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THE WURLITZER COMPANY

NORTH TONAWANDA DIVISION
NORTH TONAWANDA NEW YORK

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
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Emelda Selph 9/5/96
CHANGING MARKING OR DATE
WC Layne 9-5-96
PERSON VERIFYING MARKING & DATE
CLASSIFY W. C. Layne
RECORD ID 96SN477
DATED 9-5-96

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REPORT NUMBER 13

FOR PERIOD ENDING NOVEMBER 15, 1959

SANDIA PURCHASE ORDER 15-1536 (Item No. 10)

MC-818 IMPROVEMENT PROGRAM

Report By: Frank W. Rudolph
F. W. Rudolph
Staff Engineer

Reviewed By: R. T. Mead
R. T. Mead
Director
Power Sources Engineering Department

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R. T. Duff 9-5-96
WC Layne
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Approved By: A. D. Arsen
A. D. Arsen
Manager
Engineering & Research

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INTRODUCTION

This report covers the experimental work on the MC-818 Battery Improvement completed from September 30, 1959 to November 15, 1959.

This work was authorized under Sandia Purchase Order 15-1536; Item No. 10, and is a re-evaluation of the agglomerate process for preparing heat powder slurry.

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PROCEDURE

Heat powder, prepared by the DOFL agglomerate mixing process, was received from Eureka-Williams Corporation on October 20, 1959. Classification of material is shown in Appendix I.

Calorific checks were made by Wurlitzer on the heat powder as received (Appendix II).

DOFL was contacted and arrangements made to have Mr. Raymond Comyn and Mr. Robert McIntyre observe the operation on November 4, 1959. At this time, the fiber content to be used in each lot was given to Wurlitzer by DOFL (Appendix III). Mr. Robert Gordon from Eureka-Williams observed the second run (heat powder made with Kentucky Color Barium Chromate) made on November 5, 1959.

Neither acid nor sodium hexametaphosphate was used in preparing the slurry. All equipment was thoroughly cleaned out with demineralized water prior to operation. Acid was used to control pH in making the base sheet (Appendix III).

Each lot was mixed in two batches through Wurlitzer's homo-mixer. Samples were removed and calorific checks taken on the slurry (Appendix IV). DOFL predictions of the calorific value were within one-half of one percent of our values. This would definitely expedite production as it would be unnecessary to await calorific checks prior to a run if this degree of correlation can be maintained.

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Using standard 818 production methods which have given exceptionally uniform weight distributions,(see Figure 3) difficulties were encountered maintaining the target weight (Figures 1 and 2). From past experience, there are numerous changes in process used with the agglomerate slurry which could result in a more uniform paper. This would require a certain amount of time and experimentation with this type of mix. It was not felt advisable at this time to experiment with the equipment as we are obligated to manufacture forty batteries from each lot. Near the end of each run, the slurry in the pool was agitated with beneficial results as can be seen on charts in Figure 1 and Figure 2.

As can be seen in the distribution of the production sample, (Appendix V) more than enough paper was obtained to manufacture the experimental units. The following information is included in appropriate appendices. Burning rate (Appendix VIa), Resistance (Appendix VIb) and Calorific Values (Appendix V).

The amount of heat paper gassing will be delayed until Wurlitzer can obtain oil bath equipment necessary to run this test. All paper, other than that used to run production quality checks, has been cut into sheet, canned and sealed awaiting further instructions from Sandia.

Four sheets from each lot have been securely packed and shipped to Sandia, the University of Florida and DOFL.

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SUMMARY

The following observations can be made regarding the agglomerate process from the information on hand:

1. A change in present production methods would be called for to obtain better "on target" yield. (Comparisons on Figures 1, 2, and 3.)

2. Predictability of calorific value is better with this method than the one presently used.

3. Burning rate of the heat paper lot using Kentucky Color chromate is slower than the present material in use. (Appendix VIb)

4. Elimination of acid and sodium hexametaphosphate simplifies production procedure.

The final evaluations of the process cannot be made until this paper is used in batteries. From a production point of view, the process does have merit; that is, elimination of pH control and sodium hexametaphosphate and calorific predictability.

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APPENDIX I

Classification of Heat Powder as Received from

Eureka-Williams

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APPENDIX I

Heat Powder Obtained from Eureka-Williams

P.O. 16203-G, Lot No. 1

Zirconium powder, Lot No. 905G-4, Foote Mineral Prod. Corporation; Ignition gain 31.43. Other chemical analysis and particle size evaluations in accordance with NAVORD-OS-8935. Barium chromate supplied by J.T. Baker Chemical Co., Lot No. 20564. Eureka-Williams Lot No. 67. Calorie values 455.1, 454.5, 454.8, 454.8 - average 454.8 calories per gram. Approximate solids content - 20.2%.

P.O. 16859-G, Lot No. 2

Zirconium powder, Lot No. 905G-4, Foote Mineral Corp. Ignition gain 31.43. Other chemical analysis and particle size evaluation in accordance with NAVORD-OS-8935. Barium chromate supplied by Kentucky Color and Chemical Co., Lot No. 6907. Eureka-Williams Lot No. 69. Calorie values 455.5, 456.0, 454.8, 455.6 - average 455.3 calories per gram. Approximate solids content - 19.6%.

The material was received in two lots. Each lot had six 5 gallon plastic sealed liner cans. Each lot contained approximately 54 lbs. dry weight of material.

Barium chromate was to conform to Specification NAVORD-OS-8935.

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APPENDIX I (Continued)

Particle size according to sub-sieve sizer:

Less than 20 microns	99.5% minimum
Less than 9 microns	97.0% minimum
Less than 3 microns	87.0% minimum
Less than 0.75 microns	(16% minimum (50% maximum

Chemical:

Chloride less than .05%

Sulfate less than .01% (to be increased to .03%)

Baker met particle size and chemical specification.

Kentucky met particle size but was slightly high on chloride and sulfate.

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APPENDIX II

Calorific Values of Heat Powders

as Received

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APPENDIX II

Calorific Checks on 228 Powder as Received

	Eureka-Williams cals/gr.	Wurlitzer cals/gr.	DOFL cals/gr.
Lot No. 1, Baker Chromate	455.1	456.08	451.9
	454.5	455.77	
	454.8		
	454.8		
Lot No. 2, Kentucky Color Chromate	455.5	457.43	453.7
	456.0	457.88	
	454.8		
	455.6		

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APPENDIX III

Fibers Used in Heat Paper

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APPENDIX III

Fibers Used in Heat Paper Run

Base Sheet:

Identical for both lots.

Glass vitron	Code 104 (LOF)	1774 grams
Fiberfrax	(Carborundum)	1774 grams
Asbestos 7R	(Johns-Manville)	1182 grams

Approximately 10 grams of fibers per liter - pH adjusted to 2.6

Base sheet was maintained at 45 mgs. per square inch.

Lot No. 1, Baker Slurry:

Fibers mixed with 54 lbs. of powder.

Vitron 104	1416 grams
Fiberfrax	1416 grams
Asbestos 7R	944 grams

Lot No. 2, Kentucky Color Slurry:

Fibers mixed with 54 lbs. of powder.

Vitron 104	1443 grams
Fiberfrax	1443 grams
Asbestos 7R	962 grams

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APPENDIX IV

Calorific Checks on Slurry (Powder & Fiber)

Calorific Checks on Pre-production Paper

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APPENDIX IV

Caloric Checks on Slurry (Powder & Fibers)

The sample was filtered through a Buchner funnel, washed with acetone and oven dried for approximately 40 minutes.

Lot No. 1, Baker:

407.0 cals/gr.
406.0 cals/gr.

DOFL predicted 407 calories per gram.

Lot No. 2, Kentucky Color:

400.3 cals/gr.
403.11 cals/gr.
398.52 cals/gr.
401.04 cals/gr.

Calorific Checks on Pre-production Run of Paper:

A short run of the paper machine is made and weight adjusted to as close an approximation of what the desired weight will be in production. Samples are cut out, vacuum oven dried for two hours and caloric checks run.

Baker Lot:

364.56 cals/gr.
363.91 cals/gr.

DOFL predicted 365.0 calories per gram.

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APPENDIX IV (Continued)

Kentucky Color:

365.32 cals/gr.

366.06 cals/gr.

All calorific checks were made using the Parr calorimeters modified for argon atmosphere in the bomb.

