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October 21, 2021



Steve Kahl
Executive Secretary
ND Public Service Commission
600 East Boulevard Avenue
Bismarck, ND 58505-0480

RE: Otter Tail Power Company's 2021 Sample Meter Test Performance Report

Dear Mr. Kahl:

Pursuant to North Dakota Rule 69-09-02-28(3), attached are results from the 2021 single-phase kWh sample meter test program for Otter Tail Power Company. There were nine groups of meters selected for the 2021 Sample Test. Criterion for selecting the groups, as set forth in the tariff, was based on the time period the meters were purchased, manufacturer and model of meters. The meters were grouped as follow:

1. Itron Solid State C1S Meters
2. GE Electromechanical I70S Meters
3. SI Electromechanical J5S Meters
4. LG Electromechanical MS Meters
5. GE Solid State I210 Meters
6. SI Electromechanical Model J4S Meters
7. GE Solid-State Model I210+ Meters
8. GE Model I50S Meters
9. LG Electromechanical Model MX Meters

All groups passed the test and are performing satisfactorily.

An electronic copy of this filing is being sent to you at ndpsc@nd.gov. These items are filed for your information. If you have any questions, please contact me at (218) 739-8401 or asmith@otpc.com.

Sincerely,

/s/ ANNALISE SMITH

Annalise Smith
Load Researcher, Regulatory Administration

kaw
Enclosures
By electronic filing

2 PU-21-414 Filed 10/21/2021 Pages: 10
2021 Sample Meter Test Performance Report
Otter Tail Power Company
Annalise Smith, Load Researcher

An Equal Opportunity Employer

AN  OTTER TAIL COMPANY

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: **SAMPLE #1 ITRON C1S Meters**

LOT SIZE 41439 SAMPLE SIZE n= 131 AQL 2.5

FL BAR X 99.962 FL SIGMA 0.129

LL BAR X 99.910 LL SIGMA 0.102

ESTIMATE OF LOT ABOVE 102.0%

$\text{FL QU} = \frac{102 - \text{FL BAR X}}{\text{FL SIGMA}} = \frac{102 - 99.962}{0.129} = \frac{2.038}{0.129} = \mathbf{15.80}$	table b-5 calculations <table border="1" style="margin-left: auto; margin-right: 0;"> <tr><td>QU=</td><td>15.80</td></tr> <tr><td>n=</td><td>131</td></tr> <tr><td>P=</td><td>0.00000</td></tr> </table>	QU=	15.80	n=	131	P=	0.00000
QU=	15.80						
n=	131						
P=	0.00000						
$\text{LL QU} = \frac{102 - \text{LL BAR X}}{\text{LL SIGMA}} = \frac{102 - 99.91}{0.102} = \frac{2.090}{0.102} = \mathbf{20.49}$	<table border="1" style="margin-left: auto; margin-right: 0;"> <tr><td>QU=</td><td>20.49</td></tr> <tr><td>n=</td><td>131</td></tr> <tr><td>P=</td><td>0.00000</td></tr> </table>	QU=	20.49	n=	131	P=	0.00000
QU=	20.49						
n=	131						
P=	0.00000						
From Table B-5 = <u>0.000</u> % PU FL above 102.0% <u>0.000</u> % PU LL above 102.0 %							

