES OCT 68 2504

8000 0178

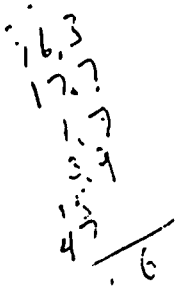
81.51

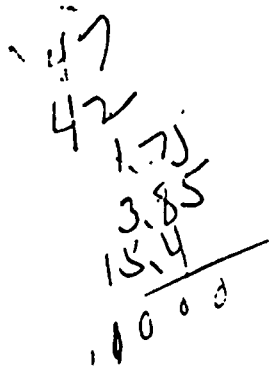
PRODUCED BY FORD

Reference Samples for X-ray Comparison with Bendix 7129D.

Sample A		Sample B
35	7004 Asbestos	45
37.5	Resin + curing agent + organic particles	37.5
20	$BaSO_4$	12.5
7.5	$CaCO_3$	5

PRODUCED BY FORD





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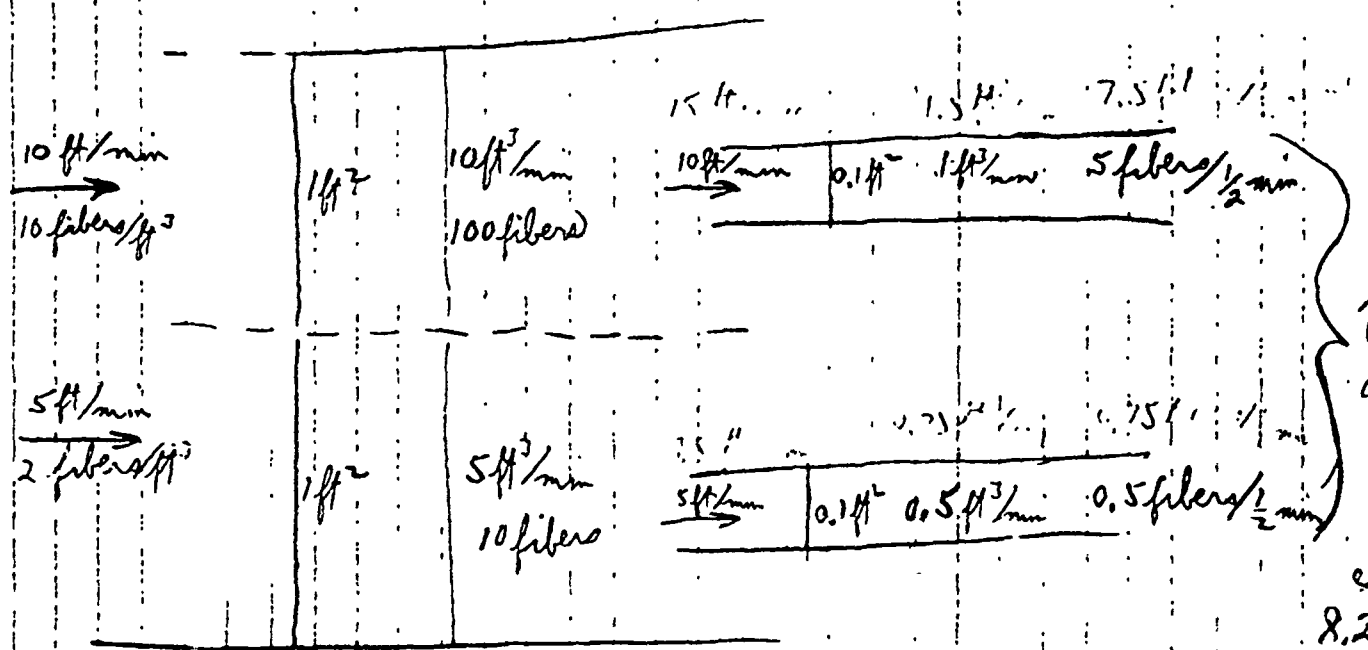


fibers sampled: 5.5 fib
9.25

air sampled: 0.75 ft
1.125

calculated fibers: $5.5 \times \frac{15}{0.75}$
$8.25 \times \frac{15}{1.125} = 110$
$= 110$