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[redacted]

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APPENDIX V

Calorific Checks of Production Sample and

Distribution Charts for these Two Lots

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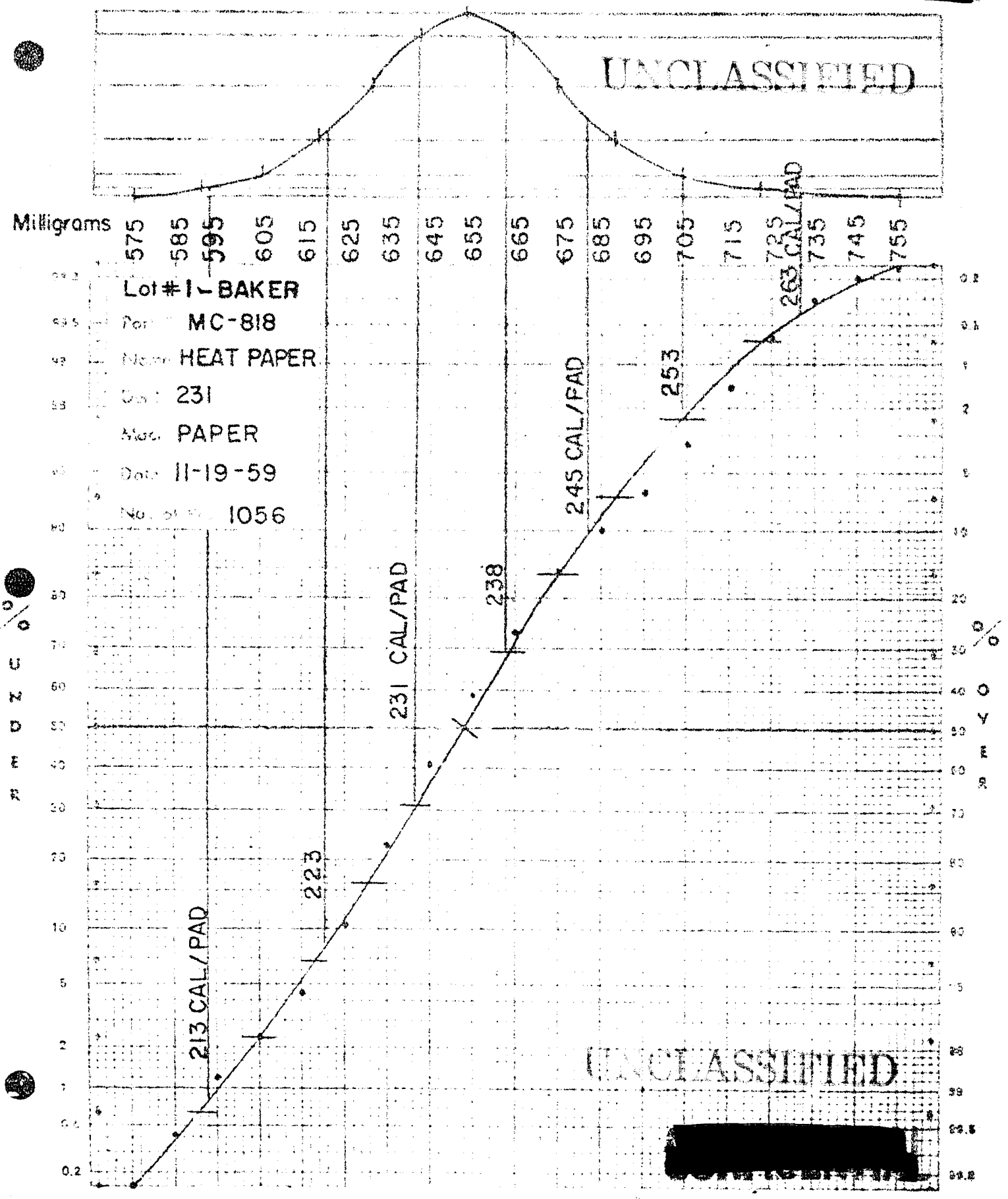
PROCESS CAPABILITY STUDY SHEET



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QUALITY CONTROL SECTION
THE WURLITZER COMPANY

MC-818 - LOT NO. 1 Baker

COMPUTATION REPORT

weight	ranges	f	d	fd	fd^2
580	590	8	-7	-56	392
590	600	10	-6	-60	360
600	610	15	-5	-75	375
610	620	30	-4	-120	480
620	630	94	-3	-282	846
630	640	163	-2	-326	652
640	650	219	-1	-219	219
650	660	159	[illegible]	1138	0
660	670	147	[illegible]	147	147
670	680	88	2	176	352
680	690	36	3	108	324
690	700	38	[illegible]	152	608
700	710	26	[illegible]	131	650
710	720	14	6	84	504
720	730	5	7	35	245
730	740	[illegible]	8	8	64
740	750	2	9	8	162
750	760	1	10	10	100
		1056		808	6480
				-270	

COMPUTATIONS [redacted]

X_w = origin + $i\left(\frac{\Sigma fd}{N}\right)$ = 655 + $10\left(\frac{-270}{1056}\right)$ = 10(-.256)

= 655 + (-2.56) = 652.4

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σ_w = $i\sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2}$ = $10\sqrt{\frac{6480}{1056} - (-.256)^2}$

= $10\sqrt{6.1364 - .0655}$ = $10\sqrt{6.0709}$ = 10(2.464) = 24.6

CALORIFIC CHECK

1 [illegible]
2 358.74
3 359.33
359.22

X = (.6524) (359.22) = 234.36

σ = (.0246) (359.22) = 8.84

AV CAL/GM $\frac{3\sigma}{5.3}$ = $\frac{26.52}{5.3}$ = 5.0

ACCEPTANCE CRITERIA		CALCULATIONS		REMARKS
1) $\frac{X - 213}{\sigma}$	= 1.822	$\frac{234.36 - 213}{8.84}$	= $\frac{21.36}{8.84}$ = 2.416	1) Accept
2) $\frac{263 - X}{\sigma}$	= 1.822	$\frac{263 - 234.36}{8.84}$	= $\frac{28.64}{8.84}$ = 3.240	2) Accept
3) $X + \frac{3\sigma}{5.3}$	= 245	234.36 + 5.0	= [illegible]	3) Accept
4) $X - \frac{3\sigma}{5.3}$	= 231	234.36 - 5.0	= [illegible]	4) [illegible]

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[redacted]

Heat Pad Stock Weight Limits

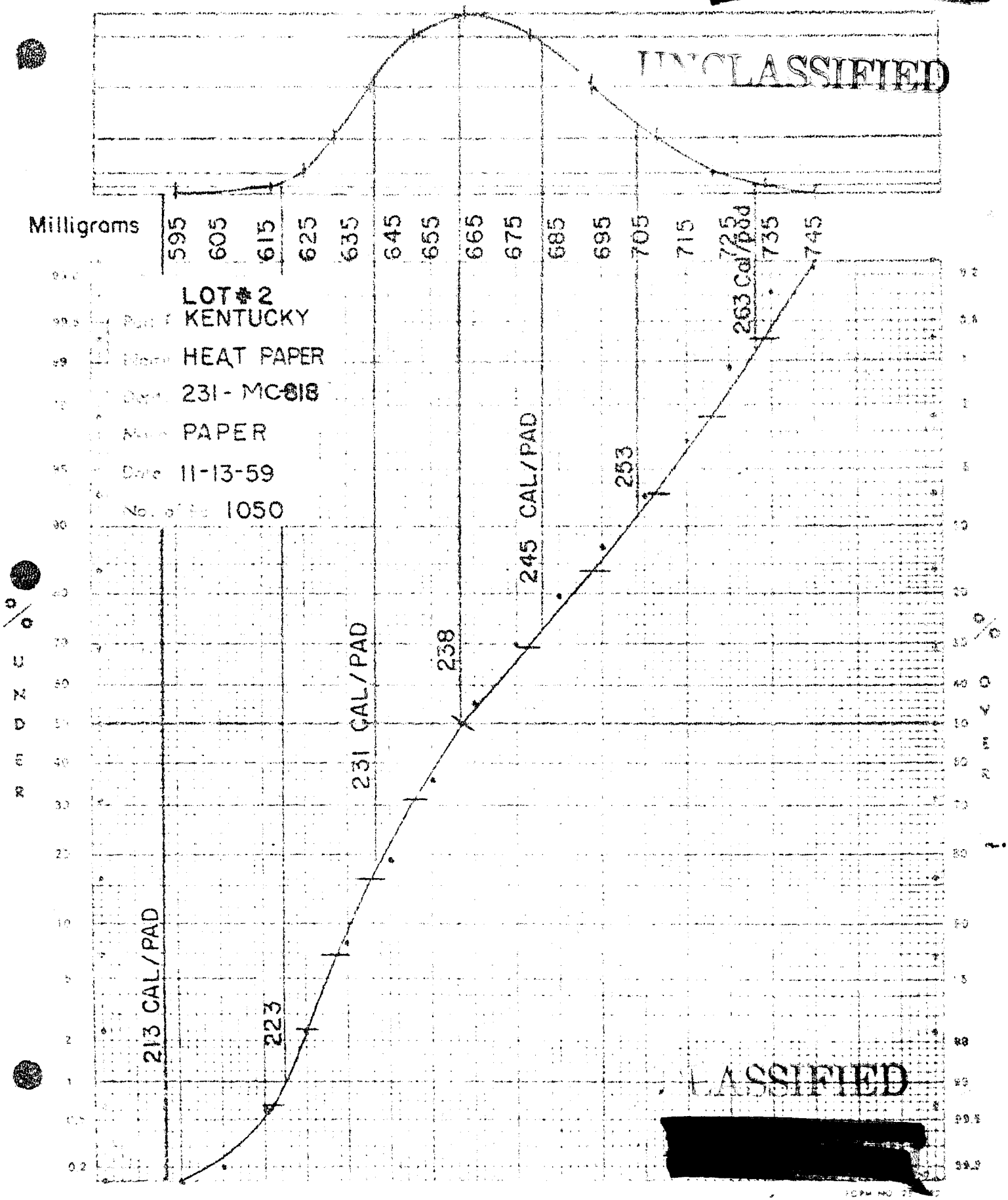
231 CAL/PAD - [illegible]

