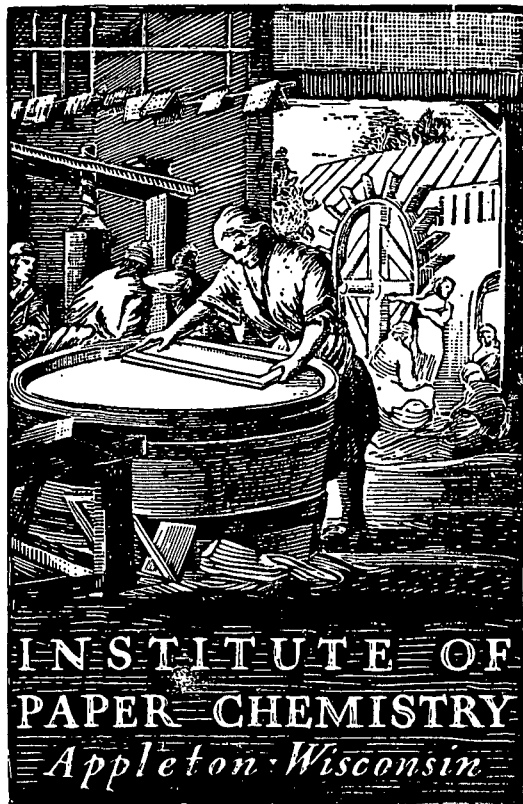


ARTS ✓

TECHNICAL



SURVEY OF "COLOR" OF 42-LB. UNBLEACHED
KRAFT LINERBOARD FOR 1972

Project 2694-8

Report Two

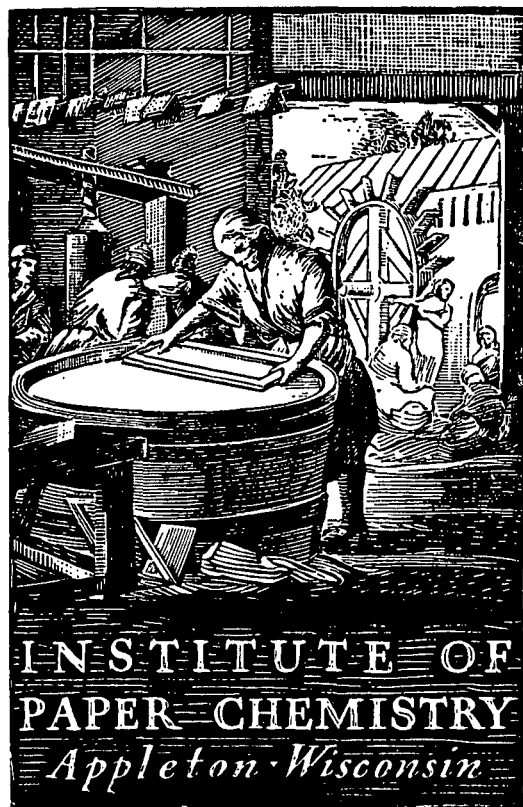
A Summary Report

to

TECHNICAL DIVISION
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

October 20, 1972

TECHNICAL



SURVEY OF "COLOR" OF 42-LB. UNBLEACHED
KRAFT LINERBOARD FOR 1972

Project 2694-8

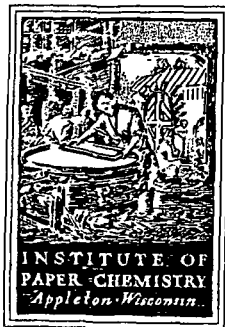
Report Two

A Summary Report

to

TECHNICAL DIVISION
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

October 20, 1972



THE INSTITUTE OF PAPER CHEMISTRY
Appleton, Wisconsin
54911

October 25, 1972

Project 2694-8

AIR MAIL

Dear Ted:

Pursuant to your letter of October 13, we are enclosing two copies of the color survey report, Project 2694-8, dated October 20, 1972. An additional 25 copies have been forwarded via air express to the Fourdrinier Kraft Board Institute, Inc. office in New York marked to your attention.

The code used in identifying the samples is shown on the attached list.

We are also sending one copy of the report to each of the five members of the Quality Audit Committee. Please advise if the remaining copies are to be sent to the other members of the technical committee or are they to be distributed at the November 16 meeting.

Yours very truly,

R. C. McKee
Chairman
Container Section

Mr. T. J. Gross, Technical Director
Fourdrinier Kraft Board Institute, Inc.
Suite 810
1605 Main Street
Sarasota, Florida 33577

