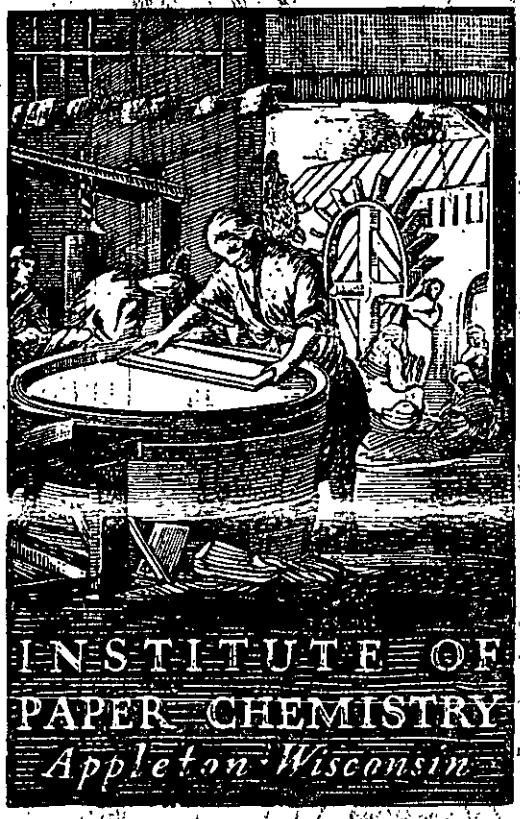

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

Project 1108-17

Progress Report 57

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

January 1, 1960

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

Project 1108-17

Progress Report 57

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

January 1, 1960

TABLE OF CONTENTS

TABLE OF CONTENTS--CONTINUED

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SUMMARY

The purpose of this study is to provide a continuous evaluation of the quality and runability of the corrugating mediums manufactured by members of the Fourdrinier Kraft Board Institute. Two rolls of corrugating medium are submitted on a weekly basis from the production of each machine. Each roll is evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), Concora flat crush (tested immediately after fluting), and runability, the latter being measured by corrugating each roll under standardized conditions into A-flute board at 600 feet per minute with minimum tension. If runability is unsatisfactory at this speed, the speed of the corrugator is reduced by increments of 25 f.p.m. until satisfactory runability is obtained as indicated by the presence of no ruptured flutes. If the runability is satisfactory at 600 f.p.m. with minimum tension, the tension is increased by increments of 1/2 lb. per in. to determine the maximum tension at which satisfactory runability is obtained. The maximum tension used is 1-1/2 lb. per in. Flat crush tests are made on the single-faced board obtained at the maximum speed with minimum tension.

In addition to the evaluation carried out at the Institute as described above, each participant may, if he so desires, evaluate each roll of corrugating medium for Concora flat crush (conditioned after fluting) and submit the results to The Institute of Paper Chemistry, thus providing an opportunity to include a comparison of Institute and mill Concora flat crush results in the monthly progress reports.

The study, as described in the preceding paragraphs, provides several important benefits. For example, it enables each participant to evaluate his quality position in relation to the rest of the industry on a continuing basis. In addition, it provides a basis for comparing Concora flat crush results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This type of comparison is a helpful adjunct to conventional calibration procedures. Another benefit is provided by virtue of the fact that the study is accumulating an ever-growing reserve of background information essential for the judicious interpretation of any proposed specifications on corrugating medium whether on a company or industry basis.

During the month of December, 120 rolls of corrugating medium were submitted to The Institute of Paper Chemistry from the production of twenty-one machines.

Shown below are the maximum and minimum current machine averages for each test (the current machine average is the average of the results obtained for all rolls submitted from a given machine); also given for each test is the current F.K.I. average which is determined by averaging the current machine averages and is indicative of the test level being maintained by the industry as a whole to the extent that the industry is represented by the participating machines:

	Maximum Current Machine Average	Minimum Current Machine Average	Current F.K.I. Average
Basis weight, lb.	29.9	26.1	27.4
Caliper, pt.	10.8	8.8	10.1
Concora flat crush, p.s.i. (Conditioned after fluting)	39.4	31.5	35.9
Concora flat crush, p.s.i. (Tested immediately after fluting)	51.6	39.4	45.4
Single-face flat crush, p.s.i.	34.9	29.2	32.3

The runability data for the 120 rolls of medium evaluated during December are summarized as follows:

Runability	Number of Rolls	Percentage of Total Rolls
Less than 600 f.p.m. with minimum tension	None	0
600 f.p.m. with minimum tension	2	1.7
600 f.p.m. with tension of 1/2 lb. per in.	20	16.7
600 f.p.m. with tension of 1 lb. per in.	26	21.7
600 f.p.m. with tension of 1-1/2 lb. per in.	72	60.0

Concora flat crush results were submitted for nineteen of the twenty-one machines from which rolls were received during the current month. The comparisons of Concora flat crush test results based on the average result obtained at the Institute and at the mill for all rolls compared for each machine are summarized below. Shown in this summary is the number of machines (and the percentage of the total machines which they represent) whose Concora test averages fall within the indicated percentage ranges from the results obtained at the Institute on the same rolls.

Average Percentage Difference Between Institute and Mill Concora Flat Crush Test Results [a]	Number of Machines	Percentage of All Machines
± 1.0	1	5.3
± 2.5	6	31.6
± 5.0	14	73.7
± 7.5	17	89.5
± 10.0	18	94.7
± 10.6	19	100.0

[a] The average obtained at the Institute was used as the point of reference in the calculation of the percentage differences.

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

PURPOSE OF THIS STUDY

The purpose of this study is to provide a continuous evaluation of the quality and runability of corrugating medium produced by members of the Fourdrinier Kraft Board Institute. The study, as it progresses, is accumulating a backlog of data and experience which provides several important benefits. For example, it enables each participant to evaluate his position in relation to the rest of the industry. In addition, it provides background information essential for the judicious interpretation of any proposed specifications on corrugating medium (on either a company or industry basis). The program also provides a basis for comparing Concora results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This comparison is a helpful adjunct to conventional calibration procedures.

PROCEDURE FOR PARTICIPATING

The procedure for participating in this study involves the submission of two rolls of corrugating medium per week from each machine to The Institute of Paper Chemistry. These rolls are taken from regular production runs on <u>different</u> days. Each roll is 10 to 12 inches wide and contains approximately 5,000 lineal feet of medium (approximately 30 inches in diameter). When received by the Institute, each roll is assigned a code letter and number. The rolls are numbered in the sequence in which they are received. Code letters are assigned on the basis of machines, and a given machine is assigned a

different code letter each month in order to mask the identity of the mills. For purposes of reference, an outline of this program which describes the necessary instructions for sampling was appended to Progress Report One in this series.

PRESENTATION AND DISCUSSION OF TEST RESULTS OBTAINED AT THE INSTITUTE OF PAPER CHEMISTRY

During the month of December, one hundred and twenty rolls of corrugating medium were selected from the production of twenty-one machines and submitted to The Institute of Paper Chemistry for evaluation. A tabulation of the number of rolls submitted from each machine is given in Table I.

Each sample of corrugating medium was evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), Concora flat crush (tested immediately after fluting), H. and D. flat crush (single-faced board), and runability. Concora flat crush results obtained on specimens tested immediately after fluting were included for the first time in Progress Report 45. Runability was measured by corrugating each roll under standardized conditions on the Institute's corrugator into A-flute board at 600 feet per minute with minimum tension. If unsatisfactory runability occurred at this speed, the corrugator was slowed down in increments of 25 f.p.m. until satisfactory runability was obtained (no ruptured flutes). If the medium fabricated satisfactorily at 600 f.p.m. with minimum tension, further runs were made at higher tensions to determine when cracking occurred. The higher tensions used were 0.5 lb. per inch, 1.0 lb. per inch, and 1.5 lb. per inch.

Flat crush was determined on the board obtained at a speed of 600 f.p.m. with minimum tension. In addition to information about quality, these

TABLE I

NUMBER OF ROLLS OF CORRUGATING MEDIUM SUBMITTED

FOR EVALUATION FROM EACH MACHINE

Machine Code	Number of Rolls
A	1
B	4
C	7
D	7
E	8
F	4
G	5
H	12
I	3
J	4
K	14
L	9
M	4
N	7
O	5
P	2
Q	8
R	4
S	4
T	4
U	4
Total	120

results will provide data which may be useful in studying the relationship between Concora flat crush and combined board flat crush for each participant's medium.

As requested by members of the F.K.B.I., the Concora medium test results are calculated on the basis of pounds of load per unit area rather than on the basis of the formula suggested by the Concora manufacturer and are reported as Concora flat crush test results. In Progress Reports One and Two, the Concora medium test results were reported on the basis of the formula suggested by the Concora manufacturer.

The average test results obtained on the rolls of corrugating medium submitted by each participant (current machine averages) are shown in Table II and graphically presented in Figures 1 to 5. In addition to a comparison of the test data obtained for the various machines, Table II also presents the current F.K.I. averages, cumulative F.K.I. averages, and the F.K.I. indexes. The current F.K.I. average is the average of test results for all machines participating in the study during the current month. The cumulative F.K.I. average is based on the results for the previous twelve-month period excluding the result for the current period. The F.K.I. index is obtained as follows:

$$\frac{\text{current F.K.I. average}}{\text{cumulative F.K.I. average}} \times 100 = \text{F.K.I. index (\%)}$$

The F.K.I. index provides a ready means of comparing the current quality with previous results. An index greater than 100% indicates that current quality is higher than the average result for the previous twelve periods; an index below 100% indicates that current quality is lower than the average result for the previous twelve periods.

