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**TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY**

**COLLABORATIVE REFERENCE PROGRAM
FOR PAPER**

REPORT NO. 59G



**U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards**

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79-1801
1979
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NBS COLLABORATIVE REFERENCE PROGRAMS

TAPPI Paper and Board (6 times per year)

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

CTS Rubber (4 times per year)

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

CTS Thermal Insulation Materials (2 times per year)

19 test methods for thermal insulation materials covering:
thermal properties; strength properties; dimensions, stability,
and density properties; fire properties; and properties of
vapor barriers

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)

NBS Collaborative Reference Programs
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National Bureau of Standards
Washington, DC 20234

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TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

**COLLABORATIVE REFERENCE PROGRAM
FOR PAPER**

Report No. 59G

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TAPPI-NBS Research Associate
Collaborative Testing Services, Inc.

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

NBSIR 79-1801

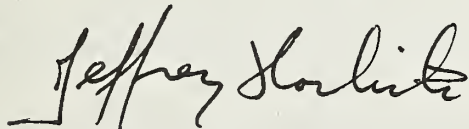
U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

INTRODUCTION

Reports 59S and 59G comprise the fifth 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.

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

July 27, 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.

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TABLE OF CONVERSION FACTORS TO METRIC (SI) UNITS

<u>Physical Quantity</u>	<u>To Convert From</u>	<u>To</u>	<u>Multiply by</u>
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-lb/ft ²	J/m ²
in.-lb/in. ²		J/m ²	175.1
kg-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:

<u>No. of test Determinations</u>	<u>Lower limit for R. SDR</u>	<u>Upper limit for R. SDR</u>
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 'O'. 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 - In addition to several quantities already defined
(At end of above, the summary shows the following values for
report) 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 compu-
tation 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 68-75, AIR RESISTANCE OF PAPER

LAB CODE	SAMPLE K43 MEAN	PRINTING 60 GFAMS PER SQUARE METER				SAMPLE B95 MEAN	HEAT SET OFFSET BOOK 91 GRAMS PER SQUARE METER				TEST D ₀ = 10		
		DEV	N ₀ DEV	SDR	R ₀ SDR		DEV	N ₀ DEV	SDR	R ₀ SDR	VAR	F	LAB
L100	14.0	-2.3	-2.69	1.2	1.05	38.9	-9.7	-3.03	2.6	.49	40D	*	L100
L106	20.0	3.7	4.24	6.9	6.23	44.8	-3.8	-1.18	3.9	.75	40D	X	L106
L107	15.5	-.8	-.97	.8	.77	48.3	-.3	-.08	2.1	.39	40D	Ø	L107
L121	16.4	.0	.04	.8	.72	48.2	-.3	-.10	4.8	.92	40D	Ø	L121
L122	16.8	.5	.56	1.4	1.25	45.1	-3.4	-1.08	4.9	.93	40D	Ø	L122
L123	14.8	-1.5	-1.73	1.0	.95	45.5	-3.0	-.95	5.7	1.10	40D	Ø	L123
L124G	15.9	-.4	-.48	.7	.61	44.9	-3.7	-1.15	3.5	.67	40D	Ø	L124G
L125	16.7	.3	.38	.9	.82	49.5	1.0	.31	2.8	.53	40D	Ø	L125
L128	17.4	1.1	1.23	1.3	1.23	49.5	.9	.29	3.2	.61	40D	Ø	L128
L141	17.0	.6	.75	1.1	.96	47.9	-.7	-.21	5.6	1.06	40D	Ø	L141
L148	17.5	1.1	1.30	.8	.74	45.6	-3.0	-.94	4.9	.93	40D	*	L148
L153	16.3	-.0	-.04	1.7	1.54	45.5	-3.1	-.96	4.3	.82	40D	Ø	L153
L158	14.3	-2.0	-2.36	.8	.75	45.1	-3.5	-1.09	6.3	1.21	40D	Ø	L158
L159	17.2	.5	1.00	1.1	1.03	51.0	2.4	.75	6.7	1.28	40D	Ø	L159
L163	17.0	.7	.80	1.2	1.06	52.5	3.9	1.23	3.1	.60	40D	Ø	L163
L166	17.5	1.2	1.35	1.3	1.19	50.5	1.9	.61	6.0	1.16	40D	Ø	L166
L174	16.3	-.1	-.09	1.0	.87	47.2	-1.4	-.43	8.6	1.64	40D	Ø	L174
L182G	15.8	-.6	-.64	1.0	.91	47.3	-1.3	-.40	5.9	1.12	40D	Ø	L182G
L183	17.1	.7	.84	.8	.76	48.3	-.3	-.08	4.7	.90	40D	Ø	L183
L190C	16.5	.2	.24	1.1	.96	50.6	2.0	.64	4.5	.85	40D	Ø	L190C
L212	14.2	-2.1	-2.43	1.2	1.06	42.3	-6.3	-1.97	4.8	.91	40D	Ø	L212
L223	16.9	.6	.70	1.1	.99	51.1	2.5	.80	4.5	.87	40D	Ø	L223
L230G	16.4	.1	.07	.5	.47	49.2	.6	.20	6.1	1.16	40D	Ø	L230G
L232	16.6	.3	.33	.6	.50	35.6	-13.0	-4.08	12.5	2.38	40D	#	L232
L236	16.7	.4	.48	.9	.82	45.3	-3.2	-1.01	4.9	.94	40D	Ø	L236
L238A	17.0	.7	.83	.9	.83	50.8	2.3	.71	5.4	1.04	40D	Ø	L238A
L241	15.9	-.4	-.50	1.2	1.09	45.5	-3.1	-.96	6.1	1.16	40D	Ø	L241
L242	16.0	-.3	-.35	.6	.59	49.5	.9	.29	5.7	1.09	40D	Ø	L242
L243G	16.3	-.0	-.01	.4	.36	46.9	-1.7	-.52	6.2	1.19	40D	Ø	L243G
L254	16.6	.3	.31	.8	.77	50.1	1.5	.48	6.1	1.17	40D	Ø	L254
L259	15.7	-.6	-.74	1.7	1.51	46.3	-2.3	-.71	4.9	.95	40D	Ø	L259
L261	16.2	-.2	-.18	1.0	.92	50.5	2.0	.62	5.0	.96	40D	Ø	L261
L262G	16.6	.3	.31	1.5	1.33	47.1	-1.5	-.46	3.3	.62	40D	Ø	L262G
L265	15.7	-.6	-.72	1.2	1.08	47.0	-1.5	-.48	2.4	.46	40D	Ø	L265
L278	16.7	.4	.48	1.3	1.22	48.3	-.3	-.09	3.7	.71	40D	Ø	L278
L285	16.7	.4	.43	.7	.60	50.0	1.4	.44	4.2	.80	40D	Ø	L285
L301	16.6	.3	.33	1.4	1.26	48.8	.2	.07	5.6	1.08	40D	Ø	L301
L308	17.0	.6	.73	1.2	1.07	56.4	7.8	2.46	6.1	1.17	40D	*	L308
L320	14.2	-2.1	-2.47	1.4	1.27	43.2	-5.4	-1.68	5.9	1.13	40D	Ø	L320
L321	16.8	.4	.50	1.5	1.32	50.4	1.8	.58	4.8	.93	40D	Ø	L321
L324	16.1	-.2	-.27	1.2	1.06	48.4	-.2	-.06	7.5	1.44	40D	Ø	L324
L326	17.6	1.3	1.50	.9	.86	52.7	4.1	1.30	5.5	1.05	40D	Ø	L326
L328	16.7	.4	.42	1.0	.92	54.0	5.5	1.72	9.7	1.85	40D	Ø	L328
L339	11.9	-4.4	-5.09	.7	.62	35.5	-13.0	-4.09	4.2	.81	40D	#	L339
L344	15.9	-.4	-.50	1.9	1.68	52.6	4.0	1.27	12.3	2.34	40D	Ø	L344
L376	16.9	.6	.64	1.1	1.01	52.7	4.1	1.29	3.6	.69	40D	Ø	L376
L388	17.2	.5	1.00	1.4	1.28	54.7	6.1	1.92	5.0	.96	40D	Ø	L388
L394	16.1	-.2	-.27	.9	.80	49.4	.8	.26	4.5	.86	40D	Ø	L394
L396M	15.6	-.7	-.79	1.2	1.09	46.7	-1.9	-.59	5.0	.96	40D	Ø	L396M
L567	16.2	-.2	-.18	1.1	1.04	45.9	-2.7	-.84	4.2	.81	40D	Ø	L567
L576	15.3	-1.0	-1.18	1.0	.87	47.8	-.8	-.24	4.3	.82	40D	Ø	L576
L585	17.2	.8	.95	1.2	1.05	52.2	3.7	1.16	7.2	1.37	40D	Ø	L585
L597	17.2	.5	1.00	.9	.83	50.3	1.7	.55	4.7	.89	40D	Ø	L597
L604	16.0	-.3	-.39	1.5	1.35	47.8	-.8	-.24	5.8	1.10	40D	Ø	L604
L651	15.8	-.5	-.62	1.1	1.03	48.4	-.2	-.05	4.2	.80	40D	Ø	L651
L676	17.6	1.2	1.42	1.1	1.04	51.5	3.0	.94	5.4	1.02	40D	Ø	L676
L697	16.4	.0	.03	1.4	1.23	47.0	-1.6	-.49	5.6	1.07	40D	Ø	L697

GR. MEAN = 16.3 GURLEY UNITS GRAND MEAN = 48.6 GURLEY UNITS TEST DETERMINATIONS = 10
SD MEANS = .9 GURLEY UNITS SD OF MEANS = 3.2 GURLEY UNITS 54 LABS IN GRAND MEANS
AVERAGE SDR = 1.1 GURLEY UNITS AVERAGE SDR = 5.2 GURLEY UNITS

L115	15.6	-.7	-.85	1.1	.98	46.9	-1.7	-.52	4.3	.82	40U	*	L115
L291	17.3	1.0	1.12	1.3	1.21	44.0	-4.6	-1.43	4.1	.79	40U	*	L291

TOTAL NUMBER OF LABORATORIES REPORTING = 59

Best values: K43 16.3 ± 1.4 Gurley units
B95 48.5 ± 5.5 Gurley units

The following laboratories were omitted from the grand means because of extreme test results: 232.

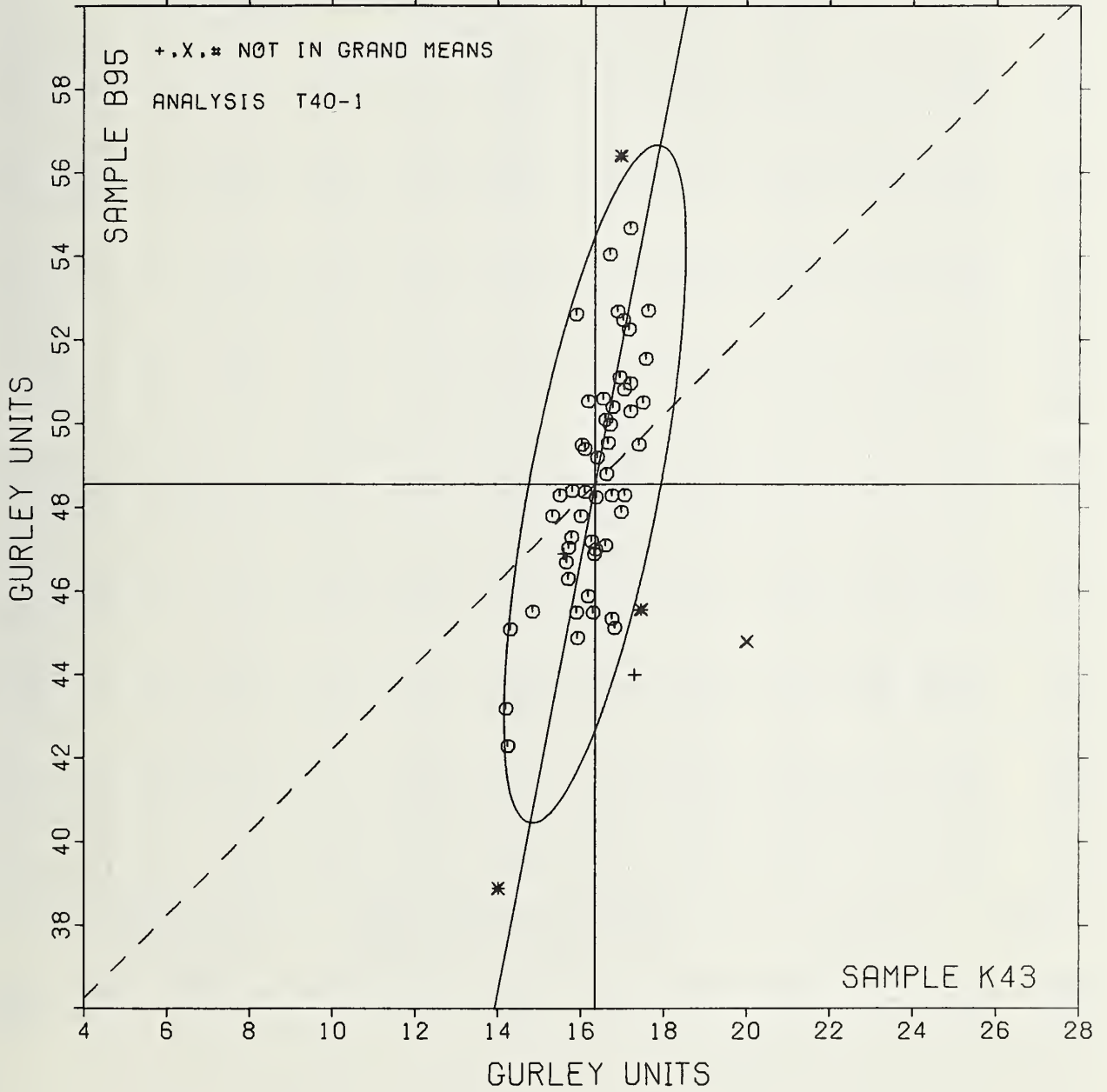
Data from the following laboratories appear to be off by a multiplicative factor: 339.

TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T40-1 TABLE 2
 AIR RESISTANCE, GURLEY UNITS (SECONDS/100 CC)
 TAPPI STANDARD T460 6S-75, AIR RESISTANCE OF PAPER

LAB CODE	F	MEANS		COORDINATES		AVG R ₀ SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS		
		K43	B95	MAJOR	MINOR					
L339	#	11.9	35.5	-13.6	1.9	.71	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L100	*	14.0	38.9	-9.9	.5	.77	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L320	Ø	14.2	43.2	-5.7	1.1	1.20	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L212	Ø	14.2	42.3	-6.5	.9	.99	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L158	Ø	14.3	45.1	-3.8	1.3	.98	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L123	Ø	14.8	45.5	-3.3	.9	1.02	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L576	Ø	15.3	47.8	-.9	.9	.84	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L107	Ø	15.5	48.3	-.4	.8	.58	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L115	*	15.6	46.9	-1.8	.4	.90	40U	AIR RESISTANCE,	SHEFFIELD IN GURLEY UNITS	
L396M	Ø	15.6	46.7	-2.0	.3	1.03	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L259	Ø	15.7	46.3	-2.3	.2	1.23	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L265	Ø	15.7	47.0	-1.6	.3	.77	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L182G	Ø	15.8	47.3	-1.3	.3	1.01	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L651	Ø	15.8	48.4	-.3	.5	.92	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L344	Ø	15.9	52.6	3.9	1.2	2.01	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L241	Ø	15.9	45.5	-3.1	-.2	1.12	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L124G	Ø	15.9	44.9	-3.7	-.3	.64	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L604	Ø	16.0	47.8	-.8	.2	1.23	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L242	Ø	16.0	49.5	.9	.5	.84	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L324	Ø	16.1	48.4	-.2	.2	1.25	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L394	Ø	16.1	49.4	.8	.4	.83	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L567	Ø	16.2	45.9	-2.7	-.4	.92	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L261	Ø	16.2	50.5	1.9	.5	.94	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L174	Ø	16.3	47.2	-1.4	-.2	1.25	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L153	Ø	16.3	45.5	-3.0	-.5	1.18	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L243G	Ø	16.3	46.9	-1.6	-.3	.78	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L697	Ø	16.4	47.0	-1.5	-.3	1.15	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L121	Ø	16.4	48.2	-.3	-.1	.82	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L230G	Ø	16.4	49.2	.6	.1	.82	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L190C	Ø	16.5	50.6	2.0	.2	.90	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L262G	Ø	16.6	47.1	-1.4	-.5	.98	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L254	Ø	16.6	50.1	1.6	.0	.97	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L232	#	16.6	35.6	-12.7	-2.7	1.44	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L301	Ø	16.6	48.8	.3	-.2	1.17	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L125	Ø	16.7	49.5	1.0	-.1	.67	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L328	Ø	16.7	54.0	5.4	.7	1.39	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L285	Ø	16.7	50.0	1.5	-.1	.70	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L236	Ø	16.7	45.3	-3.1	-1.0	.88	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L278	Ø	16.7	48.3	-.2	-.5	.97	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L321	Ø	16.8	50.4	1.9	-.1	1.12	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L122	Ø	16.8	45.1	-3.3	-1.1	1.09	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L376	Ø	16.9	52.7	4.1	.2	.85	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L223	Ø	16.9	51.1	2.6	-.1	.93	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L308	*	17.0	56.4	7.8	.9	1.12	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L141	Ø	17.0	47.9	-.5	-.8	1.01	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L163	Ø	17.0	52.5	4.0	.1	.83	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L238A	Ø	17.0	50.8	2.4	-.3	.93	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L183	Ø	17.1	48.3	-.1	-.8	.83	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L585	Ø	17.2	52.2	3.8	-.1	1.21	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L159	Ø	17.2	51.0	2.5	-.4	1.15	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L388	Ø	17.2	54.7	6.2	.3	1.12	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L597	Ø	17.2	50.3	1.9	-.5	.86	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L291	*	17.3	44.0	-4.3	-1.8	1.00	40U	AIR RESISTANCE,	SHEFFIELD IN GURLEY UNITS	
L128	Ø	17.4	49.5	1.1	-.9	.92	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L148	*	17.5	45.6	-2.7	-1.7	.84	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L166	Ø	17.5	50.5	2.1	-.8	1.17	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L676	Ø	17.6	51.5	3.2	-.6	1.03	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L326	Ø	17.6	52.7	4.3	-.5	.95	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
L106	X	20.0	44.8	-3.0	-4.3	3.49	40D	AIR RESISTANCE,	GURLEY DENSOMETER	- OIL FLOTATION
GMEANS:		16.3	48.6			1.00				
		95% ELLIPSE:		8.2	1.6	WITH GAMMA = 79 DEGREES				

AIR RESISTANCE, GURLEY

SAMPLE K43 = 16.3 GURLEY UNITS SAMPLE B95 = 48.6 GURLEY UNITS



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

LAB CODE	SAMPLE K43 MEAN	PRINTING 60 GRAMS PER SQUARE METER				SAMPLE B95 MEAN	HEAT SET OFFSET BOOK 91 GRAMS PER SQUARE METER				TEST D ₀ = 10		
		DEV	N ₀ DEV	SDR	R ₀ SDR		DEV	N ₀ DEV	SDR	R ₀ SDR	VAR	F	LAB
L114	178.6	12.1	1.88	9.4	1.07	77.3	5.1	1.18	3.9	.65	40S	Ø	L114
L121	171.0	4.5	.70	9.2	1.05	94.0	21.8	5.07	4.7	.79	40S	X	L121
L122S	164.8	-1.7	-.26	8.2	.94	79.7	7.5	1.74	5.7	.95	40S	Ø	L122S
L124S	158.8	-7.7	-1.20	9.7	1.11	70.9	-1.3	-.31	7.7	1.29	40S	Ø	L124S
L132	165.4	-1.1	-.17	5.2	.59	68.3	-3.9	-.91	7.2	1.21	40S	Ø	L132
L148	171.9	5.4	.84	6.4	.73	77.3	5.1	1.18	6.6	1.11	40S	Ø	L148
L150	184.4	17.5	2.78	11.0	1.26	74.3	2.1	.48	9.3	1.56	40S	*	L150
L157	163.0	-3.5	-.54	11.7	1.33	68.0	-4.2	-.98	4.9	.83	40S	Ø	L157
L158	164.0	-2.5	-.39	7.4	.84	76.0	3.8	.88	3.9	.66	40S	Ø	L158
L173B	166.5	.0	.60	9.1	1.04	70.0	-2.2	-.52	8.8	1.48	40S	Ø	L173B
L190C	178.4	11.9	1.85	5.3	.61	81.9	9.7	2.25	6.4	1.07	40S	Ø	L190C
L213	167.2	.7	.11	9.3	1.06	79.0	6.8	1.58	5.7	.96	40S	Ø	L213
L223	166.0	-.5	-.08	9.0	1.03	69.6	-2.6	-.61	5.0	.84	40S	Ø	L223
L228	206.8	40.3	6.27	9.7	1.10	131.2	59.0	13.72	11.8	1.98	40S	#	L228
L230S	160.6	-5.9	-.92	7.2	.82	69.0	-3.2	-.75	6.9	1.16	40S	Ø	L230S
L233	166.2	-.3	-.05	11.9	1.36	73.4	1.2	.27	3.2	.53	40S	Ø	L233
L241	197.3	30.8	4.79	20.3	2.32	87.5	15.3	3.55	4.3	.73	40S	#	L241
L249	166.6	.1	.02	12.8	1.46	70.2	-2.0	-.47	7.2	1.21	40S	Ø	L249
L255	183.8	17.3	2.69	6.2	.71	96.5	24.3	5.65	5.3	.90	40S	#	L255
L257A	162.7	-3.8	-.59	7.9	.90	73.8	1.6	.37	4.0	.68	40S	Ø	L257A
L257B	162.1	-4.4	-.68	9.5	1.09	64.7	-7.5	-1.75	7.5	1.25	40S	Ø	L257B
L257C	168.9	2.4	.37	5.6	.64	77.7	5.5	1.27	3.9	.65	40S	Ø	L257C
L260	168.8	2.3	.36	3.9	.44	72.7	.5	.11	6.7	1.12	40S	Ø	L260
L262S	167.8	1.3	.20	5.5	.63	72.2	-0.0	-.01	7.4	1.24	40S	Ø	L262S
L288	168.1	1.6	.25	16.5	1.89	73.7	1.5	.34	5.3	.90	40S	Ø	L288
L301	163.5	-3.0	-.47	7.5	.86	71.9	-.3	-.08	4.3	.72	40S	Ø	L301
L305	159.5	-7.0	-1.09	6.4	.73	73.2	1.0	.23	5.7	.95	40S	Ø	L305
L318	157.4	-9.1	-1.41	5.7	.66	67.4	-4.8	-1.12	5.7	.95	40S	Ø	L318
L352	166.2	-.3	-.05	5.7	.65	78.4	6.2	1.44	5.2	.87	40S	Ø	L352
L354	162.5	-4.0	-.62	12.3	1.40	67.1	-5.1	-1.19	5.7	.96	40S	Ø	L354
L360	162.0	-4.5	-.70	5.4	.61	70.9	-1.3	-.31	4.6	.77	40S	Ø	L360
L372	168.5	2.0	.31	8.5	.97	72.6	.4	.09	6.6	1.10	40S	Ø	L372
L390	201.0	34.5	5.36	13.3	1.52	92.0	19.8	4.60	5.9	.99	40S	#	L390
L562	177.6	11.1	1.73	11.2	1.28	69.6	-2.6	-.61	6.3	1.07	40S	Ø	L562
L575	169.8	3.3	.51	9.2	1.05	71.6	-.6	-.15	6.2	1.04	40S	Ø	L575
L585	166.5	.0	.00	9.7	1.11	69.0	-3.2	-.75	6.6	1.11	40S	Ø	L585
L597	165.0	-1.5	-.23	9.7	1.11	67.2	-5.0	-1.17	8.4	1.42	40S	Ø	L597
L600	165.9	-.6	-.09	6.2	.71	78.1	5.9	1.37	10.7	1.80	40S	Ø	L600
L626	151.5	-15.0	-2.33	10.6	1.21	67.5	-4.7	-1.10	4.2	.71	40S	Ø	L626
L684	173.4	6.5	1.07	11.3	1.29	66.6	-5.6	-1.31	5.0	.83	40S	Ø	L684
L687	171.8	5.3	.83	10.5	1.20	73.9	1.7	.39	3.6	.60	40S	Ø	L687
L698	158.3	-8.2	-1.27	13.7	1.56	67.7	-4.5	-1.05	7.7	1.29	40S	Ø	L698

