CONTAINER BOARD

report no. 127
April 1980

NBSIR 80-1836

NBS Collaborative Reference
Program for Containerboard

Fourdrinier Kraft Board Group
American Paper Institute, Inc.
and U.S. Department of
Commerce, National Bureau
of Standards

NBS COLLABORATIVE REFERENCE PROGRAMS

TAPPI Paper and Board   (6 times per year)

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

FKBG-API Containerboard   (48 times per year)

Mullen burst of linerboard
Concora test of medium

MCCA Color and Appearance   (4 times per year)

Gloss at 60°
Color and color difference

CTS Rubber   (4 times per year)

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

ASTM Cement   (2 times per year)

Chemical (11 chemical components)
Physical (15 characteristics)

AASHTO Bituminous

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

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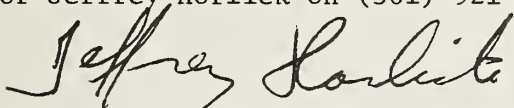U.S. Department of Commerce,
National Bureau of Standards

Fourdrinier Kraft Board Group
American Paper Institute, Inc.

NBSIR 80-1836

INTRODUCTION

The Collaborative Reference Program for Containerboard is cosponsored by the Fourdrinier Kraft Board Group (FKBG) of the American Paper Institute, Inc. and the National Bureau of Standards. The Program is maintained and operated by Collaborative Testing Services, Inc. (CTS). CTS is a non-profit organization of associations that offers CRPs to a wide range of industries.

Samples of three weights of linerboard, nominally 26 lb, 42 lb, and 69 lb and of corrugating medium (26 lb) are separately randomized from uniform narrow rolls and packaged for distribution to the participants. Each month, sufficient test material for four weekly tests is mailed to participants for testing Mullen bursting strength according to TAPPI official testing method T807 os-75 or Concora flat crush strength according to TAPPI official testing method T809 os-71. The participants return their test results to NBS for analysis and receive a monthly report from NBS. This report compares each laboratory's results with the industrial mean.

If there are any questions on the notes, the analyses, or the reports in general, contact Thomas L. Cummings on (703) 442-0433 or Jeffrey Horlick on (301) 921-2946.

Jeffrey Horlick, Technical Administrator
NBS Collaborative Reference Programs
Office of Testing Laboratory Evaluation Technology

May 29,1980

TABLE OF CONTENTS

Each table shows laboratory test results for Mullen bursting strength
of linerboard or Concora flat crush strength of corrugating medium.
The data are divided into three time spans. On the left of each table
is an analysis for each week of the month. In the center is cumulative
data for the month and on the right is cumulative data for up to 16
weeks.

Conservative statistical tests have been used in excluding extreme
data from the analyses. Thus, where the mean (average) for one labor-
atory is compared with the average for many laboratories, limits have
been used that would exclude only one laboratory in a hundred if all
laboratories followed exactly the same testing procedure. Consequently,
laboratories receiving "X" flags should review their testing procedures,
instrument calibration, and control processes. Similar conservative
criteria were used in flagging within-laboratory standard deviations
and other statistics.

	LAB		MEANS THIS MONTH		
WEEKLY VALUES:	CODE V	WK-1	WK-2	WK-3	WK-4

LAB CODE - Confidential laboratory identification number known only to the
participant and the Collaborative Reference Program staff.

V -   Code for indicating instrument type, units used, and any other
       variation in test procedure or conditions. A '+' in this column
       means a non-standard variation. Data marked '+' are not included
       in the combined averages for all laboratories. (see page 4).

MEANS THIS MONTH - For each laboratory each weekly mean is the average of
       individual test determinations, usually an average of 20
       determinations.

FLAGS (following means and standard deviations) -

X -   Data excluded from an AV MEAN or average standard deviation
       because value deviated from the AV MEAN or average standard
       deviation by more than 2.576 times the appropriate standard
       deviation. A laboratory following the prescribed test method
       could obtain such an extreme value by chance only one time in
       a hundred. Corrective action is almost certainly required.

* -   Data included in the CUMULATIVE AV MEAN but the value deviated
       from this mean by more than 1.960 and less that 2.576 times the
       SD CUM MEAN. A laboratory following the prescribed test method
       could obtain such an extreme value by chance only one time in
       twenty. Corrective action may be desired.

S -   This is a warning to the laboratory but does not affect inclusion
           or exclusion of the laboratory's results from the corresponding
           AV MEAN. This flag indicates an extremely high or low within-lab-
           oratory standard deviation (SDR, not shown) that could occur by
           chance only one time in a hundred if the laboratory is following
           the prescribed test method.

