Quality Control and Reliability

HANDBOOK (Interim) **H-109**

STATISTICAL PROCEDURES FOR DETERMINING VALIDITY OF SUPPLIERS' ATTRIBUTES INSPECTION

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SUPPLY AND LOGISTICS

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This (interim) handbook was prepared by the Chemical Corps Materiel Command, Department of the Army, on behalf of the Office of the Assistant Secretary of Defense (Supply and Logistics). It provides specially developed statistical techniques, together with appropriate critical values, to test the effectiveness of a supplier's system of sampling inspection in assuring conformance of submitted supplies with technical requirements.

The statistical methods presented are useful in procurement, storage and maintenance inspection operations when an independent check is desired of the fractions defective reported. This publication is issued to make procedures available to those in the Department of Defense and in industry who are concerned with resolving inspection and quality control problems to which such techniques might apply.

Suggestions for improvement of this handbook should be addressed to the Office of the Assistant Secretary of Defense (Supply and Logistics), Washington 25, D. C.

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1. INTRODUCTION

1.1 **PURPOSE.** The purpose of this handbook is to provide appropriate statistical tests and tables of critical values to Department of Defense procurement inspection and quality control activities for use in determining the validity of suppliers' inspection records when sampling inspection by attributes is specified. Such records serve to assure the consumer that only supplies conforming with technical requirements are being offered for acceptance.

1.2 **BACKGROUND.** DoD Instruction 4155.6, "Department of Defense Quality Assurance Concept and Policy," dated 14 April 1954, established a uniform concept and policy on quality assurance as related to procurement inspection. This policy requires that, after recorded data generated by examination and testing of manufactured product are ascertained to be reliable, optimum use be made of these data obtained by suppliers in determining the acceptability of supplies. DoD Instruction 4155.8, "Department of Defense Procurement Inspection Policies and Procedures for Items Covered by Military and Federal Specifications," dated 7 May 1957, implements the broad concept and policy published in 4155.6 by prescribing uniform policies and procedures for relatively noncomplex items of supply which are technically specified in the military and federal series of specifications. DoD Instruction 4155.8 outlines the supplier's responsibilities for performing the prescribed examinations and tests itemized in Section 4 (Quality Assurance Provisions) of specifications and requires him to maintain records of his inspection results. DoD Instruction 4155.8 also prescribes the Government's responsibility for inspection, including verification of the supplier's compliance with technical requirements of the contract.

1.3 THE GOVERNMENT'S RIGHT TO REJECT. For Government procurement applications, the right to reject all nonconforming products offered for acceptance is reserved to the consumer regardless of the findings of the supplier. At its discretion, the consumer may discontinue at any time the use of the supplier's inspection results for determining acceptability of submitted supplies until all discrepancies in the records and inspection procedures have been rectified. Failure of the supplier to correct deficiencies in his inspection system responsible for the discrepancies noted will prompt the Government to take action to protect and conserve its interests.

1.4 REINSPECTION OF SUPPLIER'S SAMPLE UNITS. Where the specification prescribes sampling inspection, reinspection of the supplier's sample units at the start of production may prove beneficial. The standards adopted by the consumer are made manifest by his examination of rejected and borderline units, and the checking of inspection aids can be accomplished. However, complete verification of the inspection operations performed by the supplier's inspectors cannot consistently be carried out. The requirement that the units of the sample be selected at random without regard to their quality cannot be verified by reinspecting the items drawn by the supplier. Only an independent sample selected by the consumer can authenticate the over-all effect of the supplier's inspection in assuring conformance of supplies with technical requirements and evaluate the true quality of the supplies offered to the consumer for acceptance.

2. VALIDATION OF SUPPLIER'S INSPECTION

2.1 INDEPENDENT SAMPLING AND INSPECTION. Selection of an independent sample from the lot and performance of product verification inspection provides the consumer with an objective basis for validating a supplier's inspection. The two samples of product from the same lot can be examined for fractions defective and compared for agreement, making allowance solely for random sampling (chance) variation. A large difference between the proportions of nonconformance in the two samples may lead to a decision to investigate factors suspected of bringing about the disparity in sampling results. Some of the key factors may be failure to select random samples, improper use of inspection aids, and misinterpretation of inspection standards. This handbook provides quantitative criteria based on statistical principles to guide inspectors in conducting verification inspection of independently selected sample units from the lot submitted for consumer inspection and acceptance.

2.2 TEST FOR HOMOGENEITY. When two independent samples are drawn at random from a lot and each item in the samples is classified as conforming and nonconforming, the fractions defective in the samples may be compared. The comparison is considered a test of homogeneity of the two samples since the concern is whether the percentages of defectives observed would be such as would only occur by chance selection of the sample units, inspection being uniformly accomplished. In other words, the question to be resolved is whether the differences in sampling inspection results between the supplier and consumer can be attributed to the "luck of the draw" in selecting sample units at random from the lot or whether the differences can be assigned to real differences in inspection practice.

In this handbook, the inspection performed by the consumer will be regarded the standard against which the performance of the supplier will be judged. Each individual lot will be inspected by the supplier in accordance with the sampling standard. A second sample, proportional in size to the prescribed sample taken by the supplier will be drawn from the same lot by the consumer. From Table I, for a specified ratio of sample sizes, the consumer ascertains an "action" number associated with the number of defectives observed and recorded by the supplier and compares the number of defectives found by the consumer with the "action" number. If the latter equals or exceeds the "action" number, $d_c(A)$, the consumer's inspector adopts a course of action on the premise that a discrepancy actually exists in the supplier's inspection system.

The critical values for indicating a discrepancy in paired attribute sampling are not to be confused with the "rejection" numbers of sampling plans in the standard prescribed for determining acceptance of supplies offered to the consumer. Table I provides criteria for arriving at a decision as to the reliability of a supplier's inspection data from an individual lot submitted for acceptance. The sampling standard provides criteria for arriving at a decision as to the acceptability of the lot offered to the consumer. Accordingly, the decision as to reliability of inspection results is distinct from the decision to accept or reject a lot although the latter decision may be contingent upon the former. Thus, having no reason to impugn the validity of the supplier's inspection records, the consumer assumes that the supplier's inspector is doing everything that the consumer's inspector would do. Under such conditions, the consumer can rely upon the supplier's inspection records to support acceptance of supplies offered to him. The amount of sampling inspection performed by the consumer can thus be reduced to the minimum required to assure a flow of material meeting acceptance quality standards.

2.3 **STATISTICAL CRITERIA FOR PAIRED ATTRIBUTE SAMPLINGS.** For convenience in referring in general terms to the quantities required for the homogeneity test, the results of paired attribute samplings are represented symbolically in Table A:

TABLE A

Notation for Two-Sample Test for Homogeneity

	Defective	Effective	Sample Size
Supplier's Sample	d_s	$n_s - d_s$	n_s
Consumer's Sample	d_c	$n_c - d_c$	n_c

These data are recorded to decide whether the results of inspecting two samples, one the supplier's of size n_s and the other, the consumer's of size n_c, which are found to contain d_s and d_c defectives (or defects), respectively, are significantly different. The recorded data can be conveniently tested for statistical significance at approximately the 5 per cent level (one chance in 20 that observed differences might be due to the "luck of the draw") by means of Table I, which provides the critical values for various ratios of $n_s/n_c = r$. The critical limits of Table I are the "action" numbers for d_c when associated with an observed d_s for specified ratios of n_s/n_c equal to 1, 2, 3, 5, and 8, respectively.

