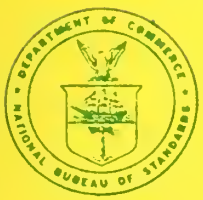
TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

REPORT NO. 56G



U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

NBS COLLABORATIVE REFERENCE PROGRAMS

TAPPI Paper and Board (6 times per year)

- Bursting strength
- Tearing strength
- Tensile breaking strength
- Elongation to break
- Tensile energy absorption
- Folding endurance
- Stiffness
- Air resistance
- Grammage
- Smoothness
- Surface pick strength
- K & N ink absorption
- pH
- Opacity
- Blue reflectance (brightness)
- Specular gloss, 75°
- Thickness
- Concora (flat crush)
- Ring crush

FKBG-API Containerboard (48 times per year)

- Mullen burst of linerboard
- Concora test of medium

MCCA Color and Appearance (4 times per year)

- Gloss at 60°
- Color and color difference
- Retroreflectivity

Rubber (4 times per year)

- Tensile strength, ultimate elongation and tensile stress
- Hardness
- Mooney viscosity
- Vulcanization properties

ASTM Textiles (3 times per year)

- Flammability (FF3-71 and FF5-74)

ASTM Cement (2 times per year)

- Chemical (11 chemical components)
- Physical (8 characteristics)

AASHTO Bituminous

- Asphalt cement (2 times per year)
- Cutbacks (once a year)

Collaborative Reference Programs
B360 Polymer Building
National Bureau of Standards
Washington, D.C. 20234

Rev. 4/77

TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

Report No. 56G

R. G. Powell
TAPPI-NBS Research Associate
Collaborative Testing Services, Inc.

J. Horlick
Office of Testing Laboratory Evaluation Technology
Office of Engineering Standards
National Engineering Laboratory

NBSIR 79-1360

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

INTRODUCTION

Reports 56S and 56G comprise the second set of reports for the 78-79 program year. Participants in tests which involve strength properties of paper will receive only the S report; those in tests which measure other properties will receive only the G report.

Notes and comments to individual laboratories and "Best Values" applicable to a particular method are given following Table 1 for each method. See page 4 of this report for an explanation of "Best Values". Please do not confuse these Best Values with provisional values included with the samples to detect serious discrepancies at the time of test. NBS results, identified as L502 in the optical tests, are included on some of the tables.

If there are any questions on the notes, the analyses, or the reports in general, contact Robert G. Powell or Jeffrey Horlick on 301/921-2946.

Jeffrey Horlick

Jeffrey Horlick, Administrator
NBS-TAPPI Collaborative Reference Program
Office of Testing Laboratory Evaluation Technology

January 26, 1979

BACKGROUND AND PURPOSE

In 1969, the National Bureau of Standards and the Technical Association of the Pulp and Paper Industry established a collaborative reference program to provide a participating laboratory with a means to check periodically the level and uniformity of its testing in comparison with that of other laboratories.

The interchange of paper and board products and of the raw materials for these products requires agreement among raw material suppliers, paper and board producers, converters, distributors, retailers, commercial testing laboratories, user organizations and the ultimate consumer as to the meaning of test results, an agreement that cannot be achieved without accurate and precise testing. This program is designed to help assure agreement.

HOW THE PROGRAM WORKS

Participants Select the Tests in which they wish to participate. This choice is made on joining the program, but additional tests may be added at any time. Also new participants may enter the program at any time.

Test Samples are Distributed Bimonthly; i.e. every 2 months.

Provisional Values are Provided with the Samples for one or both of the test levels, depending on method. The provisional values permit serious discrepancies to be detected without delay. (It is left to the discretion of the laboratory supervisor as to whether these values should be known to the operator.)

Each Participant Tests the Samples, following instructions provided for each test method. The full check on a single instrument should normally take no more than 30 minutes. The test results are then sent to NBS for analysis. The participant is also asked to report other information relevant to an accurate analysis, such as test conditions and the instruments used.

Industry Means, Best Values and Other Statistics are developed from the data by NBS. The best values are estimates based on a careful examination of all data, both current and past, with special attention to results obtained by the National Bureau of Standards and other recognized reference laboratories in this and other countries.

A Quick Report is Prepared for each participating laboratory reporting data on time. This report shows the industry mean values, and the deviations of the laboratory's results from these values for each test method.

A Longer Summary Report, Showing the Data from all Participants, is also prepared. In the summary report, of which this report is an example, each laboratory is identified by a code number so that the information is maintained on a confidential basis. However, instruments are identified by type so participants can compare their results with those obtained on similar instruments of different manufacture. This report includes test averages, best values and standard deviations for individual participants and for the group as a whole. A participant should be able to readily determine the level and variability of his results in comparison with those of the other laboratories.

Repeatability and Reproducibility Statements such as Contained in ASTM, TAPPI and ISO Standards are included at the end of the report. Participants can check their performance level against the precision statement given in the test method or specification.

TABLE OF CONTENTS

Analyses In This Report

Analyses In The S Report

TABLE OF CONVERSION FACTORS TO METRIC (SI) UNITS

Physical Quantity	To Convert From	To	Multiply by
Bursting strength	psi	kPa	6.895
	kg/cm^2	kPa	98.07
	bar	kPa	100.00
Tearing strength	g	mN	9.807
Tensile strength	lb/in.	kN/m	.1751
	lb/0.5 in.	kN/m	.3502
	lb/15 mm	kN/m	.2965
	kg/15 mm	kN/m	.6538
	kg/25 mm	kN/m	.3923
	kg/mm	kN/m	9.807
Tensile energy absorption	$ft\text{-}lb/ft^2$	J/m^2	14.59
	$in.\text{-}lb/in.^2$	J/m^2	175.1
	$kg\text{-}m/m^2$	J/m^2	9.807
Bending stiffness	g·cm	μN·m	98.07
Flat-crush strength (Concora)	lb	N	4.448
Ring-crush (TAPPI)	lb	N	4.448
(ISO)	lb/6.00 in.	kN/m	0.0292
Thickness	mil	μm	25.40

KEY TO TABLES AND GRAPHS

MEAN -	The average of individual TEST DETERMINATIONS. The number of TEST DETERMINATIONS in the mean is given in the upper right corner of the first table (TEST D.) and again at the bottom of this table.
GRAND MEAN - (GR. MEAN)	The average of the individual laboratory MEANS, excluding laboratories flagged (see column F) with an X, #, or +. The GRAND MEAN is given in US customary units and, where applicable, in SI metric units.
SD OF MEANS - (SD MEANS)	The standard deviation of the laboratory MEANS about the GRAND MEAN; an index of the among-laboratory precision.
DEV -	The deviation or difference of the laboratory MEAN from the GRAND MEAN.
N. DEV -	The normal deviate or ratio of the DEV to the SD OF MEANS; an indication of the degree of divergence of the laboratory MEAN from the GRAND MEAN. A N. DEV of more than 2 or less than -2 may indicate that the participant is not following the procedure considered standard for this analysis.
SDR -	The standard deviation of repeated measurements; that is, of individual test determinations about their MEAN.
AVERAGE SDR -	The average of the individual laboratory SDR's; an index of the within-laboratory precision of repeated measurements.
R. SDR -	The relative standard deviation of repeated measurements; that is, the ratio of the SDR to the AVERAGE SDR; an indication of the ability of a participant to repeat his measurements relative to the average ability. The greater the number of TEST DETERMINATIONS the closer the R. SDR should be to unity. If R. SDR is outside the limits given below, the participant may not be following the procedure considered standard for this analysis:

No. of test Determinations	Lower limit for R. SDR	Upper limit for R. SDR
3	0.09	2.58
5	0.27	2.06
8	0.40	1.77
10	0.46	1.67
15	0.56	1.53
20	0.61	1.45
25	0.65	1.39

VAR - Code for instrument type or variation in condition, see second table.

F - Flag, with following meaning:

+ - Excluded from grand means because VAR non-standard for this analysis.

- Excluded because data were not understood or because of a non-coded variation reported by the laboratory. (See NOTES following Table 1 for each method).

M - Excluded because data for one sample are missing.

X - Excluded because plotted point would fall outside of the 99% error ellipse, (see below for explanation of Graph).

* - Included in grand means but plotted point falls outside of the 95% error ellipse. The participants should take this as a warning to reexamine his testing procedure.

S - Included in grand mean but only after omission of one or more 'wild' values; that is, test determinations more than 3 times AVERAGE SDR from the laboratory's MEAN. Not more than 20% of the test determination may be excluded in this manner without rejecting the laboratory.

O - Included in grand mean and inside 95% error ellipse.

COORDINATES - Distances along major and minor axes of error ellipse. If special additive or concurrent model of the measuring process applies to this method, the distance along the minor axis represents the random error within a laboratory while that along the major axis also includes a systematic laboratory component of error.

95% ELLIPSE - Lengths of the major and minor axes of the ellipse and the angle that the major axis makes with the horizontal axis.

AVG R. SDR - Average of the R. SDR for the two samples; an indication of the laboratory's precision of repeated measurements.

Graph - For each laboratory the MEAN for the second sample is plotted against the MEAN for the first sample, with each point representing a laboratory. The horizontal and vertical lines are the GRAND MEANS. The dashed line is drawn at 45°. The solid sloping line, which may or may not lie close to the 45° line, is along the major axis of the error ellipse. The ellipse is drawn so that, on the average, it will include 95% of the points representing the laboratories.

Plotted symbols are as explained above (under F), except that an 'S' is plotted as an '0'. A participant whose plotted point falls outside of the ellipse should carefully reexamine the testing procedure he is following.

The graph is plotted with an ellipse when there are 20 or more laboratories in the analysis. When there are 10 through 19 laboratories in the analysis the graph is plotted but the ellipse is omitted. When there are fewer than 10 laboratories retained in the analysis the graph is not plotted.

The International System of Units (SI) is used on the plots wherever possible to aid participants in familiarizing themselves with SI. Grand means in SI units are given at the top of the plot, and supplementary scales in SI units are drawn along the axes allowing the reader to compare means and variability in common units and SI units for the same data.

Summary - (At end of report) — In addition to several quantities already defined above, the summary shows the following values for each test method:

REPL CRP - The number of replicate test determinations used in this Collaborative Reference Program.

REPL TAPPI - The number of replicate test determinations in a test result required by the applicable TAPPI Standard or assumed here if there is no TAPPI Standard. This quantity is needed in the computation of TAPPI repeatability and reproducibility from the SD OF MEANS and the AVER SDR. See TAPPI Standard T1206 for definitions and computations.

REPEAT - TAPPI repeatability, a measure of the within-laboratory precision of a test result.

REPROD - TAPPI reproducibility, a measure of the between-laboratory precision of a test result.

Best values - Given at the end of Table 1 for each method for which sufficient information is available. These best values are estimates based on a careful examination of all data, both current and past, with special attention to results obtained by the National Bureau of Standards and other recognized reference laboratories in this and other countries. All participants using equipment that is standard for the analysis should be able to achieve results within the plus-minus (±) limits, when these are shown along with the best values.

ANALYSIS T40-1 TABLE 1
AIR RESISTANCE, GURLEY UNITS (SECONDS/100 CC)
TAPPI STANDARD T460 OS-75, AIR RESISTANCE OF PAPER

LAB CODE	SAMPLE J46 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J48 MEAN	PRINTING 106 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L107	12.52	.22	.31	1.01	1.10	31.05	.11	.07	1.99	1.15	40D	@	L107
L121	12.29	-.01	-.01	.81	.88	31.17	.23	.15	1.34	.77	40D	@	L121
L122	12.06	-.24	-.34	.88	.96	31.08	.14	.09	1.16	.67	40D	@	L122
L123	12.62	.32	.45	.82	.89	32.03	1.09	.69	3.02	1.74	40D	@	L123
L124G	11.61	-.69	-.97	.70	.77	28.47	-2.47	-1.56	1.09	.63	40D	@	L124G
L125	12.50	.20	.28	.95	1.03	31.66	.72	.46	1.62	.93	40D	@	L125
L128	13.00	.70	.98	.67	.73	32.10	1.16	.74	1.20	.69	40D	@	L128
L141	13.19	.89	1.25	.81	.89	32.30	1.36	.86	1.42	.82	40D	@	L141
L148	12.78	.48	.68	1.22	1.32	29.98	-.96	-.61	1.73	1.00	40D	@	L148
L153	12.61	.31	.44	.73	.79	29.55	-1.39	-.88	1.23	.71	40D	@	L153
L163	13.84	1.54	2.17	1.36	1.48	32.87	1.93	1.22	1.17	.67	40D	@	L163
L166	13.33	1.03	1.45	.78	.85	34.28	3.34	2.12	2.02	1.16	40D	@	L166
L182G	11.54	-.76	-1.07	.70	.76	29.60	-1.34	-.85	1.65	.95	40D	@	L182G
L183	12.84	.54	.76	1.07	1.17	33.70	2.76	1.75	1.25	.72	40D	@	L183
L190C	12.79	.49	.69	.54	.59	30.30	-.64	-.40	2.11	1.22	40D	@	L190C
L190R	12.38	.08	.11	.68	.74	30.75	-.19	-.12	1.40	.80	40D	@	L190R
L212	10.31	-1.99	-2.80	.75	.82	26.53	-4.41	-2.79	1.26	.73	40D	*	L212
L223	12.47	.17	.24	.90	.98	31.73	.79	.50	2.20	1.27	40D	@	L223
L224	12.44	.14	.20	.96	1.05	29.66	-1.28	-.81	2.85	1.64	40D	@	L224
L230G	12.00	-.30	-.42	.94	1.03	30.60	-.34	-.21	1.26	.73	40D	@	L230G
L232	12.04	-.26	-.36	1.07	1.17	28.90	-2.04	-1.29	3.77	2.17	40D	@	L232
L236	12.77	.47	.66	1.00	1.09	32.35	1.41	.89	1.88	1.08	40D	@	L236
L238A	12.98	.68	.96	.78	.84	31.90	.96	.61	1.45	.83	40D	@	L238A
L241	11.30	-1.00	-1.40	.67	.73	27.40	-3.54	-2.24	.97	.56	40D	@	L241
L242	11.13	-1.17	-1.64	.40	.44	31.36	.42	.27	1.72	.99	40D	*	L242
L254	12.67	.37	.52	.76	.83	32.32	1.38	.88	1.51	.87	40D	@	L254
L261	12.17	-.13	-.18	1.10	1.20	31.20	.26	.17	.91	.52	40D	@	L261
L262G	11.69	-.61	-.86	.41	.45	25.79	-5.15	-3.26	1.63	.94	40D	X	L262G
L265	12.50	.20	.28	.63	.69	30.00	-.94	-.60	1.11	.64	40D	@	L265
L274	12.23	-.07	-.10	.43	.46	30.14	-.80	-.51	.71	.41	40D	@	L274
L278	12.44	.14	.20	1.03	1.12	31.27	.33	.21	1.28	.74	40D	@	L278
L285	12.34	.04	.06	.64	.70	33.28	2.34	1.48	3.93	2.26	40D	@	L285
L301	12.14	-.16	-.22	.60	.65	31.10	.16	.10	1.87	1.08	40D	@	L301
L308	12.43	.13	.18	.84	.92	31.10	.16	.10	1.52	.88	40D	@	L308
L313	11.28	-1.02	-1.43	.58	.64	30.16	-.78	-.49	1.41	.81	40D	@	L313
L321	11.10	-1.20	-1.69	1.58	1.72	27.90	-3.04	-1.93	1.78	1.02	40D	@	L321
L324	12.01	-.29	-.41	1.12	1.22	29.45	-1.49	-.94	2.07	1.19	40D	@	L324
L326	13.48	1.18	1.66	1.05	1.14	33.70	2.76	1.75	1.83	1.05	40D	@	L326
L328	12.45	.15	.21	.79	.86	31.86	.92	.58	1.59	.92	40D	@	L328
L339	87.40	75.10	105.55	6.62	7.21	37.90	6.96	4.41	4.31	2.48	40D	#	L339
L344	12.00	-.30	-.42	1.39	1.51	29.68	-1.26	-.80	1.61	.93	40D	@	L344
L376	12.03	-.27	-.38	.90	.98	30.71	-.23	-.15	1.75	1.01	40D	@	L376
L380	12.30	.00	.00	.82	.90	29.70	-1.24	-.79	1.70	.98	40D	@	L380
L388	6.54	-5.76	-8.09	.62	.67	14.02	-16.92	-10.72	.98	.57	40D	#	L388
L394	10.50	-1.80	-2.53	.85	.93	30.10	-.84	-.53	1.85	1.07	40D	*	L394
L396M	13.76	1.46	2.05	1.14	1.24	33.02	2.08	1.32	1.03	.59	40D	@	L396M
L567	12.45	.15	.21	1.04	1.13	30.56	-.38	-.24	2.00	1.15	40D	@	L567
L576	11.97	-.33	-.46	.90	.98	30.68	-.26	-.16	3.26	1.88	40D	@	L576
L585	12.73	.43	.61	.86	.94	31.25	.31	.20	1.06	.61	40D	@	L585
L604	12.40	.10	.14	1.15	1.25	30.56	-.38	-.24	2.21	1.27	40D	@	L604
L616	11.65	-.65	-.91	1.56	1.70	32.00	1.06	.67	.94	.54	40D	@	L616
L651	12.00	-.30	-.42	1.33	1.45	31.60	.66	.42	2.27	1.31	40D	@	L651
L676	12.60	.30	.42	.86	.94	32.29	1.35	.86	2.47	1.42	40D	@	L676

GR. MEAN = 12.30 GURLEY UNITS — GRAND MEAN = 30.94 GURLEY UNITS — TEST DETERMINATIONS = 10
SD MEANS = .71 GURLEY UNITS — SD OF MEANS = 1.58 GURLEY UNITS — 50 LABS IN GRAND MEANS
AVERAGE SDR = .92 GURLEY UNITS — AVERAGE SDR = 1.74 GURLEY UNITS

L115	12.40	.10	.14	.97	1.05	24.40	-6.54	-4.14	1.17	.68	40U	+	L115
L291	12.90	.60	.84	1.37	1.49	31.40	.46	.29	.97	.56	40U	+	L291
L484	11.67	-.63	-.88	.49	.54	28.36	-2.58	-1.63	2.70	1.56	40H	+	L484

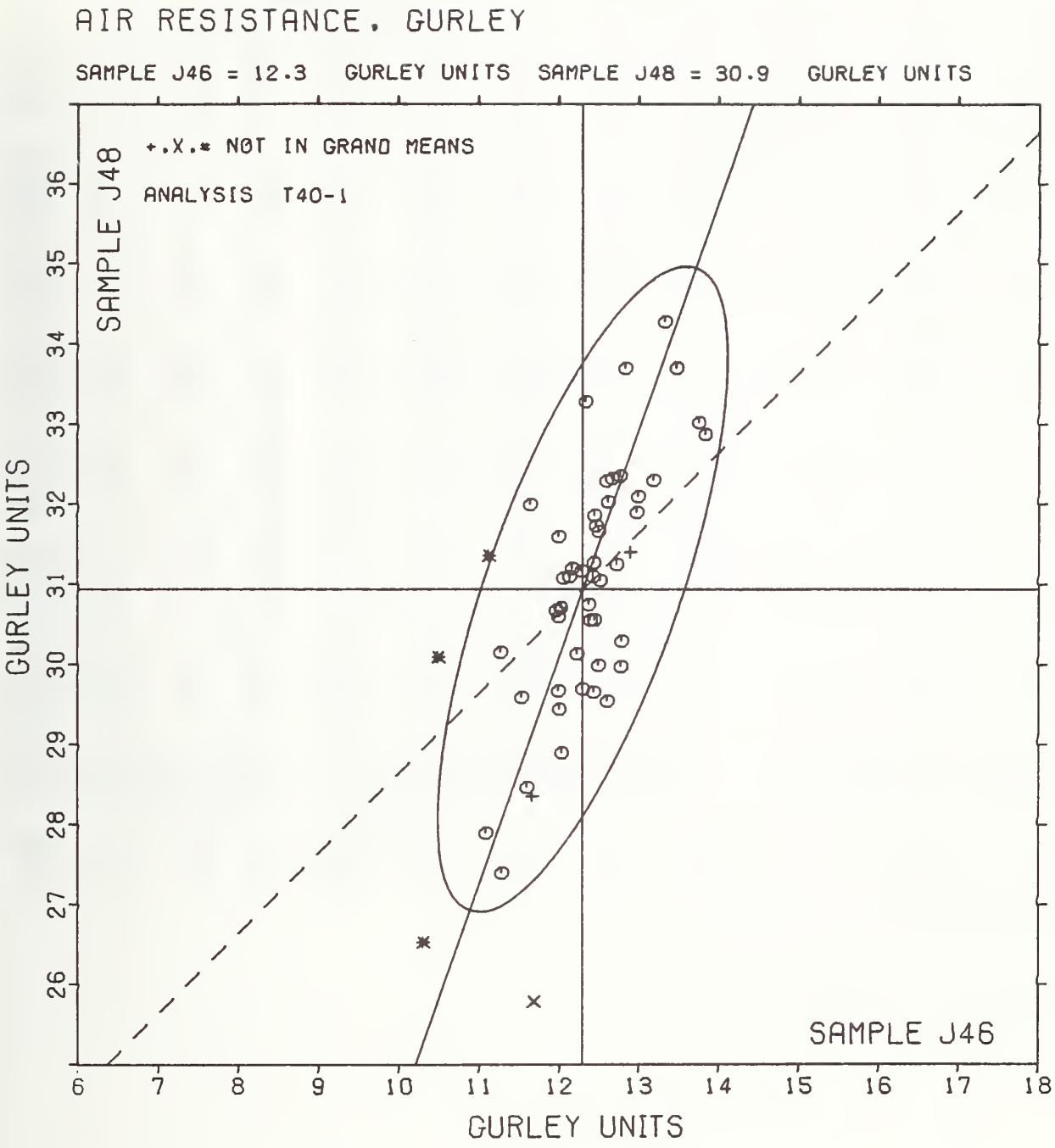
TOTAL NUMBER OF LABORATORIES REPORTING = 56

Best values: J46 12.3 ± 1.2 Gurley units
J48 31.0 ± 2.7 Gurley units

The following laboratories were omitted from the grand means because of extreme test results: 339, 388.

