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INITIAL CLASSIFICATION OF THE R&D
SMOKING POPULATION BY THEIR AVERAGE PUFF VOLUME

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WRITTEN BY M. F. Kelley
M. F. Kelley

APPROVED BY P. N. Gauvin L. F. Meyer
P. N. Gauvin L. F. Meyer

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I. INTRODUCTION

Since the initiation of the Smoker Simulator Studies Program numerous pieces of data have been collected on smoking subjects. Initially, the data was accumulated to support the development of project equipment; the Smoker Profile Recorder and the Human Smoker Simulator. Recently a portion of the data was tabulated for presentation in this report and additional information collected to give a broader insight of the human smoker.

II. CONCLUSIONS:

From the data collected on R&D smoking population and presented in this report several conclusions may be drawn:

1. The smoking parameters; puff volume, puff duration, puff flow rate, puff interval, and number of puffs for human smokers differ widely in magnitude from Standard Smoking Procedure Parameters. (Table 3) (Appendix 1).
2. The Puff X Puff TPM obtained on Representative Smokers from each class is much higher than the standard data (Table 4).
3. The testing standards presently used to examine new and modified products may require revision.
4. A complete understanding of a cigarette product's performance under actual use is essential in the development of new products acceptable to the consumer.

III. DISCUSSION

Through the application of the Smoker Profile Recorders, the Human Smoker Simulator, and an extensive Computer Program a considerable quantity of profile data has been collected on the majority of the R&D smoking population. The General Data Collection File now contains profile data on 144 smokers, smok-

ing from 2 - 4 cigarettes of their own brand. From this group, profile data on 37 smokers (9 B&H and 20 Marlboro 85) has been hand-tabulated for an initial classification. The data was based on the smoker's average puff volume. It was determined from the average puff volume calculated for each of the 37 that this group spanned a volume range of 25 - 99 cc. This span has been arbitrarily divided into 5 classes with each having a range of 14 cc. Data on each smoker placed in his respective class is given in Appendix 1. The remaining parameters (maximum flow rate, duration, interval, and number of puffs) in Appendix 1 are the low and high values from each cigarette smoked. The low to high range was concluded to be more informative than a single average value which does not reflect the latitude of the human smoker. The extensive data in Appendix 1 was further refined, resulting in Table 1 which provides concise data on each smoker class. The range concept was retained in Table 1 for flow, duration, interval, and number of puffs as the average low and average high values.

The remainder of the 144 smokers will be classified with the computer. Data from the enlarged classification will be submitted in a future memo. The computer program is being written to provide the desired classified data from the General Data Collection's IBM card bank on smokers.

From each of the five classes, one representative Marlboro 85 smoker was selected for determining Puff X Puff TPM data on the Smoker Simulator. The total smoking data accumulated on the selected smokers was submitted for statistical analysis to determine an average smoker profile for each smoker. The statistical analysis data (Table 2) was used to calculate the average profile data on each smoker as shown in Table 3 and by graph, Figure 3. This same statistical analysis data was used by the Computer Group to prepare five Command Tapes for Simulator smoking. Puff X Puff TPM data, on Marlboro 85 (Table 4), was obtained using these five tapes to command the Smoker Simulator.

Table 4 TPM data represents an average smoking on each of the selected smokers. All TPM data, including the C.I., is an average of two duplicate determinations and each determination consists of 20 cigarettes.

Appendix 2-4 illustrates checking procedures used to insure the accuracy of TPM data. The numerical data calculated (from the statistical analysis of smokers) to prepare the figures in Appendix 2 is used to check computer input data on the Command tapes. Bubble test volume data (Appendix 3) was determined on the Simulator just before TPM runs were performed to check the Simulator operation and to verify computer data on the tape. An average of the volumes recovered from Ports 1 - 4 should not deviate from the theoretical value by more than $\pm 4\%$. Strip Charts (Appendix 4) were run to check the Simulator performance at the same time that TPM were being run.

A. TABLES

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TABLE 1

CLASSIFICATION OF THE R&D SMOKING POPULATION BY THEIR AVERAGE PUFF VOLUME

Class No.	Percent of Smokers Represented	Puff Vol. Range Each Class cc.	Max. Puff flow Rate cc/Min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
			Avg Low	Avg High	Avg Low	Avg High	Avg Low	Avg High	Avg Low	Avg High
13.5	25 - 39	1412	2605	1.04	2.52	25.5	93.9	6	8	
43.2	40 - 54	1550	2914	1.37	3.03	28	99.4	8.25	10.5	
16.2	55 - 69	2088	3197	1.58	2.94	22.8	77.4	7.33	9.33	
21.5	70 - 84	2151	3798	1.47	3.44	21.0	84.2	8.13	10.4	
5.4	85 - 99	2254	4301	1.79	4.12	25.4	117.5	6	9	

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TABLE 2

STATISTICAL ANALYSIS DATA USED TO PREPARE THE FIVE REPRESENTATIVE

SMOKERS COMMAND TAPES

Class	Average No. of Puffs	Average Puff Vol. cc	Volume		Average Puff Duration Sec.	Duration		Average Puff Interval Sec.	Interval		Avg Max. Flow Rate cc/min.	Max. Flow Slope
			Slope	Slope		Slope	Slope					
	7.67	37.29	-2.11	-0.14	1.89	55.70	5.73	1878.68	46.21			
	6.56	48.35	-1.11	-0.12	1.99	73.24	0.71	2467.77	102.34			
	8.78	57.27	-0.63	0.03	2.75	32.02	2.71	2060.4	-47.54			
	8.89	80.40	-2.90	-0.11	2.21	36.68	4.59	4453.3	19.23			
	6.67	89.06	-0.57	-0.22	3.19	51.11	6.59	3052.27	234.13			

NOTE: The data shown in Table 2, except for volume, may not fall in the Class range given in Table 1. Table 2 data is an average of each smokers data while Table 1 data is an average of the low and high values for each smoker in the given class.