GR. MEAN = 166.5 SHEFF. UNITS GRAND MEAN = 72.2 SHEFF. UNITS TEST DETERMINATIONS = 10
SD MEANS = 6.4 SHEFF. UNITS SD OF MEANS = 4.3 SHEFF. UNITS 37 LABS IN GRAND MEANS
AVERAGE SDR = 8.8 SHEFF. UNITS AVERAGE SDR = 6.0 SHEFF. UNITS

L182B	755.0	588.5	91.48	49.7	5.68	270.0	197.8	46.02	20.0	3.36	40B	•	L182B
L243B	647.9	481.4	74.83	45.4	5.19	224.9	152.7	35.52	19.6	3.30	40B	•	L243B
L312	166.2	-.3	-.05	3.9	.44	79.6	7.4	1.72	2.6	.43	40T	•	L312

TOTAL NUMBER OF LABORATORIES REPORTING = 45

Best values: K43 166 ± 12 Sheffield units
B95 72 ± 7 Sheffield units

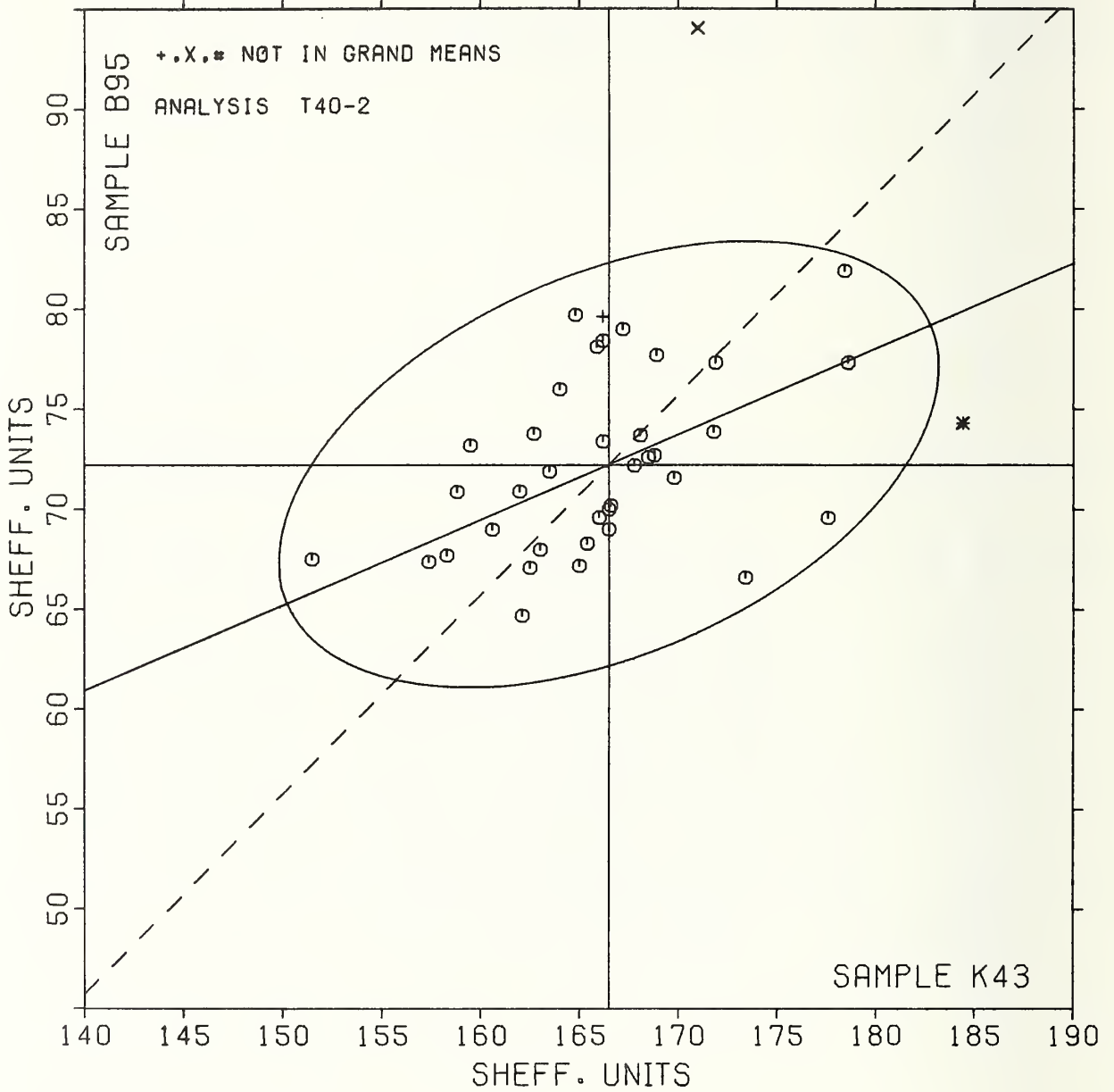
The following laboratories were omitted from the grand means because of extreme test results: 228, 241, 255, 390.

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	P	MEANS		COORDINATES		AVG		PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		K43	B95	MAJOR	MINOR	R.	SDR VAR			
L626	Ø	151.5	67.5	-15.6	1.5	.96	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L318	Ø	157.4	67.4	-10.3	-9	.80	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L698	Ø	158.3	67.7	-9.3	-9.9	1.43	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L124S	Ø	158.8	70.9	-7.6	1.8	1.20	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L305	Ø	159.5	73.2	-6.0	3.6	.84	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L230S	Ø	160.6	69.0	-6.7	-7	.99	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L360	Ø	162.0	70.9	-4.7	.5	.69	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L257B	Ø	162.1	64.7	-7.0	-5.2	1.17	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L354	Ø	162.5	67.1	-5.7	-3.1	1.18	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L257A	Ø	162.7	73.8	-2.9	2.9	.79	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L157	Ø	163.0	68.0	-4.9	-2.5	1.08	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L301	Ø	163.5	71.9	-2.9	.9	.79	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L158	Ø	164.0	76.0	-.8	4.4	.75	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L122S	Ø	164.8	79.7	1.4	7.5	.94	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L197	Ø	165.0	67.2	-3.3	-4.0	1.26	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L132	Ø	165.4	68.3	-2.5	-3.2	.90	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L600	Ø	165.9	78.1	1.8	5.6	1.25	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L223	Ø	166.0	69.6	-1.5	-2.2	.93	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L312	*	166.2	79.6	2.6	6.9	.44	40T	AIR RESISTANCE,	SHEFFIELD (3 INCH DIAMETER ORIFICE)	
L352	Ø	166.2	78.4	2.2	5.8	.76	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L233	Ø	166.2	73.4	.2	1.2	.95	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L585	Ø	166.5	69.0	-1.3	-3.0	1.11	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L173B	Ø	166.5	70.0	-.9	-2.1	1.26	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L249	Ø	166.6	70.2	-.7	-1.9	1.34	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L213	Ø	167.2	79.0	3.3	6.0	1.01	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L262S	Ø	167.8	72.2	1.2	-.5	.93	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L288	Ø	168.1	73.7	2.1	.7	1.39	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L372	Ø	168.5	72.6	2.0	-.4	1.04	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L260	Ø	168.8	72.7	2.3	-.5	.78	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L257C	Ø	168.9	77.7	4.4	4.1	.64	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L575	Ø	169.8	71.6	2.8	-1.9	1.05	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L121	X	171.0	94.0	12.7	18.3	.92	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L687	Ø	171.8	73.9	5.5	-.5	.90	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L148	Ø	171.9	77.3	7.0	2.5	.92	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L684	Ø	173.4	66.6	4.1	-7.9	1.06	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L562	Ø	177.6	69.6	9.2	-6.8	1.17	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L190C	Ø	178.4	81.9	14.7	4.2	.84	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L114	Ø	178.6	77.3	13.1	-.1	.86	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L255	#	183.8	96.5	25.4	15.5	.80	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L150	*	184.4	74.3	17.3	-5.1	1.41	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L241	#	197.3	87.5	34.3	1.9	1.52	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L390	#	201.0	92.0	39.5	4.6	1.25	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L228	#	206.8	131.2	60.2	38.4	1.54	40S	AIR RESISTANCE,	SHEFFIELD (3/4 INCH DIAMETER ORIFICE)	
L243B	*	647.9	224.9	502.7	-48.6	4.24	40B	AIR RESISTANCE,	BENDTSEN, WG 150	
L182B	*	755.0	270.0	618.9	-49.2	4.52	40B	AIR RESISTANCE,	BENDTSEN, WG 150	
GMEANS:		166.5	72.2			1.00				
		95% ELLIPSE:		17.7	9.5			WITH GAMMA = 23 DEGREES		

AIR RESISTANCE, SHEFFIELD

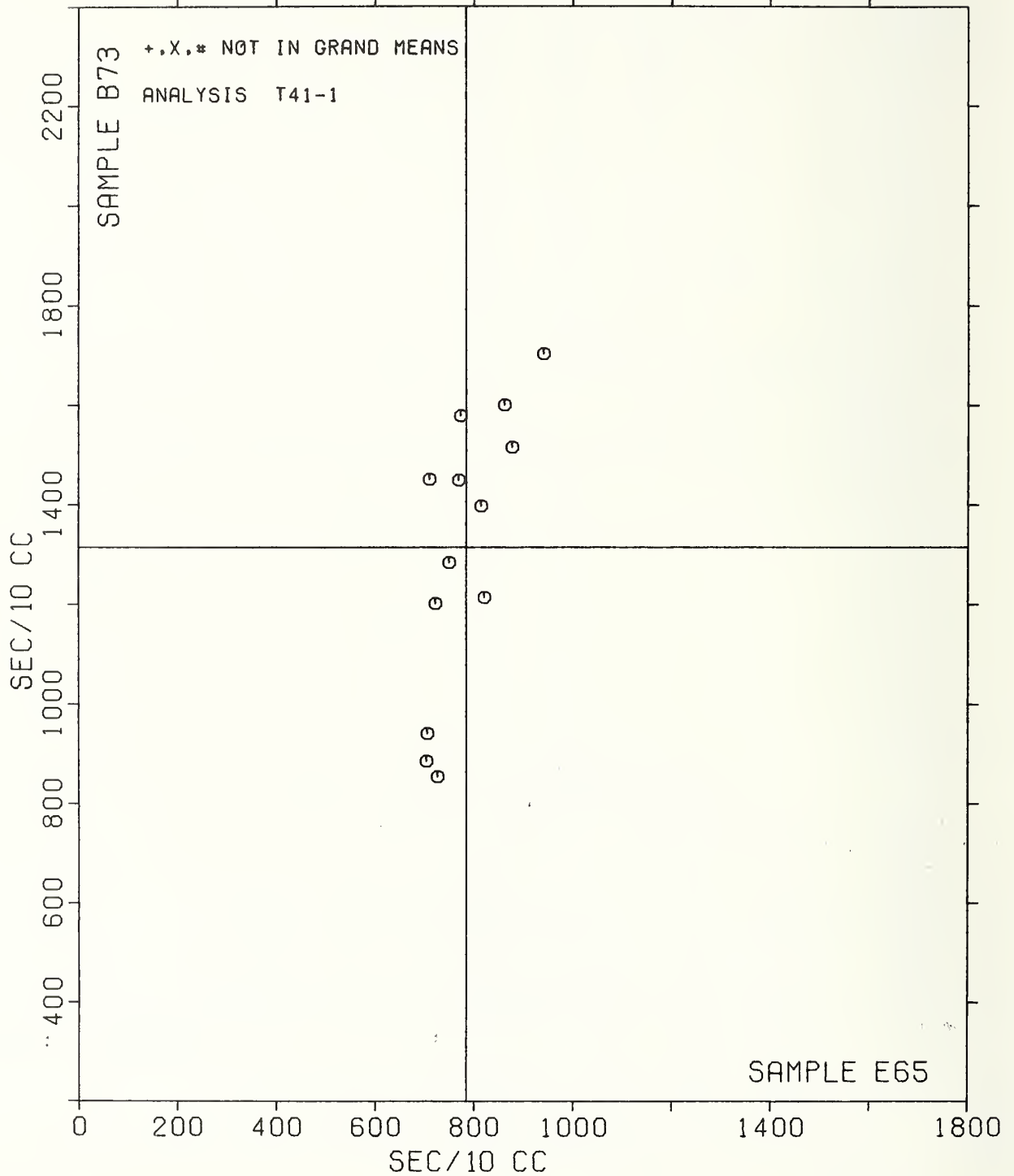
SAMPLE K43 = 166. SHEFF. UNITS SAMPLE B95 = 72. SHEFF. UNITS



AIR RESISTANCE, GURLEY HG FLOTATION

SAMPLE E65 = 783. SEC/10 CC

SAMPLE B73 = 1314. SEC/10 CC



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

LAB CODE	SAMPLE A83 MEAN	WEVE ENVELOPE PAPER				SAMPLE J50 MEAN	PRINTING				TEST D ₀ = 15		
		75 GRAMS PER SQUARE METER DEV	N ₀ DEV	SDR	R ₀ SDR		94 GRAMS PER SQUARE METER DEV	N ₀ DEV	SDR	R ₀ SDR	VAR	F	LAB
L100	112.7	7.1	.96	14.4	1.48	285.3	10.9	.83	13.7	1.84	45S	Ø	L100
L107	133.7	28.1	3.80	14.3	1.46	302.7	28.2	2.15	6.8	.91	45S	X	L107
L114	115.7	10.1	1.37	11.6	1.18	272.7	-1.8	-.14	7.8	1.04	45S	Ø	L114
L115	107.0	1.4	.20	9.2	.94	259.7	-14.8	-1.13	14.5	1.94	45S	Ø	L115
L121	90.3	-15.2	-2.06	10.0	1.02	257.8	-16.7	-1.27	4.7	.63	45S	Ø	L121
L122	115.5	9.9	1.34	16.5	1.69	266.7	-7.8	-.60	10.3	1.38	45S	Ø	L122
L123	102.6	-3.0	-.40	12.6	1.29	278.0	3.5	.27	10.1	1.36	45S	Ø	L123
L124	91.4	-14.2	-1.91	8.6	.88	260.7	-13.7	-1.05	6.9	.92	45S	Ø	L124
L125	103.0	-2.6	-.34	11.5	1.17	259.3	-15.1	-1.16	10.0	1.34	45S	Ø	L125
L126	107.1	1.5	.20	15.7	1.60	276.4	1.9	.15	7.8	1.04	45S	Ø	L126
L128	111.7	6.2	.83	11.5	1.18	276.7	2.2	.17	4.9	.66	45S	Ø	L128
L132	107.0	1.4	.20	19.0	1.94	283.1	8.6	.66	6.4	.85	45S	Ø	L132
L134	100.7	-8.9	-.66	8.6	.88	284.0	9.5	.73	8.1	1.08	45S	Ø	L134
L139S	113.2	7.6	1.03	5.8	.60	267.0	-7.5	-.57	3.7	.49	45S	Ø	L139S
L148	114.5	8.5	1.20	5.9	.61	280.7	6.2	.47	6.8	.91	45S	Ø	L148
L150	103.3	-2.3	-.31	8.9	.91	292.7	18.3	1.39	6.5	.88	45S	Ø	L150
L152	120.1	14.6	1.97	8.1	.83	257.5	-17.0	-1.30	4.8	.65	45S	Ø	L152
L153	109.9	4.3	.58	5.3	.54	293.0	18.5	1.41	5.9	.79	45S	Ø	L153
L157	111.5	5.9	.80	10.0	1.02	285.7	11.3	.86	5.9	.80	45S	Ø	L157
L158	105.3	-.2	-.03	12.7	1.30	266.7	-7.8	-.60	7.0	.94	45S	Ø	L158
L159	110.3	4.7	.64	10.1	1.03	282.3	7.8	.59	11.8	1.58	45S	Ø	L159
L162	108.0	2.4	.33	11.8	1.20	277.3	2.9	.22	8.0	1.07	45S	Ø	L162
L166	94.1	-11.4	-1.54	6.0	.61	261.5	-13.0	-.99	8.5	1.14	45S	Ø	L166
L167	108.3	2.7	.37	3.1	.31	261.7	-12.8	-.98	5.9	.79	45S	Ø	L167
L173B	98.0	-7.6	-1.02	6.8	.69	256.7	-17.8	-1.36	9.0	1.21	45S	Ø	L173B
L183S	102.5	-3.0	-.41	7.7	.79	266.3	-8.2	-.63	6.5	.87	45S	Ø	L183S
L190C	113.7	8.1	1.10	10.3	1.05	261.3	-13.1	-1.00	6.4	.86	45S	Ø	L190C
L195	116.8	11.2	1.52	11.7	1.19	271.8	-2.7	-.21	8.9	1.20	45S	Ø	L195
L203	115.3	9.7	1.31	13.4	1.37	276.2	1.7	.13	7.4	1.00	45S	Ø	L203
L206	114.3	8.8	1.19	11.6	1.19	275.3	.8	.06	5.4	.73	45S	Ø	L206
L211	100.5	-5.0	-.68	10.1	1.03	260.5	-14.0	-1.07	5.9	.79	45S	Ø	L211
L213	93.1	-12.5	-1.69	8.5	.87	255.1	-19.3	-1.48	6.7	.91	45S	Ø	L213
L223	104.5	-1.1	-.15	9.1	.93	264.2	-10.3	-.78	7.2	.97	45S	Ø	L223
L226B	100.1	-5.5	-.74	8.5	.87	266.3	-8.2	-.63	9.5	1.28	45S	Ø	L226B
L228	109.5	4.0	.54	7.1	.73	287.5	13.1	1.00	9.4	1.27	45S	Ø	L228
L230S	99.1	-6.5	-.88	11.4	1.16	284.5	10.1	.77	7.3	.98	45S	Ø	L230S
L231	106.2	.6	.09	7.7	.78	272.6	-1.9	-.14	8.1	1.09	45S	Ø	L231
L232S	104.7	-.9	-.12	4.8	.49	285.0	10.5	.80	4.6	.62	45S	Ø	L232S
L233	98.9	-6.6	-.89	11.0	1.13	280.7	6.2	.47	5.5	.74	45S	Ø	L233
L237	104.3	-1.2	-.16	6.2	.64	272.3	-2.1	-.16	5.3	.71	45S	Ø	L237
L241	110.3	4.8	.65	10.4	1.07	254.7	-19.8	-1.51	4.8	.65	45S	Ø	L241
L249	106.9	1.3	.18	12.8	1.31	283.3	8.8	.67	11.3	1.52	45S	Ø	L249
L254	109.2	3.6	.49	10.2	1.04	271.0	-3.5	-.27	7.9	1.06	45S	Ø	L254
L255	114.4	8.8	1.20	6.7	.68	279.9	5.5	.42	5.2	.70	45S	Ø	L255
L257A	100.9	-4.7	-.63	6.3	.65	273.5	-.9	-.07	7.7	1.03	45S	Ø	L257A
L257B	108.7	3.2	.43	6.4	.66	277.3	2.9	.22	6.5	.87	45S	Ø	L257B
L257C	108.3	2.7	.37	8.1	.83	267.5	-7.0	-.54	9.4	1.26	45S	Ø	L257C
L259	109.2	3.6	.49	9.3	.95	272.3	-2.2	-.17	11.6	1.55	45S	Ø	L259
L260	108.6	3.0	.41	10.8	1.11	266.1	-8.3	-.64	2.7	.36	45S	Ø	L260
L261	92.9	-12.6	-1.71	8.5	.87	278.3	3.9	.29	6.7	.90	45S	Ø	L261
L262	104.5	-1.1	-.15	9.1	.93	270.1	-4.3	-.33	10.9	1.47	45S	Ø	L262
L275	102.7	-2.9	-.39	11.5	1.17	280.7	6.2	.47	5.6	.76	45S	Ø	L275
L277	104.4	-1.2	-.16	10.4	1.06	294.2	19.7	1.50	7.7	1.03	45S	Ø	L277
L278	113.0	7.4	1.01	10.6	1.09	294.0	19.5	1.49	9.7	1.30	45S	Ø	L278
L281	110.7	5.2	.70	9.0	.92	268.1	-6.3	-.48	9.0	1.21	45S	Ø	L281
L285	93.9	-11.7	-1.58	10.6	1.09	277.6	3.1	.24	7.3	.99	45S	Ø	L285
L288	121.7	16.1	2.18	14.0	1.43	290.8	16.3	1.25	7.9	1.07	45S	Ø	L288
L290	107.7	2.2	.29	9.1	.93	247.8	-26.7	-2.04	5.5	.74	45S	Ø	L290
L291S	104.5	-1.1	-.15	6.2	.64	285.6	11.1	.85	9.4	1.27	45S	Ø	L291S
L301	99.7	-5.8	-.79	7.0	.71	276.2	1.7	.13	7.3	.98	45S	Ø	L301
L305	108.4	2.8	.38	8.7	.89	259.3	-15.2	-1.16	7.4	1.00	45S	Ø	L305
L308	98.0	-7.6	-1.02	9.7	.99	274.0	-.5	-.04	6.8	.92	45S	Ø	L308
L312	118.1	12.5	1.69	16.4	1.67	292.1	17.7	1.35	4.4	.60	45S	Ø	L312
L317	98.0	-7.6	-1.02	8.0	.81	286.3	11.9	.90	7.7	1.03	45S	Ø	L317
L318	103.3	-2.2	-.30	7.2	.74	284.4	9.9	.76	10.1	1.36	45S	Ø	L318

