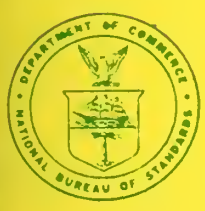
TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

REPORT NO. 55S
STRENGTH TESTS



U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

NBS COLLABORATIVE REFERENCE PROGRAMS

TAPPI Paper and Board (6 times per year)

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

FKBG-API Containerboard (48 times per year)

- Mullen burst of linerboard
- Concora test of medium

MCCA Color and Appearance (4 times per year)

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

Rubber (4 times per year)

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

ASTM Textiles (3 times per year)

- Flammability (FF3-71 and FF5-74)

ASTM Cement (2 times per year)

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

AASHTO Bituminous

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

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

Rev. 4/77

TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

Report No. 55S
STRENGTH TESTS

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

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

NBSIR 79-1358

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

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.

TABLE OF CONTENTS

Analyses In This Report

Analyses In The G Report

TABLE OF CONVERSION FACTORS TO METRIC (SI) UNITS

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

KEY TO TABLES AND GRAPHS

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

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

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

F - Flag, with following meaning:

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

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

M - Excluded because data for one sample are missing

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

* - Included in grand means but plotted point falls outside of the 95% error ellipse. The 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.

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

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

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

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

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

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

ANALYSIS T10-1 TABLE 1
BURSTING STRENGTH, PSI
TAPPI STANDARD T403 OS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C

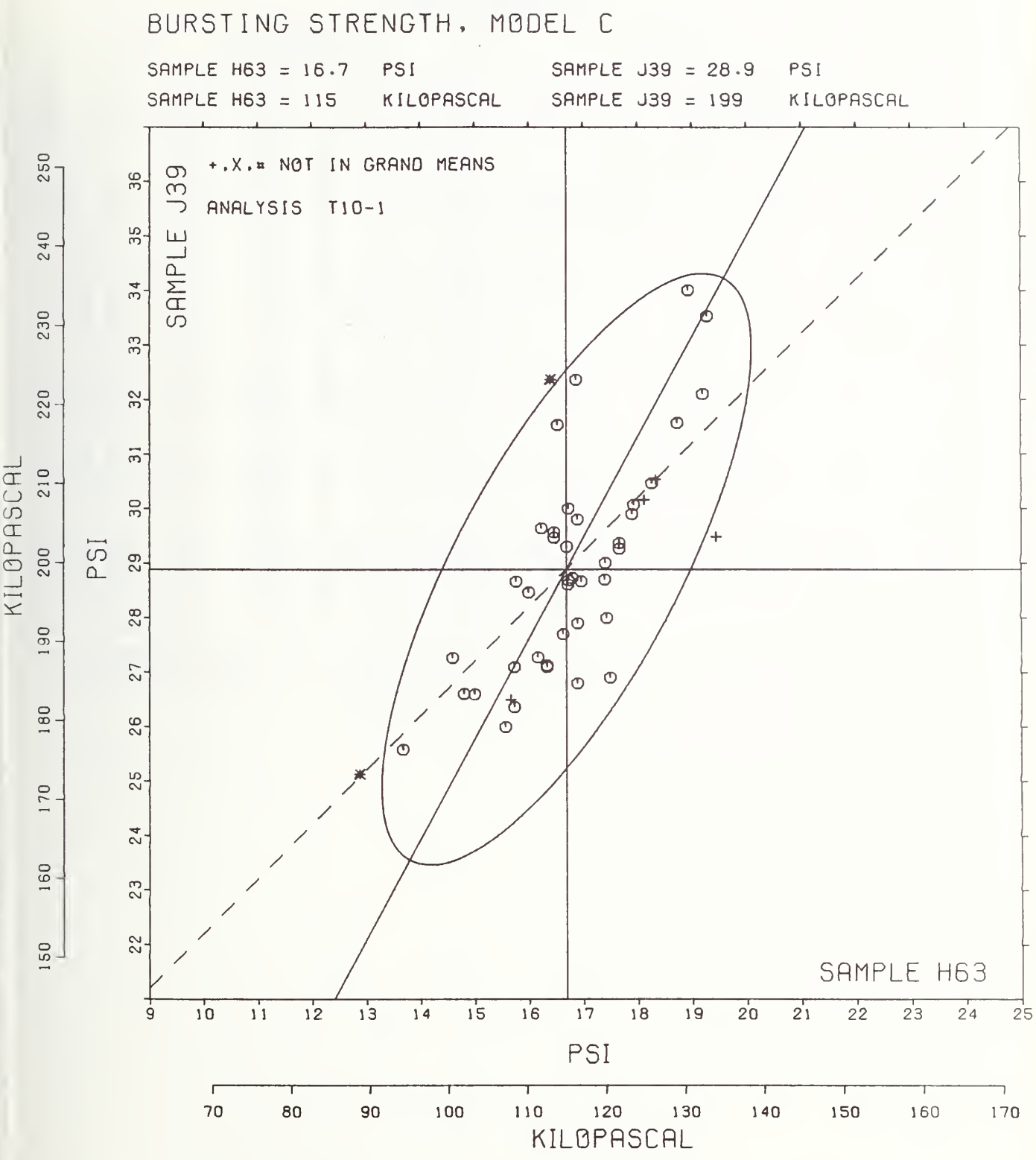
LAB CODE	SAMPLE H63 MEAN	PRINTING 77 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J39 MEAN	PRINTING 149 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 15 VAR	F	LAB
L121	16.89	.21	.16	.70	.67	26.80	-2.09	-.99	1.52	1.03	10C	O	L121
L131	15.00	-1.69	-1.28	.76	.73	26.60	-2.29	-1.09	.91	.61	10C	O	L131
L134	16.40	-.29	-.22	.57	.55	32.37	3.48	1.65	1.17	.79	10C	*	L134
L150	17.67	.98	.74	1.18	1.13	29.27	.38	.18	.92	.62	10C	O	L150
L158	16.00	-.69	-.52	1.20	1.15	28.47	-.42	-.20	.92	.62	10C	O	L158
L167	17.43	.75	.56	.68	.65	28.00	-.89	-.42	1.20	.81	10C	O	L167
L183	15.57	-1.11	-.84	1.08	1.03	26.00	-2.89	-1.37	1.66	1.12	10C	O	L183
L191	16.73	.05	.03	.73	.70	30.00	1.11	.53	1.64	1.10	10C	O	L191
L203A	15.77	-.92	-.70	.82	.79	28.67	-.22	-.11	1.59	1.07	10C	O	L203A
L203B	16.47	-.22	-.17	.95	.92	29.57	.68	.32	2.27	1.53	10C	O	L203B
L207	19.20	2.51	1.90	1.19	1.14	32.10	3.21	1.52	1.84	1.24	10C	O	L207
L212	16.53	-.15	-.12	.74	.71	31.53	2.64	1.26	1.49	1.01	10C	O	L212
L223A	19.28	2.59	1.96	1.06	1.02	33.53	4.64	2.20	1.71	1.15	10C	O	L223A
L225	16.90	.21	.16	1.21	1.16	29.80	.91	.43	1.86	1.25	10C	O	L225
L232	14.60	-2.09	-1.58	1.07	1.03	27.27	-1.62	-.77	1.29	.87	10C	O	L232
L237A	15.73	-.95	-.72	.88	.85	26.37	-2.52	-1.20	1.30	.88	10C	O	L237A
L237B	16.33	-.35	-.27	.94	.90	27.10	-1.79	-.85	.60	.41	10C	O	L237B
L243	17.67	.98	.74	1.32	1.27	29.37	.48	.23	1.38	.93	10C	O	L243
L249	13.68	-3.01	-2.27	.79	.76	25.59	-3.30	-1.57	1.35	.91	10C	O	L249
L261	16.17	-.52	-.39	.82	.79	27.28	-1.61	-.76	1.66	1.12	10C	O	L261
L264	16.80	.11	.08	1.08	1.04	28.73	-.16	-.07	1.58	1.06	10C	O	L264
L278	16.90	.21	.16	1.02	.98	27.90	-.99	-.47	1.78	1.20	10C	O	L278
L279	15.73	-.95	-.72	1.57	1.50	27.10	-1.79	-.85	1.27	.85	10C	O	L279
L299	18.93	2.25	1.70	1.43	1.37	34.00	5.11	2.43	1.89	1.27	10C	O	L299
L305	16.63	-.05	-.04	1.03	.98	27.70	-1.19	-.56	.92	.62	10C	O	L305
L311	17.93	1.25	.94	.80	.77	30.07	1.18	.56	1.22	.82	10C	O	L311
L312	16.72	.03	.02	.89	.85	28.61	-.28	-.13	.88	.59	10C	O	L312
L315	18.73	2.05	1.55	1.31	1.25	31.57	2.68	1.27	1.85	1.25	10C	O	L315
L326	16.47	-.22	-.17	.88	.84	29.47	.58	.27	1.94	1.31	10C	O	L326
L330	17.90	1.21	.92	1.16	1.11	29.90	1.01	.48	1.39	.93	10C	O	L330
L331	16.33	-.35	-.27	1.05	1.00	27.13	-1.76	-.83	1.25	.84	10C	O	L331
L333	14.81	-1.88	-1.42	1.29	1.24	26.61	-2.28	-1.08	2.12	1.43	10C	O	L333
L339	12.88	-3.80	-2.88	1.40	1.34	25.13	-3.76	-1.78	1.51	1.02	10C	*	L339
L344	16.87	.19	.14	.90	.86	32.37	3.48	1.65	1.71	1.15	10C	O	L344
L356	17.50	.81	.61	1.26	1.21	26.91	-1.98	-.94	1.94	1.31	10C	O	L356
L358	16.23	-.45	-.34	.68	.65	29.64	.75	.36	1.16	.78	10C	O	L358
L360	16.73	.05	.03	1.54	1.48	28.69	-.20	-.10	1.92	1.30	10C	O	L360
L366	17.40	.71	.54	1.27	1.22	28.70	-.19	-.09	1.81	1.22	10C	O	L366
L390	18.27	1.58	1.19	1.07	1.02	30.47	1.58	.75	1.33	.90	10C	O	L390
L563	16.70	.01	.01	1.16	1.12	29.30	.41	.20	1.41	.95	10C	O	L563
L568	16.97	.28	.21	1.14	1.10	28.67	-.22	-.11	1.18	.79	10C	O	L568
L599	17.41	.72	.54	1.06	1.02	29.01	.12	.06	1.68	1.13	10C	O	L599
GR. MEAN - 16.69 PSI						GRAND MEAN - 28.89 PSI					TEST DETERMINATIONS - 15		
SD MEANS - 1.32 PSI						SD OF MEANS - 2.11 PSI					42 LABS IN GRAND MEANS		
		AVERAGE SDR - 1.04 PSI					AVERAGE SDR - 1.48 PSI						
GR. MEAN - 115.1 KILOPASCAL						GRAND MEAN - 199.2 KILOPASCAL							
L128	18.33	1.65	1.24	.62	.59	30.53	1.64	.78	1.30	.88	10B	*	L128
L242	19.45	2.76	2.09	1.15	1.10	29.48	.59	.28	1.33	.90	10T	*	L242
L251	18.12	1.44	1.09	1.45	1.39	30.16	1.27	.60	1.22	.82	10V	*	L251
L269	24.47	7.78	5.88	1.55	1.49	37.40	8.51	4.04	1.80	1.22	10A	*	L269
L484	15.67	-1.02	-.77	.77	.74	26.50	-2.39	-1.13	1.21	.82	10M	*	L484

TOTAL NUMBER OF LABORATORIES REPORTING - 47

Best values: H63 16.8 ± 2.2 psi
J39 29.0 ± 3.4 psi

ANALYSIS T10=1 TABLE 2
BURSTING STRENGTH, PSI
TAPPI STANDARD T403 OS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C

LAB CODE	F	MEANS H63	MEANS J39	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L339	*	12.88	25.13	-5.11	1.55	1.18	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L249	O	13.68	25.59	-4.34	1.07	.83	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L232	O	14.60	27.27	-2.42	1.06	.95	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L333	O	14.81	26.61	-2.90	.57	1.33	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L131	O	15.00	26.60	-2.82	.39	.67	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L183	O	15.57	26.00	-3.07	-.40	1.08	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L484	*	15.67	26.50	-2.59	-.24	.78	10M	BURSTING STRENGTH UP TO 45 PSI, REGMED MT/MOT, MANUAL CLAMP
L279	O	15.73	27.10	-2.03	-.01	1.18	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L237A	O	15.73	26.37	-2.67	-.36	.86	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L203A	O	15.77	28.67	-.63	.70	.93	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L158	O	16.00	28.47	-.70	.40	.88	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L261	O	16.17	27.28	-1.66	-.31	.95	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L358	O	16.23	29.64	.44	.76	.72	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L331	O	16.33	27.13	-1.71	-.53	.92	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L237B	O	16.33	27.10	-1.74	-.54	.65	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L134	*	16.40	32.37	2.92	1.91	.67	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L326	O	16.47	29.47	.40	.47	1.07	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L203B	O	16.47	29.57	.49	.52	1.22	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L212	O	16.53	31.53	2.25	1.40	.86	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L305	O	16.63	27.70	-1.07	-.52	.80	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L563	O	16.70	29.30	.37	.19	1.03	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L312	O	16.72	28.61	-.23	-.16	.72	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L360	O	16.73	28.69	-.16	-.14	1.39	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L291	O	16.73	30.00	1.00	.49	.90	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L264	O	16.80	28.73	-.08	-.17	1.05	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L344	O	16.87	32.37	3.15	1.49	1.01	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L121	O	16.89	26.80	-1.74	-1.18	.85	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L278	O	16.90	27.90	-.77	-.66	1.09	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L225	O	16.90	29.80	.90	.25	1.21	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L568	O	16.97	28.67	-.06	-.35	.94	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L366	O	17.40	28.70	.17	-.72	1.22	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L599	O	17.41	29.01	.45	-.58	1.07	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L167	O	17.43	28.00	-.43	-1.08	.73	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L356	O	17.50	26.91	-1.36	-1.66	1.26	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L150	O	17.67	29.27	.80	-.66	.88	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L243	O	17.67	29.37	.89	-.63	1.10	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L330	O	17.90	29.90	1.47	-.58	1.02	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L313	O	17.93	30.07	1.63	-.53	.80	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L251	*	18.12	30.16	1.80	-.66	1.11	10V	BURSTING STRENGTH UP TO 45 PSI, L*W, MANUAL CLAMP, 20C, 65% RH
L390	O	18.27	30.47	2.14	-.64	.96	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L128	*	18.33	30.53	2.23	-.66	.74	10B	BURSTING STRENGTH UP TO 45 PSI, PERKINS B, MANUAL CLAMP
L315	O	18.73	31.57	3.33	-.52	1.25	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L299	O	18.93	34.00	5.56	.46	1.32	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L207	O	19.20	32.10	4.02	-.68	1.19	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L223A	O	19.28	33.53	5.32	-.07	1.09	10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L242	*	19.45	29.48	1.84	-2.14	1.00	10T	BURSTING STRENGTH UP TO 45 PSI, L*W, MANUAL CLAMP
L269	*	24.47	37.40	11.19	-2.78	1.35	10A	BURSTING STRENGTH UP TO 45 PSI, PERKINS A, MANUAL CLAMP
GMEANS:		16.69	28.89			1.00		
		95% ELLIPSE:		6.07	2.05	WITH GAMMA = 61 DEGREES		


BURSTING STRENGTH, MODEL C
SAMPLE H63 = 16.7 PSI
SAMPLE H63 = 115 KILOPASCAL
SAMPLE J39 = 28.9 PSI
SAMPLE J39 = 199 KILOPASCAL
+,X,* NOT IN GRAND MEANS
ANALYSIS T10-1
SAMPLE J39
PSI
KILOPASCAL
SAMPLE H63
PSI
KILOPASCAL

ANALYSIS T10-2 TABLE 1
BURSTING STRENGTH, PSI

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

LAB CODE	SAMPLE H63 77 GRAMS PER SQUARE METER MEAN	PRINTING DEV	N.DEV	SDR	R.SDR	SAMPLE J39 149 GRAMS PER SQUARE METER MEAN	PRINTING DEV	N.DEV	SDR	R.SDR	TEST D.- 15 VAR	F	LAB
L100	17.79	1.13	.69	.85	.74	29.05	.35	.18	1.37	.93	10D	6	L100
L105	12.67	-3.99	-2.46	.86	.75	24.37	-4.33	-2.25	1.66	1.13	10D	6	L105
L122	17.73	1.08	.66	1.03	.90	30.80	2.10	1.09	.56	.38	10F	6	L122
L125	13.40	-3.26	-2.01	1.64	1.43	24.80	-3.90	-2.02	2.24	1.52	10D	6	L125
L141	16.57	-.09	-.06	1.39	1.21	28.20	-.50	-.26	1.80	1.22	10D	6	L141
L148	17.87	1.21	.74	.92	.80	28.53	-.17	-.09	1.73	1.17	10D	6	L148
L159	15.41	-1.25	-.77	1.19	1.04	27.55	-1.15	-.60	1.23	.84	10D	6	L159
L162	15.47	-1.19	-.73	.74	.65	27.13	-1.57	-.81	1.77	1.20	10D	6	L162
L163	16.63	-.02	-.02	1.04	.91	28.80	.10	.05	1.84	1.25	10D	6	L163
L166	15.37	-.29	-.18	1.53	1.34	29.17	.47	.24	1.51	1.02	10D	6	L166
L176	19.32	2.68	1.65	.62	.54	30.13	1.43	.74	1.19	.81	10D	6	L176
L185	18.00	1.34	.83	.76	.66	31.00	2.30	1.19	1.77	1.21	10D	6	L185
L190C	15.97	-.69	-.43	1.52	1.33	28.37	-.33	-.17	.93	.64	10D	6	L190C
L217	17.67	1.01	.62	.82	.71	28.67	-.03	-.02	1.35	.91	10F	6	L217
L224	17.23	.58	.35	1.40	1.23	29.07	.37	.19	1.46	.99	10D	6	L224
L226B	17.71	1.05	.65	1.06	.93	28.98	.28	.14	1.42	.96	10D	6	L226B
L226C	14.37	-2.29	-1.41	1.04	.91	26.53	-2.17	-1.12	1.76	1.19	10D	6	L226C
L255	16.20	-.46	-.28	.77	.68	26.67	-2.03	-1.05	.72	.49	10D	6	L255
L257A	17.60	.94	.58	1.30	1.14	31.60	2.90	1.50	2.13	1.45	10D	6	L257A
L257B	17.13	.48	.29	1.41	1.23	31.60	2.90	1.50	1.30	.88	10D	6	L257B
L257C	17.60	.94	.58	1.30	1.14	32.00	3.30	1.71	1.65	1.12	10D	6	L257C
L262	17.57	.91	.56	1.05	.92	30.60	1.90	.98	1.53	1.04	10D	6	L262
L275	13.88	-2.78	-1.71	1.33	1.16	26.29	-2.41	-1.25	1.73	1.18	10D	6	L275
L280	18.26	1.60	.99	.88	.77	29.73	1.03	.53	1.00	.68	10D	6	L280
L285	16.60	-.06	-.04	1.55	1.36	29.47	.77	.40	1.51	1.02	10D	6	L285
L309	13.73	-2.93	-1.81	1.27	1.11	26.57	-2.13	-1.10	1.39	.95	10D	6	L309
L352	16.50	-.16	-.10	.86	.75	26.54	-2.16	-1.12	1.18	.80	10D	6	L352
L378	18.07	1.41	.87	1.44	1.26	28.67	-.03	-.02	1.54	1.05	10D	6	L378
L575	18.51	1.85	1.14	1.68	1.47	28.93	.23	.12	1.71	1.16	10D	6	L575
L581	17.67	1.01	.62	1.45	1.27	29.13	.43	.22	1.55	1.06	10D	6	L581
L587	16.93	.28	.17	.73	.64	30.77	2.07	1.07	1.08	.74	10D	6	L587

GR. MEAN = 16.66 PSI GRAND MEAN = 28.70 PSI TEST DETERMINATIONS = 15
SD MEANS = 1.62 PSI SD OF MEANS = 1.93 PSI 31 LABS IN GRAND MEANS
AVERAGE SDR = 1.14 PSI AVERAGE SDR = 1.47 PSI
GR. MEAN = 114.9 KILOPASCAL GRAND MEAN = 197.9 KILOPASCAL

L442	145.32	128.67	79.25	20.14	17.63	281.27	252.57	130.85	44.50	30.25	10Q	* L442

TOTAL NUMBER OF LABORATORIES REPORTING = 32

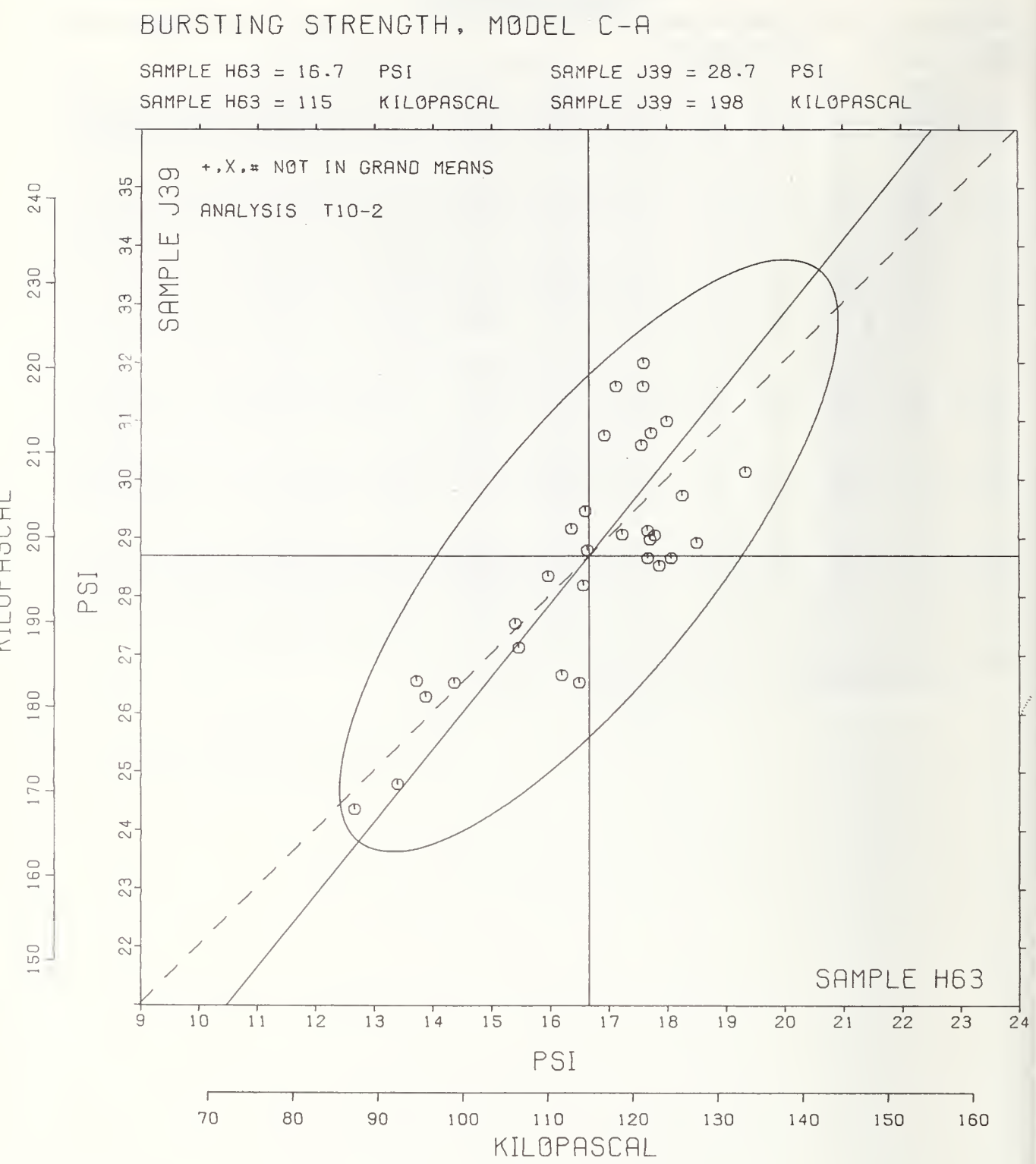
Best values: H63 17.0 ± 2.8 psi
J39 28.9 ± 2.6 psi

ANALYSIS T10-2 TABLE 2

BURSTING STRENGTH, PSI

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

LAB CODE	P	MEANS H63	MEANS J39	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L105	O	12.67	24.37	-5.88	.39	.94	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L125	O	13.40	24.80	-5.08	.09	1.48	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L309	O	13.73	26.57	-3.49	.95	1.03	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L275	O	13.88	26.29	-3.62	.66	1.17	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L226C	O	14.37	26.53	-3.13	.43	1.05	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L159	O	15.41	27.55	-1.68	.25	.94	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L162	O	15.47	27.13	-1.97	-.05	.93	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L190C	O	15.97	28.37	-.69	.33	.98	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L255	O	16.20	26.67	-1.87	-.92	.59	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L166	O	16.37	29.17	.18	.52	1.18	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L352	O	16.50	26.54	-1.78	-1.23	.78	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L141	O	16.57	28.20	-.45	-.24	1.22	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L285	O	16.60	29.47	.56	.53	1.19	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L163	O	16.63	28.80	.06	.08	1.08	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L587	O	16.93	30.77	1.78	1.08	.69	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L257B	O	17.13	31.60	2.56	1.45	1.06	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L224	O	17.23	29.07	.65	-.22	1.11	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L262	O	17.57	30.60	2.05	.48	.98	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L257C	O	17.60	32.00	3.16	1.33	1.13	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L257A	O	17.60	31.60	2.85	1.08	1.29	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L581	O	17.67	29.13	.97	-.51	1.16	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L217	O	17.67	28.67	.61	-.81	.81	10F	BURSTING STRENGTH UP TO 45 PSI,PERKINS C, H.CLAMP,TRANSDUCER
L226B	O	17.71	28.98	.87	-.64	.95	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L122	O	17.73	30.80	2.31	.48	.64	10F	BURSTING STRENGTH UP TO 45 PSI,PERKINS C, H.CLAMP,TRANSDUCER
L100	O	17.79	29.05	.98	-.66	.84	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L148	O	17.87	28.53	.63	-1.05	.99	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L185	O	18.00	31.00	2.63	.40	.93	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L378	O	18.07	28.67	.86	-1.12	1.15	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L280	O	18.26	29.73	1.81	-.60	.73	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L575	O	18.51	28.93	1.34	-1.29	1.32	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L176	O	19.33	30.13	2.79	-1.19	.67	10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L442	*	145.33	281.27	277.46	58.00	23.94	10Q	BURSTING STRENGTH UP TO 45 PSI, FRANK,HYD.CL.
GMEANS:		16.66	28.70			1.00		
		95% ELLIPSE:		6.28	2.10	WITH GAMMA = 51 DEGREES		


BURSTING STRENGTH, MODEL C-A
SAMPLE H63 = 16.7 PSI
SAMPLE H63 = 115 KILOPASCAL
SAMPLE J39 = 28.7 PSI
SAMPLE J39 = 198 KILOPASCAL
+,X,# NOT IN GRAND MEANS
ANALYSIS T10-2
SAMPLE J39
PSI
KILOPASCAL
SAMPLE H63
PSI
KILOPASCAL

ANALYSIS T11-1 TABLE 1

BURSTING STRENGTH, HIGH RANGE, PSI

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

LAB CODE	SAMPLE E77 MEAN	TUBE WINDING 132 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE K29 MEAN	KRAFT 123 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L100	69.5	-5.1	-1.57	4.4	.88	59.3	-.1	-.03	2.6	.63	11D	O	L100
L103	74.9	.3	.09	4.4	.88	63.3	3.9	1.59	2.9	.70	11C	O	L103
L107	80.1	5.5	1.70	4.1	.82	63.7	4.3	1.74	4.9	1.20	11C	O	L107
L122	73.1	-1.5	-.45	5.4	1.10	58.9	-.5	-.21	5.1	1.23	11F	O	L122
L128	71.7	-2.9	-.90	3.8	.76	59.1	-.3	-.11	2.2	.54	11D	O	L128
L141	74.1	-.5	-.15	5.7	1.16	61.2	1.8	.72	5.3	1.29	11D	O	L141
L148	75.8	1.2	.37	4.3	.87	60.9	1.5	.60	4.6	1.11	11D	O	L148
L159	73.0	-1.6	-.48	7.4	1.49	54.5	-4.9	-1.97	4.4	1.08	11D	O	L159
L170	80.2	5.6	1.73	3.4	.68	61.3	1.9	.79	1.7	.41	11C	O	L170
L176	78.6	4.0	1.23	5.6	1.13	59.5	.1	.06	3.9	.96	11D	O	L176
L182	75.9	1.3	.39	6.2	1.25	61.3	1.9	.76	5.7	1.38	11D	O	L182
L218	77.7	3.1	.96	6.1	1.23	60.8	1.4	.57	5.2	1.27	11D	O	L218
L232	61.3	-13.3	-4.10	8.2	1.65	43.2	-16.2	-6.59	9.9	2.41	11C	#	L232
L237A	73.6	-1.0	-.32	1.9	.39	61.4	2.0	.80	3.1	.77	11C	O	L237A
L237B	72.4	-2.2	-.68	1.5	.29	60.2	.8	.31	2.5	.60	11C	O	L237B
L238A	78.3	3.7	1.14	7.1	1.44	59.2	-.2	-.10	4.4	1.06	11Y	O	L238A
L243	72.8	-1.8	-.55	3.9	.79	59.4	.0	.00	4.1	1.01	11C	O	L243
L278	72.8	-1.8	-.56	5.0	1.01	57.9	-1.5	-.62	4.5	1.11	11C	O	L278
L279	72.1	-2.5	-.77	5.0	1.01	57.2	-2.2	-.89	5.6	1.36	11C	O	L279
L280	73.4	-1.2	-.38	4.5	.91	58.3	-1.1	-.46	4.8	1.18	11D	O	L280
L303	70.6	-4.0	-1.22	5.4	1.09	56.2	-3.2	-1.30	3.1	.75	11C	O	L303
L330	74.7	.1	.02	6.9	1.39	60.6	1.2	.49	4.8	1.16	11C	O	L330
L331	71.1	-3.5	-1.07	5.5	1.10	55.9	-3.5	-1.43	3.1	.75	11C	O	L331
L333	78.3	3.7	1.12	5.9	1.19	61.3	1.9	.79	3.7	.90	11C	O	L333
L344	72.0	-2.6	-.81	2.7	.54	60.3	.9	.35	2.8	.69	11C	O	L344
L356	72.7	-1.9	-.58	5.0	1.01	58.4	-1.0	-.40	5.6	1.37	11C	O	L356
L362	67.9	-6.7	-2.07	6.0	1.21	55.0	-4.4	-1.78	5.0	1.22	11D	O	L362
L378	77.8	3.2	.98	4.4	.88	60.0	.6	.25	3.6	.88	11D	O	L378
L565	71.8	-2.8	-.87	2.8	.57	59.8	.4	.16	1.8	.45	11D	O	L565
L575	79.0	4.4	1.34	6.2	1.26	61.2	1.8	.71	4.8	1.18	11D	O	L575
L581	74.9	.3	.08	4.3	.87	56.6	-2.8	-1.13	4.8	1.17	11D	O	L581
L599	75.3	.7	.22	4.8	.96	57.9	-1.5	-.59	4.1	1.00	11C	O	L599
L604	76.2	1.6	.49	7.1	1.43	59.3	-.1	-.04	5.8	1.43	11C	O	L604
L622	75.9	1.3	.39	5.8	1.18	56.8	-2.6	-1.06	3.6	.88	11E	O	L622
L650	71.6	-3.0	-.92	6.2	1.24	56.4	-3.0	-1.22	5.2	1.27	11D	O	L650
L651	81.5	6.9	2.11	8.0	1.61	65.9	6.5	2.66	6.6	1.62	11D	*	L651