TABLE 3

SMOKER DATA, BY CLASS, USED TO OBTAIN REPRESENTATIVE TPM DATA

Class	Puff Parameters	1	2	3	4	5	6	7	8	9
1	Volume cc	42.62	41.51	39.40	37.29	35.18	33.07	30.96	28.85	
	Duration sec.	2.31	2.17	2.03	1.89	1.75	1.61	1.47	1.33	
	Interval sec.	--	44.24	49.97	55.70	61.43	67.16	72.89	78.62	
	*Flow Rate cc/min.	1740.3	1786.6	1832.8	1879.0	1925.2	1971.4	2017.6	2063.8	
2	Volume cc	51.12	50.01	48.90	47.79	46.68	45.57	44.46		
	Duration sec.	2.29	2.17	2.05	1.93	1.81	1.69	1.57		
	Interval sec.	--	77.18	77.88	78.60	79.30	80.01	80.72		
	*Flow Rate cc/min.	2211.9	2314.3	2416.5	2518.9	2621.3	2723.6	2826.0		
3	Volume cc	59.47	58.85	58.21	57.58	56.96	56.32	55.69	55.07	54.43
	Duration sec.	2.64	2.67	2.70	2.73	2.76	2.79	2.82	2.85	2.88
	Interval sec.	--	25.24	27.96	30.66	33.37	36.08	38.79	41.50	44.21
	*Flow Rate cc/min.	2226.8	2179.2	2131.7	2084.2	2036.6	1989.1	1941.5	1894.0	1846.5
4	Volume cc	90.55	87.65	84.75	81.85	78.95	76.05	73.15	70.25	67.35
	Duration sec.	2.59	2.48	2.37	2.26	2.15	2.04	1.93	1.82	1.71
	Interval sec.	--	25.20	29.79	34.38	38.97	43.56	48.15	52.74	57.33
	*Flow Rate cc/min.	4386.0	4405.2	4424.5	4443.7	4462.9	4482.1	4501.4	4520.6	4539.8
5	Volume cc	90.48	89.91	89.34	88.77	88.20	87.63	87.06		
	Duration sec.	3.74	3.52	3.30	3.08	2.86	2.64	2.42		
	Interval sec.	--	41.22	47.81	54.40	60.99	67.58	74.17		
	*Flow Rate cc/min.	2467.5	2701.7	2935.8	3169.9	3404.1	3638.2	3872.3		
6	Volume cc	35	35	35	35	35	35	35	35	35
	Duration sec.	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Interval sec.	--	60	60	60	60	60	60	60	60
	*Flow Rate cc/min.	1650	1650	1650	1650	1650	1650	1650	1650	1650

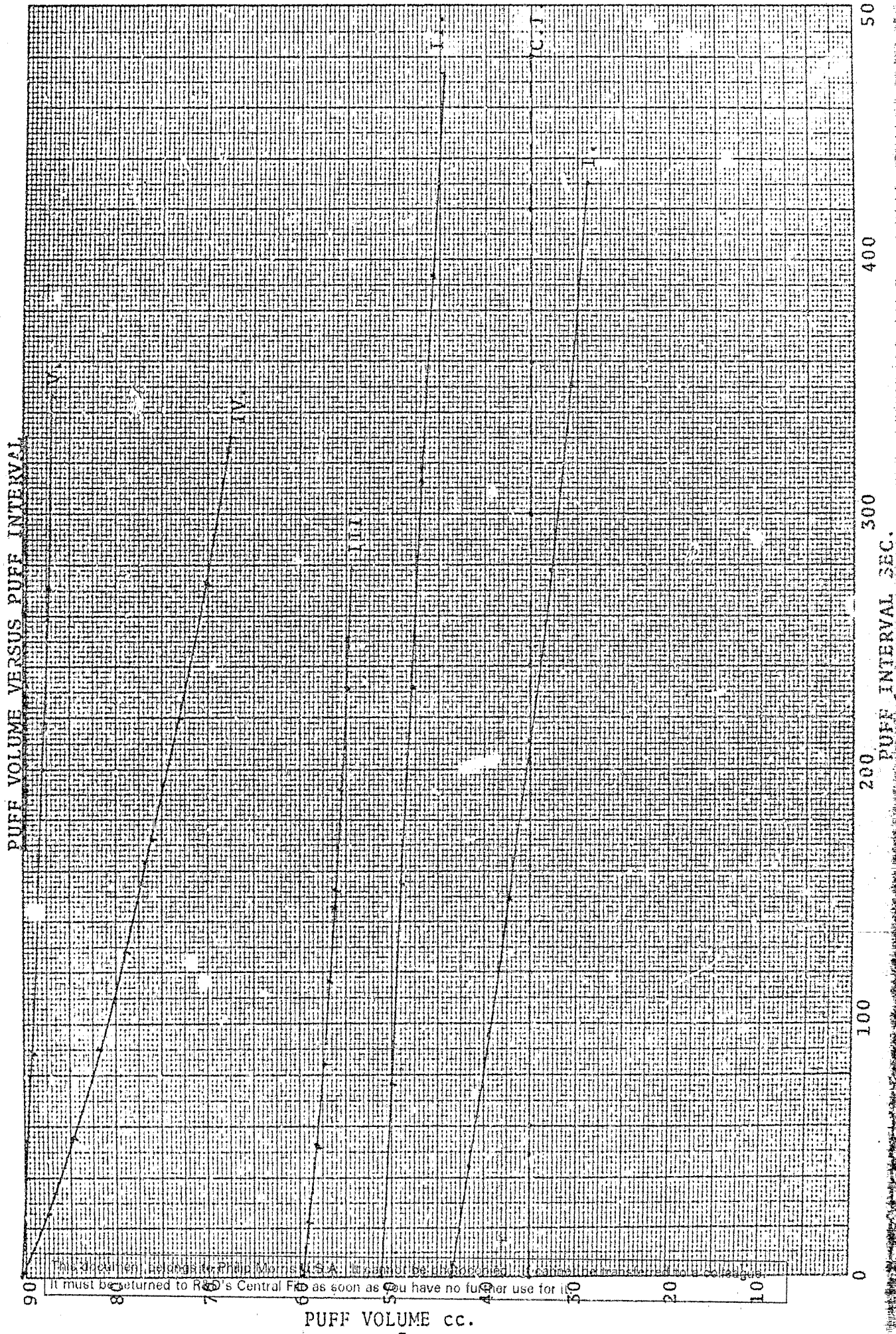
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*Max. Flow Rate

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FIGURE 3.