AV MEAN - (at bottom of table) - The average for the indicated week of the
           means for all laboratories, except those laboratories marked '+'
           in column V and those means marked with an 'X'.

SDR -   (not shown) - The standard deviation of within-laboratory measure-
           ments; i.e., the Standard Deviation of the Replicate measurements
           made at one time in one laboratory on one package of test pieces.

AV SDR -   The average for the indicated week of the SDR's of all the labora-
           tories, except those omitted from the AV MEAN. Also an extremely
           high or low SDR as compared with the AV SDR based on the remaining
           laboratories is omitted from the AV SDR and the letter 'S' is
           placed after the laboratory mean for that week. The AV SDR is an
           index of the within-laboratory precision for repeated measurements;
           i.e., a measure of the ability of an average laboratory to repeat
           its results over a short period of time. It includes measurement
           error and sample variation.

SD LABS - For each week the standard deviation of the means about the AV MEAN
           for that week after omitting those means marked with an 'X' or
           noted '+' in column V. The SD LABS is an index of the among-labora-
           tory precision of the test method as applied by the participating
           laboratories; i.e., a measure of the ability of laboratories to get
           comparable results.

NO. INCL - The number of laboratory means included in the AV MEAN for that
           week.

NO. OMIT - The number of laboratory means reported but omitted from AV MEAN
           because of non-standard equipment, environment or procedure ('+' in
           column V) or because of extreme results (X following mean).

NOT RCD - The number of laboratories failing to report data on time or in
           usable form for this week (but who reported data for at least one
           of the other weeks of this month), or who received test pieces
           from a different sample of material and whose data therefore are
           shown in another table of this report.

SD SHTS - (Concora only) The average for the indicated week of the among-
           sheet within-laboratory standard deviations. The SD SHTS is an
           index primarily of the variability among sheets.

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VALUES THIS MONTH: MEAN   SDR   SDWKS

MEAN -   The average for the indicated laboratory of the reported weekly
                MEANS THIS MONTH.

SDR -   The average for the indicated laboratory of the weekly SDRs for
                the current month.

SDWKS -   For the indicated laboratory, the standard deviation among the
                laboratory's weekly MEANS THIS MONTH (including those means
                marked with an 'X').

CUMULATIVE
CUMULATIVE VALUES: MEAN   SDR   SDWKS   WKS

MEAN -   The average for the indicated laboratory of all its weekly means
                for the number of weeks indicated, including those for the current
                month. An '*' or 'X' following this CUMULATIVE MEAN indicates the
                laboratory is running consistently low or high. (See above for
                explanation of these flags).

SDR -   The average for the indicated laboratory of the weekly SDRs for
                the indicated number of weeks.

SDWKS -   For the indicated laboratory, the standard deviation among the
                laboratory's weekly means (including those means marked with an
                'X'). SDWKS is an index of the week to week precision; i.e., a
                measure of the ability of a laboratory to repeat its results from
                week to week.

WKS -   Number of weeks for which usable results have been reported by
                that laboratory. At most, 16 weeks of data are included.

GRAND AVERAGES
GRAND AVERAGES: THIS MONTH   CUMULATIVE 12 WEEKS

THIS MONTH - Averages for the four weeks of the quantities shown to the left.

CUMULATIVE - Averages for the indicated number of weeks, including the four
                weeks of the current month.

AV SDWKS -   The average of the SDWKS for all laboratories excluding those
marked '+' in column V or with an 'X' following the corre-
sponding THIS MONTH or CUMULATIVE MEAN or SDWKS.

SD CUM MEAN - The larger of either (1) the standard deviation of the
CUMULATIVE MEANS about the average CUMULATIVE MEAN after
omitting those CUMULATIVE MEANS marked with an 'X' or with
a '+' in column V, or (2) the CUMULATIVE SD LABS divided by
the square root of the number of weeks cumulated. The
former will be appreciably larger than the latter only when
there are persistent systematic differences among the
laboratories.