GR. MEAN = 74.6 PSI GRAND MEAN = 59.4 PSI TEST DETERMINATIONS = 15

SD MEANS = 3.3 PSI SD OF MEANS = 2.5 PSI 35 LABS IN GRAND MEANS

AVERAGE SDR = 5.0 PSI AVERAGE SDR = 4.1 PSI

GR. MEAN = 514.4 KILOPASCAL GRAND MEAN = 409.5 KILOPASCAL

L242	76.3	1.7	.53	4.5	.91	61.9	2.5	1.02	6.2	1.51	11T	*	L242
L251	69.6	-5.0	-1.52	6.8	1.38	55.9	-3.5	-1.41	4.1	1.00	11V	*	L251
L393	73.4	-1.2	-.37	5.6	1.13	58.8	-.6	-.24	2.9	.72	11E	*	L393
L394	88.0	13.4	4.12	6.6	1.34	70.5	11.1	4.50	3.8	.92	11H	*	L394
L484	82.0	7.4	2.27	2.3	.46	68.5	9.1	3.71	1.6	.39	11H	*	L484
L570	78.7	4.1	1.25	6.6	1.32	64.9	5.5	2.22	3.9	.95	11H	*	L570
L576	79.8	5.2	1.61	6.1	1.23	64.5	5.1	2.09	5.8	1.41	11P	*	L576
L593	89.5	14.9	4.57	8.5	1.71	74.3	14.9	6.04	5.6	1.36	11J	*	L593
L598	80.4	5.8	1.78	6.7	1.34	67.2	7.8	3.17	6.4	1.56	11*	*	L598

TOTAL NUMBER OF LABORATORIES REPORTING = 45

Best values: E77 74 ± 5 psi
K29 59 ± 4 psi

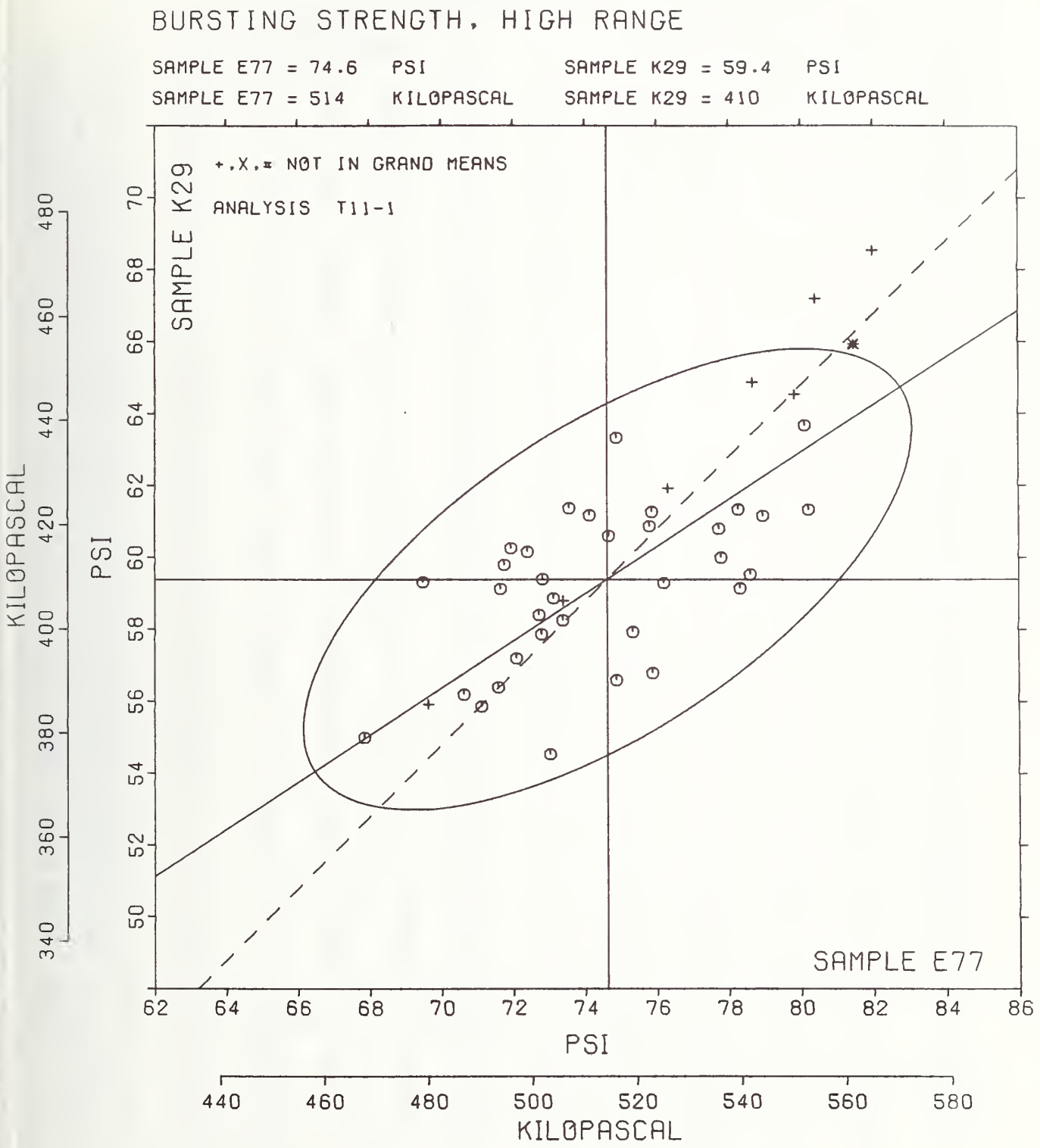
The following laboratories were omitted from the grand means because of extreme test results: 232

ANALYSIS T11-1 TABLE 2

BURSTING STRENGTH, HIGE RANGE, PSI

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

LAB CODE	P	MEANS E77	MEANS K29	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L232	#	61.3	43.2	-20.1	-6.3	2.03	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L362	G	67.9	55.0	-8.0	.0	1.21	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L100	G	69.5	59.3	-4.3	2.7	.75	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L251	*	69.6	55.9	-6.1	-.2	1.19	11V	BURSTING STRENGTH 40 - 100 PSI, L*W,MANUAL CLAMP, 20C,65% RH
L303	G	70.6	56.2	-5.1	-.5	.92	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L331	G	71.1	55.9	-4.8	-1.0	.93	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L650	G	71.6	56.4	-4.2	-.9	1.25	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L128	G	71.7	59.1	-2.6	1.4	.65	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L565	G	71.8	59.8	-2.2	1.9	.51	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L344	G	72.0	60.3	-1.7	2.2	.61	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L279	G	72.1	57.2	-3.3	-.5	1.19	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L237B	G	72.4	60.2	-1.4	1.9	.45	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L356	G	72.7	58.4	-2.1	.2	1.19	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L278	G	72.8	57.9	-2.3	-.3	1.06	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L243	G	72.8	59.4	-1.5	1.0	.90	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L159	G	73.0	54.5	-4.0	-3.2	1.28	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L122	G	73.1	58.9	-1.5	.4	1.17	11F	BURSTING STRENGTH 40 - 100 PSI,PERKINS C, E.CLAMP,TRANSDUCER
L280	G	73.4	58.3	-1.6	-.3	1.04	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L393	*	73.4	58.8	-1.3	.2	.92	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AE, HYDRAULIC CLAMP
L237A	G	73.6	61.4	.2	2.2	.58	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L141	G	74.1	61.2	.6	1.7	1.22	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L330	G	74.7	60.6	.7	1.0	1.28	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L581	G	74.9	56.6	-1.3	-2.5	1.02	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L103	G	74.9	63.3	2.4	3.1	.79	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L599	G	75.3	57.9	-.2	-1.6	.98	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L148	G	75.8	60.9	1.8	.6	.99	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L182	G	75.9	61.3	2.1	.9	1.32	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L622	G	75.9	56.8	-.4	-2.9	1.03	11E	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L604	G	76.2	59.3	1.3	-1.0	1.43	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L242	*	76.3	61.9	2.8	1.2	1.21	11T	BURSTING STRENGTH 40 - 100 PSI, L*W,MANUAL CLAMP
L218	G	77.7	60.8	3.4	-.5	1.25	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L378	G	77.8	60.0	3.0	-1.2	.88	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L333	G	78.3	61.3	4.1	-.4	1.04	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L238A	G	78.3	59.2	3.0	-2.2	1.25	11Y	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L176	G	78.6	59.5	3.4	-2.1	1.04	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L570	*	78.7	64.9	6.4	2.4	1.14	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L575	G	79.0	61.2	4.6	-.9	1.22	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L576	*	79.8	64.5	7.2	1.4	1.32	11P	BURSTING STRENGTH 40 - 100 PSI, PERKINS LC, MANUAL CLAMP
L107	G	80.1	63.7	7.0	.5	1.01	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L170	G	80.2	61.3	5.8	-1.5	.55	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L598	*	80.4	67.2	9.1	3.4	1.45	11*	BURSTING STRENGTH 40 - 100 PSI, MESSMER, MANUAL CLAMP
L651	*	81.5	65.9	9.3	1.7	1.61	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L484	*	82.0	68.5	11.2	3.6	.42	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L394	*	88.0	70.5	17.3	1.9	1.13	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L593	*	89.5	74.3	20.6	4.3	1.53	11J	BURSTING STRENGTH 40 - 100 PSI, PERKINS JUMBO,HAND DRIVEN
GMEANS:		74.6	59.4			1.00		
		95% ELLIPSE:		9.7	4.2	WITH GAMMA = 33 DEGREES		


BURSTING STRENGTH, HIGH RANGE
SAMPLE E77 = 74.6 PSI
SAMPLE E77 = 514 KILOPASCAL
SAMPLE K29 = 59.4 PSI
SAMPLE K29 = 410 KILOPASCAL
+,X,* NOT IN GRAND MEANS
ANALYSIS T11-1
SAMPLE K29
PSI
KILOPASCAL
SAMPLE E77
PSI
KILOPASCAL

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 E76 MEAN	PRINTING 116 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE E80 MEAN	WRITING 69 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L100	64.5	-1.4	-.36	2.6	1.01	53.9	-3.8	-1.03	1.0	.68	15M	G	L100
L103	82.1	-3.7	-.98	1.5	.60	55.1	-2.5	-.68	.9	.62	15T	G	L103
L105	84.6	-1.3	-.34	3.3	1.31	55.1	-2.5	-.68	1.1	.72	15T	G	L105
L107	88.5	2.7	.69	4.7	1.88	65.6	8.0	2.16	9.7	6.55	15T	*	L107
L121	82.9	-2.9	-.77	3.0	1.19	57.9	.2	.06	1.2	.81	15T	G	L121
L122	60.6	-5.3	-1.38	2.3	.93	54.1	-3.5	-.95	1.0	.68	15C	G	L122
L124	87.6	1.7	.45	3.3	1.31	60.3	2.6	.71	.7	.48	15T	G	L124
L126	88.3	2.4	.62	2.3	.93	59.1	1.4	.39	2.2	1.46	15T	G	L126
L128	84.9	-.9	-.25	1.5	.59	56.0	-1.6	-.45	1.7	1.15	15T	G	L128
L131	82.1	-3.7	-.98	5.0	1.98	54.9	-2.7	-.74	1.8	1.24	15A	G	L131
L134	86.3	.5	.12	2.1	.83	56.7	-.9	-.25	1.0	.65	15C	G	L134
L139	92.1	6.3	1.63	1.6	.65	63.8	6.2	1.67	1.7	1.15	15T	G	L139
L141	85.9	.1	.01	3.1	1.22	57.6	-.0	-.01	.8	.56	15T	G	L141
L143	87.5	1.6	.41	4.1	1.61	57.7	.0	.01	2.8	1.88	15T	G	L143
L145	82.1	-3.7	-.98	2.8	1.10	72.7	15.0	4.08	1.8	1.22	15T	#	L145
L148	84.8	-1.1	-.28	3.1	1.23	65.1	7.4	2.01	1.7	1.13	15T	*	L148
L150	87.9	2.1	.54	2.6	1.02	57.9	.3	.08	1.2	.79	15T	G	L150
L151	93.7	7.8	2.03	2.7	1.08	66.0	8.4	2.27	1.6	1.09	15C	G	L151
L158	82.3	-3.6	-.94	4.9	1.96	58.4	.8	.20	2.2	1.47	15R	G	L158
L159	87.7	1.9	.48	3.0	1.18	58.0	.4	.10	2.7	1.83	15L	G	L159
L162	87.1	1.2	.31	2.5	.99	57.6	-.0	-.01	1.1	.76	15T	G	L162
L163	64.9	-1.0	-.27	2.8	1.12	57.5	-.2	-.05	1.8	1.20	15T	G	L163
L166	88.7	2.8	.73	2.5	.98	58.2	.6	.15	1.4	.93	15T	G	L166
L167	85.3	-.5	-.14	1.0	.39	60.7	3.0	.82	1.0	.66	15C	G	L167
L170	83.5	-2.3	-.61	.9	.36	54.4	-3.2	-.88	.8	.56	15T	G	L170
L173B	84.8	-1.1	-.28	1.7	.66	61.6	4.0	1.07	1.1	.76	15T	G	L173B
L176	87.9	2.0	.52	2.3	.92	58.0	.4	.10	1.7	1.15	15T	G	L176
L182A	79.1	-6.7	-1.76	3.9	1.55	52.3	-5.4	-1.46	1.3	.87	15A	G	L182A
L182T	90.3	4.4	1.15	3.2	1.29	60.1	2.5	.67	1.2	.85	15T	G	L182T
L183	87.1	1.2	.31	2.8	1.12	56.1	-1.5	-.41	.6	.43	15T	G	L183
L185	87.5	-2.3	-.61	2.6	1.03	58.1	.5	.13	1.4	.92	15T	G	L185
L189	86.2	.3	.08	2.6	1.03	56.2	-1.4	-.39	1.2	.82	15T	G	L189
L190C	84.6	-1.3	-.34	2.5	.99	58.3	.6	.17	1.7	1.13	15T	G	L190C
L190R	85.1	.2	.05	2.4	.95	56.9	-.7	-.19	1.6	1.07	15C	G	L190R
L191	79.4	-6.5	-1.69	2.4	.95	51.0	-6.6	-1.80	2.5	1.70	15T	G	L191
L195	89.5	3.6	.94	2.6	1.02	56.1	-1.5	-.41	1.2	.81	15C	G	L195
L206	88.9	3.0	.79	1.9	.75	60.3	2.6	.72	1.8	1.22	15R	G	L206
L207	74.4	-11.5	-2.99	1.6	.65	47.1	-10.5	-2.85	2.5	1.67	15R	*	L207
L211	83.7	-2.1	-.56	1.8	.71	55.7	-1.9	-.52	1.2	.83	15R	G	L211
L212	80.8	-5.1	-1.33	3.8	1.49	56.0	-1.6	-.45	1.5	1.03	15T	G	L212
L213	83.2	-2.7	-.70	2.4	.94	59.9	2.2	.60	1.2	.81	15T	G	L213
L217	86.4	.5	.14	1.8	.72	56.9	-.7	-.20	1.1	.77	15R	G	L217
L223	86.3	.4	.11	2.4	.95	58.0	.4	.10	1.3	.86	15R	G	L223
L224	84.7	-1.1	-.30	1.7	.68	58.8	1.2	.31	1.0	.69	15T	G	L224
L225	86.9	1.0	.26	1.7	.68	56.5	-1.2	-.32	1.6	1.08	15T	G	L225
L226B	81.1	-4.8	-1.26	4.7	1.85	60.4	2.8	.75	1.7	1.17	15T	*	L226B
L226C	79.2	-6.7	-1.75	2.4	.94	54.3	-3.4	-.92	1.5	1.01	15T	G	L226C
L228	84.5	-1.3	-.35	1.6	.63	55.5	-2.2	-.59	1.4	.96	15T	G	L228
L230	76.7	-9.1	-2.39	1.9	.76	51.4	-6.2	-1.68	1.2	.81	15R	G	L230
L232	85.9	1.1	.27	2.8	1.12	60.5	2.9	.78	1.6	1.08	15T	G	L232
L236	87.7	1.8	.47	3.1	1.24	55.6	-2.0	-.56	1.1	.76	15T	G	L236
L237A	83.5	-2.3	-.61	2.2	.87	57.3	-.4	-.10	1.3	.91	15T	G	L237A
L237B	83.7	-2.1	-.56	1.7	.68	55.8	-1.8	-.50	1.3	.90	15T	G	L237B
L238A	83.5	-2.4	-.63	2.9	1.14	54.0	-3.6	-.99	.8	.51	15T	G	L238A
L243	89.3	3.5	.90	2.7	1.07	60.4	2.8	.75	1.2	.80	15T	G	L243
L244	92.9	7.1	1.84	2.1	.81	58.1	.4	.11	1.0	.65	15C	*	L244
L249	88.9	3.0	.78	3.8	1.51	61.8	4.1	1.11	1.4	.95	15T	G	L249
L254	84.7	-1.1	-.30	2.5	1.00	58.0	.4	.10	1.0	.68	15T	G	L254
L255	85.5	-.3	-.09	1.9	.76	55.5	-2.1	-.57	.8	.57	15T	G	L255
L257A	85.5	-.4	-.11	1.6	.63	59.9	2.2	.60	1.9	1.30	15C	G	L257A
L257B	85.6	-.3	-.07	2.0	.80	60.0	2.4	.64	1.7	1.15	15C	G	L257B
L257C	85.2	-.7	-.18	3.1	1.23	60.5	2.9	.78	1.8	1.20	15C	G	L257C
L259	89.1	3.2	.83	2.3	.92	60.1	2.4	.66	1.2	.79	15T	G	L259
L261	82.4	-3.5	-.91	2.8	1.10	56.9	-.7	-.19	1.2	.83	15T	G	L261
L262	86.5	.6	.15	2.0	.78	55.4	-2.2	-.61	1.6	1.11	15T	G	L262

REPORT NO. 55S

TAPPI COLLABORATIVE REFERENCE PROGRAM

SEPTEMBER 1978

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 E76 PRINTING 116 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E80 WRITING 69 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L264	76.3	-9.6	-2.51	2.8	1.12	59.5	1.8	.49	3.0	2.02	15T	X	L264
L273	87.1	1.2	.31	2.7	1.05	62.7	5.1	1.38	1.1	.75	15T	ó	L273
L275	89.3	3.5	.90	1.8	.70	56.5	-1.1	-.30	1.6	1.05	15T	ó	L275
L278	86.4	.5	.14	2.3	.91	51.1	-6.6	-1.79	1.5	1.04	15T	*	L278
L279	83.6	-2.3	-.60	3.0	1.21	57.1	-.6	-.16	1.8	1.24	15T	ó	L279
L280	87.8	1.9	.50	2.0	.78	56.0	-1.6	-.45	.9	.63	15L	ó	L280
L281	86.1	.2	.05	2.9	1.14	54.7	-2.9	-.79	1.5	1.04	15T	ó	L281
L285	89.5	3.6	.94	2.3	.92	60.9	3.3	.89	1.8	1.24	15T	ó	L285
L288	88.8	2.9	.76	2.0	.78	60.6	2.9	.80	.7	.50	15Q	ó	L288
L291	81.9	-4.0	-1.05	1.6	.65	54.3	-3.4	-.92	1.1	.75	15A	ó	L291
L303	87.2	1.3	.34	2.2	.89	57.9	.3	.08	1.5	1.01	15L	ó	L303
L305	88.9	3.1	.80	3.0	1.19	60.3	2.6	.71	1.3	.87	15T	ó	L305
L309	86.1	.3	.07	1.9	.76	57.5	-.1	-.03	1.7	1.17	15T	ó	L309
L312	82.1	-3.7	-.98	3.0	1.18	56.5	-1.1	-.30	1.9	1.30	15T	ó	L312
L315	90.3	4.4	1.15	4.0	1.60	59.3	1.7	.46	1.5	1.05	15T	ó	L315
L324	74.9	-10.9	-2.86	4.1	1.64	55.9	-1.8	-.48	1.2	.85	15T	X	L324
L328	84.2	-1.6	-.43	2.6	1.05	52.4	-5.3	-1.43	3.4	2.29	15T	ó	L328
L331	93.0	7.1	1.86	3.4	1.34	66.9	9.3	2.52	2.9	1.98	15T	*	L331
L336	85.9	-.0	-.00	2.4	.95	56.6	-1.0	-.28	1.6	1.08	15T	ó	L336
L344	93.7	7.9	2.05	2.4	.94	62.3	4.6	1.25	2.5	1.69	15C	ó	L344
L345	84.1	-1.7	-.46	4.2	1.68	56.5	-1.1	-.30	1.4	.96	15T	ó	L345
L352	91.0	5.1	1.34	2.3	.92	61.1	3.5	.94	.9	.63	15C	ó	L352
L360	68.1	2.2	.57	2.6	1.04	57.2	-.4	-.12	1.7	1.15	15T	ó	L360
L362	84.4	-1.5	-.39	2.6	1.05	56.0	-1.6	-.45	1.5	1.03	15T	ó	L362
L366	82.7	-3.1	-.82	2.5	.99	54.1	-3.5	-.95	.7	.50	15T	ó	L366
L376	90.8	4.9	1.28	2.1	.84	63.1	5.4	1.47	1.9	1.27	15T	ó	L376
L378	86.3	.4	.10	2.6	1.03	58.4	.8	.20	1.5	1.05	15T	ó	L378
L382	88.9	3.0	.78	3.3	1.30	60.5	2.9	.78	1.3	.88	15T	ó	L382
L388	79.9	-6.0	-1.57	3.5	1.38	47.9	-9.8	-2.65	1.0	.67	15T	*	L388
L390	88.3	2.4	.62	2.2	.88	60.5	2.8	.77	1.8	1.20	15T	ó	L390
L442	95.3	9.4	2.46	2.6	1.05	60.8	3.2	.86	1.4	.95	15R	*	L442
L484	88.4	2.5	.66	1.8	.72	63.3	5.7	1.54	3.5	2.39	15T	ó	L484
L554	91.2	5.3	1.39	2.7	1.07	60.4	2.8	.75	1.1	.76	15C	ó	L554
L557	90.0	4.1	1.08	2.3	.92	61.5	3.8	1.04	1.6	1.08	15T	ó	L557
L558	86.7	.9	.22	1.3	.53	54.8	-2.8	-.77	1.0	.69	15T	ó	L558
L559	89.5	3.7	.95	1.8	.70	65.7	8.0	2.18	1.3	.88	15T	ó	L559
L565	83.6	-2.3	-.60	2.5	1.00	53.7	-3.9	-1.06	1.9	1.27	15T	ó	L565
L566	81.6	-4.3	-1.12	1.7	.68	54.4	-3.2	-.88	1.4	.92	15T	ó	L566
L575	82.3	-3.6	-.94	3.3	1.30	52.5	-5.2	-1.41	.8	.57	15L	ó	L575
L576	92.3	6.4	1.67	3.3	1.31	59.5	1.9	.51	1.7	1.14	15T	ó	L576
L580	86.3	.4	.10	1.5	.61	59.6	2.0	.53	1.1	.72	15T	ó	L580
L581	88.5	2.7	.69	2.8	1.09	58.7	1.1	.29	1.5	1.05	15Q	ó	L581
L587	84.1	-1.7	-.46	1.9	.76	57.2	-.4	-.12	1.5	1.00	15T	ó	L587
L596	79.7	-6.1	-1.61	3.2	1.27	52.3	-5.4	-1.46	2.4	1.61	15T	ó	L596
L597	81.0	-4.9	-1.28	2.0	.79	54.4	-3.2	-.88	2.3	1.56	15T	ó	L597
L599	88.9	3.1	.80	2.7	1.07	59.4	1.8	.48	1.4	.95	15T	ó	L599
L600	86.1	.3	.07	2.7	1.08	61.2	3.6	.96	1.4	.93	15T	ó	L600
L604	75.2	-10.7	-2.79	3.1	1.23	47.5	-10.2	-2.76	2.6	1.74	15T	*	L604
L606	91.7	5.8	1.51	3.2	1.28	61.3	3.7	1.00	1.4	.95	15T	ó	L606
L618	19.5	-66.4	-17.35	.9	.36	13.9	-43.8	-11.88	.5	.35	15T	#	L618
L622	82.0	-3.9	-1.01	3.0	1.19	50.8	-6.8	-1.86	1.0	.69	15T	ó	L622
L651	90.3	4.4	1.15	2.3	.89	59.6	2.0	.53	.8	.56	15T	ó	L651
L670	80.9	-5.0	-1.31	3.3	1.31	55.9	-1.7	-.46	3.1	2.08	15T	ó	L670
L676	84.4	-1.5	-.39	2.6	1.05	58.9	1.2	.33	2.1	1.40	15T	ó	L676
GR. MEAN =	85.9 GRAMS					GRAND MEAN =	57.6 GRAMS				TEST DETERMINATIONS =		15
SD MEANS =	3.8 GRAMS					SD OF MEANS =	3.7 GRAMS				115 LABS IN GRAND MEANS		
	AVERAGE SDR =			2.5 GRAMS			AVERAGE SDR =			1.5 GRAMS			
GR. MEAN =	842.2 MILLINEWTON					GRAND MEAN =	565.3 MILLINEWTON						
L242	88.9	3.1	.80	3.0	1.19	58.9	1.3	.35	1.4	.94	15U	+	L242
L251	85.5	-.4	-.11	1.5	.60	56.4	-1.2	-.34	1.1	.76	15K	+	L251
L299	86.5	.7	.17	3.6	1.42	58.4	.8	.20	1.7	1.17	15V	+	L299
L311	87.5	1.6	.41	1.3	.52	58.3	.6	.17	1.2	.83	15V	+	L311
L396M	86.6	.7	.19	3.7	1.45	57.8	.2	.04	1.5	1.03	15V	+	L396M
L610	84.1	-1.7	-.46	2.4	.95	55.1	-2.6	-.70	1.3	.87	15E	+	L610

TOTAL NUMBER OF LABORATORIES REPORTING = 125

Best values: E76 86 ± 6 grams
E80 58 ± 5 grams

The following laboratories were omitted from the grand means because of extreme test results: 145

Data from the following laboratories appear to be off by a multiplicative factor: 618

Data from the following laboratories appeared to be off by a multiplicative factor: 299, 311, 396M. Code 15V was assigned temporarily to put in a factor of 2.

Please see the diagram on the inside of the back cover of thia report which shows how to distinguish between an Elmendorf tear tester with DEEP CUTOUT and an older model tester with NO CUTOUT.