TABLE II

SUMMARY OF CURRENT MACHINE AVERAGES
December, 1959

Mill Code	Basis Weight, lb.	Caliper, points	Concora Flat Crush, p.s.i. (Conditioned)	Concora Flat Crush, p.s.i. (Tested Immediately)	Single-Face Flat Crush, p.s.i.
A	27.1	9.7	37.6	46.2	34.6
B	27.1	10.5	35.2	48.0	32.8
C	27.1	9.6	35.3	43.9	32.7
D	26.4	10.7	34.7	44.6	31.2
E	27.8	10.4	39.4	51.6	34.9
F	26.4	9.9	34.8	43.1	31.1
G	26.9	10.6	33.6	40.8	29.2
H	26.5	10.3	37.7	46.8	33.2
I	29.4	9.6	34.6	44.0	30.9
J	28.8	8.8	35.9	44.3	32.4
K	26.7	10.7	36.6	47.0	32.5
L	29.9	10.8	38.3	47.7	34.0
M	26.1	9.9	32.8	41.5	30.0
N	26.7	10.4	38.7	50.2	34.5
O	26.6	9.6	34.9	42.1	32.1
P	27.3	9.7	37.1	47.2	33.3
Q	27.2	9.1	36.1	41.2	29.4
R	27.1	10.7	38.0	49.6	34.2
S	29.0	9.8	31.5	39.4	30.3
T	28.9	10.8	36.9	49.1	34.4
U	26.8	10.4	33.8	44.6	31.7
Current F.K.I. Average	27.4	10.1	35.9	45.4	32.3
Cumulative F.K.I. Average	27.2	10.2	36.8	47.0	33.0
F.K.I. Index, %	101.0	99.1	97.6	96.6	98.1

