NBSIR 78-
1342

TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

REPORT NO. 52S
STRENGTH TESTS

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

TECHNICAL ASSOCIATION OF THE
PULP AND PAPER INDUSTRY

COLLABORATIVE REFERENCE PROGRAM FOR PAPER

Report No. 52S
STRENGTH TESTS

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

E. B. Randall, Jr., J. Horlick
Laboratory Evaluation Technology Section
Standards Application and Analysis Division
Institute for Applied Technology

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards

NBSIR 78-1342

INTRODUCTION

Reports 52S and 52G comprise the fourth set of reports for the 77-78 program year. Participants in tests which involve strength properties of paper will receive only the S report; those in tests which measure other properties will receive only the G report.

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

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

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

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

June 19, 1978

TAPPI-NBS COLLABORATIVE REFERENCE PROGRAM

BACKGROUND AND PURPOSE

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

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

HOW THE PROGRAM WORKS

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T10-1 TABLE 1
BURSTING STRENGTH, PSI
TAPPI STANDARD T403 OS-76, BURSTING STRENGTH OF PAPER - PERKINS MOOBL C

TEST D.= 15

LAB CODE	SAMPLE H39 MEAN	PRINTING 84 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H60 MEAN	PRINTING 74 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L107	38.87	2.64	1.34	2.61	1.22	20.20	2.01	1.26	2.14	1.82	10C	O	L107
L121	35.72	-.51	-.26	1.80	.84	17.34	-.85	-.53	1.16	.99	10C	O	L121
L131	32.60	-3.63	-1.85	3.09	1.44	16.20	-1.99	-1.24	1.08	.92	10C	O	L131
L134	38.33	2.10	1.07	1.25	.58	17.47	-.72	-.45	.55	.47	10C	O	L134
L150	37.57	1.34	.68	2.37	1.11	18.53	.35	.22	1.22	1.03	10C	O	L150
L153	37.30	1.07	.54	1.79	.83	19.60	1.41	.88	1.12	.95	10C	O	L153
L158	33.60	-2.63	-1.34	1.45	.68	18.57	.38	.24	1.07	.91	10C	O	L158
L162	31.33	-4.90	-2.49	4.65	2.17	13.60	-4.59	-2.86	1.30	1.10	10C	*	L162
L167	36.02	-.21	-.11	1.02	.47	17.59	-.60	-.37	1.03	.88	10C	O	L167
L183	34.37	-1.86	-.95	1.63	.76	15.97	-2.22	-1.38	.95	.81	10C	O	L183
L191	34.40	-1.83	-.93	2.29	1.07	17.50	-.69	-.43	1.63	1.38	10C	O	L191
L203A	36.57	.34	.17	3.20	1.49	17.83	-.35	-.22	1.83	1.55	10C	O	L203A
L203B	34.67	-1.56	-.80	2.76	1.29	16.00	-2.19	-1.35	.73	.62	10C	O	L203B
L207	37.87	1.64	.84	2.67	1.24	20.80	2.61	1.63	1.91	1.52	10C	O	L207
L223A	40.20	3.97	2.02	1.45	.68	16.65	-1.53	-.96	.82	.70	10C	X	L223A
L225	37.07	.84	.43	2.55	1.19	19.13	.95	.59	.99	.84	10C	O	L225
L232	38.27	2.04	1.04	5.84	2.72	14.17	-4.02	-2.51	1.14	.97	10C	X	L232
L237A	36.70	.47	.24	1.21	.56	17.03	-1.15	-.72	.72	.61	10C	O	L237A
L237B	36.27	.04	.02	1.07	.50	17.63	-.55	-.35	.44	.38	10C	O	L237B
L243	34.73	-1.50	-.76	3.22	1.50	18.87	.58	.42	.88	.74	10C	O	L243
L249	34.98	-1.25	-.64	.80	.37	15.78	-2.41	-1.50	.82	.69	10C	O	L249
L261	35.17	-1.06	-.54	1.88	.87	17.22	-.97	-.60	.95	.80	10C	O	L261
L264	35.40	-.83	-.42	1.55	.72	18.80	.61	.38	.77	.66	10C	O	L264
L268	35.67	-.56	-.29	1.03	.48	18.23	.05	.03	.73	.62	10C	O	L268
L279	34.37	-1.86	-.95	2.92	1.36	17.00	-1.19	-.74	1.16	.99	10C	O	L279
L299	40.77	4.54	2.31	2.36	1.10	20.47	2.28	1.42	1.63	1.39	10C	O	L299
L311	38.20	1.97	1.00	3.41	1.59	18.73	.55	.34	1.49	1.25	10C	O	L311
L312	37.80	1.57	.80	1.94	.91	19.57	1.38	.86	.80	.68	10C	O	L312
L315	40.37	4.14	2.10	2.29	1.07	21.03	2.85	1.78	.69	.59	10C	O	L315
L321	35.60	-.63	-.32	2.32	1.08	20.27	2.08	1.30	1.28	1.09	10C	O	L321
L322	39.73	3.50	1.78	2.02	.94	19.13	.95	.59	.62	.53	10C	O	L322
L326	36.20	-.03	-.02	1.42	.66	18.53	.35	.22	1.36	1.15	10C	O	L326
L330	37.79	1.56	.79	2.05	.95	19.10	.91	.57	1.09	.92	10C	O	L330
L331	37.33	1.10	.56	2.09	.98	19.20	1.01	.63	1.61	1.37	10C	O	L331
L333	34.80	-1.43	-.73	3.61	1.68	16.20	-1.99	-1.24	2.18	1.85	10C	O	L333
L339	33.09	-3.14	-1.60	3.22	1.50	16.25	-1.93	-1.21	1.12	.95	10C	O	L339
L344	34.93	-1.30	-.66	1.35	.63	15.77	-2.42	-1.51	2.29	1.95	10C	O	L344
L356	34.81	-1.42	-.72	1.40	.65	19.51	1.33	.83	1.28	1.09	10C	O	L356
L358	36.73	.50	.25	1.71	.80	17.00	-1.19	-.74	.68	.58	10C	O	L358
L360	35.81	-.42	-.22	.90	.42	18.98	.79	.49	.78	.67	10C	O	L360
L390	37.13	.90	.46	3.59	1.67	18.31	.13	.08	1.61	1.37	10C	O	L390
L561	36.60	.37	.19	3.73	1.74	20.10	1.91	1.19	1.38	1.17	10C	O	L561
L568	36.07	-.16	-.08	2.72	1.27	18.37	.18	.11	1.32	1.12	10C	O	L568
L599	36.38	.15	.08	1.79	.83	19.57	1.38	.86	1.11	.94	10C	O	L599
L601	38.20	1.97	1.00	2.06	.96	19.06	.87	.54	1.23	1.05	10C	O	L601
L128	36.93	.70	.36	1.22	.57	18.87	.68	.42	.92	.78	10B	+	L128
L242	37.74	1.51	.77	2.87	1.34	19.94	1.76	1.09	.92	.78	10T	+	L242
L250L	31.85	-4.38	-2.23	1.33	.62	18.17	-.01	-.01	.97	.82	10N	+	L250L
L251	32.96	-3.27	-1.66	1.47	.69	17.06	-1.13	-.70	1.28	1.09	10V	+	L251
L269	38.70	2.47	1.26	2.57	1.20	22.10	3.91	2.44	1.18	1.01	10A	+	L269
L484	34.43	-1.80	-.91	2.62	1.22	21.03	2.85	1.78	1.39	1.18	10M	+	L484

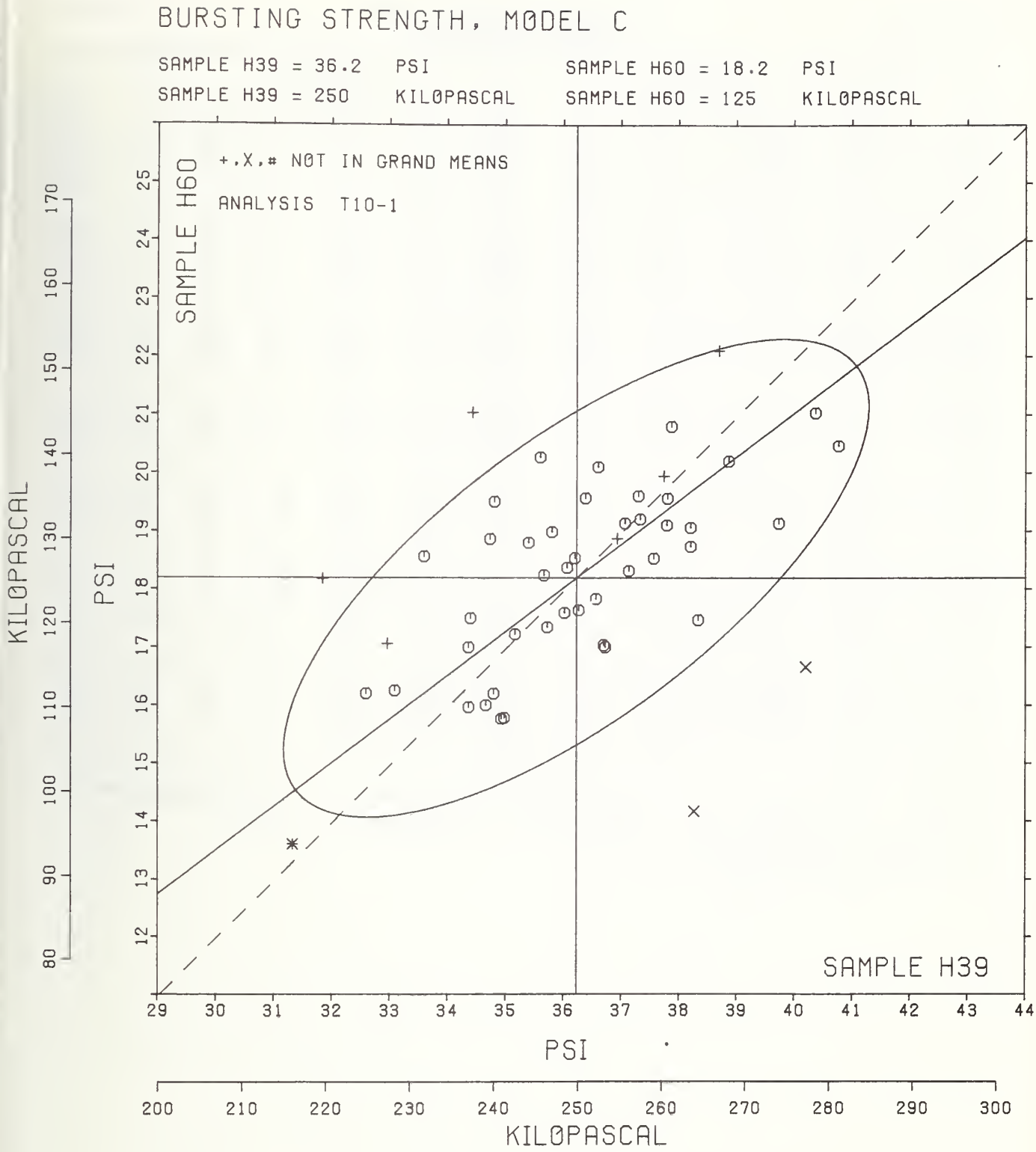
GR. MEAN = 36.23 PSI — GRAND MEAN = 18.19 PSI — TEST DETERMINATIONS = 15
SD MEANS = 1.97 PSI — SD OF MEANS = 1.60 PSI — 43 LABS IN GRAND MEANS
AVERAGE SDR = 2.15 PSI — AVERAGE SDR = 1.18 PSI
GR. MEAN = 249.8 KILOPASCAL — GRAND MEAN = 125.4 KILOPASCAL

TOTAL NUMBER OF LABORATORIES REPORTING = 51

Best Values: H39 36.0 ± 3.1 psi
H60 18.3 ± 2.2 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 H39	MEANS H60	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SQR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L162	*	31.33	13.60	-6.67	-.72	1.64 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L250L	+	31.85	18.17	-3.51	2.62	.72 10N	BURSTING STRENGTH UP TO 45 PSI,LHOMARGY,MAN.CLAMP, 20C,65%RH
L131	O	32.60	16.20	-4.10	.60	1.18 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L251	+	32.96	17.06	-3.29	1.07	.89 10V	BURSTING STRENGTH UP TO 45 PSI, L+W,MANUAL CLAMP, 20C,65% RH
L339	O	33.09	16.25	-3.67	.34	1.23 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L158	O	33.60	18.57	-1.87	1.89	.79 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L279	O	34.37	17.00	-2.20	.17	1.18 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L183	O	34.37	15.97	-2.82	-.65	.79 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L191	O	34.40	17.50	-1.88	.55	1.22 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L484	+	34.43	21.03	.28	3.35	1.20 10M	BURSTING STRENGTH UP TO 45 PSI,REGMED MT/MOT,MANUAL CLAMP
L203B	O	34.67	16.00	-2.57	-.81	.95 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L243	O	34.73	18.87	-.79	1.44	1.12 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L333	O	34.80	16.20	-2.34	-.73	1.77 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L356	O	34.81	19.51	-.33	1.91	.87 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L344	O	34.93	15.77	-2.49	-1.15	1.29 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L249	O	34.98	15.78	-2.45	-1.17	.53 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L251	O	35.17	17.22	-1.43	-.13	.84 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L264	O	35.40	18.80	-.29	.99	.69 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L321	O	35.60	20.27	.75	2.04	1.09 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L268	O	35.67	18.23	-.42	.38	.55 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L121	O	35.72	17.34	-.92	-.37	.91 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L350	O	35.81	18.98	.14	.89	.54 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L157	O	36.02	17.59	-.53	-.35	.68 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L568	O	36.07	18.37	-.02	.24	1.19 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L326	O	36.20	18.53	.18	.29	.91 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L237B	O	36.27	17.63	-.30	-.46	.44 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L599	O	36.38	19.57	.95	1.01	.89 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L203A	O	36.57	17.83	.06	-.48	1.52 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L551	O	36.60	20.10	1.45	1.31	1.46 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L237A	O	36.70	17.03	-.32	-1.20	.59 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L358	O	36.73	17.00	-.32	-1.25	.69 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L128	+	36.93	18.87	.97	.12	.67 10B	BURSTING STRENGTH UP TO 45 PSI, PERKINS B, MANUAL CLAMP
L225	O	37.07	19.13	1.24	.25	1.01 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L390	O	37.13	18.31	.80	-.44	1.52 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L153	O	37.30	19.60	1.70	.48	.89 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L331	O	37.33	19.20	1.49	.15	1.17 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L150	O	37.57	18.53	1.28	-.53	1.07 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L242	+	37.74	19.94	2.26	.49	1.06 10T	BURSTING STRENGTH UP TO 45 PSI, L+W,MANUAL CLAMP
L330	O	37.79	19.10	1.80	-.21	.94 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L312	O	37.80	19.57	2.08	.16	.79 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L207	O	37.87	20.80	2.88	1.10	1.43 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L601	O	38.20	19.06	2.10	-.49	1.00 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L311	O	38.20	18.73	1.90	-.75	1.42 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L232	X	38.27	14.17	-.79	-4.44	1.85 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L134	O	38.33	17.47	1.25	-1.84	.52 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L269	+	38.70	22.10	4.33	1.64	1.10 10A	BURSTING STRENGTH UP TO 45 PSI, PERKINS A, MANUAL CLAMP
L107	O	38.87	20.20	3.32	.02	1.52 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L322	O	39.73	19.13	3.37	-1.35	.73 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L223A	X	40.20	16.65	2.25	-3.61	.69 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L315	O	40.37	21.03	5.02	-.22	.83 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
L299	O	40.77	20.47	4.99	-.91	1.24 10C	BURSTING STRENGTH UP TO 45 PSI, PERKINS C, MANUAL CLAMP
GMEANS:		36.23	18.19			1.00	
		95% ELLIPSE:		6.06	2.40	WITH GAMMA = 36 DEGREES	


BURSTING STRENGTH, MØDEL C
SAMPLE H39 = 36.2 PSI
SAMPLE H39 = 250 KILØPASCAL
SAMPLE H60 = 18.2 PSI
SAMPLE H60 = 125 KILØPASCAL
+,X,# NØT IN GRAND MEANS
ANALYSIS T10-1
SAMPLE H60
SAMPLE H39
PSI
KILØPASCAL
KILØPASCAL
PSI

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 H39 MEAN	PRINTING 84 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H60 MEAN	PRINTING 74 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 15 VAR	F	LAB
L100	36.9	1.0	.57	1.1	.61	19.9	1.2	.91	.8	.60	10D	O	L100
L105	35.4	-.4	-.27	4.9	2.68	19.0	.4	.29	2.4	1.85	10D	O	L105
L115	38.1	2.2	1.29	1.1	.59	20.5	1.9	1.43	1.2	.93	10D	O	L115
L118	34.6	-1.3	-.76	2.7	1.46	19.8	1.1	.87	1.1	.84	10D	O	L118
L122	36.8	.9	.54	1.7	.93	19.2	.5	.41	1.7	1.28	10F	O	L122
L125	31.9	-4.0	-2.38	4.4	2.39	15.4	-3.3	-2.49	3.8	2.97	10D	*	L125
L148	36.5	.6	.34	1.7	.92	19.5	.8	.51	1.1	.87	10D	O	L148
L157	37.2	1.3	.77	2.3	1.28	21.3	2.6	1.99	.9	.68	10D	O	L157
L159	31.8	-4.1	-2.44	1.0	.56	16.1	-2.6	-1.98	1.3	1.04	10D	O	L159
L163	35.6	-.3	-.19	2.0	1.11	18.4	-.3	-.23	1.4	1.06	10D	O	L163
L166	38.1	2.2	1.31	1.5	.80	18.7	.1	.05	1.5	1.17	10D	O	L166
L185	37.5	1.6	.97	1.0	.54	20.4	1.7	1.33	1.2	.92	10D	O	L185
L190C	36.8	.9	.54	1.7	.95	18.8	.1	.10	1.3	1.02	10D	O	L190C
L190R	32.9	-3.0	-1.79	2.1	1.16	16.6	-2.1	-1.60	1.4	1.06	10D	O	L190R
L194	36.4	.5	.30	1.5	.81	19.3	.6	.48	.8	.63	10D	O	L194
L202	35.0	-.9	-.55	1.7	.93	19.2	.5	.38	.7	.54	10D	O	L202
L217	35.8	-.1	-.05	1.8	.97	18.3	-.4	-.30	1.2	.90	10F	O	L217
L224	38.1	2.2	1.29	2.0	1.07	18.8	.1	.08	1.5	1.16	10D	O	L224
L226B	35.0	-.9	-.51	1.3	.70	16.8	-1.9	-1.42	.9	.71	10D	O	L226B
L226C	34.8	-1.0	-.62	3.4	1.84	19.6	1.0	.74	1.1	.85	10D	O	L226C
L233	33.1	-2.8	-1.65	1.2	.68	17.9	-.8	-.58	1.7	1.32	10D	O	L233
L241	36.3	.4	.25	3.0	1.62	20.5	1.9	1.43	1.5	1.15	10D	O	L241
L255	34.7	-1.2	-.72	1.2	.67	17.6	-1.1	-.81	.9	.71	10D	O	L255
L257A	35.9	-.0	-.02	1.7	.94	18.5	-.1	-.10	1.2	.92	10D	O	L257A
L257B	36.9	1.0	.62	2.3	1.25	18.7	.0	.00	1.5	1.20	10D	O	L2578
L257C	36.9	1.0	.62	2.0	1.10	19.1	.4	.31	1.2	.90	10D	O	L257C
L262	36.7	.8	.48	.8	.46	19.3	.6	.49	1.0	.74	10D	O	L262
L275	38.6	2.7	1.60	1.9	1.01	18.1	-.5	-.41	2.0	1.55	10D	O	L275
L280	36.8	.9	.54	1.7	.95	19.7	1.0	.77	1.3	1.03	10D	O	L280
L309	36.8	.9	.51	1.1	.61	16.9	-1.7	-1.33	1.3	.97	10D	O	L309
L341	35.8	-.1	-.05	.7	.37	17.9	-.7	-.56	.5	.35	10D	O	L341
L352	34.9	-1.0	-.59	1.7	.92	17.3	-1.4	-1.06	1.7	1.32	10D	O	L352
L378	36.2	.3	.18	1.9	1.01	19.5	.8	.61	1.3	1.01	10D	O	L378
L567	33.1	-2.8	-1.67	1.1	.60	16.9	-1.8	-1.36	1.1	.85	10D	O	L567
L575	36.1	.2	.12	2.6	1.44	19.7	1.0	.78	1.4	1.10	10D	O	L575
L581	36.6	.7	.40	2.3	1.24	18.7	.0	.00	2.7	2.08	10D	O	L581
L587	37.7	1.8	1.05	2.2	1.21	18.9	.2	.18	.9	.67	10D	O	L587

GR. MEAN = 35.9 PSI GRAND MEAN = 18.7 PSI TEST DETERMINATIONS = 15

SD MEANS = 1.7 PSI SD OF MEANS = 1.3 PSI 37 LABS IN GRAND MEANS

AVERAGE SDR = 1.8 PSI AVERAGE SDR = 1.3 PSI

GR. MEAN = 247.5 KILOPASCAL GRAND MEAN = 128.7 KILOPASCAL

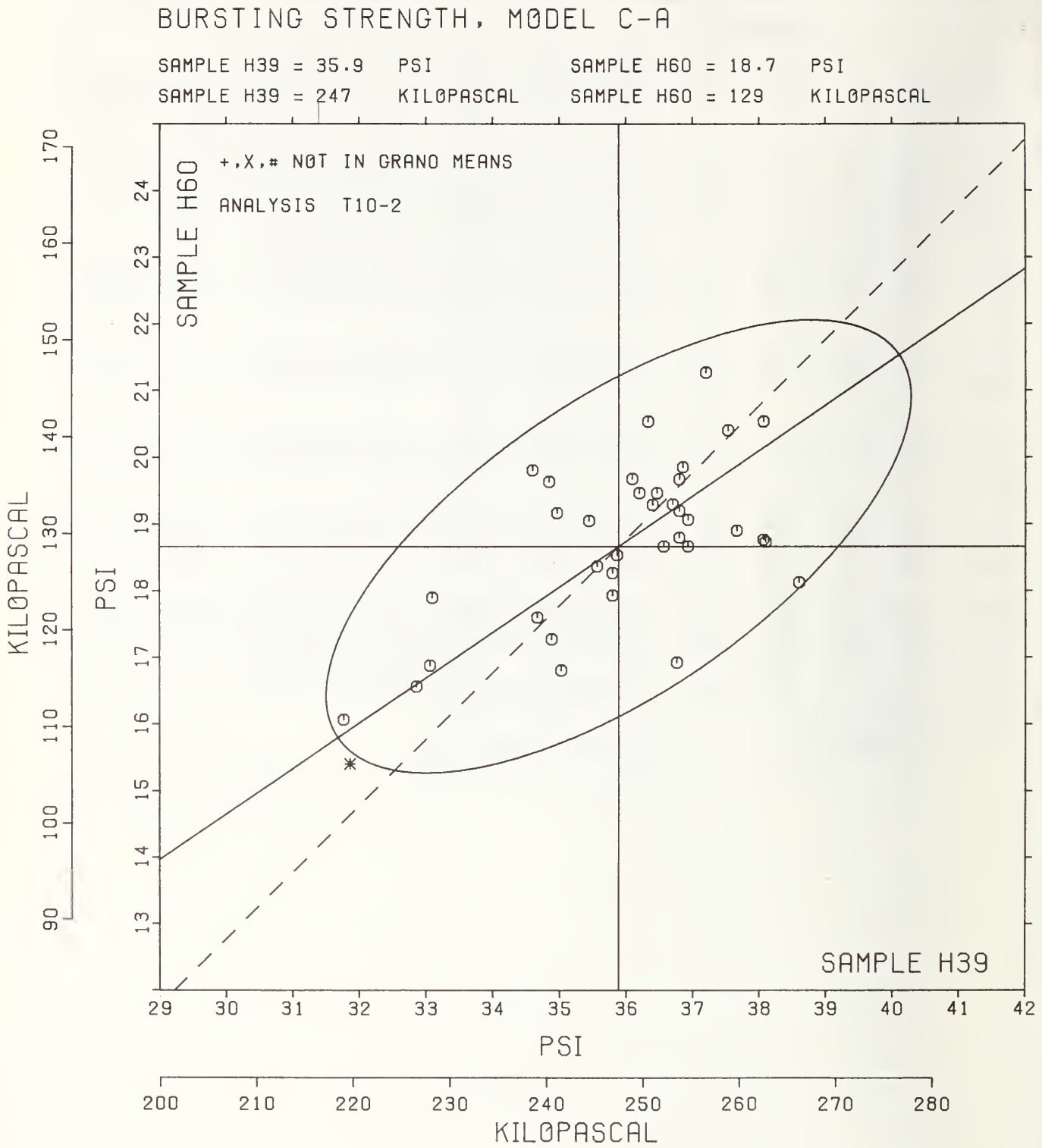
TOTAL NUMBER OF LABORATORIES REPORTING = 37

Best Values: H39 36.1 ± 2.5 psi
H60 18.9 ± 1.7 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	F	MEANS H39	MEANS H60	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L159	O	31.8	16.1	-4.9	.2	.80 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L125	*	31.9	15.4	-5.2	-.4	2.68 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L190R	O	32.9	16.6	-3.7	-.0	1.11 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L567	O	33.1	16.9	-3.3	.1	.73 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L233	O	33.1	17.9	-2.7	.9	1.00 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L118	O	34.6	19.8	-.4	1.7	1.15 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L255	O	34.7	17.6	-1.6	-.2	.69 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L226C	O	34.8	19.6	-.3	1.4	1.35 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L352	O	34.9	17.3	-1.6	-.6	1.12 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L202	O	35.0	19.2	-.5	.9	.74 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L226B	O	35.0	16.8	-1.8	-1.0	.70 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L105	O	35.4	19.0	-.2	.6	2.26 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L163	O	35.6	18.4	-.4	-.1	1.09 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L341	O	35.8	17.9	-.5	-.6	.36 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L217	O	35.8	18.3	-.3	-.3	.94 10F	BURSTING STRENGTH UP TO 45 PSI,PERKINS C, H.CLAMP,TRANSDUCER
L257A	O	35.9	18.5	-.1	-.1	.93 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L575	O	36.1	19.7	.7	.7	1.27 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L378	O	36.2	19.5	.7	.5	1.01 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L241	O	36.3	20.5	1.4	1.3	1.38 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L194	O	36.4	19.3	.8	.2	.72 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L148	O	36.5	19.5	.9	.3	.90 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L581	O	36.6	18.7	.6	-.4	1.66 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L262	O	36.7	19.3	1.0	.1	.60 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L309	O	36.8	16.9	-.3	-1.9	.79 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L190C	O	36.8	18.8	.8	-.4	.99 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L28C	O	36.8	19.7	1.3	.3	.99 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L122	O	36.8	19.2	1.1	-.1	1.10 10F	BURSTING STRENGTH UP TO 45 PSI,PERKINS C, H.CLAMP,TRANSDUCER
L100	O	36.9	19.9	1.5	.4	.60 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L257B	O	36.9	18.7	.9	-.6	1.22 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L257C	O	36.9	19.1	1.1	-.3	1.00 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L157	O	37.2	21.3	2.5	1.4	.98 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L185	O	37.5	20.4	2.3	.5	.73 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L587	O	37.7	18.9	1.6	-.8	.94 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L224	O	38.1	18.8	1.9	-1.1	1.11 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L115	O	38.1	20.5	2.8	.3	.76 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L166	O	38.1	18.7	1.9	-1.2	.99 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
L275	O	38.6	18.1	1.9	-2.0	1.28 10D	BURSTING STRENGTH UP TO 45 PSI, PERKINS CA OR C, AIR CLAMP
GMEANS:		35.9	18.7			1.00	
		95% ELLIPSE:		5.1	2.2	WITH GAMMA = 34 DEGREES	