ANALYSIS T15-1 TABLE 2

TEARING STRENGTH, GRAMS

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

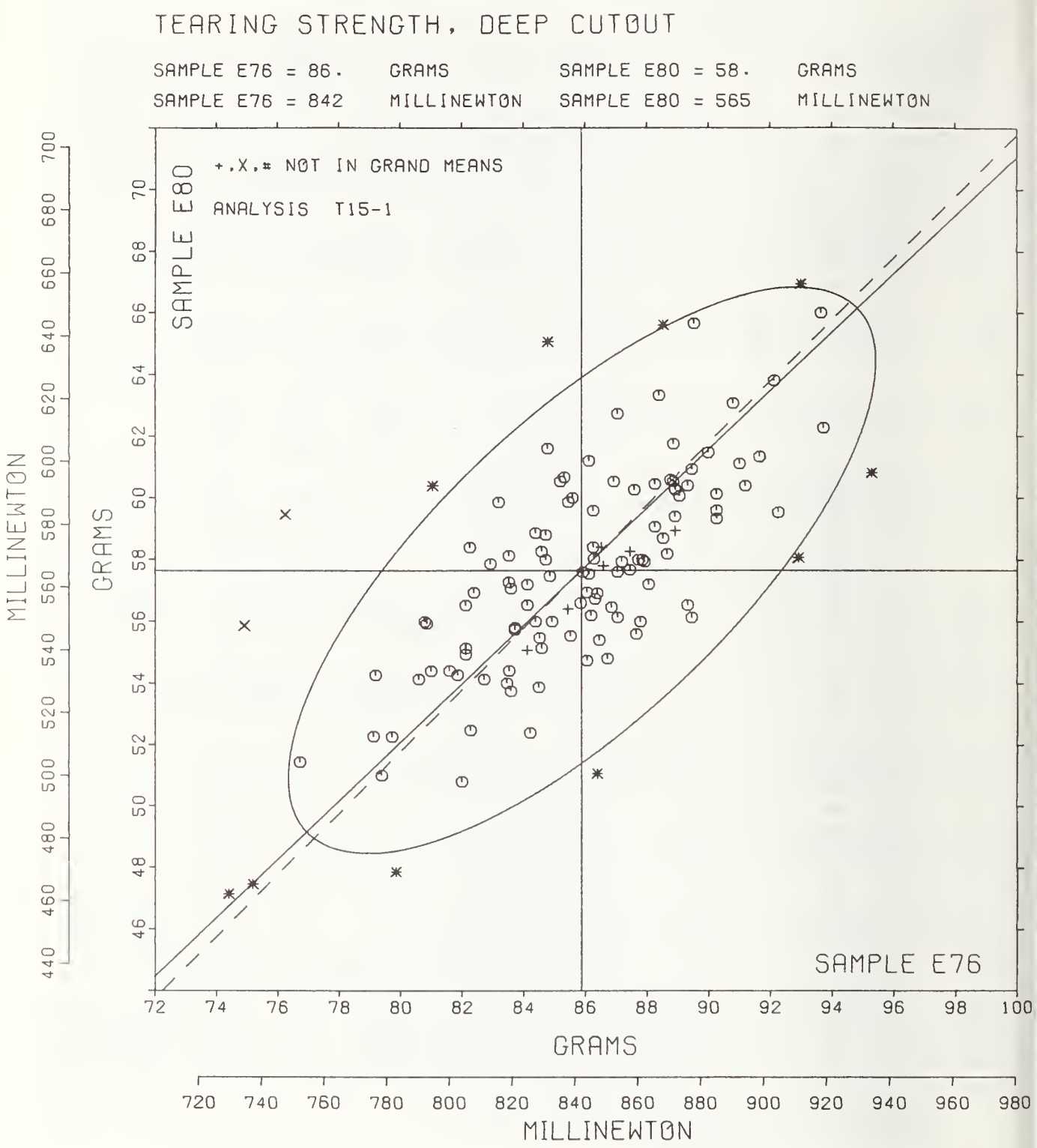
LAB CODE	F	MEANS E76	E80	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L618	#	19.5	13.9	-78.3	14.0	.36	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L207	*	74.4	47.1	-15.5	.3	1.16	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L324	X	74.9	55.9	-9.2	6.2	1.24	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L604	*	75.2	47.5	-14.8	-.0	1.48	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L264	X	76.3	59.5	-5.7	7.9	1.57	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L230	Ø	76.7	51.4	-10.9	1.8	.78	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORP,DIGITAL READOUT
L182A	Ø	79.1	52.3	-8.6	.7	1.21	15A	TEARING STRENGTH, STANDARD, APPITA
L226C	Ø	79.2	54.3	-7.2	2.2	.97	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L19%	Ø	79.4	51.0	-9.3	-.4	1.32	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L596	Ø	79.7	52.3	-8.2	.3	1.44	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L388	*	79.9	47.9	-11.1	-2.9	1.03	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L122	Ø	80.6	54.1	-6.2	1.1	.80	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORP (W.AIR CLAMP)
L212	Ø	80.8	56.0	-4.8	2.3	1.26	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L670	Ø	80.9	55.9	-4.8	2.2	1.69	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L597	Ø	81.0	54.4	-5.8	1.0	1.17	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L226B	*	81.1	60.4	-1.6	5.3	1.51	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L566	Ø	81.6	54.4	-5.3	.6	.80	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L29%	Ø	81.9	54.3	-5.2	.3	.70	15A	TEARING STRENGTH, STANDARD, APPITA
L622	Ø	82.0	50.8	-7.5	-2.3	.94	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L145	#	82.1	72.7	7.6	13.5	1.16	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L131	Ø	82.1	54.9	-4.6	.6	1.61	15A	TEARING STRENGTH, STANDARD, APPITA
L312	Ø	82.1	56.5	-3.5	1.8	1.24	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L103	Ø	82.1	55.1	-4.4	.8	.61	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L158	Ø	82.3	58.4	-2.1	3.0	1.72	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L575	Ø	82.3	52.5	-6.2	-1.3	.94	15L	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L261	Ø	82.4	56.9	-3.0	1.9	.96	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L366	Ø	82.7	54.1	-4.7	-.4	.75	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L121	Ø	82.9	57.9	-2.0	2.2	1.00	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L213	Ø	83.2	59.9	-.4	3.5	.87	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L238A	Ø	83.5	54.0	-4.3	-1.0	.83	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L170	Ø	83.5	54.4	-3.9	-.7	.46	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L185	Ø	83.5	58.1	-1.4	2.0	.97	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L237A	Ø	83.5	57.3	-2.0	1.3	.89	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L565	Ø	83.6	53.7	-4.3	-1.3	1.14	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L279	Ø	83.6	57.1	-2.1	1.2	1.22	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L237B	Ø	83.7	55.8	-2.8	.1	.79	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L211	Ø	83.7	55.7	-2.9	.1	.77	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L610	*	84.1	55.1	-3.0	-.7	.91	15H	TEARING STRENGTH, STANDARD, THWING-ELMENDORF,AMBIENT COND.
L587	Ø	84.1	57.2	-1.6	.9	.88	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L345	Ø	84.1	56.5	-2.0	.4	1.32	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L328	Ø	84.2	52.4	-4.8	-2.7	1.67	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L676	Ø	84.4	58.9	-.2	1.9	1.22	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L362	Ø	84.4	56.0	-2.2	-.2	1.04	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L100	Ø	84.5	53.9	-3.6	-1.8	.85	15M	TEARING STRENGTH, STANDARD, T.M.MIRFIELD(APPITA-ELMENDORF)
L228	Ø	84.5	55.5	-2.5	-.7	.79	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L105	Ø	84.6	55.1	-2.7	-.9	1.01	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L190C	Ø	84.6	58.3	-.5	1.3	1.06	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L224	Ø	84.7	58.8	-.0	1.6	.68	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L254	Ø	84.7	58.0	-.6	1.0	.84	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L148	*	84.8	65.1	4.3	6.1	1.18	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L173B	Ø	84.8	61.6	1.9	3.6	.71	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORP(SCALE TO 100)
L163	Ø	84.9	57.5	-.9	.6	1.16	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L128	Ø	84.9	56.0	-1.8	-.5	.87	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L257C	Ø	85.2	60.5	1.5	2.6	1.21	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORP (W.AIR CLAMP)
L167	Ø	85.3	60.7	1.7	2.6	.52	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORP (W.AIR CLAMP)
L251	*	85.5	56.4	-1.2	-.6	.68	15K	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES, 20 C, 65% RH
L257A	Ø	85.5	59.9	1.2	1.9	.97	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L255	Ø	85.5	55.5	-1.7	-1.3	.66	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L257B	Ø	85.6	60.0	1.4	1.9	.98	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L336	Ø	85.9	56.6	-.7	-.7	1.01	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L141	Ø	85.9	57.6	.0	-.1	.89	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L190R	Ø	86.1	56.9	-.4	-.6	1.01	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORP (W.AIR CLAMP)
L283	Ø	86.1	54.7	-1.9	-2.2	1.09	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L60C	Ø	86.1	61.2	2.6	2.4	1.01	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L309	Ø	86.1	57.5	.1	-.3	.97	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)

ANALYSIS T15-1 TABLE 2

TEARING STRENGTH, GRAMS

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

LAB CODE	F	MEANS E76	MEANS E80	COORDINATES MAJOR	COORDINATES MINOR	AVG R. SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L189	0	86.2	56.2	-.8	-1.3	.92	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L580	0	86.3	59.6	1.6	1.2	.66	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L378	0	86.3	58.4	.8	.3	1.04	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L223	0	86.3	58.0	.6	-.0	.91	1SR	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF,DIGITAL READOUT
L134	0	86.3	56.7	-.3	-1.0	.74	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L217	0	86.4	56.9	-.1	-.9	.75	1SR	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L278	*	86.4	51.1	-4.2	-5.1	.98	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L262	0	86.5	55.4	-1.1	-2.0	.94	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L299	*	86.5	58.4	1.0	.1	1.30	1SV	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF(SCALE TO 100)X2
L396M	*	86.6	57.8	.6	-.4	1.24	1SV	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)X2
L558	0	86.7	54.8	-1.3	-2.6	.61	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L225	0	86.9	56.5	-.1	-1.5	.88	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L232	0	86.9	60.5	2.7	1.4	1.10	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L162	0	87.1	57.6	.8	-.8	.87	1ST	TEARING STRENGTE, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L273	0	87.1	62.7	4.4	2.9	.90	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L183	0	87.1	56.1	-.2	-1.9	.78	1ST	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF(SCALE TO 100)
L303	0	87.2	57.9	1.2	-.7	.95	1SL	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L311	*	87.5	58.3	1.6	-.6	.67	1SV	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)X2
L143	0	87.5	57.7	1.2	-1.1	1.74	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L124	0	87.6	60.3	3.0	.7	.90	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L236	0	87.7	55.6	-.1	-2.7	1.00	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L159	0	87.7	58.0	1.6	-1.0	1.50	1SL	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L280	0	87.8	56.0	.3	-2.5	.71	1SL	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L176	0	87.9	58.0	1.7	-1.1	1.03	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L150	0	87.9	57.9	1.7	-1.2	.91	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L360	0	88.1	57.2	1.3	-1.8	1.10	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L126	0	88.3	59.1	2.7	-.6	1.20	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L390	0	88.3	60.5	3.7	.4	1.04	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L484	0	88.4	63.3	5.7	2.4	1.55	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L107	*	88.5	65.6	7.4	3.9	4.22	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L581	0	88.5	58.7	2.7	-1.1	1.07	1SQ	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,AIR CLAMP,DIGITL
L166	0	88.7	58.2	2.4	-1.5	.96	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L288	0	88.8	60.6	4.1	.1	.64	1SQ	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF,AIR CLAMP,DIGITL
L249	0	88.9	61.8	5.0	.9	1.23	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L382	0	88.9	60.5	4.2	.0	1.09	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L206	0	88.9	60.3	4.0	-.2	.99	1SR	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF,DIGITAL READOUT
L242	*	88.9	58.9	3.1	-1.2	1.07	1SU	TEARING STRENGTH, STANDARD, AUSTRALIAN OPT. CO.
L305	0	88.9	60.3	4.0	-.2	1.03	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L599	0	88.9	59.4	3.4	-.8	1.01	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L259	0	89.1	60.1	4.0	-.4	.85	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L243	0	89.3	60.4	4.4	-.4	.94	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L275	0	89.3	56.5	1.7	-3.2	.88	1ST	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF(SCALE TO 100)
L195	0	89.5	56.1	1.6	-3.6	.91	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L285	0	89.5	60.9	4.9	-.1	1.08	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L559	0	89.5	65.7	8.2	3.3	.79	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L557	0	90.0	61.5	5.6	-.1	1.00	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L651	0	90.3	59.6	4.5	-1.6	.73	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L315	0	90.3	59.3	4.3	-1.8	1.33	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L182T	0	90.3	60.1	4.9	-1.2	1.07	1ST	TEARING STRENGTE, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L376	0	90.8	63.1	7.3	.5	1.05	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L352	0	91.0	61.1	6.1	-1.0	.77	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L554	0	91.2	60.4	5.8	-1.7	.92	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L606	0	91.7	61.3	6.7	-1.3	1.11	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L139	0	92.1	63.8	8.8	.2	.90	1ST	TEARING STRENGTH, STANDARD,TEWING-ELMENDORF(SCALE TO 100)
L576	0	92.3	59.5	5.9	-3.0	1.23	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L244	*	92.9	58.1	5.4	-4.5	.73	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L331	*	93.0	66.9	11.6	1.8	1.66	1ST	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L151	0	93.7	66.0	11.4	.7	1.08	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L344	0	93.7	62.3	8.9	-2.1	1.32	1SC	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L442	*	95.3	60.8	9.0	-4.2	1.00	1SR	TEARING STRENGTE, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
GMEANS:		85.9	57.6			1.00		
		95% ELLIPSE:		12.3	4.8	WITH GAMMA = 43 DEGREES		


TEARING STRENGTH, DEEP CUTOUT
SAMPLE E76 = 86. GRAMS
SAMPLE E76 = 842 MILLINEWTON
SAMPLE E80 = 58. GRAMS
SAMPLE E80 = 565 MILLINEWTON
+,X,* NOT IN GRAND MEANS
ANALYSIS T15-1
SAMPLE E80
GRAMS
MILLINEWTON
SAMPLE E76
GRAMS
MILLINEWTON

REPORT NO. 55S — TAPPI COLLABORATIVE REFERENCE PROGRAM — SEPTEMBER 1978

ANALYSIS T17-1 TABLE 1

TEARING STRENGTH, GRAMS

TAPPI STANDARD T414 TS-65, THWING-ELMENDORF WITHOUT DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB	SAMPLE	PRINTING				SAMPLE	KRAFT				TEST D.F = 15		
	J41	86 GRAMS PER SQUARE METER				K19	123 GRAMS PER SQUARE METER						
CODE	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	P	LAB
L122	64.7	-2.6	-.77	4.0	1.41	146.4	-5.1	-.49	7.9	.99	17N	ó	L122
L148	69.3	2.1	.62	2.1	.74	157.1	5.6	.54	3.8	.48	17N	ó	L148
L234	73.3	6.1	1.82	2.5	.88	161.5	10.0	.97	5.7	.71	17N	ó	L234
L267	73.2	6.0	1.78	3.4	1.22	82.0	-69.5	-6.73	5.3	.67	17N	#	L267
L269	67.7	.5	.15	3.2	1.14	151.3	-.2	-.01	11.4	1.43	17N	ó	L269
L301A	66.5	-.8	-.23	2.6	.93	143.2	-8.3	-.80	9.4	1.17	17N	ó	L301A
L301B	66.3	-.9	-.27	2.5	.89	146.0	-5.5	-.53	6.5	.81	17N	ó	L301B
L308	67.0	-.2	-.07	3.2	1.14	158.5	7.0	.68	5.1	.64	17N	ó	L308
L326	68.9	1.7	.50	4.3	1.51	162.7	11.2	1.08	17.8	2.22	17N	ó	L326
L339	70.9	3.7	1.10	2.0	.72	165.6	14.1	1.37	9.7	1.21	17N	ó	L339
L372	63.0	-4.3	-1.28	2.0	.72	134.1	-17.4	-1.69	4.0	.50	17N	ó	L372
L393	62.0	-5.2	-1.57	2.6	.93	140.0	-11.5	-1.11	6.8	.85	17N	ó	L393

GR. MEAN = 67.2 GRAMS — GRAND MEAN = 151.5 GRAMS — TEST DETERMINATIONS = 15

SD MEANS = 3.3 GRAMS — SD OF MEANS = 10.3 GRAMS — 11 LABS IN GRAND MEANS

AVERAGE SDR = 2.8 GRAMS — AVERAGE SDR = 8.0 GRAMS

GR. MEAN = 659.5 MILLINEWTON — GRAND MEAN = 1485.6 MILLINEWTON

TOTAL NUMBER OF LABORATORIES REPORTING = 12

Best values: J41 67 grams
K19 150 grams

The following laboratories were omitted from the grand means because of extreme test results: 267

Please see the diagram on the inside of the back cover of this report which shows how to distinguish between an Elmendorf tear tester with DEEP CUTOUT and an older model tester with NO CUTOUT.

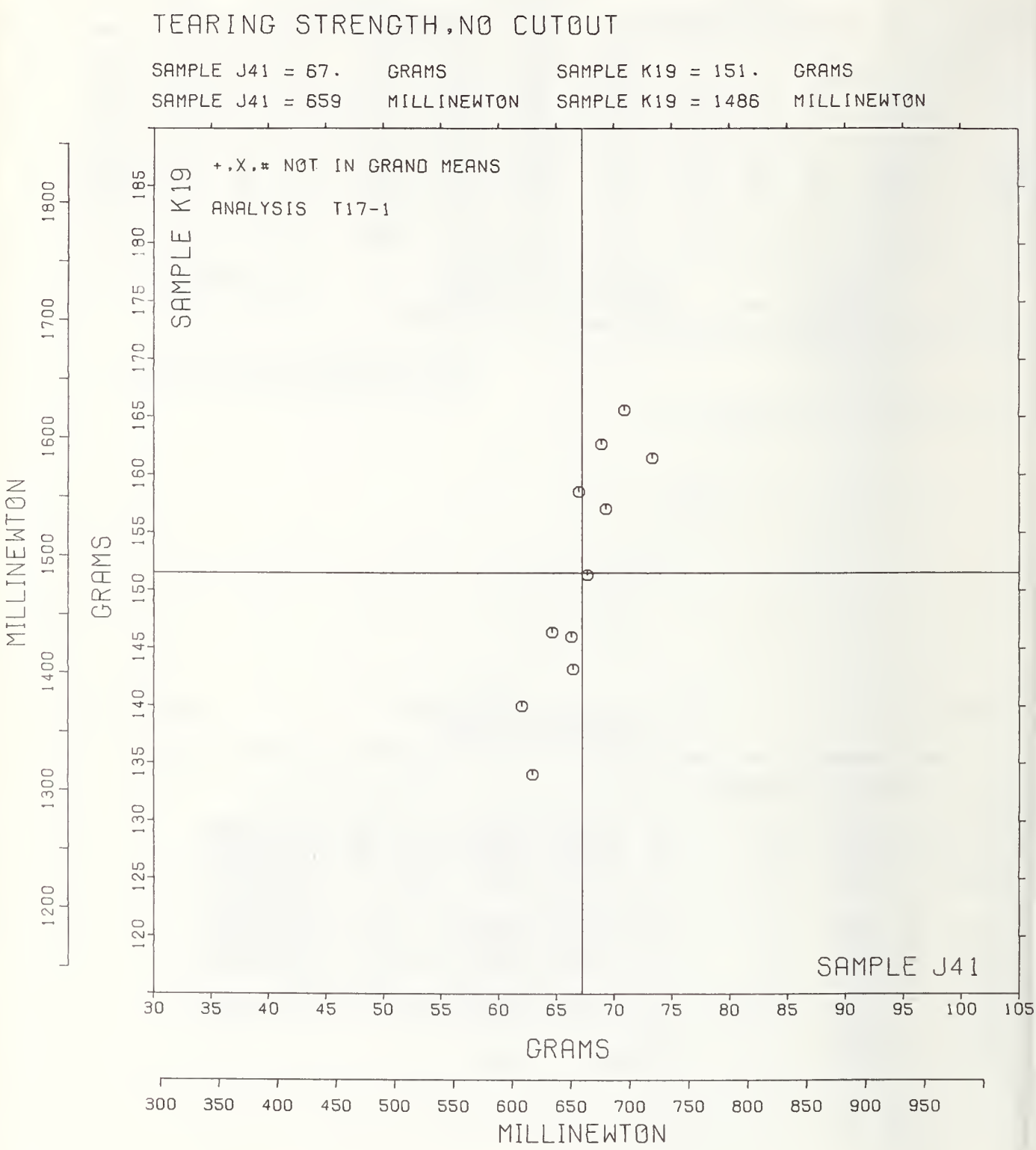
REPORT NO. 55S — TAPPI COLLABORATIVE REFERENCE PROGRAM — SEPTEMBER 1978

ANALYSIS T17-1 TABLE 2

TEARING STRENGTH, GRAMS

TAPPI STANDARD T414 TS-65, THWING-ELMENDORF WITHOUT DEEP CUTOUT IS STANDARD FOR THIS ANALYSIS

LAB		MEANS		COORDINATES		AVG		PROPERTY---TEST INSTRUMENT---CONDITIONS
CODE	F	J41	K19	MAJOR	MINOR	R.SDR	VAR	
L393	ó	62.0	140.0	-12.5	1.8	.89	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L372	ó	63.0	134.1	-17.9	-.7	.61	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L122	ó	64.7	146.4	-5.6	1.1	1.20	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L301B	ó	66.3	146.0	-5.5	-.6	.85	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L301A	ó	66.5	143.2	-8.2	-1.6	1.05	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L308	ó	67.0	158.5	6.7	2.2	.89	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L269	ó	67.7	151.3	.0	-.5	1.28	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L326	ó	68.9	162.7	11.2	1.5	1.87	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L148	ó	69.3	157.1	5.9	-.5	.61	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L339	ó	70.9	165.6	14.6	.4	.96	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L267	#	73.2	82.0	-65.1	-25.0	.95	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L234	ó	73.3	161.5	11.3	-3.1	.79	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
GMEANS:		67.2	151.5			1.00		
		95% ELLIPSE:		33.0	4.9	WITH GAMMA = 73 DEGREES		


TEARING STRENGTH,NO CUTOUT
SAMPLE J41 = 67. GRAMS
SAMPLE J41 = 659 MILLINEWTON
SAMPLE K19 = 151. GRAMS
SAMPLE K19 = 1486 MILLINEWTON
+,X,* NOT IN GRAND MEANS
ANALYSIS T17-1
SAMPLE K19
SAMPLE J41
GRAMS
MILLINEWTON
30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
300 350 400 450 500 550 600 650 700 750 800 850 900 950
120 125 130 135 140 145 150 155 160 165 170 175 180 185
1200 1300 1400 1500 1600 1700 1800

ANALYSIS T19-1 TABLE 1

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER - PACKAGING PAPER

TAPPI STANDARDS T404 OS-76 AND T494 OS-70, TENSILE BREAKING STRENGTH, PENDULUM AND CRE TYPES

LAB CODE	SAMPLE J15 MEAN	PRINTING 149 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE K31 MEAN	PRINTING 105 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 20 VAR	F	LAB
L100	8.74	.16	.48	.25	.79	8.92	.34	1.13	.38	.83	19E	O	L100
L107	8.97	.39	1.19	.28	.87	8.92	.33	1.10	.36	.80	19A	O	L107
L122	8.69	.11	.33	.32	1.00	8.69	.11	.37	.43	.94	19A	O	L122
L126	8.48	-.10	-.30	.25	.80	8.65	.06	.21	.47	1.04	19A	O	L126
L151	8.76	.18	.56	.37	1.17	8.47	-.11	-.37	.40	.88	19A	O	L151
L167	9.63	1.05	3.17	.33	1.06	9.93	1.35	4.45	.49	1.09	19G	#	L167
L182I	8.12	-.46	-1.39	.27	.85	8.35	-.23	-.76	.41	.92	19D	O	L182I
L182L	8.54	-.04	-.13	.33	1.05	8.56	-.02	-.08	.46	1.01	19T	O	L182L
L207	8.59	.01	.03	.33	1.05	8.50	-.08	-.26	.49	1.09	19A	O	L207
L217A	8.45	-.13	-.39	.24	.77	8.85	.27	.88	.34	.76	19A	O	L217A
L217P	8.51	-.07	-.20	.45	1.42	8.89	.31	1.01	.37	.81	19P	O	L217P
L224	8.40	-.18	-.55	.34	1.07	9.00	.42	1.37	.42	.93	19A	*	L224
L225	8.65	.07	.20	.21	.67	8.55	-.03	-.09	.56	1.24	19P	O	L225
L234L	8.43	-.15	-.44	.39	1.22	8.66	.08	.27	.43	.94	19P	O	L234L
L237A	8.30	-.28	-.85	.44	1.41	7.09	-1.49	-4.91	.60	1.33	19Q	#	L237A
L237B	9.32	.74	2.22	.36	1.14	9.02	.44	1.43	.63	1.40	19A	O	L237B
L238A	8.82	.24	.72	.38	1.20	8.55	-.04	-.12	.43	.94	19T	O	L238A
L243	8.37	-.21	-.63	.27	.86	8.72	.14	.45	.33	.72	19A	O	L243
L257A	8.59	.02	.03	.34	1.08	8.48	-.10	-.34	.36	.80	19P	O	L257A
L257C	8.53	-.05	-.16	.24	.76	8.55	-.03	-.11	.41	.91	19P	O	L257C
L264A	8.79	.21	.63	.41	1.29	8.69	.11	.35	.51	1.12	19A	O	L264A
L264P	9.18	.60	1.80	.28	.89	9.10	.51	1.69	.42	.93	19P	O	L264P
L265	8.11	-.47	-1.41	.22	.69	8.62	.04	.12	.42	.93	19A	O	L265
L267	8.52	-.06	-.17	.33	1.05	8.92	.34	1.11	.42	.93	19A	O	L267
L273	8.68	.11	.32	.37	1.16	8.75	.17	.57	.49	1.07	19P	O	L273
L280	7.75	-.83	-2.51	.49	1.56	7.87	-.71	-2.35	.56	1.24	19G	*	L280
L281	8.77	.19	.57	.35	1.09	8.91	.33	1.08	.41	.90	19G	O	L281
L305	8.77	.19	.57	.23	.74	8.35	-.24	-.78	.35	.78	19V	O	L305
L312	8.80	.22	.66	.26	.83	8.66	.08	.27	.34	.74	19D	O	L312
L318	8.11	-.47	-1.42	.25	.81	8.04	-.54	-1.79	.39	.87	19G	O	L318
L324	8.57	-.01	-.02	.29	.92	8.66	.08	.26	.42	.92	19A	O	L324
L336	9.03	.45	1.36	.38	1.20	8.63	.05	.17	.67	1.47	19G	O	L336
L356	9.03	.45	1.35	.26	.81	8.74	.16	.51	.51	1.12	19P	O	L356
L366	8.09	-.49	-1.46	.50	1.58	8.35	-.23	-.76	.39	.87	19P	O	L366
L565	8.66	.08	.24	.19	.59	8.49	-.09	-.30	.31	.68	19T	O	L565
L568	8.22	-.36	-1.08	.42	1.34	7.94	-.65	-2.13	.29	.63	19P	O	L568
L575	8.54	-.04	-.13	.23	.74	8.50	-.08	-.27	.36	.80	19G	O	L575
L576	8.44	-.14	-.43	.24	.78	8.32	-.26	-.87	.55	1.22	19A	O	L576
L580	8.94	.36	1.09	.31	.98	8.60	.02	.06	.42	.93	19G	O	L580
L581	8.76	.18	.56	.29	.91	8.79	.21	.68	.44	.97	19A	O	L581
L582	7.91	-.67	-2.03	.35	1.12	7.95	-.63	-2.08	.57	1.25	19A	O	L582
L604	8.45	-.13	-.40	.43	1.36	8.35	-.23	-.76	.53	1.17	19P	O	L604
L606	8.16	-.42	-1.28	.28	.90	8.27	-.31	-1.03	.51	1.13	19P	O	L606
L610	8.54	-.04	-.13	.34	1.09	8.38	-.20	-.67	.43	.96	19A	O	L610
L622	8.90	.33	.98	.32	1.01	8.76	.18	.59	.56	1.24	19G	O	L622
L650	9.06	.48	1.44	.46	1.44	9.13	.54	1.79	.56	1.23	19G	O	L650
L676	8.35	-.23	-.68	.31	.99	8.11	-.47	-1.56	.94	2.08	19A	O	L676
GR. MEAN =	8.58 KILONEWTON/M			GRAND MEAN =		8.58 KILONEWTON/M			TEST DETERMINATIONS =		20		
SD MEANS =	.33 KILONEWTON/M			SD OF MEANS =		.30 KILONEWTON/M			45 LABS IN GRAND MEANS				
	AVERAGE SDR =	.32 KILONEWTON/M				AVERAGE SDR =	.45 KILONEWTON/M						
GR. MEAN =	49.00 LB/INCH			GRAND MEAN =		49.01 LB/INCH							
L251	7.63	-.95	-2.85	.45	1.43	7.66	-.92	-3.04	.70	1.56	19I	*	L251

TOTAL NUMBER OF LABORATORIES REPORTING = 48

Best values: J15 8.6 ± 0.5 kilonewton per meter
K31 8.6 ± 0.5 kilonewton per meter

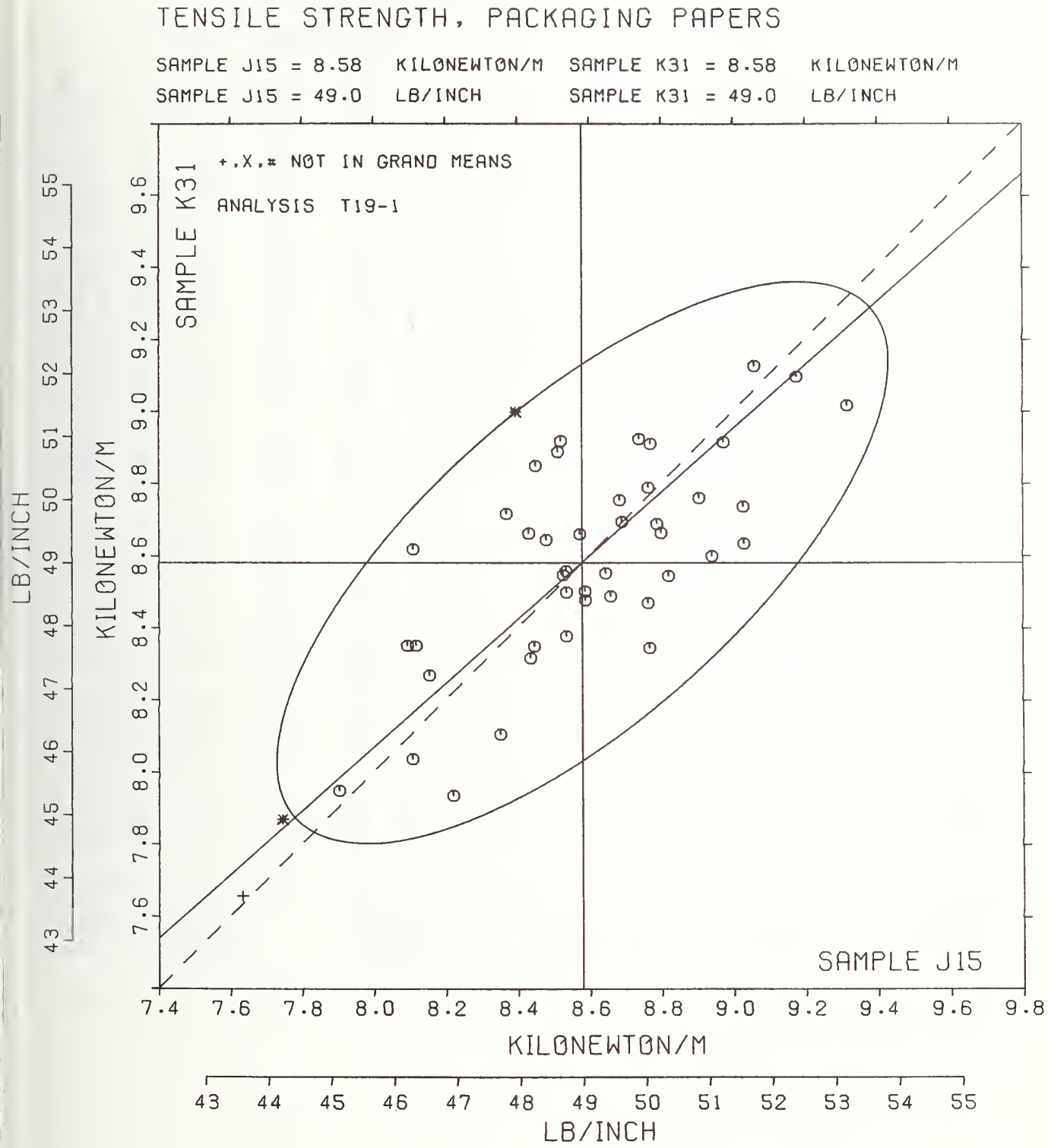
The following laboratories were omitted from the grand means because of extreme test results: 167, 237A

ANALYSIS T19=1 TABLE 2

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER - PACKAGING PAPER

TAPPI STANDARDS T404 OS-76 AND T494 OS-70, TENSILE BREAKING STRENGTH, PENDULUM AND CRE TYPES

LAB CODE	F	MEANS J15	K31	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L251	*	7.63	7.66	-1.32	-.07	1.49	19I	TENSILE STRENGTH, PACKAGING PAPER, CRE, 20C, 65% RH
L280	*	7.75	7.87	-1.10	.02	1.40	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L582	O	7.91	7.95	-.92	-.03	1.18	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L366	O	8.09	8.35	-.52	.15	1.22	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L318	O	8.11	8.04	-.71	-.10	.84	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L265	O	8.11	8.62	-.33	.34	.81	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L182I	O	8.12	8.35	-.50	.13	.89	19D	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L606	O	8.16	8.27	-.52	.05	1.01	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L568	O	8.22	7.94	-.70	-.25	.99	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L237A	#	8.30	7.09	-1.20	-.93	1.37	19Q	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L676	O	8.35	8.11	-.48	-.21	1.54	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L243	O	8.37	8.72	-.07	.24	.79	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L224	*	8.40	9.00	.14	.43	1.00	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L234L	O	8.43	8.66	-.06	.16	1.08	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L576	O	8.44	8.32	-.28	-.10	1.00	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L604	O	8.45	8.35	-.25	-.09	1.27	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L217A	O	8.45	8.85	.08	.29	.76	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L126	O	8.48	8.65	-.03	.11	.92	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L217P	O	8.51	8.89	.15	.27	1.12	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L267	O	8.52	8.92	.18	.29	.99	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L257C	O	8.53	8.55	-.06	.01	.83	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L182L	O	8.54	8.56	-.05	.01	1.03	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L61C	O	8.54	8.38	-.17	-.12	1.03	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L575	O	8.54	8.50	-.09	-.03	.77	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L324	O	8.57	8.66	.05	.06	.92	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L207	O	8.59	8.50	-.05	-.07	1.07	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L257A	O	8.59	8.48	-.06	-.08	.94	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L225	O	8.65	8.55	.03	-.07	.95	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L565	O	8.66	8.49	-.00	-.12	.64	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L273	O	8.68	8.75	.19	.06	1.12	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L122	O	8.69	8.69	.16	.01	.97	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L100	O	8.74	8.92	.35	.15	.81	19E	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L151	O	8.76	8.47	.06	-.21	1.02	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L581	O	8.76	8.79	.28	.03	.94	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L305	O	8.77	8.35	-.02	-.30	.76	19V	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L281	O	8.77	8.91	.36	.12	1.00	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L264A	O	8.79	8.69	.23	-.05	1.21	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L312	O	8.80	8.66	.22	-.08	.79	19D	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L238A	O	8.82	8.55	.16	-.19	1.07	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L622	O	8.90	8.76	.36	-.08	1.12	19O	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L580	O	8.94	8.60	.28	-.23	.95	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L107	O	8.97	8.92	.52	-.01	.84	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L356	O	9.03	8.74	.44	-.18	.96	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L336	O	9.03	8.63	.37	-.26	1.34	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L650	O	9.06	9.13	.72	.09	1.34	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L264P	O	9.18	9.10	.79	-.01	.91	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L2378	O	9.32	9.02	.84	-.16	1.27	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L167	#	9.63	9.93	1.68	.32	1.08	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
GMEANS:		8.58	8.58			1.00		
		95% ELLIPSE:		1.07	.44	WITH GAMMA = 41 DEGREES		