AV 238 CAL/PAD - 18.5402

245 CAL/PAD - 19.0855

gms — Limit for Helix = 79 gm

PROCESS CAPABILITY STUDY SHEET [redacted]



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QUALITY CONTROL SECTION
THE WURLITZER COMPANY

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COMPUTATION REPORT

MC-818 - LOT NO. 2 Kentucky

weight	ranges	f	d	fd	fd^2
600	610	4	-6	-24	144
610	620	4	-5	-20	100
620	630	32	-4	-128	512
630	640	87	-3	-261	783
640	650	141	-2	-282	564
650	660	218	-1	-218	218
660	670	182	0	-933	0
670	680	114	1	114	114
680	690	102	2	204	408
690	700	68	3	204	612
700	710	47	4	188	752
710	720	31	5	155	775
720	730	16	6	96	576
730	740	2	7	14	98
740	750	2	8	16	128
		1050		991	5784
				+58	

COMPUTATIONS [redacted]

$\bar{X}_w$ = origin + $i\left(\frac{\Sigma fd}{N}\right)$ = 665 + $10\left(\frac{58}{1050}\right)$ = $10(.055)$

= 665 + .550 = 665.55

σ_w $i\sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2}$ = $10\sqrt{\frac{5784}{1050} - \left(\frac{.055}{}\right)^2}$

= $10\sqrt{5.5056 - .0030}$ = $10\sqrt{5.5056}$ = $10(2.347)$ = 23.47

CALORIFIC CHECK

1	358.99	
2	360.30	
3	359.73	
	359.67	AV CAL/GM

$\bar{X}$ = (.6656) (359.67) = 239.40

σ = (.0235) (359.67) = 8.45

$\frac{3\sigma}{5.3} = \frac{25.35}{5.3}$ = 4.78

ACCEPTANCE CRITERIA	CALCULATIONS	REMARKS
1) $\frac{\bar{X} - 213}{\sigma} \geq 1.822$	$\frac{239.40 - 213}{8.45} = \frac{26.40}{8.45} = 3.124$	1) Accept
2) $\frac{263 - \bar{X}}{\sigma} \geq 1.822$	$\frac{263 - 239.40}{8.45} = \frac{23.60}{8.45} = 2.793$	2) Accept
3) $\bar{X} + \frac{3\sigma}{5.3} \leq 245$	239.40 + 4.78 = 244.18	3) Accept
4) $\bar{X} - \frac{3\sigma}{5.3} \geq 231$	239.40 - 4.78 = 234.62	4) Accept

Heat Pad Stack Weight Limits

231 CAL/PAD - 17.9718

AV 238 CAL/PAD - 18.5164 gms

Limits for Helix - 79 gm

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APPENDIX VIa

Burning Rate Checks

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[redacted]

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APPENDIX VIA

Burning Rate Checks

Lot No. 1. Baker:

Inches per second (taken every 30 ft.)

7.75, 7.46, 7.94, 7.63, 7.52, 6.84, 6.99, 7.35, 7.35

7.35, 7.52, 7.69, 7.69, 7.75, 7.75, 8.06, 7.75

Average - 7.55 inches per second

Lot No. 2. Kentucky:

Inches per second (taken every 30 ft.)

5.81, 5.55, 5.98, 6.13, 5.49, 6.02, 5.81

5.81, 6.13, 5.85, 5.98, 6.06, 5.71

Average - 5.88 inches per second

These burning rate checks were made on a Sandia Burning Rate Tester, Serial No. PT-416-3.

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APPENDIX VIb

Resistance Checks

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APPENDIX VI.

Heat Pad Resistance

Lot No. 1. Baker:

Weight Range (milligrams)	Heat Pad Resistance Test Results (ohms) Individual	Average
620-630	8.4 7.0 7.7	7.7
630-640	7.0 7.7 5.6	6.8
640-650	4.2 6.3 9.1	6.5
660-670	8.4 5.6 7.7	7.1
670-680	4.9 4.2 4.2	4.4
680-690	2.1 4.2 4.9	3.7
690-700	3.5 3.5 2.8	3.3

These resistance checks were made on a Sandia Heat Pad Resistor, Serial No. PT-412-5.

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APPENDIX VIb

Heat Pad Resistance

Lot No. 2, Kentucky:

Weight Range (milligrams)	Heat Pad Resistance Test Results (ohms) Individual	Average
620-630	7.0 4.2 7.0	6.1
630-640	4.2 5.6 7.0	5.6
640-650	5.6 5.6 4.2	5.1
650-660	2.8 4.2 3.5	3.5
660-670	4.9 3.5 4.2	4.2
670-680	4.9 4.2 6.3	5.1
680-690	4.2 4.9 4.2	4.4
690-700	4.2 4.2 3.5	4.0

These resistance checks were made on a Sandia Heat Pad Resistor, Serial No. FT-412-5.

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FIGURE 1

Production Weight Control Charts on Baker Run

Lot No. 1

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FIGURE 1

M.C. 818
HEAT PAPER PROCESS INSPECTION

SAMPLE SIZE = Three determinations taken across the sheet (1.496/in^2)
$\bar{X}_o$ = Target weight .688 MGM'S