BURSTING STRENGTH, MODEL C-A
SAMPLE H39 = 35.9 PSI
SAMPLE H39 = 247 KILOPASCAL
SAMPLE H60 = 18.7 PSI
SAMPLE H60 = 129 KILOPASCAL
+,X,* NOT IN GRAND MEANS
ANALYSIS T10-2
SAMPLE H60
SAMPLE H39
PSI
KILOPASCAL
13 14 15 16 17 18 19 20 21 22 23 24
90 100 110 120 130 140 150 160 170
29 30 31 32 33 34 35 36 37 38 39 40 41 42
200 210 220 230 240 250 260 270 280

TAPPI COLLABORATIVE REFERENCE PROGRAM
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 H07 MEAN	KRAFT 147 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H25 MEAN	PRINTING 151 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 15 VAR	F	LAB
L100	70.1	-3.5	-1.15	5.5	.86	53.8	-.2	-.11	2.2	.80	11D	O	L100
L103	76.1	2.4	.80	3.2	.51	55.3	1.3	.59	2.9	1.06	11C	O	L103
L107	73.5	-.2	-.05	6.2	.97	53.9	-.1	-.05	2.5	.93	11C	O	L107
L118	76.9	3.2	1.06	5.2	.82	53.7	-.3	-.15	3.6	1.33	11D	O	L118
L122	73.0	-.6	-.20	6.9	1.10	54.3	.2	.10	2.7	1.00	11F	O	L122
L128	73.4	-.2	-.07	3.1	.48	55.3	1.3	.59	2.0	.72	11D	O	L128
L148	71.2	-2.4	-.79	5.2	.81	54.7	.6	.29	3.4	1.25	11D	O	L148
L159	70.2	-3.4	-1.12	6.7	1.06	50.9	-3.1	-1.42	2.8	1.04	11D	O	L159
L170	74.9	1.3	.43	6.4	1.01	55.0	1.0	.44	2.5	.91	11C	O	L170
L174	81.1	7.4	2.44	7.0	1.10	62.1	8.1	3.69	2.4	.90	11D	#	L174
L182	74.9	1.3	.43	5.1	.81	53.7	-.4	-.17	2.1	.76	11D	O	L182
L218	77.6	3.9	1.29	6.6	1.05	55.1	1.1	.50	3.6	1.32	11D	O	L218
L232	70.2	-3.4	-1.12	5.6	.89	52.3	-1.7	-.79	3.1	1.13	11C	O	L232
L237A	72.5	-1.1	-.36	2.5	.40	54.7	.6	.29	1.2	.45	11C	O	L237A
L237B	77.2	3.6	1.18	5.1	.81	54.5	.5	.23	1.7	.61	11C	O	L237B
L238A	73.5	-.2	-.05	12.5	1.97	50.2	-3.9	-1.76	3.5	1.30	11Y	O	L238A
L243	70.8	-2.8	-.93	6.2	.97	52.8	-1.2	-.56	2.4	.87	11C	O	L243
L273	71.8	-1.8	-.60	5.2	.83	51.3	-2.7	-1.23	2.9	1.05	11C	O	L273
L279	78.1	4.4	1.45	9.5	1.50	57.6	3.5	1.61	3.5	1.30	11C	O	L279
L280	76.9	3.3	1.08	6.7	1.05	56.5	2.4	1.11	2.2	.82	11D	O	L280
L294	106.9	33.2	10.90	14.5	2.29	52.9	-1.1	-.50	3.9	1.42	11C	#	L294
L303	68.1	-5.5	-1.80	4.6	.72	51.6	-2.4	-1.10	2.3	.84	11C	O	L303
L330	71.2	-2.5	-.81	9.8	1.54	57.4	3.4	1.55	2.7	.97	11C	O	L330
L331	70.5	-3.1	-1.01	8.9	1.40	56.4	2.4	1.08	3.4	1.26	11C	O	L331
L333	88.1	14.5	4.76	10.5	1.67	52.1	-1.9	-.87	6.9	2.53	11C	#	L333
L334	74.2	.5	.18	5.7	.89	56.5	2.5	1.12	3.0	1.11	11D	O	L334
L344	79.7	6.1	2.00	7.6	1.19	50.5	-3.6	-1.63	3.8	1.40	11C	*	L344
L356	76.3	2.6	.87	8.9	1.40	55.6	1.6	.71	2.4	.89	11C	O	L356
L362	69.7	-3.9	-1.29	5.4	.85	54.8	.8	.35	2.7	1.01	11D	O	L362
L378	73.4	-.2	-.07	5.6	.88	55.8	1.8	.80	2.8	1.02	11D	O	L378
L565	70.4	-3.2	-1.05	3.9	.61	53.9	-.1	-.06	1.5	.55	11D	O	L565
L567	72.1	-1.6	-.51	7.0	1.10	48.6	-5.5	-2.49	3.6	1.33	11D	O	L567
L575	75.5	1.9	.62	9.0	1.42	55.8	1.8	.80	3.5	1.30	11D	O	L575
L604	78.5	4.8	1.59	8.1	1.28	52.7	-1.3	-.61	2.9	1.07	11C	O	L604
L242	77.2	3.6	1.17	5.6	.89	57.4	3.4	1.54	2.7	.99	11T	*	L242
L250L	70.4	-3.2	-1.05	5.2	.83	50.5	-3.6	-1.63	1.7	.63	11N	*	L250L
L251	64.0	-9.6	-3.16	7.5	1.19	45.1	-8.9	-4.05	2.7	1.01	11V	*	L251
L290	71.9	-1.7	-.55	4.4	.69	57.5	3.5	1.59	1.9	.71	11A	*	L290
L393	73.5	-.2	-.05	8.2	1.29	54.9	.9	.41	2.3	.85	11H	*	L393
L394	84.0	10.4	3.40	3.0	.47	61.4	7.4	3.36	2.1	.77	11H	*	L394
L570	73.9	.2	.08	4.2	.66	56.5	2.5	1.14	2.3	.85	11E	*	L570
L576	78.5	4.8	1.59	3.1	.49	55.9	1.8	.83	2.5	.92	11P	*	L576
L593	85.4	11.8	3.86	10.8	1.71	62.5	8.4	3.84	4.2	1.55	11J	*	L593

GR. MEAN = 73.6 PSI
SD MEANS = 3.0 PSI
AVERAGE SDR = 6.3 PSI
GR. MEAN = 507.6 KILOPASCAL

GRAND MEAN = 54.0 PSI
SD OF MEANS = 2.2 PSI
AVERAGE SDR = 2.7 PSI
GRAND MEAN = 372.6 KILOPASCAL

TEST DETERMINATIONS = 15
31 LABS IN GRAND MEANS

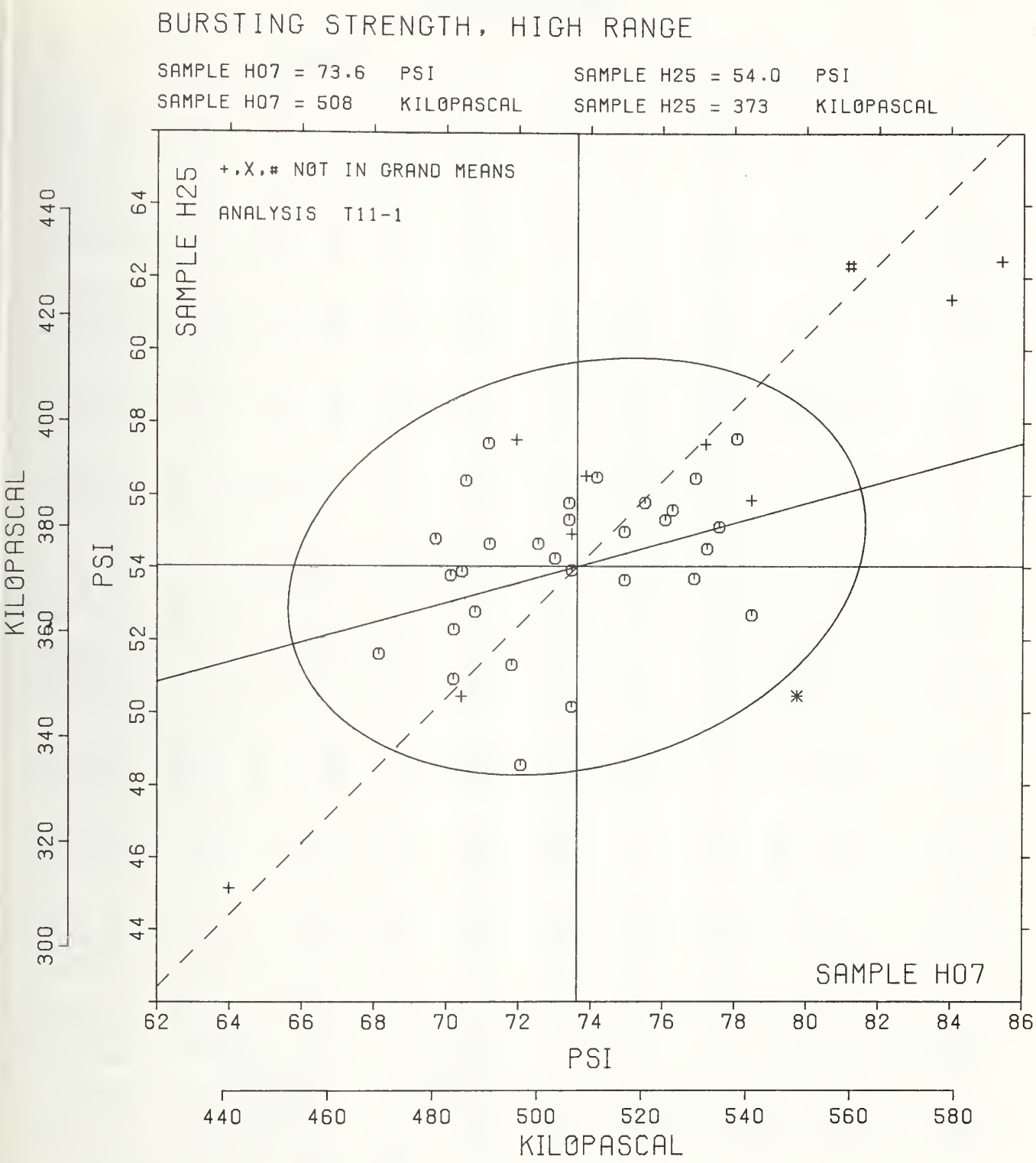
TOTAL NUMBER OF LABORATORIES REPORTING = 43

Best Values: H07 74 ± 4 psi
H25 54 ± 3 psi

The following laboratories were omitted from the grand means because of extreme test results: 174, 294, 333.

ANALYSIS T11-1 TABLE 2
BURSTING STRENGTH, HIGH RANGE, PSI
TAPPI STANDARD T403 OS-76, BURSTING STRENGTH OF PAPER - PERKINS MODEL C OR C-A

LAB CODE	F	MEANS H07	H25	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L251	*	64.0	45.1	-11.6	-6.0	1.10	11V	BURSTING STRENGTH 40 - 100 PSI, L*W,MANUAL CLAMP, 20C,65% RH
L303	O	68.1	51.6	-5.9	-.9	.78	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L362	O	69.7	54.8	-3.6	1.8	.93	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L100	O	70.1	53.8	-3.4	.7	.83	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L159	O	70.2	50.9	-4.1	-2.1	1.05	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L232	O	70.2	52.3	-3.8	-.8	1.01	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L250L	*	70.4	50.5	-4.0	-2.6	.73	11N	BURSTING STRENGTH 40 - 100 PSI,LHGMARGI,MAN.CLAMP, 20C,65%RH
L565	O	70.4	53.9	-3.1	.7	.58	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L331	O	70.5	56.4	-2.4	3.1	1.33	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L243	O	70.8	52.8	-3.1	-.4	.92	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L330	O	71.2	57.4	-1.5	3.9	1.26	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L148	O	71.2	54.7	-2.2	1.2	1.03	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L273	O	71.8	51.3	-2.5	-2.1	.94	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L290	*	71.9	57.5	-.7	3.8	.70	11A	BURSTING STRENGTH 40 - 100 PSI, PERKINS A, MANUAL CLAMP
L567	O	72.1	48.6	-3.0	-4.9	1.22	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L237A	O	72.5	54.7	-.9	.9	.43	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L122	O	73.0	54.3	-.5	.4	1.05	11P	BURSTING STRENGTH 40 - 100 PSI,PERKINS C, H.CLAMP,TRANSDUCER
L378	O	73.4	55.8	.3	1.8	.95	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L128	O	73.4	55.3	.1	1.3	.60	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L238A	O	73.5	50.2	-1.2	-3.7	1.63	11Y	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L393	*	73.5	54.9	.1	.9	1.07	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L107	O	73.5	53.9	-.2	-.1	.95	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L570	*	73.9	56.5	.9	2.3	.76	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L334	O	74.2	56.5	1.2	2.2	1.00	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L182	O	74.9	53.7	1.2	-.7	.78	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L170	O	74.9	55.0	1.5	.6	.96	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L575	O	75.5	55.8	2.3	1.2	1.36	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L103	O	76.1	55.3	2.7	.6	.79	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L355	O	76.3	55.6	3.0	.8	1.15	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L118	O	76.9	53.7	3.0	-1.2	1.07	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L280	O	76.9	56.5	3.8	1.5	.94	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L242	*	77.2	57.4	4.3	2.3	.94	11T	BURSTING STRENGTH 40 - 100 PSI, L*W,MANUAL CLAMP
L237H	O	77.2	54.5	3.6	-.5	.71	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L218	O	77.6	55.1	4.1	.0	1.19	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L279	O	78.1	57.6	5.2	2.2	1.40	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L604	O	78.5	52.7	4.3	-2.6	1.17	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L576	*	78.5	55.9	5.2	.5	.70	11P	BURSTING STRENGTH 40 - 100 PSI, PERKINS LC, MANUAL CLAMP
L344	*	79.7	50.5	4.9	-5.1	1.29	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L174	#	81.1	62.1	9.3	5.8	1.00	11D	BURSTING STRENGTH 40 - 100 PSI, PERKINS CA, AIR CLAMP
L394	*	84.0	61.4	12.0	4.3	.62	11H	BURSTING STRENGTH 40 - 100 PSI, PERKINS AH, HYDRAULIC CLAMP
L593	*	85.4	62.5	13.6	5.0	1.63	11J	BURSTING STRENGTH 40 - 100 PSI, PERKINS JUMHO,HAND DRIVEN
L333	#	88.1	52.1	13.5	-5.7	2.10	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
L294	#	106.9	52.9	31.8	-9.9	1.85	11C	BURSTING STRENGTH 40 - 100 PSI, PERKINS C, MANUAL CLAMP
GMEANS:		73.6	54.0			1.00		
		95% ELLIPSE:		8.2	5.5	WITH GAMMA = 15 DEGREES		


BURSTING STRENGTH, HIGH RANGE
SAMPLE H07 = 73.6 PSI
SAMPLE H07 = 508 KILOPASCAL
SAMPLE H25 = 54.0 PSI
SAMPLE H25 = 373 KILOPASCAL
+,X,# NOT IN GRAND MEANS
ANALYSIS T11-1
SAMPLE H25
PSI
KILOPASCAL
SAMPLE H07
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 E11 WRITING 70 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E17 BROWN KRAFT 74 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.* 15 VAR	P	LAB
L100	55.6	-2.5	-.95	1.0	.69	58.2	-2.6	-.77	2.0	1.01	1SM	G	L100
L103	58.3	.2	.07	.5	.34	60.3	-.5	-.14	1.5	.78	1ST	G	L103
L105	55.8	-2.4	-.89	1.8	1.27	58.3	-2.5	-.75	4.5	2.24	1ST	S	L105
L107	62.7	4.5	1.70	1.4	1.01	65.9	5.1	1.52	1.8	.89	1ST	G	L107
L115	60.4	2.3	.86	1.3	.87	61.7	.9	.26	1.6	.80	1SC	G	L115
L118	56.6	-1.6	-.59	1.2	.86	59.7	-1.1	-.32	1.9	.98	1ST	G	L118
L121	60.0	1.8	.69	2.0	1.39	59.2	-1.6	-.48	2.1	1.06	1ST	G	L121
L122	60.0	1.9	.71	.7	.50	62.0	1.2	.35	2.0	1.01	1SC	G	L122
L124	62.5	4.3	1.62	1.1	.78	62.5	1.7	.50	2.2	1.09	1ST	G	L124
L126	59.3	1.2	.44	1.5	1.07	63.7	2.9	.86	2.5	1.26	1ST	G	L126
L128	58.9	.8	.29	1.1	.77	62.6	1.8	.54	1.9	.95	1ST	S	L128
L134	58.5	.4	.14	1.3	.91	62.2	1.4	.42	1.8	.90	1ST	G	L134
L139	59.6	1.4	.54	1.9	1.31	63.2	2.4	.72	2.1	1.05	1ST	G	L139
L145	55.5	-2.7	-1.01	2.2	1.53	56.9	-3.9	-1.19	2.2	1.09	1ST	G	L145
L148	57.1	-1.1	-.41	2.8	1.96	59.2	-1.6	-.48	2.7	1.36	1ST	S	L148
L150	63.7	5.6	2.10	1.3	.93	63.2	2.4	.72	2.3	1.18	1ST	G	L150
L151	69.9	11.8	4.43	1.4	.96	73.7	12.9	3.90	2.1	1.05	1SC	X	L151
L153	56.3	-1.8	-.69	1.4	.97	56.9	-3.9	-1.19	1.9	.95	1SC	G	L153
L157	54.5	-3.7	-1.39	1.0	.69	58.7	-2.1	-.65	2.1	1.07	1ST	G	L157
L158	53.9	-4.3	-1.62	3.2	2.20	73.1	12.3	3.69	2.5	1.25	1SR	X	L158
L159	58.5	.3	.12	1.4	.98	65.4	4.6	1.38	2.6	1.29	1SL	S	L159
L162	57.8	-.4	-.14	1.2	.82	61.2	.4	.13	1.5	.75	1ST	G	L162
L163	57.9	-.2	-.09	1.3	.89	59.0	-1.8	-.54	2.3	1.16	1ST	G	L163
L166	57.7	-.4	-.16	1.3	.89	59.4	-1.4	-.42	2.0	1.00	1ST	G	L166
L167	58.5	.4	.14	.9	.64	64.9	4.1	1.24	1.0	.52	1SC	G	L167
L170	55.1	-3.1	-1.16	1.0	.72	59.8	-1.0	-.30	.4	.21	1ST	G	L170
L173B	58.5	.4	.14	1.4	.98	57.8	-3.0	-.91	1.5	.74	1ST	G	L173B
L174S	60.5	2.4	.89	2.9	2.00	67.7	6.9	2.09	4.1	2.08	1ST	G	L174S
L182A	56.1	-2.1	-.79	1.6	1.10	63.7	2.9	.88	4.0	2.02	1SA	G	L182A
L182T	60.3	2.1	.79	1.2	.85	65.2	4.4	1.32	1.7	.85	1ST	S	L182T
L183	58.1	-.0	-.01	1.6	1.11	58.7	-2.1	-.63	2.0	1.00	1ST	G	L183
L185	42.5	-15.6	-5.88	1.2	.83	45.5	-15.3	-4.62	1.0	.50	1ST	#	L185
L190C	56.2	-2.0	-.74	.9	.65	55.7	-5.1	-1.53	1.8	.88	1ST	G	L190C
L190R	60.7	2.6	.97	1.5	1.03	62.3	1.5	.44	1.7	.86	1SC	G	L190R
L191	60.1	2.0	.74	1.4	.98	64.1	3.3	1.00	1.8	.89	1ST	G	L191
L194	60.1	1.9	.73	2.5	1.74	61.7	.9	.28	1.7	.86	1ST	G	L194
L195	60.8	2.6	.99	1.3	.88	61.2	.4	.12	2.6	1.31	1SC	G	L195
L206	59.7	1.5	.57	2.4	1.70	62.3	1.5	.46	2.0	1.02	1ST	G	L206
L207	53.1	-5.1	-1.91	1.5	1.08	89.0	28.2	8.51	3.3	1.67	1SR	#	L207
L211	57.1	-1.0	-.39	1.5	1.01	58.3	-2.5	-.77	1.9	.96	1SR	G	L211
L213	59.0	.8	.32	1.2	.83	62.7	1.9	.56	1.2	.62	1ST	G	L213
L217	56.6	-1.6	-.59	.9	.63	63.3	2.5	.74	2.1	1.05	1ST	G	L217
L223	59.4	1.3	.48	.7	.46	61.2	.4	.12	1.5	.76	1SR	G	L223
L224	55.3	-2.9	-1.09	1.9	1.30	55.4	-5.4	-1.63	1.2	.60	1ST	G	L224
L225	61.1	2.9	1.09	1.1	.77	64.9	4.1	1.24	1.2	.59	1ST	G	L225
L226B	52.9	-5.2	-1.97	1.6	1.14	53.3	-7.5	-2.26	2.0	1.00	1ST	G	L2268
L226C	52.4	-5.8	-2.17	1.0	.68	53.4	-7.4	-2.23	1.3	.64	1ST	S	L226C
L228	55.5	-2.6	-.99	1.3	.91	56.3	-4.5	-1.37	2.0	1.01	1ST	G	L228
L232	57.3	-.8	-.31	1.0	.68	63.1	2.3	.68	2.1	1.07	1ST	G	L232
L233	64.5	6.4	2.40	1.3	.91	67.5	6.7	2.01	2.4	1.23	1ST	G	L233
L235	54.3	-3.8	-1.44	1.2	.86	57.5	-3.3	-.99	1.4	.68	1ST	G	L236
L237A	57.3	-.8	-.31	1.4	1.01	62.4	1.6	.48	2.3	1.15	1ST	G	L237A
L237B	58.4	.2	.09	1.1	.78	61.9	1.1	.32	1.6	.80	1ST	S	L237B
L238A	54.5	-3.6	-1.37	.9	.64	57.3	-3.5	-1.05	2.2	1.12	1ST	G	L238A
L241	57.5	-.6	-.24	1.6	1.12	63.2	2.4	.72	1.2	.61	1ST	G	L241
L243	58.5	.4	.14	1.1	.74	62.5	1.7	.50	2.0	.99	1ST	G	L243
L244	57.4	-.8	-.29	1.2	.86	61.1	.3	.08	1.6	.82	1SC	S	L244
L249	59.0	.8	.32	1.0	.73	63.5	2.7	.80	2.3	1.17	1ST	G	L249
L254	59.1	.9	.34	1.0	.72	60.7	-.1	-.04	2.0	.98	1ST	G	L254
L257A	57.7	-.4	-.16	2.1	1.48	62.0	1.2	.36	1.5	.76	1SC	G	L257A
L257B	58.3	.1	.04	1.7	1.16	61.9	1.1	.32	1.6	.80	1SC	G	L257B
L257C	58.4	.2	.09	1.9	1.31	61.9	1.1	.32	1.9	.97	1SC	G	L257C
L259	62.4	4.2	1.60	.7	.51	60.9	.1	.02	1.8	.91	1ST	G	L259
L261	53.9	-4.2	-1.59	1.6	1.13	57.3	-3.5	-1.05	2.2	1.09	1ST	G	L261
L262	58.0	-.2	-.06	.7	.46	60.7	-.1	-.02	.8	.40	1ST	G	L262

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T15-1 TABLE 1
TEARING STRENGTH, GRAMS