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

LAB CODE	SAMPLE A83 MEAN	WEVE ENVELOPE PAPER 75 GRAMS PER SQUARE METER				SAMPLE J50 MEAN	PRINTING 94 GRAMS PER SQUARE METER				TEST D. = 15		
		DEV	N. DEV	SDR	R. SDR		DEV	N. DEV	SDR	R. SDR	VAR	F	LAB
L321	95.3	-10.2	-1.38	5.5	.56	266.7	-7.8	-.60	6.7	.90	45S	Ø	L321
L323	101.7	-3.9	-.53	8.6	.88	281.7	7.2	.55	6.7	.90	45S	Ø	L323
L326	107.0	1.4	.20	9.3	.95	255.0	-19.5	-1.49	5.2	.69	45S	Ø	L326
L328	115.7	10.2	1.38	8.0	.82	282.5	8.1	.61	5.5	.74	45S	Ø	L328
L349	99.8	-5.8	-.78	5.7	.59	304.2	29.7	2.27	7.9	1.06	45S	*	L349
L352I	109.7	4.1	.56	9.4	.96	253.1	-21.3	-1.63	11.4	1.53	45S	Ø	L352I
L360	102.0	-3.6	-.48	10.7	1.09	276.9	2.4	.18	6.5	.87	45S	Ø	L360
L372	134.3	-1.3	-.17	4.1	.42	306.9	32.4	2.47	5.8	.78	45S	*	L372
L376	111.3	5.7	.77	13.1	1.34	279.9	5.4	.41	6.6	.88	45S	Ø	L376
L382	102.0	-3.6	-.48	8.2	.84	283.3	8.9	.68	7.0	.94	45S	Ø	L382
L390	128.7	23.1	3.12	10.8	1.10	303.0	28.5	2.18	10.0	1.34	45S	X	L390
L396M	101.9	-3.7	-.50	6.1	.62	261.4	-13.1	-1.00	5.2	.70	45S	Ø	L396M
L554	104.7	-.9	-.12	19.6	2.00	274.0	-.5	-.04	8.8	1.19	45S	Ø	L554
L567	91.0	-14.6	-1.97	8.7	.89	268.2	-6.3	-.48	8.2	1.10	45S	Ø	L567
L571	120.7	15.1	2.04	11.5	1.17	296.3	21.9	1.67	5.5	.74	45S	Ø	L571
L575	102.1	-3.4	-.46	8.2	.83	303.2	28.7	2.19	6.0	.81	45S	Ø	L575
L585	91.2	-14.4	-1.94	9.5	.97	268.0	-6.5	-.49	7.5	1.01	45S	Ø	L585
L597	56.0	-9.6	-1.29	11.4	1.16	272.7	-1.8	-.14	8.8	1.19	45S	Ø	L597
L600	119.2	13.6	1.84	10.9	1.11	280.3	5.9	.45	6.4	.86	45S	Ø	L600
L626	104.7	-.9	-.12	10.7	1.09	277.3	2.9	.22	6.8	.91	45S	Ø	L626
L648	107.5	2.0	.27	15.5	1.59	275.9	1.5	.11	5.8	.78	45S	Ø	L648
L651	108.7	3.2	.43	9.8	1.00	239.3	-35.2	-2.69	3.7	.50	45S	*	L651
L670	101.4	-4.2	-.56	7.7	.78	288.1	13.6	1.04	6.1	.82	45S	Ø	L670
L679	56.5	-9.0	-1.22	6.7	.68	246.9	-27.6	-2.11	9.3	1.25	45S	Ø	L679
L688	105.5	-.0	-.00	12.3	1.26	271.9	-2.5	-.19	7.4	.99	45S	Ø	L688
L698	92.0	-13.6	-1.83	8.9	.91	287.1	12.7	.97	6.6	.89	45S	Ø	L698

GR. MEAN = 105.6 SHEFF. UNITS GRAND MEAN = 274.5 SHEFF. UNITS TEST DETERMINATIONS = 117
SD MEANS = 7.4 SHEFF. UNITS SD OF MEANS = 13.1 SHEFF. UNITS 89 LABS IN GRAND MEANS
AVERAGE SDR = 9.8 SHEFF. UNITS AVERAGE SDR = 7.4 SHEFF. UNITS

L174 215.9 110.4 14.91 5.9 .60 315.2 40.7 3.11 3.3 .44 45R * I174
TOTAL NUMBER OF LABORATORIES REPORTING = 92

Best values: A83 105 ± 13 Sheffield units
J50 274 ± 21 Sheffield units

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

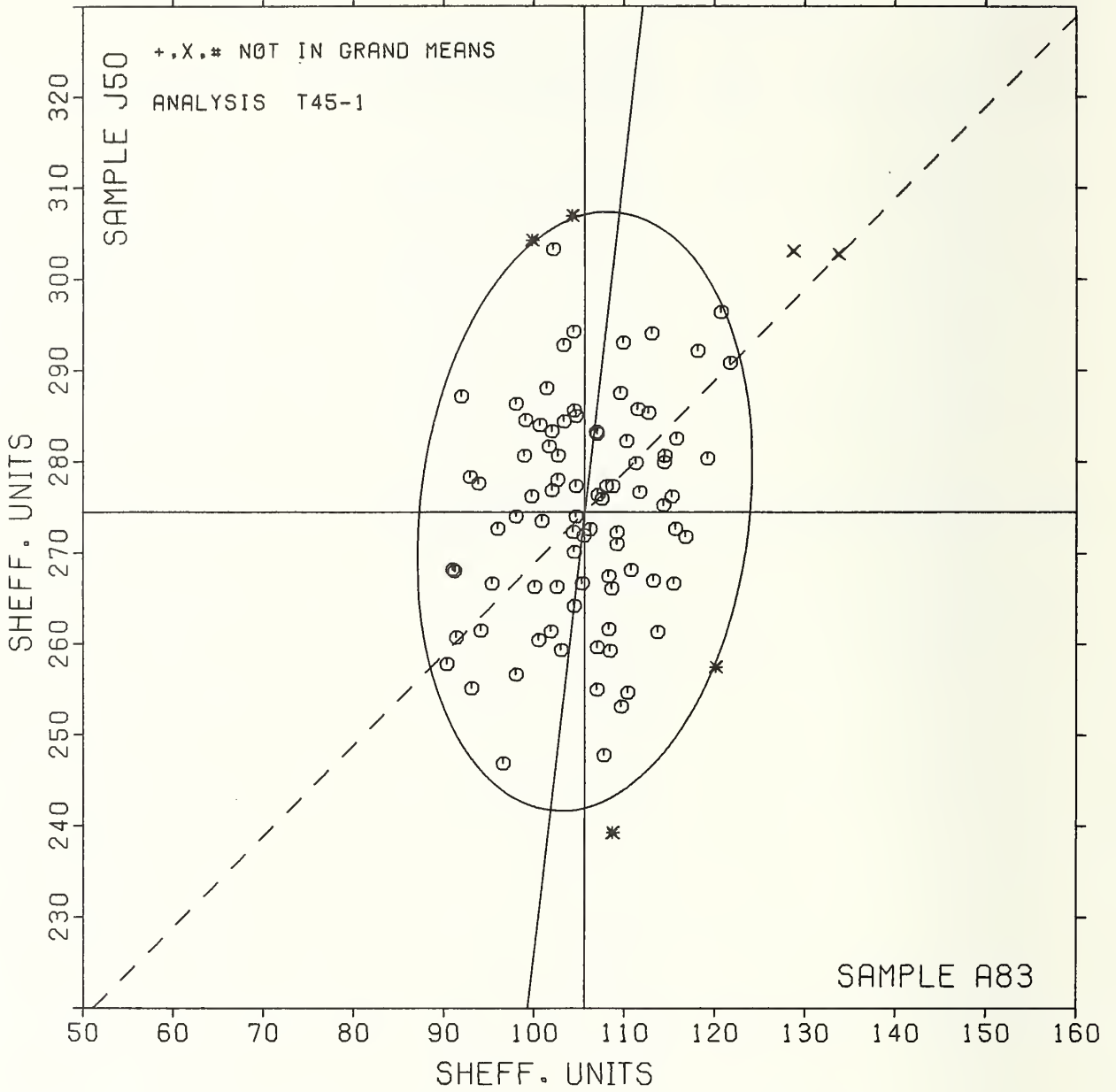
LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		A83	J50	MAJOR	MINOR	R.SDR	VAR			
L121	Ø	90.3	257.8	-18.3	13.2	.82	45S	SMOOTHNESS,	SHEFFIELD	
L567	Ø	91.0	268.2	-7.9	13.7	1.00	45S	SMOOTHNESS,	SHEFFIELD	
L585	Ø	91.2	268.0	-8.1	13.5	.99	45S	SMOOTHNESS,	SHEFFIELD	
L124	Ø	91.4	260.7	-15.3	12.5	.90	45S	SMOOTHNESS,	SHEFFIELD	
L698	Ø	92.0	287.1	11.0	14.9	.90	45S	SMOOTHNESS,	SHEFFIELD	
L261	Ø	92.9	278.3	2.4	13.0	.89	45S	SMOOTHNESS,	SHEFFIELD	
L213	Ø	93.1	255.1	-20.7	10.2	.89	45S	SMOOTHNESS,	SHEFFIELD	
L285	Ø	93.9	277.6	1.8	12.0	1.04	45S	SMOOTHNESS,	SHEFFIELD	
L166	Ø	94.1	261.5	-14.2	9.8	.88	45S	SMOOTHNESS,	SHEFFIELD	
L321	Ø	95.3	266.7	-8.9	9.3	.73	45S	SMOOTHNESS,	SHEFFIELD	
L597	Ø	96.0	272.7	-2.9	9.3	1.17	45S	SMOOTHNESS,	SHEFFIELD	
L679	Ø	96.5	246.9	-28.5	5.8	.96	45S	SMOOTHNESS,	SHEFFIELD	
L317	Ø	98.0	286.3	10.9	8.9	.92	45S	SMOOTHNESS,	SHEFFIELD	
L308	Ø	98.0	274.0	-1.3	7.4	.95	45S	SMOOTHNESS,	SHEFFIELD	
L173H	Ø	98.0	256.7	-18.6	5.5	.95	45S	SMOOTHNESS,	SHEFFIELD	
L233	Ø	98.9	280.7	5.4	7.3	.93	45S	SMOOTHNESS,	SHEFFIELD	
L230S	Ø	99.1	284.5	9.2	7.6	1.07	45S	SMOOTHNESS,	SHEFFIELD	
L301	Ø	99.7	276.2	1.0	6.0	.85	45S	SMOOTHNESS,	SHEFFIELD	
L349	*	99.8	304.2	28.9	9.1	.83	45S	SMOOTHNESS,	SHEFFIELD	
L226B	Ø	100.1	266.3	-8.8	4.5	1.07	45S	SMOOTHNESS,	SHEFFIELD	
L211	Ø	100.5	260.5	-14.5	3.4	.91	45S	SMOOTHNESS,	SHEFFIELD	
L134	Ø	100.7	284.0	8.9	6.0	.98	45S	SMOOTHNESS,	SHEFFIELD	
L257A	Ø	100.9	273.5	-1.5	4.5	.84	45S	SMOOTHNESS,	SHEFFIELD	
L670	Ø	101.4	288.1	13.0	5.7	.80	45S	SMOOTHNESS,	SHEFFIELD	
L323	Ø	101.7	281.7	6.7	4.7	.89	45S	SMOOTHNESS,	SHEFFIELD	
L396M	Ø	101.9	261.4	-13.4	2.2	.66	45S	SMOOTHNESS,	SHEFFIELD	
L382	Ø	102.0	283.3	8.4	4.6	.89	45S	SMOOTHNESS,	SHEFFIELD	
L360	Ø	102.0	276.9	2.0	3.8	.98	45S	SMOOTHNESS,	SHEFFIELD	
L575	Ø	102.1	303.2	28.1	6.7	.82	45S	SMOOTHNESS,	SHEFFIELD	
L183S	Ø	102.5	266.3	-8.5	2.1	.83	45S	SMOOTHNESS,	SHEFFIELD	
L123	Ø	102.6	278.0	3.2	3.3	1.33	45S	SMOOTHNESS,	SHEFFIELD	
L275	Ø	102.7	280.7	5.8	3.6	.96	45S	SMOOTHNESS,	SHEFFIELD	
L125	Ø	103.0	259.3	-15.3	.8	1.26	45S	SMOOTHNESS,	SHEFFIELD	
L150	Ø	103.3	292.7	17.9	4.4	.89	45S	SMOOTHNESS,	SHEFFIELD	
L318	Ø	103.3	284.4	9.6	3.3	1.05	45S	SMOOTHNESS,	SHEFFIELD	
L372	*	104.3	306.9	32.0	5.0	.60	45S	SMOOTHNESS,	SHEFFIELD	
L237	Ø	104.3	272.3	-2.3	1.0	.67	45S	SMOOTHNESS,	SHEFFIELD	
L277	Ø	104.4	294.2	19.5	3.4	1.04	45S	SMOOTHNESS,	SHEFFIELD	
L291S	Ø	104.5	285.6	10.9	2.4	.95	45S	SMOOTHNESS,	SHEFFIELD	
L262	Ø	104.5	270.1	-4.4	.6	1.20	45S	SMOOTHNESS,	SHEFFIELD	
L223	Ø	104.5	264.2	-10.3	-1.1	.95	45S	SMOOTHNESS,	SHEFFIELD	
L626	Ø	104.7	277.3	2.7	1.2	1.00	45S	SMOOTHNESS,	SHEFFIELD	
L554	Ø	104.7	274.0	-.6	.8	1.59	45S	SMOOTHNESS,	SHEFFIELD	
L232S	Ø	104.7	285.0	10.3	2.1	.56	45S	SMOOTHNESS,	SHEFFIELD	
L158	Ø	105.3	266.7	-7.8	-1.7	1.12	45S	SMOOTHNESS,	SHEFFIELD	
L688	Ø	105.5	271.9	-2.5	-.3	1.12	45S	SMOOTHNESS,	SHEFFIELD	
L231	Ø	106.2	272.6	-1.8	-.9	.94	45S	SMOOTHNESS,	SHEFFIELD	
L249	Ø	106.9	283.3	8.9	-.3	1.41	45S	SMOOTHNESS,	SHEFFIELD	
L132	Ø	107.0	283.1	8.7	-.4	1.40	45S	SMOOTHNESS,	SHEFFIELD	
L326	Ø	107.0	255.0	-19.2	-3.7	.82	45S	SMOOTHNESS,	SHEFFIELD	
L115	Ø	107.0	259.7	-14.5	-3.1	1.44	45S	SMOOTHNESS,	SHEFFIELD	
L126	Ø	107.1	276.4	2.1	-1.3	1.32	45S	SMOOTHNESS,	SHEFFIELD	
L648	Ø	107.5	275.9	1.7	-1.8	1.18	45S	SMOOTHNESS,	SHEFFIELD	
L290	Ø	107.7	247.8	-26.2	-5.2	.84	45S	SMOOTHNESS,	SHEFFIELD	
L162	Ø	108.0	277.3	3.1	-2.1	1.14	45S	SMOOTHNESS,	SHEFFIELD	
L167	Ø	108.3	261.7	-12.4	-4.2	.55	45S	SMOOTHNESS,	SHEFFIELD	
L257C	Ø	108.3	267.5	-6.7	-3.5	1.05	45S	SMOOTHNESS,	SHEFFIELD	
L305	Ø	108.4	259.3	-14.8	-4.6	.94	45S	SMOOTHNESS,	SHEFFIELD	
L260	Ø	108.6	266.1	-7.9	-4.0	.73	45S	SMOOTHNESS,	SHEFFIELD	
L257B	Ø	108.7	277.3	3.2	-2.8	.76	45S	SMOOTHNESS,	SHEFFIELD	
L651	*	108.7	239.3	-34.6	-7.2	.75	45S	SMOOTHNESS,	SHEFFIELD	
L259	Ø	109.2	272.3	-1.8	-3.9	1.25	45S	SMOOTHNESS,	SHEFFIELD	
L254	Ø	109.2	271.0	-3.0	-4.0	1.05	45S	SMOOTHNESS,	SHEFFIELD	
L228	Ø	109.5	287.5	13.4	-2.4	1.00	45S	SMOOTHNESS,	SHEFFIELD	
L352I	Ø	109.7	253.1	-20.7	-6.5	1.24	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		COORDINATES		AVG		PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		A83	J50	MAJOR	MINOR	R.SDR	VAR			
L153	Ø	109.9	293.0	18.9	-2.1	.67	45S	SMOOTHNESS,	SHEFFIELD	
L159	Ø	110.3	282.3	8.3	-3.8	1.31	45S	SMOOTHNESS,	SHEFFIELD	
L241	Ø	110.3	254.7	-19.1	-7.0	.86	45S	SMOOTHNESS,	SHEFFIELD	
L281	Ø	110.7	268.1	-5.7	-5.9	1.07	45S	SMOOTHNESS,	SHEFFIELD	
L376	Ø	111.3	279.9	6.0	-5.1	1.11	45S	SMOOTHNESS,	SHEFFIELD	
L157	Ø	111.5	285.7	11.9	-4.6	.91	45S	SMOOTHNESS,	SHEFFIELD	
L128	Ø	111.7	276.7	2.9	-5.9	.92	45S	SMOOTHNESS,	SHEFFIELD	
L100	Ø	112.7	285.3	11.6	-5.8	1.66	45S	SMOOTHNESS,	SHEFFIELD	
L278	Ø	113.0	294.0	20.2	-5.1	1.19	45S	SMOOTHNESS,	SHEFFIELD	
L139S	Ø	113.2	267.0	-6.5	-8.5	.55	45S	SMOOTHNESS,	SHEFFIELD	
L190C	Ø	113.7	261.3	-12.1	-9.6	.95	45S	SMOOTHNESS,	SHEFFIELD	
L206	Ø	114.3	275.3	1.8	-8.6	.96	45S	SMOOTHNESS,	SHEFFIELD	
L255	Ø	114.4	279.9	6.4	-8.2	.69	45S	SMOOTHNESS,	SHEFFIELD	
L148	Ø	114.5	280.7	7.2	-8.1	.76	45S	SMOOTHNESS,	SHEFFIELD	
L203	Ø	115.3	276.2	2.8	-9.5	1.18	45S	SMOOTHNESS,	SHEFFIELD	
L122	Ø	115.5	266.7	-6.6	-10.7	1.53	45S	SMOOTHNESS,	SHEFFIELD	
L114	Ø	115.7	272.7	-6.6	-10.3	1.11	45S	SMOOTHNESS,	SHEFFIELD	
L328	Ø	115.7	282.5	9.2	-9.2	.78	45S	SMOOTHNESS,	SHEFFIELD	
L195	Ø	116.8	271.8	-1.4	-11.5	1.19	45S	SMOOTHNESS,	SHEFFIELD	
L312	Ø	118.1	292.1	19.0	-10.4	1.13	45S	SMOOTHNESS,	SHEFFIELD	
L600	Ø	119.2	280.3	7.4	-12.9	.98	45S	SMOOTHNESS,	SHEFFIELD	
L152	*	120.1	257.5	-15.2	-16.4	.74	45S	SMOOTHNESS,	SHEFFIELD	
L571	Ø	120.7	296.3	23.5	-12.5	.96	45S	SMOOTHNESS,	SHEFFIELD	
L288	Ø	121.7	290.8	18.1	-14.1	1.25	45S	SMOOTHNESS,	SHEFFIELD	
L390	X	128.7	303.0	31.0	-19.7	1.22	45S	SMOOTHNESS,	SHEFFIELD	
L107	X	133.7	302.7	31.2	-24.7	1.19	45S	SMOOTHNESS,	SHEFFIELD	
L174	*	215.9	315.2	53.2	-105.0	.52	45R	SMOOTHNESS,	SHEFFIELD,	NON-STANDARD INSTRUMENT
GMEANS:		105.6	274.5			1.00				
		95% ELLIPSE:		33.0	18.3			WITH GAMMA = 83 DEGREES		

SMOOTHNESS, SHEFFIELD

SAMPLE A83 = 106. SHEFF. UNITS SAMPLE J50 = 274. SHEFF. UNITS



TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T45-2 TABLE 1
 SMOOTHNESS, BEKK SECONDS
 TAPPI SUGGESTED METHOD T479 SU-71, SMOOTHNESS OF PAPER (BEKK METHOD)

LAB CODE	SAMPLE A83 MEAN	WEVE ENVELOPE PAPER 75 GRAMS PER SQUARE METER				SAMPLE J50 MEAN	PRINTING 94 GRAMS PER SQUARE METER				TEST D ₀ = 15		
		DEV	N,DEV	SDR	R,SDR		DEV	N,DEV	SDR	R,SDR	VAR	F	LAB
L139B	53.60	.75	.20	9.54	1.26	11.13	-.14	-.08	1.19	1.66	45K	Ø	L139B
L162	51.07	-1.78	-.48	4.71	.62	10.00	-1.27	-.71	.38	.53	45K	Ø	L162
L182K	54.40	1.55	.42	9.98	1.32	9.79	-1.48	-.83	.83	1.16	45K	Ø	L182K
L190C	58.47	5.62	1.51	9.82	1.30	11.07	-.20	-.11	.75	1.05	45K	Ø	L190C
L230B	56.87	4.02	1.08	6.75	.89	9.27	-2.00	-1.11	.70	.98	45K	Ø	L230B
L232B	49.61	-3.24	-.87	5.55	.73	15.56	4.29	2.38	.87	1.22	45K	Ø	L232B
L243K	50.60	-2.25	-.60	5.22	.69	11.73	.46	.26	.60	.84	45K	Ø	L243K
L291K	56.85	4.00	1.08	11.67	1.54	12.67	1.40	.78	.99	1.38	45K	Ø	L291K
L581	49.47	-3.38	-.91	7.28	.96	11.00	-.27	-.15	.38	.53	45K	Ø	L581
L697	47.56	-5.29	-1.42	5.10	.67	10.49	-.78	-.43	.46	.65	45K	Ø	L697

