

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

DOCKET NO. 10A-134G

**IN THE MATTER OF THE VERIFIED APPLICATION OF BLACK
HILLS/COLORADO GAS UTILITY COMPANY, L.P., DOING BUSINESS AS BLACK
HILLS ENERGY, FOR APPROVAL OF GAS METER SAMPLING TEST PROGRAM.**

**SETTLEMENT AGREEMENT
AND MOTION FOR APPROVAL OF SETTLEMENT AGREEMENT**

Black Hills/Colorado Gas Utility Company, LP (“Black Hills” or the “Company”) and the Trial Staff of the Colorado Public Utilities Commission (“Trial Staff”) (the “Parties”), by and through their respective undersigned counsel herewith enter into this Settlement Agreement to resolve all disputed issues that have arisen or could have arisen in this docket regarding Black Hills’ gas meter test sampling program.

The Parties request that the Colorado Public Utilities Commission (“Commission”) approve this Motion for Approval of Settlement Agreement, the Settlement Agreement, and the Gas Meter Test Sampling Program attached hereto as Attachment A. The Parties submit to the Commission that this Settlement Agreement results in a fair disposition of all disputed issues that arose or could have arisen in this docket and that this Settlement Agreement is just and reasonable.

I. PROCEDURAL HISTORY

On March 16, 2010, Black Hills filed a Verified Application for approval of a gas meter sampling test program (“Application”) with the Commission. The Commission issued a Notice of the Application on March 18, 2010.

On March 26, 2010, Staff filed a “Letter of Deficiencies in Docket No. 10A-134G.” Black Hills filed a “Response to Staff’s Letter of Alleged Deficiencies” on April 5, 2010.

On April 28, 2010, the Commission deemed the Application complete and assigned the case to Administrative Law Judge Dale E. Isley (the “ALJ”).

On April 29, 2010, Staff filed a timely intervention as of right in this matter. No other person or entity sought to intervene in this proceeding.

On May 12, 2010, the ALJ informally directed Black Hills and Staff to attempt to reach agreement on a procedural schedule. On May 17, 2010, an agreed-upon procedural schedule was communicated to the ALJ. Later that day the ALJ issued Decision No. R10-0489-I which adopted procedures to be used in the course of the docket and set a procedural schedule for the docket. The ALJ subsequently granted various procedural Motions of the Parties altering the procedures and schedule adopted in Decision No. R10-0489-I by Interim Orders Nos. R10-0575, R10-0604, R10-0718, and R10-0782.

On June 18, 2010, Black Hills filed the Direct Testimony and Exhibits of Michael J. Kisicki. On July 13, 2010, Staff filed the Answer Testimony and Exhibits of Billy Kwan. On July 26, 2010, Black Hills filed the Rebuttal Testimony and Exhibits of Michael J. Kisicki.

During the prehearing phase of this docket, the Parties have actively exchanged information through audit, formal discovery and informal exchanges of information. Numerous settlement discussions also took place. As a result of those settlement negotiations, the Parties have concluded a settlement of all the disputed issues in this docket.

This Settlement Agreement memorializes the negotiated settlement and stipulations among the Parties. As a result of the settlement negotiations, the Parties agree, as set forth below, that all issues in dispute, or that could have been disputed in this docket, have been

resolved to their satisfaction, that the stipulations in this Settlement Agreement and the terms of the Gas Meter Test Sampling Program in Attachment A are fair, just and reasonable, and that the Commission should approve the settlement.

II. THE SETTLEMENT

During settlement negotiations, a total of six (6) principal issues were identified as disputed between the Parties. This section of the Settlement Agreement will set forth the position of the Parties on each disputed issue and the negotiated resolution of the disputed issue.

Issue 1: Tolerance Level and Flow Test Method. Black Hills proposed to test the accuracy limits of meters to within a +/- 2% tolerance on an average test basis (open flow rate plus check flow rate divided by 2). Trial Staff proposed that the Company test accuracy limits of meters to within a +/- 1% tolerance when passing gas at 20% of its rated capacity at one-half-inch water column differential on a check test basis.

Resolution: The Parties agree that a just and reasonable resolution is and request that the Commission should approve, for the purpose of accepting or rejecting a meter under Black Hills' gas meter sampling program, the use of an accuracy limit of +/-2% when passing gas at 20% of its rated capacity at one-half-inch water column differential on a check test basis.

Issue 2: Procedure for Testing. Black Hills proposed to use the MIL-STD-414 which is substantively similar to the ANSI/ASQ Z1.9 standard. Trial Staff proposed that the Company use ANSI/ASQ Z1.4.

Resolution: The Parties agree that a just and reasonable standard is, and request that the Commission approve, the use of the MIL-STD-414 standard.

Issue 3: Acceptable Quality Level (AQL). Black Hills proposed to use an AQL of 6.5. Trial Staff proposed to use an AQL of 2.5.

Resolution: The Parties agree that a just and reasonable AQL is, and request that the Commission approve, the use of an AQL of 6.5.

Issue 4: Removal and Replacement of Meters. Black Hills proposed to replace the meters in a failed lot over a 5 year period. Trial Staff proposed to require a failed lot be replaced within 12 months.

Resolution: The Parties agree that the Commission should approve the use of the replacement methodology as proposed by Black Hills and that it is just and reasonable for Black Hills to replace the meters in a failed lot over a 5 year period.

Issue 5: Initial Placing of Meters into the Sample Pool. Black Hills proposed to exempt meters from initial sample testing until 15 years after installation for domestic meters and 10 years for intermediate meters. Trial Staff proposed to have the all meters included in the sample testing lots from the first year they go into service.

Resolution: The Parties agree that Black Hills will test meters 15 years after installation for domestic meters and 10 years for intermediate meters, on an interim basis of 5 years. During this interim period Black Hills will compile and monitor meter test results to assess whether 15 years installation for domestic meters and 10 years for intermediate meters is a reasonable time to wait before sample testing meters in the field. Black Hills shall analyze the test results and Black Hills commits to file an application five years from the effective date of the Commission's

decision approving this Settlement Agreement, seeking authorization to make the 15 year time period installation for domestic meters and 10 year time period for intermediate meters a permanent fixture of the Black Hills' gas meter sampling program, or proposing a different period of years for including meters in the sample testing lots.

Issue 6: Vendor Testing of New Meters. Black Hills maintained that its vendor for the manufacture of new meters tests 100% of the meters it manufactures before shipping the meters to Black Hills. Trial Staff was concerned that all new meters are not tested by the manufacturer, but instead that new meters are actually sample-tested. During settlement negotiations, Staff discussed requiring Black Hills to present, in an annual test result report, all records on the manufacturer's testing of new meters.

Resolution: The Parties agree that no annual reporting requirement with respect to vendor test results on new meters will be required. Staff may request, through the exercise of its audit powers, test result data from the manufacturers for meters installed in Colorado.

The Parties agree that all other issues, raised in the pre-filed testimony and exhibits of either Party, not specifically addressed in this Settlement Agreement are deemed to be resolved by this settlement.

The Parties agree that the Gas Meter Sampling Test Program in Attachment A hereto incorporates the specific terms of this Settlement Agreement, is just and reasonable, in the public interest, and should be approved by the Commission. Black Hills commits to the implementation of the Gas Meter Sampling Test Program, as specified in this Settlement Agreement and in Attachment A, no later than 90 days of the effective date of the Commission's order approving

this Settlement Agreement. The Gas Metering Sampling Test Program set forth in this agreement is based on the gas meter technology currently contained in the meters used by Black Hills and the gas meter sampling program rules in accordance in Commission Rules Regulating Gas Utilities and Pipeline Operations as set forth at 4 CCR 723-4-4304 et al. If, during the time period this meter sampling program is in effect, Black Hills begins installing new non-diaphragm meters of a type not currently addressed in the Commission's Rules, Black Hills and the Staff will work together to determine an appropriate sample testing procedure for such meters.

III. GENERAL TERMS AND CONDITIONS

Through active prehearing investigation and negotiation, the Parties have reached the settlement set forth herein resolving all contested and disputed issues in this docket in a manner which the Parties agree is just and reasonable and in the public interest. This Settlement Agreement reflects the compromise and settlement of all issues raised or that could have been raised in this docket. The Parties further agree that reaching agreement by means of negotiation and settlement rather than through litigation is in the public interest.

The Parties agree to present, to support, and to defend this Settlement Agreement before the Commission and in the courts. The Parties further agree, if the Commission sets a hearing on this Settlement Agreement, to present testimony and exhibits in a hearing to obtain the Commission's approval of this Settlement Agreement. If such a hearing is conducted, the Parties hereby agree that all pre-filed testimony and exhibits shall be admitted into evidence in this docket without cross-examination.

This Settlement Agreement shall not become effective until the issuance of a final Commission Order approving the Settlement Agreement, which Order does not contain any

modifications of the terms and conditions of this Settlement Agreement that are unacceptable to any of the Parties. In the event the Commission modifies this Settlement Agreement in a manner unacceptable to any Party, that Party shall have the right to withdraw from this Settlement Agreement and proceed to hearing on the issues that may be appropriately raised by that Party in this docket. The withdrawing Party shall notify the Commission and the other Parties to this Settlement Agreement by e-mail and facsimile within five (5) business days of the Commission Order that the withdrawing Party is withdrawing from the Settlement Agreement and that the withdrawing Party is ready to proceed to hearing; the e-mail and facsimile notice shall designate the precise issue or issues on which the withdrawing Party desires to proceed to hearing (the "Hearing Notice").

The withdrawal of a Party shall not automatically terminate this Settlement Agreement as to any other Party. Within three (3) business days of the date of the Hearing Notice from the first withdrawing Party, all Parties shall confer to arrive at a comprehensive list of issues that shall proceed to hearing and a list of issues that remain settled as a result of the first Party's withdrawal from this Settlement Agreement. Within five (5) business days of the date of the Hearing Notice, the Parties shall file with the Commission a formal notice containing the list of issues that shall proceed to hearing and those issues that remain settled. The Parties who proceed to hearing shall have and be entitled to exercise all rights with respect to the issues that are heard that they would have had in the absence of this Settlement Agreement.