ANALYSIS T40-1 TABLE 2
AIR RESISTANCE, GURLEY UNITS (SECONDS/100 CC)
TAPPI STANDARD T460 OS-75, AIR RESISTANCE OF PAPER

LAB CODE	F	MEANS J46	MEANS J48	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L388	#	6.54	14.02	-17.87	-.18	.62 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L212	*	10.31	26.53	-4.82	.41	.77 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L394	*	10.50	30.10	-1.39	1.42	1.00 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L321	O	11.10	27.90	-3.26	.12	1.37 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L242	*	11.13	31.36	.01	1.24	.71 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L313	O	11.28	30.16	-1.07	.70	.73 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L241	O	11.30	27.40	-3.67	-.23	.65 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L182G	O	11.54	29.60	-1.52	.27	.86 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L124G	O	11.61	28.47	-2.56	-.17	.70 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L616	O	11.65	32.00	.79	.96	1.12 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L484	+	11.67	28.36	-2.64	-.26	1.05 40E	AIR RESISTANCE, REGMED-TYPE GURLEY DENSOMETER -OIL FLOTATION
L262G	X	11.69	25.79	-5.06	-1.13	.69 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L576	O	11.97	30.68	-.35	.22	1.43 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L344	O	12.00	29.68	-1.29	-.14	1.22 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L651	O	12.00	31.60	.52	.50	1.38 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L230G	O	12.00	30.60	-.42	.17	.88 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L324	O	12.01	29.45	-1.50	-.22	1.21 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L376	O	12.03	30.71	-.31	.18	.99 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L232	O	12.04	28.90	-2.01	-.43	1.67 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L122	O	12.06	31.08	.05	.27	.81 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L301	O	12.14	31.10	.10	.20	.87 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L261	O	12.17	31.20	.20	.21	.86 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L274	O	12.23	30.14	-.78	-.20	.44 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L121	O	12.29	31.17	.21	.09	.83 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L380	O	12.30	29.70	-1.17	-.41	.94 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L285	O	12.34	33.28	2.22	.74	1.48 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L190R	O	12.38	30.75	-.15	-.14	.77 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L604	O	12.40	30.56	-.32	-.22	1.26 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L115	+	12.40	24.40	-6.14	-2.26	.86 40U	AIR RESISTANCE, SHEFFIELD IN GURLEY UNITS
L308	O	12.43	31.10	.20	-.07	.90 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L224	O	12.44	29.66	-1.16	-.56	1.34 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L278	O	12.44	31.27	.36	-.02	.93 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L567	O	12.45	30.56	-.31	-.27	1.14 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L328	O	12.45	31.86	.92	.16	.89 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L223	O	12.47	31.73	.80	.10	1.12 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L265	O	12.50	30.00	-.82	-.50	.66 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L125	O	12.50	31.66	.75	.05	.98 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L107	O	12.52	31.05	.18	-.17	1.12 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L676	O	12.60	32.29	1.37	.16	1.18 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L153	O	12.61	29.55	-1.21	-.75	.75 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L123	O	12.62	32.03	1.14	.06	1.32 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L254	O	12.67	32.32	1.43	.11	.85 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L585	O	12.73	31.25	.44	-.30	.77 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L236	O	12.77	32.35	1.49	.02	1.08 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L148	O	12.78	29.98	-.75	-.77	1.16 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L190C	O	12.79	30.30	-.44	-.67	.90 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L183	O	12.84	33.70	2.78	.41	.94 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L291	+	12.90	31.40	.63	-.41	1.02 40U	AIR RESISTANCE, SHEFFIELD IN GURLEY UNITS
L238A	O	12.98	31.90	1.13	-.32	.84 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L128	O	13.00	32.10	1.33	-.28	.71 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L141	O	13.19	32.30	1.58	-.39	.85 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L166	O	13.33	34.28	3.49	.14	1.01 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L326	O	13.48	33.70	3.00	-.20	1.10 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L396M	O	13.76	33.02	2.45	-.69	.92 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L163	O	13.84	32.87	2.33	-.81	1.08 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
L339	#	87.40	37.90	31.49	-68.53	4.84 40D	AIR RESISTANCE, GURLEY DENSOMETER - OIL FLOTATION
GMEANS:		12.30	30.94			1.00	
		95% ELLIPSE:		4.25	1.21	WITH GAMMA = 70 DEGREES	


AIR RESISTANCE, GURLEY
SAMPLE J46 = 12.3 GURLEY UNITS SAMPLE J48 = 30.9 GURLEY UNITS
+.X.* NOT IN GRAND MEANS
ANALYSIS T40-1
SAMPLE J48
GURLEY UNITS
26
27
28
29
30
31
32
33
34
35
36
SAMPLE J46
6
7
8
9
10
11
12
13
14
15
16
17
18
GURLEY UNITS

ANALYSIS T40-2 TABLE 1

AIR RESISTANCE, SHEFFIELD UNITS (CC/MIN) FOR 0.442 SQ. IN (3/4 IN. DIA) ORIFICE

SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE J46 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J48 MEAN	PRINTING 106 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L114	234.6	12.3	.97	15.1	1.24	107.6	3.1	.53	2.9	.63	40S	G	L114
L121	235.5	13.2	1.04	17.1	1.40	110.0	5.5	.95	4.7	1.04	40S	G	L121
L122S	222.4	.1	.01	15.5	1.27	114.1	9.6	1.65	4.7	1.02	40S	G	L122S
L124S	232.7	10.4	.82	15.5	1.27	102.0	-2.5	-.43	5.2	1.14	40S	G	L124S
L132	211.0	-11.3	-.89	15.4	1.27	101.2	-3.3	-.57	6.9	1.51	40S	G	L132
L148	220.1	-2.2	-.17	15.7	1.29	105.8	1.3	.22	6.5	1.43	40S	G	L148
L150	240.3	18.0	1.41	12.3	1.01	107.0	2.5	.43	6.8	1.49	40S	G	L150
L173B	222.0	-.3	-.02	2.6	.21	101.5	-3.0	-.52	2.4	.53	40S	G	L173B
L190C	225.5	3.2	.25	8.3	.68	107.0	2.5	.43	5.4	1.18	40S	G	L190C
L213	215.5	-6.8	-.53	15.0	1.23	106.7	2.2	.38	3.6	.78	40S	G	L213
L223	216.8	-5.5	-.43	12.1	1.00	92.7	-11.8	-2.03	2.5	.56	40S	G	L223
L228	251.0	28.7	2.26	11.0	.91	160.2	55.7	9.60	4.6	1.00	40S	#	L228
L230S	215.7	-6.6	-.52	14.1	1.16	96.9	-7.6	-1.31	4.1	.90	40S	G	L230S
L241	238.5	16.2	1.27	5.8	.48	102.5	-2.0	-.35	5.4	1.19	40S	G	L241
L249	206.7	-15.6	-1.23	12.7	1.05	101.0	-3.5	-.60	5.2	1.15	40S	G	L249
L255	231.0	8.7	.68	11.3	.93	117.6	13.1	2.26	3.2	.71	40S	G	L255
L257A	231.6	9.3	.73	9.3	.76	106.2	1.7	.29	4.7	1.03	40S	G	L257A
L257B	231.5	9.2	.72	13.7	1.13	104.5	-.0	-.00	7.5	1.65	40S	G	L257B
L257C	223.9	1.6	.13	8.1	.67	111.0	6.5	1.12	4.3	.95	40S	G	L257C
L260	227.3	5.0	.39	7.5	.62	104.7	.2	.03	3.4	.75	40S	G	L260
L262S	223.7	1.4	.11	6.9	.57	101.7	-2.8	-.48	4.5	.99	40S	G	L262S
L288	233.3	11.0	.86	10.2	.84	105.8	1.3	.22	2.5	.55	40S	G	L288
L301	219.5	-2.8	-.22	12.6	1.04	111.2	6.7	1.15	4.3	.94	40S	G	L301
L305	221.0	-1.3	-.10	7.0	.57	106.5	2.0	.34	4.7	1.04	40S	G	L305
L318	203.6	-18.7	-1.47	10.7	.88	101.4	-3.1	-.53	5.4	1.19	40S	G	L318
L352	216.0	-6.3	-.49	10.5	.86	107.8	3.3	.57	4.6	1.02	40S	G	L352
L354	246.1	23.8	1.87	9.0	.74	114.1	9.6	1.65	6.3	1.38	40S	G	L354
L360	213.5	-8.8	-.69	19.4	1.59	105.4	.9	.15	3.6	.79	40S	G	L360
L366	194.5	-27.8	-2.18	14.6	1.20	96.8	-7.7	-1.33	2.7	.60	40S	G	L366
L372	224.6	2.3	.18	17.6	1.45	108.2	3.7	.64	4.8	1.07	40S	G	L372
L390	231.0	8.7	.68	17.4	1.43	101.5	-3.0	-.52	4.1	.90	40S	G	L390
L562	233.2	10.9	.86	14.1	1.16	106.9	2.4	.41	5.6	1.24	40S	G	L562
L585	220.0	-2.3	-.18	12.7	1.04	98.0	-6.5	-1.12	2.6	.57	40S	G	L585
L597	224.4	2.1	.17	11.9	.98	105.0	.5	.09	2.7	.59	40S	G	L597
L600	207.5	-14.8	-1.16	12.1	.99	94.1	-10.4	-1.79	6.8	1.50	40S	G	L600
L626	185.7	-36.6	-2.88	4.5	.37	93.2	-11.3	-1.95	3.4	.74	40S	*	L626
L182B	942.5	720.2	56.59	68.8	5.65	394.0	289.5	49.88	19.0	4.17	40B	*	L182B
L312	242.0	19.7	1.55	12.5	1.03	105.3	.8	.14	4.1	.91	40T	*	L312
L484	947.0	724.7	56.94	52.3	4.30	366.0	261.5	45.06	20.7	4.54	40B	*	L484
L587	224.0	1.7	.13	11.7	.96	108.0	3.5	.60	4.8	1.06	40T	*	L587

GR. MEAN = 222.3 SHEFF. UNITS — GRAND MEAN = 104.5 SHEFF. UNITS — TEST DETERMINATIONS = 10

SD MEANS = 12.7 SHEFF. UNITS — SD OF MEANS = 5.8 SHEFF. UNITS — 35 LABS IN GRAND MEANS

AVERAGE SDR = 12.2 SHEFF. UNITS — AVERAGE SDR = 4.6 SHEFF. UNITS

TOTAL NUMBER OF LABORATORIES REPORTING = 40

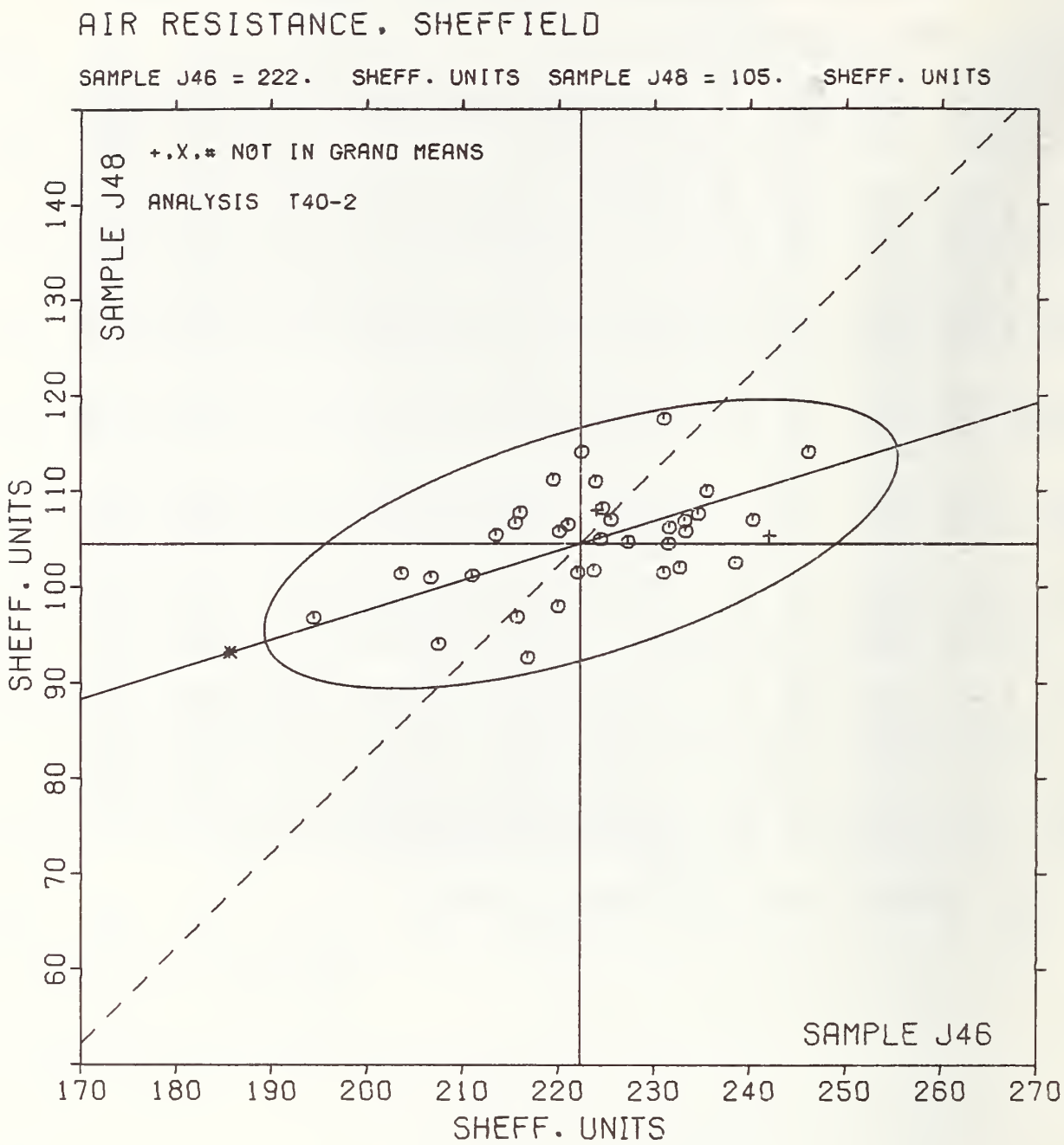
Best values: J46 223 ± 17 Sheffield units
J48 105 ± 10 Sheffield units

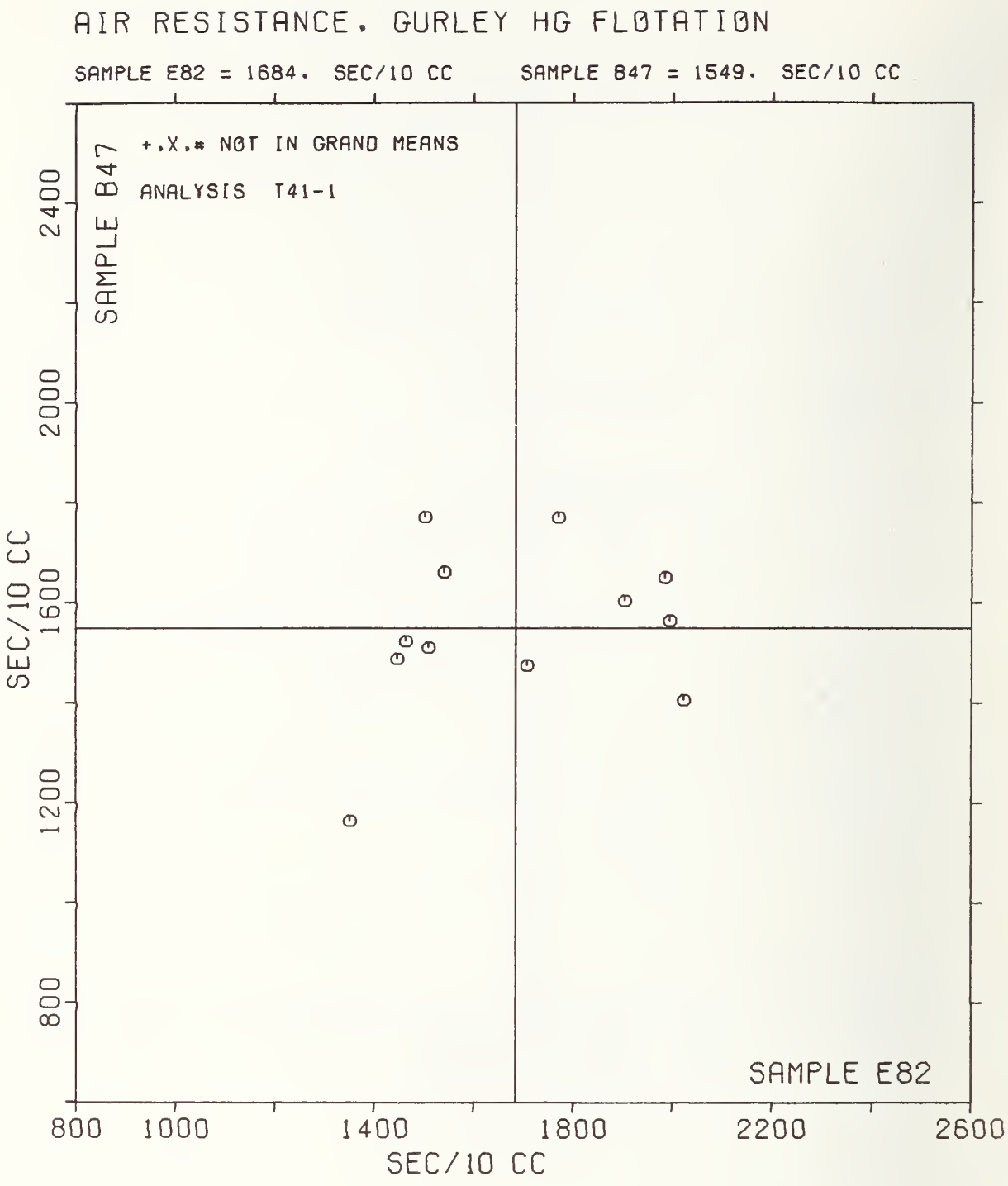
The following laboratories were omitted from the grand means because of extreme test results: 228.

ANALYSIS T40-2 TABLE 2

AIR RESISTANCE, SHEFFIELD UNITS (CC/MIN) FOR 0.442 SQ. IN (3/4 IN. DIA) ORIFICE
SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS J46	MEANS J48	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L626	*	185.7	93.2	-38.3	.0	.56	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L366	O	194.5	96.8	-28.8	.8	.90	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L318	O	203.6	101.4	-18.8	2.6	1.03	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L249	O	206.7	101.0	-15.9	1.3	1.10	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L600	O	207.5	94.1	-17.2	-5.6	1.25	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L132	O	211.0	101.2	-11.8	.2	1.39	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L360	O	213.5	105.4	-8.1	3.5	1.19	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L213	O	215.5	106.7	-5.8	4.1	1.01	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L230S	O	215.7	96.9	-8.5	-5.3	1.03	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L352	O	216.0	107.8	-5.0	5.0	.94	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L223	O	216.8	92.7	-8.7	-9.7	.78	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L301	O	219.5	111.2	-.7	7.2	.99	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L585	O	220.0	98.0	-4.1	-5.5	.80	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L148	O	220.1	105.8	-1.7	1.9	1.36	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L305	O	221.0	106.5	-.6	2.3	.81	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L173B	O	222.0	101.5	-1.2	-2.8	.37	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L122S	O	222.4	114.1	2.9	9.1	1.15	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L262S	O	223.7	101.7	.5	-3.1	.78	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L257C	O	223.9	111.0	3.5	5.7	.81	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L587	*	224.0	108.0	2.7	2.8	1.01	40T AIR RESISTANCE, SHEFFIELD (3 INCH DIAMETER ORIFICE)
L597	O	224.4	105.0	2.2	-.1	.79	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L372	O	224.6	108.2	3.3	2.9	1.26	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L190C	O	225.5	107.0	3.8	1.4	.93	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L260	O	227.3	104.7	4.8	-1.3	.68	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L390	O	231.0	101.5	7.4	-5.4	1.17	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L255	O	231.0	117.6	12.2	9.9	.82	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L257H	O	231.5	104.5	8.8	-2.7	1.39	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L257A	O	231.6	106.2	9.4	-1.1	.90	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L124S	O	232.7	102.0	9.2	-5.5	1.21	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L562	O	233.2	106.9	11.1	-.9	1.20	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L288	O	233.3	105.8	10.9	-2.0	.69	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L114	O	234.6	107.6	12.7	-.7	.93	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L121	O	235.5	110.0	14.2	1.4	1.22	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L241	O	238.5	102.5	14.9	-6.7	.83	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L150	O	240.3	107.0	17.9	-2.9	1.25	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L312	*	242.0	105.3	19.1	-5.1	.97	40T AIR RESISTANCE, SHEFFIELD (3 INCH DIAMETER ORIFICE)
L354	O	246.1	114.1	25.6	2.1	1.06	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L228	#	251.0	160.2	43.9	44.7	.95	40S AIR RESISTANCE, SHEFFIELD (3/4 INCH DIAMETER ORIFICE)
L182B	*	942.5	394.0	773.6	63.9	4.91	40H AIR RESISTANCE, HENDTSHN, WG 150
L484	*	947.0	366.0	769.6	35.9	4.42	40H AIR RESISTANCE, HENDTSEN, WG 150
GMEANS:		222.3	104.5			1.00	
		95% ELLIPSE:		34.5	11.7	WITH GAMMA = 17 DEGREES	


AIR RESISTANCE, SHEFFIELD
SAMPLE J46 = 222. SHEFF. UNITS SAMPLE J48 = 105. SHEFF. UNITS
+.X.* NOT IN GRAND MEANS
ANALYSIS T40-2
SAMPLE J48
SHEFF. UNITS
60
70
80
90
100
110
120
130
140
170
180
190
200
210
220
230
240
250
260
270
SAMPLE J46
SHEFF. UNITS


AIR RESISTANCE, GURLEY HG FLOTATION
SAMPLE E82 = 1684. SEC/10 CC
SAMPLE B47 = 1549. SEC/10 CC
+,X,* NOT IN GRAND MEANS
ANALYSIS T41-1
SAMPLE B47
SAMPLE E82
SEC/10 CC
SEC/10 CC
800
1000
1400
1800
2200
2600
800
1200
1600
2000
2400

REPORT NO. 56G

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T44-1 TABLE 1
SMOOTHNESS, PARKER PRINTSURF

NOVEMBER 1978

LAB CODE	SAMPLE J49 PRINTING 94 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE J73 PRINTING 76 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	VAR	P	LAB
L122	6.98	.86	1.65	.06	.69	5.07	.58	1.42	.11	.89	44P	6	L122
L136	5.87	-.25	-.48	.09	1.01	4.30	-.19	-.46	.13	1.07	44P	6	L136
L182	5.96	-.16	-.31	.09	.95	4.52	.03	.08	.16	1.32	44P	6	L182
L183	5.97	-.15	-.29	.07	.73	4.59	.10	.24	.10	.81	44P	6	L183
L223	5.89	-.23	-.44	.08	.83	4.26	-.23	-.55	.13	1.03	44P	6	L223
L288	7.01	.89	1.71	.12	1.30	5.11	.62	1.51	.09	.76	44P	6	L288
L317	6.01	-.11	-.22	.11	1.19	4.58	.09	.22	.13	1.07	44P	6	L317
L588	5.47	-.65	-1.26	.14	1.54	3.96	-.53	-1.29	.16	1.34	44P	6	L588
L669	5.94	-.18	-.35	.07	.76	4.01	-.48	-1.17	.09	.71	44P	6	L669

GR. MEAN = 6.12 MICRONS — GRAND MEAN = 4.49 MICRONS — TEST DETERMINATIONS = 10
SD MEANS = .52 MICRONS — SD OF MEANS = .41 MICRONS — 9 LABS IN GRAND MEANS
AVERAGE SDR = .09 MICRONS — AVERAGE SDR = .12 MICRONS
TOTAL NUMBER OF LABORATORIES REPORTING = 9

Best values: J49 6.0 microns
J73 4.5 microns

REPORT NO. 56G

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T44-1 TABLE 2
SMOOTHNESS, PARKER PRINTSURF

NOVEMBER 1978

LAB CODE	F	MEANS J49	J73	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L588	6	5.47	3.96	-.84	-.02	1.44	44P	SMOOTHNESS, PARKER PRINTSURF
L136	6	5.87	4.30	-.31	.00	1.04	44P	SMOOTHNESS, PARKER PRINTSURF
L223	6	5.89	4.26	-.32	-.04	.93	44P	SMOOTHNESS, PARKER PRINTSURF
L669	6	5.94	4.01	-.44	-.27	.74	44P	SMOOTHNESS, PARKER PRINTSURF
L182	6	5.96	4.52	-.11	.13	1.13	44P	SMOOTHNESS, PARKER PRINTSURF
L183	6	5.97	4.59	-.06	.17	.77	44P	SMOOTHNESS, PARKER PRINTSURF
L317	6	6.01	4.58	-.03	.14	1.13	44P	SMOOTHNESS, PARKER PRINTSURF
L122	6	6.98	5.07	1.03	-.06	.79	44P	SMOOTHNESS, PARKER PRINTSURF
L288	6	7.01	5.11	1.08	-.05	1.03	44P	SMOOTHNESS, PARKER PRINTSURF
GMEANS:		6.12	4.49			1.00		
		95% ELLIPSE:		2.13	.44	WITH GAMMA = 37 DEGREES		