GR. MEAN = 52.85 BEKK SECONDS GRAND MEAN = 11.27 BEKK SECONDS TEST DETERMINATIONS = 15
 SD MEANS = 3.72 BEKK SECONDS SD OF MEANS = 1.80 BEKK SECONDS 10 LABS IN GRAND MEANS
 AVERAGE SDR = 7.56 BEKK SECONDS AVERAGE SDR = .71 BEKK SECONDS

L250M 44.20 -2.65 -2.32 5.10 .67 9.60 -1.67 -.93 .51 .71 45L + L250M
 TOTAL NUMBER OF LABORATORIES REPORTING = 11

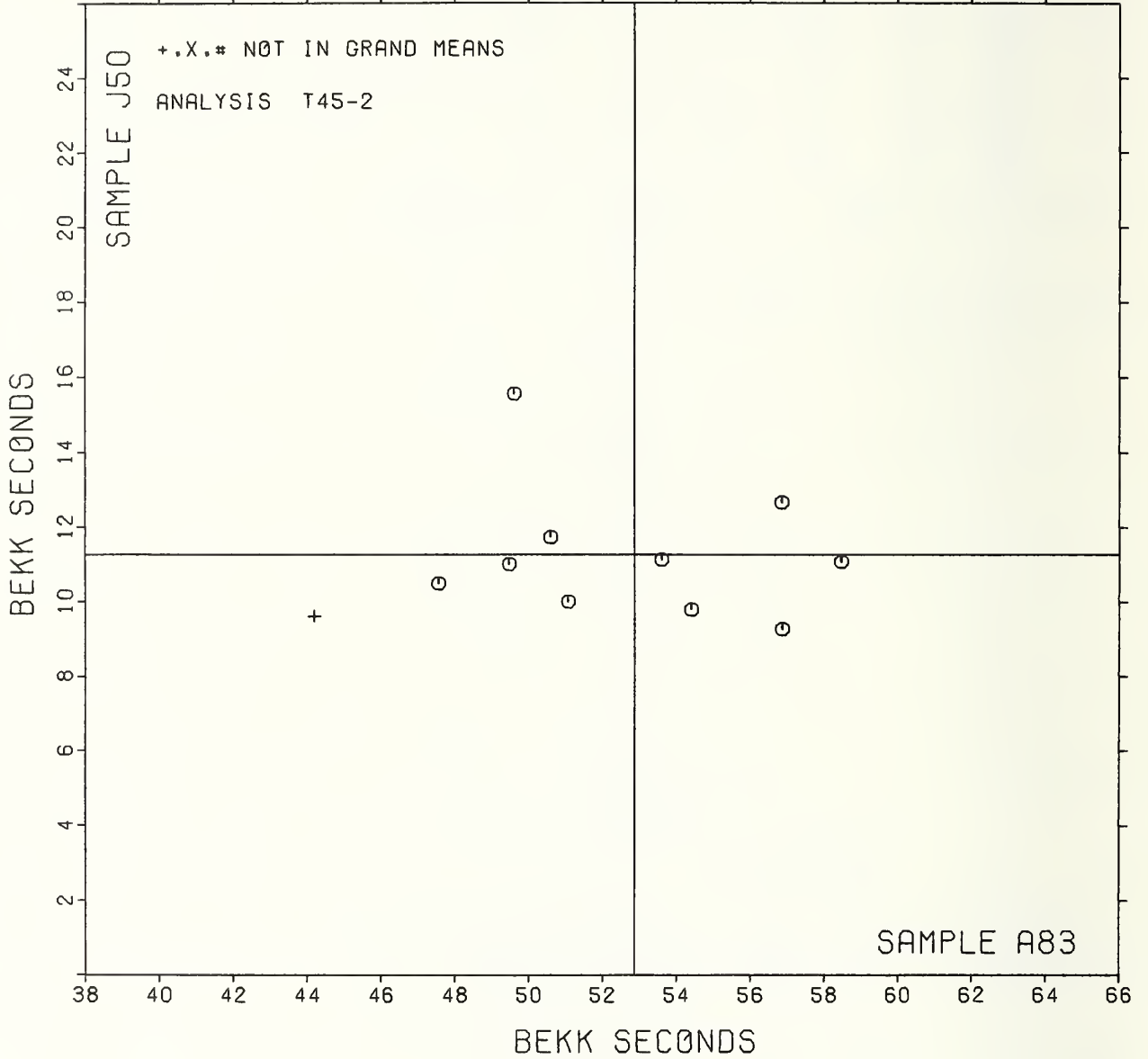
Best values: A83 52 Bekk seconds
 J50 11 Bekk seconds

TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T45-2 TABLE 2
 SMOOTHNESS, BEKK SECONDS
 TAPPI SUGGESTED METHOD T479 SU-71, SMOOTHNESS OF PAPER (BEKK METHOD)

LAB CODE	F	MEANS		COORDINATES		AVG R,SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS		
		A83	J50	MAJOR	MINOR			PROPERTY	TEST INSTRUMENT	CONDITIONS
L250M	+	44.20	9.60	-8.34	-2.85	.69	45L	SMOOTHNESS, BEKK,	20 C,	65% RH
L697	Ø	47.56	10.49	-5.13	-1.50	.66	45K	SMOOTHNESS, BEKK		
L581	Ø	49.47	11.00	-3.31	-.74	.75	45K	SMOOTHNESS, BEKK		
L232B	Ø	49.61	15.56	-3.80	3.80	.98	45K	SMOOTHNESS, BEKK		
L243K	Ø	50.60	11.73	-2.29	.15	.77	45K	SMOOTHNESS, BEKK		
L162	Ø	51.07	10.00	-1.59	-1.51	.58	45K	SMOOTHNESS, BEKK		
L139B	Ø	53.60	11.13	.76	-.03	1.46	45K	SMOOTHNESS, BEKK		
L182K	Ø	54.40	9.79	1.74	-1.26	1.24	45K	SMOOTHNESS, BEKK		
L291K	Ø	56.85	12.67	3.77	1.93	1.46	45K	SMOOTHNESS, BEKK		
L230B	Ø	56.87	9.27	4.26	-1.43	.94	45K	SMOOTHNESS, BEKK		
L190C	Ø	58.47	11.07	5.59	.58	1.17	45K	SMOOTHNESS, BEKK		
GMEANS:		52.85	11.27			1.00				
		95% ELLIPSE:		11.89	5.51	WITH GAMMA = -7 DEGREES				

SMOOTHNESS, BEKK

SAMPLE A83 = 52.8 BEKK SECONDS SAMPLe J50 = 11.3 BEKK SECONDS



LAB CODE	SAMPLE B58 MEAN	HEAT SET OFFSET BOOK 76 GRAMS PER SQUARE METER				SAMPLE E50 MEAN	PRINTING 91 GRAMS PER SQUARE METER				TEST D. = 4		
		DEV	N.DEV	SDR	R. SDR		DEV	N.DEV	SDR	R. SDR	VAR	F	LAB
L126	53.8	-6.9	-1.02	.7	1.03	57.5	-6.2	-1.04	.3	.66	56K	Ø	L126
L149	56.7	-3.9	-.58	.5	.71	59.2	-4.5	-.75	.5	1.11	56K	Ø	L149
L182	61.8	1.2	.18	.5	.78	66.1	2.3	.39	.1	.28	56K	Ø	L182
L213	64.5	3.9	.58	.9	1.26	68.2	4.5	.75	.3	.59	56K	Ø	L213
L277	67.2	6.6	.98	1.3	1.77	70.0	6.2	1.04	.0	.00	56K	Ø	L277
L291	63.8	3.1	.47	.6	.78	65.2	1.5	.24	.4	.90	56K	Ø	L291
L333	53.2	-7.4	-1.10	.5	.71	57.5	-6.3	-1.04	1.0	2.22	56K	Ø	L333
L339	71.5	10.9	1.61	.6	.81	72.7	9.0	1.50	.5	1.11	56K	Ø	L339
L643	53.0	-7.6	-1.13	.8	1.15	57.2	-6.5	-1.08	1.0	2.13	56K	Ø	L643

GR. MEAN = 60.6 K & N UNITS GRAND MEAN = 63.8 K & N UNITS TEST DETERMINATIONS = 4
SD MEANS = 6.7 K & N UNITS SD OF MEANS = 6.0 K & N UNITS 9 LABS IN GRAND MEANS
AVERAGE SDR = .7 K & N UNITS AVERAGE SDR = .4 K & N UNITS

L651	33.4	-27.3	-4.04	.2	.27	32.2	-31.5	-5.25	.1	.28	56Ø	Ø	L651
L688	27.7	-32.9	-4.88	.4	.52	26.1	-37.7	-6.28	.4	1.00	56Ø	Ø	L688

TOTAL NUMBER OF LABORATORIES REPORTING = 11

Best values: B58 61 K & N units
E50 64 K & N units

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		B58	E50	MAJOR	MINOR	R. SDR	VAR	
L688	*	27.7	26.1	-49.6	-6.3	.76	56Ø	INK ABSORPTION: OWN METHOD
L651	*	33.4	32.2	-41.3	-5.4	.27	56Ø	INK ABSORPTION: OWN METHOD
L643	Ø	53.0	57.2	-10.0	.2	1.64	56K	INK ABSORPTION, K&N INK TEST
L333	Ø	53.2	57.5	-9.7	.2	1.46	56K	INK ABSORPTION, K&N INK TEST
L126	Ø	53.8	57.5	-9.3	-.1	.84	56K	INK ABSORPTION, K&N INK TEST
L149	Ø	56.7	59.2	-5.9	-.8	.91	56K	INK ABSORPTION, K&N INK TEST
L182	Ø	61.8	66.1	2.4	.9	.53	56K	INK ABSORPTION, K&N INK TEST
L291	Ø	63.8	65.2	3.3	-1.0	.84	56K	INK ABSORPTION, K&N INK TEST
L213	Ø	64.5	68.2	5.9	.8	.93	56K	INK ABSORPTION, K&N INK TEST
L277	Ø	67.2	70.0	9.1	.3	.89	56K	INK ABSORPTION, K&N INK TEST
L339	Ø	71.5	72.7	14.1	-.5	.96	56K	INK ABSORPTION, K&N INK TEST
GMEANS:		60.6	63.8			1.00		
		55% ELLIPSE:		29.6	2.2	WITH GAMMA = 41 DEGREES		

OPACITY (89% REFLECTANCE BACKING) IN PERCENT
TAPPI STANDARD T425 CS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	SAMPLE B21 MEAN	SEMI BLEACHED 65 GRAMS PER SQUARE METER				SAMPLE K24 MEAN	PRINTING 103 GRAMS PER SQUARE METER				TEST D ₅₀ = 10	
		DEV	N ₀ DEV	SDR	R ₀ SDR		DEV	N ₀ DEV	SDR	R ₀ SDR	VAR	F IAB
L105	72.64	.21	.20	.84	.79	95.48	.05	.12	.17	.54	60H	Ø L105
L115	73.06	.63	.58	1.39	1.30	95.28	-.15	-.40	.27	.87	60B	Ø L115
L118	72.78	.35	.32	1.36	1.28	95.41	-.02	-.06	.32	1.04	60B	Ø L118
L121	72.48	.05	.05	1.46	1.37	94.83	-.60	-1.58	.33	1.05	60B	Ø L121
L122	71.25	-1.18	-1.08	1.04	.98	95.39	-.04	-.11	.25	.81	60D	Ø L122
L123	71.12	-1.31	-1.20	1.08	1.02	95.27	-.16	-.43	.53	1.69	60W	Ø L123
L124	73.45	1.02	.94	1.16	1.10	96.01	.58	1.51	.25	.80	60B	Ø L124
L125	72.11	-.32	-.29	.99	.93	95.14	-.29	-.77	.43	1.39	60H	Ø L125
L131	70.55	-1.88	-1.72	.78	.74	94.57	-.86	-2.25	.15	.48	60R	Ø L131
L132	71.59	-.84	-.77	1.52	1.44	95.36	-.07	-.19	.32	1.04	60B	Ø L132
L134	72.50	.07	.07	.71	.67	95.60	.17	.44	.52	1.67	60R	Ø L134
L139	71.87	-.56	-.51	1.36	1.28	95.08	-.35	-.92	.45	1.46	60B	Ø L139
L148H	72.10	-.33	-.30	.96	.90	95.21	-.22	-.58	.33	1.07	60H	Ø L148H
L150	73.65	1.22	1.12	.85	.80	95.95	.52	1.35	.28	.92	60B	Ø L150
L152	73.36	.93	.86	.81	.76	95.60	.17	.44	.16	.53	60B	Ø L152
L153	71.35	-1.08	-.98	1.29	1.22	95.50	.07	.17	.41	1.32	60B	Ø L153
L157	73.30	.87	.80	1.06	1.00	95.80	.37	.96	.26	.83	60B	Ø L157
L158	73.50	1.07	.98	.69	.65	95.82	.39	1.01	.36	1.18	60D	Ø L158
L159	71.67	-.76	-.69	.74	.70	95.67	.24	.62	.19	.63	60R	Ø L159
L162	71.52	-.91	-.83	1.35	1.27	95.61	.18	.46	.32	1.05	60W	Ø L162
L166	71.00	-1.43	-1.31	1.34	1.27	95.14	-.29	-.77	.22	.70	60B	Ø L166
L173A	71.74	-.69	-.63	1.35	1.27	95.39	-.04	-.11	.38	1.24	60B	Ø L173A
L206	72.49	.06	.06	.93	.88	95.46	.03	.07	.25	.82	60B	Ø L206
L210B	72.66	.23	.21	1.00	.94	95.33	-.10	-.27	.23	.75	60B	Ø L210B
L210D	73.38	.95	.87	1.40	1.32	95.72	.29	.75	.20	.64	60D	Ø L210D
L211S	72.53	.10	.10	1.19	1.12	95.28	-.15	-.40	.29	.95	60R	Ø L211S
L212	74.51	2.08	1.91	1.86	1.75	95.85	.42	1.09	.58	1.88	60B	Ø L212
L213	72.65	.22	.21	.79	.75	95.68	.25	.64	.24	.79	60B	Ø L213
L223B	72.81	.38	.35	.56	.53	95.49	.06	.15	.39	1.27	60B	Ø L223B
L225	72.35	-.08	-.07	.66	.62	95.75	.32	.83	.53	1.70	60B	Ø L225
L226B	71.31	-1.12	-1.02	1.03	.97	95.21	-.22	-.58	.45	1.45	60B	Ø L226B
L228	71.00	-1.43	-1.31	1.00	.94	95.14	-.29	-.77	.31	1.01	60H	Ø L228
L230	71.81	-.62	-.56	1.19	1.12	95.63	.20	.51	.38	1.23	60B	Ø L230
L236B	70.74	-1.69	-1.54	1.50	1.41	95.08	-.35	-.92	.38	1.22	60B	Ø L236B
L238A	70.46	-1.97	-1.80	.82	.77	94.66	-.77	-2.02	.29	.94	60R	Ø L238A
L241	72.05	-.38	-.34	1.22	1.15	95.19	-.24	-.64	.30	.97	60B	Ø L241
L243	71.35	-1.08	-.98	1.68	1.58	95.21	-.22	-.58	.24	.78	60B	Ø L243
L254	72.87	.44	.41	1.15	1.09	95.53	.10	.25	.21	.66	60H	Ø L254
L259	73.49	1.06	.97	.48	.45	95.89	.46	1.19	.19	.60	60B	Ø L259
L261	74.46	2.03	1.86	1.03	.97	96.08	.65	1.69	.20	.64	60B	Ø L261
L262	72.46	.03	.03	.64	.60	96.40	.97	2.53	.28	.91	60R	* L262
L275	71.46	-.97	-.88	.61	.58	95.40	-.03	-.09	.18	.59	60R	Ø L275
L278	73.09	.66	.61	.98	.92	95.47	.04	.10	.28	.90	60B	Ø L278
L281	72.83	.40	.37	.86	.81	95.43	-.00	-.01	.34	1.10	60D	Ø L281
L285D	72.17	-.26	-.23	.98	.93	94.92	-.51	-1.34	.39	1.26	60D	Ø L285D
L288	72.25	-.18	-.16	1.01	.95	95.49	.06	.15	.30	.98	60D	Ø L288
L301	72.71	.26	.26	1.06	.99	95.48	.05	.12	.29	.95	60B	Ø L301
L305	71.62	-.81	-.74	.60	.57	95.67	.24	.62	.14	.46	60R	Ø L305
L308	73.38	.95	.87	1.59	1.50	95.70	.27	.70	.36	1.17	60H	Ø L308
L317	72.24	-.15	-.17	.71	.67	95.03	-.40	-1.05	.37	1.18	60B	Ø L317
L318	73.20	.77	.71	1.25	1.18	95.25	-.18	-.48	.59	1.90	60B	Ø L318
L323	72.33	-.10	-.09	1.02	.96	95.51	.08	.20	.31	.99	60W	Ø L323
L326	73.98	1.55	1.42	1.10	1.04	95.42	-.01	-.03	.40	1.28	60B	Ø L326
L328	71.99	-.44	-.40	1.27	1.20	94.40	-1.03	-2.70	.84	2.72	60B	* L328
L339	72.00	-.43	-.39	.47	.44	96.00	.57	1.48	.00	.00	60B	Ø L339
L341	70.97	-1.46	-1.33	.78	.73	95.15	-.28	-.74	.25	.82	60R	Ø L341
L349	73.60	1.17	1.08	.84	.79	95.00	-.43	-1.13	.58	1.86	60D	Ø L349
L352	71.72	-.71	-.65	.76	.71	95.16	-.27	-.71	.07	.23	60R	Ø L352
L354	70.30	-2.13	-1.95	1.16	1.09	94.70	-.73	-1.92	.48	1.56	60B	Ø L354
L390	72.92	.45	.45	1.16	1.09	95.34	-.09	-.24	.27	.86	60B	Ø L390
L396	74.50	2.07	1.90	1.08	1.02	95.80	.37	.96	.42	1.36	60B	Ø L396
L523	72.61	.18	.17	.93	.88	95.64	.21	.54	.20	.65	60R	Ø L523
L567	75.65	3.22	2.95	.85	.80	96.44	1.01	2.63	.30	.98	60D	* L567
L571	73.12	.69	.64	1.56	1.47	95.63	.20	.51	.31	1.00	60D	Ø L571
L573	72.75	.32	.30	1.09	1.03	95.60	.17	.44	.19	.61	60H	Ø L573

OPACITY (89% REFLECTANCE BACKING) IN PERCENT
TAPPI STANDARD T425 GS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	SAMPLE B21 MEAN	SEMI BLEACHED 65 GRAMS PER SQUARE METER				SAMPLE K24 MEAN	PRINTING 103 GRAMS PER SQUARE METER				TEST D. = 10		
		DEV	N.DEV	SDR	R ₀ SDR		DEV	N.DEV	SDR	R ₀ SDR	VAR	F	LAB
L581	72.65	.22	.21	1.47	1.38	95.35	-.08	-.22	.14	.44	60B	Ø	L581
L592	71.24	-1.19	-1.09	1.27	1.19	94.95	-.48	-1.26	.40	1.30	60W	Ø	L592
L594	75.02	2.55	2.38	.62	.58	95.52	.09	.23	.26	.83	60D	*	L594
L597	71.00	-1.43	-1.31	1.33	1.25	95.40	-.03	-.09	.70	2.26	60B	Ø	L597
L599	74.40	1.97	1.81	.66	.62	95.70	.27	.70	.35	1.13	60B	Ø	L599
L673R	72.89	.46	.43	1.41	1.33	95.45	.02	.04	.21	.67	60B	Ø	L673R
L673T	71.90	-.53	-.48	.71	.67	95.67	.24	.62	.19	.61	60B	Ø	L673T
L688	72.16	-.27	-.24	.66	.62	96.04	.61	1.58	.28	.89	60B	Ø	L688
L692	71.89	-.54	-.49	1.18	1.11	95.25	-.18	-.48	.14	.46	60D	Ø	L692
L698	71.40	-1.03	-.94	1.47	1.38	94.84	-.59	-1.55	.30	.96	60D	Ø	L698

GR. MEAN = 72.43 PERCENT
SD MEANS = 1.09 PERCENT

GRAND MEAN = 95.43 PERCENT
SD OF MEANS = .38 PERCENT

TEST DETERMINATIONS = 10
75 LABS IN GRAND MEANS

AVERAGE SDR = 1.06 PERCENT

AVERAGE SDR = .31 PERCENT

L100	72.91	.48	.44	.70	.66	95.59	.16	.41	.23	.74	60E	*	L100
L232	71.50	-.93	-.85	.53	.50	95.50	.07	.17	.24	.76	60P	*	L232
L249	73.66	1.23	1.13	.99	.93	95.43	-.00	-.01	.28	.89	60P	*	L249
L256	70.54	-1.89	-1.73	1.14	1.07	94.72	-.71	-1.86	.40	1.30	60N	*	L256
L260	72.00	-.43	-.39	.41	.38	95.65	.22	.57	.24	.78	60P	*	L260
L277	28.90	-43.53	-39.86	.99	.94	4.90	-90.53	-236.46	.57	1.83	60P	*	L277
L312	69.70	-2.73	-2.50	.86	.81	94.70	-.73	-1.92	.42	1.36	60P	*	L312
L685B	71.17	-1.26	-1.15	.96	.90	95.48	.05	.12	.32	1.03	60P	*	L685B
L687	70.82	-1.61	-1.47	.52	.49	95.94	.51	1.32	.37	1.21	60P	*	L687