Hearing shall be scheduled as soon as practicable on all of the issues designated in the formal Hearing Notice filed with the Commission. In the event that this Settlement Agreement is not approved, the negotiations or discussions undertaken in conjunction with the Settlement Agreement shall not be admissible into evidence in this or any other proceeding. In the event that this Settlement Agreement is approved with conditions that are unacceptable to any Party who subsequently withdraws, the

negotiations or discussions undertaken in conjunction with the Settlement Agreement shall not be admissible into evidence in this or any other proceeding as to that withdrawing Party.

Approval by the Commission of this Settlement Agreement shall constitute a determination that the Settlement Agreement represents a just, equitable and reasonable resolution of all issues that were or could have been contested amongst all the Parties in this proceeding.

The Parties specifically agree and understand that this Settlement Agreement represents a negotiated settlement in the public interest with respect to the various matters and issues presented in this docket, for the sole purpose of the settlement of the matters agreed to in this Settlement Agreement. No Party or person shall be deemed to have approved, accepted, agreed to, or consented to any concept, theory or principle underlying or supposed to underlie any of the matters provided for in this Settlement Agreement, other than as specifically provided for herein. Notwithstanding the resolution of the issues set forth in this Settlement Agreement, none of the methods or principles herein contained shall be deemed by the Parties to constitute a settled practice or precedent in any future proceeding.

This Settlement Agreement may be executed in counterparts and by facsimile copies of signatures, all of which when taken together shall constitute the entire Settlement Agreement with respect to the issues addressed by this Settlement Agreement.

CONCLUSION

For the reasons stated above, the Parties respectfully request that the Commission enter an order approving this Settlement Agreement and the Gas Meter Sampling Test Program in Attachment A hereto with findings that the Settlement Agreement represents a fair, just, and reasonable resolution of all disputed issues that have arisen, or which could have arisen, in this docket and that the Gas Meter Sampling Test Program in Attachment A is just and reasonable and in the public interest.

RESPECTFULLY SUBMITTED this 7th day of September, 2010.

Approved as to form:

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TRIAL STAFF OF THE COLORADO
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BY: /s/ Eugene L. Camp

Eugene L. Camp
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CERTIFICATE OF SERVICE

I hereby certify that on this 7th day of September, 2010, the foregoing **Settlement Agreement and Motion for Approval of Settlement Agreement** was filed through the Commission's E-filing System, and a copy was served on the following parties through the E-filing system and e-mail addresses indicated:

Name	Service	Party in Case
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s/ Christopher M. Irby _____

BLACK HILLS / COLORADO GAS UTILITY COMPANY GAS METER SAMPLING PROGRAM

I. INTRODUCTION / OBJECTIVE

The gas meter testing and maintenance procedures, and the level of accuracy specified are designed for a reasonable balance between high accuracy levels and the cost of maintaining these levels. Consistent with the objective of periodic testing of gas meters, the Gas Meter Sampling Program / Statistical Sampling Program for Gas Meters (Program) is intended to benefit the gas consuming public with accurate measurement and hence accurate utility bills where the consumer is paying only for the actual gas consumption.

Statistical sampling programs use statistical analysis techniques to monitor the accuracy of meters in service. Statistical sampling is used for domestic and intermediate diaphragm meters under the Program.

The Gas Metering Sampling Test Program set forth in this agreement is based on the gas meter technology currently contained in the meters used by Black Hills and the gas meter sampling program rules in accordance in Commission Rules Regulating Gas Utilities and Pipeline Operations as set forth at 4 CCR 723-4-4304 et al. If, during the time period this meter sampling program is in effect, Black Hills begins installing new non-diaphragm meters of a type not currently addressed in the Commission's Rules, Black Hills and the Staff will work together to determine an appropriate sample testing procedure for such meters.

New meters will be tested and calibrated at the manufacturer's facility prior to installation by Company.

Revisions to any portion of the sampling program shall be accomplished by the filing of, and Commission approval of, a new application.

II. GAS METER SAMPLING TEST PROGRAM

A. Definition Of Terms

1. **CHECK TEST.** Gas meter tested at a prover with a check flow rate. The check flow shall be 20% of the rated 1/2" WC differential capacity derated for air.
2. **DOMESTIC METER. DOMESTIC DIAPHRAM METER.** A gas meter that conforms to ANSI Code B109.1 - 1992 Diaphragm Type Gas Displacement Meters (Under 500 Cubic Feet per Hour Capacity).
3. **INTERMEDIATE METER.** Also referred to as **INTERMEDIATE DIAPHRAGM METER** or **INTERMEDIATE GAS METER.** A meter that conforms to ANSI Code B109.2-1992 Diaphragm Type Gas Displacement Meters (500 cubic Feet Per Hour Capacity and over).

4. OPEN TEST. Gas meter tested at a prover with an open flow rate. The open flow rate for domestic meters shall be 100 % of the rated 1/2" WC differential capacity derated for air. The open flow rate for intermediate meters shall be 100% of the rated 2" WC differential capacity derated for air.
5. METER ACCURACY. The degree to which a meter correctly measures the volume of gas passing through it, determined by comparing the volume registered by the meter with that registered by the prover. Rule 4302(a) prescribes the meter accuracy as correct to within one percent when passing gas at 20 percent of its rated capacity at one-half inch water column differential.
6. PROVER. Device for measuring the accuracy of gas meter registration.
7. SONIC FLOW PROVER. Also referred to as CRITICAL FLOW PROVER or SONIC FLOW NOZZLE. A device employing either venturis, orifices or sonic nozzles as restrictions that is used for testing meters, usually at elevated pressures, by passing gas or air through both the meter and restriction and finally discharging it at a lower pressure that maintains sonic velocity (critical flow) through the restriction. The time for a given quantity of gas or air to pass through the meter compared to the restriction standard time corrected for test conditions provides a measure of the meter accuracy.
8. TRANSFER PROVER. A device for determining the accuracy of a meter under test by comparing its reading against the reading obtained from a calibrated reference meter connected in series with the meter under test.

B. Statistical Sampling Procedure

Meters are tested in accordance with Defense Department Military Standards 414: Sampling Procedures and Tables for Inspection by Variables for Percent Defective. Double Specification Limit, Variability Unknown - Standard Deviation Method, Normal Inspection: Level IV, and Acceptable Quality Level (A.Q.L.) 6.5 for Upper and Lower Specification Limit. A sample lot which passes inspection will fall within the acceptance accuracy limits of $\pm 2\%$ on the check test. Black Hills does not switch from normal inspection to tightened or reduced inspections.

Black Hills uses Table A-2, Example B-3, Table B-3, and Table B-5 to evaluate its program. Tables A-2, B-3, B-5, and Example B-3 are attached hereto at the end as Appendix A.

Under the Program, meters are grouped into homogenous groups or lots determined by manufacturer, type, size and years in service. Meters are randomly selected from each lot. The minimum lot size is three meters. The minimum sample size is three meters except for rejected lots. A retired meter test is entered for all meters that need rebuilt or junked. A new meter number is assigned when the meter is rebuilt. The size of the group or lot is only affected by meters that are retired and by meters removed as a part of the Program. Except as provided for in Section C where more meters will be tested by dividing a group or lot, once established,

Attachment A

meters within a group or lot cannot be dropped from the group or lot, consolidated into another group or lot or changed group or lot.

Sampling begins in the fifteenth year after installation for domestic meters and in the tenth year after installation for intermediate meters, except for those that were rebuilt.

The system is programmed to randomly select meters for the sampling program. The program uses the random test selection table (Defense Department Military Standards 414, Table A-2) to determine how many meters (sample size) for each meter type group should be selected. If a sample group or lot fails to test within guidelines, the meter lot will be subject to removal as set forth in Section C.

Meters shall be excluded from the sampling criteria for the following reasons:

- Damage caused by outside forces such as visual damage caused by snow, ice, water from flooding, vehicles hitting the meter, trees or other structures falling on the meter that may have altered how the meter was actually performing while in service.
- Meters which Black Hills suspects have been tampered with or meters removed by theft and later recovered by Black Hills.

C. Removal of Failed Meter Lots

If any sample from a test lot or batch is rejected, the entire test lot or batch will be subject to removal over a five year period ("five year removal") as follows.

Approximately 20% of the failed lot will be removed in the first calendar year following lot failure.

Additionally, the normal sample for the size of the meters remaining in the lot will be removed each year and tested according to Black Hills sampling procedures under the Program. If the failed lot subsequently passes, the five-year removal is halted, i.e., the entire lot of the remaining meters will be under the Program and no part of it will be subject to five-year removal .

In the second calendar year following lot failure, if the normal size sample fails the accuracy tests, 25% of the remaining lot is removed (remaining meters divided by four). In the third calendar year following lot failure, if the normal size sample fails the accuracy tests, 33% of the remaining lot is removed (remaining meters divided by three). In the fourth calendar year following lot failure, if the normal size sample fails the accuracy tests, 50% of the remaining lot is removed (remaining meters divided by two). In the fifth calendar year following lot failure, if the normal size sample fails the accuracy tests, 100% of the remaining lot is removed.

D. Test Method - Prover Flow Test

Diaphragm gas meters are tested at a minimum of two flow rates. For domestic meters the open flow rate shall be 100% of the rated 1/2" differential capacity derated for air and for intermediate

Attachment A

meters the open flow rate shall be 100% of the rated 2" differential capacity derated for air. The check flow rate shall be 20% of the rated 1/2" differential capacity derated for air. (The difference in specific gravity between natural gas and air is .7746.) The meters shall be adjusted to +0.8% accuracy. There shall not be a spread between the flow tests exceeding 0.5% accuracy. Domestic diaphragm meter and Intermediate diaphragm gas meters are physically removed from the meter set and transported to a meter shop location for testing. The meters are brought into the prover area to temper, meaning to bring to the same temperature as the provers. All diaphragm meters must be in-tested on certified provers. To assure the accuracy of a sonic nozzle prover, weekly maintenance checks need to be performed. Also the sonic nozzle provers need to be maintained at a modest climate control of + / - 3 degrees variation over the course of the day.

A certified transfer prover can be used on all diaphragm gas meters that have a capacity over 1000 cfh at 1/2" WC differential.

