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TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM
FOR PAPER

REPORT NO. 52S
STRENGTH TESTS



U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards



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PULP AND PAPER INDUSTRY

**COLLABORATIVE REFERENCE PROGRAM
FOR PAPER**

Report No. 52S
STRENGTH TESTS

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INTRODUCTION

Reports 52S and 52G comprise the fourth set of reports for the 77-78 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.

Please note that some changes have been made in the computer-generated plots. These changes should aid participants in familiarizing themselves with the International System of Units (SI) as it applies to TAPPI test methods. Wherever possible, Grand Means in SI units have been added at the top of the plots, and scales in SI units have been added to the axes allowing the reader to compare means and variability in common units and SI units for the same data. On all plots, sample codes and unit of test have been shifted to new positions.

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

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



Edwin B. Randall, Jr., Administrator
TAPPI Collaborative Reference Program
Laboratory Evaluation Technology Section

June 19, 1978

TAPPI-NBS COLLABORATIVE REFERENCE PROGRAM

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	1b/in.	kN/m	.1751
	1b/0.5 in.	kN/m	.3502
	1b/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	14.59
	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)	1b	N	4.448
Ring-crush (TAPPI)	1b	N	4.448
	(ISO)	1b/6.00 in.	kN/m
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 participant should take this as a warning to reexamine his testing procedure
- S - Included in grand mean but only after omission of one of 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 computation
of TAPPI repeatability and reproducibility from the
SD OF MEANS and the AVER SDR. See TAPPI Standard
T1206 for definitions and computations.
- REPEAT - TAPPI repeatability, a measure of the within-
laboratory precision of a test result.
- REPROD - TAPPI reproducibility, a measure of the between-
laboratory precision of a test result.
- Best values - Given at the end of Table 1 for each method for
which sufficient information is available. These
best values are estimates based on a careful
examination of all data, both current and past,
with special attention to results obtained by the
National Bureau of Standards and other recognized
reference laboratories in this and other countries.
All participants using equipment that is standard
for the analysis should be able to achieve results
within the plus-minus (+) limits, when these are
shown along with the best values.

TAPPI STANDARD T403 GS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C

LAB CODE	P	MEANS		COORDINATES		AVG R,S	SOR	VAR	PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		H39	H60	MAJOR	MINOR						
L162	*	31.33	13.60	-6.67	-.72	1.64	10C		BURSTING	STRENGTE	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L250L	*	31.85	18.17	-3.51	2.62	.72	10N		BURSTING	STRENGTH	UP T0 45 PSI, LHMARGY, MAN. CLAMP, 20C, 65%RH
L131	0	32.60	16.20	-4.10	.60	1.18	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L251	*	32.96	17.06	-3.29	1.07	.89	10V		BURSTING	STRENGTH	UP T0 45 PSI, L*W, MANUAL CLAMP, 20C, 65% RH
L339	0	33.09	16.25	-3.67	.34	1.23	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L158	0	33.60	18.57	-1.87	1.89	.79	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L279	0	34.37	17.00	-2.20	.17	1.18	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L183	0	34.37	15.97	-2.82	-.65	.79	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L191	0	34.40	17.50	-1.88	.55	1.22	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L484	*	34.43	21.03	.28	3.35	1.20	10M		BURSTING	STRENGTH	UP T0 45 PSI, REGMED MT/MGT, MANUAL CLAMP
L203B	0	34.67	16.00	-2.57	-.81	.95	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L243	0	34.73	18.87	-.79	1.44	1.12	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L333	0	34.80	16.20	-2.34	-.73	1.77	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L356	0	34.81	19.51	-.33	1.91	.87	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L344	0	34.93	15.77	-2.49	-1.15	1.29	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L249	0	34.98	15.78	-2.45	-1.17	.53	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L251	0	35.17	17.22	-1.43	-.13	.84	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L264	0	35.40	18.80	-.29	.59	.69	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L321	0	35.60	20.27	.75	2.04	1.09	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L268	0	35.67	18.23	-.42	.38	.55	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L121	0	35.72	17.34	-.92	-.37	.91	10C		BURSTING	STRENGTE	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L350	0	35.81	18.98	.14	.89	.54	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L167	0	36.02	17.59	-.53	-.35	.68	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L568	0	36.07	18.37	-.02	.24	1.19	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L326	0	36.20	18.53	.18	.29	.91	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L237B	0	36.27	17.63	-.30	-.46	.44	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L599	0	36.38	19.57	.95	1.01	.89	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L203A	0	36.57	17.83	.06	-.48	1.52	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L561	0	36.60	20.10	1.45	1.31	1.46	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L237A	0	36.70	17.03	-.32	-1.20	.59	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L358	0	36.73	17.00	-.32	-1.25	.69	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L128	*	36.93	18.87	.97	.12	.67	10B		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS B, MANUAL CLAMP
L225	0	37.07	19.13	1.24	.25	1.01	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L390	0	37.13	18.31	.80	-.44	1.52	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L153	0	37.30	19.60	1.70	.48	.89	10C		BURSTING	STRENGTE	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L331	0	37.33	19.20	1.49	.15	1.17	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L150	0	37.57	18.53	1.28	-.53	1.07	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L242	*	37.74	19.94	2.26	-.49	1.06	10T		BURSTING	STRENGTH	UP T0 45 PSI, L*W, MANUAL CLAMP
L330	0	37.79	19.10	1.80	-.21	.94	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L312	0	37.80	19.57	2.08	.16	.79	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L207	0	37.87	20.80	2.88	1.10	1.43	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L601	0	38.20	19.06	2.10	-.49	1.00	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L311	0	38.20	18.73	1.90	-.75	1.42	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L232	X	38.27	14.17	-.79	-4.44	1.85	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L134	0	38.37	17.47	1.25	-1.84	.52	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L269	*	38.70	22.10	4.33	1.64	1.10	10A		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS A, MANUAL CLAMP
L107	0	38.87	20.10	3.32	.02	1.52	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L322	0	39.73	19.13	3.37	-1.35	.73	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L223A	X	40.20	16.65	2.25	-3.61	.69	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L315	0	40.37	21.03	5.02	-.22	.83	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
L299	0	40.77	20.47	4.99	-.91	1.24	10C		BURSTING	STRENGTH	UP T0 45 PSI, PERKINS C, MANUAL CLAMP
GMEANS:		36.23	18.19			1.00					
		95% ELLIPSE:		6.06	2.40						WITH GAMMA = 36 DEGREES

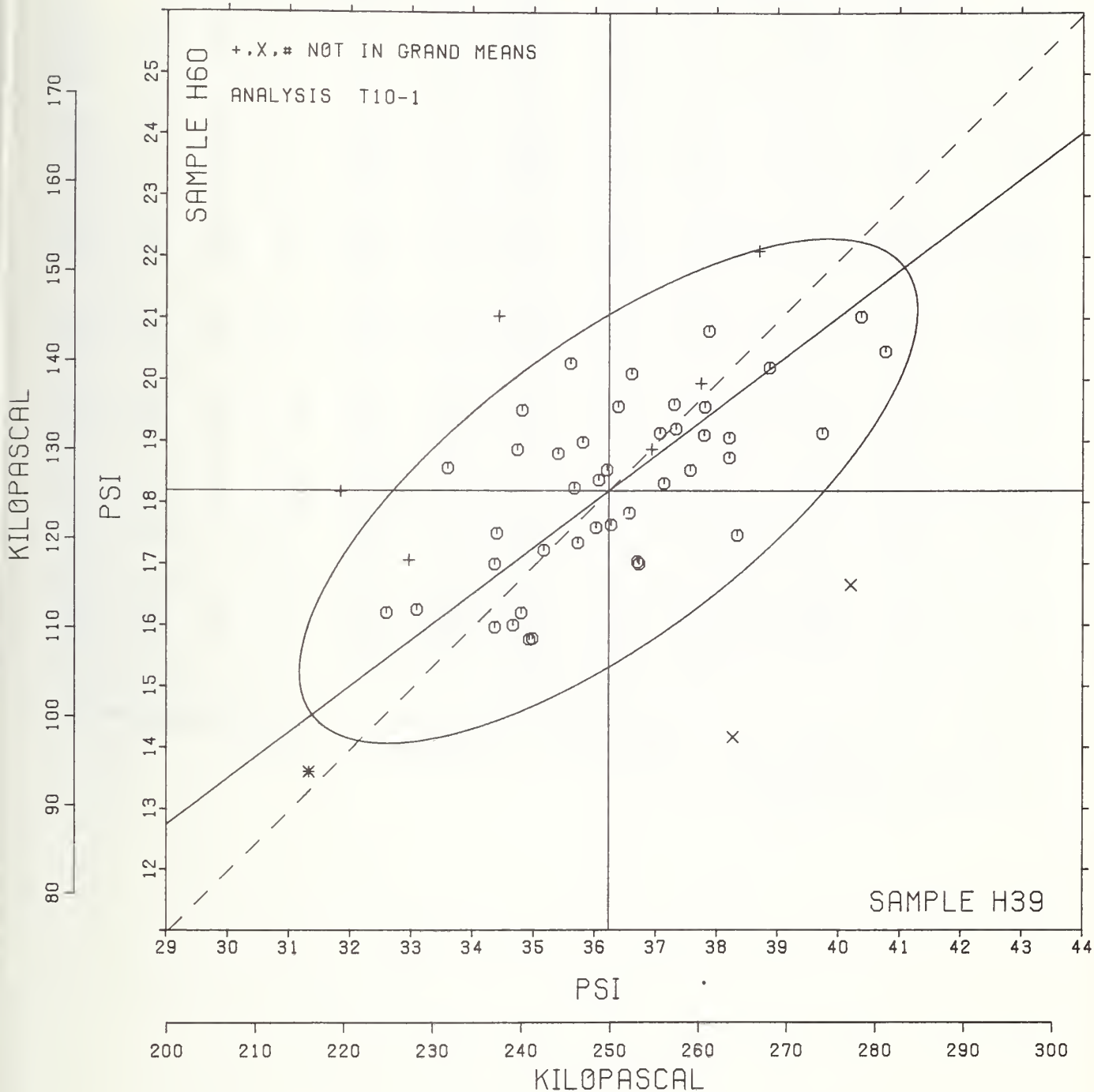
BURSTING STRENGTH, MODEL C

SAMPLE H39 = 36.2 PSI

SAMPLE H60 = 18.2 PSI

SAMPLE H39 = 250 KILOPASCAL

SAMPLE H60 = 125 KILOPASCAL



TAPPI STANDARD T403 68-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C-A OR C WITH AIR OR HYDRAULIC CLAMPS

LA8 CODE	SAMPLE H39 PRINTING 64 GRAMS PER SQUARE METER					SAMPLE H60 PRINTING 74 GRAMS PER SQUARE METER					TEST D. = 15		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LA9
L100	36.9	1.0	.57	1.1	.61	19.9	1.2	.91	.8	.60	10D	Ø	L100
L105	35.4	-.4	-.27	4.9	2.68	19.0	.4	.29	2.4	1.85	10D	Ø	L105
L115	38.1	2.2	1.29	1.1	.59	20.5	1.9	1.43	1.2	.93	10D	Ø	L115
L118	34.6	-1.3	-.76	2.7	1.46	19.8	1.1	.87	1.1	.84	10D	Ø	L118
L122	36.8	.9	.54	1.7	.93	19.2	.5	.41	1.7	1.28	10F	Ø	L122
L125	31.9	-4.0	-2.38	4.4	2.39	15.4	-3.3	-2.49	3.8	2.97	10D	*	L125
L148	36.5	.6	.34	1.7	.92	19.5	.8	.51	1.1	.87	10D	Ø	L148
L157	37.2	1.3	.77	2.3	1.28	21.3	2.6	1.99	.9	.68	10D	Ø	L157
L159	31.8	-4.1	-2.44	1.0	.56	16.1	-2.6	-1.98	1.3	1.04	10D	Ø	L159
L163	35.6	-.3	-.19	2.0	1.11	18.4	-.3	-.23	1.4	1.06	10D	Ø	L163
L166	38.1	2.2	1.31	1.5	.80	18.7	.1	.05	1.5	1.17	10D	Ø	L166
L185	37.5	1.6	.97	1.0	.54	20.4	1.7	1.33	1.2	.92	10D	Ø	L185
L190C	36.8	.9	.54	1.7	.95	18.8	.1	.10	1.3	1.02	10D	Ø	L190C
L190R	32.9	-3.0	-1.79	2.1	1.16	16.6	-2.1	-1.60	1.4	1.06	10D	Ø	L190R
L194	36.4	.5	.30	1.5	.81	19.3	.6	.48	.8	.63	10D	Ø	L194
L202	35.0	-.9	-.55	1.7	.93	19.2	.5	.38	.7	.54	10D	Ø	L202
L217	35.8	-.1	-.05	1.8	.97	18.3	-.4	-.30	1.2	.90	10F	Ø	L217
L224	38.1	2.2	1.29	2.0	1.07	18.8	.1	.08	1.5	1.16	10D	Ø	L224
L226B	35.0	-.9	-.51	1.3	.70	16.8	-1.9	-1.42	.9	.71	10D	Ø	L226B
L226C	34.8	-1.0	-.62	3.4	1.84	19.6	1.0	.74	1.1	.85	10D	Ø	L226C
L233	33.1	-2.8	-1.65	1.2	.68	17.9	-.8	-.58	1.7	1.32	10D	Ø	L233
L241	36.3	.4	.25	3.0	1.62	20.5	1.9	1.43	1.5	1.15	10D	Ø	L241
L255	34.7	-1.2	-.72	1.2	.67	17.6	-1.1	-.81	.9	.71	10D	Ø	L255
L257A	35.9	-.0	-.02	1.7	.94	18.5	-.1	-.10	1.2	.92	10D	Ø	L257A
L257B	36.9	1.0	.62	2.3	1.25	18.7	.0	.00	1.5	1.20	10D	Ø	L257B
L257C	36.9	1.0	.62	2.0	1.10	19.1	.4	.31	1.2	.90	10D	Ø	L257C
L262	36.7	.8	.48	.8	.46	19.3	.6	.49	1.0	.74	10D	Ø	L262
L275	38.6	2.7	1.60	1.9	1.01	18.1	-.5	-.41	2.0	1.55	10D	Ø	L275
L280	36.8	.9	.54	1.7	.95	19.7	1.0	.77	1.3	1.03	10D	Ø	L280
L309	36.8	.9	.51	1.1	.61	16.9	-1.7	-1.33	1.3	.97	10D	Ø	L309
L341	35.8	-.1	-.05	.7	.37	17.9	-.7	-.55	.5	.35	10D	Ø	L341
L352	34.9	-1.0	-.59	1.7	.92	17.3	-1.4	-1.06	1.7	1.32	10D	Ø	L352
L378	36.2	.3	.18	1.9	1.01	19.5	.8	.61	1.3	1.01	10D	Ø	L378
L567	33.1	-2.8	-1.67	1.1	.60	16.9	-1.8	-1.36	1.1	.85	10D	Ø	L567
L575	36.1	.2	.12	2.6	1.44	19.7	1.0	.78	1.4	1.10	10D	Ø	L575
L581	36.6	.7	.40	2.3	1.24	18.7	.0	.00	2.7	2.08	10D	Ø	L581
L587	37.7	1.8	1.05	2.2	1.21	18.9	.2	.18	.9	.67	10D	Ø	L587

GR. MEAN = 35.9 PSI
SD MEANS = 1.7 PSI

GRAND MEAN = 18.7 PSI
SD OF MEANS = 1.3 PSI

TEST DETERMINATIONS = 15
37 LA68 IN GRAND MEANS

AVERAGE SDR = 1.8 PSI
GR. MEAN = 247.5 KILOPASCAL
TOTAL NUMBER OF LABORATORIES REPORTING = 37

AVERAGE SDR = 1.3 PSI
GRAND MEAN = 128.7 KILOPASCAL

Best Values: H39 36.1 ± 2.5 psi
H60 18.9 ± 1.7 psi

TAPPI STANDARD T403 GS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C-A OR C WITH AIR OR HYDRAULIC CLAMPS

LAB CODE	F	MEANS		COORDINATES		AVG R.SDR	VAR	PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		H39	H60	MAJOR	MINOR					
L159	Ø	31.8	16.1	-4.9	.2	.80	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L125	*	31.9	15.4	-5.2	-.4	2.68	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L190R	Ø	32.9	16.6	-3.7	-.0	1.11	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L567	Ø	33.1	16.9	-3.3	.1	.73	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L233	Ø	33.1	17.9	-2.7	.9	1.00	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L118	Ø	34.6	19.8	-.4	1.7	1.15	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L255	Ø	34.7	17.6	-1.6	-.2	.69	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L226C	Ø	34.8	19.6	-.3	1.4	1.35	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L352	Ø	34.9	17.3	-1.6	-.6	1.12	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L202	Ø	35.0	19.2	-.5	.9	.74	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L226Ø	Ø	35.0	16.8	-1.8	-1.0	.70	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L105	Ø	35.4	19.0	-.2	.6	2.26	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L163	Ø	35.6	18.4	-.4	-.1	1.09	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L341	Ø	35.8	17.9	-.5	-.6	.36	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L217	Ø	35.8	18.3	-.3	-.3	.94	10F	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS C, H. CLAMP, TRANSDUCER
L257A	Ø	35.9	18.5	-.1	-.1	.93	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L575	Ø	36.1	19.7	.7	.7	1.27	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L378	Ø	36.2	19.5	.7	.5	1.01	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L241	Ø	36.3	20.5	1.4	1.3	1.38	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L194	Ø	36.4	19.3	.8	.2	.72	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L148	Ø	36.5	19.5	.9	.3	.95	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L581	Ø	36.6	18.7	.6	-.4	1.66	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L262	Ø	36.7	19.3	1.0	.1	.60	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L309	Ø	36.8	16.9	-.3	-1.9	.79	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L190C	Ø	36.8	18.8	.8	-.4	.99	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L28C	Ø	36.8	19.7	1.3	.3	.99	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L122	Ø	36.8	19.2	1.1	-.1	1.10	10F	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS C, H. CLAMP, TRANSDUCER
L100	Ø	36.9	19.9	1.5	.4	.60	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L257B	Ø	36.9	18.7	.9	-.6	1.22	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L257C	Ø	36.9	19.1	1.1	-.3	1.00	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L157	Ø	37.2	21.3	2.5	1.4	.98	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L185	Ø	37.5	20.4	2.3	.5	.73	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L587	Ø	37.7	18.9	1.6	-.8	.94	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L224	Ø	38.1	18.8	1.9	-1.1	1.11	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L115	Ø	38.1	20.5	2.8	.3	.76	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L166	Ø	38.1	18.7	1.9	-1.2	.99	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
L275	Ø	38.6	18.1	1.9	-2.0	1.28	10D	BURSTING	STRENGTH	UP TØ 45 PSI, PERKINS CA ØR C, AIR CLAMP
GMEANS:		35.9	18.7			1.00				
95% ELLIPSE:				5.1	2.2					WITH GAMMA = 34 DEGREES

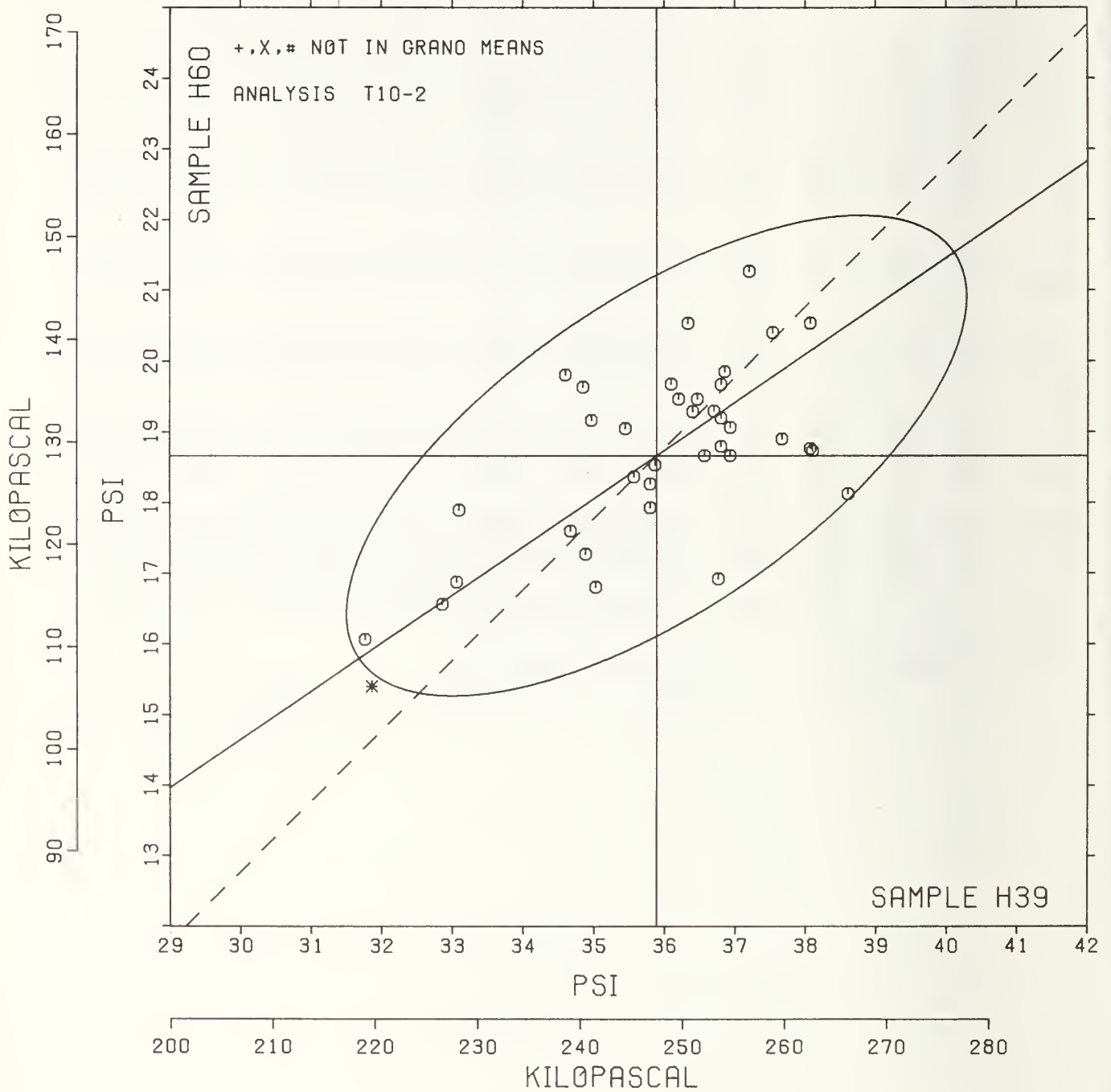
BURSTING STRENGTH, MODEL C-A

SAMPLE H39 = 35.9 PSI

SAMPLE H60 = 18.7 PSI

SAMPLE H39 = 247 KILOPASCAL

SAMPLE H60 = 129 KILOPASCAL



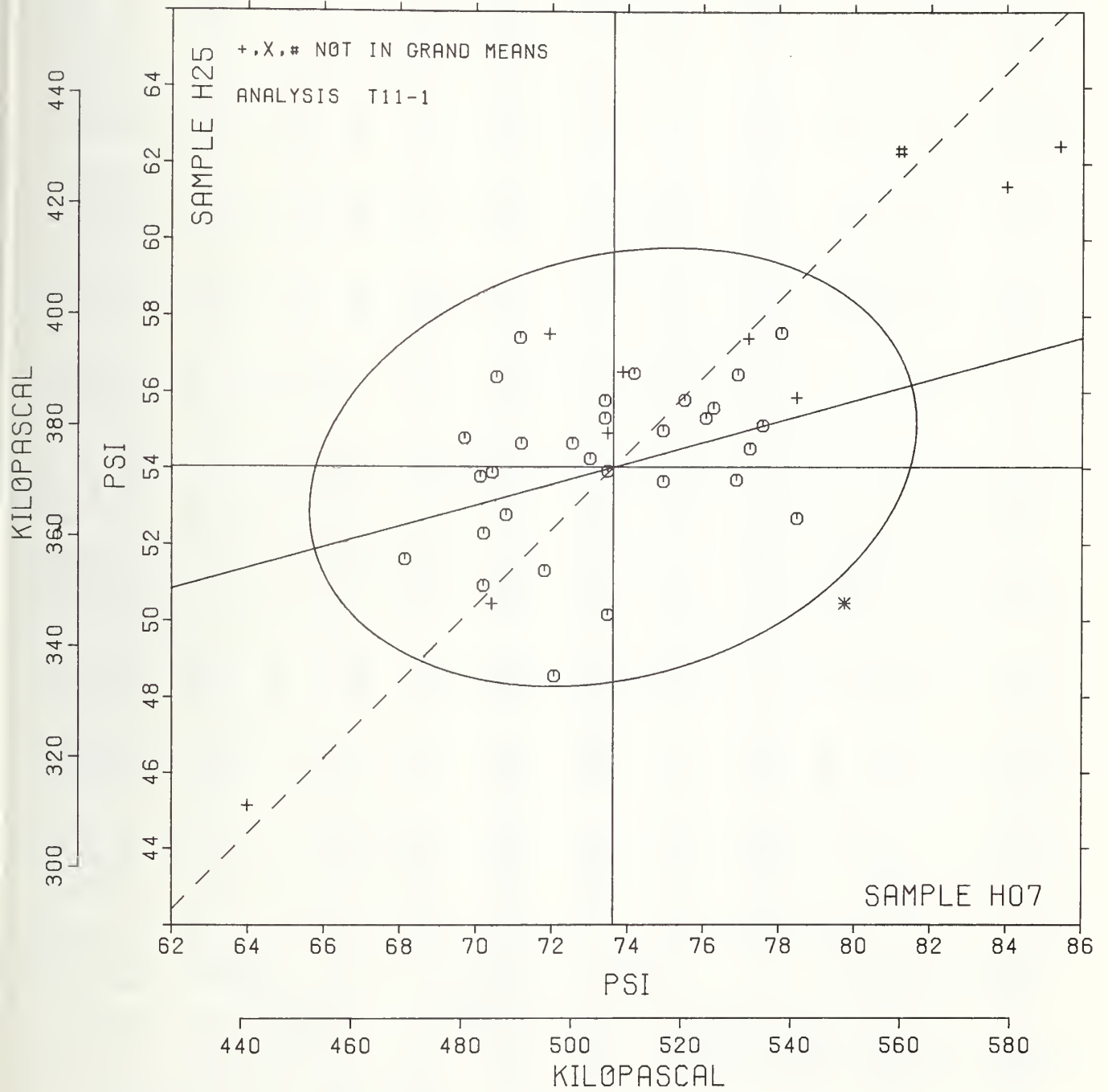
ANALYSIS T11-1 TABLE 2
BURSTING STRENGTH, HIGH RANGE, PSI

TAPPI STANDARD T403 CS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C OR C-A