ANALYSIS T45-1 TABLE 1
SMOOTHNESS, SHEFFIELD UNITS
SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE J49 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J73 MEAN	PRINTING 76 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L107	261.7	-13.2	-1.24	9.6	1.37	99.7	12.7	1.69	7.7	1.48	45S	O	L107
L108	271.3	-3.5	-.33	4.8	.68	80.1	-6.9	-.91	2.8	.54	45S	O	L108
L114	285.4	10.5	.99	7.4	1.07	93.8	6.8	.91	7.1	1.37	45S	O	L114
L115	266.3	-8.5	-.80	9.3	1.34	86.7	-.3	-.04	5.9	1.13	45S	O	L115
L121	273.7	-1.2	-.11	10.4	1.50	89.3	2.4	.32	5.3	1.02	45S	O	L121
L122	272.8	-2.1	-.19	11.7	1.67	85.5	-1.4	-.19	4.9	.94	45S	O	L122
L124	268.6	-6.3	-.59	5.7	.82	84.5	-2.5	-.33	4.1	.79	45S	O	L124
L125	269.0	-5.9	-.55	8.7	1.25	93.7	6.7	.89	11.1	2.14	45S	O	L125
L126	283.8	8.9	.84	11.4	1.63	90.7	3.7	.49	7.2	1.39	45S	O	L126
L128	271.0	-3.9	-.36	5.4	.78	93.0	6.0	.80	4.6	.88	45S	O	L128
L132	275.7	.9	.08	5.3	.77	82.2	-4.8	-.63	6.7	1.29	45S	O	L132
L139S	274.0	-.9	-.08	9.1	1.31	100.0	13.0	1.73	5.3	1.03	45S	O	L139S
L148	279.3	4.4	.41	7.1	1.01	87.3	.3	.04	4.9	.95	45S	O	L148
L150	289.5	14.7	1.38	8.8	1.26	80.5	-6.5	-.86	5.2	.99	45S	O	L150
L152	252.4	-22.5	-2.11	4.5	.65	97.5	10.5	1.39	5.5	1.07	45S	*	L152
L153	303.5	28.6	2.68	7.1	1.03	109.8	22.8	3.03	4.0	.77	45S	X	L153
L162	273.3	-1.5	-.14	9.8	1.40	87.3	.4	.05	6.2	1.20	45S	O	L162
L166	263.3	-11.6	-1.09	7.7	1.11	84.3	-2.7	-.36	4.2	.81	45S	O	L166
L167	270.3	-4.5	-.43	4.0	.57	81.3	-5.6	-.75	2.3	.44	45S	O	L167
L173B	254.3	-20.5	-1.93	4.2	.60	88.0	1.0	.14	2.5	.49	45S	O	L173B
L183S	270.7	-4.2	-.39	5.4	.78	92.5	5.5	.73	8.7	1.68	45S	O	L183S
L190C	263.3	-11.5	-1.08	6.2	.89	88.0	1.0	.14	5.3	1.02	45S	O	L190C
L190R	258.1	-16.7	-1.57	6.2	.89	74.7	-12.3	-1.63	2.4	.46	45S	O	L190R
L195	275.4	.5	.05	7.1	1.03	74.5	-12.5	-1.66	5.9	1.14	45S	O	L195
L203	279.3	4.5	.42	7.5	1.08	80.3	-6.7	-.89	6.2	1.20	45S	O	L203
L206	269.3	-5.6	-.53	4.0	.57	91.1	4.1	.55	4.7	.92	45S	O	L206
L211	266.1	-8.8	-.83	8.6	1.23	78.2	-8.8	-1.16	5.9	1.13	45S	O	L211
L213	251.1	-23.8	-2.23	7.2	1.03	81.3	-5.6	-.75	10.1	1.95	45S	O	L213
L223	272.1	-2.8	-.26	9.0	1.29	76.1	-10.8	-1.44	3.5	.68	45S	O	L223
L224	291.9	17.0	1.59	6.3	.90	97.2	10.2	1.36	4.8	.93	45S	O	L224
L226B	269.8	-5.1	-.48	4.9	.71	77.8	-9.2	-1.21	5.6	1.08	45S	O	L226B
L228	285.2	10.3	.97	11.9	1.71	96.9	9.9	1.32	4.4	.84	45S	O	L228
L230S	280.0	5.1	.48	5.9	.84	82.6	-4.4	-.58	6.5	1.25	45S	O	L230S
L231	289.1	14.3	1.34	8.7	1.26	88.6	1.6	.22	4.4	.85	45S	O	L231
L232S	293.3	18.5	1.73	6.5	.93	87.7	.7	.09	5.3	1.02	45S	O	L232S
L237	276.0	1.1	.11	6.0	.87	85.3	-1.6	-.22	4.8	.93	45S	O	L237
L241	290.7	15.8	1.48	8.6	1.24	124.3	37.4	4.96	12.9	2.50	45S	X	L241
L249	281.1	6.3	.59	7.8	1.12	86.3	-.7	-.09	3.6	.70	45S	O	L249
L254	277.6	2.7	.26	4.4	.63	91.4	4.4	.59	6.5	1.25	45S	O	L254
L255	273.1	-1.8	-.17	3.8	.54	100.7	13.7	1.82	2.5	.48	45S	O	L255
L257A	270.0	-4.9	-.46	6.5	.93	78.1	-8.8	-1.17	4.8	.93	45S	O	L257A
L257B	272.9	-1.9	-.18	8.6	1.23	103.8	16.8	2.23	7.8	1.51	45S	O	L257B
L257C	272.7	-2.1	-.20	9.1	1.31	102.0	15.0	2.00	5.3	1.02	45S	O	L257C
L260	269.7	-5.1	-.48	6.0	.86	84.2	-2.8	-.37	3.9	.74	45S	O	L260
L261	279.7	4.8	.45	4.8	.69	83.0	-4.0	-.52	3.9	.74	45S	O	L261
L262	276.5	1.7	.16	5.1	.73	99.2	12.2	1.62	4.7	.90	45S	O	L262
L275	272.7	-2.2	-.21	9.7	1.40	82.5	-4.4	-.59	4.8	.93	45S	O	L275
L277	283.1	8.2	.77	7.5	1.07	94.5	7.6	1.01	4.7	.92	45S	O	L277
L278	295.3	20.5	1.92	6.1	.88	90.7	3.8	.50	5.2	1.01	45S	O	L278
L281	274.4	-.5	-.04	4.9	.71	84.7	-2.3	-.30	6.4	1.24	45S	O	L281
L285	269.2	-5.7	-.53	5.7	.83	81.4	-5.6	-.74	3.9	.74	45S	O	L285
L288	278.1	3.3	.31	5.3	.76	88.0	1.0	.14	4.1	.80	45S	O	L288
L290	281.9	7.1	.66	6.4	.92	73.9	-13.0	-1.73	7.0	1.34	45S	O	L290
L291S	280.1	5.3	.49	3.0	.44	93.7	6.7	.89	3.7	.72	45S	O	L291S
L301	248.5	-26.3	-2.47	4.0	.58	90.5	3.6	.47	4.9	.95	45S	*	L301
L305	273.0	-1.9	-.18	6.2	.89	82.3	-4.6	-.61	3.7	.72	45S	O	L305
L308	271.9	-2.9	-.28	7.5	1.08	79.9	-7.1	-.94	3.3	.63	45S	O	L308
L312	297.5	22.6	2.12	6.3	.90	93.9	6.9	.92	3.4	.66	45S	O	L312
L317	273.9	-1.0	-.09	8.2	1.18	78.8	-8.2	-1.08	5.2	1.00	45S	O	L317
L318	271.9	-3.0	-.28	9.5	1.37	92.5	5.5	.73	9.7	1.87	45S	O	L318
L321	260.0	-14.9	-1.40	.0	.00	70.7	-16.3	-2.16	1.8	.34	45S	O	L321
L323	275.3	.5	.04	7.4	1.07	90.5	3.6	.47	6.6	1.28	45S	O	L323
L326	304.3	29.5	2.76	4.0	.58	87.2	.2	.03	4.4	.85	45S	*	L326
L328	278.7	3.8	.36	4.6	.67	85.6	-1.4	-.18	4.9	.94	45S	O	L328
L352	275.7	.9	.08	5.9	.85	92.7	5.8	.77	7.0	1.35	45S	O	L352

ANALYSIS 145-1 TABLE 1
SMOOTHNESS, SHEFFIELD UNITS
SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE J49 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J73 MEAN	PRINTING 76 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.F 15 VAR	F	LAB
L360	276.4	1.5	.14	8.7	1.25	86.5	-.4	-.06	3.1	.61	45S	6	L360
L366	270.9	-4.0	-.38	8.5	1.22	91.7	4.8	.63	7.6	1.46	45S	6	L366
L372	276.0	1.1	.11	6.3	.90	81.7	-5.3	-.70	4.8	.93	45S	6	L372
L376	273.3	-1.5	-.14	7.9	1.13	98.7	11.8	1.56	6.7	1.30	45S	6	L376
L380	264.0	-10.9	-1.02	8.7	1.25	79.9	-7.1	-.94	2.6	.49	45S	6	L380
L382	294.3	19.5	1.83	5.1	.73	80.5	-6.5	-.86	3.8	.73	45S	6	L382
L390	276.7	1.8	.17	8.2	1.17	84.3	-2.6	-.35	5.0	.96	45S	6	L390
L396M	285.0	10.1	.95	6.8	.98	91.0	4.0	.54	6.0	1.16	45S	6	L396M
L554	281.7	6.9	.64	3.4	.49	82.4	-4.6	-.60	3.5	.68	45S	6	L554
L567	258.4	-16.5	-1.55	10.6	1.52	83.0	-4.0	-.52	5.9	1.13	45S	6	L567
L585	268.0	-6.9	-.64	10.7	1.53	70.3	-16.6	-2.21	4.8	.93	45S	6	L585
L587	268.0	-6.9	-.64	7.5	1.08	91.0	4.0	.54	4.7	.91	45S	6	L587
L597	303.7	28.9	2.71	7.1	1.03	93.0	6.0	.80	7.7	1.49	45S	*	L597
L600	281.8	6.9	.65	6.1	.88	86.3	-.7	-.09	6.6	1.27	45S	6	L600
L626	268.6	-6.2	-.58	4.4	.63	75.4	-11.6	-1.53	2.2	.42	45S	6	L626
L648	273.7	-1.2	-.11	10.0	1.43	79.1	-7.8	-1.04	5.8	1.13	45S	6	L648
L651	235.3	-39.6	-3.72	3.5	.50	91.7	4.7	.63	6.6	1.27	45S	X	L651
L670	282.4	7.5	.71	8.0	1.15	89.5	2.6	.34	7.1	1.37	45S	6	L670
L679	276.0	1.1	.11	3.3	.47	98.3	11.4	1.51	4.2	.80	45S	6	L679

GR. MEAN = 274.9 SHEFF. UNITS GRAND MEAN = 87.0 SHEFF. UNITS TEST DETERMINATIONS = 15
SD MEANS = 10.7 SHEFF. UNITS SD OF MEANS = 7.5 SHEFF. UNITS 81 LABS IN GRAND MEANS
AVERAGE SDR = 7.0 SHEFF. UNITS AVERAGE SDR = 5.2 SHEFF. UNITS
TOTAL NUMBER OF LABORATORIES REPORTING = 84

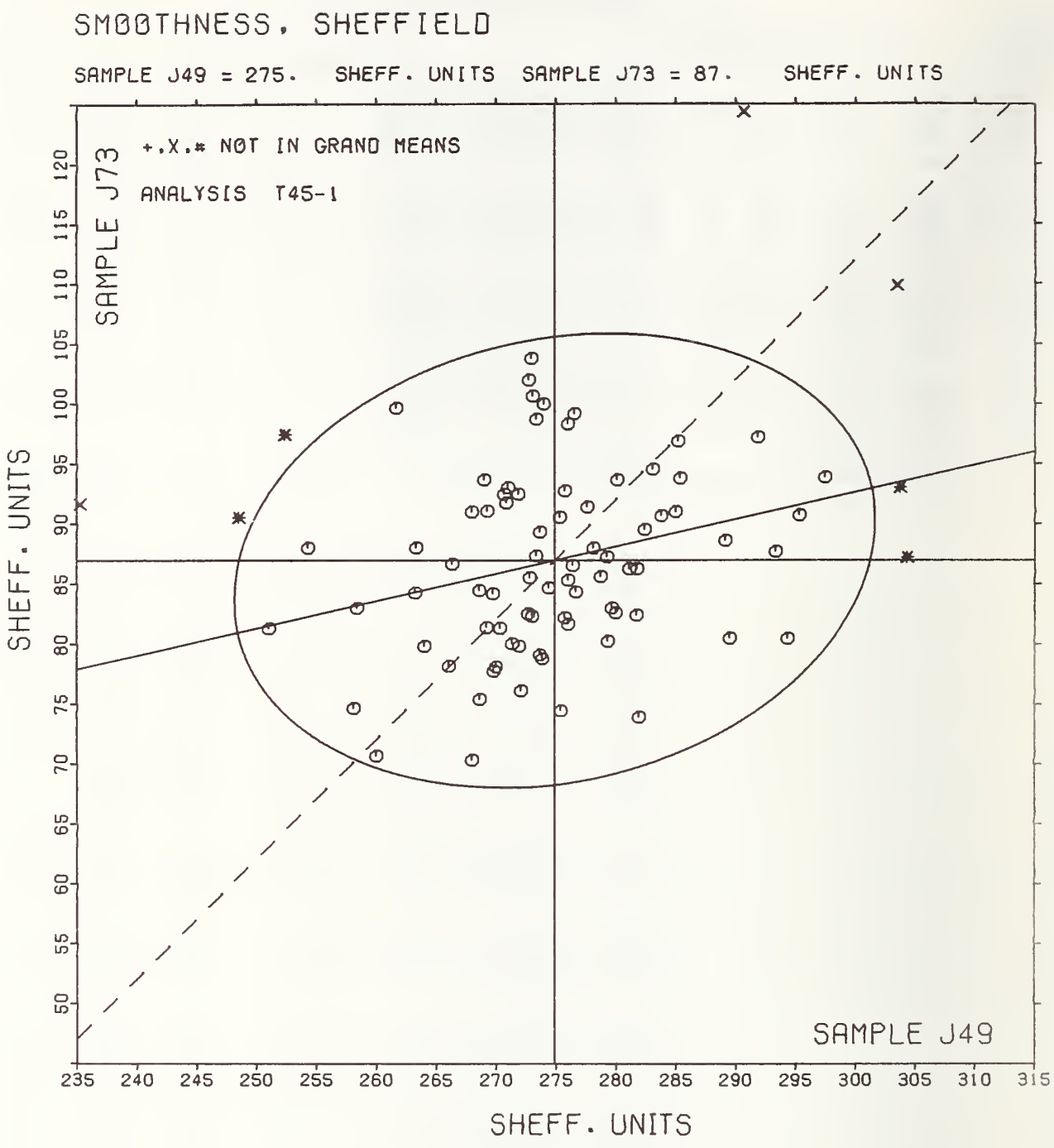
Best values: J49 275 ± 20 Sheffield units
J73 87 ± 13 Sheffield units

ANALYSIS T45-1 TABLE 2
SMOOTHNESS, SHEFFIELD UNITS
SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS J49	MEANS J73	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L651	X	235.3	91.7	-37.6	13.3	.89	45S	SMOOTHNESS, SHEFFIELD
L301	*	248.5	90.5	-24.9	9.3	.76	45S	SMOOTHNESS, SHEFFIELD
L213	G	251.1	81.3	-24.5	-.2	1.49	45S	SMOOTHNESS, SHEFFIELD
L152	*	252.4	97.5	-19.6	15.2	.86	45S	SMOOTHNESS, SHEFFIELD
L173B	G	254.3	88.0	-19.8	5.5	.54	45S	SMOOTHNESS, SHEFFIELD
L190R	G	258.1	74.7	-19.0	-8.3	.68	45S	SMOOTHNESS, SHEFFIELD
L567	G	258.4	83.0	-16.9	-.2	1.33	45S	SMOOTHNESS, SHEFFIELD
L321	G	260.0	70.7	-18.1	-12.6	.17	45S	SMOOTHNESS, SHEFFIELD
L107	G	261.7	99.7	-10.1	15.3	1.43	45S	SMOOTHNESS, SHEFFIELD
L166	G	263.3	84.3	-11.9	-.1	.96	45S	SMOOTHNESS, SHEFFIELD
L190C	G	263.3	88.0	-11.0	3.6	.95	45S	SMOOTHNESS, SHEFFIELD
L380	G	264.0	79.9	-12.2	-4.5	.87	45S	SMOOTHNESS, SHEFFIELD
L211	G	266.1	78.2	-10.5	-6.6	1.18	45S	SMOOTHNESS, SHEFFIELD
L115	G	266.3	86.7	-8.4	1.6	1.24	45S	SMOOTHNESS, SHEFFIELD
L587	G	268.0	91.0	-5.8	5.5	.99	45S	SMOOTHNESS, SHEFFIELD
L585	G	268.0	70.3	-10.4	-14.7	1.23	45S	SMOOTHNESS, SHEFFIELD
L124	G	268.6	84.5	-6.7	-1.0	.81	45S	SMOOTHNESS, SHEFFIELD
L626	G	268.6	75.4	-8.6	-9.9	.52	45S	SMOOTHNESS, SHEFFIELD
L125	G	269.0	93.7	-4.2	7.8	1.70	45S	SMOOTHNESS, SHEFFIELD
L285	G	269.2	81.4	-6.8	-4.2	.78	45S	SMOOTHNESS, SHEFFIELD
L206	G	269.3	91.1	-4.6	5.2	.74	45S	SMOOTHNESS, SHEFFIELD
L260	G	269.7	84.2	-5.6	-1.6	.80	45S	SMOOTHNESS, SHEFFIELD
L226B	G	269.8	77.8	-7.0	-7.8	.89	45S	SMOOTHNESS, SHEFFIELD
L257A	G	270.0	78.1	-6.7	-7.5	.93	45S	SMOOTHNESS, SHEFFIELD
L167	G	270.3	81.3	-5.7	-4.5	.51	45S	SMOOTHNESS, SHEFFIELD
L183S	G	270.7	92.5	-2.9	6.3	1.23	45S	SMOOTHNESS, SHEFFIELD
L366	G	270.9	91.7	-2.9	5.5	1.34	45S	SMOOTHNESS, SHEFFIELD
L128	G	271.0	93.0	-2.4	6.7	.83	45S	SMOOTHNESS, SHEFFIELD
L108	G	271.3	80.1	-5.0	-5.9	.61	45S	SMOOTHNESS, SHEFFIELD
L318	G	271.9	92.5	-1.7	6.0	1.62	45S	SMOOTHNESS, SHEFFIELD
L308	G	271.9	79.9	-4.4	-6.3	.85	45S	SMOOTHNESS, SHEFFIELD
L223	G	272.1	76.1	-5.1	-9.9	.98	45S	SMOOTHNESS, SHEFFIELD
L275	G	272.7	82.5	-3.1	-3.8	1.16	45S	SMOOTHNESS, SHEFFIELD
L257C	G	272.7	102.0	1.2	15.1	1.16	45S	SMOOTHNESS, SHEFFIELD
L122	G	272.8	85.5	-2.3	-.9	1.31	45S	SMOOTHNESS, SHEFFIELD
L257B	G	272.9	103.8	1.8	16.9	1.37	45S	SMOOTHNESS, SHEFFIELD
L305	G	273.0	82.3	-2.8	-4.1	.80	45S	SMOOTHNESS, SHEFFIELD
L255	G	273.1	100.7	1.3	13.8	.51	45S	SMOOTHNESS, SHEFFIELD
L162	G	273.3	87.3	-1.4	.7	1.30	45S	SMOOTHNESS, SHEFFIELD
L376	G	273.3	98.7	1.1	11.8	1.22	45S	SMOOTHNESS, SHEFFIELD
L648	G	273.7	79.1	-2.9	-7.4	1.28	45S	SMOOTHNESS, SHEFFIELD
L121	G	273.7	89.3	-.7	2.6	1.26	45S	SMOOTHNESS, SHEFFIELD
L317	G	273.9	78.8	-2.8	-7.7	1.09	45S	SMOOTHNESS, SHEFFIELD
L139S	G	274.0	100.0	2.0	12.9	1.17	45S	SMOOTHNESS, SHEFFIELD
L281	G	274.4	84.7	-1.0	-2.1	.98	45S	SMOOTHNESS, SHEFFIELD
L323	G	275.3	90.5	1.2	3.4	1.17	45S	SMOOTHNESS, SHEFFIELD
L195	G	275.4	74.5	-2.2	-12.3	1.08	45S	SMOOTHNESS, SHEFFIELD
L132	G	275.7	82.2	-.2	-4.8	1.03	45S	SMOOTHNESS, SHEFFIELD
L352	G	275.7	92.7	2.1	5.4	1.10	45S	SMOOTHNESS, SHEFFIELD
L679	G	276.0	98.3	3.6	10.9	.63	45S	SMOOTHNESS, SHEFFIELD
L372	G	276.0	81.7	-.1	-5.4	.92	45S	SMOOTHNESS, SHEFFIELD
L237	G	276.0	85.3	.7	-1.8	.90	45S	SMOOTHNESS, SHEFFIELD
L360	G	276.4	86.5	1.4	-.7	.93	45S	SMOOTHNESS, SHEFFIELD
L262	G	276.5	99.2	4.3	11.6	.81	45S	SMOOTHNESS, SHEFFIELD
L390	G	276.7	84.3	1.2	-3.0	1.06	45S	SMOOTHNESS, SHEFFIELD
L254	G	277.6	91.4	3.6	3.7	.94	45S	SMOOTHNESS, SHEFFIELD
L288	G	278.1	88.0	3.4	.3	.78	45S	SMOOTHNESS, SHEFFIELD
L328	G	278.7	85.6	3.5	-2.2	.81	45S	SMOOTHNESS, SHEFFIELD
L148	G	279.3	87.3	4.4	-.7	.98	45S	SMOOTHNESS, SHEFFIELD
L203	G	279.3	80.3	2.9	-7.5	1.14	45S	SMOOTHNESS, SHEFFIELD
L261	G	279.7	83.0	3.8	-4.9	.72	45S	SMOOTHNESS, SHEFFIELD
L230S	G	280.0	82.6	4.0	-5.4	1.05	45S	SMOOTHNESS, SHEFFIELD
L291S	G	280.1	93.7	6.6	5.4	.58	45S	SMOOTHNESS, SHEFFIELD
L249	G	281.1	86.3	6.0	-2.1	.91	45S	SMOOTHNESS, SHEFFIELD
L554	G	281.7	82.4	5.7	-6.0	.58	45S	SMOOTHNESS, SHEFFIELD

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T45-1 TABLE 2
SMOOTHNESS, SHEFFIELD UNITS
SHEFFIELD TESTER IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS J49	MEANS J73	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L600	G	281.8	86.3	6.6	-2.2	1.08	45S SMOOTHNESS, SHEFFIELD
L290	G	281.9	73.9	4.0	-14.3	1.13	45S SMOOTHNESS, SHEFFIELD
L670	G	282.4	89.5	7.9	.9	1.26	45S SMOOTHNESS, SHEFFIELD
L277	G	283.1	94.5	9.7	5.6	1.00	45S SMOOTHNESS, SHEFFIELD
L126	G	283.8	90.7	9.5	1.7	1.51	45S SMOOTHNESS, SHEFFIELD
L396M	G	285.0	91.0	10.8	1.7	1.07	45S SMOOTHNESS, SHEFFIELD
L228	G	285.2	96.9	12.3	7.4	1.27	45S SMOOTHNESS, SHEFFIELD
L114	G	285.4	93.8	11.8	4.4	1.22	45S SMOOTHNESS, SHEFFIELD
L231	G	289.1	88.6	14.3	-1.5	1.05	45S SMOOTHNESS, SHEFFIELD
L150	G	289.5	80.5	12.9	-9.5	1.13	45S SMOOTHNESS, SHEFFIELD
L241	X	290.7	124.3	23.6	23.0	1.87	45S SMOOTHNESS, SHEFFIELD
L224	G	291.9	97.2	18.8	6.3	.91	45S SMOOTHNESS, SHEFFIELD
L232S	G	293.3	87.7	18.2	-3.4	.97	45S SMOOTHNESS, SHEFFIELD
L382	G	294.3	80.5	17.6	-10.6	.73	45S SMOOTHNESS, SHEFFIELD
L278	G	295.3	90.7	20.8	-.8	.94	45S SMOOTHNESS, SHEFFIELD
L312	G	297.5	93.9	23.6	1.8	.78	45S SMOOTHNESS, SHEFFIELD
L153	X	303.5	109.8	32.9	16.0	.90	45S SMOOTHNESS, SHEFFIELD
L597	*	303.7	93.0	29.5	-.5	1.26	45S SMOOTHNESS, SHEFFIELD
L326	*	304.3	87.2	28.8	-6.2	.71	45S SMOOTHNESS, SHEFFIELD
GMEANS:		274.9	87.0			1.00	
		95% ELLIPSE:		27.1	18.4	WITH GAMMA = 12 DEGREES	


SMOOTHNESS, SHEFFIELD
SAMPLE J49 = 275. SHEFF. UNITS SAMPLE J73 = 87. SHEFF. UNITS
+.X.* NOT IN GRAND MEANS
ANALYSIS T45-1
SAMPLE J73
SHEFF. UNITS
50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
SAMPLE J49
235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315
SHEFF. UNITS

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T45-2 TABLE 1

SMOOTHNESS , BEKK SECONDS

TAPPI SUGGESTED METHOD T479 SU-71, SMOOTHNESS OF PAPER (BEKK METHOD)

LAB CODE	SAMPLE J49 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J73 MEAN	PRINTING 76 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.F 15 VAR	F	LAB
L139B	11.00	1.06	1.76	.85	1.50	80.60	14.52	.99	7.36	1.28	45K	O	L139H
L162	4.93	-5.01	-8.29	.12	.22	97.47	31.39	2.15	7.63	1.33	45K	#	L162
L182K	9.31	-.63	-1.04	.76	1.35	61.87	-4.21	-.29	5.93	1.03	45K	O	L182K
L190C	10.36	.42	.70	.41	.72	79.00	12.92	.88	10.39	1.81	45K	O	L190C
L212	9.10	-.84	-1.39	.24	.43	44.53	-21.55	-1.47	3.00	.52	45K	O	L212
L230B	9.67	-.27	-.45	.72	1.28	77.60	11.52	.79	4.72	.82	45K	O	L230B
L232B	10.09	.16	.26	.55	.97	65.36	-.72	-.05	7.52	1.31	45K	O	L232B
L274K	9.83	-.10	-.17	.34	.60	45.27	-20.81	-1.42	1.53	.27	45K	O	L274K
L291K	13.19	3.25	5.38	.96	1.70	91.66	25.58	1.75	8.83	1.54	45K	#	L291K
L581	10.13	.20	.33	.64	1.13	74.40	8.32	.57	5.50	.96	45K	O	L581
GR. MEAN =	9.94 BEKK SECONDS					GRAND MEAN =	66.08 BEKK SECONDS				TEST DETERMINATIONS =		15
SD MEANS =	.60 BEKK SECONDS					SD OF MEANS =	14.62 BEKK SECONDS				8 LABS IN GRAND MEANS		
	AVERAGE SDR =	.56 BEKK SECONDS					AVERAGE SDR =	5.74 BEKK SECONDS					
L250M	10.36	.42	.70	.75	1.32	64.00	-2.08	-.14	6.21	1.08	45L	*	L250M
L251	9.19	-.75	-1.24	.49	.86	66.76	.68	.05	4.38	.76	45L	*	L251
L274H	37.12	27.18	45.01	.87	1.54	62.54	-3.54	-.24	1.58	.27	45H	*	L274B

TOTAL NUMBER OF LABORATORIES REPORTING = 13

Best values: J49 10 Bekk seconds
J73 66 Bekk seconds

The following laboratories were omitted from the grand means because of extreme test results: 162, 291K.