2.3.1 **EXAMPLE OF USE OF TABLE I.** Suppose a specification prescribes lot sampling inspection in accordance with Military Standard 105 at inspection level II for AQL (Major) = 1.0 per cent defective and AQL (Minor) = 2.5 per cent defective. If the supplier produced lots of 1,000 units each and used single sampling, the appropriate sampling plan for major defects would be sample size = 110 and acceptance number = 3. The supplier performs sampling inspection and records that he found 2 defectives in the sample of 110 units inspected for majors. After completing his inspection, the supplier submits the lot with his inspection record to the consumer's inspector. Since this is the first lot, the inspector might appropriately choose to perform product verification inspection using the same sample size as the supplier. The inspector performs sampling inspection and finds 5 defectives in his sample of 110 units inspected. The sampling results are displayed as follows:

	Defective	Effective	Sample Size
Supplier's Sample	2	108	110
Consumer's Sample	5	105	110

Referring to Table I, for r = 1 (since the ratio of the supplier's sample size to the consumer's sample size equals 1), the inspector finds that, corresponding to the 2 defectives observed by the supplier, the "action" limit for the number of defectives observed in the consumer's sample is 7. Since the consumer noted only 5 defectives in his verification sample, he has no evidence at this time to doubt the validity of the supplier's inspection result for the lot in question.

After the consumer's inspector has performed verification inspection for the first few lots and has found no significant discrepancies between the supplier's results and his own, he may reduce his sample size to one-half that of the supplier. (More definite guidance for reducing verification sampling is available from the operating characteristics of the test as explained in the next section of this handbook.) Now, suppose the contractor's record for the lot verified showed 3 defectives in a sample of 110 units, but the consumer's inspector found 3 defectives in a sample of 55 units from the same lot. Referring to Table I for r = 2 (ratio of supplier's sample size to consumer's sample = 2) with the entry $d_s = 3$ we note that $d_c = 3$ does not exceed the corresponding critical value, $d_c(A) = 5$. Again, from the single test performed, there is no pronounced indication that random variation is not responsible for the differences observed in the paired samplings from the same lot.

2.4 COMBINATION OF TESTS FOR HOMOGENEITY. When the supplier institutes reduced inspection as provided by MIL-STD 105, the expected number of defectives in his samples may be very small (average less than 1.0 per sample). Likewise, the expected number of defectives in the consumer's samples, maintained at a fixed size ratio (say r = 2) to the contractor's samples, will be even smaller. Since the power of the test to detect discrepancies in inspection depends in large measure on the total number of defectives found as well as the division of sample sizes, some way must be found to build up the power of the test. As long as the ratio (r) is maintained without change, the appropriate procedure is to pool inspection results on several lots produced in sequence (say 2 to 5 lots) and compare by means of Table I, the total number of defectives found in the supplier's successive samples with the totals for the paired samplings of the consumer.

A change in the sample size ratio (r) or the convenience and additional information obtained by collecting data on individual lot comparisons necessitates a different approach. What is needed is an over-all test which considers the over-all tendency for the paired sampling results to disagree, whether or not individual comparisons yield a significant result. This provides a single measure of the performance of the supplier's inspection system as a whole. The over-all measure is obtained by assigning check ratings from Table II to each comparison of paired sampling results and cumulating the ratings to give a sum which can be tested for significance against critical values in Table III.

Table II, for the appropriate sample size ratio (r) is entered from the top with the number of defectives (or defects) found in the supplier's sample and from the left with the number of defectives (or defects) observed in the consumer's sample. Where the column and row entries intersect, the value is read from the table. This value can be summed with other similarly obtained values, regardless of lot size, sample size ratio, or the nature of the defect, to yield an over-all check rating for any defect, for any class of defects, or for all tests and inspections considered as a whole. To judge the significance of the cumulated check ratings, Table III provides "warning" and "action" limits which indicate the relative significance of divergent inspection results considered as a whole over a period of operation. When the "warning" limit is reached, the consumer's inspector is alerted to look for a possible discrepancy in the contractor's inspection system. Upon exceeding the "action" limit, the consumer is advised to take corrective action and not to rely upon the supplier's inspection data for determining acceptability of supplies. The "warning" and "action" critical values in Table III for a given number of comparisons (predetermined in advance of summing the check ratings) are at the 5 per cent and 1 per cent levels of significance. The median value in Table III is the 50 per cent level, which the cumulative check ratings are as likely as not to exceed when the systems of inspection are identical in effect. In the long run, when the supplier and the consumer have achieved accordance in inspection, half the cumulative check ratings will lie above the median value and half will be below.

2.4.1 **EXAMPLES OF USE OF CHECK RATINGS.** Using the illustrative example of 2.3.1, but with respect to inspection for minor defects (sample size = 110 and acceptance number = 6), the consumer's inspector uses an equal sample size ($r = 1$) for the first 3 lots and then reduces his sample by one-half ($r = 2$) for the next 7 lots. He desires an over-all rating for the period during which the supplier produced and inspected 10 lots in sequence. The results of the paired sampling results for the 10 lots, together with check ratings, are presented in Table B:

TABLE B

Illustration of Cumulative Check Rating Method

Lot No.	Supplier's Sample Size	Consumer's Sample Size	Supplier's Defectives	Consumer's Defectives	Check Rating
1	110	110	3	1	0.17
2	110	110	2	2	0.69
3	110	110	2	5	2.06
4	110	55	0	0	0.94
5	110	55	3	0	0.11
6	110	55	2	0	0.19
7	110	55	2	3	2.24
8	110	55	0	1	2.39
9	110	55	2	1	0.76
10	110	55	7	3	0.56

Cumulative Check Rating = 10.11

The cumulative check rating, 10.[illegible]1, for the 10 consecutive lots is very close to the median value, 9.67, and well below the warning and action limits of Table III. The data illustrated were obtained from a series of lots ranging in quality from 0 to 6 per cent defective, with an over-all average of 2.5 per cent. Random samples were drawn and the sample items were designated (without error) as defective or effective in accordance with a classification of defects.

Another example, indicative of a discrepancy in the supplier's inspection system, is set forth in Table C below. The lot size range for level II inspection calls for a single sample of 225 items. The acceptance number specified for an AQL of 1.0 per cent is 5. Validation sampling inspection was conducted for a five lot period using one-third (r = 3) of the supplier's sample size.

TABLE C

Indication of Inspection Discrepancies by Check Rating Method

Lot No.	Supplier's Sample Size	Consumer's Sample Size	Supplier's Defectives	Consumer's Defectives	Check Rating
1	225	75	0	1	2.85
2	225	75	2	2	2.06
3	225	75	3	[illegible]	2.46
4	225	75	3	2	1.57
5	225	75	2	1	1.10

Cumulative Check Rating = 10.04

The cumulative check rating suggests an investigation of the supplier's inspection system. The over-all rating for the 5 lot period exceeded the critical value of 9.15 but not the action limit of 11.60 given in Table III. These results are a portion of sequentially observed inspection data from samples drawn at random from lots originating from a process yielding 1% defectives - paired with samples from lots produced by a process yielding 3% defectives. It is assumed in the above example that the supplier's inspection system is weak and consistently generates results so that the quality of his product appears to be maintained at the 1% defective level. Further, it is assumed that the consumer's inspection results are unbiased and that the true product quality is actually controlled at the 3% defective level.

When the series of results shown in Table C was extended, the next 2 lots provided strong evidence that corrective action was required. Both lots yielded identical sampling results, $d_s = 1$ and $d_c = 4$, which are significant in accordance with the criterion of Table I. The check rating of 5.40 each for these results derived from Table II is also substantial, and, if summed, would exceed the "warning" critical value of Table III for a group of 5 lot verifications.

3. ADJUSTING THE AMOUNT OF VERIFICATION SAMPLING

3.1 GENERAL PROCEDURES. At the start of production, when little is known about a supplier's quality history or the validity of his inspection records, it may be appropriate to perform product verification inspection at the same inspection level as that required in the specification. For example, if the specification required sampling inspection in accordance with MIL-STD 105 at inspection level II, the consumer's inspector could use that same level for his initial verification inspection. When the consumer's inspector has validated the supplier's inspection records after the first few lots, he might decrease his sample for verification purposes to one-half or one-third of the supplier's sample. As production continues and the process average stabilizes between the upper and lower limits for the prescribed AQL, the consumer's inspector may shift to a sample size of one-fifth or even one-eighth of the supplier's sample.