ESTIMATE OF LOT BELOW 98.0%

$\text{FL QL} = \frac{\text{FL BAR X} - 98}{\text{FL SIGMA}} = \frac{99.962 - 98}{0.129} = \frac{1.962}{0.129} = \mathbf{15.21}$	table b-5 calculations <table border="1" style="margin-left: auto; margin-right: 0;"> <tr><td>QL=</td><td>15.21</td></tr> <tr><td>n=</td><td>131</td></tr> <tr><td>P=</td><td>0.00000</td></tr> </table>	QL=	15.21	n=	131	P=	0.00000
QL=	15.21						
n=	131						
P=	0.00000						
$\text{LL QL} = \frac{\text{LL BAR X} - 98}{\text{LL SIGMA}} = \frac{99.91 - 98}{0.102} = \frac{1.910}{0.102} = \mathbf{18.73}$	<table border="1" style="margin-left: auto; margin-right: 0;"> <tr><td>QL=</td><td>18.73</td></tr> <tr><td>n=</td><td>131</td></tr> <tr><td>P=</td><td>0.00000</td></tr> </table>	QL=	18.73	n=	131	P=	0.00000
QL=	18.73						
n=	131						
P=	0.00000						
From table B-5 = <u>0.000</u> % PL FL below 98.0 % <u>0.000</u> % PL LL below 98.0 %							

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000

Light Load P = PU LL + PL LL 0.000 + 0.000 = 0.000

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.43

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	99.962 + 0.516	UFL = <u>100.478</u>
LFL = FL BAR X - (4 x FL Sigma)	99.962 - 0.516	LFL = <u>99.446</u>
ULL = LL BAR X + (4 x LL Sigma)	99.910 + 0.408	ULL = <u>100.318</u>
LLL = LL BAR X - (4 x LL Sigma)	99.910 - 0.408	LLL = <u>99.502</u>

Lot is acceptable X

Lot is unacceptable

Tested & Reported by: Steve Ness

Approved:

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: SAMPLE #2 GE I70S Meters

LOT SIZE 26628 SAMPLE SIZE n= 100 AQL 2.5

FL BAR X 99.884 FL SIGMA 0.264
 LL BAR X 99.435 LL SIGMA 0.592

ESTIMATE OF LOT ABOVE 102.0%

FL QU = $\frac{102 - FL \text{ BAR X}}{FL \text{ SIGMA}} = \frac{102 - 99.884}{0.264} = \frac{2.116}{0.264} = \underline{8.02}$ table b-5 calculations

QU=	8.02
n=	100
P=	0.00000

LL QU = $\frac{102 - LL \text{ BAR X}}{LL \text{ SIGMA}} = \frac{102 - 99.435}{0.592} = \frac{2.565}{0.592} = \underline{4.33}$ table b-5 calculations

QU=	4.33
n=	100
P=	0.00000

From Table B-5 = 0.000 % PU FL above 102.0%
0.000 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = $\frac{FL \text{ BAR X} - 98}{FL \text{ SIGMA}} = \frac{99.884 - 98}{0.264} = \frac{1.884}{0.264} = \underline{7.14}$ table b-5 calculations

QL=	7.14
n=	100
P=	0.00000

LL QL = $\frac{LL \text{ BAR X} - 98}{LL \text{ SIGMA}} = \frac{99.435 - 98}{0.592} = \frac{1.435}{0.592} = \underline{2.42}$ table b-5 calculations

QL=	2.42
n=	100
P=	0.71200

From table B-5 = 0.000 % PL FL below 98.0 %
0.712 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000
 Light Load P = PU LL + PL LL 0.000 + 0.712 = 0.712

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.69

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.884 + 1.056 UFL = 100.940
 LFL = FL BAR X - (4 x FL Sigma) 99.884 - 1.056 LFL = 98.828
 ULL = LL BAR X + (4 x LL Sigma) 99.435 + 2.368 ULL = 101.803
 LLL = LL BAR X - (4 x LL Sigma) 99.435 - 2.368 LLL = 97.067

Lot is acceptable X Lot is unacceptable

Tested & Reported by: Steve Hess

Approved: 

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: **SAMPLE #3 SANGAMO J5S Meters**

LOT SIZE 18819 SAMPLE SIZE n= 78 AQL 2.5

FL BAR X 99.889 FL SIGMA 0.350
 LL BAR X 99.761 LL SIGMA 0.479

ESTIMATE OF LOT ABOVE 102.0%

FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.889}{0.35} = \frac{2.111}{0.35} = \underline{6.03}$ table b-5 calculations