RCM/mjm
Enclosure

Copy to: A. R. Boren

RECEIVED OCT 26 1972

Project 2694-8 - Sample Code

Company	Location	Machine No.	Code Numbers		
			Normal ^a	Darkest ^a	Lightest ^a
1. Alabama Kraft Company	Phenix City, Ala.	--	70	71	72
2. Alton Box Board Company	Jacksonville, Fla.	--	76	77	78
3. The Chesapeake Corp.	West Point, Va.	1	64	65	66
	West Point, Va.	2	67	68	69
4. Container Corp. of America	Fernandina Beach, Fla.	3	40	41	42
5. Continental Can Co., Inc.	Port Wentworth, Ga.	1	61	62	63
6. Crown Zellerbach Corp.	Antioch, Calif.	1	91	92	93
	Bogalusa, La.	--	25	26	27
7. Georgia Kraft Co.	Macon, Ga.	--	1	2	3
	Rome, Ga.	1	88	89	90
	Rome, Ga.	2	85	86	87
8. Georgia-Pacific Corp.	Toledo, Ore.	1	106	107	108
9. Great Northern Paper Co.	Cedar Springs, Ga.	1	103	104	105
	Cedar Springs, Ga.	2	100	101	102
10. Hoerner Waldorf Corp.	Missoula, Mont.	1	94	95	96
	Missoula, Mont.	2	97	98	99
	Roanoke Rapids, N.C.	4	49	50	51
11. International Paper Co.	Gardiner, Ore.	1	124	125	126
	Georgetown, S. C.	1	73	74	75
	Georgetown, S. C.	3	82	83	84
	Panama City, Fla.	--	58	59	60
	Springhill, La.	1	46	47	48
	Vicksburg, Miss.	1	31	32	33
12. MacMillan Bloedel Inc.	Pine Hill, Ala.	1	34	35	36
13. Olinkraft, Inc.	West Monroe, La.	2	109	110	111
14. Owens-Illinois, Inc.	Orange, Texas	--	4	5	6
	Valdosta, Ga.	1	16	17	18
	Valdosta, Ga.	2	10	11	12
15. Pineville Kraft Corp.	Pineville, La.	--	52	53	54
16. St. Joe Paper Co.	Port St. Joe, Fla.	1	7	8	9
	Port St. Joe, Fla.	2	13	14	15

<u>Company</u>	<u>Location</u>	<u>Machine No.</u>	<u>Code Numbers</u>		
			<u>Normal^a</u>	<u>Darkest^a</u>	<u>Lightest^a</u>
17. St. Regis Paper Co.	Monticello, Miss.	2	79	80	81
	Jacksonville, Fla.	2	55	56	57
	Tacoma, Washington	32	22	33	24
	Tacoma, Washington	2	127	128	129
18. Tenn. River Pulp & Paper Co.	Counce, Tenn.	--	112	113	114
19. Union Camp Corp.	Montgomery, Ala.	--	28	29	30
	Savannah, Ga.	4	37	38	39
	Savannah, Ga.	6	43	44	45
20. Westvaco Corp.	N. Charleston, S. C.	--	19	20	21
21. Weyerhaeuser Co.	Plymouth, N. C.	1	121	122	123
	Springfield, Ore.	1	118	119	120
	Springfield, Ore.	2	115	116	117

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SURVEY OF "COLOR" OF 42-LB. UNBLEACHED KRAFT LINERBOARD FOR 1972

Project 2694-8

Report Two

A Summary Report

to

TECHNICAL DIVISION
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

October 20, 1972

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THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SURVEY OF "COLOR" OF 42-LB. UNBLEACHED KRAFT LINERBOARD FOR 1972

INTRODUCTION

A comparative evaluation of the "color" of 42-lb. unbleached kraft liner has been carried out to determine the "color" variations present in current "industry" production. Color is characterized in terms of (a) luminous reflectance, (b) standard brightness measured by means of the Brightness tester, and (c) brightness measured by means of the Photovolt tester. This survey includes 129 samples from 43 machines of the following companies:

Alabama Kraft Company	International Paper Company
Alton Box Board Company	MacMillan Bloedel Inc.
The Chesapeake Corporation	Olinkraft, Inc.
Container Corporation of America	Owens-Illinois, Inc.
Continental Can Company, Inc.	Pineville Kraft Corporation
Crown Zellerbach Corporation	St. Joe Paper Company
Georgia Kraft Company	St. Regis Paper Company
Georgia-Pacific Corporation	Tenn. River Pulp & Paper Co.
Great Northern Paper Company	Union Camp Corporation
Hoerner Waldorf Corporation	Westvaco Corporation
	Weyerhaeuser Company

All samples are identified by code number.

SAMPLING AND TEST PROCEDURE

Each company was requested to submit three samples from each machine which produced 42-lb. unbleached kraft linerboard during the past six months. The samples were to be selected from normal production intended for use in the United States - i.e., no special production was to be included. The three samples from a given machine were to be selected so as to represent the "normal," darkest, and lightest production of 42-lb. unbleached linerboard of the machine in question during the six-month period.

Code numbers were assigned to each set of three samples as follows:

Mill Designation	Code Number
Normal sample	Lowest number
Darkest sample	Intermediate number
Lightest sample	Highest number

For example, Code Numbers 76, 77, and 78 represent the normal, darkest, and lightest samples, respectively, from a given machine.

In most cases a sample consisted of six 12 x 12-inch sheets. One luminous reflectance, standard brightness, and Photovolt brightness measurement was made on each of five sheets, material permitting, to give a total of five readings per sample per type of measurement. The determinations were made on the side opposite the wire side.