When the supplier is authorized to proceed under the reduced sampling provisions of MIL-STD 105, the consumer should review his prior results of product verification to determine the incidence of defects as well as the check ratings obtained. The relative occurrence of defects will be about one-fifth the rate previously attained for normal single sample of the standard. Consequently, if individual lot comparisons are desired, the sample size ratio (r) should return to 1 or 2.

An alternate procedure, more powerful in differentiating effects of disparate inspection systems, is to arrange for accumulation of defectives in 2 or more consecutive samples, providing the sample size ratio remains constant. Thus, for the results of Table C, where the sample size ratio (r) is maintained equal to 3, the pooled results of the first 2 lots ($d_s = 2$ and $d_c = 3$), are significant, whereas the individual lots results are not, as judged by the critical values of Table I. In using the method of pooling data, the number of comparisons to be included in the group should be determined in advance, and it should be restricted to only a few (say 5 comparisons) in order not to delay decisive action. The pooled results can be treated as a one lot entity for assignment of check ratings through Table II, and the cumulated check ratings can be combined with other ratings bearing on the validation of the supplier's inspection records for an over-all evaluation against the critical values of Table III.

3.2 PROCEDURES BASED ON OPERATING CHARACTERISTICS (O-C) CURVES. Analogous to the O-C Curves of acceptance sampling plans, the operating characteristics of the test for homogeneity may be shown graphically.

The Appendix of this handbook depicts five sets of these curves, each set indexed by the sample size ratio (r) and the expected number of defectives in the supplier's samples. These curves show the relationship between a range of apparent quality differences brought about by differences in the consumer-supplier inspection systems and the probability of accepting the hypothesis of homogeneity.

If the consumer can specify the tolerable ratio of the quality which should be detected as frequently as possible when it exists, then the appropriate sample size ratio can be selected, providing the expected number of defectives in the supplier's samples can be estimated from his process average and his sample size.

The frequency rate of detection or probability of not accepting the hypothesis of homogeneity can be set with the aid of Table IV in the Appendix. This table shows the correspondence between the probability of acceptance of a single verification test and the probability of no significant result in a series of K tests. Thus, if the consumer wishes to find at least one significant result in a series of 5 verification trials with a probability of 0.88 (equivalent to a probability of acceptance of 0.12), Table IV shows that he should set the probability of acceptance of a single trial at 0.65. This value also corresponds with the probability of 0.99 that at least one significant result will turn up in 10 verification trials.

Now, with a decision as to the probability of acceptance (say 0.65) for a single verification trial to be associated with the specified tolerable ratio of consumer's fraction defection relative to the supplier's, a review can be made of the O-C curves for a single homogeneity test to select the r value appropriate for the expected number of defectives in the supplier's samples. Table V, included in the Appendix of this handbook, which has been derived from the O-C Curves, will be found useful in determining the r value for a tolerable ratio of 2, 3, or 4.5 yielding the desired probability of acceptance at eight levels of $p_c'n_c$, the expected number of defectives in the supplier's samples.

3.2.1 **EXAMPLE OF USE OF O-C CURVES IN DETERMINING SIZE OF VERIFICATION SAMPLE.** Suppose the prescribed AQL is 1.0 per cent; under Level II inspection for a lot size of 2000 units, the supplier has been taking a single sample of 150 units. After producing and inspecting 10 lots, the supplier estimates the process average as 0.89 per cent (which lies between the lower and upper limits of Table II-A and Table II-C, respectively, of MIL-STD 105 for an AQL of 1.0 per cent). Roughly then, the expected fraction defective in the supplier's samples is about one per cent and the number of defectives expected in a sample of 150 units is about 1.50. The latter figure is determined from the supplier's inspection records - not from the consumer's validation results.

Next, from Table IV, the consumer decides upon a probability of acceptance of 0.60 to 0.65 which corresponds to a risk of about 0.10 of not detecting at least one significant difference in 5 trials. He associates with this risk a tolerable quality discrepancy ratio of 3. Entering Table V with 1.50 as the expected number of defectives in the supplier's sample of 150 units, the consumer observes that for the probability of acceptance within the range 0.60 to 0.65, under $p_c'/p_s' = 3$, only an r value of 1 can be selected. If the consumer can extend his risk so that a probability of acceptance of 0.66 is satisfactory, then he can select the r value of 2. The only alternative is to pool the results of two successive verification trials, yielding an expected value of 3.00 defectives in the combined sample of 300 units. This technique leads to an r value of 3 for a probability of acceptance of 0.61. Finer adjustments in determining the appropriate size of the validation sample can be accomplished by direct reference to the O-C Curves in the Appendix.

4. SPECIAL APPLICATIONS.

4.1 **THE SMALL LOT.** Usually, the lot size is large relative to the total sample size (say, at least 8 to 1). The O-C Curves then give good approximations of the true probability of acceptance associated with any of the quality discrepancy ratios shown. When the samples of the supplier and the consumer deplete the lot seriously, a special arrangement is required to permit valid comparison to be made of the respective inspection results. The arrangement is simply that the supplier retains his sample and does not return it to the lot purified of the defectives it contains until the consumer has drawn an independent sample. Further, since the incidence of defectives in a small lot is extremely low, the results from consecutive lots must be pooled until the expected number of defectives in the supplier's sample can provide a probability of acceptance within the range desired for the tolerable quality discrepancy ratio. With very low incidence of defectives, it is often not practical to resort to an independent sample for verifying the supplier's sampling data.

4.1.1 EXAMPLE OF VERIFYING SMALL LOT INSPECTION RESULTS. The lot size is 50 and the supplier, under an AQL requirement of 1.0 per cent, is taking a single sample of 10 units. The expected number of defectives in the supplier's sample is 0.10. By pooling ten lots, the expected number of defectives will be 1.0. The consumer decides from the O-C functions depicted that an r value of 2, yielding a sample size of 5, would be appropriate for a tolerable quality discrepancy ratio of 4 associated with a probability of acceptance of 0.65. The small sample suffices since the consumer is relying in part upon an engineering check of the quality control and inspection system of the supplier. Now, when the supplier draws his sample of 10 units from the lot of 50 items, he does not return the sample to the lot until the consumer has had an opportunity to select 5 units from the remaining 40 items in the lot. In this way, any defectives discovered in the supplier's sample and replaced or repaired will not bias the test for homogeneity.

4.2 DOUBLE AND MULTIPLE SAMPLING. When the supplier elects to use double or multiple sampling, instead of single sampling, some minor modifications are necessary in the verification technique. Check ratings are obtained only for the first sample from each lot, although the critical values of Table I are applicable to each sample individually or collectively as predetermined. Resubmitted lots may require a larger verification sample either because the relative incidence of defects may be smaller than usual or because the tolerable quality discrepancy ratio and the associated risk may be modified to protect the consumer. Whether to pool results of resubmitted lots or not will depend upon the number to be submitted at any one occasion and the expected number of defectives in the supplier's samples.

4.3 TIGHTENED AND REDUCED SAMPLING. The consumer may use his own verification results to estimate the quality of product offered for acceptance. This estimate will reflect the average outgoing quality rather than the supplier's process average. When the average outgoing quality is unsatisfactory and conducive to inspection discrepancies, the consumer may wish to increase the relative size of the verification sample. He can use the O-C Curves as explained in the preceding section of this handbook, and, in particular, Table V. Thus, if he had been using a tolerable quality discrepancy ratio of 3, he can shift to a ratio of 2 or alternately he can use Table IV to arrive at new value for the associated probability of acceptance for a single test of homogeneity. Similarly for a consistently satisfactory outgoing quality level, the consumer can raise his tolerable quality discrepancy ratio to 4.5 or make the alternate change in the associated probability of acceptance for a single test of homogeneity. The latter adjustments may lead to the pooling of fewer lots, when the supplier is operating under the reduced inspection provisions of MIL-STD-105, to obtain the required size of verification sample.