QU=	6.03
n=	78
P=	0.00000

LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.761}{0.479} = \frac{2.239}{0.479} = \underline{4.67}$ table b-5 calculations

QU=	4.67
n=	78
P=	0.00000

From Table B-5 = 0.000 % PU FL above 102.0%
0.000 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.889 - 98}{0.35} = \frac{1.889}{0.35} = \underline{5.40}$ table b-5 calculations

QL=	5.40
n=	78
P=	0.00000

LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.761 - 98}{0.479} = \frac{1.761}{0.479} = \underline{3.68}$ table b-5 calculations

QL=	3.68
n=	78
P=	0.00600

From table B-5 = 0.000 % PL FL below 98.0 %
0.006 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000
 Light Load P = PU LL + PL LL 0.000 + 0.006 = 0.006

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.87

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.889 + 1.4 UFL = 101.289
 LFL = FL BAR X - (4 x FL Sigma) 99.889 - 1.4 LFL = 98.489
 ULL = LL BAR X + (4 x LL Sigma) 99.761 + 1.916 ULL = 101.677
 LLL = LL BAR X - (4 x LL Sigma) 99.761 - 1.916 LLL = 97.845

Lot is acceptable X Lot is unacceptable

Tested & Reported by: Steve Ness

Approved: 

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE:

SAMPLE #4 LANDIS & GYR MS Meters

LOT SIZE **13207**

SAMPLE SIZE n= **75**

AQL **2.5**

FL BAR X **99.978**

FL SIGMA **0.325**

LL BAR X **99.494**

LL SIGMA **0.750**

ESTIMATE OF LOT ABOVE 102.0%

$$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.978}{0.325} = \frac{2.022}{0.325} = \underline{\underline{6.22}}$$

table b-5 calculations

QU=	6.22
n=	75
P=	0.00000

$$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.494}{0.75} = \frac{2.506}{0.750} = \underline{\underline{3.34}}$$

QU=	3.34
n=	75
P=	0.02600

From Table B-5 = **0.000** % PU FL above 102.0%

0.026 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

$$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.978 - 98}{0.325} = \frac{1.978}{0.325} = \underline{\underline{6.09}}$$

table b-5 calculations

QL=	6.09
n=	75
P=	0.00000

$$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.494 - 98}{0.75} = \frac{1.494}{0.750} = \underline{\underline{1.99}}$$

QL=	1.99
n=	75
P=	2.22000

From table B-5 = **0.000** % PL FL below 98.0 %

2.220 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000

Light Load P = PU LL + PL LL 0.026 + 2.220 = 2.246

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **4.87**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.978 + 1.3 UFL = 101.278

LFL = FL BAR X - (4 x FL Sigma) 99.978 - 1.3 LFL = 98.678

ULL = LL BAR X + (4 x LL Sigma) 99.494 + 3 ULL = 102.494

LLL = LL BAR X - (4 x LL Sigma) 99.494 - 3 LLL = 96.494

Lot is acceptable X

Lot is unacceptable _____

Tested & Reported by: Steve Ness

Approved: 

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: SAMPLE #5 GE I210 Meters

LOT SIZE **10395** SAMPLE SIZE n= **76** AQL **2.5**

FL BAR X **99.993** FL SIGMA **0.090**

LL BAR X **99.983** LL SIGMA **0.092**

ESTIMATE OF LOT ABOVE 102.0%

FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.993}{0.09} = \frac{2.007}{0.090} = \underline{\underline{22.30}}$ table b-5 calculations

QU=	22.30
n=	76
P=	0.00000

LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.983}{0.092} = \frac{2.017}{0.092} = \underline{\underline{21.92}}$ table b-5 calculations

QU=	21.92
n=	76
P=	0.00000

From Table B-5 = **0.000** % PU FL above 102.0%

0.000 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.993 - 98}{0.09} = \frac{1.993}{0.090} = \underline{\underline{22.14}}$ table b-5 calculations