INSTRUMENT CODES
FOR
MULLEN BURST OF LINERBOARD
(Column V)

Code	Description
A	Model A, Manual Clamp
H	Model AH, Hydraulic Clamp
I	Model A, Hydraulic Clamp added
J	Jumbo, Hand Clamp, Hand Driven
L	Lhomargy, Hydraulic Clamp, in kPa
M	Model AH, Hydraulic Clamp, Transducer
R	Model A, Air Clamp added
X	Other Model, Please Describe Instrument Make and Model
Y	Nonstandard Instrument or Method
Z	Data received too late to be included in statistical analysis

INSTRUMENT CODES
FOR
CONCORA TEST OF MEDIUM
(Column V)

Code	Description
Z	Data received too late to be included in statistical analysis

4

A large supply of linerboard in three weights was randomized and placed in sealed packages ready for shipment. The supply for each weight of board was divided into several narrow "rolls" or cross-machine "positions" of a larger roll, and each position was separately randomized. Each package contains test pieces from one position only. The position is designated by the number following the letter in the code marked on the package. Thus 42H 1 indicates that this package contains 42 lb board from position 1 of lot H. Samples from the first position are distributed until exhausted, then from the second position, and so forth for each weight of board. Thus for short periods of time (several weeks to months), the samples that the participants test are from the same position of a lot, and for a longer period from the same lot.

The three weights of linerboard distributed in this program may be used as reference standards. The best reference values are the cumulative grand AV MEANs in the latest reports. These values are given at the bottom right of each table. For each weight of board, comparisons should be made first for measurements made on the same position, i.e., for checking your current measurement, use grand AV MEANs that have the same position code as on the packages being tested. The position is shown in the upper left corner of the table. If no report is yet available on the current position, grand AV MEANs from previously tested positions of the same lot may be used as approximate reference values.

Similarly a large supply of a 26 lb corrugating medium was randomized, after dividing into several narrow rolls or positions. The above discussion for linerboard also applies to the corrugating medium.

We are currently using the fourth lot of linerboard and the fourth lot of corrugating medium:

Lot	Material	Codes	Used
1	linerboard	A,B,C	October 1969 – April 1973
2	linerboard	D,E,F	September 1972 – September 1976
3	linerboard	G,H,I,J	October 1976 – September 1979
4	linerboard	K,L,M	September 1979 –
1	corrugating medium	(A)	May 1973 – March 1976
2	corrugating medium	B	April 1976 – February 1977
3	corrugating medium	C	March 1977 – August 1978
4	corrugating medium	D	Septemher 1978 –