4.4 TWO-SIDED TEST FOR HOMOGENEITY. The critical values of Table I have been computed to test the hypothesis that the supplier's inspection system furnishes lot quality protection at least equal to that prescribed. This is a one-sided test since the emphasis is upon curbing any tendency of the supplier to underestimate the true fraction defective in the lot. Where the desire is to control the accuracy of a supplier's inspection results without regard to the direction in which they may depart from the consumer's, a two-sided test is appropriate. This type of test is not generally recommended since the power of the test to discriminate between quality differences in any one direction is not as great as the one-sided test. The two-sided test implies that nothing is known in advance of the test of the course in which the results may go, and that it is equally important to detect a discrepancy in either direction.

A convenient procedure for conducting the two-sided test is to obtain a check rating for a pair of sampling results, as for the one-sided test, using Table II. Then for the 5 per cent level of significance, the check rating obtained is compared against the critical limits 0.025 and 3.69. A value at or beyond either bound is considered significant. In applying the two-sided test the user is cautioned not to cumulate the check ratings of Table II and not to pool the sample observations.

4.4.1 **EXAMPLES OF TWO-SIDED TESTS FOR HOMOGENEITY.** Paired test results for various sample size ratios (r) have been tabulated by the consumer for determination of homogeneity. The data are recorded in Table D below, together with a notation whether or not a significant result was obtained. 22

TABLE D

Analyses of Two-Sided Tests for Homogeneity

Test No.	Ratio of Sample Size	Supplier's Defectives	Consumer's Defectives	Check Rating	Significant Result
1	1	0	3	3.41	No
2	1	4	0	0.02	Yes
3	2	1	4	4.15	Yes
4	2	5	1	0.22	No
5	3	1	3	4.12	Yes
6	3	9	0	0.02	Yes
7	5	2	2	2.98	No
8	5	15	1	0.14	No
9	8	3	3	4.99	Yes
10	8	22	0	0.02	Yes

5. CORRECTIVE ACTION

5.1 STATISTICAL CRITERIA INDICATE "WARNING." The warning limit criteria of Table III were computed at the 5 per cent level of significance. After a predetermined number of lot verifications have been performed and the check ratings cumulated, the consumer is in a position to evaluate objectively the effect of the supplier's inspection system in comparison with his own. If the warning limit has been reached, the consumer's inspector should be alerted to keep a close watch on the way that the supplier (1) selects his sample units, (2) performs the required examinations or tests, and (3) calibrates his gages, standards, measuring and testing equipment.

5.2 STATISTICAL CRITERIA INDICATE "ACTION." The appropriate action to be taken is contingent upon the contractual arrangements agreed upon by the consumer and the supplier. For the individual lot comparison the "action" limit of Table I was computed at the level of about 5 per cent. Reaching or exceeding this limit should signify to the consumer's inspector that there is likely to be something wrong with the supplier's inspection of the lot in question. Using the consumer's sampling inspection procedures as the standard, a review and check of the supplier's sampling, examination and testing methods should be initiated promptly. To facilitate this study of the supplier's inspection methods, it may be desirable to request the supplier to perform a reinspection of the questionable lot under the direct surveillance of the consumer's inspector.

For the accumulated data, the "action" limit column of Table III was calculated at the 1 per cent level of significance. As soon as an "action" limit is reached, the consumer's inspector should discontinue using the supplier's inspection results as a basis for acceptance until the cause of the discrepancy is determined and corrected. These causes can be an improper selection of representative sample units from the lot, misinformation or misinterpretation of what constitutes a defect, improper utilization of inspection and testing equipment, etc. An official report of the deficiencies discovered in the inspection system should be made to the supplier's representative so that corrective action may be initiated immediately. When all discrepancies have been corrected or removed to the satisfaction of the customer, the latter can then start a completely new cycle of checking the supplier's inspection system and records. Whatever the action taken, it should be recalled that the prime purpose of verification sampling inspection is to assure the consumer that the supplier's system of inspection is operating satisfactorily and is effective in insuring that only lots of acceptable quality are being offered for acceptance.

TABLE I

Limits for Determining Discrepancies Between Supplier's and Consumer's Paired Attributes Sampling Inspections

	r = 1	r = 2	r = 3	r = 5	r = 8
d_s	$d_c(A)$	$d_c(A)$	$d_c(A)$	$d_c(A)$	$d_c(A)$
0	3	2	2	1	1
1	5	3	3	2	2
2	7	4	3	3	2
3	9	5	4	3	2
4	11	6	5	3	3
5	12	7	5	4	3
6	14	8	6	4	3
7	15	9	6	5	3
8	17	9	7	5	4
9	18	10	7	5	4
10	19	11	8	6	4
11	21	12	8	6	4
12	22	12	9	6	5
13	23	13	9	7	5
14	25	14	10	7	5
15	26	14	10	7	5
16	27	15	11	7	5
17	28	16	11	8	6
18	30	16	12	8	6
19	31	17	12	8	6
20	32	18	13	9	6
21	34	18	13	9	6
22	35	19	14	9	7
23	36	20	14	9	7
24	37	20	15	10	7
25	39	21	15	10	7
26	40	22	15	10	7
27	41	22	16	11	8

TABLE I (Continued)

d_s	r = 1 $d_c(A)$	r = 2 $d_c(A)$	r = 3 $d_c(A)$	r = 5 $d_c(A)$	r = 8 $d_c(A)$
28	42	23	16	11	8
29	43	24	17	11	8
30	45	24	17	11	8
31	46	25	18	12	8
32	47	25	18	12	8
33	48	26	18	12	9
34	49	27	19	13	9
35	51	27	19	13	9

r = Ratio of size of supplier's sample to that of the consumer's.

d_s = Number of defectives (or defects) observed in the supplier's sample.

d_c = Number of defectives (or defects) observed in the consumer's sample.

$d_c(A)$ = "Action" limit for d_c. When this number is reached or exceeded in the consumer's sample, a course of action is adopted on the premise that a discrepancy does exist.