TOTAL NUMBER OF LABORATORIES REPORTING = 84

Best values: B21 72.4 ± 1.9 percent
K24 95.4 ± 0.6 percent

ANALYSIS T60-1 TABLE 2
 OPACITY (89% REFLECTANCE BACKING) IN PERCENT
 TAPPI STANDARD T425 6S-75, OPACITY OF PAPER (15 DEG./DIPFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	F	MEANS		COORDINATES		AVG	PROPERTY---TEST INSTRUMENT---CONDITIONS		
		B21	K24	MAJOR	MINOR	R, SDR VAR			
L277	*	28.90	4.90	-62.35	-72.76	1.38 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L312	*	69.70	94.70	-2.82	-.12	1.08 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L354	Ø	70.30	94.70	-2.23	-.25	1.32 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L238A	Ø	70.46	94.66	-2.09	-.32	.85 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L256	*	70.54	94.72	-2.00	-.28	1.18 60N	OPACITY (WHITE BACKING),	HUNTER	
L131	Ø	70.55	94.57	-2.02	-.43	.61 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L236B	Ø	70.74	95.08	-1.72	.03	1.32 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L687	*	70.82	95.94	-1.45	.25	.85 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L341	Ø	70.97	95.15	-1.48	.04	.78 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L228	Ø	71.00	95.14	-1.46	.03	.58 60H	OPACITY (WHITE BACKING),	HUYGEN	
L166	Ø	71.00	95.14	-1.46	.03	.98 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L597	Ø	71.00	95.40	-1.40	.28	1.76 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L123	Ø	71.12	95.27	-1.31	.13	1.36 60W	OPACITY (WHITE BACKING),	HUYGEN, DIGITAL	
L685B	*	71.17	95.48	-1.21	.32	.97 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L592	Ø	71.24	94.95	-1.26	-.21	1.25 60W	OPACITY (WHITE BACKING),	HUYGEN, DIGITAL	
L122	Ø	71.25	95.39	-1.16	.22	.90 60D	OPACITY (WHITE BACKING),	BNL-2	
L226B	Ø	71.31	95.21	-1.14	.03	1.21 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L153	Ø	71.35	95.50	-1.03	.30	1.27 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L243	Ø	71.35	95.21	-1.10	.02	1.18 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L698	Ø	71.40	94.84	-1.13	-.35	1.17 60D	OPACITY (WHITE BACKING),	BNL-2	
L275	Ø	71.46	95.40	-.95	.18	.58 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L232	*	71.50	95.50	-.89	.27	.63 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L162	Ø	71.52	95.61	-.84	.37	1.16 60W	OPACITY (WHITE BACKING),	BUYGEN, DIGITAL	
L132	Ø	71.59	95.36	-.83	.11	1.24 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L305	Ø	71.62	95.67	-.73	.41	.51 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L159	Ø	71.67	95.67	-.68	.40	.66 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L352	Ø	71.72	95.16	-.75	-.11	.47 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L173A	Ø	71.74	95.39	-.68	.11	1.25 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L230	Ø	71.81	95.63	-.56	.33	1.18 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L139	Ø	71.87	95.08	-.62	-.22	1.37 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L692	Ø	71.89	95.25	-.56	-.06	.79 60D	OPACITY (WHITE BACKING),	BNL-2	
L673T	Ø	71.90	95.67	-.46	.35	.64 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L328	*	71.99	94.40	-.65	-.91	1.96 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L260	*	72.00	95.65	-.37	.30	.58 60P	OPACITY (WHITE BACKING),	PHOTOVOLT	
L339	Ø	72.00	96.00	-.29	.65	.22 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L241	Ø	72.05	95.19	-.42	-.15	1.06 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L148H	Ø	72.10	95.21	-.37	.15	.99 60H	OPACITY (WHITE BACKING),	BUYGEN	
L125	Ø	72.11	95.14	-.37	-.22	1.16 60H	OPACITY (WHITE BACKING),	HUYGEN	
L688	Ø	72.16	96.04	-.13	.65	.75 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L285D	Ø	72.17	94.92	-.36	-.44	1.09 60D	OPACITY (WHITE BACKING),	BNL-2	
L317	Ø	72.24	95.03	-.27	-.35	.93 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L288	Ø	72.25	95.49	-.16	.09	.57 60D	OPACITY (WHITE BACKING),	BNL-2	
L323	Ø	72.33	95.51	-.08	.10	.97 60W	OPACITY (WHITE BACKING),	HUYGEN, DIGITAL	
L225	Ø	72.35	95.75	-.00	.33	1.16 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L262	*	72.46	96.40	.25	.94	.76 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L121	Ø	72.48	94.83	-.08	-.60	1.21 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L206	Ø	72.49	95.46	.07	.01	.85 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L134	Ø	72.50	95.60	.11	.15	1.17 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L211S	Ø	72.53	95.28	.07	-.17	1.03 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L523	Ø	72.61	95.64	.23	.16	.76 60R	OPACITY (WHITE BACKING),	THWING-ALBERT (FORMERLY SRL)	
L105	Ø	72.64	95.48	.22	-.00	.67 60H	OPACITY (WHITE BACKING),	HUYGEN	
L213	Ø	72.65	95.68	.27	.19	.77 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L581	Ø	72.65	95.35	.20	-.13	.91 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L210B	Ø	72.66	95.33	.21	-.15	.84 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L301	Ø	72.71	95.48	.29	-.02	.97 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L573	Ø	72.75	95.60	.35	.09	.82 60B	OPACITY (WHITE BACKING),	BUYGEN	
L118	Ø	72.78	95.41	.34	-.10	1.16 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L223B	Ø	72.81	95.49	.39	-.03	.90 60D	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L281	Ø	72.83	95.43	.39	-.09	.95 60B	OPACITY (WHITE BACKING),	BNL-2	
L254	Ø	72.87	95.53	.45	-.00	.88 60H	OPACITY (WHITE BACKING),	BUYGEN	
L673R	Ø	72.89	95.45	.46	-.09	1.00 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L100	*	72.91	95.59	.51	.05	.70 60E	OPACITY (WHITE BACKING),	ZEISS ELREPBØ, FMY-C(10) FILTER	
L390	Ø	72.92	95.34	.46	-.20	.98 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L115	Ø	73.06	95.28	.59	-.29	1.09 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	
L278	Ø	73.09	95.47	.66	-.11	.91 60B	OPACITY (WHITE BACKING),	BAUSCH * LOMB	

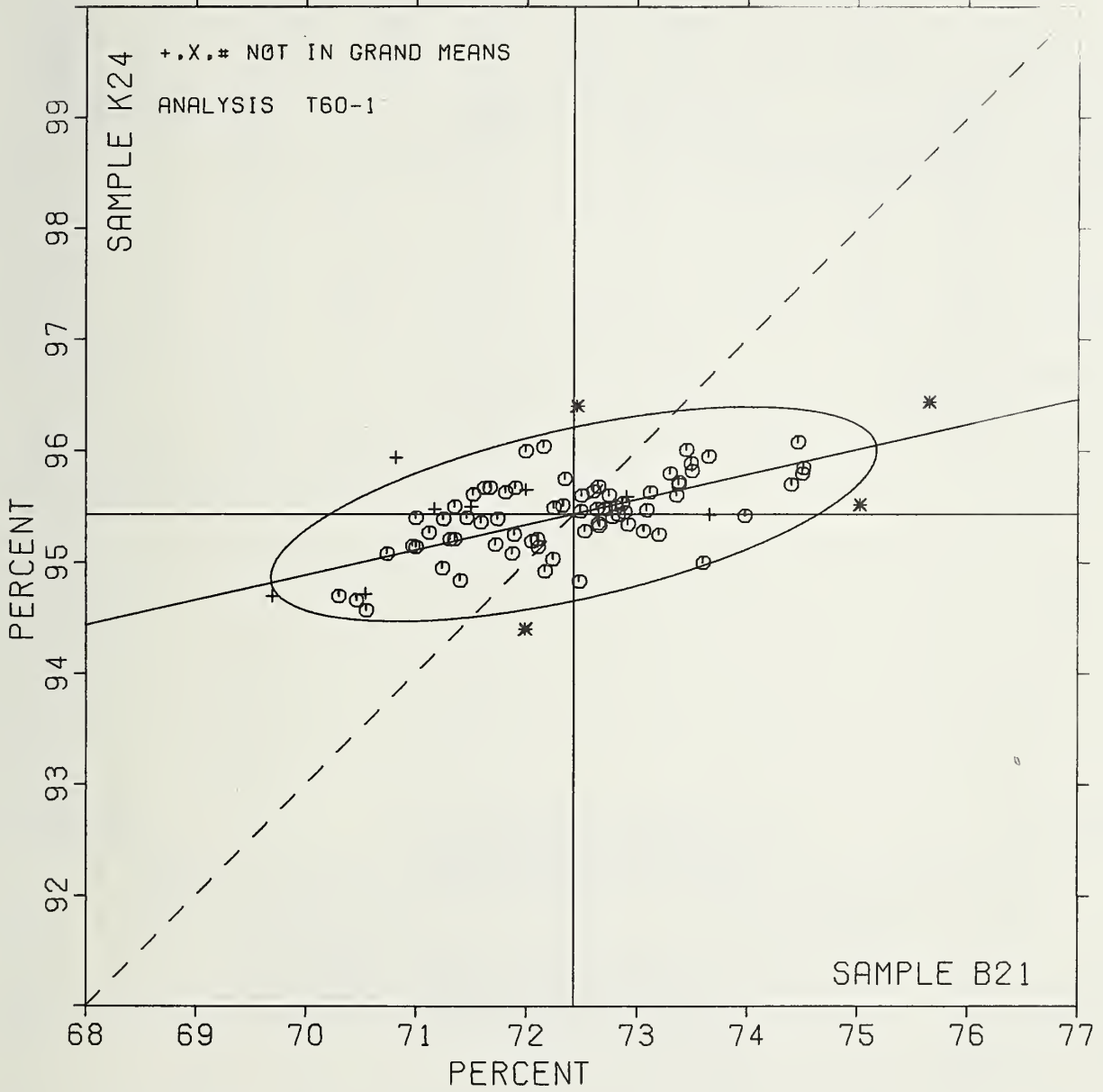
OPACITY (89% REFLECTANCE BACKING) IN PERCENT
TAPPI STANDARD T425 GS-75, OPACITY OF PAPER (15 DEG./DIFFUSE, ILLUMINANT A) - B&L TYPE

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		B21	K24	MAJOR	MINOR	R.SDR	VAR	
L571	Ø	73.12	95.63	.72	.04	1.23	60D	OPACITY (WHITE BACKING), BNL-2
L318	Ø	73.20	95.25	.72	-.35	1.54	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L157	Ø	73.30	95.80	.93	.17	.92	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L152	Ø	73.36	95.60	.95	-.04	.64	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L308	Ø	73.38	95.70	.99	.05	1.33	60H	OPACITY (WHITE BACKING), HUYGEN
L210D	Ø	73.38	95.72	.99	.07	.98	60D	OPACITY (WHITE BACKING), BNL-2
L124	Ø	73.45	96.01	1.13	.34	.95	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L259	Ø	73.49	95.89	1.14	.21	.52	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L158	Ø	73.50	95.82	1.13	.14	.91	60D	OPACITY (WHITE BACKING), BNL-2
L349	Ø	73.60	95.00	1.05	-.68	1.33	60D	OPACITY (WHITE BACKING), BNL-2
L150	Ø	73.65	95.95	1.31	.24	.86	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L249	*	73.66	95.43	1.20	-.27	.91	60P	OPACITY (WHITE BACKING), PHOTOVOLT
L326	Ø	73.98	95.42	1.51	-.35	1.16	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L599	Ø	74.40	95.70	1.98	-.17	.87	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L271	Ø	74.46	96.08	2.13	.18	.81	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L396	Ø	74.50	95.80	2.10	-.10	1.19	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L212	Ø	74.51	95.85	2.13	-.05	1.81	60B	OPACITY (WHITE BACKING), BAUSCH * LOMB
L594	*	75.02	95.52	2.55	-.49	.71	60D	OPACITY (WHITE BACKING), BNL-2
L567	*	75.65	96.44	3.37	.27	.89	60D	OPACITY (WHITE BACKING), BNL-2
GMEANS:		72.43	95.43			1.00		
		95% ELLIPSE:		2.81	.76			WITH GAMMA = 12 DEGREES

OPACITY, B&L TYPE, 89% BACKING

SAMPLE B21 = 72.4 PERCENT

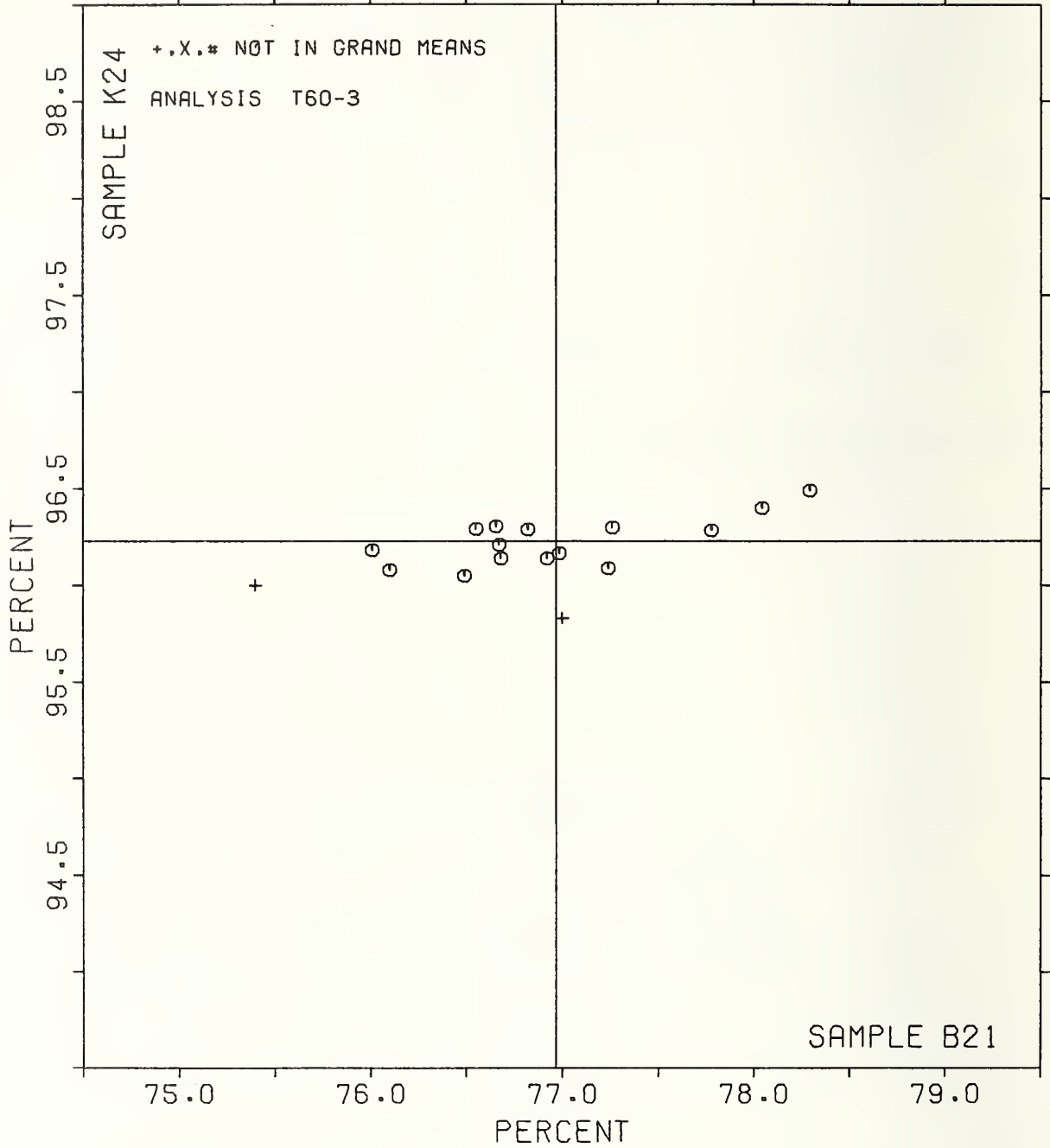
SAMPLE K24 = 95.4 PERCENT



OPACITY, ELREPHØ TYPE, PAPER BACKING

SAMPLE B21 = 76.97 PERCENT

SAMPLE K24 = 96.23 PERCENT



DIRECTIONAL BLUE REFLECTANCE IN PERCENT
TAPPI STANDARD T452 GS-77, 'BRIGHTNESS': MARTIN SWEETS (ACBT & GE) IS STANDARD FOR THIS ANALYSIS

LAB CODE	PRINTING 73 GRAMS PER SQUARE METER					PRINTING 116 GRAMS PER SQUARE METER					TEST D. # 8		
	J79 MEAN	DEV	N.DEV	SDR	R.SDR	E79 MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L122	67.90	.04	.10	.13	.59	95.61	-.17	-.18	.06	.56	65N	Ø	L122
L132	68.09	.23	.57	.17	.78	96.01	.23	.23	.06	.56	65N	Ø	L132
L158	68.50	.64	1.61	.29	1.33	97.21	1.43	1.45	.14	1.19	65N	Ø	L158
L176A	67.12	-.73	-1.84	.28	1.25	94.69	-1.10	-1.11	.04	.31	65A	Ø	L176A
L190C	67.91	.05	.14	.14	.62	95.80	.01	.01	.14	1.24	65A	Ø	L190C
L210M	67.76	-.10	-.24	.29	1.33	95.64	-.15	-.15	.21	1.81	65M	Ø	L210M
L210N	67.86	.60	.01	.15	.68	96.44	.65	.66	.13	1.14	65N	Ø	L210N
L211	68.20	.34	.86	.13	.59	93.59	-2.20	-2.23	.50	4.38	65N	*	L211
L225	67.94	.08	.20	.35	1.57	96.14	.35	.36	.43	3.74	65N	Ø	L225
L243	67.92	.07	.17	.15	.67	95.92	.14	.14	.09	.78	65A	Ø	L243
L259	67.92	.07	.17	.16	.72	95.76	-.02	-.02	.05	.45	65M	Ø	L259
L275	68.56	.70	1.77	.16	.72	96.40	.61	.62	.11	.94	65M	Ø	L275
L285	66.76	-1.10	-2.75	.38	1.71	93.09	-2.70	-2.74	.20	1.72	65N	*	L285
L288	67.67	-.18	-.46	.10	.47	95.60	-.19	-.19	.05	.47	65N	Ø	L288
L308	68.04	.18	.45	.13	.59	96.37	.59	.60	.09	.78	65N	Ø	L308
L317	67.75	-.11	-.27	.14	.64	95.24	-.55	-.56	.19	1.68	65M	Ø	L317
L523	68.01	.15	.39	.10	.45	95.31	-.47	-.48	.06	.56	65N	Ø	L523
L565	68.10	.24	.61	.09	.42	95.96	.18	.18	.13	1.14	65A	Ø	L565
L598	67.42	-.43	-1.09	.55	2.48	96.41	.63	.64	.08	.73	65M	Ø	L598
L636	68.00	.14	.36	.61	2.75	97.00	1.21	1.23	.00	.00	65M	Ø	L636
L673R	67.51	-.35	-.87	.24	1.07	96.42	.64	.65	.10	.91	65N	Ø	L673R
L692	67.91	.05	.14	.19	.85	96.67	.89	.90	.12	1.02	65N	Ø	L692
GR. MEAN = 67.86 PERCENT	GRAND MEAN = 95.79 PERCENT					TEST DETERMINATIONS = 8							
SD MEANS = .40 PERCENT	SD OF MEANS = .99 PERCENT					22 LABS IN GRAND MEANS							
AVERAGE SDR = .22 PERCENT					AVERAGE SDR = .11 PERCENT								
L105	67.44	-.42	-1.06	.13	.59	97.77	1.99	2.02	.12	1.02	65T	*	L105
L213	68.17	.32	.79	.14	.63	97.06	1.28	1.29	.20	1.75	65T	*	L213
L223	68.54	.68	1.70	.11	.48	97.84	2.05	2.08	.11	.93	65G	*	L223
L232	65.50	1.64	4.12	.27	1.21	98.00	2.21	2.25	.00	.00	65P	*	L232
L241	68.14	.28	.70	.21	.97	96.44	.65	.66	.12	1.04	65I	*	L241
L249	69.12	1.27	3.18	.10	.47	95.97	.19	.19	.07	.62	65P	*	L249
L256	66.94	-.92	-2.31	.14	.64	98.05	2.26	2.30	.13	1.15	65H	*	L256
L260	68.31	.45	1.14	.36	1.65	96.64	.85	.86	.27	2.38	65P	*	L260
L277	75.00	7.14	17.92	.00	.00	93.00	-2.79	-2.83	.00	.00	65P	*	L277
L278	68.00	.14	.36	.00	.00	96.00	.21	.22	.00	.00	65P	*	L278
L301	68.19	.33	.83	.17	.78	97.36	1.58	1.60	.07	.65	65G	*	L301
L312	70.12	2.27	5.69	.35	1.60	96.00	.21	.22	.00	.00	65P	*	L312
L321	70.44	2.58	6.47	.18	.80	99.00	3.21	3.26	.27	2.34	65P	*	L321
L328	70.00	2.14	5.37	.00	.00	95.22	-.56	-.57	.32	2.84	65P	*	L328
L339	70.39	2.53	6.35	.26	1.17	98.51	2.73	2.77	.18	1.58	65P	*	L339
L442	67.25	-.61	-1.53	.09	.42	97.45	1.66	1.69	.12	1.05	65T	*	L442
L562	74.00	6.14	15.41	.00	.00	95.50	-.29	-.29	.00	.00	65P	*	L562
L591	66.70	-1.16	-2.90	.09	.40	98.75	2.97	3.01	.12	1.08	65H	*	L591
L617	70.00	2.14	5.37	.20	.91	97.00	1.21	1.23	.11	.94	65G	*	L617
L626	70.06	2.20	5.53	.18	.80	96.25	.46	.47	.27	2.34	65P	*	L626
L684	67.16	-.70	-1.75	.24	1.08	92.16	-3.62	-3.68	.21	1.81	65H	*	L684
L695	70.06	2.20	5.53	.18	.80	99.69	3.90	3.96	.26	2.27	65P	*	L695
L698	67.84	-.02	-.05	.18	.80	96.70	.91	.93	.08	.66	65I	*	L698