LAB CODE	V	MEANS THIS MONTH WK-1	WK-2	WK-3	WK-4	THIS MONTH MEAN	SDR	SDWKS	CUMULATIVE MEAN	SDR	SDWKS	WKS
100	H	118.4	116.0	121.2	121.2	119.2	8.6	2.5	119.3	7.9	1.5	11
102	H	114.4	115.2	119.5	115.3	116.1	7.2	2.3	116.1	6.9	1.9	11
103	I	119.3	119.1	119.5	119.4	119.3	5.4	.1	119.4	6.3	1.4	11
105	M	118.6	119.3	118.4		118.8	6.6	.5	117.2	8.3	3.0	10
106	H	120.1	121.2	116.2	117.3	118.7	6.1	2.3	121.2	6.7	2.6	11
108	M	119.4	121.1	122.3	118.8	120.4	7.2	1.6	120.0	6.9	1.2	9
109	H	118.5	124.6X	122.5	121.0	121.6	7.3	2.6	120.4	7.0	2.3	11
110	M	117.9	119.0		122.9	120.0	6.8	2.6	120.8	7.7	2.3	10
111	M	122.7	118.2	117.0	114.5S	118.1	8.6	3.4	117.7	8.1	3.0	11
112	H	118.5	120.3	115.0	116.1	117.5	8.4	2.4	114.6	8.5	4.0	11
113	R	114.1	120.3	115.0	117.0	116.6	7.2	2.8	116.7	6.9	2.1	11
114	M	115.1	120.9	120.1S	117.2	118.4	8.9	2.7	119.9	7.5	2.7	11
115	R	117.6	119.3	121.7	120.7	119.8	7.2	1.8	117.0	6.6	3.3	11
117	H	118.0	116.4	116.8	115.1	116.6	8.2	1.2	115.5	7.3	2.4	11
119	H	121.8	117.6	116.1	119.8	118.8	7.0	2.5	117.9	7.5	3.2	10
120	R	118.0	116.3	115.9	114.4	116.2	7.5	1.5	116.4	7.6	1.8	11
121	M	121.0	122.4	120.3	122.3	121.5	6.9	1.0	121.2	7.3	1.8	11
125	I	119.4	119.3	122.4	120.7	120.5	7.7	1.4	119.1	7.7	2.0	11
127	H	120.6	118.9	118.0	118.5	119.0	5.9	1.1	119.7	6.4	1.9	11
128	H	122.2	117.4	119.1	117.3	119.0	7.6	2.3	118.8	7.5	2.6	11
130	H	122.1	119.7	118.0	120.8	120.2	7.9	1.8	120.7	7.9	1.8	11
131	R	113.7	112.9X	111.7XS	115.8	113.5X	8.2	1.7	115.7	8.8	3.4	11
133	A	118.4	119.9	117.2	121.0	119.1	7.7	1.7	117.3	7.0	1.9	11
134	H	115.2	117.3	117.6	118.8	117.3	7.1	1.5	117.3	7.3	1.2	11
135	I	117.1	117.2	113.3	111.8	114.9	8.2	2.8	115.8	7.7	2.4	8
136	H	118.7	116.2	116.6	120.1	117.9	7.8	1.8	116.6	7.5	2.5	11
137	H	115.1	119.2	120.7	119.7	118.7	9.2	2.5	120.4	8.3	4.4X	11
138	H	122.3	120.4	122.6	120.0	121.3	8.1	1.3	123.1*	7.9	2.2	11
139	R	115.9	117.6	117.4	118.7	117.4	9.1	1.2	115.4	7.9	4.1	10
140	H	116.0S	117.9S	119.9S		117.9	2.8	1.9	117.3	3.1X	1.2	9
141	M	115.9	115.9	116.6	116.1	116.1	6.6	.3	116.4	6.4	.8	11
142	A	118.4	118.7	118.6	117.7	118.4	5.6	.4	117.2	6.5	2.3	11
143	H	121.5	117.0	122.2	118.7	119.8	8.0	2.4	120.7	8.7	2.3	6
145	H	115.4	117.8	119.4	123.2	118.9	5.7	3.3	118.6	6.4	3.0	10
147	H	119.9	117.4	119.8	115.4	118.2	8.1	2.1	116.5	7.8	2.5	11
149	H	120.2	118.6	117.7	117.9	118.6	7.9	1.1	118.5	7.2	3.1	11
151	H	117.3	121.4	120.6	119.1	119.6	7.5	1.8	120.3	7.5	1.8	11
153	H	126.5X	123.1	118.4	126.1X	123.5X	6.9	3.7	123.1*	7.3	3.3	11
155	H	117.4	120.2	118.5	117.5	118.4	7.0	1.3	118.8	8.0	1.1	11
157	H	114.6	114.3	113.4	115.3	114.4	6.6	.8	114.7	6.2	1.0	11
161	+X	120.4	123.5	120.0	120.3	121.1	8.3	1.7	123.4*	7.1	2.7	10
165	R	117.8	119.3	118.4	115.5	117.8	7.5	1.6	117.5	6.9	1.6	11
167	H	112.3	116.0	117.1	117.3	115.7	6.2	2.3	115.3	7.0	2.1	11
169	I	119.6	115.9	117.8	111.6S	116.2	7.8	3.4	116.8	7.5	2.5	11
171	H	114.4	118.3	120.3	116.4	117.4	7.0	2.5	115.8	6.8	2.4	11
172	H	117.5	117.4	116.0S	117.5	117.1	4.6	.7	117.9	5.8	1.9	11
173	H	121.0	122.0	119.6	118.6	120.3	6.6	1.5	121.5	6.2	2.3	11
174	H	116.1	112.3X	113.7	114.4	114.2	8.1	1.6	116.2	7.9	2.5	11
175	H	124.6X	124.0X	119.0	124.5	123.0	8.4	2.7	120.7	8.1	3.3	10
176	H	115.7	117.1	117.6	115.3	116.4	8.2	1.1	116.0	7.5	2.8	11
177	H	115.9	115.3	116.3		115.9	8.1	.5	117.7	7.6	2.1	10
182	H	118.5	116.9	121.9	119.6	119.2	6.4	2.1	119.8	7.4	2.0	11
184	H	118.7	141.6XS	126.4X	119.3	126.5X	9.6	10.7	123.1*	8.2	7.0X	10
186	I	119.6	118.6	116.9	119.5	118.7	8.1	1.2	119.7	7.8	1.2	11
188	I	117.6	117.1	119.2	118.1	118.0	6.1	.9	117.9	6.6	1.0	11