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T45-2 TABLE 2

SMOOTHNESS , BEKK SECONDS

TAPPI SUGGESTED METHOD T479 SU-71, SMOOTHNESS OF PAPER (BEKK METHOD)

LAB CODE	P	MEANS J49	J73	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L162	#	4.93	97.47	31.23	5.89	.77	45K	SMOOTHNESS, BEKK
L212	O	9.10	44.53	-21.56	.23	.48	45K	SMOOTHNESS, BEKK
L251	*	9.19	66.76	.66	.77	.81	45L	SMOOTHNESS, BEKK, 20 C, 65% RH
L182K	O	9.31	61.87	-4.23	.51	1.19	45K	SMOOTHNESS, BEKK
L230B	O	9.67	77.60	11.51	.59	1.05	45K	SMOOTHNESS, BEKK
L274K	O	9.83	45.27	-20.81	-.48	.43	45K	SMOOTHNESS, BEKK
L232B	O	10.09	65.36	-.71	-.18	1.14	45K	SMOOTHNESS, BEKK
L581	O	10.13	74.40	8.32	.04	1.05	45K	SMOOTHNESS, BEKK
L190C	O	10.36	79.00	12.93	-.06	1.27	45K	SMOOTHNESS, BEKK
L250M	*	10.36	64.00	-2.07	-.48	1.20	45L	SMOOTHNESS, BEKK, 20 C, 65% RH
L139B	O	11.00	80.60	14.55	-.65	1.39	45K	SMOOTHNESS, BEKK
L291K	#	13.19	91.66	25.66	-2.53	1.62	45K	SMOOTHNESS, BEKK
L274H	*	37.12	62.54	-2.77	-27.27	.91	45B	SMOOTHNESS, GURLEY OIL FLOTATION
GMEANS:		9.94	66.08			1.00		
		95% ELLIPSE:		50.66	1.53	WITH GAMMA = 88 DEGREES		

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978
ANALYSIS T47-1 TABLE 1
SMOOTHNESS, BENDTSEN

LAB	SAMPLE J49	PRINTING 94 GRAMS PER SQUARE METER				SAMPLE J73	PRINTING 76 GRAMS PER SQUARE METER				TEST D.F. 10		
CODE	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L182B	463.0	-2.8	-.15	37.5	1.12	119.9	15.6	1.40	7.7	.93	47B	6	L182B
L236	499.0	33.2	1.74	67.9	2.03	114.5	10.2	.91	9.4	1.15	47B	6	L236
L242	461.0	-4.8	-.25	34.8	1.04	92.3	-12.0	-1.08	8.0	.97	47B	6	L242
L244	480.5	14.7	.77	19.2	.57	93.5	-10.8	-.97	9.9	1.20	47B	6	L244
L248	437.2	-28.6	-1.50	46.1	1.38	90.3	-14.0	-1.26	9.5	1.15	47B	6	L248
L313	473.0	7.2	.38	28.7	.86	104.5	.2	.02	11.7	1.41	47B	6	L313
L333	465.0	-.8	-.04	27.1	.81	110.8	6.5	.58	5.2	.63	47B	6	L333
L484	448.0	-17.8	-.94	6.3	.19	108.8	4.5	.40	4.6	.55	47B	6	L484

GR. MEAN = 465.8 ML/MIN GRAND MEAN = 104.3 ML/MIN TEST DETERMINATIONS = 10
SD MEANS = 19.0 ML/MIN SD OF MEANS = 11.1 ML/MIN 8 LABS IN GRAND MEANS
AVERAGE SDR = 33.4 ML/MIN AVERAGE SDR = 8.2 ML/MIN
TOTAL NUMBER OF LABORATORIES REPORTING = 8

Best values: J49 465 milliliter per minute
J73 105 milliliter per minute

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978
ANALYSIS T47-1 TABLE 2
SMOOTHNESS, BENDTSEN

LAB CODE	F	MEANS J49	J73	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L248	6	437.2	90.3	-31.4	-5.7	1.27	47B	SMOOTHNESS, BENDTSEN, WG 150
L484	6	448.0	108.8	-16.0	9.1	.37	47B	SMOOTHNESS, BENDTSEN, WG 150
L242	6	461.0	92.3	-7.9	-10.3	1.01	47B	SMOOTHNESS, BENDTSEN, WG 150
L182B	6	463.0	119.9	1.5	15.8	1.03	47B	SMOOTHNESS, BENDTSEN, WG 150
L333	6	465.0	110.8	.9	6.5	.72	47B	SMOOTHNESS, BENDTSEN, WG 150
L313	6	473.0	104.5	6.9	-1.8	1.14	47B	SMOOTHNESS, BENDTSEN, WG 150
L244	6	480.5	93.5	11.2	-14.4	.89	47B	SMOOTHNESS, BENDTSEN, WG 150
L236	6	499.0	114.5	34.7	.8	1.59	47B	SMOOTHNESS, BENDTSEN, WG 150
GMEANS:		465.8	104.3			1.00		
95% ELLIPSE:				67.8	35.2	WITH GAMMA = 15 DEGREES		

REPORT NO. 56G — TAPPI COLLABORATIVE REFERENCE PROGRAM — NOVEMBER 1978

ANALYSIS T56-1 TABLE 1

K & N INK ABSORPTION

LAB CODE	SAMPLE B59 PRINTING 106 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE B80 COATED OFFSET BOOK 75 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L126	58.70	-5.05	-.90	.20	.46	22.87	-1.66	-.59	.49	.87	56K	@	L126
L149	56.00	-7.75	-1.38	.00	.00	20.00	-4.53	-1.62	.82	1.45	56K	@	L149
L182	63.70	-.05	-.01	.57	1.30	26.17	1.64	.59	.50	.89	56K	@	L182
L213	66.82	3.08	.55	.61	1.38	27.75	3.22	1.15	.13	.23	56K	@	L213
L277	70.00	6.25	1.12	.00	.00	27.50	2.97	1.06	.58	1.02	56K	@	L277
L291	66.80	3.05	.54	.45	1.04	22.57	-1.96	-.70	1.19	2.10	56K	@	L291
L333	57.70	-6.05	-1.08	.29	.67	23.27	-1.26	-.45	.90	1.59	56K	@	L333
L339	72.00	8.25	1.47	.41	.93	27.62	3.09	1.11	.48	.85	56K	@	L339
L616	62.00	-1.75	-.31	1.41	3.22	23.00	-1.53	-.55	.00	.00	56K	@	L616
GR. MEAN = 63.75 K & N UNITS						GRAND MEAN = 24.53 K & N UNITS					TEST DETERMINATIONS = 4		
SD MEANS = 5.60 K & N UNITS						SD OF MEANS = 2.79 K & N UNITS					9 LABS IN GRAND MEANS		
AVERAGE SDR = .44 K & N UNITS						AVERAGE SDR = .56 K & N UNITS							
L643	54.25	-9.50	-1.70	.96	2.18	21.25	-3.28	-1.17	.96	1.70	56@	*	L643
L651	31.45	-32.30	-5.76	.66	1.49	53.80	29.27	10.47	.57	1.01	56@	*	L651

TOTAL NUMBER OF LABORATORIES REPORTING = 11

Best values: H59 64 K + N units
B80 25 K + N units

REPORT NO. 56G — TAPPI COLLABORATIVE REFERENCE PROGRAM — NOVEMBER 1978

ANALYSIS T56-1 TABLE 2

K & N INK ABSORPTION

LAB CODE	F	MEANS B59	B80	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L651	*	31.45	53.80	-17.89	39.74	1.25	56@	INK ABSORPTION: OWN METHOD
L643	*	54.25	21.25	-10.02	.79	1.94	56@	INK ABSORPTION: OWN METHOD
L149	@	56.00	20.00	-8.91	-1.05	.72	56K	INK ABSORPTION, K&N INK TEST
L333	@	57.70	23.27	-6.04	1.27	1.13	56K	INK ABSORPTION, K&N INK TEST
L126	@	58.70	22.87	-5.29	.50	.66	56K	INK ABSORPTION, K&N INK TEST
L616	@	62.00	23.00	-2.21	-.70	1.61	56K	INK ABSORPTION, K&N INK TEST
L182	@	63.70	26.17	.61	1.53	1.09	56K	INK ABSORPTION, K&N INK TEST
L291	@	66.80	22.57	2.02	-3.01	1.57	56K	INK ABSORPTION, K&N INK TEST
L213	@	66.82	27.75	4.11	1.72	.81	56K	INK ABSORPTION, K&N INK TEST
L277	@	70.00	27.50	6.92	.22	.51	56K	INK ABSORPTION, K&N INK TEST
L339	@	72.00	27.62	8.80	-.46	.89	56K	INK ABSORPTION, K&N INK TEST
GMEANS:		63.75	24.53			1.00		
95% ELLIPSE:				20.00	4.95	WITH GAMMA = 23 DEGREES		

REPORT NO. 56G

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T57-1 TABLE 1
HYDROGEN ION CONCENTRATION (PH), COLD
TAPPI STANDARD T509 OS-77

NOVEMBER 1978

LAB CODE	SAMPLE J18 MEAN	PRINTING 93 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J62 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 5 VAR	P	LAB
L182C	4.560	-.104	-1.28	.055	2.16	5.454	-.081	-1.27	.064	1.54	57D	O	L182C
L251C	4.692	.028	.34	.011	.43	5.602	.067	1.05	.013	.31	57P	O	L251C
L274	4.650	-.014	-.17	.000	.00	5.564	.029	.46	.035	.85	57V	O	L274
L328	6.000	1.336	16.41	.071	2.79	6.350	.815	12.82	.071	1.71	57M	#	L328
L356	4.754	.090	1.11	.036	1.41	5.520	-.015	-.24	.054	1.30	57V	O	L356
L484A	5.100	.436	5.35	.071	2.79	5.520	-.015	-.24	.084	2.02	57Y	#	L484A

GR. MEAN = 4.664 PH UNITS — GRAND MEAN = 5.535 PH UNITS — TEST DETERMINATIONS = 5
SD MEANS = .081 PH UNITS — SD OF MEANS = .064 PH UNITS — 4 LABS IN GRAND MEANS
AVERAGE SDR = .025 PH UNITS — AVERAGE SDR = .041 PH UNITS
TOTAL NUMBER OF LABORATORIES REPORTING = 6

The following laboratories were omitted from the grand means because of extreme test results: 328, 484.

REPORT NO. 56G

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T57-1 TABLE 2
HYDROGEN ION CONCENTRATION (PH), COLD
TAPPI STANDARD T509 OS-77

NOVEMBER 1978

LAB CODE	F	MEANS J18	J62	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L182C	O	4.560	5.454	-.131	-.012	1.85	57D	PH, COLD, RADIOMETER TYPE PH M 28
L274	O	4.650	5.564	.004	.032	.42	57V	PH, COLD, BECKMAN EXPANDOMATIC
L251C	O	4.692	5.602	.060	.041	.37	57P	PH, COLD, RADIOMETER TYPE PH M64
L356	O	4.754	5.520	.068	-.061	1.35	57V	PH, COLD, BECKMAN EXPANDOMATIC
L484A	#	5.100	5.520	.359	-.249	2.40	57Y	PH, COLD, BECKMAN MODEL H2
L328	#	6.000	6.350	1.565	-.038	2.25	57M	PH, COLD, BECKMAN ZEROMATIC
GMEANS:		4.664	5.535			1.00		
		95% ELLIPSE:		.699	.357	WITH GAMMA = 32 DEGREES		

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978
ANALYSIS T57-2 TABLE 1
HYDROGEN ION CONCENTRATION (PH), HOT
TAPPI STANDARD T435 OS-77

LAB CODE	SAMPLE J18 MEAN	PRINTING 93 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J62 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L128	4.230	-.091	-.50	.016	.58	5.054	.080	.41	.011	.21	57L	6	L128
L162	4.120	-.201	-1.09	.016	.58	4.680	-.294	-1.49	.066	1.23	57C	6	L162
L182H	4.396	.075	.40	.022	.81	5.062	.088	.45	.067	1.24	57E	6	L182H
L484H	4.540	.219	1.18	.055	2.02	5.100	.126	.64	.071	1.32	57Z	6	L484H

TEST D. = 5

GR. MEAN = 4.321 PH UNITS GRAND MEAN = 4.974 PH UNITS TEST DETERMINATIONS = 5
SD MEANS = .185 PH UNITS SD OF MEANS = .197 PH UNITS 4 LABS IN GRAND MEANS
AVERAGE SDR = .027 PH UNITS AVERAGE SDR = .054 PH UNITS
TOTAL NUMBER OF LABORATORIES REPORTING = 4

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978
ANALYSIS T57-2 TABLE 2
HYDROGEN ION CONCENTRATION (PH), HOT
TAPPI STANDARD T435 OS-77

LAB CODE	F	MEANS J18	J62	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L162	6	4.120	4.680	-.353	-.051	.91	57C	PH, HOT, CORNING MODEL 12 RESEARCH METER
L128	6	4.230	5.054	-.003	.122	.40	57L	PH, HOT, L+N
L182H	6	4.396	5.062	.115	.005	1.03	57E	PH, HOT, RADIOMETER TYPE PH M 28
L484B	6	4.540	5.100	.241	-.075	1.67	57Z	PH, HOT, BECKMAN MODEL H2
GMEANS:		4.321	4.974			1.00		
		95% ELLIPSE:		1.941	.666	WITH GAMMA = 47 DEGREES		

ANALYSIS T60-1 TABLE 1

OPACITY (89% REFLECTANCE BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	SAMPLE K23 MEAN	PRINTING 103 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J58 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.F 10 VAR	F	LAB
L105	95.75	.33	.79	.28	1.01	93.01	.32	.55	.30	.89	60B	O	L105
L108	95.24	-.18	-.43	.12	.42	95.29	2.60	4.53	.09	.26	60B	#	L108
L115	95.30	-.12	-.28	.22	.78	92.38	-.31	-.55	.29	.86	60B	O	L115
L121	95.69	.27	.65	.30	1.06	93.17	.48	.83	.32	.95	60B	O	L121
L122	95.50	.08	.20	.35	1.24	92.90	.21	.36	.27	.79	60D	O	L122
L123	95.57	.15	.36	.22	.79	92.63	-.06	-.11	.34	1.00	60W	O	L123
L124	94.86	-.56	-1.33	.32	1.15	91.89	-.80	-1.40	.44	1.30	60B	O	L124
L125	94.57	-.85	-2.03	.31	1.12	92.39	-.30	-.53	.40	1.18	60B	X	L125
L131	95.00	-.42	-1.00	.00	.00	92.10	-.59	-1.04	.32	.93	60R	O	L131
L132	94.95	-.47	-1.12	.21	.76	92.10	-.59	-1.04	.49	1.44	60B	O	L132
L136	95.14	-.28	-.66	.26	.93	92.02	-.67	-1.18	.33	.96	60B	O	L136
L139	95.61	.19	.46	.30	1.08	92.72	.03	.05	.35	1.02	60B	O	L139
L148B	95.13	-.29	-.69	.11	.38	92.34	-.35	-.62	.33	.96	60B	O	L148B
L150	95.80	.38	.91	.26	.93	93.40	.71	1.23	.52	1.51	60B	O	L150
L152	95.95	.53	1.27	.18	.64	93.37	.68	1.18	.31	.90	60B	O	L152
L153	94.35	-1.07	-2.55	.47	1.70	91.40	-1.29	-2.26	.39	1.16	60B	*	L153
L162	95.81	.39	.94	.21	.75	93.33	.64	1.11	.25	.74	60W	O	L162
L166	95.45	.03	.08	.51	1.84	92.44	-.25	-.44	.32	.95	60B	O	L166
L173A	95.58	.16	.39	.27	.97	93.06	.37	.64	.18	.54	60B	O	L173A
L190C	95.40	-.02	-.04	.35	1.27	92.63	-.06	-.11	.52	1.53	60B	O	L190C
L190R	95.60	.18	.44	.34	1.21	92.83	.14	.24	.35	1.02	60B	O	L190R
L206	95.45	.03	.08	.29	1.05	92.83	.14	.24	.24	.70	60B	O	L206
L210B	95.50	.08	.20	.27	.96	92.80	.11	.19	.38	1.11	60B	O	L210B
L210D	95.71	.29	.70	.19	.67	93.05	.36	.62	.37	1.07	60D	O	L210D
L211S	95.30	-.12	-.28	.40	1.45	92.78	.09	.15	.39	1.15	60R	O	L211S
L212	95.70	.28	.67	.67	2.42	93.00	.31	.53	.47	1.38	60B	O	L212
L213	95.31	-.11	-.26	.16	.57	93.31	.62	1.08	.28	.83	60B	X	L213
L223B	95.69	.27	.65	.32	1.14	92.76	.07	.12	.29	.85	60B	O	L223B
L225	95.93	.51	1.22	.38	1.38	92.83	.14	.24	.39	1.16	60B	*	L225
L226B	95.11	-.31	-.74	.29	1.05	92.44	-.25	-.44	.25	.75	60B	O	L226B
L228	95.00	-.42	-1.00	.35	1.26	92.27	-.42	-.74	.34	1.00	60H	O	L228
L230	96.13	.71	1.70	.23	.81	93.78	1.09	1.90	.39	1.15	60B	O	L230
L236B	94.31	-1.11	-2.65	.66	2.37	91.10	-1.59	-2.78	.51	1.49	60B	*	L236B
L238A	94.79	-.63	-1.50	.17	.60	91.81	-.88	-1.54	.25	.74	60R	O	L238A
L241	95.68	.26	.63	.27	.98	93.36	.67	1.16	.43	1.26	60B	O	L241
L254	95.73	.31	.75	.28	1.02	93.38	.69	1.20	.42	1.24	60B	O	L254
L255	95.36	-.06	-.14	.16	.59	93.02	.33	.57	.21	.61	60B	O	L255
L261	95.60	.18	.44	.52	1.85	92.95	.26	.45	.28	.83	60B	O	L261
L262	95.90	.48	1.15	.19	.68	93.18	.49	.85	.29	.86	60R	O	L262
L275	95.52	.10	.24	.19	.69	92.69	-.00	-.01	.26	.77	60R	O	L275
L278	95.25	-.17	-.40	.33	1.19	92.63	-.06	-.11	.32	.93	60B	O	L278
L281	95.83	.41	.99	.21	.74	93.18	.49	.85	.32	.92	60D	O	L281
L285D	95.11	-.31	-.74	.31	1.12	91.91	-.78	-1.37	.37	1.07	60D	O	L285D
L285R	95.24	-.18	-.43	.23	.82	92.34	-.35	-.62	.39	1.13	60R	O	L285R
L288	95.30	-.12	-.28	.16	.56	92.74	.05	.08	.25	.73	60D	O	L288
L301	94.89	-.53	-1.26	.20	.73	91.93	-.76	-1.33	.32	.93	60B	O	L301
L305	95.50	.08	.20	.28	1.00	92.78	.09	.15	.31	.91	60R	O	L305
L308	95.68	.26	.63	.25	.89	92.97	.28	.48	.40	1.18	60B	O	L308
L315	95.73	.31	.75	.32	1.16	93.01	.32	.55	.24	.71	60D	O	L315
L317	95.35	-.07	-.16	.25	.88	92.69	-.00	-.01	.63	1.83	60B	O	L317
L318	95.60	.18	.44	.46	1.65	93.40	.71	1.23	.46	1.35	60B	O	L318
L323	95.71	.29	.70	.24	.85	92.84	.15	.26	.24	.71	60W	O	L323
L326	96.10	.68	1.63	.22	.78	93.48	.79	1.37	.37	1.08	60B	O	L326
L328	96.00	.58	1.39	.00	.00	92.00	-.69	-1.21	.00	.00	60B	X	L328
L339	95.25	-.17	-.40	.49	1.75	92.45	-.24	-.43	.50	1.46	60B	O	L339
L352	95.30	-.12	-.28	.20	.72	92.73	.04	.06	.15	.44	60R	O	L352
L354	94.70	-.72	-1.72	.48	1.73	91.60	-1.09	-1.91	.52	1.51	60B	O	L354
L390	95.84	.42	1.01	.26	.95	93.37	.68	1.18	.33	.96	60B	O	L390
L523	95.34	-.08	-.19	.17	.62	92.48	-.21	-.37	.27	.80	60R	O	L523
L567	96.35	.93	2.23	.23	.82	93.96	1.27	2.21	.30	.86	60D	O	L567
L573	95.73	.31	.75	.19	.68	92.81	.12	.20	.20	.58	60H	O	L573
L581	95.45	.03	.08	.20	.70	92.91	.22	.38	.32	.94	60B	O	L581
L587	95.38	-.04	-.09	.32	1.16	92.72	.03	.05	.40	1.19	60B	O	L587
L592	94.70	-.72	-1.72	.21	.74	91.75	-.94	-1.65	.32	.94	60W	O	L592
L594	95.27	-.15	-.35	.31	1.11	92.61	-.08	-.15	.29	.85	60D	O	L594

ANALYSIS T60-1 TABLE 1

OPACITY (89% REFLECTANCE BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	SAMPLE K23 MEAN	PRINTING 103 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J58 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	P	LAB
L597	94.30	-1.12	-2.67	.48	1.73	91.40	-1.29	-2.26	.84	2.47	60B	*	L597
L599	95.40	-.02	-.04	.52	1.85	92.95	.26	.45	.28	.83	60B	O	L599
L673R	95.62	.20	.48	.29	1.05	92.78	.09	.15	.32	.92	60B	O	L673R
L673T	95.39	-.03	-.07	.21	.77	92.92	.23	.39	.50	1.47	60B	O	L673T
GR. MEAN = 95.42 PERCENT						GRAND MEAN = 92.69 PERCENT					TEST DETERMINATIONS = 10		
SD MEANS = .42 PERCENT						SD OF MEANS = .57 PERCENT					65 LABS IN GRAND MEANS		
		AVERAGE SDR = .28 PERCENT					AVERAGE SDR = .34 PERCENT						
L224	95.35	-.07	-.16	.52	1.86	92.29	-.40	-.70	.37	1.09	60P	*	L224
L232	95.70	.28	.67	.35	1.26	92.10	-.59	-1.04	.39	1.16	60P	*	L232
L249	95.21	-.21	-.50	.32	1.14	91.95	-.74	-1.30	.16	.46	60P	*	L249
L256	97.56	2.14	5.13	.15	.54	94.18	1.49	2.60	.23	.66	60N	*	L256
L260	95.62	.20	.48	.26	.92	92.19	-.50	-.88	.23	.67	60P	*	L260
L274P	95.65	.23	.56	.34	1.21	92.25	-.44	-.77	.26	.77	60P	*	L274P
L312	95.00	-.42	-1.00	.00	.00	92.00	-.69	-1.21	.00	.00	60P	*	L312
L380	95.00	-.42	-1.00	.00	.00	91.40	-1.29	-2.26	.39	1.16	60P	*	L380
L396	95.50	.08	.20	.33	1.20	92.85	.16	.27	.24	.71	60X	*	L396

TOTAL NUMBER OF LABORATORIES REPORTING = 78

Best values: K23 95.4 ± 0.6 percent
J58 92.7 ± 0.9 percent

The following laboratories were omitted from the grand means because of extreme test results: 108.