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TABLE 4

PUFF BY PUFF TPM DATA ON SMOKER REPRESENTATIVE FROM EACH CLASS

Class No.	1	2	3	4	5	6	7	8	9	Total TPM
1	1.91	2.17	2.17	2.25	2.21	2.30	2.09	2.12	--	17.22
2	2.57	2.82	3.10	3.10	3.29	4.02	5.92	--	--	24.81
3	2.57	3.05	3.50	3.89	4.00	4.47	4.71	5.56	6.25	37.99
4	4.13	4.75	5.85	5.93	6.09	6.44	7.02	7.78	8.88	56.85
5	4.21	5.15	6.16	6.98	8.15	10.07	12.12	--	--	52.83
6	1.63	2.00	2.28	2.27	2.56	2.71	2.88	3.19	2.03*	21.54

Lab Data

*6. I. Lab data reported on 8.5 puffs. 9th puff data divided by 2 for reporting.

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B. APPENDICES

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APPENDIX 1

SPECIFIC PARAMETER DATA ON EACH OF THE 37 SMOKERS
BY CLASS

Profile data on 144 smokers, smoking 2-4 cigarettes of their own brand has been accumulated in the General Data Collection File. A hand-tabulation of 37 of these smokers (9 B&H and 28 Marlboro 85) data has been made for an initial classification. The classification was based on the smoker's average puff volume. From the average puff volume calculated for each of the 37 it was determined that the group spanned a volume range of 25-99 cc. This span has been arbitrarily divided into five classes with each having a range of 14 cc. Data on each smoker placed in his respective class is given in Appendix 1. The remaining parameters (maximum flow rate, duration, interval, and number of puffs) in Appendix 1 are the low and high volume from each cigarette smoked.

- Class I Smoker Data, page 10.
- Class II Smoker Data, pages 11, 12.
- Class III Smoker Data, page 13.
- Class IV Smoker Data, page 14.
- Class V Smoker Data, page 15.

CLASS I SMOKERS

AVERAGE PUFF VOLUME RANGE 25-39 cc.

RANGE

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
1	1646	2332	1.35	1.95	46.4	68.8	4	9
	992	2852	1.15	2.10	12.2	123.0		
	1717	3028	1.30	2.05	7.3	77.8		
2	1484	2386	1.30	3.15	36.9	61.8	6	8
	1393	2649	1.20	3.55	23.0	86.4		
	1941	2889	1.20	3.25	21.6	52.6		
3	1672	3076	1.10	1.50	18.0	90.3	6	8
	1462	2237	1.10	2.25	18.8	100.6		
	2149	2722	0.50	1.40	35.5	95.1		
4	1710	2796	1.20	1.90	36.3	71.6	6	7
	1436	2536	0.60	2.45	26.3	109.2		
	1052	2639	0.65	1.40	36.9	91.1		
5	883	1944	1.10	4.05	28.5	126.1	8	8
	796	2681	0.85	3.30	13.5	127.8		

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CLASS II SMOKERS

AVERAGE PUFF VOLUME RANGE 40-54 cc.

RANGE

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
1	1169	2689	0.45	2.00	8.5	62.8	4	13
	1283	2680	0.60	5.00	8.3	95.3		
	1590	2217	1.26	2.80	9.9	14.4		
2	1700	2161	1.10	1.80	23.0	58.5	8	9
	1543	2326	1.50	2.65	22.6	55.0		
	1152	2244	1.65	2.45	6.0	80.8		
3	868	2407	0.88	2.28	14.0	75.7	8	10
	1455	5105	1.28	2.38	16.1	96.0		
	1814	4466	1.52	3.06	15.3	89.3		
	1193	2774	1.74	2.64	37.2	110.0		
4	1273	2071	1.65	5.00	13.2	115.0	9	12
	1154	2623	1.15	4.15	12.4	103.9		
	1118	2070	1.55	3.95	12.3	84.2		
	1258	3082	0.90	2.95	13.0	88.7		
5	1013	2739	1.60	3.05	9.5	35.7	9	10
	587	2197	1.80	2.70	17.2	50.1		
	1070	2924	1.25	2.35	3.3	105.3		
6	1819	3894	0.90	1.55	9.6	117.6	13	14
	1609	3514	0.90	2.55	9.0	32.4		
	1710	2876	0.95	2.05	6.1	51.9		
7	2529	3435	1.10	3.45	6.8	46.4	10	12
	2048	2906	1.25	2.10	18.4	51.0		
	2073	3434	1.20	2.45	12.3	37.6		
8	2175	3230	1.75	3.60	31.6	71.5	6	8
	1492	2937	1.85	2.75	77.8	177.6		
	1850	2777	1.60	2.70	18.0	233.8		
9	1846	2671	1.18	2.24	48.5	82.7	6	8
	1650	2477	1.52	2.46	16.9	109.7		
	1572	2603	1.70	2.32	42.7	71.6		
	1669	3177	1.16	1.96	8.4	157.0		
10	1239	3133	2.10	2.85	12.8	33.2	12	14
	1846	2939	1.85	2.50	9.1	32.1		
	1364	3399	1.90	4.20	10.2	78.0		