TENSILE STRENGTH, PACKAGING PAPERS
SAMPLE J15 = 8.58 KILONEWTON/M SAMPLE K31 = 8.58 KILONEWTON/M
SAMPLE J15 = 49.0 LB/INCH SAMPLE K31 = 49.0 LB/INCH
+,X,* NOT IN GRAND MEANS
ANALYSIS T19-1
SAMPLE K31
KILONEWTON/M
LB/INCH
SAMPLE J15
KILONEWTON/M
LB/INCH

ANALYSIS T20-1 TABLE 1

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

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

LAB CODE	SAMPLE J04 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J08 MEAN	PRINTING 85 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 20 VAR	F	LAB
L100	3.62	-.05	-.28	.17	.99	6.22	.14	.46	.19	.51	20E	G	L100
L105	3.55	-.12	-.67	.20	1.16	6.46	.38	1.27	.55	1.47	20A	*	L105
L122	3.89	.22	1.23	.15	.86	6.27	.18	.63	.40	1.06	20A	G	L122
L124C	3.52	-.15	-.86	.21	1.24	5.82	-.27	-.92	.39	1.05	20A	G	L124C
L125	3.86	.19	1.05	.19	1.15	6.17	.08	.29	.65	1.74	20C	G	L125
L131	3.97	.30	1.66	.11	.64	6.54	.46	1.54	.33	.88	20E	G	L131
L141T	3.78	.11	.61	.11	.68	6.16	.07	.23	.38	1.01	20A	G	L141T
L143	3.36	-.32	-1.77	.17	1.00	5.41	-.67	-2.28	.31	.83	20E	G	L143
L148	3.74	.07	.40	.17	1.01	5.99	-.10	-.35	.24	.64	20A	G	L148
L159	3.79	.12	.65	.12	.69	6.22	.13	.45	.42	1.11	20A	G	L159
L163	3.81	.14	.76	.19	1.11	6.41	.32	1.08	.16	.42	20D	G	L163
L167	4.02	.35	1.94	.22	1.29	6.67	.58	1.97	.50	1.32	20G	G	L167
L176	3.39	-.29	-1.60	.19	1.13	5.64	-.45	-1.53	.34	.91	20E	G	L176
L185	3.73	.06	.32	.22	1.29	6.30	.21	.70	.31	.83	20C	G	L185
L190R	3.64	-.03	-.16	.10	.59	6.02	-.07	-.24	.45	1.20	20A	G	L190R
L223B	3.73	.06	.32	.15	.88	6.25	.16	.55	.28	.74	20A	G	L223B
L226C	3.92	.25	1.38	.27	1.59	6.40	.31	1.04	.67	1.79	20C	G	L226C
L230	3.80	.12	.70	.16	.93	6.45	.36	1.23	.17	.46	20G	G	L230
L243	3.79	.11	.63	.13	.79	6.09	-.00	-.01	.38	1.01	20A	G	L243
L255	3.82	.15	.82	.12	.73	6.33	.25	.83	.20	.53	20A	G	L255
L260	3.57	-.10	-.56	.13	.74	6.06	-.03	-.09	.25	.67	20A	G	L260
L261	3.80	.13	.73	.18	1.04	6.41	.32	1.09	.32	.86	20A	G	L261
L278	3.60	-.07	-.42	.17	1.00	6.15	.07	.22	.29	.77	20A	G	L278
L291	3.19	-.48	-2.70	.24	1.41	5.63	-.46	-1.56	.54	1.45	20A	*	L291
L309	20.39	16.72	93.55	17.22	101.65	5.64	-.44	-1.50	.19	.52	20E	#	L309
L315	3.61	-.06	-.35	.16	.96	6.07	-.02	-.05	.39	1.03	20A	G	L315
L318	3.52	-.15	-.86	.12	.71	5.63	-.45	-1.54	.48	1.29	20G	G	L318
L325	3.52	-.16	-.87	.26	1.53	5.90	-.19	-.64	.28	.76	20E	G	L325
L328	3.65	-.02	-.12	.16	.92	5.89	-.20	-.66	.35	.93	20A	G	L328
L331	3.50	-.17	-.97	.20	1.18	5.48	-.61	-2.05	.45	1.21	20A	G	L331
L333	3.75	.08	.46	.16	.97	6.13	.04	.13	.40	1.08	20A	G	L333
L344	3.79	.11	.64	.14	.82	6.03	-.06	-.20	.60	1.59	20A	G	L344
L352	3.56	-.11	-.61	.22	1.29	5.84	-.25	-.86	.44	1.17	20A	G	L352
L360	1.26	-2.41	-13.49	.09	.53	2.13	-3.96	-13.41	.08	.22	20B	#	L360
L372	.34	-3.33	-18.62	.03	.17	6.09	.01	.02	.52	1.38	20A	#	L372
L378	3.73	.06	.31	.19	1.12	5.75	-.34	-1.14	.56	1.51	20A	G	L378
L390	3.83	.16	.88	.21	1.23	6.37	.28	.94	.35	.93	20A	G	L390
L442	3.51	-.16	-.88	.11	.66	5.91	-.18	-.61	.33	.87	20G	G	L442
L557	3.40	-.27	-1.50	.18	1.06	5.93	-.16	-.53	.27	.71	20A	G	L557
L558	.96	-2.71	-15.18	.18	1.06	1.32	-4.77	-16.13	.13	.35	20A	#	L558
L559	3.52	-.15	-.83	.11	.67	6.17	.08	.27	.18	.49	20A	G	L559
L563A	3.50	-.18	-.98	.22	1.29	5.79	-.30	-1.00	.91	2.42	20A	G	L563A
L575	3.84	.16	.92	.17	1.00	6.46	.37	1.25	.25	.67	20G	G	L575
L587	3.75	.08	.42	.18	1.05	NO DATA REPORTED FOR SAMPLE J08					20A	M	L587
L592	3.66	-.01	-.06	.16	.95	6.10	.01	.05	.29	.79	20A	G	L592
L616	1.17	-2.50	-14.01	.16	.96	.40	-5.69	-19.24	.08	.21	20D	#	L616
L618	3.79	.11	.64	.21	1.24	6.10	.01	.03	.46	1.23	20A	G	L618

GR. MEAN = 3.67 KILONEWTON/M — GRAND MEAN = 6.09 KILONEWTON/M — TEST DETERMINATIONS = 20

SD MEANS = .18 KILONEWTON/M — SD OF MEANS = .30 KILONEWTON/M — 41 LABS IN GRAND MEANS

AVERAGE SDR = .17 KILONEWTON/M — AVERAGE SDR = .37 KILONEWTON/M

GR. MEAN =12.386 LB/15 MM — GRAND MEAN =20.534 LB/15 MM

L139	3.72	.05	.28	.20	1.17	6.02	-.07	-.23	.30	.81	20H	*	L139
L251	3.20	-.47	-2.63	.36	2.12	5.57	-.52	-1.74	.41	1.10	20I	*	L251

TOTAL NUMBER OF LABORATORIES REPORTING = 49

Best values: J04 3.7 ± 0.3 kilonewton per meter
J08 6.1 ± 0.4 kilonewton per meter

The following laboratories were omitted from the grand means because of extreme test results: 309, 372, 616

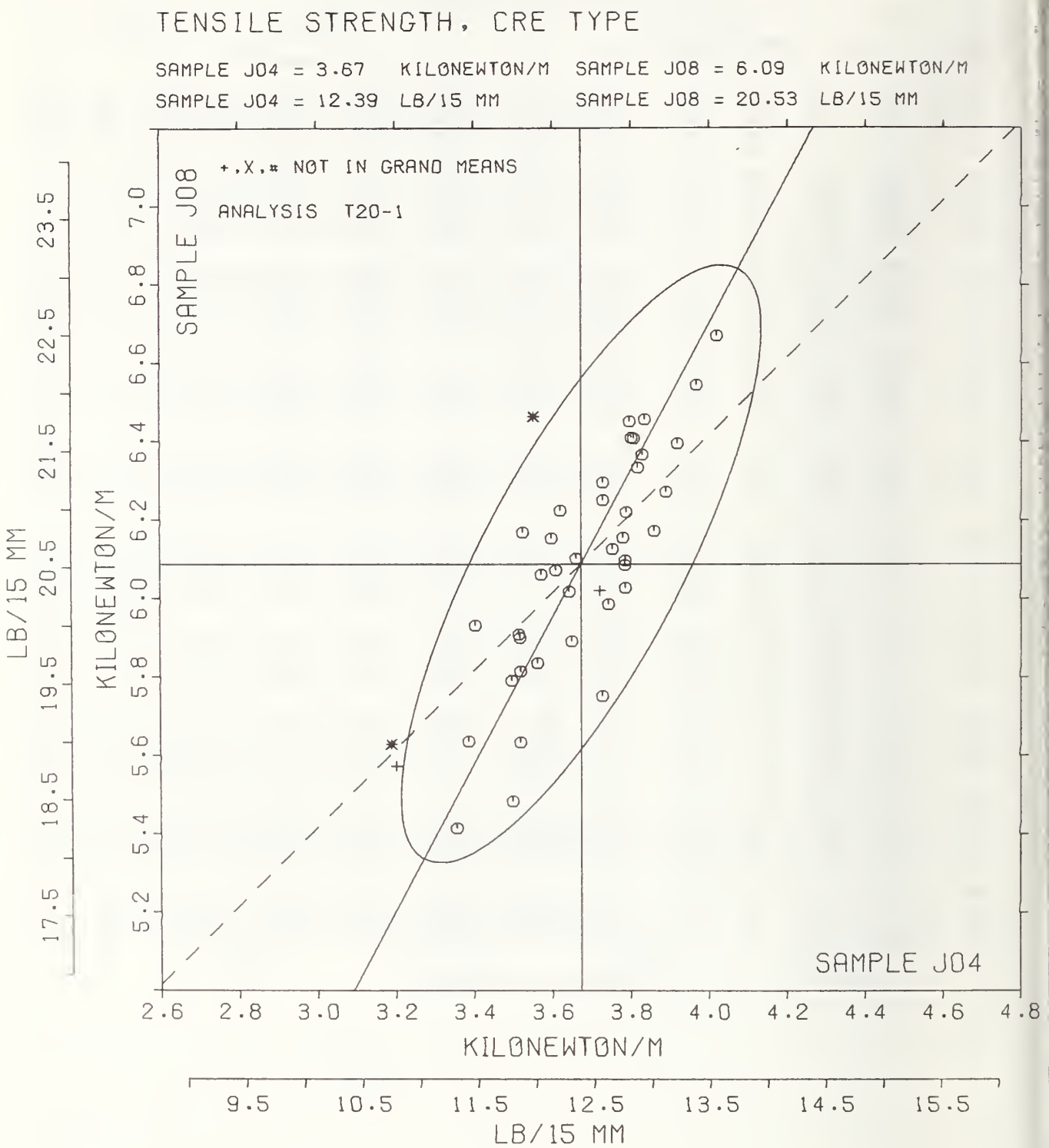
Data from the following laboratories appear to be off by a multiplicative factor: 360, 558

ANALYSIS T20-1 TABLE 2

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

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

LAB CODE	P	MEANS J04	MEANS J08	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L372	#	.34	6.09	-1.56	2.94	.77	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L558	#	.96	1.32	-5.48	.15	.70	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L616	#	1.17	.40	-6.19	-.47	.58	20D	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L360	#	1.26	2.13	-4.63	.26	.37	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L291	*	3.19	5.63	-.63	.21	1.43	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L251	*	3.20	5.57	-.68	.17	1.61	20I	TENSILE STRENGTH, PRINTING PAPER, CRE, 20 C, 65% RH
L143	O	3.36	5.41	-.74	-.04	.92	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L176	O	3.39	5.64	-.53	.04	1.02	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L557	O	3.40	5.93	-.26	.16	.89	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L563A	O	3.50	5.79	-.34	.02	1.86	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L331	O	3.50	5.48	-.62	-.13	1.20	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L442	O	3.51	5.91	-.23	.05	.77	20G	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L325	O	3.52	5.90	-.24	.05	1.15	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L319	O	3.52	5.63	-.47	-.08	1.00	20G	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L124C	O	3.52	5.82	-.31	.01	1.15	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L559	O	3.52	6.17	.00	.17	.58	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L105	*	3.55	6.46	.27	.28	1.32	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L352	O	3.56	5.84	-.27	-.02	1.23	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L260	O	3.57	6.06	-.07	.08	.71	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L278	O	3.60	6.15	.02	.10	.89	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L315	O	3.61	6.07	-.04	.05	1.00	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L100	O	3.62	6.22	.10	.11	.75	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L190R	O	3.64	6.02	-.08	-.01	.90	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L328	O	3.65	5.89	-.18	-.07	.92	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L592	O	3.66	6.10	.01	.02	.87	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L139	*	3.72	6.02	-.04	-.08	.99	20H	TENSILE STRENGTH, PRINTING PAPER, CRE, SHORT TEST SPAN
L378	O	3.73	5.75	-.27	-.21	1.31	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L223B	O	3.73	6.25	.17	.03	.81	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L185	O	3.73	6.30	.21	.05	1.06	20C	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L148	O	3.74	5.99	-.06	-.11	.83	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L587	M	3.75				1.05	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE
L333	O	3.75	6.13	.07	-.05	1.02	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L141T	O	3.78	6.16	.11	-.06	.84	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L243	O	3.79	6.09	.05	-.10	.90	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L344	O	3.79	6.03	.00	-.13	1.20	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L618	O	3.79	6.10	.06	-.10	1.24	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L159	O	3.79	6.22	.17	-.04	.90	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L230	O	3.80	6.45	.38	.06	.70	20G	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L261	O	3.80	6.41	.34	.04	.95	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L163	O	3.81	6.41	.35	.03	.77	20D	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L255	O	3.82	6.33	.29	-.01	.63	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L390	O	3.83	6.37	.32	-.01	1.08	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L575	O	3.84	6.46	.40	.03	.84	20G	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L125	O	3.86	6.17	.16	-.13	1.45	20C	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L122	O	3.89	6.27	.27	-.11	.96	20A	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L226C	O	3.92	6.40	.39	-.07	1.69	20C	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L131	O	3.97	6.54	.54	-.05	.76	20E	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L167	O	4.02	6.67	.68	-.03	1.31	20G	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
L309	#	20.39	5.64	7.49	-14.96	51.08	20B	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, LOAD CELL (CRE)
GMEANS:		3.67	6.09			1.00		
		95% ELLIPSE:		.85	.26	WITH GAMMA = 61 DEGREES		


TENSILE STRENGTH, CRE TYPE
SAMPLE J04 = 3.67 KILONEWTON/M SAMPLE J08 = 6.09 KILONEWTON/M
SAMPLE J04 = 12.39 LB/15 MM SAMPLE J08 = 20.53 LB/15 MM
+,X,* NOT IN GRAND MEANS
ANALYSIS T20-1
SAMPLE J08
KILONEWTON/M
LB/15 MM
SAMPLE J04
KILONEWTON/M
LB/15 MM

ANALYSIS T20-2 TABLE 1

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

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

LAB CODE	SAMPLE J04 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J08 MEAN	PRINTING 85 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 20 VAR	F	LAB
L103	3.88	.12	.59	.12	.60	6.48	.25	.64	.25	.58	20R	@	L103
L108	3.70	-.05	-.24	.19	.93	6.50	.28	.70	.18	.43	20P	@	L108
L121	3.90	.15	.69	.16	.79	6.28	.05	.14	.51	1.19	20P	@	L121
L124P	3.54	-.21	-.99	.23	1.12	5.93	-.30	-.74	.44	1.02	20P	@	L124P
L128	3.81	.05	.26	.13	.63	6.34	.12	.29	.41	.96	20T	@	L128
L148	3.73	-.02	-.10	.17	.83	6.03	-.19	-.48	.27	.63	20P	@	L148
L162	3.47	-.28	-1.34	.30	1.45	6.20	-.03	-.07	.36	.85	20*	@	L162
L182L	3.69	-.07	-.31	.20	.96	6.07	-.15	-.38	.51	1.19	20T	@	L182L
L189	4.06	.30	1.44	.18	.87	6.83	.61	1.52	.62	1.45	20R	@	L189
L191P	3.90	.15	.69	.19	.94	6.50	.27	.69	.35	.82	20P	@	L191P
L195	3.83	.08	.38	.16	.79	6.17	-.06	-.14	.28	.66	20R	@	L195
L211	2.81	-.94	-4.46	.21	1.00	4.99	-1.23	-3.10	.28	.65	20R	#	L211
L212	3.28	-.47	-2.22	.25	1.20	5.53	-.70	-1.75	.31	.72	20R	@	L212
L213	3.51	-.24	-1.15	.22	1.08	6.22	-.01	-.01	.39	.92	20T	@	L213
L218	3.81	.05	.26	.15	.71	6.33	.11	.27	.32	.74	20P	@	L218
L242	3.70	-.05	-.25	.18	.85	5.66	-.56	-1.40	.63	1.47	20Y	@	L242
L249	3.64	-.12	-.56	.19	.93	5.96	-.26	-.66	.67	1.57	20P	@	L249
L259	4.00	.25	1.16	.19	.91	6.30	.08	.19	.59	1.38	20P	@	L259
L262	3.82	.07	.32	.20	.96	6.88	.66	1.65	.24	.56	20R	@	L262
L275	3.68	-.08	-.37	.28	1.33	6.47	.24	.61	.54	1.27	20R	@	L275
L279P	3.84	.09	.42	.47	2.28	6.85	.62	1.56	.42	.98	20P	@	L279P
L285	3.50	-.26	-1.21	.14	.67	4.77	-1.45	-3.65	.16	.37	20P	#	L285
L311	3.78	.03	.15	.18	.88	5.51	-.71	-1.78	.39	.91	20V	@	L311
L330	3.69	-.07	-.31	.21	1.01	6.22	-.00	-.00	.55	1.28	20P	@	L330
L356	4.02	.27	1.26	.16	.79	6.45	.23	.58	.56	1.30	20P	@	L356
L362	3.75	-.01	-.03	.29	1.42	6.32	.09	.23	.39	.91	20R	@	L362
L370	3.79	.03	.16	.12	.58	6.46	.24	.60	.39	.90	20P	@	L370
L376	3.68	-.07	-.32	.18	.88	5.72	-.51	-1.28	.55	1.28	20P	@	L376
L393	3.95	.19	.92	.15	.73	6.46	.24	.60	.37	.86	20P	@	L393
L484	3.53	-.22	-1.04	.25	1.19	5.51	-.71	-1.79	.55	1.28	20U	@	L484
L554	3.98	.23	1.09	.22	1.06	6.75	.53	1.32	.32	.74	20P	@	L554
L556	4.13	.38	1.79	.20	.95	6.27	.04	.11	.66	1.55	20P	@	L556
L563P	4.04	.29	1.36	.20	.95	6.78	.56	1.39	.49	1.14	20P	@	L563P
L585	3.32	-.44	-2.07	.15	.73	5.71	-.51	-1.28	.30	.69	20V	@	L585
L599	3.40	-.35	-1.65	.35	1.69	5.70	-.52	-1.31	.32	.75	20V	@	L599

GR. MEAN = 3.75 KILONEWTON/M GRAND MEAN = 6.22 KILONEWTON/M TEST DETERMINATIONS = 20

SD MEANS = .21 KILONEWTON/M SD OF MEANS = .40 KILONEWTON/M 33 LABS IN GRAND MEANS

AVERAGE SDR = .21 KILONEWTON/M AVERAGE SDR = .43 KILONEWTON/M

GR. MEAN =12.660 LB/15 MM GRAND MEAN =20.989 LB/15 MM

TOTAL NUMBER OF LABORATORIES REPORTING = 35

Best values: J04 3.7 ± 0.4 kilonewton per meter
J08 6.3 ± 0.6 kilonewton per meter

The following laboratories were omitted from the grand means because of extreme test results: 211, 285

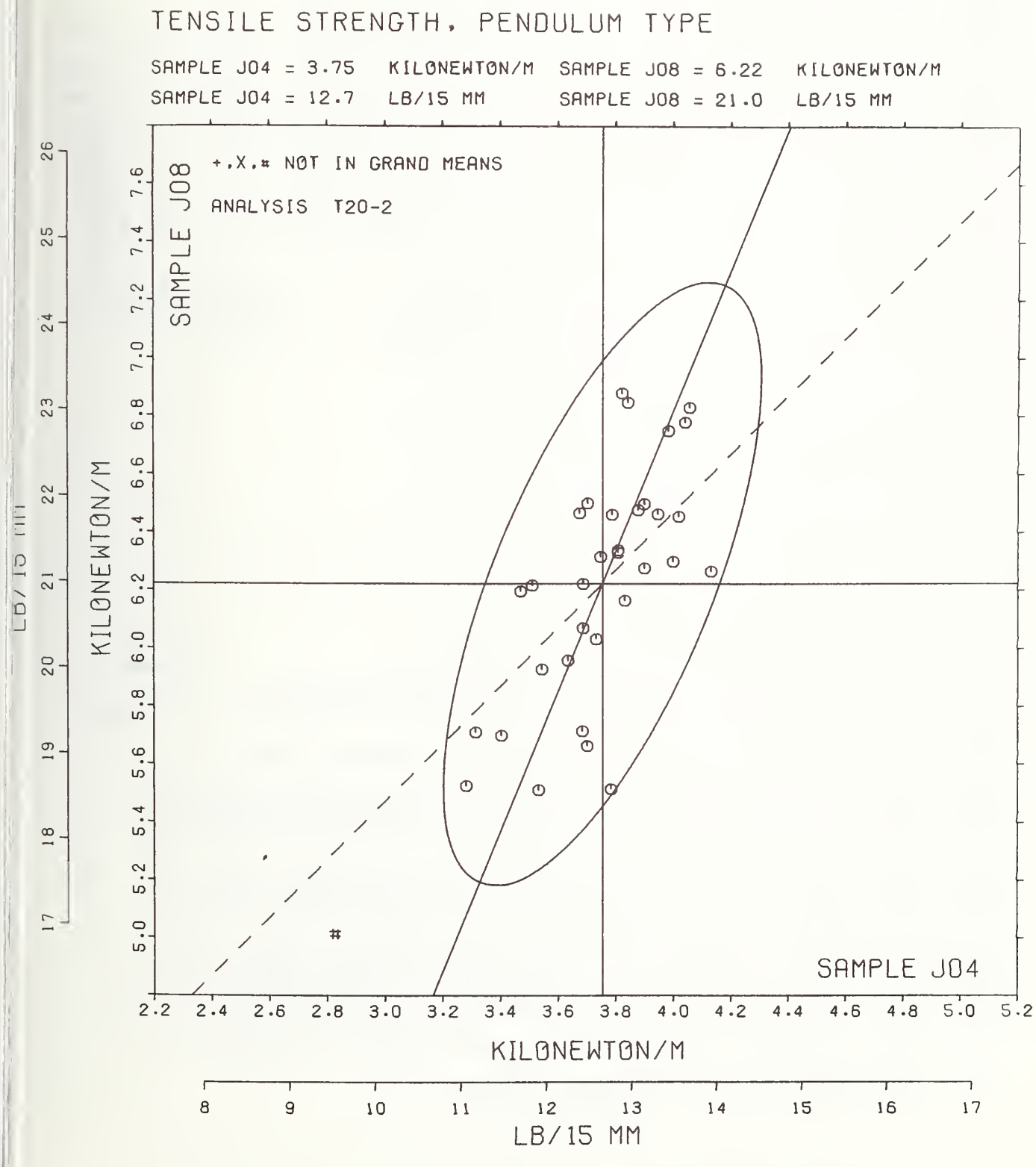
REPORT NO. 555 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T20-2 TABLE 2

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

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

LAB CODE	P	MEANS J04	MEANS J08	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L211	#	2.81	4.99	-1.50	.40	.82 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L212	O	3.28	5.53	-.82	.17	.96 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L585	O	3.32	5.71	-.64	.21	.71 20V	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L599	O	3.40	5.70	-.62	.12	1.22 20V	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L162	O	3.47	6.20	-.13	.25	1.15 20*	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L285	#	3.50	4.77	-1.44	-.32	.52 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L213	O	3.51	6.22	-.10	.22	1.00 20T	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L484	O	3.53	5.51	-.74	-.07	1.23 20U	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L124P	O	3.54	5.93	-.35	.08	1.07 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L249	O	3.64	5.96	-.29	.01	1.25 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L275	O	3.68	6.47	.19	.17	1.30 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L376	O	3.68	5.72	-.50	-.13	1.08 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L182L	O	3.69	6.07	-.17	.00	1.07 20T	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L330	O	3.69	6.22	-.03	.06	1.15 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L242	O	3.70	5.66	-.54	-.17	1.16 20Y	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L108	O	3.70	6.50	.24	.15	.68 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L148	O	3.73	6.03	-.18	-.05	.73 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L362	O	3.75	6.32	.08	.04	1.16 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L311	O	3.78	5.51	-.64	-.30	.89 20V	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L370	O	3.79	6.46	.23	.06	.74 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L128	O	3.81	6.34	.13	-.01	.80 20T	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L218	O	3.81	6.33	.12	-.01	.72 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L262	O	3.82	6.88	.63	.19	.76 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L195	O	3.83	6.17	-.02	-.10	.72 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L279P	O	3.84	6.85	.61	.15	1.63 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L103	O	3.88	6.48	.28	-.02	.59 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L191P	O	3.90	6.50	.31	-.03	.88 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L121	O	3.90	6.28	.11	-.11	.99 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L393	O	3.95	6.46	.30	-.09	.80 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L554	O	3.98	6.75	.57	-.01	.90 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L259	O	4.00	6.30	.16	-.20	1.15 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L356	O	4.02	6.45	.31	-.16	1.04 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L563P	O	4.04	6.78	.62	-.05	1.04 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L189	O	4.06	6.83	.68	-.05	1.16 20R	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
L556	O	4.13	6.27	.18	-.33	1.25 20P	TENSILE STRENGTH, PRIMARILY PRINTING PAPERS, PENDULUM TESTER
GMEANS:		3.75	6.22			1.00	
		95% ELLIPSE:		1.11	.38	WITH GAMMA = 67 DEGREES	


TENSILE STRENGTH, PENDULUM TYPE
SAMPLE J04 = 3.75 KILONEWTON/M
SAMPLE J04 = 12.7 LB/15 MM
SAMPLE J08 = 6.22 KILONEWTON/M
SAMPLE J08 = 21.0 LB/15 MM
+,X,* NOT IN GRAND MEANS
ANALYSIS T20-2
SAMPLE J08
KILONEWTON/M
LB/15 MM
SAMPLE J04
KILONEWTON/M
LB/15 MM

ANALYSIS T25-1 TABLE 1

TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PACKAGING PAPER

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

LAB CODE	SAMPLE J15 MEAN	PRINTING 149 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE K31 MEAN	PRINTING 105 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 20 VAR	F	LAB
L122	132.2	10.5	.93	11.3	.90	80.2	4.1	.51	9.5	.94	25P	O	L122
L126	121.1	-.5	-.05	9.1	.73	76.6	.5	.07	9.9	.98	25G	O	L126
L151	124.6	3.0	.27	17.4	1.39	82.5	6.4	.81	13.4	1.32	25F	O	L151
L182	115.3	-6.4	-.56	10.7	.85	71.5	-4.6	-.58	9.1	.90	25B	O	L182
L234B	123.0	1.4	.12	14.8	1.18	87.3	11.2	1.40	11.4	1.12	25H	O	L234B
L237B	107.5	-14.1	-1.24	10.7	.86	69.2	-7.0	-.87	10.1	1.00	25H	O	L237B
L243	120.0	-1.7	-.15	9.0	.72	74.2	-1.9	-.23	6.9	.68	25Z	O	L243
L264	111.1	-10.5	-.93	15.6	1.24	66.5	-9.6	-1.20	10.4	1.03	25F	O	L264
L267	124.7	3.0	.27	11.8	.94	83.2	7.1	.89	7.7	.76	25F	O	L267
L273	136.4	14.8	1.30	13.1	1.04	85.6	9.5	1.19	10.3	1.02	25F	O	L273
L280	106.7	-14.9	-1.31	18.4	1.47	69.4	-6.7	-.84	12.8	1.26	25B	O	L280
L312	147.1	25.4	2.24	12.3	.98	87.5	11.4	1.43	10.8	1.07	25J	O	L312
L318	129.3	7.7	.68	12.1	.97	76.4	.3	.03	8.6	.85	25A	O	L318
L580	115.6	-6.0	-.53	11.7	.93	68.1	-8.0	-1.00	6.1	.61	25C	O	L580
L604	87.2	-34.4	-3.03	14.8	1.18	72.0	-4.2	-.52	12.4	1.23	25A	#	L604
L676	109.9	-11.7	-1.03	10.0	.80	63.3	-12.8	-1.60	14.7	1.46	25F	O	L676

GR. MEAN = 121.6 JOULES/SQ M GRAND MEAN = 76.1 JOULES/SQ M TEST DETERMINATIONS = 20

SD MEANS = 11.3 JOULES/SQ M SD OF MEANS = 8.0 JOULES/SQ M 15 LABS IN GRAND MEANS

AVERAGE SDR = 12.5 JOULES/SQ M AVERAGE SDR = 10.1 JOULES/SQ M

GR. MEAN = 8.332 FT.LB/SQ PT GRAND MEAN = 5.214 FT.LB/SQ PT

TOTAL NUMBER OF LABORATORIES REPORTING = 16

Best values: J15 120 ± 16 joules per square meter

K31 76 ± 11 joules per square meter

The following laboratories were omitted from the grand means because of extreme test results: 604