QL=	22.14
n=	76
P=	0.00000

LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.983 - 98}{0.092} = \frac{1.983}{0.092} = \underline{\underline{21.55}}$ table b-5 calculations

QL=	21.55
n=	76
P=	0.00000

From table B-5 = **0.000** % PL FL below 98.0 %

0.000 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000

Light Load P = PU LL + PL LL 0.000 + 0.000 = 0.000

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **4.87**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.993 + 0.36 UFL = 100.353

LFL = FL BAR X - (4 x FL Sigma) 99.993 - 0.36 LFL = 99.633

ULL = LL BAR X + (4 x LL Sigma) 99.983 + 0.368 ULL = 100.351

LLL = LL BAR X - (4 x LL Sigma) 99.983 - 0.368 LLL = 99.615

Lot is acceptable X Lot is unacceptable _____

Tested & Reported by: Steve Ness

Approved: 

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: **SAMPLE #6 SANGAMO J4S Meters**

LOT SIZE 9317 SAMPLE SIZE n= 75 AQL 2.5

FL BAR X 99.896 FL SIGMA 0.474

LL BAR X 99.585 LL SIGMA 0.707

ESTIMATE OF LOT ABOVE 102.0%

$FL\ QU = \frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 99.896}{0.474}$	=	$\frac{2.104}{0.474}$	=	<u>4.44</u>	
						table b-5 calculations
						QU= 4.44
						n= 75
						P= 0.00000
$LL\ QU = \frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.585}{0.707}$	=	$\frac{2.415}{0.707}$	=	<u>3.42</u>	
						QU= 3.42
						n= 75
						P= 0.01900
From Table B-5 =	<u>0.000</u>	% PU FL above 102.0%				
	<u>0.019</u>	% PU LL above 102.0 %				

ESTIMATE OF LOT BELOW 98.0%

$FL\ QL = \frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{99.896 - 98}{0.474}$	=	$\frac{1.896}{0.474}$	=	<u>4.00</u>	
						table b-5 calculations
						QL= 4.00
						n= 75
						P= 0.00000
$LL\ QL = \frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.585 - 98}{0.707}$	=	$\frac{1.585}{0.707}$	=	<u>2.24</u>	
						QL= 2.24
						n= 75
						P= 1.15400
From table B-5 =	<u>0.000</u>	% PL FL below 98.0 %				
	<u>1.154</u>	% PL LL below 98.0 %				

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000

Light Load P = PU LL + PL LL 0.019 + 1.154 = 1.173

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 4.87

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.896 + 1.896 UFL = 101.792

LFL = FL BAR X - (4 x FL Sigma) 99.896 - 1.896 LFL = 98.000

ULL = LL BAR X + (4 x LL Sigma) 99.585 + 2.828 ULL = 102.413

LLL = LL BAR X - (4 x LL Sigma) 99.585 - 2.828 LLL = 96.757

Lot is acceptable X Lot is unacceptable _____

Tested & Reported by: Steve Ness

Approved:

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: **SAMPLE #7 GE I210+ Meters**

LOT SIZE 6290 SAMPLE SIZE n= 56 AQL 2.5

FL BAR X 99.864 FL SIGMA 0.097
 LL BAR X 99.875 LL SIGMA 0.096

ESTIMATE OF LOT ABOVE 102.0%

FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA} = \frac{102 - 99.864}{0.097} = \frac{2.136}{0.097} = 22.02$ table b-5 calculations

QU=	22.02
n=	56
P=	0.00000

LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA} = \frac{102 - 99.875}{0.096} = \frac{2.125}{0.096} = 22.14$ table b-5 calculations

QU=	22.14
n=	56
P=	0.00000

From Table B-5 = 0.000 % PU FL above 102.0%
0.000 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA} = \frac{99.864 - 98}{0.097} = \frac{1.864}{0.097} = 19.22$ table b-5 calculations