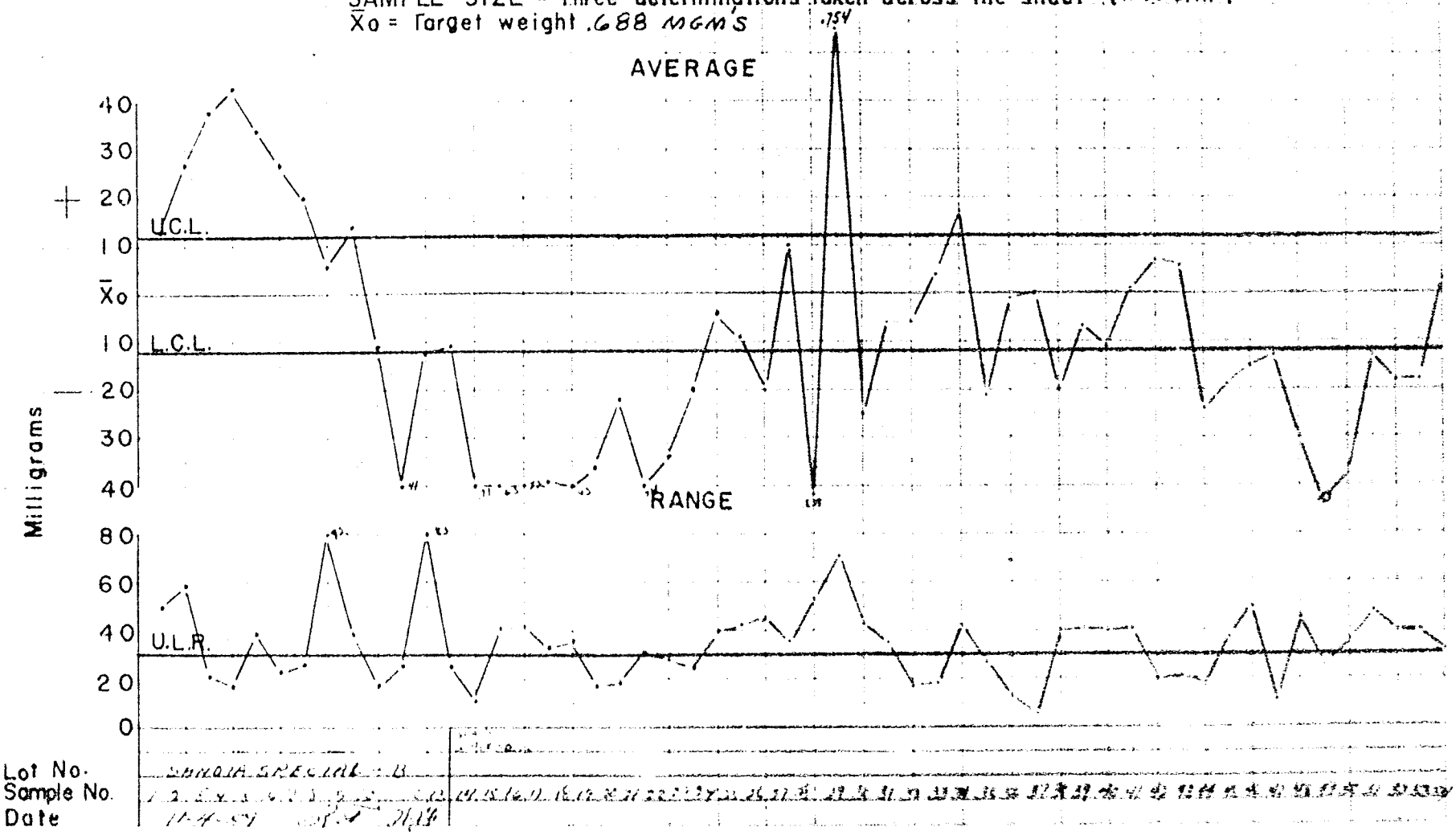

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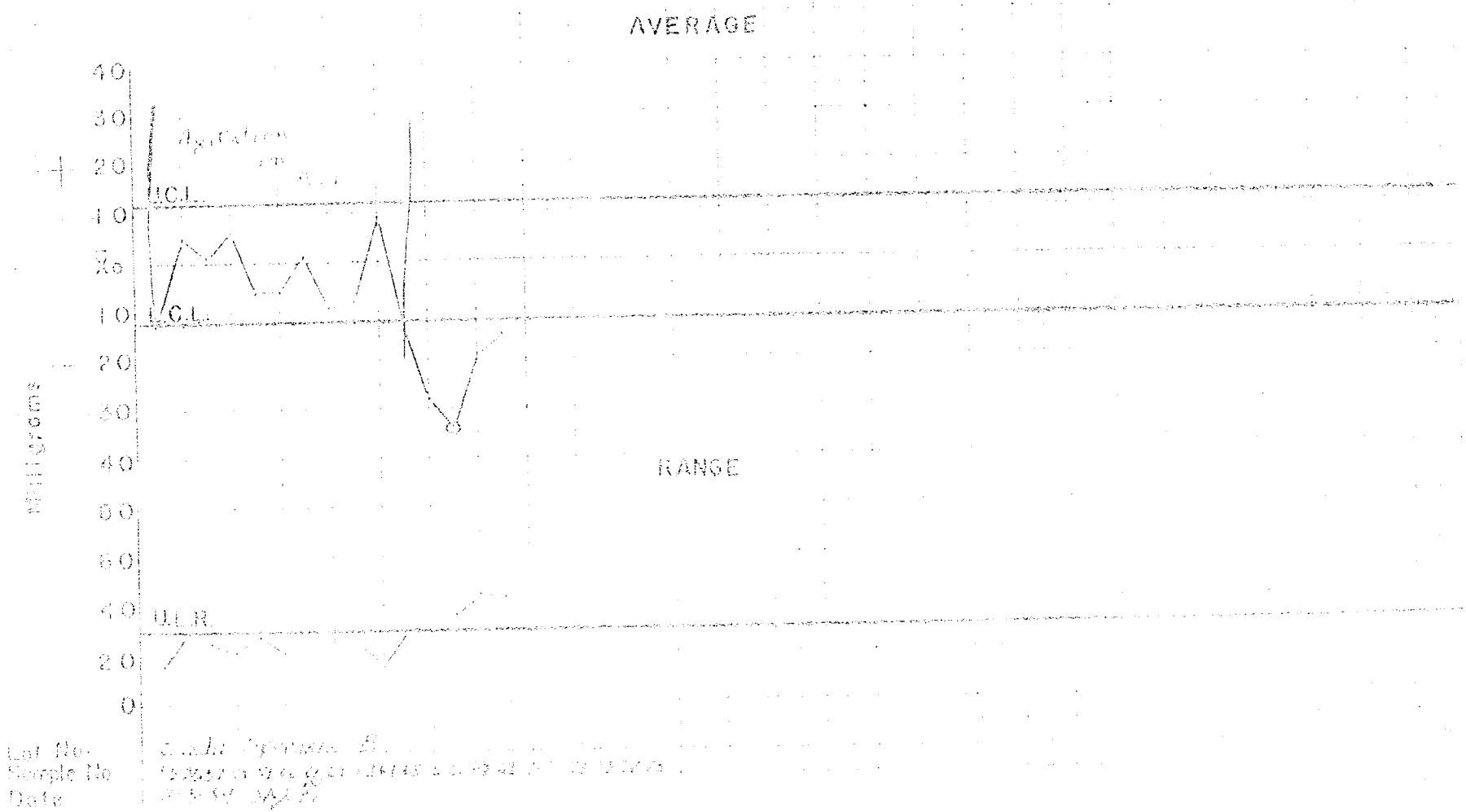
FIGURE 1

M.C. 818
HEAT PAPER PROCESS INSPECTION

SAMPLE SIZE = Three determinations taken across the sheet ($1.496 A_0^2$)
X_0 = Target weight .688 MGMS



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THE WURLITZER COMPAN[redacted]
NORTH TONAWANDA, NEW YORK[redacted]

Part Name	Heat Paper	Part No.	80368
Product	MC-818	Oper. No	Dept. No. 255
Dim. & Tol.	Target Wgt. - .683 MGM's	Char.	
Gage	Scale #95810	Mach. Name	Lab. Paper

SAMPLE DATA SUMMARY WORK SHEET

Sandia Special - B

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SAMPLE	DATE	SAMPLES X 1	X 2	X 3	X 4	X 5	X 6	Σx	$\bar{x}$	R	ACTION
1	11/4/59	670	712	720	.169			2102	701	050	
2		699	694	753				2146	715	059	
3		718	740	719				2177	726	021	
4		729	740	723				2192	731	017	
5		716	744	705				2165	722	039	
6		704	727	715				2146	715	023	
7		691	715	717				2123	708	026	
8		672	751	659				2082	694	092	
9		707	719	680				2106	702	039	
10		688	674	670				2032	677	018	ohm moved
11		636	642	662				1940	647	026	
12		684	714	631				2029	676	083	
13		676	690	665				2031	677	025	
14		618	607	607	165	163	166	1832	611	011	12 gals. water added & propeller
15		623	647	606	171			1876	625	041	
16		624	663	621				1908	636	042	
17		643	633	666				1947	649	033	propeller used ohm moved
18		630	638	666				1934	645	036	
19		654	660	643				1957	652	017	
20		671	654	673				1998	666	019	ohm moved
21		628	597	618				2143	714	031	
22		639	667	655				1961	654	028	
23		678	653	672				2003	668	025	
24		698	658	695				2051	684	040	
25		698	655	683				2036	679	043	
26		688	643	674				2005	668	045	
27		693	718	682				2093	698	036	
28		669	616	634				1919	639	053	

n	A_2	D_4	$3/d_2$
2	1.88	3.268	2.6595
3	1.023	2.574	1.772
4	.729	2.282	1.457
5	.577	2.114	1.290
6	.483	2.004	1.184
7	.419	1.924	1.109
8	.373	1.864	1.054

$\Sigma\bar{X}$	$\bar{\bar{X}}$	ΣR	$\bar{R}$	$3/d_2\bar{R}$
$A_2\bar{R}$	$D_4\bar{R}$	$UL_{\bar{X}}$	$LL_{\bar{X}}$	UL_R

FORM NO. 231-936

THE WURLITZER COMPANY [redacted]
NORTH TONAWANDA, NEW YORK

Part Name	Heat Paper	Part No. 80368	
Product	MC-818	Oper. No.	Dept. No.
Dim. & Tol.	Target Wgt. - .688 MGM's	Char.	
Gage	Scale	Mach. Name	Lab. Paper Machine

SAMPLE DATA SUMMARY WORK SHEET

Sandia Special B

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SAMPLE	DATE	SAMPLES X 1	X 2	X 3	X 4	X 5	X 6	ΣX	$\bar{X}$	R	ACTION
29	11/4/59	721	792	748				2261	.754	.071	
30		685	642	663				1990	.663	.043	
31		704	669	673				2046	.682	035	
32		690	673	682				2045	682	019	
33		680	698	697				2075	692	018	
34		695	689	731				2115	705	042	
35		680	653	668				2001	667	027	
36		697	679	691				2062	687	013	
37		685	691	688				2064	688	006	
38		663	691	651				2005	668	040	
39		704	663	675				2042	681	041	
40		651	690	691				2032	677	040	
41		676	676	717				2069	689	041	
42		685	694	705				2084	695	020	
43		706	685	692				2083	694	021	
44		675	657	661				1993	664	018	
45		693	660	656				2009	669	037	
46		703	662	653				2018	673	050	
47		675	669	680				2024	675	011	
48		683	638	654				1975	658	045	
49		661	635	640				1936	645	026	Adj. made
50		666	630	654				1950	650	036	
51		698	650	677				2025	675	048	
52		687	647	676				2010	670	040	
53		683	648	675				2011	670	040	
54		708	676	688				2072	691	032	
55		687	673	671				2031	677	016	
56		700	675	704				2079	693	029	

n	A_2	D_4	$3/d_2$
2	1.88	3.268	2.6595
3	1.023	2.574	1.772
4	.729	2.282	1.457
5	.577	2.114	1.290
6	.483	2.004	1.184
7	.419	1.924	1.109
8	.373	1.864	1.054