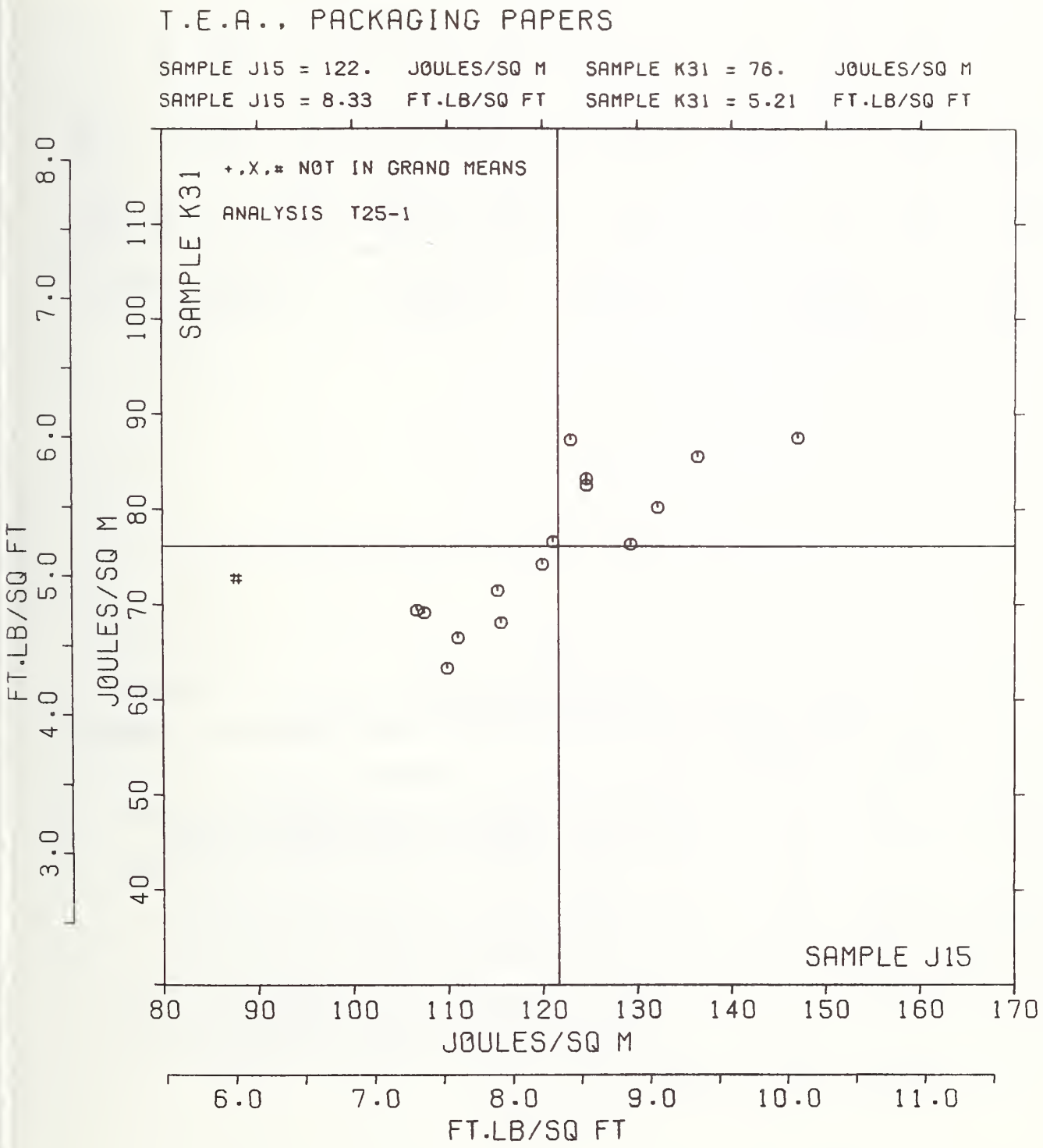
REPORT NO. 55S TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T25-1 TABLE 2

TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PACKAGING PAPER

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

LAB CODE	F	MEANS J15	K31	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L604	#	87.2	72.0	-31.0	15.5	1.20	25A	TENSILE ENERGY ABS.,PACKAGING PAPER,FLAT/FLAT JAWS
L280	O	106.7	69.4	-16.1	2.6	1.36	25B	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L237B	O	107.5	69.2	-15.6	1.9	.93	25H	TENSILE ENERGY ABS.,PACKAGING PAPER,2-PIN STRAIN GAGE
L676	O	109.9	63.3	-16.8	-4.2	1.13	25F	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L264	O	111.1	66.5	-14.1	-2.2	1.13	25F	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L182	O	115.3	71.5	-7.8	-.4	.88	25B	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L580	O	115.6	68.1	-9.4	-3.4	.77	25C	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/LINE JAWS
L243	O	120.0	74.2	-2.4	-.6	.70	25Z	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/LINE JAWS
L126	O	121.1	76.6	-.1	.7	.85	25G	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/LINE JAWS
L234B	O	123.0	87.3	7.3	8.6	1.15	25H	TENSILE ENERGY ABS.,PACKAGING PAPER,2-PIN STRAIN GAGE
L151	O	124.6	82.5	6.1	3.7	1.36	25F	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L267	O	124.7	83.2	6.4	4.3	.85	25F	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L318	O	129.3	76.4	6.5	-4.0	.91	25A	TENSILE ENERGY ABS.,PACKAGING PAPER,FLAT/FLAT JAWS
L122	O	132.2	80.2	11.0	-2.4	.92	25P	TENSILE ENERGY ABS.,PACKAGING PAPER,PATTERNED FLAT JAWS
L273	O	136.4	85.6	17.5	-.2	1.03	25F	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
L312	O	147.1	87.5	27.5	-4.4	1.03	25J	TENSILE ENERGY ABS.,PACKAGING PAPER,LINE/FLAT JAWS
GMEANS:		121.6	76.1			1.00		
		95% ELLIPSE:		38.3	10.6	WITH GAMMA = 33 DEGREES		


T.E.A., PACKAGING PAPERS
SAMPLE J15 = 122. JOULES/SQ M
SAMPLE J15 = 8.33 FT.LB/SQ FT
SAMPLE K31 = 76. JOULES/SQ M
SAMPLE K31 = 5.21 FT.LB/SQ FT
+,X,# NOT IN GRAND MEANS
ANALYSIS T25-1
SAMPLE K31
SAMPLE J15
JOULES/SQ M
FT.LB/SQ FT
80 90 100 110 120 130 140 150 160 170
40 50 60 70 80 90 100 110
3.0 4.0 5.0 6.0 7.0 8.0
6.0 7.0 8.0 9.0 10.0 11.0

ANALYSIS T26-1 TABLE 1

TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PRINTING PAPER

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

LAB CODE	SAMPLE J04 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J08 MEAN	PRINTING 85 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L100	34.8	-2.9	-1.12	3.9	.96	78.0	2.1	.32	6.1	.82	26A	O	L100
L122	39.9	2.2	.84	3.5	.87	79.2	3.4	.51	10.8	1.44	26L	O	L122
L139	36.0	-1.8	-.68	5.9	1.46	68.6	-7.3	-1.09	7.6	1.03	26H	O	L139
L159	40.3	2.6	1.00	4.2	1.04	82.0	6.2	.93	8.6	1.15	26F	O	L159
L163	36.5	-1.2	-.48	4.1	1.01	78.9	3.1	.46	5.5	.73	26J	O	L163
L167	40.2	2.5	.97	2.2	.54	66.7	-9.1	-1.37	5.0	.67	26D	O	L167
L185	34.5	-3.2	-1.24	5.4	1.34	69.9	-5.9	-.89	7.8	1.04	26C	O	L185
L255	43.2	5.5	2.14	3.3	.82	87.3	11.4	1.72	5.9	.80	26P	O	L255
L309	38.2	.5	.21	5.5	1.35	69.8	-6.0	-.90	5.4	.72	26J	O	L309
L318	38.4	.7	.26	3.5	.87	72.2	-3.6	-.54	10.9	1.46	26A	O	L318
L393	36.3	-1.4	-.54	3.5	.87	80.8	5.0	.75	5.0	.67	26V	O	L393
L442	38.6	.9	.34	3.8	.93	81.7	5.9	.89	9.2	1.23	26B	O	L442
L575	36.6	-1.1	-.43	4.5	1.11	79.8	4.0	.60	7.4	1.00	26A	O	L575
L587	35.4	-2.3	-.91	5.0	1.24	NO DATA REPORTED FOR SAMPLE J08					26C	M	L587
L592	34.5	-3.3	-1.27	3.4	.85	66.6	-9.2	-1.38	9.2	1.24	26H	O	L592

GR. MEAN = 37.7 JOULES/SQ M GRAND MEAN = 75.8 JOULES/SQ M TEST DETERMINATIONS = 20

SD MEANS = 2.6 JOULES/SQ M SD OF MEANS = 6.6 JOULES/SQ M 14 LABS IN GRAND MEANS

AVERAGE SDR = 4.1 JOULES/SQ M AVERAGE SDR = 7.4 JOULES/SQ M

GR. MEAN = 2.584 FT.LB/SQ FT GRAND MEAN = 5.194 FT.LB/SQ FT

TOTAL NUMBER OF LABORATORIES REPORTING = 15

Best values: J04 38 ± 5 joules per square meter
J08 76 ± 10 joules per square meter

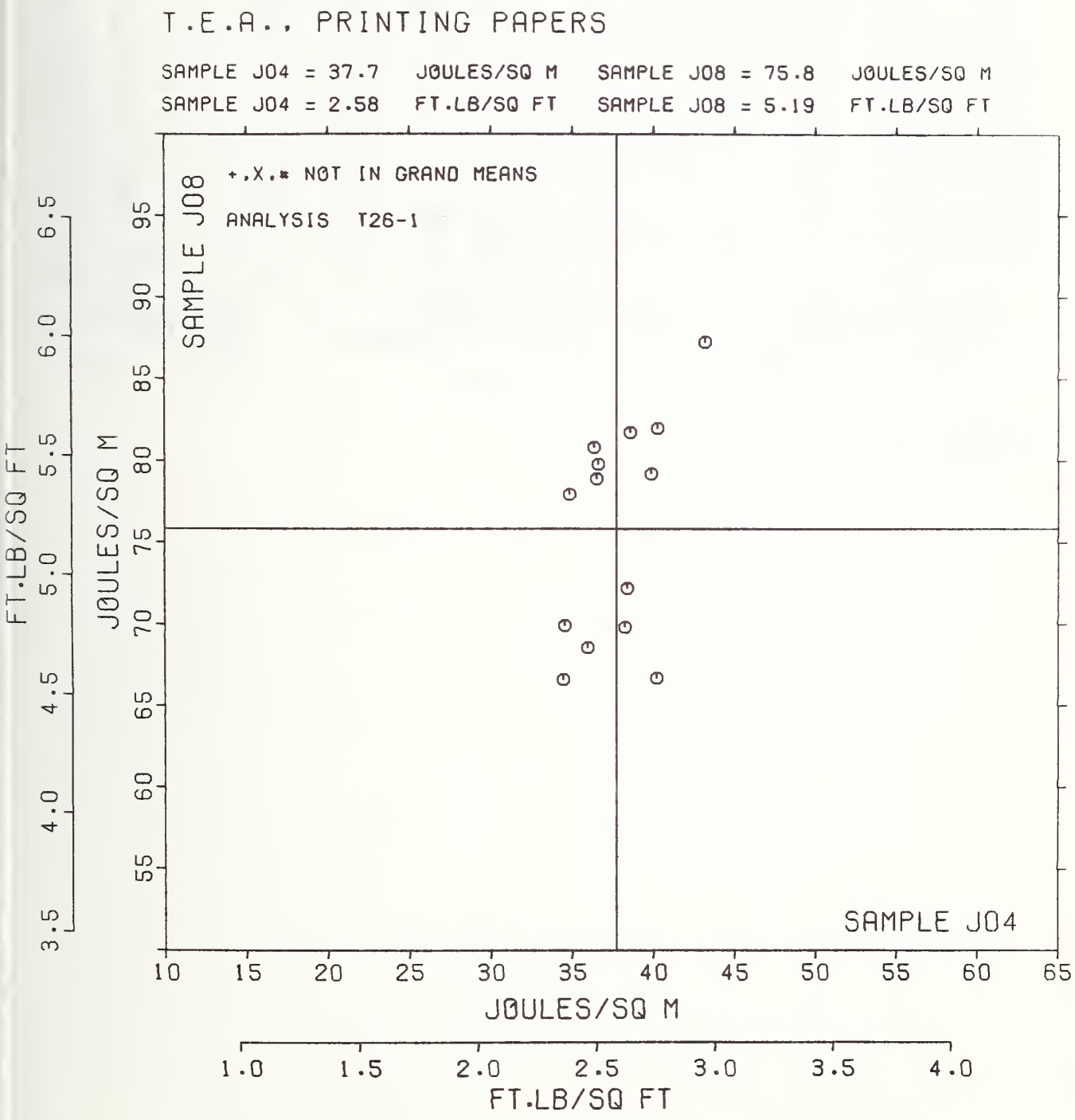
REPORT NO. 555 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T26-1 TABLE 2

TENSILE ENERGY ABSORPTION, JOULES PER SQUARE METER - PRINTING PAPER

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

LAB CODE	F	MEANS J04	J08	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L592	O	34.5	66.6	-9.6	1.4	1.04	26H	TENSILE ENERGY ABS.,PRINTING PAPERS,2-PIN STRAIN GAGE
L185	O	34.5	69.9	-6.4	1.9	1.19	26C	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/LINE JAWS
L100	O	34.8	78.0	1.5	3.2	.89	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L587	M	35.4				1.24	26C	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/LINE JAWS
L139	O	36.0	68.6	-7.5	.3	1.24	26H	TENSILE ENERGY ABS.,PRINTING PAPERS,2-PIN STRAIN GAGE
L393	O	36.3	80.8	4.6	2.3	.77	26V	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L163	O	36.5	78.9	2.8	1.8	.87	26J	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L575	O	36.6	79.8	3.7	1.9	1.05	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L309	O	38.2	69.8	-5.8	-1.7	1.03	26J	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L318	O	38.4	72.2	-3.4	-1.4	1.17	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L442	O	38.6	81.7	6.0	.3	1.08	26B	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L122	O	39.9	79.2	3.7	-1.4	1.16	26L	TENSILE ENERGY ABS.,PRINTING PAPERS,PATTERNED FLAT JAWS
L167	O	40.2	66.7	-8.5	-4.2	.60	26D	TENSILE ENERGY ABS.,PRINTING PAPERS,2-PIN STRAIN GAGE
L159	O	40.3	82.0	6.6	1.3	1.10	26F	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L255	O	43.2	87.3	12.3	-3.1	.81	26P	TENSILE ENERGY ABS.,PRINTING PAPERS,PATTERNED FLAT JAWS
GMEANS:		37.7	75.8			1.00		
		95% ELLIPSE:		19.6	6.5	WITH GAMMA = 78 DEGREES		


T.E.A., PRINTING PAPERS
SAMPLE J04 = 37.7 JOULES/SQ M
SAMPLE J04 = 2.58 FT.LB/SQ FT
SAMPLE J08 = 75.8 JOULES/SQ M
SAMPLE J08 = 5.19 FT.LB/SQ FT
+,X,* NOT IN GRAND MEANS
ANALYSIS T26-1
SAMPLE J08
SAMPLE J04
JOULES/SQ M
FT.LB/SQ FT
10 15 20 25 30 35 40 45 50 55 60 65
55 60 65 70 75 80 85 90 95
3.5 4.0 4.5 5.0 5.5 6.0 6.5
1.0 1.5 2.0 2.5 3.0 3.5 4.0

ANALYSIS T28-1 TABLE 1

ELONGATION TO BREAK, PERCENT - PACKAGING PAPER

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

LAB CODE	SAMPLE J15 149 GRAMS PER SQUARE METER MEAN	PRINTING DEV	N.DEV	SDR	R.SDR	SAMPLE K31 105 GRAMS PER SQUARE METER MEAN	PRINTING DEV	N.DEV	SDR	R.SDR	TEST D.* 20 VAR	F	LAB
L100	2.005	-.113	-1.42	.100	.69	1.375	-.082	-1.07	.107	.97	28A	O	L100
L122	2.253	.135	1.70	.122	.84	1.473	.016	.21	.099	.90	28P	O	L122
L126	2.096	-.022	-.27	.113	.78	1.421	-.036	-.47	.113	1.02	28C	O	L126
L151	2.280	.162	2.04	.228	1.58	1.860	.403	5.29	.235	2.13	28B	#	L151
L182	2.096	-.021	-.27	.130	.90	1.376	-.081	-1.06	.102	.93	28B	O	L182
L243	2.084	-.033	-.42	.094	.65	1.354	-.102	-1.34	.076	.69	28C	O	L243
L264	2.085	-.033	-.41	.211	1.46	1.405	-.052	-.68	.143	1.30	28B	O	L264
L265	2.034	-.084	-1.05	.134	.92	1.522	.065	.85	.116	1.06	28A	O	L265
L267	2.200	.082	1.03	.138	.96	1.554	.098	1.28	.084	.76	28B	O	L267
L280	2.219	.102	1.28	.285	1.97	1.554	.098	1.28	.091	.82	28B	O	L280
L312	2.565	.447	5.61	.139	.96	1.750	.293	3.85	.119	1.08	28B	#	L312
L318	2.464	.347	4.35	.108	.74	1.546	.089	1.17	.121	1.10	28A	#	L318
L324	2.020	-.098	-1.23	.083	.58	1.390	-.067	-.88	.079	.71	28P	O	L324
L336	2.124	.006	.08	.153	1.06	1.461	.005	.06	.165	1.49	28A	O	L336
L580	2.055	-.063	-.79	.164	1.43	1.415	-.042	-.55	.131	1.19	28C	O	L580
L581	2.208	.091	1.14	.128	.89	1.577	.120	1.58	.106	.96	28A	O	L581
L582	2.167	.050	.62	.171	1.18	1.517	.060	.79	.132	1.20	28A	O	L582
L676	2.645	.527	6.62	.170	1.17	2.090	.633	8.30	.506	4.59	28B	#	L676

GR. MEAN = 2.118 PERCENT GRAND MEAN = 1.457 PERCENT TEST DETERMINATIONS = 20

SD MEANS = .080 PERCENT SD OF MEANS = .076 PERCENT 14 LABS IN GRAND MEANS

AVERAGE SDR = .145 PERCENT AVERAGE SDR = .110 PERCENT

TOTAL NUMBER OF LABORATORIES REPORTING = 18

Best values: J15 2.15 ± 0.14 percent
K31 1.45 ± 0.12 percent

The following laboratories were omitted from the grand means because of extreme test results: 151, 312, 318, 676

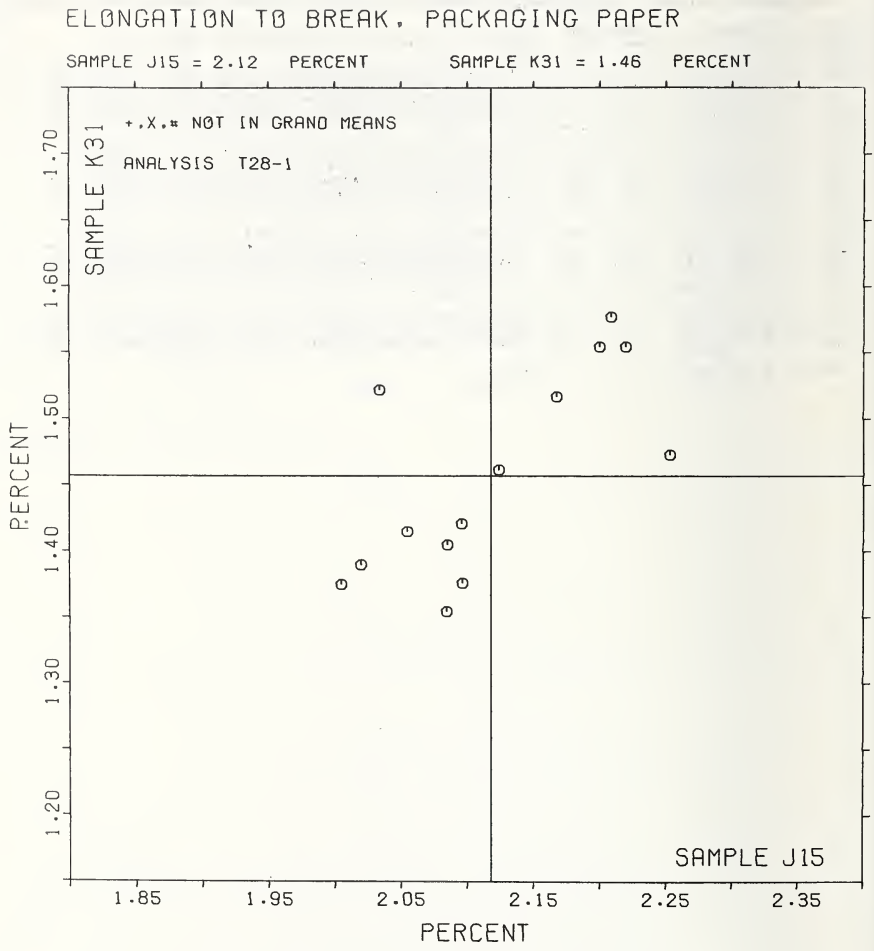
REPORT NO. 558 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T26-1 TABLE 2

ELONGATION TO BREAK, PERCENT - PACKAGING PAPER

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

LAB CODE	P	MEANS J15	MEANS K31	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L100	O	2.005	1.375	-.138	.017	.83	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/FLAT JAWS
L324	O	2.020	1.390	-.117	.018	.65	28P	ELONGATION,PACKAGING PAPER,LOAD CELL,PATTERNED PLAT JAWS
L265	O	2.034	1.522	-.016	.105	.99	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/PLAT JAWS
L580	O	2.055	1.415	-.074	.012	1.16	28C	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/LINE JAWS
L243	O	2.084	1.354	-.094	-.052	.67	28C	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/LINE JAWS
L264	O	2.085	1.405	-.059	-.015	1.38	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
L126	O	2.096	1.421	-.040	-.011	.90	28C	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/LINE JAWS
L182	O	2.096	1.376	-.071	-.044	.91	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/PLAT JAWS
L336	O	2.124	1.461	.008	-.001	1.28	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/PLAT JAWS
L582	O	2.167	1.517	.077	.010	1.19	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/FLAT JAWS
L267	O	2.200	1.554	.127	.015	.86	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
L581	O	2.208	1.577	.148	.025	.93	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/FLAT JAWS
L280	O	2.219	1.554	.141	.002	1.40	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
L122	O	2.253	1.473	.110	-.081	.87	28P	ELONGATION,PACKAGING PAPER,LOAD CELL,PATTERNED FLAT JAWS
L151	#	2.280	1.860	.394	.183	1.85	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
L318	#	2.464	1.546	.314	-.172	.92	28A	ELONGATION,PACKAGING PAPER,LOAD CELL,PLAT/FLAT JAWS
L312	#	2.565	1.750	.527	-.092	1.02	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
L676	#	2.645	2.090	.818	.101	2.88	28B	ELONGATION,PACKAGING PAPER,LOAD CELL,LINE/FLAT JAWS
GMEANS:		2.118	1.457			1.00		
		95% ELLIPSE:		.294	.125	WITH GAMMA = 43 DEGREES		


ELONGATION TO BREAK, PACKAGING PAPER
SAMPLE J15 = 2.12 PERCENT
SAMPLE K31 = 1.46 PERCENT
+,X,* NOT IN GRAND MEANS
ANALYSIS T28-1
SAMPLE K31
SAMPLE J15
PERCENT
PERCENT
1.70
1.60
1.50
1.40
1.30
1.20
1.85
1.95
2.05
2.15
2.25
2.35

REPORT NO. 558 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T29-1 TABLE 1

ELONGATION TO BREAK, PERCENT - PRINTING PAPER

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

LAB CODE	SAMPLE J04 MEAN	PRINTING 73 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J08 MEAN	PRINTING 65 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 20 VAR	F	LAB
L100	1.470	-.070	-.35	.142	1.19	1.855	.013	.07	.094	.63	29A	G	L100
L105	1.075	-.465	-2.32	.143	1.20	1.437	-.405	-2.22	.197	1.31	29A	G	L105
L122	1.560	.021	.10	.089	.74	1.912	.070	.39	.160	1.06	29P	G	L122
L141T	1.495	-.045	-.22	.107	.90	1.766	-.076	-.42	.140	.93	29D	G	L141T
L176	1.465	-.075	-.37	.179	1.50	1.914	.072	.40	.158	1.05	29B	G	L176
L185	1.454	-.086	-.43	.148	1.24	1.758	-.084	-.46	.111	.74	29C	G	L185
L190R	1.541	.001	.01	.091	.77	1.779	-.063	-.35	.168	1.12	29A	G	L190R
L255	1.785	.245	1.22	.081	.68	2.125	.283	1.55	.089	.59	29P	G	L255
L278	1.592	.052	.26	.132	1.11	1.945	.103	.57	.155	1.03	29A	G	L278
L309	1.778	.238	1.19	.160	1.35	2.042	.200	1.10	.114	.76	29A	G	L309
L318	1.712	.172	.86	.120	1.01	1.979	.137	.76	.157	1.05	29A	G	L318
L344	1.437	-.102	-.51	.138	1.15	1.662	-.180	-.99	.211	1.41	29A	G	L344
L372	1.246	-.294	-1.46	.067	.57	1.513	-.329	-1.81	.223	1.49	29B	G	L372
L378	1.920	.381	1.89	.152	1.28	1.974	.132	.73	.216	1.44	29A	*	L378
L442	1.657	.117	.58	.106	.89	1.987	.145	.80	.130	.87	29B	G	L442
L575	1.497	-.043	-.21	.116	.97	1.904	.062	.34	.131	.87	29A	G	L575
L587	1.460	-.080	-.40	.127	1.07	NO DATA REPORTED FOR SAMPLE J08					29C	M	L587
L592	1.492	-.047	-.24	.089	.75	1.759	-.083	-.45	.163	1.08	29D	G	L592

GR. MEAN = 1.540 PERCENT GRAND MEAN = 1.842 PERCENT TEST DETERMINATIONS = 20

SD MEANS = .201 PERCENT SD OF MEANS = .182 PERCENT 17 LABS IN GRAND MEANS

AVERAGE SDR = .119 PERCENT AVERAGE SDR = .150 PERCENT

L242	1.920	.380	1.89	.182	1.53	2.070	.228	1.25	.172	1.15	29R	*	L242
L484	1.460	-.080	-.40	.229	1.92	1.750	-.092	-.50	.238	1.58	29R	*	L484

TOTAL NUMBER OF LABORATORIES REPORTING = 20

Best values: J04 1.50 $\pm$ 0.28 percent
J08 1.86 $\pm$ 0.34 percent

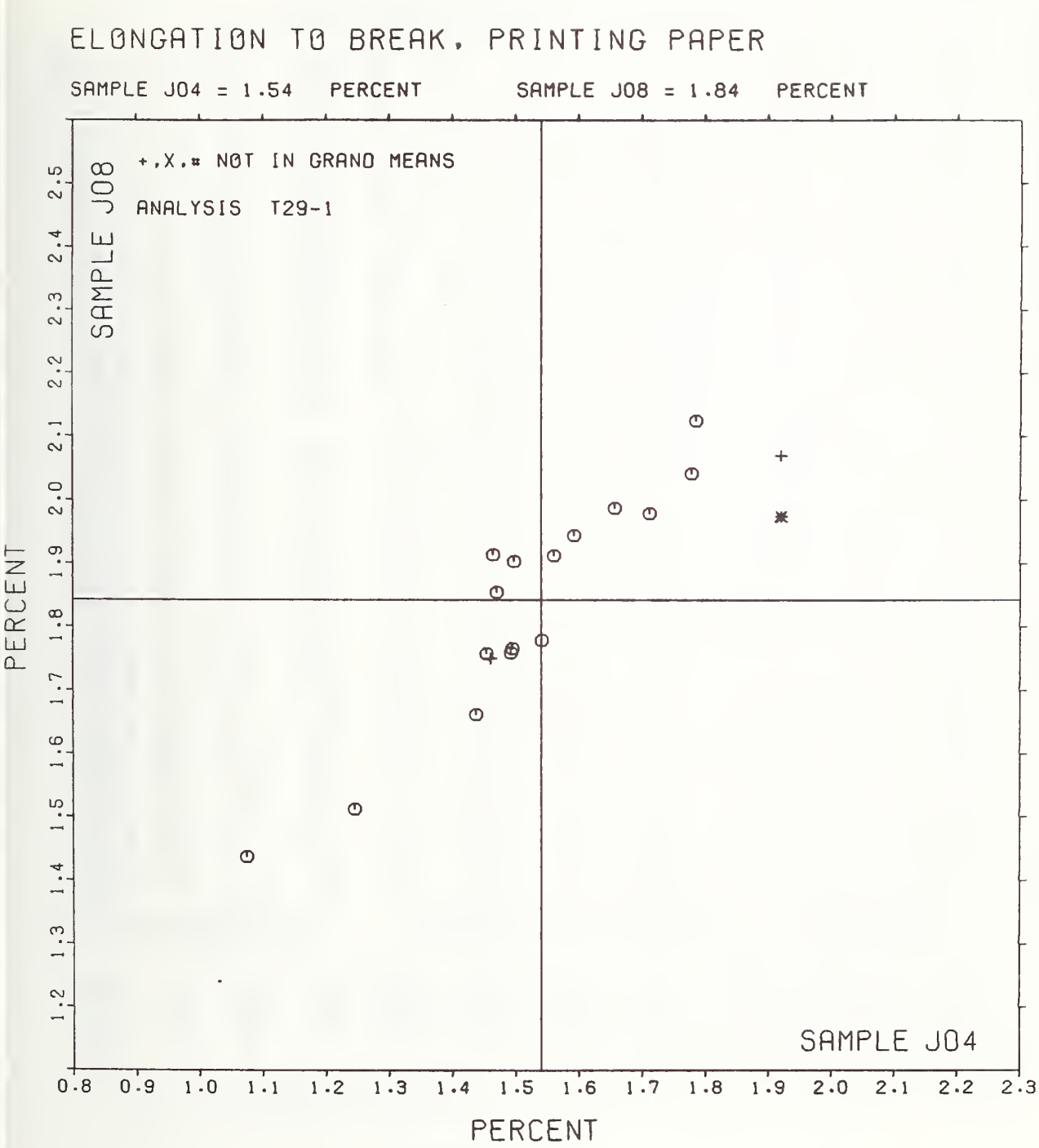
REPORT NO. 55S TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T29-1 TABLE 2

ELONGATION TO BREAK, PERCENT - PRINTING PAPER

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

LAB CODE	F	MEANS J04	MEANS J08	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L105	O	1.075	1.437	-.616	.009	1.25	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L372	O	1.246	1.513	-.439	-.049	1.03	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L344	O	1.437	1.662	-.196	-.065	1.28	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L185	O	1.454	1.758	-.120	-.005	.99	29C	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/LINE JAWS
L484	*	1.460	1.750	-.121	-.015	1.75	29R	ELONGATION,PRINTING PAPERS,PENDULUM, FLAT/FLAT JAWS
L587	M	1.460				1.07	29C	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/LINE JAWS
L176	O	1.465	1.914	-.008	.104	1.28	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L100	O	1.470	1.855	-.043	.056	.91	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L592	O	1.492	1.759	-.090	-.030	.92	29D	ELONGATION,PRINTING PAPERS,LOAD CELL,2-PIN STRAIN GAGE
L141T	O	1.495	1.766	-.084	-.026	.92	29D	ELONGATION,PRINTING PAPERS,LOAD CELL,2-PIN STRAIN GAGE
L575	O	1.497	1.904	.010	.074	.92	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L190E	O	1.541	1.779	-.041	-.048	.94	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L122	O	1.560	1.912	.062	.039	.90	29P	ELONGATION,PRINTING PAPERS,LOAD CELL,PATTERNED FLAT JAWS
L278	O	1.592	1.945	.108	.042	1.07	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L442	O	1.657	1.987	.184	.030	.88	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L318	O	1.712	1.979	.220	-.012	1.03	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L309	O	1.778	2.042	.311	-.010	1.05	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L255	O	1.785	2.125	.371	.047	.64	29P	ELONGATION,PRINTING PAPERS,LOAD CELL,PATTERNED FLAT JAWS
L242	*	1.920	2.070	.435	-.084	1.34	29R	ELONGATION,PRINTING PAPERS,PENDULUM, FLAT/FLAT JAWS
L378	*	1.920	1.974	.372	-.155	1.36	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
GMEANS:		1.540	1.842			1.00		
		95% ELLIPSE:		.740	.173	WITH GAMMA = 41 DEGREES		