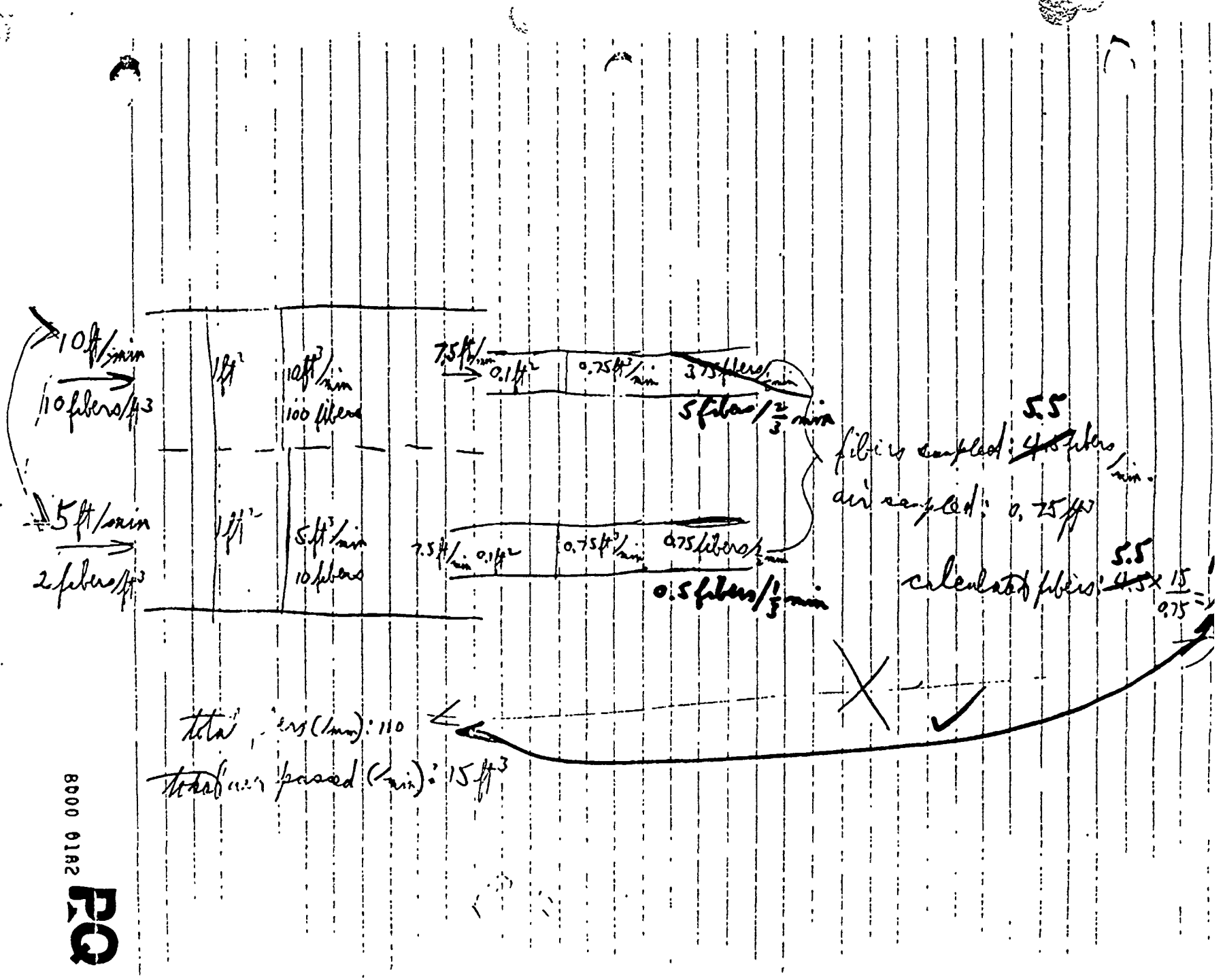
total fibers (per min): 110
total air passed (per min): 15 ft³