The Photovolt measurements were carried out at the Institute using an instrument supplied by one of the F.K.I. members. The sensing element was marked 610W. The instrument adjustment was calibrated using the ceramic standard supplied with the instrument.

DISCUSSION OF RESULTS

The results for all machines are summarized in Table I. Separate tabulations for the southern and western machines are shown in Tables II and III, respectively. In each table the results are arranged in ascending order of luminous reflectance based on the normal sample.

In some instances the mill designations of the normal, darkest, and lightest samples did not correspond with the luminous reflectance readings. In these cases the sample order was changed in tabulating the data to correspond with the luminous reflectance readings. For example, in Table I, Sample 1 which was designated normal by the mill exhibited a lower luminous reflectance than the darkest sample for that mill (Code No. 2). Accordingly, the results for Sample 2 were tabulated in the Normal column and the results for Sample 1 in the Darkest column.

The average, maximum, minimum, and standard deviation values are based on the results for the normal samples only.

Table IV shows frequency distributions based on the normal samples.

Appendix I contains a display of the 129 samples. The specimens are cut 1-1/2 inches C.D. by 2 inches M.D. and are displayed wire side down.

The specimens are arranged in Appendix I in the same order as shown in Table I - i.e., from darkest to lightest in terms of luminous reflectance of the "normal" sample from each machine. The darkest normal sample is located at the upper left corner of the first folded page and the lightest normal sample is located at the lower right corner (Normal column) of the second folded page.

Table V compares the 1971 and 1972 results.

TABLE I
 COMPOSITE DATA FOR ALL MACHINES

Code Number	Luminous Reflectance, %			Standard Brightness, %			Photovolt Brightness, %		
	Normal	Darkest	Lightest	Normal	Darkest	Lightest	Normal	Darkest	Lightest
76,77,78	20.7	20.4	23.9	11.7	11.3	13.1	18.6	18.1	20.7
61,62,63	22.2	20.3	25.4	12.3	11.3	14.4	20.6	19.0	22.1
28,29,30	23.7	21.3	25.8	13.5	12.5	15.1	21.4	19.3	22.8
2,1,3 ^a	24.0	22.2	25.9	14.6	11.6	14.5	21.2	19.5	21.7
58,59,60	24.0	22.6	27.5	15.2	14.1	18.1	21.7	20.9	24.7
57,56,55 ^a	24.0	23.2	24.3	13.8	13.6	14.4	21.1	21.2	21.7
72,71,70 ^a	24.2	21.9	25.3	13.9	12.5	14.8	21.8	19.6	21.9
106,107,108 ^b	24.7	22.3	26.3	13.9	12.7	15.2	21.4	20.6	22.5
11,10,12 ^a	24.8	24.4	28.4	14.6	14.4	17.2	21.1	20.7	23.7
94,95,96 ^b	24.9	24.9	26.4	14.6	14.6	15.7	22.0	22.3	23.2
103,104,105	25.0	24.2	25.5	14.3	14.2	14.3	22.5	22.0	22.5
124,125,126 ^b	25.1	22.5	25.5	14.8	12.9	14.6	22.6	20.1	22.5
34,35,36	25.2	22.9	28.4	14.6	13.9	17.0	21.7	19.8	23.7
64,65,66	25.2	24.4	26.5	15.4	14.9	16.8	22.3	21.5	23.5
121,122,123	25.5	23.7	27.1	14.8	13.5	15.9	22.0	21.0	23.9
52,53,54	25.6	23.6	26.0	14.9	13.1	15.1	22.7	21.2	22.8
98,99,97 ^{a,b}	25.7	24.8	26.0	15.5	14.4	15.2	23.1	22.5	23.9
112,113,114	26.1	24.4	29.2	16.2	14.9	17.9	23.3	22.5	25.0
40,41,42	26.2	26.2	27.8	15.7	16.2	17.2	22.1	22.7	23.7
21,20,19 ^a	26.3	24.4	29.3	15.6	13.6	17.9	22.7	20.9	24.9
13,14,15	26.4	25.0	28.5	15.1	14.6	17.0	22.9	22.4	24.8
4,5,6	26.5	24.7	30.0	14.6	13.7	17.7	22.7	21.7	26.3
85,86,87	26.5	25.0	28.7	15.6	14.8	17.2	23.4	21.8	24.7
67,68,69	26.5	25.0	30.1	15.1	14.5	18.3	22.5	22.0	25.0
100,101,102	26.9	24.7	27.9	15.9	14.3	17.1	23.0	21.8	23.7
31,32,33	27.0	26.1	28.2	15.8	15.2	17.0	23.0	22.1	23.5
115,116,117 ^b	27.1	26.2	28.7	16.3	15.2	17.0	23.5	23.1	25.1
43,44,45	27.3	25.8	29.5	16.2	15.1	18.1	24.0	22.2	24.8
49,50,51	27.3	26.0	29.1	16.8	16.1	18.5	23.9	22.9	25.8
88,89,90	27.4	24.4	28.9	16.3	14.4	17.7	23.9	22.2	25.5
118,119,120 ^b	27.4	26.8	29.6	16.0	15.6	17.4	23.8	23.2	25.3
109,110,111	27.5	26.5	28.3	16.3	15.3	16.9	23.1	22.7	24.1
92,91,93 ^{a,b}	27.5	27.3	30.5	16.4	16.1	18.2	23.2	23.3	25.3
16,17,18	27.7	25.5	29.6	16.5	15.0	18.1	23.8	22.5	25.7
37,38,39	27.8	24.7	29.4	17.1	14.7	17.6	23.3	21.7	24.6
82,83,84	27.8	27.0	30.0	17.1	16.1	18.3	24.2	23.4	25.6
25,26,27	27.9	25.7	29.0	17.5	16.1	17.7	24.9	23.7	25.6
7,8,9	28.2	26.1	28.8	16.4	15.2	16.9	23.6	22.7	24.9
79,80,81	28.2	26.9	29.3	16.4	15.4	17.1	23.7	22.7	24.6
73,74,75	28.5	28.0	30.5	17.5	17.5	19.5	25.3	24.7	26.5
46,47,48	29.1	28.3	31.4	17.4	17.8	19.1	24.1	24.4	26.0
22,23,24 ^b	31.6	25.7	34.7	19.5	15.7	22.4	27.0	23.3	30.0
127,128,129 ^b	33.7	26.0	39.4	21.0	15.8	25.2	29.7	23.5	33.1
Average	26.4			15.6			23.0		
Maximum	33.7			21.0			29.7		
Minimum	20.7			11.7			18.6		
Standard deviation	2.23			1.65			1.74		