$\Sigma\bar{X}$	$\bar{\bar{X}}$	ΣR	$\bar{R}$	$3/d_2\bar{R}$
$A_2\bar{R}$	$D_4\bar{R}$	$UL_{\bar{X}}$	$LL_{\bar{X}}$	UL_R

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THE WURLITZER COMPANY [redacted]
NORTH TONAWANDA, NEW YORK

Part Name	Heat Paper	Part No. 80368	
Product	MC-818	Oper. No.	Dept. No.
Dim. & Tol.	Target Wgt. - 685 MGM's	Char.	
Gage	Scale	Mach. Name Lab. Paper Machine	

SAMPLE DATA SUMMARY WORK SHEET

Sandia Special 8

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SAMPLE	DATE	SAMPLES X1	X2	X3	X4	X5	X6	ΣX	$\bar{X}$	R	ACTION
57		694	674	699				2067	689	025	
58		690	686	707				2083	694	021	
59		668	684	695				2047	682	027	
60		693	681	672				2046	682	021	
61		690	677	700				2067	689	023	
62		682	664	690				2036	679	026	
63		678	669	693				2040	680	024	
64		690	695	705				2090	6[illegible]	015	
65		666	663	692				2021	674	029	
66		656	645	680				1981	660	035	
67		648	639	675				1962	654	036	Adj. made
68		668	648	692				2008	669	044	
69		655	666	698				2019	673	043	

n	A_2	D_4	$3/d_2$
2	1.88	3.268	2.6595
3	1.023	2.574	1.772
4	.729	2.282	1.457
5	.577	2.114	1.290
6	.483	2.004	1.184
7	.419	1.924	1.109
8	.373	1.864	1.054

$\Sigma\bar{X}$	$\bar{X}$	ΣR	$\bar{R}$	$3/d_2\bar{R}$
$A_2\bar{R}$	$D_4\bar{R}$	$UL_{\bar{X}}$	$LL_{\bar{X}}$	UL_R

FORM NO. 221-R64

[redacted]

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FIGURE 2

Production Weight Control Chart on Kentucky Run

Lot No. 2

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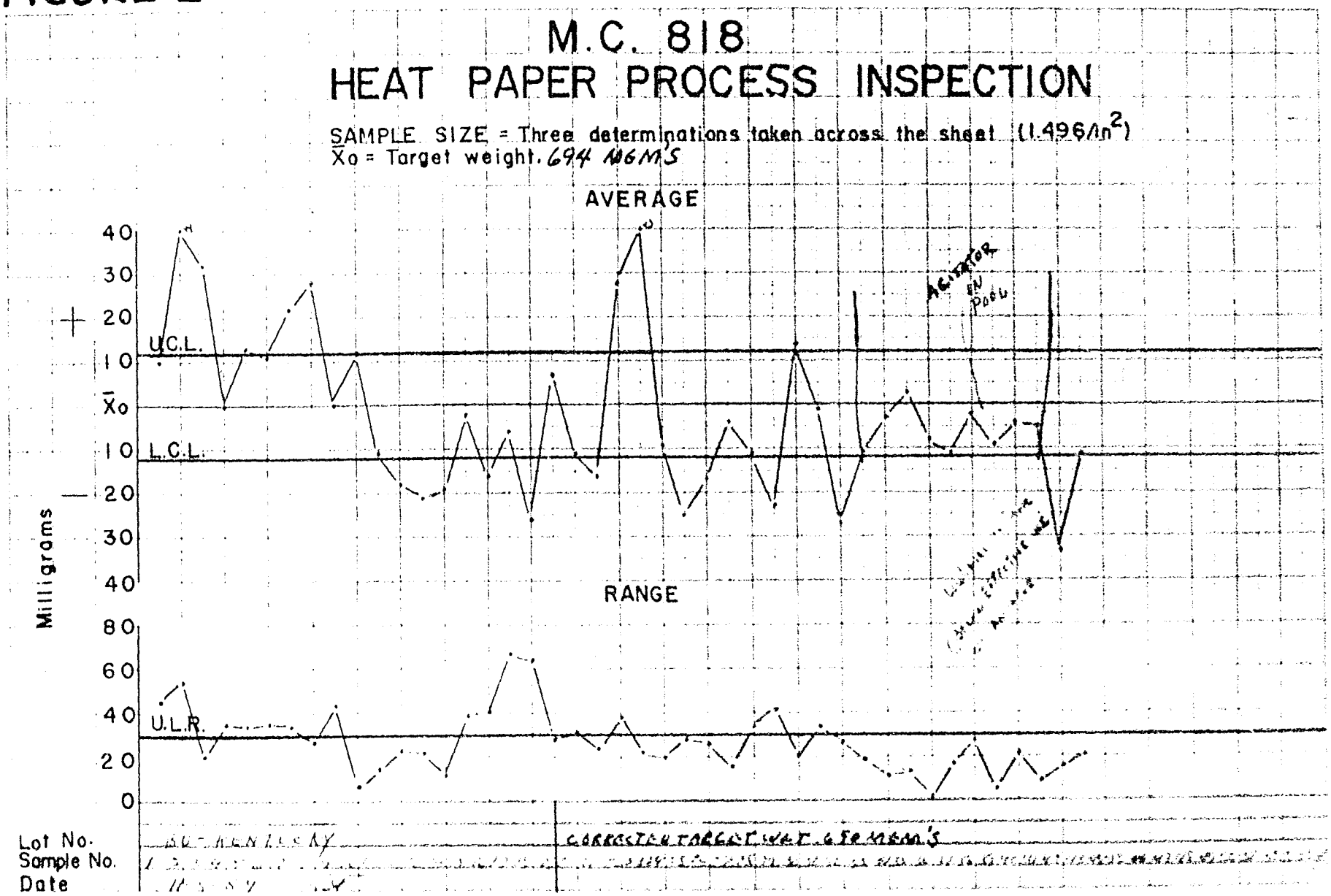
[redacted]

FIGURE 2



[redacted] UNCLASSIFIED

001295

THE WURLITZER COMPANY [redacted]
NORTH TONAWANDA, NEW YORK

Part Name Heat Paper
Product MC-818
Dim. & Tol. Target Wgt. - 694 MGM's
Gage Scale No. 95810

Part No. 80368
Oper. No. | Dept. No.
Char.
Mach. Name Lab. Paper Machine
BU-Kentucky

SAMPLE DATA SUMMARY WORK SHEET

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SAMPLE	DATE	SAMPLES X1	X2	X3	X4	X5	X6	ΣX	$\bar{X}$	R	ACTION
1	11/5/59	710	723	678	162	163	165	2111	704	045	
2		711	765	737				2213	738	054	
3		712	732	723				2167	726	020	
4		696	711	696				2083	694	035	
5		688	722	710				2120	707	034	
6		692	727	697				2116	708	035	
7		704	738	707				2149	716	034	
8		733	726	706				2165	722	027	
9		676	720	685				2081	694	044	
10		702	709	708				2119	706	007	
11		699	674	675	167	160	165	2048	683	025	Teflon strip on dam changed
12		687	664	676				2027	676	023	
13		661	683	676				2020	673	022	
14		668	680	676				2024	675	012	
15		668	707	700				2075	692	039	
16		655	696	683				2034	678	041	
17		674	728	661				2063	688	067	
18		644	708	651				2003	668	064	
19		643	677	686				2006	669	043	
20		694	690	718				2102	701	028	
21		665	696	677				2038	679	031	Corrected target wgt. - 690 MGM's
22		694	727	732				2153	718	038	
23		718	740	740				2198	733	022	
24		670	690	684				2044	681	020	
25		655	683	657				2995	665	028	
26		660	674	686				2020	673	026	
27		676	689	692				2057	686	016	
28		658	692	687				2037	679	034	

$\Sigma\bar{X}$	$\bar{\bar{X}}$	ΣR	$\bar{R}$	$3/d_2\bar{R}$
$A_2\bar{R}$	$D_4\bar{R}$	$UL_{\bar{X}}$	$LL_{\bar{X}}$	UL_R

n	A_2	D_4	$3/d_2$
2	1.88	3.268	2.6595
3	1.023	2.574	1.772
4	.729	2.282	1.457
5	.577	2.114	1.290
6	.483	2.004	1.184
7	.419	1.924	1.109
8	.373	1.864	1.054

FORM NO. 231-F54

001297

THE WURLITZER COMPANY [redacted]

NORTH TONAWANDA, NEW YORK

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Part Name	Heat Paper	Part No.	80368
Product	MC-818	Oper. No.	Dept. No.
Dim. & Tol.	Target Wgt.-690 MGM's	Char.	
Gage	Scale No. 95810	Mach. Name	Lab. Paper Machine BU-Kentucky