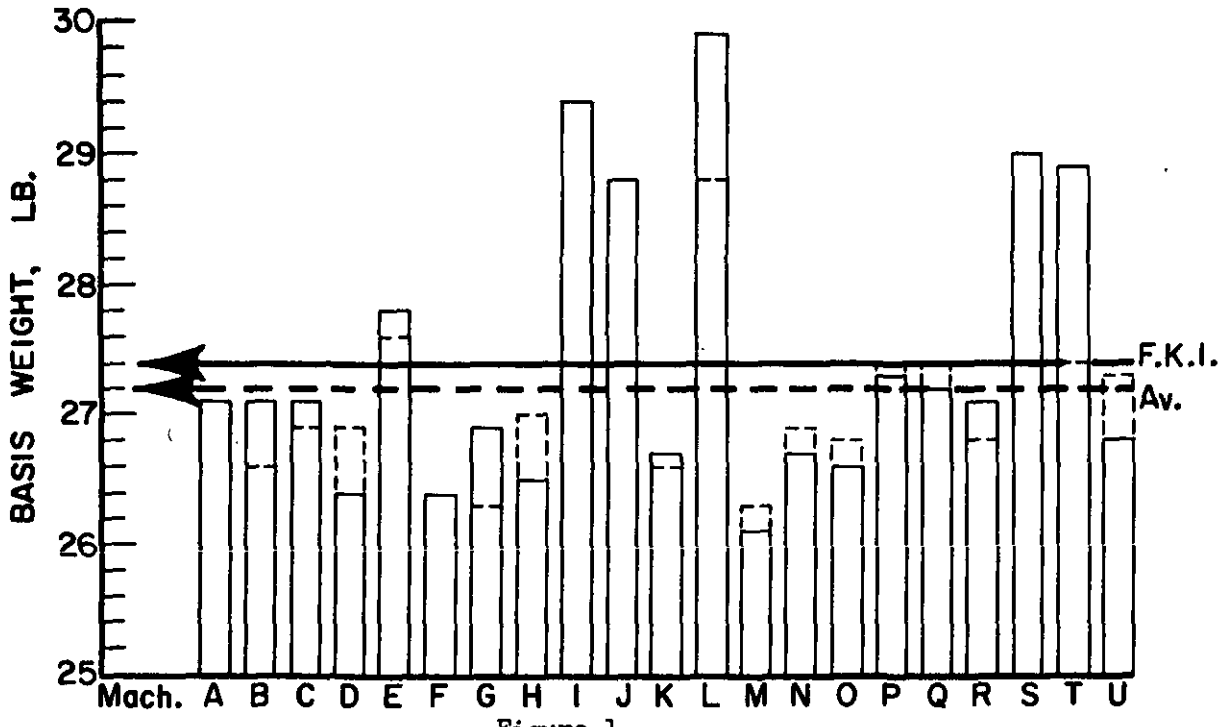

Figure 1

Comparison of Basis Weight Results for December, 1959

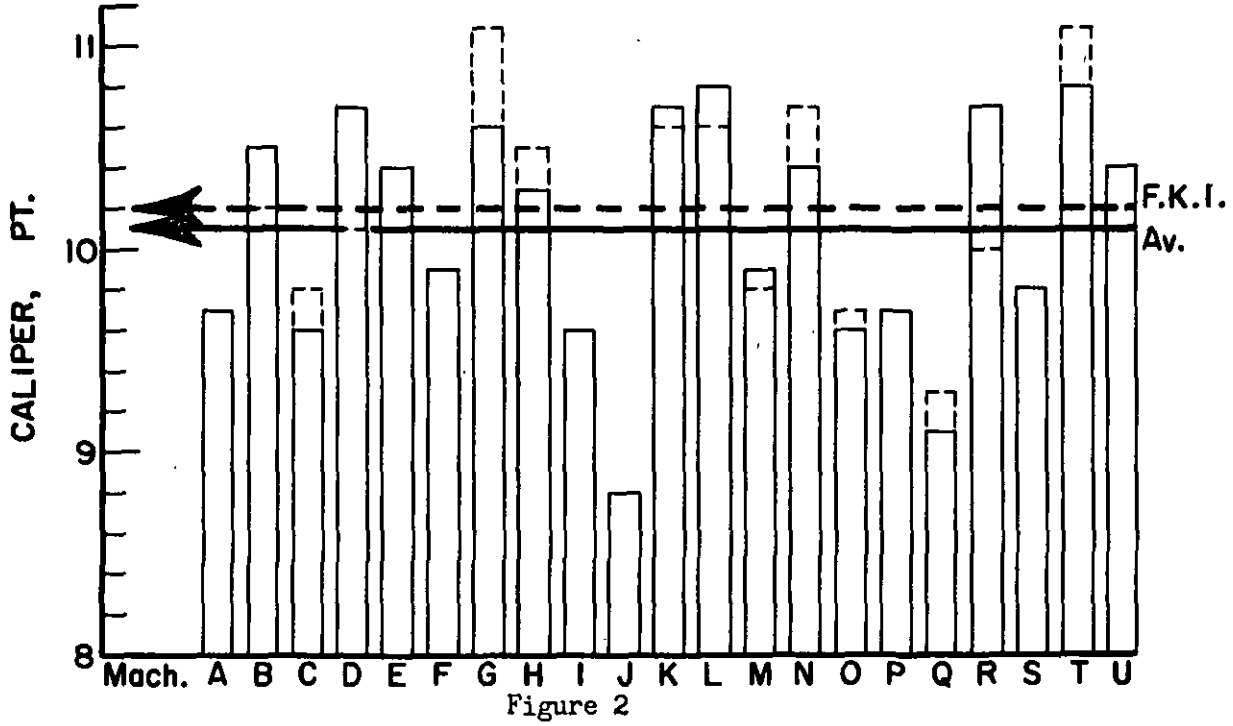

Figure 2

Comparison of Caliper Results for December, 1959

——— Current machine average

– – – – – Cumulative machine average

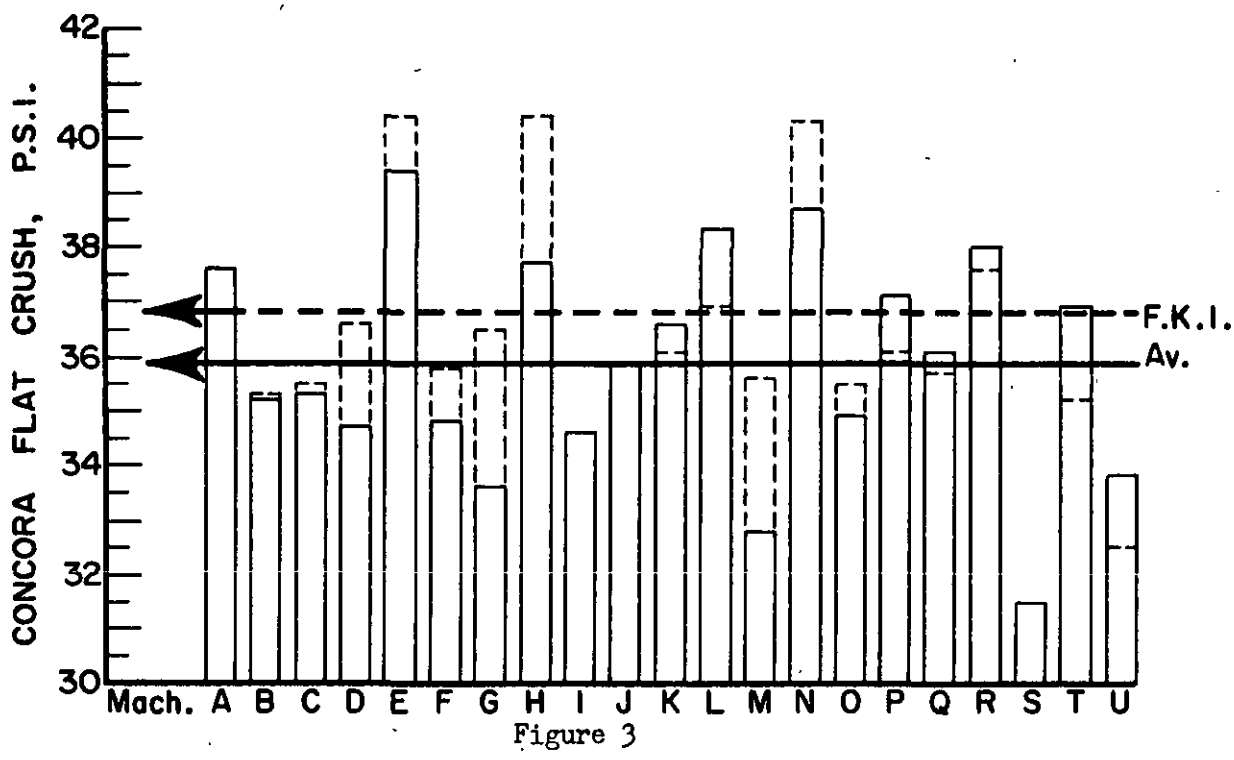

Figure 3

Comparison of Concora Flat Crush Results (Conditioned) for December, 1959

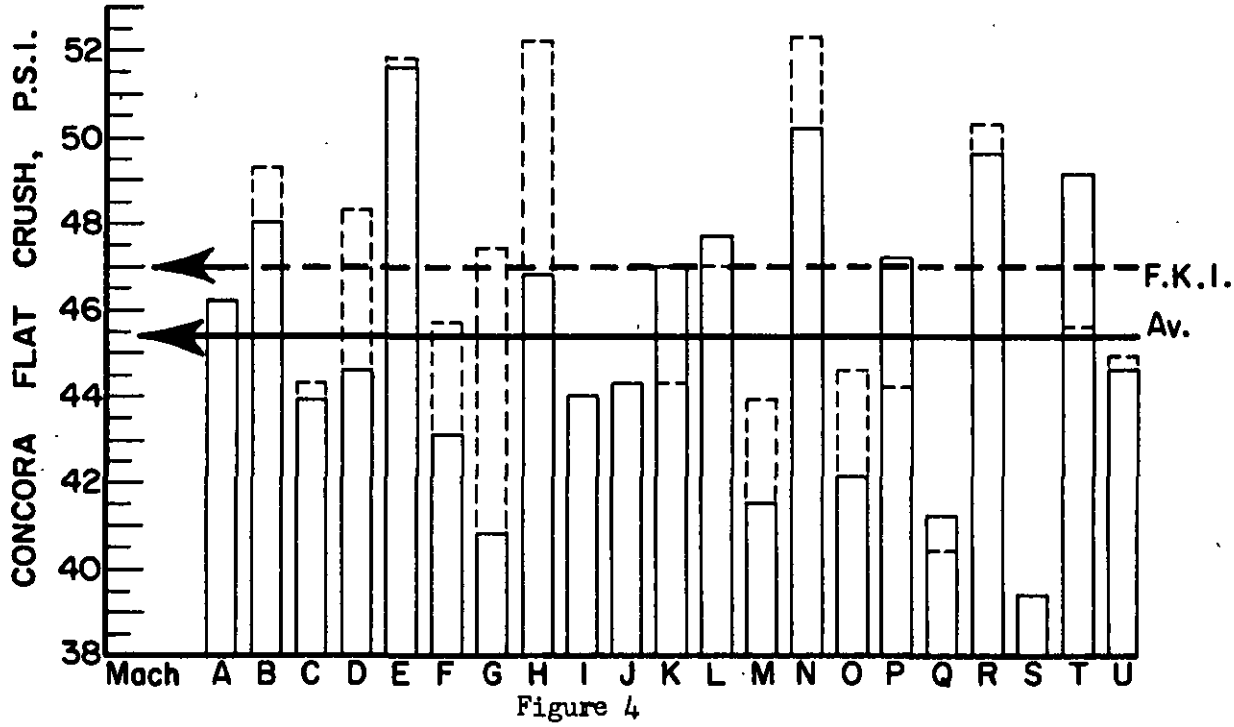

Figure 4

Comparison of Concora Flat Crush Results (Tested Immediately) for December, 1959

——— Current machine average

- - - - - Cumulative machine average

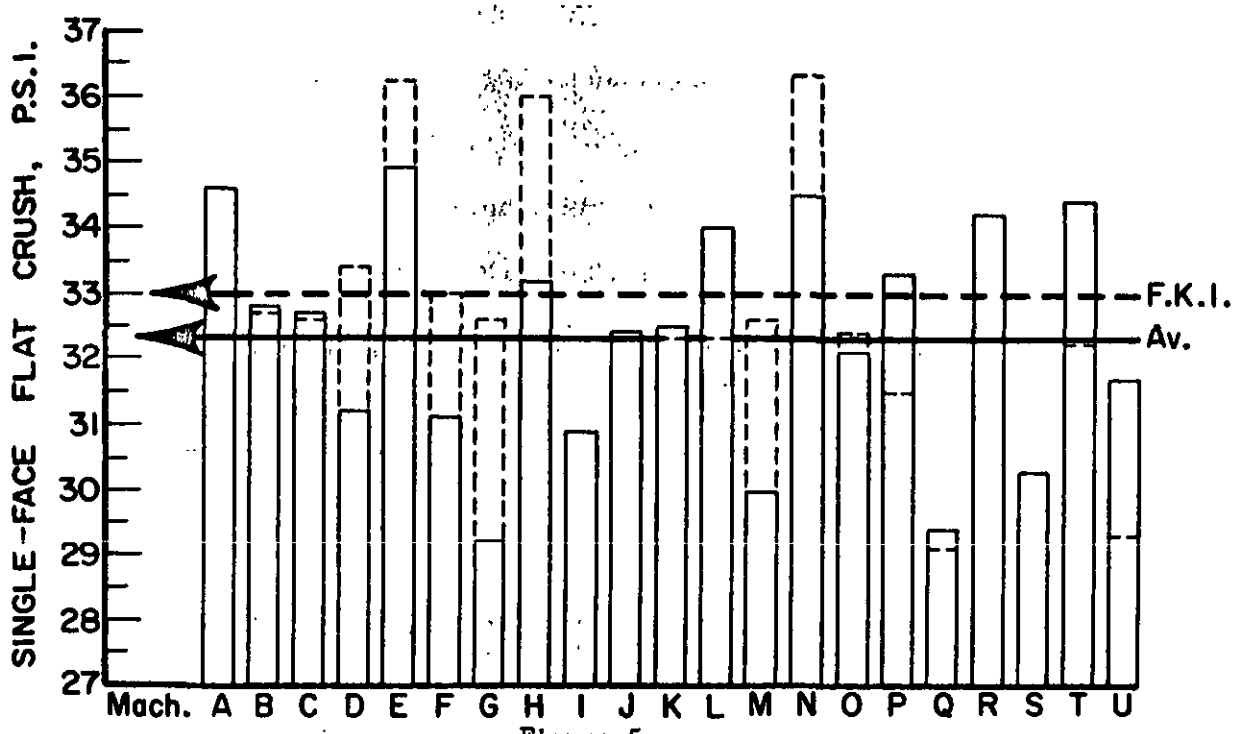

Figure 5

Comparison of Single-Face Flat Crush Results for December, 1959

——— Current mill average

- - - - - Cumulative mill average

In Table II the current machine averages for the month of December are summarized. It may be noted in Table II and Figure 1 that basis weight varied from a low of 26.1 lb. for Machine M to a high of 29.9 lb. for Machine L. The current F.K.I. average for basis weight was 27.4 lb., which was slightly higher than the cumulative F.K.I. average of 27.2 lb. Of the current machine averages shown in Table II, none was below the 26-lb. minimum requirement of Rule 41. On the basis of individual rolls, it may be noted that the tabulated data for each machine shown in Tables III through XXIII included nine basis weight averages which were below 26 lb.

With regard to the caliper results for the current period, it may be seen in Table II and also in Figure 2 that the lowest average caliper data of 8.8 points was associated with Machine J and the highest average of 10.8 points was shared by Machines L and T. The current F.K.I. average of 10.1 points was slightly lower than the cumulative F.K.I. average of 10.2 points. The minimum caliper requirement of nine points specified in Rule 41 was met by all participants except Machine J on the basis of the current machine averages shown in Table II. On the basis of individual rolls, six caliper averages were below 9 points.

The Concora flat crush averages obtained on specimens conditioned after fluting are presented graphically in Figure 3 based on the data in Table II. An inspection of these results reveals that 39.4 p.s.i. was the highest average and 31.5 p.s.i. the lowest. Machine E had the highest average and Machine S the lowest. The current F.K.I. average of 35.9 p.s.i. was lower than the cumulative F.K.I. average of 36.8 p.s.i.