or calculated fibers: $5.5 \times \frac{2}{0.1}$
$= 110$

81.52

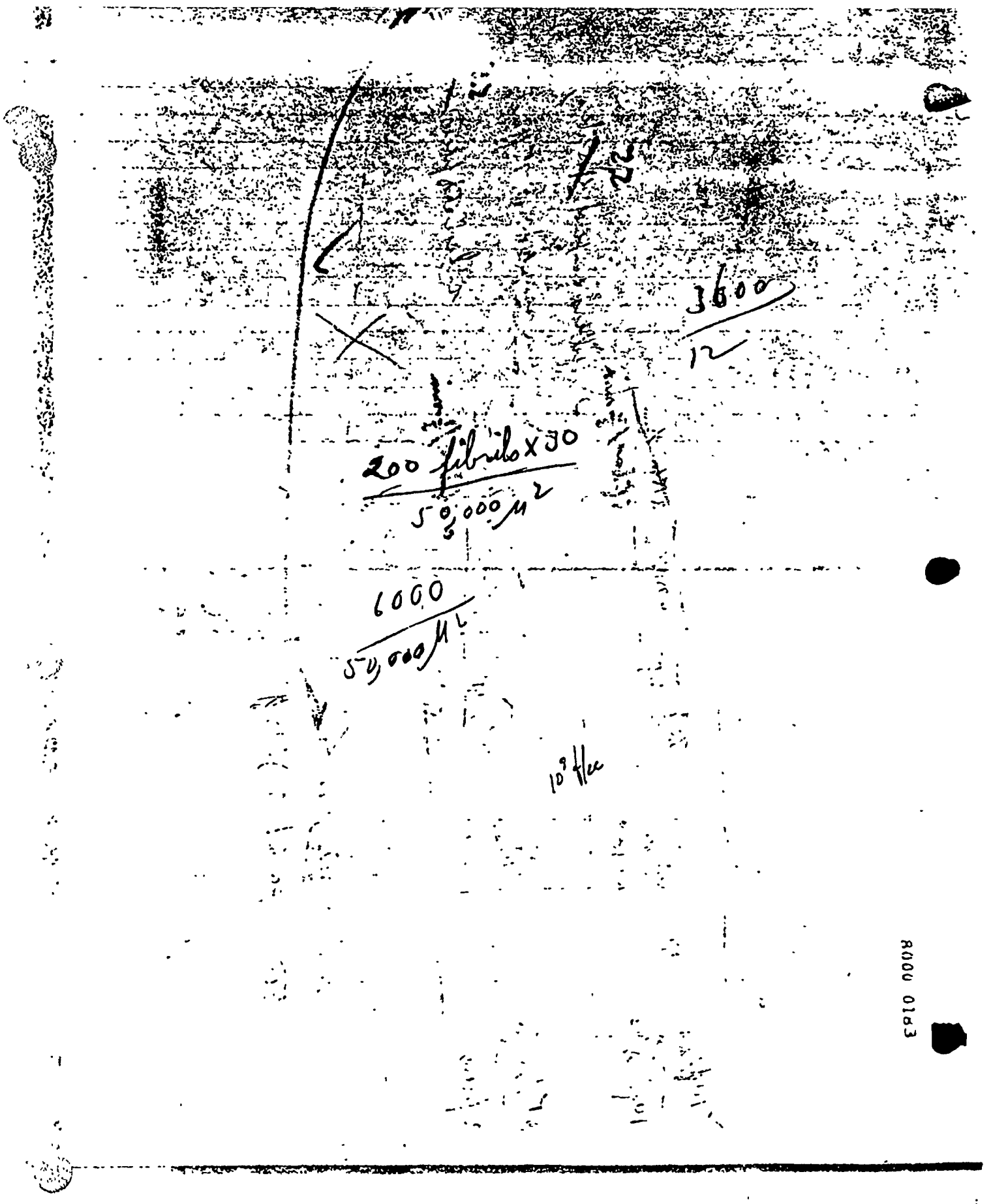
PQ 8000 0131

PRODUCED BY FORD



8000 0182 FQ

PRODUCED BY FORD



8000 01d3

Total number of stops: 720.

Volume of air sampled: 1012 cu. ft.

Fibers observed: 12 fibers

Area scanned: ~40,000 sq. microns

Fraction of filter scanned $= \frac{40{,}000\ \mu^2}{9.6\ cm^2} \times \frac{1\ cm^2}{10^8\ \mu^2} = 4.16 \times 10^{-5}$

Number of fibers expected on whole filter: $\frac{12}{4.16 \times 10^{-5}} \cong 3 \times 10^5$

Number of fibers/cu ft for sampled $\cong \frac{3 \times 10^5}{1012} = 300.$

Total time air passed through filter: 21.92 hr.

Total time during which brake was applied: $820^{stops} \times 7\ \frac{sec}{stop} \times \frac{1\ hr}{3600\ sec}$

$= 1.6$ hr

Volume of air sampled during stops: $1012 \times \frac{1.6}{21.92} \rightarrow 74$ cu ft

Number of fibers/vol on during stops $\cong \frac{3 \times 10^5}{74} = 4000\ \frac{fibers}{cu\ ft}$

$= 0.14\ \frac{fibers}{cm^3}$

$= 140{,}000\ \frac{fibers}{m^3}$

Wt of filter sample collected: ~ 1 mg

~ fibers/g sample $\cong 3 \times 10^8$ fibers/g.