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

LAB CODE	SAMPLE E11 MEAN	WRITING 70 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE E17 MEAN	BROWN KRAFT 74 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 15 VAR	F	LAB
L264	70.4	12.2	4.61	5.4	3.76	91.7	30.9	9.32	2.8	1.42	15T	#	L264
L268	58.7	.5	.19	1.2	.86	62.7	1.9	.56	.6	.31	15T	@	L268
L273	57.6	-.6	-.21	2.3	1.60	62.4	1.6	.48	1.6	.80	15T	@	L273
L275	59.7	1.5	.57	1.3	.90	64.5	3.7	1.12	1.8	.93	15T	@	L275
L277	46.7	-11.5	-4.33	2.0	1.36	47.7	-13.1	-3.94	2.0	1.00	15T	#	L277
L278	60.0	1.8	.69	2.8	1.97	63.8	3.0	.90	6.9	3.49	15T	@	L278
L279	57.7	-.5	-.19	1.2	.86	61.7	.9	.28	2.3	1.18	15T	@	L279
L280	55.9	-2.2	-.84	.9	.61	60.1	-.7	-.22	1.7	.86	15L	@	L280
L281	55.9	-2.2	-.84	1.0	.67	57.9	-2.9	-.87	1.4	.70	15T	@	L281
L288	61.6	3.4	1.29	1.1	.80	63.6	2.8	.85	2.3	1.16	15Q	@	L288
L290	58.1	-.1	-.04	1.6	1.10	63.5	2.7	.82	2.6	1.32	15T	@	L290
L291	57.7	-.5	-.19	1.2	.82	60.9	.1	.04	1.6	.82	15A	@	L291
L299	62.3	4.1	1.55	1.5	1.03	64.4	3.6	1.08	1.7	.87	15T	@	L299
L303	54.6	-3.6	-1.34	1.9	1.31	53.3	-7.5	-2.27	1.9	.98	15L	@	L303
L309	56.6	-1.6	-.59	1.5	1.08	59.9	-.9	-.26	2.1	1.07	15T	@	L309
L311	58.9	.8	.29	1.0	.67	60.1	-.7	-.20	3.2	1.63	15T	@	L311
L312	56.8	-1.4	-.51	3.0	2.09	55.1	-5.7	-1.73	2.3	1.13	15T	@	L312
L315	59.3	1.1	.42	1.1	.77	61.3	.5	.14	2.8	1.43	15T	@	L315
L321	56.4	-1.8	-.66	1.1	.78	54.7	-6.1	-1.85	1.2	.62	15T	@	L321
L324	60.7	2.5	.94	2.1	1.43	62.1	1.3	.40	2.0	.99	15T	@	L324
L328	52.2	-6.0	-2.24	2.6	1.81	55.1	-5.7	-1.71	1.6	.78	15T	@	L328
L331	52.9	-5.2	-1.97	1.3	.89	54.5	-6.3	-1.91	1.6	.80	15T	@	L331
L334	54.9	-3.2	-1.21	1.0	.72	56.0	-4.8	-1.45	1.4	.69	15T	@	L334
L336	57.2	-1.0	-.36	1.2	.84	59.6	-1.2	-.36	1.8	.93	15T	@	L336
L344	58.7	.5	.19	1.8	1.25	59.6	-1.2	-.36	2.3	1.15	15C	@	L344
L345	55.5	-2.7	-1.01	2.1	1.44	60.5	-.3	-.08	3.0	1.50	15T	@	L345
L352	61.0	2.8	1.06	1.7	1.18	62.1	1.3	.39	1.8	.88	15C	@	L352
L360	57.1	-1.1	-.41	1.1	.78	61.1	.3	.09	1.5	.75	15T	@	L360
L362	54.9	-3.2	-1.21	1.5	1.03	58.3	-2.5	-.77	1.7	.84	15T	@	L362
L366	54.5	-3.6	-1.37	1.6	1.11	55.6	-5.2	-1.57	1.7	.87	15T	@	L366
L376	60.9	2.8	1.04	1.7	1.16	58.9	-1.9	-.57	2.9	1.47	15T	@	L376
L378	58.1	-.1	-.04	1.5	1.07	60.1	-.7	-.22	1.8	.88	15T	@	L378
L382	63.1	4.9	1.85	1.4	.96	66.3	5.5	1.65	1.8	.90	15T	@	L382
L390	57.7	-.4	-.16	1.3	.89	59.5	-1.3	-.40	1.8	.89	15T	@	L390
L396M	50.4	-7.8	-2.92	2.8	1.98	82.0	21.2	6.39	4.7	2.38	15T	#	L396M
L442	65.8	7.6	2.86	1.7	1.16	67.2	6.4	1.93	2.3	1.17	15R	*	L442
L484	60.7	2.5	.94	2.2	1.55	74.4	13.6	4.10	4.3	2.16	15T	#	L484
L554	65.7	7.5	2.83	1.0	.68	65.5	4.7	1.42	1.8	.93	15C	*	L554
L562	62.7	4.5	1.70	2.6	1.78	78.6	17.8	5.36	9.5	4.77	15T	#	L562
L565	55.7	-2.4	-.91	2.5	1.71	59.5	-1.3	-.40	1.5	.73	15T	@	L565
L566	56.9	-1.2	-.46	1.5	1.03	67.3	6.5	1.97	1.8	.91	15T	X	L566
L567	60.5	2.3	.87	1.4	.94	64.3	3.5	1.04	2.1	1.07	15C	@	L567
L575	57.0	-1.2	-.45	1.3	.88	61.3	.5	.15	2.0	.98	15L	@	L575
L576	60.6	2.4	.92	1.8	1.23	67.3	6.5	1.97	2.1	1.07	15T	@	L576
L580	57.7	-.4	-.16	.8	.56	58.7	-2.1	-.63	1.6	.82	15T	@	L580
L581	59.0	.8	.32	1.2	.82	61.1	.3	.09	1.9	.97	15Q	@	L581
L587	56.5	-1.6	-.61	1.4	.98	54.0	-6.8	-2.05	1.3	.66	15T	@	L587
L596	56.8	-1.4	-.51	3.1	2.16	66.1	5.3	1.60	5.6	2.83	15T	*	L596
L599	58.1	-.0	-.01	1.2	.87	59.8	-1.0	-.30	2.5	1.26	15T	@	L599
L600	59.9	1.7	.64	1.4	.98	61.6	.8	.24	2.1	1.04	15T	@	L600
L604	52.3	-5.9	-2.22	2.4	1.65	80.8	20.0	6.03	2.7	1.36	15T	#	L604
L606	56.5	-1.7	-.64	1.4	.94	61.4	.6	.18	1.9	.97	15T	@	L606

GR. MEAN = 58.2 GRAMS — GRAND MEAN = 60.8 GRAMS — TEST DETERMINATIONS = 15
SD MEANS = 2.7 GRAMS — SD OF MEANS = 3.3 GRAMS — 106 LABS IN GRAND MEANS
AVERAGE SDR = 1.4 GRAMS — AVERAGE SDR = 2.0 GRAMS
GR. MEAN = 570.4 MILLINEWTON — GRAND MEAN = 596.3 MILLINEWTON

Best Values: E11 58 ± 4 grams
E17 61 ± 6 grams

The following laboratories were omitted from the grand means because of extreme test results: 185, 207, 264, 277, 396M, 484, 562, 604.

Data from the following laboratories appeared to be off by a multiplicative factor: 221, 230, 255, 561. Code 15V was assigned temporarily to put in a factor of 2.

Data from the following laboratories were given X codes and omitted from the grand means because the tests were made on NO CUTOUT tear testers: 602.

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 NOT CUTOUT.

ANALYSIS T15-1 TABLE 1

TEARING STRENGTH, GRAMS

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

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

TOTAL NUMBER OF LABORATORIES REPORTING = 126

ANALYSIS T15-1 TABLE 2

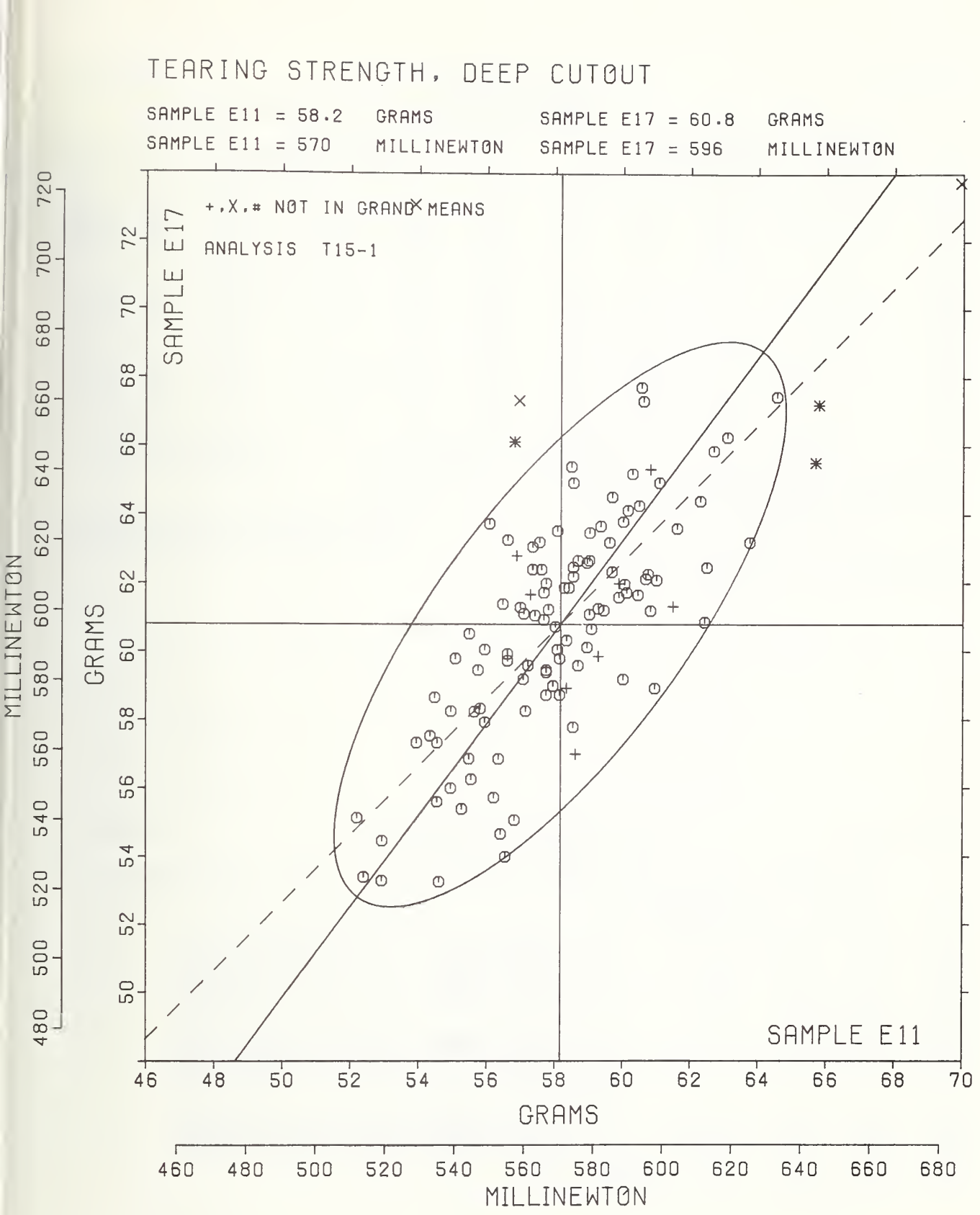
TEARING STRENGTH, GRAMS

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

LAB CODE	F	MEANS E11	MEANS E17	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L185	#	42.5	45.5	-21.6	3.4	.66	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L277	#	46.7	47.7	-17.4	1.4	1.18	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L396M	#	50.4	82.0	12.4	18.9	2.18	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L328	O	52.2	55.1	-8.1	1.4	1.29	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L604	#	52.3	80.8	12.5	16.7	1.51	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L226C	O	52.4	53.4	-9.4	.2	.66	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L226B	O	52.9	53.3	-9.2	-.3	1.07	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L331	O	52.9	54.5	-8.2	.4	.85	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L207	#	53.1	89.0	19.6	20.9	1.37	15R	TEARING STRENGTH, STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L158	X	53.9	73.1	7.3	10.8	1.73	15R	TEARING STRENGTH, STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L261	O	53.9	57.3	-5.3	1.3	1.11	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L236	O	54.3	57.5	-4.9	1.1	.77	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L157	O	54.5	58.7	-3.9	1.7	.88	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L366	O	54.5	55.6	-6.3	-.2	.99	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L238A	O	54.5	57.3	-5.0	.8	.88	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L303	O	54.6	53.3	-8.2	-1.6	1.14	15L	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L362	O	54.9	58.3	-4.0	1.1	.94	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L334	O	54.9	56.0	-5.8	-.3	.70	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L170	O	55.1	59.8	-2.7	1.9	.46	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L224	O	55.3	55.4	-6.1	-.9	.95	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L145	O	55.5	56.9	-4.8	-.2	1.31	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L345	O	55.5	60.5	-1.8	2.0	1.47	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L228	O	55.5	56.3	-5.2	-.6	.96	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L100	O	55.6	58.2	-3.6	.5	.85	15M	TEARING STRENGTH, STANDARD, T.M.MIRFIELD(APPITA-ELMENDORF)
L565	O	55.7	59.5	-2.5	1.1	1.22	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L105	O	55.8	58.3	-3.4	.4	1.75	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L281	O	55.9	57.9	-3.6	.1	.68	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L280	O	55.9	60.1	-1.9	1.3	.74	15L	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L182A	O	56.1	63.7	1.1	3.4	1.56	15A	TEARING STRENGTH, STANDARD, APPITA
L190C	O	56.2	55.7	-5.2	-1.5	.77	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L153	O	56.3	56.9	-4.3	-.9	.96	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L321	O	56.4	54.7	-6.0	-2.3	.70	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L506	O	56.5	61.4	-.5	1.7	.95	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L587	O	56.5	54.0	-6.4	-2.8	.82	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L309	O	56.6	59.9	-1.6	.7	1.07	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L118	O	56.6	59.7	-1.8	.6	.92	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L217	O	56.6	63.3	1.0	2.7	.84	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L596	*	56.8	66.1	3.6	4.3	2.49	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L312	O	56.8	55.1	-5.4	-2.3	1.61	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L251	+	56.9	62.8	.8	2.2	1.13	15K	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES, 20 C, 65% RH
L566	X	56.9	67.3	4.6	4.9	.97	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L575	O	57.0	61.3	-.3	1.2	.93	15L	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L148	O	57.1	59.2	-1.9	-.1	1.66	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L360	O	57.1	61.1	-.4	1.1	.77	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L211	O	57.1	58.3	-2.7	-.7	.99	15R	TEARING STRENGTH, STANDARD, THWING-ELMENDORF, DIGITAL READOUT
L336	O	57.2	59.6	-1.5	.0	.88	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L230	+	57.3	61.7	.2	1.2	.83	15V	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)X2
L237A	O	57.3	62.4	.8	1.6	1.08	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L232	O	57.3	63.1	1.3	2.0	.87	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L244	O	57.4	61.1	-.2	.8	.84	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L241	O	57.5	63.2	1.5	1.9	.86	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L273	O	57.6	62.4	.9	1.4	1.20	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L291	O	57.7	60.9	-.2	.5	.82	15A	TEARING STRENGTH, STANDARD, APPITA
L279	O	57.7	61.7	.4	.9	1.02	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L580	O	57.7	58.7	-1.9	-.9	.69	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L390	O	57.7	59.5	-1.3	-.5	.89	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L166	O	57.7	59.4	-1.4	-.5	.95	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L257A	O	57.7	62.0	.7	1.1	1.12	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L162	O	57.8	61.2	.1	.5	.79	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L163	O	57.9	59.0	-1.6	-.9	1.02	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L262	O	58.0	60.7	-.2	.1	.43	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L378	O	58.1	60.1	-.7	-.4	.97	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L290	O	58.1	63.5	2.1	1.7	1.21	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L599	O	58.1	59.8	-.8	-.6	1.07	15T	TEARING STRENGTH, STANDARD, THWING-ELMENDORF(SCALE TO 100)
L183	O	58.1	58.7	-1.7	-1.2	1.05	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 E11	MEANS E17	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L257B	6	58.3	61.9	.9	.5	.98	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L531	*	58.3	58.9	-1.4	-1.3	1.15	15E	TEARING STRENGTH, STANDARD, THWING-ELMENDORF,AMBIENT COND.
L103	6	58.3	60.3	-.3	-.4	.56	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L257C	6	58.4	61.9	1.0	.4	1.14	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L237B	6	58.4	61.9	1.0	.4	.79	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L159	6	58.5	65.4	3.9	2.5	1.13	15L	TEARING STRENGTH, STANDARD, LORENTZ-WETTRES
L134	6	58.5	62.2	1.3	.5	.90	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L167	6	58.5	64.9	3.5	2.2	.58	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L243	6	58.5	62.5	1.6	.7	.86	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L173B	6	58.5	57.8	-2.2	-2.1	.86	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L602	*	58.6	57.0	-2.8	-2.6	.54	15X	TEARING STRENGTH, STANDARD: GIVE INSTRUMENT MAKE,MODEL
L268	6	58.7	62.7	1.8	.7	.58	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L344	6	58.7	59.6	-.7	-1.1	1.20	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L128	6	58.9	62.6	1.9	.5	.86	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L311	6	58.9	60.1	-.1	-1.0	1.15	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L581	6	59.0	61.1	.7	-.5	.89	15Q	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,AIR CLAMP,DIGITL
L213	6	59.0	62.7	2.0	.4	.73	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L249	6	59.0	63.5	2.6	.9	.95	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L254	6	59.1	60.7	.4	-.8	.85	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L610	*	59.3	59.9	-.1	-1.4	1.07	15E	TEARING STRENGTH, STANDARD, THWING-ELMENDORF,AMBIENT COND.
L315	6	59.3	61.3	1.0	-.6	1.10	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L126	6	59.3	63.7	3.0	.8	1.17	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L223	6	59.4	61.2	1.1	-.8	.61	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L139	6	59.6	63.2	2.8	.3	1.18	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L206	6	59.7	62.3	2.1	-.3	1.36	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L275	6	59.7	64.5	3.9	1.0	.91	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L561	*	59.9	62.0	2.0	-.7	.99	15V	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)X2
L600	6	59.9	61.6	1.7	-.9	1.01	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L121	6	60.0	59.2	-.2	-2.4	1.23	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L278	6	60.0	63.8	3.5	.3	2.73	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L122	6	60.0	62.0	2.1	-.8	.75	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L194	6	60.1	61.7	1.9	-1.0	1.30	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L191	6	60.1	64.1	3.8	.4	.93	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L182T	6	60.3	65.2	4.8	.9	.85	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L115	6	60.4	61.7	2.0	-1.3	.84	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L567	6	60.5	64.3	4.2	.2	1.01	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L174S	6	60.5	67.7	7.0	2.2	2.04	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L576	6	60.6	67.3	6.7	1.9	1.15	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L324	6	60.7	62.1	2.6	-1.2	1.21	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L484	#	60.7	74.4	12.4	6.1	1.85	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L190R	6	60.7	62.3	2.7	-1.2	.95	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L221	*	60.8	65.3	5.2	.6	1.11	15V	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)X2
L195	6	60.8	61.2	1.9	-1.9	1.09	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L376	6	60.9	58.9	.2	-3.3	1.31	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L352	6	61.0	62.1	2.7	-1.5	1.03	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L225	6	61.1	64.9	5.0	.1	.68	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L255	*	61.5	61.3	2.4	-2.3	1.02	15V	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)X2
L288	6	61.6	63.6	4.3	-1.1	.98	15Q	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,AIR CLAMP,DIGITL
L299	6	62.3	64.4	5.3	-1.1	.95	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L259	6	62.4	60.9	2.6	-3.4	.71	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L124	6	62.5	62.5	3.9	-2.5	.94	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L562	#	62.7	78.6	17.0	7.0	3.27	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L107	6	62.7	65.9	6.7	-.6	.95	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L382	6	63.1	66.3	7.3	-.7	.93	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L150	6	63.7	63.2	5.2	-3.0	1.05	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L233	6	64.5	67.5	9.1	-1.1	1.07	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
L250L	*	64.7	77.0	16.8	4.4	.88	15H	TEARING STRENGTH, STANDARD, LHOMARGY, 20 C, 65% RH
L554	*	65.7	65.5	8.3	-3.2	.80	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L442	*	65.8	67.2	9.7	-2.3	1.16	15R	TEARING STRENGTH, STANDARD,THWING-ELMENDORF,DIGITAL READOUT
L151	X	69.9	73.7	17.4	-1.7	1.01	15C	TEARING STRENGTH, STANDARD, THWING-ELMENDORF (W.AIR CLAMP)
L264	#	70.4	91.7	32.1	8.7	2.59	15T	TEARING STRENGTH, STANDARD,THWING-ELMENDORF(SCALE TO 100)
GMEANS:		58.2	60.8			1.00		
		95% ELLIPSE:		10.0	3.6	WITH GAMMA = 53 DEGREES		


TEARING STRENGTH, DEEP CUTOUT
SAMPLE E11 = 58.2 GRAMS
SAMPLE E11 = 570 MILLINEWTON
SAMPLE E17 = 60.8 GRAMS
SAMPLE E17 = 596 MILLINEWTON
+,X,* NOT IN GRAND MEANS
ANALYSIS T15-1
SAMPLE E17
GRAMS
MILLINEWTON
SAMPLE E11
GRAMS
MILLINEWTON

REPORT NO. 52S — TAPPI COLLABORATIVE REFERENCE PROGRAM — MARCH 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 CODE	SAMPLE E63 KRAFT ENVELOPE 75 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E21 BROWN KRAFT 74 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	VAR	F	LAB
L122	78.6	1.2	.35	3.7	1.50	64.7	.0	.01	2.5	.99	17N	ó	L122
L148	74.9	-2.4	-.70	2.4	.97	66.9	2.2	.83	2.4	.95	17N	ó	L148
L174N	77.3	-.0	-.01	3.7	1.51	64.0	-.7	-.26	3.4	1.35	17N	ó	L174N
L231	77.9	.6	.16	2.9	1.18	64.5	-.2	-.06	2.7	1.07	17N	ó	L231
L234	81.6	4.2	1.21	1.4	.56	66.8	2.1	.78	2.6	1.03	17N	ó	L234
L267	83.2	5.8	1.67	3.4	1.41	68.5	3.8	1.42	4.0	1.58	17N	ó	L267
L269	80.3	2.9	.83	1.8	.72	65.7	1.0	.38	1.2	.46	17N	ó	L269
L301A	75.6	-1.8	-.51	2.8	1.16	65.5	.8	.31	1.9	.75	17N	ó	L301A
L301B	71.0	-6.4	-1.82	1.8	.74	58.5	-6.2	-2.28	2.1	.84	17N	ó	L301B
L308	80.2	2.8	.81	2.0	.82	66.4	1.7	.63	3.4	1.37	17N	ó	L308
L326	72.7	-4.7	-1.35	2.8	1.17	60.5	-4.2	-1.54	2.0	.81	17N	ó	L326
L339	66.2	-11.2	-3.20	2.8	1.14	54.5	-10.2	-3.78	1.8	.72	17N	#	L339
L366	75.2	-2.2	-.62	1.8	.75	63.2	-1.5	-.55	2.0	.79	17N	ó	L366
L372	77.4	-.0	-.00	1.2	.51	65.6	.9	.33	2.5	1.01	17N	ó	L372

TEST D.F. = 15

GR. MEAN = 77.4 GRAMS — GRAND MEAN = 64.7 GRAMS — TEST DETERMINATIONS = 15

SD MEANS = 3.5 GRAMS — SD OF MEANS = 2.7 GRAMS — 13 LABS IN GRAND MEANS

AVERAGE SDR = 2.4 GRAMS — AVERAGE SDR = 2.5 GRAMS

GR. MEAN = 758.8 MILLINEWTON — GRAND MEAN = 634.5 MILLINEWTON

TOTAL NUMBER OF LABORATORIES REPORTING = 14

Best Values: E63 78 ± 6 grams
E21 65 ± 5 grams

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

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 NOT CUTOUT

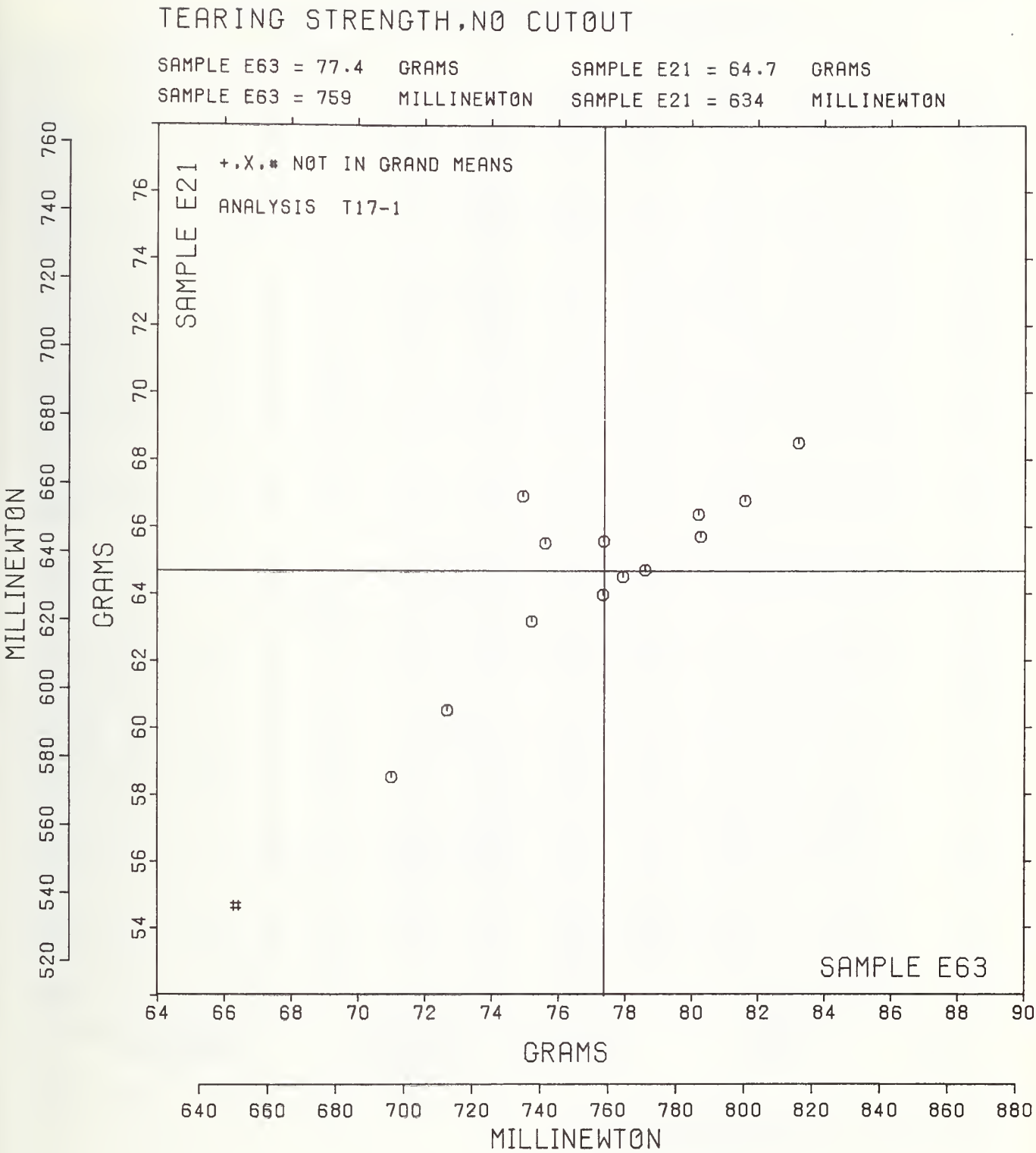
REPORT NO. 52S — TAPPI COLLABORATIVE REFERENCE PROGRAM — MARCH 1978

ANALYSIS T17-1 TABLE 2

TEARING STRENGTH, GRAMS

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

LAB CODE	F	MEANS E63	E21	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L339	#	66.2	54.5	-15.1	-1.6	.93	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L301B	ó	71.0	58.5	-8.8	-1.2	.79	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L326	ó	72.7	60.5	-6.3	-.6	.99	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L148	ó	74.9	66.9	-.6	3.2	.96	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L366	ó	75.2	63.2	-2.6	.1	.77	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L301A	ó	75.6	65.5	-.9	1.7	.96	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L174N	ó	77.3	64.0	-.4	-.5	1.43	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L372	ó	77.4	65.6	.5	.7	.76	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L231	ó	77.9	64.5	.4	-.5	1.13	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L122	ó	78.6	64.7	1.0	-.7	1.25	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L308	ó	80.2	66.4	3.3	-.3	1.10	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L269	ó	80.3	65.7	2.9	-.9	.59	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L234	ó	81.6	66.8	4.6	-.8	.80	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
L267	ó	83.2	68.5	7.0	-.4	1.49	17N	TEARING STRENGTH, NO CUT OUT, THWING-ELMENDORF
GMEANS:		77.4	64.7			1.00		
95% ELLIPSE:				12.5	3.7	WITH GAMMA = 36 DEGREES		


TEARING STRENGTH,NO CUTOUT
SAMPLE E63 = 77.4 GRAMS
SAMPLE E63 = 759 MILLINEWTON
SAMPLE E21 = 64.7 GRAMS
SAMPLE E21 = 634 MILLINEWTON
+,X,* NOT IN GRAND MEANS
ANALYSIS T17-1
SAMPLE E21
GRAMS
MILLINEWTON
SAMPLE E63
GRAMS
MILLINEWTON

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

GR. MEAN = 3.92 KILONEWTON/M GRAND MEAN = 3.74 KILONEWTON/M TEST DETERMINATIONS = 20

SD MEANS = .19 KILONEWTON/M SD OF MEANS = .24 KILONEWTON/M 45 LABS IN GRAND MEANS

AVERAGE SDR = .17 KILONEWTON/M AVERAGE SDR = .32 KILONEWTON/M

GR. MEAN = 22.38 LB/INCH GRAND MEAN = 21.35 LB/INCH

L250I	3.28	-.64	-3.39	.20	1.16	3.13	-.61	-2.59	.33	1.05	19L	*	L250I
L251	3.17	-.75	-3.97	.23	1.33	3.29	-.45	-1.92	.22	.71	19I	*	L251