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS					
		H07	H25	MAJOR	MINOR	R.SDR	VAR						
L251	*	64.0	45.1	-11.6	-6.0	1.10	11V	BURSTING	STRENGTH	40	=	100	PSI, L*W, MANUAL CLAMP, 20C, 65% RH
L303	Ø	68.1	51.6	-5.9	-9.9	.78	11C	BURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L362	Ø	69.7	54.8	-3.6	1.8	.93	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L100	Ø	70.1	53.8	-3.4	.7	.83	11D	BURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L159	Ø	70.2	50.9	-4.1	-2.1	1.05	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L232	Ø	70.2	52.3	-3.8	-.8	1.01	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L250L	*	70.4	50.5	-4.0	-2.6	.73	11N	BURSTING	STRENGTH	40	=	100	PSI, LHMARGY, MAN. CLAMP, 20C, 65%RH
L565	Ø	70.4	53.9	-3.1	.7	.58	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L331	Ø	70.5	56.4	-2.4	3.1	1.33	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L243	Ø	70.8	52.8	-3.1	-.4	.92	11C	BURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L330	Ø	71.2	57.4	-1.5	3.9	1.26	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L148	Ø	71.2	54.7	-2.2	1.2	1.03	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L273	Ø	71.8	51.3	-2.5	-2.1	.94	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L290	*	71.9	57.5	-.7	3.8	.70	11A	HURSTING	STRENGTH	40	=	100	PSI, PERKINS A, MANUAL CLAMP
L567	Ø	72.1	48.6	-3.0	-4.9	1.22	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L237A	Ø	72.5	54.7	-.9	.9	.43	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L122	Ø	73.0	54.3	-.5	.4	1.05	11P	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, H. CLAMP, TRANSDUCER
L378	Ø	73.4	55.8	.3	1.8	.95	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L128	Ø	73.4	55.3	.1	1.3	.60	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L238A	Ø	73.5	50.2	-1.2	-3.7	1.63	11Y	BURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L393	*	73.5	54.9	.1	.9	1.07	11H	HURSTING	STRENGTH	40	=	100	PSI, PERKINS AH, HYDRAULIC CLAMP
L107	Ø	73.5	53.9	-.2	-.1	.95	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L570	*	73.9	56.5	.9	2.3	.76	11H	HURSTING	STRENGTH	40	=	100	PSI, PERKINS AH, HYDRAULIC CLAMP
L334	Ø	74.2	56.5	1.2	2.2	1.00	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L182	Ø	74.9	53.7	1.2	-.7	.78	11D	BURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L170	Ø	74.9	55.0	1.5	.6	.96	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L575	Ø	75.5	55.8	2.3	1.2	1.36	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L103	Ø	76.1	55.3	2.7	.6	.79	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L356	Ø	76.3	55.6	3.0	.8	1.15	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L118	Ø	76.9	53.7	3.0	-1.2	1.07	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L280	Ø	76.9	56.5	3.8	1.5	.54	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L242	*	77.2	57.4	4.3	2.3	.94	11T	HURSTING	STRENGTH	40	=	100	PSI, L*W, MANUAL CLAMP
L237H	Ø	77.2	54.5	3.6	-.5	.71	11C	BURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L218	Ø	77.6	55.1	4.1	.0	1.19	11D	BURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L279	Ø	78.1	57.6	5.2	2.2	1.40	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L604	Ø	79.5	52.7	4.3	-2.6	1.17	11C	BURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L576	*	78.5	55.9	5.2	.5	.70	11P	BURSTING	STRENGTH	40	=	100	PSI, PERKINS LC, MANUAL CLAMP
L344	*	79.7	50.5	4.9	-5.1	1.29	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L174	#	81.1	62.1	9.3	5.8	1.00	11D	HURSTING	STRENGTH	40	=	100	PSI, PERKINS CA, AIR CLAMP
L394	*	84.0	61.4	12.0	4.3	.62	11H	HURSTING	STRENGTH	40	=	100	PSI, PERKINS AH, HYDRAULIC CLAMP
L593	*	85.4	62.5	13.6	5.0	1.63	11J	HURSTING	STRENGTH	40	=	100	PSI, PERKINS JUMHO, HAND DRIVEN
L333	#	88.1	52.1	13.5	-5.7	2.10	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
L294	#	106.9	52.9	31.8	-9.9	1.85	11C	HURSTING	STRENGTH	40	=	100	PSI, PERKINS C, MANUAL CLAMP
GMEANS:		73.6	54.0			1.00							
		95% ELLIPSE:		8.2	5.5	WITH GAMMA = 15 DEGRHS							

BURSTING STRENGTH, HIGH RANGE

SAMPLE H07 = 73.6 PSI SAMPLE H25 = 54.0 PSI
 SAMPLE H07 = 508 KILOPASCAL SAMPLE H25 = 373 KILOPASCAL



ANALYSIS T15-1 TABLE 1

TEARING STRENGTH, GRAMS

TAPPI STANDARD T414 TS-65, ANY MAKE ELXENDORP WITH DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE B11 70 GRAMS PER SQUARE METER					SAMPLE E17 74 GRAMS PER SQUARE METER					TEST D. = 15		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	P	LAB
L100	55.6	-2.5	-.95	1.0	.69	58.2	-2.6	-.77	2.0	1.01	15M	Ø	L100
L103	58.3	.2	.07	.5	.34	60.3	-.5	-.14	1.5	.78	15T	Ø	L103
L105	55.8	-2.4	-.89	1.8	1.27	58.3	-2.5	-.75	4.5	2.24	15T	Ø	L105
L107	62.7	4.5	1.70	1.4	1.01	65.9	5.1	1.52	1.8	.89	15T	Ø	L107
L115	60.4	2.3	.86	1.3	.87	61.7	.9	.26	1.6	.80	15C	Ø	L115
L118	56.6	-1.6	-.59	1.2	.86	59.7	-1.1	-.32	1.9	.98	15T	Ø	L118
L121	60.0	1.8	.69	2.0	1.39	59.2	-1.6	-.48	2.1	1.06	15T	Ø	L121
L122	60.0	1.9	.71	.7	.50	62.0	1.2	.35	2.0	1.01	15C	Ø	L122
L124	62.5	4.3	1.62	1.1	.78	62.5	1.7	.50	2.2	1.09	15T	Ø	L124
L126	59.3	1.2	.44	1.5	1.07	63.7	2.9	.86	2.5	1.26	15T	Ø	L126
L128	58.9	.8	.29	1.1	.77	62.6	1.8	.54	1.9	.95	15T	Ø	L128
L134	58.5	.4	.14	1.3	.91	62.2	1.4	.42	1.8	.90	15T	Ø	L134
L139	59.6	1.4	.54	1.9	1.31	63.2	2.4	.72	2.1	1.05	15T	Ø	L139
L145	55.5	-2.7	-1.01	2.2	1.53	56.9	-3.9	-1.19	2.2	1.09	15T	Ø	L145
L148	57.1	-1.1	-.41	2.8	1.96	59.2	-1.6	-.48	2.7	1.36	15T	Ø	L148
L150	63.7	5.6	2.10	1.3	.93	63.2	2.4	.72	2.3	1.18	15T	Ø	L150
L151	69.9	11.8	4.43	1.4	.96	73.7	12.9	3.90	2.1	1.05	15C	X	L151
L153	56.3	-1.8	-.69	1.4	.97	56.9	-3.9	-1.19	1.9	.95	15C	Ø	L153
L157	54.5	-3.7	-1.39	1.0	.69	58.7	-2.1	-.65	2.1	1.07	15T	Ø	L157
L158	53.9	-4.3	-1.62	3.2	2.20	73.1	12.3	3.69	2.5	1.25	15R	X	L158
L159	58.5	.3	.12	1.4	.98	65.4	4.6	1.38	2.6	1.29	15L	Ø	L159
L162	57.8	-.4	-.14	1.2	.82	61.2	.4	.13	1.5	.75	15T	Ø	L162
L163	57.9	-.2	-.09	1.3	.89	59.0	-1.8	-.54	2.3	1.16	15T	Ø	L163
L166	57.7	-.4	-.16	1.3	.89	59.4	-1.4	-.42	2.0	1.00	15T	Ø	L166
L167	58.5	.4	.14	.9	.64	64.9	4.1	1.24	1.0	.52	15C	Ø	L167
L170	55.1	-3.1	-1.16	1.0	.72	59.8	-1.0	-.30	.4	.21	15T	Ø	L170
L173B	58.5	.4	.14	1.4	.98	57.8	-3.0	-.91	1.5	.74	15T	Ø	L173B
L174S	60.5	2.4	.89	2.9	2.00	67.7	6.9	2.09	4.1	2.08	15T	Ø	L174S
L182A	56.1	-2.1	-.79	1.6	1.10	63.7	2.9	.88	4.0	2.02	15A	Ø	L182A
L182T	60.3	2.1	.79	1.2	.85	65.2	4.4	1.32	1.7	.85	15T	Ø	L182T
L183	58.1	-.0	-.01	1.6	1.11	58.7	-2.1	-.63	2.0	1.00	15T	Ø	L183
L185	42.5	-15.6	-5.88	1.2	.83	45.5	-15.3	-4.62	1.0	.50	15T	#	L185
L190C	56.2	-2.0	-.74	.9	.65	55.7	-5.1	-1.53	1.8	.88	15T	Ø	L190C
L190R	60.7	2.6	.97	1.5	1.03	62.3	1.5	.44	1.7	.86	15C	Ø	L190R
L191	60.1	2.0	.74	1.4	.98	64.1	3.3	1.00	1.8	.89	15T	Ø	L191
L194	60.1	1.9	.73	2.5	1.74	61.7	.9	.28	1.7	.86	15T	Ø	L194
L195	60.8	2.6	.99	1.3	.88	61.2	.4	.12	2.6	1.31	15C	Ø	L195
L206	59.7	1.5	.57	2.4	1.70	62.3	1.5	.46	2.0	1.02	15T	Ø	L206
L207	53.1	-5.1	-1.91	1.5	1.08	89.0	28.2	8.51	3.3	1.67	15R	#	L207
L211	57.1	-1.0	-.39	1.5	1.01	58.3	-2.5	-.77	1.9	.96	15R	Ø	L211
L213	59.0	.8	.32	1.2	.83	62.7	1.9	.56	1.2	.62	15T	Ø	L213
L217	56.6	-1.6	-.59	.9	.63	63.3	2.5	.74	2.1	1.05	15T	Ø	L217
L223	59.4	1.3	.48	.7	.46	61.2	.4	.12	1.5	.76	15R	Ø	L223
L224	55.3	-2.9	-1.09	1.9	1.30	55.4	-5.4	-1.63	1.2	.60	15T	Ø	L224
L225	61.1	2.9	1.09	1.1	.77	64.9	4.1	1.24	1.2	.59	15T	Ø	L225
L226B	52.9	-5.2	-1.97	1.6	1.14	53.3	-7.5	-2.26	2.0	1.00	15T	Ø	L226B
L226C	52.4	-5.8	-2.17	1.0	.68	53.4	-7.4	-2.23	1.3	.64	15T	Ø	L226C
L228	55.5	-2.6	-.99	1.3	.91	56.3	-4.5	-1.37	2.0	1.01	15T	Ø	L228
L232	57.3	-.8	-.31	1.0	.68	63.1	2.3	.68	2.1	1.07	15T	Ø	L232
L233	64.5	6.4	2.40	1.3	.91	67.5	6.7	2.01	2.4	1.23	15T	Ø	L233
L235	54.3	-3.8	-1.44	1.2	.86	57.5	-3.3	-.99	1.4	.68	15T	Ø	L235
L237A	57.3	-.8	-.31	1.4	1.01	62.4	1.6	.48	2.3	1.15	15T	Ø	L237A
L237B	58.4	.2	.09	1.1	.78	61.9	1.1	.32	1.6	.80	15T	Ø	L237B
L238A	54.5	-3.6	-1.37	.9	.64	57.3	-3.5	-1.05	2.2	1.12	15T	Ø	L238A
L241	57.5	-.6	-.24	1.6	1.12	63.2	2.4	.72	1.2	.61	15T	Ø	L241
L243	58.5	.4	.14	1.1	.74	62.5	1.7	.50	2.0	.99	15T	Ø	L243
L244	57.4	-.8	-.29	1.2	.86	61.1	.3	.08	1.6	.82	15C	Ø	L244
L249	59.0	.8	.32	1.0	.73	63.5	2.7	.80	2.3	1.17	15T	Ø	L249
L254	59.1	.9	.34	1.0	.72	60.7	-.1	-.04	2.0	.98	15T	Ø	L254
L257A	57.7	-.4	-.16	2.1	1.48	62.0	1.2	.36	1.5	.76	15C	Ø	L257A
L257B	58.3	.1	.04	1.7	1.16	61.9	1.1	.32	1.6	.80	15C	Ø	L257B
L257C	58.4	.2	.09	1.9	1.31	61.9	1.1	.32	1.9	.97	15C	Ø	L257C
L259	62.4	4.2	1.60	.7	.51	60.9	.1	.02	1.8	.91	15T	Ø	L259
L261	53.9	-4.2	-1.59	1.6	1.13	57.3	-3.5	-1.05	2.2	1.09	15T	Ø	L261
L262	58.0	-.2	-.06	.7	.46	60.7	-.1	-.02	.8	.40	15T	Ø	L262

ANALYSIS T15-1 TABLE 1
TEARING STRENGTH, GRAMS

TAPPI STANDARD T414 TS-65, ANY MAKE ELMENDORF WITH DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB CODE	SAMPLE E11 70 GRAMS PER SQUARE METER					SAMPLE E17 74 GRAMS PER SQUARE METER					TEST D. - 15		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L221	60.8	2.6	.99	1.9	1.35	65.3	4.5	1.36	1.7	.86	15V	*	L221
L230	57.3	-.9	-.34	.8	.58	61.7	.9	.26	2.2	1.08	15V	*	L230
L250L	64.7	6.5	2.45	1.5	1.07	77.0	16.2	4.87	1.4	.69	15H	*	L250L
L251	56.9	-1.3	-.49	1.6	1.08	62.8	2.0	.60	2.3	1.18	15K	*	L251
L255	61.5	3.3	1.24	1.4	.98	61.3	.5	.16	2.1	1.05	15V	*	L255
L531	58.3	.2	.07	1.8	1.22	58.9	-1.9	-.57	2.1	1.07	15E	*	L531
L561	59.9	1.7	.64	1.4	.98	62.0	1.2	.36	2.0	1.01	15V	*	L561
L602	58.6	.4	.17	.8	.58	57.0	-3.8	-1.15	1.0	.50	15X	*	L602
L610	59.3	1.1	.42	1.2	.81	59.9	-.9	-.28	2.6	1.33	15E	*	L610

TOTAL NUMBER OF LABORATORIES REPORTING = 126

TAPPI STANDARD T414 TS-65, ANY MAKE ELMENDORF WITH DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---CONDITIONS
		E11	E17	MAJOR	MINOR	R.SDR	VAR		
L185	#	42.5	45.5	-21.6	3.4	.66	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L277	#	46.7	47.7	-17.4	1.4	1.18	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L396M	#	50.4	82.0	12.4	18.9	2.18	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L328	#	52.2	55.1	-8.1	1.4	1.29	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L604	#	52.3	80.8	12.5	16.7	1.51	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L226C	#	52.4	53.4	-9.4	.2	.66	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L226B	#	52.9	53.3	-9.2	-.3	1.07	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L331	#	52.9	54.5	-8.2	.4	.85	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L207	#	53.1	89.0	19.6	20.9	1.37	15R	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L158	X	53.9	73.1	7.3	10.8	1.73	15R	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L261	#	53.9	57.3	-5.3	1.3	1.11	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L236	#	54.3	57.5	-4.9	1.1	.77	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L157	#	54.5	58.7	-3.9	1.7	.88	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L366	#	54.5	55.6	-6.3	-.2	.99	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L238A	#	54.5	57.3	-5.0	.8	.88	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L303	#	54.6	53.3	-8.2	-1.6	1.14	15L	TEARING STRENGTH,	STANDARD, LORENTZ-WETTRES
L362	#	54.9	58.3	-4.0	1.1	.94	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L334	#	54.9	56.0	-5.8	-.3	.70	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L170	#	55.1	59.8	-2.7	1.9	.46	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L224	#	55.3	55.4	-6.1	-.9	.95	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L145	#	55.5	56.9	-4.8	-.2	1.31	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L345	#	55.5	60.5	-1.8	2.0	1.47	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L228	#	55.5	56.3	-5.2	-.6	.96	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L100	#	55.6	58.2	-3.6	.5	.85	15M	TEARING STRENGTH,	STANDARD, T. M. MIRFIELD(APPITA-ELMENDORF)
L565	#	55.7	59.5	-2.5	1.1	1.22	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L105	#	55.8	58.3	-3.4	.4	1.75	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L281	#	55.9	57.9	-3.6	.1	.68	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L280	#	55.9	60.1	-1.9	1.3	.74	15L	TEARING STRENGTH,	STANDARD, LORENTZ-WETTRES
L182A	#	56.1	63.7	1.1	3.4	1.56	15A	TEARING STRENGTH,	STANDARD, APPITA
L190C	#	56.2	55.7	-5.2	-1.5	.77	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L153	#	56.3	56.9	-4.3	-.9	.96	15C	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF (W. AIR CLAMP)
L321	#	56.4	54.7	-6.0	-2.3	.70	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L506	#	56.5	61.4	-.5	1.7	.95	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L587	#	56.5	54.0	-6.4	-2.8	.82	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L309	#	56.6	59.9	-1.6	.7	1.07	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L118	#	56.6	59.7	-1.8	.6	.92	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L217	#	56.6	63.3	1.0	2.7	.84	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L596	#	56.8	66.1	3.6	4.3	2.49	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L312	#	56.8	55.1	-5.4	-2.3	1.61	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L251	#	56.9	62.8	.8	2.2	1.13	15K	TEARING STRENGTH,	STANDARD, LORENTZ-WETTRES, 20 C, 65% RH
L566	X	56.9	67.3	4.6	4.9	.97	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L575	#	57.0	61.3	-.3	1.2	.93	15L	TEARING STRENGTH,	STANDARD, LORENTZ-WETTRES
L148	#	57.1	59.2	-1.9	-.1	1.66	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L360	#	57.1	61.1	-.4	1.1	.77	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L211	#	57.1	58.3	-2.7	-.7	.99	15R	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L336	#	57.2	59.6	-1.5	.0	.88	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L230	#	57.3	61.7	.2	1.2	.83	15V	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)X2
L237A	#	57.3	62.4	.8	1.6	1.08	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L232	#	57.3	63.1	1.3	2.0	.87	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L244	#	57.4	61.1	-.2	.8	.84	15C	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF (W. AIR CLAMP)
L241	#	57.5	63.2	1.5	1.9	.86	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L273	#	57.6	62.4	.9	1.4	1.20	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L291	#	57.7	60.9	-.2	.5	.82	15A	TEARING STRENGTH,	STANDARD, APPITA
L279	#	57.7	61.7	.4	.9	1.02	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L580	#	57.7	58.7	-1.9	-.9	.69	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L390	#	57.7	59.5	-1.3	-.5	.89	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L166	#	57.7	59.4	-1.4	-.5	.95	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L257A	#	57.7	62.0	.7	1.1	1.12	15C	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF (W. AIR CLAMP)
L162	#	57.8	61.2	.1	.5	.79	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L163	#	57.9	59.0	-1.6	-.9	1.02	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L262	#	58.0	60.7	-.2	.1	.43	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L378	#	58.1	60.1	-.7	-.4	.97	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L290	#	58.1	63.5	2.1	1.7	1.21	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L599	#	58.1	59.8	-.8	-.6	1.07	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)
L183	#	58.1	58.7	-1.7	-1.2	1.05	15T	TEARING STRENGTH,	STANDARD, THWING-ELMENDORF(SCALE T6 100)

ANALYSIS T15-1 TABLE 2

TEARING STRENGTH, GRAMS

TAPPI STANDARD T414 TS-65, ANY MAKE ELVENDORF WITH DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---	CONDITIONS
		E11	E17	MAJOR	MINOR	R, SDR	VAR			
L257B	Ø	58.3	61.9	.9	.5	.98	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L531	+	58.3	58.9	-1.4	-1.3	1.15	15E	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF, AMBIENT COND.
L103	Ø	58.3	60.3	-.3	-.4	.56	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L257C	Ø	58.4	61.9	1.0	.4	1.14	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L237B	Ø	58.4	61.9	1.0	.4	.79	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L159	Ø	58.5	65.4	3.9	2.5	1.13	15L	TEARING STRENGTH	STANDARD,	LØRENTZ-WETTRES
L134	Ø	58.5	62.2	1.3	.5	.90	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L167	Ø	58.5	64.9	3.5	2.2	.58	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L243	Ø	58.5	62.5	1.6	.7	.86	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L173B	Ø	58.5	57.8	-2.2	-2.1	.86	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L602	+	58.6	57.0	-2.8	-2.6	.54	15X	TEARING STRENGTH	STANDARD:	GIVE INSTRUMENT MAKE, MODEL
L268	Ø	58.7	62.7	1.8	.7	.58	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L344	Ø	58.7	59.6	-.7	-1.1	1.20	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L128	Ø	58.9	62.6	1.9	.5	.86	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L311	Ø	58.9	60.1	-.1	-1.0	1.15	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L581	Ø	59.0	61.1	.7	-.5	.89	15Q	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF, AIR CLAMP, DIGITL
L213	Ø	59.0	62.7	2.0	.4	.73	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L249	Ø	59.0	63.5	2.6	.9	.95	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L254	Ø	59.1	60.7	.4	-.8	.85	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L610	+	59.3	59.9	-.1	-1.4	1.07	15E	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF, AMBIENT COND.
L315	Ø	59.3	61.3	1.0	-.6	1.10	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L126	Ø	59.3	63.7	3.0	.8	1.17	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L223	Ø	59.4	61.2	1.1	-.8	.61	15R	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF, DIGITAL READOUT
L139	Ø	59.6	63.2	2.8	.3	1.18	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L206	Ø	59.7	62.3	2.1	-.3	1.36	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L275	Ø	59.7	64.5	3.9	1.0	.91	15T	THARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L561	+	59.9	62.0	2.0	-.7	.99	15V	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)X2
L600	Ø	59.9	61.6	1.7	-.9	1.01	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L121	Ø	60.0	59.2	-.2	-2.4	1.23	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L278	Ø	60.0	63.8	3.5	.3	2.73	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L122	Ø	60.0	62.0	2.1	-.8	.75	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L194	Ø	60.1	61.7	1.9	-1.0	1.30	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L191	Ø	60.1	64.1	3.8	.4	.93	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L182T	Ø	60.3	65.2	4.8	.9	.85	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L115	Ø	60.4	61.7	2.0	-1.3	.84	15C	TEARING STRHNGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L567	Ø	60.5	64.3	4.2	.2	1.01	15C	THARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L174S	Ø	60.5	67.7	7.0	2.2	2.04	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L576	Ø	60.6	67.3	6.7	1.9	1.15	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L324	Ø	60.7	62.1	2.6	-1.2	1.21	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L484	#	60.7	74.4	12.4	6.1	1.85	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L190R	Ø	60.7	62.3	2.7	-1.2	.95	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L221	+	60.8	65.3	5.2	.6	1.11	15V	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)X2
L195	Ø	60.8	61.2	1.9	-1.9	1.09	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L376	Ø	60.9	58.9	.2	-3.3	1.31	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L352	Ø	61.0	62.1	2.7	-1.5	1.03	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L225	Ø	61.1	64.9	5.0	.1	.68	15T	THARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L255	+	61.5	61.3	2.4	-2.3	1.02	15V	THARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)X2
L288	Ø	61.6	63.6	4.3	-1.1	.98	15Q	TEARING STRHNGTH	STANDARD,	THWING-ELVENDORF, AIR CLAMP, DIGITL
L299	Ø	62.3	64.4	5.3	-1.1	.95	15T	TEARING STRHNGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L259	Ø	62.4	60.9	2.6	-3.4	.71	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L124	Ø	62.5	62.5	3.9	-2.5	-.94	15T	THARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L562	#	62.7	78.6	17.0	7.0	3.27	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L107	Ø	62.7	65.9	6.7	-.6	.95	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L382	Ø	63.1	66.3	7.3	-.7	.93	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L150	Ø	63.7	63.2	5.2	-3.0	1.05	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L233	Ø	64.5	67.5	9.1	-1.1	1.07	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
L250L	+	64.7	77.0	16.8	4.4	.88	15H	TEARING STRENGTH	STANDARD,	LØSMARY, 20 C, 65% RH
L554	+	65.7	65.5	8.3	-3.2	.80	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L442	+	65.8	67.2	9.7	-2.3	1.16	15R	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF, DIGITAL READOUT
L151	X	69.9	73.7	17.4	-1.7	1.01	15C	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (W.AIR CLAMP)
L264	#	70.4	91.7	32.1	8.7	2.59	15T	TEARING STRENGTH	STANDARD,	THWING-ELVENDORF (SCALE TO 100)
GMEANS:		58.2	60.8			1.00				
		95% ELLIPSE:	10.0	3.6		WITH GAMMA = 53 DEGREES				