Density of asbestos $\cong 2.69$/cc

If typical fibers as bundle $900\text{Å} = 9 \times 10^{-6}$ cm diameter and 180×10^{-4} cm long,

fiber volume is $\frac{\pi}{4} \times 81 \times 10^{-12} \times 180 \times 10^{-6}\ cm^3 = 1.14 \times 10^{-14}\ cm^3$

Single fiber weight $= 2.6 \times 1.14 \times 10^{-14} = 3 \times 10^{-14}$ g

Wt fraction fibers $= 3 \times 10^8 \times 3 \times 10^{-14} = 9 \times 10^{-6}$ g fiber/g sample

8000 01A4

PQ

PRODUCED BY FORD

$$\frac{\sim 160\ \text{g total debris}}{\text{car year}} \times \frac{3\times10^{8}\ \text{fibers}}{\text{g}} \times \frac{2\times10^{6}\ \text{cars}}{100\ \text{sq. mi}} \times \frac{1\ \text{yr}}{365\ \text{day}} \times \frac{1\ \text{sq mi}}{(5.28)^2\times10^{6}\ \text{sq ft}}$$

$$= 94{,}400\ \frac{\text{fibers}}{\text{sq. ft.}}$$

$$94{,}400\ \frac{\text{fibers}}{\text{sq. ft}} \times \frac{1}{6\ \text{ft}} = 15{,}700\ \frac{\text{fibers}}{\text{cu. ft.}} \times \frac{1\ \text{cu ft}}{28{,}300\ \text{cu cm}}$$