TOTAL NUMBER OF LABORATORIES REPORTING = 45

Best values: J79 67.9 ± 0.7 percent
E79 95.9 ± 1.5 percent

ANALYSIS T65-1 TABLE 2

DIRECTIONAL BLUE REFLECTANCE IN PERCENT

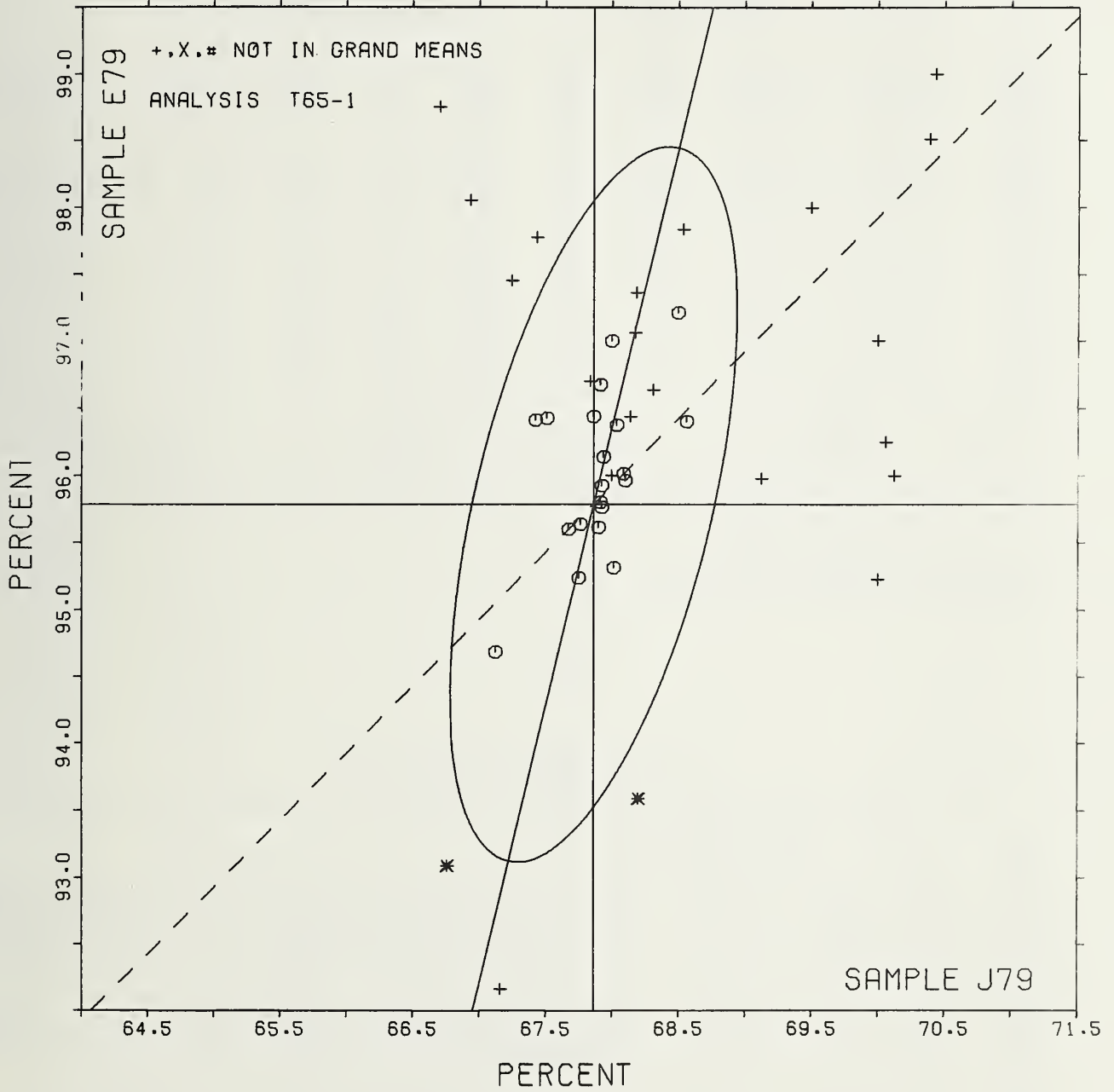
TAPPI STANDARD T452 6S-77, 'BRIGHTNESS'; MARTIN SWEETS (ACBT & GE) IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		J79	E79	MAJOR	MINOR	R ₀ SDR	VAR	
L591	*	66.70	98.75	2.61	1.82	.74	65B	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L285	*	66.76	93.09	-2.88	.44	1.71	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L256	*	66.94	98.05	1.99	1.42	.89	65H	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L176A	Ø	67.12	94.69	-1.24	.46	.78	65A	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (ACBT), S-2
L684	*	67.16	92.16	-3.69	-.17	1.45	65H	BLUE REFLECTANCE (DIRECTIONAL), HUNTER
L442	*	67.25	97.45	1.48	.98	.73	65T	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2M
L598	Ø	67.42	96.41	.51	.57	1.61	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L105	*	67.44	97.77	1.84	.87	.81	65T	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2M
L673R	Ø	67.51	96.42	.54	.49	.99	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L288	Ø	67.67	95.60	-.22	.13	.47	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L317	Ø	67.75	95.24	-.56	-.02	1.16	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L210M	Ø	67.76	95.64	-.17	.06	1.57	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L698	*	67.84	96.70	.88	.23	.73	65I	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2A
L210N	Ø	67.86	96.44	.63	.15	.91	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L122	Ø	67.90	95.61	-.16	-.08	.58	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L190C	Ø	67.91	95.80	.03	-.05	.93	65A	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (ACBT), S-2
L692	Ø	67.91	96.67	.88	.16	.94	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L259	Ø	67.92	95.76	-.01	-.07	.59	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L243	Ø	67.92	95.92	.15	-.03	.73	65A	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (ACBT), S-2
L225	Ø	67.94	96.14	.36	.01	2.66	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L636	Ø	68.00	97.00	1.21	.15	1.38	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L278	*	68.00	96.00	.24	-.09	.00	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L523	Ø	68.01	95.31	-.42	-.26	.51	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L308	Ø	68.04	96.37	.61	-.04	.68	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L132	Ø	68.09	96.01	.27	-.17	.67	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L565	Ø	68.10	95.96	.23	-.19	.78	65A	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (ACBT), S-2
L241	*	68.14	96.44	.70	-.12	1.00	65I	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2A
L213	*	68.17	97.06	1.31	-.01	1.19	65T	BLUE REFLECTANCE (DIRECTIONAL), HUNTER D25D2M
L301	*	68.19	97.36	1.61	.05	.72	65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L211	*	68.20	93.59	-2.06	-.85	2.49	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L260	*	68.31	96.64	.93	-.24	2.02	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L158	Ø	68.50	97.21	1.54	-.29	1.26	65N	BLUE REFLECTANCE (DIRECTIONAL), TECHNIDYNE/DIANG/M.S., S-4
L223	*	68.54	97.84	2.15	-.18	.70	65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L275	Ø	68.56	96.40	.76	-.54	.83	65M	BLUE REFLECTANCE (DIRECTIONAL), MARTIN SWEETS (GE), S-1
L249	*	69.12	95.97	.48	-1.19	.54	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L232	*	69.50	98.00	2.54	-1.08	.61	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L617	*	70.00	97.00	1.68	-1.80	.92	65G	BLUE REFLECTANCE (DIRECTIONAL), GARDNER
L328	*	70.00	95.22	-.05	-2.21	1.42	65F	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L695	*	70.06	99.69	4.31	-1.23	1.53	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L626	*	70.06	96.25	.97	-2.03	1.57	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L312	*	70.12	96.00	.74	-2.15	.80	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L339	*	70.39	98.51	3.24	-1.82	1.38	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L321	*	70.44	99.00	3.73	-1.76	1.57	65P	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L562	*	74.00	95.50	1.16	-6.04	.00	65F	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
L277	*	75.00	93.00	-1.04	-7.59	.00	65F	BLUE REFLECTANCE (DIRECTIONAL), PHOTOVOLT
GMEANS:		67.86	95.79			1.00		
		95% ELLIPSE:		2.74	.89	WITH GAMMA = 76 DEGREES		

BLUE REFLECTANCE, DIRECTIONAL

SAMPLE J79 = 67.9 PERCENT

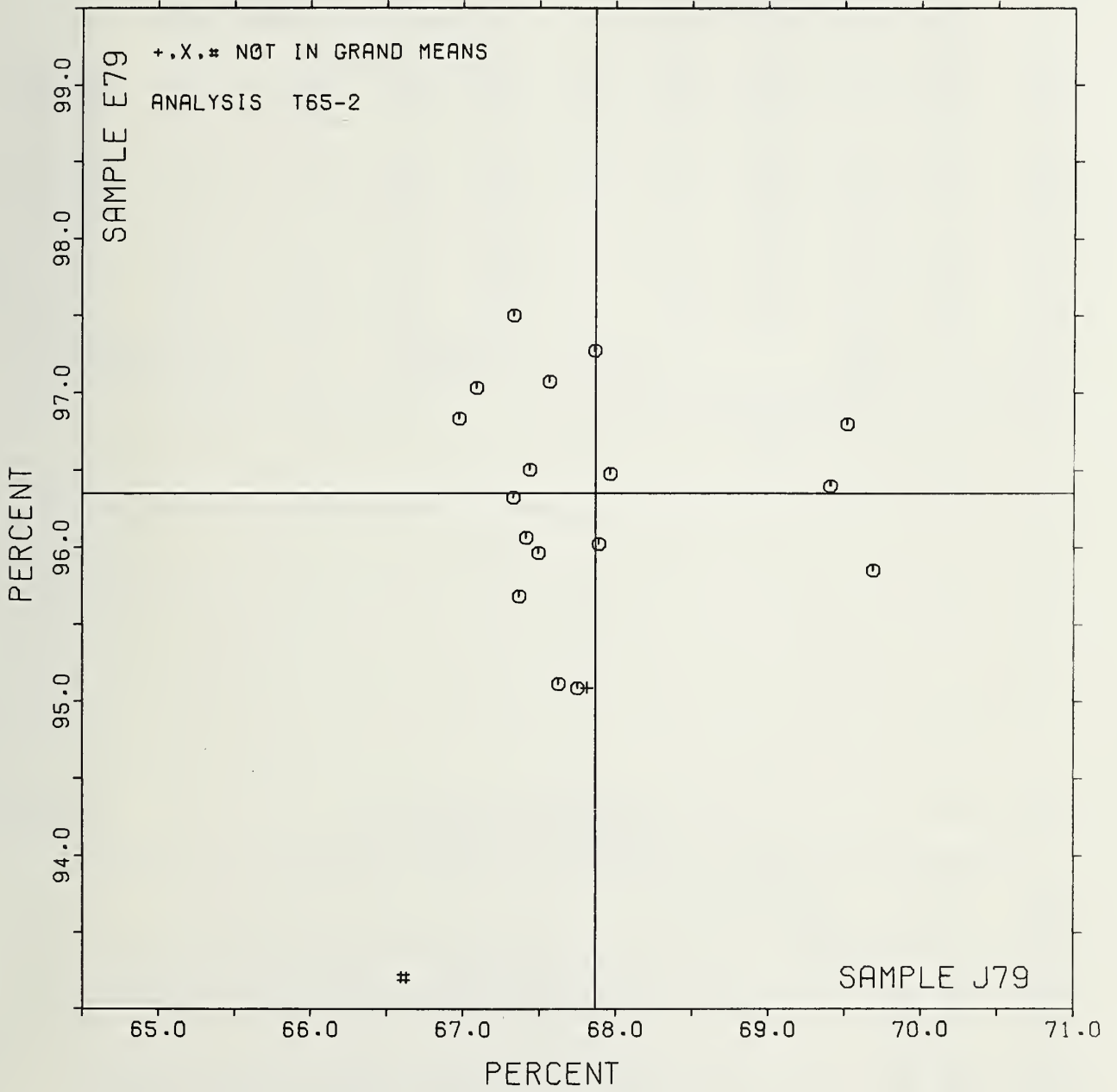
SAMPLE E79 = 95.8 PERCENT



BLUE REFLECTANCE, DIFFUSE, WITH TRAP

SAMPLE J79 = 67.9 PERCENT

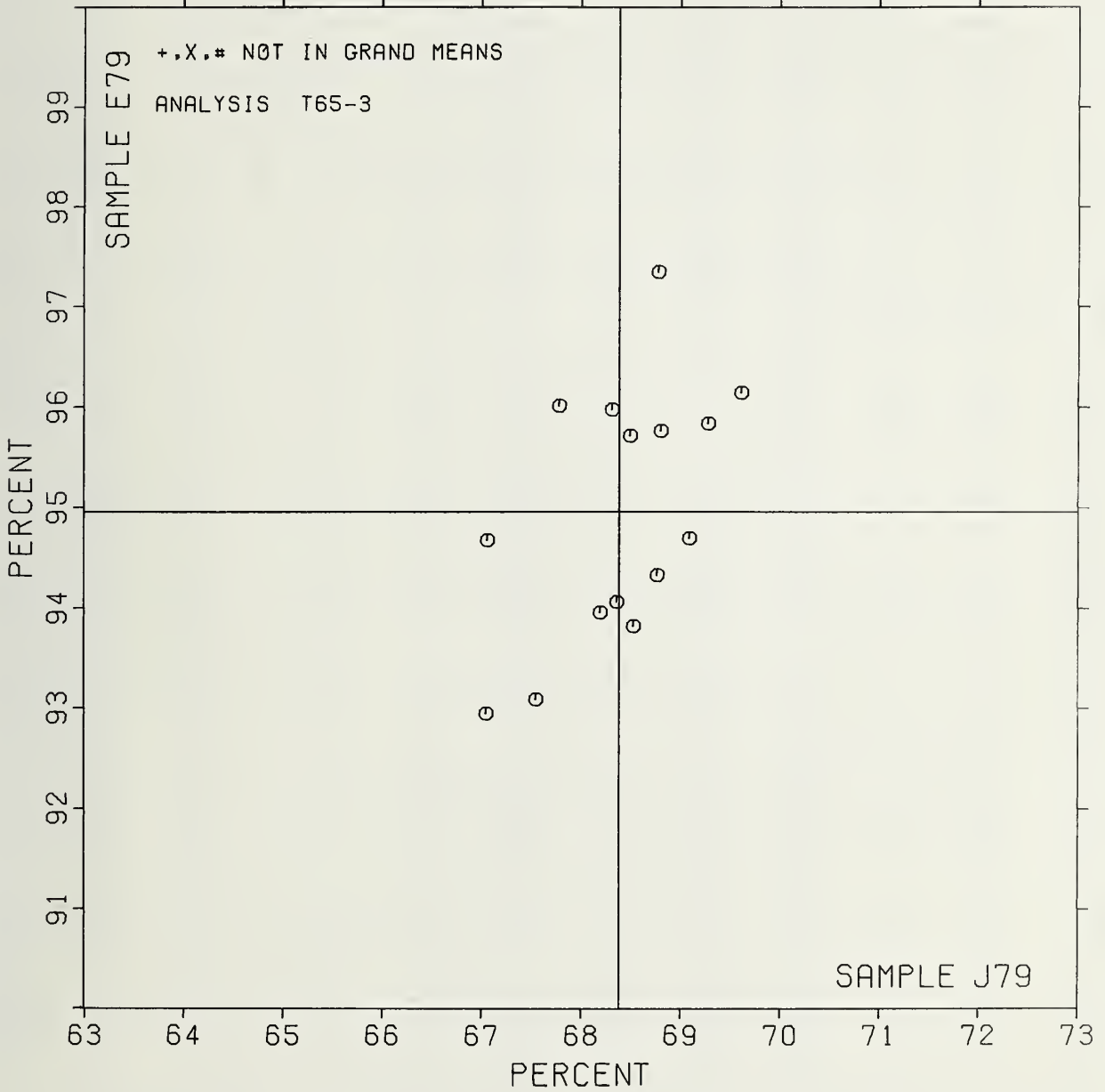
SAMPLE E79 = 96.4 PERCENT



BLUE REFLECTANCE, DIFFUSE, NO TRAP

SAMPLE J79 = 68.4 PERCENT

SAMPLE E79 = 95.0 PERCENT



ANALYSIS T75-1 TABLE 1
 SPECULAR GLOSS AT 75 DEGREES, IN GLOSS UNITS
 TAPPI STANDARD 1480 6S-78, SPECULAR GLOSS OF PAPER AND PAPERBOARD AT 75 DEGREES

LAB CODE	SAMPLE E51 MEAN	COATED BOOK 118 GRAMS PER SQUARE METER				R _s SDR	SAMPLE E91 MEAN	COATED PRINTING 167 GRAMS PER SQUARE METER				TEST D _o = 10		
		DEV	N _o DEV	SDR	R _s SDR			DEV	N _o DEV	SDR	R _s SDR	VAR	F	LAB
L121	67.05	-0.99	-0.49	1.19	1.15	47.88	-1.92	-1.04	.54	.63	75H	Ø	L121	
L122	67.49	-0.55	-0.27	.83	.80	49.39	-0.41	-0.22	.77	.89	75H	Ø	L122	
L128	66.40	-1.64	-0.81	1.07	1.03	51.70	1.90	1.03	1.06	1.22	75G	*	L128	
L134	70.00	1.96	.96	1.15	1.11	50.50	.70	.38	1.08	1.24	75H	Ø	L134	
L149	77.60	9.56	4.69	1.26	1.22	62.70	12.90	7.02	1.16	1.34	75G	#	L149	
L153	72.35	4.31	2.11	1.53	1.47	52.95	3.15	1.71	.60	.69	75G	Ø	L153	
L162	72.48	4.44	2.18	1.74	1.67	53.48	3.68	2.00	.81	.93	75G	Ø	L162	
L173A	63.90	-4.14	-2.03	.57	.55	46.00	-3.80	-2.07	.67	.77	75G	Ø	L173A	
L182	67.63	-0.41	-0.20	.81	.78	48.86	-0.94	-0.51	.69	.80	75H	Ø	L182	
L189	66.00	-2.04	-1.00	1.03	.99	50.95	1.15	.63	.55	.63	75P	Ø	L189	
L190C	66.06	-1.98	-0.97	1.17	1.13	48.04	-1.76	-0.96	1.14	1.31	75G	Ø	L190C	
L206	68.14	.10	.05	.80	.77	49.19	-0.61	-0.33	.98	1.13	75H	Ø	L206	
L210	72.26	4.22	2.07	.96	.92	52.69	2.89	1.57	1.03	1.18	75H	Ø	L210	
L211	66.96	-1.08	-0.53	.82	.78	49.66	-0.14	-0.08	1.37	1.58	75H	Ø	L211	
L212	66.80	-1.24	-0.61	1.32	1.27	52.00	2.20	1.20	.94	1.09	75P	Ø	L212	
L213	67.83	-0.21	-0.10	.73	.70	49.35	-0.45	-0.24	.89	1.02	75H	Ø	L213	
L223	66.25	-1.79	-0.88	.95	.91	48.28	-1.52	-0.83	1.16	1.34	75H	Ø	L223	
L230	66.80	-1.24	-0.61	1.14	1.09	50.20	.40	.22	.92	1.06	75H	Ø	L230	
L243	69.50	1.46	.72	1.51	1.45	50.00	.20	.11	.82	.94	75B	Ø	L243	
L253P	70.45	2.41	1.18	.98	.95	50.09	.29	.16	1.06	1.22	75G	Ø	L253P	
L255	68.70	.66	.32	.82	.79	50.50	.70	.38	.53	.61	75G	Ø	L255	
L256	68.05	.01	.00	.83	.80	49.67	-0.13	-0.07	.57	.66	75H	Ø	L256	
L259	70.61	2.57	1.26	1.36	1.31	51.69	1.89	1.03	1.19	1.37	75H	Ø	L259	
L262	68.20	.16	.08	.63	.61	50.10	.30	.16	1.10	1.27	75K	Ø	L262	
L277A	71.76	3.72	1.82	1.60	1.54	52.38	2.58	1.40	.79	.91	75H	Ø	L277A	
L277B	71.90	3.86	1.89	.83	.80	53.20	3.40	1.85	.78	.90	75H	Ø	L277B	
L278	66.18	-1.86	-0.91	1.10	1.06	48.86	-0.94	-0.51	.55	.63	75G	Ø	L278	
L279	67.40	-0.64	-0.31	1.78	1.71	49.20	-0.60	-0.33	1.11	1.28	75G	Ø	L279	
L291	68.21	.17	.08	1.07	1.03	49.97	.17	.09	.99	1.14	75H	Ø	L291	
L301	68.38	.34	.17	.61	.59	49.74	-0.06	-0.03	.97	1.12	75H	Ø	L301	
L317	68.90	.86	.42	.88	.84	49.80	.00	.00	1.32	1.52	75H	Ø	L317	
L321	71.35	3.31	1.62	.24	.23	50.85	1.05	.57	.71	.82	75G	Ø	L321	
L323	67.77	-0.27	-0.13	1.19	1.15	48.80	-1.00	-0.54	.71	.82	75H	Ø	L323	
L328	67.77	-0.27	-0.13	1.03	.99	49.91	.11	.06	.82	.94	75H	Ø	L328	
L339	67.80	-0.24	-0.12	.42	.41	53.00	3.20	1.74	.00	.00	75P	*	L339	
L349	66.88	-1.16	-0.57	.99	.95	45.65	-4.15	-2.26	.91	1.05	75H	*	L349	
L372	67.80	-0.24	-0.12	.48	.46	50.08	.28	.15	.58	.66	75B	Ø	L372	
L388	60.15	-7.89	-3.87	1.03	.99	48.25	-1.55	-0.84	1.57	1.81	75P	#	L388	
L396	63.65	-4.39	-2.15	3.06	2.94	50.95	1.15	.63	1.67	1.93	75G	X	L396	
L456	67.02	-1.02	-0.50	1.24	1.19	48.03	-1.77	-0.96	.79	.91	75H	Ø	L456	
L483	67.36	-0.68	-0.33	1.21	1.16	48.69	-1.11	-0.60	.58	.67	75H	Ø	L483	
L573	65.80	-2.24	-1.10	1.40	1.34	49.70	-0.10	-0.05	.82	.95	75G	Ø	L573	
L574	65.00	-3.04	-1.49	1.15	1.11	46.90	-2.90	-1.58	.57	.65	75G	Ø	L574	
L583	68.92	.88	.43	.57	.55	51.01	1.21	.66	1.38	1.59	75H	Ø	L583	
L592	65.64	-2.40	-1.18	1.29	1.24	47.08	-2.72	-1.46	1.00	1.22	75H	Ø	L592	
L598	65.78	-2.26	-1.11	1.56	1.50	48.08	-1.72	-0.94	.88	1.01	75H	Ø	L598	
L643	67.25	-0.79	-0.39	.87	.83	49.75	-0.05	-0.03	.65	.75	75H	Ø	L643	
L668	66.15	-1.89	-0.93	1.14	1.09	47.49	-2.31	-1.26	.79	.91	75G	Ø	L668	
L670	69.28	1.24	.61	1.02	.98	51.12	1.32	.72	.96	1.11	75H	Ø	L670	
L688	67.74	-0.30	-0.15	.66	.64	48.10	-1.70	-0.92	.98	1.13	75G	Ø	L688	