Large volume diaphragm gas meters are flow tested in the field. It is tested at the load if known.

E. Records and Reporting

Records of gas meter tests are maintained in the customer information system. For programs using meter groups, the records maintained include the number of meters initially installed in each group, subsequent modifications or combinations of groups, and at the end of each year for each group, the number remaining in service, size of test sample, test results and corrective action taken.

Black Hills will file an annual report with the Commission including narrative and tables which will include identification and test results of each lot or batch, evaluation and analysis of the data, and any corrective action taken. Black Hills will file this annual report on the Program coincident with its filing of the annual financial report with the Commission.

III. QUALITY ASSURANCE SAMPLING OF NEW AND REMANUFACTURED METERS

All meters are tested by the manufacturer prior to shipment. In addition to the meter testing done by the manufacturer on all new and remanufactured diaphragm gas meters, Black Hills will sample test new meter groups or lots by performing the quality assurance sampling and testing as follows:

New and remanufactured meters are tested in accordance with ANSI Z1.4: Sampling Procedures and Tables for Inspection by Attributes. Sampling Plan: General Inspection Level II, Normal Inspection, Single Sampling and 2.5 AQL. A sample lot which passes inspection will fall within an acceptance accuracy limits of $\pm 1\%$ on the check test.

Attachment A

Lot Size	Sample Size	AQL 2.5	
		Accept	Reject
2 to 8	2	0	1
9 to 15	3	0	1
16 to 25	5	0	1
26 to 50	8	0	1
51 to 90	13	1	2
91 to 150	20	1	2
151 to 280	32	2	3
281 to 500	50	3	4
501 to 1200	80	5	6
1201 to 3200	125	7	8
3201 to 10000	200	10	11
10001 to 35000	315	14	15

Accept--means accept the Lot or Batch with no more than this quantity of defective meters.

Reject--means reject the Lot or Batch with equal or greater to this number of defective meters.

If a sample lot fails to test within guidelines, the meter shipment can be returned and replaced at the supplier's expense.

If the sample passes 10 lots then we may go to reduced sampling in accordance with ANSI Z1.4: Sampling Procedures and Tables for Inspection by Attributes. Sampling plan: General Inspection Level II, Reduced Inspection, Single Sampling and 2.5 AQL.

Lot Size	Sample Size	AQL 2.5	
		Accept	Reject
2 to 8	2	0	1
9 to 15	2	0	1
16 to 25	2	0	1
26 to 50	3	0	1
51 to 90	5	0	2
91 to 150	8	0	2
151 to 280	13	1	3
281 to 500	20	1	4
501 to 1200	32	2	5
1201 to 3200	50	3	6
3201 to 10000	80	5	8
10001 to 35000	125	7	10

Appendix A

DEPARTMENT OF DEFENSE MILITARY STANDARD 414

TABLES A-2, B-3, B-5 AND EXAMPLE B-3

Attachment A

MIL-STD-414
TABLE A-2
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MIL-STD-414
11 June 1957

TABLE A-2
Sample Size Code Letters¹

Lot Size		Inspection Levels				
		I	II	III	IV	V
3 to	8	A	B	B	B	C
9 to	15	B	B	B	B	D
16 to	25	B	B	B	C	E
26 to	40	A	B	B	D	F
41 to	65	B	B	C	E	G
66 to	110	B	B	D	F	H
111 to	180	B	C	E	G	I
181 to	300	B	D	F	H	J
301 to	500	C	E	G	I	K
501 to	800	D	F	H	J	L
801 to	1,300	E	G	I	K	L
1,301 to	3,200	F	H	J	L	M
3,201 to	8,000	G	I	L	M	N
8,001 to	22,000	H	J	M	N	O
22,001 to	110,000	I	K	N	O	P
110,001 to	550,000	I	K	O	P	Q
550,001 and over		I	K	P	Q	C

¹Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

Attachment A

MIL-STD-414
TABLE B-3
Page 1 of 1

MIL-STD-414
11 June 1957

TABLE B-3
Master Table for Normal and Tightened Inspection Plans Based on Variability Unknown
(Double Specification Limit and Form 2—Single Specification Limit)

Sample size code letter	Sample size	Acceptable Quality Levels (normal inspection)										Acceptability Quality Levels (tightened inspection)									
		.04	.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00	25.00	40.00	65.00	100.00	150.00	250.00
B	3	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
C	4	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
D	5	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
E	7	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
F	10	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
G	15	0.099	0.166	0.312	0.503	0.818	1.31	2.11	3.05	4.31	6.56	9.46	13.71	18.94	25.61	35.00	50.00	70.00	95.00	125.00	160.00
H	20	0.335	0.228	0.365	0.544	0.846	1.29	2.05	2.93	4.09	6.17	8.92	12.99	18.03	24.55	33.00	45.00	60.00	80.00	105.00	135.00
I	25	0.155	0.250	0.380	0.551	0.877	1.29	2.00	2.86	3.93	5.97	8.63	12.57	17.51	23.97	32.00	42.00	55.00	75.00	100.00	130.00
J	30	0.179	0.280	0.413	0.581	0.879	1.29	1.98	2.83	3.91	5.86	8.47	12.36	17.24	23.50	31.00	40.00	52.00	70.00	90.00	115.00
K	35	0.170	0.264	0.388	0.555	0.847	1.23	1.87	2.68	3.70	5.51	8.10	11.87	16.65	22.91	30.00	39.00	50.00	68.00	88.00	110.00
L	40	0.179	0.275	0.401	0.566	0.873	1.26	1.88	2.71	3.72	5.58	8.09	11.85	16.61	22.86	30.00	39.00	50.00	68.00	88.00	110.00
M	50	0.163	0.250	0.363	0.503	0.789	1.17	1.71	2.49	3.45	5.20	7.61	11.23	15.87	22.00	28.00	36.00	46.00	58.00	75.00	95.00
N	65	0.147	0.228	0.330	0.461	0.720	1.07	1.60	2.29	3.20	4.87	7.15	10.63	15.13	21.11	27.00	35.00	45.00	57.00	73.00	92.00
O	100	0.145	0.226	0.317	0.447	0.689	1.02	1.55	2.20	3.07	4.69	6.91	10.32	14.73	20.66	26.00	34.00	44.00	56.00	72.00	91.00
P	150	0.134	0.203	0.293	0.413	0.618	0.949	1.43	2.05	2.89	4.43	6.57	9.88	14.20	20.02	25.00	33.00	43.00	55.00	71.00	90.00
Q	200	0.135	0.204	0.294	0.414	0.617	0.945	1.42	2.04	2.87	4.40	6.53	9.81	14.12	19.92	25.00	33.00	43.00	55.00	71.00	90.00
		0.065	0.10	0.15	0.25	0.40	0.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00	25.00	40.00	65.00	100.00	150.00	250.00	400.00

All AQL and table values are in percent defective.
[Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.]