CLASS II SMOKERS - continued

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
11	2130	3806	1.55	2.60	19.9	91.4	6	7
	2454	3794	1.55	2.85	22.1	89.7		
	2042	3794	1.35	2.50	32.4	77.7		
12	869	1553	2.35	3.75	61.0	111.0	3	7
	1227	1666	1.90	4.00	128.5	202.5		
	1532	1782	2.75	4.20	170.0	293.1		
13	1430	3594	1.25	2.70	26.9	213.6	5	6
	1453	3164	1.25	2.50	122.0	145.3		
14	2269	4369	1.20	1.80	21.19	118.5	8	10
	2174	3255	1.45	1.90	35.1	56.0		
	2069	4720	1.05	2.00	27.8	52.7		
15	1378	1953	0.75	5.35	8.5	22.5	14	14
	1230	2532	0.85	4.65	11.4	27.3		
	1395	2020	0.85	4.90	7.5	48.5		
16	1115	2409	1.55	4.85	21.4	62.1	11	14
	1461	2284	1.05	3.20	25.1	85.9		
	1296	2489	1.30	4.85	8.3	77.4		

CLASS III SMOKERS

AVERAGE PUFF VOLUME RANGE 55-69 cc.

RANGE

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
1	3467	4544	1.40	2.55	15.8	67.9	9	11
	3583	5896	1.35	2.70	23.9	46.9		
	3581	5305	1.60	2.80	3.0	37.2		
2	1843	2706	1.35	2.45	44.5	69.9	6	6
	1746	2898	1.35	2.50	34.9	118.3		
	2059	3012	1.50	2.80	31.1	83.8		
3	2335	3540	1.60	2.95	16.7	67.1	10	12
	2117	3373	1.05	3.45	18.1	57.2		
	2284	3556	1.00	2.25	8.0	49.5		
4	1171	2260	2.20	3.40	33.0	187.3	5	10
	1454	2486	2.40	4.55	32.3	75.2		
	1469	2857	1.35	3.70	34.3	62.6		
5	1467	2417	1.30	2.10	8.4	32.7	6	9
	2168	3104	2.20	2.90	19.6	125.7		
6	1826	2432	1.65	3.30	35.2	79.3	8	8
	1523	2128	1.65	2.95	13.2	80.0		

CLASS IV SMOKERS

AVERAGE PUFF VOLUME RANGE 70-84 cc.

RANGE

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
1	2304	3930	1.15	5.00	15.7	141.0	8	11
	1738	3112	1.75	3.55	17.3	90.1		
	2161	3326	1.40	3.95	23.5	69.1		
2	1305	3262	1.52	3.82	10.6	31.4	8	11
	1556	3228	1.42	4.40	16.4	73.3		
	1535	4660	0.64	4.08	10.7	52.8		
3	2377	3388	1.62	2.30	44.1	89.7	6	8
	3304	3938	1.24	3.86	10.2	61.0		
	3066	4238	1.28	2.84	27.8	118.7		
	2920	3617	1.20	2.88	17.3	145.4		
4	1165	3349	1.60	4.15	12.9	77.9	7	10
	2181	2748	1.65	3.60	24.6	133.2		
	2667	3067	2.10	2.95	52.2	83.4		
5	1781	4907	1.05	3.75	20.2	45.7	9	10
	1748	5061	1.15	2.75	26.3	85.9		
	2096	4495	0.70	2.35	13.7	99.3		
6	1474	2334	1.95	2.80	37.5	114.7	6	9
	1976	3010	1.85	2.95	23.0	69.8		
7	3155	5244	1.40	2.25	17.3	139.6	7	10
	3576	4676	1.80	2.80	40.9	136.5		
	2493	4697	1.85	3.10	28.3	74.2		
8	2111	3516	1.65	4.15	2.1	39.4	14	14
	2047	4468	1.30	3.90	3.7	26.9		

CLASS V SMOKERS

AVERAGE PUFF VOLUME RANGE 85-99 cc.

RANGE

Smoker No.	Puff Max. Flow Rate cc/min.		Puff Duration Sec.		Puff Interval Sec.		No. of Puffs	
	Low	High	Low	High	Low	High	Low	High
1	1269	3144	1.40	4.8	6.3	33.1	7	11
	1234	4780	1.70	4.05	10.4	82.0		
	2409	4835	1.90	2.95	28.3	56.4		
2	3511	4720	2.15	3.95	10.5	119.0	5	7
	4084	5540	1.47	2.95	42.0	206.0		
	2904	5323	3.00	5.25	79.1	290.4		
	985	5813	1.00	5.10	11.2	96.0		