The Concora flat crush averages obtained on specimens tested immediately after fluting are shown graphically in Figure 4 based on the data in Table II. Machine E had the highest average of 51.6 p.s.i. and Machine S the lowest average of 39.4 p.s.i. The current F.K.I. average was 45.4 p.s.i. which was slightly lower than the cumulative F.K.I. average of 47.0 p.s.i.

The highest single-face flat crush average of 34.9 p.s.i. was obtained for Machine E and the lowest of 29.2 p.s.i. for Machine G. These data are shown in Table II and are presented graphically in Figure 5. The current F.K.I. average was 32.3 p.s.i., whereas the cumulative F.K.I. average was 33.0 p.s.i.

For the current period, the current F.K.I. average for basis weight was higher than the cumulative F.K.I. average, and the current F.K.I. averages for caliper, Concora flat crush (conditioned), Concora flat crush (tested immediately), and single-face flat crush were lower than their respective cumulative F.K.I. averages.

The test results obtained on the sample lots submitted from the production of each of the machines are shown in Tables III through XXIII for Machines A through U, respectively. The maximum, minimum, and average test results obtained on each sample lot are shown for all tests except basis weight for which only the average is shown; in addition, the over-all average result for all sample lots submitted from a given machine is shown for each test. The latter over-all averages are reported as "current machine averages." A cumulative machine average is also shown and is calculated by averaging

the current machine averages for the previous twelve periods (excluding the current period). Also shown for each machine in Tables III to XXIII are the machine factor and machine index which are defined as follows:

$$\frac{\text{current machine average}}{\text{cumulative machine average}} \times 100 = \text{machine factor (\%)}$$

$$\frac{\text{current machine average}}{\text{cumulative F.K.I. average}} \times 100 = \text{machine index (\%)}$$

The machine factor and machine index provide a means for comparing the current machine average with either the previous results for that particular machine or with the cumulative results for all machines--i.e., the cumulative F.K.I. average.

TABLE III

SUMMARY OF TEST RESULTS FOR MACHINE A
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
A-1	11-29-59	12-14-59	2	27.1	10.0	9.1	9.7	39.6	36.0	37.6	49.2	41.4	46.2	36.6	32.0	34.6	1/2
Current Machine Average				27.1			9.7			37.6			46.2			34.6	
Cumulative Machine Average				--			—			—			—			—	
Machine Factor, %				—			--			--			--			--	
Machine Index, %				99.7			95.3			102.2			98.4			104.8	

TABLE IV

SUMMARY OF TEST RESULTS FOR MACHINE B
December, 1959

B-1	11-20-59	11-30-59	211	27.0	11.0	10.3	10.7	37.2	33.0	34.6	48.6	45.6	47.4	33.4	31.8	32.6	1-1/2
B-2	11-20-59	11-30-59	212	27.4	11.0	10.4	10.8	37.8	32.4	34.2	51.6	44.4	48.8	34.2	31.6	32.6	1-1/2
B-3	12- 2-59	12- 9-59	219	27.1	10.8	10.0	10.4	39.0	31.2	35.4	52.2	45.6	48.1	33.4	30.8	32.5	1-1/2
B-4	12- 2-59	12- 9-59	220	26.9	10.5	9.4	10.1	38.4	34.2	36.5	51.6	45.6	47.6	34.6	32.6	33.6	1-1/2
Current Machine Average				27.1			10.5			35.2			48.0			32.8	
Cumulative Machine Average				26.6			10.2			35.3			49.3			32.7	
Machine Factor, %				102.1			102.4			99.7			97.4			100.5	
Machine Index, %				99.9			102.8			95.6			102.2			99.6	

TABLE V

SUMMARY OF TEST RESULTS FOR MACHINE C
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
C-1	10-26-59	11-25-59	1961	26.8	9.8	9.2	9.6	38.4	30.6	35.9	48.6	40.8	43.9	35.4	32.4	33.7	1-1/2
C-2	10-30-59	11-25-59	2256	25.6	9.5	9.1	9.2	33.6	27.6	31.0	42.0	34.8	38.2	31.2	29.6	30.5	1-1/2
C-3	11- 4-59	12-11-59	313	27.4	9.8	9.2	9.5	38.4	34.2	35.8	49.2	41.4	46.6	33.6	31.0	32.3	1-1/2
C-4	11- 5-59	12-11-59	359	27.7	10.0	9.6	9.8	40.2	34.2	37.6	46.8	43.8	45.1	37.2	33.0	34.9	1-1/2
C-5	11- 7-59	12-11-59	507	28.0	10.1	9.7	10.0	36.0	32.4	34.6	46.8	40.8	44.3	36.2	31.4	32.5	1
C-6	11-16-59	12-23-59	1119	26.5	9.8	9.4	9.6	36.0	31.2	33.1	42.6	37.8	39.6	31.4	29.8	30.6	1-1/2
C-7	11-21-59	12-23-59	1398	27.8	9.7	9.1	9.4	40.2	37.8	39.2	54.6	46.2	49.3	36.6	31.0	34.1	1-1/2
Current Machine Average				27.1			9.6			35.3			43.9			32.7	
Cumulative Machine Average				26.9			9.8			35.5			44.3			32.6	
Machine Factor, %				100.9			98.0			99.6			98.9			100.2	
Machine Index, %				99.8			94.1			96.0			93.4			99.0	

TABLE VI

SUMMARY OF TEST RESULTS FOR MACHINE D
December, 1959

D-1	11-17-59	12- 1-59	221	26.5	10.7	10.0	10.2	38.4	33.0	35.3	49.8	45.6	47.8	34.0	31.6	33.1	1-1/2
D-2	11-24-59	12- 1-59	222	26.8	10.9	10.4	10.7	38.4	34.2	36.1	51.0	45.6	47.3	33.4	30.4	32.2	1-1/2
D-3	11-27-59	12- 1-59	223	26.7	10.9	10.5	10.7	37.2	31.8	34.0	48.6	43.8	46.2	34.8	31.2	32.7	1-1/2
D-4	12- 1-59	12-18-59	224	26.6	11.4	10.9	11.1	35.4	31.8	34.1	45.6	40.8	42.6	31.4	30.0	30.7	1
D-5	12- 3-59	12-18-59	225	26.1	11.1	10.5	10.9	36.0	30.6	32.9	42.6	34.8	39.1	32.2	29.8	30.7	1-1/2
D-6	12- 7-59	12-18-59	226	26.3	11.0	10.3	10.7	40.8	30.6	36.0	47.4	45.6	46.3	32.2	30.0	30.8	1-1/2
D-7	12- 9-59	12-18-59	227	26.1	11.1	10.4	10.8	37.2	33.6	34.9	46.8	38.4	42.7	29.6	27.0	28.2	1-1/2
Current Machine Average				26.4			10.7			34.7			44.6			31.2	
Cumulative Machine Average				26.9			10.1			36.6			48.3			33.4	
Machine Factor, %				98.4			106.7			95.1			92.4			93.5	
Machine Index, %				97.4			105.5			94.5			94.9			94.6	

TABLE VII

SUMMARY OF TEST RESULTS FOR MACHINE E
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
E-1	11-17-59	11-30-59	364	27.8	10.9	10.0	10.2	42.0	38.4	40.0	53.4	48.6	50.0	36.2	33.4	35.4	1
E-2	11-20-59	12- 4-59	365	28.4	10.9	10.8	10.9	45.0	43.2	43.9	60.0	55.2	57.0	39.2	34.0	37.0	1-1/2
E-3	11-25-59	12-10-59	366	27.6	10.8	10.0	10.3	42.0	36.0	39.2	57.0	48.0	52.8	36.4	34.4	35.1	1-1/2
E-4	11-26-59	12-10-59	367	27.7	10.4	10.1	10.2	37.8	36.6	37.4	57.0	52.2	54.4	34.6	31.6	33.5	1-1/2
E-5	12- 1-59	12-14-59	368	27.8	10.2	9.9	10.1	41.4	36.6	38.3	55.2	47.4	52.2	37.4	34.2	35.3	1
E-6	12- 3-59	12-16-59	369	28.0	11.0	10.1	10.4	41.4	36.0	38.2	53.4	43.8	47.8	35.6	32.4	34.0	1-1/2
E-7	12- 9-59	12-21-59	370	27.6	11.0	10.3	10.6	40.8	36.6	39.5	49.8	47.4	48.8	35.8	32.4	34.4	1-1/2
E-8	12-11-59	12-22-59	371	27.6	10.3	10.0	10.1	42.0	34.8	38.6	52.8	45.6	49.8	35.6	33.4	34.3	1-1/2
Current Machine Average				27.8			10.4			39.4			51.6			34.9	
Cumulative Machine Average				27.6			10.4			40.4			51.8			36.2	
Machine Factor, %				100.8			100.0			97.4			99.6			96.3	
Machine Index, %				102.4			101.7			107.1			109.9			105.7	