^aMill designations of normal, darkest, and lightest brightness did not correspond with luminous reflectance results. Therefore, the sample order was changed in the tabulation to correspond with the luminous reflectance readings.

^bWestern machines.

TABLE II
 RESULTS ON SOUTHERN SAMPLES

Code Number	Luminous Reflectance, %			Standard Brightness, %			Photovolt Brightness, %		
	Normal	Darkest	Lightest	Normal	Darkest	Lightest	Normal	Darkest	Lightest
76,77,78	20.7	20.4	23.9	11.7	11.3	13.1	18.6	18.1	20.7
61,62,63	22.2	20.3	25.4	12.3	11.3	14.4	20.6	19.0	22.1
28,29,30	23.7	21.3	25.8	13.5	12.5	15.1	21.4	19.3	22.8
2,1,3 ^a	24.0	22.2	25.9	14.6	11.6	14.5	21.2	19.5	21.7
58,59,60	24.0	22.6	27.5	15.2	14.1	18.1	21.7	20.9	24.7
57,56,55 ^a	24.0	23.2	24.3	13.8	13.6	14.4	21.1	21.2	21.7
72,71,70 ^a	24.2	21.9	25.3	13.9	12.5	14.8	21.8	19.6	21.9
11,10,12 ^a	24.8	24.4	28.4	14.6	14.4	17.2	21.1	20.7	23.7
103,104,105	25.0	24.2	25.5	14.3	14.2	14.3	22.5	22.0	22.5
34,35,36	25.2	22.9	28.4	14.6	13.9	17.0	21.7	19.8	23.7
64,65,66	25.2	24.4	26.5	15.4	14.9	16.8	22.3	21.5	23.5
121,122,123	25.5	23.7	27.1	14.8	13.5	15.9	22.0	21.0	23.9
52,53,54	25.6	23.6	26.0	14.9	13.1	15.1	22.7	21.2	22.8
112,113,114	26.1	24.4	29.2	16.2	14.9	17.9	23.3	22.5	25.0
40,41,42	26.2	26.2	27.8	15.7	16.2	17.2	22.1	22.7	23.7
21,20,19 ^a	26.3	24.4	29.3	15.6	13.6	17.9	22.7	20.9	24.9
13,14,15	26.4	25.0	28.5	15.1	14.6	17.0	22.9	22.4	24.8
4,5,6	26.5	24.7	30.0	14.6	13.7	17.7	22.7	21.7	26.3
85,86,87	26.5	25.0	28.7	15.6	14.8	17.2	23.4	21.8	24.7
67,68,69	26.5	25.0	30.1	15.1	14.5	18.3	22.5	22.0	25.0
100,101,102	26.9	24.7	27.9	15.9	14.3	17.1	23.0	21.8	23.7
31,32,33	27.0	26.1	28.2	15.8	15.2	17.0	23.0	22.1	23.5
43,44,45	27.3	25.8	29.5	16.2	15.1	18.1	24.0	22.2	24.8
49,50,51	27.3	26.0	29.1	16.8	16.1	18.5	23.9	22.9	25.8
88,89,90	27.4	24.4	28.9	16.3	14.4	17.7	23.9	22.2	25.5
109,110,111	27.5	26.5	28.3	16.3	15.3	16.9	23.1	22.7	24.1
16,17,18	27.7	25.5	29.6	16.5	15.0	18.1	23.8	22.5	25.7
37,38,39	27.8	24.7	29.4	17.1	14.7	17.6	23.3	21.7	24.6
82,83,84	27.8	27.0	30.0	17.1	16.1	18.3	24.2	23.4	25.6
25,26,27	27.9	25.7	29.0	17.5	16.1	17.7	24.9	23.7	25.6
7,8,9	28.2	26.1	28.8	16.4	15.2	16.9	23.6	22.7	24.9
79,80,81	28.2	26.9	29.3	16.4	15.4	17.1	23.7	22.7	24.6
73,74,75	28.5	28.0	30.5	17.5	17.5	19.5	25.3	24.7	26.5
46,47,48	29.1	28.3	31.4	17.4	17.8	19.1	24.1	24.4	26.0
Average	26.1			15.4			22.7		
Maximum	29.1			17.5			25.3		
Minimum	20.7			11.7			18.6		
Standard deviation	1.87			1.39			1.34		