Attachment A

MLL-STD-414
TABLE B-5
Page 1 of 9

Table B-5
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Q ₁ or Q ₂	Sample Size																
	3	4	5	7	10	15	20	25	30	35	50	75	100	150	200	300	400
0	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
1	47.26	46.67	46.44	46.25	46.16	46.10	46.08	46.06	46.05	46.05	46.04	46.03	46.03	46.03	46.02	46.02	46.02
2	44.40	43.33	42.90	42.54	42.35	42.24	42.19	42.16	42.15	42.15	42.14	42.13	42.10	42.09	42.09	42.08	42.08
3	41.63	40.00	39.37	38.87	38.60	38.44	38.37	38.33	38.32	38.29	38.27	38.25	38.24	38.23	38.23	38.22	38.22
4	39.15	36.67	35.92	35.50	35.23	35.06	34.99	34.95	34.94	34.91	34.89	34.87	34.86	34.85	34.85	34.84	34.84
5	36.86	33.33	32.67	32.14	31.86	31.69	31.62	31.58	31.57	31.54	31.51	31.49	31.48	31.47	31.47	31.46	31.46
6	34.71	30.00	29.32	28.70	28.41	28.24	28.17	28.13	28.12	28.09	28.07	28.05	28.04	28.03	28.03	28.02	28.02
7	32.68	26.67	26.00	25.40	25.11	24.94	24.87	24.83	24.82	24.79	24.77	24.75	24.74	24.73	24.73	24.72	24.72
8	30.76	24.00	23.42	22.84	22.55	22.38	22.31	22.27	22.26	22.23	22.21	22.19	22.18	22.17	22.17	22.16	22.16
9	28.94	21.33	20.85	20.29	20.00	19.83	19.76	19.72	19.71	19.68	19.66	19.64	19.63	19.62	19.62	19.61	19.61
10	27.21	19.00	18.62	18.08	17.79	17.62	17.55	17.51	17.50	17.47	17.45	17.43	17.42	17.41	17.41	17.40	17.40
11	25.57	16.67	16.39	15.87	15.58	15.41	15.34	15.30	15.29	15.26	15.24	15.22	15.21	15.20	15.20	15.19	15.19
12	24.02	15.00	14.82	14.32	14.04	13.87	13.80	13.76	13.75	13.72	13.70	13.68	13.67	13.66	13.66	13.65	13.65
13	22.55	13.33	13.25	12.77	12.49	12.32	12.25	12.21	12.20	12.17	12.15	12.13	12.12	12.11	12.11	12.10	12.10
14	21.16	11.67	11.68	11.22	10.95	10.78	10.71	10.67	10.66	10.63	10.61	10.59	10.58	10.57	10.57	10.56	10.56
15	19.84	10.00	10.11	9.67	9.41	9.24	9.17	9.13	9.12	9.09	9.07	9.05	9.04	9.03	9.03	9.02	9.02
16	18.58	8.67	8.88	8.46	8.21	8.04	7.97	7.93	7.92	7.89	7.87	7.85	7.84	7.83	7.83	7.82	7.82
17	17.37	7.33	7.64	7.24	6.99	6.82	6.75	6.71	6.70	6.67	6.65	6.63	6.62	6.61	6.61	6.60	6.60
18	16.21	6.00	6.41	6.03	5.79	5.62	5.55	5.51	5.50	5.47	5.45	5.43	5.42	5.41	5.41	5.40	5.40
19	15.09	5.00	5.51	5.15	4.92	4.75	4.68	4.64	4.63	4.60	4.58	4.56	4.55	4.54	4.54	4.53	4.53
20	14.01	4.00	4.61	4.27	4.05	3.88	3.81	3.77	3.76	3.73	3.71	3.69	3.68	3.67	3.67	3.66	3.66
21	12.97	3.33	4.04	3.72	3.51	3.34	3.27	3.23	3.22	3.19	3.17	3.15	3.14	3.13	3.13	3.12	3.12
22	11.96	3.00	3.81	3.50	3.30	3.13	3.06	3.02	3.01	2.98	2.96	2.94	2.93	2.92	2.92	2.91	2.91
23	10.98	2.67	3.58	3.28	3.09	2.92	2.85	2.81	2.80	2.77	2.75	2.73	2.72	2.71	2.71	2.70	2.70
24	10.03	2.33	3.39	3.10	2.92	2.75	2.68	2.64	2.63	2.60	2.58	2.56	2.55	2.54	2.54	2.53	2.53
25	9.10	2.00	3.20	2.92	2.75	2.58	2.51	2.47	2.46	2.43	2.41	2.39	2.38	2.37	2.37	2.36	2.36
26	8.19	1.67	3.01	2.74	2.57	2.40	2.33	2.29	2.28	2.25	2.23	2.21	2.20	2.19	2.19	2.18	2.18
27	7.30	1.33	2.82	2.56	2.40	2.23	2.16	2.12	2.11	2.08	2.06	2.04	2.03	2.02	2.02	2.01	2.01
28	6.43	1.00	2.63	2.38	2.22	2.05	1.98	1.94	1.93	1.90	1.88	1.86	1.85	1.84	1.84	1.83	1.83
29	5.58	0.67	2.44	2.20	2.04	1.87	1.80	1.76	1.75	1.72	1.70	1.68	1.67	1.66	1.66	1.65	1.65
30	4.74	0.33	2.25	2.02	1.86	1.69	1.62	1.58	1.57	1.54	1.52	1.50	1.49	1.48	1.48	1.47	1.47
31	3.91	0.00	2.06	1.84	1.68	1.51	1.44	1.40	1.39	1.36	1.34	1.32	1.31	1.30	1.30	1.29	1.29
32	3.10		1.87	1.66	1.50	1.33	1.26	1.22	1.21	1.18	1.16	1.14	1.13	1.12	1.12	1.11	1.11
33	2.30		1.68	1.48	1.32	1.15	1.08	1.04	1.03	1.00	0.98	0.96	0.95	0.94	0.94	0.93	0.93
34	1.51		1.49	1.30	1.14	0.97	0.90	0.86	0.85	0.82	0.80	0.78	0.77	0.76	0.76	0.75	0.75
35	0.72		1.30	1.12	0.96	0.79	0.72	0.68	0.67	0.64	0.62	0.60	0.59	0.58	0.58	0.57	0.57
36	0.33		1.11	0.94	0.78	0.61	0.54	0.50	0.49	0.46	0.44	0.42	0.41	0.40	0.40	0.39	0.39
37	0.14		0.92	0.76	0.60	0.43	0.36	0.32	0.31	0.28	0.26	0.24	0.23	0.22	0.22	0.21	0.21
38	0.05		0.73	0.58	0.42	0.25	0.18	0.14	0.13	0.10	0.08	0.06	0.05	0.04	0.04	0.03	0.03
39	0.02		0.54	0.40	0.24	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.01		0.35	0.22	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	0.00		0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	0.00		0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
62	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

¹Values tabulated are read in percent.

Attachment A

MLL-STD-414
TABLE B-5
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Table B-5-Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Q ₁ or Q ₂	Sample Size																	
	3	4	5	7	10	15	20	25	30	40	50	75	100	150	200			
.70	29.27	26.67	25.74	25.03	24.67	24.46	24.38	24.33	24.31	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	
.71	28.92	26.33	25.41	24.71	24.35	24.15	24.08	24.03	24.01	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	
.72	28.57	26.00	25.09	24.39	24.03	23.83	23.75	23.71	23.68	23.67	23.66	23.66	23.66	23.66	23.66	23.66	23.66	
.73	28.22	25.67	24.76	24.07	23.71	23.52	23.44	23.40	23.37	23.36	23.35	23.35	23.35	23.35	23.35	23.35	23.35	
.74	27.86	25.33	24.44	23.75	23.41	23.21	23.13	23.09	23.07	23.05	23.05	23.05	23.05	23.05	23.05	23.05	23.05	
.75	27.50	25.00	24.11	23.44	23.10	22.90	22.83	22.79	22.76	22.75	22.74	22.74	22.74	22.74	22.74	22.74	22.74	
.76	27.15	24.67	23.79	23.12	22.79	22.60	22.52	22.48	22.46	22.44	22.44	22.44	22.44	22.44	22.44	22.44	22.44	
.77	26.79	24.33	23.47	22.81	22.48	22.30	22.22	22.18	22.16	22.14	22.14	22.14	22.14	22.14	22.14	22.14	22.14	
.78	26.43	24.00	23.15	22.50	22.18	21.99	21.92	21.88	21.86	21.85	21.84	21.84	21.84	21.84	21.84	21.84	21.84	
.79	26.07	23.67	22.83	22.19	21.87	21.70	21.63	21.59	21.57	21.55	21.55	21.55	21.55	21.55	21.55	21.55	21.55	
.80	25.71	23.33	22.51	21.86	21.57	21.40	21.33	21.29	21.27	21.26	21.25	21.25	21.25	21.25	21.25	21.25	21.25	
.81	25.35	23.00	22.19	21.55	21.27	21.10	21.04	21.00	20.98	20.97	20.96	20.96	20.96	20.96	20.96	20.96	20.96	
.82	24.99	22.67	21.87	21.23	20.96	20.81	20.75	20.71	20.69	20.68	20.67	20.67	20.67	20.67	20.67	20.67	20.67	
.83	24.63	22.33	21.56	20.92	20.66	20.52	20.46	20.42	20.40	20.39	20.37	20.37	20.37	20.37	20.37	20.37	20.37	
.84	24.27	22.00	21.24	20.60	20.35	20.23	20.17	20.14	20.12	20.11	20.09	20.09	20.09	20.09	20.09	20.09	20.09	
.85	23.91	21.67	20.93	20.30	20.05	19.94	19.89	19.86	19.84	19.82	19.80	19.79	19.78	19.78	19.78	19.78	19.78	
.86	23.55	21.33	20.61	20.00	19.75	19.66	19.60	19.57	19.56	19.54	19.53	19.53	19.53	19.53	19.53	19.53	19.53	
.87	23.19	21.00	20.31	19.70	19.45	19.38	19.32	19.30	19.28	19.27	19.25	19.25	19.24	19.23	19.23	19.23	19.23	
.88	22.83	20.67	20.00	19.40	19.15	19.08	19.03	19.02	19.00	18.99	18.98	18.98	18.96	18.96	18.96	18.96	18.96	
.89	22.47	20.33	19.68	19.10	18.85	18.80	18.74	18.71	18.70	18.69	18.67	18.67	18.67	18.67	18.67	18.67	18.67	
.90	22.11	20.00	19.38	18.80	18.57	18.50	18.44	18.41	18.40	18.39	18.37	18.37	18.37	18.37	18.37	18.37	18.37	
.91	21.75	19.67	19.07	18.50	18.27	18.20	18.14	18.11	18.10	18.09	18.07	18.07	18.07	18.07	18.07	18.07	18.07	
.92	21.39	19.33	18.77	18.20	17.95	17.90	17.84	17.81	17.80	17.79	17.77	17.77	17.77	17.77	17.77	17.77	17.77	
.93	21.03	19.00	18.46	17.90	17.65	17.60	17.54	17.51	17.50	17.49	17.47	17.47	17.47	17.47	17.47	17.47	17.47	
.94	20.67	18.67	18.16	17.60	17.35	17.30	17.24	17.21	17.20	17.19	17.17	17.17	17.17	17.17	17.17	17.17	17.17	
.95	20.31	18.33	17.86	17.30	17.05	17.00	16.94	16.91	16.90	16.89	16.87	16.87	16.87	16.87	16.87	16.87	16.87	
.96	19.95	18.00	17.55	17.00	16.75	16.70	16.64	16.61	16.60	16.59	16.57	16.57	16.57	16.57	16.57	16.57	16.57	
.97	19.59	17.67	17.25	16.70	16.45	16.40	16.34	16.31	16.30	16.29	16.27	16.27	16.27	16.27	16.27	16.27	16.27	
.98	19.23	17.33	16.93	16.38	16.13	16.08	16.02	16.00	15.99	15.98	15.96	15.96	15.96	15.96	15.96	15.96	15.96	
.99	18.87	17.00	16.61	16.06	15.81	15.76	15.70	15.67	15.66	15.65	15.63	15.63	15.63	15.63	15.63	15.63	15.63	
1.00	18.51	16.67	16.30	15.75	15.50	15.45	15.39	15.36	15.35	15.34	15.32	15.32	15.32	15.32	15.32	15.32	15.32	
1.01	18.15	16.33	16.00	15.45	15.20	15.15	15.09	15.06	15.05	15.04	15.02	15.02	15.02	15.02	15.02	15.02	15.02	
1.02	17.79	16.00	15.68	15.13	14.88	14.83	14.77	14.74	14.73	14.72	14.70	14.70	14.70	14.70	14.70	14.70	14.70	
1.03	17.43	15.67	15.38	14.83	14.58	14.53	14.47	14.44	14.43	14.42	14.40	14.40	14.40	14.40	14.40	14.40	14.40	
1.04	17.07	15.33	15.07	14.52	14.27	14.22	14.16	14.13	14.12	14.11	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
1.05	16.71	15.00	14.76	14.21	13.96	13.91	13.85	13.82	13.81	13.80	13.78	13.78	13.78	13.78	13.78	13.78	13.78	
1.06	16.35	14.67	14.45	13.90	13.65	13.60	13.54	13.51	13.50	13.49	13.47	13.47	13.47	13.47	13.47	13.47	13.47	
1.07	15.99	14.33	14.13	13.58	13.33	13.28	13.22	13.19	13.18	13.17	13.15	13.15	13.15	13.15	13.15	13.15	13.15	
1.08	15.63	14.00	13.81	13.26	13.01	12.96	12.90	12.87	12.86	12.85	12.83	12.83	12.83	12.83	12.83	12.83	12.83	
1.09	15.27	13.67	13.49	12.94	12.69	12.64	12.58	12.55	12.54	12.53	12.51	12.51	12.51	12.51	12.51	12.51	12.51	

¹Values tabulated are read in percent.