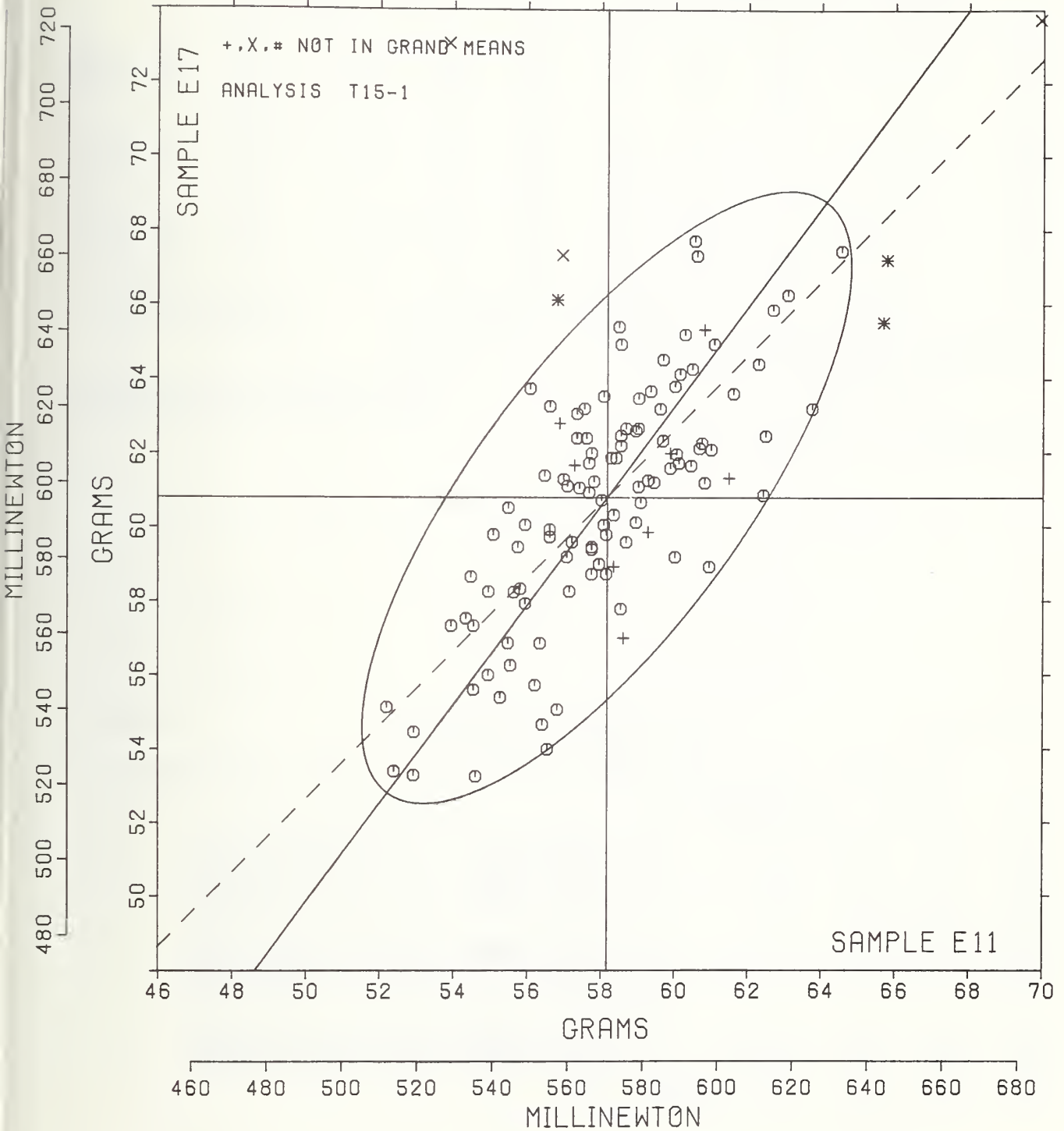
TEARING STRENGTH, DEEP CUTOUT

SAMPLE E11 = 58.2 GRAMS

SAMPLE E17 = 60.8 GRAMS

SAMPLE E11 = 570 MILLINEWTON

SAMPLE E17 = 596 MILLINEWTON



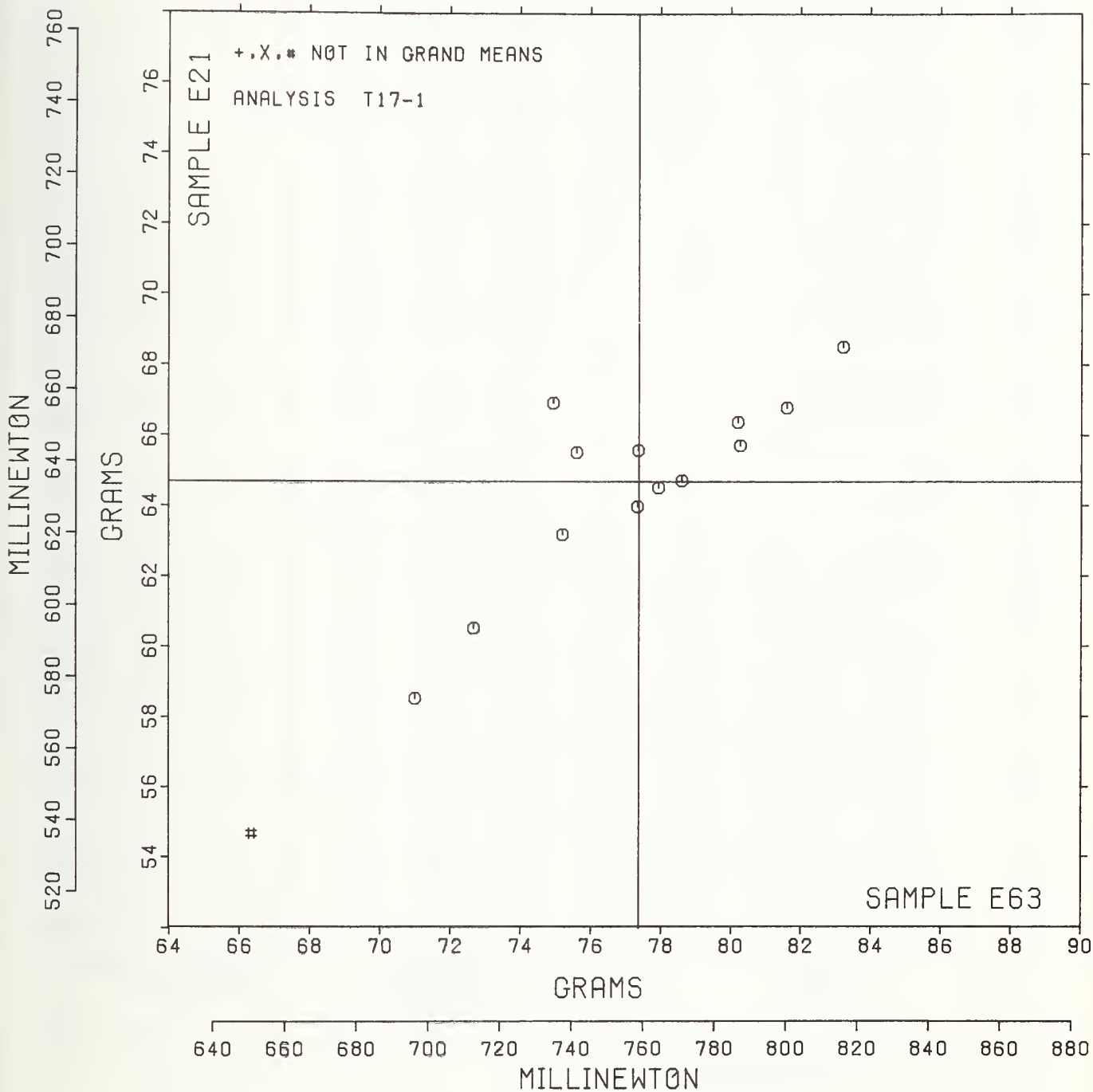
TEARING STRENGTH, NO CUTOUT

SAMPLE E63 = 77.4 GRAMS

SAMPLE E21 = 64.7 GRAMS

SAMPLE E63 = 759 MILLINEWTON

SAMPLE E21 = 634 MILLINEWTON



TENSILE BREAKING STRENGTH, KILOWEIGHTS PER METER - PACKAGING PAPER
TAPPI STANDARDS T404 GS-76 AND T494 GS-70, TENSILE BREAKING STRENGTH, PENDULUM AND CRE TYPES

LAB CODE	KRAFT ENVELOPE E63 75 GRAMS PER SQUARE METER					KRAFT E66 83 GRAMS PER SQUARE METER					TEST D. = 20			
	MEAN	DEV	N.DEV	SDR	R. SDR	MEAN	DEV	N.DEV	SDR	R. SDR	VAR	F	LAB	
L107	3.76	-.16	-.87	.25	1.46	3.61	-.13	-.53	.32	1.01	19A	Ø	L107	
L122	3.69	-.22	-1.19	.14	.83	3.46	-.28	-1.19	.35	1.11	19A	Ø	L122	
L126	3.78	-.14	-.76	.16	.95	3.57	-.16	-.69	.23	.72	19A	Ø	L126	
L151	3.73	-.19	-1.02	.18	1.07	3.46	-.28	-1.19	.41	1.28	19A	Ø	L151	
L153	4.13	.21	1.09	.16	.92	3.80	.06	.25	.32	1.01	19P	Ø	L153	
L157A	3.90	-.02	-.10	.18	1.06	3.64	-.10	-.41	.31	.99	19P	Ø	L157A	
L157I	3.82	-.10	-.53	.19	1.12	3.66	-.08	-.32	.32	1.01	19A	Ø	L157I	
L167	4.38	.46	2.44	.24	1.43	4.34	.60	2.55	.43	1.37	19Ø	*	L167	
L174	3.78	-.14	-.74	.14	.80	3.63	-.10	-.44	.53	1.67	19A	Ø	L174	
L182I	36.70	32.78	173.42	1.32	7.72	33.68	29.95	127.06	1.83	5.81	19D	#	L182I	
L182L	3.82	-.10	-.53	.17	.99	3.47	-.27	-1.16	.24	.77	19T	Ø	L182L	
L207	3.82	-.10	-.51	.13	.79	3.67	-.07	-.30	.27	.84	19A	Ø	L207	
L217P	3.95	.03	.17	.13	.77	3.50	-.24	-1.00	.33	1.05	19P	Ø	L217P	
L224	4.01	.09	.48	.20	1.19	3.85	.11	.46	.34	1.08	19A	Ø	L224	
L225	4.08	.16	.85	.26	1.53	4.04	.31	1.30	.50	1.60	19P	Ø	L225	
L234L	4.10	.18	.94	.13	.75	3.84	.10	.42	.32	1.01	19P	Ø	L234L	
L237A	3.96	.04	.22	.15	.88	3.69	-.04	-.19	.33	1.05	19Q	Ø	L237A	
L237B	4.03	.11	.61	.24	1.43	3.93	.19	.83	.40	1.28	19A	Ø	L237B	
L238A	41.12	37.21	196.81	1.45	8.50	37.97	34.23	145.24	3.50	11.08	19T	#	L238A	
L243	3.64	-.27	-1.45	.20	1.18	3.40	-.34	-1.45	.28	.89	19A	Ø	L243	
L257A	4.03	.11	.60	.12	.69	3.85	.11	.46	.27	.85	19P	Ø	L257A	
L257B	3.90	-.02	-.11	.18	1.06	3.65	-.09	-.37	.24	.78	19P	Ø	L257B	
L257C	4.04	.12	.65	.14	.85	3.85	.11	.46	.28	.90	19P	Ø	L257C	
L264A	4.84	.92	4.88	.47	2.75	4.46	.72	3.05	.95	3.02	19A	#	L264A	
L264P	41.60	37.68	199.35	1.43	8.40	39.43	35.69	151.45	3.05	9.65	19P	#	L264P	
L265	3.85	-.07	-.35	.19	1.11	3.66	-.08	-.35	.37	1.16	19A	Ø	L265	
L267	3.77	-.15	-.80	.16	.93	3.67	-.07	-.29	.27	.87	19A	Ø	L267	
L268A	3.83	-.09	-.46	.10	.57	3.87	.13	.55	.22	.70	19A	Ø	L268A	
L268P	4.08	.16	.83	.09	.54	3.88	.14	.61	.17	.54	19P	Ø	L268P	
L273	4.02	.10	.53	.19	1.09	NO DATA REPORTED FOR SAMPLE E66							19P M L273	
L280	3.85	-.07	-.35	.15	.88	3.45	-.29	-1.24	.37	1.18	19Q	Ø	L280	
L281	3.91	-.01	-.07	.15	.90	3.70	-.04	-.16	.26	.82	19Q	Ø	L281	
L312	4.10	.18	.98	.34	1.97	4.15	.42	1.77	.26	.84	19D	Ø	L312	
L318	3.48	-.44	-2.31	.19	1.10	3.42	-.32	-1.36	.29	.93	19Q	*	L318	
L324	3.72	-.20	-1.05	.18	1.05	3.64	-.09	-.40	.29	.93	19A	Ø	L324	
L334	4.07	.16	.82	.17	.98	3.90	.16	.69	.26	.83	19P	Ø	L334	
L336	3.80	-.12	-.65	.11	.64	3.72	-.02	-.09	.21	.68	19Q	Ø	L336	
L356	4.13	.21	1.13	.23	1.34	3.97	.23	.99	.42	1.33	19P	Ø	L356	
L561	4.07	.15	.81	.12	.70	3.66	-.08	-.35	.47	1.50	19P	Ø	L561	
L562	4.08	.16	.83	.27	1.56	4.04	.30	1.26	.23	.74	19P	Ø	L562	
L565	4.13	.21	1.09	.19	1.11	4.07	.33	1.42	.16	.51	19T	Ø	L565	
L568	3.82	-.10	-.51	.17	.98	3.63	-.11	-.46	.33	1.06	19P	Ø	L568	
L575	3.78	-.14	-.74	.14	.82	3.58	-.16	-.68	.30	.95	19D	Ø	L575	
L576	3.91	-.01	-.03	.15	.88	NO DATA REPORTED FOR SAMPLE E66							19A M L576	
L580	3.94	.02	.11	.16	.92	3.82	.08	.35	.26	.84	19Q	Ø	L580	
L581	4.02	.10	.53	.13	.76	3.50	-.24	-1.01	.27	.84	19A	*	L581	
L582	3.61	-.31	-1.62	.16	.96	3.51	-.23	-.96	.24	.78	19A	Ø	L582	
L604	3.89	-.03	-.13	.18	1.03	3.70	-.04	-.15	.40	1.26	19P	Ø	L604	
L606	3.54	.02	.11	.17	1.00	3.80	.06	.24	.42	1.32	19P	Ø	L606	
L607	4.43	.51	2.70	.23	1.34	4.45	.71	3.01	.30	.94	19A	*	L607	
L610	3.70	-.22	-1.14	.12	.69	3.53	-.21	-.89	.40	1.28	19A	Ø	L610	
GR. MEAN	3.92	KILONEWTN/M				GRAND MEAN	3.74	KILONEWTN/M				TEST DETERMINATIONS = 20		
SD MEANS	.19	KILONEWTN/M				SD OF MEANS	.24	KILONEWTN/M				45 LABS IN GRAND MEANS		
		AVERAGE SDR = .17						AVERAGE SDR = .32				KILONEWTN/M		
GR. MEAN	22.38	LB/INCH				GRAND MEAN	21.35	LB/INCH						
L250I	3.28	-.64	-3.39	.20	1.16	3.13	-.61	-2.59	.33	1.05	19L	*	L250I	
L251	3.17	-.75	-3.97	.23	1.33	3.29	-.45	-1.92	.22	.71	19I	*	L251	

TOTAL NUMBER OF LABORATORIES REPORTING = 53
Best Values: E63 3.8 ± 0.3 kilonewton per meter
E66 3.5 ± 0.5 kilonewton per meter

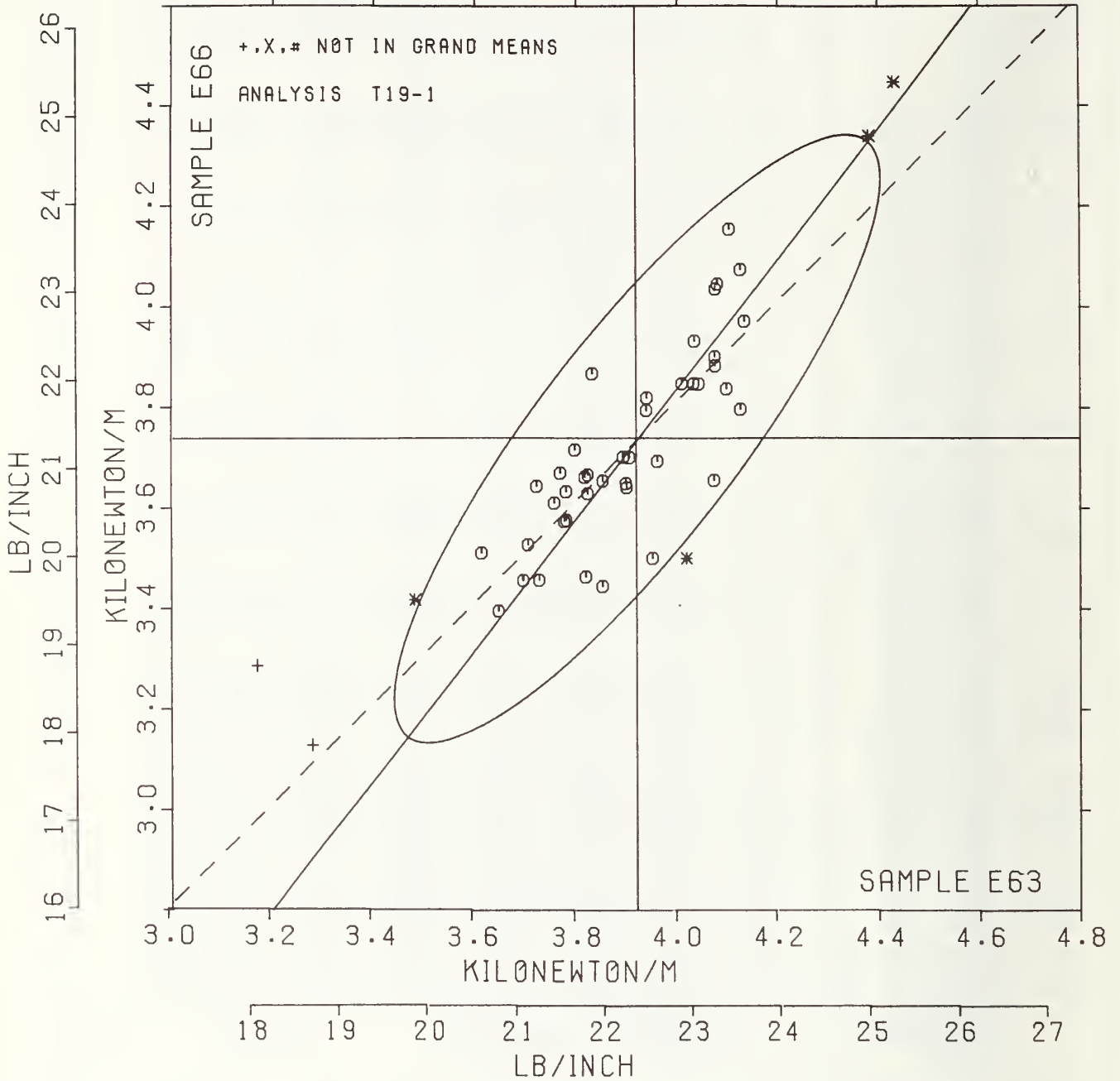
The following laboratories were omitted from the grand means because of extreme test results: 182I, 238A, 264A 264P.

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER - PACKAGING PAPER
TAPPI STANDARDS T404 GS-76 AND T494 GS-70, TENSILE BREAKING STRENGTH, PENDULUM AND CRE TYPES

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---CONDITIONS
		E63	E66	MAJOR	MINOR	R.SDR	VAR		
L251	*	3.17	3.29	-.82	.32	1.02	19I	TENSILE STRENGTH,	PACKAGING PAPER, CRE, 20C, 65% RH
L2501	*	3.28	3.13	-.87	.13	1.10	19L	TENSILE STRENGTH,	PACKAGING PAPER, CRE, 20 C, 65% RH
L318	*	3.48	3.42	-.52	.15	1.02	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L582	Ø	3.61	3.51	-.37	.10	.87	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L243	Ø	3.64	3.40	-.44	.01	1.04	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L122	Ø	3.69	3.46	-.36	.01	.97	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L610	Ø	3.70	3.53	-.30	.04	.98	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L324	Ø	3.72	3.64	-.20	.10	.99	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L151	Ø	3.73	3.46	-.34	-.02	1.18	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L107	Ø	3.76	3.61	-.20	.05	1.23	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L267	Ø	3.77	3.67	-.15	.08	.90	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L126	Ø	3.78	3.57	-.22	.01	.83	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L174	Ø	3.78	3.63	-.17	.05	1.23	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L575	Ø	3.78	3.58	-.21	.01	.88	19D	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L336	Ø	3.80	3.72	-.09	.08	.66	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L1571	Ø	3.82	3.66	-.12	.03	1.07	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L182L	Ø	3.82	3.47	-.28	-.09	.88	19T	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L558	Ø	3.82	3.63	-.14	.01	1.02	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L207	Ø	3.82	3.67	-.11	.03	.82	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L268A	Ø	3.83	3.87	.05	.15	.63	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L280	Ø	3.85	3.45	-.27	-.13	1.03	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L265	Ø	3.85	3.66	-.11	.00	1.13	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L604	Ø	3.89	3.70	-.04	-.00	1.15	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L257B	Ø	3.90	3.65	-.08	-.04	.92	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L157A	Ø	3.90	3.64	-.09	-.04	1.03	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L281	Ø	3.91	3.70	-.04	-.01	.86	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L576	M	3.91				.88	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L606	Ø	3.94	3.80	.06	.02	1.16	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L580	Ø	3.94	3.82	.08	.03	.88	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L217P	Ø	3.95	3.50	-.17	-.17	.91	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L237A	Ø	3.96	3.69	-.01	-.06	.96	19Q	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L224	Ø	4.01	3.85	.14	-.00	1.13	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L273	M	4.02				1.09	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L581	*	4.02	3.50	-.13	-.22	.80	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L257A	Ø	4.03	3.85	.16	-.02	.77	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L237B	Ø	4.03	3.93	.22	.03	1.35	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L257C	Ø	4.04	3.85	.16	-.03	.88	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L561	Ø	4.07	3.66	.03	-.17	1.10	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L334	Ø	4.07	3.90	.22	-.02	.90	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L268P	Ø	4.08	3.88	.21	-.04	.54	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L552	Ø	4.08	4.04	.33	.06	1.15	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L225	Ø	4.08	4.04	.34	.06	1.57	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L234L	Ø	4.10	3.84	.19	-.08	.88	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L312	Ø	4.10	4.15	.44	.11	1.40	19D	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L153	Ø	4.13	3.80	.17	-.13	.96	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L555	Ø	4.13	4.07	.39	.04	.81	19T	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L356	Ø	4.13	3.97	.31	-.03	1.34	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L167	*	4.38	4.34	.76	.00	1.40	19G	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L607	*	4.43	4.45	.87	.03	1.14	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L264A	#	4.84	4.46	1.13	-.29	2.89	19A	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L182I	#	36.70	33.68	43.74	-7.62	6.76	19D	TENSILE STRENGTH,	PACKAGING PAPER, LOAD CELL (CRE)
L238A	#	41.12	37.97	49.84	-8.50	9.79	19T	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
L264P	#	41.60	39.43	51.29	-7.98	9.03	19P	TENSILE STRENGTH,	PACKAGING PAPER, PENDULUM TESTER
GMEANS:		3.92	3.74			1.00			
		95% ELLIPSE:		.75	.20			WITH GAMMA = 52 DEGREES	

TENSILE STRENGTH, PACKAGING PAPERS

SAMPLE E63 = 3.92 KILONEWTON/M SAMPLE E66 = 3.74 KILONEWTON/M
 SAMPLE E63 = 22.4 LB/INCH SAMPLE E66 = 21.3 LB/INCH



ANALYSIS T20-1 TABLE 1

TENSILE BREAKING STRENGTH, KILOWEIGHTS PER METER

TAPPI STANDARD T494 GS-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	SAMPLE J07		PRINTING 85 GRAMS PER SQUARE METER				SAMPLE J05		PRINTING 102 GRAMS PER SQUARE METER				TEST D. = 20		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB		
L100	6.17	-.12	-.34	.20	.57	5.12	-.27	-.86	.22	.92	20E	Ø	L100		
L105	6.17	-.12	-.33	.46	1.29	4.77	-.61	-1.97	.31	1.32	20A	*	L105		
L115	6.35	.06	.17	.20	.56	5.30	-.08	-.26	.14	.59	20D	Ø	L115		
L118	6.31	.02	.05	.18	.49	5.33	-.05	-.16	.16	.66	20A	Ø	L118		
L122	6.06	-.23	-.64	.41	1.14	5.30	-.08	-.27	.16	.70	20A	Ø	L122		
L124C	6.05	-.24	-.67	.35	.98	5.33	-.05	-.15	.16	.69	20A	Ø	L124C		
L125	6.59	.30	.82	.40	1.12	5.61	.23	.73	.28	1.17	20C	Ø	L125		
L131	6.32	.03	.09	.34	.95	5.44	.05	.18	.26	1.11	20E	Ø	L131		
L143	7.04	.75	2.07	.35	.98	5.90	.51	1.65	.27	1.16	20E	Ø	L143		
L148	6.24	-.05	-.13	.40	1.12	5.35	-.04	-.11	.21	.91	20A	Ø	L148		
L159	5.63	-.66	-1.83	.54	1.51	4.84	-.54	-1.74	.25	1.08	20A	Ø	L159		
L163	6.30	.01	.02	.37	1.05	5.40	.02	.07	.20	.85	20D	Ø	L163		
L167	6.76	.47	1.30	.56	1.57	5.97	.59	1.89	.19	.82	20G	Ø	L167		
L185	6.07	-.22	-.60	.33	.92	5.24	-.14	-.45	.23	.98	20C	Ø	L185		
L190R	5.77	-.52	-1.42	.56	1.57	5.07	-.31	-1.01	.19	.82	20A	Ø	L190R		
L194	6.17	-.12	-.34	.24	.67	5.28	-.10	-.32	.14	.62	20A	Ø	L194		
L206	6.33	.04	.10	.41	1.15	5.53	.15	.47	.26	1.11	20A	Ø	L206		
L223B	6.49	.20	.55	.19	.52	5.50	.12	.39	.14	.61	20A	Ø	L223B		
L226C	6.52	.23	.62	.58	1.63	6.33	.95	3.05	.67	2.86	20C	X	L226C		
L230	3.04	-3.25	-9.00	.09	.25	2.56	-2.82	-9.07	.10	.44	20Ø	*	L230		
L243	6.08	-.21	-.58	.40	1.12	5.25	-.13	-.41	.22	.94	20A	Ø	L243		
L255	6.54	.25	.68	.21	.58	5.49	.10	.33	.21	.89	20A	Ø	L255		
L260	6.75	.46	1.27	.43	1.22	5.78	.39	1.27	.28	1.19	20A	Ø	L260		
L261	6.29	.00	.01	.27	.77	5.44	.06	.20	.40	1.70	20A	Ø	L261		
L278	5.89	-.40	-1.10	.31	.88	4.92	-.47	-1.50	.24	1.03	20A	Ø	L278		
L291	6.84	.55	1.51	.63	1.78	5.32	-.06	-.19	.49	2.10	20A	*	L291		
L309	6.61	.32	.89	.31	.88	5.77	.39	1.26	.28	1.20	20E	Ø	L309		
L315	6.29	-.00	-.00	.28	.79	5.25	-.13	-.41	.17	.73	20A	Ø	L315		
L318	5.88	-.41	-1.14	.32	.90	4.85	-.53	-1.72	.25	1.05	20G	Ø	L318		
L328	6.78	.49	1.35	.21	.60	5.68	.30	.97	.23	.96	20A	Ø	L328		
L331	6.58	.29	.80	.63	1.78	5.80	.42	1.36	.29	1.25	20A	Ø	L331		
L333	6.07	-.22	-.62	.39	1.11	5.15	-.24	-.76	.16	.67	20A	Ø	L333		
L344	6.42	.13	.36	.51	1.43	5.63	.25	.81	.24	1.03	20A	Ø	L344		
L360	6.20	-.10	-.26	.25	.70	5.24	-.14	-.45	.29	1.25	20B	Ø	L360		
L372	6.15	-.14	-.39	.40	1.13	5.16	-.22	-.71	.34	1.44	20A	Ø	L372		
L378	6.12	-.17	-.46	.33	.93	5.29	-.09	-.30	.16	.67	20A	Ø	L378		
L390	.63	-5.66	-15.65	.04	.11	.56	-4.82	-15.51	.02	.10	20A	#	L390		
L442	5.94	-.35	-.98	.21	.58	5.15	-.23	-.75	.24	1.01	20G	Ø	L442		
L531	7.05	.76	2.11	.42	1.17	5.94	.55	1.78	.36	1.52	20A	Ø	L531		
L557	5.39	-.90	-2.48	.63	1.78	4.93	-.45	-1.45	.22	.93	20C	*	L557		
L559	6.41	.12	.34	.21	.60	5.35	-.03	-.11	.21	.90	20C	Ø	L559		
L560	5.56	-.73	-2.01	.55	1.54	5.19	-.19	-.61	.24	1.03	20C	*	L560		
L561	6.37	.08	.21	.46	1.29	5.27	-.11	-.35	.40	1.70	20A	Ø	L561		
L567	6.69	.40	1.10	.71	2.00	6.11	.73	2.34	.20	.84	20A	*	L567		
L574	6.17	-.12	-.33	.65	1.83	5.43	.05	.15	.25	1.06	20A	Ø	L574		
L575	6.33	.04	.11	.24	.68	5.44	.06	.18	.24	1.03	20D	Ø	L575		
L592	6.55	.26	.72	.41	1.16	5.69	.31	1.00	.22	.94	20A	Ø	L592		
GR. MEAN	6.29	KILONEWTN/M		GRAND MEAN	5.38	KILONEWTN/M		TEST DETERMINATIONS	20						
SD MEANS	.36	KILONEWTN/M		SD OF MEANS	.31	KILONEWTN/M		44 LABS IN GRAND MEANS							
		AVERAGE SDR =		.36	KILONEWTN/M	AVERAGE SDR =		.23 KILONEWTN/M							
GR. MEAN	21.214	LB/15 MM		GRAND MEAN	18.151	LB/15 MM									
L139	6.16	-.13	-.37	.27	.76	5.24	-.14	-.46	.19	.81	20H	*	L139		
L231	6.61	.32	.90	.26	.74	5.48	.10	.32	.21	.87	20H	*	L231		
L250I	5.29	-1.00	-2.77	.17	.48	4.46	-.92	-2.96	.15	.65	20L	*	L250I		
L251	44.17	37.88	104.74	5.13	14.44	37.66	32.28	103.87	3.43	14.62	20U	*	L251		

TOTAL NUMBER OF LABORATORIES REPORTING = 51
 Best Values: J07 6.2 ± 0.5 kilonewton per meter
 J05 5.3 ± 0.5 kilonewton per meter

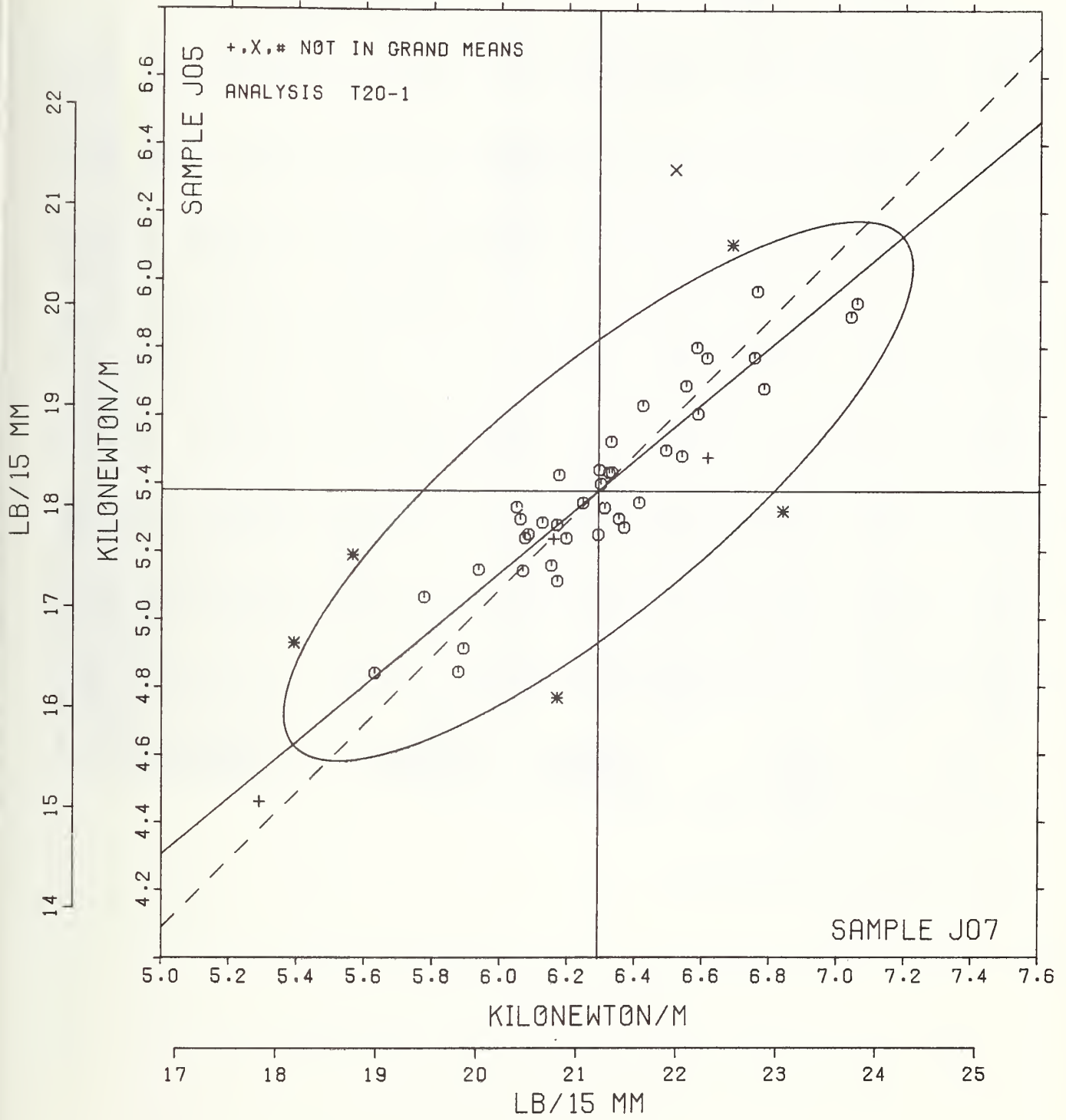
Data from the following laboratories appear to be off by a multiplicative factor: 230, 390.