LAB CODE	V	MEANS THIS MONTH WK-1	WK-2	WK-3	WK-4	THIS MONTH MEAN	SDR	SDWKS	CUMULATIVE MEAN	SDR	SDWKS	WKS
198	R	118.1	117.0	116.0		117.0	6.2	1.0	115.9	6.5	1.9	10
250	+N		115.6S	115.1	116.9	115.9	10.1	.9	115.2	9.6X	1.5	8
274	H	116.9	117.3	117.3	118.7	117.6	7.0	.8	117.1	6.8	1.0	11
283	H	121.0		121.3		121.2	6.9	.2	119.2	6.6	1.9	6
287	A	130.5XS	131.2X	132.4X	128.1X	130.6X	9.9	1.8	130.1X	10.2X	2.6	11
359	H	120.1	119.8	116.7	119.2	119.0	8.4	1.5	116.1	7.6	2.9	11
553	M	120.0	120.3	118.2	125.9X	121.1	6.1	3.3	121.3	6.9	2.2	11
562	A	121.1	123.8	122.0	119.5	121.6	8.3	1.8	122.9*	8.0	3.6	11
568	I	129.4X	130.1X	125.9XS	125.6X	127.8X	10.7	2.3	126.9X	8.9	4.3X	11
569	A	121.5	117.7	118.1	118.0	118.8	8.9	1.8	120.3	8.3	2.2	11
658	H	116.5	117.9			117.2	5.1	1.0	117.2	5.4X	.8	6
701	H	120.8	117.4	122.9	118.4	119.9	7.2	2.4	119.8	7.7	2.0	11

	WK-1	WK-2	WK-3	WK-4	GRAND AVERAGES	THIS MONTH	CUMULATIVE 11 WEEKS
AV MEAN	118.2	118.5	118.5	118.2	AV MEAN	118.4	118.3
AV SDR	7.5	7.1	7.1	7.5	AV SDR	7.3	7.3
SD LABS	2.5	2.0	2.4	2.6	SD LABS	2.4	2.8
NO.INCL	61	57	59	55	NO.INCL	58.0	59.2
NO.OMIT	5	9	6	6	AV SDWKS	1.9	2.2
NOT RCD	1	1	2	6	SD CUM MEAN		2.2