TOTAL NUMBER OF LABORATORIES REPORTING = 53

Best Values: E63 3.8 ± 0.3 kilonewton per meter
E66 3.5 ± 0.5 kilonewton per meter

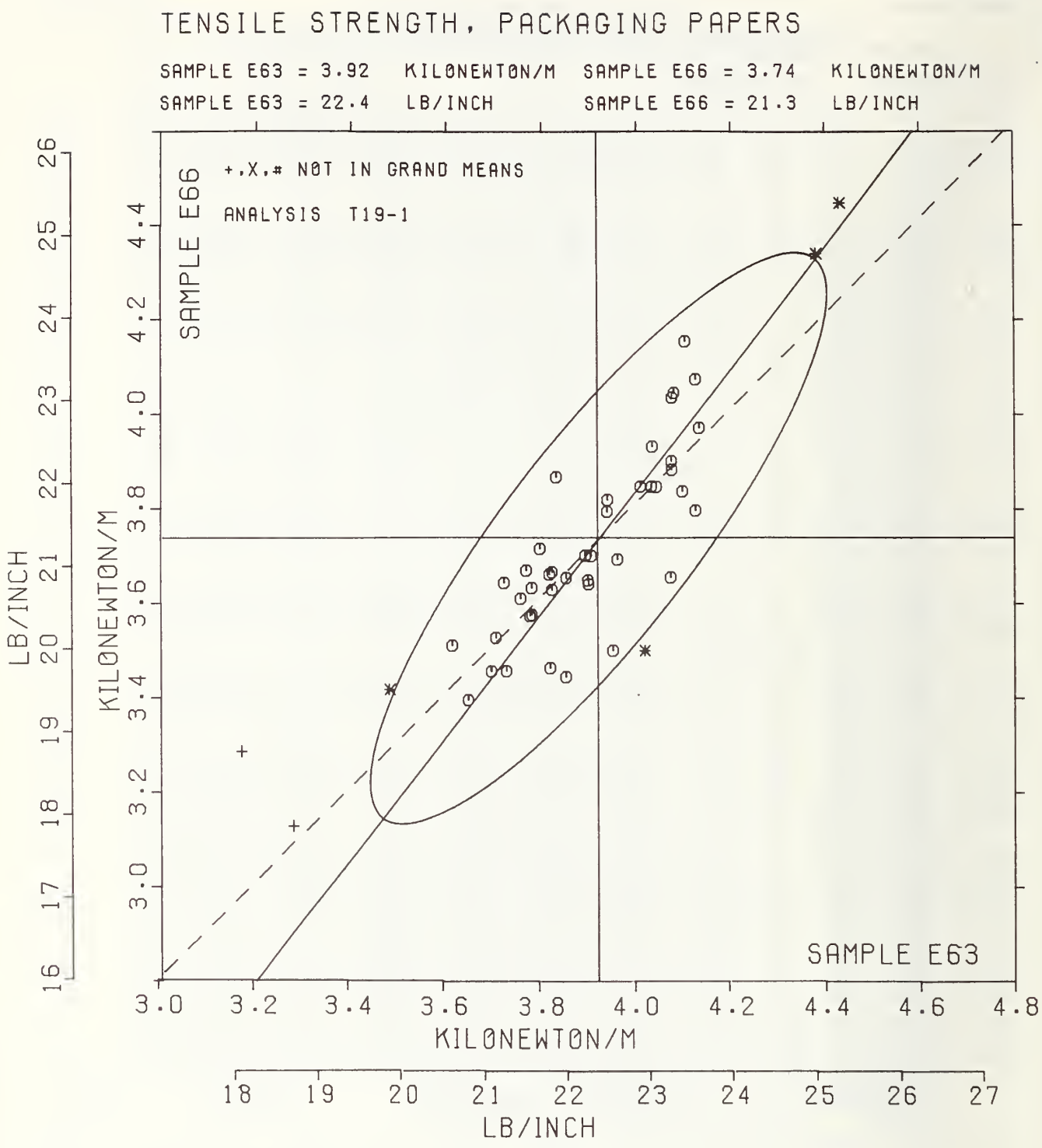
The following laboratories were omitted from the grand means because of extreme test results: 182I, 238A, 264A 264P.

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 B63	MEANS E66	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L251	*	3.17	3.29	-.82	.32	1.02	19I	TENSILE STRENGTH, PACKAGING PAPER, CRE, 20C, 65% RH
L250I	*	3.28	3.13	-.87	.13	1.10	19L	TENSILE STRENGTH, PACKAGING PAPER, CRE, 20 C, 65% RH
L318	*	3.48	3.42	-.52	.15	1.02	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L582	O	3.61	3.51	-.37	.10	.87	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L243	O	3.64	3.40	-.44	.01	1.04	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L122	O	3.69	3.46	-.36	.01	.97	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L610	O	3.70	3.53	-.30	.04	.98	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L324	O	3.72	3.64	-.20	.10	.99	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L151	O	3.73	3.46	-.34	-.02	1.18	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L107	O	3.76	3.61	-.20	.05	1.23	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L267	O	3.77	3.67	-.15	.08	.90	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L126	O	3.78	3.57	-.22	.01	.83	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L174	O	3.78	3.63	-.17	.05	1.23	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L575	O	3.78	3.58	-.21	.01	.88	19D	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L336	O	3.80	3.72	-.09	.08	.66	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L157I	O	3.82	3.66	-.12	.03	1.07	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L182L	O	3.82	3.47	-.28	-.09	.88	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L558	O	3.82	3.63	-.14	.01	1.02	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L207	O	3.82	3.67	-.11	.03	.82	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L268A	O	3.83	3.87	.05	.15	.63	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L280	O	3.85	3.45	-.27	-.13	1.03	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L265	O	3.85	3.66	-.11	.00	1.13	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L604	O	3.89	3.70	-.04	-.00	1.15	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L257B	O	3.90	3.65	-.08	-.04	.92	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L157A	O	3.90	3.64	-.09	-.04	1.03	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L281	O	3.91	3.70	-.04	-.01	.86	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L576	M	3.91				.88	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L606	O	3.94	3.80	.06	.02	1.16	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L580	O	3.94	3.82	.08	.03	.88	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L217P	O	3.95	3.50	-.17	-.17	.91	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L237A	O	3.96	3.69	-.01	-.06	.96	19Q	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L224	O	4.01	3.85	.14	-.00	1.13	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L273	M	4.02				1.09	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L581	*	4.02	3.50	-.13	-.22	.80	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L257A	O	4.03	3.85	.16	-.02	.77	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L237B	O	4.03	3.93	.22	.03	1.35	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L257C	O	4.04	3.85	.16	-.03	.88	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L561	O	4.07	3.66	.03	-.17	1.10	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L334	O	4.07	3.90	.22	-.02	.90	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L268P	O	4.08	3.88	.21	-.04	.54	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L562	O	4.08	4.04	.33	.06	1.15	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L225	O	4.08	4.04	.34	.06	1.57	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L234L	O	4.10	3.84	.19	-.08	.88	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L312	O	4.10	4.15	.44	.11	1.40	19D	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L153	O	4.13	3.80	.17	-.13	.96	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L555	O	4.13	4.07	.39	.04	.81	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L356	O	4.13	3.97	.31	-.03	1.34	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L167	*	4.38	4.34	.76	.00	1.40	19G	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L607	*	4.43	4.45	.87	.03	1.14	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L264A	#	4.84	4.46	1.13	-.29	2.89	19A	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L182I	#	36.70	33.68	43.74	-7.62	6.76	19D	TENSILE STRENGTH, PACKAGING PAPER, LOAD CELL (CRE)
L238A	#	41.12	37.97	49.84	-8.50	9.79	19T	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
L264P	#	41.60	39.43	51.29	-7.98	9.03	19P	TENSILE STRENGTH, PACKAGING PAPER, PENDULUM TESTER
GMEANS:		3.92	3.74			1.00		
		95% ELLIPSE:		.75	.20	WITH GAMMA = 52 DEGREES		


TENSILE STRENGTH, PACKAGING PAPERS
SAMPLE E63 = 3.92 KILONEWTON/M SAMPLE E66 = 3.74 KILONEWTON/M
SAMPLE E63 = 22.4 LB/INCH SAMPLE E66 = 21.3 LB/INCH
+,X,# NOT IN GRAND MEANS
ANALYSIS T19-1
SAMPLE E66
SAMPLE E63
KILONEWTON/M
LB/INCH
3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8
18 19 20 21 22 23 24 25 26 27
16 17 18 19 20 21 22 23 24 25 26

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

TOTAL NUMBER OF LABORATORIES REPORTING = 51

Best Values: J07 6.2 ± 0.5 kilonewton per meter
J05 5.3 ± 0.5 kilonewton per meter

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

ANALYSIS T20-1 TABLE 2

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

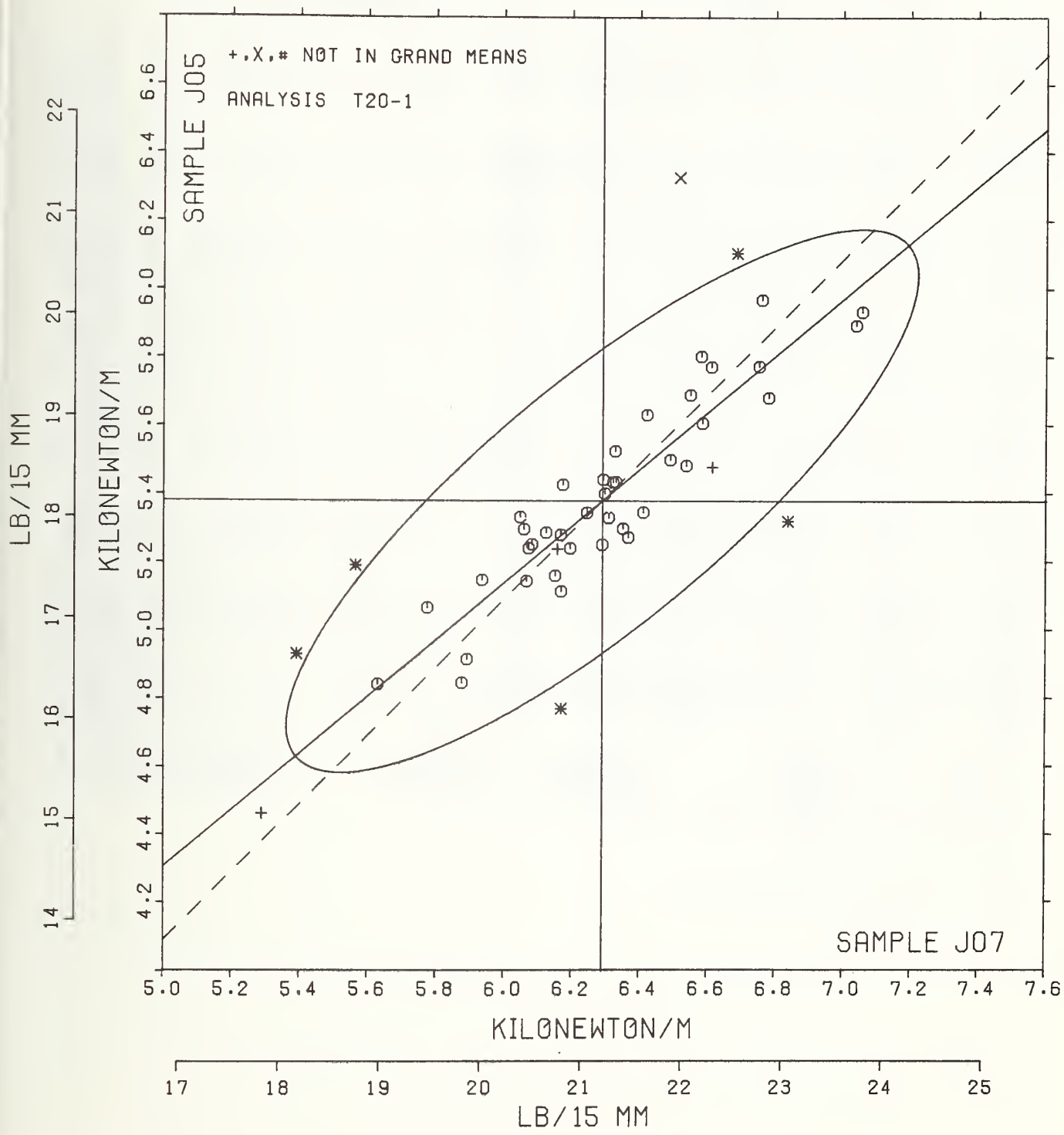
TAPPI STANDARD T494 OS-70, TENSILE BREAKING PROPERTIES OF PAPER & PAPERBOARD (CONSTANT RATE OF ELONGATION)

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

TENSILE STRENGTH, CRE TYPE

SAMPLE J07 = 6.29 KILONEWTON/M SAMPLE J05 = 5.38 KILONEWTON/M

SAMPLE J07 = 21.2 LB/15 MM SAMPLE J05 = 18.2 LB/15 MM



ANALYSIS T20-2 TABLE 1

TENSILE BREAKING STRENGTH, KILONEWTONS PER METER

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

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

GR. MEAN = 6.21 KILONEWTON/M GRAND MEAN = 5.41 KILONEWTON/M TEST DETERMINATIONS = 20

SD MEANS = .40 KILONEWTON/M SD OF MEANS = .38 KILONEWTON/M 36 LABS IN GRAND MEANS

AVERAGE SDR = .41 KILONEWTON/M AVERAGE SDR = .28 KILONEWTON/M

GR. MEAN = 20.94 LB/15 MM GRAND MEAN = 18.24 LB/15 MM

TOTAL NUMBER OF LABORATORIES REPORTING = 39

Best Values: J07 6.2 ± 0.6
J05 5.4 ± 0.5

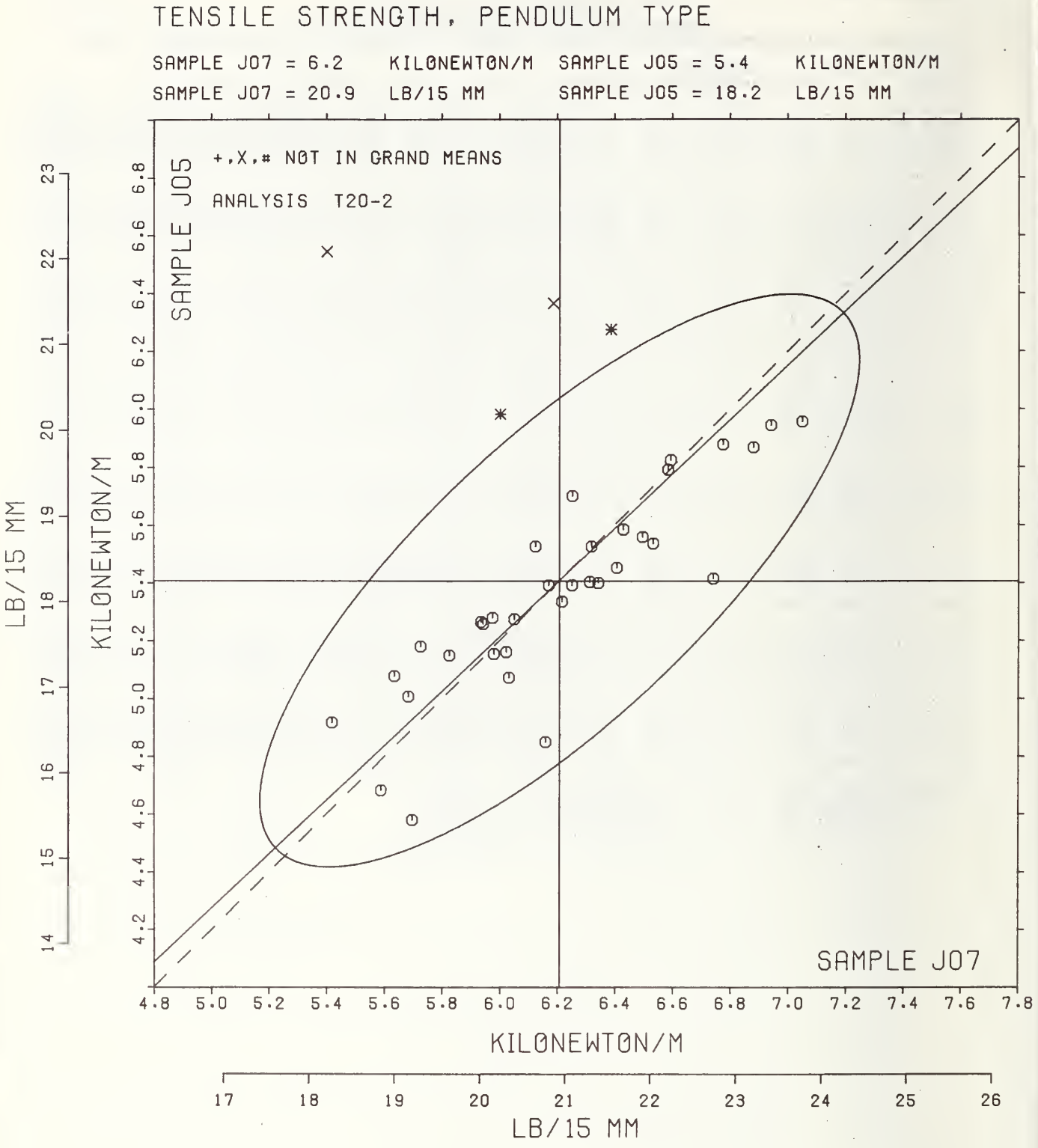
Data from the following laboratories appear to be off by a multiplicative factor: 241.

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


TENSILE STRENGTH, PENDULUM TYPE
SAMPLE J07 = 6.2 KILONEWTON/M SAMPLE J05 = 5.4 KILONEWTON/M
SAMPLE J07 = 20.9 LB/15 MM SAMPLE J05 = 18.2 LB/15 MM
+,X,* NOT IN GRAND MEANS
ANALYSIS T20-2
SAMPLE J05
SAMPLE J07
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 E63 MEAN	KRAFT ENVELOPE 75 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE E66 MEAN	KRAFT 83 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 20 VAR	F	LAB
L122	93.3	11.1	1.71	11.1	.96	75.2	1.3	.24	20.4	1.14	25P	O	L122
L126	83.7	1.5	.23	12.6	1.08	77.4	3.5	.64	13.4	.75	25P	O	L126
L151	88.3	6.1	.93	10.9	.94	77.4	3.4	.64	23.8	1.33	25P	O	L151
L174	78.7	-3.5	-.54	10.8	.93	73.5	-.4	-.08	28.2	1.58	25Y	O	L174
L182	88.1	5.9	.90	8.9	.77	70.1	-3.9	-.72	11.1	.62	25B	O	L182
L234A	87.1	4.9	.75	13.0	1.12	86.4	12.4	2.30	18.6	1.04	25H	O	L234A
L237B	73.4	-8.8	-1.36	8.5	.74	70.4	-3.6	-.66	16.7	.93	25H	O	L237B
L243	81.3	-.9	-.14	13.8	1.19	66.1	-7.8	-1.45	16.0	.89	25Z	O	L243
L250	87.0	4.8	.74	10.9	.94	71.9	-2.0	-.38	22.3	1.24	25A	O	L250
L254	744.1	661.9	101.93	94.1	8.10	606.9	533.0	98.64	161.7	9.03	25P	#	L264
L255	76.5	-5.7	-.88	11.5	.99	69.0	-5.0	-.92	22.0	1.23	25B	O	L265
L267	88.9	6.6	1.02	10.3	.88	75.2	1.2	.22	16.7	.93	25P	O	L267
L268	80.0	-2.2	-.34	8.7	.75	78.3	4.3	.80	14.1	.78	25B	O	L268
L273	85.0	2.8	.43	12.3	1.06	74.7	.7	.14	19.0	1.06	25F	O	L273
L280	85.2	3.0	.47	11.0	.95	63.3	-10.7	-1.98	17.9	1.00	25B	O	L280
L312	69.9	-12.3	-1.89	15.6	1.34	73.1	-.9	-.17	15.8	.88	25J	O	L312
L318	84.5	2.3	.36	12.4	1.07	81.0	7.0	1.30	18.0	1.01	25A	O	L318
L336	72.5	-9.7	-1.49	15.3	1.32	76.7	2.7	.50	11.5	.64	25A	O	L336
L580	76.4	-5.8	-.89	11.5	.99	71.6	-2.3	-.43	16.9	.94	25C	O	L580
L604	49.1	-33.1	-5.09	14.0	1.21	70.5	-3.5	-.64	20.0	1.12	25A	#	L604

GR. MEAN = 82.2 JOULES/SQ M GRAND MEAN = 74.0 JOULES/SQ M TEST DETERMINATIONS = 20

SD MEANS = 6.5 JOULES/SQ M SD OF MEANS = 5.4 JOULES/SQ M 18 LABS IN GRAND MEANS

AVERAGE SDR = 11.6 JOULES/SQ M AVERAGE SDR = 17.9 JOULES/SQ M

GR. MEAN = 5.63 PT.LB/SQ FT GRAND MEAN = 5.07 PT.LB/SQ FT

TOTAL NUMBER OF LABORATORIES REPORTING = 20

Best Values: E63 84 ± 11 joules per square meter

E66 73 ± 7 joules per square meter

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

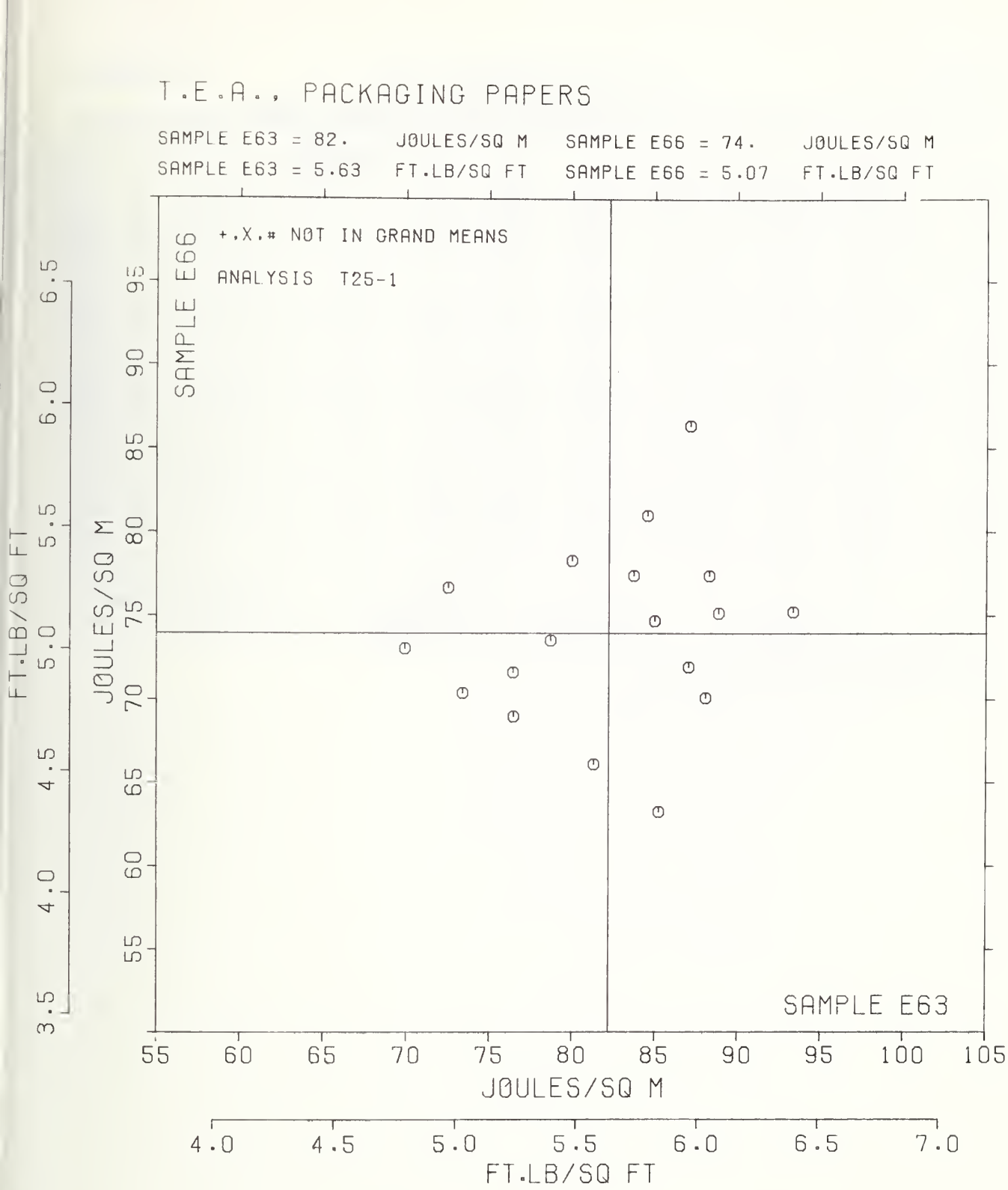
Data from the following laboratories appear to be off by a multiplicative factor: 264.