ELONGATION TO BREAK, PRINTING PAPER
SAMPLE J04 = 1.54 PERCENT
SAMPLE J08 = 1.84 PERCENT
+,X,* NOT IN GRAND MEANS
ANALYSIS T29-1
SAMPLE J08
SAMPLE J04
PERCENT
PERCENT
0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5

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

LAB CODE	SAMPLE J29 MEAN	PRINTING 102 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J31 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L100M	16.4	-7.9	-1.13	4.3	.46	69.1	-3.9	-.26	12.5	.70	30M	G	L100M
L100N	15.9	-8.4	-1.20	2.4	.26	77.3	4.3	.29	8.0	.45	30N	G	L100N
L105	22.2	-2.1	-.29	14.8	1.59	75.2	2.3	.15	9.3	.52	30M	G	L105
L121	24.5	.2	.03	21.0	2.24	78.6	5.7	.38	15.1	.84	30M	G	L121
L122	31.8	7.5	1.08	21.5	2.30	68.5	-4.4	-.29	35.3	1.97	30M	G	L122
L124	28.9	4.7	.67	19.0	2.03	62.7	-10.2	-.68	10.7	.60	30N	G	L124
L150	30.6	6.3	.91	17.9	1.91	80.4	7.5	.50	22.4	1.26	30M	G	L150
L159	38.9	14.6	2.09	25.5	2.72	85.4	12.5	.83	21.0	1.17	30N	G	L159
L162	22.7	-1.6	-.23	12.5	1.33	64.8	-8.1	-.54	22.3	1.24	30M	G	L162
L163	30.7	6.4	.92	10.4	1.11	55.3	-17.7	-1.17	19.1	1.07	30N	G	L163
L176	27.0	2.7	.39	5.0	.54	67.9	-5.0	-.33	13.8	.77	30N	G	L176
L182M	28.5	4.3	.61	22.2	2.37	92.9	19.9	1.32	19.6	1.09	30M	G	L182M
L185	23.9	-.4	-.06	7.5	.80	81.5	8.5	.57	15.7	.88	30N	G	L185
L190C	29.3	5.0	.72	4.5	.48	72.1	-.8	-.05	18.7	1.05	30N	G	L190C
L212	18.8	-5.5	-.78	5.2	.56	62.3	-10.6	-.70	11.4	.64	30M	G	L212
L223F	21.2	-3.1	-.44	9.0	.97	73.7	.8	.05	16.8	.94	30M	G	L223F
L230	19.5	-4.8	-.69	5.9	.63	64.9	-8.0	-.53	22.0	1.23	30N	G	L230
L232	28.0	3.7	.54	7.7	.82	92.9	19.9	1.32	31.6	1.77	30N	G	L232
L236	18.3	-6.0	-.86	5.3	.57	80.4	7.5	.50	11.2	.63	30N	G	L236
L238A	21.2	-3.1	-.44	6.0	.64	62.8	-10.1	-.67	25.1	1.40	30N	G	L238A
L238B	16.0	-8.3	-1.18	5.0	.53	58.0	-14.9	-.99	13.2	.74	30D	G	L238B
L243	24.3	.0	.00	7.5	.80	93.2	20.3	1.34	18.5	1.03	30D	G	L243
L254	13.4	-10.9	-1.56	4.3	.46	47.2	-25.7	-1.71	11.9	.66	30M	G	L254
L262	20.1	-4.1	-.59	6.0	.64	70.3	-2.6	-.17	14.6	.82	30N	G	L262
L275	18.7	-5.6	-.80	5.9	.63	92.9	20.0	1.33	21.2	1.19	30N	G	L275
L278	15.6	-8.7	-1.24	2.8	.30	48.1	-24.9	-1.65	12.7	.71	30C	G	L278
L279	20.3	-4.0	-.57	8.4	.90	50.6	-22.3	-1.48	30.7	1.72	30N	G	L279
L285A	23.9	-.3	-.05	7.4	.79	81.5	8.6	.57	17.3	.97	30N	G	L285A
L285B	22.4	-1.9	-.27	7.7	.82	92.1	19.2	1.27	30.9	1.73	30N	G	L285B
L299	20.8	-3.5	-.49	6.2	.66	79.1	6.1	.41	17.4	.97	30N	G	L299
L320	43.1	18.9	2.71	33.7	3.61	83.8	10.8	.72	26.2	1.47	30N	*	L320
L326N	16.3	-7.9	-1.13	4.7	.50	43.7	-29.2	-1.94	14.7	.82	30N	G	L326N
L339	18.9	-5.3	-.76	4.8	.52	69.0	-3.9	-.26	13.4	.75	30N	G	L339
L366A	25.7	1.5	.21	6.8	.73	74.0	1.1	.07	25.4	1.42	30N	G	L366A
L376	16.1	-8.2	-1.17	4.5	.48	56.1	-16.9	-1.12	10.8	.60	30N	G	L376
L378	23.2	-1.1	-.15	5.7	.61	93.9	20.9	1.39	14.9	.83	30N	G	L378
L388	22.8	-1.5	-.21	5.2	.55	86.3	13.3	.88	12.5	.70	30N	G	L388
L390	25.7	1.4	.20	14.3	1.53	72.7	-.2	-.01	29.3	1.64	30N	G	L390
L393	17.3	-6.9	-.99	3.5	.38	61.1	-11.9	-.79	18.4	1.03	30M	G	L393
L396M	33.1	8.9	1.27	7.7	.83	113.5	40.5	2.69	24.3	1.36	30N	*	L396M
L565	28.0	3.7	.54	13.7	1.47	59.4	-13.5	-.90	13.5	.75	30N	G	L565
L589	35.2	10.9	1.57	22.7	2.43	62.1	-10.8	-.72	9.1	.51	30N	G	L589
L599	27.1	2.9	.41	8.8	.94	91.1	18.2	1.21	21.1	1.18	30C	G	L599
L622	51.1	26.8	3.84	33.6	3.60	86.9	14.0	.93	26.1	1.46	30M	X	L622
L670	40.9	16.7	2.39	32.4	3.47	60.8	-12.1	-.81	22.5	1.26	30N	*	L670
L182S	25.8	1.5	.22	27.8	2.98	148.9	76.0	5.04	44.7	2.50	30S	*	L182S
L190D	26.7	2.5	.36	6.9	.74	158.0	85.1	5.65	40.1	2.24	30S	*	L190D
L280	15.8	-8.5	-1.21	4.0	.43	49.8	-23.1	-1.54	15.3	.86	30K	*	L280
L326S	22.3	-2.0	-.28	6.0	.64	120.3	47.3	3.14	32.8	1.83	30S	*	L326S
L396S	23.3	-1.0	-.14	3.7	.39	29.9	-43.1	-2.86	6.8	.38	30T	*	L396S

GR. MEAN = 24.3 DOUBLE FOLDS — GRAND MEAN = 72.9 DOUBLE FOLDS — TEST DETERMINATIONS = 15
SD MEANS = 7.0 DOUBLE FOLDS — SD OF MEANS = 15.1 DOUBLE FOLDS — 44 LABS IN GRAND MEANS
AVERAGE SDR = 9.3 DOUBLE FOLDS — AVERAGE SDR = 17.9 DOUBLE FOLDS

TOTAL NUMBER OF LABORATORIES REPORTING = 50

Best values: J29 23 double folds
J31 75 double folds

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.

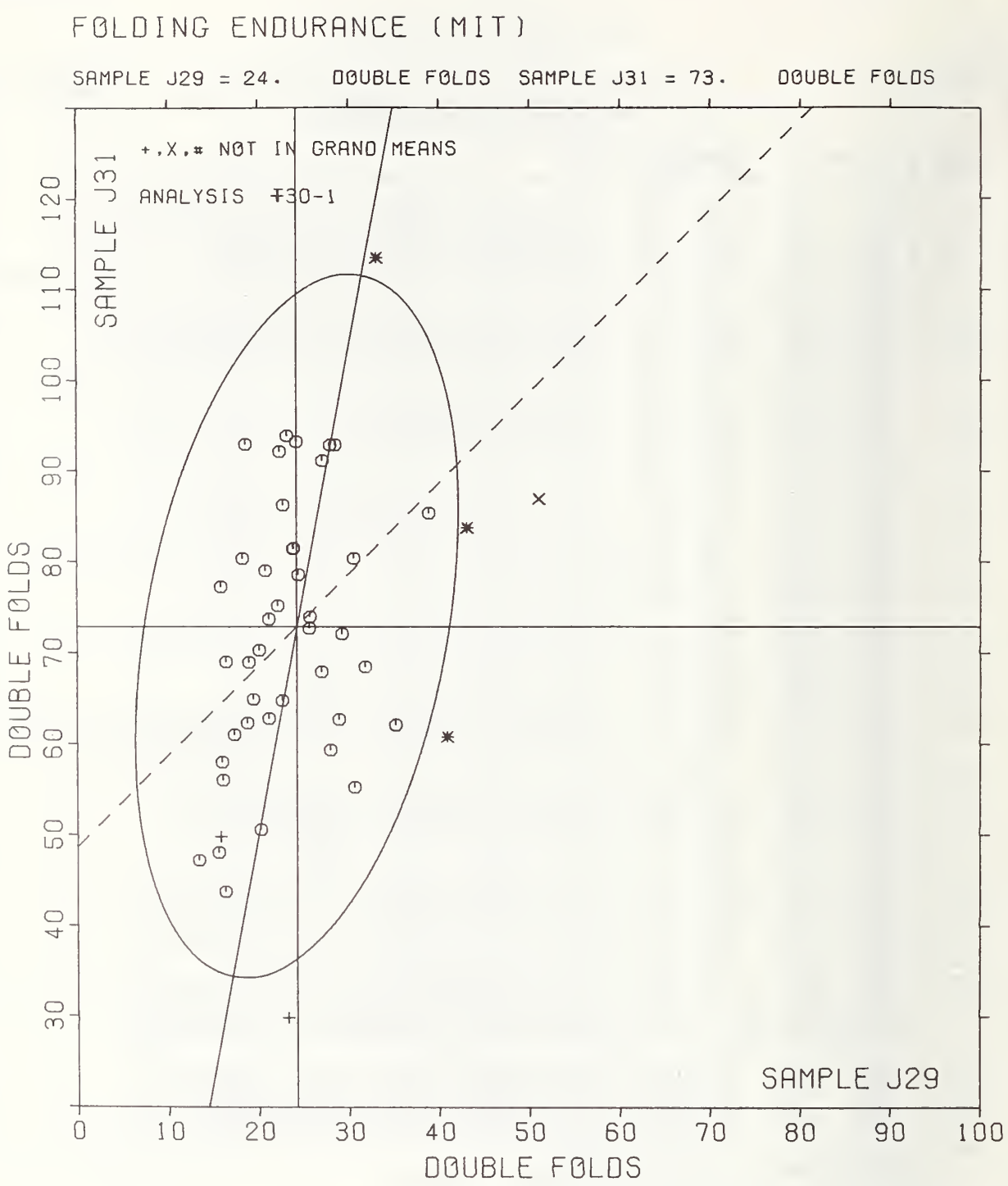
Please see page 43 of this report for a demonstration of this proposal.

REPORT NO. 55S

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

SEPTEMBER 1978

LAB CODE	F	MEANS J29	MEANS J31	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L254	O	13.4	47.2	-27.3	5.9	.56	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L278	O	15.6	48.1	-26.0	3.9	.51	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L280	*	15.8	49.8	-24.3	4.1	.64	30K	FOLDING ENDURANCE, KOEHLER-MOLIN
L100N	O	15.9	77.3	2.7	9.0	.35	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L238B	O	16.0	58.0	-16.2	5.4	.63	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L376	O	16.1	56.1	-18.1	5.0	.54	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L326N	O	16.3	43.7	-30.2	2.4	.66	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100M	O	16.4	69.1	-5.2	7.0	.58	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L393	O	17.3	61.1	-12.9	4.6	.70	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L236	O	18.3	80.4	6.2	7.3	.60	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L275	O	18.7	92.9	18.6	9.2	.91	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L212	O	18.8	62.3	-11.4	3.4	.60	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L339	O	18.9	69.0	-4.8	4.5	.63	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L230	O	19.5	64.9	-8.7	3.2	.93	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L262	O	20.1	70.3	-3.3	3.6	.73	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L279	O	20.3	50.6	-22.7	-.2	1.31	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L299	O	20.8	79.1	5.4	4.5	.82	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L223F	O	21.2	73.7	.2	3.1	.95	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L238A	O	21.2	62.8	-10.5	1.1	1.02	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L105	O	22.2	75.2	1.8	2.4	1.05	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L326S	*	22.3	120.3	46.2	10.6	1.24	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L285B	O	22.4	92.1	18.5	5.3	1.28	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L162	O	22.7	64.8	-8.3	.1	1.29	30M	FOLDING ENDURANCE, MIT, WITE CENTRIFUGAL FAN
L388	O	22.8	86.3	12.8	3.9	.63	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L378	O	23.2	93.9	20.4	4.9	.72	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396S	*	23.3	29.9	-42.5	-6.9	.39	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L185	O	23.9	81.5	8.3	1.9	.84	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L285A	O	23.9	81.5	8.4	1.9	.88	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L243	O	24.3	93.2	19.9	3.7	.92	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L121	O	24.5	78.6	5.6	.8	1.54	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L390	O	25.7	72.7	.1	-1.4	1.58	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L366A	O	25.7	74.0	1.3	-1.3	1.07	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L182S	*	25.8	148.9	75.0	12.4	2.74	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L190D	*	26.7	158.0	84.1	13.2	1.49	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L176	O	27.0	67.9	-4.4	-3.6	.65	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L599	O	27.1	91.1	18.4	.5	1.06	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L232	O	28.0	92.9	20.3	-.0	1.29	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L565	O	28.0	59.4	-12.6	-6.2	1.11	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L182M	O	28.5	92.9	20.4	-.6	1.73	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L124	O	28.9	62.7	-9.2	-6.5	1.32	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L190C	O	29.3	72.1	.1	-5.1	.76	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L150	O	30.6	80.4	8.5	-4.9	1.58	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L163	O	30.7	55.3	-16.2	-9.5	1.09	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L122	O	31.8	68.5	-2.9	-8.2	2.13	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L396M	*	33.1	113.5	41.5	-1.3	1.09	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L589	O	35.2	62.1	-8.6	-12.7	1.47	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L159	O	38.9	85.4	14.9	-12.1	1.95	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L670	*	40.9	60.8	-8.9	-18.6	2.36	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L320	*	43.1	83.8	14.1	-16.6	2.54	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L622	X	51.1	86.9	18.7	-23.8	2.53	30M	FOLDING ENDURANCE, MIT, WITE CENTRIFUGAL FAN
GMEANS:		24.3	72.9			1.00		
		95% ELLIPSE:		39.2	16.7	WITH GAMMA = 79 DEGREES		


FOLDING ENDURANCE (MIT)
SAMPLE J29 = 24. DOUBLE FOLDS
SAMPLE J31 = 73. DOUBLE FOLDS
+,X,* NOT IN GRAND MEANS
ANALYSIS #30-1
SAMPLE J31
DOUBLE FOLDS
SAMPLE J29
DOUBLE FOLDS
0
10
20
30
40
50
60
70
80
90
100
110
120

ANALYSIS T30-2 TABLE 1
FOLDING ENDURANCE (MIT)
DATA IS LOG(BASE 10) OF THE DOUBLE FOLD MEASUREMENT

LAB CODE	SAMPLE J29 MEAN	PRINTING 102 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J31 MEAN	PRINTING 86 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L100M	1.202	-.141	-1.26	.110	.71	1.833	-.006	-.06	.078	.66	30M	@	L100M
L100N	1.196	-.147	-1.31	.066	.42	1.886	.047	.49	.044	.38	30N	@	L100N
L105	1.291	-.051	-.46	.207	1.33	1.873	.034	.36	.053	.45	30M	@	L105
L121	1.296	-.046	-.41	.264	1.70	1.888	.049	.50	.088	.75	30M	@	L121
L122	1.429	.087	.78	.254	1.64	1.760	-.078	-.81	.295	2.51	30M	@	L122
L124	1.392	.050	.45	.242	1.56	1.791	-.047	-.49	.077	.65	30N	@	L124
L150	1.428	.085	.76	.226	1.46	1.888	.050	.51	.128	1.09	30M	@	L150
L159	1.523	.181	1.62	.234	1.50	1.919	.081	.83	.107	.91	30N	@	L159
L162	1.307	-.036	-.32	.203	1.31	1.785	-.053	-.55	.162	1.38	30M	@	L162
L163	1.467	.124	1.11	.131	.84	1.718	-.121	-1.25	.152	1.30	30N	@	L163
L176	1.424	.082	.73	.081	.52	1.823	-.015	-.16	.091	.78	30N	@	L176
L182M	1.389	.047	.42	.219	1.41	1.959	.121	1.25	.088	.75	30M	@	L182M
L185	1.356	.014	.12	.145	.93	1.903	.064	.67	.087	.74	30N	@	L185
L190C	1.461	.119	1.07	.068	.44	1.847	.008	.08	.100	.85	30N	@	L190C
L212	1.259	-.084	-.75	.121	.78	1.788	-.051	-.52	.078	.67	30M	@	L212
L223F	1.303	-.040	-.35	.134	.86	1.858	.019	.20	.095	.81	30M	@	L223F
L230	1.270	-.072	-.64	.135	.87	1.792	-.046	-.48	.132	1.13	30N	@	L230
L232	1.433	.091	.82	.110	.71	1.931	.092	.95	.210	1.78	30N	@	L232
L236	1.246	-.096	-.86	.116	.75	1.901	.063	.65	.059	.50	30N	@	L236
L238A	1.309	-.033	-.30	.127	.82	1.761	-.078	-.81	.195	1.66	30N	@	L238A
L238B	1.183	-.159	-1.43	.145	.93	1.752	-.087	-.90	.109	.93	30D	@	L238B
L243	1.368	.026	.23	.123	.79	1.962	.123	1.27	.085	.73	30D	@	L243
L254	1.104	-.238	-2.13	.150	.96	1.662	-.177	-1.83	.105	.89	30M	@	L254
L262	1.286	-.056	-.50	.128	.82	1.839	.000	.00	.086	.73	30N	@	L262
L275	1.253	-.089	-.80	.126	.81	1.957	.118	1.22	.105	.90	30N	@	L275
L278	1.186	-.156	-1.40	.080	.52	1.668	-.171	-1.77	.113	.97	30C	@	L278
L279	1.275	-.067	-.60	.168	1.08	1.621	-.217	-2.25	.289	2.46	30N	@	L279
L285A	1.361	.018	.17	.129	.83	1.898	.059	.61	.123	1.05	30N	@	L285A
L285B	1.329	-.014	-.12	.140	.90	1.937	.098	1.01	.169	1.44	30N	@	L285B
L299	1.299	-.043	-.39	.135	.87	1.887	.048	.50	.107	.91	30N	@	L299
L320	1.519	.176	1.58	.319	2.06	1.897	.058	.60	.170	1.45	30N	@	L320
L326N	1.197	-.145	-1.30	.119	.77	1.620	-.219	-2.27	.138	1.18	30N	@	L326N
L339	1.264	-.078	-.70	.110	.71	1.832	-.007	-.07	.081	.69	30N	@	L339
L366A	1.395	.053	.47	.124	.80	1.847	.008	.09	.142	1.21	30N	@	L366A
L376	1.189	-.153	-1.37	.126	.81	1.742	-.097	-1.00	.078	.66	30N	@	L376
L378	1.353	.011	.10	.107	.69	1.967	.129	1.33	.070	.60	30N	@	L378
L388	1.348	.005	.05	.097	.63	1.932	.093	.96	.061	.52	30N	@	L388
L390	1.369	.027	.24	.177	1.14	1.834	-.005	-.05	.155	1.32	30N	@	L390
L393	1.230	-.112	-1.00	.089	.57	1.765	-.074	-.76	.142	1.21	30M	@	L393
L396M	1.509	.166	1.49	.106	.68	2.046	.207	2.15	.089	.76	30N	@	L396M
L565	1.405	.063	.56	.190	1.23	1.763	-.076	-.78	.101	.86	30N	@	L565
L589	1.466	.124	1.11	.268	1.73	1.789	-.050	-.52	.065	.56	30N	@	L589
L599	1.412	.070	.63	.141	.91	1.949	.110	1.14	.099	.84	30C	@	L599
L622	1.634	.292	2.61	.254	1.63	1.918	.079	.82	.150	1.28	30M	*	L622
L670	1.487	.145	1.30	.341	2.20	1.755	-.083	-.86	.166	1.41	30N	@	L670

GR. MEAN = 1.342 LOG(10) FOLD — GRAND MEAN = 1.839 LOG(10) FOLD — TEST DETERMINATIONS = 15
SD MEANS = .112 LOG(10) FOLD — SD OF MEANS = .097 LOG(10) FOLD — 45 LABS IN GRAND MEANS
AVERAGE SDR = .155 LOG(10) FOLD — AVERAGE SDR = .117 LOG(10) FOLD

L182S	1.312	-.031	-.27	.251	1.61	2.154	.316	3.27	.133	1.13	30S	*	L182S
L190D	1.412	.070	.63	.120	.77	2.185	.346	3.58	.113	.97	30S	*	L190D
L280	1.185	-.157	-1.41	.113	.73	1.670	-.169	-1.74	.177	1.51	30K	*	L280
L326S	1.332	-.010	-.09	.122	.79	2.063	.224	2.32	.131	1.11	30S	*	L326S
L396S	1.362	.019	.17	.068	.44	1.464	-.374	-3.87	.101	.86	30T	*	L396S

TOTAL NUMBER OF LABORATORIES REPORTING = 50

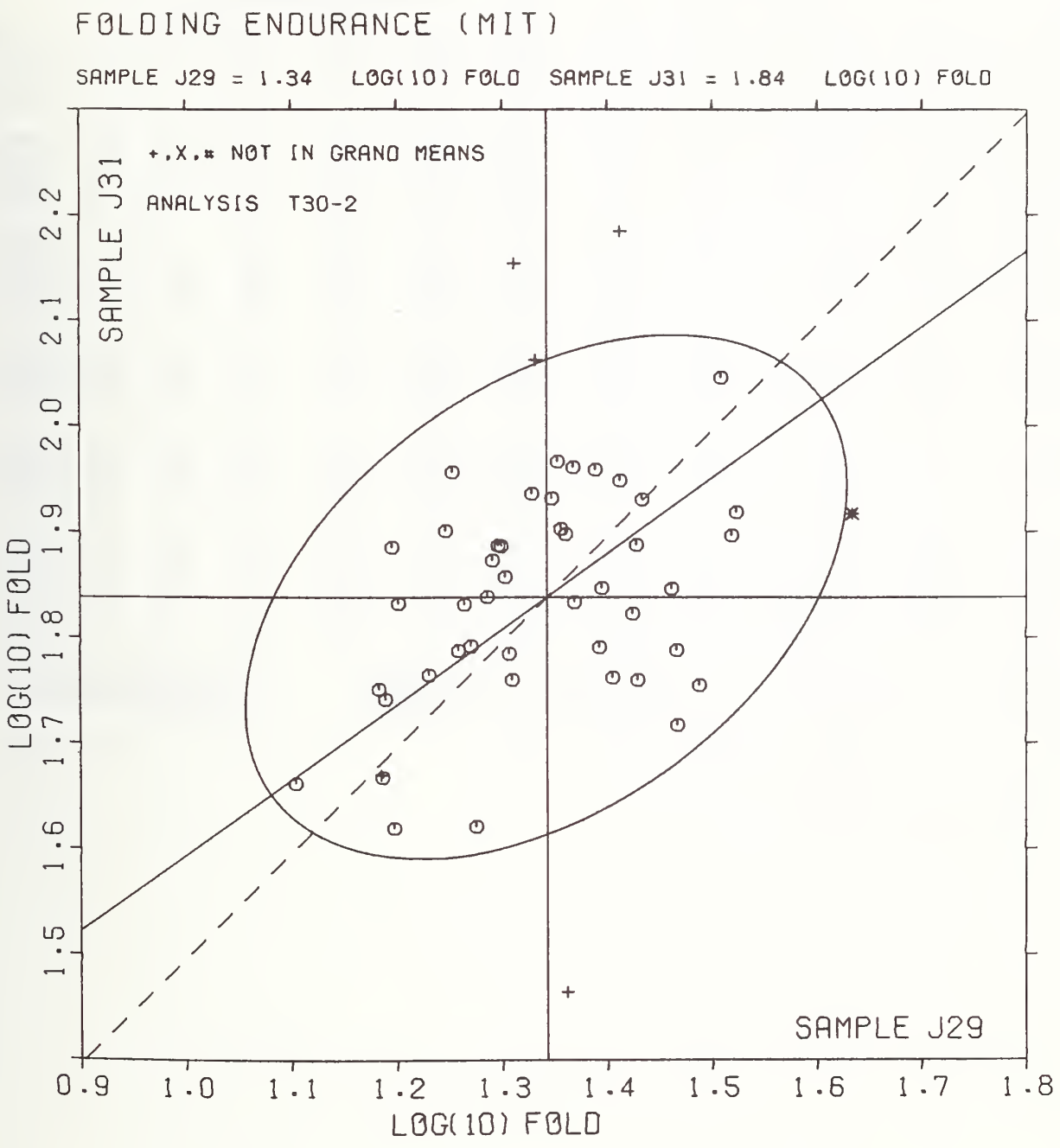
The ISO (International Standards Organization) is proposing that MIT folding endurance be reported as the logarithm (to the base 10) of the double fold instead of the double fold as in the past.

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"

ANALYSIS T30-2 TABLE 2
FOLDING ENDURANCE (MIT)
DATA IS LOG(BASE 10) OF THE DOUBLE FOLD MEASUREMENT

LAB CODE	F	MEANS J29	J31	COORDINATES MAJOR	MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L254	O	1.104	1.662	-.296	-.006	.93 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L238E	O	1.183	1.752	-.180	.022	.93 30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L280	*	1.185	1.670	-.226	-.046	1.12 30K	FOLDING ENDURANCE, KOEHLER-MOLIN
L278	O	1.186	1.668	-.226	-.048	.74 30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L376	O	1.189	1.742	-.181	.010	.74 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100N	O	1.196	1.886	-.092	.124	.40 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L326N	O	1.197	1.620	-.245	-.094	.97 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100M	O	1.202	1.833	-.118	.077	.69 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L393	O	1.230	1.765	-.134	.005	.89 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L236	O	1.246	1.901	-.042	.107	.62 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L275	O	1.253	1.957	-.004	.148	.85 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L212	O	1.259	1.788	-.098	.008	.72 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L339	O	1.264	1.832	-.068	.040	.70 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L230	O	1.270	1.792	-.086	.004	1.00 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L279	O	1.275	1.621	-.181	-.138	1.77 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L262	O	1.286	1.839	-.046	.033	.78 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L105	O	1.291	1.873	-.022	.058	.89 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L121	O	1.296	1.888	-.009	.066	1.22 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L295	O	1.299	1.887	-.007	.064	.89 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L223F	O	1.303	1.858	-.021	.039	.84 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L162	O	1.307	1.785	-.060	-.023	1.34 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L238A	O	1.309	1.761	-.072	-.044	1.24 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L182S	*	1.312	2.154	.159	.275	1.37 30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L285E	O	1.329	1.937	.046	.088	1.17 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L326S	*	1.332	2.063	.122	.188	.95 30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L388	O	1.348	1.932	.058	.073	.57 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L378	O	1.353	1.967	.084	.098	.64 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L185	O	1.356	1.903	.049	.044	.84 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L285A	O	1.361	1.898	.049	.037	.94 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396S	*	1.362	1.464	-.202	-.316	.65 30T	FOLDING ENDURANCE, SCHOPPER, TMI
L243	O	1.368	1.962	.092	.085	.76 30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L390	O	1.369	1.834	.019	-.019	1.23 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L182M	O	1.389	1.959	.108	.071	1.08 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L124	O	1.392	1.791	.013	-.068	1.10 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L366A	O	1.395	1.847	.048	-.024	1.00 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L565	O	1.405	1.763	.007	-.098	1.04 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L599	O	1.412	1.949	.121	.049	.87 30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L190D	*	1.412	2.185	.258	.241	.87 30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L176	O	1.424	1.823	.058	-.060	.65 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L150	O	1.428	1.888	.098	-.009	1.27 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L122	O	1.429	1.760	.025	-.114	2.07 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L232	O	1.433	1.931	.128	.022	1.25 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L190C	O	1.461	1.847	.101	-.063	.64 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L589	O	1.466	1.789	.072	-.112	1.14 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L163	O	1.467	1.718	.031	-.171	1.07 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L670	O	1.487	1.755	.070	-.152	1.81 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396M	O	1.509	2.046	.256	.072	.72 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L320	O	1.519	1.897	.177	-.055	1.75 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L159	O	1.523	1.919	.194	-.040	1.21 30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L622	*	1.634	1.918	.283	-.105	1.46 30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
GMEANS:		1.342	1.839			1.00	
		95% ELLIPSE:		.322	.200	WITH GAMMA = 35 DEGREES	


FOLDING ENDURANCE (MIT)
SAMPLE J29 = 1.34 LOG(10) FOLD SAMPLE J31 = 1.84 LOG(10) FOLD
+,X,* NOT IN GRAND MEANS
ANALYSIS T30-2
SAMPLE J31
LOG(10) FOLD
SAMPLE J29
LOG(10) FOLD
0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8
1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2

ANALYSIS T35-1 TABLE 1

GURLEY STIFFNESS

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

LAB CODE	SAMPLE H69 MEAN	PRINTING 96 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J25 MEAN	PRINTING 103 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 10 VAR	F	LAB
L100	445.	-7.	-.24	15.	.71	244.	3.	.17	10.	.72	350	6	L100
L121	498.	46.	1.68	15.	.71	268.	26.	1.57	15.	1.09	350	6	L121
L132	396.	-56.	-2.01	25.	1.18	236.	-6.	-.34	8.	.63	350	*	L132
L139	442.	-10.	-.35	12.	.60	250.	8.	.48	17.	1.26	350	6	L139
L148	445.	-6.	-.22	16.	.78	236.	-5.	-.32	15.	1.14	350	6	L148
L159	437.	-15.	-.53	19.	.93	229.	-13.	-.77	16.	1.15	350	6	L159
L162	5.	-447.	-16.14	0.	.01	5.	-237.	-14.13	0.	.02	350	#	L162
L163	442.	-10.	-.34	37.	1.78	227.	-14.	-.85	23.	1.68	350	6	L163
L183	517.	66.	2.38	31.	1.50	268.	26.	1.55	16.	1.17	350	6	L183
L190C	394.	-57.	-2.07	15.	.74	195.	-47.	-2.78	12.	.91	350	*	L190C
L195	493.	42.	1.50	36.	1.75	276.	34.	2.03	13.	.99	350	6	L195
L212	448.	-3.	-.11	30.	1.44	252.	10.	.60	10.	.71	350	6	L212
L223	433.	-18.	-.66	15.	.71	230.	-11.	-.67	8.	.62	350	6	L223
L224	470.	19.	.67	17.	.79	252.	10.	.59	18.	1.37	350	6	L224
L232	473.	21.	.76	19.	.90	235.	-6.	-.38	12.	.89	350	6	L232
L236	415.	-36.	-1.30	28.	1.36	207.	-34.	-2.06	11.	.82	350	6	L236
L249	458.	7.	.24	28.	1.34	249.	8.	.47	14.	1.04	350	6	L249
L254	411.	-41.	-1.46	15.	.70	222.	-20.	-1.19	6.	.46	350	6	L254
L260	444.	-8.	-.27	14.	.67	244.	2.	.11	5.	.38	350	6	L260
L285	435.	-16.	-.58	23.	1.12	261.	20.	1.18	11.	.83	350	6	L285
L291	463.	12.	.42	19.	.93	246.	4.	.23	23.	1.67	350	6	L291
L308	461.	9.	.33	35.	1.67	237.	-4.	-.27	14.	1.02	350	6	L308
L356	443.	-8.	-.30	22.	1.06	226.	-16.	-.96	8.	.57	350	6	L356
L376	469.	17.	.61	18.	.85	245.	3.	.20	23.	1.72	350	6	L376
L378	443.	-9.	-.31	18.	.85	237.	-5.	-.28	25.	1.85	350	6	L378
L382	467.	15.	.55	21.	.99	247.	5.	.30	13.	.98	350	6	L382
L390	460.	8.	.29	27.	1.30	242.	0.	.01	9.	.68	350	6	L390
L396	445.	-7.	-.24	15.	.70	248.	7.	.40	9.	.69	350	6	L396
L600	465.	13.	.48	12.	.57	245.	4.	.21	8.	.56	350	6	L600
L648	489.	38.	1.37	13.	.60	252.	11.	.64	6.	.43	350	6	L648
L650	443.	-9.	-.31	14.	.68	244.	2.	.11	20.	1.50	350	6	L650