ANALYSIS T60-1 TABLE 2

OPACITY (89% REFLECTANCE BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - H&L TYPE

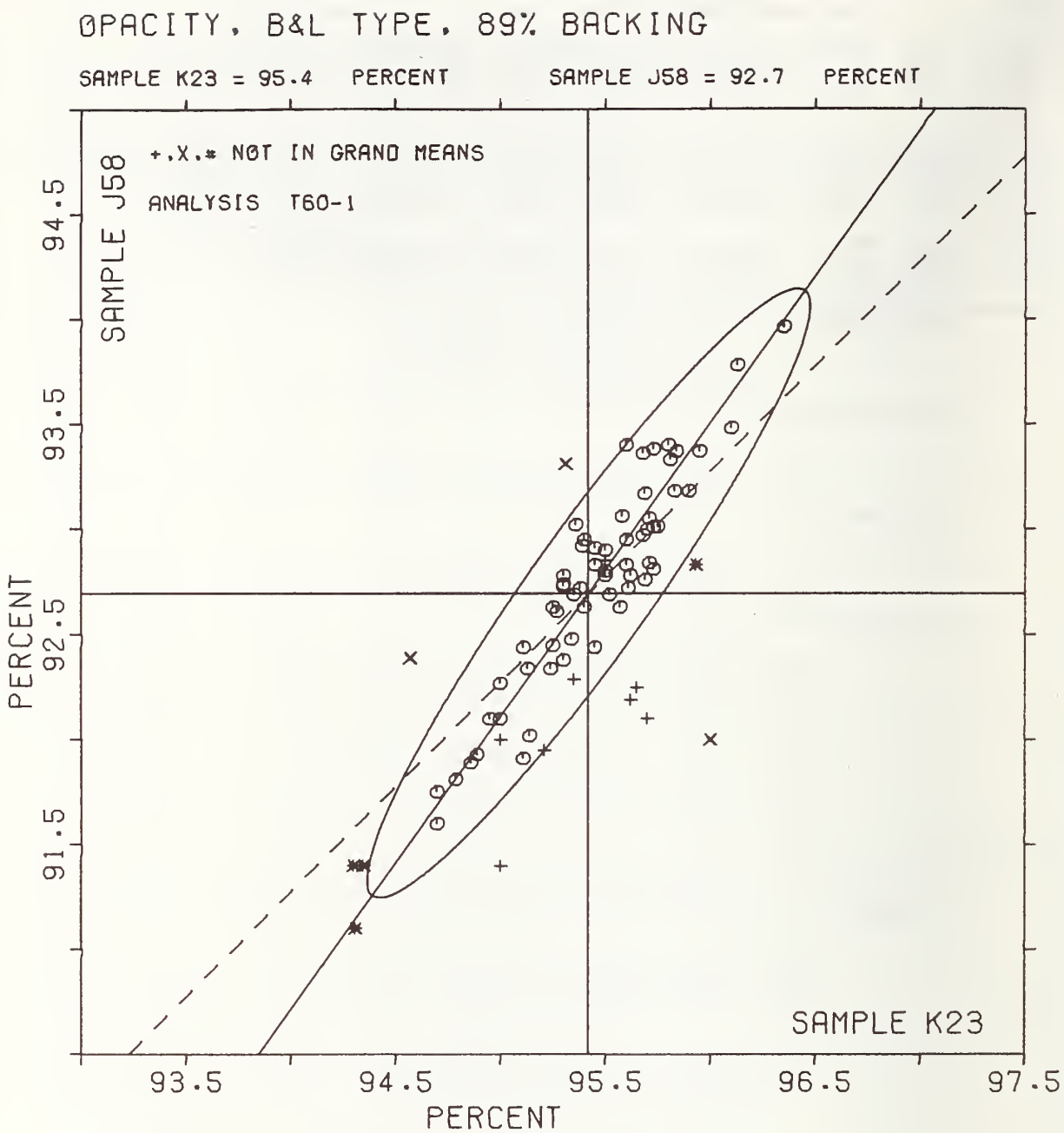
LAB CODE	F	MEANS E23	MEANS J58	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L597	*	94.30	91.40	-1.70	.16	2.10	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L236B	*	94.31	91.10	-1.94	-.03	1.93	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L153	*	94.35	91.40	-1.67	.11	1.43	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L125	X	94.57	92.39	-.74	.51	1.15	60H OPACITY (WHITE BACKING), HUYGEN
L592	O	94.70	91.75	-1.19	.03	.84	60W OPACITY (WHITE BACKING), HUYGEN,DIGITAL
L354	O	94.70	91.60	-1.31	-.05	1.62	60H OPACITY (WHITE BACKING), BAUSCH + LOMB
L238A	O	94.79	91.81	-1.08	-.00	.67	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L124	O	94.86	91.89	-.98	-.01	1.22	60H OPACITY (WHITE BACKING), BAUSCH + LOMB
L301	O	94.89	91.93	-.93	-.02	.83	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L132	O	94.95	92.10	-.76	.03	1.10	60H OPACITY (WHITE BACKING), BAUSCH + LOMB
L228	O	95.00	92.27	-.59	.09	1.13	60H OPACITY (WHITE BACKING), HUYGEN
L380	*	95.00	91.40	-1.29	-.41	.58	60P OPACITY (WHITE BACKING), PHOTOVOLT
L312	*	95.00	92.00	-.81	-.06	.00	60P OPACITY (WHITE BACKING), PHOTOVOLT
L131	O	95.00	92.10	-.73	-.01	.46	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L285D	O	95.11	91.91	-.82	-.21	1.09	60D OPACITY (WHITE BACKING), BNL-2
L226B	O	95.11	92.44	-.39	.10	.90	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L148H	O	95.13	92.34	-.46	.03	.67	60H OPACITY (WHITE BACKING), HUYGEN
L136	O	95.14	92.02	-.71	-.17	.95	60H OPACITY (WHITE BACKING), HUYGEN
L249	*	95.21	91.95	-.73	-.26	.80	60P OPACITY (WHITE BACKING), PHOTOVOLT
L285R	O	95.24	92.34	-.39	-.06	.97	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L108	#	95.24	95.29	2.01	1.66	.34	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L339	O	95.25	92.45	-.30	-.01	1.60	60H OPACITY (WHITE BACKING), BAUSCH + LOMB
L278	O	95.25	92.63	-.15	.10	1.06	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L594	O	95.27	92.61	-.15	.07	.98	60D OPACITY (WHITE BACKING), BNL-2
L352	O	95.30	92.73	-.04	.12	.58	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L211S	O	95.30	92.78	.00	.15	1.30	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L288	O	95.30	92.74	-.03	.12	.65	60D OPACITY (WHITE BACKING), BNL-2
L115	O	95.30	92.38	-.32	-.09	.82	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L213	X	95.31	93.31	.44	.45	.70	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L523	O	95.34	92.48	-.22	-.06	.71	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L224	*	95.35	92.29	-.37	-.18	1.48	60P OPACITY (WHITE BACKING), PHOTOVOLT
L317	O	95.35	92.69	-.04	.05	1.36	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L255	O	95.36	93.02	.23	.24	.60	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L587	O	95.38	92.72	-.00	.05	1.17	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L673T	O	95.39	92.92	.17	.15	1.12	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L190C	O	95.40	92.63	-.06	-.02	1.40	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L599	O	95.40	92.95	.20	.16	1.34	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L166	O	95.45	92.44	-.19	-.17	1.39	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L581	O	95.45	92.91	.19	.10	.82	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L206	O	95.45	92.83	.13	.05	.88	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L396	*	95.50	92.85	.17	.02	.95	60X OPACITY: GIVE INSTR. MAKE,MODEL;( )WHITE OR ( )PAPER BACKING
L210B	O	95.50	92.80	.13	-.00	1.04	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L122	O	95.50	92.90	.22	.05	1.02	60D OPACITY (WHITE BACKING), BNL-2
L305	O	95.50	92.78	.12	-.02	.96	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L275	O	95.52	92.69	.06	-.09	.73	60R OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L123	O	95.57	92.63	.04	-.16	.90	60W OPACITY (WHITE BACKING), HUYGEN,DIGITAL
L173A	O	95.58	93.06	.39	.08	.75	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L261	O	95.60	92.95	.31	.00	1.34	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L190R	O	95.60	92.83	.22	-.07	1.11	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L318	O	95.60	93.40	.68	.26	1.50	60H OPACITY (WHITE BACKING), BAUSCH + LOMB
L139	O	95.61	92.72	.13	-.14	1.05	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L260	*	95.62	92.19	-.29	-.46	.80	60P OPACITY (WHITE BACKING), PHOTOVOLT
L673R	O	95.62	92.78	.19	-.11	.99	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L274P	*	95.65	92.25	-.23	-.45	.99	60P OPACITY (WHITE BACKING), PHOTOVOLT
L308	O	95.68	92.97	.38	-.05	1.04	60H OPACITY (WHITE BACKING), HUYGEN
L241	O	95.68	93.36	.69	.17	1.12	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L121	O	95.69	93.17	.55	.06	1.01	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L223B	O	95.69	92.76	.21	-.18	1.00	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L232	*	95.70	92.10	-.32	-.58	1.21	60P OPACITY (WHITE BACKING), PHOTOVOLT
L212	O	95.70	93.00	.41	-.05	1.90	60B OPACITY (WHITE BACKING), BAUSCH + LOMB
L323	O	95.71	92.84	.29	-.15	.78	60W OPACITY (WHITE BACKING), HUYGEN,DIGITAL
L210D	O	95.71	93.05	.46	-.03	.87	60D OPACITY (WHITE BACKING), BNL-2
L254	O	95.73	93.38	.74	.15	1.13	60B OPACITY (WHITE BACKING), HUYGEN
L573	O	95.73	92.81	.28	-.19	.63	60H OPACITY (WHITE BACKING), HUYGEN
L315	O	95.73	93.01	.44	-.07	.94	60D OPACITY (WHITE BACKING), BNL-2

ANALYSIS T60-1 TABLE 2

OPACITY (89% REFLECTANCE BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - H&L TYPE

LAB CODE	P	MEANS K23	MEANS J58	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L105	O	95.75	93.01	.45	-.09	.95	60H	OPACITY (WHITE BACKING), HUYGEN
L150	O	95.80	93.40	.80	.10	1.22	60B	OPACITY (WHITE BACKING), BAUSCH • LOMB
L162	O	95.81	93.33	.75	.05	.75	60W	OPACITY (WHITE BACKING), HUYGEN,DIGITAL
L281	O	95.83	93.18	.64	-.05	.83	60D	OPACITY (WHITE BACKING), HNL-2
L390	O	95.84	93.37	.80	.05	.95	60H	OPACITY (WHITE BACKING), BAUSCH • LOMB
L262	O	95.90	93.18	.68	-.11	.77	60R	OPACITY (WHITE BACKING), THWING-ALBERT (FORMERLY SRL)
L225	*	95.93	92.83	.41	-.34	1.27	60B	OPACITY (WHITE BACKING), BAUSCH • LOMB
L152	O	95.95	93.37	.86	-.04	.77	60H	OPACITY (WHITE BACKING), BAUSCH • LOMB
L328	X	96.00	92.00	-.22	-.88	.00	60H	OPACITY (WHITE BACKING), HAUSCH • LOMB
L326	O	96.10	93.48	1.04	-.10	.93	60B	OPACITY (WHITE BACKING), HAUSCH • LOMB
L230	O	96.13	93.78	1.30	.05	.98	60B	OPACITY (WHITE BACKING), BAUSCH • LOMB
L567	O	96.35	93.96	1.57	-.02	.84	60D	OPACITY (WHITE BACKING), HNL-2
L256	•	97.56	94.18	2.46	-.88	.60	60N	OPACITY (WHITE BACKING), HUNTER
GMEANS:		95.42	92.69			1.00		
		95% ELLIPSE:		1.77	.29	WITH GAMMA = 54 DEGREES		


OPACITY, B&L TYPE, 89% BACKING
SAMPLE K23 = 95.4 PERCENT
SAMPLE J58 = 92.7 PERCENT
+,X,* NOT IN GRAND MEANS
ANALYSIS T60-1
SAMPLE J58
PERCENT
94.5
93.5
92.5
91.5
SAMPLE K23
93.5
94.5
95.5
96.5
97.5
PERCENT

REPORT NO. 560 TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T60-2 TABLE 1

OPACITY (PAPER BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	SAMPLE K23 PRINTING 103 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE J58 PRINTING 94 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.F. 10 VAR	P	LAB
L115	96.04	.15	.92	.31	1.04	93.46	.37	1.11	.13	.38	60C	O	L115
L190C	95.67	-.22	-1.35	.27	.89	93.33	.24	.72	.35	1.00	60C	O	L190C
L190R	96.02	.13	.80	.33	1.10	92.94	-.15	-.43	.36	1.01	60C	O	L190R
L236B	95.77	-.12	-.74	.43	1.43	93.10	.01	.04	.40	1.14	60C	O	L236B
L274	95.95	.06	.37	.16	.53	92.60	-.49	-1.44	.52	1.47	60C	O	L274

GR. MEAN = 95.89 PERCENT GRAND MEAN = 93.09 PERCENT TEST DETERMINATIONS = 10

SD MEANS = .16 PERCENT SD OF MEANS = .34 PERCENT 5 LABS IN GRAND MEANS

AVERAGE SDR = .30 PERCENT AVERAGE SDR = .35 PERCENT

TOTAL NUMBER OF LABORATORIES REPORTING = 5

Best values: K23 95.9 percent
J58 93.1 percent

REPORT NO. 560 TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T60-2 TABLE 2

OPACITY (PAPER BACKING) IN PERCENT

TAPPI STANDARD T425 OS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	F	MEANS K23	J58	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L190C	O	95.67	93.33	-.27	-.19	.95	60C	OPACITY (PAPER BACKING), PAUSCB * LOMB
L236B	O	95.77	93.10	-.03	-.12	1.28	60C	OPACITY (PAPER BACKING), BAUSCB * LOMB
L274	O	95.95	92.60	.49	-.00	1.00	60C	OPACITY (PAPER BACKING), BAUSCB * LOMB
L190R	O	96.02	92.94	.16	.11	1.06	60C	OPACITY (PAPER BACKING), BAUSCB * LOMB
L115	O	96.04	93.46	-.35	.20	.71	60C	OPACITY (PAPER BACKING), BAUSCB * LOMB
GMEANS:		95.89	93.09			1.00		
95% ELLIPSE:				1.72	.80	WITH GAMMA =-82 DEGREES		

REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T60-3 TABLE 1

OPACITY (PAPER BACKING) IN PERCENT

TAPPI SUGGESTED METHOD T519 OS-78, DIFFUSE OPACITY OF PAPER - ILLUMINANT C, ELREPHO TYPE

LAB CODE	SAMPLE K23 MEAN	PRINTING 103 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J58 MEAN	PRINTING 94 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 10 VAR	P	LAB
L150	96.29	-.02	-.11	.21	1.47	93.56	.01	.05	.18	.89	60J	O	L150
L182E	96.25	-.05	-.33	.16	1.10	93.41	-.14	-.70	.13	.66	60J	O	L182E
L236	96.31	.01	.04	.13	.90	93.46	-.09	-.46	.31	1.60	60J	O	L236
L242	96.44	.14	.84	.12	.82	93.61	.06	.28	.23	1.16	60J	O	L242
L244	96.12	-.18	-1.13	.19	1.31	93.32	-.23	-1.15	.20	1.01	60F	O	L244
L250T	96.03	-.27	-1.68	.14	.99	93.35	-.20	-1.00	.31	1.60	60J	O	L250T
L251	96.04	-.27	-1.65	.17	1.22	93.28	-.28	-1.37	.22	1.14	60F	O	L251
L309	95.25	-1.05	-6.48	.27	1.90	91.83	-1.72	-8.50	.31	1.59	60J	#	L309
L313	96.56	.26	1.57	.13	.88	93.88	.33	1.62	.16	.82	60F	O	L313
L360	96.31	.01	.04	.12	.84	93.47	-.08	-.41	.18	.93	60F	O	L360
L446	96.41	.11	.66	.13	.90	93.55	.00	.01	.15	.77	60J	O	L446
L484	96.40	.10	.62	.14	.97	93.76	.21	1.01	.21	1.06	60F	O	L484
L598	96.47	.17	1.02	.14	.99	93.91	.36	1.76	.12	.61	60J	O	L598
L678	96.32	.02	.12	.09	.63	93.62	.07	.34	.15	.76	60J	O	L678
GR. MEAN *	96.30 PERCENT					GRAND MEAN *	93.55 PERCENT				TEST DETERMINATIONS *		10
SD MEANS *	.16 PERCENT					SD OF MEANS *	.20 PERCENT				13 LABS IN GRAND MEANS		
	AVERAGE SDR *	.14 PERCENT				AVERAGE SDR *	.20 PERCENT						
L626	96.00	-.30	-1.87	.00	.00	93.00	-.55	-2.73	.00	.00	60Q	*	L626

TOTAL NUMBER OF LABORATORIES REPORTING * 15

Best values: K23 96.3 ± 0.3 percent
J58 93.5 ± 0.4 percent

The following laboratories were omitted from the grand means because of extreme test results: 309.

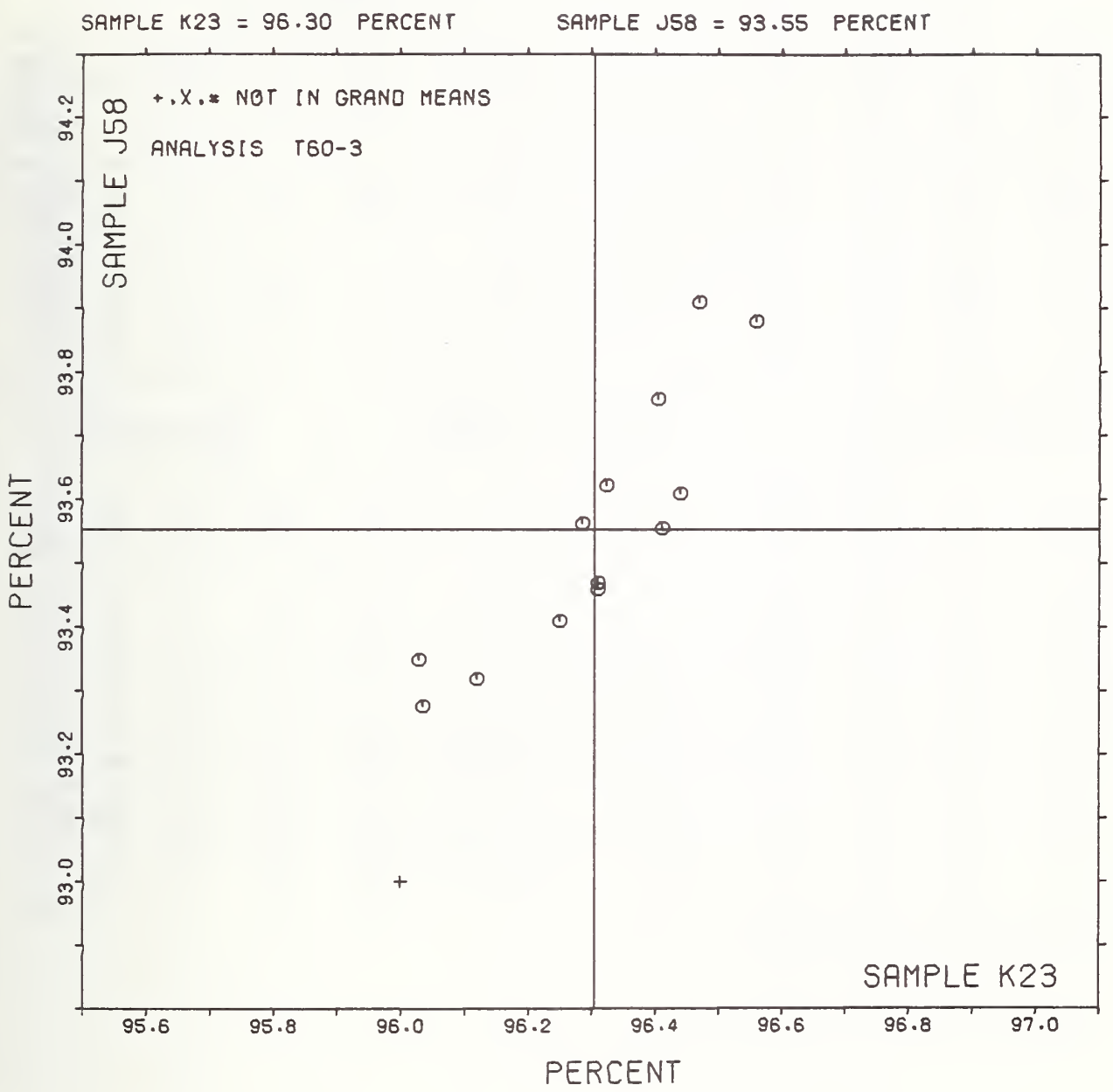
REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T60-3 TABLE 2

OPACITY (PAPER BACKING) IN PERCENT

TAPPI SUGGESTED METHOD T519 OS-78, DIFFUSE OPACITY OF PAPER - ILLUMINANT C, ELREPHO TYPE

LAB CODE	F	MEANS K23	J58	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L309	#	95.25	91.83	-2.01	-.23	1.74	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L626	*	96.00	93.00	-.62	-.10	.00	60Q	OPACITY (PAPER BACKING), PHOTOVOLT
L250T	O	96.03	93.35	-.33	.09	1.29	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L251	O	96.04	93.28	-.38	.04	1.18	60F	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) NO TRAP
L244	O	96.12	93.32	-.30	.00	1.16	60F	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) NO TRAP
L182E	O	96.25	93.41	-.15	-.05	.88	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L150	O	96.29	93.56	-.00	.02	1.18	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L236	O	96.31	93.46	-.07	-.06	1.25	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L360	O	96.31	93.47	-.06	-.06	.88	60F	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) NO TRAP
L678	O	96.32	93.62	.07	.03	.69	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L484	O	96.40	93.76	.22	.05	1.01	60F	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) NO TRAP
L446	O	96.41	93.55	.07	-.08	.83	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L242	O	96.44	93.61	.13	-.07	.99	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L598	O	96.47	93.91	.38	.09	.80	60J	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) FILTER
L313	O	96.56	93.88	.42	.00	.85	60F	OPACITY (PAPER BACKING), ZEISS ELREPHO, FMY-C(10) NO TRAP
GMEANS:		96.30	93.55			1.00		
95% ELLIPSE:				.75	.17	WITH GAMMA * 51 DEGREES		


OPACITY, ELREPHO TYPE, PAPER BACKING
SAMPLE K23 = 96.30 PERCENT
SAMPLE J58 = 93.55 PERCENT
+,X,* NOT IN GRAND MEANS
ANALYSIS T60-3
SAMPLE J58
PERCENT
94.2
94.0
93.8
93.6
93.4
93.2
93.0
SAMPLE K23
95.6
95.8
96.0
96.2
96.4
96.6
96.8
97.0
PERCENT

ANALYSIS T65-1 TABLE 1
DIRECTIONAL BLUE REFLECTANCE IN PERCENT
TAPPI STANDARD T452 OS-77, 'BRIGHTNESS'; MARTIN SWEETS (ACBT & GE) IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE E78 MEAN	PRINTING 116 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J97 MEAN	PRINTING 89 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 8 VAR	F	LAB
L108	95.94	-.37	-.81	.16	1.54	76.60	.69	1.36	.15	1.00	65M	ó	L108
L122	96.00	-.30	-.67	.05	.52	75.61	-.30	-.60	.15	.97	65N	ó	L122
L132	96.96	.66	1.46	.09	.88	76.11	.20	.40	.17	1.15	65N	ó	L132
L190C	95.67	-.63	-1.39	.12	1.12	75.02	-.89	-1.76	.10	.69	65A	ó	L190C
L210M	96.04	-.27	-.59	.07	.72	75.52	-.39	-.77	.07	.47	65M	ó	L210M
L210N	95.87	-.43	-.95	.07	.68	75.37	-.54	-1.07	.13	.85	65N	ó	L210N
L211	93.99	-2.32	-5.13	.30	2.94	74.81	-1.10	-2.18	.15	.97	65N	#	L211
L225	96.50	.20	.44	.09	.89	96.15	20.24	40.18	.11	.71	65N	#	L225
L275	95.91	-.39	-.87	.08	.81	75.50	-.41	-.82	.12	.79	65M	ó	L275
L285	96.47	.17	.38	.24	2.35	76.25	.34	.67	.23	1.55	65N	ó	L285
L288	96.49	.18	.41	.17	1.67	76.50	.59	1.17	.12	.79	65N	ó	L288
L308	96.94	.63	1.40	.07	.72	76.79	.88	1.74	.12	.83	65N	ó	L308
L315	96.49	.18	.41	.08	.81	76.17	.26	.52	.25	1.69	65N	ó	L315
L523	96.01	-.29	-.64	.04	.34	76.17	.26	.52	.09	.59	65N	ó	L523
L598	96.09	-.22	-.48	.08	.81	75.75	-.16	-.32	.17	1.12	65M	ó	L598
L636	96.51	.21	.46	.14	1.31	75.76	-.15	-.30	.25	1.66	65M	ó	L636
L673R	97.15	.65	1.88	.08	.73	75.54	-.38	-.74	.13	.86	65N	ó	L673R
GR. MEAN *	96.30 PERCENT					GRAND MEAN *	75.91 PERCENT				TEST DETERMINATIONS *		8
SD MEANS *	.45 PERCENT					SD OF MEANS *	.50 PERCENT				15 LABS IN GRAND MEANS		
		AVERAGE SDR *		.10 PERCENT			AVERAGE SDR *		.15 PERCENT				
L105	98.00	1.70	3.76	.15	1.46	75.86	-.05	-.10	.17	1.12	65T	*	L105
L213	97.76	1.46	3.23	.12	1.15	76.17	.26	.52	.15	.99	65T	*	L213
L223	97.70	1.40	3.09	.05	.52	76.71	.80	1.59	.20	1.30	65G	*	L223
L224	96.14	-.17	-.37	.12	1.15	75.90	-.01	-.02	.19	1.23	65B	*	L224
L232	97.00	.70	1.54	.53	5.16	77.25	1.34	2.66	.27	1.77	65P	*	L232
L241	96.11	-.19	-.42	.23	2.22	76.52	.61	1.22	.13	.85	65I	*	L241
L249	97.02	.72	1.60	.07	.68	77.72	1.81	3.60	.14	.92	65P	*	L249
L256	96.62	.32	.71	.09	.86	75.62	-.29	-.57	.10	.69	65B	*	L256
L260	96.05	-.25	-.56	.08	.73	77.04	1.13	2.23	.12	.79	65P	*	L260
L277	93.00	-3.30	-7.32	1.07	10.32	81.00	5.09	10.10	.00	.00	65P	*	L277
L278	97.82	1.52	3.37	.21	1.98	77.50	1.59	3.15	.28	1.88	65P	*	L278
L301	96.89	.58	1.29	.10	.96	75.81	-.10	-.20	.16	1.09	65G	*	L301
L312	96.25	-.05	-.12	.38	3.65	78.25	2.34	4.64	.27	1.77	65P	*	L312
L321	100.00	3.70	8.19	.00	.00	78.00	2.09	4.14	.00	.00	65P	*	L321
L328	99.42	3.12	6.91	.48	4.64	78.50	2.59	5.14	.00	.00	65P	*	L328
L339	96.94	.63	1.40	.32	3.09	76.87	.96	1.91	.23	1.53	65P	*	L339
L380	95.12	-1.18	-2.61	.23	2.23	78.00	2.09	4.14	.00	.00	65P	*	L380
L562	96.50	.20	.44	.00	.00	81.50	5.59	11.09	.00	.00	65P	*	L562
L587	96.07	-.23	-.51	.05	.45	74.96	-.95	-1.89	.09	.61	65I	*	L587
L591	98.67	2.36	5.24	.07	.71	74.84	-1.07	-2.13	.17	1.14	65H	*	L591
L617	94.45	-1.85	-4.11	.13	1.26	74.69	-1.22	-2.43	.11	.75	65G	*	L617
L626	96.62	.32	.71	.35	3.41	78.12	2.21	4.39	.10	.69	65P	*	L626