TENSILE BREAKING STRENGTH, KILOGNEWTONS PER METER
TAPPI STANDARD T494 6S-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	F	MEANS		COORDINATES		AVG R.SDR	VAR	PROPERTY---TEST	INSTRUMENT---	CONDITIONS
		J07	J05	MAJOR	MINOR					
L390	#	.63	.56	-7.43	-.08	.10	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L230	#	3.04	2.56	-4.30	-.08	.35	20G	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L250I	*	5.29	4.46	-1.36	-.07	.57	20L	TENSILE STRENGTH,	PRINTING PAPER, CRE, 20 C,	65% RH
L557	*	5.39	4.93	-.98	.23	1.36	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L560	*	5.56	5.19	-.68	.32	1.28	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L159	Ø	5.63	4.84	-.85	.01	1.30	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L190R	Ø	5.77	5.07	-.60	.09	1.20	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L318	Ø	5.88	4.85	-.66	-.15	.98	20G	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L278	Ø	5.89	4.92	-.60	-.10	.95	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L442	Ø	5.94	5.15	-.42	.05	.79	20G	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L124C	Ø	6.05	5.33	-.22	.12	.83	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L122	Ø	6.06	5.30	-.23	.08	.92	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L333	Ø	6.07	5.15	-.32	-.04	.89	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L185	Ø	6.07	5.24	-.26	.03	.95	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L243	Ø	6.08	5.25	-.24	.03	1.03	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L378	Ø	6.12	5.29	-.19	.03	.80	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L372	Ø	6.15	5.16	-.25	-.08	1.29	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L139	*	6.16	5.24	-.19	-.02	.78	20H	TENSILE STRENGTH,	PRINTING PAPER, CRE, SHORT	TEST SPAN
L194	Ø	6.17	5.28	-.16	.00	.64	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L100	Ø	6.17	5.12	-.26	-.13	.74	20E	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L105	*	6.17	4.77	-.48	-.39	1.30	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L574	Ø	6.17	5.43	-.06	.11	1.44	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L360	Ø	6.20	5.24	-.16	-.05	.98	20B	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L148	Ø	6.24	5.35	-.06	.00	1.02	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L315	Ø	6.29	5.25	-.08	-.10	.76	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L261	Ø	6.29	5.44	.04	.05	1.24	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L163	Ø	6.30	5.40	.02	.01	.95	20D	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L118	Ø	6.31	5.33	-.02	-.05	.58	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L131	Ø	6.32	5.44	.06	.02	1.03	20E	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L206	Ø	6.33	5.53	.12	.09	1.13	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L575	Ø	6.33	5.44	.07	.02	.86	20D	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L115	Ø	6.35	5.30	-.01	-.10	.57	20D	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L561	Ø	6.37	5.27	-.01	-.13	1.50	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L559	Ø	6.41	5.35	.07	-.10	.75	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L344	Ø	6.42	5.63	.26	.11	1.23	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L223B	Ø	6.49	5.50	.23	-.04	.57	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L226C	X	6.52	6.33	.78	.58	2.25	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L255	Ø	6.54	5.49	.26	-.08	.74	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L592	Ø	6.55	5.69	.40	.07	1.05	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L331	Ø	6.58	5.80	.49	.14	1.51	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L125	Ø	6.59	5.61	.37	-.01	1.14	20C	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L309	Ø	6.61	5.77	.50	.10	1.04	20E	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L231	*	6.61	5.48	.31	-.13	.81	20H	TENSILE STRENGTH,	PRINTING PAPER, CRE, SHORT	TEST SPAN
L567	*	6.69	6.11	.77	.30	1.42	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L260	Ø	6.75	5.78	.61	.01	1.21	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L167	Ø	6.76	5.97	.74	.15	1.19	20G	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L328	Ø	6.78	5.68	.57	-.08	.78	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L291	*	6.84	5.32	.38	-.40	1.94	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L143	Ø	7.04	5.90	.90	-.08	1.07	20E	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L531	Ø	7.05	5.94	.94	-.06	1.35	20A	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	LOAD CELL (CRE)
L251	*	44.17	37.66	49.76	.56	14.53	20U	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS,	PENDULUM TESTER
GMEANS:		6.29	5.38			1.00				
		95% ELLIPSH:		1.17	.35			WITH GAMMA = 39 DEGREES		

TENSILE STRENGTH, CRE TYPE

SAMPLE J07 = 6.29 KILONEWTON/M SAMPLE J05 = 5.38 KILONEWTON/M
 SAMPLE J07 = 21.2 LB/15 MM SAMPLE J05 = 18.2 LB/15 MM



ANALYSIS T20-2 TABLE 1
TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

TAPPI STANDARD T404 6S-76, TENSILE BREAKING STRENGTH OF PAPER AND PAPERBOARD (PENDULUM-TYPE TESTER)

LAB CODE	SAMPLE J07 MEAN	PRINTING 85 GRAMS PER SQUARE METER				SAMPLE J05 MEAN	PRINTING 102 GRAMS PER SQUARE METER				TEST D. - 20		
		DEV	N. DEV	SDR	R. SDR		DEV	N. DEV	SDR	R. SDR	VAR	F	LAB
L103	5.40	-.81	-2.01	.24	.60	6.55	1.14	2.99	.23	.83	20R	X	L103
L108	6.19	-.02	-.05	.59	1.45	6.36	.96	2.51	.50	1.81	20P	X	L108
L121	5.63	-.57	-1.43	.52	1.28	5.08	-.33	-.86	.46	1.66	20P	Ø	L121
L124P	6.03	-.18	-.44	.77	1.89	5.07	-.33	-.88	.61	2.21	20P	Ø	L124P
L128	6.31	.10	.26	.44	.59	5.40	-.00	-.01	.21	.77	20T	Ø	L128
L148	6.17	-.04	-.09	.27	.65	5.39	-.01	-.04	.19	.68	20P	Ø	L148
L158	5.59	-.62	-1.55	.32	.79	4.68	-.72	-1.90	.24	.88	20T	Ø	L158
L162	5.94	-.27	-.66	.56	1.38	5.26	-.15	-.39	.25	.92	20*	Ø	L162
L182L	5.93	-.27	-.68	.59	1.44	5.27	-.14	-.37	.18	.64	20T	Ø	L182L
L189	6.59	.38	.94	.58	1.42	5.79	.38	1.01	.26	.96	20R	Ø	L189
L191P	6.25	.04	.11	.19	.47	5.39	-.01	-.04	.13	.47	20P	Ø	L191P
L195	6.05	-.16	-.39	.32	.79	5.27	-.13	-.35	.27	.98	20R	Ø	L195
L213	6.16	-.05	-.12	.59	1.44	4.85	-.56	-1.46	.34	1.24	20T	Ø	L213
L218	6.50	.29	.72	.30	.74	5.56	.15	.40	.27	.97	20P	Ø	L218
L233	5.70	-.51	-1.28	.37	.92	4.58	-.83	-2.17	.29	1.06	20Q	Ø	L233
L241	1.45	-4.76	-11.90	.22	.55	1.16	-4.25	-11.15	.04	.14	20R	#	L241
L242	6.02	-.18	-.46	.32	.79	5.16	-.25	-.65	.23	.84	20Y	Ø	L242
L249	6.34	.13	.34	.19	.46	5.40	-.01	-.02	.22	.81	20P	Ø	L249
L254	6.74	.53	1.34	.12	.30	5.41	.01	.02	.25	.90	20P	Ø	L254
L259	7.05	.84	2.10	.25	.61	5.96	.55	1.45	.27	.99	20P	Ø	L259
L262	6.39	.18	.45	.45	1.11	6.27	.87	2.28	.51	1.84	20R	*	L262
L275	5.42	-.79	-1.97	.32	.79	4.92	-.49	-1.28	.22	.80	20R	Ø	L275
L279P	6.22	.01	.02	.45	1.11	5.34	-.07	-.19	.44	1.59	20P	Ø	L279P
L290	6.43	.22	.56	.28	.69	5.59	.18	.47	.20	.74	20P	Ø	L290
L311	5.97	-.23	-.58	.35	.86	5.28	-.13	-.34	.27	.97	20V	Ø	L311
L321	5.82	-.38	-.96	.83	2.03	5.15	-.26	-.68	.43	1.57	20V	Ø	L321
L322	6.53	.33	.81	.85	2.08	5.54	.13	.34	.50	1.80	20P	Ø	L322
L330	6.94	.73	1.83	.45	1.09	5.94	.54	1.41	.28	1.03	20P	Ø	L330
L356	6.32	.11	.28	.45	1.11	5.53	.12	.31	.30	1.08	20P	Ø	L356
L362	5.73	-.48	-1.21	.49	1.20	5.18	-.23	-.59	.27	.96	20R	Ø	L362
L370	6.59	.39	.97	.25	.61	5.82	.42	1.09	.22	.80	20P	Ø	L370
L376	6.41	.20	.50	.35	.85	5.45	.04	.12	.22	.80	20P	Ø	L376
L393	6.88	.67	1.68	.36	.89	5.87	.46	1.21	.23	.85	20P	Ø	L393
L484	5.68	-.52	-1.31	.22	.54	5.01	-.40	-1.05	.14	.51	20U	Ø	L484
L554	6.25	.05	.11	.51	1.25	5.70	.29	.77	.33	1.19	20T	Ø	L554
L556	6.77	.57	1.42	.33	.81	5.88	.47	1.24	.21	.76	20P	Ø	L556
L571	6.00	-.21	-.51	.51	1.24	5.98	.57	1.51	.57	2.06	20P	*	L571
L585	6.12	-.08	-.21	.53	1.30	5.53	.12	.31	.14	.49	20V	Ø	L585
L599	5.98	-.23	-.57	.35	.85	5.15	-.25	-.66	.29	1.07	20V	Ø	L599

GR. MEAN = 6.21 KILONEWTON/M GRAND MEAN = 5.41 KILONEWTON/M TEST DETERMINATIONS = 20
 SD MEANS = .40 KILONEWTON/M SD OF MEANS = .38 KILONEWTON/M 36 LABS IN GRAND MEANS
 AVERAGE SDR = .41 KILONEWTON/M AVERAGE SDR = .28 KILONEWTON/M

GR. MEAN = 20.94 LB/15 MM GRAND MEAN = 18.24 LB/15 MM
 TOTAL NUMBER OF LABORATORIES REPORTING = 39

Best Values: J07 6.2 ± 0.6
 J05 5.4 ± 0.5

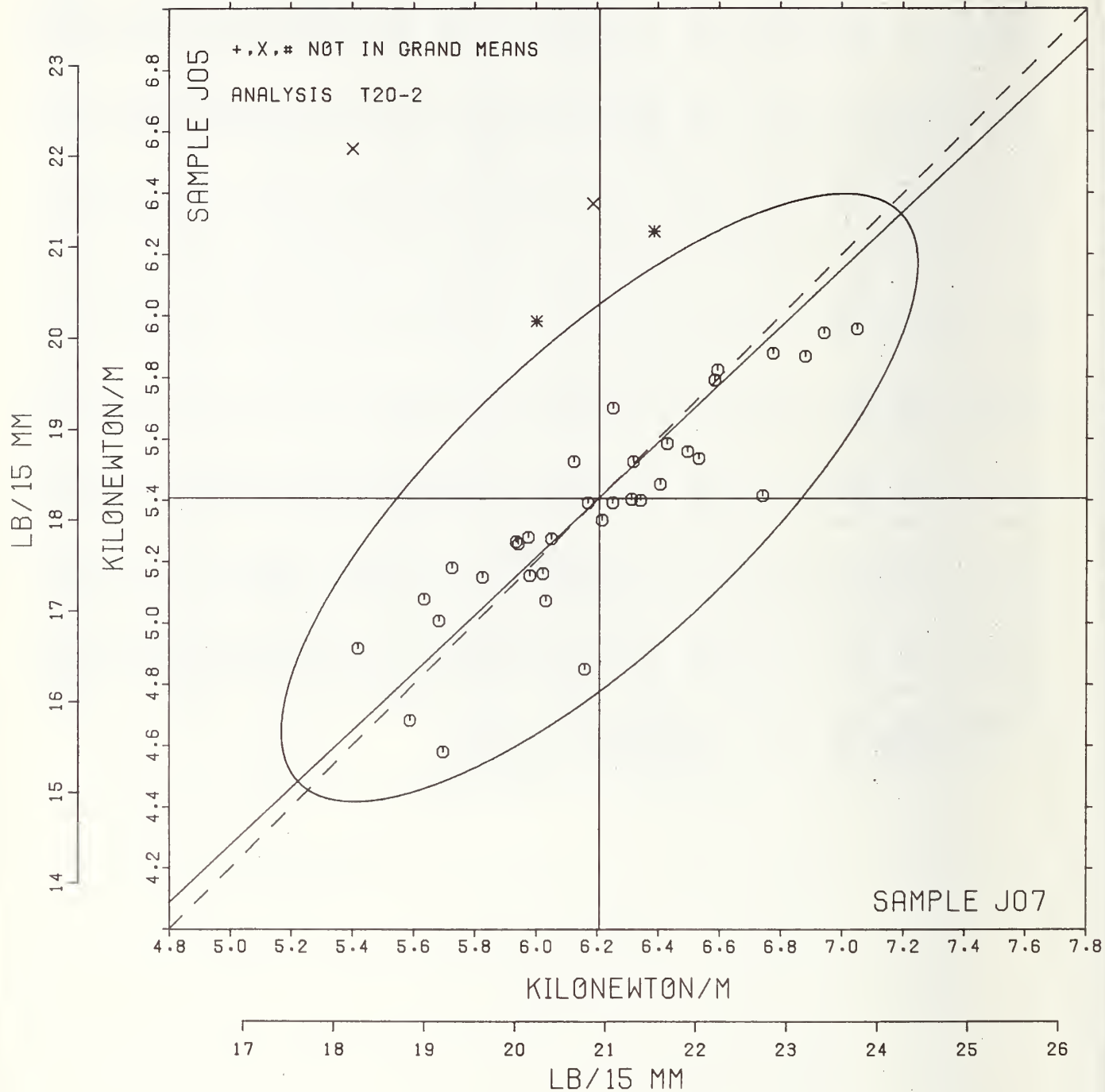
Data from the following laboratories appear to be off by a multiplicative factor: 241.

TAPPI STANDARD T404 69-76, TENSILE BREAKING STRENGTH OF PAPER AND PAPERBOARD (PENDULUM-TYPE TESTER)

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---CONDITIONS
		J07	J05	MAJOR	MINOR	R.SDR	VAR		
L241	#	1.45	1.16	-6.37	.16	.34	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L103	X	5.40	6.55	.19	1.38	.71	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L275	Ø	5.42	4.92	-.91	.18	.80	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L158	Ø	5.59	4.68	-.95	-.10	.84	20T	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L121	Ø	5.63	5.08	-.64	.15	1.47	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L484	Ø	5.68	5.01	-.66	.07	.53	20U	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L233	Ø	5.70	4.58	-.94	-.25	.99	20Q	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L352	Ø	5.73	5.18	-.51	.16	1.08	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L321	Ø	5.82	5.15	-.46	.07	1.80	20V	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L182L	Ø	5.93	5.27	-.30	.08	1.04	20T	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L162	Ø	5.94	5.26	-.30	.07	1.15	20*	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L311	Ø	5.97	5.28	-.26	.07	.92	20V	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L599	Ø	5.98	5.18	-.34	-.03	.96	20V	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L571	*	6.00	5.98	.24	.56	1.65	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L242	Ø	6.02	5.16	-.30	-.05	.82	20Y	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L124P	Ø	6.03	5.07	-.36	-.12	2.05	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L195	Ø	6.05	5.27	-.21	.01	.88	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L585	Ø	6.12	5.53	.02	.14	.89	20V	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L213	Ø	6.16	4.85	-.42	-.37	1.34	20T	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L148	Ø	6.17	5.39	-.04	.01	.67	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L108	X	6.19	6.36	.64	.71	1.63	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L279P	Ø	6.22	5.34	-.04	-.06	1.35	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L191P	Ø	6.25	5.39	.02	-.04	.47	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L554	Ø	6.25	5.70	.23	.18	1.22	20T	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L128	Ø	6.31	5.40	.07	-.07	.68	20T	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L356	Ø	6.32	5.53	.16	.01	1.09	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L249	Ø	6.34	5.40	.09	-.10	.64	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L262	*	6.39	6.27	.72	.81	1.47	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L376	Ø	6.41	5.45	.18	-.10	.82	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L290	Ø	6.43	5.59	.28	-.02	.71	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L218	Ø	6.50	5.56	.31	-.09	.86	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L322	Ø	6.53	5.54	.33	-.13	1.94	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L189	Ø	6.59	5.79	.54	.02	1.19	20R	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L370	Ø	6.59	5.82	.57	.04	.70	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L254	Ø	6.74	5.41	.39	-.36	.60	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L556	Ø	6.77	5.88	.74	-.04	.79	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L393	Ø	6.88	5.87	.81	-.12	.87	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L330	Ø	6.94	5.94	.90	-.11	1.06	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
L259	Ø	7.05	5.96	.99	-.17	.80	20P	TENSILE STRENGTH,	PRIMARYLY PRINTING PAPERS, PENDULUM TESTER
GMEANS:		6.21	5.41			1.00			
		95% ELLIPSE:		1.35	.48			WITH GAMMA = 43 DEGREES	

TENSILE STRENGTH, PENDULUM TYPE

SAMPLE J07 = 6.2 KILONEWTON/M SAMPLE J05 = 5.4 KILONEWTON/M
 SAMPLE J07 = 20.9 LB/15 MM SAMPLE J05 = 18.2 LB/15 MM

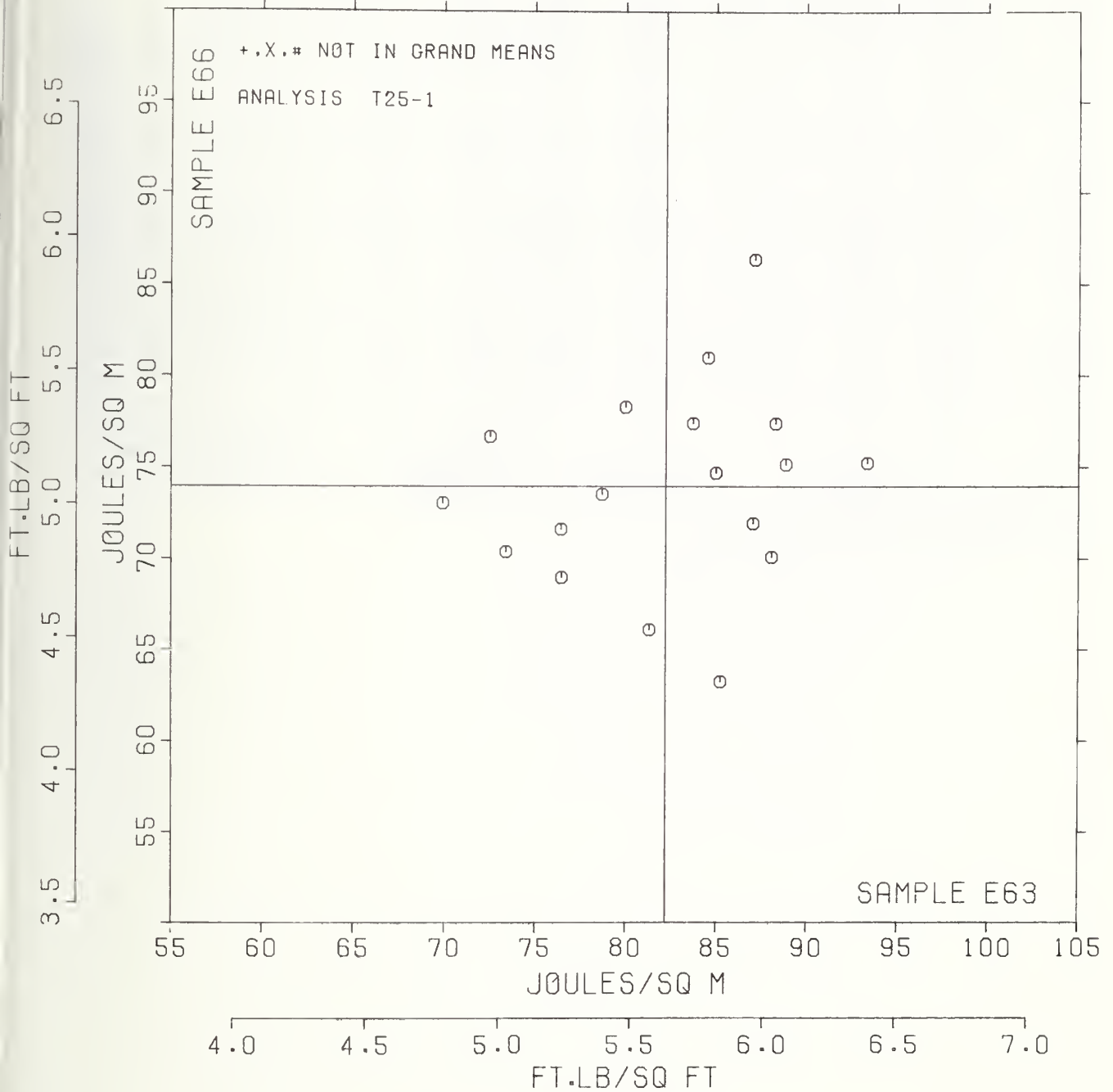


TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PACKAGING PAPER
TAPPI STANDARD T494 GS-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAE CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		E63	E66	MAJOR	MINOR	R.9DR	VAR	
L604	#	49.1	70.5	-31.7	10.1	1.16	25A	TENSILE ENERGY ABS., PACKAGING PAPER, PLAT/FLAT JAWS
L312	Ø	69.9	73.1	-11.6	4.1	1.11	25J	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L336	Ø	72.5	76.7	-7.8	6.4	.98	25A	TENSILE ENERGY ABS., PACKAGING PAPER, PLAT/FLAT JAWS
L237B	Ø	73.4	70.4	-9.5	.3	.83	25H	TENSILE ENERGY ABS., PACKAGING PAPER, 2-PIN STRAIN GAGE
L580	Ø	76.4	71.6	-6.2	.2	.97	25C	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/LINE JAWS
L265	Ø	76.5	69.0	-7.3	-2.3	1.11	25E	TENSILE ENERGY ABS., PACKAGING PAPER, PLAT/FLAT JAWS
L174	Ø	78.7	73.5	-3.4	1.0	1.25	25Y	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L268	Ø	80.0	78.3	-.3	4.9	.77	25E	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L243	Ø	81.3	66.1	-4.0	-6.8	1.04	25Z	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/LINE JAWS
L126	Ø	83.7	77.4	2.8	2.6	.91	25P	TENSILE ENERGY ABS., PACKAGING PAPER, PATTERNED FLAT JAWS
L318	Ø	84.5	81.0	4.9	5.5	1.04	25A	TENSILE ENERGY ABS., PACKAGING PAPER, PLAT/FLAT JAWS
L273	Ø	85.0	74.7	2.8	-.4	1.06	25P	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L280	Ø	85.2	63.3	-1.5	-11.0	.98	25E	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L250	Ø	87.0	71.9	3.6	-3.8	1.09	25A	TENSILE ENERGY ABS., PACKAGING PAPER, PLAT/FLAT JAWS
L234A	Ø	87.1	86.4	9.5	9.4	1.08	25H	TENSILE ENERGY ABS., PACKAGING PAPER, 2-PIN STRAIN GAGE
L182	Ø	88.1	70.1	3.8	-5.9	.69	25B	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L151	Ø	88.3	77.4	6.9	.7	1.13	25P	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L267	Ø	88.9	75.2	6.6	-1.5	.91	25F	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
L122	Ø	93.3	75.2	10.7	-3.3	1.05	25P	TENSILE ENERGY ABS., PACKAGING PAPER, PATTERNED FLAT JAWS
L264	#	744.1	606.9	820.1	222.7	8.56	25F	TENSILE ENERGY ABS., PACKAGING PAPER, LINE/FLAT JAWS
GMEANS:		82.2	74.0			1.00		
95% ELLIPSE:				18.7	14.2	WITH GAMMA • 23 DEGREES		