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


T.E.A., PACKAGING PAPERS
SAMPLE E63 = 82. JOULES/SQ M
SAMPLE E63 = 5.63 FT.LB/SQ FT
SAMPLE E66 = 74. JOULES/SQ M
SAMPLE E66 = 5.07 FT.LB/SQ FT
+.X.# NOT IN GRAND MEANS
ANALYSIS T25-1
SAMPLE E66
SAMPLE E63
JOULES/SQ M
FT.LB/SQ FT
55 60 65 70 75 80 85 90 95 100 105
4.0 4.5 5.0 5.5 6.0 6.5 7.0
3.5 4.0 4.5 5.0 5.5 6.0 6.5
55 60 65 70 75 80 85 90 95

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	SAMPLE J07	PRINTING 85 GRAMS PER SQUARE METER				SAMPLE J05	PRINTING 102 GRAMS PER SQUARE METER				TEST D.F. = 20		
CODE	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR	P	LAB
L100	73.5	-.7	-.09	6.2	.70	56.6	-2.8	-.52	6.2	1.05	26A	δ	L100
L115	72.7	-1.5	-.20	4.2	.48	58.6	-.8	-.15	3.4	.58	26C	δ	L115
L118	80.7	6.5	.89	6.4	.73	59.8	.4	.08	3.9	.65	26E	δ	L118
L122	76.2	2.0	.28	12.1	1.38	63.7	4.3	.78	5.1	.86	26L	δ	L122
L139	74.3	.1	.02	9.0	1.03	60.0	.6	.12	7.2	1.23	26H	δ	L139
L159	63.3	-10.9	-1.49	18.6	2.12	46.6	-12.8	-2.34	8.0	1.36	26P	δ	L159
L163	77.3	3.1	.43	9.6	1.10	58.0	-1.4	-.26	4.6	.78	26J	δ	L163
L167	71.0	-3.2	-.44	4.2	.48	70.5	11.1	2.03	3.2	.55	26D	*	L167
L185	71.5	-2.7	-.36	7.1	.81	55.3	-4.1	-.74	6.2	1.05	26C	δ	L185
L206	65.9	-8.3	-1.13	12.2	1.39	56.6	-2.8	-.51	10.0	1.70	26Y	δ	L206
L231	85.7	11.5	1.58	9.1	1.04	58.6	-.8	-.15	6.0	1.03	26E	δ	L231
L250	72.7	-1.5	-.21	5.1	.58	58.2	-1.2	-.23	4.6	.77	26A	δ	L250
L255	90.1	15.9	2.18	6.8	.78	69.2	9.8	1.80	6.3	1.08	26P	δ	L255
L309	81.3	7.1	.98	9.5	1.09	65.7	6.3	1.14	7.3	1.23	26I	δ	L309
L318	77.3	3.1	.43	8.1	.92	58.4	-1.0	-.18	5.2	.89	26A	δ	L318
L372	57.9	-16.3	-2.24	5.9	.67	50.8	-8.7	-1.58	4.0	.68	26Y	δ	L372
L378	76.0	1.8	.25	8.5	.97	62.4	3.0	.55	5.7	.96	26A	δ	L378
L393	75.5	1.3	.18	8.3	.95	59.4	-.0	-.01	4.1	.70	26V	δ	L393
L442	76.5	2.3	.31	6.8	.78	63.8	4.4	.81	7.0	1.19	26B	δ	L442
L567	70.8	-3.4	-.46	15.5	1.77	60.3	.9	.17	6.6	1.12	26A	δ	L567
L575	77.9	3.7	.51	8.8	1.01	61.4	2.0	.36	6.3	1.06	26A	δ	L575
L592	64.0	-10.2	-1.40	6.2	.71	53.0	-6.4	-1.17	6.2	1.04	26G	δ	L592

GR. MEAN = 74.2 JOULES/SQ M — GRAND MEAN = 59.4 JOULES/SQ M — TEST DETERMINATIONS = 20

SD MEANS = 7.3 JOULES/SQ M — SD OF MEANS = 5.5 JOULES/SQ M — 22 LABS IN GRAND MEANS

AVERAGE SDR = 8.8 JOULES/SQ M — AVERAGE SDR = 5.9 JOULES/SQ M

GR. MEAN = 5.083 PT.LB/SQ FT — GRAND MEAN = 4.069 PT.LB/SQ PT

TOTAL NUMBER OF LABORATORIES REPORTING = 22

Best Values: J07 75 ± 12 joulea per aquare meter

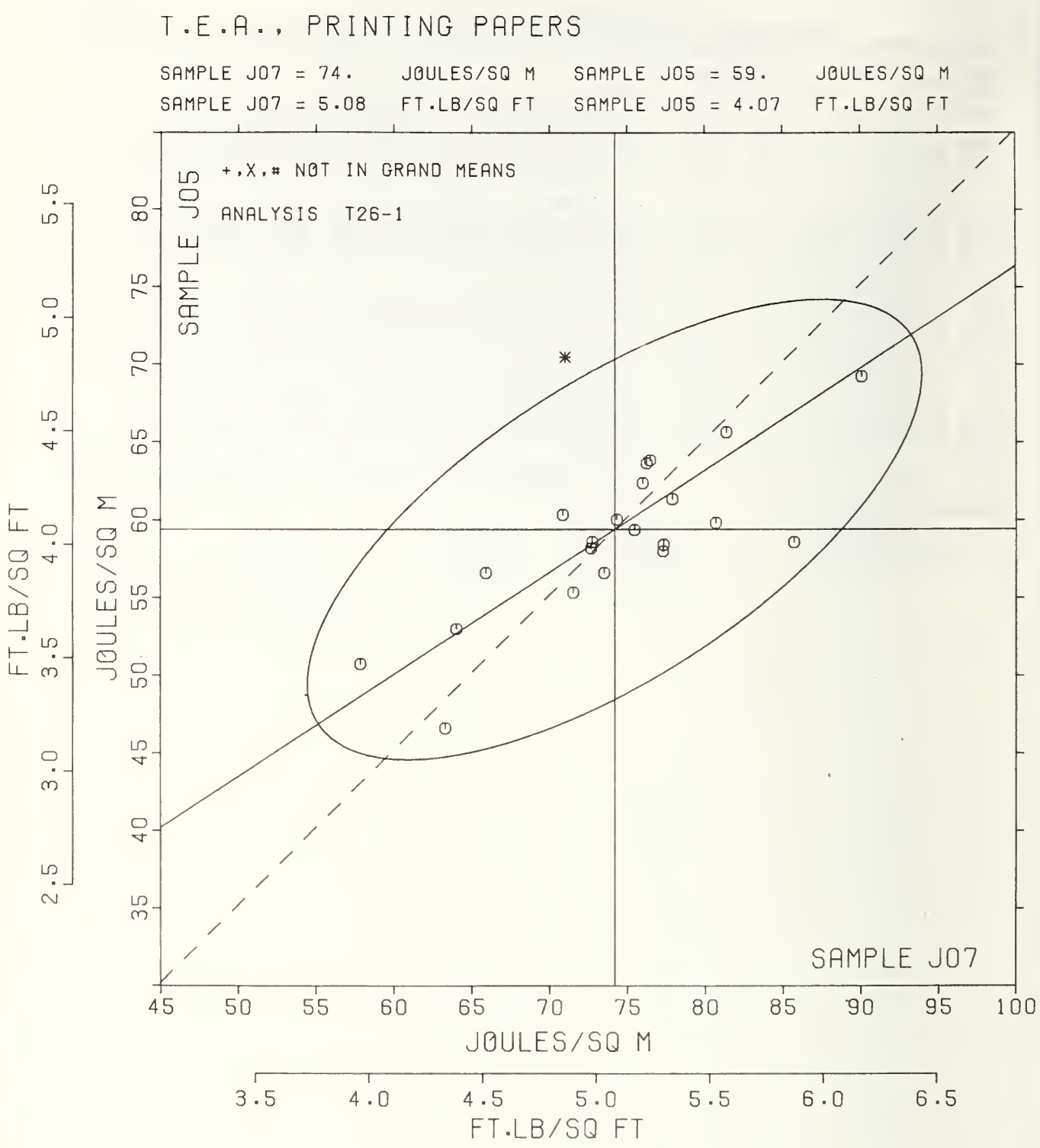
J05 59 ± 11 joules per aquare meter

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	P	MEANS J07	MEANS J05	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L372	O	57.9	50.8	-18.4	1.7	.68	26Y	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L159	O	63.3	46.6	-16.1	-4.7	1.74	26P	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L592	O	64.0	53.0	-12.0	.2	.88	26G	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/LINE JAWS
L206	O	65.9	56.6	-8.4	2.2	1.54	26Y	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L567	O	70.8	60.3	-2.3	2.6	1.44	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L167	*	71.0	70.5	3.4	11.0	.51	26D	TENSILE ENERGY ABS.,PRINTING PAPERS,2-PIN STRAIN GAGE
L185	O	71.5	55.3	-4.5	-1.9	.93	26C	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/LINE JAWS
L250	O	72.7	58.2	-1.9	-.2	.68	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L115	O	72.7	58.6	-1.7	.1	.53	26C	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/LINE JAWS
L100	O	73.5	56.6	-2.1	-2.0	.88	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L139	O	74.3	60.0	.5	.5	1.13	26H	TENSILE ENERGY ABS.,PRINTING PAPERS,2-PIN STRAIN GAGE
L393	O	75.5	59.4	1.1	-.7	.82	26V	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L378	O	76.0	62.4	3.2	1.5	.97	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L122	O	76.2	63.7	4.1	2.4	1.12	26L	TENSILE ENERGY ABS.,PRINTING PAPERS,PATTERNED PLAT JAWS
L442	O	76.5	63.8	4.3	2.5	.99	26B	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L163	O	77.3	58.0	1.8	-2.9	.94	26J	TENSILE ENERGY ABS.,PRINTING PAPERS,LINE/FLAT JAWS
L318	O	77.3	58.4	2.1	-2.6	.91	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L575	O	77.9	61.4	4.2	-.4	1.04	26A	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L118	O	80.7	59.8	5.7	-3.2	.69	26B	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L309	O	81.3	65.7	9.4	1.3	1.16	26I	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L231	O	85.7	58.6	9.2	-7.0	1.03	26E	TENSILE ENERGY ABS.,PRINTING PAPERS,FLAT/FLAT JAWS
L255	O	90.1	69.2	18.6	-.5	.93	26P	TENSILE ENERGY ABS.,PRINTING PAPERS,PATTERNED FLAT JAWS
GMEANS:		74.2	59.4			1.00		
		95% ELLIPSE:		22.8	9.5	WITH GAMMA = 33 DEGREES		


T.E.A., PRINTING PAPERS
SAMPLE J07 = 74. JOULES/SQ M
SAMPLE J07 = 5.08 FT.LB/SQ FT
SAMPLE J05 = 59. JOULES/SQ M
SAMPLE J05 = 4.07 FT.LB/SQ FT
+,X,* NOT IN GRAND MEANS
ANALYSIS T26-1
SAMPLE J05
SAMPLE J07
JOULES/SQ M
FT.LB/SQ FT
35 40 45 50 55 60 65 70 75 80
45 50 55 60 65 70 75 80 85 90 95 100
2.5 3.0 3.5 4.0 4.5 5.0 5.5
3.5 4.0 4.5 5.0 5.5 6.0 6.5

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 E63 MEAN	KRAFT ENVELOPE 75 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE E66 MEAN	KRAFT 83 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.- 20 VAR	F	LAB
L122	3.59	.55	1.65	.28	.99	3.16	.30	.87	.53	1.20	28P	O	L122
L126	2.99	-.05	-.14	.35	1.21	2.96	.11	.30	.40	.91	28C	O	L126
L151	3.38	.34	1.03	.27	.97	3.22	.36	1.04	.59	1.34	28B	O	L151
L182	3.21	.18	.53	.23	.81	2.80	-.05	-.15	.33	.75	28B	O	L182
L243	3.01	-.02	-.07	.36	1.26	2.67	-.19	-.54	.49	1.12	28C	O	L243
L264	2.76	-.27	-.81	.27	.94	2.54	-.31	-.89	.55	1.24	28B	O	L264
L265	2.73	-.30	-.90	.30	1.04	2.56	-.29	-.83	.57	1.29	28A	O	L265
L267	3.45	.41	1.23	.27	.94	2.93	.08	.22	.49	1.11	28B	O	L267
L268	2.75	-.28	-.84	.20	.72	3.01	.15	.44	.26	.59	28B	O	L268
L280	3.09	.06	.17	.28	.98	2.62	-.23	-.66	.46	1.05	28B	O	L280
L312	2.40	-.64	-1.90	.32	1.14	2.47	-.38	-1.09	.37	.83	28B	O	L312
L318	3.24	.21	.61	.28	.98	3.19	.34	.96	.39	.88	28A	O	L318
L324	2.80	-.23	-.69	.34	1.20	2.75	-.10	-.29	.32	.72	28P	O	L324
L336	3.31	.28	.83	.26	.92	3.43	.57	1.64	.35	.80	28A	O	L336
L580	3.07	.04	.12	.31	1.08	2.86	.00	.01	.45	1.02	28C	O	L580
L581	2.51	-.53	-1.58	.22	.77	2.06	-.80	-2.27	.36	.82	28A	O	L581
L582	3.28	.25	.74	.30	1.07	3.29	.43	1.24	.58	1.33	28A	O	L582
GR. MEAN -	3.04 PERCENT				GRAND MEAN -	2.86 PERCENT				TEST DETERMINATIONS - 20			
SD MEANS -	.34 PERCENT				SD OF MEANS -	.35 PERCENT				17 LABS IN GRAND MEANS			
		AVERAGE SDR -	.28 PERCENT				AVERAGE SDR -	.44 PERCENT					
L153	3.41	.38	1.13	.29	1.03	2.96	.10	.30	.48	1.08	28Q	*	L153

TOTAL NUMBER OF LABORATORIES REPORTING - 18

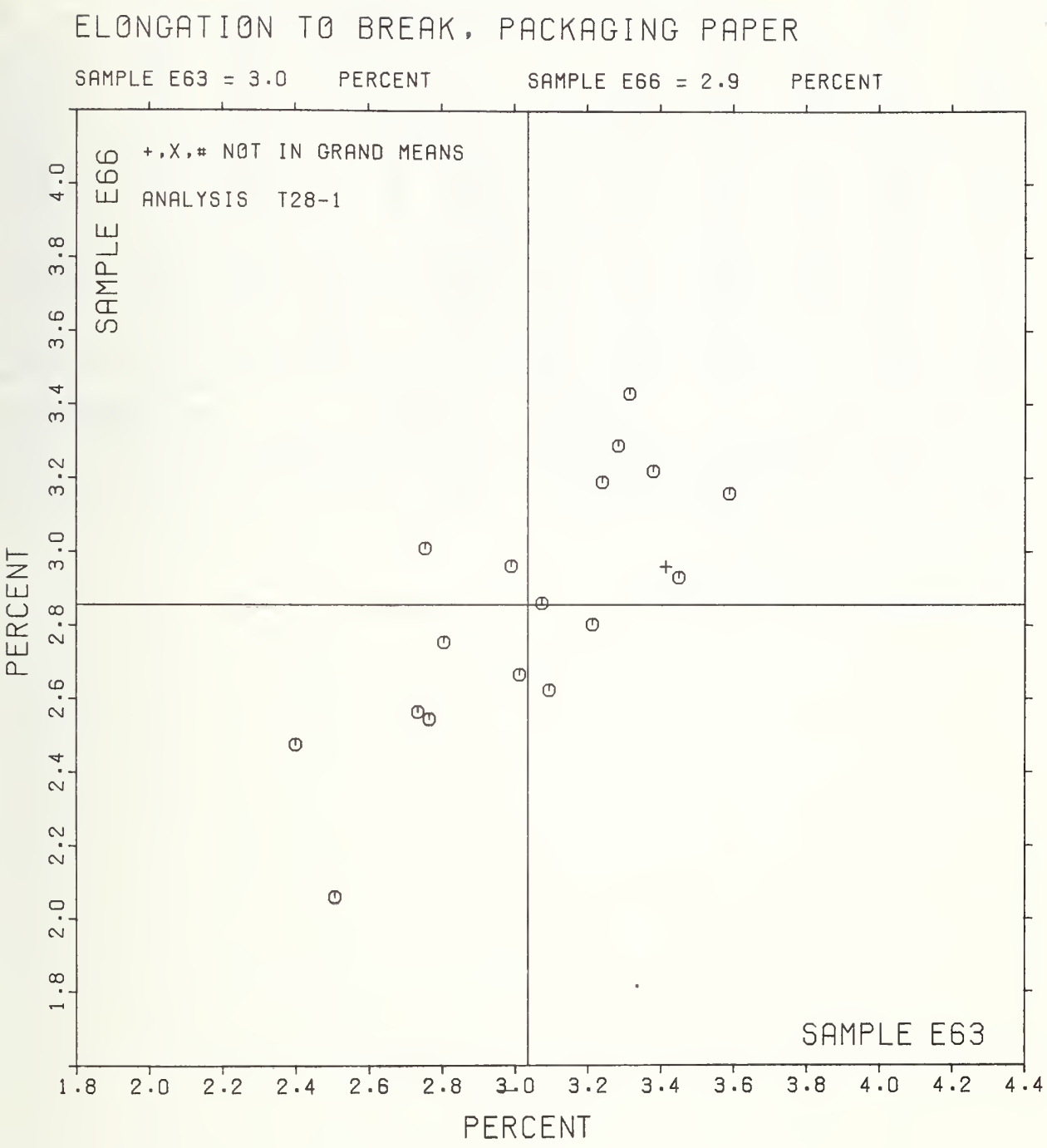
Best Values: E63 3.1 ± 0.5 percent
E66 2.9 ± 0.4 percent

ANALYSIS T28-1 TABLE 2

ELONGATION TO BREAK, PERCENT - PACKAGING PAPER

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

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


ELONGATION TO BREAK, PACKAGING PAPER
SAMPLE E63 = 3.0 PERCENT
SAMPLE E66 = 2.9 PERCENT
+,X,# NOT IN GRAND MEANS
ANALYSIS T28-1
SAMPLE E66
SAMPLE E63
PERCENT
PERCENT
1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4

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

TOTAL NUMBER OF LABORATORIES REPORTING - 20

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

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

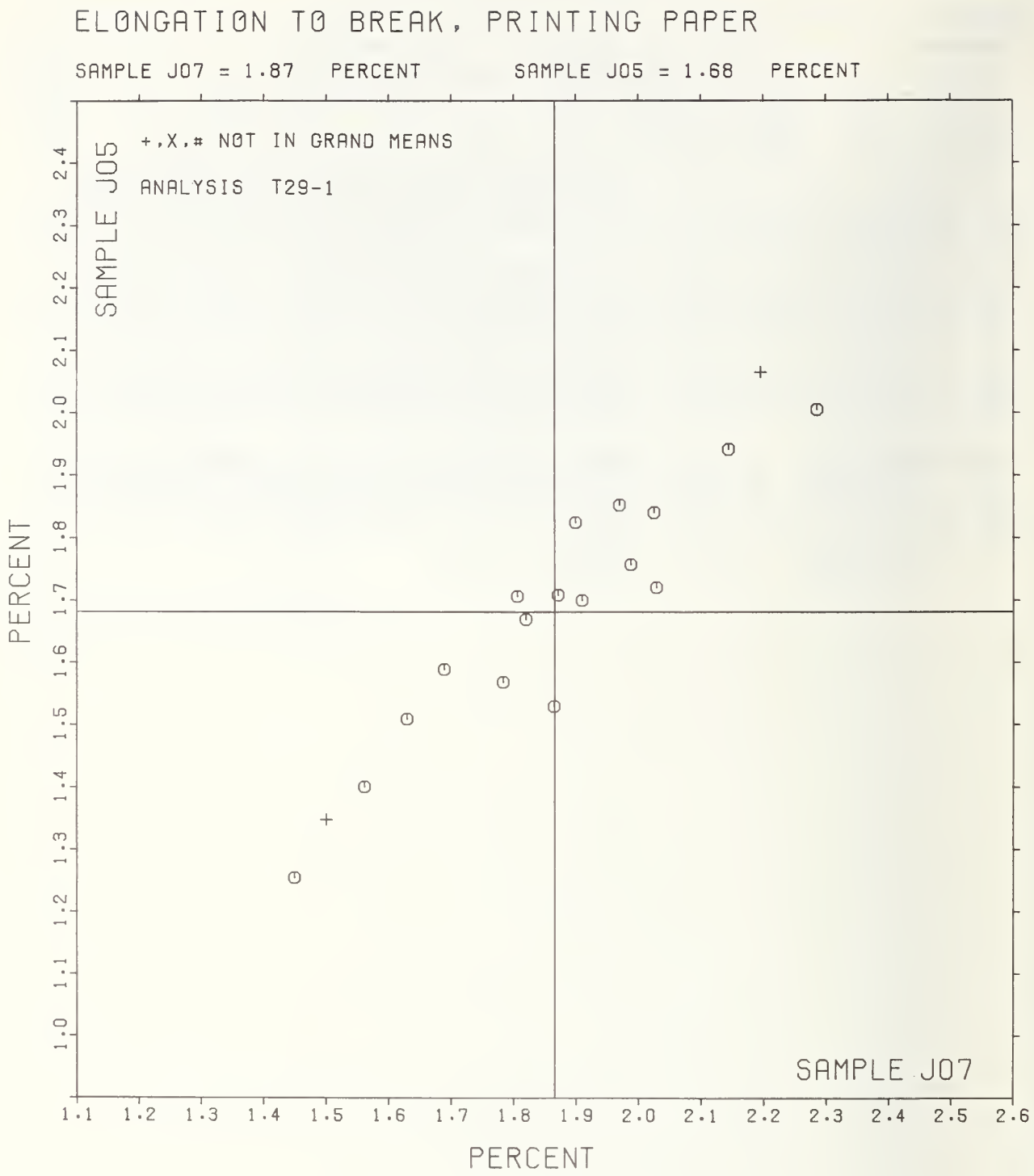
REPORT NO. 52S TAPPI COLLABORATIVE REFERENCE PROGRAM MARCH 1978

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 J07	MEANS J05	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L105	#	1.417	.784	-.937	-.359	3.23	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L561	O	1.450	1.255	-.595	-.034	1.39	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L484	*	1.501	1.348	-.495	.000	1.68	29R	ELONGATION,PRINTING PAPERS,PENDULUM, FLAT/FLAT JAWS
L372	O	1.562	1.401	-.414	-.001	.77	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L567	O	1.630	1.510	-.290	.033	1.38	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L592	O	1.689	1.590	-.192	.052	.85	29C	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/LINE JAWS
L344	O	1.784	1.569	-.137	-.028	1.17	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L190R	O	1.806	1.707	-.027	.060	1.25	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L100	O	1.820	1.670	-.042	.023	.89	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L378	O	1.865	1.530	-.103	-.111	.75	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L575	O	1.871	1.709	.022	.017	.92	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L442	O	1.899	1.825	.121	.083	1.00	29B	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/FLAT JAWS
L185	O	1.910	1.700	.045	-.015	.88	29C	ELONGATION,PRINTING PAPERS,LOAD CELL,LINE/LINE JAWS
L122	O	1.969	1.852	.192	.057	1.03	29P	ELONGATION,PRINTING PAPERS,LOAD CELL,PATTERNED PLAT JAWS
L318	O	1.987	1.758	.141	-.025	.85	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L309	O	2.025	1.841	.225	.011	1.05	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L118	O	2.028	1.721	.146	-.080	.82	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
L255	O	2.144	1.941	.380	.004	.85	29P	ELONGATION,PRINTING PAPERS,LOAD CELL,PATTERNED PLAT JAWS
L242	*	2.195	2.065	.501	.061	1.02	29R	ELONGATION,PRINTING PAPERS,PENDULUM, FLAT/FLAT JAWS
L231	O	2.285	2.005	.527	-.044	1.13	29A	ELONGATION,PRINTING PAPERS,LOAD CELL,FLAT/FLAT JAWS
GMEANS:		1.866	1.682			1.00		
		95% ELLIPSE:		.782	.143	WITH GAMMA = 42 DEGREES		


ELONGATION TO BREAK, PRINTING PAPER
SAMPLE J07 = 1.87 PERCENT
SAMPLE J05 = 1.68 PERCENT
+,X,# NOT IN GRAND MEANS
ANALYSIS T29-1
SAMPLE J05
PERCENT
SAMPLE J07
PERCENT

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

LAB CODE	SAMPLE H35 PRINTING 151 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE H47 PRINTING 84 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 15 VAR	F	LAB
L100M	57.	-15.	-.58	18.	.79	58.	-15.	-1.07	13.	.68	30M	Ø	L100M
L100N	52.	-20.	-.78	18.	.80	59.	-15.	-1.04	12.	.64	30N	Ø	L100N
L105	28.	-44.	-1.69	9.	.40	55.	-19.	-1.31	21.	1.14	30M	Ø	L105
L118	72.	0.	.01	15.	.69	73.	-1.	-.07	11.	.61	30D	Ø	L118
L121	39.	-32.	-1.24	9.	.42	68.	-6.	-.41	13.	.72	30M	Ø	L121
L122	76.	4.	.15	26.	1.17	94.	20.	1.42	35.	1.90	30M	Ø	L122
L124	54.	-18.	-.68	16.	.72	69.	-5.	-.34	12.	.64	30N	Ø	L124
L150	96.	24.	.93	35.	1.58	55.	-19.	-1.30	22.	1.21	30M	*	L150
L158	34.	-38.	-1.44	23.	1.05	51.	-22.	-1.54	10.	.54	30N	Ø	L158
L159	100.	28.	1.09	27.	1.20	76.	2.	.15	23.	1.26	30N	Ø	L159
L162	60.	-12.	-.46	10.	.47	82.	9.	.62	17.	.93	30M	Ø	L162
L163	77.	5.	.21	22.	.97	69.	-5.	-.34	26.	1.41	30N	Ø	L163
L182M	101.	29.	1.13	24.	1.07	94.	20.	1.40	19.	1.02	30M	Ø	L182M
L185	117.	45.	1.71	41.	1.85	82.	9.	.61	17.	.94	30N	Ø	L185
L190C	57.	-14.	-.55	29.	1.29	76.	3.	.18	21.	1.14	30N	Ø	L190C
L221	111.	39.	1.48	24.	1.10	102.	28.	1.96	37.	2.02	30N	Ø	L221
L223F	100.	28.	1.09	27.	1.22	78.	5.	.31	12.	.68	30M	Ø	L223F
L230	77.	5.	.18	25.	1.14	73.	-1.	-.05	16.	.87	30N	Ø	L230
L232	112.	41.	1.56	20.	.91	72.	-2.	-.12	24.	1.30	30N	Ø	L232
L236	60.	-11.	-.44	24.	1.07	79.	6.	.39	24.	1.29	30N	Ø	L236
L238A	71.	-0.	-.02	17.	.76	79.	5.	.35	14.	.75	30N	Ø	L238A
L238B	56.	-16.	-.60	27.	1.19	63.	-11.	-.75	17.	.91	30D	Ø	L238B
L243	98.	26.	1.01	30.	1.36	66.	-7.	-.49	12.	.67	30D	Ø	L243
L254	62.	-10.	-.39	25.	1.11	59.	-14.	-1.00	25.	1.36	30M	Ø	L254
L262	45.	-27.	-1.05	8.	.36	66.	-8.	-.53	18.	.96	30N	Ø	L262
L275	117.	45.	1.72	35.	1.59	104.	31.	2.14	28.	1.52	30N	Ø	L275
L278	85.	13.	.49	34.	1.51	60.	-14.	-.97	14.	.74	30C	Ø	L278
L279	77.	5.	.20	28.	1.25	86.	12.	.87	21.	1.12	30N	Ø	L279
L299	32.	-39.	-1.51	16.	.72	62.	-11.	-.80	16.	.86	30N	Ø	L299
L321	77.	5.	.19	35.	1.59	86.	13.	.90	13.	.73	30M	Ø	L321
L326N	131.	60.	2.28	16.	.72	156.	83.	5.75	14.	.78	30N	X	L326N
L339	4.	-68.	-2.59	2.	.08	23.	-50.	-3.49	8.	.41	30N	#	L339
L366A	45.	-26.	-1.01	18.	.81	67.	-7.	-.47	18.	.96	30N	Ø	L366A
L376	46.	-26.	-1.00	14.	.63	74.	0.	.03	20.	1.08	30N	Ø	L376
L378	79.	7.	.27	17.	.74	84.	11.	.77	15.	.81	30N	Ø	L378
L388	78.	6.	.22	23.	1.02	74.	0.	.00	19.	1.02	30N	Ø	L388
L390	35.	-37.	-1.42	11.	.48	60.	-14.	-.95	13.	.73	30N	Ø	L390
L396M	115.	43.	1.65	34.	1.52	94.	20.	1.42	22.	1.22	30N	Ø	L396M
L531	27.	-45.	-1.72	15.	.67	54.	-20.	-1.36	26.	1.41	30N	Ø	L531
L565	84.	12.	.47	23.	1.05	70.	-4.	-.27	16.	.87	30N	Ø	L565
L567	98.	26.	1.00	40.	1.78	108.	34.	2.39	17.	.90	30N	Ø	L567
L589	67.	-5.	-.19	16.	.71	58.	-16.	-1.11	17.	.90	30N	Ø	L589
L599	72.	0.	.00	18.	.82	79.	6.	.38	14.	.76	30C	Ø	L599
L143	213.	141.	5.42	119.	5.32	122.	48.	3.35	28.	1.54	30T	*	L143
L182S	856.	784.	30.05	187.	8.37	146.	73.	5.07	37.	2.04	30S	*	L182S
L190D	529.	458.	17.53	164.	7.37	99.	26.	1.79	17.	.95	30S	*	L190D
L280	45.	-27.	-1.04	26.	1.18	56.	-18.	-1.24	15.	.83	30K	*	L280
L326S	403.	331.	12.69	209.	9.38	118.	44.	3.09	34.	1.86	30S	*	L326S
L366B	43.	-29.	-1.11	23.	1.05	114.	41.	2.86	24.	1.32	30T	*	L366B
L396S	252.	180.	6.90	214.	9.58	143.	69.	4.83	19.	1.05	30T	*	L396S
L581	467.	396.	15.16	236.	10.57	116.	42.	2.95	30.	1.63	30T	*	L581