LAB CODE	V	MEANS THIS MONTH WK-1	WK-2	WK-3	WK-4	THIS MONTH MEAN	SDR	SDWKS	CUMULATIVE MEAN	SDR	SDWKS	WKS
100	H	83.4	79.5	81.3	81.6	81.5	5.4	1.6	81.3	5.6	1.3	12
102	H	74.9X	79.4	76.9	77.1	77.1	5.1	1.8	77.9	5.1	2.0	11
103	I	80.5	80.5	80.5	78.9	80.1	6.6	.8	80.0	6.0	1.9	12
105	M	80.9	85.5	84.0		83.5	6.4	2.4	81.2	6.3	2.2	11
106	H	82.4	82.2	81.8	82.4	82.2	4.9	.3	82.1	6.4	1.8	12
108	M	84.1	82.4	80.4	79.7	81.7	5.4	2.0	82.9	5.6	2.4	6
109	H	79.6	79.4	79.4	78.7	79.3	6.2	.4	78.6	6.4	2.0	12
110	M	81.1	83.2		84.1	82.8	8.2	1.6	83.2	7.0	1.3	11
111	M	83.1	82.5	81.8	78.6	81.5	6.2	2.0	80.5	6.9	2.5	12
112	H	74.1X	77.6	74.6	78.2	76.1	8.5	2.1	72.9X	7.9	2.9	12
113	R	81.7	83.8	81.0	80.1	81.7	6.7	1.6	80.1	5.7	1.6	12
114	M	86.3	83.4	83.2	85.5	84.6	5.7	1.5	83.5	5.8	2.0	11
115	R	80.5	81.8	78.7	80.4	80.4	5.5	1.3	78.7	5.5	2.0	12
117	H	78.6	81.5	78.8	77.8	79.2	6.5	1.6	79.7	5.9	2.0	12
119	H	84.1	76.2	78.9	77.9	79.3	7.2	3.4	79.1	6.4	2.5	11
120	R	82.8	81.2	82.1	81.4	81.9	5.9	.7	83.1	6.2	1.9	11
121	M	85.8	83.4	86.7	84.0	85.0	7.2	1.6	83.2	6.7	2.5	12
125	I	79.4	76.0	81.3	81.3	79.5	6.9	2.5	81.6	6.2	3.0	12
127	H	82.5	80.9	81.3	81.6	81.6	5.0	.7	81.7	5.1	.7	12
128	H	82.2	81.4	84.7	79.6	82.0	6.7	2.1	81.9	6.8	1.6	12
130	H	83.3	81.3	82.4	82.0	82.3	6.6	.8	82.0	7.2	1.7	12
131	R	77.5	78.3	73.4	76.0	76.3	6.9	2.2	78.9	6.7	2.9	12
133	A	82.1	79.9	80.3	76.8	79.8	7.2	2.2	79.6	7.1	2.0	12
134	H	79.1	82.9	84.1	83.3	82.4	5.8	2.2	83.9	5.7	3.1	12
135	I	81.6	78.4	75.9	78.5	78.6	6.9	2.3	83.3	6.2	5.4X	8
136	H	80.8	81.0	82.7	82.3	81.7	5.8	1.0	81.2	5.9	1.1	12
137	H	77.8	77.6	78.0	81.2	78.7	7.9	1.7	79.4	7.4	3.1	12
138	H	81.8	81.4	82.3	84.4	82.5	6.6	1.3	82.8	6.9	1.6	12
139	P	79.2	80.8	83.4	80.5	81.0	7.4	1.8	78.1	7.1	2.6	12
140	H	78.3	75.6	75.4		76.4	3.5	1.6	76.1*	4.3X	1.3	11
141	M	78.0	77.4	78.5	79.5	78.4	5.0	.9	78.8	5.7	.8	12
142	A	77.2	76.7	78.5	76.2	77.2	5.7	1.0	76.5*	5.9	1.1	12
143	H	79.0	79.0	76.8	78.9	78.4	5.7	1.1	78.4	5.7	1.1	4
145	H	82.3	76.2	83.4	84.7	81.7	6.3	3.8	81.8	6.1	2.9	10
147	H	76.8	79.6	79.3	83.0	79.7	7.0	2.5	80.2	6.7	2.0	12
149	H	83.5	81.7	81.4	79.7	81.6	6.4	1.6	82.2	6.4	1.2	11
151	H	80.7	82.9	82.6	79.7	81.5	6.2	1.6	79.8	6.5	2.4	11
153	H	84.1	81.8	85.5	85.1	84.1	6.7	1.7	83.1	7.1	1.9	12
155	H	82.2	79.0	81.4	81.3	81.0	5.6	1.4	80.5	6.3	1.3	12
157	H	79.6	76.6	76.6	77.2	77.5	4.8	1.4	82.3	5.6	4.4X	12
161	*X	80.4	80.0	83.0	81.2	81.2	5.8	1.3	80.6	5.7	1.8	12
165	R	79.5	83.3	81.4	82.4	81.6	7.0	1.6	81.8	6.8	1.6	11
167	H	78.1	78.3	79.8	81.1	79.3	5.9	1.4	77.3	5.6	2.5	12
169	I	80.9	82.0	82.0	82.6	81.9	6.9	.7	82.9	6.3	1.6	11
171	H	74.4X	77.2	74.6	78.2	76.1	7.1	1.9	78.7	6.4	2.5	12
172	H	80.5	81.8	80.5	79.9	80.7	4.7	.8	79.9	5.4	2.6	12
173	H	83.3	80.7	83.1	84.9	83.0	4.9	1.7	82.6	4.7X	1.5	11
174	H	80.4	82.1	77.3	75.1	78.8	8.1	3.1	80.6	6.9	3.3	12
175	H	85.7	93.3X	88.0	89.9X	89.3X	5.7	3.2	83.8	5.9	5.7X	12
176	H	80.9	78.3	79.9	77.8	79.3	6.3	1.4	79.4	6.6	1.6	12
177	H	77.8	77.5	79.1		78.1	6.5	.8	77.3	6.5	2.0	10
182	H	84.3	84.8	88.1	80.4	84.4	5.7	3.2	83.6	6.4	2.0	12
184	H	79.6	85.0	80.4S	78.9	81.0	8.4	2.7	81.8	7.6	3.1	12
186	I	83.3	80.8	77.5	80.3	80.5	6.2	2.4	81.5	6.0	2.3	12
188	I	79.0	80.3	79.1	80.8	79.8	6.9	.9	80.1	6.5	1.2	12