Attachment A

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TABLE B-5
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Table B-5—Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Chart or Cp	Sample Size																
	3	4	5	7	10	15	20	25	30	35	50	75	100	150	200		
1.10	9.84	13.33	15.45	15.49	15.50	15.51	15.52	15.52	15.53	15.54	15.54	15.55	15.55	15.56	15.56		
1.11	8.89	13.00	15.20	15.25	15.26	15.26	15.27	15.27	15.28	15.28	15.29	15.30	15.30	15.31	15.31		
1.12	7.82	12.67	14.93	15.00	15.00	15.01	15.01	15.02	15.02	15.03	15.03	15.04	15.04	15.05	15.05		
1.13	6.66	12.35	14.63	14.75	14.80	14.80	14.81	14.81	14.82	14.82	14.83	14.84	14.84	14.85	14.85		
1.14	5.00	12.00	14.33	14.51	14.57	14.61	14.63	14.65	14.66	14.67	14.68	14.69	14.70	14.70	14.71		
1.15	3.87	11.67	14.03	14.27	14.34	14.38	14.42	14.44	14.45	14.46	14.47	14.48	14.49	14.49	14.50		
1.16	0.00	11.35	13.72	14.03	14.13	14.16	14.21	14.22	14.24	14.25	14.26	14.28	14.28	14.29	14.29		
1.17	0.00	11.00	13.36	13.79	13.90	13.96	14.00	14.02	14.03	14.04	14.06	14.07	14.08	14.09	14.09		
1.18	0.00	10.67	13.04	13.50	13.65	13.75	13.79	13.81	13.82	13.84	13.85	13.87	13.88	13.89	13.89		
1.19	0.00	10.33	12.72	13.23	13.40	13.54	13.58	13.61	13.62	13.63	13.65	13.67	13.68	13.69	13.69		
1.20	0.00	10.00	12.40	12.95	13.14	13.28	13.38	13.41	13.42	13.43	13.46	13.47	13.48	13.49	13.49		
1.21	0.00	9.67	12.08	12.67	12.88	13.03	13.13	13.18	13.21	13.22	13.24	13.26	13.28	13.29	13.29		
1.22	0.00	9.33	11.75	12.38	12.61	12.78	12.89	12.94	12.97	12.98	13.01	13.02	13.04	13.05	13.05		
1.23	0.00	9.00	11.43	12.09	12.34	12.53	12.65	12.70	12.73	12.74	12.77	12.78	12.80	12.81	12.81		
1.24	0.00	8.67	11.11	11.80	12.07	12.28	12.41	12.46	12.49	12.50	12.53	12.54	12.56	12.57	12.57		
1.25	0.00	8.33	10.79	11.50	11.79	12.02	12.16	12.21	12.24	12.25	12.28	12.29	12.31	12.32	12.32		
1.26	0.00	8.00	10.47	11.20	11.51	11.76	11.91	11.96	11.99	12.00	12.03	12.04	12.06	12.07	12.07		
1.27	0.00	7.67	10.15	10.90	11.23	11.49	11.65	11.70	11.73	11.74	11.77	11.78	11.80	11.81	11.81		
1.28	0.00	7.33	9.83	10.60	10.95	11.23	11.40	11.46	11.49	11.50	11.53	11.54	11.56	11.57	11.57		
1.29	0.00	7.00	9.50	10.29	10.66	10.95	11.13	11.20	11.23	11.24	11.27	11.28	11.30	11.31	11.31		
1.30	0.00	6.67	9.17	9.98	10.37	10.68	10.87	10.94	10.97	10.98	11.01	11.02	11.04	11.05	11.05		
1.31	0.00	6.33	8.85	9.68	10.09	10.41	10.61	10.69	10.72	10.73	10.76	10.77	10.79	10.80	10.80		
1.32	0.00	6.00	8.53	9.38	9.81	10.14	10.36	10.44	10.47	10.48	10.51	10.52	10.54	10.55	10.55		
1.33	0.00	5.67	8.21	9.08	9.53	9.87	10.10	10.18	10.21	10.22	10.25	10.26	10.28	10.29	10.29		
1.34	0.00	5.33	7.89	8.78	9.25	9.60	9.84	9.92	9.95	9.96	9.99	10.00	10.02	10.03	10.03		
1.35	0.00	5.00	7.57	8.48	8.97	9.33	9.58	9.66	9.69	9.70	9.73	9.74	9.76	9.77	9.77		
1.36	0.00	4.67	7.25	8.18	8.69	9.06	9.32	9.40	9.43	9.44	9.47	9.48	9.50	9.51	9.51		
1.37	0.00	4.33	6.93	7.88	8.41	8.79	9.06	9.14	9.17	9.18	9.21	9.22	9.24	9.25	9.25		
1.38	0.00	4.00	6.61	7.58	8.13	8.52	8.80	8.88	8.91	8.92	8.95	8.96	8.98	8.99	8.99		
1.39	0.00	3.67	6.29	7.28	7.85	8.25	8.54	8.62	8.65	8.66	8.69	8.70	8.72	8.73	8.73		
1.40	0.00	3.35	5.98	6.99	7.58	7.99	8.29	8.37	8.40	8.41	8.44	8.45	8.47	8.48	8.48		
1.41	0.00	3.00	5.66	6.69	7.30	7.72	8.03	8.12	8.15	8.16	8.19	8.20	8.22	8.23	8.23		
1.42	0.00	2.67	5.34	6.39	7.02	7.45	7.77	7.86	7.89	7.90	7.93	7.94	7.96	7.97	7.97		
1.43	0.01	2.33	5.03	6.09	6.74	7.18	7.51	7.60	7.63	7.64	7.67	7.68	7.70	7.71	7.71		
1.44	0.00	2.00	4.72	5.80	6.47	6.92	7.26	7.35	7.38	7.39	7.42	7.43	7.45	7.46	7.46		
1.45	0.00	1.67	4.41	5.50	6.19	6.65	7.00	7.09	7.12	7.13	7.16	7.17	7.19	7.20	7.20		
1.46	0.00	1.33	4.10	5.20	5.91	6.38	6.74	6.83	6.86	6.87	6.90	6.91	6.93	6.94	6.94		
1.47	0.00	1.00	3.79	4.90	5.63	6.11	6.48	6.57	6.60	6.61	6.64	6.65	6.67	6.68	6.68		
1.48	0.00	.67	3.49	4.61	5.36	5.85	6.23	6.32	6.35	6.36	6.39	6.40	6.42	6.43	6.43		
1.49	0.00	.33	3.19	4.33	5.09	5.59	5.98	6.07	6.10	6.11	6.14	6.15	6.17	6.18	6.18		

¹Values tabulated are read in percent.

Attachment A

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TABLE B-5
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Table B-5—Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