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APPENDIX 2

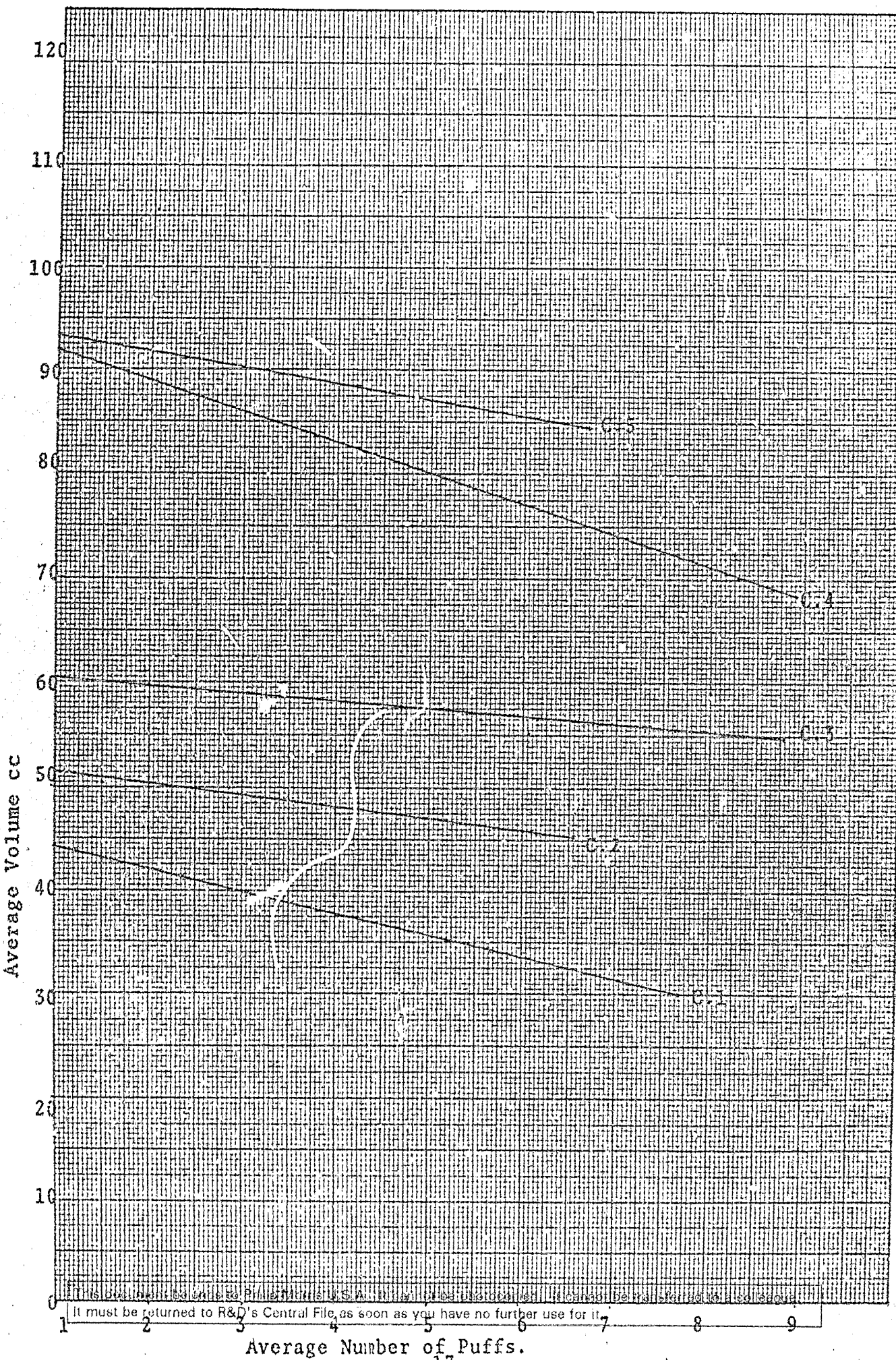
GRAPHS OF STATISTICAL ANALYSIS DATA FOR COMPARISON
OF EACH PARAMETER FOR EACH REPRESENTATIVE SMOKER

Plots of individual parameters are frequently used to compare smokers and/or to examine the effect of cigarette changes on each parameter. The data calculated to prepare the graphs is also used as a check on the data input to a command tape.

Heading on Graphs:

Volume versus Number of Puffs	Class 1-5, page 17
Max. Flow Rate versus Number of Puffs	Class 1-5, page 18
Duration versus Number of Puffs	Class 1-5, page 19
Interval versus Number of Puffs	Class 1-5, page 20

VOLUME VERSUS NO. OF PUFFS



10 X 100 TO THE TIME 48
 MADE IN
 KRUPP & ESSER CO.

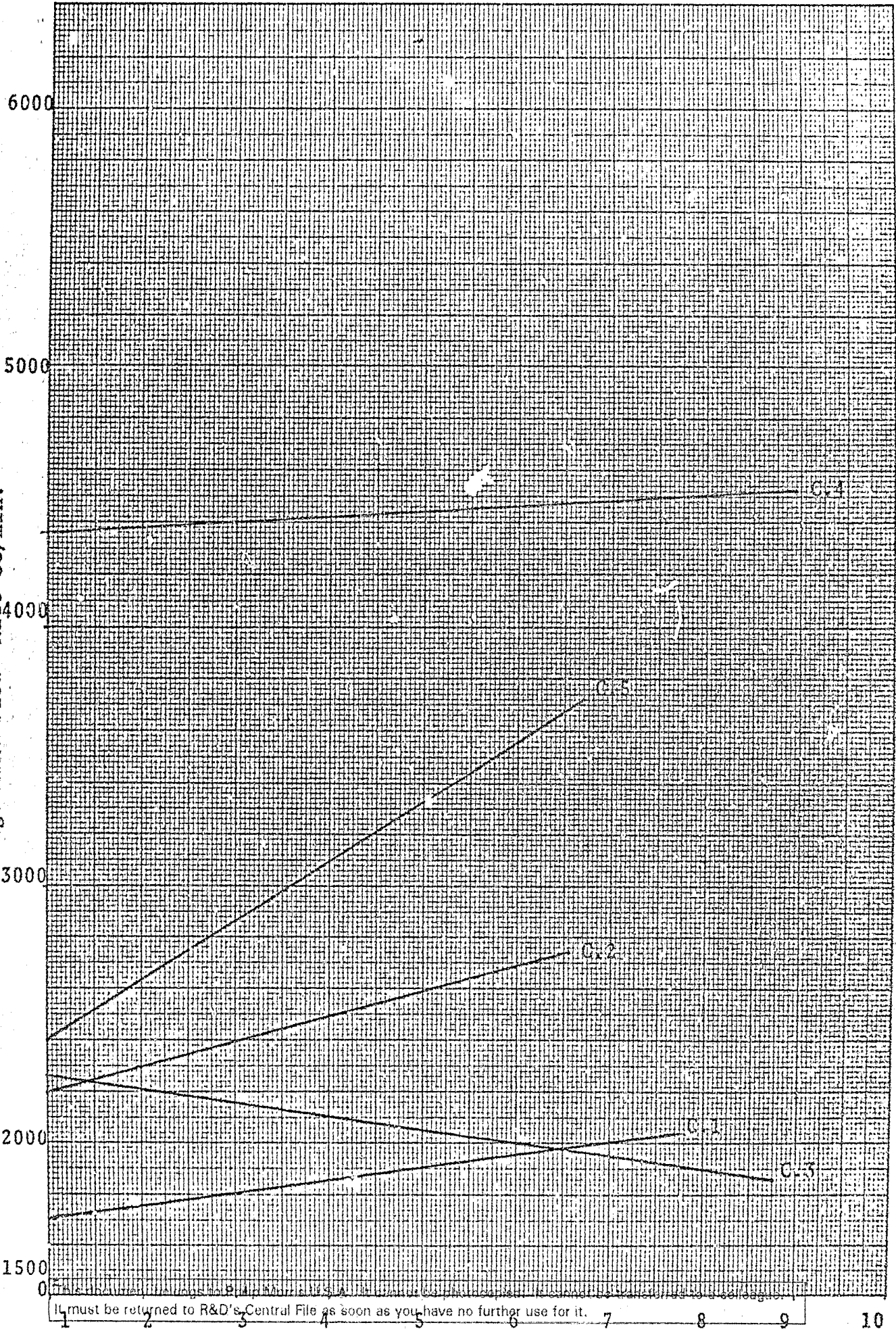
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2050941316