GR. MEAN = 452. GURLEY UNITS GRAND MEAN = 242. GURLEY UNITS TEST DETERMINATIONS = 10

SD MEANS = 28. GURLEY UNITS SD OF MEANS = 17. GURLEY UNITS 30 LABS IN GRAND MEANS

AVERAGE SDR = 21. GURLEY UNITS AVERAGE SDR = 13. GURLEY UNITS

L213	477.	26.	.94	31.	1.51	235.	-7.	-.41	9.	.67	35H	*	L213

TOTAL NUMBER OF LABORATORIES REPORTING = 32

Best values: H69 450 ± 50 Gurley units
J25 240 ± 30 Gurley units

Data from the following laboratories appear to be off by a multiplicative factor: 162

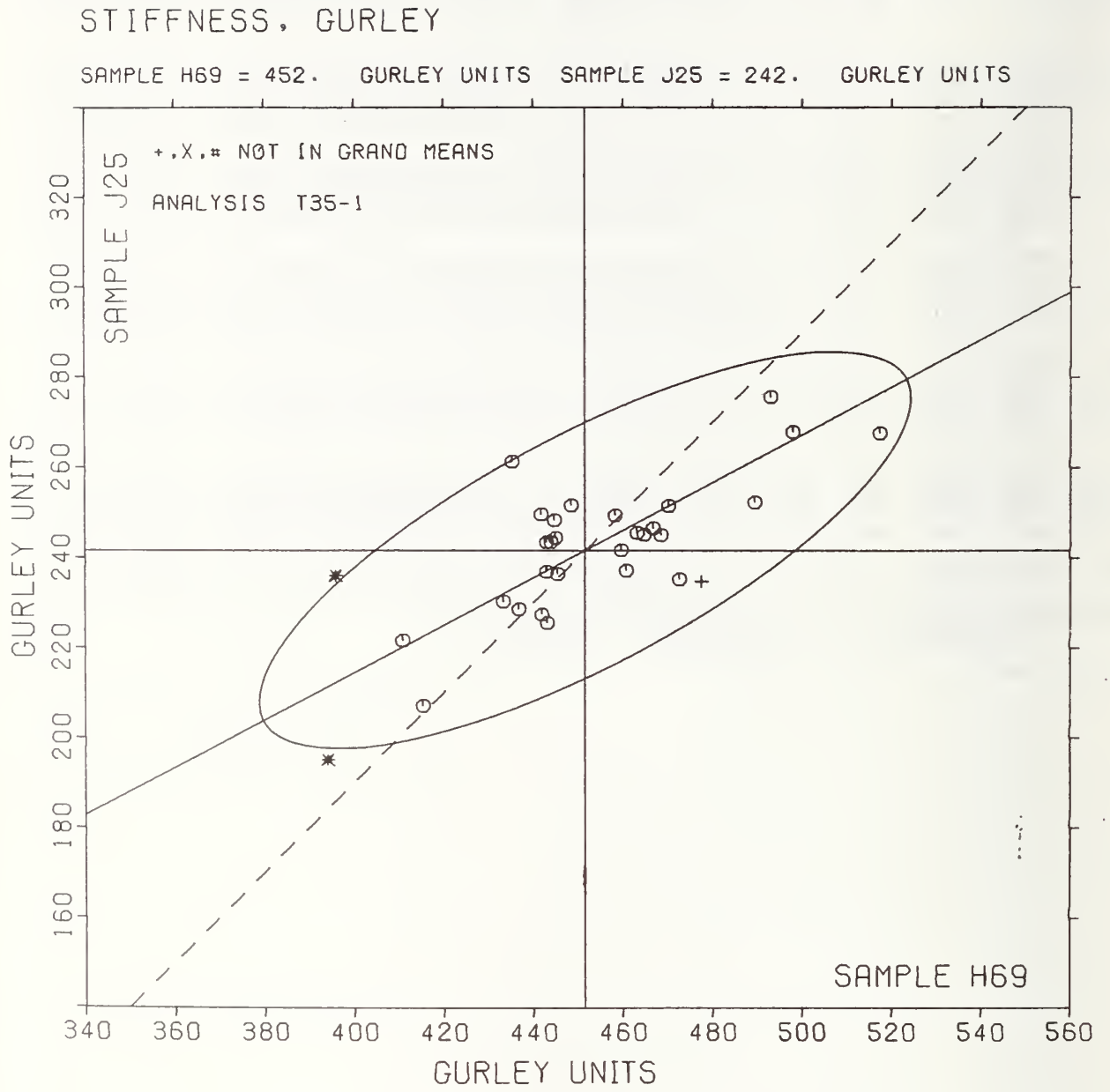
REPORT NO. 558 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T35-1 TABLE 2

GURLEY STIFFNESS

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

LAB CODE	P	MEANS H69	MEANS J25	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L162	#	5.	5.	-506.	-1.	.01	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L190C	*	394.	195.	-72.	-14.	.83	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L132	*	396.	236.	-52.	21.	.90	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L254	6	411.	222.	-45.	1.	.58	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L236	6	415.	207.	-48.	-14.	1.09	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L223	6	433.	230.	-21.	-2.	.66	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L285	6	435.	261.	-5.	25.	.97	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L159	6	437.	229.	-19.	-5.	1.04	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L139	6	442.	250.	-5.	12.	.93	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L163	6	442.	227.	-15.	-8.	1.73	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L650	6	443.	244.	-7.	6.	1.09	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L378	6	443.	237.	-10.	-0.	1.35	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L356	6	443.	226.	-15.	-10.	.81	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L260	6	444.	244.	-6.	5.	.52	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L396	6	445.	248.	-3.	9.	.69	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L100	6	445.	244.	-4.	6.	.71	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L148	6	445.	236.	-8.	-2.	.96	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L212	6	448.	252.	2.	10.	1.08	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L249	6	458.	249.	10.	4.	1.19	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L390	6	460.	242.	7.	-4.	.99	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L308	6	461.	237.	6.	-8.	1.35	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L291	6	463.	246.	12.	-2.	1.30	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L600	6	465.	245.	13.	-3.	.57	35G	STIPPNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L382	6	467.	247.	16.	-3.	.99	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L376	6	469.	245.	17.	-5.	1.29	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L224	6	470.	252.	21.	0.	1.08	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L232	6	473.	235.	16.	-15.	.90	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L213	*	477.	235.	20.	-18.	1.09	35H	STIPFNESS, GURLEY (UNITS: MG/1X3 TEST PIECE), 20 C, 65% RH
L648	6	489.	252.	39.	-8.	.52	35G	STIPFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L195	6	493.	276.	53.	11.	1.37	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L121	6	498.	268.	53.	2.	.90	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L183	6	517.	268.	70.	-8.	1.34	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
GMEANS:		452.	242.			1.00		
		95% ELLIPSE:		81.	25.	WITH GAMMA = 27 DEGREES		


STIFFNESS, GURLEY
SAMPLE H69 = 452. GURLEY UNITS SAMPLE J25 = 242. GURLEY UNITS
+,X,* NOT IN GRAND MEANS
ANALYSIS T35-1
SAMPLE J25
GURLEY UNITS
160 180 200 220 240 260 280 300 320
340 360 380 400 420 440 460 480 500 520 540 560
GURLEY UNITS
SAMPLE H69

ANALYSIS T36-1 TABLE 1

TABER STIFFNESS

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

LAB CODE	SAMPLE J10 149 GRAMS PER SQUARE METER PRINTING MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE J69 149 GRAMS PER SQUARE METER PRINTING MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.F. 10 VAR	F	LAB
L107A	16.63	.11	.10	1.18	1.56	6.52	.56	.55	.17	.49	36T	0	L107A
L122	15.76	-.76	-.75	.54	.72	6.34	.38	.37	.42	1.22	36T	0	L122
L123	16.20	-.32	-.32	2.04	2.71	6.80	.84	.82	.63	1.83	36T	0	L123
L126	15.65	-.87	-.86	.32	.42	4.50	-1.46	-1.43	.18	.53	36T	0	L126
L150	16.70	.18	.17	.82	1.09	6.60	.64	.63	.52	1.50	36T	0	L150
L163	17.00	.48	.47	.41	.54	5.43	-.52	-.51	.30	.88	36T	0	L163
L1738	15.40	-1.12	-1.10	.52	.68	6.20	.24	.24	.42	1.22	36T	0	L1738
L176	17.10	.58	.57	.39	.52	5.04	-.92	-.90	.13	.37	36T	0	L176
L182	17.22	.70	.68	.75	.99	6.16	.20	.20	.26	.76	36T	0	L182
L207	16.89	.37	.36	.57	.75	6.93	.97	.95	.44	1.29	36T	0	L207
L212	14.85	-1.67	-1.64	.53	.70	4.95	-1.01	-.99	.14	.42	36T	0	L212
L228	17.30	.78	.76	1.34	1.77	10.60	4.64	4.54	.84	2.44	36T	#	L228
L230	18.20	1.68	1.65	2.20	2.91	6.00	.04	.04	.82	2.36	36T	0	L230
L236	51.00	34.48	33.88	2.67	3.53	21.40	15.44	15.11	1.17	3.40	36T	#	L236
L242	16.35	-.17	-.17	.65	.86	6.30	.34	.34	.20	.57	36T	0	L242
L243	16.85	.33	.32	.88	1.17	8.05	2.09	2.05	.13	.37	36T	0	L243
L260	16.67	.15	.15	.35	.47	5.92	-.03	-.03	.17	.49	36T	0	L260
L262	17.90	1.38	1.35	1.05	1.39	6.90	.94	.92	.21	.61	36T	0	L262
L281	17.12	.60	.59	.34	.45	4.87	-1.08	-1.06	.25	.72	36T	0	L281
L318	15.62	-.90	-.88	.49	.65	6.12	.17	.16	.21	.62	36T	0	L318
L324	17.45	.93	.91	.50	.66	4.85	-1.10	-1.07	.14	.41	36T	0	L324
L339	15.18	-1.34	-1.32	.38	.51	3.98	-1.98	-1.94	.59	1.70	36T	0	L339
L388	27.45	10.93	10.74	3.13	4.15	15.70	9.74	9.53	1.69	4.88	36T	#	L388
L442	16.56	.04	.04	1.26	1.67	6.77	.81	.80	1.07	3.10	36T	0	L442
L484	13.98	-2.54	-2.50	.64	.85	3.88	-2.08	-2.03	.19	.56	36T	0	L484
L570	18.00	1.48	1.45	.67	.88	7.00	1.04	1.02	.00	.00	36T	0	L570
L580	17.40	.88	.86	.70	.93	6.40	.44	.43	.52	1.50	36T	0	L580
L616	22.00	5.48	5.38	2.49	3.30	5.80	-.16	-.15	.79	2.29	36T	#	L616
L651	16.40	-.12	-.12	.70	.93	6.40	.44	.43	.52	1.50	36T	0	L651

GR. MEAN = 16.52 TABER UNITS GRAND MEAN = 6.96 TABER UNITS TEST DETERMINATIONS = 10

SD MEANS = 1.02 TABER UNITS SD OF MEANS = 1.02 TABER UNITS 25 LABS IN GRAND MEANS

AVERAGE SDR = .76 TABER UNITS AVERAGE SDR = .35 TABER UNITS

TOTAL NUMBER OF LABORATORIES REPORTING = 29

Best values: J10 16.6 ± 1.5 Taber units
J69 6.1 ± 1.6 Taber units

The following laboratories were omitted from the grand means because of extreme test results: 228, 388, 616

Data from the following laboratories appear to be off by a multiplicative factor: 236

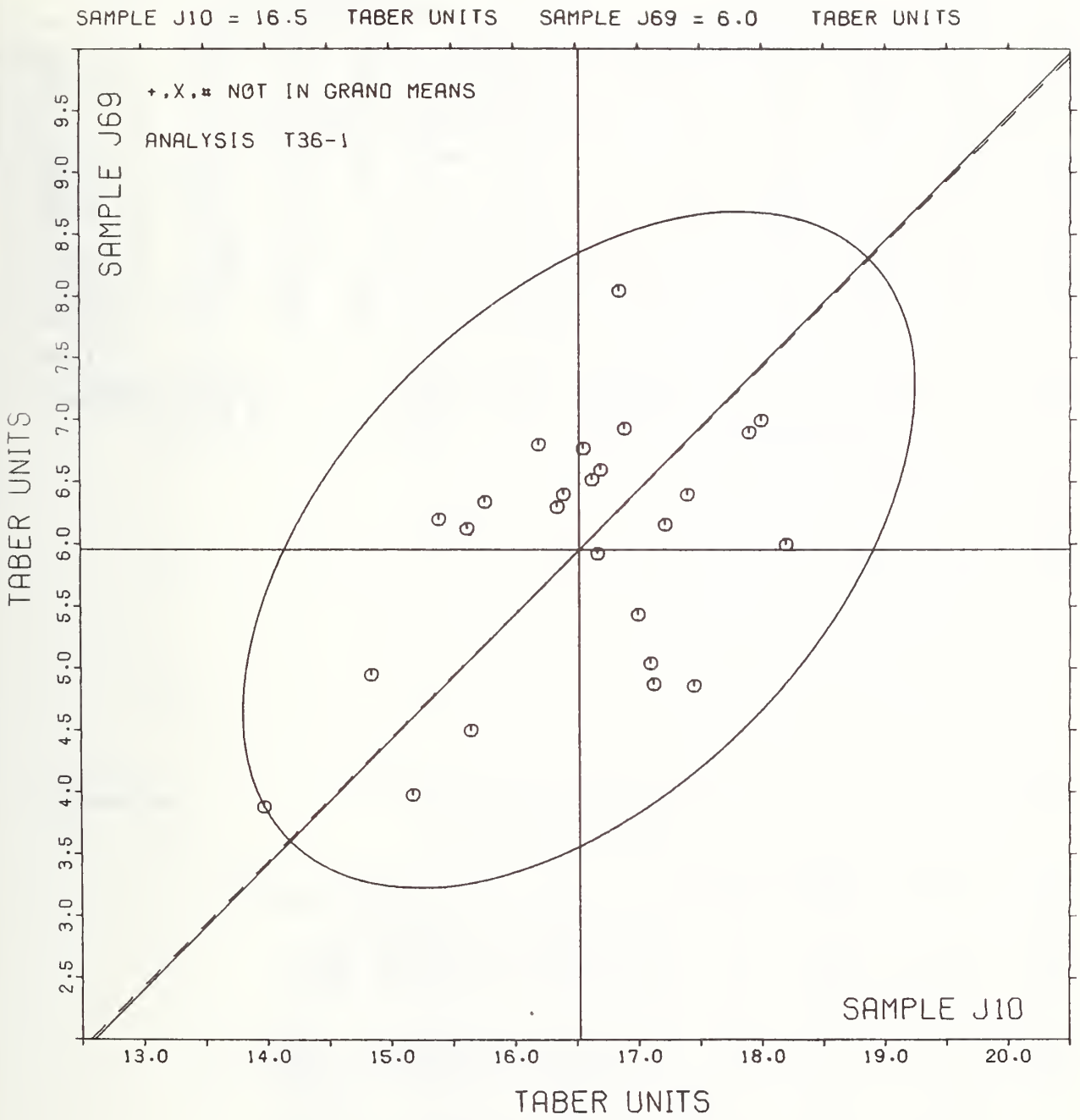
ANALYSIS T36-1 TABLE 2

TABER STIFFNESS

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

LAB CODE	F	MEANS J10	MEANS J69	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L484	O	13.98	3.88	-3.27	.34	.70	36T	STIFFNESS, TABER
L212	O	14.85	4.95	-1.89	.48	.56	36T	STIFFNESS, TABER
L339	O	15.18	3.98	-2.35	-.44	1.10	36T	STIFFNESS, TABER
L173B	O	15.40	6.20	-.62	.97	.95	36T	STIFFNESS, TABER
L318	O	15.62	6.12	-.51	.76	.63	36T	STIFFNESS, TABER
L126	O	15.65	4.50	-1.65	-.41	.48	36T	STIFFNESS, TABER
L122	O	15.76	6.34	-.26	.81	.97	36T	STIFFNESS, TABER
L123	O	16.20	6.80	.37	.82	2.27	36T	STIFFNESS, TABER
L242	O	16.35	6.30	.12	.36	.71	36T	STIFFNESS, TABER
L651	O	16.40	6.40	.23	.40	1.21	36T	STIFFNESS, TABER
L442	O	16.56	6.77	.60	.55	2.38	36T	STIFFNESS, TABER
L107A	O	16.63	6.52	.47	.32	1.02	36T	STIFFNESS, TABER
L260	O	16.67	5.92	.08	-.13	.48	36T	STIFFNESS, TABER
L150	O	16.70	6.60	.58	.33	1.29	36T	STIFFNESS, TABER
L243	O	16.85	8.05	1.72	1.24	.77	36T	STIFFNESS, TABER
L207	O	16.89	6.93	.95	.42	1.02	36T	STIFFNESS, TABER
L163	O	17.00	5.43	-.04	-.71	.71	36T	STIFFNESS, TABER
L176	O	17.10	5.04	-.25	-1.05	.44	36T	STIFFNESS, TABER
L281	O	17.12	4.87	-.35	-1.19	.58	36T	STIFFNESS, TABER
L182	O	17.22	6.16	.63	-.35	.88	36T	STIFFNESS, TABER
L228	#	17.30	10.60	3.84	2.72	2.11	36T	STIFFNESS, TABER
L580	O	17.40	6.40	.93	-.31	1.21	36T	STIFFNESS, TABER
L324	O	17.45	4.86	-.13	-1.43	.54	36T	STIFFNESS, TABER
L262	O	17.90	6.90	1.64	-.31	1.00	36T	STIFFNESS, TABER
L570	O	18.00	7.00	1.78	-.31	.44	36T	STIFFNESS, TABER
L230	O	18.20	6.00	1.21	-1.16	2.64	36T	STIFFNESS, TABER
L616	#	22.00	5.80	3.74	-4.00	2.79	36T	STIFFNESS, TABER
L388	#	27.45	15.70	14.61	-.90	4.51	36T	STIFFNESS, TABER
L236	#	51.00	21.40	35.24	-13.61	3.46	36T	STIFFNESS, TABER
GMEANS:		16.52	5.96			1.00		
		95% ELLIPSE:		3.32	1.96	WITH GAMMA = 45 DEGREES		

STIFFNESS, TABER



ANALYSIS T49-1 TABLE 1
SURFACE PICK STRENGTH, IGT

LAB CODE	SAMPLE H79 PRINTING 151 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E60 PRINTING 68 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.F. 4 VAR	F	LAB
L122	49.8	-36.9	-.72	2.0	.39	40.5	-34.9	-.71	2.0	.41	49Q	H	L122
L149	68.6	-18.1	-.35	6.6	1.33	61.9	-13.6	-.28	4.8	.98	49L	G	L149
L182I	26.1	-60.6	-1.18	.6	.11	17.5	-57.9	-1.18	.7	.15	49Q	G	L182I
L190C	56.3	-30.4	-.59	2.1	.41	45.2	-30.2	-.62	2.8	.57	49T	G	L190C
L207	92.0	5.3	.10	4.3	.86	NO DATA REPORTED FOR SAMPLE E60					49I	M	L207
L242	50.7	-36.0	-.70	5.5	1.10	38.5	-37.0	-.75	4.0	.83	49P	G	L242
L243	103.2	16.6	.32	8.3	1.65	81.5	6.0	.12	7.1	1.47	49T	G	L243
L280	3.7	-83.0	-1.61	.0	.00	3.7	-71.8	-1.47	.0	.00	49U	#	L280
L291	88.7	2.0	.04	4.3	.86	59.5	-15.9	-.33	2.9	.60	49I	G	L291
L388	118.8	32.1	.62	8.8	1.76	140.4	64.9	1.33	8.8	1.81	49Q	G	L388
L484	1460.0	1373.3	26.69	40.0	8.00	1135.0	1059.5	21.63	86.6	17.80	49P	#	L484
L564	42.8	-43.9	-.85	3.2	.65	45.6	-29.9	-.61	4.6	.94	49D	G	L564
L598	187.2	100.5	1.95	7.8	1.56	165.9	90.5	1.85	10.7	2.20	49P	G	L598
L616	182.5	95.8	1.86	11.9	2.38	202.5	127.0	2.59	8.7	1.78	49M	#	L616
L643	161.2	74.6	1.45	5.8	1.17	133.5	58.0	1.18	5.1	1.04	49I	G	L643
L651	400.0	313.3	6.09	.0	.00	400.0	324.5	6.63	.0	.00	49F	#	L651

GR. MEAN = 86.7 KP CM/SEC GRAND MEAN = 75.5 KP CM/SEC TEST DETERMINATIONS = 4
SD MEANS = 51.5 KP CM/SEC SD OF MEANS = 49.0 KP CM/SEC 11 LABS IN GRAND MEANS
AVERAGE SDR = 5.0 KP CM/SEC AVERAGE SDR = 4.9 KP CM/SEC
TOTAL NUMBER OF LABORATORIES REPORTING = 16

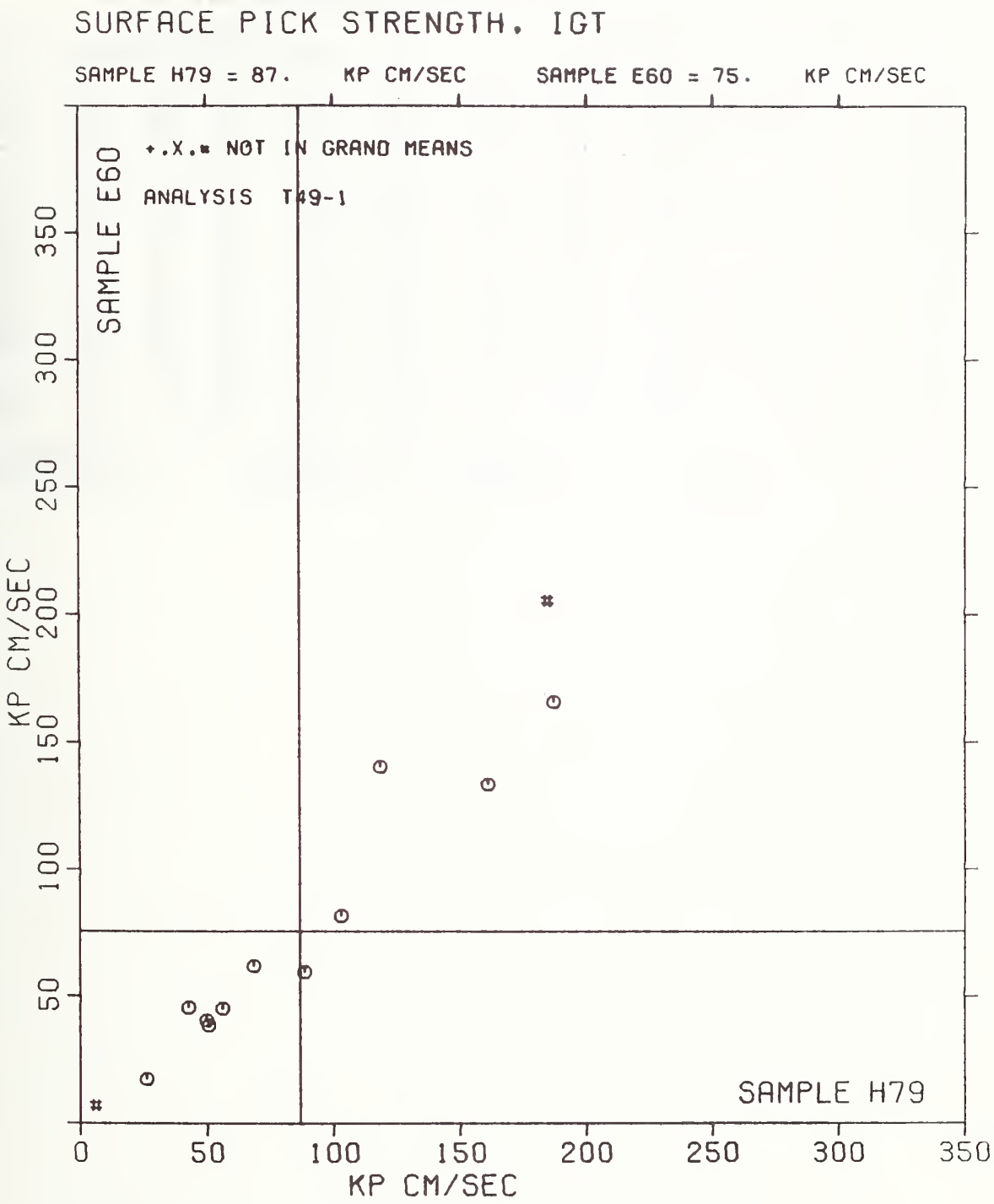
Data from the following laboratories were omitted from the grand means because no viscosity values were reported: 484, 616, 651

Data from the following laboratories were omitted from the grand means because the values were outside the range of the instrument: 280

REPORT NO. 55S TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T49-1 TABLE 2
SURFACE PICK STRENGTH, IGT

LAB CODE	F	MEANS H79	E60	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L280	#	3.7	3.7	-109.6	5.1	.00	49U	SURFACE PICK STRENGTH,IGT, OIL
L182I	G	26.1	17.5	-83.8	-.3	.13	49Q	SURFACE PICK STRENGTH,IGT, IGT OIL
L564	G	42.8	45.6	-52.4	8.6	.79	49D	SURFACE PICK STRENGTH,IGT, INK
L122	G	49.8	40.5	-50.8	.1	.40	49Q	SURFACE PICK STRENGTH,IGT, IGT OIL
L242	G	50.7	38.5	-51.5	-2.0	.96	49P	SURFACE PICK STRENGTH,IGT, IGT OIL
L190C	G	56.3	45.2	-42.9	-1.0	.49	49T	SURFACE PICK STRENGTH,IGT, IPC FLUID
L149	G	68.6	61.9	-22.5	2.6	1.15	49L	SURFACE PICK STRENGTH,IGT, PIB FLUID
L291	G	88.7	59.5	-9.5	-13.0	.73	49I	SURFACE PICK STRENGTH,IGT, PIB FLUID
L207	M	92.0				.86	49I	SURFACE PICK STRENGTH,IGT, PIB FLUID
L243	G	103.2	81.5	16.2	-7.0	1.56	49T	SURFACE PICK STRENGTH,IGT, IPC FLUID
L388	G	118.8	140.4	68.0	25.0	1.79	49Q	SURFACE PICK STRENGTH,IGT, IGT OIL
L643	G	161.2	133.5	94.0	-9.3	1.11	49I	SURFACE PICK STRENGTH,IGT, PIB FLUID
L616	#	182.5	202.5	157.0	26.1	2.08	49M	SURFACE PICK STRENGTH,IGT, PIB FLUID
L598	G	187.2	165.9	135.2	-3.6	1.88	49P	SURFACE PICK STRENGTH,IGT, IGT OIL
L651	#	400.0	400.0	450.7	19.5	.00	49F	SURFACE PICK STRENGTH,IGT, INK
L484	#	1460.0	1135.0	1725.4	-177.6	12.90	49P	SURFACE PICK STRENGTH,IGT, IGT OIL
GMEANS:		86.7	75.5			1.00		
		95% ELLIPSE:		216.3	31.1	WITH GAMMA = 43 DEGREES		


SURFACE PICK STRENGTH, IGT
SAMPLE H79 = 87. KP CM/SEC
SAMPLE E60 = 75. KP CM/SEC
+.X.* NOT IN GRAND MEANS
ANALYSIS T49-1
SAMPLE E60
KP CM/SEC
0
50
100
150
200
250
300
350
SAMPLE H79
KP CM/SEC

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

LAB CODE	SAMPLE H79 MEAN	PRINTING 151 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE J51 MEAN	PRINTING 89 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* VAR	F	LAB
L105	10.40	.71	.94	.55	1.15	9.40	.45	.47	.55	1.21	50W	6	L105
L122	9.00	-.69	-.93	.00	.00	8.20	-.75	-.78	1.10	2.41	50W	6	L122
L162	11.00	1.31	1.74	.00	.00	9.00	.05	.05	.00	.00	50W	6	L162
L173A	8.40	-1.29	-1.73	.55	1.15	7.20	-1.75	-1.82	.45	.99	50W	6	L173A
L182W	10.20	.51	.68	1.10	2.29	8.60	-.35	-.37	.55	1.21	50W	6	L182W
L183	9.80	.11	.14	.45	.94	9.00	.05	.05	.00	.00	50W	6	L183
L195	9.20	-.49	-.66	.45	.94	9.20	.25	.26	.45	.99	50W	6	L195
L213	10.20	.51	.68	.45	.94	10.00	1.05	1.09	.00	.00	50W	6	L213
L225	10.00	.31	.41	.71	1.48	9.40	.45	.47	.55	1.21	50W	6	L225
L228	10.00	.31	.41	.00	.00	7.00	-1.95	-2.03	.00	.00	50W	6	L228
L230	9.00	-.69	-.93	.00	.00	9.20	.25	.26	.84	1.84	50W	6	L230
L236	10.20	.51	.68	.45	.94	9.40	.45	.47	.55	1.21	50W	6	L236
L243	8.40	-1.29	-1.73	.55	1.15	8.60	-.35	-.37	.55	1.21	50W	6	L243
L285	10.20	.51	.68	1.10	2.29	9.40	.45	.47	.55	1.21	50W	6	L285
L339	9.20	-.49	-.66	.45	.94	8.00	-.95	-.99	.71	1.56	50W	6	L339
L366	9.20	-.49	-.66	.45	.94	9.80	.85	.88	.45	.99	50W	6	L366
L378	10.40	.71	.94	.89	1.87	10.80	1.85	1.92	.45	.99	50W	6	L378
L616	11.20	1.51	2.01	1.30	2.73	13.60	4.65	4.84	.55	1.21	50W	6	L616