$$= 0.55\ \frac{\text{fibers}}{\text{cu. cm.}}$$

Eight days accumulation $4\ \frac{\text{fibers}}{\text{cm}}$

8000 0185

PRODUCED BY FORD

7/13/70
REFERENCE TEST
0.2μ Filter

Air Velocity across wheel ffpm

Top 800

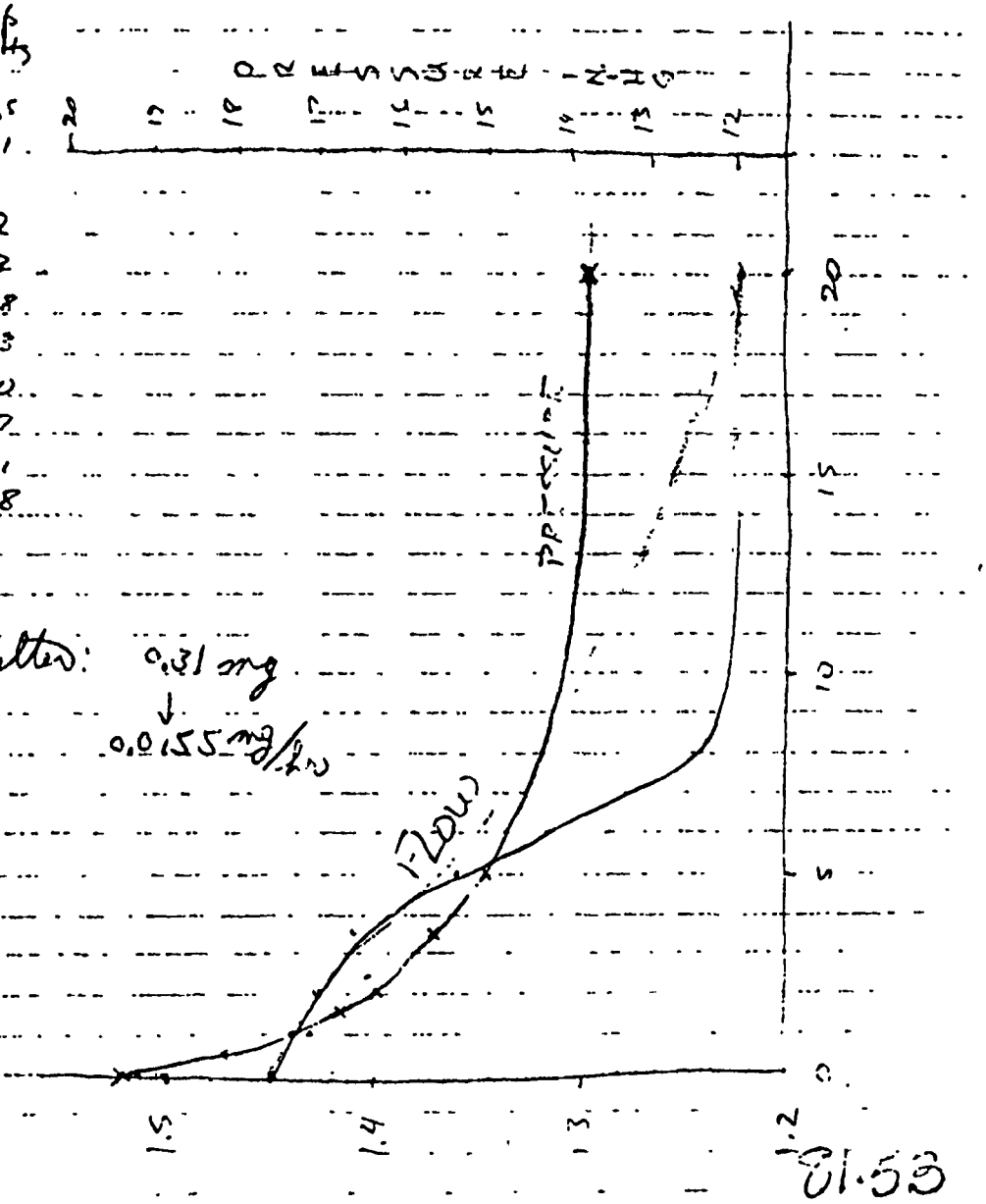
Mid 1200

Bottom 1600

R.H. 34.9%

Air Velocity at filter position (18" off floor, 9'5" down from brake)
~500 FPM

Time	Flow (Rotameter scale)	Δp in Hg
1 min	1.415	19.5
5	1.415	19.1
10	1.415	19.1
30	1.415	18.2
66	1.414	17.2
1:30	1.41	16.8
2:00	1.413	16.3
2:36	1.410	16.0
3:30	1.41	15.7
5:06	1.36	15.1
20:00	1.22	13.8
end		



Weight picked on filter: 0.31 mg

Sample 1 ↓ 0.0155 mg/ft³

8000 0186

01.53

PRODUCED BY FORD

Ref. AIR 0.3mg in 20 hrs. (sample 1) APRIL 10, '70

Start Burnish @ 9:30 AM. R.H. 31.5% 9.70 mg

6 to 7 seconds active braking/stop.

START PUMP AT 9:4 AFTER 11TH STOP

Prim Lining 3107-62 Init Wt 701.8g.
Sec. Lining 3107-98 " " 729.9g.
Drum 1978 Full cast Rib. It Car
Front Load

Stop 16	226°F → 312°F	
Stop 17	228°F → 312°F	
Stop 18	228°F → 314°F	
Stop 19	234°F → 317°F	
Stop 22	235°F → 322°F	
Stop 23	231°F → 312°F	

Stop Break in at 228 stops
3:56 PM

Time	mHg ΔP	Top of Ball CFM Scale Q	Stop #
1 min	14.8	1.30	12
5 min	14.3	1.30	15
15 min	14.2	1.28	21
30 min	14.1	1.27	31
1 hr	13.9	1.27	51
2 hr	13.8	1.26	90
3½ hr	13.6	1.2[illegible]	150
4½ hr	13.7	1.20	185
6 hr	13.3	1.23	218
6¼ hr	13.3	1.22	228

Total stops: 216

Sample 2
Filter weight pickup: 0.27mg
= 0.043 mg/hr
= 0.0013 mg/stop

Sample 3
Start new background sample
4:45 PM 13.9 1.25
Set clock to stop filter pump and blower after 20 hr.

4/13/70 Continue break-in, starting at 8:52 AM
Replace filter sample 2

1 min	14.7	1.31	229
9 min	14.3	1.33	234
1:35 hr	13.5	1.25	279

Dynamometer shut-down
Resume at 11:20

1:40 hr	14.0	1.28	280
4:40 hr	13.2	1.22	400

Continue Break-in
Completed Total of 400 stops @ 2:23 pm.