MAX. FLOW RATE VERSUS NO. OF PUFFS

10 x 23 CM. KEUFFEL & ESSER CO. MADE IN U.S.A. THE TIME TO PUFF IS 1.6 SECONDS

Average Max. Flow Rate cc/min.

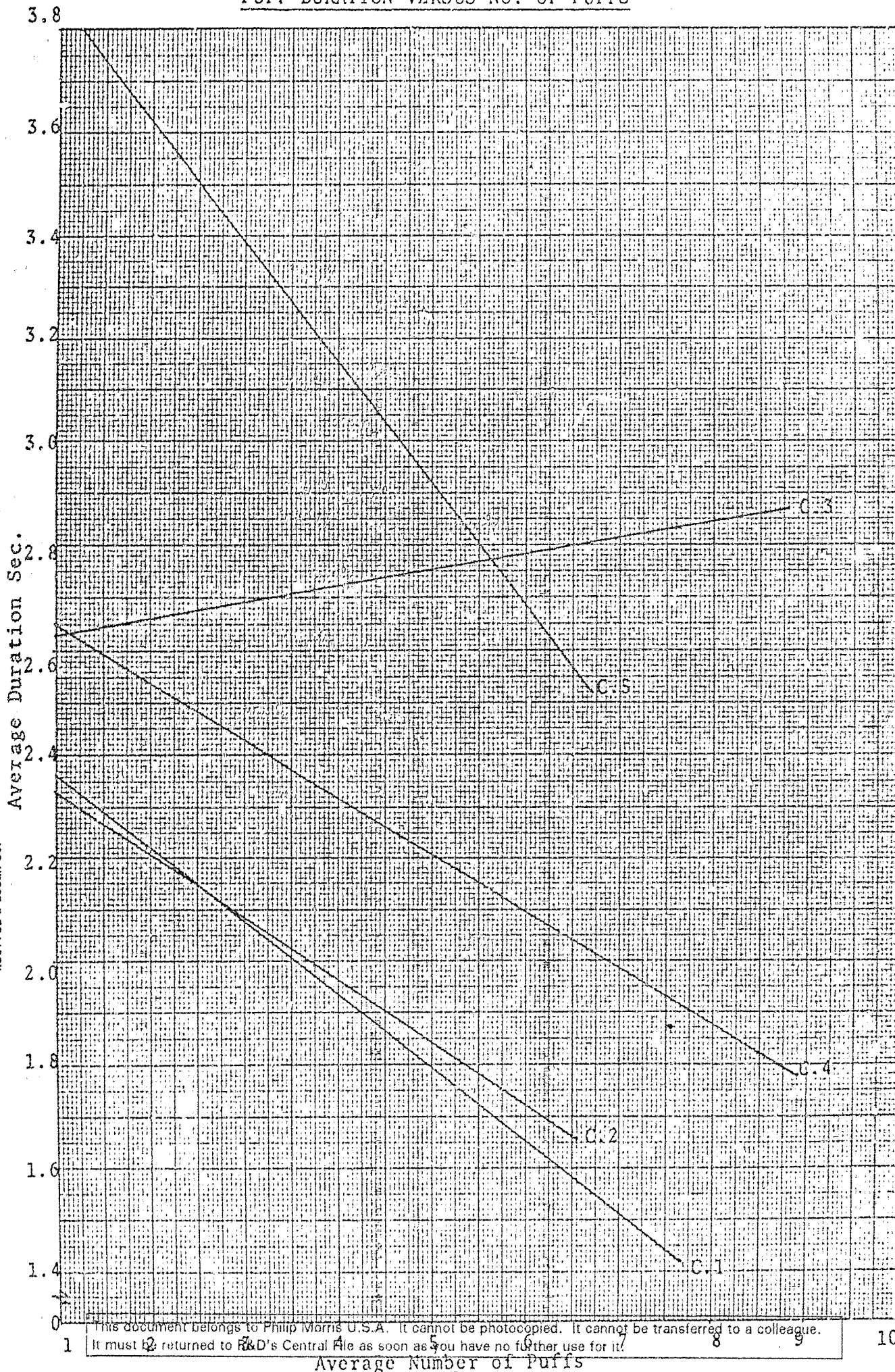


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Average Number of Puffs

2050941317

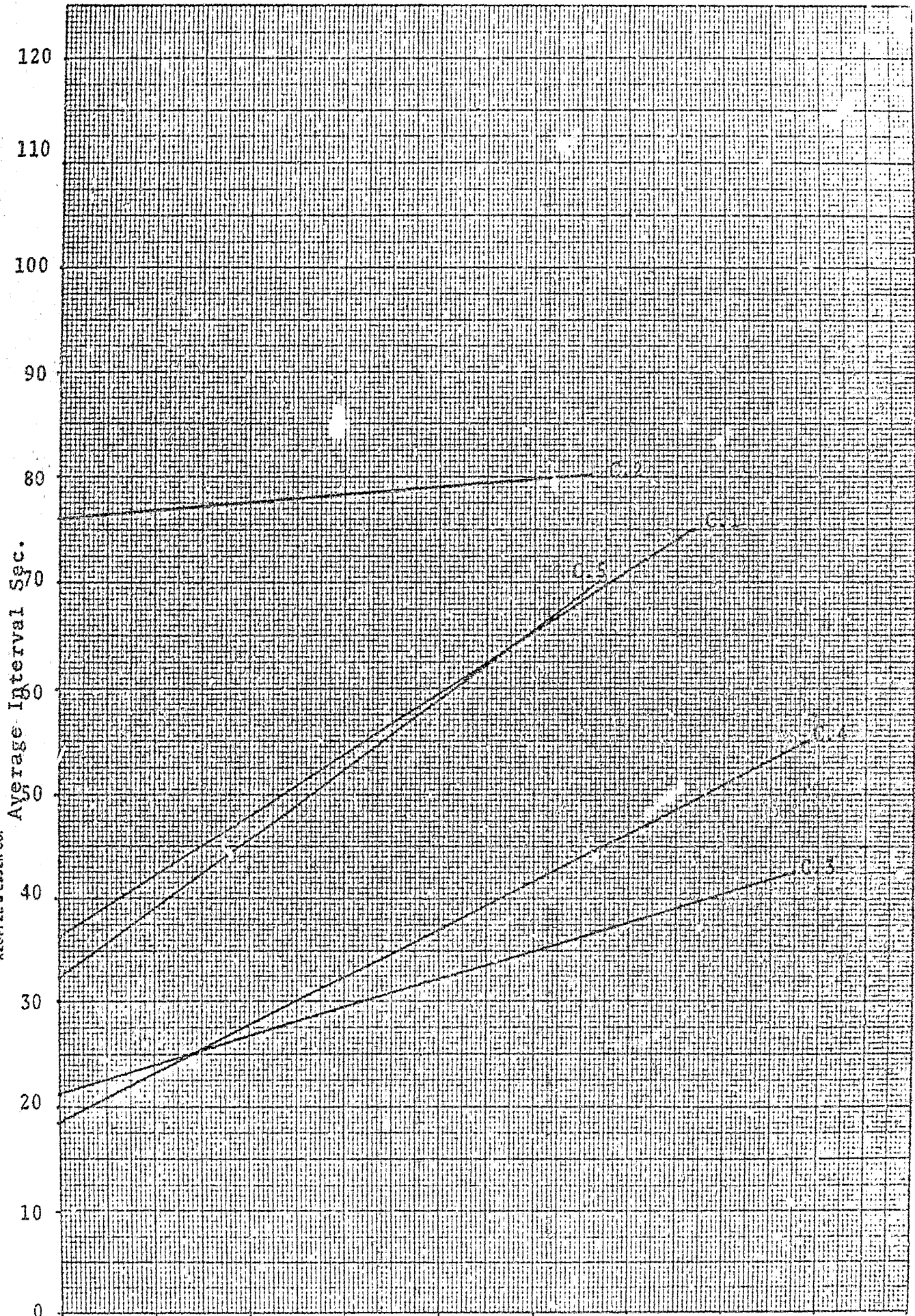
PUFF DURATION VERSUS NO. OF PUFFS



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PUFF INTERVAL VERSUS NO. OF PUFFS



10 X 10 TO THE CENTIMETER
 MADE IN U.S.A.
 KEUFFEL & ESSER CO.

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 It must be returned to R&D's Central File on the average number of puffs for it.

2050941319

APPENDIX 3

VOLUME RECOVERY DATA ON COMMAND TAPES TAKEN WITH

A BUBBLE TESTER

Prior to TPM data collection on a Command tape, a volume recovery determination with a bubble tester is made on each puff and each port of the Simulator. The testing provides a check on the computer preparation of the tape, Simulator performance, and the percent accuracy of the TPM to be obtained.