LAB CODE	V	MEANS THIS MONTH WK-1	WK-2	WK-3	WK-4	THIS MONTH MEAN	SDR	SDWKS	CUMULATIVE MEAN	SDR	SDWKS	WKS
198	R	82.7	78.8	77.6		79.7	5.9	2.6	82.4	5.9	4.1X	10
250	+N		77.2	75.4	76.7	76.5	6.6	.9	75.3X	7.1	3.7X	9
274	H	80.7	79.4	79.9	80.1	80.1	5.3	.5	80.0	5.5	.5	12
283	H	79.1		82.3		80.7	7.0	2.3	80.2	7.9X	1.7	8
287	A	85.5	85.2	87.4	86.0	86.1	8.1	1.0	86.9X	8.2X	1.9	12
359	H	78.6	80.2	78.9	79.5	79.3	6.2	.7	78.1	6.7	1.9	8
553	M	83.6	85.7	86.2	86.1	85.4	5.8	1.2	84.7	5.7	2.5	12
562	A	84.0	85.0	78.5S	80.9	82.1	8.1	2.9	83.1	7.4	4.1X	12
568	I	83.4	83.4	77.5	77.2	80.4	6.9	3.5	79.4	6.6	3.1	11
569	A	78.9	79.4	80.8	75.1	78.6	5.8	2.4	79.1	6.2	1.8	10
658	H	80.0	79.7			79.9	4.2	.2	80.6	5.1	1.2	9
701	H	85.2	84.7	83.5	78.3	82.9	7.4	3.2	82.8	7.2	1.8	12

GRAND AVERAGES

	WK-1	WK-2	WK-3	WK-4		THIS MONTH	CUMULATIVE 12 WEEKS
AV MEAN	81.3	80.7	80.7	80.4	AV MEAN	80.8	80.8
AV SDR	6.3	6.4	6.2	6.3	AV SDR	6.3	6.2
SD LABS	2.4	2.6	3.2	2.7	SD LABS	2.8	2.9
NO.INCL	62	63	63	58	NO.INCL	61.5	59.7
NO.OMIT	4	3	2	3	AV SDWKS	1.7	2.0
NOT RCD	1	1	2	6	SD CUM MEAN		2.0