Filter weighed
3:05

PQ 8000 0187

PRODUCED BY FORD

400 Stop Burnish · Prim. Wt 701.8 g init.
700.9 g after 400 stop Burn
000.9 g wt Loss

Sec. Wt 729.9 g init.
727.5 g after 400 Stop
2.4 g wt. Loss

4/14/70

Set for 216 stops after cleaning and weighing of lining/shoe assemblies & wear debris from drum & backing plate (total ~.80 grams) (all filter used again) same location

Run time	Clock time	stop #	in Hg	Hg at bell CFM	Temp St	Temp End
0	10:05	0	14.9	1.32		
5	10:10	3	14.3	1.30		
32	10:37	21	13.8	1.26	261°F	35[illegible]
1:20	11:25	52	13.4	1.26	255	361
2:35	12:40	103	13.0	1.21	256	354
5:15	15:20	209	12.8	1.20	254°F	354°F
5:28	15:33	216	12.8	1.25		

RH 36% Start
RH 36% End
Filter weighed

4-15-70

0	[illegible]	216	14.6	1.30		
40	9:13	242	13.2	1.25		
2:32	11:05	316	12.8	1.22		
3:28	12:01	353	12.7	1.21		
5:06	1:39	418	12.4	1.25		
5:30	2:03	432	12.3	1.20		

R: 35%
Bar. 29.67 in Hg

8000 6188

PRODUCED BY FORD

1. Background – 4/9/70
1. Initial wt: 44.57 mg
Wt after 20 hrs: 44.88 mg
pickup 0.31

New background – 4/10/70
Initial wt: 45.28

2. Break-in sample – 4/10/70

Initial wt – 43.43 mg
Wt after 216 steps ($6\frac{1}{2}$ hrs) – 43.70 mg } pickup 0.27 mg
Wt after – 44.25 mg } pickup 0.55 mg
172 additional steps (388 total steps)
($4\frac{3}{5}$ additional hours)

Pickup/step
$\frac{0.27 - \frac{5.5}{20} \times 0.31}{216} = 0.80 \frac{\mu g}{step}$
$\frac{0.55 - \frac{4.67}{20} \times 0.31}{172} = 2.8 \frac{\mu g}{step}$

3. Background – 4/10/70 (immediately after break-in steps)
Initial wt – 43.38 mg
Wt after 25 hrs 44.00 mg
pickup 0.62 mg

4.
Initial wt – 45.18 mg.

Wt after 216 additional steps ($5\frac{1}{2}$ hrs) 44.62 mg
4/14/70
pickup 0.37 mg
pickup/step = $\frac{0.37 - \frac{5.5}{20} \times 0.62}{216} = 0.3 \frac{\mu g}{step}$

Wt after 216 additional steps ($5\frac{1}{2}$ hrs) 44.77
4/15/70
pickup 0.15 mg ???

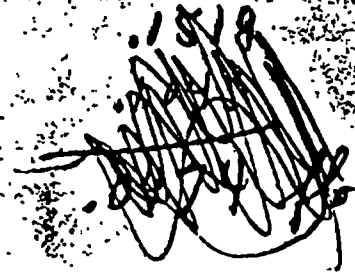
Total pickup (820 steps over period of 21.9 hours): 44.77 – 43.43 = 1.34 mg

PQ 0000 0189

PRODUCED BY FORD

.18228	.18246
.13747	.13776
.4481	.4470
.18250	.18260
.13776	.13783
.4474	.4477

PRODUCED BY FORD



~~.1518~~

~~.0174 floor~~

0.0896 drum sweepings
0.1045 retained on brush

0.1941 total from drum & wheel

.2564
− .1941
0.0623 floor (24%)

8000 0191

PRODUCED BY FORD



0896
9.1436
9.2332

Lining wear.
Secondary:
Initial wt: 729.9
after 400 stops: 727.5 — 2.4
after 832 stops: 726.9 — 0.6

Primary:
Initial wt: 701.8
after 400 stops: 700.9 — 0.9
after 832 stops: 700.6 — 0.3