T.E.A., PACKAGING PAPERS

SAMPLE E63 = 82. JOULES/SQ M SAMPLE E66 = 74. JOULES/SQ M
 SAMPLE E63 = 5.63 FT.LB/SQ FT SAMPLE E66 = 5.07 FT.LB/SQ FT

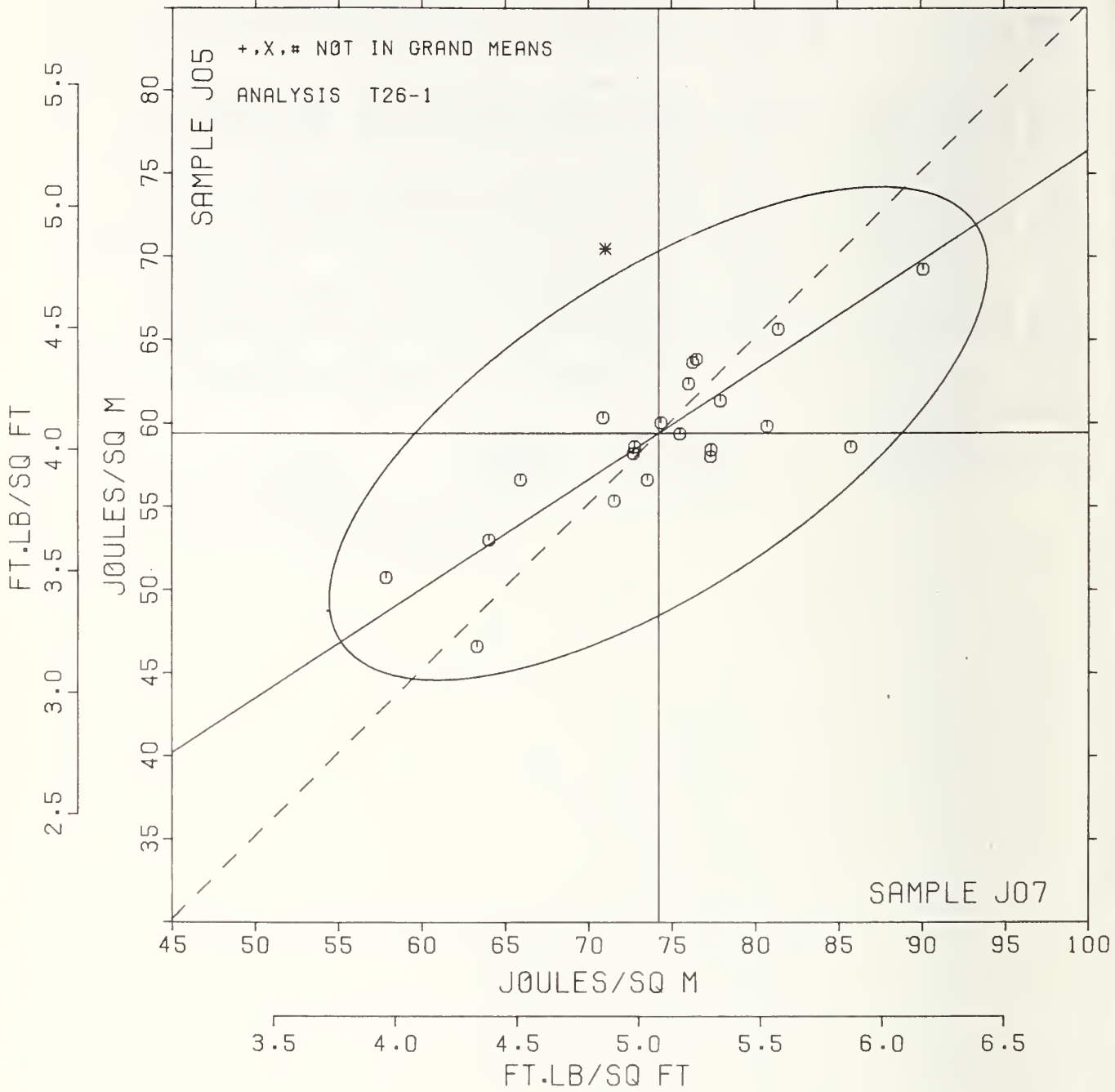


TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PRINTING PAPER
TAPPI STANDARD T494 G3-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	P	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		J07	J05	MAJOR	MINOR	R.SDR	VAR	
L372	Ø	57.9	50.8	-18.4	1.7	.68	26Y	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/PLAT JAWS
L159	Ø	63.3	46.6	-16.1	-4.7	1.74	26P	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/FLAT JAWS
L592	Ø	64.0	53.0	-12.0	.2	.88	26G	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/LINE JAWS
L206	Ø	65.9	56.6	-8.4	2.2	1.54	26Y	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/PLAT JAWS
L567	Ø	70.8	60.3	-2.3	2.6	1.44	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L167	*	71.0	70.5	3.4	11.0	.51	26D	TENSILE ENERGY ABS., PRINTING PAPERS, 2-PIN STRAIN GAGE
L185	Ø	71.5	55.3	-4.5	-1.9	.93	26C	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/LINE JAWS
L250	Ø	72.7	58.2	-1.9	-2	.68	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L115	Ø	72.7	58.6	-1.7	.1	.53	26C	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/LINE JAWS
L100	Ø	73.5	56.6	-2.1	-2.0	.88	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/PLAT JAWS
L139	Ø	74.3	60.0	.5	.5	1.13	26H	TENSILE ENERGY ABS., PRINTING PAPERS, 2-PIN STRAIN GAGE
L393	Ø	75.5	59.4	1.1	-0.7	.82	26V	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/FLAT JAWS
L378	Ø	76.0	62.4	3.2	1.5	.97	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L122	Ø	76.2	63.7	4.1	2.4	1.12	26L	TENSILE ENERGY ABS., PRINTING PAPERS, PATTERNED PLAT JAWS
L442	Ø	76.5	63.8	4.3	2.5	.99	26B	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/PLAT JAWS
L163	Ø	77.3	58.0	1.8	-2.9	.94	26J	TENSILE ENERGY ABS., PRINTING PAPERS, LINE/PLAT JAWS
L318	Ø	77.3	58.4	2.1	-2.6	.91	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L575	Ø	77.9	61.4	4.2	-0.4	1.04	26A	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L118	Ø	80.7	59.8	5.7	-3.2	.69	26E	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L309	Ø	81.3	65.7	9.4	1.3	1.16	26I	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L231	Ø	85.7	58.6	9.2	-7.0	1.03	26F	TENSILE ENERGY ABS., PRINTING PAPERS, FLAT/FLAT JAWS
L255	Ø	90.1	69.2	18.6	-0.5	.93	26P	TENSILE ENERGY ABS., PRINTING PAPERS, PATTERNED PLAT JAWS
GMEANS:		74.2	59.4			1.00		
		95% ELLIPSE:		22.8	9.5			WITH GAMMA = 33 DEGREES

T.E.A., PRINTING PAPERS

SAMPLE J07 = 74. JOULES/SQ M SAMPLE J05 = 59. JOULES/SQ M
 SAMPLE J07 = 5.08 FT.LB/SQ FT SAMPLE J05 = 4.07 FT.LB/SQ FT



ELONGATION TO BREAK, PERCENT - PACKAGING PAPER
TAPPI STANDARD T494 OS-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	SAMPLE E63 MEAN	KRAFT ENVELOPE 75 GRAMS PER SQUARE METER				SAMPLE E66 MEAN	KRAFT 83 GRAMS PER SQUARE METER				TEST D. = 20		
		DEV	N.DEV	SDR	R.SDR		DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L122	3.59	.55	1.65	.28	.99	3.16	.30	.87	.53	1.20	28P	Ø	L122
L126	2.99	-.05	-.14	.35	1.21	2.96	.11	.30	.40	.91	28C	Ø	L126
L151	3.38	.34	1.03	.27	.97	3.22	.36	1.04	.59	1.34	28B	Ø	L151
L182	3.21	.18	.53	.23	.81	2.80	-.05	-.15	.33	.75	28B	Ø	L182
L243	3.01	-.02	-.07	.36	1.26	2.67	-.19	-.54	.49	1.12	28C	Ø	L243
L264	2.76	-.27	-.81	.27	.94	2.54	-.31	-.89	.55	1.24	28B	Ø	L264
L265	2.73	-.30	-.90	.30	1.04	2.56	-.29	-.83	.57	1.29	28A	Ø	L265
L267	3.45	.41	1.23	.27	.94	2.93	.08	.22	.49	1.11	28B	Ø	L267
L268	2.75	-.28	-.84	.20	.72	3.01	.15	.44	.26	.59	28B	Ø	L268
L280	3.09	.06	.17	.28	.98	2.62	-.23	-.66	.46	1.05	28B	Ø	L280
L312	2.40	-.64	-1.90	.32	1.14	2.47	-.38	-1.09	.37	.83	28B	Ø	L312
L318	3.24	.21	.61	.28	.98	3.19	.34	.96	.39	.88	28A	Ø	L318
L324	2.80	-.23	-.69	.34	1.20	2.75	-.10	-.29	.32	.72	28P	Ø	L324
L336	3.31	.28	.83	.26	.92	3.43	.57	1.64	.35	.80	28A	Ø	L336
L580	3.07	.04	.12	.31	1.08	2.86	.00	.01	.45	1.02	28C	Ø	L580
L581	2.51	-.53	-1.58	.22	.77	2.06	-.80	-2.27	.36	.82	28A	Ø	L581
L582	3.28	.25	.74	.30	1.07	3.29	.43	1.24	.58	1.33	28A	Ø	L582

GR. MEAN = 3.04 PERCENT
SD MEANS = .34 PERCENT

GRAND MEAN = 2.86 PERCENT
SD OF MEANS = .35 PERCENT

TEST DETERMINATIONS = 20
17 LABS IN GRAND MEANS

AVERAGE SDR = .28 PERCENT AVERAGE SDR = .44 PERCENT

L153 3.41 .38 1.13 .29 1.03 2.96 .10 .30 .48 1.08 28Q • L153
TOTAL NUMBER OF LABORATORIES REPORTING = 18

Best Values: E63 3.1 ± 0.5 percent
E66 2.9 ± 0.4 percent

ANALYSIS T28-1 TABLE 2
ELONGATION TO BREAK, PERCENT - PACKAGING PAPER

TAPPI STANDARD T494 GS-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		E63	E66	MAJOR	MINOR	R.SDR	VAR	
L312	Ø	2.40	2.47	-.71	.20	.98	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L581	Ø	2.51	2.06	-.94	-.16	.79	28A	ELONGATION, PACKAGING PAPER, LOAD CELL, FLAT/FLAT JAWS
L265	Ø	2.73	2.56	-.42	.02	1.17	28A	ELONGATION, PACKAGING PAPER, LOAD CELL, FLAT/FLAT JAWS
L268	Ø	2.75	3.01	-.08	.31	.65	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L264	Ø	2.76	2.54	-.41	-.02	1.09	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L324	Ø	2.80	2.75	-.23	.10	.96	28P	ELONGATION, PACKAGING PAPER, LOAD CELL, PATTERNED PLAT JAWS
L126	Ø	2.99	2.96	.05	.11	1.06	28C	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/LINE JAWS
L243	Ø	3.01	2.67	-.15	-.11	1.19	28C	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/LINE JAWS
L580	Ø	3.07	2.86	.03	-.03	1.05	28C	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/LINE JAWS
L280	Ø	3.09	2.62	-.13	-.20	1.01	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L182	Ø	3.21	2.80	.08	-.17	.78	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L318	Ø	3.24	3.19	.38	.08	.93	28A	ELONGATION, PACKAGING PAPER, LOAD CELL, FLAT/FLAT JAWS
L582	Ø	3.28	3.29	.49	.12	1.20	28A	ELONGATION, PACKAGING PAPER, LOAD CELL, FLAT/FLAT JAWS
L336	Ø	3.31	3.43	.61	.19	.86	28A	ELONGATION, PACKAGING PAPER, LOAD CELL, FLAT/FLAT JAWS
L151	Ø	3.38	3.22	.50	.00	1.15	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L153	*	3.41	2.96	.34	-.20	1.05	28Q	ELONGATION, PACKAGING PAPER, PENDULUM, PATTERNED PLAT JAWS
L267	Ø	3.45	2.93	.34	-.25	1.02	28B	ELONGATION, PACKAGING PAPER, LOAD CELL, LINE/FLAT JAWS
L122	Ø	3.59	3.16	.60	-.19	1.10	28P	ELONGATION, PACKAGING PAPER, LOAD CELL, PATTERNED PLAT JAWS
GMEANS:		3.04	2.86			1.00		
		95% ELLIPSE:		1.28	.46	WITH GAMMA = 46 DEGREES		

ELONGATION TO BREAK, PERCENT - PRINTING PAPER
TAPPI STANDARD T494 6S-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	SAMPLE J07 MEAN	PRINTING 85 GRAMS PER SQUARE METER				R. SDR	SAMPLE J05 MEAN	PRINTING 102 GRAMS PER SQUARE METER				TEST D. - 20		
		DEV	N. DEV	SDR	R. SDR			DEV	N. DEV	SDR	R. SDR	VAR	F	LAB
L100	1.820	-.046	-.22	.124	.84	1.670	-.012	-.06	.108	.94	29A	0	L100	
L105	1.417	-.449	-2.15	.735	4.99	.784	-.897	-4.67	.169	1.47	29A	#	L105	
L118	2.028	.162	.78	.131	.89	1.721	.039	.21	.086	.75	29A	0	L118	
L122	1.969	.103	.49	.175	1.19	1.852	.171	.89	.101	.88	29P	0	L122	
L185	1.910	.044	.21	.113	.77	1.700	.019	.10	.114	.99	29C	0	L185	
L190R	1.806	-.060	-.29	.200	1.36	1.707	.026	.14	.132	1.15	29A	0	L190R	
L231	2.285	.419	2.00	.198	1.34	2.005	.323	1.68	.105	.92	29A	0	L231	
L255	2.144	.278	1.33	.107	.73	1.941	.260	1.35	.112	.97	29P	0	L255	
L309	2.025	.159	.76	.151	1.03	1.841	.159	.83	.124	1.08	29A	0	L309	
L318	1.987	.121	.58	.134	.91	1.758	.076	.40	.090	.78	29A	0	L318	
L344	1.784	-.083	-.40	.177	1.20	1.569	-.113	-.59	.131	1.15	29A	0	L344	
L372	1.562	-.304	-1.46	.094	.64	1.401	-.280	-1.46	.103	.90	29B	0	L372	
L378	1.865	-.001	-.01	.118	.80	1.530	-.152	-.79	.080	.70	29A	0	L378	
L442	1.899	.033	.16	.133	.91	1.825	.143	.75	.125	1.09	29B	0	L442	
L561	1.450	-.416	-1.99	.196	1.33	1.255	-.427	-2.22	.167	1.46	29B	0	L561	
L567	1.630	-.236	-1.13	.230	1.56	1.510	-.172	-.89	.137	1.20	29A	0	L567	
L575	1.871	.005	.02	.131	.89	1.709	.027	.14	.110	.96	29A	0	L575	
L592	1.689	-.177	-.85	.091	.62	1.590	-.092	-.48	.124	1.08	29C	0	L592	
GR. MEAN = 1.866 PERCENT		GRAND MEAN = 1.682 PERCENT				TEST DETERMINATIONS = 20								
SD MEANS = .209 PERCENT		SD OF MEANS = .192 PERCENT				17 LABS IN GRAND MEANS								
AVERAGE SDR = .147 PERCENT		AVERAGE SDR = .115 PERCENT												
L242	2.195	.329	1.57	.154	1.04	2.065	.383	2.00	.114	.99	29R	*	L242	
L484	1.501	-.365	-1.75	.228	1.55	1.348	-.334	-1.74	.209	1.82	29R	*	L484	
TOTAL NUMBER OF LABORATORIES REPORTING = 20														

Best Values: J07 1.9 ± 0.3 percent
J05 1.7 ± 0.2 percent

The following laboratories were omitted from the grand means because of extreme test results: 105.

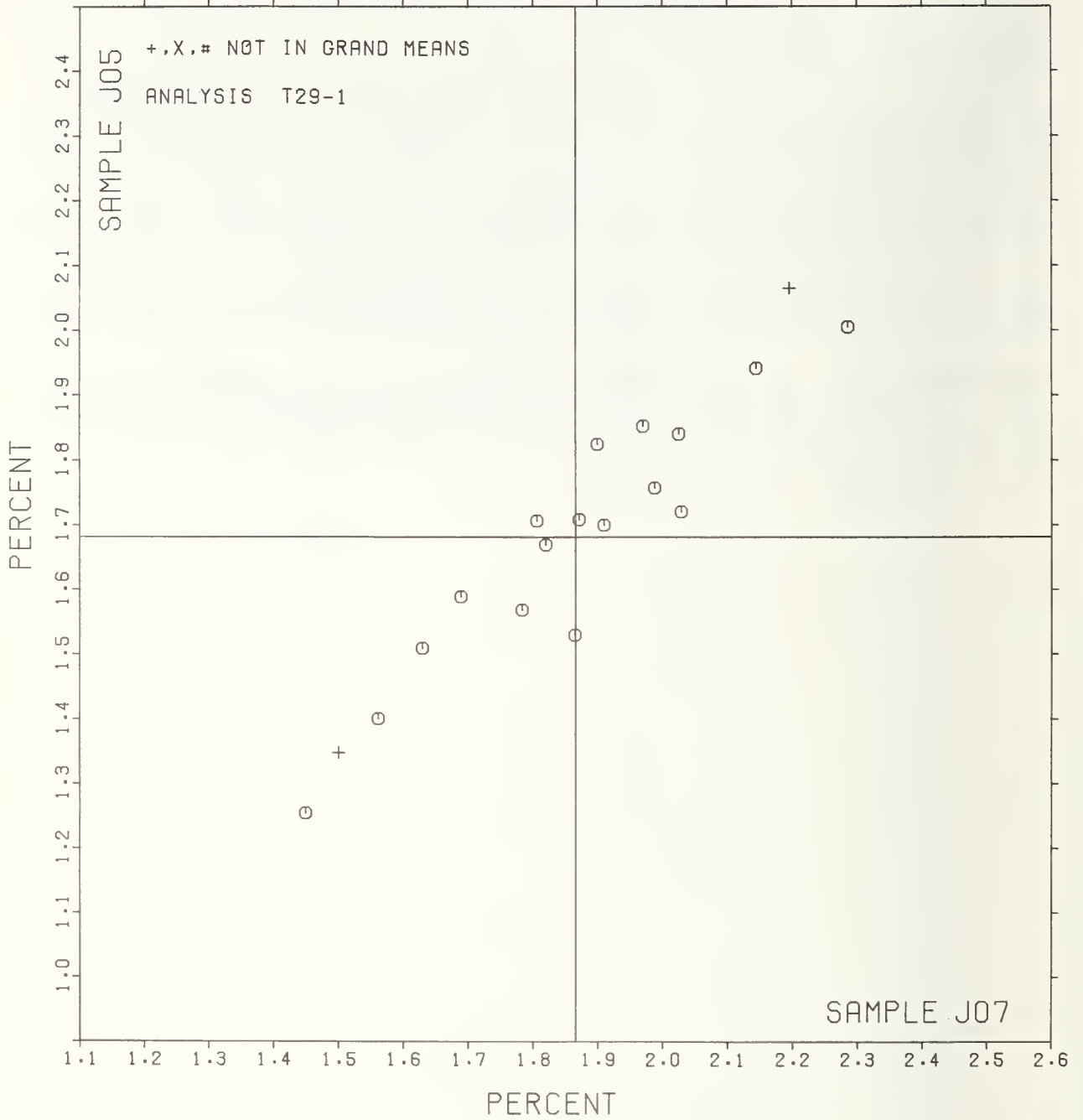
ELONGATION TO BREAK, PERCENT - PRINTING PAPER
TAPPI STANDARD T494 63-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

LAB CODE	P	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		J07	J05	MAJOR	MINOR	R,SDR	VAR	
L105	#	1.417	.784	-.937	-.359	3.23	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L561	0	1.450	1.255	-.595	-.034	1.39	29B	ELONGATION, PRINTING PAPERS, LOAD CELL, LINE/PLAT JAWS
L484	*	1.501	1.348	-.495	.000	1.68	29E	ELONGATION, PRINTING PAPERS, PENDULUM, PLAT/PLAT JAWS
L372	0	1.562	1.401	-.414	-.001	.77	29B	ELONGATION, PRINTING PAPERS, LOAD CELL, LINE/PLAT JAWS
L567	0	1.630	1.510	-.290	.033	1.38	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L592	0	1.689	1.590	-.192	.052	.85	29C	ELONGATION, PRINTING PAPERS, LOAD CELL, LINE/LINE JAWS
L344	0	1.784	1.569	-.137	-.028	1.17	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L190R	0	1.806	1.707	-.027	.060	1.25	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L100	0	1.820	1.670	-.042	.023	.89	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L378	0	1.865	1.530	-.103	-.111	.75	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L575	0	1.871	1.709	.022	.017	.92	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L442	0	1.899	1.825	.121	.083	1.00	29B	ELONGATION, PRINTING PAPERS, LOAD CELL, LINE/PLAT JAWS
L185	0	1.910	1.700	.045	-.015	.88	29C	ELONGATION, PRINTING PAPERS, LOAD CELL, LINE/LINE JAWS
L122	0	1.969	1.852	.192	.057	1.03	29P	ELONGATION, PRINTING PAPERS, LOAD CELL, PATTERNED PLAT JAWS
L318	0	1.987	1.758	.141	-.025	.85	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L309	0	2.025	1.841	.225	.011	1.05	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L118	0	2.028	1.721	.146	-.080	.82	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
L255	0	2.144	1.941	.180	.004	.85	29P	ELONGATION, PRINTING PAPERS, LOAD CELL, PATTERNED PLAT JAWS
L242	*	2.195	2.065	.101	.061	1.02	29E	ELONGATION, PRINTING PAPERS, PENDULUM, PLAT/PLAT JAWS
L231	0	2.285	2.005	.127	-.044	1.13	29A	ELONGATION, PRINTING PAPERS, LOAD CELL, PLAT/PLAT JAWS
GMEANS:		1.866	1.682			1.00		
		95% ELLIPSE:		.182	.143			WITH GAMMA = 42 DEGREES

ELONGATION TO BREAK, PRINTING PAPER

SAMPLE J07 = 1.87 PERCENT

SAMPLE J05 = 1.68 PERCENT



TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T30-1 TABLE 1
FOLDING ENDURANCE (MIT), DOUBLE FOLDS
TAPPI STANDARD T511 SU-69

LAB CODE	SAMPLE H35 MEAN	PRINTING 151 GRAMS PER SQUARE METER				SAMPLE H47 MEAN	PRINTING 84 GRAMS PER SQUARE METER				TEST D. = 15		
		DEV	N.DEV	SDR	R.SDR		DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L100M	57.	-15.	-.58	18.	.79	58.	-15.	-1.07	13.	.68	30M	Ø	L100M
L100N	52.	-20.	-.78	18.	.80	59.	-15.	-1.04	12.	.64	30N	Ø	L100N
L105	28.	-44.	-1.69	9.	.40	55.	-19.	-1.31	21.	1.14	30M	Ø	L105
L118	72.	0.	.01	15.	.69	73.	-1.	-.07	11.	.61	30D	Ø	L118
L121	39.	-32.	-1.24	9.	.42	68.	-6.	-.41	13.	.72	30M	Ø	L121
L122	76.	4.	.15	26.	1.17	94.	20.	1.42	35.	1.90	30M	Ø	L122
L124	54.	-18.	-.68	16.	.72	69.	-5.	-.34	12.	.64	30N	Ø	L124
L150	96.	24.	.93	35.	1.58	55.	-19.	-1.30	22.	1.21	30M	*	L150
L158	34.	-38.	-1.44	23.	1.05	51.	-22.	-1.54	10.	.54	30N	Ø	L158
L159	100.	28.	1.09	27.	1.20	76.	2.	.15	23.	1.26	30N	Ø	L159
L162	60.	-12.	-.46	10.	.47	82.	9.	.62	17.	.93	30M	Ø	L162
L163	77.	5.	.21	22.	.97	69.	-5.	-.34	26.	1.41	30N	Ø	L163
L182M	101.	29.	1.13	24.	1.07	94.	20.	1.40	19.	1.02	30M	Ø	L182M
L185	117.	45.	1.71	41.	1.85	82.	9.	.61	17.	.94	30N	Ø	L185
L190C	57.	-14.	-.55	29.	1.29	76.	3.	.18	21.	1.14	30N	Ø	L190C
L221	111.	39.	1.48	24.	1.10	102.	28.	1.96	37.	2.02	30N	Ø	L221
L223F	100.	28.	1.09	27.	1.22	78.	5.	.31	12.	.68	30M	Ø	L223F
L230	77.	5.	.18	25.	1.14	73.	-1.	-.05	16.	.87	30N	Ø	L230
L232	112.	41.	1.56	20.	.91	72.	-2.	-.12	24.	1.30	30N	Ø	L232
L236	60.	-11.	-.44	24.	1.07	79.	6.	.39	24.	1.29	30N	Ø	L236
L238A	71.	-0.	-.02	17.	.76	79.	5.	.35	14.	.75	30N	Ø	L238A
L238B	56.	-16.	-.60	27.	1.19	63.	-11.	-.75	17.	.91	30D	Ø	L238B
L243	98.	26.	1.01	30.	1.36	66.	-7.	-.49	12.	.67	30D	Ø	L243
L254	62.	-10.	-.39	25.	1.11	59.	-14.	-1.00	25.	1.36	30M	Ø	L254
L262	45.	-27.	-1.05	8.	.36	66.	-8.	-.53	18.	.96	30N	Ø	L262
L275	117.	45.	1.72	35.	1.59	104.	31.	2.14	28.	1.52	30N	Ø	L275
L278	85.	13.	.49	34.	1.51	60.	-14.	-.97	14.	.74	30C	Ø	L278
L279	77.	5.	.20	28.	1.25	86.	12.	.87	21.	1.12	30N	Ø	L279
L299	32.	-39.	-1.51	16.	.72	62.	-11.	-.80	16.	.86	30N	Ø	L299
L321	77.	5.	.19	35.	1.59	86.	13.	.90	13.	.73	30M	Ø	L321
L326N	131.	60.	2.28	16.	.72	156.	83.	5.75	14.	.78	30N	X	L326N
L339	4.	-68.	-2.59	2.	.08	23.	-50.	-3.49	8.	.41	30N	#	L339
L366A	45.	-26.	-1.01	18.	.81	67.	-7.	-.47	18.	.96	30N	Ø	L366A
L376	46.	-26.	-1.00	14.	.63	74.	0.	.03	20.	1.08	30N	Ø	L376
L378	79.	7.	.27	17.	.74	84.	11.	.77	15.	.81	30N	Ø	L378
L388	78.	6.	.22	23.	1.02	74.	0.	.00	19.	1.02	30N	Ø	L388
L390	35.	-37.	-1.42	11.	.48	60.	-14.	-.95	13.	.73	30N	Ø	L390
L396M	115.	43.	1.65	34.	1.52	94.	20.	1.42	22.	1.22	30N	Ø	L396M
L531	27.	-45.	-1.72	15.	.67	54.	-20.	-1.36	26.	1.41	30N	Ø	L531
L565	84.	12.	.47	23.	1.05	70.	-4.	-.27	16.	.87	30N	Ø	L565
L567	98.	26.	1.00	40.	1.78	108.	34.	2.39	17.	.90	30N	Ø	L567
L589	67.	-5.	-.19	16.	.71	58.	-16.	-1.11	17.	.90	30N	Ø	L589
L599	72.	0.	.00	18.	.82	79.	6.	.38	14.	.76	30C	Ø	L599

GR. MEAN = 72. DOUBLE FOLDS GRAND MEAN = 73. DOUBLE FOLDS TEST DETERMINATIONS = 15
SD MEANS = 26. DOUBLE FOLDS SD OF MEANS = 14. DOUBLE FOLDS 41 LABS IN GRAND MEANS
AVERAGE SDR = 22. DOUBLE FOLDS AVERAGE SDR = 18. DOUBLE FOLDS

L143	213.	141.	5.42	119.	5.32	122.	48.	3.35	28.	1.54	30T	*	L143
L182S	856.	784.	30.05	187.	8.37	146.	73.	5.07	37.	2.04	30S	*	L182S
L190D	529.	458.	17.53	164.	7.37	99.	26.	1.79	17.	.95	30S	*	L190D
L280	45.	-27.	-1.04	26.	1.18	56.	-18.	-1.24	15.	.83	30K	*	L280
L326S	403.	331.	12.69	209.	9.38	118.	44.	3.09	34.	1.86	30S	*	L326S

L366B	43.	-29.	-1.11	23.	1.05	114.	41.	2.86	24.	1.32	30T	*	L366B
L396S	252.	180.	6.90	214.	9.58	143.	69.	4.83	19.	1.05	30T	*	L396S
L581	467.	396.	15.16	236.	10.67	116.	42.	2.95	30.	1.63	30T	*	L581

TOTAL NUMBER OF LABORATORIES REPORTING = 51

Best Values: H35 75 double folds
H47 75 double folds

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

The ISO (International Standards Organization) is proposing the MIT folding endurance be reported as the logarithm (to the base 10) of the double fold instead of the double fold as in the past.