^a Mill designations of normal, darkest, and lightest brightness did not correspond with luminous reflectance results. Therefore, the sample order was changed in the tabulation to correspond with the luminous reflectance readings.

TABLE III
 RESULTS ON WESTERN SAMPLES

Code Number	Luminous Reflectance, %		Standard Brightness, %		Photovolt Brightness, %	
	Normal	Darkest	Normal	Darkest	Normal	Darkest
106,107,108	24.7	22.3	13.9	12.7	21.4	20.6
94,95,96	24.9	24.9	14.6	14.6	22.0	22.3
124,125,126	25.1	22.5	14.8	12.9	22.6	20.1
98,99,97 ^a	25.7	24.8	15.5	14.4	23.1	22.5
115,116,117	27.1	26.2	16.3	15.2	23.5	23.9
118,119,120	27.4	26.8	16.0	15.6	23.8	23.1
92,91,93 ^a	27.5	27.3	16.4	16.1	23.2	23.2
22,23,24	31.6	25.7	19.5	15.7	27.0	23.3
127,128,129	33.7	26.0	21.0	15.8	29.7	23.5
Average	27.5		16.4		24.0	
Maximum	33.7		21.0		29.7	
Minimum	24.7		13.9		21.4	
Standard deviation	3.14		2.34		2.64	

^a Mill designations of normal, darkest, and lightest brightness did not correspond with luminous reflectance results. Therefore, the sample order was changed in the tabulation to correspond with the luminous reflectance readings.

TABLE IV
 FREQUENCY DISTRIBUTIONS BASED ON NORMAL SAMPLES

Range	Composite		Western		Southern	
	Number	%	Number	%	Number	%
Luminous Reflectance						
20.0-20.9	1	2.3	--	--	1	2.9
21.0-21.9	0	--	--	--	0	--
22.0-22.9	1	2.3	--	--	1	2.9
23.0-23.9	1	2.3	--	--	1	2.9
24.0-24.9	7	16.3	2	22.2	5	14.7
25.0-25.9	7	16.3	2	22.2	5	14.7
26.0-26.9	8	18.6	--	--	8	23.5
27.0-27.9	12	27.9	3	33.3	9	26.5
28.0-28.9	3	7.0	--	--	3	8.8
29.0-29.9	1	2.3	--	--	1	2.9
30.0-30.9	--	--	--	--	--	--
31.0-31.9	1	2.3	1	11.1	--	--
32.0-32.9	--	--	--	--	--	--
33.0-33.9	1	2.3	1	11.1	--	--
Standard Brightness						
11.0-11.9	1	2.3	--	--	1	2.9
12.0-12.9	1	2.3	--	--	1	2.9
13.0-13.9	4	9.3	1	11.1	3	8.8
14.0-14.9	9	20.9	2	22.2	7	20.6
15.0-15.9	10	23.3	1	11.1	9	26.5
16.0-16.9	11	25.6	3	33.3	8	23.5
17.0-17.9	5	11.6	--	--	5	14.7
18.0-18.9	--	--	--	--	--	--
19.0-19.9	1	2.3	1	11.1	--	--
20.0-20.9	--	--	--	--	--	--
21.0-21.9	1	2.3	1	11.1	--	--
Photovolt Brightness						
18.0-18.9	1	2.3	--	--	1	2.9
19.0-19.9	--	--	--	--	--	--
20.0-20.9	1	2.3	--	--	1	2.9
21.0-21.9	8	18.6	1	11.1	7	20.6
22.0-22.9	11	25.6	2	22.2	9	26.5
23.0-23.9	15	34.9	4	44.4	11	32.4
24.0-24.9	4	9.3	--	--	4	11.8
25.0-25.9	1	2.3	--	--	1	2.9
26.0-26.9	--	--	--	--	--	--
27.0-27.9	1	2.3	1	11.1	--	--
28.0-28.9	--	--	--	--	--	--
29.0-29.9	1	2.3	1	11.1	--	--

TABLE V
 COMPARISON OF 1971 AND 1972 RESULTS

	Luminous Reflectance		Standard Brightness		Photovolt Brightness	
	1971	1972	1971	1972	1971	1972
Composite						
Average	26.3	26.4	15.8	15.6	24.0	23.0
Maximum	34.3	33.7	22.1	21.0	30.5	29.7
Minimum	21.1	20.7	12.4	11.7	20.7	18.6
Standard deviation	1.87	2.23	1.48	1.65	1.52	1.74
Southern						
Average	26.2	26.1	15.7	15.4	23.8	22.7
Maximum	28.5	29.1	18.5	17.5	26.2	25.3
Minimum	23.5	20.7	13.3	11.7	20.8	18.6
Standard deviation	1.27	1.87	1.12	1.39	1.10	1.34
Western						
Average	27.0	27.5	16.2	16.4	24.7	24.0
Maximum	34.3	33.7	22.1	21.0	30.5	29.7
Minimum	21.1	24.7	12.4	13.9	20.7	21.4
Standard deviation	3.48	3.14	2.58	2.34	2.65	2.64

APPENDIX I
SAMPLE DISPLAY

Code No.