PQ

8066 0192

PRODUCED BY FORD

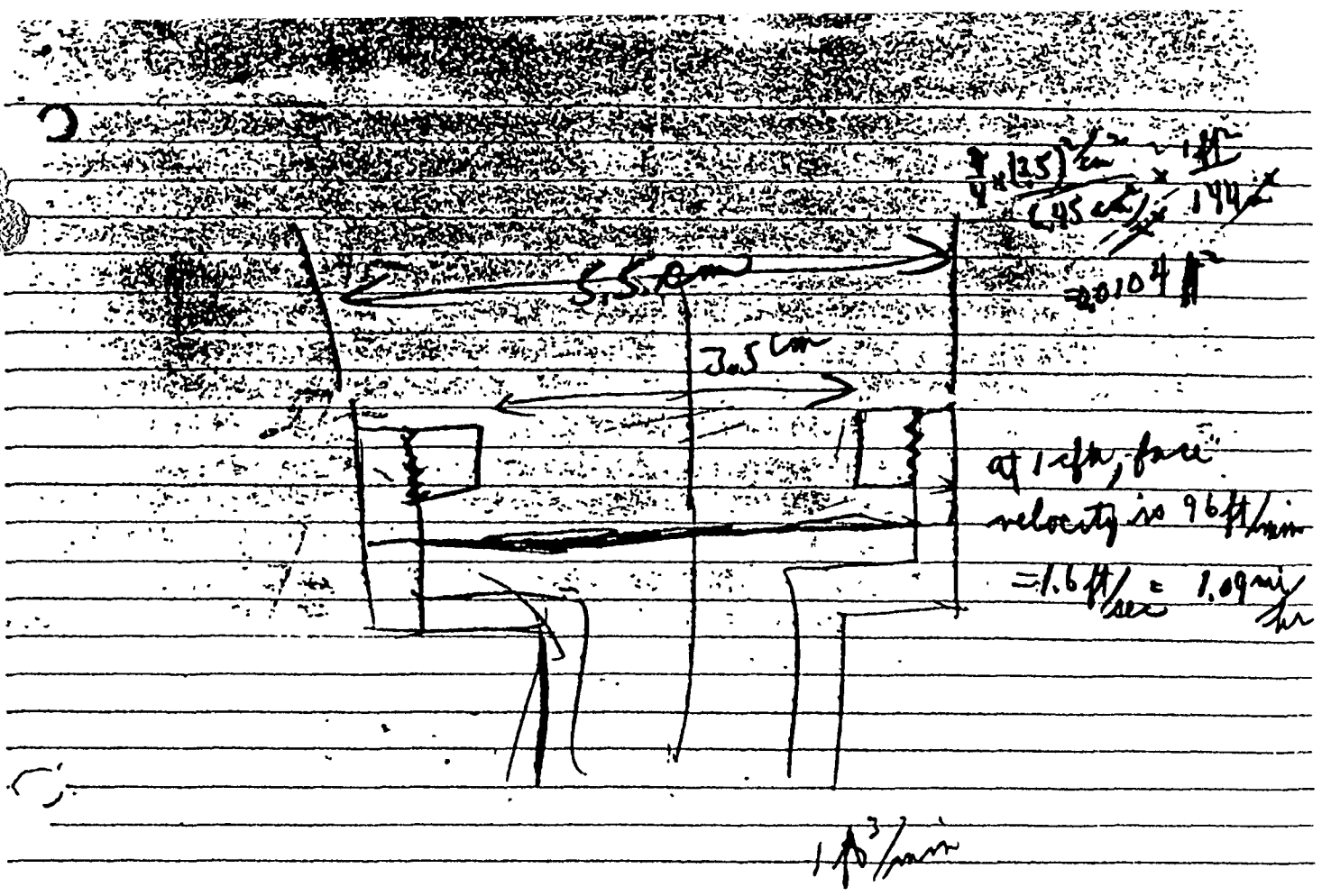
29.1704 Bottle + debris
28.3985 Bottle Tare
.7719
+ .0303 brush gain
.8022 g
+ .0082 g by hairs in sample
0 .0.7940