TOTAL NUMBER OF LABORATORIES REPORTING * 39

Best values: E78 96.1 ± 0.9 percent
J97 75.8 ± 0.8 percent

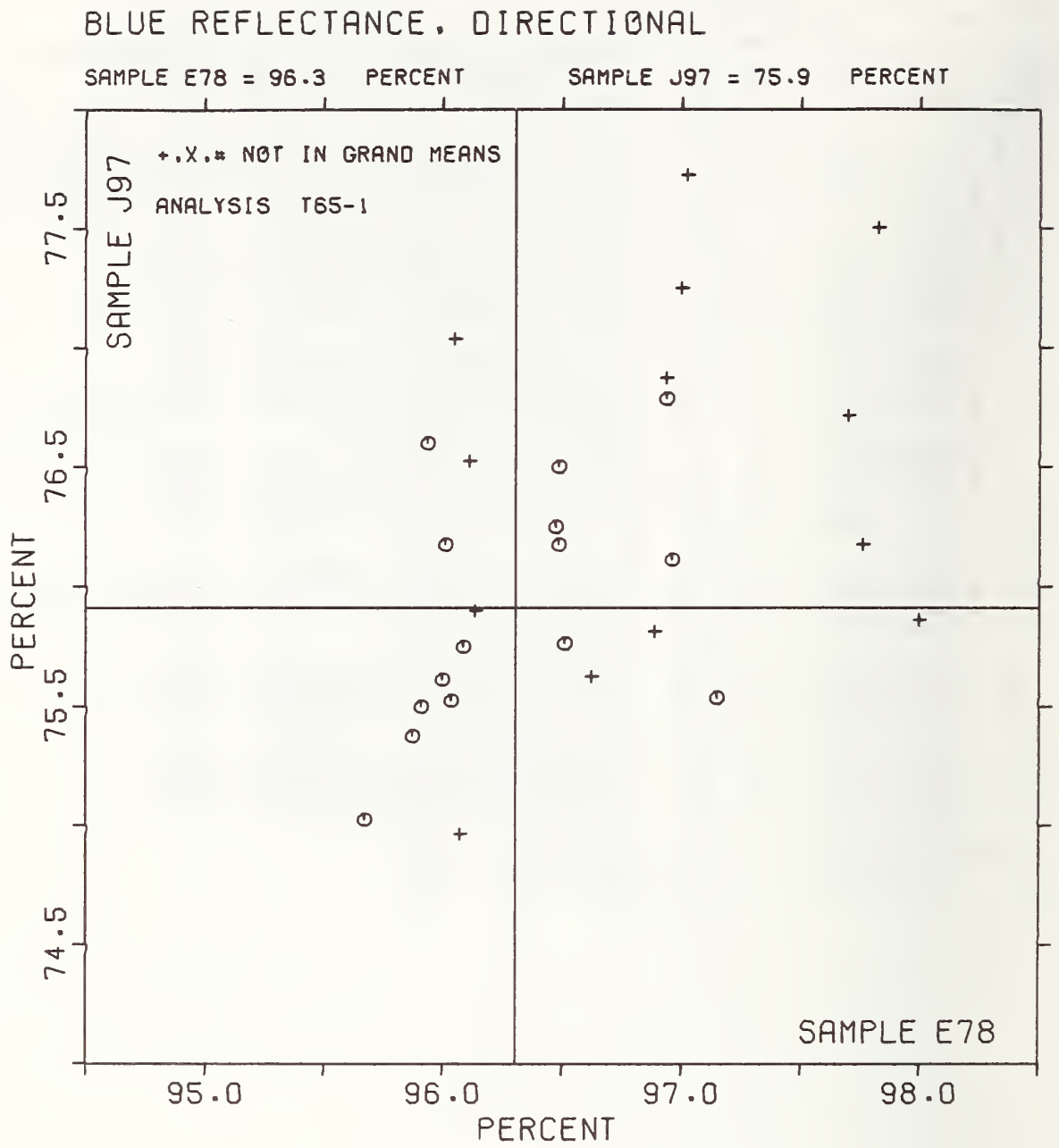
The following laboratories were omitted from the grand means because of extreme test results: 211, 225.

ANALYSIS T65-1 TABLE 2

DIRECTIONAL BLUE REFLECTANCE IN PERCENT

TAPPI STANDARD T452 OS-77, 'BRIGHTNESS'; MARTIN SWEETS (ACHT & GE) IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS E78	MEANS J97	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L277	*	93.00	81.00	1.97	5.74	5.16 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L211	#	93.99	74.81	-2.29	1.15	1.95 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L617	*	94.45	74.69	-2.11	.71	1.01 65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L380	*	95.12	78.00	.92	2.21	1.12 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L190C	O	95.67	75.02	-1.09	-.05	.91 65A	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (ACHT),S-2
L210N	O	95.87	75.37	-.69	.01	.77 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L275	O	95.91	75.50	-.57	.05	.80 65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L108	O	95.94	76.60	.32	.71	1.27 65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L122	O	96.00	75.61	-.42	.05	.74 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L523	O	96.01	76.17	.03	.39	.46 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L210M	O	96.04	75.52	-.47	-.03	.59 65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L260	*	96.05	77.04	.73	.89	.76 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L587	*	96.07	74.96	-.89	-.41	.53 65I	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2A
L598	O	96.09	75.75	-.26	.07	.96 65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L241	*	96.11	76.52	.37	.53	1.53 65I	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2A
L224	*	96.14	75.90	-.11	.12	1.19 65H	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L312	*	96.25	78.25	1.81	1.48	2.71 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L285	O	96.47	76.25	.37	.07	1.95 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L315	O	96.49	76.17	.32	.02	1.25 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L288	O	96.49	76.50	.58	.22	1.23 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L562	*	96.50	81.50	4.52	3.29	.00 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L225	#	96.50	96.15	16.07	12.31	.80 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L636	O	96.51	75.76	.01	-.26	1.48 65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L626	*	96.62	78.12	1.94	1.11	2.05 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L256	*	96.62	75.62	-.03	-.43	.77 65H	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L301	*	96.89	75.81	.28	-.52	1.02 65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L339	*	96.94	76.87	1.15	.09	2.31 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L308	O	96.94	76.79	1.08	.04	.77 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L132	O	96.96	76.11	.56	-.40	1.01 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L232	*	97.00	77.25	1.48	.27	3.47 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L249	*	97.02	77.72	1.87	.55	.80 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L673R	O	97.15	75.54	.23	-.90	.80 65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANO/M.S., S-4
L223	*	97.70	76.71	1.49	-.61	.91 65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L213	*	97.76	76.17	1.11	-.99	1.07 65T	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2M
L278	*	97.82	77.50	2.19	-.22	1.93 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L105	*	98.00	75.86	1.01	-1.37	1.29 65T	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2M
L591	*	98.67	74.84	.61	-2.52	.92 65H	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L328	*	99.42	78.50	3.96	-.87	2.32 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L321	*	100.00	78.00	3.92	-1.63	.00 65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
GMEANS:		96.30	75.91			1.00	
		95% ELLIPSE:		1.65	1.01	WITH GAMMA = 51 DEGREES	


BLUE REFLECTANCE, DIRECTIONAL
SAMPLE E78 = 96.3 PERCENT
SAMPLE J97 = 75.9 PERCENT
+,X,* NOT IN GRAND MEANS
ANALYSIS T65-1
SAMPLE J97
SAMPLE E78
PERCENT
77.5
76.5
75.5
74.5
95.0
96.0
97.0
98.0
PERCENT

ANALYSIS T65-2 TABLE 1

DIFFUSE BLUE REFLECTANCE IN PERCENT (GLOSS TRAP)

TAPPI SUGGESTED METHOD T525 SU-72, BRIGHTNESS OF PULP (DIFFUSE ILLUMINATION AND 0 DEG. OBSERVATION)

LAB	SAMPLE E78	PRINTING 116 GRAMS PER SQUARE METER				SAMPLE J97	PRINTING 89 GRAMS PER SQUARE METER				TEST D.= 8		
CODE	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L121	96.12	-.36	-.61	.05	.45	76.86	1.07	1.68	.10	.59	65K	@	L121
L136	96.64	.16	.27	.08	.77	76.18	.39	.60	.12	.74	65F	@	L136
L150	96.88	.40	.68	.06	.55	74.76	-1.03	-1.62	.16	.94	65Q	@	L150
L182	96.45	-.03	-.05	.11	1.05	75.52	-.27	-.42	.11	.64	65F	@	L182
L210K	95.56	-.92	-1.57	.33	3.20	76.70	.91	1.42	.18	1.09	65K	@	L210K
L236	97.19	.71	1.20	.06	.58	75.73	-.06	-.10	.10	.56	65F	@	L236
L242	96.55	.07	.12	.08	.74	75.24	-.55	-.86	.19	1.10	65F	@	L242
L250T	96.85	.37	.63	.11	1.05	76.03	.24	.37	.14	.85	65F	@	L250T
L280	96.19	-.29	-.49	.14	1.39	75.15	-.64	-1.00	.55	3.25	65Q	@	L280
L325	97.60	1.12	1.90	.09	.90	76.41	.61	.96	.17	1.00	65F	@	L325
L446	96.22	-.26	-.45	.08	.73	75.11	-.68	-1.06	.06	.37	65F	@	L446
L573	98.84	2.36	4.00	.05	.51	77.61	1.81	2.84	.12	.71	65F	#	L573
L598	95.51	-.97	-1.65	.10	.96	75.90	.11	.17	.15	.88	65K	@	L598
L636	96.48	.00	.01	.06	.62	75.70	-.09	-.14	.17	.99	65K	@	L636
GR. MEAN = 96.48 PERCENT						GRAND MEAN = 75.79 PERCENT					TEST DETERMINATIONS = 8		
SD MEANS = .59 PERCENT						SD OF MEANS = .64 PERCENT					13 LABS IN GRAND MEANS		
		AVERAGE SDR = .10 PERCENT					AVERAGE SDR = .17 PERCENT						
L289	96.72	.24	.42	.10	1.00	76.42	.63	.99	.13	.76	65@	*	L289

TOTAL NUMBER OF LABORATORIES REPORTING = 15

Best values: E78 96.5 ± 1.0 percent
J97 75.7 ± 1.1 percent

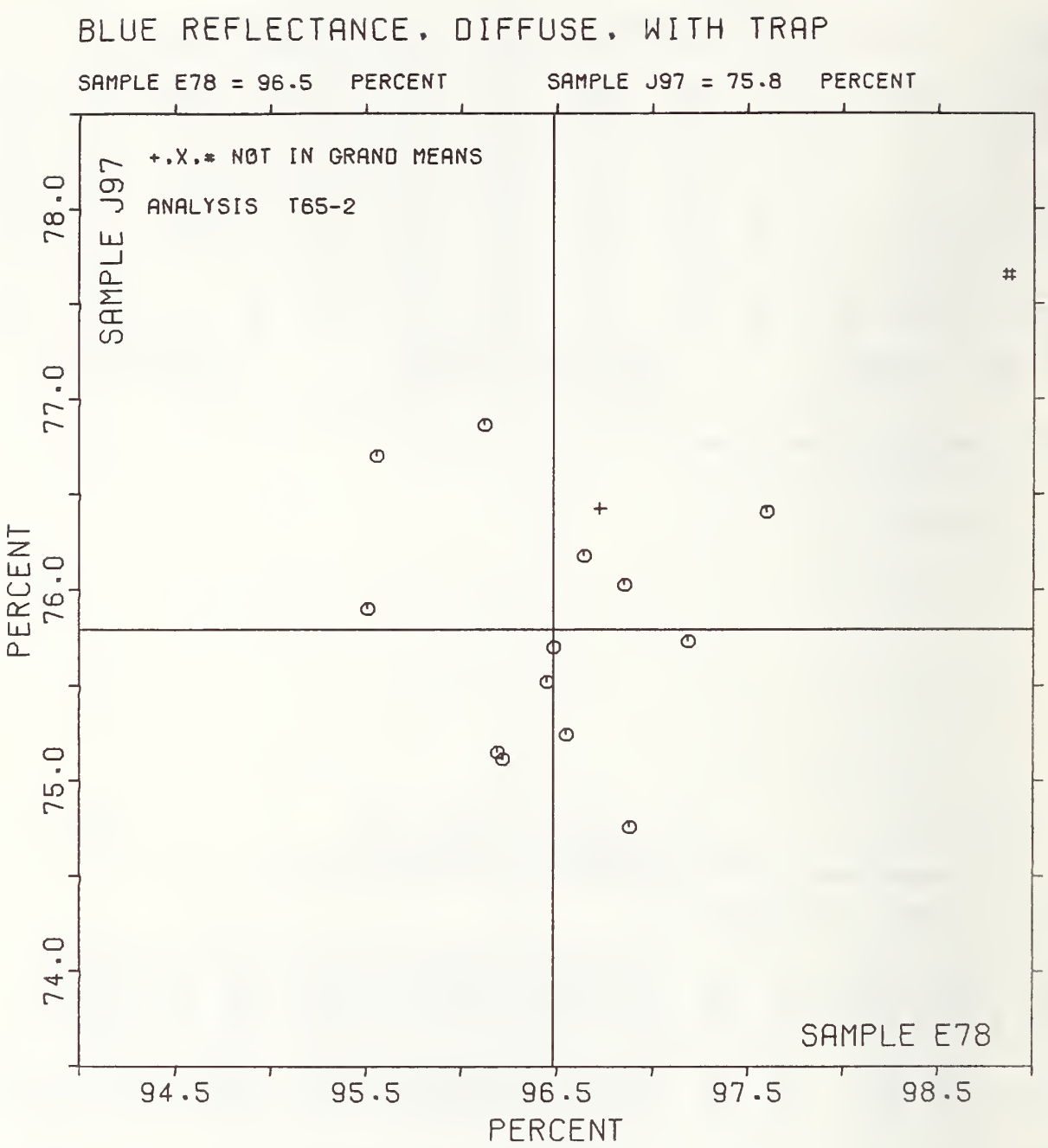
The following laboratories were omitted from the grand means because of extreme test results: 573.

ANALYSIS T65-2 TABLE 2

DIFFUSE BLUE REFLECTANCE IN PERCENT (GLOSS TRAP)

TAPPI SUGGESTED METHOD T525 SU-72, BRIGHTNESS OF PULP (DIFFUSE ILLUMINATION AND 0 DEG. OBSERVATION)

LAB		MEANS		COORDINATES		AVG		
CODE	F	E78	J97	MAJOR	MINOR	R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L598	@	95.51	75.90	-.58	-.79	.92	65K	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAP, MG@ (ZEISS) BASE
L210K	@	95.56	76.70	-1.25	-.35	2.14	65K	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAP, MG@ (ZEISS) BASE
L121	@	96.12	76.86	-1.11	.22	.52	65K	DIFFUSE REFLECTANCE, ELREPH@, GL.TRAF, MG@ (ZEISS) BASE
L280	@	96.19	75.15	.41	-.57	2.32	65Q	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAF, ZEISS ABS@LUTE BASE
L446	@	96.22	75.11	.46	-.56	.55	65F	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAF, NRC-FTB ABS@LUTE BASE
L182	@	96.45	75.52	.22	-.16	.84	65F	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAF, NRC-FTB ABS@LUTE BASE
L636	@	96.48	75.70	.08	-.04	.81	65K	DIFFUSE REFLECTANCE, ELREFE@, GL.TRAP, MG@ (ZEISS) BASE
L242	@	96.55	75.24	.51	-.21	.92	65F	DIFFUSE REFLECTANCE, ELREPB@, GL.TRAP, NRC-PTB ABS@LUTE BASE
L136	@	96.64	76.18	-.26	.33	.76	65F	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAP, NRC-FTB ABS@LUTE BASE
L289	*	96.72	76.42	-.43	.53	.88	65@	DIFFUSE REFLECTANCE, ELREFH@, GL.TRAF, SPECIFIC CALIBRATION
L250T	@	96.85	76.03	-.02	.44	.95	65F	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAF, NRC-FTB ABS@LUTE BASE
L150	@	96.88	74.76	1.10	-.16	.75	65Q	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAF, ZEISS ABS@LUTE BASE
L236	@	97.19	75.73	.40	.59	.57	65F	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAP, NRC-FTB ABS@LUTE BASE
L325	@	97.60	76.41	.02	1.28	.95	65F	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAF, NRC-PTB ABS@LUTE BASE
L573	#	98.84	77.61	-.41	2.95	.61	65F	DIFFUSE REFLECTANCE, ELREFB@, GL.TRAP, NRC-FTB ABS@LUTE BASE
GMEANS:		96.48	75.79			1.00		
		95% ELLIPSE:		1.95	1.66	WITH GAMMA =-60 DEGREES		


BLUE REFLECTANCE, DIFFUSE, WITH TRAP
SAMPLE E78 = 96.5 PERCENT
SAMPLE J97 = 75.8 PERCENT
+.X.* NOT IN GRAND MEANS
ANALYSIS T65-2
SAMPLE J97
PERCENT
78.0
77.0
76.0
75.0
74.0
SAMPLE E78
94.5
95.5
96.5
97.5
98.5
PERCENT

ANALYSIS T65-3 TABLE 1

DIFFUSE BLUE REFLECTANCE IN PERCENT (NO GLOSS TRAP)

TAPPI SUGGESTED METHOD T525 SU-72, BRIGHTNESS OF PULP (DIFFUSE ILLUMINATION AND 0 DEG. OBSERVATION)

LAB CODE	SAMPLE E78 MEAN	PRINTING 116 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J97 MEAN	PRINTING 89 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	VAR	P	LAB
L115	93.53	-1.44	-1.07	.15	1.10	75.16	-1.33	-1.71	.20	1.82	65E	O	L115
L152	94.50	-.47	-.35	.19	1.42	76.41	-.09	-.11	.09	.82	65E	O	L152
L161	94.88	-.09	-.07	.04	.29	76.97	.48	.62	.07	.58	65E	O	L161
L173A	95.99	1.02	.76	.16	1.19	77.53	1.04	1.33	.14	1.26	65E	O	L173A
L194	93.22	-1.75	-1.30	.11	.80	76.66	.16	.21	.10	.89	65E	O	L194
L238A	94.53	-.44	-.33	.06	.48	76.87	.38	.48	.05	.48	65E	O	L238A
L241	95.29	.32	.24	.07	.53	74.68	-1.82	-2.34	.11	.96	65E	O	L241
L244	95.49	.52	.39	.11	.87	76.81	.31	.40	.09	.77	65D	O	L244
L251	95.45	.48	.36	.09	.69	76.66	.16	.21	.11	1.01	65E	O	L251
L255	97.06	2.09	1.56	.11	.82	77.37	.87	1.13	.11	.95	65D	O	L255
L305	93.62	-1.35	-1.01	.54	4.04	75.86	-.63	-.81	.13	1.20	65D	O	L305
L309	95.95	.98	.73	.17	1.31	76.92	.43	.55	.10	.90	65J	O	L309
L313	96.46	1.49	1.11	.05	.40	75.80	-.70	-.89	.17	1.50	65E	O	L313
L360	95.31	.34	.26	.09	.70	76.59	.10	.13	.13	1.15	65E	O	L360
L384	96.24	1.27	.94	.05	.39	76.37	-.12	-.15	.13	1.15	65S	O	L384
L484	92.01	-2.96	-2.20	.13	.96	77.22	.73	.94	.06	.56	65E	O	L484

GR. MEAN = 94.97 PERCENT GRAND MEAN = 76.49 PERCENT TEST DETERMINATIONS = 8

SD MEANS = 1.34 PERCENT SD OF MEANS = .78 PERCENT 16 LABS IN GRAND MEANS

AVERAGE SDR = .13 PERCENT AVERAGE SDR = .11 PERCENT

TOTAL NUMBER OF LABORATORIES REPORTING = 16

Best values: E78 95.2 ± 2.0 percent
J97 76.5 ± 1.3 percent

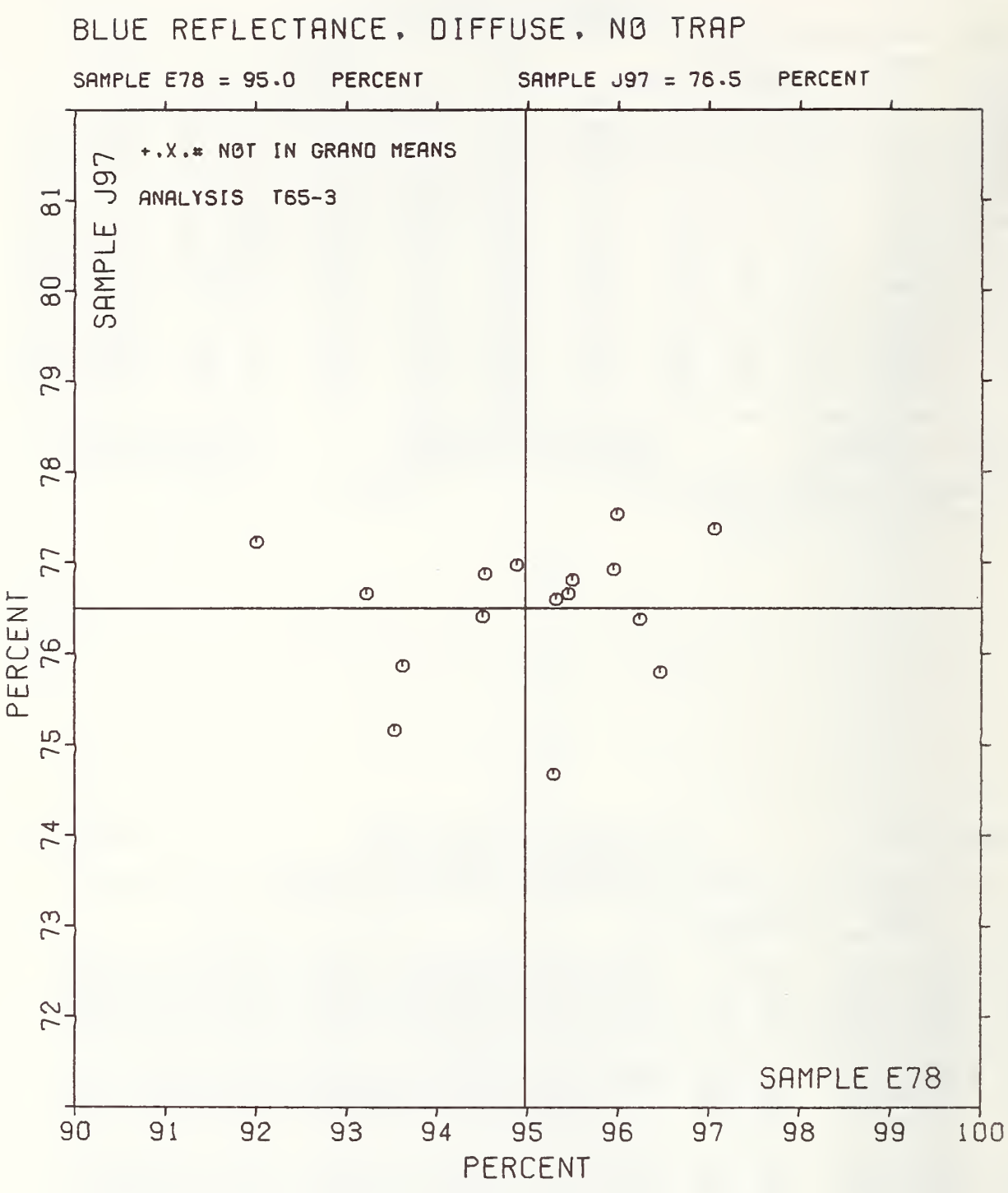
REPORT NO. 56G TAPPI COLLABORATIVE REFERENCE PROGRAM NOVEMBER 1978

ANALYSIS T65-3 TABLE 2

DIFFUSE BLUE REFLECTANCE IN PERCENT (NO GLOSS TRAP)

TAPPI SUGGESTED METHOD T525 SU-72, BRIGHTNESS OF PULP (DIFFUSE ILLUMINATION AND 0 DEG. OBSERVATION)

LAB CODE	P	MEANS E78	J97	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L484	O	92.01	77.22	-2.86	1.04	.76	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L194	O	93.22	76.66	-1.72	.35	.85	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L115	O	93.53	75.16	-1.57	-1.17	1.46	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L305	O	93.62	75.86	-1.41	-.48	2.62	65D	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, NBC-PTB ABSOLUTE
L152	O	94.50	76.41	-.47	-.03	1.12	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L238A	O	94.53	76.87	-.40	.42	.48	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L161	O	94.88	76.97	-.04	.49	.44	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L241	O	95.29	74.68	.12	-1.84	.75	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L360	O	95.31	76.59	.35	.06	.92	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L251	O	95.45	76.66	.49	.11	.85	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L244	O	95.49	76.81	.55	.26	.82	65D	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, NBC-PTB ABSOLUTE
L309	O	95.95	76.92	1.02	.32	1.11	65J	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, NBS ABSOLUTE
L173A	O	95.99	77.53	1.12	.92	1.23	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L384	O	96.24	76.37	1.25	-.25	.77	65S	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, ABSOLUTE-UNKNOWN BASE
L313	O	96.46	75.80	1.41	-.85	.95	65E	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, MGO (ZEISS) BASE
L255	O	97.06	77.37	2.17	.65	.89	65D	DIFFUSE REFLECTANCE, ELREPHO, NO TRAP, NBC-PTB ABSOLUTE
GMEANS:		94.97	76.49			1.00		
95% ELLIPSE:				3.82	2.18	WITB GAMMA = 6 DEGREES		