TABLE VIII

SUMMARY OF TEST RESULTS FOR MACHINE F
December, 1959

F-1	11-10-59	11-25—59	—	27.0	10.0	9.2	9.6	37.2	35.4	36.4	49.8	44.4	46.8	34.2	33.0	33.4	1
F-2	11-18-59	11-25-59	—	25.9	10.0	9.8	9.9	36.0	31.2	34.2	45.6	39.6	42.5	33.2	29.6	31.6	1/2
F-3	11-26-59	12-10-59	—	27.0	10.1	9.8	10.0	34.2	31.2	33.2	45.0	40.2	42.2	30.4	27.6	29.0	1
F-4	12- 2-59	12-10-59	—	25.8	10.2	10.0	10.1	38.4	33.6	35.4	42.0	40.2	40.9	31.2	29.6	30.2	1/2
Current Machine Average				26.4			9.9			34.8			43.1			31.1	
Cumulative Machine Average				26.4			9.9			35.8			45.7			33.0	
Machine Factor, %				100.0			100.0			97.3			94.4			94.0	
Machine Index, %				97.3			97.2			94.6			91.8			94.2	

TABLE IX

SUMMARY OF TEST RESULTS FOR MACHINE G
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
G-1	11-18-59	12- 3-59	12	27.4	11.8	10.9	11.3	32.4	29.4	31.0	37.2	35.4	36.4	29.0	27.8	28.3	1
G-2	11-24-59	12- 3-59	13	26.0	10.5	10.0	10.2	39.6	34.2	37.0	50.4	40.2	46.1	35.0	32.6	34.0	1/2
G-3	11-25-59	12-4-59	14	26.9	11.0	10.1	10.6	38.4	31.2	36.2	46.2	40.2	44.4	32.6	30.0	31.2	1/2
G-4	12- 2-59	12-15-59	15	26.6	11.0	10.0	10.6	30.6	27.0	28.8	36.6	30.6	33.6	24.0	22.4	23.2	1/2
G-5	12- 4-59	12-15-59	16	27.4	10.8	10.2	10.5	36.6	34.2	34.9	46.8	40.8	43.6	30.6	28.4	29.4	Min.
Current Machine Average				26.9			10.6			33.6			40.8			29.2	
Cumulative Machine Average				26.3			11.1			36.5			47.4			32.6	
Machine Factor, %				102.2			95.4			92.1			86.2			89.5	
Machine Index, %				98.9			104.4			91.3			86.9			88.5	

TABLE X

SUMMARY OF TEST RESULTS FOR MACHINE H
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
H-1	11- 6-59	12- 1-59	175	27.1	11.4	10.3	10.9	42.0	35.4	40.6	52.8	48.0	50.0	38.6	34.6	36.7	1/2
H-2	11-10-59	12-1-59	301	26.7	11.3	10.7	11.0	40.2	31.2	34.1	52.2	37.8	43.8	33.6	28.8	30.7	1
H-3	11-12-59	12- 1-59	364	26.3	12.0	10.0	10.6	40.2	36.0	37.4	49.8	42.6	46.4	33.0	30.4	31.5	1/2
H-4	11-14-59	12- 1-59	429	25.5	10.8	9.2	10.0	37.2	31.8	34.9	49.2	43.2	46.7	32.2	29.4	30.8	1/2
H-5	11-20-59	12-11-59	617	26.9	10.6	9.8	10.2	39.6	36.0	37.9	50.4	45.0	47.3	36.0	31.8	34.3	1
H-6	11-25-59	12-11-59	786	26.8	10.2	9.7	10.1	46.8	38.4	42.5	58.2	48.0	53.6	38.2	36.4	37.4	1
H-7	11-27-59	12-11-59	849	27.7	10.6	10.0	10.2	43.2	35.4	40.1	54.6	45.0	51.6	36.6	35.0	35.6	1-1/2
H-8	12- 3-59	12-23-59	58	27.0	10.6	10.0	10.3	40.2	36.0	38.3	49.2	40.2	44.9	33.8	33.0	33.6	1-1/2
H-9	12- 4-59	12-23-59	91	26.7	10.8	10.0	10.4	40.8	34.2	37.3	49.2	41.4	44.6	34.8	29.4	31.5	1-1/2
H-10	12- 8-59	12-23-59	217	26.4	10.3	9.3	9.9	41.4	36.0	38.6	54.6	45.6	48.5	37.6	32.0	35.8	1-1/2
H-11	12-11-59	12-23-59	304	26.1	10.1	9.1	9.7	37.2	32.4	34.9	43.8	37.8	40.6	31.0	30.0	30.6	1-1/2
H-12	12-14-59	12-23-59	391	25.2	10.0	9.4	9.7	37.8	33.6	35.9	48.0	40.8	43.7	31.2	29.0	30.1	1/2
Current Machine Average				26.5			10.3			37.7			46.8			33.2	
Cumulative Machine Average				27.0			10.5			40.4			52.2			36.0	
Machine Factor, %				98.1			97.2			93.3			89.7			92.2	
Machine Index, %				97.7			100.7			102.6			99.7			100.7	

TABLE XI

SUMMARY OF TEST RESULTS FOR MACHINE I
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
I-1	12- 1-59	12- 8-59	1	30.0	9.9	9.2	9.5	38.4	33.6	35.8	51.0	45.6	47.9	33.4	32.0	32.8	1-1/2
I-2	12- 8-59	12-18-59	2	28.7	10.1	9.1	9.6	36.6	31.2	33.2	44.4	39.0	41.3	31.0	27.8	29.3	1-1/2
I-3	12-11-59	12-18-59	3	29.5	10.0	9.1	9.7	36.6	31.8	34.7	47.4	41.4	43.0	31.4	29.4	30.6	1-1/2
Current Machine Average				29.4			9.6			34.6			44.0			30.9	
Cumulative Machine Average				--			--			--			--			--	
Machine Factor, %				--			--			--			--			--	
Machine Index, %				108.2			94.2			94.0			93.8			93.7	

TABLE XII

SUMMARY OF TEST RESULTS FOR MACHINE J
December, 1959

J-1	11-23-59	12- 8-59	1	29.2	9.3	8.5	8.9	34.8	30.6	33.1	43.8	37.8	40.0	31.2	29.4	30.1	1-1/2
J-2	11-24-59	12- 8-59	2	28.7	9.3	8.5	8.9	39.0	31.8	36.0	51.0	43.2	46.9	34.6	32.8	33.8	1-1/2
J-3	12-15-59	12-23-59	3	27.6	8.9	7.9	8.2	42.6	34.8	38.8	52.2	48.0	49.7	36.0	34.4	35.1	1-1/2
J-4	12-16-59	12-23-59	4	29.8	9.2	8.7	8.9	39.0	33.6	35.8	43.8	37.8	40.8	31.6	29.6	30.7	1-1/2
Current Machine Average				28.8			8.8			35.9			44.3			32.4	
Cumulative Machine Average				—			--			--			--			--	
Machine Factor, %				—			--			--			--			--	
Machine Index, %				106.1			85.9			97.7			94.4			98.2	

TABLE XIII

SUMMARY OF TEST RESULTS FOR MACHINE K
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
K-1	10-24-59	11-30-59	45	26.9	11.3	11.0	11.2	39.6	34.2	37.3	53.4	48.0	49.8	34.2	31.6	32.9	1-1/2
K-2	10-26-59	11-30-59	46	26.9	11.0	10.6	10.7	36.6	33.0	35.0	49.2	43.2	45.2	32.0	29.8	31.2	1
K-3	10-29-59	11-30-59	47	27.1	11.3	10.7	11.0	39.6	34.2	37.0	51.0	41.4	46.4	35.0	30.4	32.6	1
K-4	11- 5-59	11-30-59	48	27.3	11.0	10.2	10.6	40.8	36.0	38.4	52.2	44.4	48.6	34.6	31.2	32.8	1-1/2
K-5	11-11-59	11-30-59	49	26.6	11.0	10.1	10.4	38.4	34.8	36.7	51.0	42.0	46.7	33.0	30.2	31.7	1
K-6	11-16-59	11-30-59	50	26.8	11.3	10.1	10.9	37.8	34.2	35.8	46.2	44.4	45.2	32.0	29.0	30.5	1
K-7	11-21-59	12-24-59	51	25.8	10.8	10.1	10.4	38.4	33.0	35.8	48.6	40.8	44.4	33.0	31.0	32.0	1
K-8	11-24-59	12-24-59	52	26.0	10.7	10.1	10.4	40.8	36.0	37.4	50.4	39.6	45.4	35.4	33.0	33.8	1-1/2
K-9	11-25-59	12-24-59	53	26.2	10.9	10.4	10.8	40.2	32.4	36.1	49.2	42.0	44.9	33.4	30.2	32.0	1
K-10	12- 1-59	12-24-59	54	26.6	10.9	10.2	10.5	37.8	32.4	35.8	51.0	46.2	48.8	34.6	32.8	33.6	1-1/2
K-11	12- 6-59	12-24-59	55	26.6	10.9	10.3	10.7	38.4	31.2	35.0	49.8	43.8	47.3	33.0	31.2	32.1	1-1/2
K-12	12-10-59	12-24-59	56	27.2	11.0	10.7	10.8	37.8	35.4	36.6	54.6	45.6	49.2	36.0	31.8	33.3	1-1/2
K-13	12-12-59	12-24-59	57	26.7	10.9	10.2	10.7	40.2	34.2	37.8	52.8	41.4	47.5	35.6	32.4	34.0	1-1/2
K-14		12-24-59	58	27.4	11.1	10.9	11.0	40.2	35.4	37.9	52.8	46.8	48.8	34.0	30.6	32.2	1-1/2
Current Machine Average				26.7			10.7			36.6			47.0			32.5	
Cumulative Machine Average				26.6			10.6			36.1			44.3			32.3	
Machine Factor, %				100.5			100.9			101.5			106.2			100.5	
Machine Index, %				98.4			105.3			99.6			100.2			98.5	