SAMPLE DATA SUMMARY WORK SHEET

SAMPLE	DATE	SAMPLES X 1	X 2	X 3	X 4	X 5	X 6	Σx	$\bar{x}$	R	ACTION
29	11/5/59	645	687	659				1991	667	042	
30		691	708	712				2111	704	021	
31		668	702	698				2068	689	034	
32		669	646	673	165	166	169	1988	663	027	Agitator put in tool
33		689	678	670				2037	679	019	
34		695	684	683				2062	687	012	
35		692	686	700				2078	693	014	
36		681	681	683				2045	682	002	
37		670	687	680				2037	679	017	
38		677	681	705				2063	688	028	
39		682	678	683				2043	681	005	
40		672	691	694				2057	686	022	
41		680	686	689				2055	685	009	
42		651	652	667				1970	657	016	
43		666	683	687				2036	679	021	

n	A_2	D_4	$3/d_2$
2	1.88	3.268	2.6595
3	1.023	2.574	1.772
4	.729	2.282	1.457
5	.577	2.114	1.290
6	.483	2.004	1.184
7	.419	1.924	1.109
8	.373	1.864	1.054

$\Sigma\bar{X}$	$\bar{\bar{X}}$	ΣR	$\bar{R}$	$3/d_2\bar{R}$
$A_2\bar{R}$	$D_4\bar{R}$	$UL_{\bar{X}}$	$LL_{\bar{X}}$	UL_R

FORM NO. 271-F84

[redacted]

001296

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FIGURE 3

Production Weight Control Charts on Normal 818 Runs

Lot Nos. 220, 226, 227, 240 and 245

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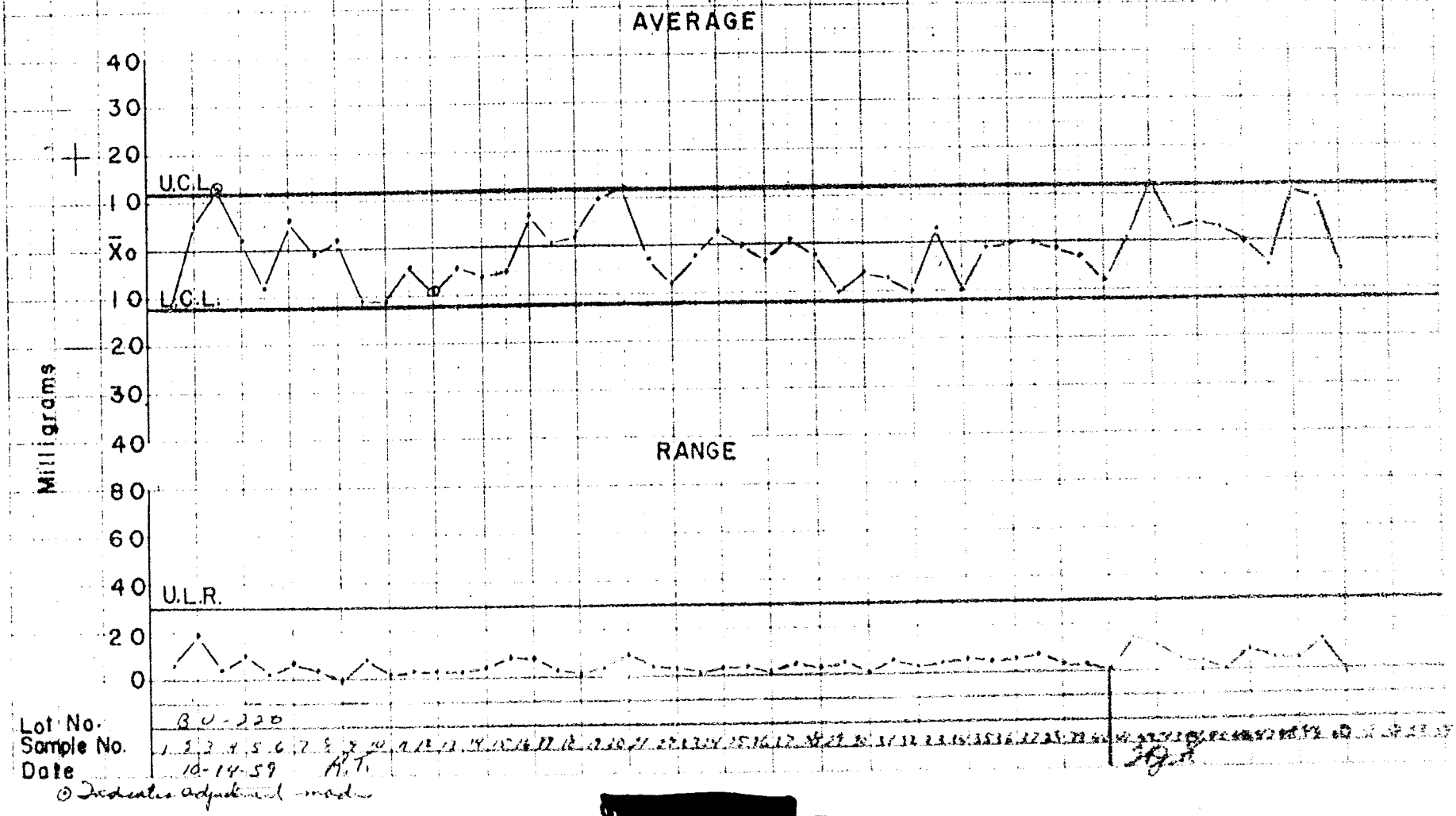
[redacted]

FIGURE 3

M.C. 818
HEAT PAPER PROCESS INSPECTION

SAMPLE SIZE = Three determinations taken across the sheet (1.496 in^2)
$\bar{X}_0$ = Target weight .686 milligrams



⊙ Indicates adjustment made

[redacted]

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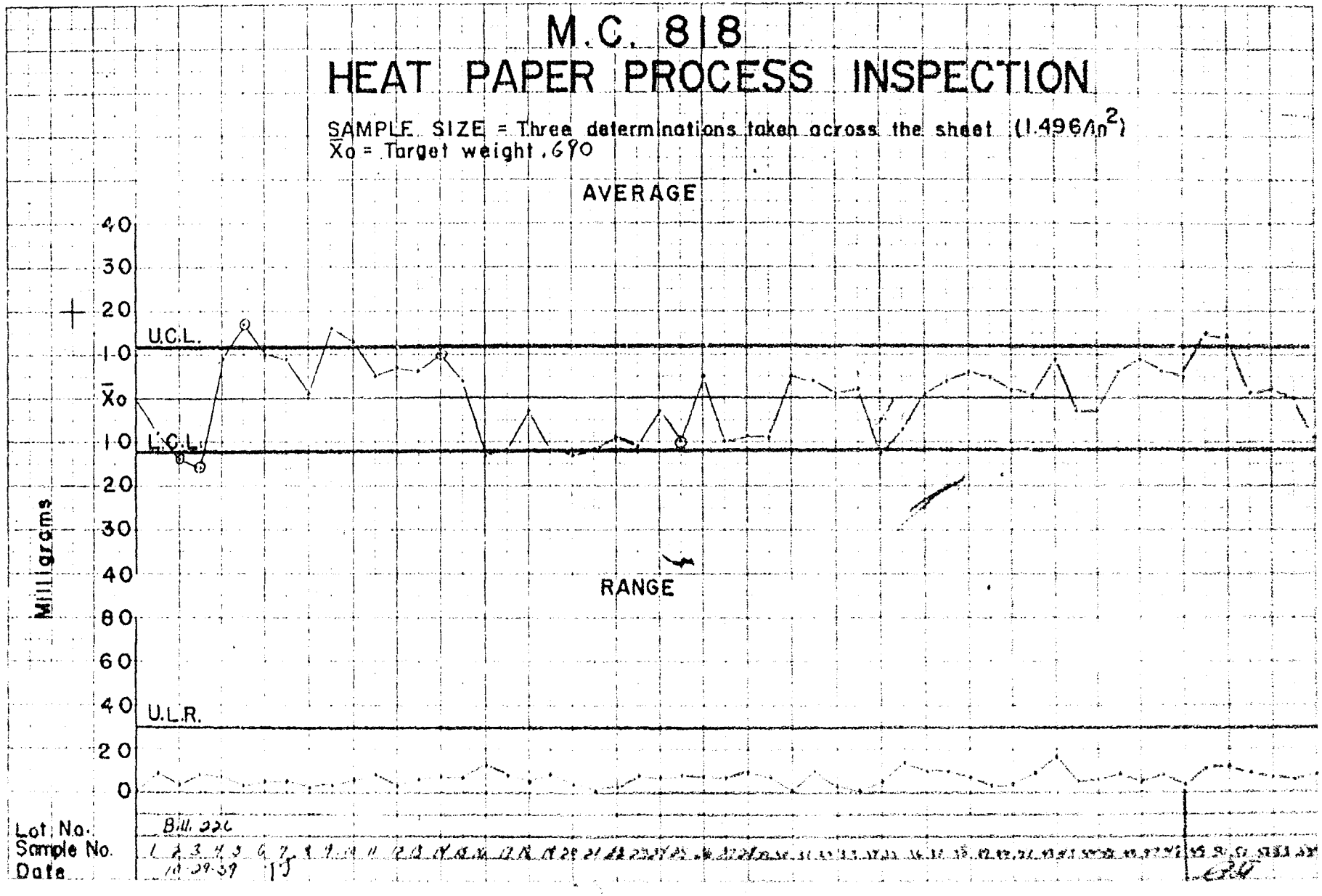
FIGURE 3