QL=	19.22
n=	56
P=	0.00000

LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA} = \frac{99.875 - 98}{0.096} = \frac{1.875}{0.096} = 19.53$ table b-5 calculations

QL=	19.53
n=	56
P=	0.00000

From table B-5 = 0.000 % PL FL below 98.0 %
0.000 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000
 Light Load P = PU LL + PL LL 0.000 + 0.000 = 0.000

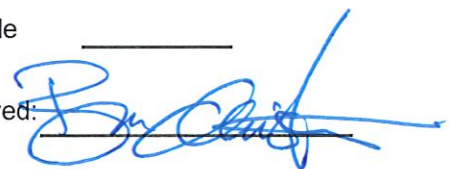
ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 5.2

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.864 + 0.388 UFL = 100.252
 LFL = FL BAR X - (4 x FL Sigma) 99.864 - 0.388 LFL = 99.476
 ULL = LL BAR X + (4 x LL Sigma) 99.875 + 0.384 ULL = 100.259
 LLL = LL BAR X - (4 x LL Sigma) 99.875 - 0.384 LLL = 99.491

Lot is acceptable X Lot is unacceptable _____

Tested & Reported by: Steve Ness

Approved: 

OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: **SAMPLE #8 GE I50S Meters**

LOT SIZE 2431 SAMPLE SIZE n= 40 AQL 2.5

FL BAR X 100.091 FL SIGMA 0.245

LL BAR X 100.151 LL SIGMA 0.812

ESTIMATE OF LOT ABOVE 102.0%

$\text{FL QU} = \frac{102 - \text{FL BAR X}}{\text{FL SIGMA}} = \frac{102 - 100.091}{0.245} = \frac{1.909}{0.245} = \underline{7.79}$	table b-5 calculations <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>QU=</td><td style="text-align: right;">7.79</td></tr> <tr><td>n=</td><td style="text-align: right;">40</td></tr> <tr><td>P=</td><td style="text-align: right;">0.00000</td></tr> </table>	QU=	7.79	n=	40	P=	0.00000
QU=	7.79						
n=	40						
P=	0.00000						
$\text{LL QU} = \frac{102 - \text{LL BAR X}}{\text{LL SIGMA}} = \frac{102 - 100.151}{0.812} = \frac{1.849}{0.812} = \underline{2.28}$	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>QU=</td><td style="text-align: right;">2.28</td></tr> <tr><td>n=</td><td style="text-align: right;">40</td></tr> <tr><td>P=</td><td style="text-align: right;">0.94300</td></tr> </table>	QU=	2.28	n=	40	P=	0.94300
QU=	2.28						
n=	40						
P=	0.94300						
From Table B-5 = <u>0.000</u> % PU FL above 102.0%							
	<u>0.943</u> % PU LL above 102.0 %						

ESTIMATE OF LOT BELOW 98.0%

$\text{FL QL} = \frac{\text{FL BAR X} - 98}{\text{FL SIGMA}} = \frac{100.091 - 98}{0.245} = \frac{2.091}{0.245} = \underline{8.53}$	table b-5 calculations <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>QL=</td><td style="text-align: right;">8.53</td></tr> <tr><td>n=</td><td style="text-align: right;">40</td></tr> <tr><td>P=</td><td style="text-align: right;">0.00000</td></tr> </table>	QL=	8.53	n=	40	P=	0.00000
QL=	8.53						
n=	40						
P=	0.00000						
$\text{LL QL} = \frac{\text{LL BAR X} - 98}{\text{LL SIGMA}} = \frac{100.151 - 98}{0.812} = \frac{2.151}{0.812} = \underline{2.65}$	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>QL=</td><td style="text-align: right;">2.65</td></tr> <tr><td>n=</td><td style="text-align: right;">40</td></tr> <tr><td>P=</td><td style="text-align: right;">0.28200</td></tr> </table>	QL=	2.65	n=	40	P=	0.28200
QL=	2.65						
n=	40						
P=	0.28200						
From table B-5 = <u>0.000</u> % PL FL below 98.0 %							
	<u>0.282</u> % PL LL below 98.0 %						