GR. MEAN = 68.04 GLOSS UNITS GRAND MEAN = 49.80 GLOSS UNITS TEST DETERMINATIONS = 10
 SD MEANS = 2.04 GLOSS UNITS SD OF MEANS = 1.84 GLOSS UNITS 47 LABS IN GRAND MEANS
 AVERAGE SDR = 1.04 GLOSS UNITS AVERAGE SDR = .87 GLOSS UNITS

L250	58.30	-9.74	-4.78	2.54	2.44	45.40	-4.40	-2.39	.84	.97	75Q	*	L250
L288	68.45	.41	.20	.91	.87	49.71	-0.09	-0.05	.83	.96	75I	*	L288
L697	66.79	-1.25	-0.61	1.24	1.19	47.43	-2.37	-1.29	.56	.65	75X	*	L697

TOTAL NUMBER OF LABORATORIES REPORTING = 53

Best values: E51 68 ± 4 gloss units
 E91 50 ± 3 gloss units

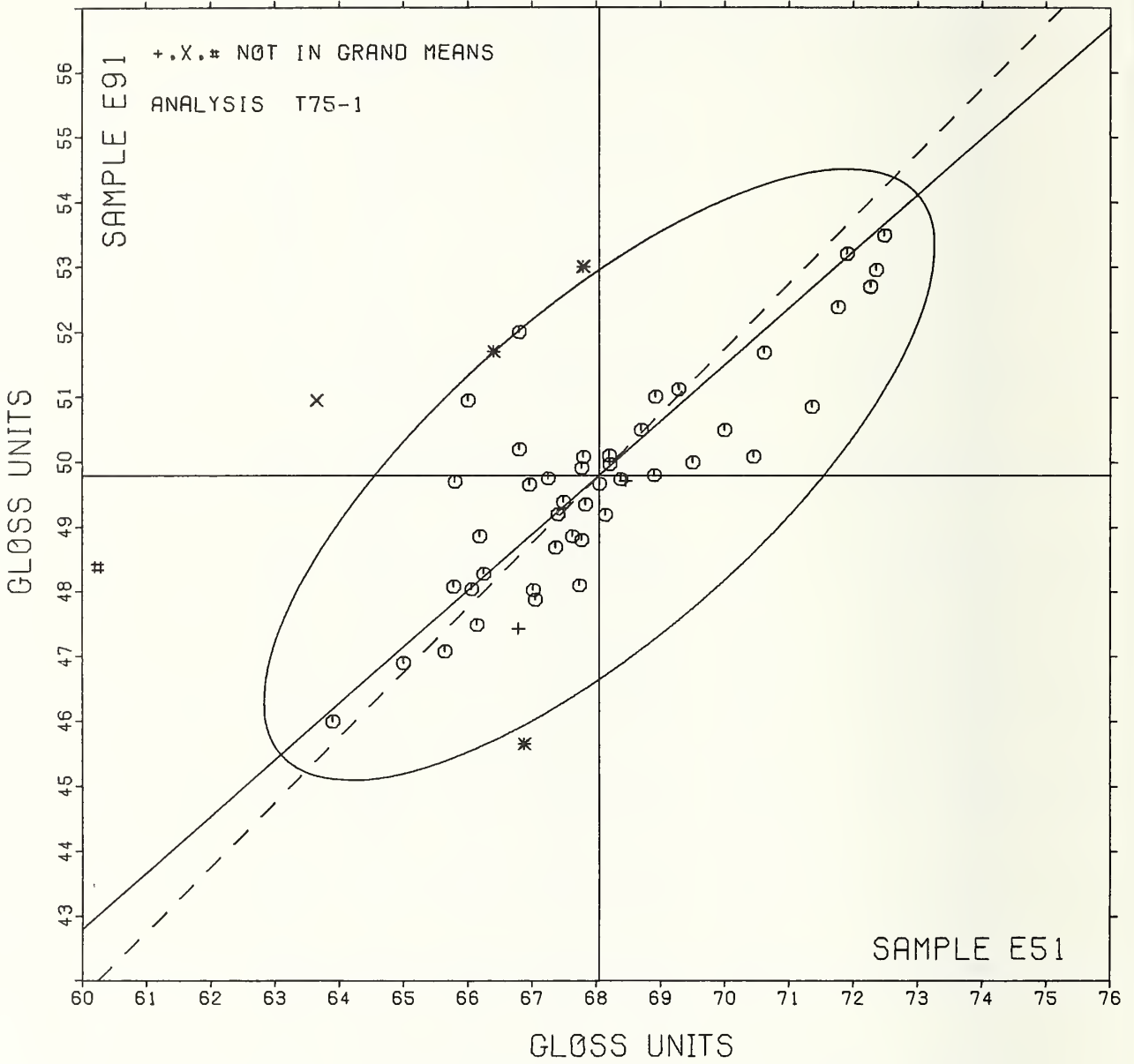
The following laboratories were omitted from the grand means because of extreme test results: 149, 388.

ANALYSIS T75-1 TABLE 2
 SPECULAR GLOSS AT 75 DEGREES, IN GLOSS UNITS
 TAPPI STANDARD T480 6S-78, SPECULAR GLOSS OF PAPER AND PAPERBOARD AT 75 DEGREES

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		E51	E91	MAJOR	MINOR	R _s SDR	VAR	
L250	*	58.30	45.40	-10.24	3.08	1.71	75Q	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT, 20 C, 65% RH
L388	#	60.15	48.25	-6.57	4.01	1.40	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L396	X	63.65	50.95	-2.56	3.75	2.43	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L173A	Ø	63.90	46.00	-5.62	-1.15	.66	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L574	Ø	65.00	46.90	-4.20	-.19	.88	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L592	Ø	65.64	47.08	-3.60	-.47	1.23	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L598	Ø	65.78	48.08	-2.83	.19	1.25	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L573	Ø	65.80	49.70	-1.76	1.40	1.15	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L189	Ø	66.00	50.95	-.76	2.21	.81	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L190C	Ø	66.06	48.04	-2.65	-.03	1.22	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L668	Ø	66.15	47.49	-2.94	-.50	1.00	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L278	Ø	66.18	48.66	-2.02	.51	.84	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L223	Ø	66.25	48.28	-2.35	.03	1.12	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L128	*	66.40	51.70	.01	2.51	1.13	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L697	*	66.79	47.43	-2.50	-.97	.92	75X	SPECULAR GLOSS (75 DEGREE): GIVE INSTRUMENT MAKE * MODEL
L212	Ø	66.80	52.00	.51	2.48	1.18	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L230	Ø	66.80	50.20	-.67	1.12	1.07	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L349	*	66.88	45.65	-3.60	-2.37	1.00	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L211	Ø	66.96	49.66	-.91	.61	1.18	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L456	Ø	67.02	48.03	-1.93	-.66	1.05	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L121	Ø	67.05	47.88	-2.01	-.80	.89	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L643	Ø	67.25	49.75	-.63	.48	.79	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L483	Ø	67.36	48.69	-1.24	-.39	.92	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L279	Ø	67.40	49.20	-.88	-.03	1.49	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L122	Ø	67.49	49.39	-.68	.05	.84	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L182	Ø	67.63	48.86	-.93	-.44	.79	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L688	Ø	67.74	48.10	-1.34	-1.08	.88	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L328	Ø	67.77	49.91	-.13	.26	.97	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L323	Ø	67.77	48.80	-.86	-.58	.99	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L372	Ø	67.80	50.08	.00	.37	.56	75B	SPECULAR GLOSS (75 DEGREE), BAUSCH * LOMB
L339	*	67.80	53.00	1.92	2.57	.20	75P	SPECULAR GLOSS (75 DEGREE), PHOTOVOLT
L213	Ø	67.83	49.35	-.45	-.20	.86	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L256	Ø	68.05	45.67	-.08	-.10	.73	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L206	Ø	68.14	45.19	-.33	-.52	.95	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L262	Ø	68.20	50.10	.32	.12	.94	75K	SPECULAR GLOSS (75 DEGREE), GAERTNER (K-C TYPE)
L291	Ø	68.21	49.97	.24	.02	1.08	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L301	Ø	68.38	49.74	.22	-.27	.85	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L288	*	68.45	49.71	.25	-.34	.92	75I	SPECULAR GLOSS (75 DEGREE), HUNTER, 20 C, 65% RH
L255	Ø	68.70	50.50	.96	.10	.70	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L317	Ø	68.90	45.80	.65	-.56	1.18	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L583	Ø	68.92	51.01	1.46	.34	1.07	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L670	Ø	69.28	51.12	1.80	.18	1.04	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L243	Ø	69.50	50.00	1.23	-.81	1.20	75B	SPECULAR GLOSS (75 DEGREE), BAUSCH * LOMB
L134	Ø	70.00	50.50	1.94	-.76	1.18	75K	SPECULAR GLOSS (75 DEGREE), HUNTER
L253P	Ø	70.45	50.09	2.01	-1.36	1.08	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L259	Ø	70.61	51.69	3.18	-.26	1.34	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L321	Ø	71.35	50.85	3.19	-1.38	.52	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L277A	Ø	71.76	52.38	4.50	-.49	1.23	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L277B	Ø	71.90	53.20	5.14	.03	.85	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L210	Ø	72.26	52.69	5.08	-.59	1.05	75H	SPECULAR GLOSS (75 DEGREE), HUNTER
L153	Ø	72.35	52.95	5.32	-.45	1.08	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L162	Ø	72.48	53.48	5.76	-.14	1.30	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
L149	#	77.60	62.70	15.68	3.46	1.28	75G	SPECULAR GLOSS (75 DEGREE), GARDNER
GMEANS:		68.04	49.80			1.00		
		95% ELLIPSE:		6.56	2.50	WITH GAMMA = 41 DEGREES		

SPECULAR GLOSS, 75 DEGREE

SAMPLE E51 = 68.0 GLOSS UNITS SAMPLE E91 = 49.8 GLOSS UNITS



TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS 190-1 TABLE 1
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 6S-76

LAB CODE	PRINTING					PRINTING					TEST D. = 10		
	J83 MEAN	73 GRAMS PER SQUARE METER DEV	N. DEV	SDR	R. SDR	J66 MEAN	93 GRAMS PER SQUARE METER DEV	N. DEV	SDR	R. SDR	VAR	F	LAB
L100	2.810	.098	1.42	.028	.70	6.451	.162	1.38	.040	.34	90V	Ø	L100
L105	2.771	.059	.85	.029	.73	6.438	.149	1.26	.100	.84	90Q	Ø	L105
L118	2.697	-.015	-.22	.037	.92	6.332	.043	.36	.127	1.06	90Q	Ø	L118
L122	2.760	.048	.69	.057	1.43	6.296	.007	.06	.126	1.06	90V	Ø	L122
L123F	2.865	.153	2.21	.034	.84	6.510	.221	1.88	.188	1.57	90F	Ø	L123F
L125	2.602	-.110	-1.60	.051	1.26	6.047	-.242	-2.06	.107	.89	90T	Ø	L125
L128	2.712	-.000	-.00	.029	.73	6.228	-.061	-.52	.095	.79	90T	Ø	L128
L141	2.686	-.026	-.38	.040	1.01	6.173	-.116	-.99	.124	1.04	90T	Ø	L141
L153	2.782	.070	1.01	.034	.84	6.144	-.145	-1.23	.099	.83	90T	*	L153
L158	2.710	-.002	-.03	.032	.79	6.390	.101	.86	.057	.47	90T	Ø	L158
L159	2.717	.005	.07	.023	.58	6.377	.088	.75	.093	.77	90T	Ø	L159
L162	2.680	-.032	-.47	.063	1.58	6.240	-.049	-.42	.143	1.19	90D	Ø	L162
L166	2.653	-.059	-.86	.032	.80	6.299	.010	.08	.078	.65	90T	Ø	L166
L173B	2.786	.074	1.07	.047	1.17	6.370	.081	.69	.086	.71	90F	Ø	L173B
L174	2.700	-.012	-.18	.047	1.18	6.280	-.009	-.08	.215	1.79	90T	Ø	L174
L182	2.723	.010	.15	.051	1.27	6.308	.019	.16	.109	.91	90L	Ø	L182
L183	2.744	.032	.46	.024	.60	6.425	.136	1.15	.071	.60	90T	Ø	L183
L190C	2.640	-.072	-1.05	.052	1.29	6.140	-.149	-1.27	.117	.98	90T	Ø	L190C
L203A	2.600	-.112	-1.62	.053	1.32	6.125	-.164	-1.39	.177	1.48	90T	Ø	L203A
L203C	2.760	.048	.69	.074	1.84	6.360	.071	.60	.117	.98	90T	Ø	L203C
L212	2.785	.073	1.05	.034	.84	6.470	.181	1.54	.103	.86	90T	Ø	L212
L213	2.590	-.122	-1.77	.032	.79	6.360	.071	.60	.117	.98	90T	*	L213
L223	2.690	-.022	-.32	.042	1.06	6.254	-.035	-.30	.116	.97	90V	Ø	L223
L228	2.740	.028	.40	.061	1.53	6.300	.011	.09	.131	1.10	90T	Ø	L228
L233	2.724	.012	.17	.028	.70	6.323	.034	.29	.155	1.29	90Q	Ø	L233
L238A	2.642	-.070	-1.02	.027	.68	6.178	-.111	-.94	.180	1.50	90T	Ø	L238A
L241	2.895	.183	2.65	.016	.39	6.275	-.014	-.12	.142	1.18	90T	X	L241
L242Ø	2.752	.040	.58	.039	.98	6.198	-.091	-.77	.135	1.12	90Ø	Ø	L242Ø
L242P	2.706	-.007	-.10	.031	.78	6.207	-.082	-.70	.088	.73	90P	Ø	L242P
L249	2.648	-.064	-.93	.034	.86	6.286	-.003	-.03	.070	.59	90T	Ø	L249
L259	2.645	-.067	-.97	.035	.87	6.038	-.251	-2.13	.206	1.72	90T	Ø	L259
L260	2.664	-.048	-.70	.020	.50	6.362	.073	.62	.033	.27	90T	Ø	L260
L261	2.760	.048	.69	.024	.61	6.458	.169	1.43	.049	.41	90T	Ø	L261
L262	2.695	-.017	-.25	.028	.71	6.120	-.169	-1.44	.132	1.10	90T	Ø	L262
L285	2.610	-.102	-1.48	.032	.79	6.300	.011	.09	.094	.79	90T	Ø	L285
L291	2.850	.138	2.00	.053	1.32	6.380	.091	.77	.193	1.61	90T	Ø	L291
L305	2.720	.008	.11	.042	1.05	6.330	.041	.35	.114	.95	90T	Ø	L305
L309	2.650	-.062	-.90	.053	1.32	6.140	-.149	-1.27	.184	1.53	90T	Ø	L309
L318	2.625	-.087	-1.26	.042	1.06	6.185	-.104	-.88	.153	1.28	90T	Ø	L318
L320	.003	-2.709	-39.24	.000	.00	.006	-6.283	-53.36	.000	.00	90T	#	L320
L323	2.686	-.026	-.38	.024	.59	6.296	.007	.06	.145	1.21	90T	Ø	L323
L324	2.740	.028	.40	.039	.58	6.265	-.024	-.20	.041	.34	90T	Ø	L324
L326	2.765	.053	.77	.047	1.18	6.515	.226	1.92	.078	.65	90T	Ø	L326
L328	2.706	-.006	-.09	.055	1.36	6.300	.011	.09	.081	.67	90T	Ø	L328
L331	2.789	.077	1.11	.042	1.04	6.216	-.073	-.62	.062	.52	90T	Ø	L331
L339	2.660	-.052	-.76	.032	.79	6.245	-.044	-.37	.171	1.42	90T	Ø	L339
L341	2.780	.068	.98	.039	.98	6.436	.147	1.25	.138	1.15	90T	Ø	L341
L352	2.720	.008	.11	.032	.80	6.343	.054	.46	.068	.57	90Q	Ø	L352
L356	2.684	-.028	-.41	.050	1.26	6.240	-.049	-.42	.188	1.57	90T	Ø	L356
L358	2.702	-.010	-.15	.038	.95	6.291	.002	.02	.119	.99	90T	Ø	L358
L376	2.800	.088	1.27	.053	1.32	6.370	.081	.69	.134	1.12	90T	Ø	L376
L382	2.790	.078	1.13	.057	1.42	6.320	.031	.26	.220	1.84	90T	Ø	L382
L390	2.846	.134	1.94	.028	.71	6.504	.215	1.83	.047	.39	90T	Ø	L390
L442	2.816	.104	1.50	.023	.57	6.548	.259	2.20	.091	.76	90V	Ø	L442
L556	2.770	.058	.84	.042	1.05	6.265	-.024	-.20	.180	1.50	90T	Ø	L556
L557	2.620	-.092	-1.33	.042	1.05	6.140	-.149	-1.27	.084	.70	90T	Ø	L557
L567	2.672	-.040	-.58	.060	1.50	6.269	-.020	-.17	.153	1.27	90V	Ø	L567
L571	2.710	-.002	-.03	.074	1.84	6.180	-.109	-.93	.193	1.61	90V	Ø	L571
L574	2.650	-.062	-.90	.034	.86	6.232	-.057	-.48	.125	1.04	90V	Ø	L574
L575	2.720	.008	.11	.023	.58	6.207	-.082	-.70	.046	.38	90T	Ø	L575
L581	2.760	.048	.69	.052	1.29	6.420	.131	1.11	.114	.95	90T	Ø	L581
L585	2.530	-.182	-2.64	.048	1.21	6.210	-.079	-.67	.179	1.50	90T	*	L585
L626	2.610	-.102	-1.48	.011	.26	6.128	-.161	-1.37	.156	1.30	90T	Ø	L626
L679	2.710	-.002	-.03	.046	1.15	6.130	-.159	-1.35	.160	1.34	90T	Ø	L679
L693	2.737	.025	.36	.032	.79	6.319	.030	.25	.089	.75	90T	Ø	L693

GR. MEAN = 2.712 MILS
SD MEAN = .069 MILS

GRAND MEAN = 6.289 MILS
SD OF MEANS = .118 MILS

TEST DETERMINATIONS = 10
63 LABS IN GRAND MEANS

AVERAGE SDR = .040 MILS

AVERAGE SDR = .120 MILS

GR. MEAN = 68.89 MICROMETER

GRAND MEAN = 159.74 MICROMETER

TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T90-1 TABLE 1
 THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
 TAPPI STANDARD T411 GS-76

LAB CODE	SAMPLE J83 MEAN	PRINTING 73 GRAMS PER SQUARE METER				R, SDR	SAMPLE J66 MEAN	PRINTING 93 GRAMS PER SQUARE METER				TEST D ₀ = 10		
		DEV	N, DEV	SDR	R, SDR			DEV	N, DEV	SDR	R, SDR	VAR	F	LAB
L106	27.100	24.388	353.23	.994	24.83	60.000	53.711	456.18	.000	.00	90C	*	L106	
L185	2.660	-.052	-.76	.038	.94	6.136	-.153	-1.30	.103	.86	90B	*	L185	
L203B	2.540	-.172	-2.49	.052	1.29	6.110	-.179	-1.52	.129	1.07	90C	*	L203B	
L243	2.684	-.028	-.41	.032	.81	6.138	-.151	-1.28	.059	.49	90S	*	L243	
L344	2.587	-.125	-1.81	.036	.90	6.164	-.125	-1.06	.184	1.54	90U	*	L344	
L396M	2.700	-.012	-.18	.033	.83	6.035	-.254	-2.16	.145	1.21	90S	*	L396M	
L563	2.730	.018	.26	.048	1.21	6.320	.031	.26	.123	1.03	90U	*	L563	
L576	2.640	-.072	-1.05	.070	1.75	6.590	.301	2.56	.137	1.14	90C	*	L576	
L684	2.690	-.022	-.32	.032	.79	6.250	-.039	-.33	.097	.81	90U	*	L684	

TOTAL NUMBER OF LABORATORIES REPORTING = 74

Best values: J83 2.72 ± 0.11 mils
 J66 6.29 ± 0.18 mils

Data from the following laboratories appear to be off by a multiplicative factor: 320.