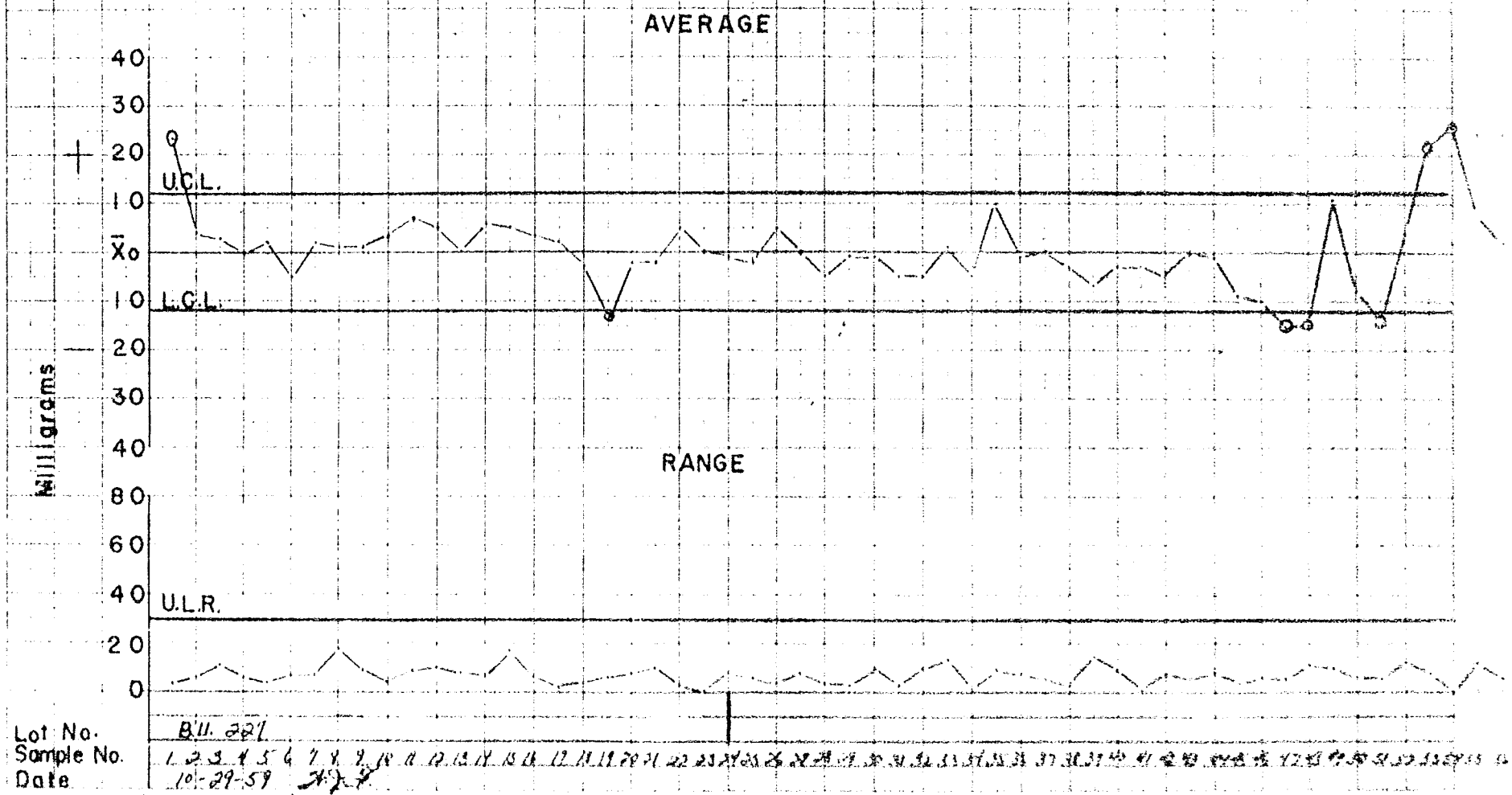


[redacted] UNCLASSIFIED

FIGURE 3

M.C. 818
HEAT PAPER PROCESS INSPECTION

SAMPLE SIZE = Three determinations taken across the sheet (1.496/in^2)
$\bar{X}_o$ = Target weight .484 MGMS



Lot No. B11. 221
Sample No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
Date 10-29-59