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = 0.000

Light Load P = PU LL + PL LL 0.943 + 0.282 = 1.225

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 5.58

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma)	100.091 + 0.98	UFL = <u>101.071</u>
LFL = FL BAR X - (4 x FL Sigma)	100.091 - 0.98	LFL = <u>99.111</u>
ULL = LL BAR X + (4 x LL Sigma)	100.151 + 3.248	ULL = <u>103.399</u>
LLL = LL BAR X - (4 x LL Sigma)	100.151 - 3.248	LLL = <u>96.903</u>

Lot is acceptable X

Lot is unacceptable _____

Tested & Reported by: Steve Ness

Approved:

**OTTER TAIL POWER CO.
SAMPLE METER TEST CALCULATION FORM
METERS IN SERVICE AT OTTER TAIL POWER CO.**

8/11/2021

REFERENCE - TABLES A-2, B-3, B-4, B-5, AND EXAMPLE B-3 OF MIL-STD-414.

TYPE OF METERS IN THIS SAMPLE: SAMPLE #9 LANDIS & GYR MX Meters

LOT SIZE **750** SAMPLE SIZE n= **30** AQL **2.5**

FL BAR X 99.871 **FL SIGMA 0.159**

LL BAR X 99.728 **LL SIGMA 0.273**

ESTIMATE OF LOT ABOVE 102.0%

FL QU = $\frac{102 - FL\ BAR\ X}{FL\ SIGMA}$	$\frac{102 - 99.871}{0.159}$	=	$\frac{2.129}{0.159}$	=	13.39	table b-5 calculations
						QU= 13.39
						n= 30
						P= 0.00000

LL QU = $\frac{102 - LL\ BAR\ X}{LL\ SIGMA}$	$\frac{102 - 99.728}{0.273}$	=	$\frac{2.272}{0.273}$	=	8.32	table b-5 calculations
						QU= 8.32
						n= 30
						P= 0.00000

From Table B-5 = **0.000** % PU FL above 102.0%
0.000 % PU LL above 102.0 %

ESTIMATE OF LOT BELOW 98.0%

FL QL = $\frac{FL\ BAR\ X - 98}{FL\ SIGMA}$	$\frac{99.871 - 98}{0.159}$	=	$\frac{1.871}{0.159}$	=	11.77	table b-5 calculations
						QL= 11.77
						n= 30
						P= 0.00000

LL QL = $\frac{LL\ BAR\ X - 98}{LL\ SIGMA}$	$\frac{99.728 - 98}{0.273}$	=	$\frac{1.728}{0.273}$	=	6.33	table b-5 calculations
						QL= 6.33
						n= 30
						P= 0.00000

From table B-5 = **0.000** % PL FL below 98.0 %
0.000 % PL LL below 98.0 %

TOTAL PERCENT DEFECTIVE

Full Load P = PU FL + PL FL 0.000 + 0.000 = **0.000**

Light Load P = PU LL + PL LL 0.000 + 0.000 = **0.000**

ALLOWABLE PERCENT DEFECTIVE: TABLE B-3 **5.86**

OUTLIERS

UFL = FL BAR X + (4 x FL Sigma) 99.871 + 0.636 UFL = **100.507**

LFL = FL BAR X - (4 x FL Sigma) 99.871 - 0.636 LFL = **99.235**

ULL = LL BAR X + (4 x LL Sigma) 99.728 + 1.092 ULL = **100.820**

LLL = LL BAR X - (4 x LL Sigma) 99.728 - 1.092 LLL = **98.636**

Lot is acceptable X

Lot is unacceptable _____

Approved: 

Tested & Reported by: Steve Ness