TABLE XIV

SUMMARY OF TEST RESULTS FOR MACHINE L
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
L-1	11-18-59	11-30-59	288	29.4	11.0	10.0	10.6	37.8	33.0	35.6	49.8	45.0	47.6	33.2	32.0	32.5	1/2
L-2	11-21-59	11-30-59	289	29.8	11.0	10.4	10.7	41.4	36.0	38.6	52.2	43.8	49.0	36.2	35.0	35.4	1
L-3	11-24-59	11-30-59	290	30.0	11.2	10.8	11.0	39.0	36.0	37.7	49.8	43.8	47.4	35.4	32.4	33.4	1
L-4	11-27-59	12- 9-59	291	30.4	11.2	10.7	10.9	40.2	39.0	39.8	51.6	44.4	48.8	34.4	32.6	33.7	1-1/2
L-5	12- 1-59	12- 9-59	292	29.7	10.8	10.5	10.7	40.2	37.8	39.0	49.8	45.0	48.0	35.2	31.2	33.2	1
L-6	12- 3-59	12- 9-59	293	29.9	11.0	10.3	10.7	41.4	37.8	39.8	52.2	46.8	49.1	35.2	32.6	34.3	1-1/2
L-7	12- 9-59	12-21-59	294	29.5	11.7	11.0	11.2	41.4	37.2	39.1	52.8	44.4	48.2	36.2	33.6	34.7	1
L-8	12-11-59	12-21-59	295	30.7	11.0	10.0	10.4	41.4	34.8	39.0	51.0	42.0	45.6	39.4	35.0	37.7	1-1/2
L-9	12-16-59	12-21-59	296	30.0	11.5	10.8	11.2	39.6	33.0	36.0	48.0	42.0	45.2	33.0	29.2	31.1	1-1/2
Current Machine Average				29.9			10.8			38.3			47.7			34.0	
Cumulative Machine Average				28.8			10.6			36.9			47.0			32.3	
Machine Factor, %				104.0			102.6			103.8			101.3			105.4	
Machine Index, %				110.2			106.5			104.2			101.5			103.1	

TABLE XV

SUMMARY OF TEST RESULTS FOR MACHINE M
December, 1959

M-1	11-11-59	11-25-59	--	25.9	9.9	9.2	9.6	34.8	33.0	33.8	45.6	43.2	44.8	31.8	28.6	30.5	1
M-2	11-17-59	11-25--59	--	26.5	10.0	10.0	10.0	35.4	30.0	33.0	44.4	38.4	41.4	31.0	29.8	30.4	1/2
M-3	11-27-59	12-10-59	--	26.3	10.1	9.9	10.0	34.2	31.2	32.9	42.6	40.2	41.0	30.0	29.2	29.6	1/2
M-4	12- 3-59	12-10-59	--	25.8	10.2	9.9	10.0	33.6	30.0	31.4	40.2	36.0	38.6	30.4	28.2	29.4	1
Current Machine Average				26.1			9.9			32.8			41.5			30.0	
Cumulative Machine Average				26.3			9.8			35.6			43.9			32.6	
Machine Factor, %				99.4			100.8			92.2			94.5			92.1	
Machine Index, %				96.2			97.3			89.2			88.3			90.9	

TABLE XVI

SUMMARY OF TEST RESULTS FOR MACHINE N
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
N-1	11-24-59	11-30-59	522	26.7	10.4	10.0	10.2	39.6	34.8	38.0	52.8	45.6	49.3	35.2	32.4	33.9	1-1/2
N-2	11-27-59	11-30-59	523	27.1	11.0	10.4	10.7	37.8	36.6	37.1	51.0	44.4	47.4	34.4	31.8	33.7	1-1/2
N-3	12- 1-59	12- 4-59	524	26.8	10.8	10.1	10.6	40.2	37.2	38.5	51.0	46.2	48.7	34.4	32.6	33.3	1-1/2
N-4	12-8- 59	12-11-59	525	26.0	10.3	10.0	10.2	40.2	36.6	38.6	55.8	51.6	53.6	36.8	35.2	35.8	1-1/2
N-5	12-11-59	12-15-59	526	26.7	10.7	10.0	10.2	43.2	36.6	40.4	58.2	52.2	55.2	37.4	35.0	36.0	1/2
N-6	12-17-59	12-22-59	527	27.2	11.1	10.3	10.8	46.2	35.4	40.8	52.2	43.8	49.4	36.0	34.2	35.1	1-1/2
N-7	12-18-59	12-22-59	528	26.3	10.8	10.1	10.3	38.4	35.4	37.4	49.2	45.6	47.4	34.6	32.0	33.4	1-1/2
Current Machine Average				26.7			10.4			38.7			50.2			34.5	
Cumulative Machine Average				26.9			10.7			40.3			52.3			36.3	
Machine Factor, %				99.4			97.3			96.1			95.9			94.9	
Machine Index, %				98.3			102.3			105.3			106.8			104.5	

TABLE XVII

SUMMARY OF TEST RESULTS FOR MACHINE O
December, 1959

O-1	10-27-59	11-25-59	2155	25.8	9.9	9.2	9.6	36.6	31.8	33.6	42.0	36.0	38.8	33.6	31.2	31.9	1-1/2
O-2	11- 1-59	11-25-59	17	27.0	10.0	9.7	9.9	37.8	33.0	35.5	48.0	41.4	45.0	33.0	31.4	32.2	1-1/2
O-3	11- 4-59	12-11-59	273	27.4	10.0	9.7	9.9	37.8	33.6	36.1	46.2	43.2	44.8	34.2	31.8	33.1	1-1/2
O-4	11-18-59	12-23-59	1394	26.0	9.8	9.0	9.4	37.8	30.6	34.7	42.0	37.2	39.7	31.0	29.8	30.5	1-1/2
O-5	11-21-59	12-23-59	--	26.9	9.8	9.2	9.5	36.6	32.4	34.6	46.8	37.2	42.2	34.8	30.2	32.7	1-1/2
Current Machine Average				26.6			9.6			34.9			42.1			32.1	
Cumulative Machine Average				26.8			9.7			35.5			44.6			32.4	
Machine Factor, %				99.4			99.2			98.2			94.3			98.9	
Machine Index, %				98.1			94.6			94.9			89.7			97.3	

TABLE XVIII

SUMMARY OF TEST RESULTS FOR MACHINE P
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
P-1	11-27-59	12- 5-59	213	27.2	9.9	9.7	9.8	40.2	36.6	38.3	54.6	45.6	49.3	34.4	32.2	33.6	1-1/2
P-2	11-27-59	12- 5-59	214	27.3	9.9	9.0	9.5	39.6	33.6	35.9	50.4	41.4	45.0	34.4	30.4	33.0	1-1/2
Current Machine Average				27.3			9.7			37.1			47.2			33.3	
Cumulative Machine Average				27.4			9.7			36.1			44.2			31.5	
Machine Factor, %				99.6			100.0			102.7			106.8			105.7	
Machine Index, %				100.4			94.9			100.8			100.4			100.8	

TABLE XIX

SUMMARY OF TEST RESULTS FOR MACHINE Q
December, 1959

Q-1	12- 5-59	12-15-59	43	26.8	9.2	8.7	8.9	36.0	33.0	34.7	39.0	37.2	38.0	29.6	27.8	29.1	1
Q-2	12- 5-59	12-15-59	44	26.9	9.9	8.8	9.1	34.8	30.0	33.1	43.8	37.2	40.4	29.0	26.0	27.9	1
Q-3	12-17-59	12-22-59	45	27.0	9.4	8.4	8.9	36.6	34.8	35.6	44.4	40.2	42.4	33.8	30.0	31.2	1/2
Q-4	12-17-59	12-22-59	46	27.1	9.8	8.8	9.2	38.4	36.0	36.8	46.2	40.8	43.1	31.0	29.0	30.1	1/2
Q-5	12-17-59	12-22-59	47	27.4	9.6	9.1	9.3	39.0	35.4	37.3	43.2	40.8	42.0	30.0	28.2	29.2	1
Q-6	12-17-59	12-22-59	48	27.4	9.4	8.6	9.1	40.8	36.6	38.8	43.8	39.0	41.5	30.2	28.6	29.3	1-1/2
Q-7	12-17-59	12-22-59	49	28.0	9.7	9.0	9.3	37.8	34.2	35.9	40.8	36.0	38.4	30.8	28.8	29.7	1-1/2
Q-8	12-17-59	12-22-59	50	27.1	9.2	8.6	9.0	37.8	35.4	36.7	46.2	42.0	44.2	29.2	28.4	28.7	1-1/2
Current Machine Average				27.2			9.1			36.1			41.2			29.4	
Cumulative Machine Average				27.4			9.3			35.7			40.4			29.1	
Machine Factor, %				99.3			98.2			101.2			102.2			100.9	
Machine Index, %				100.2			89.4			98.2			87.9			89.1	