10.2633
10.15883 Bound
.1045
.0896 (Bubble)
.1941

9.2955
9.1436
.1519
.1045
.2564

8000 0193

PRODUCED BY FORD



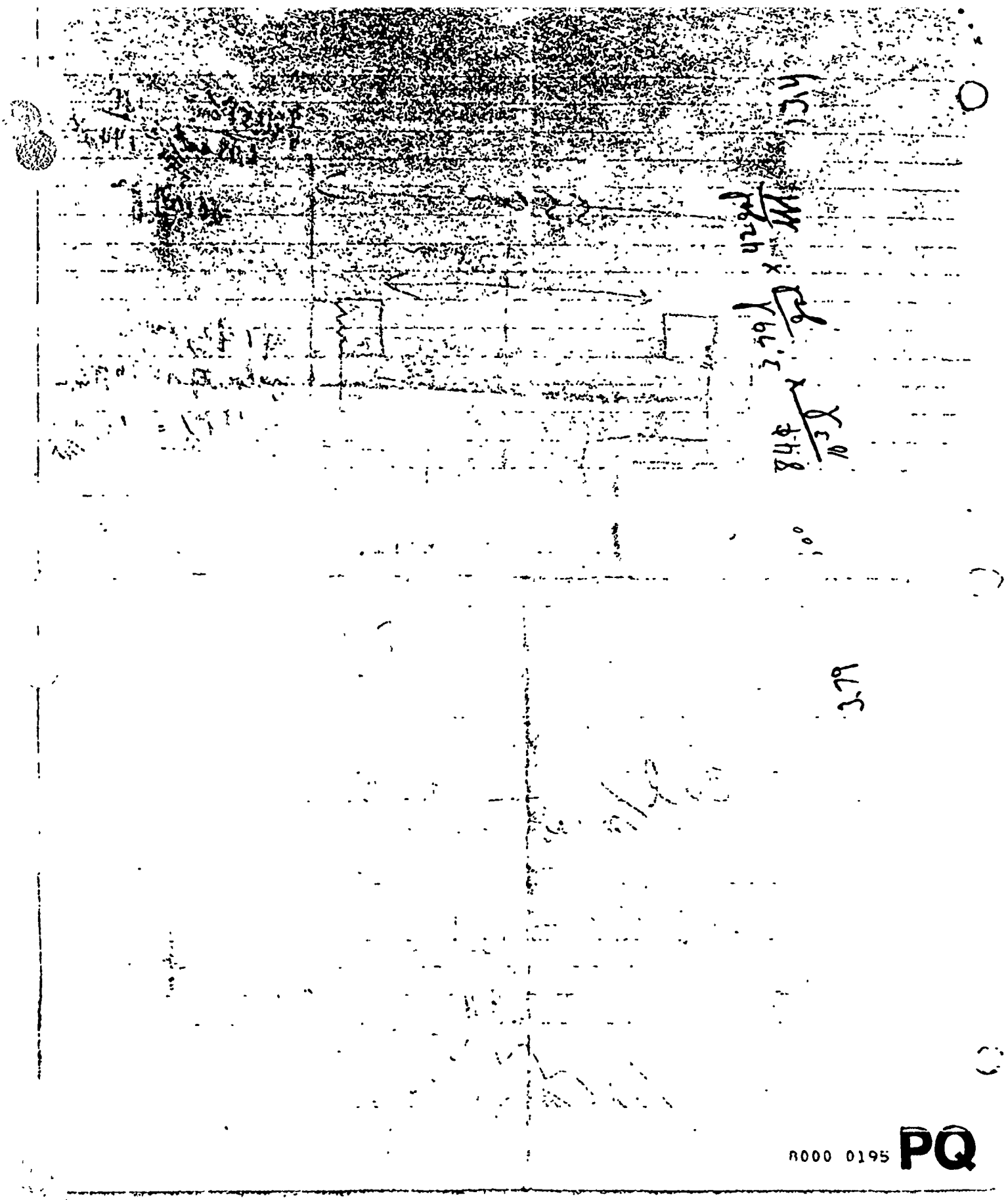
30 l/min — 0.2 μ

50 l/min — 0.45 μ

0.8 μ

8000 8194

PRODUCED BY FORD



PRODUCED BY FORD

Secondary Brake 3107-98 (1)

Wt. of dish + sample 23.6192
" " " 23.1223
" " " .4969

Wt. of dish + residue 23.4020
" " " 23.1223
" " " .2807 5[illegible]

Primary Brake 3107-62 (2)

Wt. of dish + sample 24.4033
" " " 23.6454
" " " .7579

Wt. of dish + residue 24.1235
" " " 23.6954
" " " .4771 [illegible]

Drum + Wheel dust (3)

Wt. of dish + sample 23.6547
" " " 23.3458
" " " .3089

[illegible] 23.3458
" " "

8009 0196 PQ

PRODUCED BY FORD

Primary formulation 3107-62

600 g	asbestos 7004
~6 g	H_2O
85 g	NaF
100 g	NC-111
204 g	NC 300 (80.9% solids) = 165 g.
16.5 g	Kelzan
1011.5	
- 51 solvents + H_2O	
960.5	62.5% asbestos

Secondary formulation 3107-98

600 g	asbestos 7004
6 g	H_2O
~59 g	CRS 2105 (79.4% solids) = 2
103 g	Kelzan
100 g	NC-111
33 g	microballoons
1000.5	
- 66 solvent + H_2O	
934.5	64.3% asbestos

8000 0197

PRODUCED BY FORD

5/11/70 –

Flow 29.5 cm Hg

	ΔP	FLOW
	16.3	1.49
K2	16.0	1.45

Filter #4

Filter initial wt: 41.90 mg

Filter final wt: 42.12 mg

Wt pickup: 0.22 mg

R000 0198

PRODUCED BY FORD