d_c \ d_s	0	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
0	0.69	0.20	0.08	0.03	0.02	0.01	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	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
1	1.70	0.69	0.34	0.17	0.09	0.05	0.03	0.01	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2.58	1.24	0.69	0.40	0.23	0.14	0.08	0.05	0.03	0.02	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	3.41	1.83	1.11	0.67	0.44	0.28	0.17	0.11	0.07	0.04	0.02	0.01	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	4.20	2.43	1.57	1.04	0.69	0.46	0.31	0.20	0.13	0.09	0.05	0.03	0.02	0.01	0.01	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	0.00	0.00	0.00	0.00	0.00
5	4.98	3.05	2.06	1.42	0.99	0.69	0.48	0.33	0.23	0.15	0.10	0.07	0.04	0.03	0.02	0.01	0.01	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	0.00	0.00	0.00
6	5.74	3.68	2.57	1.84	1.33	0.95	0.69	0.50	0.35	0.25	0.17	0.12	0.08	0.05	0.04	0.02	0.02	0.01	0.01	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	0.00
7	6.50	4.31	3.10	2.28	1.70	1.26	0.94	0.69	0.51	0.37	0.27	0.19	0.13	0.09	0.06	0.04	0.03	0.02	0.01	0.01	0.01	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
8	7.25	4.96	3.65	2.75	2.09	1.59	1.21	0.92	0.69	0.52	0.38	0.28	0.21	0.15	0.11	0.07	0.05	0.04	0.02	0.02	0.01	0.01	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
9	7.99	5.60	4.21	3.23	2.51	1.95	1.51	1.17	0.90	0.69	0.53	0.40	0.30	0.22	0.16	0.12	0.08	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		6.25	4.78	3.73	2.94	2.33	1.84	1.45	1.14	0.89	0.69	0.53	0.41	0.31	0.23	0.17	0.13	0.09	0.07	0.05	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		6.81	5.34	4.24	3.40	2.73	2.19	1.75	1.40	1.11	0.88	0.69	0.54	0.42	0.32	0.24	0.18	0.14	0.10	0.07	0.05	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		7.46	5.91	4.76	3.86	3.14	2.56	2.08	1.68	1.36	1.09	0.87	0.69	0.55	0.43	0.33	0.25	0.19	0.15	0.11	0.08	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		8.10	6.50	5.29	4.34	3.57	2.94	2.42	1.99	1.62	1.32	1.07	0.87	0.69	0.55	0.44	0.34	0.27	0.20	0.16	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
14			7.09	5.83	4.83	4.01	3.34	2.78	2.30	1.91	1.58	1.29	1.06	0.86	0.69	0.56	0.44	0.35	0.27	0.21	0.16	0.13	0.10	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
15			7.69	6.38	5.33	4.47	3.75	3.15	2.64	2.21	1.84	1.53	1.27	1.04	0.85	0.69	0.56	0.45	0.36	0.28	0.22	0.17	0.13	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
16				6.94	5.84	4.94	4.18	3.54	2.99	2.52	2.13	1.78	1.49	1.24	1.03	0.85	0.69	0.56	0.46	0.37	0.29	0.23	0.18	0.14	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00
17				7.50	6.36	5.41	4.62	3.94	3.36	2.86	2.43	2.06	1.73	1.46	1.22	1.04	0.84	0.69	0.57	0.46	0.37	0.30	0.24	0.19	0.15	0.11	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
18				8.07	6.89	5.90	5.07	4.35	3.73	3.20	2.74	2.34	2.00	1.69	1.43	1.20	1.01	0.84	0.69	0.57	0.47	0.38	0.31	0.25	0.19	0.15	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01	0.01
19					7.42	6.39	5.52	4.77	4.12	3.56	3.07	2.64	2.26	1.94	1.65	1.40	1.18	0.99	0.83	0.69	0.57	0.47	0.39	0.31	0.25	0.20	0.16	0.13	0.10	0.08	0.06	0.04	0.03	0.03	0.02	0.01
20					7.96	6.90	5.99	5.21	4.53	3.93	3.41	2.95	2.55	2.20	1.88	1.61	1.37	1.17	0.99	0.83	0.69	0.58	0.48	0.39	0.32	0.26	0.21	0.17	0.13	0.10	0.08	0.06	0.05	0.04	0.03	0.02
21						7.41	6.47	5.65	4.94	4.31	3.76	3.28	2.85	2.47	2.14	1.84	1.58	1.35	1.15	0.98	0.83	0.69	0.58	0.48	0.40	0.33	0.27	0.21	0.17	0.14	0.11	0.09	0.07	0.05	0.04	0.03
22						7.93	6.95	6.10	5.36	4.70	4.13	3.61	3.16	2.76	2.40	2.08	1.80	1.55	1.33	1.14	0.97	0.82	0.69	0.58	0.48	0.40	0.33	0.27	0.22	0.18	0.14	0.11	0.09	0.07	0.06	0.04
23							7.44	6.56	5.79	5.11	4.50	3.96	3.48	3.06	2.67	2.34	2.03	1.77	1.52	1.31	1.13	0.96	0.82	0.69	0.58	0.49	0.41	0.34	0.28	0.23	0.18	0.15	0.12	0.09	0.07	0.06
24							7.94	7.03	6.23	5.52	4.89	4.32	3.82	3.36	2.96	2.60	2.27	1.99	1.73	1.50	1.30	1.11	0.96	0.82	0.69	0.59	0.49	0.41	0.34	0.28	0.23	0.19	0.15	0.12	0.10	0.08
25								7.51	6.68	5.94	5.28	4.69	4.16	3.69	3.26	2.88	2.53	2.23	1.94	1.70	1.48	1.28	1.11	0.95	0.81	0.69	0.59	0.50	0.42	0.35	0.29	0.24	0.19	0.16	0.13	0.10
26								7.99	7.13	6.37	5.68	5.07	4.51	4.02	3.57	3.17	2.80	2.47	2.17	1.91	1.67	1.46	1.27	1.10	0.94	0.81	0.69	0.59	0.50	0.42	0.35	0.29	0.24	0.20	0.16	0.13
27									7.59	6.80	6.09	5.45	4.88	4.36	3.89	3.46	3.07	2.73	2.41	2.13	1.87	1.65	1.44	1.25	1.09	0.94	0.81	0.69	0.59	0.50	0.42	0.36	0.30	0.25	0.20	0.17
28									8.06	7.25	6.51	5.85	5.25	4.71	4.21	3.77	3.36	3.00	2.66	2.36	2.09	1.84	1.62	1.42	1.24	1.08	0.93	0.81	0.69	0.59	0.51	0.43	0.36	0.30	0.25	0.21
29										7.70	6.94	6.25	5.63	5.07	4.55	4.09	3.66	3.28	2.92	2.60	2.31	2.05	1.81	1.59	1.40	1.23	1.07	0.53	0.81	0.69	0.59	0.51	0.43	0.37	0.31	0.26
30											7.37	6.66	6.02	5.43	4.90	4.41	3.97	3.56	3.19	2.85	2.55	2.26	2.01	1.78	1.58	1.39	1.21	1.06	0.92	0.80	0.69	0.60	0.51	0.44	0.37	0.31
31											[illegible]	[illegible]	[illegible]	[illegible]	5.25	4.75	4.28	3.86	3.47	3.11	2.79	2.50	2.23	1.98	[illegible]	1.56	1.37	1.20	1.06	0.92	0.80	0.69	0.60	0.51	0.44	0.37
32												7.51	6.82	6.19	5.62	5.09	4.61	4.16	3.76	3.39	3.04	2.73	2.45	2.19	1.95	1.73	1.53	1.35	1.19	1.05	0.92	0.80	0.69	0.60	0.52	0.44
33												7.93	7.23	6.58	5.99	5.44	4.94	4.48	4.06	3.67	3.31	2.98	2.68	2.40	2.15	1.92	1.71	1.52	1.34	1.18	1.04	0.91	0.80	0.69	0.60	0.52
34													7.65	6.98	6.37	5.80	5.28	4.80	4.36	3.95	3.58	3.23	2.92	2.63	2.36	2.12	1.89	1.69	1.50	1.33	1.18	1.04	0.91	0.80	0.69	0.60
35														7.38	6.75	6.17	5.63	5.13	4.67	4.25	3.86	3.50	3.17	2.86	2.58	2.32	2.09	1.86	1.67	1.48	1.32	1.17	1.03	0.91	0.79	0.69
36														7.79	7.14	6.54	5.98	5.47	4.99	4.56	4.15	3.77	3.42	3.11	2.81	2.54	2.28	2.06	1.84	1.65	1.47	1.31	1.16	1.02	0.90	0.79
37															7.54	6.92	6.34	5.81	5.32	4.87	4.44	4.05	3.69	3.36	3.04	2.76	2.49	2.24	2.02	1.82	1.63	1.45	1.29	1.15	1.02	0.90
38															7.94	7.30	6.72	6.17	5.66	5.18	4.75	4.34	3.96	3.62	3.29	2.99	2.71	2.45	2.22	2.00	1.80	1.61	1.44	1.28	1.14	1.01
39																7.70	7.09	6.52	6.00	5.51	5.06	4.64	4.24	3.88	3.54	3.23	2.94	2.67	2.42	2.19	1.97	1.77	1.59	1.43	1.28	1.14
40																	7.47	6.89	6.35	5.85	5.38	4.94	4.53	4.15	3.80	3.47	3.17	2.89	2.62	2.38	2.15	1.94	1.75	1.58	1.41	1.27
41																	7.86	7.26	6.70	6.19	5.70	5.25	4.83	4.44	4.07	3.73	3.41	3.11	2.84	2.58	2.35	2.13	1.92	1.74	1.56	1.40
42																		7.64	7.07	6.53	6.03	5.57	5.13	4.72	4.34	3.99	3.66	3.35	3.06	2.79	2.55	2.31	2.10	1.90	1.72	1.55
43																			7.43	6.89	6.37	5.89	5.44	5.02	4.63	4.25	3.91	3.59	3.29	3.01	2.75	2.51	2.28	2.07	1.88	1.70
44																			7.81	7.24	6.72	6.22	5.76	5.32	4.91	4.53	4.17	3.84	3.53	3.24	2.97	2.71	2.48	2.25	2.05	1.86
45																				7.61	7.06	6.56	6.08	5.62	5.21	4.81	4.45	4.10	3.77	3.47	3.19	7.92	2.67	2.44	2.23	2.02
46																					7.42	6.90	6.41	5.94	5.51	5.10	4.72	4.36	4.03	3.71	3.41	3.14	2.88	2.64	2.41	2.20
47																					7.78	7.24	6.74	6.27	5.82	5.40	5.00	4.63	4.28	3.95	3.65	3.36	3.09	2.84	2.60	2.38
48																						7.60	7.08	6.59	6.13	5.70	5.29	4.91	4.55	4.21	3.89	3.59	3.31	3.05	2.80	2.57
49																							7.42	6.92	6.45	6.01	5.59	5.19	4.82	4.47	4.14	3.83	3.55	3.27	3.00	2.76
50																							7.78	7.26	6.78	6.32	5.89	5.48	5.10	4.73	4.39	4.07	3.77	3.39	3.22	2.96
51																								7.60	7.11	6.64	6.19	5.77	5.38	5.01	4.65	4.32	4.01	3.72	3.43	3.17
52																									7.44	6.96	6.50	6.07	5.67	5.28	4.92	4.58	4.25	3.94	3.66	3.38
53																									7.78	7.29	6.82	6.38	5.96	5.56	5.19	4.84	4.50	4.19	3.89	3.60
54																										7.63	7.14	6.69	6.26	5.85	5.47	5.10	4.76	4.43	4.12	3.83
55																										7.96	7.47	7.01	6.56	6.15	5.75	5.38	5.02	4.68	4.36	4.06
56																											7.80	7.33	6.88	6.44	6.04	5.66	5.29	4.94	4.61	4.30
57																												7.66	7.19	6.75	6.34	5.94	5.56	5.20	4.86	4.55
58																													7.51	7.06	6.63	6.22	5.84	5.47	5.12	4.79
59																													7.84	7.38	6.94	6.52	6.12	5.74	5.39	5.05
60																														7.70	7.25	6.82	6.41	6.02	5.66	5.30
61																															7.56	7.12	6.70	6.31	5.93	5.57
62																																7.43	7.00	6.59	6.21	5.84
63																																7.74	7.31	6.89	6.49	6.11
64																																	7.61	7.19	6.78	6.39
65																																		7.49	7.07	6.68
66																																		7.80	7.37	6.96
67																																			7.67	7.26
68																																				7.55
69																																				7.86