Normal

Darkest

Lightest

76, 77, 78

61, 62, 63

28, 29, 30

2, 1, 3

58, 59, 60

57, 56, 55

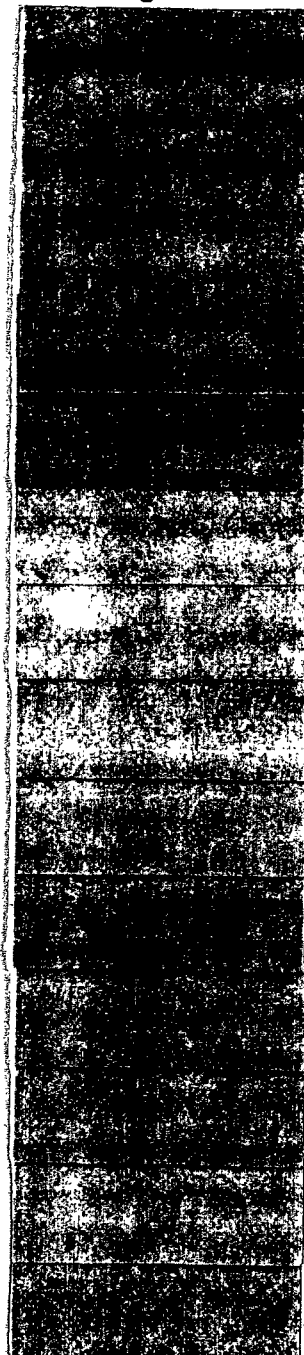
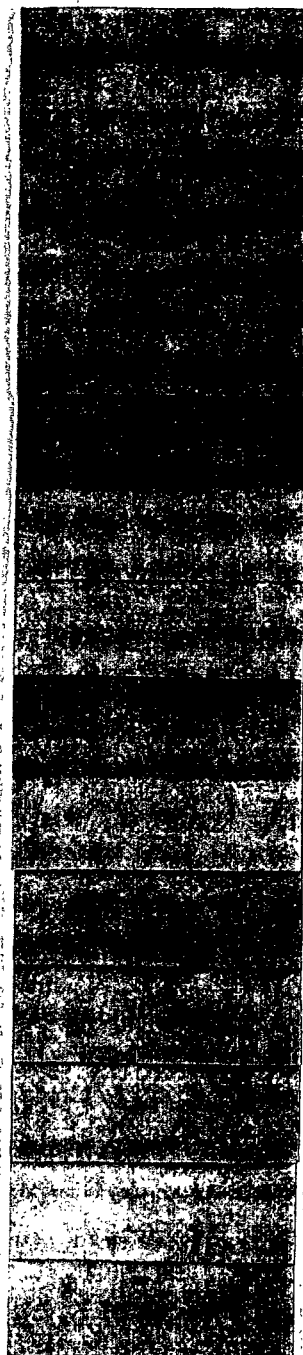
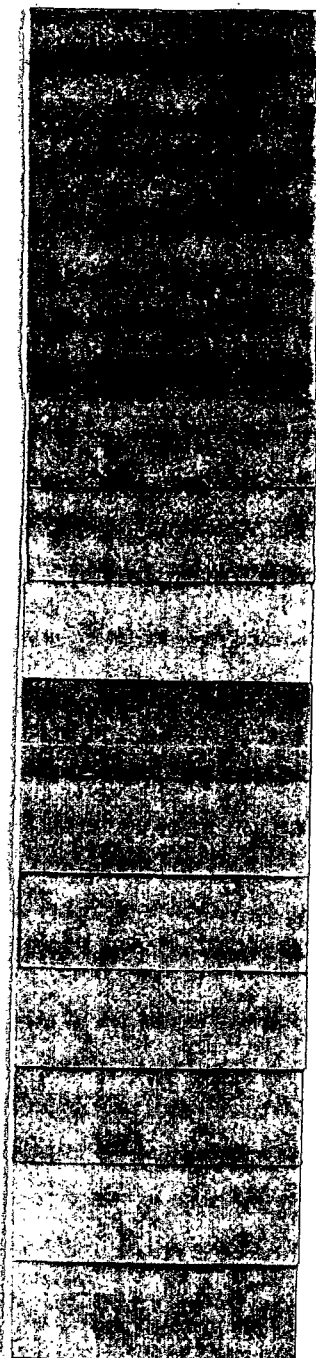
72, 71, 70

106, 107, 108

11, 10, 12

94, 95, 96

103, 104, 105



Code No.