- Class I, Volume Recovery Data, page 22
- Class II, Volume Recovery Data, page 23
- Class III, Volume Recovery Data, page 24
- Class IV, Volume Recovery Data, page 25
- Class V, Volume Recovery Data, page 26

CLASS I SMOKER

VOLUME RECOVERIES

TABLE NUMBER - HSS-026	THEORETICAL VOLUME C.C.	DATE - 12-11-74				Average % Recovery		
		Port 1 Volume C.C.	Port 2 Volume C.C.	Port 3 Volume C.C.	Port 4 Volume C.C.			
Port 1 % Rec.	Port 2 % Rec.	Port 3 % Rec.	Port 4 % Rec.					
43.62	44.5	102	107.7	42.0	96.3	49.0	112.3	104.6
41.51	42.6	104	107.4	39.8	95.5	44.0	106.0	102.8
39.40	39.0	99	106.6	36.4	92.3	43.5	110.4	102.1
37.29	37.0	99.2	106.5	34.7	93.1	40.7	109.1	102.0
35.18	35.9	102	106.6	33.1	94.1	38.5	109.4	103.0
33.07	33.4	101	107.3	30.1	91.0	35.9	108.6	102.0
30.96	30.0	96.9	105.7	29.5	95.3	33.3	107.6	101.4
28.85	29.3	101.6	102.3	27.8	96.4	30.0	104.0	101.1
Average % Recovery		100.7	106.3		94.3		108.4	102.4