TABLE XX

SUMMARY OF TEST RESULTS FOR MACHINE R
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
R-1	11-12-59	11-25-59	--	27.0	10.8	10.1	10.3	38.4	34.8	36.7	52.2	44.4	47.4	37.0	33.4	35.4	1/2
R-2	11-20-59	11-25-59	--	27.4	11.0	10.2	10.8	42.6	37.2	39.8	57.0	51.4	52.7	35.8	33.6	34.5	Min.
R-3	11-25-59	12-10-59	--	27.1	11.1	10.4	10.7	37.8	37.2	37.7	51.6	45.6	48.8	33.8	31.8	32.7	1/2
R-4	12- 1-59	12-10-59	--	27.0	11.1	10.7	10.9	40.2	36.6	37.8	53.4	48.0	49.6	34.8	33.6	34.2	1/2
Current Machine Average				27.1			10.7			38.0			49.6			34.2	
Cumulative Machine Average				26.8			10.0			37.6			50.3			34.2	
Machine Factor, %				101.1			107.2			101.1			98.6			100.0	
Machine Index, %				99.9			104.9			103.4			105.7			103.6	

TABLE XXI

SUMMARY OF TEST RESULTS FOR MACHINE S
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
S-1	11-18-59	11-27-59	1	29.6	9.2	9.0	9.1	31.8	28.2	30.2	39.6	32.4	35.3	29.0	27.8	28.2	1-1/2
S-2	11-19-59	11-27-59	2	29.6	9.8	9.0	9.3	36.0	28.8	31.6	42.6	36.0	39.6	33.4	29.2	31.1	1-1/2
S-3	12- 8-59	12-15-59	3	28.0	11.0	9.8	10.4	32.4	29.4	30.6	47.4	37.2	41.4	33.6	28.0	31.5	1
S-4	12- 9-59	12-15-59	4	28.7	10.8	9.7	10.2	36.6	29.4	33.6	44.4	36.0	41.4	31.8	29.6	30.5	1/2
Current Machine Average				29.0			9.8			31.5			39.4			30.3	
Cumulative Machine Average				--			--			--			--			--	
Machine Factor, %				--			--			--			--			--	
Machine Index, %				106.7			95.9			85.7			84.0			91.9	

TABLE XXII

SUMMARY OF TEST RESULTS FOR MACHINE T
December, 1959

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i. (Conditioned)			Concora Flat Crush, p.s.i. (Tested Immediately)			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
T-1	11-25-59	12- 1-59	213	28.6	10.9	10.2	10.6	38.4	34.8	36.2	48.6	43.2	46.7	35.2	33.4	34.2	1-1/2
T-2	11-25-59	12- 1-59	214	29.1	10.9	10.0	10.7	37.8	31.8	35.6	52.2	45.6	48.6	34.4	32.6	33.3	1-1/2
T-3	12-11-59	12-15-59	221	28.9	11.3	10.8	11.0	40.2	38.4	39.1	53.4	48.6	50.5	36.4	32.8	34.4	1-1/2
T-4	12-11-59	12-15-59	222	28.9	11.5	10.0	11.0	41.4	34.8	36.7	55.2	44.4	50.6	36.6	34.2	35.6	1-1/2
Current Machine Average				28.9			10.8			36.9			49.1			34.4	
Cumulative Machine Average				27.4			11.1			35.2			45.6			32.2	
Machine Factor, %				105.4			97.2			105.0			107.7			106.7	
Machine Index, %				106.3			106.3			100.4			104.6			104.3	

TABLE XXIII

SUMMARY OF TEST RESULTS FOR MACHINE U
December, 1959

U-1	11-17-59	11-27-59	209	26.5	10.4	10.0	10.2	34.2	30.6	32.8	45.6	37.8	42.5	30.4	28.0	29.1	1-1/2
U-2	11-17-59	11-27-59	210	27.5	11.0	10.4	10.8	37.2	31.8	34.6	49.8	43.8	46.0	32.2	31.0	31.4	1-1/2
U-3	12- 2-59	12- 9-59	217	26.7	11.1	10.0	10.7	36.6	30.6	34.7	48.6	43.2	45.8	34.8	31.8	33.1	1-1/2
U-4	12- 2-59	12- 9-59	218	26.5	10.4	9.2	9.8	34.2	30.0	33.4	48.0	41.4	44.3	34.2	32.4	33.3	1-1/2
Current Machine Average				26.8			10.4			33.8			44.6			31.7	
Cumulative Machine Average				27.3			10.4			32.5			44.9			29.3	
Machine Factor, %				98.2			100.0			104.3			99.3			108.4	
Machine Index, %				98.8			101.6			92.0			95.1			96.2	

DISCUSSION OF CONCORA FLAT CRUSH TEST RESULTS OBTAINED AT THE INSTITUTE OF PAPER CHEMISTRY AND THOSE OBTAINED AT THE MILLS

In Table XXIV a comparison of Institute and mill Concora flat crush test results obtained on conditioned specimens is given for the month of December. These comparisons were initiated in Progress Report 30 and permit interested participants to submit their Concora flat crush test results to The Institute of Paper Chemistry so that comparative results may be included in the monthly reports. Data sheets for supplying this information may be obtained from the Institute. Comparisons of this kind are a helpful adjunct to other calibration procedures. It may be noted in Table XXIV that nineteen of the twenty-one participating machines are included in this comparison of Concora flat crush data. Shown in Table XXIV are the Institute and mill Concora averages for each roll included in this comparison. In a few cases mill averages were not submitted for all rolls. In these instances, the current machine average based on Institute data included only those rolls for which mill data were received. The average difference between the current machine average based on Institute data and that based on mill data is shown in Table XXIV for each machine. For each roll the difference between the average Concora result based on Institute data and that based on mill data is also shown. The plus or minus sign denotes whether the mill average was higher or lower than the Institute average.

TABLE XXIV

INSTITUTE AND MILL CONCORA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR DECEMBER, 1959

Machine A						Machine B						Machine C					
	Mill		Concora Flat Crush, p.s.i.				Mill		Concora Flat Crush, p.s.i.				Mill		Concora Flat Crush, p.s.i.		
Code	Roll No.	Date Made	Institute	Mill	Difference [a]	Code	Roll No.	Date Made	Institute	Mill	Difference [a]	Code	Roll No.	Date Made	Institute	Mill	Difference [a]
A-1	2	11-29-59	46.2	45.6	-0.6[b]	B-1	211	11-20-59	34.6	38.0	+3.4	C-1	1961	10-26-59	35.9	37.1	+1.2
						B-2	212	11-20-59	34.2	37.0	+2.8	C-2	2256	10-30-59	31.0	31.7	+0.7
						B-3	219	12- 2-59	35.4	37.6	+2.2	C-3	313	11- 4-59	35.8	38.1	+2.3
						B-4	220	12- 2-59	36.5	37.8	+1.3	C-4	359	11- 5-59	37.6	36.5	-1.1
												C-5	507	11- 7-59	34.6	35.1	+0.5
												C-6	1119	11-16-59	33.1	31.3	-1.8
												C-7	1398	11-21-59	39.2	40.1	+0.9
Current Machine Av.			46.2	45.6	-0.6[b]	Current Machine Av.			35.2	37.6	+2.4	Current Machine Av.			35.3	35.7	+0.4

Machine D						Machine E						Machine F					
D-1	221	11-17-59	35.3	34.4	-0.9	E-1	364	11-17-59	40.0	38.6	-1.4	F-1	--	11-10-59	36.4	36.6	+0.2
D-2	222	11-24-59	36.1	36.1	0.0	E-2	365	11-20-59	43.9	42.7	-1.2	F-3	--	11-26-59	33.2	33.0	-0.2
D-3	223	11-27-59	34.0	35.8	+1.8	E-3	366	11-25-59	39.2	38.0	-1.2	F-4	--	12-2- 59	35.4	31.8	-3.6
D-4	224	12- 1-59	34.1	32.9	-1.2	E-4	367	11-26-59	37.4	37.3	-0.1						
D-5	225	12- 3-59	32.9	34.8	+1.9	E-5	368	12- 1-59	38.3	37.8	-0.5						
D-6	226	12- 7-59	36.0	34.9	-1.1	E-6	369	12- 3-59	38.2	37.8	-0.4						
D-7	227	12- 9-59	34.9	32.3	-2.6	E-7	370	12- 9-59	39.5	39.0	-0.5						
						E-8	371	12-11-59	38.6	37.6	-1.0						
Current Machine Av.			34.7	34.5	-0.2	Current Machine Av.			39.4	38.6	-0.8	Current Machine Av.			35.0	33.8	-1.2

Machine H						Machine I						Machine J					
H-1	175	11- 6-59	40.6	39.6	-1.0	I-1	1	12-1-59	47.9	45.7	-2.2[b]	J-1	1	11-23-59	40.0	45.1	+5.1
H-2	301	11-10-59	34.1	35.2	+1.1	I-2	2	12-8-59	41.3	46.2	+4.9[b]	J-2	2	11-24-59	46.9	49.3	+2.4
H-3	364	11-12-59	37.4	34.2	-3.2	I-3	3	12-11-59	43.0	44.6	+1.6[b]	J-3	3	12-15-59	49.7	51.4	+1.7
H-4	429	11-14-59	34.9	33.4	-1.5							J-4	4	12-16-59	40.8	44.8	+4.0
H-5	617	11-20-59	37.9	37.0	-0.9												
H-6	786	11-25-59	42.5	40.4	-2.1												
H-8	58	12- 3-59	38.3	38.4	+0.1												
H-9	91	12- 4-59	37.3	33.6	-3.7												
H-10	217	12- 8-59	38.6	39.1	+0.5												
H-11	304	12-11-59	34.9	31.0	-3.9												
H-12	391	12-14-59	35.9	36.0	+0.1												
Current Machine Av.			37.5	36.2	-1.3	Current Machine Av.			44.0	45.5	+1.5[b]	Current Machine Av.			44.3	47.6	+3.3

[a] The difference given here is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

[b] This comparison is based on Concora flat crush results obtained on specimens which were tested immediately after being fluted.