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T90-1 TABLE 2
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 69-76

LAB CODE	F	MEANS		COORDINATES		AVG S.DR	VAR	PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		J83	J66	MAJOR	MINOR					
L320	#	.003	.006	-6.840	-.150	.00	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L585	*	2.530	6.210	-.148	.133	1.35	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L203B	+	2.540	6.110	-.234	.082	1.18	90C	THICKNESS (CALIPER),	CADY,	HAND DRIVEN
L344	+	2.587	6.164	-.166	.062	1.22	90U	THICKNESS (CALIPER),	TMI,	HAND DRIVEN
L213	*	2.590	6.360	.014	.141	.88	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L203A	Ø	2.600	6.125	-.196	.034	1.40	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L125	Ø	2.602	6.047	-.266	-.001	1.08	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L626	Ø	2.610	6.128	-.189	.026	.78	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L285	Ø	2.610	6.300	-.033	.097	.79	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L557	Ø	2.620	6.140	-.174	.022	.88	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L318	Ø	2.625	6.185	-.131	.036	1.17	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L576	+	2.640	6.590	.244	.191	1.44	90C	THICKNESS (CALIPER),	CADY,	HAND DRIVEN
L190C	Ø	2.640	6.140	-.166	.004	1.13	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L238A	Ø	2.642	6.178	-.130	.018	1.09	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L259	Ø	2.645	6.038	-.256	-.043	1.30	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L249	Ø	2.648	6.286	-.029	.057	.72	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L574	Ø	2.650	6.232	-.078	.033	.95	90V	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN, DIGITIZED
L309	Ø	2.650	6.140	-.161	-.005	1.43	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L166	Ø	2.653	6.259	-.016	.058	.72	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L185	+	2.660	6.136	-.161	-.016	.90	90B	THICKNESS (CALIPER),	AMTHOR,	HAND DRIVEN
L339	Ø	2.660	6.245	-.062	.029	1.11	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L260	Ø	2.664	6.362	.046	.074	.39	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L567	Ø	2.672	6.265	-.035	.028	1.39	90V	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN, DIGITIZED
L162	Ø	2.680	6.240	-.058	.009	1.39	90D	THICKNESS (CALIPER),	CADY,	MOTOR DRIVEN
L243	+	2.684	6.138	-.149	-.037	.65	90S	THICKNESS (CALIPER),	SCHÖPPER,	HAND DRIVEN
L356	Ø	2.684	6.240	-.056	.005	1.41	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L141	Ø	2.686	6.173	-.116	-.024	1.02	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L323	Ø	2.686	6.256	-.005	.027	.90	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L684	+	2.690	6.250	-.045	.004	.80	90U	THICKNESS (CALIPER),	TMI,	HAND DRIVEN
L223	Ø	2.690	6.254	-.041	.006	1.01	90V	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN, DIGITIZED
L262	Ø	2.695	6.120	-.161	-.055	.90	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L118	Ø	2.697	6.332	.033	.032	.99	90Q	THICKNESS (CALIPER),	EMVECO,	MOTOR DRIVEN
L396M	+	2.700	6.035	-.236	-.055	1.02	90S	THICKNESS (CALIPER),	SCHÖPPER,	HAND DRIVEN
L174	Ø	2.700	6.280	-.013	.007	1.49	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L358	Ø	2.702	6.251	-.002	.010	.57	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L242P	Ø	2.706	6.207	-.077	-.028	.76	90P	THICKNESS (CALIPER),	MESSMER,	MOTOR DRIVEN, ISO R534
L328	Ø	2.706	6.300	.007	.010	1.02	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L679	Ø	2.710	6.130	-.146	-.064	1.24	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L571	Ø	2.710	6.180	-.100	-.043	1.73	90V	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN, DIGITIZED
L158	Ø	2.710	6.390	.091	.044	.63	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L128	Ø	2.712	6.228	-.056	-.025	.76	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L159	Ø	2.717	6.377	.082	.032	.68	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L575	Ø	2.720	6.207	-.071	-.041	.48	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L352	Ø	2.720	6.343	.052	.015	.68	90Q	THICKNESS (CALIPER),	EMVECO,	MOTOR DRIVEN
L305	Ø	2.720	6.330	.040	.010	1.00	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L182	Ø	2.723	6.308	.021	-.002	1.09	90L	THICKNESS (CALIPER),	L + W,	MOTOR DRIVEN
L233	Ø	2.724	6.323	.036	.003	.59	90Q	THICKNESS (CALIPER),	EMVECO,	MOTOR DRIVEN
L563	+	2.730	6.320	.036	-.003	1.12	90U	THICKNESS (CALIPER),	TMI,	HAND DRIVEN
L693	Ø	2.737	6.319	.038	-.010	.77	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L228	Ø	2.740	6.300	.022	-.021	1.31	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L324	Ø	2.740	6.265	-.010	-.035	.66	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L183	Ø	2.744	6.425	.137	.028	.60	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L242Ø	Ø	2.752	6.198	-.066	-.074	1.05	90Ø	THICKNESS (CALIPER),	MESSMER,	MOTOR DRIVEN, BS3983
L261	Ø	2.760	6.458	.174	.027	.51	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L122	Ø	2.760	6.296	.026	-.041	1.24	90V	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN, DIGITIZED
L203C	Ø	2.760	6.360	.084	-.014	1.41	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L581	Ø	2.760	6.420	.139	.011	1.12	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L326	Ø	2.765	6.515	.227	.046	.92	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L556	Ø	2.770	6.265	.002	-.063	1.28	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L105	Ø	2.771	6.438	.160	.008	.78	90Q	THICKNESS (CALIPER),	EMVECO,	MOTOR DRIVEN
L341	Ø	2.780	6.436	.162	-.001	1.06	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L153	*	2.782	6.144	-.103	-.124	.83	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L212	Ø	2.785	6.470	.195	.009	.85	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN
L173B	Ø	2.786	6.370	.104	-.033	.94	90F	THICKNESS (CALIPER),	FEDERAL,	MOTOR DRIVEN
L331	Ø	2.789	6.216	-.034	-.100	.78	90T	THICKNESS (CALIPER),	TMI,	MOTOR DRIVEN

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T90-1 TABLE 2
THICKNESS (CALIPER), THOUSANDTHS OF AN INCH
TAPPI STANDARD T411 08-76

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---	CONDITIONS
		J83	J66	MAJOR	MINOR	R.SDR	VAR		
L382	Ø	2.790	6.320	.061	-.058	1.63	90T	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN
L376	Ø	2.800	6.370	.110	-.046	1.22	90T	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN
L100	Ø	2.810	6.451	.188	-.022	.52	90V	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN, DIGITIZED
L442	Ø	2.816	6.548	.279	.013	.66	90V	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN, DIGITIZED
L350	Ø	2.846	6.504	.251	-.032	.55	90T	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN
L291	Ø	2.850	6.380	.140	-.087	1.46	90T	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN
L123F	Ø	2.865	6.510	.264	-.047	1.21	90F	THICKNESS (CALIPER), FEDERAL,	MOTOR DRIVEN
L241	X	2.895	6.275	.063	-.172	.79	90T	THICKNESS (CALIPER), TMI,	MOTOR DRIVEN
L106	*	27.100	60.000	58.988	.172	12.41	90C	THICKNESS (CALIPER), CADY,	HAND DRIVEN
GMEANS:		2.712	6.289			1.00			
		95% ELLIPSE:		.323	.123			WITH GAMMA = 65 DEGREES	

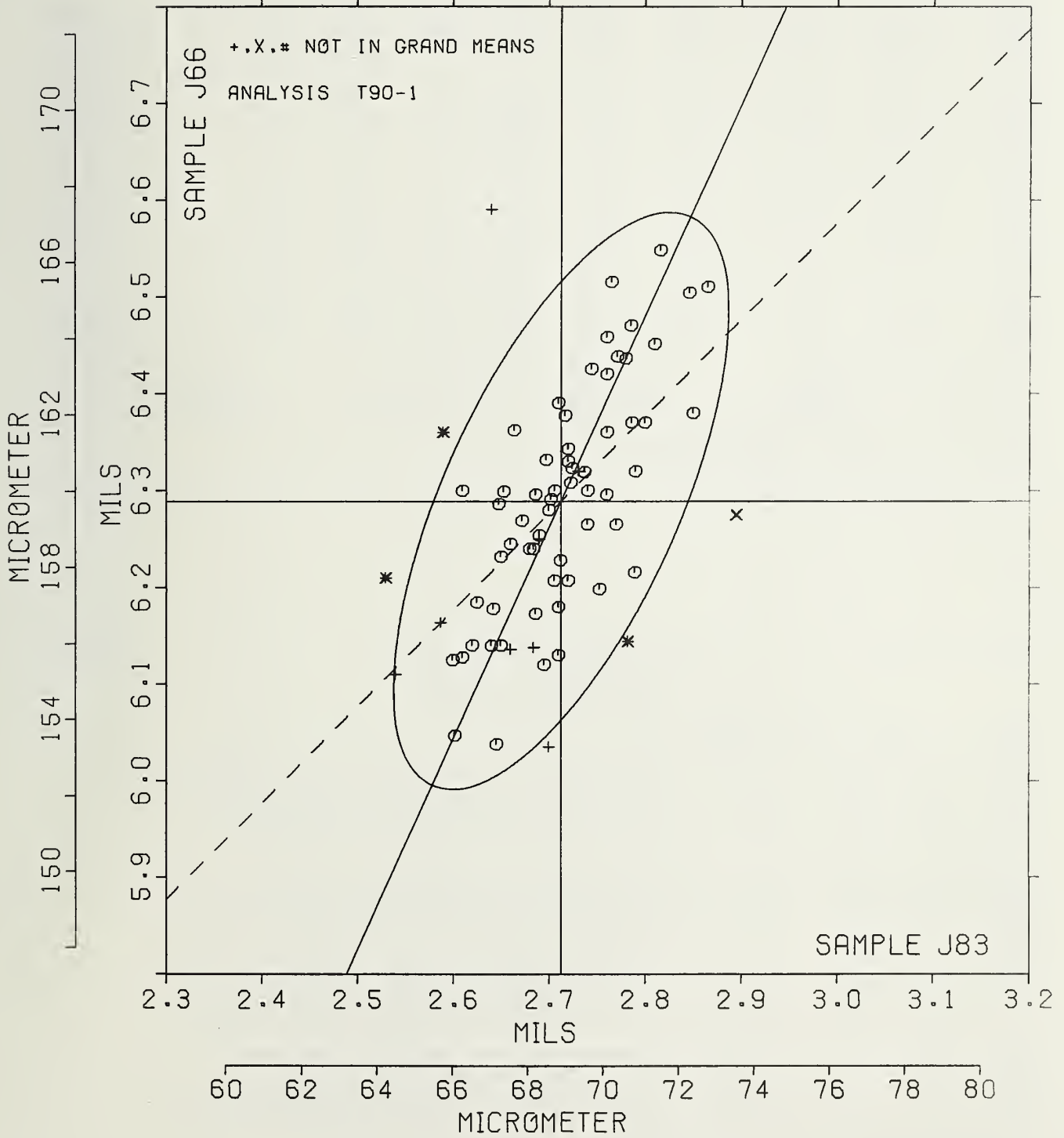
THICKNESS (CALIPER)

SAMPLE J83 = 2.71 MILS

SAMPLE J66 = 6.29 MILS

SAMPLE J83 = 68.9 MICROMETER

SAMPLE J66 = 159.7 MICROMETER



TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T95-1 TABLE 1
GRAMMAGE (MASS PER UNIT AREA)
TAPPI STANDARD T410 6S-68

LAB CODE	SAMPLE D33 MEAN	MANILA ENVELOPE 118 GRAMS PER SQUARE METER				SAMPLE D34 MEAN	OFFSET ENAMEL COATED 117 GRAMS PER SQUARE METER				TEST D. = 10		
		DEV	N.DEV	SDR	R.SDR		DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L100	118.10	.31	.57	1.10	.82	119.10	.41	.49	.74	.86	95C	Ø	L100
L121	116.88	-.91	-1.66	1.03	.77	117.07	-1.62	-1.93	1.04	1.20	95B	Ø	L121
L162	118.08	.29	.54	1.91	1.43	119.93	1.24	1.48	1.17	1.36	95K	Ø	L162
L213	116.85	-.93	-1.71	1.73	1.29	118.04	-.65	-.78	.74	.85	95F	Ø	L213
L233	118.09	.30	.56	1.55	1.16	117.20	-1.49	-1.78	.58	.67	95T	Ø	L233
L249	123.86	6.07	11.14	1.01	.75	118.48	-.21	-.25	.64	.74	95I	#	L249
L280	117.65	-.14	-.25	1.72	1.29	119.22	.53	.63	1.15	1.34	95T	Ø	L280
L305	118.64	.85	1.57	1.51	1.13	118.38	-.31	-.37	.74	.86	95T	Ø	L305
L339	117.70	-.09	-.16	.48	.36	119.00	.31	.37	.00	.00	95T	Ø	L339
L342	117.83	.04	.07	1.60	1.19	119.58	.89	1.07	.44	.51	95C	Ø	L342
L344	118.33	.54	1.00	.33	.25	119.13	.44	.52	.13	.15	95T	Ø	L344
L442	117.78	-.01	-.01	.81	.61	118.46	-.23	-.28	.28	.33	95K	Ø	L442
L557	117.31	-.48	-.87	2.06	1.54	118.58	-.11	-.13	1.93	2.24	95C	Ø	L557
L559	118.13	.34	.63	1.56	1.17	118.99	.30	.36	.84	.97	95K	Ø	L559
L567	116.78	-1.01	-1.85	1.01	.75	117.45	-1.24	-1.48	1.62	1.88	95E	Ø	L567
L571	117.40	-.39	-.71	1.61	1.20	118.05	-.64	-.77	2.29	2.66	95P	Ø	L571
L574	117.73	-.06	-.10	1.23	.92	119.70	1.01	1.21	1.47	1.71	95D	Ø	L574
L597	118.16	.37	.68	1.24	.93	119.34	.65	.78	.55	.64	95C	Ø	L597
L688	117.91	.12	.23	2.23	1.67	118.46	-.23	-.28	.44	.51	95T	Ø	L688
L693	118.60	.81	1.49	.67	.50	119.44	.75	.90	.22	.25	95G	Ø	L693

GR. MEAN = 117.79 G/SQ.METER GRAND MEAN = 118.69 G/SQ.METER TEST DETERMINATIONS = 10
SD MEANS = .55 G/SQ.METER SD OF MEANS = .84 G/SQ.METER 19 LABS IN GRAND MEANS
AVERAGE SDR = 1.34 G/SQ.METER AVERAGE SDR = .86 G/SQ.METER

TOTAL NUMBER OF LABORATORIES REPORTING = 20
Best values: D33 117.8 ± 1.0 grams per square meter
D34 118.7 ± 1.3 grams per square meter

The following laboratories were omitted from the grand means because of extreme test results: 249.

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T95-1 TABLE 2
GRAMMAGE (MASS PER UNIT AREA)
TAPPI STANDARD T410 6S-68

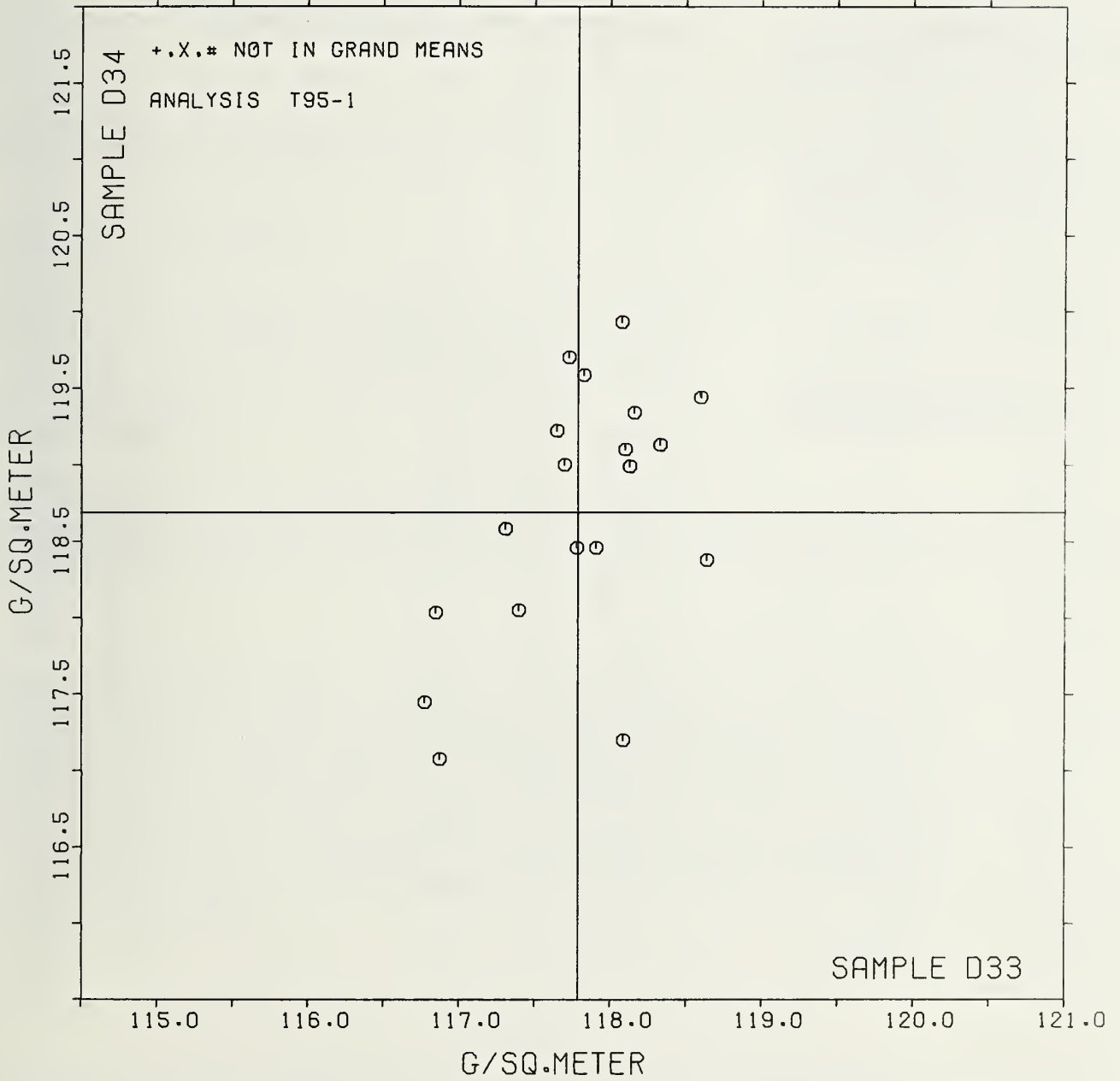
LAB CODE	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
	F	D33	D34	MAJOR	MINOR	R.SDR	
L567	Ø	116.78	117.45	-1.55	.38	1.32	95E BASIS WEIGHT (GRAMMAGE), GUILLOTINE TYPE CUTTER
L213	Ø	116.85	118.04	-.99	.56	1.07	95F BASIS WEIGHT (GRAMMAGE), FOUR-SQUARE CUTTER
L121	Ø	116.88	117.07	-1.85	.13	.99	95B BASIS WEIGHT (GRAMMAGE), CONCOCA CUTTER
L557	Ø	117.31	118.58	-.30	.38	1.89	95C BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L571	Ø	117.40	118.05	-.75	.07	1.93	95P BASIS WEIGHT (GRAMMAGE), PRODUCTION REAM CUTTER
L280	Ø	117.65	119.22	.42	.35	1.32	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L339	Ø	117.70	119.00	.24	.21	.18	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L574	Ø	117.73	119.70	.89	.48	1.31	95D BASIS WEIGHT (GRAMMAGE), DIE CUT
L442	Ø	117.78	118.46	-.21	-.09	.47	95K BASIS WEIGHT (GRAMMAGE), WEIGHED AS RECEIVED
L342	Ø	117.83	119.58	.82	.35	.85	95C BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L688	Ø	117.91	118.46	-.16	-.21	1.09	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L162	Ø	118.08	119.93	1.24	.27	1.39	95K BASIS WEIGHT (GRAMMAGE), WEIGHED AS RECEIVED
L233	Ø	118.09	117.20	-1.22	-.91	.92	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L100	Ø	118.10	119.10	.50	-.11	.84	95C BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L559	Ø	118.13	118.99	.42	-.18	1.07	95K BASIS WEIGHT (GRAMMAGE), WEIGHED AS RECEIVED
L597	Ø	118.16	119.34	.75	-.06	.78	95C BASIS WEIGHT (GRAMMAGE), CUTTING BOARD
L344	Ø	118.33	119.13	.63	-.30	.20	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L693	Ø	118.60	119.44	1.03	-.41	.38	95G BASIS WEIGHT (GRAMMAGE), PRECISION CUTTER
L305	Ø	118.64	118.38	.09	-.90	1.00	95T BASIS WEIGHT (GRAMMAGE), TEMPLATE CUT
L249	#	123.86	118.48	2.42	-5.58	.75	95I BASIS WEIGHT (GRAMMAGE), INGENTØ PAPER CUTTER

GMEANS: 117.79 118.69 1.00
95% ELLIPSE: 2.49 1.17 WITH GAMMA = 64 DEGREES

GRAMMAGE (MASS PER UNIT AREA)

SAMPLE D33 = 117.8 G/SQ.METER

SAMPLE D34 = 118.7 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 T40-1 GURLEY UNITS	K43 B95	16.3 48.6	.9 3.2	1.1 5.2	10	54	59	10	1.0 4.6	2.4 8.8
AIR RESISTANCE, SHEFFIELD T40-2 SHEFF. UNITS	K43 B95	166.5 72.2	6.4 4.3	8.8 6.0	10	37	45	10	7.7 5.2	17.8 11.9
AIR RESISTANCE, GURLEY HG FLOTATION T41-1 SEC/10 CC	E65 B73	783. 1314.	75. 281.	173. 517.	10	13	15	10	152. 453.	209. 777.
SMOOTHNESS, PARKER PRINISURF T44-1 MICRONS	A83 J50	4.613 5.801	.168 .223	.150 .087	10	7	8	10	.132 .077	.466 .617
SMOOTHNESS, SHEFFIELD T45-1 SHEFF. UNITS	A83 J50	105.6 274.5	7.4 13.1	9.8 7.4	15	89	92	10	8.6 6.5	21.1 36.5
SMOOTHNESS, BEKK T45-2 BEKK SECONDS	A83 J50	52.85 11.27	3.72 1.80	7.56 .71	15	10	11	10	6.62 .63	11.00 5.00
SMOOTHNESS, BENDTSEN T47-1 ML/MIN	A83 J50	119. 516.	12. 45.	16. 51.	10	7	9	10	14. 45.	34. 125.
K & N INK ABSORPTION T56-1 K & N UNITS	B58 E50	60.6 63.8	6.7 6.0	.7 .4	4	9	11	4	1.0 .6	18.7 16.6
PH, COLD T57-1 PH UNITS	J75 J17	6.173 4.653	.087 .091	.067 .040	5	4	5	2	.132 .078	.263 .260
PH, HOT T57-2 PH UNITS	J75 J17	5.618 4.319	.090 .020	.037 .032	5	4	5	2	.073 .063	.255 .074
OPACITY, B&L TYPE, 89% FACKING T60-1 PERCENT	B21 K24	72.43 95.43	1.09 .38	1.06 .31	10	75	84	5	1.32 .38	3.16 1.09
OPACITY, B&L TYPE, PAPER BACKING T60-2 PERCENT	B21 K24	75.74 95.72	.74 .12	1.02 .34	10	4	4	5	1.27 .42	2.23 .44
OPACITY, ELREPHO TYPE, PAPER BACKING T60-3 PERCENT	B21 K24	76.97 96.23	.66 .12	.70 .17	10	15	17	5	.86 .21	1.92 .38
BLUE REFLECTANCE, DIRECTIONAL T65-1 PERCENT	J79 E79	67.86 95.79	.40 .99	.22 .11	8	22	45	6	.25 .13	1.11 2.73
BLUE REFLECTANCE, DIFFUSE, WITH TRAP T65-2 PERCENT	J79 E79	67.87 96.35	.84 .70	.14 .08	8	17	19	6	.16 .09	2.33 1.93
BLUE REFLECTANCE, DIFFUSE, NO TRAP T65-3 PERCENT	J79 E79	68.38 94.96	.75 1.27	.14 .07	8	15	15	6	.16 .08	2.09 3.51
SPECULAR GLOSS, 75 DEGREE T75-1 GLOSS UNITS	E51 E91	68.04 49.80	2.04 1.84	1.04 .87	10	47	53	5	1.29 1.08	5.72 5.15
THICKNESS (CALIPER) T90-1 MILS	J83 J66	2.712 6.289	.069 .118	.040 .120	10	63	74	10	.035 .105	.191 .326
GRAMMAGE (MASS PER UNIT AREA) T95-1 G/SQ.METER	D33 D34	117.79 118.69	.55 .84	1.34 .86	10	19	20	3	2.14 1.38	2.34 2.59

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