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CLASS II SMOKER

VOLUME RECOVERIES

TAPE NUMBER - HSS-019

DATE - 12-13-74

Puff No	Theoretical Volume C.C.	Port 1		Port 2		Port 3		Port 4		Average % Recovery
		Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	
1	51.12	54.4	106.4	55.0	107.6	51.4	100.5	56.0	109.5	106.0
2	50.01	51.6	103.2	52.0	103.9	49.4	98.8	53.0	105.9	102.9
3	48.90	50.6	103.5	51.8	105.9	47.6	97.3	52.6	107.6	103.6
4	47.79	49.4	103.4	51.0	106.7	47.8	100.0	49.0	102.5	103.2
5	46.68	47.4	101.5	48.4	103.7	46.2	98.9	49.4	105.8	102.5
6	45.57	47.2	103.6	47.2	103.6	43.0	94.4	47.6	104.5	101.5
7	44.46	45.2	101.7	46.2	103.9	43.8	98.5	47.0	105.7	102.5
Average % Recovery			103.3		105.0		98.3		105.9	103.2

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CLASS III SMOKER

VOLUME RECOVERIES

TAPE NUMBER - HSS-024

DATE - 12-16-74

Theoretical Volume C.C.	Port 1		Port 2		Port 3		Port 4		Average % Recovery
	Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	
59.47	59.6	100.2	63.0	106.0	59.4	99.9	66.4	112.0	104.5
58.85	59.8	101.5	62.4	106.0	57.8	98.2	64.4	109.0	103.7
58.21	58.8	101.0	60.8	104.0	58.0	99.6	63.6	109.0	103.4
57.58	57.0	99.0	59.0	102.5	57.0	99.0	63.6	110.0	102.6
56.96	56.4	99.0	60.6	106.0	55.6	98.0	62.6	110.0	103.3
56.32	55.4	98.0	58.8	104.0	55.6	99.0	62.0	110.0	102.8
55.69	55.0	99.0	57.4	103.0	54.6	98.0	61.6	111.0	102.8
55.07	53.6	97.0	57.8	105.0	52.8	96.0	61.4	112.0	102.5
54.43	52.0	96.0	57.8	106.0	51.2	94.0	61.2	112.0	102.0
Average & Recovery									103.1
									98.0
									110.6
									104.7

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CLASS IV SMOKER
VOLUME RECOVERIES

TAPE NUMBER - HSS-023

DATE - 12-17-74

No.	Theoretical Volume C.C.	Port 1		Port 2		Port 3		Port 4		Average % Recovery
		Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	Volume C.C.	% Rec.	
1	90.55	93.0	102.7	92.4	102.0	89.6	99.0	94.2	104.0	101.9
2	87.65	86.5	99.0	89.4	102.0	86.4	99.0	90.4	103.1	100.8
3	84.75	88.0	103.8	86.8	102.1	84.6	100.0	88.0	103.8	102.5
4	81.85	83.8	102.4	82.8	101.2	81.4	99.5	85.2	104.1	101.8
5	78.95	80.6	102.1	80.4	101.8	74.0	93.7	82.0	103.9	100.4
6	76.05	77.8	102.3	75.2	99.0	76.4	100.5	78.8	103.6	101.4
7	73.15	74.0	101.2	75.0	102.5	73.0	100.0	73.4	100.3	101.0
8	70.25	73.4	104.5	71.0	101.1	71.0	101.1	71.4	101.6	102.1
9	67.35	68.0	101.0	69.0	102.4	67.4	100.1	70.4	104.5	102.0
Average % Recovery			102.1		101.6		99.2			101.5

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CLEARING EXP. SERIES

TAPE NUMBER - KSS-005

DATE - 12-18-74

No.	Theoretical Volume C.C.	Port 1 Volume C.C.	% I.S.E.	Port 2 Volume C.C.	% Rec.	Port 3 Volume C.C.	% Rec.	Port 4 Volume C.C.	% Rec.	Average % Recovery
1	90.48	89.0	98.4	92.0	101.7	93.6	103.4	94.8	104.8	102.1
2	89.91	88.6	98.5	91.4	101.7	92.6	103.0	93.6	104.1	101.8
3	89.34	88.0	98.5	89.8	100.5	91.0	101.9	92.2	103.2	101.0
4	88.77	89.4	100.7	88.6	99.8	90.6	102.1	90.6	102.1	101.2
5	88.20	88.6	100.5	86.8	98.4	89.4	101.4	89.2	101.1	100.4
6	87.63	88.6	101.1	86.6	98.8	89.4	102.0	86.8	99.1	100.3
7	87.06	87.8	100.8	85.4	98.1	88.6	101.8	85.4	98.1	99.7
Average % Recovery										101.8

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APPENDIX 4

STRIP CHART DATA ON EACH PORT OF SIMULATOR TAKEN DURING
TPM DETERMINATIONS

The strip chart data, at 0.25 mm/sec. speed, is collected as a checking procedure during the TPM determinations. The readout shows each port's π tran response, resulting from the actual puff taken on the cigarette. An example of incorrect response, resulting from a malfunction, is seen on the sheet for Class I, puff 3, port 3 marked with an arrow. Checking procedures are considered essential at this stage to insure the accuracy of results.

Strip Chart, Class I, page 28

Strip Chart, Class, IV, page 29

CLASS I

Port 1

Port 2

Port 3

Port 4

Cigarette 2

Puff 8

Puff 7

Puff 6

Puff 5

Puff 4

Puff 3

Puff 2

Puff 1

Cigarette 1

CLASS IV

Port 1

Port 2

Port 3

Port 4



Cigarette 2

Cigarette 1

Puff 9

Puff 8

Puff 7

Puff 6

Puff 5

Puff 4

Puff 3

Puff 2

Puff 1

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