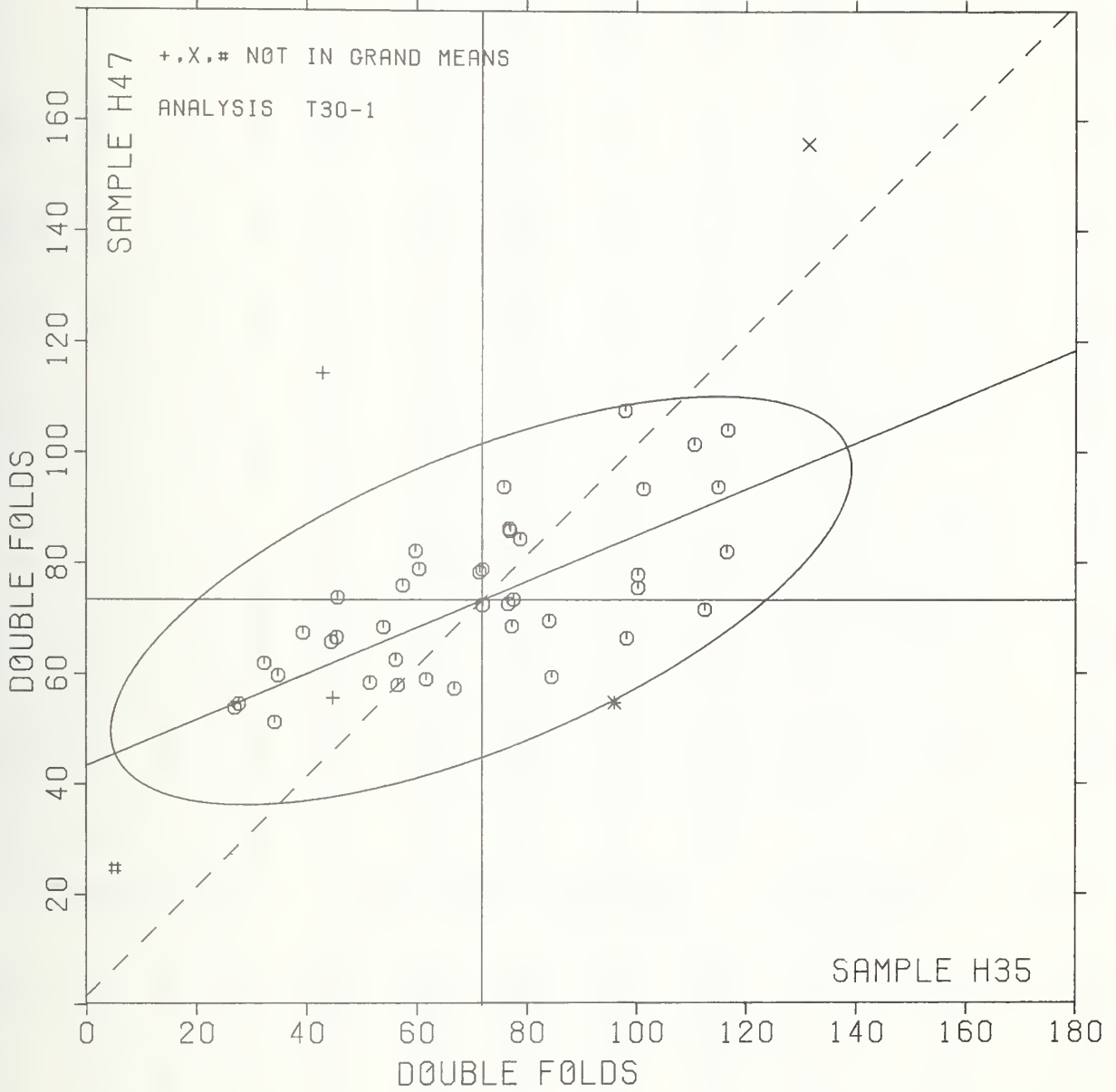
Please see page 46 of this report for a demonstration of this proposal.

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T30-1 TABLE 2
FOLDING ENDURANCE (MIT), DOUBLE FOLDS
TAPPI STANDARD T511 SU-69

LAB CODE	F	MEANS		COORDINATES		AVG R.SDR	VAR	PROPERTY---	TEST INSTRUMENT---	CONDITIONS
		H35	H47	MAJOR	MINOR					
L339	#	4.	23.	-82.	-20.	.25	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L531	Ø	27.	54.	-49.	-1.	1.04	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L105	Ø	28.	55.	-48.	-0.	.77	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L299	Ø	32.	62.	-41.	5.	.79	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L158	Ø	34.	51.	-43.	-6.	.80	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L390	Ø	35.	60.	-39.	2.	.60	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L121	Ø	39.	68.	-32.	7.	.57	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L366B	*	43.	114.	-11.	49.	1.18	30T	FOLDING	ENDURANCE,	SCHÖFFER, TMI
L262	Ø	45.	66.	-28.	4.	.66	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L280	*	45.	56.	-32.	-6.	1.00	30K	FOLDING	ENDURANCE,	KÖHLER-MÖLIN
L366A	Ø	45.	67.	-27.	4.	.88	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L376	Ø	46.	74.	-24.	10.	.86	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L100N	Ø	52.	59.	-24.	-6.	.72	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L124	Ø	54.	69.	-18.	2.	.68	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L238B	Ø	56.	63.	-19.	-4.	1.05	30D	FOLDING	ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L100M	Ø	57.	58.	-20.	-8.	.73	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L190C	Ø	57.	76.	-12.	8.	1.21	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L162	Ø	60.	82.	-8.	13.	.70	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L236	Ø	60.	79.	-8.	10.	1.18	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L254	Ø	62.	59.	-15.	-9.	1.24	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L589	Ø	67.	58.	-11.	-13.	.81	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L238A	Ø	71.	79.	2.	5.	.75	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L599	Ø	72.	79.	2.	5.	.79	30C	FOLDING	ENDURANCE,	MIT, CIRCULATING FAN IN CEILING
L118	Ø	72.	73.	-0.	-1.	.65	30D	FOLDING	ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L122	Ø	76.	94.	12.	17.	1.53	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L230	Ø	77.	73.	4.	-3.	1.00	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L321	Ø	77.	86.	10.	10.	1.16	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L279	Ø	77.	86.	10.	9.	1.19	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L163	Ø	77.	69.	3.	-7.	1.19	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L388	Ø	78.	74.	5.	-2.	1.02	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L378	Ø	79.	84.	11.	7.	.78	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L565	Ø	84.	70.	10.	-8.	.96	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L278	Ø	85.	60.	6.	-18.	1.12	30C	FOLDING	ENDURANCE,	MIT, CIRCULATING FAN IN CEILING
L150	*	96.	55.	15.	-26.	1.39	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L557	Ø	98.	108.	37.	22.	1.34	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L243	Ø	98.	66.	22.	-17.	1.01	30D	FOLDING	ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L159	Ø	100.	76.	27.	-9.	1.23	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L223F	Ø	100.	78.	28.	-7.	.95	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L182M	Ø	101.	94.	35.	7.	1.04	30M	FOLDING	ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L221	Ø	111.	102.	47.	11.	1.56	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L232	Ø	112.	72.	37.	-17.	1.10	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L396M	Ø	115.	94.	48.	2.	1.37	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L185	Ø	117.	82.	45.	-9.	1.39	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L275	Ø	117.	104.	53.	11.	1.56	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L326N	X	131.	156.	87.	53.	.75	30N	FOLDING	ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L143	*	213.	122.	149.	-10.	3.43	30T	FOLDING	ENDURANCE,	SCHÖFFER, TMI
L396S	*	252.	143.	193.	-5.	5.32	30T	FOLDING	ENDURANCE,	SCHÖFFER, TMI
L326S	*	403.	118.	323.	-87.	5.62	30S	FOLDING	ENDURANCE,	SCHÖFFER, LEIPZIG
L581	*	467.	116.	381.	-113.	6.10	30T	FOLDING	ENDURANCE,	SCHÖFFER, TMI
L190D	*	529.	99.	432.	-153.	4.16	30S	FOLDING	ENDURANCE,	SCHÖFFER, LEIPZIG
L182S	*	856.	146.	752.	-235.	5.20	30S	FOLDING	ENDURANCE,	SCHÖFFER, LEIPZIG
GMEANS:		72.	73.			1.00				
		95% ELLIPSE:		72.	27.					WITH GAMMA = 22 DEGREES

FOLDING ENDURANCE (MIT)

SAMPLE H35 = 72. DOUBLE FOLDS SAMPLE H47 = 73. DOUBLE FOLDS



DATA IS LOG(BASE 10) OF THE DOUBLE FOLD MEASUREMENT

LAB CODE	SAMPLE H35		PRINTING 151 GRAMS PER SQUARE METER				SAMPLE H47		PRINTING 84 GRAMS PER SQUARE METER				TEST D. = 15		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB		
L100M	1.735	-.066	-.36	.128	.90	1.755	-.088	-1.00	.094	.82	30M	0	L100M		
L100N	1.688	-.112	-.61	.150	1.05	1.759	-.084	-.95	.089	.78	30N	0	L100N		
L105	1.422	-.378	-2.06	.146	1.02	1.702	-.141	-1.60	.195	1.71	30M	0	L105		
L118	1.848	.048	.26	.093	.65	1.856	.013	.15	.066	.58	30D	0	L118		
L121	1.581	-.219	-1.19	.120	.84	1.822	-.021	-.24	.087	.76	30M	0	L121		
L122	1.856	.055	.30	.153	1.07	1.944	.101	1.15	.164	1.45	30M	0	L122		
L124	1.715	-.086	-.47	.128	.89	1.830	-.013	-.15	.073	.64	30N	0	L124		
L150	1.952	.152	.83	.171	1.20	1.706	-.137	-1.56	.179	1.57	30M	*	L150		
L158	1.446	-.354	-1.93	.288	2.01	1.702	-.140	-1.60	.087	.76	30N	0	L158		
L159	1.985	.185	1.01	.123	.86	1.859	.016	.18	.138	1.21	30N	0	L159		
L162	1.771	-.030	-.16	.076	.53	1.907	.064	.73	.089	.78	30M	0	L162		
L163	1.872	.072	.39	.123	.86	1.807	-.036	-.41	.173	1.52	30N	0	L163		
L182M	1.994	.194	1.05	.104	.73	1.963	.120	1.37	.087	.76	30M	0	L182M		
L185	2.043	.243	1.32	.145	1.02	1.907	.064	.72	.087	.76	30N	0	L185		
L190C	1.708	-.093	-.50	.225	1.57	1.867	.024	.27	.117	1.03	30N	0	L190C		
L221	2.034	.234	1.27	.090	.63	1.988	.145	1.65	.124	1.09	30N	0	L221		
L223F	1.985	.185	1.00	.127	.89	1.887	.044	.50	.070	.61	30M	0	L223F		
L230	1.861	.061	.33	.149	1.04	1.853	.010	.11	.090	.79	30N	0	L230		
L232	2.044	.244	1.33	.082	.57	1.832	-.011	-.12	.149	1.31	30N	0	L232		
L236	1.753	-.047	-.26	.160	1.12	1.879	.036	.41	.133	1.17	30N	0	L236		
L238A	1.842	.042	.23	.103	.72	1.889	.046	.52	.078	.69	30N	0	L238A		
L238B	1.705	-.095	-.52	.205	1.43	1.782	-.061	-.69	.119	1.04	30D	0	L238B		
L243	1.973	.173	.94	.136	.95	1.816	-.027	-.31	.079	.69	30D	0	L243		
L254	1.761	-.039	-.21	.164	1.15	1.733	-.110	-1.25	.198	1.74	30M	0	L254		
L262	1.642	-.158	-.86	.079	.55	1.803	-.040	-.45	.125	1.10	30N	0	L262		
L275	2.046	.246	1.34	.144	1.00	2.001	.158	1.80	.130	1.14	30N	0	L275		
L278	1.892	.091	.50	.189	1.32	1.762	-.081	-.92	.112	.99	30C	0	L278		
L279	1.862	.061	.33	.150	1.05	1.923	.080	.91	.099	.87	30N	0	L279		
L299	1.471	-.329	-1.79	.184	1.28	1.777	-.066	-.75	.123	1.08	30N	0	L299		
L321	1.839	.039	.21	.213	1.49	1.932	.089	1.01	.068	.60	30M	0	L321		
L326N	2.115	.315	1.71	.051	.36	2.191	.349	3.96	.039	.34	30N	X	L326N		
L339	.579	-1.221	-6.64	.183	1.28	1.343	-.500	-5.68	.159	1.39	30N	#	L339		
L366A	1.629	-.171	-.93	.160	1.12	1.809	-.034	-.38	.120	1.06	30N	0	L366A		
L376	1.640	-.160	-.87	.137	.96	1.854	.011	.13	.118	1.04	30N	0	L376		
L378	1.887	.086	.47	.098	.68	1.920	.077	.88	.078	.68	30N	0	L378		
L388	1.871	.071	.38	.134	.93	1.852	.009	.11	.118	1.03	30N	0	L388		
L390	1.523	-.277	-1.51	.133	.93	1.767	-.076	-.87	.100	.88	30N	0	L390		
L396M	2.043	.243	1.32	.127	.89	1.960	.117	1.33	.108	.95	30N	0	L396M		
L531	1.364	-.436	-2.37	.260	1.81	1.664	-.179	-2.03	.277	2.44	30N	0	L531		
L565	1.910	.110	.60	.115	.81	1.832	-.011	-.13	.105	.92	30N	0	L565		
L567	1.960	.160	.87	.166	1.16	2.028	.185	2.10	.067	.59	30N	0	L567		
L589	1.814	.014	.08	.102	.71	1.742	-.101	-1.15	.133	1.17	30N	0	L589		
L599	1.843	.042	.23	.118	.83	1.891	.048	.54	.084	.73	30C	0	L599		

GR. MEAN = 1.800 LOG(10) FOLD GRAND MEAN = 1.843 LOG(10) FOLD TEST DETERMINATIONS = 15
SD MEANS = .184 LOG(10) FOLD SD OF MEANS = .088 LOG(10) FOLD 41 LABS IN GRAND MEANS
AVERAGE SDR = .143 LOG(10) FOLD AVERAGE SDR = .114 LOG(10) FOLD

L143	2.252	.452	2.46	.284	1.99	2.073	.230	2.62	.106	.93	30T	*	L143
L182S	2.923	1.123	6.11	.093	.65	2.151	.308	3.51	.115	1.01	30S	*	L182S
L190D	2.704	.904	4.92	.135	.94	1.991	.148	1.68	.074	.65	30S	*	L190D
L280	1.579	-.221	-1.20	.263	1.84	1.732	-.111	-1.26	.114	1.00	30K	*	L280
L326S	2.541	.741	4.03	.258	1.80	2.049	.206	2.35	.153	1.35	30S	*	L326S
L366B	1.564	-.236	-1.28	.263	1.83	2.049	.206	2.35	.095	.83	30T	*	L366B
L396S	2.237	.437	2.38	.411	2.87	2.151	.308	3.50	.059	.52	30T	*	L396S
L581	2.595	.795	4.32	.300	2.10	2.049	.206	2.34	.120	1.06	30T	*	L581

TOTAL NUMBER OF LABORATORIES REPORTING = 51

The ISO (International Standards Organization) is proposing that MIT folding endurance be reported as the logarithm (to the base 10) of the double fold instead of the double fold as in the past.

Analysis T30-1 in this report is the same as in the past with no changes. This analysis, T30-2, shows the data as the ISO proposes. This analysis used the raw data reported for T30-1. The raw data are converted to the logarithm (base 10) as shown in the example to the right, and then the mean of the converted data is calculated and reported as ISO folding endurance.

Raw data (Folding number in double folds)	log (base 10) of raw data
207	2.32
166	2.22
151	2.18
332	2.52
260	2.41
137	2.14
199	2.30
230	2.36
210	2.31

mean of raw data

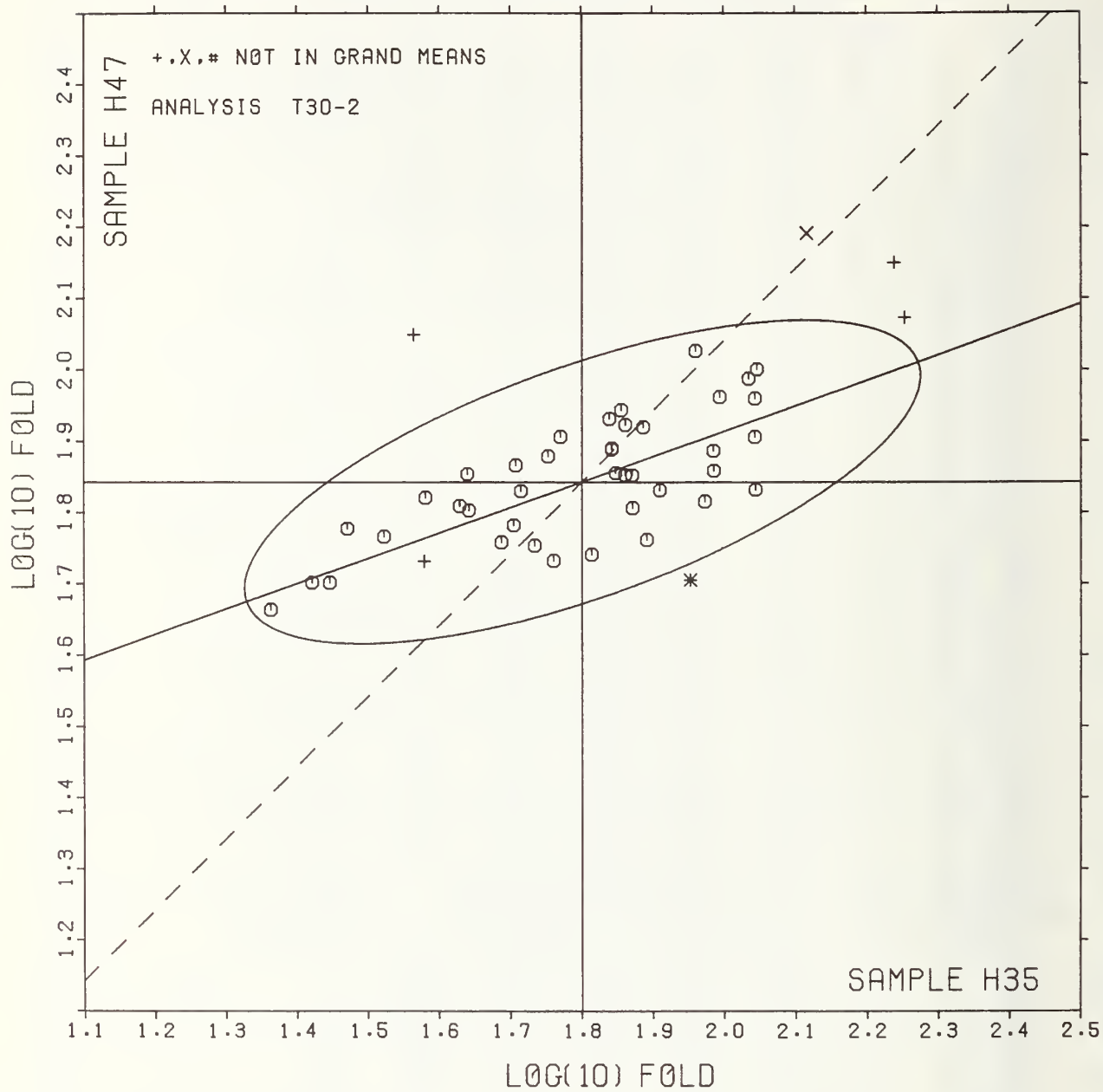
mean of logs
"Folding endurance"

DATA IS LOG(BASE 10) OF THE DOUBLE FOLD MEASUREMENT

LAB C0DZ	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---CONDITIONS
		H35	H47	MAJOR	MINOR	R	VAR		
L339	#	.579	1.343	-1.318	-.060	1.34	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L531	Ø	1.364	1.664	-.471	-.022	2.13	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L105	Ø	1.422	1.702	-.404	-.006	1.37	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L158	Ø	1.446	1.702	-.380	-.013	1.39	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L299	Ø	1.471	1.777	-.332	.049	1.18	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L390	Ø	1.523	1.767	-.286	.021	.90	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L366B	+	1.564	2.049	-.153	.274	1.33	30T	FOLDING ENDURANCE,	SCHÖPFER, TMI
L280	+	1.579	1.732	-.245	-.030	1.42	30K	FOLDING ENDURANCE,	KÖHLER-MÖLIN
L121	Ø	1.581	1.822	-.213	.053	1.80	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L366A	Ø	1.629	1.809	-.172	.026	1.09	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L376	Ø	1.640	1.854	-.147	.064	1.00	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L262	Ø	1.642	1.803	-.162	.016	.82	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L100N	Ø	1.688	1.759	-.134	-.041	.81	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L238B	Ø	1.705	1.782	-.110	-.025	1.24	30D	FOLDING ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L190C	Ø	1.708	1.867	-.079	.054	1.30	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L124	Ø	1.715	1.830	-.085	.017	.77	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L100M	Ø	1.735	1.755	-.092	-.061	.86	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L236	Ø	1.753	1.875	-.032	.050	1.11	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L254	Ø	1.761	1.733	-.078	-.051	1.14	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L162	Ø	1.771	1.907	-.007	.070	.66	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L589	Ø	1.814	1.742	-.021	-.100	.94	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L321	Ø	1.839	1.932	.066	.070	1.04	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L238A	Ø	1.842	1.889	.055	.029	.70	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L559	Ø	1.843	1.891	.055	.031	.78	30C	FOLDING ENDURANCE,	MIT, CIRCULATING FAN IN CEILING
L118	Ø	1.848	1.856	.049	-.004	.62	30D	FOLDING ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L122	Ø	1.855	1.944	.086	.077	1.26	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L230	Ø	1.861	1.853	.061	-.011	.92	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L279	Ø	1.862	1.923	.085	.055	.96	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L388	Ø	1.871	1.852	.070	-.015	.98	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L163	Ø	1.872	1.807	.055	-.058	1.19	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L378	Ø	1.887	1.920	.107	.044	.68	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L278	Ø	1.892	1.762	.059	-.107	1.15	30C	FOLDING ENDURANCE,	MIT, CIRCULATING FAN IN CEILING
L565	Ø	1.910	1.832	.099	-.048	.86	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L150	*	1.952	1.706	.097	-.180	1.38	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L567	Ø	1.960	2.028	.213	.120	.87	30M	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L243	Ø	1.973	1.816	.154	-.084	.82	30D	FOLDING ENDURANCE,	MIT, MODIFIED DRIVE TO REDUCE HEATING
L223F	Ø	1.985	1.887	.189	-.021	.75	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L159	Ø	1.985	1.859	.180	-.047	1.04	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L182M	Ø	1.994	1.963	.223	.048	.74	30M	FOLDING ENDURANCE,	MIT, WITH CENTRIFUGAL FAN
L221	Ø	2.034	1.988	.269	.058	.86	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L396M	Ø	2.043	1.960	.268	.029	.92	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L185	Ø	2.043	1.907	.250	-.022	.89	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L232	Ø	2.044	1.832	.226	-.092	.94	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L275	Ø	2.046	2.001	.285	.066	1.07	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L326N	X	2.115	2.191	.414	.222	.35	30N	FOLDING ENDURANCE,	MIT, NO CENTRIFUGAL FAN
L396S	+	2.237	2.151	.515	.143	1.70	30T	FOLDING ENDURANCE,	SCHÖPFER, TMI
L143	+	2.252	2.073	.503	.065	1.46	30T	FOLDING ENDURANCE,	SCHÖPFER, TMI
L326S	+	2.541	2.049	.767	-.055	1.68	30S	FOLDING ENDURANCE,	SCHÖPFER, LEIPZIG
L581	+	2.595	2.049	.618	-.073	1.58	30T	FOLDING ENDURANCE,	SCHÖPFER, TMI
L190D	+	2.704	1.991	.901	-.165	.73	30S	FOLDING ENDURANCE,	SCHÖPFER, LEIPZIG
L182S	+	2.923	2.151	1.161	-.087	.83	30S	FOLDING ENDURANCE,	SCHÖPFER, LEIPZIG
GMEANS:		1.800	1.843			1.00			
		95% ELLIPSE:	.500	.162		WITH GAMMA * 19 DEGREES			

FOLDING ENDURANCE (MIT)

SAMPLE H35 = 1.80 LOG(10) FOLD SAMPLE H47 = 1.84 LOG(10) FOLD



RESULTS EXPRESSED IN STANDARD GURLEY UNITS: MILLIGRAMS FOR A 1X3 INCH SPECIMEN (ACTUAL LENGTH 3.5 INCHES)

LAB CODE	PRINTING H68 96 GRAMS PER SQUARE METER					PRINTING H65 106 GRAMS PER SQUARE METER					TEST D. = 10		
	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L100	493.	36.	1.28	20.	.85	400.	3.	.11	13.	.71	35G	Ø	L100
L118	450.	-7.	-.23	23.	.96	379.	-18.	-.75	16.	.86	35G	Ø	L118
L121	504.	47.	1.65	48.	2.03	454.	57.	2.34	45.	2.42	35G	Ø	L121
L122	460.	3.	.09	26.	1.12	378.	-19.	-.77	21.	1.11	35G	Ø	L122
L132	463.	6.	.21	34.	1.46	409.	12.	.49	44.	2.33	35G	Ø	L132
L139	444.	-13.	-.46	19.	.79	394.	-3.	-.12	15.	.82	35G	Ø	L139
L148	464.	7.	.26	20.	.86	372.	-25.	-1.05	19.	.99	35G	Ø	L148
L153	452.	-5.	-.17	21.	.90	414.	16.	.68	9.	.46	35G	Ø	L153
L159	412.	-45.	-1.58	36.	1.52	385.	-13.	-.52	32.	1.69	35G	Ø	L159
L162	408.	-49.	-1.74	26.	1.09	355.	-43.	-1.75	12.	.62	35G	Ø	L162
L163	440.	-17.	-.60	31.	1.31	376.	-21.	-.88	32.	1.71	35G	Ø	L163
L183	513.	57.	1.99	17.	.73	422.	25.	1.02	29.	1.56	35G	Ø	L183
L190C	478.	21.	.74	16.	.69	430.	32.	1.34	13.	.68	35G	Ø	L190C
L195	465.	8.	.28	23.	1.00	398.	1.	.02	14.	.75	35G	Ø	L195
L223	433.	-24.	-.83	12.	.49	372.	-25.	-1.02	11.	.61	35G	Ø	L223
L224	474.	17.	.60	21.	.89	398.	1.	.04	23.	1.20	35G	Ø	L224
L232	430.	-27.	-.96	16.	.70	395.	-2.	-.07	23.	1.23	35G	Ø	L232
L236	383.	-74.	-2.60	39.	1.68	350.	-47.	-1.95	12.	.63	35G	*	L236
L241	479.	22.	.76	29.	1.23	427.	30.	1.25	24.	1.30	35G	Ø	L241
L249	437.	-20.	-.69	17.	.70	383.	-15.	-.60	11.	.58	35G	Ø	L249
L254	401.	-56.	-1.97	11.	.47	344.	-53.	-2.18	11.	.58	35G	Ø	L254
L260	463.	6.	.22	16.	.67	416.	19.	.79	9.	.51	35G	Ø	L260
L268	461.	4.	.15	14.	.59	397.	-0.	-.01	8.	.43	35G	Ø	L268
L291	461.	4.	.15	12.	.52	390.	-7.	-.29	16.	.83	35G	Ø	L291
L297	414.	-43.	-1.50	21.	.89	366.	-31.	-1.29	9.	.48	35G	Ø	L297
L308	455.	-2.	-.06	13.	.54	408.	10.	.43	28.	1.49	35G	Ø	L308
L321	465.	8.	.27	32.	1.35	392.	-5.	-.22	19.	1.00	35G	Ø	L321
L356	446.	-11.	-.39	21.	.91	372.	-25.	-1.02	11.	.61	35G	Ø	L356
L376	460.	4.	.12	36.	1.54	423.	26.	1.07	17.	.92	35G	Ø	L376
L378	467.	10.	.34	18.	.78	408.	11.	.45	15.	.79	35G	Ø	L378
L382	476.	19.	.66	42.	1.77	400.	3.	.12	23.	1.21	35G	Ø	L382
L390	458.	1.	.05	29.	1.25	407.	10.	.40	30.	1.60	35G	Ø	L390
L396	469.	12.	.43	13.	.54	401.	4.	.17	14.	.73	35G	Ø	L396
L567	482.	25.	.87	24.	1.00	412.	15.	.63	23.	1.23	35G	Ø	L567
L571	464.	8.	.27	16.	.67	419.	22.	.90	12.	.64	35G	Ø	L571
L575	484.	27.	.94	34.	1.45	429.	32.	1.31	15.	.78	35G	Ø	L575
L600	497.	40.	1.42	41.	1.72	421.	23.	.97	10.	.51	35G	Ø	L600