LAB CODE V	MEANS THIS MONTH WK-1	WK-2	WK-3	WK-4	THIS MONTH MEAN	SDR	SDWKS	CUMULATIVE MEAN	SDR	SDWKS	WKS
100	74.4	71.4	72.1	74.1	73.0	3.1	1.5	72.6	4.0	1.1	16
102	72.0	72.7	72.7	72.1	72.4	3.8	.4	72.7	3.4	.6	16
105	73.7	70.1	69.2		71.0	4.0	2.4	72.6	4.2	1.7	13
106	73.9	73.7	72.9	72.5	73.2	3.5	.7	73.0	3.4	.4	16
110	72.8	74.1		72.4	73.1	4.4	.9	74.4	3.7	1.8	15
113	72.2	68.5	71.6	71.3	70.9	3.8	1.7	71.9	3.2	1.1	16
114	71.9	71.9	71.4	71.5	71.7	2.5	.2	71.5	2.6X	.8	16
115	74.1	73.5	72.3	72.8	73.2	3.4	.8	72.2	3.5	1.4	16
119	72.1	72.5	70.8	73.9	72.3	4.2	1.3	70.5	4.0	2.8	15
120	73.7	72.3	71.8S	69.2	71.8	3.8	1.9	71.2	3.7	1.4	16
125	82.9X	81.8X	79.3X	78.3X	80.6X	4.4	2.1	80.4X	4.8X	1.3	16
128	74.3	70.7	71.9	72.0	72.2	3.6	1.5	72.2	3.3	1.0	16
136	70.5	74.0	73.9	70.4	72.2	4.1	2.0	71.2	3.9	2.1	16
138	75.1	76.3	74.5	74.5	75.1	3.9	.8	76.0	4.2	1.7	16
140	74.7	73.0	74.0	73.3	73.8	3.3	.7	73.3	3.6	1.0	16
143	72.3		70.1	71.7	71.4	3.6	1.1	71.5	3.5	.9	4
151	72.3	72.5	73.5S		72.8	4.5	.6	72.7	4.1	.5	15
161	72.9	72.4	78.0S	72.1	73.9	4.9	2.8	74.0	4.4	2.9	16
164	71.5	71.0	71.1	71.7	71.4	3.7	.3	71.9	3.7	1.2	16
167	71.3	72.0	71.5	72.3	71.8	3.2	.5	71.2	3.1	1.1	16
177	69.4	72.8	70.1		70.8	3.8	1.8	69.6	3.3	1.6	15
182	77.5	70.2	71.4	73.6	73.2	3.9	3.2	73.2	3.9	2.0	16
188	71.9	71.1	70.7	70.4	71.0	2.9	.7	71.5	3.0	1.1	16
198	71.7S	71.4	78.3	75.8	74.3	3.8	3.3	71.3	4.3	2.7	16
237	72.9	74.1	72.0	72.1	72.8	3.9	1.0	72.9	4.0	1.1	16
250	68.5	68.6	69.0		68.7	2.3	.3	68.9	2.1X	1.4	12
269	69.8	73.9	74.0	72.3	72.5	3.7	1.9	71.6	3.6	1.5	16
284	71.0	71.4	70.5	69.7	70.7	4.0	.7	70.8	3.9	1.0	16
287	77.3	77.1	76.5S	78.1X	77.3	3.9	.7	77.2*	4.1	.9	16
289		65.6X	68.0	63.3X	65.7X	3.7	2.4	68.8*	3.3	2.8	15
292	64.1X	63.2X	67.9		65.1X	4.0	2.5	67.9*	3.7	2.6	15
350	86.1XS	87.6XS	86.7XS	86.2XS	86.7X	7.9	.7	84.2X	6.4X	3.1	16
351	72.9	71.4	71.0	69.6	71.2	2.6	1.4	72.6	2.6X	1.6	16
353	75.0	73.4	72.4	72.0	73.2	4.3	1.3	73.3	3.9	2.2	14
355	74.9	74.6	73.7	72.9	74.1	3.6	.9	72.9	3.6	1.3	16
357	69.1	67.9	71.5	69.0	69.4	3.3	1.5	69.3	3.3	1.4	15
359	66.8X	67.1	65.1X	70.1	67.3X	3.8	2.1	80.5X	4.7X	9.0X	15
361	71.0	71.2	71.0	71.4	71.2	2.9	.2	70.4	3.4	1.5	15
363		70.5	70.4	69.0	70.0	3.4	.8	70.3	3.2	1.2	15
365	70.0	70.1	68.3	69.0	69.4	3.2	.9	69.5	3.7	1.4	16
367	72.4	73.6	72.4	74.2	73.1	3.0	.9	74.0	3.4	1.0	14
369	72.3	72.1	72.8	72.6	72.5	3.3	.3	72.4	3.4	.7	15
377	78.9X	76.2	75.1	75.7	76.5	4.2	1.7	74.6	3.8	2.1	16
379	72.3	74.8	72.9	72.9	73.3	3.9	1.1	74.1	3.9	1.1	14
381	74.8	75.2	74.8	73.8	74.7	4.2	.6	73.6	3.9	1.1	16
383	73.5	70.4	74.6	73.5	73.0	2.8	1.8	73.6	3.3	2.4	16
385	75.3	73.1	75.6	74.9	74.7	3.1	1.1	74.1	3.2	2.2	15
387	72.8	77.2	77.4	78.4X	76.5	3.8	2.5	76.1	4.0	1.7	16
391		70.1	71.3		70.7	2.3	.9	67.1X	2.3X	3.8X	12
395	72.8	73.9	73.9	74.8	73.8	4.0	.8	73.9	3.7	1.3	16
397	75.5	68.3	75.3	70.3	72.4	4.0	3.6	73.8	3.7	2.2	16
399	71.5	71.2	70.9	72.1	71.5	3.5	.5	70.8	3.5	1.8	16
553	73.3	72.6	73.1	72.5	72.9	3.3	.4	73.0	3.3	.7	16
562	74.6	72.1	71.8	71.2	72.5	4.6	1.5	71.9	4.2	1.4	16
568	72.1	72.0	73.2	73.3	72.7	3.9	.7	73.5	3.6	1.3	16

LAB		MEANS THIS MONTH				THIS MONTH			CUMULATIVE			
CODE V	WK-1	WK-2	WK-3	WK-4		MEAN	SDR	SDWKS	MEAN	SDR	SDWKS	WKS
572	72.5	73.8	76.6	70.8		73.4	3.8	2.4	73.3	3.6	1.7	12
578	69.3	76.2	75.4	72.7		73.4	3.9	3.1	75.6	4.1	3.0	16
609	71.7	71.1	71.0	70.4		71.1	3.0	.5	72.2	3.6	1.4	16
617	77.4	75.0	80.9XS	76.9		77.6X	5.1	2.5	77.5X	4.7X	1.5	16

	WK-1	WK-2	WK-3	WK-4		GRAND AVERAGES		
							THIS MONTH	CUMULATIVE 16 WEEKS
AV MEAN	72.8	72.4	72.6	72.3	AV MEAN	72.5	72.5
AV SDR	3.6	3.7	3.4	3.6	AV SDR	3.6	3.6
SD LABS	2.0	2.3	2.4	1.9	SD LABS	2.1	2.4
NO.INCL	51	54	54	48	NO.INCL	51.7	53.8
NO.OMIT	5	4	4	5	AV SDWKS	1.3	1.5
NOT RCD	3	1	1	6	SD CUM MEAN		1.9
SD SHTS	2.3	2.2	2.2	2.1			

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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)*

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