r = RATIO OF SIZE OF SUPPLIER'S SAMPLE TO THAT OF THE CONSUMER'S

d_s = NUMBER OF DEFECTIVES (OR DEFECTS) OBSERVED IN THE SUPPLIER'S SAMPLE

d_c = NUMBER OF DEFECTIVES (OR DEFECTS) OBSERVED IN THE CONSUMER'S SAMPLE

TABLE II : r=1

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTION

d_c \ d_s	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0.69	0.20	0.08	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1.70	0.69	0.34	0.17	0.09	0.05	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2.58	1.24	0.69	0.40	0.23	0.14	0.08	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00
3	3.41	1.83	1.11	0.69	0.44	0.28	0.17	0.11	0.07	0.04	0.02	0.01	0.01	0.00	0.00	0.00
4	4.20	2.43	1.57	1.04	0.69	0.46	0.31	0.20	0.13	0.09	0.05	0.03	0.02	0.01	0.01	0.00
5	4.98	3.05	2.06	1.42	0.99	0.69	0.48	0.33	0.23	0.15	0.10	0.07	0.04	0.03	0.02	0.01
6	5.74	3.68	2.57	1.84	1.33	0.95	0.69	0.50	0.35	0.25	0.17	0.12	0.08	0.05	0.04	0.02
7	6.50	4.31	3.10	2.28	1.70	1.26	0.94	0.69	0.51	0.37	0.27	0.19	0.13	0.09	0.06	0.04
8	7.25	4.96	3.65	2.75	2.09	1.59	1.21	0.92	0.69	0.52	0.38	0.28	0.21	0.15	0.11	0.07
9	7.99	5.60	4.21	3.23	2.51	1.95	1.51	1.17	0.90	0.69	0.53	0.40	0.30	0.22	0.16	0.12
10		6.25	4.78	3.73	2.94	2.33	1.84	1.45	1.14	0.89	0.69	0.53	0.41	0.31	0.23	0.17
11		6.81	5.34	4.24	3.40	2.73	2.19	1.75	1.40	1.11	0.88	0.69	0.54	0.42	0.32	0.24
12		7.46	5.91	4.76	3.86	3.14	2.56	2.08	1.68	1.36	1.09	0.87	0.69	0.55	0.43	0.33
13		8.10	6.50	5.29	4.34	3.57	2.94	2.42	1.99	1.62	1.32	1.07	0.87	0.69	0.55	0.44
14			7.09	5.83	4.83	4.01	3.34	2.78	2.30	1.91	1.58	1.29	1.06	0.86	0.69	0.56
15			7.69	6.38	5.33	4.47	3.75	3.15	2.64	2.21	1.84	1.53	1.27	1.04	0.85	0.69
16				6.94	5.84	4.94	4.18	3.54	2.99	2.52	2.13	1.78	1.49	1.24	1.03	0.85
17				7.50	6.36	5.41	4.62	3.94	3.36	2.86	2.43	2.06	1.73	1.46	1.22	1.01
18				8.07	6.89	5.90	5.07	4.35	3.73	3.20	2.74	2.34	2.00	1.69	1.43	1.20
19					7.42	6.39	5.52	4.77	4.12	3.56	3.07	2.64	2.26	1.94	1.65	1.40
20					7.96	6.90	5.99	5.21	4.53	3.93	3.41	2.95	2.55	2.20	1.88	1.61
21						7.41	6.47	5.65	4.94	4.31	3.76	3.28	2.85	2.47	2.14	1.84
22						7.93	6.95	6.10	5.36	4.70	4.13	3.61	3.16	2.76	2.40	2.08
23							7.44	6.56	5.79	5.11	4.50	3.96	3.48	3.06	2.67	2.34
24							7.94	7.03	6.23	5.52	4.89	4.32	3.82	3.36	2.96	2.60
25								7.51	6.68	5.94	5.28	4.69	4.16	3.69	3.26	2.88
26								7.99	7.13	6.37	5.68	5.07	4.51	4.02	3.57	3.17
27									7.59	6.80	6.09	5.45	4.88	4.36	3.89	3.46
28									8.06	7.25	6.51	5.85	5.25	4.71	4.21	3.77
29										7.70	6.94	6.25	5.63	5.07	4.55	4.09
30											7.37	6.66	6.02	5.43	4.90	4.41
31											7.81	7.08	6.41	5.81	5.25	4.75
32												7.51	6.82	6.19	5.62	5.09
33												7.93	7.23	6.58	5.99	5.44
34													7.65	6.98	6.37	5.80
35														7.38	6.75	6.17
36														7.79	7.14	6.54
37															7.54	6.92
38															7.94	7.30
39																7.70

TABLE II: $r=1$, $d_s = 0$ TO 15 (ENLARGED SECTOR)