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

TOTAL NUMBER OF LABORATORIES REPORTING = 51

Best Values: H35 75 double folds
H47 75 double folds

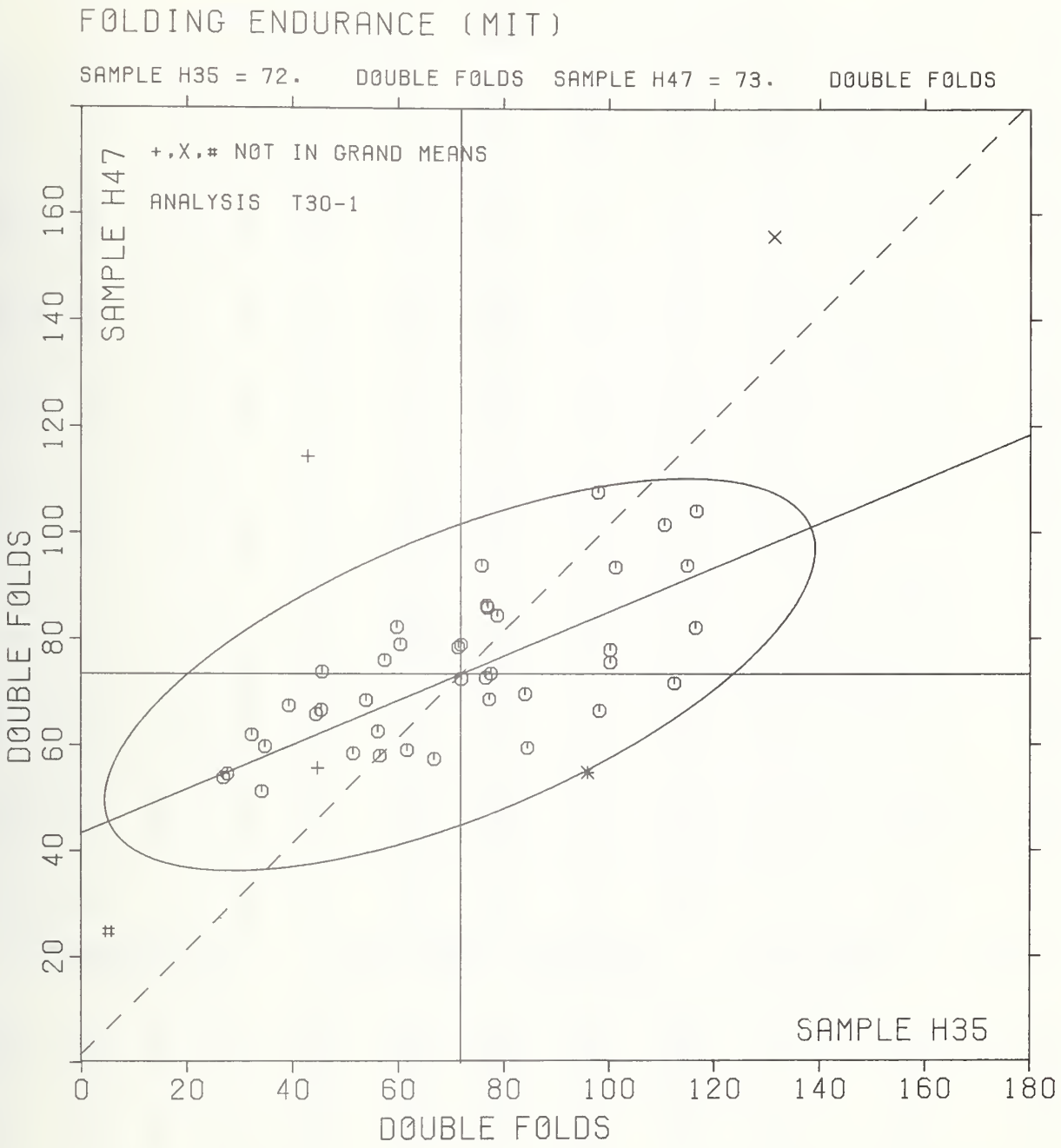
The following laboratories were omitted from the grand means because of extreme test results: 339.

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

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

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

LAB CODE	P	MEANS H35	MEANS H47	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L339	#	4.	23.	-82.	-20.	.25	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L531	O	27.	54.	-49.	-1.	1.04	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L105	O	28.	55.	-48.	-0.	.77	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L299	O	32.	62.	-41.	5.	.79	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L158	O	34.	51.	-43.	-6.	.80	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L390	O	35.	60.	-39.	2.	.60	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L121	O	39.	68.	-32.	7.	.57	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L366B	*	43.	114.	-11.	49.	1.18	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L262	O	45.	66.	-28.	4.	.66	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L280	*	45.	56.	-32.	-6.	1.00	30K	FOLDING ENDURANCE, KOHLER-MOLIN
L366A	O	45.	67.	-27.	4.	.88	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L376	O	46.	74.	-24.	10.	.86	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100N	O	52.	59.	-24.	-6.	.72	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L124	O	54.	69.	-18.	2.	.68	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L238B	O	56.	63.	-19.	-4.	1.05	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L100M	O	57.	58.	-20.	-8.	.73	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L190C	O	57.	76.	-12.	8.	1.21	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L162	O	60.	82.	-8.	13.	.70	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L236	O	60.	79.	-8.	10.	1.18	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L254	O	62.	59.	-15.	-9.	1.24	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L589	O	67.	58.	-11.	-13.	.81	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L238A	O	71.	79.	2.	5.	.75	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L599	O	72.	79.	2.	5.	.79	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L118	O	72.	73.	-0.	-1.	.65	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L122	O	76.	94.	12.	17.	1.53	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L230	O	77.	73.	4.	-3.	1.00	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L221	O	77.	86.	10.	10.	1.16	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L279	O	77.	86.	10.	9.	1.19	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L163	O	77.	69.	3.	-7.	1.19	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L388	O	78.	74.	5.	-2.	1.02	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L378	O	79.	84.	11.	7.	.78	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L565	O	84.	70.	10.	-8.	.96	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L278	O	85.	60.	6.	-18.	1.12	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L150	*	96.	55.	15.	-26.	1.39	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L567	O	98.	108.	37.	22.	1.34	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L243	O	98.	66.	22.	-17.	1.01	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L159	O	100.	76.	27.	-9.	1.23	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L223F	O	100.	78.	28.	-7.	.95	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L182M	O	101.	94.	35.	7.	1.04	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L221	O	111.	102.	47.	11.	1.56	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L232	O	112.	72.	37.	-17.	1.10	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396M	O	115.	94.	48.	2.	1.37	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L185	O	117.	82.	45.	-9.	1.39	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L275	O	117.	104.	53.	11.	1.56	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L326N	X	131.	156.	87.	53.	.75	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L143	*	213.	122.	149.	-10.	3.43	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L396S	*	252.	143.	193.	-5.	5.32	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L326S	*	403.	118.	323.	-87.	5.62	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L581	*	467.	116.	381.	-113.	6.10	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L190D	*	529.	99.	432.	-153.	4.16	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L182S	*	856.	146.	752.	-235.	5.20	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
GMEANS:		72.	73.			1.00		
		95% ELLIPSE:		72.	27.	WITH GAMMA = 22 DEGREES		


FOLDING ENDURANCE (MIT)
SAMPLE H35 = 72. DOUBLE FOLDS
SAMPLE H47 = 73. DOUBLE FOLDS
+,X,# NOT IN GRAND MEANS
ANALYSIS T30-1
SAMPLE H47
DOUBLE FOLDS
20
40
60
80
100
120
140
160
SAMPLE H35
0
20
40
60
80
100
120
140
160
180
DOUBLE FOLDS

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

LAB CODE	SAMPLE H35 MEAN	PRINTING 151 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H47 MEAN	PRINTING 84 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.F 15 VAR	F	LAB
L100M	1.735	-.066	-.36	.128	.90	1.755	-.088	-1.00	.094	.82	30M	ó	L100M
L100N	1.688	-.112	-.61	.150	1.05	1.759	-.084	-.95	.089	.78	30N	ó	L100N
L105	1.422	-.378	-2.06	.146	1.02	1.702	-.141	-1.60	.195	1.71	30M	ó	L105
L118	1.848	.048	.26	.093	.65	1.856	.013	.15	.066	.58	30D	ó	L118
L121	1.581	-.219	-1.19	.120	.84	1.822	-.021	-.24	.087	.76	30M	ó	L121
L122	1.856	.055	.30	.153	1.07	1.944	.101	1.15	.164	1.45	30M	ó	L122
L124	1.715	-.086	-.47	.128	.89	1.830	-.013	-.15	.073	.64	30N	ó	L124
L150	1.952	.152	.83	.171	1.20	1.706	-.137	-1.56	.179	1.57	30M	*	L150
L158	1.446	-.354	-1.93	.288	2.01	1.702	-.140	-1.60	.087	.76	30N	ó	L158
L159	1.985	.185	1.01	.123	.86	1.859	.016	.18	.138	1.21	30N	ó	L159
L162	1.771	-.030	-.16	.076	.53	1.907	.064	.73	.089	.78	30M	ó	L162
L163	1.872	.072	.39	.123	.86	1.807	-.036	-.41	.173	1.52	30N	ó	L163
L182M	1.994	.194	1.05	.104	.73	1.963	.120	1.37	.087	.76	30M	ó	L182M
L185	2.043	.243	1.32	.145	1.02	1.907	.064	.72	.087	.76	30N	ó	L185
L190C	1.708	-.093	-.50	.225	1.57	1.867	.024	.27	.117	1.03	30N	ó	L190C
L221	2.034	.234	1.27	.090	.63	1.988	.145	1.65	.124	1.09	30N	ó	L221
L223F	1.985	.185	1.00	.127	.89	1.887	.044	.50	.070	.61	30M	ó	L223F
L230	1.861	.061	.33	.149	1.04	1.853	.010	.11	.090	.79	30N	ó	L230
L232	2.044	.244	1.33	.082	.57	1.832	-.011	-.12	.149	1.31	30N	ó	L232
L236	1.753	-.047	-.26	.160	1.12	1.879	.036	.41	.133	1.17	30N	ó	L236
L238A	1.842	.042	.23	.103	.72	1.889	.046	.52	.078	.69	30N	ó	L238A
L238B	1.705	-.095	-.52	.205	1.43	1.782	-.061	-.69	.119	1.04	30D	ó	L238B
L243	1.973	.173	.94	.136	.95	1.816	-.027	-.31	.079	.69	30D	ó	L243
L254	1.761	-.039	-.21	.164	1.15	1.733	-.110	-1.25	.198	1.74	30M	ó	L254
L262	1.642	-.158	-.86	.079	.55	1.803	-.040	-.45	.125	1.10	30N	ó	L262
L275	2.046	.246	1.34	.144	1.00	2.001	.158	1.80	.130	1.14	30N	ó	L275
L278	1.892	.091	.50	.189	1.32	1.762	-.081	-.92	.112	.99	30C	ó	L278
L279	1.862	.061	.33	.150	1.05	1.923	.080	.91	.099	.87	30N	ó	L279
L299	1.471	-.329	-1.79	.184	1.28	1.777	-.066	-.75	.123	1.08	30N	ó	L299
L321	1.839	.039	.21	.213	1.49	1.932	.089	1.01	.068	.60	30M	ó	L321
L326N	2.115	.315	1.71	.051	.36	2.191	.349	3.96	.039	.34	30N	X	L326N
L339	.579	-1.221	-6.64	.183	1.28	1.343	-.500	-5.68	.159	1.39	30N	#	L339
L366A	1.629	-.171	-.93	.160	1.12	1.809	-.034	-.38	.120	1.06	30N	ó	L366A
L376	1.640	-.160	-.87	.137	.96	1.854	.011	.13	.118	1.04	30N	ó	L376
L378	1.887	.086	.47	.098	.68	1.920	.077	.88	.078	.68	30N	ó	L378
L388	1.871	.071	.38	.134	.93	1.852	.009	.11	.118	1.03	30N	ó	L388
L390	1.523	-.277	-1.51	.133	.93	1.767	-.076	-.87	.100	.88	30N	ó	L390
L396M	2.043	.243	1.32	.127	.89	1.960	.117	1.33	.108	.95	30N	ó	L396M
L531	1.364	-.436	-2.37	.260	1.81	1.664	-.179	-2.03	.277	2.44	30N	ó	L531
L565	1.910	.110	.60	.115	.81	1.832	-.011	-.13	.105	.92	30N	ó	L565
L567	1.960	.160	.87	.166	1.16	2.028	.185	2.10	.067	.59	30N	ó	L567
L589	1.814	.014	.08	.102	.71	1.742	-.101	-1.15	.133	1.17	30N	ó	L589
L599	1.843	.042	.23	.118	.83	1.891	.048	.54	.084	.73	30C	ó	L599
GR. MEAN = 1.800 LOG(10) FOLD						GRAND MEAN = 1.843 LOG(10) FOLD					TEST DETERMINATIONS = 15		
SD MEANS = .184 LOG(10) FOLD				SD OF MEANS = .143 LOG(10) FOLD					AVERAGE SDR = .088 LOG(10) FOLD		41 LABS IN GRAND MEANS		
			AVERAGE SDR =						AVERAGE SDR = .114 LOG(10) FOLD				
L143	2.252	.452	2.46	.284	1.99	2.073	.230	2.62	.106	.93	30T	*	L143
L182S	2.923	1.123	6.11	.093	.65	2.151	.308	3.51	.115	1.01	30S	*	L182S
L190D	2.704	.904	4.92	.135	.94	1.991	.148	1.68	.074	.65	30S	*	L190D
L280	1.579	-.221	-1.20	.263	1.84	1.732	-.111	-1.26	.114	1.00	30K	*	L280
L326S	2.541	.741	4.03	.258	1.80	2.049	.206	2.35	.153	1.35	30S	*	L326S
L366B	1.564	-.236	-1.28	.263	1.83	2.049	.206	2.35	.095	.83	30T	*	L366B
L396S	2.237	.437	2.38	.411	2.87	2.151	.308	3.50	.059	.52	30T	*	L396S
L581	2.595	.795	4.32	.300	2.10	2.049	.206	2.34	.120	1.06	30T	*	L581

TOTAL NUMBER OF LABORATORIES REPORTING = 51

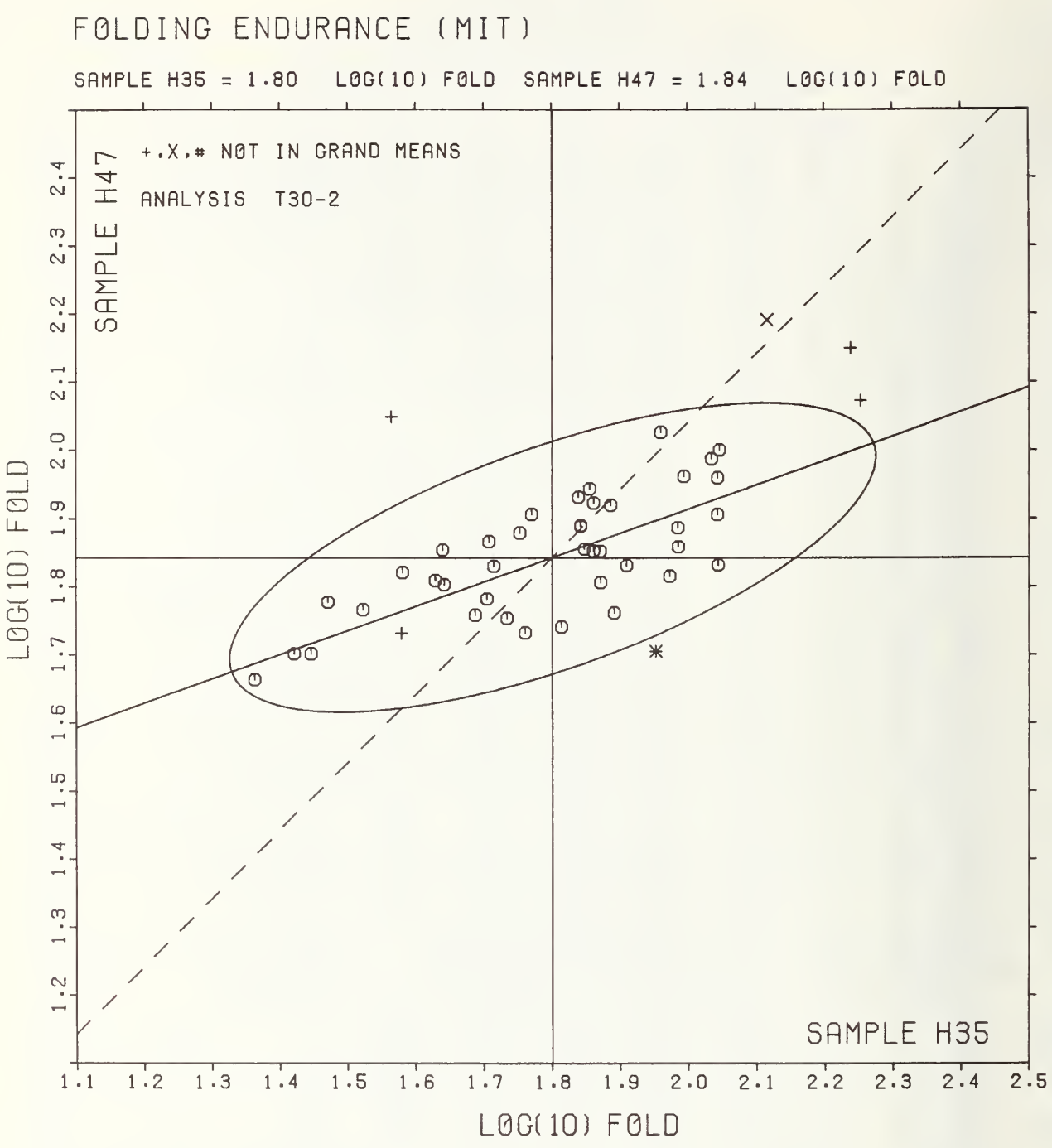
The ISO (International Standards Organization) is proposing that MIT folding endurance be reported as the logarithm (to the base 10) of the double fold instead of the double fold as in the past.

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

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

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

LAB CODE	F	MEANS H35	MEANS H47	COORDINATES MAJOR	COORDINATES MINOR	AVG RESDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L339	#	.579	1.343	-1.318	-.060	1.34	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L531	@	1.364	1.664	-.471	-.022	2.13	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L105	@	1.422	1.702	-.404	-.006	1.37	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L158	@	1.446	1.702	-.380	-.013	1.39	30M	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L299	@	1.471	1.777	-.332	.049	1.18	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L390	@	1.523	1.767	-.286	.021	.90	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L366B	*	1.564	2.049	-.153	.274	1.33	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L280	*	1.579	1.732	-.245	-.030	1.42	30K	FOLDING ENDURANCE, KOHLER-MOLIN
L121	@	1.581	1.822	-.213	.053	.80	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L366A	@	1.629	1.809	-.172	.026	1.09	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L376	@	1.640	1.854	-.147	.064	1.00	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L262	@	1.642	1.803	-.162	.016	.82	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100N	@	1.688	1.759	-.134	-.041	.91	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L238B	@	1.705	1.782	-.110	-.025	1.24	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L190C	@	1.708	1.867	-.079	.054	1.30	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L124	@	1.715	1.830	-.085	.017	.78	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L100M	@	1.735	1.755	-.092	-.061	.86	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L236	@	1.753	1.879	-.032	.050	1.14	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L254	@	1.761	1.733	-.079	-.091	1.14	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L162	@	1.771	1.907	-.007	.070	.66	30N	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L589	@	1.814	1.742	-.021	-.100	.94	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L321	@	1.839	1.932	.066	.070	1.04	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L238A	@	1.842	1.889	.055	.029	.70	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L599	@	1.843	1.891	.055	.031	.78	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L118	@	1.848	1.856	.049	-.004	.62	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L122	@	1.856	1.944	.086	.077	1.26	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L230	@	1.861	1.853	.061	-.011	.92	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L279	@	1.862	1.923	.085	.055	.96	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L388	@	1.871	1.852	.070	-.015	.98	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L163	@	1.872	1.807	.055	-.058	1.19	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L378	@	1.887	1.920	.107	.044	.68	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L278	@	1.892	1.762	.059	-.107	1.15	30C	FOLDING ENDURANCE, MIT, CIRCULATING FAN IN CEILING
L565	@	1.910	1.832	.099	-.048	.86	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L150	*	1.952	1.706	.097	-.180	1.38	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L567	@	1.960	2.028	.213	.120	.87	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L243	@	1.973	1.816	.154	-.084	.82	30D	FOLDING ENDURANCE, MIT, MODIFIED DRIVE TO REDUCE HEATING
L223F	@	1.985	1.887	.189	-.021	.75	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L159	@	1.985	1.859	.180	-.047	1.04	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L182M	@	1.994	1.963	.223	.048	.74	30M	FOLDING ENDURANCE, MIT, WITH CENTRIFUGAL FAN
L221	@	2.034	1.988	.269	.058	.86	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396M	@	2.043	1.960	.268	.029	.92	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L185	@	2.043	1.907	.250	-.022	.89	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L232	@	2.044	1.832	.226	-.092	.94	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L275	@	2.046	2.001	.285	.066	1.07	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L326N	X	2.115	2.191	.414	.222	.35	30N	FOLDING ENDURANCE, MIT, NO CENTRIFUGAL FAN
L396S	*	2.237	2.151	.515	.143	1.70	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L143	*	2.252	2.073	.503	.065	1.46	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L326S	*	2.541	2.049	.767	-.055	1.58	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L581	*	2.595	2.049	.818	-.073	1.58	30T	FOLDING ENDURANCE, SCHOPPER, TMI
L190D	*	2.704	1.991	.901	-.165	.73	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
L182S	*	2.923	2.151	1.161	-.087	.83	30S	FOLDING ENDURANCE, SCHOPPER, LEIPZIG
GMEANS:		1.800	1.843			1.00		
		95% ELLIPSE:		.500	.162	WITH GAMMA = 19 DEGREES		


FOLDING ENDURANCE (MIT)
SAMPLE H35 = 1.80 LOG(10) FOLD SAMPLE H47 = 1.84 LOG(10) FOLD
+,X,* NOT IN GRAND MEANS
ANALYSIS T30-2
SAMPLE H47
LOG(10) FOLD
SAMPLE H35
LOG(10) FOLD
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 2.4 2.5
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

TAPPI COLLABORATIVE REFERENCE PROGRAM
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 H68 MEAN	PRINTING 96 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H65 MEAN	PRINTING 106 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 10 VAR	F	LAB
L100	493.	36.	1.28	20.	.85	400.	3.	.11	13.	.71	35G	@	L100
L118	450.	-7.	-.23	23.	.96	379.	-18.	-.75	16.	.86	35G	@	L118
L121	504.	47.	1.65	48.	2.03	454.	57.	2.34	45.	2.42	35G	@	L121
L122	460.	3.	.09	26.	1.12	378.	-19.	-.77	21.	1.11	35G	@	L122
L132	463.	6.	.21	34.	1.46	409.	12.	.49	44.	2.33	35G	@	L132
L139	444.	-13.	-.46	19.	.79	394.	-3.	-.12	15.	.82	35G	@	L139
L148	464.	7.	.26	20.	.86	372.	-25.	-1.05	19.	.99	35G	@	L148
L153	452.	-5.	-.17	21.	.90	414.	16.	.68	9.	.46	35G	@	L153
L159	412.	-45.	-1.58	36.	1.52	385.	-13.	-.52	32.	1.69	35G	@	L159
L162	408.	-49.	-1.74	26.	1.09	355.	-43.	-1.75	12.	.62	35G	@	L162
L163	440.	-17.	-.60	31.	1.31	376.	-21.	-.88	32.	1.71	35G	@	L163
L183	513.	57.	1.99	17.	.73	422.	25.	1.02	29.	1.56	35G	@	L183
L190C	478.	21.	.74	16.	.69	430.	32.	1.34	13.	.68	35G	@	L190C
L195	465.	8.	.28	23.	1.00	398.	1.	.02	14.	.75	35G	@	L195
L223	433.	-24.	-.83	12.	.49	372.	-25.	-1.02	11.	.61	35G	@	L223
L224	474.	17.	.60	21.	.89	398.	1.	.04	23.	1.20	35G	@	L224
L232	430.	-27.	-.96	16.	.70	395.	-2.	-.07	23.	1.23	35G	@	L232
L236	383.	-74.	-2.60	39.	1.68	350.	-47.	-1.95	12.	.63	35G	*	L236
L241	479.	22.	.76	29.	1.23	427.	30.	1.25	24.	1.30	35G	@	L241
L249	437.	-20.	-.69	17.	.70	383.	-15.	-.60	11.	.58	35G	@	L249
L254	401.	-56.	-1.97	11.	.47	344.	-53.	-2.18	11.	.58	35G	@	L254
L260	463.	6.	.22	16.	.67	416.	19.	.79	9.	.51	35G	@	L260
L268	461.	4.	.15	14.	.59	397.	-0.	-.01	8.	.43	35G	@	L268
L291	461.	4.	.15	12.	.52	390.	-7.	-.29	16.	.83	35G	@	L291
L297	414.	-43.	-1.50	21.	.89	366.	-31.	-1.29	9.	.48	35G	@	L297
L308	455.	-2.	-.06	13.	.54	408.	10.	.43	28.	1.49	35G	@	L308
L321	465.	8.	.27	32.	1.35	392.	-5.	-.22	19.	1.00	35G	@	L321
L356	446.	-11.	-.39	21.	.91	372.	-25.	-1.02	11.	.61	35G	@	L356
L376	460.	4.	.12	36.	1.54	423.	26.	1.07	17.	.92	35G	@	L376
L378	467.	10.	.34	18.	.78	408.	11.	.45	15.	.79	35G	@	L378
L382	476.	19.	.66	42.	1.77	400.	3.	.12	23.	1.21	35G	@	L382
L390	458.	1.	.05	29.	1.25	407.	10.	.40	30.	1.60	35G	@	L390
L396	469.	12.	.43	13.	.54	401.	4.	.17	14.	.73	35G	@	L396
L567	482.	25.	.87	24.	1.00	412.	15.	.63	23.	1.23	35G	@	L567
L571	464.	8.	.27	16.	.67	419.	22.	.90	12.	.64	35G	@	L571
L575	484.	27.	.94	34.	1.45	429.	32.	1.31	15.	.78	35G	@	L575
L600	497.	40.	1.42	41.	1.72	421.	23.	.97	10.	.51	35G	@	L600
GR. MEAN *	457. GURLEY UNITS					GRAND MEAN *	397. GURLEY UNITS				TEST DETERMINATIONS * 10		
SD MEANS *	28. GURLEY UNITS					SD OF MEANS *	24. GURLEY UNITS				37 LABS IN GRAND MEANS		
	AVERAGE SDR *	24. GURLEY UNITS					AVERAGE SDR *	19. GURLEY UNITS					
L213	465.	8.	.29	43.	1.83	427.	30.	1.23	32.	1.72	35H	*	L213