$\frac{Q_d}{Q_n}$	$\frac{Q_d}{Q_n}$	Sample Size															
		3	4	5	7	10	15	20	25	30	35	50	75	100	150	200	
1.50	0.00	0.00	1.90	5.78	9.87	9.20	9.34	9.41	9.46	9.50	9.55	9.60	9.65	9.69	9.74	9.79	
1.51	0.00	0.00	1.91	5.13	5.73	6.06	6.20	6.28	6.33	6.36	6.42	6.47	6.49	6.51	6.52	6.53	
1.52	0.00	0.00	1.92	4.97	5.59	5.91	6.07	6.15	6.20	6.23	6.29	6.34	6.36	6.38	6.39	6.40	
1.53	0.00	0.00	1.93	4.82	5.45	5.80	5.94	6.02	6.07	6.11	6.17	6.21	6.24	6.26	6.27	6.28	
1.54	0.00	0.00	1.95	4.67	5.31	5.67	5.81	5.89	5.95	5.98	6.04	6.09	6.11	6.13	6.15	6.16	
1.55	0.00	0.00	1.97	4.52	5.18	5.54	5.69	5.77	5.82	5.86	5.92	5.97	5.99	6.01	6.02	6.03	
1.56	0.00	0.00	1.99	4.38	5.04	5.41	5.56	5.65	5.70	5.74	5.80	5.85	5.87	5.89	5.90	5.91	
1.57	0.00	0.00	2.02	4.24	4.93	5.29	5.44	5.53	5.58	5.62	5.68	5.73	5.75	5.78	5.79	5.80	
1.58	0.00	0.00	2.05	4.10	4.79	5.16	5.32	5.41	5.46	5.50	5.56	5.61	5.64	5.66	5.67	5.68	
1.59	0.00	0.00	2.10	3.96	4.66	5.04	5.20	5.29	5.34	5.38	5.43	5.50	5.52	5.55	5.56	5.57	
1.60	0.00	0.00	2.05	3.82	4.54	4.92	5.08	5.17	5.23	5.27	5.33	5.38	5.41	5.43	5.44	5.45	
1.61	0.00	0.00	1.87	3.69	4.41	4.81	4.97	5.06	5.12	5.16	5.21	5.27	5.30	5.32	5.33	5.34	
1.62	0.00	0.00	1.72	3.57	4.30	4.69	4.86	4.95	5.01	5.04	5.11	5.16	5.19	5.21	5.23	5.24	
1.63	0.00	0.00	1.57	3.44	4.18	4.58	4.75	4.84	4.90	4.94	5.01	5.06	5.08	5.11	5.12	5.13	
1.64	0.00	0.00	1.42	3.31	4.06	4.47	4.64	4.73	4.79	4.83	4.90	4.95	4.98	5.00	5.01	5.02	
1.65	0.00	0.00	1.28	3.19	3.95	4.36	4.53	4.62	4.68	4.72	4.79	4.84	4.87	4.89	4.91	4.92	
1.66	0.00	0.00	1.13	3.07	3.84	4.25	4.43	4.51	4.58	4.62	4.69	4.74	4.77	4.80	4.81	4.82	
1.67	0.00	0.00	1.02	2.93	3.70	4.11	4.30	4.38	4.45	4.50	4.57	4.64	4.67	4.70	4.71	4.72	
1.68	0.00	0.00	0.89	2.84	3.62	4.03	4.22	4.30	4.38	4.43	4.49	4.55	4.57	4.60	4.61	4.62	
1.69	0.00	0.00	0.77	2.73	3.52	3.94	4.12	4.20	4.28	4.33	4.39	4.45	4.47	4.50	4.51	4.52	
1.70	0.00	0.00	0.66	2.62	3.41	3.84	4.02	4.10	4.18	4.23	4.30	4.35	4.38	4.41	4.42	4.43	
1.71	0.00	0.00	0.55	2.51	3.31	3.75	3.93	4.02	4.09	4.13	4.20	4.26	4.29	4.31	4.32	4.33	
1.72	0.00	0.00	0.45	2.41	3.21	3.65	3.83	3.93	3.99	4.04	4.11	4.17	4.19	4.22	4.23	4.24	
1.73	0.00	0.00	0.36	2.30	3.11	3.55	3.74	3.84	3.90	3.94	4.02	4.08	4.10	4.13	4.14	4.15	
1.74	0.00	0.00	0.27	2.20	3.02	3.46	3.65	3.75	3.81	3.85	3.93	3.99	4.01	4.04	4.05	4.06	
1.75	0.00	0.00	0.19	2.11	2.92	3.36	3.55	3.66	3.72	3.77	3.84	3.90	3.93	3.95	3.97	3.98	
1.76	0.00	0.00	0.12	2.01	2.83	3.28	3.47	3.57	3.63	3.68	3.76	3.81	3.84	3.87	3.88	3.89	
1.77	0.00	0.00	0.06	1.92	2.74	3.20	3.38	3.48	3.55	3.59	3.67	3.73	3.76	3.78	3.80	3.81	
1.78	0.00	0.00	0.02	1.83	2.66	3.11	3.30	3.40	3.47	3.51	3.59	3.64	3.67	3.70	3.71	3.72	
1.79	0.00	0.00	0.00	1.74	2.57	3.02	3.21	3.32	3.38	3.43	3.51	3.56	3.59	3.62	3.63	3.64	
1.80	0.00	0.00	0.00	1.65	2.49	2.94	3.13	3.24	3.30	3.35	3.43	3.48	3.51	3.54	3.55	3.56	
1.81	0.00	0.00	0.00	1.57	2.40	2.86	3.05	3.16	3.22	3.27	3.35	3.40	3.43	3.46	3.47	3.48	
1.82	0.00	0.00	0.00	1.49	2.32	2.79	2.98	3.09	3.15	3.19	3.27	3.33	3.36	3.39	3.40	3.41	
1.83	0.00	0.00	0.00	1.41	2.25	2.71	2.90	3.00	3.07	3.11	3.19	3.25	3.28	3.31	3.32	3.33	
1.84	0.00	0.00	0.00	1.34	2.17	2.63	2.82	2.93	2.99	3.04	3.12	3.18	3.21	3.23	3.25	3.26	
1.85	0.00	0.00	0.00	1.26	2.09	2.56	2.75	2.85	2.92	2.97	3.05	3.10	3.13	3.16	3.17	3.18	
1.86	0.00	0.00	0.00	1.19	2.02	2.48	2.68	2.78	2.85	2.89	2.97	3.03	3.06	3.09	3.10	3.11	
1.87	0.00	0.00	0.00	1.12	1.95	2.41	2.61	2.71	2.78	2.82	2.90	2.96	2.99	3.02	3.03	3.04	
1.88	0.00	0.00	0.00	1.06	1.88	2.34	2.54	2.64	2.71	2.75	2.83	2.89	2.92	2.95	2.96	2.97	
1.89	0.00	0.00	0.00	0.99	1.81	2.28	2.47	2.57	2.64	2.69	2.77	2.83	2.86	2.89	2.90	2.91	

¹ Values tabulated are read in percent.

Attachment A

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TABLE B-5
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Table B-5- Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

U ₀ (%)	Sample Size															
	3	4	5	7	10	15	20	25	30	35	50	75	100	150	200	
1.00	0.00	0.00	0.00	0.93	1.75	2.21	2.40	2.51	2.57	2.62	2.70	2.76	2.79	2.83	2.87	
1.01	0.00	0.00	0.00	0.87	1.66	2.14	2.34	2.44	2.51	2.56	2.63	2.69	2.72	2.75	2.77	
1.02	0.00	0.00	0.00	0.81	1.62	2.08	2.27	2.38	2.45	2.49	2.57	2.63	2.66	2.69	2.70	
1.03	0.00	0.00	0.00	0.76	1.55	2.02	2.21	2.32	2.38	2.43	2.51	2.57	2.60	2.63	2.64	
1.04	0.00	0.00	0.00	0.70	1.50	1.96	2.15	2.25	2.32	2.37	2.45	2.51	2.54	2.56	2.58	
1.05	0.00	0.00	0.00	0.65	1.44	1.90	2.09	2.19	2.26	2.31	2.39	2.45	2.48	2.50	2.52	
1.06	0.00	0.00	0.00	0.60	1.33	1.84	2.03	2.14	2.20	2.25	2.33	2.39	2.42	2.44	2.46	
1.07	0.00	0.00	0.00	0.56	1.33	1.78	1.97	2.08	2.14	2.19	2.27	2.33	2.36	2.39	2.40	
1.08	0.00	0.00	0.00	0.51	1.27	1.73	1.92	2.02	2.09	2.13	2.21	2.27	2.30	2.33	2.34	
1.09	0.00	0.00	0.00	0.47	1.22	1.67	1.86	1.97	2.03	2.08	2.16	2.22	2.25	2.27	2.29	
1.00	0.00	0.00	0.00	0.43	1.17	1.62	1.81	1.91	1.98	2.03	2.10	2.16	2.19	2.22	2.23	
2.01	0.00	0.00	0.00	0.39	1.12	1.57	1.76	1.86	1.93	1.97	2.05	2.11	2.14	2.17	2.18	
2.02	0.00	0.00	0.00	0.36	1.07	1.52	1.71	1.81	1.87	1.92	2.00	2.06	2.09	2.11	2.14	
2.03	0.00	0.00	0.00	0.32	1.03	1.47	1.66	1.76	1.82	1.87	1.95	2.01	2.04	2.06	2.08	
2.04	0.00	0.00	0.00	0.29	0.98	1.42	1.61	1.71	1.77	1.82	1.90	1.96	1.99	2.01	2.03	
2.05	0.00	0.00	0.00	0.26	0.94	1.37	1.56	1.65	1.72	1.77	1.85	1.91	1.94	1.96	1.98	
2.06	0.00	0.00	0.00	0.23	0.90	1.33	1.51	1.61	1.67	1.72	1.80	1.86	1.89	1.92	1.93	
2.07	0.00	0.00	0.00	0.21	0.86	1.28	1.47	1.57	1.63	1.68	1.76	1.81	1.84	1.87	1.88	
2.08	0.00	0.00	0.00	0.18	0.82	1.24	1.42	1.52	1.59	1.63	1.71	1.77	1.79	1.82	1.84	
2.09	0.00	0.00	0.00	0.16	0.78	1.20	1.38	1.48	1.54	1.59	1.66	1.73	1.75	1.78	1.79	
2.10	0.00	0.00	0.00	0.14	0.74	1.16	1.34	1.44	1.50	1.54	1.62	1.68	1.71	1.73	1.75	
2.11	0.00	0.00	0.00	0.12	0.71	1.12	1.30	1.39	1.46	1.50	1.58	1.63	1.66	1.69	1.70	
2.12	0.00	0.00	0.00	0.10	0.67	1.08	1.26	1.35	1.42	1.46	1.54	1.59	1.62	1.65	1.66	
2.13	0.00	0.00	0.00	0.08	0.64	1.04	1.22	1.31	1.38	1.42	1.50	1.55	1.58	1.61	1.62	
2.14	0.00	0.00	0.00	0.07	0.61	1.00	1.18	1.28	1.34	1.38	1.46	1.51	1.54	1.57	1.58	
2.15	0.00	0.00	0.00	0.06	0.58	0.97	1.14	1.24	1.30	1.34	1.42	1.47	1.50	1.53	1.54	
2.16	0.00	0.00	0.00	0.05	0.55	0.93	1.10	1.20	1.26	1.30	1.38	1.43	1.46	1.49	1.50	
2.17	0.00	0.00	0.00	0.04	0.52	0.90	1.07	1.16	1.22	1.25	1.34	1.40	1.42	1.45	1.46	
2.18	0.00	0.00	0.00	0.03	0.49	0.87	1.03	1.13	1.19	1.23	1.30	1.36	1.39	1.41	1.42	
2.19	0.00	0.00	0.00	0.02	0.46	0.83	1.00	1.09	1.15	1.20	1.27	1.32	1.35	1.38	1.39	
2.20	0.000	0.000	0.000	0.015	0.437	0.805	0.965	1.060	1.120	1.160	1.235	1.287	1.314	1.340	1.352	
2.21	0.000	0.000	0.000	0.010	0.421	0.792	0.946	1.038	1.097	1.136	1.211	1.263	1.290	1.316	1.328	
2.22	0.000	0.000	0.000	0.006	0.389	0.734	0.905	0.996	1.054	1.093	1.166	1.218	1.245	1.271	1.284	
2.23	0.000	0.000	0.000	0.005	0.366	0.715	0.874	0.965	1.023	1.061	1.134	1.186	1.212	1.238	1.250	
2.24	0.000	0.000	0.000	0.002	0.345	0.687	0.844	0.935	0.992	1.032	1.102	1.154	1.180	1.205	1.218	
2.25	0.000	0.000	0.000	0.001	0.324	0.660	0.816	0.905	0.962	1.002	1.071	1.123	1.149	1.173	1.186	
2.26	0.000	0.000	0.000	0.000	0.304	0.634	0.789	0.878	0.933	0.972	1.041	1.092	1.117	1.142	1.155	
2.27	0.000	0.000	0.000	0.000	0.285	0.609	0.762	0.848	0.904	0.943	1.011	1.062	1.087	1.112	1.124	
2.28	0.000	0.000	0.000	0.000	0.267	0.585	0.723	0.821	0.876	0.915	0.982	1.033	1.058	1.082	1.095	
2.29	0.000	0.000	0.000	0.000	0.250	0.561	0.710	0.794	0.849	0.887	0.954	1.004	1.029	1.053	1.065	

¹Values tabulated are read in percent.