GR. MEAN = 457. GURLEY UNITS GRAND MEAN = 397. GURLEY UNITS TEST DETERMINATIONS = 10
SD MEANS = 28. GURLEY UNITS SD OF MEANS = 24. GURLEY UNITS 37 LABS IN GRAND MEANS
AVERAGE SDR = 24. GURLEY UNITS AVERAGE SDR = 19. GURLEY UNITS

L213 465. 8. .29 43. 1.83 427. 30. 1.23 32. 1.72 35H Ø L213
TOTAL NUMBER OF LABORATORIES REPORTING = 38

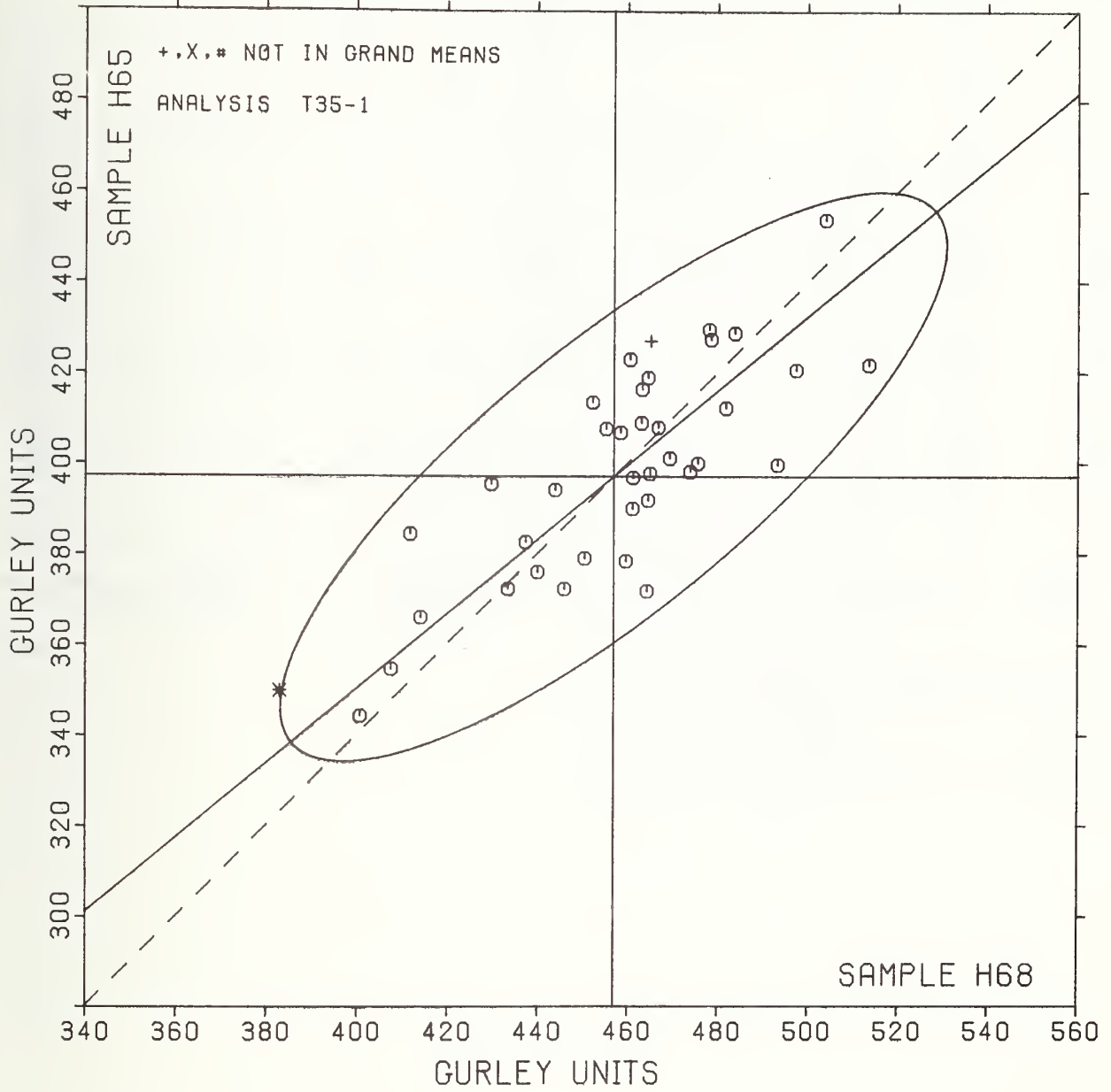
Best Values: H68 460 ± 50 Gurley units
H65 400 ± 30 Gurley units

RESULTS EXPRESSED IN STANDARD GURLEY UNITS; MILLIGRAMS FOR A 1X3 INCH SPECIMEN (ACTUAL LENGTH 3.5 INCHES)

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		H68	H65	MAJOR	MINOR	R.SDR	VAR	
L236	*	383.	350.	-87.	10.	1.15	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L254	Ø	401.	344.	-77.	-5.	.53	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L162	Ø	408.	355.	-65.	-2.	.85	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L159	Ø	412.	385.	-43.	19.	1.61	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L297	Ø	414.	366.	-53.	3.	.69	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L232	Ø	430.	395.	-22.	16.	.96	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L223	Ø	433.	372.	-34.	-4.	.55	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L249	Ø	437.	383.	-24.	1.	.64	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L163	Ø	440.	376.	-27.	-6.	1.51	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L139	Ø	444.	394.	-12.	6.	.81	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L355	Ø	446.	372.	-24.	-12.	.76	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L118	Ø	450.	379.	-17.	-10.	.91	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L153	Ø	452.	414.	7.	16.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L308	Ø	455.	408.	5.	9.	1.02	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L390	Ø	458.	407.	7.	7.	1.42	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L122	Ø	460.	378.	-10.	-16.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L376	Ø	460.	423.	19.	18.	1.23	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L291	Ø	461.	390.	-1.	-8.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L268	Ø	461.	397.	3.	-3.	.51	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L132	Ø	463.	409.	12.	5.	1.89	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L260	Ø	463.	416.	17.	11.	.59	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L148	Ø	464.	372.	-11.	-24.	.93	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L571	Ø	464.	419.	20.	12.	.65	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L321	Ø	465.	392.	2.	-9.	1.18	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L195	Ø	465.	398.	7.	-5.	.88	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L213	*	465.	427.	25.	18.	1.77	35H	STIFFNESS, GURLEY (UNITS: MG/1X3 TEST PIECE), 20 C, 65% RH
L378	Ø	467.	408.	14.	2.	.79	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L396	Ø	469.	401.	12.	-5.	.64	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L224	Ø	474.	398.	14.	-10.	1.05	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L382	Ø	476.	400.	16.	-10.	1.49	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L190C	Ø	478.	430.	37.	12.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L241	Ø	479.	427.	36.	10.	1.27	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L567	Ø	482.	412.	29.	-4.	1.11	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L575	Ø	484.	429.	41.	7.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L100	Ø	493.	400.	30.	-21.	.78	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L600	Ø	497.	421.	46.	-8.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L121	Ø	504.	454.	72.	14.	2.23	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
G183	Ø	513.	422.	59.	-17.	1.14	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
GMEANS:		457.	397.			1.00		
		95% ELLIPSE:		92.	29.			WITH GAMMA = 39 DEGREES

STIFFNESS, GURLEY

SAMPLE H68 = 457. GURLEY UNITS SAMPLE H65 = 397. GURLEY UNITS



TAPPI STANDARD T489 OS-76, RESULTS EXPRESSED IN GRAM CENTIMETERS

LAB CODE	SAMPLE B63 MEAN	KRAFT ENVELOPE 124 GRAMS PER SQUARE METER					SAMPLE J09 MEAN	PRINTING 149 GRAMS PER SQUARE METER					TEST D.- 10		
		DEV	N.DEV	SDR	R.SDR	DEV		N.DEV	SDR	R.SDR	VAR	F	LAB		
L107A	17.86	-1.03	-1.29	.53	.71	16.03	-1.30	-1.55	.88	1.03	36T	Ø	L107A		
L123	18.30	-.59	-.74	.48	.65	10.00	-7.33	-8.76	.67	.78	36T	#	L123		
L126	18.25	-.64	-.80	.35	.48	16.95	-.38	-.46	.50	.58	36T	Ø	L126		
L149	19.90	1.01	1.26	.74	1.00	18.40	1.07	1.28	.84	.99	36T	Ø	L149		
L150	18.95	.06	.08	.60	.81	17.00	-.33	-.40	1.18	1.38	36T	Ø	L150		
L158	19.00	.11	.14	1.29	1.74	17.00	-.33	-.40	2.30	2.70	36T	Ø	L158		
L163	18.40	-.49	-.61	.91	1.23	17.85	.52	.62	.47	.56	36T	Ø	L163		
L173B	18.03	-.86	-1.07	.74	1.01	16.55	-.78	-.93	.63	.73	36T	Ø	L173B		
L176	21.25	2.36	2.95	1.30	1.75	19.15	1.82	2.17	.97	1.14	36T	#	L176		
L182	18.92	.03	.04	.58	.78	18.00	.67	.80	1.60	1.87	36T	Ø	L182		
L207	18.76	-.13	-.16	.42	.57	17.36	.03	.03	.89	1.05	36T	Ø	L207		
L228	17.70	-1.19	-1.49	.63	.85	16.10	-1.23	-1.47	.46	.54	36T	Ø	L228		
L242	20.51	1.63	2.03	1.21	1.64	19.02	1.69	2.02	1.15	1.35	36T	Ø	L242		
L243	18.75	-.14	-.17	.54	.73	16.20	-1.13	-1.35	.48	.57	36T	Ø	L243		
L260	19.30	.41	.51	.58	.79	18.14	.81	.97	.56	.65	36T	Ø	L260		
L262	18.75	-.14	-.17	.72	.97	17.75	.42	.50	.54	.63	36T	Ø	L262		
L268	18.65	-.24	-.30	.63	.85	17.05	-.28	-.34	.28	.33	36T	Ø	L268		
L273	18.30	-.59	-.74	.48	.65	16.40	-.93	-1.11	.84	.99	36T	Ø	L273		
L281	19.10	.21	.26	.49	.66	17.92	.59	.71	.73	.85	36T	Ø	L281		
L290	18.30	-.59	-.74	.95	1.28	16.90	-.43	-.51	.74	.87	36T	Ø	L290		
L318	19.15	.26	.33	.68	.92	17.22	-.11	-.13	.38	.45	36T	Ø	L318		
L321	19.11	.22	.28	1.04	1.40	17.10	-.23	-.28	1.18	1.39	36T	Ø	L321		
L324	18.70	-.19	-.24	.45	.61	17.40	.07	.08	.91	1.07	36T	Ø	L324		
L339	18.49	-.40	-.50	.68	.92	16.67	-.66	-.79	.76	.90	36T	Ø	L339		
L442	22.60	3.71	4.64	1.62	2.18	19.38	2.05	2.45	1.31	1.54	36T	#	L442		
L570	19.70	.81	1.01	2.00	2.71	17.10	-.23	-.28	.99	1.17	36T	Ø	L570		
L580	18.40	-.49	-.61	.52	.70	18.00	.67	.80	1.15	1.35	36T	Ø	L580		

GR. MEAN = 18.89 TABER UNITS GRAND MEAN = 17.33 TABER UNITS TEST DETERMINATIONS = 10
SD MEANS = .80 TABER UNITS SD OF MEANS = .84 TABER UNITS 25 LABS IN GRAND MEANS
AVERAGE SDR = .74 TABER UNITS AVERAGE SDR = .85 TABER UNITS

L250 17.95 -.94 -1.17 .72 .98 16.00 -1.33 -1.59 .67 .78 36U * L250
TOTAL NUMBER OF LABORATORIES REPORTING = 28

Best Values: B63 18.8 ± 1.1 Taber units
J09 17.2 ± 1.1 Taber units

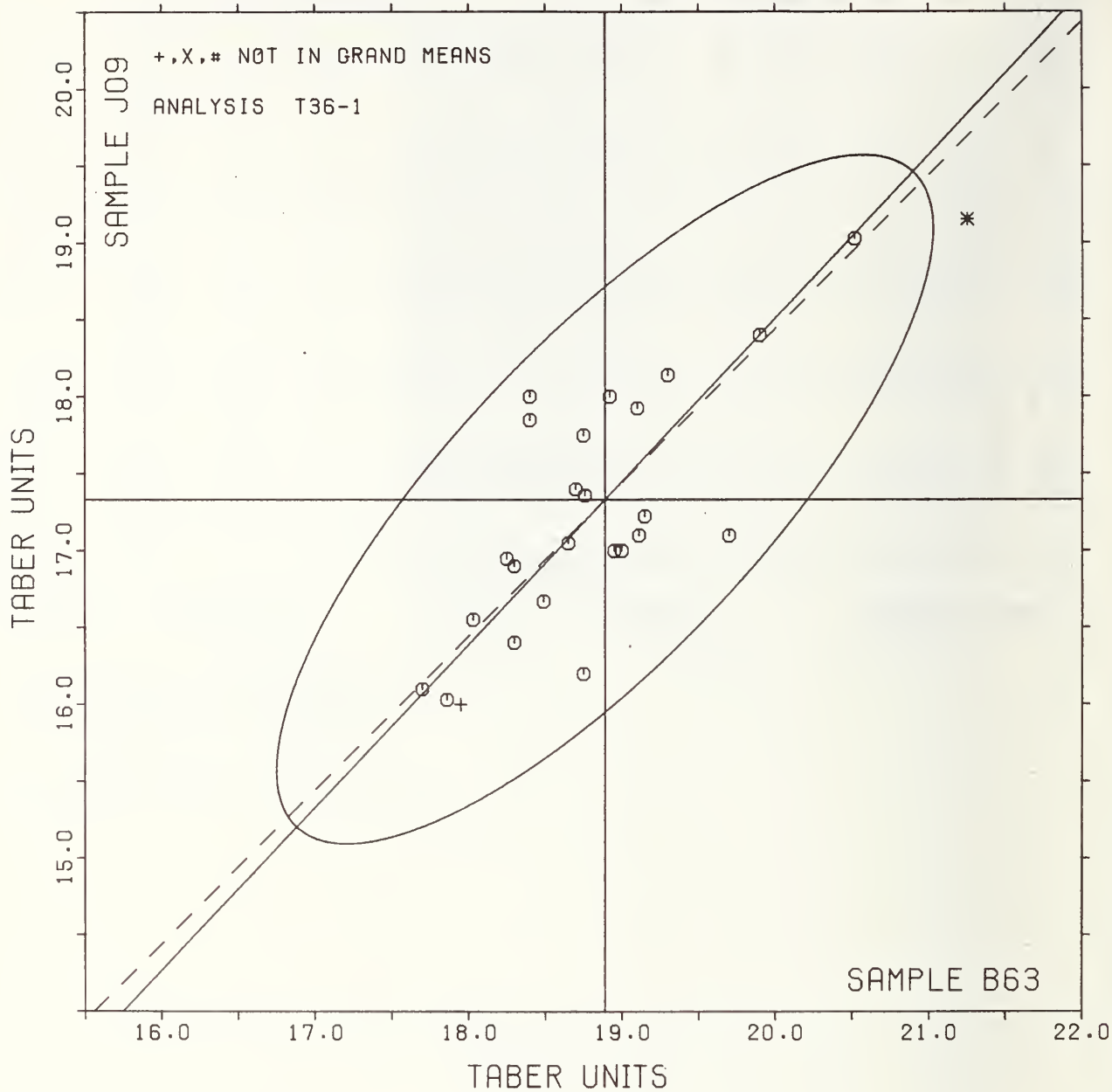
The following laboratories were omitted from the grand means because of extreme test results: 123, 442.

TAPPI STANDARD T489 OS-76, RESULTS EXPRESSED IN GRAM CENTIMETERS

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
		B63	J09	MAJOR	MINOR	R.SDR	VAR	
L228	Ø	17.70	16.10	-1.71	.02	.70	36T	STIFFNESS, TABER
L107A	Ø	17.86	16.03	-1.65	-.14	.87	36T	STIFFNESS, TABER
L250	*	17.95	16.00	-1.61	-.23	.88	36U	STIFFNESS, TABER, 20 C, 65% RH
L173B	Ø	18.03	16.55	-1.16	.09	.87	36T	STIFFNESS, TABER
L126	Ø	18.25	16.95	-.72	.20	.53	36T	STIFFNESS, TABER
L290	Ø	18.30	16.90	-.72	.13	1.07	36T	STIFFNESS, TABER
L273	Ø	18.30	16.40	-1.08	-.21	.82	36T	STIFFNESS, TABER
L123	#	18.30	10.00	-5.74	-4.60	.72	36T	STIFFNESS, TABER
L580	Ø	18.40	18.00	.15	.82	1.03	36T	STIFFNESS, TABER
L163	Ø	18.40	17.85	.04	.71	.89	36T	STIFFNESS, TABER
L339	Ø	18.49	16.67	-.75	-.16	.91	36T	STIFFNESS, TABER
L268	Ø	18.65	17.05	-.37	-.02	.59	36T	STIFFNESS, TABER
L324	Ø	18.70	17.40	-.08	.19	.84	36T	STIFFNESS, TABER
L262	Ø	18.75	17.75	.21	.39	.80	36T	STIFFNESS, TABER
L243	Ø	18.75	16.20	-.92	-.67	.65	36T	STIFFNESS, TABER
L207	Ø	18.76	17.36	-.07	.11	.81	36T	STIFFNESS, TABER
L182	Ø	18.92	18.00	.51	.44	1.33	36T	STIFFNESS, TABER
L150	Ø	18.95	17.00	-.20	-.27	1.10	36T	STIFFNESS, TABER
L158	Ø	19.00	17.00	-.16	-.31	2.22	36T	STIFFNESS, TABER
L281	Ø	19.10	17.92	.58	.25	.76	36T	STIFFNESS, TABER
L321	Ø	19.11	17.10	-.02	-.32	1.39	36T	STIFFNESS, TABER
L318	Ø	19.15	17.22	.10	-.26	.68	36T	STIFFNESS, TABER
L260	Ø	19.30	18.14	.87	.26	.72	36T	STIFFNESS, TABER
L570	Ø	19.70	17.10	.39	-.75	1.94	36T	STIFFNESS, TABER
L149	Ø	19.90	18.40	1.47	-.00	.99	36T	STIFFNESS, TABER
L242	Ø	20.51	19.02	2.35	-.02	1.50	36T	STIFFNESS, TABER
L176	*	21.25	19.15	2.94	-.47	1.45	36T	STIFFNESS, TABER
L442	#	22.60	19.38	4.04	-1.29	1.86	36T	STIFFNESS, TABER
GMEANS:		18.89	17.33			1.00		
		95% ELLIPSE:		2.92	1.01	WITH GAMMA = 46 DEGREES		

STIFFNESS, TABER

SAMPLE B63 = 18.9 TABER UNITS SAMPLE J09 = 17.3 TABER UNITS



LAB CODE	SAMPLE H80 MEAN	PRINTING 84 GRAMS PER SQUARE METER				SAMPLE H76 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
L107	77.0	6.4	.21	.0	.00	33.7	-20.3	-.87	3.2	1.00	49I	Ø	L107
L121	660.0	589.4	19.16	.0	.00	543.7	489.7	20.94	78.2	24.47	49F	#	L121
L122	47.6	-23.0	-.75	2.1	.68	48.6	-5.5	-.23	1.3	.39	49Q	Ø	L122
L149	83.5	12.9	.42	2.6	.85	52.1	-1.9	-.08	5.5	1.73	49L	Ø	L149
L182I	20.1	-50.6	-1.64	.8	.27	16.4	-37.7	-1.61	1.8	.57	49Q	Ø	L182I
L183	NO DATA REPORTED FOR SAMPLE H80					44.4	-9.7	-.41	1.3	.42	49Q	M	L183
L190C	55.5	-15.1	-.49	1.7	.55	59.5	5.4	.23	2.9	.90	49T	Ø	L190C
L207	128.0	57.4	1.86	9.6	3.06	97.0	42.9	1.83	1.4	.44	49I	Ø	L207
L242	37.2	-33.5	-1.09	2.8	.89	NO DATA REPORTED FOR SAMPLE H76					49P	M	L242
L280	3.7	-66.9	-2.18	.0	.00	3.0	-51.0	-2.18	.3	.10	49U	#	L280
L291	65.5	-5.1	-.17	5.1	1.63	65.1	11.1	.47	4.2	1.30	49I	Ø	L291
L382	66.0	-4.7	-.15	2.7	.86	NO DATA REPORTED FOR SAMPLE H76					49I	M	L382
L388	167.4	96.8	3.15	6.2	1.99	108.0	53.9	2.31	8.8	2.76	49Q	#	L388
L484	96.3	25.7	.84	4.6	1.46	72.8	18.8	.80	7.4	2.31	49P	Ø	L484
L600	62.2	-8.4	-.27	1.6	.50	41.4	-12.7	-.54	1.1	.35	49Q	Ø	L600

GR. MEAN = 70.6 KP CM/SEC

GRAND MEAN = 54.1 KP CM/SEC

TEST DETERMINATIONS = 4

SD MEANS = 30.8 KP CM/SEC

SD OF MEANS = 23.4 KP CM/SEC

9 LABS IN GRAND MEANS

AVERAGE SDR = 3.1 KP CM/SEC

AVERAGE SDR = 3.2 KP CM/SEC

TOTAL NUMBER OF LABORATORIES REPORTING = 15

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

The following laboratories were omitted from the grand means because the values were outside the range of the instrument: 121, 280.

ANALYSIS T50-1 TABLE 1
 SURFACE PICK STRENGTH, WAX NUMBER
 TAPPI STANDARD T459 GS-75, SURFACE STRENGTH OF PAPER (WAX PICK TEST)

LAB CODE	SAMPLE H80 MEAN	PRINTING 84 GRAMS PER SQUARE METER				R.SDR	SAMPLE H76 MEAN	PRINTING 91 GRAMS PER SQUARE METER				R.SDR	TEST D. = 5		
		DEV	N.DEV	SDR	R.SDR			DEV	N.DEV	SDR	R.SDR		VAR	F	LAB
L105	11.00	-.02	-.02	.71	1.76	8.80	.17	.13	.84	1.35	50W	Ø	L105		
L122	10.00	-1.02	-.90	.00	.00	8.00	-.63	-.48	.00	.00	50W	Ø	L122		
L158	11.40	.38	.34	.55	1.37	7.80	-.83	-.64	.45	.72	50W	Ø	L158		
L162	12.00	.98	.86	.00	.00	7.00	-1.63	-1.26	.00	.00	50W	Ø	L162		
L173A	11.00	-.02	-.02	.00	.00	7.40	-1.23	-.95	.55	.88	50W	Ø	L173A		
L182W	10.60	-.42	-.37	.55	1.37	9.40	.77	.59	.55	.88	50W	Ø	L182W		
L183	11.40	.38	.34	.89	2.23	9.20	.57	.44	.84	1.35	50W	Ø	L183		
L195	11.00	-.02	-.02	.00	.00	8.20	-.43	-.33	.45	.72	50W	Ø	L195		
L213	10.80	-.22	-.19	.45	1.12	8.60	-.03	-.02	.55	.88	50W	Ø	L213		
L225	13.00	1.98	1.75	.00	.00	9.60	.97	.75	.55	.88	50W	Ø	L225		
L228	9.60	-1.42	-1.25	.55	1.37	7.40	-1.23	-.95	.55	.88	50W	Ø	L228		
L230	11.00	-.02	-.02	.00	.00	8.00	-.63	-.48	.00	.00	50W	Ø	L230		
L236	13.00	1.98	1.75	.00	.00	11.20	2.57	1.98	.45	.72	50W	Ø	L236		
L243	8.60	-2.42	-2.13	.55	1.37	8.20	-.43	-.33	.84	1.35	50W	Ø	L243		
L339	10.60	-.42	-.37	1.14	2.85	10.80	2.17	1.67	2.59	4.18	50W	Ø	L339		
L366	12.20	1.18	1.04	.84	2.09	10.20	1.57	1.21	.84	1.35	50W	Ø	L366		
L378	11.20	.18	.16	.45	1.12	7.40	-1.23	-.95	.55	.88	50W	Ø	L378		
L390	8.80	-2.22	-1.96	1.30	3.25	7.40	-1.23	-.95	.89	1.44	50W	Ø	L390		
L561	12.00	.98	.86	.00	.00	8.80	.17	.13	1.10	1.77	50W	Ø	L561		
L564	11.00	-.02	-.02	.00	.00	10.80	2.17	1.67	.45	.72	50W	Ø	L564		
L567	11.20	.18	.16	.45	1.12	7.00	-1.63	-1.26	.00	.00	50W	Ø	L567		

GR. MEAN = 11.02 WAX NUMBER
 SD MEANS = 1.13 WAX NUMBER
 AVERAGE SDR = .40 WAX NUMBER
 TOTAL NUMBER OF LABORATORIES REPORTING = 21
 Best Values: H80 11.0 ± 1.9 wax number
 H76 9.0 ± 1.8 wax number

GRAND MEAN = 8.63 WAX NUMBER
 SD OF MEANS = 1.30 WAX NUMBER
 AVERAGE SDR = .62 WAX NUMBER

TEST DETERMINATIONS = 5
 21 LABS IN GRAND MEANS

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T50-1 TABLE 2

SURFACE PICK STRENGTH, WAX NUMBER
TAPPI STANDARD T459 6S-75, SURFACE STRENGTH OF PAPER (WAX PICK TEST)