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTIONS

Government and Industry participants seeking to reduce or eliminate expendi

d_c \ d_s	0	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
0	0.94	0.37	0.19	0.11	0.07	0.04	0.02	0.03	0.01	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	2.39	1.23	0.76	0.49	0.33	0.22	0.15	0.10	0.07	0.05	0.03	0.03	0.02	0.01	0.01	0.01	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	0.00	0.00	0.00	0.00
2	3.68	2.17	1.46	1.02	0.74	0.53	0.39	0.28	0.21	0.15	0.11	0.08	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	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
3	4.93	3.15	2.24	1.66	1.25	0.95	0.73	0.56	0.43	0.33	0.25	0.19	0.15	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	6.13	4.15	3.08	2.36	1.85	1.45	1.15	0.91	0.72	0.57	0.45	0.36	0.28	0.22	0.17	0.14	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	7.32	5.17	3.96	3.12	2.50	2.02	1.63	1.33	1.08	0.88	0.72	0.58	0.47	0.38	0.31	0.25	0.20	0.16	0.12	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
6		6.19	4.86	3.92	3.20	2.64	2.18	1.81	1.51	1.26	1.04	0.86	0.71	0.59	0.49	0.40	0.33	0.27	0.22	0.18	0.14	0.11	0.09	0.07	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00
7		7.23	5.79	4.75	3.95	3.30	2.78	2.35	1.98	1.68	1.42	1.19	1.01	0.85	0.71	0.60	0.50	0.42	0.35	0.29	0.24	0.19	0.16	0.13	0.11	0.09	0.07	0.06	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01
8		8.28	6.73	5.60	4.72	4.01	3.42	2.92	2.50	2.15	1.84	1.58	1.35	1.15	0.98	0.84	0.71	0.60	0.51	0.43	0.36	0.30	0.25	0.21	0.17	0.14	0.12	0.10	0.08	0.06	0.05	0.04	0.03	0.03	0.02	0.02
9			7.69	6.48	5.52	4.74	4.09	3.54	3.06	2.66	2.31	2.00	1.73	1.50	1.29	1.12	0.97	0.83	0.71	0.61	0.52	0.44	0.37	0.32	0.27	0.22	0.19	0.16	0.13	0.11	0.09	0.07	0.06	0.05	0.04	0.03
10				7.37	6.35	5.50	4.79	4.19	3.66	3.20	2.81	2.46	2.15	1.88	1.65	1.44	1.26	1.09	0.95	0.82	0.71	0.61	0.53	0.45	0.39	0.33	0.28	0.24	0.20	0.17	0.14	0.12	0.10	0.08	0.07	0.06
11				8.29	7.20	6.29	5.52	4.86	4.28	3.78	3.34	2.95	2.61	2.31	2.03	1.80	1.58	1.39	1.22	1.07	0.93	0.81	0.71	0.62	0.53	0.46	0.40	0.34	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09
12					8.06	7.09	6.27	5.56	4.94	4.39	3.91	3.48	3.10	2.76	2.46	2.18	1.94	1.72	1.52	1.35	1.19	1.05	0.92	0.81	0.71	0.62	0.54	0.47	0.41	0.35	0.30	0.26	0.22	0.19	0.16	0.14
13						7.91	7.04	6.28	5.62	5.03	4.51	4.03	3.62	3.25	2.91	2.60	2.33	2.08	1.86	1.66	1.48	1.31	1.16	1.03	0.91	0.81	0.71	0.62	0.54	0.47	0.41	0.36	0.31	0.27	0.23	0.20
14							7.83	7.02	6.31	5.69	5.12	4.62	4.17	3.76	3.39	3.06	2.75	2.48	2.23	2.00	1.80	1.60	1.44	1.28	1.14	1.02	0.90	0.80	0.71	0.62	0.55	0.48	0.42	0.37	0.32	0.28
15								7.78	7.03	6.37	5.77	5.22	4.74	4.30	3.90	3.53	3.20	2.90	2.62	2.37	2.14	1.92	1.74	1.56	1.40	1.26	1.12	1.01	0.89	0.80	0.70	0.63	0.55	0.49	0.43	0.38
16									7.77	7.06	6.43	5.85	5.33	4.85	4.42	4.03	3.67	3.34	3.04	2.76	2.51	2.27	2.06	1.86	1.69	1.52	1.37	1.23	1.11	0.99	0.89	0.79	0.71	0.63	0.56	0.49
17										7.78	7.11	6.50	5.94	5.44	4.98	4.56	4.17	3.81	3.48	3.18	2.90	2.65	2.41	2.19	2.00	1.81	1.64	1.49	1.34	1.21	1.09	0.98	0.88	0.79	0.71	0.63
18											7.78	7.16	6.58	6.04	5.55	5.10	4.68	4.31	3.95	3.62	3.32	3.04	2.78	2.55	2.33	2.12	1.94	1.76	1.60	1.45	1.32	1.19	1.08	0.97	0.87	0.79
19												7.84	7.23	6.66	6.14	5.66	5.22	4.81	4.43	4.08	3.76	3.46	3.18	2.92	2.68	2.46	2.25	2.06	1.88	1.72	1.57	1.43	1.29	1.17	1.07	0.96
20													7.90	7.30	6.75	6.25	5.78	5.35	4.94	4.57	4.22	3.90	3.60	3.32	3.06	2.82	2.59	2.38	2.19	2.00	1.84	1.68	1.53	1.40	1.28	1.16
21														7.95	7.38	6.85	6.35	5.90	5.47	5.07	4.70	4.35	4.03	3.73	3.45	3.19	2.95	2.72	2.51	2.31	2.13	1.95	1.80	1.65	1.51	1.38
22														8.60	8.02	7.46	6.94	6.46	6.01	5.59	5.20	4.83	4.49	4.17	3.87	3.59	3.33	3.08	2.85	2.64	2.44	2.24	2.08	1.91	1.75	1.61
23																8.10	7.55	7.04	6.57	6.13	5.72	5.33	4.97	4.63	4.31	4.01	3.73	3.46	3.21	2.98	2.77	2.56	2.37	2.19	2.02	1.86
24																		7.64	7.15	6.68	6.25	5.84	5.46	5.10	4.76	4.44	4.14	3.86	3.60	3.35	3.11	2.89	2.69	2.49	2.31	2.14
25																			7.74	7.25	6.79	6.37	5.96	5.58	5.23	4.89	4.58	4.28	4.00	3.73	3.48	3.24	3.02	2.81	2.62	2.43
26																				7.83	7.36	6.91	6.49	6.09	5.71	5.36	5.02	4.71	4.41	4.12	3.86	3.61	3.37	3.15	2.94	2.74
27																					7.93	7.47	7.02	6.61	6.21	5.84	5.49	5.16	4.84	4.54	4.25	4.00	3.74	3.50	3.28	3.06
28																						8.03	7.58	7.14	6.73	6.34	5.97	5.62	5.28	4.97	4.67	4.39	4.12	3.87	3.65	3.40
29																								7.68	7.25	6.85	6.46	6.09	5.74	5.41	5.10	4.80	4.52	4.25	4.00	3.76
30																									7.79	7.37	6.97	6.59	6.22	5.87	5.55	5.23	4.94	4.65	4.38	4.13
31																										7.91	7.49	7.09	6.71	6.35	6.00	5.68	5.36	5.07	4.78	4.51
32																											8.02	7.60	7.21	6.82	6.47	6.13	5.81	5.49	5.20	4.91
33																											8.56	8.13	7.72	7.33	6.96	6.60	6.26	5.93	5.62	5.33
34																														7.84	7.45	7.08	6.73	6.38	6.06	5.75
35																															7.96	7.57	7.20	6.85	6.51	6.19
36																																	7.69	7.33	6.98	6.64
37																																		7.81	7.45	7.10
38																																			7.93	7.57