BLUE REFLECTANCE, DIFFUSE, NØ TRAP
SAMPLE E78 = 95.0 PERCENT
SAMPLE J97 = 76.5 PERCENT
+.X.* NØT IN GRAND MEANS
ANALYSIS T65-3
SAMPLE J97
PERCENT
81
80
79
78
77
76
75
74
73
72
SAMPLE E78
90
91
92
93
94
95
96
97
98
99
100
PERCENT

ANALYSIS T75-1 TABLE 1

SPECULAR GLOSS AT 75 DEGREES, IN GLOSS UNITS

TAPPI STANDARD T480 OS-78, SPECULAR GLOSS OF PAPER AND PAPERBOARD AT 75 DEGREES

LAB CODE	SAMPLE E59 CAST COATED 211 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE J24 PRINTING 116 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L108	85.1	.6	.62	1.2	1.16	67.2	.8	.49	.6	.63	75H	O	L108
L121	83.8	-.8	-.85	.8	.73	64.4	-2.0	-1.17	1.4	1.35	75H	O	L121
L122	82.9	-1.7	-1.86	1.3	1.24	66.7	.3	.19	1.3	1.24	75H	O	L122
L128	85.8	1.2	1.39	1.0	.97	63.3	-3.0	-1.82	.9	.94	75G	*	L128
L136	85.2	.6	.70	1.0	.90	70.2	3.8	2.29	.9	.85	75G	O	L136
L149	80.2	-4.4	-4.90	1.1	1.07	56.1	-10.2	-6.13	2.0	1.94	75G	#	L149
L153	85.1	.6	.66	.9	.89	68.5	2.2	1.30	.9	.90	75G	O	L153
L162	85.7	1.1	1.26	1.3	1.25	70.7	4.4	2.61	.6	.56	75G	*	L162
L173A	86.3	1.7	1.95	1.1	1.00	65.5	-.8	-.50	1.0	.96	75G	O	L173A
L182	85.5	1.0	1.07	.9	.84	67.4	1.1	.66	.5	.52	75H	O	L182
L189	84.7	.2	.18	1.0	.90	60.4	-5.9	-3.52	1.3	1.31	75P	X	L189
L190C	83.9	-.7	-.75	1.2	1.13	64.6	-1.7	-1.04	1.4	1.41	75G	O	L190C
L190R	83.5	-1.0	-1.14	.8	.79	66.5	.2	.12	.9	.86	75G	O	L190R
L206	84.1	-.4	-.47	1.0	.98	66.8	.5	.28	.9	.84	75H	O	L206
L210	85.9	1.3	1.51	1.8	1.74	69.1	2.8	1.66	1.1	1.08	75H	O	L210
L211	83.8	-.8	-.85	1.3	1.23	66.1	-.2	-.12	1.0	.97	75H	O	L211
L212	89.7	5.1	5.77	1.5	1.41	67.9	1.6	.94	3.5	3.47	75P	X	L212
L213	84.6	.0	.04	1.3	1.27	67.9	1.6	.93	1.1	1.11	75H	O	L213
L223	85.0	.4	.49	1.2	1.14	66.3	.0	.01	1.0	.95	75H	O	L223
L224	83.9	-.7	-.79	.8	.79	64.5	-1.8	-1.10	.8	.81	75H	O	L224
L230	84.1	-.5	-.52	1.1	1.04	65.1	-1.2	-.74	.6	.56	75H	O	L230
L251	84.5	-.0	-.02	1.1	1.05	67.0	.7	.43	1.3	1.26	75G	O	L251
L255	84.9	.3	.38	.6	.54	67.3	1.0	.58	.9	.94	75G	O	L255
L256	84.1	-.5	-.55	.9	.84	66.7	.4	.24	1.1	1.10	75H	O	L256
L262	85.2	.6	.71	.6	.55	68.0	1.7	1.00	.7	.66	75K	O	L262
L274	85.2	.7	.77	.6	.60	64.9	-1.4	-.86	1.0	.98	75P	O	L274
L277A	84.5	-.1	-.06	1.2	1.14	66.1	-.2	-.13	.7	.68	75H	O	L277A
L277B	84.8	.2	.23	1.3	1.25	65.9	-.4	-.25	1.1	1.07	75H	O	L277B
L278	84.3	-.2	-.24	1.2	1.11	67.8	1.5	.91	1.0	.95	75G	O	L278
L279	83.1	-1.5	-1.65	1.2	1.13	63.4	-2.9	-1.76	1.3	1.25	75G	O	L279
L291	83.4	-1.1	-1.29	1.2	1.17	62.9	-3.4	-2.06	.9	.85	75H	O	L291
L301	84.2	-.4	-.42	.8	.73	65.9	-.4	-.23	1.1	1.11	75H	O	L301
L315	84.9	.3	.38	1.3	1.21	66.0	-.3	-.20	1.2	1.14	75G	O	L315
L317	85.0	.4	.49	1.3	1.26	65.4	-.9	-.56	1.0	.95	75H	O	L317
L323	83.8	-.8	-.89	1.2	1.16	65.8	-.5	-.30	1.2	1.17	75H	O	L323
L328	95.2	10.7	11.98	1.7	1.56	70.8	4.4	2.66	2.8	2.81	75H	#	L328
L339	85.2	.7	.77	2.7	2.59	58.4	-7.9	-4.75	3.0	2.95	75P	#	L339
L372	90.7	6.1	6.89	1.5	1.41	70.0	3.7	2.22	.7	.68	75B	X	L372
L388	84.3	-.2	-.24	.8	.77	59.6	-6.7	-4.00	1.0	.96	75P	#	L388
L396	84.3	-.2	-.24	.7	.70	66.1	-.2	-.14	1.5	1.50	75G	O	L396
L456	84.1	-.5	-.52	1.1	1.03	65.9	-.5	-.28	.7	.66	75H	O	L456
L483	84.3	-.2	-.28	1.2	1.15	65.4	-.9	-.54	1.1	1.07	75H	O	L483
L573	82.2	-2.4	-2.66	1.1	1.07	65.0	-1.3	-.80	1.2	1.23	75G	*	L573
L574	80.2	-4.3	-4.86	1.4	1.31	63.0	-3.3	-2.00	.4	.39	75G	X	L574
L583	85.7	1.1	1.26	.9	.86	65.6	-.7	-.41	.7	.64	75H	O	L583
L587	85.6	1.0	1.16	1.0	.91	68.1	1.8	1.06	1.0	.98	75H	O	L587
L592	85.1	.6	.66	.8	.72	67.1	.7	.44	1.1	1.09	75H	O	L592
L598	83.3	-1.3	-1.41	.9	.82	64.2	-2.2	-1.30	1.0	1.02	75H	O	L598
L643	84.6	.0	.05	.9	.90	66.9	.5	.32	1.0	.98	75H	O	L643
L668	85.6	1.0	1.15	1.3	1.23	66.3	-.1	-.04	1.4	1.39	75G	O	L668
L670	85.0	.5	.52	1.1	1.07	67.7	1.4	.85	1.5	1.50	75H	O	L670
GR. MEAN =	84.6 GLOSS UNITS			GRAND MEAN =		66.3 GLOSS UNITS			TEST DETERMINATIONS = 10				
SD MEANS =	.9 GLOSS UNITS			SD OF MEANS =		1.7 GLOSS UNITS			43 LABS IN GRAND MEANS				
	AVERAGE SDR = 1.1 GLOSS UNITS					AVERAGE SDR = 1.0 GLOSS UNITS							
L250	87.3	2.7	3.07	.9	.89	58.4	-7.9	-4.75	2.1	2.04	75Q	+	L250
L288	83.0	-1.5	-1.70	1.4	1.33	65.7	-.6	-.39	1.3	1.25	75I	+	L288
L321	84.3	-.3	-.30	.4	.40	64.9	-1.4	-.86	.3	.31	75F	+	L321

TOTAL NUMBER OF LABORATORIES REPORTING = 54

Best values: E59 85 ± 2 gloss units
J24 66 ± 3 gloss units

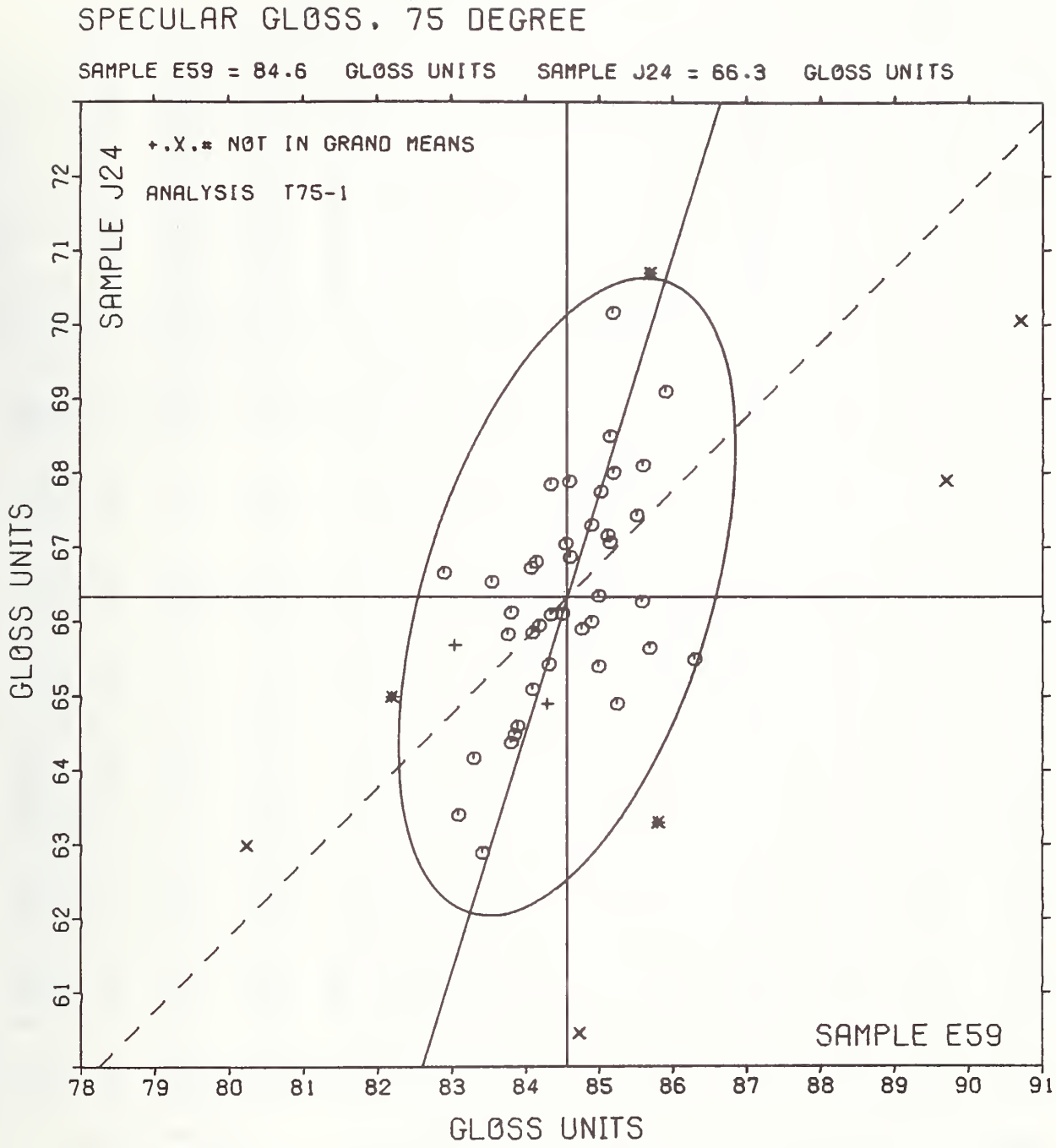
The following laboratories were omitted from the grand means because of extreme test results: 149, 328, 339, 388.

ANALYSIS T75-1 TABLE 2

SPECULAR GLOSS AT 75 DEGREES, IN GLOSS UNITS

TAPPI STANDARD T480 OS-78, SPECULAR GLOSS OF PAPER AND PAPERBOARD AT 75 DEGREES

LAB CODE	F	MEANS B59	MEANS J24	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L149	#	80.2	56.1	-11.1	1.1	1.51	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L574	X	80.2	63.0	-4.5	3.1	.85	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L573	*	82.2	65.0	-2.0	1.9	1.15	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L122	O	82.9	66.7	-.2	1.7	1.24	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L288	•	83.0	65.7	-1.1	1.3	1.29	75I	SPECULAR GLOSS (75 DEGREE), HUNTER, 20 C, 65% RH
L279	O	83.1	63.4	-3.2	.5	1.19	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L598	O	83.3	64.2	-2.4	.6	.92	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L291	O	83.4	62.9	-3.6	.1	1.01	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L190R	O	83.5	66.5	-.1	1.0	.83	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L323	O	83.8	65.8	-.7	.6	1.17	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L121	O	83.8	64.4	-2.1	.1	1.04	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L211	O	83.8	66.1	-.4	.7	1.10	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L224	O	83.9	64.5	-2.0	.1	.80	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L190C	O	83.9	64.6	-1.9	.1	1.27	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L256	O	84.1	66.7	.2	.6	.97	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L456	O	84.1	65.9	-.6	.3	.85	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L230	O	84.1	65.1	-1.3	.1	.80	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L206	O	84.1	66.8	.3	.5	.91	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L301	O	84.2	65.9	-.5	.2	.92	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L321	•	84.3	64.9	-1.4	-.2	.35	75F	SPECULAR GLOSS (75 DEGREE), ZEISS ELREPHO, 20C, 65%RH
L483	O	84.3	65.4	-.9	-.0	1.11	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L396	O	84.3	65.1	-.3	.1	1.10	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L388	#	84.3	59.6	-6.4	-1.8	.87	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L278	O	84.3	67.8	1.4	.7	1.03	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L277A	O	84.5	66.1	-.2	-.0	.91	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L251	O	84.5	67.0	.7	.2	1.16	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L213	O	84.6	67.9	1.5	.4	1.19	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L643	O	84.6	66.9	.5	.1	.94	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L189	X	84.7	60.4	-5.6	-1.9	1.10	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L277B	O	84.8	65.9	-.3	-.3	1.16	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L255	O	84.9	67.3	1.0	-.0	.74	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L315	O	84.9	66.0	-.2	-.4	1.18	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L223	O	85.0	66.3	.1	-.4	1.05	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L317	O	85.0	65.4	-.8	-.7	1.11	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L670	O	85.0	67.7	1.5	-.0	1.28	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L108	O	85.1	67.2	1.0	-.3	.90	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L153	O	85.1	68.5	2.2	.1	.90	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L592	O	85.1	67.1	.9	-.3	.91	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L136	O	85.2	70.2	3.8	.5	.88	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L262	O	85.2	68.0	1.8	-.1	.61	75K	SPECULAR GLOSS (75 DEGREE), GAERTNER (K-C TYPE)
L339	#	85.2	58.4	-7.4	-3.0	2.77	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L274	O	85.2	64.9	-1.2	-1.1	.79	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L182	O	85.5	67.4	1.3	-.6	.68	75E	SPECULAR GLOSS (75 DEGREE), HUNTER
L668	O	85.6	66.3	.2	-1.0	1.31	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L587	O	85.6	68.1	2.0	-.5	.95	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L162	*	85.7	70.7	4.5	.2	.90	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L583	O	85.7	65.6	-.3	-1.3	.75	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L128	*	85.8	63.3	-2.5	-2.1	.96	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L210	O	85.9	69.1	3.0	-.5	1.41	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L173A	O	86.3	65.5	-.3	-1.9	.98	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L250	•	87.3	58.4	-6.8	-5.0	1.47	75Q	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT, 20 C, 65% RH
L212	X	89.7	67.9	3.0	-4.4	2.44	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L372	X	90.7	70.0	5.4	-4.8	1.04	75H	SPECULAR GLOSS (75 DEGREE), BAUSCH + LOMB
L328	#	95.2	70.8	7.4	-8.9	2.18	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
GMEANS:		84.6	66.3			1.00		
		95% ELLIPSE:		4.5	2.0	WITH GAMMA = 72 DEGREES		


SPECULAR GLOSS, 75 DEGREE
SAMPLE E59 = 84.6 GLOSS UNITS
SAMPLE J24 = 66.3 GLOSS UNITS
+.X.* NOT IN GRAND MEANS
ANALYSIS T75-1
SAMPLE J24
GLOSS UNITS
61
62
63
64
65
66
67
68
69
70
71
72
78
79
80
81
82
83
84
85
86
87
88
89
90
91
SAMPLE E59
GLOSS UNITS

ANALYSIS T90-1 TABLE 1
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 OS-76

LAB CODE	SAMPLE J65 MEAN	PRINTING 93 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J81 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 10 VAR	F	LAB
L105	6.448	.096	.94	.110	1.11	2.754	.044	.51	.030	.71	90Q	G	L105
L122	6.240	-.112	-1.09	.107	1.08	2.590	-.120	-1.40	.057	1.36	90V	G	L122
L123P	6.445	.093	.91	.263	2.64	2.895	.185	2.15	.044	1.05	90F	G	L123F
L125	6.788	.436	4.26	.111	1.12	2.622	-.088	-1.03	.044	1.06	90T	#	L125
L128	6.308	-.044	-.43	.154	1.54	2.712	.002	.02	.023	.56	90T	G	L128
L141	6.223	-.129	-1.26	.082	.82	2.693	-.017	-.20	.052	1.24	90T	G	L141
L153	6.145	-.207	-2.02	.085	.86	2.785	.075	.87	.022	.53	90T	*	L153
L162	6.310	-.042	-.41	.120	1.20	2.680	-.030	-.35	.042	1.01	90D	G	L162
L166	6.450	.098	.96	.067	.67	2.760	.050	.58	.026	.63	90T	G	L166
L173B	6.460	.108	1.06	.052	.52	2.800	.090	1.04	.000	.00	90F	G	L173B
L182	6.332	-.020	-.20	.089	.89	2.663	-.047	-.55	.033	.80	90L	G	L182
L183	6.288	-.064	-.62	.065	.66	2.794	.084	.98	.028	.67	90T	G	L183
L190C	6.260	-.092	-.90	.097	.97	2.630	-.080	-.94	.082	1.97	90T	G	L190C
L203A	6.410	.058	.57	.152	1.53	2.690	-.020	-.24	.057	1.36	90T	G	L203A
L203C	6.220	-.132	-1.29	.127	1.28	2.655	-.055	-.65	.069	1.64	90T	G	L203C
L212	6.483	.131	1.28	.077	.77	2.730	.020	.23	.047	1.13	90T	G	L212
L213	6.480	.128	1.25	.092	.92	2.770	.060	.70	.048	1.16	90T	G	L213
L223	6.508	.156	1.52	.055	.55	2.786	.076	.88	.025	.60	90V	G	L223
L228	6.350	-.002	-.02	.118	1.18	2.740	.030	.35	.070	1.67	90T	G	L228
L238A	6.300	-.052	-.51	.038	.38	2.596	-.114	-1.33	.018	.44	90T	G	L238A
L241	6.310	-.042	-.41	.088	.88	2.845	.135	1.57	.064	1.54	90T	G	L241
L249	6.319	-.033	-.32	.053	.53	2.720	.010	.11	.029	.69	90T	G	L249
L260	6.389	.037	.36	.064	.64	2.676	-.034	-.40	.034	.82	90T	G	L260
L261	6.470	.118	1.15	.061	.61	2.789	.079	.92	.027	.65	90T	G	L261
L262	6.400	.048	.47	.033	.33	2.640	-.070	-.82	.046	1.10	90T	G	L262
L274	6.380	.028	.28	.042	.42	2.950	.240	2.79	.053	1.26	90D	*	L274
L285	6.260	-.092	-.90	.171	1.72	2.570	-.140	-1.64	.095	2.27	90T	G	L285
L291	6.495	.143	1.40	.098	.99	2.820	.110	1.28	.063	1.51	90T	G	L291
L305	6.270	-.082	-.80	.195	1.95	2.615	-.095	-1.11	.078	1.88	90T	G	L305
L309	6.250	-.102	-.99	.135	1.36	2.520	-.190	-2.22	.035	.84	90T	G	L309
L318	6.340	-.012	-.11	.107	1.08	2.620	-.090	-1.05	.054	1.29	90T	G	L318
L323	6.168	-.184	-1.79	.082	.82	2.548	-.162	-1.89	.044	1.05	90T	G	L323
L324	6.390	.038	.37	.088	.88	2.710	-.000	-.00	.039	.94	90T	G	L324
L326	6.455	.103	1.01	.069	.69	2.720	.010	.11	.026	.62	90T	G	L326
L328	6.400	.048	.47	.105	1.06	2.740	.030	.35	.084	2.02	90T	G	L328
L331	6.492	.140	1.37	.220	2.21	2.800	.090	1.04	.027	.64	90T	G	L331
L339	6.337	-.015	-.14	.064	.65	2.687	-.023	-.27	.015	.36	90T	G	L339
L352	6.446	.094	.92	.081	.82	2.729	.019	.22	.038	.90	90Q	G	L352
L356	6.311	-.041	-.40	.104	1.04	2.696	-.014	-.17	.020	.48	90T	G	L356
L358	6.310	-.042	-.41	.115	1.15	2.714	.004	.04	.031	.73	90T	G	L358
L376	6.540	.188	1.84	.084	.85	2.740	.030	.35	.052	1.24	90T	G	L376
L380	6.385	.033	.32	.088	.89	2.800	.090	1.04	.000	.00	90T	G	L380
L382	6.515	.163	1.59	.053	.53	2.720	.010	.11	.026	.62	90T	G	L382
L390	6.328	-.024	-.23	.108	1.08	2.740	.030	.35	.041	.98	90T	G	L390
L556	6.306	-.046	-.45	.170	1.71	2.610	-.100	-1.17	.029	.70	90T	G	L556
L557	6.270	-.082	-.80	.125	1.26	2.630	-.080	-.94	.082	1.97	90T	G	L557
L560	5.911	-.441	-4.30	.054	.54	2.294	-.416	-4.85	.050	1.21	90T	#	L560
L567	6.200	-.152	-1.48	.141	1.42	2.680	-.030	-.35	.042	1.01	90V	G	L567
L574	6.216	-.136	-1.32	.051	.51	2.729	.019	.22	.029	.69	90V	G	L574
L581	6.475	.123	1.20	.136	1.36	2.800	.090	1.04	.041	.98	90T	G	L581
L585	6.440	.088	.86	.052	.52	2.700	-.010	-.12	.000	.00	90T	G	L585
L587	6.310	-.042	-.41	.057	.57	2.710	-.000	-.00	.057	1.36	90T	G	L587
L626	6.160	-.192	-1.87	.069	.69	2.578	-.132	-1.54	.048	1.14	90T	G	L626
L679	6.295	-.057	-.55	.050	.50	2.670	-.040	-.47	.042	1.01	90T	G	L679

GR. MEAN = 6.352 MILS — GRAND MEAN = 2.710 MILS — TEST DETERMINATIONS = 10
SD MEANS = .102 MILS — SD OF MEANS = .086 MILS — 52 LABS IN GRAND MEANS
AVERAGE SDR = .100 MILS — AVERAGE SDR = .042 MILS
GR. MEAN = 161.33 MICROMETER — GRAND MEAN = 68.84 MICROMETER

ANALYSIS T90-1 TABLE 1
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 OS-76

LAB CODE	SAMPLE J65 MEAN	PRINTING 93 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J81 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.F 10 VAR	F	LAB
L185	6.220	-.132	-1.29	.063	.63	2.640	-.070	-.82	.052	1.24	90B	*	L185
L203B	6.270	-.082	-.80	.170	1.71	2.530	-.180	-2.10	.095	2.27	90C	*	L203B
L242G	6.328	-.024	-.24	.028	.28	2.671	-.039	-.46	.081	1.93	90G	*	L242G
L242P	6.300	-.052	-.50	.086	.86	2.715	.004	.05	.022	.54	90P	*	L242P
L251	6.233	-.119	-1.16	.061	.61	2.703	-.008	-.09	.020	.49	90W	*	L251
L274C	6.350	-.002	-.02	.053	.53	2.970	.260	3.03	.048	1.16	90C	*	L274C
L344	6.210	-.142	-1.38	.074	.74	2.640	-.070	-.82	.052	1.24	90U	*	L344
L396M	60.600	54.248	529.30	1.430	14.35	26.600	23.890	278.54	.516	12.36	90S	*	L396M
L484	6.142	-.210	-2.05	.149	1.50	2.736	.026	.30	.221	5.28	90E	*	L484
L563	.001	-6.351	-61.97	.000	.00	.000	-2.710	-31.60	.000	.00	90U	*	L563
L576	6.013	-.339	-3.31	.041	.41	2.910	.200	2.33	.031	.75	90C	*	L576
L616	150.700	144.348	1408.40	1.252	12.56	65.600	62.890	733.25	.516	12.36	90C	*	L616