Normal

Darkent

Lightent

124, 125, 126

34, 35, 36

64, 65, 66

121, 122, 123

52, 53, 54

98, 99, 97

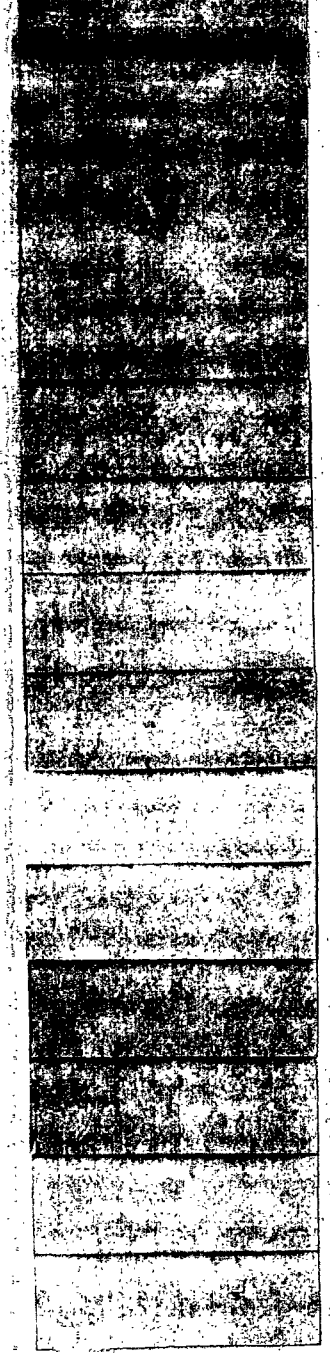
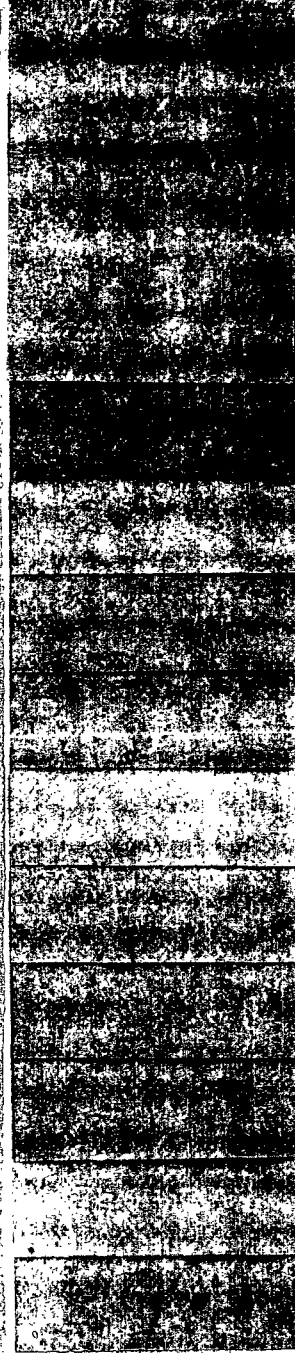
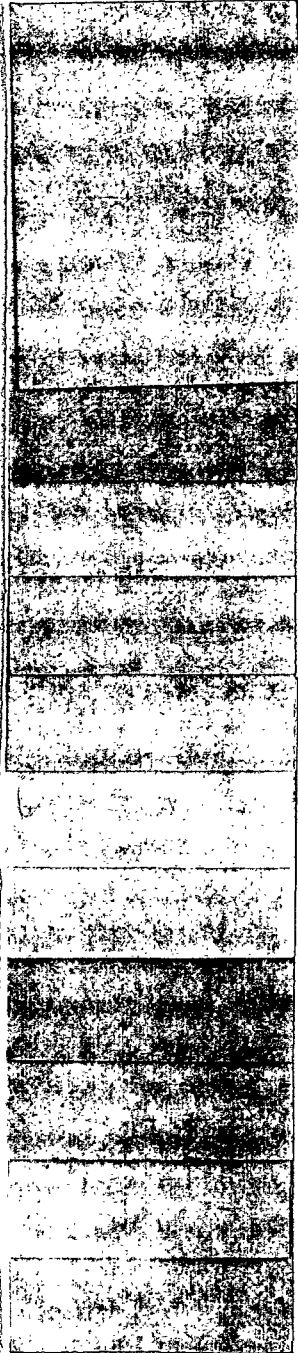
112, 113, 114

40, 41, 42

21, 20, 19

13, 14, 15

4, 5, 6



Code No.