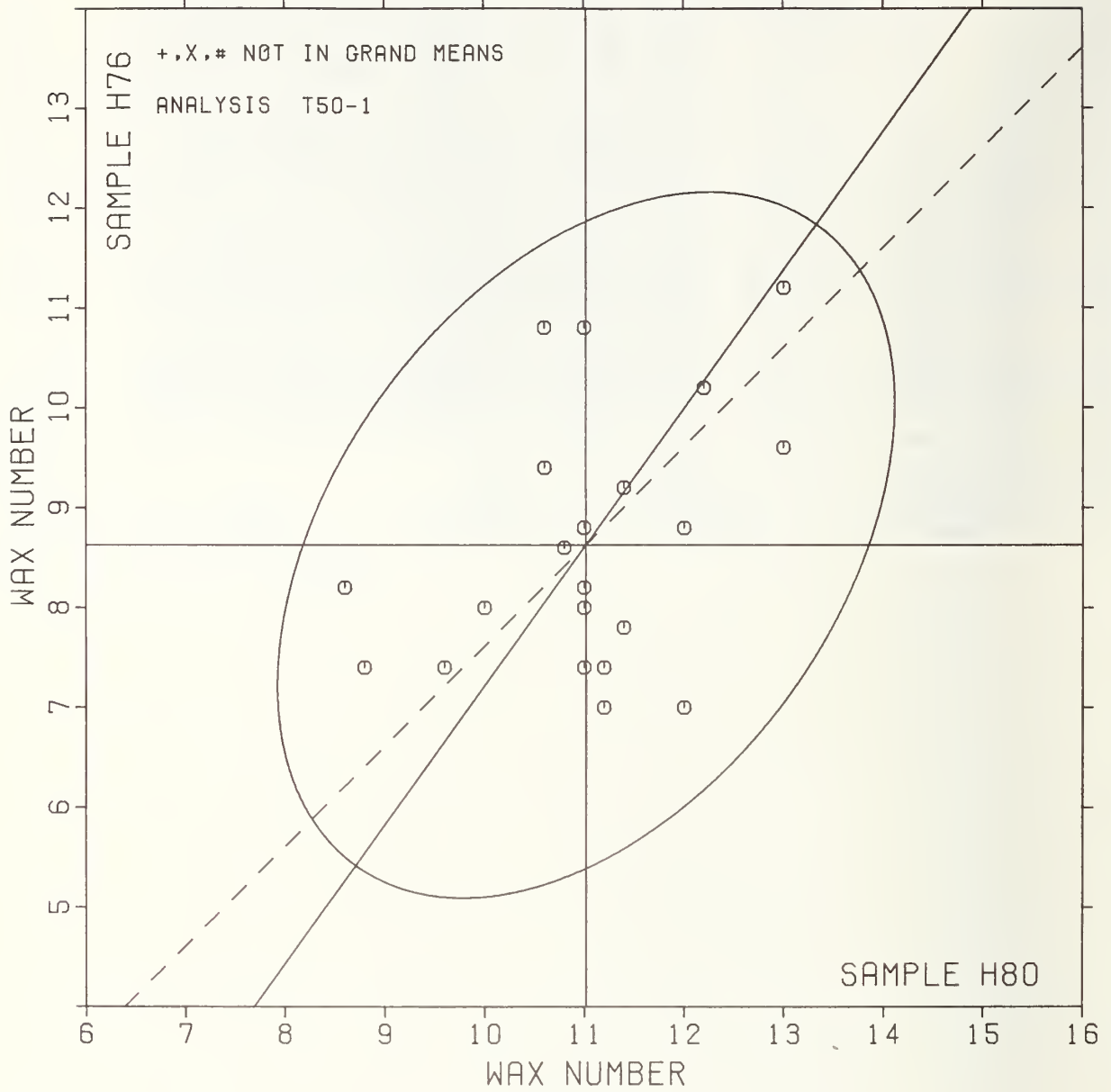
LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS		
		H80	H76	MAJOR	MINOR	R.SDR	VAR			
L243	Ø	8.60	8.20	-1.76	1.71	1.36	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L399	Ø	8.80	7.40	-2.29	1.08	2.35	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L228	Ø	9.60	7.40	-1.83	.43	1.13	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L122	Ø	10.00	8.00	-1.11	.46	.00	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L339	Ø	10.60	10.80	1.52	1.61	3.51	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L182W	Ø	10.60	9.40	.38	.79	1.13	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L213	Ø	10.80	8.60	-.15	.16	1.00	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L564	Ø	11.00	10.80	1.75	1.28	.36	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L195	Ø	11.00	8.20	-.36	-.23	.36	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L173A	Ø	11.00	7.40	-1.01	-.70	.44	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L105	Ø	11.00	8.80	.13	.12	1.56	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L230	Ø	11.00	8.00	-.52	-.35	.00	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L557	Ø	11.20	7.00	-1.22	-1.10	.55	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L378	Ø	11.20	7.40	-.89	-.86	1.00	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L183	Ø	11.40	9.20	.69	.02	1.79	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L158	Ø	11.40	7.80	-.45	-.79	1.04	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L561	Ø	12.00	8.80	.71	-.70	.88	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L162	Ø	12.00	7.00	-.75	-1.75	.00	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L366	Ø	12.20	10.20	1.97	-.04	1.72	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L236	Ø	13.00	11.20	3.24	-.11	.36	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
L225	Ø	13.00	9.60	1.95	-1.04	.44	50W	SURFACE PICK STRENGTH,	WAX (TAPPI T459 6S75)	
GMEANS:		11.02	8.63			1.00				
		95% ELLIPSE:		3.95	2.53	WITH GAMMA = 54 DEGREES				

SURFACE PICK STRENGTH, WAX

SAMPLE H80 = 11.0 WAX NUMBER

SAMPLE H76 = 8.6 WAX NUMBER

WAX NUMBER



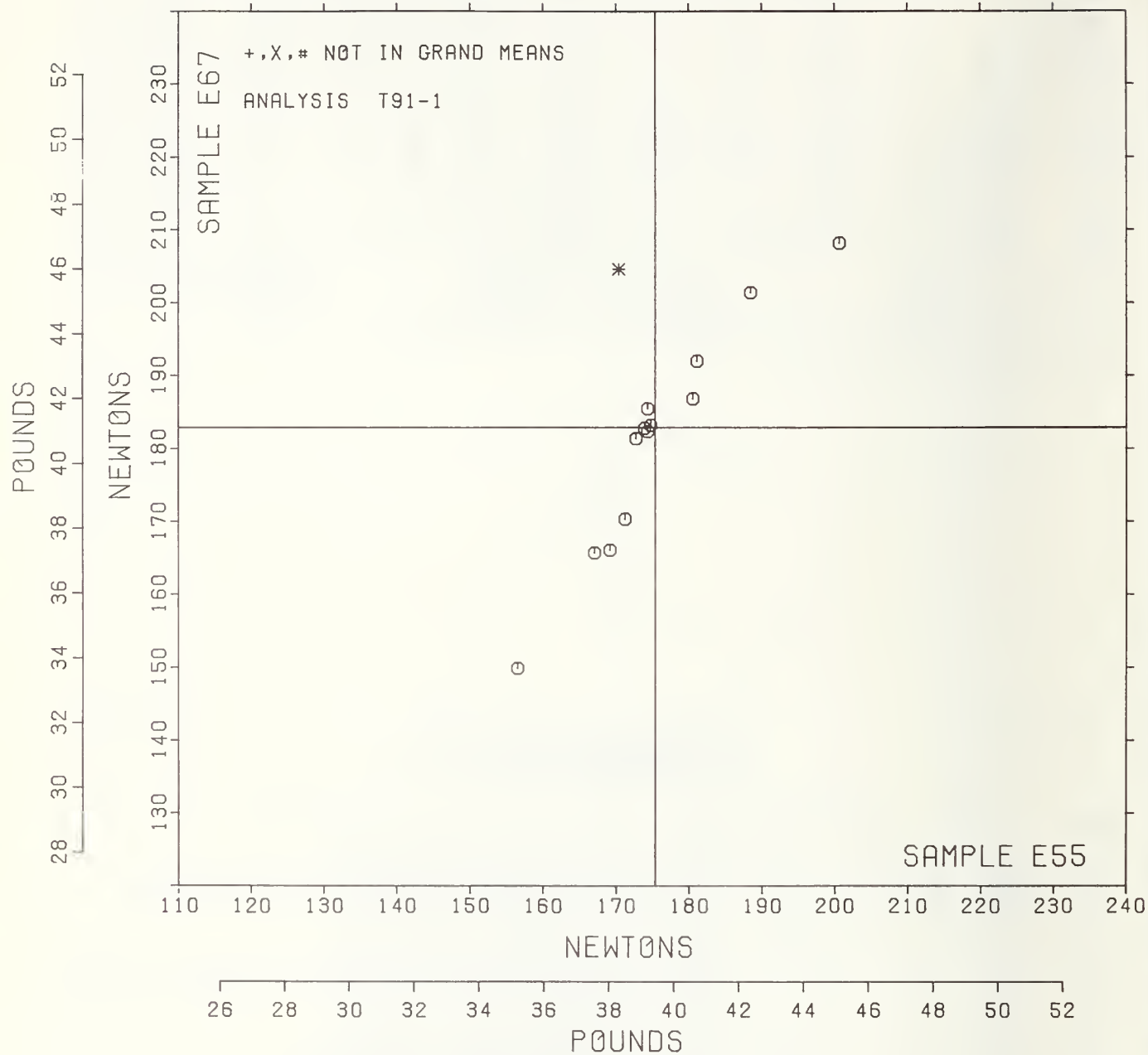
CONCORA (CMT)

SAMPLE E55 = 175. NEWTONS

SAMPLE E67 = 183. NEWTONS

SAMPLE E55 = 39.4 POUNDS

SAMPLE E67 = 41.1 POUNDS



TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T96-1 TABLE 1
 RING CRUSH (COMPRESSION RESISTANCE OF PAPERBOARD)
 TAPPI STANDARD T472 SU-68

LAB CODE	SAMPLE E55 MEAN	LINERBOARD 129 GRAMS PER SQUARE METER				SAMPLE E67 MEAN	KRAFT 143 GRAMS PER SQUARE METER				TEST D. = 10		
		DEV	N.DEV	SDR	R.SDR		DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L100	188.	-6.	-.22	37.	2.18	244.	14.	.43	16.	1.09	96H	Ø	L100
L107	185.	-9.	-.35	16.	.95	218.	-12.	-.39	20.	1.34	96P	Ø	L107
L114	197.	3.	-.10	13.	.79	234.	4.	.11	14.	.97	96P	Ø	L114
L122	141.	-53.	-2.08	26.	1.56	175.	-55.	-1.73	15.	1.04	96P	Ø	L122
L124	152.	-42.	-1.64	20.	1.17	192.	-38.	-1.19	13.	.86	96P	Ø	L124
L126	206.	12.	.47	12.	.71	259.	29.	.90	9.	.62	96P	Ø	L126
L127	199.	5.	.20	17.	.99	210.	-20.	-.65	12.	.83	96P	Ø	L127
L157	192.	-2.	-.07	12.	.71	207.	-23.	-.72	15.	1.00	96P	Ø	L157
L171	207.	13.	.50	11.	.67	242.	12.	.39	20.	1.37	96H	Ø	L171
L182	213.	19.	.73	17.	1.00	257.	27.	.84	10.	.68	96H	Ø	L182
L191	179.	-15.	-.60	18.	1.03	210.	-20.	-.63	25.	1.67	96P	Ø	L191
L242	244.	50.	1.96	8.	.48	258.	29.	.90	15.	1.01	96G	Ø	L242
L303	233.	39.	1.53	16.	.93	299.	69.	2.19	14.	.93	96H	Ø	L303
L307	189.	-5.	-.21	15.	.87	207.	-23.	-.72	12.	.80	96P	Ø	L307
L329	223.	29.	1.13	13.	.78	287.	57.	1.79	7.	.50	96P	Ø	L329
L336	193.	-1.	-.02	19.	1.12	230.	0.	-.01	16.	1.08	96P	Ø	L336
L350	198.	4.	.15	16.	.94	231.	1.	.03	10.	.66	96P	Ø	L350
L393	201.	7.	.29	12.	.72	254.	24.	.77	10.	.65	96P	Ø	L393
L484	153.	-41.	-1.61	15.	.87	177.	-53.	-1.66	16.	1.07	96R	Ø	L484
L553	180.	-14.	-.55	22.	1.31	196.	-34.	-1.07	22.	1.53	96P	Ø	L553
L562	196.	2.	.09	20.	1.18	232.	2.	.07	17.	1.13	96P	Ø	L562
L570	189.	-5.	-.21	15.	.90	199.	-31.	-.97	9.	.62	96T	Ø	L570
L575	212.	18.	.71	16.	.94	245.	15.	.48	14.	.99	96H	Ø	L575
L603	231.	37.	1.44	18.	1.07	269.	39.	1.22	14.	.98	96P	Ø	L603
L610	215.	21.	.81	10.	.59	259.	29.	.91	14.	.99	96P	Ø	L610
L617	150.	-44.	-1.73	26.	1.56	203.	-27.	-.84	22.	1.48	96Y	Ø	L617
L663	174.	-20.	-.79	16.	.97	215.	-15.	-.48	16.	1.09	96P	Ø	L663

GR. MEAN = 194. NEWTONS

SD MEANS = 26. NEWTONS

GRAND MEAN = 230. NEWTONS

SD OF MEANS = 32. NEWTONS

TEST DETERMINATIONS = 10

27 LABS IN GRAND MEANS

AVERAGE SDR = 17. NEWTONS

AVERAGE SDR = 15. NEWTONS

GR. MEAN = 43.63 POUNDS

GRAND MEAN = 51.71 POUNDS

TOTAL NUMBER OF LABORATORIES REPORTING = 27

Best Values: E55 200 ± 45 newtons

E67 230 ± 50 newtons

TAPPI COLLABORATIVE REFERENCE PROGRAM
 ANALYSIS T96-1 TABLE 2
 RING CRUSH (COMPRESSION RESISTANCE OF PAPERBOARD)
 TAPPI STANDARD T472 SU-68

LAB CODE	F	MEANS		COORDINATES		AVG		PROPERTY---TEST	INSTRUMENT---CONDITIONS
		E55	E67	MAJOR	MINOR	R.SDR	VAR		
L122	Ø	141.	175.	-76.	8.	1.30	96P	RING CRUSH, H AND D	
L617	Ø	150.	203.	-48.	18.	1.52	96Y	RING CRUSH; GIVE INSTRUMENT MAKE + MODEL	
L124	Ø	152.	192.	-56.	10.	1.01	96P	RING CRUSH, H AND D	
L484	Ø	153.	177.	-67.	0.	.97	96R	RING CRUSH, REOMED	
L663	Ø	174.	215.	-24.	7.	1.03	96P	RING CRUSH, H AND D	
L191	Ø	179.	210.	-25.	-0.	1.35	96P	RING CRUSH, H AND D	
L553	Ø	180.	196.	-35.	-10.	1.42	96P	RING CRUSH, H AND D	
L107	Ø	185.	218.	-15.	-1.	1.15	96P	RING CRUSH, H AND D	
L100	Ø	188.	244.	7.	13.	1.63	96H	RING CRUSH, H AND D	
L570	Ø	189.	199.	-28.	-15.	.76	96T	RING CRUSH, TMI	
L307	Ø	189.	207.	-21.	-10.	.83	96P	RING CRUSH, H AND D	
L157	Ø	192.	207.	-19.	-12.	.86	96P	RING CRUSH, H AND D	
L336	Ø	193.	230.	-0.	1.	1.10	96P	RING CRUSH, H AND D	
L562	Ø	196.	232.	3.	-0.	1.16	96P	RING CRUSH, H AND D	
L114	Ø	197.	234.	4.	0.	.88	96P	RING CRUSH, H AND D	
L350	Ø	198.	231.	3.	-3.	.80	96P	RING CRUSH, H AND D	
L127	Ø	199.	210.	-13.	-17.	.91	96P	RING CRUSH, H AND D	
L393	Ø	201.	254.	24.	9.	.69	96P	RING CRUSH, H AND D	
L126	Ø	206.	259.	30.	8.	.67	96P	RING CRUSH, H AND D	
L171	Ø	207.	242.	18.	-2.	1.02	96H	RING CRUSH, H AND D	
L575	Ø	212.	245.	23.	-5.	.96	96H	RING CRUSH, H AND D	
L182	Ø	213.	257.	32.	2.	.84	96H	RING CRUSH, H AND D	
L610	Ø	215.	259.	36.	1.	.79	96P	RING CRUSH, H AND D	
L329	Ø	223.	287.	63.	12.	.64	96P	RING CRUSH, H AND D	
L603	Ø	231.	269.	53.	-5.	1.03	96P	RING CRUSH, H AND D	
L303	Ø	233.	299.	79.	12.	.93	96H	RING CRUSH, H AND D	
L242	Ø	244.	258.	53.	-22.	.74	96G	RING CRUSH, GAYDON PLAT CRUSH TESTER	
GMEANS:		194.	230.			1.00			
		95% ELLIPSE:		105.	26.			WITH GAMMA = 52 DEGREES	

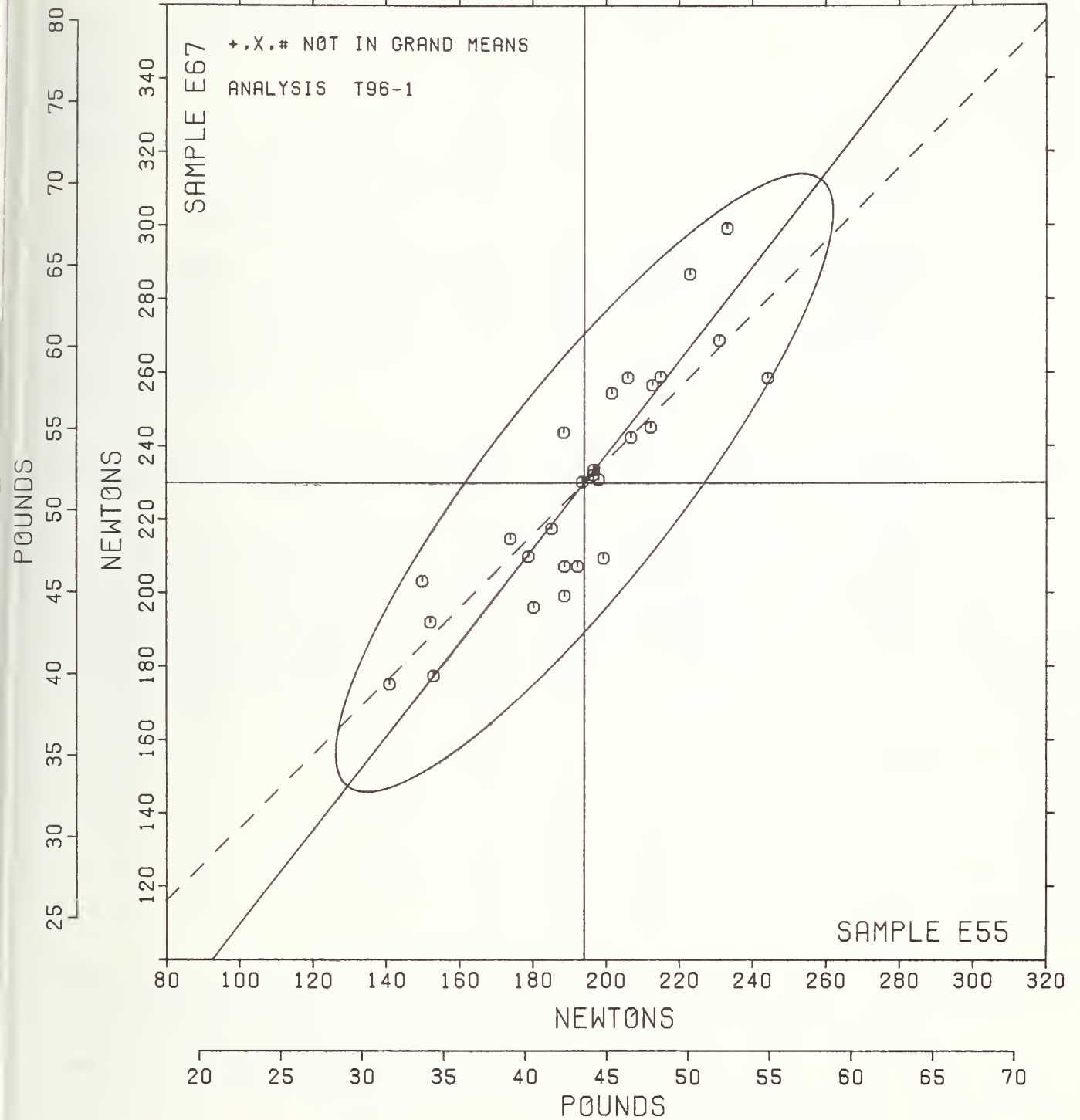
RING CRUSH

SAMPLE E55 = 194. NEWTONS

SAMPLE E67 = 230. NEWTONS

SAMPLE E55 = 43.6 POUNDS

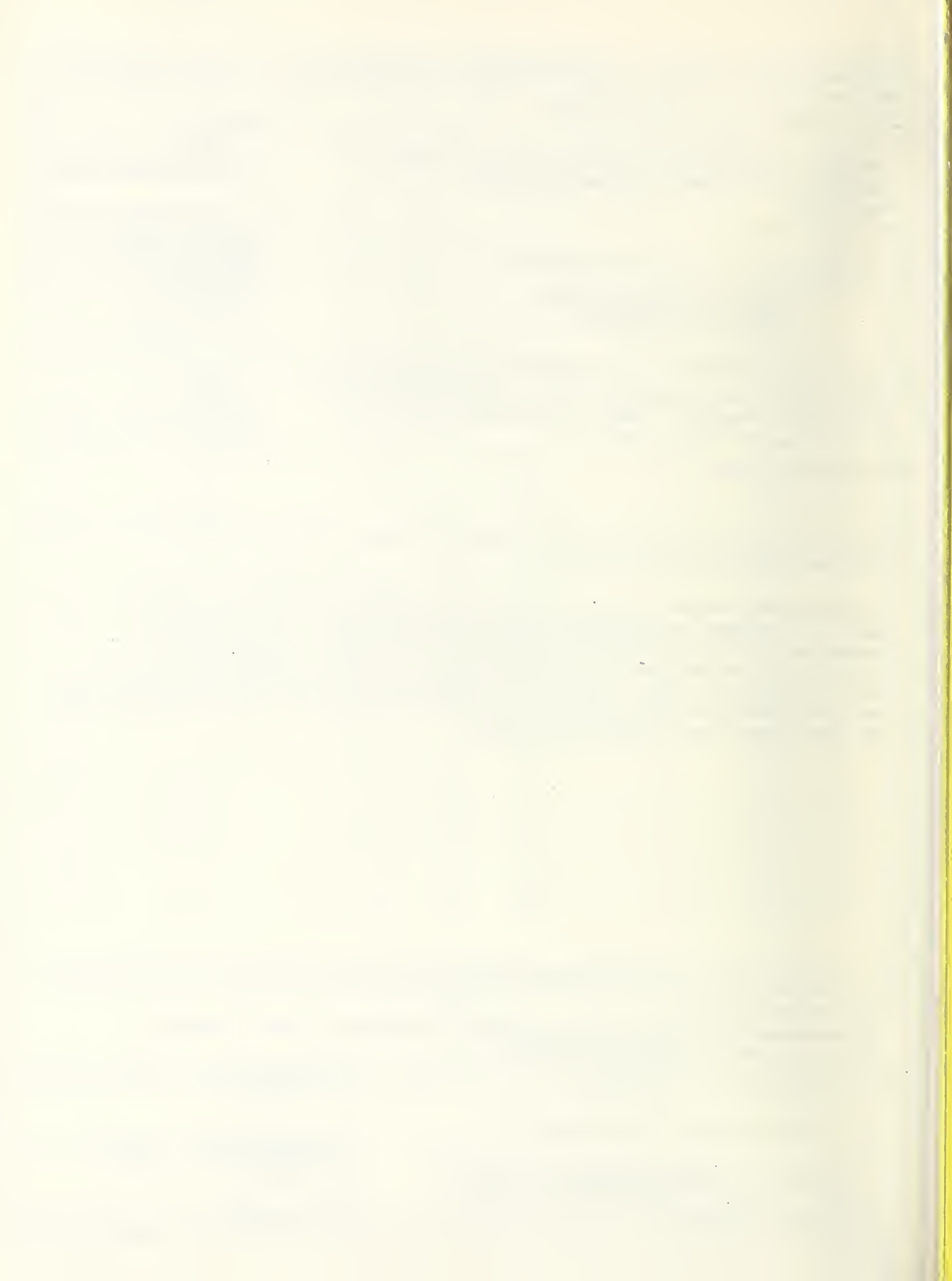
SAMPLE E67 = 51.7 POUNDS



SUMMARY TABLE

TEST METHOD	SAMPLE CODE	GRAND MEAN	SD OF MEAN	AVER SDR	REPL CRP	LABS INCL	LABS PARTIC	REPL TAPPI	REPEAT	REPROD
BURSTING STRENGTH, MODEL C T10-1 PSI	H39	36.23	1.97	2.15	15	43	51	10	1.88	5.55
	H60	18.19	1.60	1.18					1.03	4.48
BURSTING STRENGTH, MODEL C-A T10-2 PSI	H39	35.9	1.7	1.8	15	37	37	10	1.6	4.8
	H60	18.7	1.3	1.3					1.1	3.7
BURSTING STRENGTH, HIGH RANGE T11-1 PSI	H07	73.6	3.0	6.3	15	31	43	10	5.5	9.0
	H25	54.0	2.2	2.7					2.4	6.2
TEARING STRENGTH, DEEP CUTOUT T15-1 GRAMS	E11	58.2	2.7	1.4	15	106	126	10	1.3	7.4
	E17	60.8	3.3	2.0					1.7	9.2
TEARING STRENGTH, NO CUTOUT T17-1 GRAMS	E63	77.4	3.5	2.4	15	13	14	10	2.1	9.8
	E21	64.7	2.7	2.5					2.2	7.6
TENSILE STRENGTH, PACKAGING PAPERS T19-1 KILONEWTON/M	E63	3.92	.19	.17	20	45	53	12	.14	.53
	E66	3.74	.24	.32					.25	.67
TENSILE STRENGTH, CRE TYPE T20-1 KILONEWTON/M	J07	6.29	.36	.36	20	44	51	12	.28	1.02
	J05	5.38	.31	.23					.19	.87
TENSILE STRENGTH, PENDULUM TYPE T20-2 KILONEWTON/M	J07	6.21	.40	.41	20	36	39	12	.33	1.13
	J05	5.41	.38	.28					.22	1.06
T.E.A., PACKAGING PAPERS T25-1 JOULES/SQ M	E63	82.2	6.5	11.6	20	18	20	12	9.3	18.9
	E66	74.0	5.4	17.9					14.3	17.5
T.E.A., PRINTING PAPERS T26-1 JOULES/SQ M	J07	74.2	7.3	8.8	20	22	22	12	7.0	20.7
	J05	59.4	5.5	5.9					4.7	15.4
ELONGATION TO BREAK, PACKAGING PAPER T28-1 PERCENT	E63	3.04	.34	.28	20	17	18	12	.23	.94
	E66	2.86	.35	.44					.35	.99
ELONGATION TO BREAK, PRINTING PAPER T29-1 PERCENT	J07	1.866	.209	.147	20	17	20	12	.118	.583
	J05	1.682	.192	.115					.092	.535
FOLDING ENDURANCE (MIT) T30-1 DOUBLE FOLDS	H35	72.	26.	22.	15	41	51	10	20.	73.
	H47	73.	14.	18.					16.	41.
FOLDING ENDURANCE (MIT) T30-2 LOG(10) FOLD	H35	1.800	.184	.143	15	41	51	10	.125	.514
	H47	1.843	.088	.114					.100	.250
STIFFNESS, GURLEY T35-1 GURLEY UNITS	H68	457.	28.	24.	10	37	38	10	21.	79.
	H65	397.	24.	19.					16.	67.
STIFFNESS, TABER T36-1 TABER UNITS	B63	18.89	.80	.74	10	25	28	5	.92	2.31
	J09	17.33	.84	.85					1.06	2.44
SURFACE PICK STRENGTH, IGT T49-1 KP CM/SEC	H80	70.6	30.8	3.1	4	9	15	4	4.3	85.2
	H76	54.1	23.4	3.2					4.4	64.8
SURFACE PICK STRENGTH, WAX T50-1 WAX NUMBER	H80	11.02	1.13	.40	5	21	21	5	.50	3.14
	H76	8.63	1.30	.62					.77	3.59
CONCORA (CMT) T91-1 NEWTONS	B55	175.	10.	11.	10	14	14	10	10.	29.
	B67	183.	16.	12.					11.	45.
RING CRUSH T96-1 NEWTONS	B55	194.	26.	17.	10	27	27	10	15.	71.
	B67	230.	32.	15.					13.	88.

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This diagram is composed of two full-size overlaid tracings. One tracing was made from the Thwing-Elmendorf tear tester with NO CUTOUT (old style). The other tracing was made from the Thwing-Elmendorf tear tester with DEEP CUTOUT. The cross hatched area represents the metal removed from the swinging sector when the deep cutout (new) style was created.

DEEP CUTOUT instrument
is $\frac{5}{8}$ inch across
NO CUTOUT instrument
is $1 \frac{1}{4}$ inch across

Note shape of pendulum
sector with respect to
an imaginary line drawn
across the top of the
specimen clamp