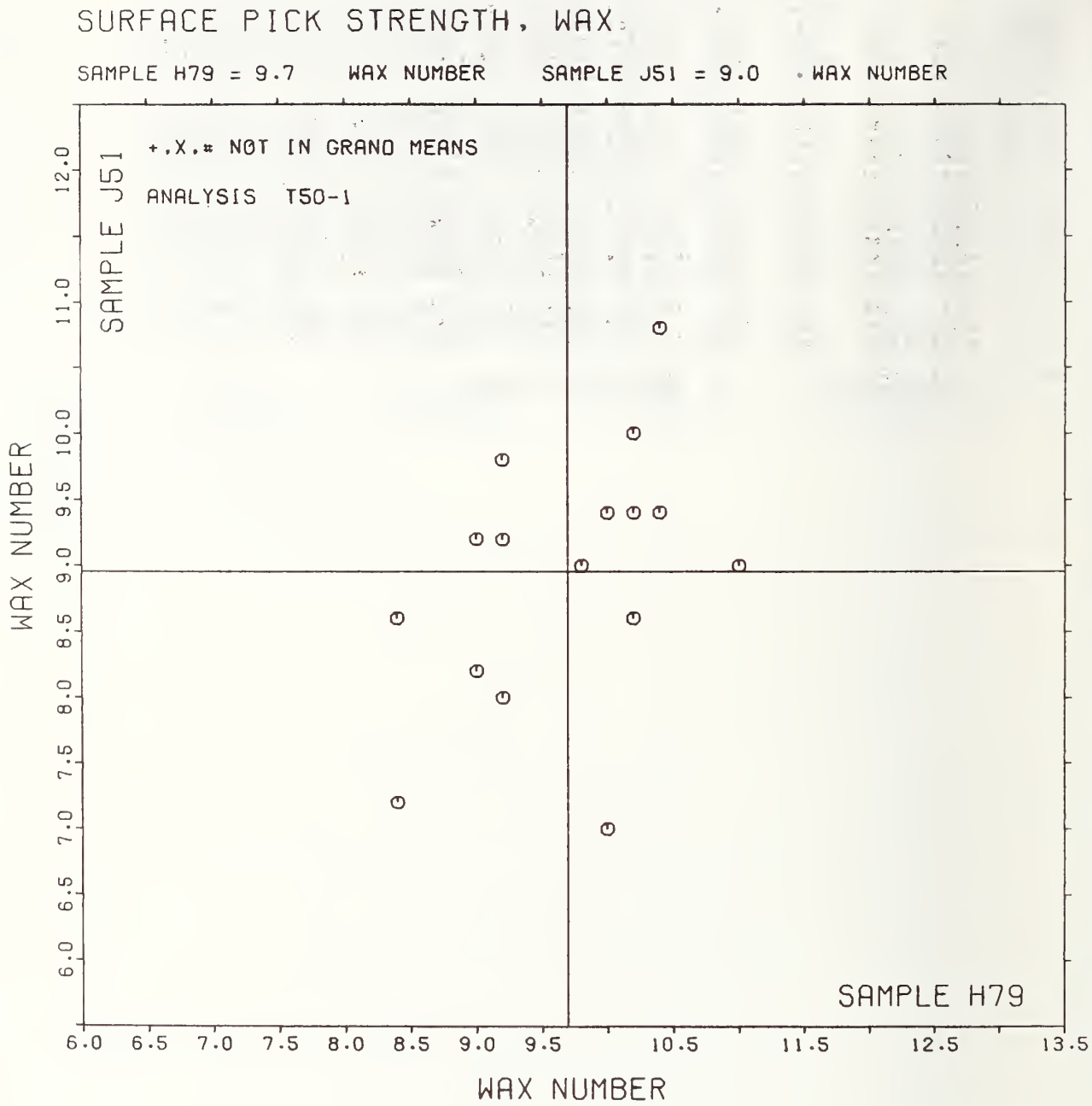
GR. MEAN = 9.69 WAX NUMBER GRAND MEAN = 8.95 WAX NUMBER TEST DETERMINATIONS = 5
SD MEANS = .75 WAX NUMBER SD OF MEANS = .96 WAX NUMBER 17 LABS IN GRAND MEANS
AVERAGE SDR = .48 WAX NUMBER AVERAGE SDR = .45 WAX NUMBER
TOTAL NUMBER OF LABORATORIES REPORTING = 18

Best values: H79 9.8 ± 1.3 wax number
J51 9.0 ± 1.7 wax number

The following laboratories were omitted from the grand means because of extreme test results: 616

ANALYSIS T50-I TABLE 2
SURFACE PICK STRENGTH, WAX NUMBER
TAPPI STANDARD T459 OS-75, SURFACE STRENGTH OF PAPER (WAX PICK TEST)

LAB CODE	F	MEANS H79	MEANS JSI	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L243	6	8.40	8.60	-.95	.94	1.18	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L173A	6	8.40	7.20	-2.17	.24	1.07	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L230	6	9.00	9.20	-.13	.72	.92	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L122	6	9.00	8.20	-1.00	.22	1.21	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L366	6	9.20	9.80	.49	.85	.96	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L339	6	9.20	8.00	-1.07	-.05	1.25	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L195	6	9.20	9.20	-.03	.55	.96	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L183	6	9.80	9.00	.09	-.07	.47	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L228	6	10.00	7.00	-1.54	-1.24	.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L225	6	10.00	9.40	.54	-.04	1.34	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L182W	6	10.20	8.60	-.05	-.61	1.75	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L213	6	10.20	10.00	1.16	.09	.47	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L236	6	10.20	9.40	.64	-.21	1.07	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L285	6	10.20	9.40	.64	-.21	1.75	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L378	6	10.40	10.80	1.95	.31	1.43	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L105	6	10.40	9.40	.74	-.39	1.18	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L162	6	11.00	9.00	.69	-1.11	.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L616	#	11.20	13.60	4.78	1.02	1.97	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
GMEANS:		9.69	8.95			1.00		
		95% ELLIPSE:		2.95	1.72	WITH GAMMA = 59 DEGREES		


SURFACE PICK STRENGTH, WAX
SAMPLE H79 = 9.7 WAX NUMBER
SAMPLE J51 = 9.0 WAX NUMBER
+,X,* NOT IN GRAND MEANS
ANALYSIS T50-1
SAMPLE J51
SAMPLE H79
WAX NUMBER
WAX NUMBER
6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.5 11.5 12.5 13.5
6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 11.0 12.0

REPORT NO. 555 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T91-1 TABLE 1

CONCORA (CORRUGATING MEDIUM TEST-CMT)

TAPPI STANDARD T809 OS-71

LAB CODE	SAMPLE E72 LINERBOARD 127 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E83 KRAFT 126 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L176	235.	10.	.62	19.	1.47	306.	6.	.20	16.	.92	91P	O	L176
L182	234.	9.	.54	16.	1.25	321.	21.	.68	8.	.45	91N	O	L182
L185	243.	17.	1.10	15.	1.17	344.	45.	1.42	12.	.69	91A	O	L185
L218	190.	-35.	-2.23	11.	.82	278.	-21.	-.67	16.	.91	91A	O	L218
L242	240.	15.	.95	9.	.66	345.	46.	1.46	11.	.65	91G	O	L242
L255	213.	-12.	-.77	9.	.72	237.	-63.	-1.98	6.	.33	91P	O	L255
L269	215.	-10.	-.63	8.	.60	302.	3.	.09	14.	.82	91P	O	L269
L280	226.	1.	.07	14.	1.06	312.	13.	.40	26.	1.46	91N	O	L280
L289	237.	12.	.74	13.	1.02	248.	-52.	-1.63	30.	1.72	91P	O	L289
L329	212.	-13.	-.83	15.	1.15	301.	1.	.04	36.	2.02	91P	O	L329
L393	212.	-13.	-.83	14.	1.06	178.	-121.	-3.84	8.	.46	91P	#	L393
L394	215.	-11.	-.66	10.	.78	281.	-19.	-.59	15.	.86	91P	O	L394
L484	223.	-2.	-.14	6.	.48	305.	6.	.18	14.	.81	91N	O	L484
L621	211.	-14.	-.89	19.	1.42	274.	-25.	-.79	21.	1.19	91P	O	L621
L622	244.	19.	1.18	18.	1.38	305.	5.	.17	29.	1.63	91P	O	L622
L650	249.	23.	1.46	12.	.88	343.	44.	1.40	14.	.80	91N	O	L650
L665	218.	-8.	-.49	15.	1.14	288.	-12.	-.37	13.	.73	91P	O	L665

GR. MEAN = 225. NEWTONS GRAND MEAN = 299. NEWTONS TEST DETERMINATIONS = 10

SD MEANS = 16. NEWTONS SD OF MEANS = 32. NEWTONS 16 LABS IN GRAND MEANS

AVERAGE SDR = 13. NEWTONS AVERAGE SDR = 18. NEWTONS

GR. MEAN = 50.67 POUNDS GRAND MEAN = 67.29 POUNDS

TOTAL NUMBER OF LABORATORIES REPORTING = 17

Best values: E72 225 ± 20 newtons
E83 300 ± 50 newtons

The following laboratories were omitted from the grand means because of extreme test results: 393

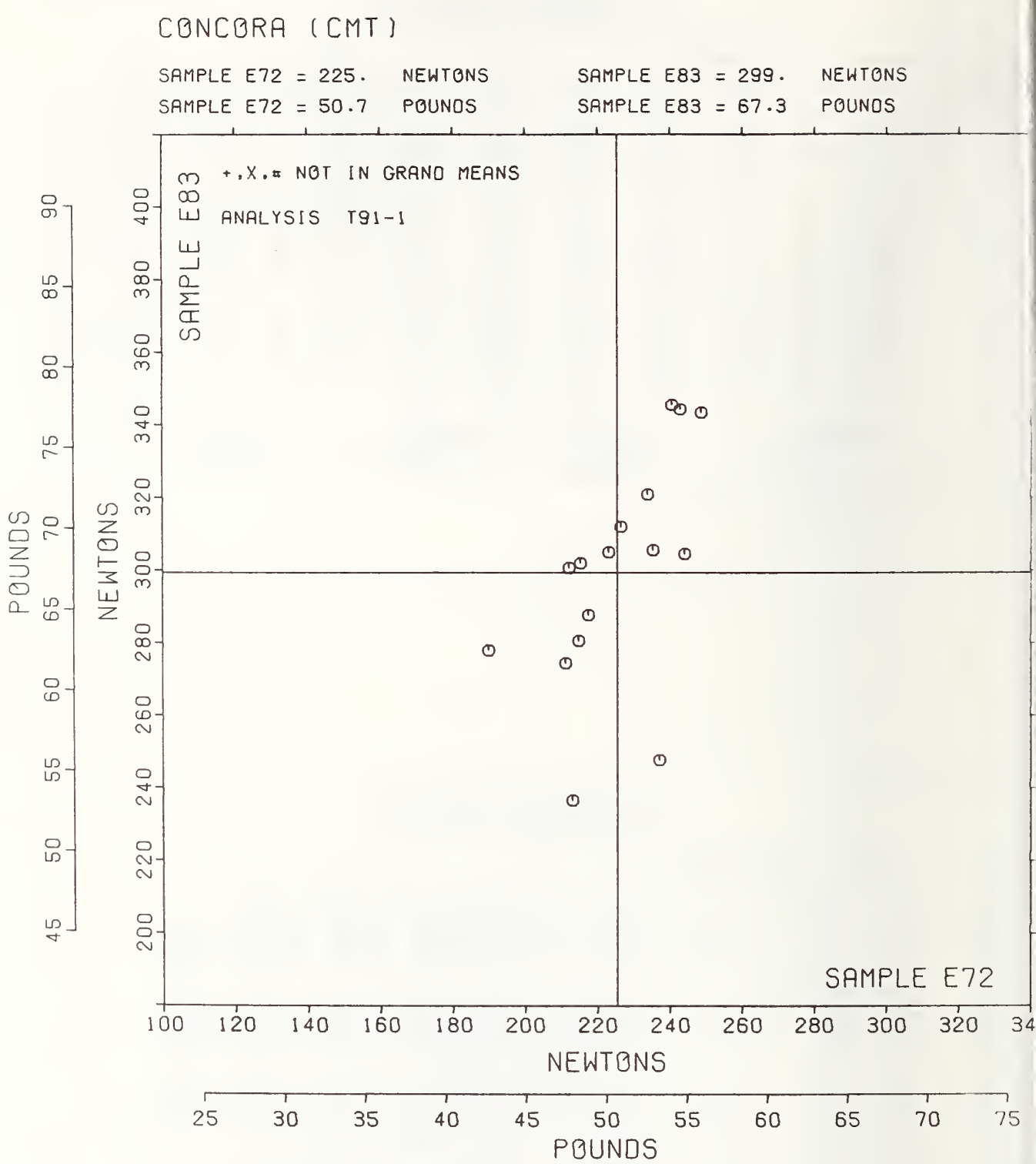
REPORT NO. 555 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T91-1 TABLE 2

CONCORA (CORRUGATING MEDIUM TEST-CMT)

TAPPI STANDARD T809 OS-71

LAB CODE	F	MEANS E72	E83	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L218	O	190.	276.	-32.	27.	.86	91A	FLAT CRUSH STRENGTH, CONCORA, INSTRON
L621	O	211.	274.	-28.	5.	1.31	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L393	#	212.	178.	-119.	-27.	.76	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L329	O	212.	301.	-3.	13.	1.59	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L255	O	213.	237.	-63.	-9.	.53	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L394	O	215.	281.	-21.	4.	.82	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L269	O	215.	302.	-1.	10.	.71	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L665	O	218.	288.	-13.	4.	.93	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L484	O	223.	305.	5.	4.	.64	91N	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L280	O	226.	312.	12.	3.	1.26	91N	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L182	O	234.	321.	23.	-1.	.85	91N	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L176	O	235.	306.	9.	-7.	1.20	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L289	O	237.	248.	-45.	-28.	1.37	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L242	O	240.	345.	49.	1.	.65	91G	FLAT CRUSH STRENGTH, CONCORA, GAYDON PLAT CRUSH TESTER
L185	O	243.	344.	48.	-2.	.93	91A	FLAT CRUSH STRENGTH, CONCORA, INSTRON
L622	O	244.	305.	11.	-16.	1.50	91P	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
L650	O	249.	343.	49.	-8.	.84	91N	FLAT CRUSH STRENGTH, CONCORA, TMI/HINDE & DAUCH
GMEANS:		225.	299.			1.00		
		95% ELLIPSE:		94.	35.	WITH GAMMA = 70 DEGREES		


CONCORA (CMT)
SAMPLE E72 = 225. NEWTONS
SAMPLE E72 = 50.7 POUNDS
SAMPLE E83 = 299. NEWTONS
SAMPLE E83 = 67.3 POUNDS
+,X,* NOT IN GRAND MEANS
ANALYSIS T91-1
SAMPLE E83
SAMPLE E72
NEWTONS
POUNDS
100 120 140 160 180 200 220 240 260 280 300 320 34
200 220 240 260 280 300 320 340 360 380 400
45 50 55 60 65 70 75 80 85 90
25 30 35 40 45 50 55 60 65 70 75

REPORT NO. 555 TAPPI COLLABORATIVE REFERENCE PROGRAM SEPTEMBER 1978

ANALYSIS T96-1 TABLE 1

RING CRUSH (COMPRESSION RESISTANCE OF PAPERBOARD)

TAPPI STANDARD T818 OS-76

LAB CODE	SAMPLE E72 LINERBOARD 127 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E83 KRAFT 126 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L107	367.	162.	6.29	2.	.19	346.	192.	11.33	67.	6.62	96P	#	L107
L114	174.	-31.	-1.20	16.	1.31	137.	-17.	-.98	11.	1.08	96P	@	L114
L122	201.	-4.	-.16	10.	.78	145.	-9.	-.54	9.	.88	96P	@	L122
L124	174.	-31.	-1.22	23.	1.87	141.	-13.	-.77	15.	1.49	96P	@	L124
L126	196.	-9.	-.36	14.	1.09	150.	-4.	-.26	11.	1.07	96P	@	L126
L141	218.	12.	.48	11.	.98	169.	15.	.89	6.	.56	96P	@	L141
L176	170.	-36.	-1.39	16.	1.27	133.	-21.	-1.25	17.	1.64	96P	@	L176
L182	220.	15.	.58	8.	.61	161.	7.	.42	8.	.81	96N	@	L182
L191	201.	-4.	-.16	28.	2.25	153.	-1.	-.04	27.	2.68	96P	@	L191
L234	156.	-49.	-1.91	12.	.94	100.	-54.	-3.18	14.	1.42	96P	#	L234
L237	180.	-25.	-.98	11.	.89	145.	-9.	-.51	7.	.69	96P	@	L237
L242	260.	55.	2.13	14.	1.11	183.	29.	1.70	17.	1.71	96G	@	L242
L303	225.	20.	.76	11.	.89	166.	12.	.70	6.	.58	96N	@	L303
L305	219.	14.	.54	6.	.44	144.	-10.	-.62	8.	.83	96P	*	L305
L329	203.	-2.	-.10	8.	.67	154.	-0.	-.02	6.	.63	96P	@	L329
L333	178.	-27.	-1.05	7.	.54	136.	-18.	-1.09	7.	.66	96I	@	L333
L336	188.	-17.	-.66	14.	1.14	134.	-20.	-1.19	5.	.48	96P	@	L336
L350	218.	12.	.48	11.	.89	165.	11.	.67	7.	.68	96P	@	L350
L484	188.	-18.	-.68	12.	.94	152.	-2.	-.13	9.	.91	96R	@	L484
L553	229.	23.	.91	15.	1.18	175.	21.	1.22	17.	1.67	96P	@	L553
L570	195.	-10.	-.41	5.	.43	134.	-20.	-1.19	6.	.56	96P	@	L570
L603	246.	40.	1.57	17.	1.32	185.	31.	1.82	8.	.78	96P	@	L603
L610	226.	21.	.80	10.	.76	173.	18.	1.09	10.	.99	96P	@	L610
L617	178.	-27.	-1.06	22.	1.75	126.	-28.	-1.64	12.	1.21	96I	@	L617
L621	161.	-44.	-1.71	9.	.73	137.	-18.	-1.04	8.	.83	96P	@	L621
L623	236.	31.	1.20	9.	.74	178.	24.	1.40	8.	.83	96P	@	L623
L649	225.	20.	.77	5.	.42	161.	7.	.43	10.	.95	96P	@	L649
L650	237.	31.	1.22	8.	.66	172.	18.	1.07	7.	.67	96N	@	L650
L663	197.	-8.	-.30	11.	.90	152.	-2.	-.12	10.	.94	96P	@	L663

GR. MEAN = 205. NEWTONS GRAND MEAN = 154. NEWTONS TEST DETERMINATIONS = 10

SD MEANS = 26. NEWTONS SD OF MEANS = 17. NEWTONS 27 LABS IN GRAND MEANS

AVERAGE SDR = 13. NEWTONS AVERAGE SDR = 10. NEWTONS

GR. MEAN = 46.15 POUNDS GRAND MEAN = 34.66 POUNDS

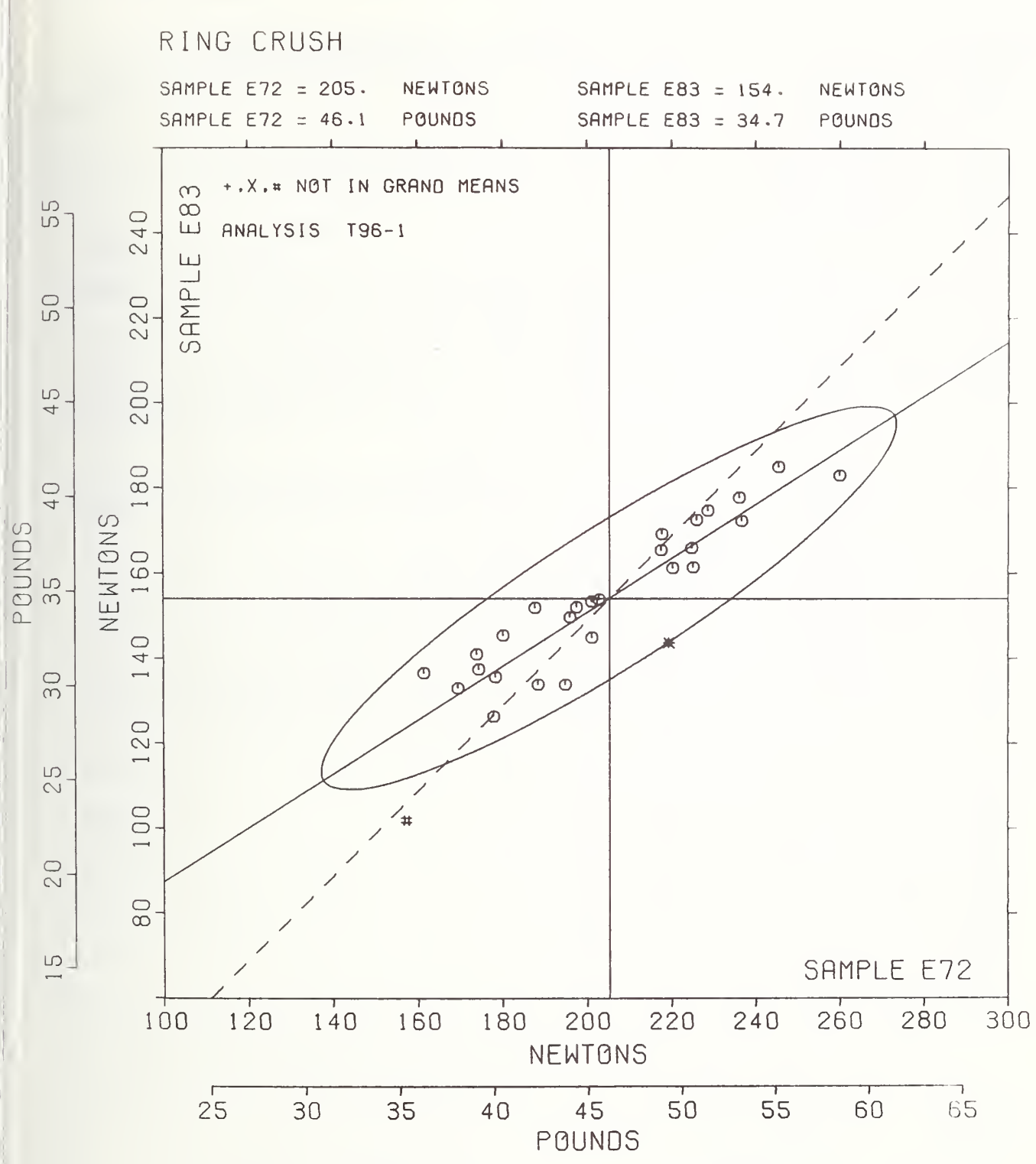
TOTAL NUMBER OF LABORATORIES REPORTING = 29

Best values: E72 210 ± 38 newtons
E83 160 ± 25 newtons

The following laboratories were omitted from the grand means because of extreme test results: 107, 234

ANALYSIS T96-1 TABLE 2
RING CRUSH (COMPRESSION RESISTANCE OF PAPERBOARD)
TAPPI STANDARD T818 OS-76

LAB CODE	F	MEANS E72	E83	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L234	#	156.	100.	-70.	-19.	1.18	96P	RING CRUSH, TMI/HINDE & DAUCH
L621	0	161.	137.	-46.	9.	.78	96P	RING CRUSH, TMI/HINDE & DAUCH
L176	0	170.	133.	-42.	1.	1.45	96P	RING CRUSH, TMI/HINDE & DAUCH
L124	0	174.	141.	-34.	6.	1.68	96P	RING CRUSH, TMI/HINDE & DAUCH
L114	0	174.	137.	-35.	2.	1.20	96P	RING CRUSH, TMI/HINDE & DAUCH
L617	0	178.	126.	-38.	-9.	1.48	96I	RING CRUSH, INSTRON
L333	0	178.	136.	-33.	-1.	.60	96I	RING CRUSH, INSTRON
L237	0	180.	145.	-26.	6.	.79	96P	RING CRUSH, TMI/HINDE & DAUCH
L484	0	188.	152.	-16.	8.	.93	96R	RING CRUSH, REGMED
L336	0	198.	134.	-25.	-8.	.81	96P	RING CRUSH, TMI/HINDE & DAUCH
L570	0	195.	134.	-20.	-12.	.50	96P	RING CRUSH, TMI/HINDE & DAUCH
L126	0	196.	150.	-10.	1.	1.08	96P	RING CRUSH, TMI/HINDE & DAUCH
L663	0	197.	152.	-8.	2.	.92	96P	RING CRUSH, TMI/HINDE & DAUCH
L191	0	201.	153.	-4.	2.	2.47	96P	RING CRUSH, TMI/HINDE & DAUCH
L122	0	201.	145.	-8.	-5.	.83	96P	RING CRUSH, TMI/HINDE & DAUCH
L329	0	203.	154.	-2.	1.	.65	96P	RING CRUSH, TMI/HINDE & DAUCH
L350	0	218.	165.	16.	3.	.78	96P	RING CRUSH, TMI/HINDE & DAUCH
L141	0	218.	169.	19.	6.	.72	96P	RING CRUSH, TMI/HINDE & DAUCH
L305	*	219.	144.	6.	-16.	.64	96P	RING CRUSH, TMI/HINDE & DAUCH
L182	0	220.	161.	17.	-2.	.71	96N	RING CRUSH, TMI/HINDE & DAUCH
L303	0	225.	166.	23.	-0.	.74	96N	RING CRUSH, TMI/HINDE & DAUCH
L649	0	225.	161.	21.	-4.	.68	96P	RING CRUSH, TMI/HINDE & DAUCH
L610	0	226.	173.	27.	4.	.87	96P	RING CRUSH, TMI/HINDE & DAUCH
L553	0	229.	175.	31.	5.	1.43	96P	RING CRUSH, TMI/HINDE & DAUCH
L623	0	236.	178.	39.	3.	.78	96P	RING CRUSH, TMI/HINDE & DAUCH
L650	0	237.	172.	36.	-1.	.66	96N	RING CRUSH, TMI/HINDE & DAUCH
L603	0	246.	185.	51.	4.	1.05	96P	RING CRUSH, TMI/HINDE & DAUCH
L242	0	260.	183.	62.	-5.	1.41	96G	RING CRUSH, GAYDON FLAT CRUSH TESTER
L107	#	367.	346.	240.	76.	3.40	96P	RING CRUSH, TMI/HINDE & DAUCH
CMEANS:		205.	154.			1.00		
		95% ELLIPSE:		80.	16.	WITH GAMMA = 32 DEGREES		


RING CRUSH
SAMPLE E72 = 205. NEWTONS
SAMPLE E72 = 46.1 POUNDS
SAMPLE E83 = 154. NEWTONS
SAMPLE E83 = 34.7 POUNDS
+.X.* NOT IN GRAND MEANS
ANALYSIS T96-1
SAMPLE E83
NEWTONS
POUNDS
SAMPLE E72
NEWTONS
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	B63	16.69	1.32	1.04	15	42	47	10	.91	3.70
T403-1 PSI	J39	28.89	2.11	1.48					1.30	5.88
BURSTING STRENGTH, MODEL C-A	B63	16.66	1.62	1.14	15	31	32	10	1.00	4.53
T403-2 PSI	J39	28.70	1.93	1.47					1.29	5.40
BURSTING STRENGTH, HIGH RANGE	E77	74.6	3.3	5.0	15	35	45	10	4.4	9.4
T403-1 PSI	K29	59.4	2.5	4.1					3.6	7.1
TEARING STRENGTH, DEEP CUTOUT	E76	85.9	3.8	2.5	15	115	125	10	2.2	10.7
T414-1 GRAMS	E80	57.6	3.7	1.5					1.3	10.2
TEARING STRENGTH, NO CUTOUT	J41	67.2	3.3	2.8	15	11	12	10	2.5	9.4
T414-1 GRAMS	K39	151.5	10.3	8.0					7.0	28.9
TENSILE STRENGTH, PACKAGING PAPERS	J15	8.58	.33	.32	20	45	48	12	.25	.93
T494-1 KILONEWTON/M	K31	8.58	.30	.45					.36	.87
TENSILE STRENGTH, CRE TYPE	J04	3.67	.18	.17	20	41	49	12	.14	.50
T220-1 KILONEWTON/M	J08	6.09	.30	.37					.30	.84
TENSILE STRENGTH, PENDULUM TYPE	J04	3.75	.21	.21	20	33	35	12	.17	.59
T220-2 KILONEWTON/M	J08	6.22	.40	.43					.34	1.12
T.E.A., PACKAGING PAPERS	J15	121.6	11.3	12.5	20	15	16	12	10.0	32.1
T425-1 JOULES/SQ M	K31	76.1	8.0	10.1					8.1	22.7
T.E.A., PRINTING PAPERS	J04	37.7	2.6	4.1	20	14	15	12	3.2	7.4
T426-1 JOULES/SQ M	J08	75.8	6.6	7.4					6.0	18.8
ELONGATION TO BREAK, PACKAGING PAPER	J15	2.118	.080	.145	20	14	18	12	.116	.232
T828-1 PERCENT	K31	1.457	.076	.110					.088	.218
ELONGATION TO BREAK, PRINTING PAPER	J04	1.540	.201	.119	20	17	20	12	.095	.560
T829-1 PERCENT	J08	1.842	.182	.150					.120	.510
FOLDING ENDURANCE (MIT)	J29	24.3	7.0	9.3	15	44	50	10	8.2	19.9
T30C-1 DOUBLE FOLDS	J31	72.9	15.1	17.9					15.7	42.7
FOLDING ENDURANCE (MIT)	J29	1.342	.112	.155	15	45	50	10	.136	.319
T30C-2 LOG(10) FOLD	J31	1.839	.097	.117					.103	.274
STIFFNESS, GURLEY	H69	452.	28.	21.	10	30	32	10	18.	77.
T535-1 GURLEY UNITS	J25	242.	17.	13.					12.	46.
STIFFNESS, TABER	J10	16.52	1.02	.76	10	25	29	5	.94	2.90
T536-1 TABER UNITS	J69	5.96	1.02	.35					.43	2.85
SURFACE PICK STRENGTH, IGT	H79	86.7	51.5	5.0	4	11	16	4	6.9	142.5
T499-1 KP CM/SEC	E60	75.5	49.0	4.9					6.7	135.7
SURFACE PICK STRENGTH, WAX	H79	9.69	.75	.48	5	17	18	5	.59	2.07
T50C-1 WAX NUMBER	J51	8.95	.96	.45					.56	2.66
CONCORA (CMT)	E72	225.	16.	13.	10	16	17	10	11.	44.
T95C-1 NEWTONS	E83	299.	32.	18.					15.	88.
RING CRUSH	E72	205.	26.	13.	10	27	29	10	11.	71.
T96C-1 NEWTONS	E83	154.	17.	10.					9.	47.

NBS-114A (REV. 9-78)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. TAPPI CRP 55S	2. Gov't. Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

Technical Association of the Pulp and Paper Industry
COLLABORATIVE REFERENCE PROGRAM FOR PAPER
Report #55S

5. Publication Date

January 10, 1978

6. Performing Organization Code

7. AUTHOR(S)

R. G. Powell, J. Horlick

8. Performing Organ. Report No.

NBSIR 79-1358

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, DC 20234

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS *(Street, City, State, ZIP)*

Collaborative Testing Services, Inc., 9241 Wood Glade Drive, Great Falls, Virginia 22066; and Technical Association of the Pulp and Paper Industry

13. Type of Report & Period Covered

Final

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

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

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

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

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Collaborative reference program; Laboratory evaluation; Paper; Precision; Reference samples, Testing calibration

18. AVAILABILITY ☐ Unlimited

☒ For Official Distribution. Do Not Release to NTIS

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

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

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PRINTED PAGES
UNCLASSIFIED	69
20. SECURITY CLASS (THIS PAGE)	**22. Price**
UNCLASSIFIED	

USCOMM-DC

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.