⊙ Indicates Adjustment Made

[redacted] UNCLASSIFIED

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FIGURE 3

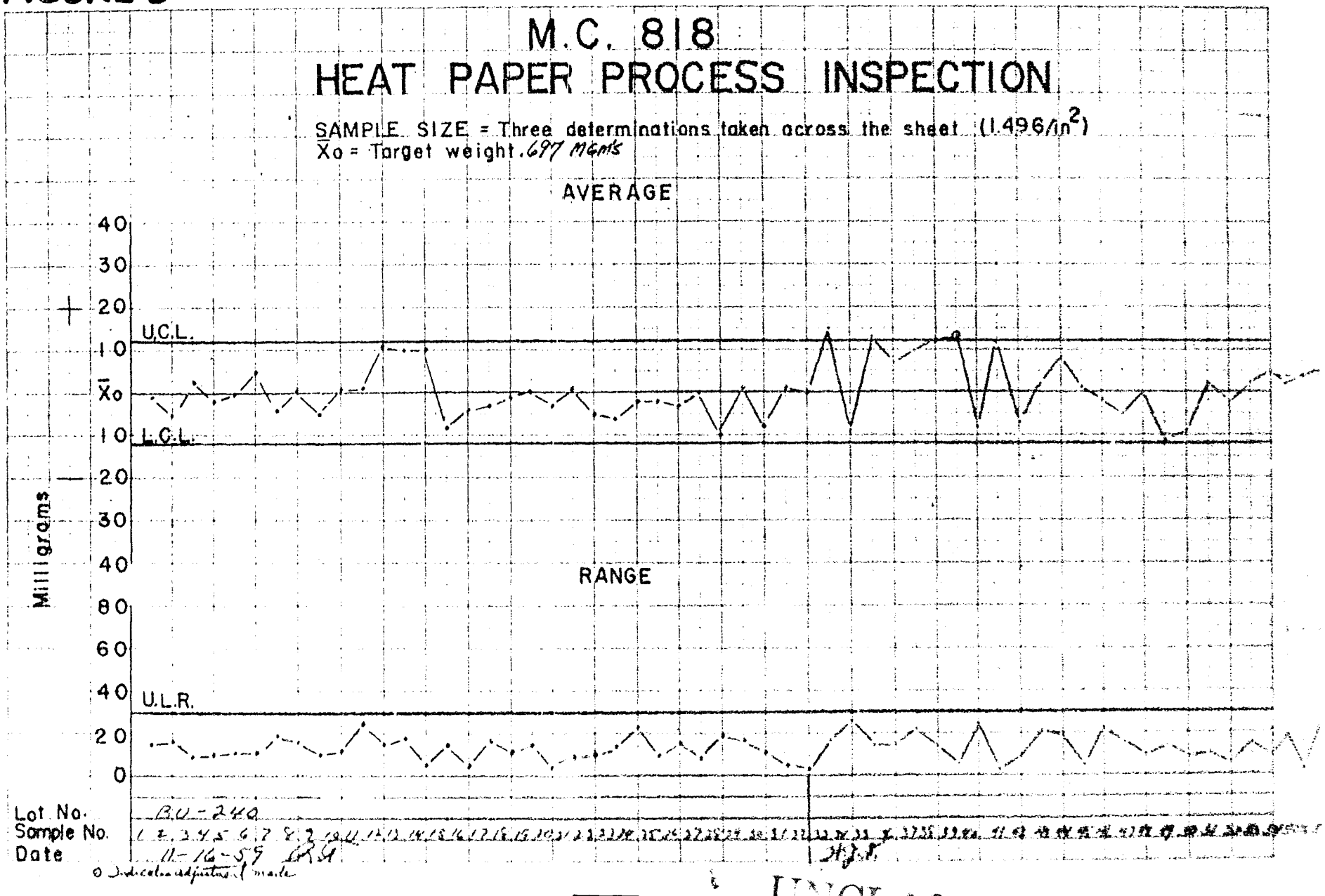

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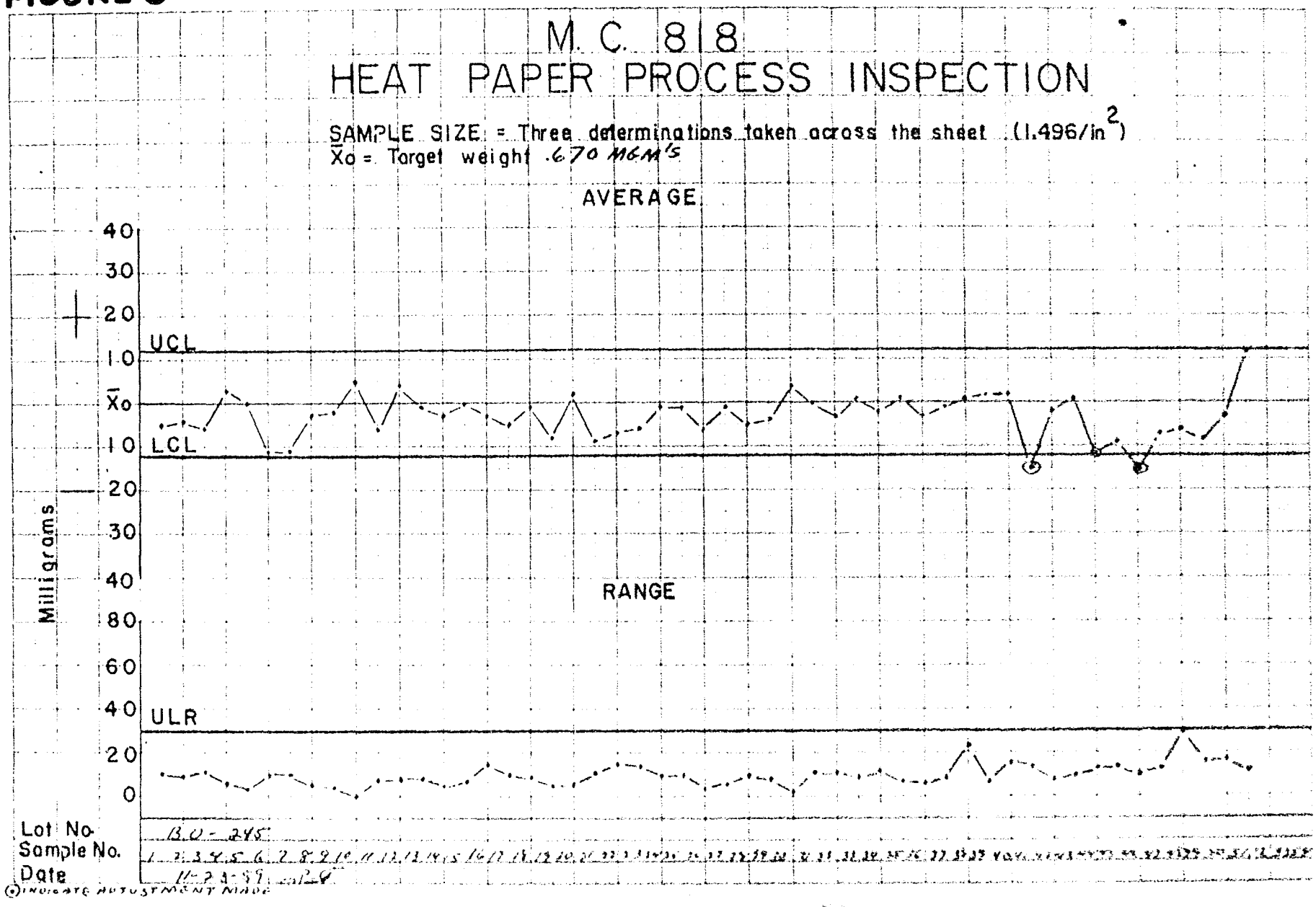
FIGURE 3



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[redacted]

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APPENDIX VII

Letters of Authorization

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[redacted]

001305

[redacted]

SANDIA CORPORATION

SANDIA BASE, ALBUQUERQUE, N. M.

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559

PURCHASING DEPARTMENT

R&D File: MC-818, 1-4

The Wurlitzer Co.
North Tonawanda, N. Y.

Attn: Mr. J. W. Lally

Re: P.O. 15-1'36, Item 30

References: 1. Ltr Skoberg to Lally, dtd 4/20/59

2. Ltr Lally to Herrity, dtd 5/18/59

Gentlemen:

We wish to modify our proposal of Reference 1.

As now proposed, you will procure two Z-28 heat-powder slurry lots from Eureka Williams Co. Both of these lots are to be made by the DOFL agglomerate mixing process. The calorific value shall be as required for the MC-818.

One lot of the Eureka Williams slurry will be made with Baker $BaCrO_4$ made especially for this process. The second lot of slurry is to be made with $BaCrO_4$ procured from Kentucky Color and Chemical Co. This material is used for gasless heat powders and is to meet Military Specifications B 550A. The average particle size is to be less than 2 microns diameter as measured on a Fisher Sub-sieve Sizer. However, if Kentucky Color can supply material that does not yield crystalline particles larger than 20 microns and also meets Military Specifications B 550A, then this material may be procured for the slurry.

The two slurries will then be used to make two lots of heat paper on the paper machine.

After fabrication of the heat paper at Wurlitzer, send a four-foot sample of each heat paper lot to Sandia, DOFL, and the University of Florida for testing.

Prior to the assembly of any batteries, obtain all production and test information on this paper. If it is evident that the MC-818 heat paper specifications have been met with the heat paper, batteries may be fabricated using this paper.

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This material [illegible] National Defense [illegible] meaning of the [illegible] ers. 793 and 794, the [illegible]

[redacted]

Forty evaluation batteries are to be made with each heat paper lot. Twenty of these are to be fired at -65°F (TR-310427, para 2.7.1.2) and twenty at 165°F (TR-310427, para 2.7.1.3). In addition, sufficient control batteries shall be made with standard heat paper to establish a standard for comparison. (Possibly standard production D-tested units may be used for this purpose.)

Inform Mr. Ray Osuya of DOFL when the paper is to be made (and the slurry mixed at Eureka Williams if at all possible) so he may be present as an observer and consultant.

It is our understanding, based on the letter of Reference 2 (assuming that the scope of work outlined in this letter is slightly more than double that of Reference 1) that this work can be accomplished in approximately four months with an expenditure of $3,500.00.

This being the case, you are authorized to begin work on this item immediately.

Very truly yours,

R. S. Shobary
Buyer

CRW:1311-1:ha

Copy to:
R. B. Goodrich
Diamond Ordnance Fuze Laboratory
Washington 25, D.C.

[redacted]

001307

SANDIA CORPORATION

SANDIA BASE, ALBUQUERQUE, N. M.

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PURCHASING DEPARTMENT

OCT 21 1959

The Wurlitzer Company
North Tonawanda, New York

Attn: Mr. E. R. McDonald, Security Officer

For: J. W. Lally

Re: P. O. 15-1536, Item 10

References: 1. Ltr. Snoberg to Lally, dtd. 4/20/59
2. Ltr. Lally to Herrity, dtd. 5/18/59
3. Ltr. Snoberg to Lally, dtd. 7/13/59

Gentlemen:

Reference 3 outlines a method of obtaining materials to fabricate two lots of heat paper by the DOFL agglomerate mixing process. We wish to modify this proposal.

In paragraph 6, it is stated "Prior to the assembly of any batteries, obtain all production and test information on this paper. If it is evident that the MC-818 heat paper specifications have been met with the heat paper, batteries may be fabricated using the paper." This should be disregarded and the following instructions substituted:

All production information tests should be conducted on each lot of heat paper and relayed to Sandia Corporation. These tests should include burning rate, calorific value, and resistance. In addition, the amount of heat paper passing should be reported. Approval of the tests by Sandia Corporation will be needed prior to assembly of any batteries on this item by your personnel.

After approval has been granted, forty evaluation batteries are to be made with each heat paper lot. Twenty of these are to be fired at -65°F (TR-310427, Para. 2.7.1.2) and twenty at +165°F (TR-310427, Para. 2.7.1.3). In addition, forty control batteries will be made with standard heat paper. Twenty of the control batteries are to be fired at each temperature.

All batteries are to be made concurrent with normal production using normal production parts. All heat paper used in the 120 heat paper evaluation batteries is to be selected using the method in force prior to ECO-MC-818-2701.

Are we to send samples (4 ft) to Sandia, OCFL & U. of F ? - per letter 7/13/59

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[redacted]

[redacted]

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This letter supersedes all applicable portions of Reference 3.

For our information, you will furnish Sandia Corporation an estimate of the total cost to perform item 10 as outlined in this letter and the references.

Very truly yours,

R. S. Shoberg
Assistant Buyer

CRM:1311-1:ps

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