Attachment A

ML-STD-414
TABLE B-5
Page 6 of 9

Table B-5—Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Q ₁ Q ₂	Sample Size															
	1	4	5	7	10	15	20	25	30	35	50	75	100	150	200	
2.30	0.000	0.300	0.000	0.000	0.233	0.513	0.688	0.760	0.825	0.861	0.937	0.977	1.001	1.025	1.037	
2.31	0.000	0.300	0.000	0.000	0.2318	0.516	0.661	0.743	0.797	0.834	0.900	0.949	0.974	0.998	1.009	
2.32	0.000	0.300	0.000	0.000	0.2303	0.495	0.637	0.719	0.773	0.809	0.874	0.923	0.947	0.971	0.982	
2.33	0.000	0.300	0.000	0.000	0.2289	0.474	0.614	0.695	0.748	0.784	0.848	0.897	0.921	0.944	0.956	
2.34	0.000	0.300	0.000	0.000	0.2278	0.451	0.592	0.672	0.724	0.760	0.824	0.873	0.897	0.920	0.930	
2.35	0.000	0.300	0.000	0.000	0.2265	0.435	0.571	0.652	0.701	0.736	0.799	0.847	0.870	0.893	0.903	
2.36	0.000	0.300	0.000	0.000	0.2251	0.416	0.550	0.630	0.678	0.711	0.774	0.821	0.844	0.867	0.877	
2.37	0.000	0.300	0.000	0.000	0.2239	0.398	0.530	0.609	0.656	0.689	0.751	0.798	0.821	0.844	0.854	
2.38	0.000	0.300	0.000	0.000	0.2228	0.381	0.510	0.588	0.635	0.668	0.729	0.776	0.799	0.822	0.832	
2.39	0.000	0.300	0.000	0.000	0.2218	0.364	0.491	0.566	0.614	0.646	0.706	0.754	0.777	0.799	0.810	
2.40	0.000	0.300	0.000	0.000	0.2209	0.348	0.473	0.546	0.594	0.626	0.686	0.733	0.756	0.777	0.787	
2.41	0.000	0.300	0.000	0.000	0.2200	0.332	0.455	0.527	0.575	0.607	0.667	0.714	0.737	0.758	0.768	
2.42	0.000	0.300	0.000	0.000	0.2191	0.317	0.437	0.509	0.556	0.588	0.648	0.695	0.718	0.739	0.749	
2.43	0.000	0.300	0.000	0.000	0.2183	0.302	0.421	0.491	0.537	0.569	0.629	0.676	0.699	0.720	0.730	
2.44	0.000	0.300	0.000	0.000	0.2175	0.287	0.405	0.475	0.521	0.553	0.613	0.660	0.683	0.704	0.714	
2.45	0.000	0.300	0.000	0.000	0.2167	0.272	0.389	0.458	0.504	0.536	0.596	0.643	0.666	0.687	0.697	
2.46	0.000	0.300	0.000	0.000	0.2159	0.257	0.373	0.442	0.488	0.519	0.579	0.626	0.649	0.670	0.680	
2.47	0.000	0.300	0.000	0.000	0.2151	0.242	0.358	0.427	0.472	0.504	0.564	0.611	0.634	0.655	0.665	
2.48	0.000	0.300	0.000	0.000	0.2143	0.227	0.342	0.411	0.456	0.487	0.547	0.594	0.617	0.638	0.648	
2.49	0.000	0.300	0.000	0.000	0.2135	0.212	0.326	0.395	0.440	0.471	0.531	0.578	0.601	0.622	0.632	
2.50	0.000	0.300	0.000	0.000	0.2127	0.197	0.311	0.380	0.425	0.456	0.516	0.563	0.586	0.607	0.617	
2.51	0.000	0.300	0.000	0.000	0.2119	0.182	0.296	0.365	0.410	0.441	0.501	0.548	0.571	0.592	0.602	
2.52	0.000	0.300	0.000	0.000	0.2111	0.167	0.281	0.350	0.395	0.426	0.486	0.533	0.556	0.577	0.587	
2.53	0.000	0.300	0.000	0.000	0.2103	0.152	0.266	0.335	0.380	0.411	0.471	0.518	0.541	0.562	0.572	
2.54	0.000	0.300	0.000	0.000	0.2095	0.137	0.251	0.320	0.365	0.396	0.456	0.503	0.526	0.547	0.557	
2.55	0.000	0.300	0.000	0.000	0.2087	0.122	0.236	0.305	0.350	0.381	0.441	0.488	0.511	0.532	0.542	
2.56	0.000	0.300	0.000	0.000	0.2079	0.107	0.221	0.290	0.335	0.366	0.426	0.473	0.496	0.517	0.527	
2.57	0.000	0.300	0.000	0.000	0.2071	0.092	0.206	0.275	0.320	0.351	0.411	0.458	0.481	0.502	0.512	
2.58	0.000	0.300	0.000	0.000	0.2063	0.077	0.191	0.260	0.305	0.336	0.396	0.443	0.466	0.487	0.497	
2.59	0.000	0.300	0.000	0.000	0.2055	0.062	0.176	0.245	0.290	0.321	0.381	0.428	0.451	0.472	0.482	
2.60	0.000	0.300	0.000	0.000	0.2047	0.047	0.161	0.230	0.275	0.306	0.366	0.413	0.436	0.457	0.467	
2.61	0.000	0.300	0.000	0.000	0.2039	0.032	0.146	0.215	0.260	0.291	0.351	0.398	0.421	0.442	0.452	
2.62	0.000	0.300	0.000	0.000	0.2031	0.017	0.131	0.200	0.245	0.276	0.336	0.383	0.406	0.427	0.437	
2.63	0.000	0.300	0.000	0.000	0.2023	0.002	0.116	0.185	0.230	0.261	0.321	0.368	0.391	0.412	0.422	
2.64	0.000	0.300	0.000	0.000	0.2015	0.000	0.101	0.170	0.215	0.246	0.306	0.353	0.376	0.397	0.407	
2.65	0.000	0.300	0.000	0.000	0.2007	0.000	0.086	0.155	0.200	0.231	0.291	0.338	0.361	0.382	0.392	
2.66	0.000	0.300	0.000	0.000	0.2000	0.000	0.071	0.140	0.185	0.216	0.276	0.323	0.346	0.367	0.377	
2.67	0.000	0.300	0.000	0.000	0.1992	0.000	0.056	0.125	0.170	0.201	0.261	0.308	0.331	0.352	0.362	
2.68	0.000	0.300	0.000	0.000	0.1984	0.000	0.041	0.110	0.155	0.186	0.246	0.293	0.316	0.337	0.347	
2.69	0.000	0.300	0.000	0.000	0.1976	0.000	0.026	0.095	0.140	0.171	0.231	0.278	0.301	0.322	0.332	

¹Values tabulated are read in percent.