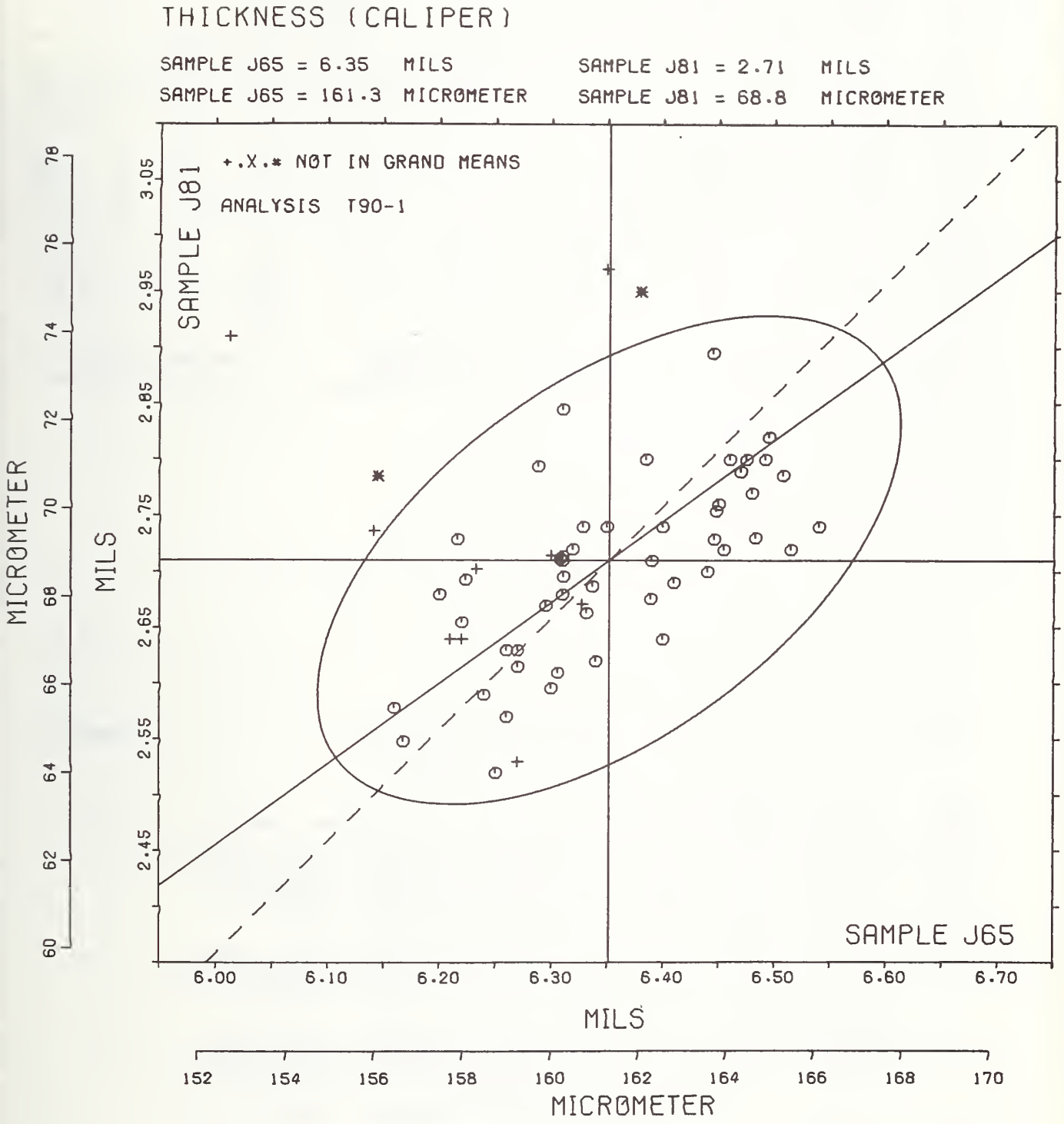
TOTAL NUMBER OF LABORATORIES REPORTING * 66

Best values: J65 6.36 ± 0.15 mils
J81 2.70 ± 0.14 mils

The following laboratories were omitted from the grand means because of extreme test results: 125, 560.

ANALYSIS T90-1 TABLE 2
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 OS-76

LAB CODE	P	MEANS J65	MEANS J81	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L563	*	.001	.000	-6.733	1.530	.00	90U	THICKNESS (CALIPER), TMI, HAND DRIVEN
L560	#	5.911	2.294	-.601	-.079	.87	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L576	*	6.013	2.910	-.157	.360	.58	90C	THICKNESS (CALIPER), CADY, HAND DRIVEN
L484	*	6.142	2.736	-.155	.144	3.39	90E	THICKNESS (CALIPER), SCHOPPER, HAND DRIVEN
L153	*	6.145	2.785	-.124	.182	.69	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L626	O	6.160	2.578	-.233	.005	.91	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L323	O	6.168	2.548	-.244	-.024	.93	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L567	O	6.200	2.680	-.141	.064	1.21	90V	THICKNESS (CALIPER), TMI, MOTOR DRIVEN,DIGITIZED
L344	*	6.210	2.640	-.156	.026	.99	90U	THICKNESS (CALIPER), TMI, HAND DRIVEN
L574	O	6.216	2.729	-.099	.095	.60	90V	THICKNESS (CALIPER), TMI, MOTOR DRIVEN,DIGITIZED
L203C	O	6.220	2.655	-.139	.032	1.46	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L185	*	6.220	2.640	-.148	.020	.94	90E	THICKNESS (CALIPER), AMTEGR, HAND DRIVEN
L141	O	6.223	2.693	-.114	.061	1.03	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L251	*	6.233	2.703	-.101	.064	.55	90W	THICKNESS (CALIPER), L + W, MOTOR DRIVEN, 20 C, 65% RE
L122	O	6.240	2.590	-.161	-.032	1.22	90V	THICKNESS (CALIPER), TMI, MOTOR DRIVEN,DIGITIZED
L309	O	6.250	2.520	-.194	-.094	1.10	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L190C	O	6.260	2.630	-.121	-.011	1.47	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L285	O	6.260	2.570	-.157	-.060	1.99	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L203E	*	6.270	2.530	-.172	-.098	1.99	90C	THICKNESS (CALIPER), CADY, HAND DRIVEN
L557	O	6.270	2.630	-.113	-.017	1.61	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L305	O	6.270	2.615	-.122	-.029	1.91	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L183	O	6.288	2.794	-.003	.105	.66	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L679	O	6.295	2.670	-.070	.001	.75	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L238A	O	6.300	2.596	-.109	-.062	.41	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L242P	*	6.300	2.715	-.039	.034	.70	90P	THICKNESS (CALIPER), MESSMER, MOTOR DRIVEN, ISO R534
L556	O	6.306	2.610	-.096	-.054	1.21	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L128	O	6.308	2.712	-.034	.027	1.05	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L587	O	6.310	2.710	-.034	.024	.96	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L162	O	6.310	2.680	-.052	-.000	1.11	90D	THICKNESS (CALIPER), CADY, MOTOR DRIVEN
L241	O	6.310	2.845	.045	.134	1.21	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L358	O	6.310	2.714	-.032	.027	.94	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L356	O	6.311	2.696	-.041	.012	.76	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L249	O	6.319	2.720	-.021	.027	.61	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L242O	*	6.328	2.671	-.042	-.017	1.10	90O	THICKNESS (CALIPER), MESSMER, MOTOR DRIVEN, BS3983
L390	O	6.328	2.740	-.002	.038	1.03	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L182	O	6.332	2.663	-.044	-.026	.84	90L	THICKNESS (CALIPER), L + W, MOTOR DRIVEN
L339	O	6.337	2.687	-.026	-.010	.50	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L318	O	6.340	2.620	-.063	-.066	1.18	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L228	O	6.350	2.740	.016	.025	1.43	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L274C	*	6.350	2.970	.151	.211	.84	90C	THICKNESS (CALIPER), CADY, HAND DRIVEN
L274	*	6.380	2.950	.163	.178	.84	90D	THICKNESS (CALIPER), CADY, MOTOR DRIVEN
L380	O	6.385	2.800	.079	.053	.44	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L260	O	6.389	2.676	.010	-.050	.73	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L324	O	6.390	2.710	.031	-.023	.91	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L262	O	6.400	2.640	-.002	-.085	.72	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L328	O	6.400	2.740	.056	-.004	1.54	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L203A	O	6.410	2.690	.035	-.051	1.44	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L585	O	6.440	2.700	.065	-.060	.26	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L123P	O	6.445	2.895	.184	.095	1.84	90F	THICKNESS (CALIPER), PEDERAL, MOTOR DRIVEN
L352	O	6.446	2.729	.087	-.040	.86	90Q	THICKNESS (CALIPER), EMVECO, MOTOR DRIVEN
L105	O	6.448	2.754	.104	-.021	.91	90Q	THICKNESS (CALIPER), EMVECO, MOTOR DRIVEN
L166	O	6.450	2.760	.109	-.017	.65	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L326	O	6.455	2.720	.089	-.053	.65	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L173E	O	6.460	2.800	.140	.009	.26	90P	THICKNESS (CALIPER), PEDERAL, MOTOR DRIVEN
L261	O	6.470	2.789	.142	-.006	.63	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L581	O	6.475	2.800	.152	.000	1.17	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L213	O	6.480	2.770	.139	-.027	1.04	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L212	O	6.483	2.730	.118	-.061	.95	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L331	O	6.492	2.800	.166	-.010	1.42	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L291	O	6.495	2.820	.180	.005	1.25	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L223	O	6.508	2.786	.171	-.030	.58	90V	THICKNESS (CALIPER), TMI, MOTOR DRIVEN,DIGITIZED
L382	O	6.515	2.720	.138	-.088	.57	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L376	O	6.540	2.740	.170	-.086	1.04	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L125	#	6.788	2.622	.301	-.327	1.09	90T	THICKNESS (CALIPER), TMI, MOTOR DRIVEN
L396M	*	60.600	26.600	57.949	-12.472	13.35	90S	THICKNESS (CALIPER), SCHOPPER, HAND DRIVEN
L616	*	150.700	65.600	153.797	-33.736	12.46	90C	THICKNESS (CALIPER), CADY, HAND DRIVEN
GMEANS:		6.352	2.710			1.00		
		95% ELLIPSE:		.301	.159	WITH GAMMA = 35 DEGREES		


THICKNESS (CALIPER)
SAMPLE J65 = 6.35 MILS
SAMPLE J65 = 161.3 MICROMETER
SAMPLE J81 = 2.71 MILS
SAMPLE J81 = 68.8 MICROMETER
+.X.* NOT IN GRAND MEANS
ANALYSIS T90-1
SAMPLE J81
SAMPLE J65
MILS
MICROMETER
3.05
2.95
2.85
2.75
2.65
2.55
2.45
78
76
74
72
70
68
66
64
62
60
6.00
6.10
6.20
6.30
6.40
6.50
6.60
6.70
152
154
156
158
160
162
164
166
168
170

ANALYSIS T95-1 TABLE 1
GRAMMAGE (MASS PER UNIT AREA)
TAPPI STANDARD T410 OS-68

LAB CODE	SAMPLE D30 MEAN	PRINTING 92 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE D31 MEAN	COATED BOOK 74 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L121	92.60	-.26	-.65	.92	1.15	76.98	.71	1.35	.44	.61	95E	o	L121
L162	93.24	.37	.94	1.60	1.99	77.48	1.21	2.29	1.96	2.72	95K	o	L162
L213	92.67	-.20	-.50	.91	1.13	76.16	-.11	-.21	.61	.85	95F	o	L213
L249	92.90	.03	.09	.76	.95	75.55	-.72	-1.38	.37	.52	95I	o	L249
L274	93.20	.33	.84	.63	.79	76.50	.23	.43	.53	.73	95B	o	L274
L280	92.40	-.47	-1.17	1.04	1.29	76.13	-.14	-.27	.65	.90	95T	o	L280
L305	92.98	.11	.29	.39	.48	76.25	-.02	-.04	.58	.80	95T	o	L305
L339	93.49	.62	1.57	.34	.42	76.44	.17	.32	.14	.20	95T	o	L339
L342	93.16	.29	.73	.94	1.17	75.97	-.30	-.57	.87	1.21	95C	o	L342
L344	93.27	.40	1.02	.22	.28	76.54	.27	.51	.12	.16	95T	o	L344
L557	93.09	.23	.57	.55	.69	76.07	-.21	-.39	.65	.90	95C	o	L557
L559	90.08	-2.79	-7.01	.59	.73	74.04	-2.23	-4.25	.33	.46	95K	#	L559
L567	5.59	-87.27	-219.61	.05	.06	4.62	-71.66	-136.23	.04	.06	95E	#	L567
L574	92.48	-.39	-.97	.56	.70	76.37	.10	.18	.54	.75	95D	o	L574
L597	92.22	-.65	-1.62	1.58	1.97	75.92	-.35	-.67	1.96	2.72	95C	o	L597
L616	92.41	-.46	-1.15	.81	1.01	75.46	-.81	-1.55	.69	.95	95T	o	L616

GR. MEAN = 92.87 G/SQ.METER GRAND MEAN = 76.27 G/SQ.METER TEST DETERMINATIONS = 10
SD MEANS = .40 G/SQ.METER SD OF MEANS = .53 G/SQ.METER 14 LABS IN GRAND MEANS
AVERAGE SDR = .80 G/SQ.METER AVERAGE SDR = .72 G/SQ.METER
TOTAL NUMBER OF LABORATORIES REPORTING = 16

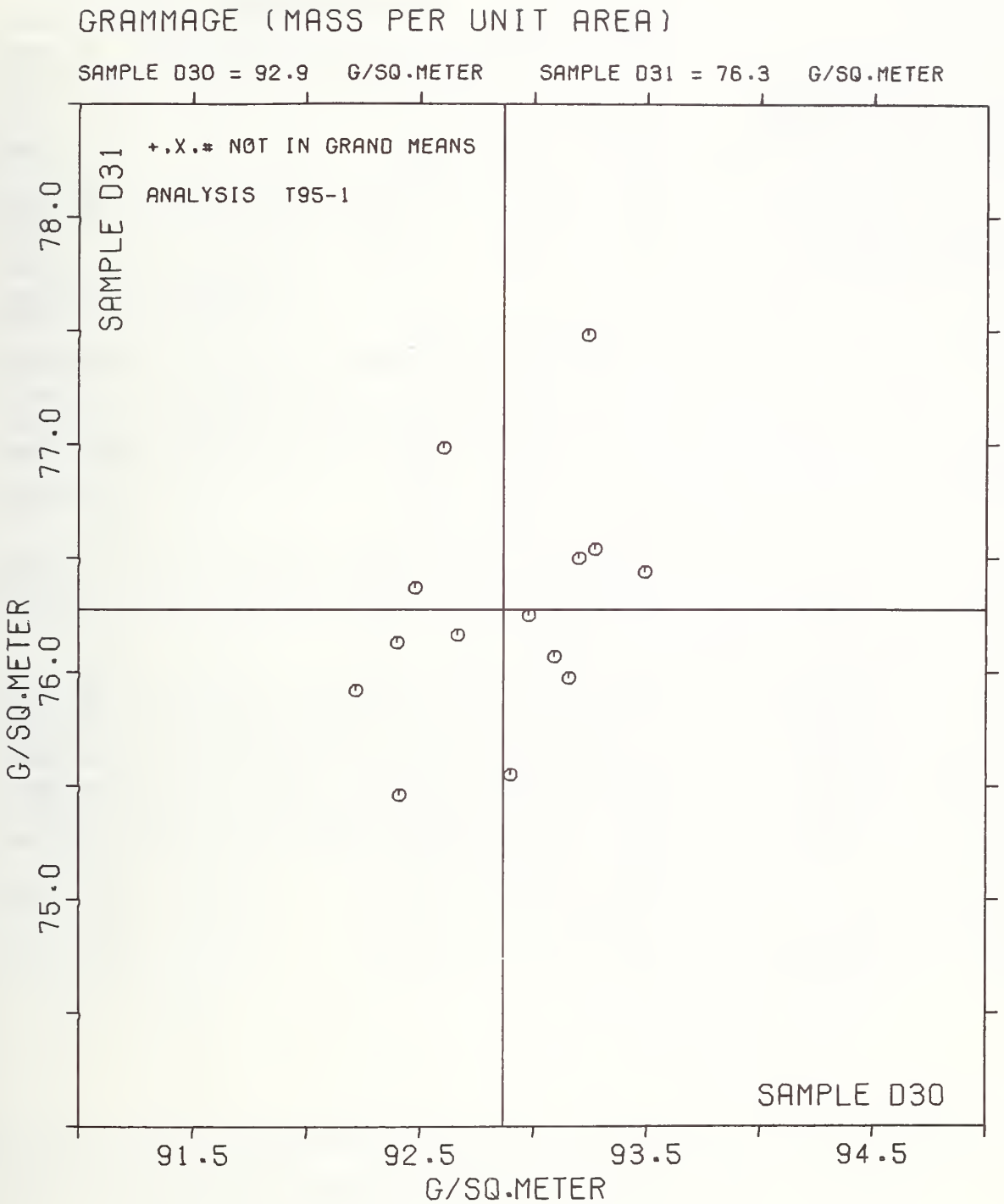
Best values: D30 92.9 ± 0.6 grams per square meter
D31 76.3 ± 0.9 grams per square meter

The following laboratories were omitted from the grand means because of extreme test results: 559.

Data from the following laboratories appear to be off by a multiplicative factor: 567.

ANALYSIS T95-1 TABLE 2
GRAMMAGE (MASS PER UNIT AREA)
TAPPI STANDARD T410 OS-68

LAB CODE	F	MEANS D30	D31	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L567	#	5.59	4.62	-103.27	45.69	.06	95B	BASIS WEIGHT (GRAMMAGE), GUILLOTINE TYPE CUTTER
L559	#	90.08	74.04	-3.25	1.48	.59	95K	BASIS WEIGHT (GRAMMAGE), WEIGHED AS RECEIVED
L597	o	92.22	75.92	-.61	.42	2.34	95C	BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L280	o	92.40	76.13	-.34	.35	1.09	95T	BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L616	o	92.41	75.46	-.93	.04	.98	95T	BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L574	o	92.48	76.37	-.09	.39	.72	95D	BASIS WEIGHT (GRAMMAGE), DIE CUT
L121	o	92.60	76.98	.52	.55	.88	95B	BASIS WEIGHT (GRAMMAGE), CONCORA CUTTER
L213	o	92.67	76.16	-.19	.13	.99	95F	BASIS WEIGHT (GRAMMAGE), FOUR-SQUARE CUTTER
L249	o	92.90	75.55	-.63	-.36	.73	95I	BASIS WEIGHT (GRAMMAGE), INGENTO PAPER CUTTER
L305	o	92.98	76.25	.03	-.11	.64	95T	BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L557	o	93.09	76.07	-.08	-.30	.79	95C	BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L342	o	93.16	75.97	-.14	-.40	1.19	95C	BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L274	o	93.20	76.50	.35	-.20	.76	95B	BASIS WEIGHT (GRAMMAGE), CONCORA CUTTER
L162	o	93.24	77.48	1.25	.21	2.35	95K	BASIS WEIGHT (GRAMMAGE), WEIGHED AS RECEIVED
L344	o	93.27	76.54	.42	-.24	.22	95T	BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L339	o	93.49	76.44	.43	-.48	.31	95T	BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
GMEANS:		92.87	76.27			1.00		
95% ELLIPSE:				1.63	.99	WITH GAMMA = 63 DEGREES		


GRAMMAGE (MASS PER UNIT AREA)
SAMPLE D30 = 92.9 G/SQ.METER
SAMPLE D31 = 76.3 G/SQ.METER
+,X,* NOT IN GRAND MEANS
ANALYSIS T95-1
SAMPLE D31
78.0
77.0
76.0
75.0
G/SQ.METER
SAMPLE D30
91.5
92.5
93.5
94.5
G/SQ.METER

SUMMARY TABLE

TEST METHOD	SAMPLE CODE	GRAND MEAN	SD OF MEAN	AVER SDR	REPL CRP	LABS INCL	LABS PARTIC	REPL TAPPI	REPEAT	REPROD
AIR RESISTANCE, GURLEY	J46	12.30	.71	.92	10	50	56	10	.80	1.97
T40-1 GURLEY UNITS	J48	30.94	1.58	1.74					1.52	4.37
AIR RESISTANCE, SEFFIELD	J46	222.3	12.7	12.2	10	35	40	10	10.7	35.3
T40-2 SEFF. UNITS	J48	104.5	5.8	4.6					4.0	16.1
AIR RESISTANCE, GURLEY FG FLOTATION	E82	1684.	244.	532.	10	12	14	10	466.	677.
T41-1 SEC/10 CC	B47	1549.	166.	336.					295.	461.
SMOOTHNESS, PARKER PRINTSURF	J49	6.12	.52	.09	10	9	9	10	.08	1.44
T44-1 MICRONS	J73	4.49	.41	.12					.11	1.13
SMOOTHNESS, SEFFIELD	J49	274.9	10.7	7.0	15	81	84	10	6.1	29.7
T45-1 SEFFP. UNITS	J73	87.0	7.5	5.2					4.5	21.0
SMOOTHNESS, BEKK	J49	9.94	.60	.56	15	8	13	10	.49	1.70
T45-2 BEKK SECONDS	J73	66.08	14.62	5.74					5.03	40.59
SMOOTHNESS, BENDTSEN	J49	465.8	19.0	33.4	10	8	8	10	29.3	52.7
T47-1 ML/MIN	J73	104.3	11.1	8.2					7.2	30.8
K & N INK ABSORPTION	B59	63.75	5.60	.44	4	9	11	4	.61	15.52
T56-1 K & N UNITS	B80	24.53	2.79	.56					.78	7.74
PH, COLD	J18	4.664	.081	.025	5	4	6	2	.050	.229
T57-1 PH UNITS	J62	5.535	.064	.041					.081	.187
PH, HOT	J18	4.321	.185	.027	5	4	4	2	.053	.513
T57-2 PH UNITS	J62	4.974	.197	.054					.105	.552
OPACITY, B&L TYPE, 89% BACKING	K23	95.42	.42	.28	10	65	78	5	.34	1.18
T60-1 PERCENT	J58	92.69	.57	.34					.42	1.62
OPACITY, B&L TYPE, PAPER BACKING	K23	95.89	.16	.30	10	5	5	5	.37	.52
T60-2 PERCENT	J58	93.09	.34	.35					.44	.99
OPACITY, ELREPHO TYPE, PAPER BACKING	K23	96.30	.16	.14	10	13	15	5	.18	.47
T60-3 PERCENT	J58	93.55	.20	.20					.24	.59
BLUE REFLECTANCE, DIRECTIONAL	E78	96.30	.45	.10	8	15	39	6	.12	1.25
T65-1 PERCENT	J97	75.91	.50	.15					.17	1.40
BLUE REFLECTANCE, DIFFUSE, WITH TRAP	E78	96.48	.59	.10	8	13	15	6	.12	1.63
T65-2 PERCENT	J97	75.79	.64	.17					.19	1.77
BLUE REFLECTANCE, DIFFUSE, NO TRAP	E78	94.97	1.34	.13	8	16	16	6	.15	3.72
T65-3 PERCENT	J97	76.49	.78	.11					.13	2.15
SPECULAR GLOSS, 75 DEGREE	E59	84.6	.9	1.1	10	43	54	5	1.3	2.6
T75-1 GLOSS UNITS	J24	66.3	1.7	1.0					1.3	4.7
THICKNESS (CALIPER)	J65	6.352	.102	.100	10	52	66	10	.087	.284
T90-1 MILS	J81	2.710	.086	.042					.037	.238
GRAMMAGE (MASS PER UNIT AREA)	D30	92.87	.40	.80	10	14	16	3	1.29	1.54
T95-1 G/SQ.METER	D31	76.27	.53	.72					1.15	1.75

NBS-114A (REV. 9-78)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. TAPPI CRP 56G	2. Gov't. Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE
Technical Association of the Pulp and Paper Industry
COLLABORATIVE REFERENCE PROGRAM FOR PAPER
Report #56G

5. Publication Date

6. Performing Organization Code

7. AUTHOR(S)
R. G. Powell, J. Horlick

8. Performing Organ. Report No.
NBSIR 79-1360

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, DC 20234

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS *(Street, City, State, ZIP)*
Collaborative Testing Services, Inc., 9241 Wood Glade Drive, Great Falls, Virginia 22066; and Technical Association of the Pulp and Paper Industry

13. Type of Report & Period Covered
FINAL

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

Collaborative Reference Programs provide participating laboratories with the means for checking periodically the level and uniformity of their testing in comparison with that of other participating laboratories. An important by-product of the programs is the provision of realistic pictures of the state of the testing art. This is one of the periodic reports showing averages for each participant, within and between laboratory variability, and other information for participants and standards committees.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*
Collaborative reference program; Laboratory evaluation; Paper; Precision; Reference samples, Testing calibration

18. AVAILABILITY

☐ Unlimited

☒ For Official Distribution. Do Not Release to NTIS

☐ Order From Sup. of Doc., U.S. Government Printing Office, Washington, DC 20402, SD Stock No. SN003-003-

☐ Order From National Technical Information Service (NTIS), Springfield, VA. 22161

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PRINTED PAGES
UNCLASSIFIED	55
20. SECURITY CLASS (THIS PAGE)	**22. Price**
UNCLASSIFIED	

USCOMM-DC