TABLE XXIV--Continued

INSTITUTE AND MILL CONCORA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR DECEMBER, 1959

Machine K

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
K-1	45	10-24-59	37.3	36.8	-0.5
K-2	46	10-26-59	35.0	36.5	+1.5
K-3	47	10-29-59	37.0	37.6	+0.6
K-4	48	11- 5-59	33.4	40.0	+1.6
K-5	49	11-11-59	36.7	37.7	+1.0
K-6	50	11-16-59	35.8	34.2	-1.6
K-7	51	11-21-59	35.8	39.1	+3.3
K-8	52	11-24-59	37.4	39.6	+2.2
K-9	53	11-25-59	36.1	37.2	+1.1
K-10	54	12- 1-59	35.8	38.2	+2.4
K-11	55	12- 6-59	35.0	38.5	+3.5
K-12	56	12-10-59	36.6	39.2	+2.6
K-13	57	12-12-59	37.8	37.6	-0.2
K-14	58	12-18-59	37.9	38.0	+0.1
Current Machine Av.			36.6	37.9	+1.3

Machine O

O-1	2155	10-27-59	33.6	32.8	-0.8
O-2	17	11- 1-59	35.5	37.7	+2.2
O-3	273	11- 4-59	36.1	38.5	+2.4
O-4	1394	11-18-59	34.7	35.2	+0.5
O-5	--	11-21-59	34.6	37.6	+3.0
Current Machine Av.			34.9	36.4	+1.5

Machine R

R-1	--	11-12-59	36.7	40.1	+3.4
R-3	--	11-25-59	37.7	36.2	-1.5
R-4	--	12- 1-59	37.8	34.6	-3.2
Current Machine Av.			37.4	37.0	-0.4

Machine U

U-1	209	11-17-59	32.8	36.0	+3.2
U-2	210	11-17-59	34.6	36.2	+1.6
U-3	217	12- 2-59	34.7	37.3	+2.6
U-4	218	12- 2-59	33.4	37.3	+3.9
Current Machine Av.			33.8	36.7	+2.9

Machine M

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
M-1	--	11-11-59	33.8	35.5	+1.7
M-3	--	11-27-59	32.9	31.2	-1.7
M-4	--	12- 3-59	31.4	30.0	-1.4
Current Machine Av.			32.7	32.2	-0.5

Machine P

P-1	213	11-27-59	38.3	39.7	+1.4
P-2	214	11-27-59	35.9	39.1	+3.2
Current Machine Av.			37.1	39.4	+2.3

Machine S

S-1	1	11-18-59	35.3	36.7	+1.4
S-2	2	11-19-59	39.6	36.6	-3.0
S-3	3	12- 8-59	41.4	45.6	+4.2
S-4	4	12- 9-59	41.4	43.8	+2.4
Current Machine Av.			39.4	40.7	+1.3

Machine N

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
N-1	522	11-24-59	38.0	41.8	+3.8
N-2	523	11-27-59	37.1	40.2	+3.1
N-3	524	12- 1-59	38.5	39.8	+1.3
N-4	525	12- 8-59	38.6	41.3	+2.7
N-5	526	12-11-59	40.4	40.6	+0.2
N-6	527	12-17-59	40.8	41.2	+0.4
N-7	528	12-18-59	37.4	39.0	+1.6
Current Machine Av.			38.7	40.6	+1.9

Machine Q

Q-1	43	12- 5-59	34.7	35.5	+0.8
Q-2	44	12- 5-59	33.1	33.6	+0.5
Q-3	45	12-17-59	35.6	39.6	+4.0
Q-4	46	12-17-59	36.8	39.4	+2.6
Q-5	47	12-17-59	37.3	39.4	+2.1
Q-6	48	12-17-59	38.8	36.4	-2.4
Q-7	49	12-17-59	35.9	37.8	+1.9
Q-8	50	12-17-59	36.7	38.3	+1.6
Current Machine Av.			36.1	37.5	+1.4

Machine T

T-1	213	11-25-59	36.2	39.7	+3.5
T-2	214	11-25-59	35.6	39.5	+3.9
T-3	221	12-11-59	39.1	42.1	+3.0
T-4	222	12-11-59	36.7	41.9	+5.2
Current Machine Av.			36.9	40.8	+3.9

[a] The difference given here is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

The data shown in Table XXIV are summarized in Part I of Table XXV where for each machine the following information is given: (1) Current machine average based on Institute data, (2) current machine average based on mill data, (3) the average difference--that is, the difference between the current machine average based on Institute data and that based on mill data and (4) the maximum difference encountered in comparing Institute and mill test averages for individual rolls. In Part II of Table XXV the average difference of Part I has been converted to per cent by dividing it by the Institute average and multiplying the result by 100. The average differences in per cent for the current report and the two preceding reports are shown. It may be seen that the highest average difference of 10.6% was associated with Machine T for the current period and the lowest of 0.6% with Machine D. Differences greater than five per cent were noted for Machines B, J, P, T, and U. Only the difference for Machine T was greater than ten per cent. In the majority of comparisons, agreement between Institute and mill data was good.

The reader's attention is directed to page 4 of this report where the comparison of Institute and mill Concora flat crush results is summarized to show the number of machines (and the cumulative percentage of all machines which this number represents) whose average Concora flat crush test results for the month of December fall within designated percentage ranges from the corresponding data obtained at the Institute.

TABLE XXV

PART I: A COMPARATIVE SUMMARY FOR EACH MACHINE OF THE CONCORA FLAT CRUSH AVERAGES BASED ON INSTITUTE DATA AND THOSE BASED ON MILL DATA

Machine Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Number of Rolls Compared	1	4	7	7	8	3	0	11	3	4	14	0	3	7	5	2	8	3	4	4	4
Concora Flat Crush, p.s.i.																					
Current Machine Av.(Institute)[a]	46.2[d]	35.2	35.3	34.7	39.4	35.0	--	37.5	44.0[d]	44.3	36.6	---	32.7	38.7	34.9	37.1	36.1	37.4	39.4	36.9	33.8
Current Machine Av.(Mill)[a]	45.6[d]	37.6	35.7	34.5	38.6	33.8	--	36.2	45.5[d]	47.6	37.9	--	32.2	40.6	36.4	39.4	37.5	37.0	40.7	40.8	36.7
Average Difference[b]	-0.6[d]	+2.4	+0.4	-0.2	-0.8	-1.2	--	-1.3	+1.5[d]	+3.3	+1.3	--	-0.5	+1.9	+1.5	+2.3	+1.4	-0.4	+1.3	+3.9	+2.9
Maximum Difference[c]	-0.6[d]	+3.4	+2.3	-2.6	-1.4	-3.6		-3.9	+4.9[d]	+5.1	+3.5	--	±1.7	+3.8	+3.0	+3.2	+4.0	+3.4	+4.2	+5.2	+3.9

PART II: A TABULATION FOR EACH MACHINE OF THE AVERAGE DIFFERENCE (PER CENT) BETWEEN THE CONCORA FLAT CRUSH AVERAGE BASED ON INSTITUTE DATA AND THAT BASED ON MILL DATA

Average Difference, %[e]																					
Current Report (December)	-1.3[d]	+6.8	+1.1	-0.6	-2.0	-3.4	--	-3.5	+3.4[d]	+7.4	+3.6	--	-1.5	+4.9	+4.3	+6.2	+3.9	-1.1	+3.3	+10.6	+8.6
55th Report (November)	--	+3.7	+2.6	+1.4	-2.3	-6.7	--	-3.8	--	--	-0.3	--	+1.5	+7.0	+8.5	+8.8	-2.0	-2.6	--	+11.0	+4.9
53rd Report (October)	--	--	+1.4	-3.9	-1.8	-3.2	--	-4.6	--	--	+5.4	--	-1.8	+3.0	+5.3	--	-4.1	+3.4	--	+10.8	+4.6

[a] Comparisons based on current machine average include only those rolls for which mill data were submitted.

[b] Average difference is the difference between the current machine average based on I.P.C. test results and that based on mill test results with the I.P.C. test results used as the reference. See Table XXIV.

[c] Maximum difference is the greatest difference encountered in comparing I.P.C. and mill test averages for individual rolls. See Table XXIV.

[d] This comparison is based on Concora flat crush results for specimens tested immediately after being fluted.

[e] Average difference (per cent) is computed by dividing the average difference in p.s.i. (shown above in Part I of this table) by the I.P.C. current machine average and multiplying the result by 100.

THE INSTITUTE OF PAPER CHEMISTRY

W. N. Hubert

W. N. Hubert, Research Aide
Container Section

R. C. McKee / L.S.

R. C. McKee, Chief, Container Section