TOTAL NUMBER OF LABORATORIES REPORTING * 38

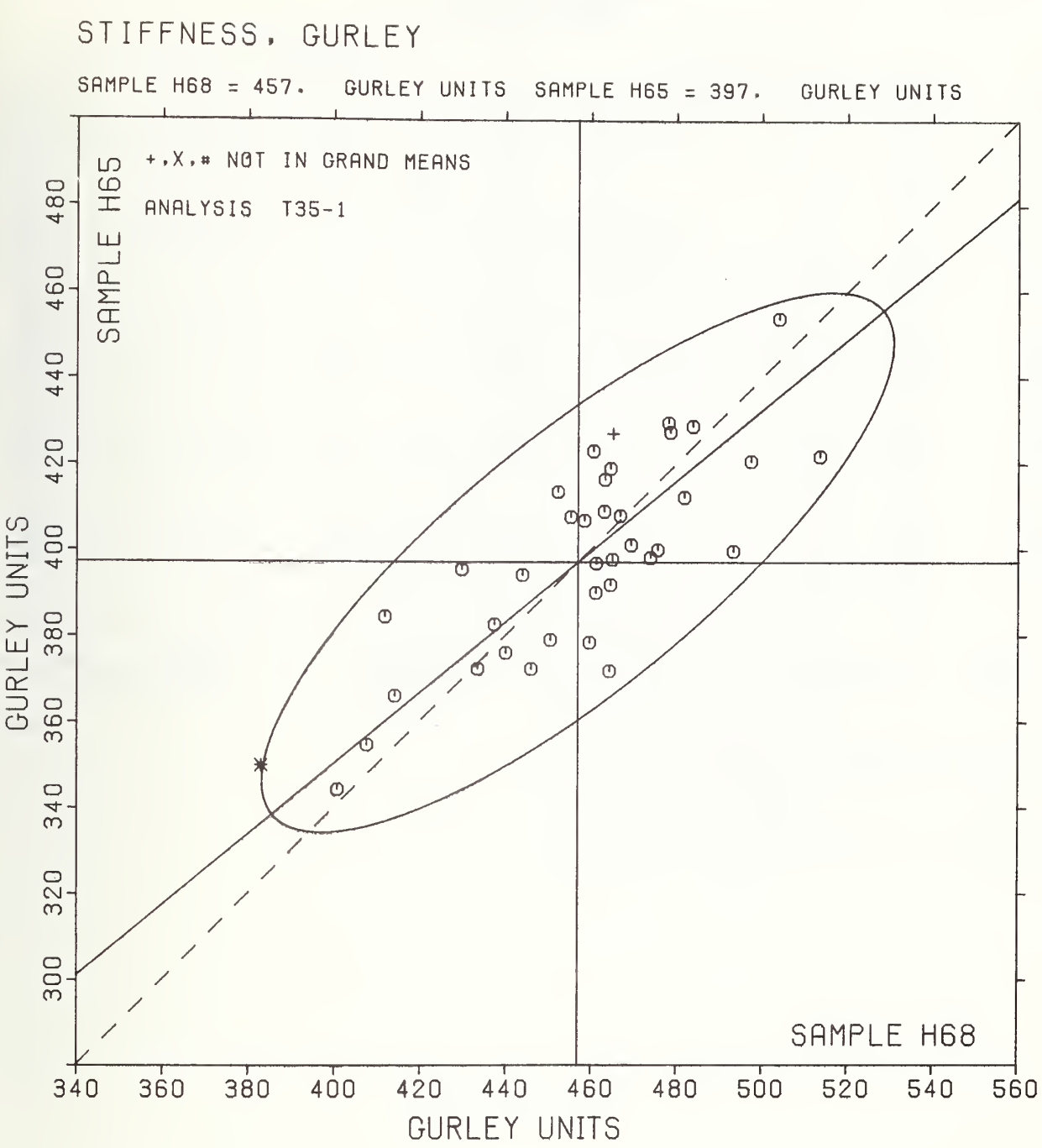
Best Values: H68 460 ± 50 Gurley units
H65 400 ± 30 Gurley units

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 H68	MEANS H65	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L236	*	383.	350.	-87.	10.	1.15	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L254	6	401.	344.	-77.	-5.	.53	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L162	6	408.	355.	-65.	-2.	.85	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L159	6	412.	385.	-43.	19.	1.61	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L297	6	414.	366.	-53.	3.	.69	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L232	6	430.	395.	-22.	16.	.96	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L223	6	433.	372.	-34.	-4.	.55	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L249	6	437.	383.	-24.	1.	.64	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L163	6	440.	376.	-27.	-6.	1.51	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L139	6	444.	394.	-12.	6.	.81	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L355	6	446.	372.	-24.	-12.	.76	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L118	6	450.	379.	-17.	-10.	.91	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L153	6	452.	414.	7.	16.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L308	6	455.	408.	5.	9.	1.02	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L390	6	458.	407.	7.	7.	1.42	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L122	6	460.	378.	-10.	-16.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L376	6	460.	423.	19.	18.	1.23	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L291	6	461.	390.	-1.	-8.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L268	6	461.	397.	3.	-3.	.51	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L132	6	463.	409.	12.	5.	1.89	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L260	6	463.	416.	17.	11.	.59	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L148	6	464.	372.	-11.	-24.	.93	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L571	6	464.	419.	20.	12.	.65	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L321	6	465.	392.	2.	-9.	1.18	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L195	6	465.	398.	7.	-5.	.88	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L213	*	465.	427.	25.	18.	1.77	35H	STIFFNESS, GURLEY (UNITS: MG/1X3 TEST PIECE), 20 C, 65% RH
L378	6	467.	408.	14.	2.	.79	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L396	6	469.	401.	12.	-5.	.64	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L224	6	474.	398.	14.	-10.	1.05	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L382	6	476.	400.	16.	-10.	1.49	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L190C	6	478.	430.	37.	12.	.68	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L241	6	479.	427.	36.	10.	1.27	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L567	6	482.	412.	29.	-4.	1.11	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L575	6	484.	429.	41.	7.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L100	6	493.	400.	30.	-21.	.78	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L600	6	497.	421.	46.	-8.	1.12	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L121	6	504.	454.	72.	14.	2.23	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
L183	6	513.	422.	59.	-17.	1.14	35G	STIFFNESS, GURLEY (UNITS: MG/1X3 -ACTUALLY 3.5- TEST PIECE)
GMEANS:		457.	397.			1.00		
		95% ELLIPSE:		92.	29.	WITH GAMMA = 39 DEGREES		


STIFFNESS, GURLEY
SAMPLE H68 = 457. GURLEY UNITS SAMPLE H65 = 397. GURLEY UNITS
+,X,* NOT IN GRAND MEANS
ANALYSIS T35-1
SAMPLE H65
GURLEY UNITS
300 320 340 360 380 400 420 440 460 480
SAMPLE H68
340 360 380 400 420 440 460 480 500 520 540 560
GURLEY UNITS

ANALYSIS T36-1 TABLE 1

TABER STIFFNESS

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

	SAMPLE	KRAFT ENVELOPE				SAMPLE	PRINTING				TEST D.= 10	
LAB	B63	124 GRAMS PER SQUARE METER				J09	149 GRAMS PER SQUARE METER					
CODE	MEAN	DEV	N.DEV	SDR	R.SDR	MEAN	DEV	N.DEV	SDR	R.SDR	VAR F	LAB
L107A	17.86	-1.03	-1.29	.53	.71	16.03	-1.30	-1.55	.88	1.02	36T ó	L107A
L123	18.30	-.59	-.74	.48	.65	10.00	-7.33	-8.76	.67	.78	36T *	L123
L126	18.25	-.64	-.80	.35	.48	16.95	-.38	-.46	.50	.58	36T ó	L126
L149	19.90	1.01	1.26	.74	1.00	18.40	1.07	1.28	.84	.99	36T ó	L149
L150	18.95	.06	.08	.60	.81	17.00	-.33	-.40	1.18	1.38	36T ó	L150
L158	19.00	.11	.14	1.29	1.74	17.00	-.33	-.40	2.30	2.70	36T ó	L158
L163	18.40	-.49	-.61	.91	1.23	17.85	.52	.62	.47	.56	36T ó	L163
L173B	18.03	-.86	-1.07	.74	1.01	16.55	-.78	-.93	.63	.73	36T ó	L173B
L176	21.25	2.36	2.95	1.30	1.75	19.15	1.82	2.17	.97	1.14	36T *	L176
L182	18.92	.03	.04	.58	.78	18.00	.67	.80	1.60	1.87	36T ó	L182
L207	18.76	-.13	-.16	.42	.57	17.36	.03	.03	.89	1.05	36T ó	L207
L228	17.70	-1.19	-1.49	.63	.85	16.10	-1.23	-1.47	.46	.54	36T ó	L228
L242	20.51	1.63	2.03	1.21	1.64	19.02	1.69	2.02	1.15	1.35	36T ó	L242
L243	18.75	-.14	-.17	.54	.73	16.20	-1.13	-1.35	.48	.57	36T ó	L243
L260	19.30	.41	.51	.58	.79	18.14	.81	.97	.56	.65	36T ó	L260
L262	18.75	-.14	-.17	.72	.97	17.75	.42	.50	.54	.63	36T ó	L262
L268	18.65	-.24	-.30	.63	.85	17.05	-.28	-.34	.28	.33	36T ó	L268
L273	18.30	-.59	-.74	.48	.65	16.40	-.93	-1.11	.84	.99	36T ó	L273
L281	19.10	.21	.26	.49	.66	17.92	.59	.71	.73	.85	36T ó	L281
L290	18.30	-.59	-.74	.95	1.28	16.90	-.43	-.51	.74	.87	36T ó	L290
L318	19.15	.26	.33	.68	.92	17.22	-.11	-.13	.38	.45	36T ó	L318
L321	19.11	.22	.28	1.04	1.40	17.10	-.23	-.28	1.18	1.39	36T ó	L321
L324	18.70	-.19	-.24	.45	.61	17.40	.07	.08	.91	1.07	36T ó	L324
L339	18.49	-.40	-.50	.68	.92	16.67	-.66	-.79	.76	.90	36T ó	L339
L442	22.60	3.71	4.64	1.62	2.18	19.38	2.05	2.45	1.31	1.54	36T *	L442
L570	19.70	.81	1.01	2.00	2.71	17.10	-.23	-.28	.99	1.17	36T ó	L570
L580	18.40	-.49	-.61	.52	.70	18.00	.67	.80	1.15	1.35	36T ó	L580

GR. MEAN = 18.89 TABER UNITS — GRAND MEAN = 17.33 TABER UNITS — TEST DETERMINATIONS = 10

SD MEANS = .80 TABER UNITS — SD OF MEANS = .84 TABER UNITS — 25 LABS IN GRAND MEANS

AVERAGE SDR = .74 TABER UNITS — AVERAGE SDR = .85 TABER UNITS

L250	17.95	-.94	-1.17	.72	.98	16.00	-1.33	-1.59	.67	.78	36U *	L250

TOTAL NUMBER OF LABORATORIES REPORTING = 28

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

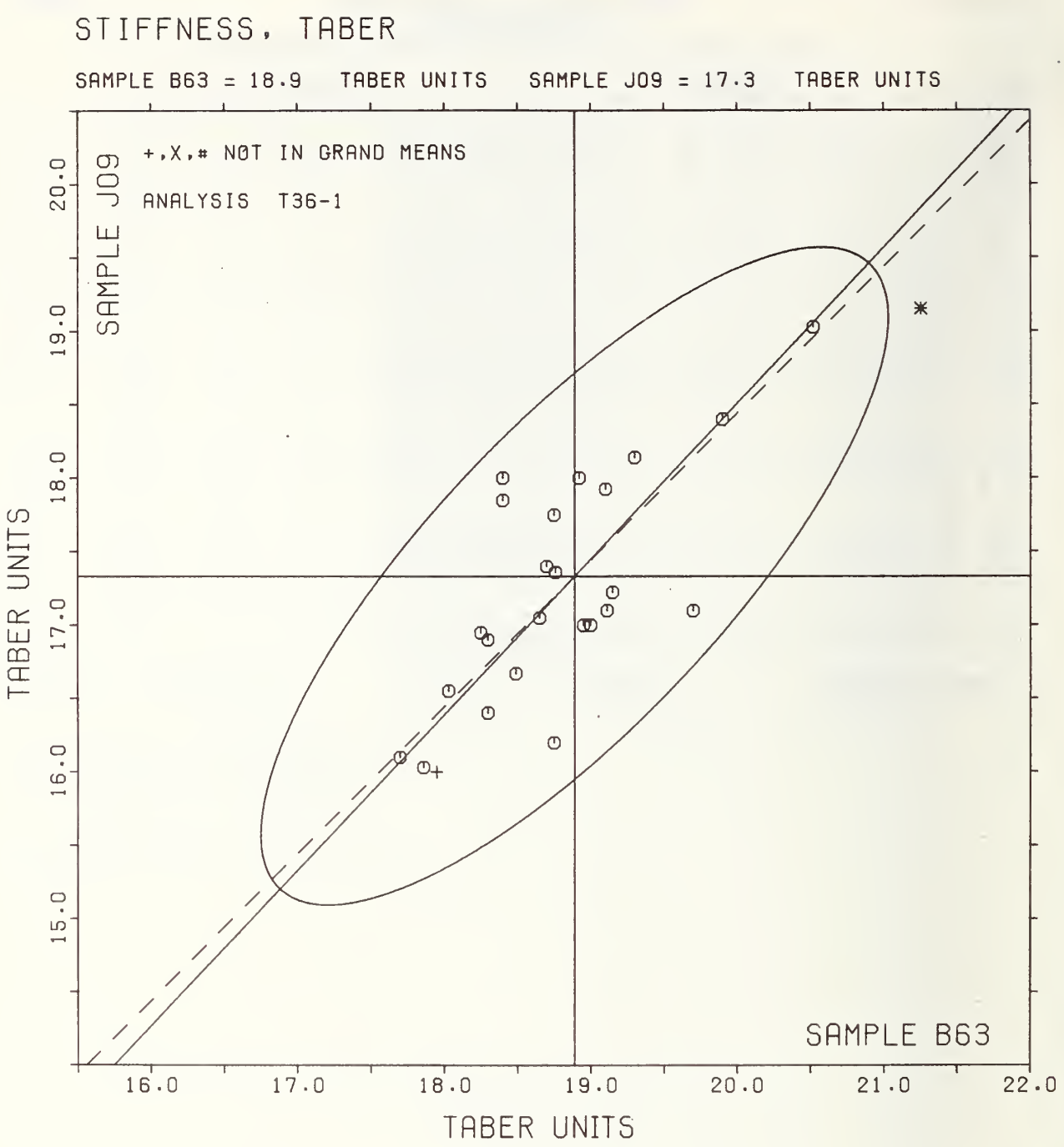
The following laboratories were omitted from the grand means because of extreme test results: 123, 442.

ANALYSIS T36-1 TABLE 2

TABER STIFFNESS

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

LAB CODE	F	MEANS B63	MEANS J09	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L228	ó	17.70	16.10	-1.71	.02	.70	36T	STIFFNESS, TABER
L107A	ó	17.86	16.03	-1.65	-.14	.87	36T	STIFFNESS, TABER
L250	*	17.95	16.00	-1.61	-.23	.88	36U	STIFFNESS, TABER, 20 C, 65% RH
L173B	ó	18.03	16.55	-1.16	.09	.87	36T	STIFFNESS, TABER
L126	ó	18.25	16.95	-.72	.20	.53	36T	STIFFNESS, TABER
L290	ó	18.30	16.90	-.72	.13	1.07	36T	STIFFNESS, TABER
L273	ó	18.30	16.40	-1.08	-.21	.82	36T	STIFFNESS, TABER
L123	#	18.30	10.00	-5.74	-4.60	.72	36T	STIFFNESS, TABER
L580	ó	18.40	18.00	.15	.82	1.03	36T	STIFFNESS, TABER
L163	ó	18.40	17.85	.04	.71	.89	36T	STIFFNESS, TABER
L339	ó	18.49	16.67	-.75	-.16	.91	36T	STIFFNESS, TABER
L268	ó	18.65	17.05	-.37	-.02	.59	36T	STIFFNESS, TABER
L324	ó	18.70	17.40	-.08	.19	.84	36T	STIFFNESS, TABER
L262	ó	18.75	17.75	.21	.39	.80	36T	STIFFNESS, TABER
L243	ó	18.75	16.20	-.92	-.67	.65	36T	STIFFNESS, TABER
L207	ó	18.76	17.36	-.07	.11	.81	36T	STIFFNESS, TABER
L182	ó	18.92	18.00	.51	.44	1.33	36T	STIFFNESS, TABER
L150	ó	18.95	17.00	-.20	-.27	1.10	36T	STIFFNESS, TABER
L158	ó	19.00	17.00	-.16	-.31	2.22	36T	STIFFNESS, TABER
L281	ó	19.10	17.92	.58	.25	.76	36T	STIFFNESS, TABER
L321	ó	19.11	17.10	-.02	-.32	1.39	36T	STIFFNESS, TABER
L318	ó	19.15	17.22	.10	-.26	.68	36T	STIFFNESS, TABER
L260	ó	19.30	18.14	.87	.26	.72	36T	STIFFNESS, TABER
L570	ó	19.70	17.10	.39	-.75	1.94	36T	STIFFNESS, TABER
L149	ó	19.90	18.40	1.47	-.00	.99	36T	STIFFNESS, TABER
L242	ó	20.51	19.02	2.35	-.02	1.50	36T	STIFFNESS, TABER
L176	*	21.25	19.15	2.94	-.47	1.48	36T	STIFFNESS, TABER
L442	#	22.60	19.38	4.04	-1.29	1.86	36T	STIFFNESS, TABER
GMEANS:		18.89	17.33			1.00		
		95% ELLIPSE:		2.92	1.01	WITH GAMMA = 46 DEGREES		


STIFFNESS, TABER
SAMPLE B63 = 18.9 TABER UNITS
SAMPLE J09 = 17.3 TABER UNITS
+,X,# NOT IN GRAND MEANS
ANALYSIS T36-1
SAMPLE J09
TABER UNITS
20.0
19.0
18.0
17.0
16.0
15.0
SAMPLE B63
16.0
17.0
18.0
19.0
20.0
21.0
22.0
TABER UNITS

LAB CODE	SAMPLE H80 MEAN	PRINTING 84 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE H76 MEAN	PRINTING 91 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.= 4 VAR	F	LAB
L107	77.0	6.4	.21	.0	.00	33.7	-20.3	-.87	3.2	1.00	49I	G	L107
L121	660.0	589.4	19.16	.0	.00	543.7	489.7	20.94	78.2	24.47	49F	#	L121
L122	47.6	-23.0	-.75	2.1	.68	48.6	-5.5	-.23	1.3	.39	49Q	G	L122
L149	83.5	12.9	.42	2.6	.85	52.1	-1.9	-.08	5.5	1.73	49L	G	L149
L182I	20.1	-50.6	-1.64	.8	.27	16.4	-37.7	-1.61	1.8	.57	49Q	G	L182I
L183	NO DATA REPORTED FOR SAMPLE H80					44.4	-9.7	-.41	1.3	.42	49Q	M	L183
L190C	55.5	-15.1	-.49	1.7	.55	59.5	5.4	.23	2.9	.90	49T	G	L190C
L207	128.0	57.4	1.86	9.6	3.06	97.0	42.9	1.83	1.4	.44	49I	G	L207
L242	37.2	-33.5	-1.09	2.8	.89	NO DATA REPORTED FOR SAMPLE H76					49P	M	L242
L280	3.7	-66.9	-2.18	.0	.00	3.0	-51.0	-2.18	.3	.10	49U	#	L280
L291	65.5	-5.1	-.17	5.1	1.63	65.1	11.1	.47	4.2	1.30	49I	G	L291
L382	66.0	-4.7	-.15	2.7	.86	NO DATA REPORTED FOR SAMPLE H76					49I	M	L382
L388	167.4	96.8	3.15	6.2	1.99	108.0	53.9	2.31	8.8	2.76	49Q	#	L388
L484	96.3	25.7	.84	4.6	1.46	72.8	18.8	.80	7.4	2.31	49P	G	L484
L600	62.2	-8.4	-.27	1.6	.50	41.4	-12.7	-.54	1.1	.35	49Q	G	L600

GR. MEAN = 70.6 KP CM/SEC — GRAND MEAN = 54.1 KP CM/SEC — TEST DETERMINATIONS = 4
SD MEANS = 30.8 KP CM/SEC — SD OF MEANS = 23.4 KP CM/SEC — 9 LABS IN GRAND MEANS
AVERAGE SDR = 3.1 KP CM/SEC — AVERAGE SDR = 3.2 KP CM/SEC
TOTAL NUMBER OF LABORATORIES REPORTING = 15

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

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

ANALYSIS T50-1 TABLE 1

SURFACE PICK STRENGTH, WAX NUMBER

TAPPI STANDARD T459 OS-75, SURFACE STRENGTH OF PAPER (WAX PICK TEST)

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

GR. MEAN = 11.02 WAX NUMBER GRAND MEAN = 8.63 WAX NUMBER TEST DETERMINATIONS = 5

SD MEANS = 1.13 WAX NUMBER SD OF MEANS = 1.30 WAX NUMBER 21 LABS IN GRAND MEANS

AVERAGE SDR = .40 WAX NUMBER AVERAGE SDR = .62 WAX NUMBER

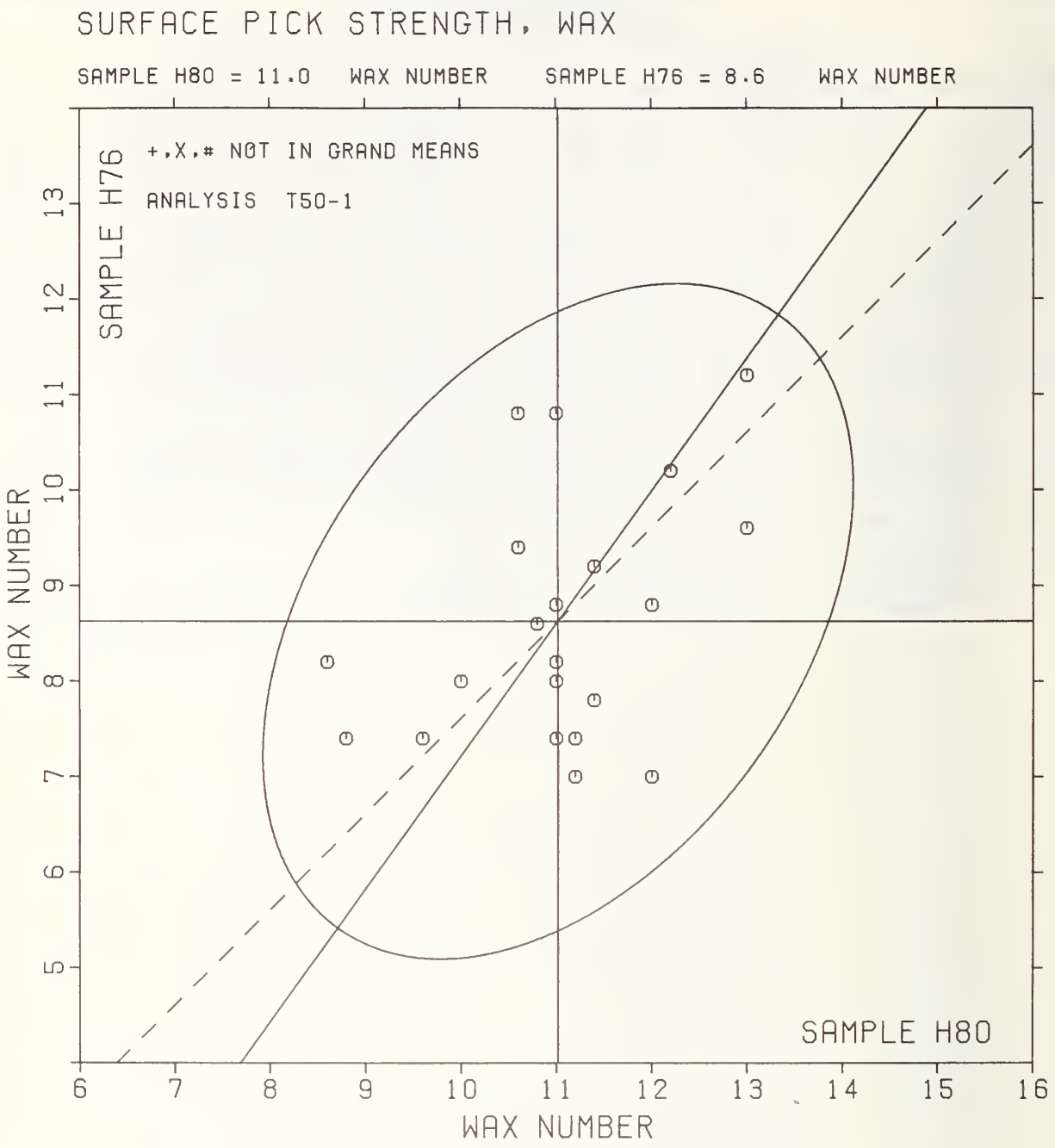
TOTAL NUMBER OF LABORATORIES REPORTING = 21

Best Values: H80 11.0 ± 1.9 wax number

H76 9.0 ± 1.8 wax number

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T50-1 TABLE 2
SURFACE PICK STRENGTH, WAX NUMBER
TAPPI STANDARD T459 OS-75, SURFACE STRENGTH OF PAPER (WAX PICK TEST)