Normal

Darkest

Lightest

85, 86, 87

67, 68, 69

100, 101, 102

31, 32, 33

115, 116, 117

43, 44, 45

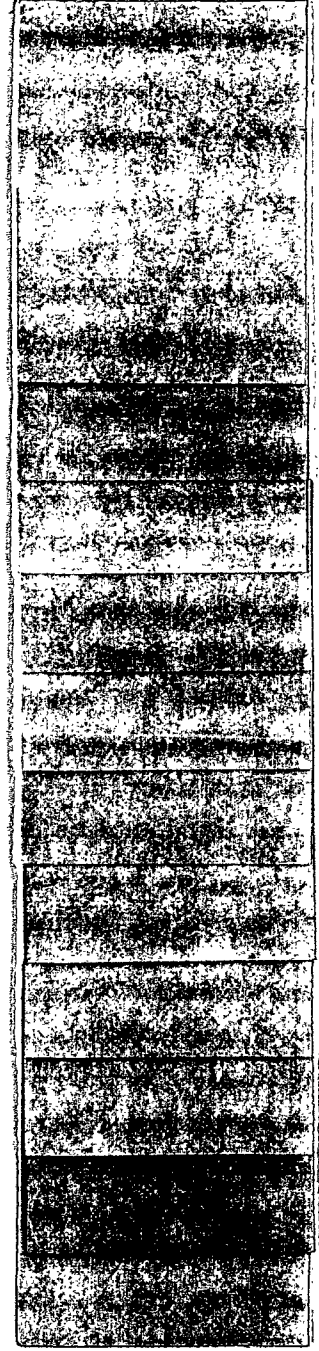
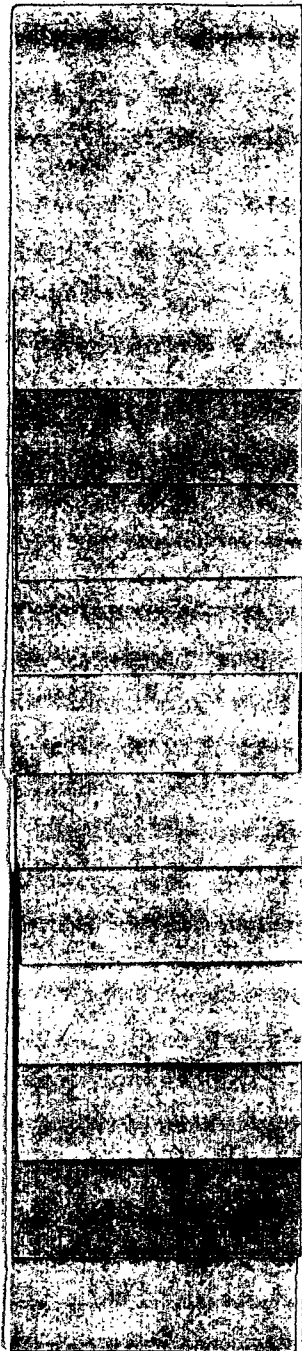
49, 50, 51

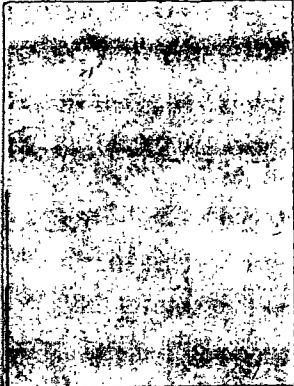
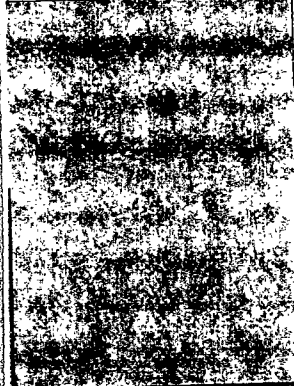
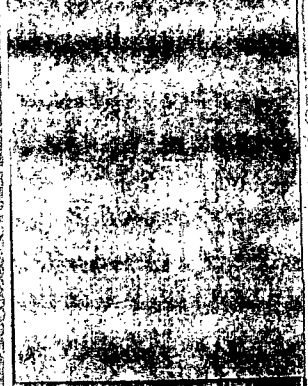



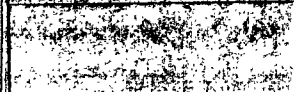


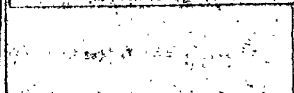

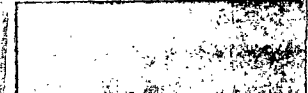
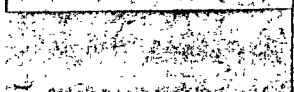








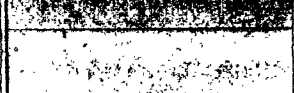


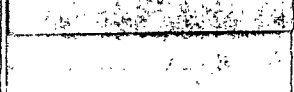

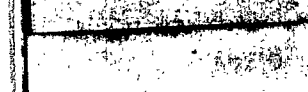
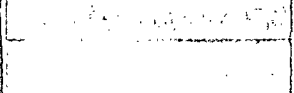

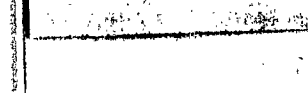
88, 89, 90

118, 119, 120

109, 110, 111

92, 91, 93



Code No.	Normal	Darkest	Lightest
16, 17, 18			
37, 38, 39			
82, 83, 84			
25, 26, 27			
7, 8, 9			
79, 80, 81			
73, 74, 75			
46, 47, 48			
22, 23, 24			
127, 128, 129			

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