Attachment A

ML-STD-414
TABLE B-5
Page 7 of 9

Table B-5—Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Quality Level, %	Sample Size															
	3	4	5	6	10	15	20	25	30	35	50	75	100	150	200	
2.70	0.006	0.020	0.030	0.040	0.060	0.066	0.130	0.171	0.220	0.220	0.258	0.288	0.302	0.317	0.323	
2.71	0.006	0.020	0.030	0.040	0.060	0.064	0.128	0.164	0.192	0.212	0.249	0.278	0.293	0.307	0.313	
2.72	0.006	0.020	0.030	0.040	0.060	0.066	0.128	0.157	0.154	0.204	0.241	0.269	0.283	0.298	0.303	
2.73	0.006	0.020	0.030	0.040	0.060	0.057	0.112	0.151	0.179	0.192	0.232	0.260	0.274	0.288	0.296	
2.74	0.006	0.020	0.030	0.040	0.060	0.063	0.119	0.144	0.170	0.180	0.224	0.232	0.266	0.279	0.286	
2.75	0.006	0.020	0.030	0.040	0.060	0.064	0.112	0.138	0.163	0.182	0.216	0.240	0.257	0.271	0.277	
2.76	0.006	0.020	0.030	0.040	0.060	0.066	0.097	0.132	0.157	0.175	0.205	0.235	0.248	0.262	0.268	
2.77	0.006	0.020	0.030	0.040	0.060	0.063	0.092	0.126	0.151	0.168	0.201	0.237	0.241	0.254	0.260	
2.78	0.006	0.020	0.030	0.040	0.060	0.060	0.087	0.121	0.145	0.162	0.194	0.220	0.233	0.246	0.252	
2.79	0.006	0.020	0.030	0.040	0.060	0.061	0.083	0.115	0.139	0.156	0.189	0.212	0.226	0.238	0.244	
2.80	0.006	0.020	0.030	0.040	0.060	0.060	0.079	0.110	0.135	0.150	0.181	0.205	0.218	0.230	0.237	
2.81	0.006	0.020	0.030	0.040	0.060	0.061	0.075	0.105	0.130	0.144	0.174	0.198	0.211	0.223	0.229	
2.82	0.006	0.020	0.030	0.040	0.060	0.060	0.071	0.101	0.122	0.138	0.168	0.192	0.204	0.216	0.222	
2.83	0.006	0.020	0.030	0.040	0.060	0.060	0.067	0.096	0.117	0.133	0.162	0.185	0.197	0.209	0.215	
2.84	0.006	0.020	0.030	0.040	0.060	0.060	0.063	0.092	0.113	0.128	0.156	0.179	0.190	0.202	0.208	
2.85	0.006	0.020	0.030	0.040	0.060	0.060	0.060	0.088	0.109	0.122	0.150	0.173	0.184	0.195	0.201	
2.86	0.006	0.020	0.030	0.040	0.060	0.060	0.057	0.084	0.105	0.119	0.145	0.167	0.178	0.189	0.195	
2.87	0.006	0.020	0.030	0.040	0.060	0.060	0.055	0.080	0.099	0.113	0.139	0.161	0.172	0.183	0.188	
2.88	0.006	0.020	0.030	0.040	0.060	0.060	0.053	0.076	0.094	0.108	0.134	0.155	0.166	0.177	0.182	
2.89	0.006	0.020	0.030	0.040	0.060	0.060	0.051	0.072	0.090	0.104	0.129	0.150	0.160	0.171	0.176	
2.90	0.006	0.020	0.030	0.040	0.060	0.060	0.048	0.068	0.087	0.100	0.125	0.145	0.155	0.166	0.171	
2.91	0.006	0.020	0.030	0.040	0.060	0.060	0.045	0.063	0.083	0.096	0.120	0.140	0.150	0.160	0.165	
2.92	0.006	0.020	0.030	0.040	0.060	0.060	0.043	0.060	0.079	0.092	0.115	0.135	0.145	0.155	0.160	
2.93	0.006	0.020	0.030	0.040	0.060	0.060	0.042	0.058	0.076	0.088	0.111	0.130	0.140	0.149	0.154	
2.94	0.006	0.020	0.030	0.040	0.060	0.060	0.041	0.056	0.073	0.084	0.107	0.125	0.135	0.144	0.149	
2.95	0.006	0.020	0.030	0.040	0.060	0.060	0.040	0.054	0.071	0.082	0.104	0.121	0.130	0.140	0.144	
2.96	0.006	0.020	0.030	0.040	0.060	0.060	0.039	0.052	0.069	0.079	0.099	0.117	0.126	0.135	0.140	
2.97	0.006	0.020	0.030	0.040	0.060	0.060	0.038	0.050	0.067	0.077	0.095	0.112	0.121	0.130	0.135	
2.98	0.006	0.020	0.030	0.040	0.060	0.060	0.038	0.048	0.065	0.075	0.091	0.108	0.117	0.126	0.130	
2.99	0.006	0.020	0.030	0.040	0.060	0.060	0.037	0.047	0.064	0.073	0.088	0.104	0.113	0.122	0.126	
3.00	0.006	0.020	0.030	0.040	0.060	0.060	0.035	0.042	0.058	0.068	0.084	0.101	0.109	0.118	0.122	
3.01	0.006	0.020	0.030	0.040	0.060	0.060	0.034	0.040	0.055	0.065	0.081	0.097	0.105	0.114	0.118	
3.02	0.006	0.020	0.030	0.040	0.060	0.060	0.033	0.039	0.054	0.064	0.079	0.093	0.101	0.110	0.114	
3.03	0.006	0.020	0.030	0.040	0.060	0.060	0.032	0.038	0.053	0.063	0.077	0.090	0.098	0.106	0.110	
3.04	0.006	0.020	0.030	0.040	0.060	0.060	0.031	0.036	0.051	0.061	0.075	0.087	0.094	0.103	0.106	
3.05	0.006	0.020	0.030	0.040	0.060	0.060	0.030	0.035	0.050	0.060	0.073	0.085	0.093	0.101	0.104	
3.06	0.006	0.020	0.030	0.040	0.060	0.060	0.029	0.034	0.049	0.059	0.072	0.083	0.091	0.099	0.103	
3.07	0.006	0.020	0.030	0.040	0.060	0.060	0.028	0.033	0.048	0.058	0.071	0.082	0.090	0.098	0.102	
3.08	0.006	0.020	0.030	0.040	0.060	0.060	0.027	0.032	0.047	0.057	0.070	0.081	0.089	0.097	0.101	
3.09	0.006	0.020	0.030	0.040	0.060	0.060	0.026	0.031	0.046	0.056	0.069	0.080	0.088	0.096	0.100	

¹Values tabulated are read in percent.

Attachment A

ML-STD-414
TABLE B-5
Page 8 of 9

Table B-5—Continued
Table for Estimating the Lot Percent Nonconforming Using Standard Deviation Method¹

Cp Q ₂	Sample Size																
	3	4	5	7	10	15	20	25	30	35	40	45	50	55	60	65	70
3.10	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.013	0.024	0.034	0.041	0.050	0.058	0.067	0.076	0.083	0.088
3.11	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.013	0.024	0.033	0.040	0.049	0.056	0.065	0.073	0.080	0.085
3.12	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.022	0.031	0.038	0.046	0.054	0.062	0.070	0.077	0.082
3.13	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.021	0.030	0.037	0.045	0.053	0.061	0.068	0.074	0.079
3.14	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.020	0.028	0.034	0.042	0.050	0.058	0.065	0.071	0.075
3.15	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.018	0.026	0.032	0.040	0.048	0.056	0.063	0.069	0.073
3.16	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.017	0.025	0.031	0.038	0.046	0.053	0.060	0.066	0.070
3.17	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.008	0.016	0.024	0.030	0.037	0.044	0.052	0.059	0.064	0.068
3.18	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.015	0.022	0.028	0.034	0.041	0.048	0.055	0.060	0.064
3.19	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.015	0.021	0.027	0.033	0.039	0.046	0.052	0.058	0.062
3.20	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.006	0.014	0.020	0.026	0.032	0.038	0.044	0.050	0.056	0.060
3.21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.013	0.019	0.024	0.030	0.036	0.042	0.048	0.053	0.057
3.22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.012	0.018	0.023	0.029	0.034	0.040	0.046	0.051	0.055
3.23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.011	0.017	0.022	0.028	0.033	0.039	0.044	0.050	0.054
3.24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.011	0.016	0.021	0.027	0.032	0.038	0.043	0.048	0.052
3.25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.010	0.015	0.020	0.026	0.031	0.037	0.042	0.047	0.051
3.26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.009	0.014	0.019	0.024	0.030	0.035	0.040	0.045	0.049
3.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.009	0.014	0.018	0.023	0.028	0.034	0.039	0.044	0.048
3.28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.008	0.013	0.017	0.022	0.027	0.033	0.038	0.043	0.047
3.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.008	0.012	0.016	0.021	0.026	0.032	0.037	0.042	0.046
3.30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.007	0.011	0.015	0.020	0.025	0.031	0.036	0.041	0.045
3.31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.007	0.011	0.015	0.020	0.024	0.030	0.035	0.040	0.044
3.32	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.010	0.014	0.019	0.023	0.029	0.034	0.039	0.043
3.33	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.010	0.013	0.018	0.022	0.028	0.033	0.038	0.042
3.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.009	0.013	0.017	0.021	0.027	0.032	0.037	0.041
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.009	0.012	0.016	0.020	0.026	0.031	0.036	0.040
3.36	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.008	0.011	0.015	0.019	0.024	0.029	0.034	0.038
3.37	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.008	0.011	0.014	0.018	0.023	0.028	0.033	0.037
3.38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.007	0.010	0.013	0.017	0.022	0.027	0.032	0.036
3.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.007	0.010	0.013	0.016	0.021	0.026	0.031	0.035
3.40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.007	0.009	0.012	0.015	0.020	0.025	0.030	0.034
3.41	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.009	0.012	0.015	0.020	0.024	0.029	0.033
3.42	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.011	0.014	0.019	0.023	0.028	0.032
3.43	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.011	0.013	0.018	0.022	0.027	0.031
3.44	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.011	0.013	0.017	0.021	0.026	0.030
3.45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.025	0.029
3.46	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.024	0.028
3.47	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.024	0.028
3.48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.024	0.028
3.49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.024	0.028

¹Values tabulated are read in percent.

Table B-5—Continued

[illegible]

¹Values tabulated are read in percent.

Attachment A

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EXAMPLE B-3
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EXAMPLE B-3

Example of Calculations

Double Specification Limit

Variability Unknown - Standard Deviation Method

One AQL Value for both Upper and Lower Specification Limits Combined

Example The minimum temperature of operation for a certain device is specified as 180° F. The maximum temperature is 209° F. A lot of 40 items is submitted for inspection. Inspection Level IV, normal inspection, with AQL = 1% is to be used. From Tables A-2 and B-3 it is seen that a sample of size 5 is required. Suppose the measurements obtained are as follows: 197°, 189°, 184°, 205°, and 201°; and compliance with the acceptability criterion is to be determined.

Line	Information Needed	Value Obtained	Explanation
1	Sample Size: n	5	
2	Sum of Measurements: ΣX	975	
3	Sum of Squared Measurements: ΣX^2	190,435	
4	Correction Factor (CF): $(\Sigma X)^2/n$	190,125	$(975)^2/5$
5	Corrected Sum of Squares (SS): $\Sigma X^2 - CF$	310	$190,435 - 190,125$
6	Variance (V): $SS/(n-1)$	77.5	$310/4$
7	Estimate of Lot Standard Deviation σ : $\sqrt{V}$	8.81	$\sqrt{77.5}$
8	Sample Mean $\bar{X}$: $\Sigma X/n$	195	$975/5$
9	Upper Specification Limit: U	209	
10	Lower Specification Limit: L	180	
11	Quality Index: $Q_U = (U - \bar{X})/\sigma$	1.59	$(209 - 195)/8.81$
12	Quality Index: $Q_L = (\bar{X} - L)/\sigma$	1.70	$(195 - 180)/8.81$
13	Est. of Lot Percent Def. above U: p_U	2.19%	See Table B-5
14	Est. of Lot Percent Def. below L: p_L	.66%	See Table B-5
15	Total Est. Percent Def. in Lot: $p = p_U + p_L$	2.85%	$2.19\% + .66\%$
16	Max. Allowable Percent Def.: M	3.32%	See Table B-3
17	Acceptability Criterion: Compare $p = p_U + p_L$ with M	$2.85\% < 3.32\%$	See Para. B12.1.2 (7)

The lot meets the acceptability criterion, since $p = p_U + p_L$ is less than M.