LAB CODE	F	MEANS H80	H76	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L243	O	8.60	8.20	-1.76	1.71	1.36	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L390	O	8.80	7.40	-2.29	1.08	2.35	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L228	O	9.60	7.40	-1.83	.43	1.13	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L122	O	10.00	8.00	-1.11	.46	.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L339	O	10.60	10.80	1.52	1.61	3.51	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L182W	O	10.60	9.40	.38	.79	1.13	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L213	O	10.80	8.60	-.15	.16	1.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L564	O	11.00	10.80	1.75	1.28	.36	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L195	O	11.00	8.20	-.36	-.23	.36	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L173A	O	11.00	7.40	-1.01	-.70	.44	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L105	O	11.00	8.80	.13	.12	1.56	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L230	O	11.00	8.00	-.52	-.35	.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L557	O	11.20	7.00	-1.22	-1.10	.56	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L378	O	11.20	7.40	-.89	-.86	1.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L183	O	11.40	9.20	.69	.02	1.79	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L158	O	11.40	7.80	-.45	-.79	1.04	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L561	O	12.00	8.80	.71	-.70	.88	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L162	O	12.00	7.00	-.75	-1.75	.00	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L366	O	12.20	10.20	1.97	-.04	1.72	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L236	O	13.00	11.20	3.24	-.11	.36	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
L225	O	13.00	9.60	1.95	-1.04	.44	50W	SURFACE PICK STRENGTH, WAX (TAPPI T459 OS75)
GMEANS:		11.02	8.63			1.00		
		95% ELLIPSE:		3.95	2.53	WITH GAMMA = 54 DEGREES		


SURFACE PICK STRENGTH, WAX
SAMPLE H80 = 11.0 WAX NUMBER
SAMPLE H76 = 8.6 WAX NUMBER
+,X,# NOT IN GRAND MEANS
ANALYSIS T50-1
SAMPLE H76
WAX NUMBER
SAMPLE H80
WAX NUMBER
5
6
7
8
9
10
11
12
13
6
7
8
9
10
11
12
13
14
15
16

REPORT NO. 52S

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T91-1 TABLE 1
CONCORA (CORRUGATING MEDIUM TEST-CMT)
TAPPI STANDARD T809 OS-71

MARCH 1978

LAB CODE	SAMPLE E55 MEAN	LINERBOARD 129 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	SAMPLE E67 MEAN	KRAFT 143 GRAMS PER SQUARE METER DEV	N.DEV	SDR	R.SDR	TEST D.* 10 VAR	P	LAB
L100	181.	6.	.55	13.	1.13	192.	9.	.57	16.	1.31	91H	O	L100
L182	175.	-1.	-.06	7.	.63	183.	0.	.02	19.	1.55	91T	O	L182
L185	188.	13.	1.27	10.	.93	201.	18.	1.15	11.	.90	91A	O	L185
L218	173.	-3.	-.26	7.	.67	181.	-1.	-.09	13.	1.03	91I	O	L218
L242	169.	-6.	-.60	10.	.87	166.	-17.	-1.04	17.	1.39	91G	O	L242
L255	157.	-19.	-1.83	13.	1.21	150.	-33.	-2.04	15.	1.25	91I	O	L255
L269	174.	-1.	-.10	14.	1.24	185.	3.	.16	6.	.49	91I	O	L269
L289	181.	5.	.50	14.	1.24	187.	4.	.24	11.	.95	91I	O	L289
L329	174.	-1.	-.14	20.	1.82	183.	-0.	-.00	10.	.80	91I	O	L329
L336	201.	25.	2.45	10.	.93	208.	25.	1.57	17.	1.42	91I	O	L336
L394	171.	-4.	-.40	3.	.28	170.	-13.	-.78	4.	.30	91R	O	L394
L484	167.	-8.	-.80	12.	1.12	166.	-17.	-1.06	7.	.60	91H	O	L484
L575	170.	-5.	-.48	16.	1.43	205.	22.	1.35	19.	1.54	91H	*	L575
L666	174.	-1.	-.10	10.	.94	182.	-1.	-.03	12.	1.01	91S	O	L666

GR. MEAN = 175. NEWTONS — GRAND MEAN = 183. NEWTONS — TEST DETERMINATIONS = 10
SD MEANS = 10. NEWTONS — SD OF MEANS = 16. NEWTONS — 14 LABS IN GRAND MEANS
AVERAGE SDR = 11. NEWTONS — AVERAGE SDR = 12. NEWTONS
GR. MEAN = 39.43 POUNDS — GRAND MEAN = 41.11 POUNDS
TOTAL NUMBER OF LABORATORIES REPORTING = 14

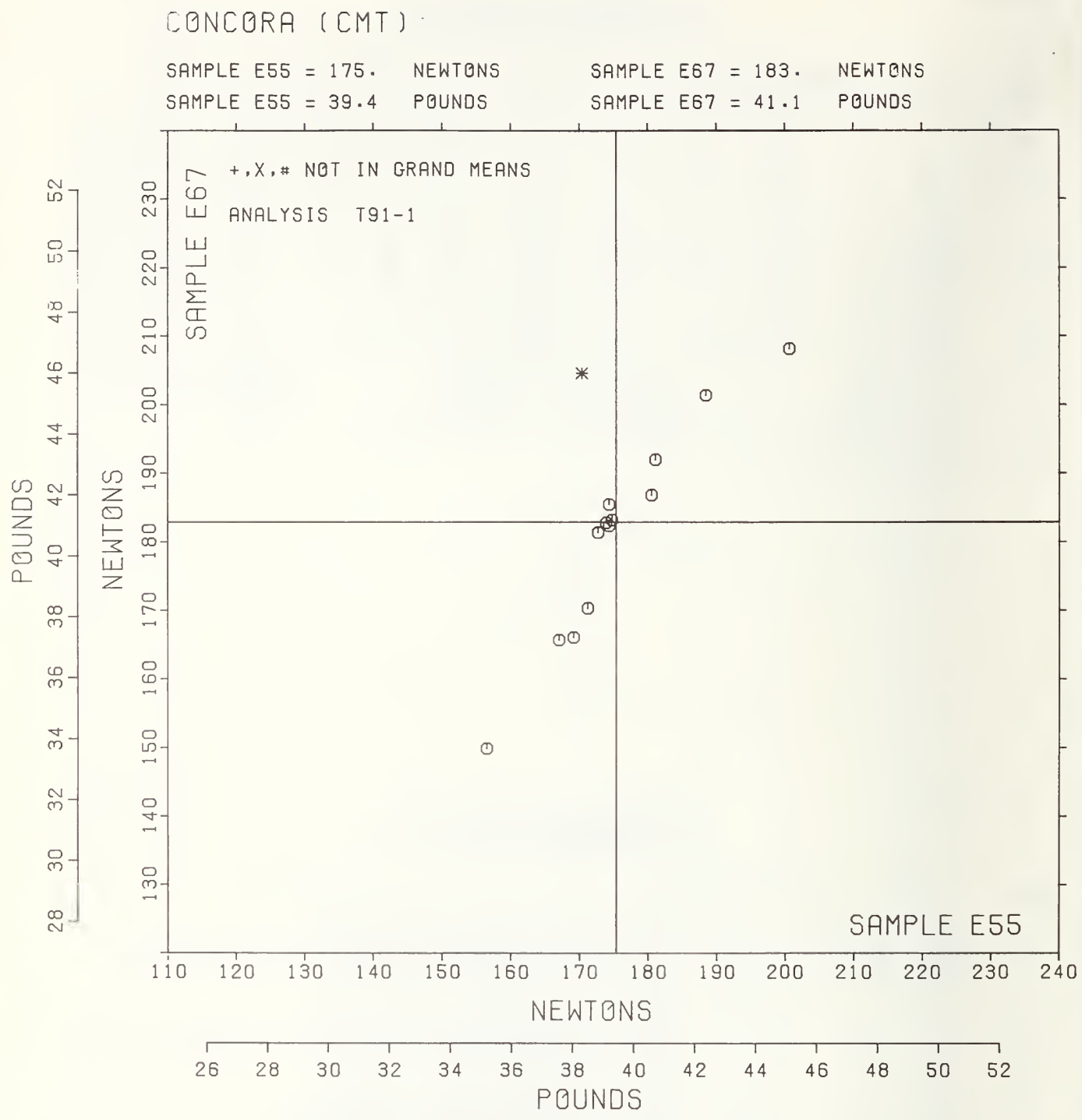
Best values: E55 175 ± 20 newtons
E67 180 ± 25 newtons

REPORT NO. 52S

TAPPI COLLABORATIVE REFERENCE PROGRAM
ANALYSIS T91-1 TABLE 2
CONCORA (CORRUGATING MEDIUM TEST-CMT)
TAPPI STANDARD T809 OS-71

MARCH 1978

LAB CODE	F	MEANS E55	E67	COORDINATES MAJOR	MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L255	O	157.	150.	-38.	-0.	1.23	91I	FLAT CRUSH STRENGTH, CONCORA, H*D
L484	O	167.	166.	-19.	-1.	.86	91H	FLAT CRUSH STRENGTH, CONCORA, H*D
L242	O	169.	166.	-18.	-3.	1.13	91G	FLAT CRUSH STRENGTH, CONCORA, GAYDON PLAT CRUSH TESTER
L575	*	170.	205.	16.	15.	1.49	91H	FLAT CRUSH STRENGTH, CONCORA, H*D
L394	O	171.	170.	-13.	-3.	.29	91R	PLAT CRUSH STRENGTH, CONCORA, TMI
L218	O	173.	181.	-3.	2.	.85	91I	FLAT CRUSH STRENGTH, CONCORA, H*D
L329	O	174.	183.	-1.	1.	1.31	91I	FLAT CRUSH STRENGTH, CONCORA, H*D
L666	O	174.	182.	-1.	1.	.97	91S	FLAT CRUSH STRENGTH, CONCORA, TOYO SEIKI (METHOD JIS-P-8126)
L269	O	174.	185.	2.	2.	.86	91I	FLAT CRUSH STRENGTH, CONCORA, H*D
L182	O	175.	183.	-0.	1.	1.09	91T	FLAT CRUSH STRENGTH, CONCORA, TMI
L289	O	181.	187.	6.	-3.	1.09	91I	FLAT CRUSH STRENGTH, CONCORA, H*D
L100	O	181.	192.	11.	-0.	1.22	91H	PLAT CRUSH STRENGTH, CONCORA, H*D
L185	O	188.	201.	23.	-2.	.92	91A	FLAT CRUSH STRENGTH, CONCORA, INSTRON
L336	O	201.	208.	35.	-9.	1.18	91I	PLAT CRUSH STRENGTH, CONCORA, H*D
GMEANS:		175.	183.			1.00		
		95% ELLIPSE:		53.	15.	WITH GAMMA = 59 DEGREES		


CONCORA (CMT)
SAMPLE E55 = 175. NEWTONS
SAMPLE E55 = 39.4 POUNDS
SAMPLE E67 = 183. NEWTONS
SAMPLE E67 = 41.1 POUNDS
+,X,# NOT IN GRAND MEANS
ANALYSIS T91-1
SAMPLE E67
SAMPLE E55
NEWTONS
POUNDS
110 120 130 140 150 160 170 180 190 200 210 220 230 240
26 28 30 32 34 36 38 40 42 44 46 48 50 52
130 140 150 160 170 180 190 200 210 220 230
28 30 32 34 36 38 40 42 44 46 48 50 52

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

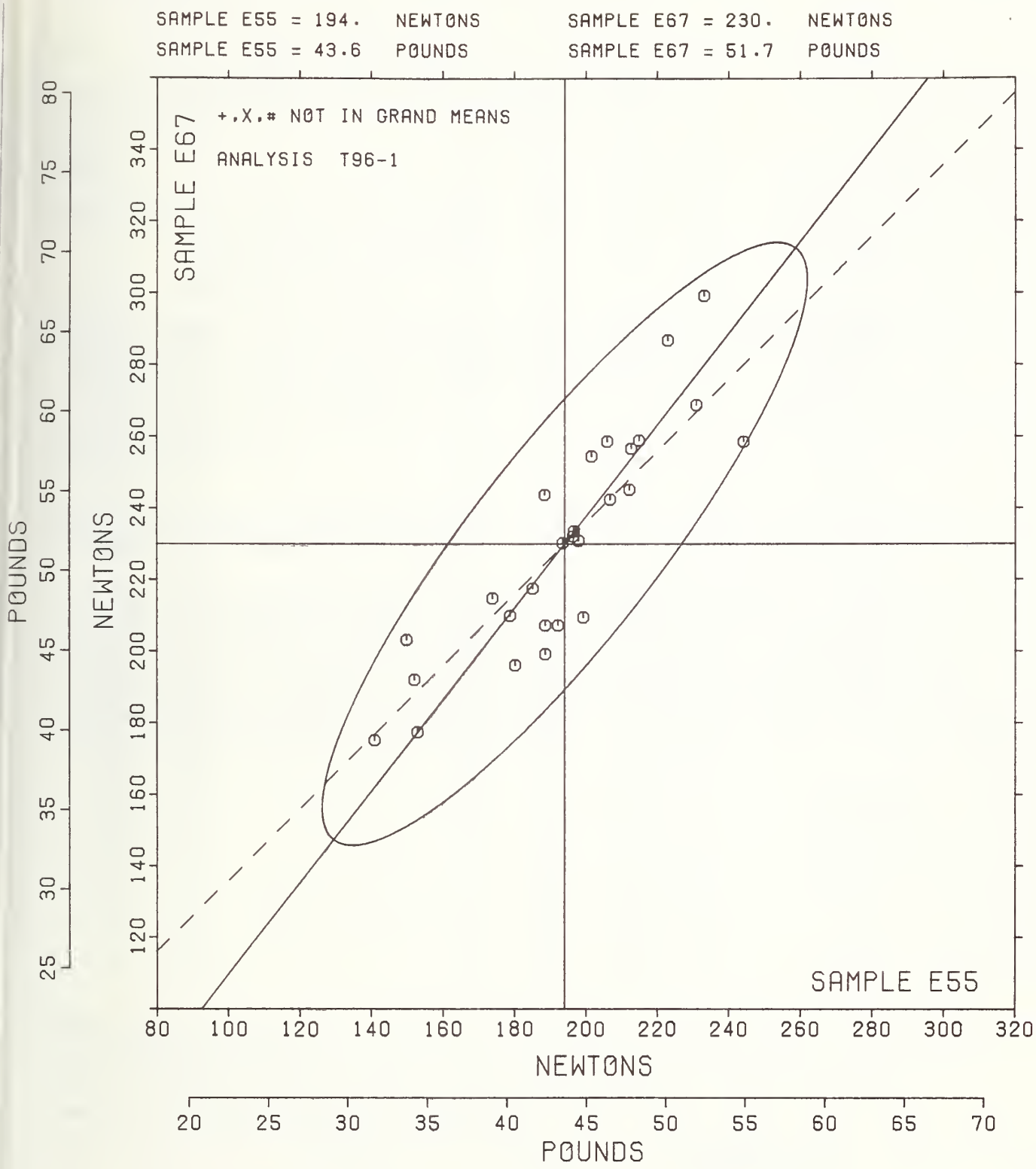
LAB CODE	SAMPLE E55 LINERBOARD 129 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	SAMPLE E67 KRAFT 143 GRAMS PER SQUARE METER MEAN	DEV	N.DEV	SDR	R.SDR	TEST D.= 10 VAR	F	LAB
L100	188.	-6.	-.22	37.	2.18	244.	14.	.43	16.	1.09	96H	6	L100
L107	185.	-9.	-.35	16.	.95	218.	-12.	-.39	20.	1.34	96P	6	L107
L114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

GR. MEAN = 194. NEWTONS — GRAND MEAN = 230. NEWTONS — TEST DETERMINATIONS = 10
SD MEANS = 26. NEWTONS — SD OF MEANS = 32. NEWTONS — 27 LABS IN GRAND MEANS
AVERAGE SDR = 17. NEWTONS — AVERAGE SDR = 15. NEWTONS
GR. MEAN = 43.63 POUNDS — GRAND MEAN = 51.71 POUNDS
TOTAL NUMBER OF LABORATORIES REPORTING = 27

Best Values: E55 200 ± 45 newtons
E67 230 ± 50 newtons

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

LAB CODE	F	MEANS E55	MEANS E67	COORDINATES MAJOR	COORDINATES MINOR	AVG R.SDR	VAR	PROPERTY---TEST INSTRUMENT---CONDITIONS
L122	0	141.	175.	-76.	8.	1.30	96P	RING CRUSH, H AND D
L617	0	150.	203.	-48.	18.	1.52	96Y	RING CRUSH: GIVE INSTRUMENT MAKE + MODEL
L124	0	152.	192.	-56.	10.	1.01	96P	RING CRUSH, H AND D
L484	0	153.	177.	-67.	0.	.97	96R	RING CRUSH, REGMED
L663	0	174.	215.	-24.	7.	1.03	96P	RING CRUSH, H AND D
L191	0	179.	210.	-25.	-0.	1.35	96P	RING CRUSH, H AND D
L553	0	180.	196.	-35.	-10.	1.42	96P	RING CRUSH, H AND D
L107	0	185.	218.	-15.	-1.	1.15	96P	RING CRUSH, H AND D
L100	0	188.	244.	7.	13.	1.63	96H	RING CRUSH, H AND D
L570	0	189.	199.	-28.	-15.	.76	96T	RING CRUSH, TMI
L307	0	189.	207.	-21.	-10.	.83	96P	RING CRUSH, H AND D
L157	0	192.	207.	-19.	-12.	.86	96P	RING CRUSH, H AND D
L336	0	193.	230.	-0.	1.	1.10	96P	RING CRUSH, H AND D
L562	0	196.	232.	3.	-0.	1.16	96P	RING CRUSH, H AND D
L114	0	197.	234.	4.	0.	.88	96P	RING CRUSH, H AND D
L350	0	198.	231.	3.	-3.	.80	96P	RING CRUSH, H AND D
L127	0	199.	210.	-13.	-17.	.91	96P	RING CRUSH, H AND D
L393	0	201.	254.	24.	9.	.69	96P	RING CRUSH, H AND D
L126	0	206.	259.	30.	8.	.67	96P	RING CRUSH, H AND D
L171	0	207.	242.	18.	-2.	1.02	96H	RING CRUSH, H AND D
L575	0	212.	245.	23.	-5.	.96	96H	RING CRUSH, H AND D
L182	0	213.	257.	32.	2.	.84	96H	RING CRUSH, H AND D
L610	0	215.	259.	36.	1.	.79	96P	RING CRUSH, H AND D
L329	0	223.	287.	63.	12.	.64	96P	RING CRUSH, H AND D
L503	0	231.	269.	53.	-5.	1.03	96P	RING CRUSH, H AND D
L303	0	233.	299.	79.	12.	.93	96H	RING CRUSH, H AND D
L242	0	244.	258.	53.	-22.	.74	96G	RING CRUSH, GAYDON PLAT CRUSH TESTER
GMEANS:		194.	230.			1.00		
		95% ELLIPSE:		105.	26.	WITH GAMMA = 52 DEGREES		


RING CRUSH
SAMPLE E55 = 194. NEWTONS
SAMPLE E55 = 43.6 POUNDS
SAMPLE E67 = 230. NEWTONS
SAMPLE E67 = 51.7 POUNDS
+.X.# NOT IN GRAND MEANS
ANALYSIS T96-1
SAMPLE E67
NEWTONS
POUNDS
SAMPLE E55
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	H39	36.23	1.97	2.15	15	43	51	10	1.88	5.55
T10-1 PSI	H60	18.19	1.60	1.18					1.03	4.48
BURSTING STRENGTH, MODEL C-A	H39	35.9	1.7	1.8	15	37	37	10	1.6	4.8
T10-2 PSI	H60	18.7	1.3	1.3					1.1	3.7
BURSTING STRENGTH, HIGH RANGE	H07	73.6	3.0	6.3	15	31	43	10	5.5	9.0
T11-1 PSI	H25	54.0	2.2	2.7					2.4	6.2
TEARING STRENGTH, DEEP CUTOUT	E11	58.2	2.7	1.4	15	106	126	10	1.3	7.4
T15-1 GRAMS	E17	60.8	3.3	2.0					1.7	9.2
TEARING STRENGTH,NO CUTOUT	E63	77.4	3.5	2.4	15	13	14	10	2.1	9.8
T17-1 GRAMS	E21	64.7	2.7	2.5					2.2	7.6
TENSILE STRENGTH, PACKAGING PAPERS	E63	3.92	.19	.17	20	45	53	12	.14	.53
T19-1 KILONEWTON/M	E66	3.74	.24	.32					.25	.67
TENSILE STRENGTH, CRE TYPE	J07	6.29	.36	.36	20	44	51	12	.28	1.02
T20-1 KILONEWTON/M	J05	5.38	.31	.23					.19	.87
TENSILE STRENGTH, PENDULUM TYPE	J07	6.21	.40	.41	20	36	39	12	.33	1.13
T20-2 KILONEWTON/M	J05	5.41	.38	.28					.22	1.06
T.E.A., PACKAGING PAPERS	E63	82.2	6.5	11.6	20	18	20	12	9.3	18.9
T25-1 JOULES/SQ M	E66	74.0	5.4	17.9					14.3	17.5
T.E.A., PRINTING PAPERS	J07	74.2	7.3	8.8	20	22	22	12	7.0	20.7
T26-1 JOULES/SQ M	J05	59.4	5.5	5.9					4.7	15.4
ELONGATION TO BREAK, PACKAGING PAPER	E63	3.04	.34	.28	20	17	18	12	.23	.94
T28-1 PERCENT	E66	2.86	.35	.44					.35	.99
ELONGATION TO BREAK, PRINTING PAPER	J07	1.866	.209	.147	20	17	20	12	.118	.583
T29-1 PERCENT	J05	1.682	.192	.115					.092	.535
FOLDING ENDURANCE (MIT)	H35	72.	26.	22.	15	41	51	10	20.	73.
T30-1 DOUBLE FOLDS	H47	73.	14.	18.					16.	41.
FOLDING ENDURANCE (MIT)	H35	1.800	.184	.143	15	41	51	10	.125	.514
T30-2 LOG(10) FOLD	H47	1.843	.088	.114					.100	.250
STIFFNESS, GURLEY	H68	457.	28.	24.	10	37	38	10	21.	79.
T35-1 GURLEY UNITS	H65	397.	24.	19.					16.	67.
STIFFNESS, TABER	B63	18.89	.80	.74	10	25	28	5	.92	2.31
T36-1 TABER UNITS	J09	17.33	.84	.85					1.06	2.44
SURFACE PICK STRENGTH, IGT	H80	70.6	30.8	3.1	4	9	15	4	4.3	85.2
T49-1 KP CM/SEC	H76	54.1	23.4	3.2					4.4	64.8
SURFACE PICK STRENGTH, WAX	H80	11.02	1.13	.40	5	21	21	5	.50	3.14
T50-1 WAX NUMBER	H76	8.63	1.30	.62					.77	3.59
CONCORA (CMT)	E55	175.	10.	11.	10	14	14	10	10.	29.
T91-1 NEWTONS	E67	183.	16.	12.					11.	45.
RING CRUSH	E55	194.	26.	17.	10	27	27	10	15.	71.
T96-1 NEWTONS	E67	230.	32.	15.					13.	88.

NBS-114A (REV. 7-73)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. TAPPI CRP 52S	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 #52S

5. Publication Date: 6/19/78

6. Performing Organization Code

7. AUTHOR(S)

8. Performing Organ. Report No. NBSIR 78-1342

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No. 7825578

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

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, D.C. 20402, SD Cat. No. C13

☐ Order From National Technical Information Service (NTIS) Springfield, Virginia 22151

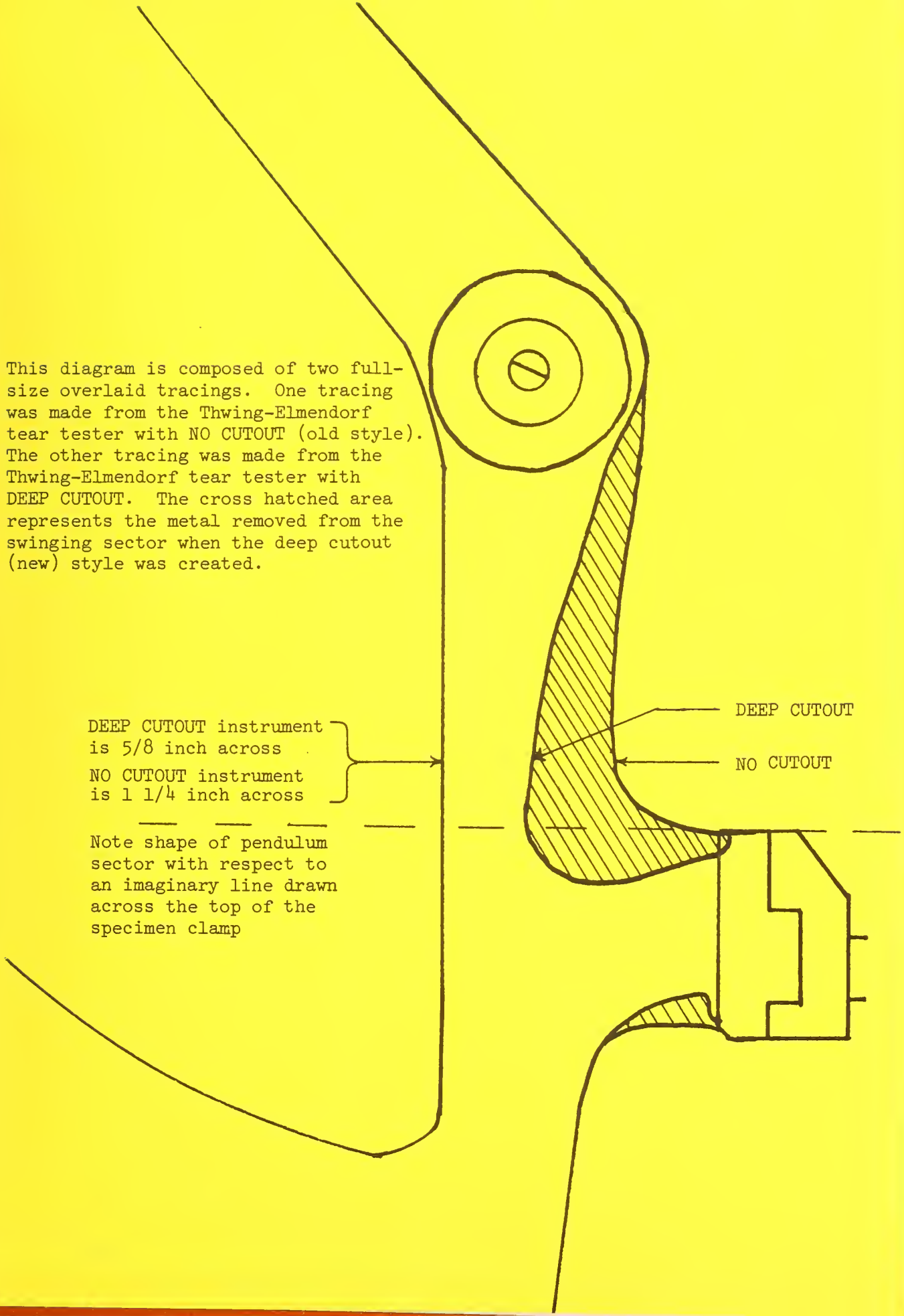
19. SECURITY CLASS (THIS REPORT): UNCLASSIFIED

21. NO. OF PAGES: 70

20. SECURITY CLASS (THIS PAGE): UNCLASSIFIED

22. Price

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.



1002

WERT
BOOKBINDING
MIDDLETOWN, PA
SEPT 81
Service Quality Bound