TABLE II: r=2

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTIONS

d_c \ d_s	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0.94	0.37	0.19	0.11	0.07	0.04	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
1	2.39	1.23	0.76	0.49	0.33	0.22	0.15	0.10	0.07	0.05	0.03	0.03	0.02	0.01	0.01	0.01
2	3.68	2.17	1.46	1.02	0.74	0.53	0.39	0.28	0.21	0.15	0.11	0.08	0.06	0.04	0.03	0.02
3	4.93	3.15	2.24	1.66	1.25	0.95	0.73	0.36	0.43	0.33	0.25	0.19	0.15	0.11	0.08	0.06
4	6.13	4.15	3.08	2.36	1.85	1.45	1.15	0.91	0.72	0.57	0.45	0.36	0.28	0.22	0.17	0.14
5	7.32	5.17	3.96	3.12	2.50	2.02	1.63	1.33	1.08	0.88	0.72	0.58	0.47	0.38	0.31	0.25
6		6.19	4.86	3.92	3.20	2.64	2.18	1.81	1.51	1.26	1.04	0.86	0.71	0.59	0.49	0.40
7		7.23	5.79	4.75	3.95	3.30	2.78	2.35	1.98	1.68	1.42	1.19	1.01	0.85	0.71	0.60
8		8.28	6.73	5.60	4.72	4.01	3.42	2.92	2.50	2.15	1.84	1.58	1.35	1.15	0.98	0.84
9			7.69	6.48	5.52	4.74	4.09	3.54	3.06	2.66	2.31	2.00	1.73	1.50	1.29	1.12
10				7.37	6.35	5.50	4.79	4.19	3.66	3.20	2.81	2.46	2.15	1.88	1.65	1.44
11				8.29	7.20	6.29	5.52	4.86	4.28	3.78	3.34	2.95	2.61	2.31	2.03	1.80
12					8.06	7.09	6.27	5.56	4.94	4.39	3.91	3.48	3.10	2.76	2.46	2.18
13						7.91	7.04	6.28	5.62	5.03	4.51	4.03	3.62	3.25	2.91	2.60
14							7.83	7.02	6.31	5.69	5.12	4.62	4.17	3.76	3.39	3.06
15								7.78	7.03	6.37	5.77	5.22	4.74	4.30	3.90	3.53
16									7.77	7.06	6.43	5.85	5.33	4.85	4.42	4.03
17										7.78	7.11	6.50	5.94	5.44	4.98	4.56
18											7.78	7.16	6.58	6.04	5.55	5.10
19												7.84	7.23	6.66	6.14	5.66
20													7.90	7.30	6.75	6.25
21														7.95	7.38	6.85
22														8.60	8.02	7.46
23																8.10

TABLE II: $r=2$, $d_s = 0$ TO 15 (ENLARGED SECTOR)

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTIONS

d_c \ d_s	0	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
0	1.10	0.50	0.29	0.19	0.12	0.09	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00
1	2.85	1.63	1.10	0.78	0.57	0.43	0.32	0.24	0.19	0.14	0.11	0.09	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	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
2	4.45	2.85	2.06	1.57	1.21	0.95	0.75	0.60	0.48	0.38	0.31	0.25	0.20	0.16	0.13	0.10	0.08	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	5.98	4.12	3.13	2.46	1.90	1.61	1.32	1.08	0.89	0.74	0.61	0.51	0.42	0.35	0.29	0.24	0.20	0.16	0.14	0.11	0.09	0.08	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
4	7.48	5.40	4.24	3.44	2.84	2.36	1.98	1.67	1.41	1.20	1.02	0.86	0.73	0.62	0.53	0.45	0.38	0.32	0.27	0.23	0.19	0.16	0.14	0.11	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01
5	8.96	6.71	5.40	4.47	3.76	3.20	2.73	2.35	2.02	1.74	1.51	1.29	1.12	0.97	0.84	0.73	0.63	0.54	0.47	0.40	0.35	0.30	0.25	0.22	0.19	0.16	0.13	0.11	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.03
6		8.02	6.59	5.55	4.74	4.09	3.55	3.09	2.70	2.36	2.07	1.81	1.58	1.39	1.22	1.07	0.94	0.83	0.72	0.63	0.55	0.48	0.42	0.37	0.32	0.27	0.24	0.21	0.18	0.15	0.13	0.11	0.10	0.08	0.07	0.06
7			7.80	6.66	5.76	5.03	4.41	3.89	3.44	3.06	2.70	2.38	2.12	1.88	1.67	1.49	1.32	1.17	1.04	0.92	0.82	0.72	0.64	0.56	0.48	0.44	0.38	0.33	0.29	0.26	0.22	0.19	0.17	0.15	0.13	0.11
8				7.80	6.82	6.01	5.32	4.74	4.23	3.78	3.38	3.02	2.71	2.43	2.18	1.96	1.75	1.58	1.41	1.27	1.13	1.01	0.90	0.81	0.72	0.64	0.57	0.51	0.45	0.40	0.35	0.31	0.27	0.24	0.21	0.18
9					7.90	7.02	6.28	5.62	5.06	4.56	4.11	3.70	3.35	3.03	2.76	2.48	2.24	2.03	1.83	1.66	1.50	1.35	1.22	1.10	0.99	0.89	0.80	0.72	0.64	0.58	0.51	0.46	0.41	0.36	0.32	0.29
10						8.07	7.26	6.55	5.93	5.38	4.87	4.42	4.03	3.67	3.35	3.05	2.78	2.53	2.31	2.10	1.91	1.74	1.58	1.44	1.31	1.19	1.08	0.97	0.88	0.79	0.72	0.65	0.58	0.52	0.47	0.42
11						9.13	8.26	7.50	6.82	6.22	5.68	5.20	4.76	4.36	4.00	3.67	3.36	3.08	2.83	2.59	2.38	2.17	2.00	1.82	1.67	1.52	1.39	1.27	1.16	1.05	0.96	0.87	0.79	0.72	0.65	0.59
12									7.76	7.11	6.53	6.00	5.52	5.08	4.68	4.31	3.98	3.67	3.38	3.12	2.88	2.65	2.44	2.24	2.07	1.90	1.75	1.60	1.47	1.35	1.24	1.13	1.04	0.94	0.86	0.79
13										8.03	7.40	6.83	6.31	5.84	5.40	5.00	4.63	4.30	3.97	3.68	3.41	3.16	2.93	2.71	2.51	2.32	2.15	1.98	1.83	1.68	1.55	1.43	1.32	1.21	1.11	1.02
14												7.69	7.14	6.63	6.16	5.72	5.32	4.95	4.61	4.28	3.98	3.71	3.45	3.21	2.98	2.77	2.57	2.39	2.22	2.06	1.90	1.76	1.63	1.51	1.39	1.28
15													7.99	7.46	6.94	6.48	6.04	5.64	5.27	4.90	4.59	4.28	4.01	3.73	3.49	3.25	3.04	2.83	2.64	2.44	2.28	2.13	1.98	1.84	1.70	1.58
16															7.75	7.25	6.79	6.36	5.96	5.58	5.23	4.90	4.59	4.30	4.03	3.77	3.53	3.30	3.09	2.89	2.70	2.53	2.36	2.20	2.06	1.91
17																	7.56	7.10	6.67	6.27	5.89	5.54	5.21	4.89	4.60	4.32	4.06	3.81	3.58	3.36	3.15	2.95	2.77	2.59	2.43	2.27
18																		7.87	7.62	6.99	6.59	6.20	5.85	5.51	5.19	4.89	4.61	4.36	4.09	3.85	3.63	3.41	3.21	3.02	2.83	2.66
19																				7.72	7.30	6.90	6.52	6.16	5.82	5.49	5.19	4.90	4.63	4.37	4.12	3.89	3.67	3.46	3.26	3.08
20																						7.61	7.21	6.82	6.46	6.12	5.80	5.49	5.20	4.92	4.65	4.41	4.17	3.94	3.72	3.52
21																							7.92	7.51	7.13	6.77	6.43	6.10	5.79	5.49	5.21	4.94	4.68	4.44	4.21	3.98
22																							8.65	8.23	7.82	7.44	7.08	6.73	6.39	6.08	5.78	5.50	5.22	4.96	4.71	4.47
23																											7.75	7.38	7.03	6.70	6.38	6.07	5.79	5.51	5.24	4.99
24																													7.69	7.33	7.00	6.68	6.37	6.07	5.80	5.53
25																															7.64	7.30	6.98	6.66	6.37	6.08
26																																	7.60	7.27	6.96	6.66
27																																		7.90	7.57	7.25
28																																				7.86

TABLE II: r=3

d_c \ d_s	0	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
0	1.32	0.68	0.45	0.32	0.24	0.18	0.14	0.11	0.09	0.07	0.05	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	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
1	3.49	2.21	1.62	1.26	1.00	0.81	0.66	0.54	0.45	0.38	0.32	0.27	0.23	0.19	0.17	0.14	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
2	5.49	3.83	2.98	2.41	1.99	1.67	1.41	1.21	1.04	0.89	0.77	0.66	0.57	0.50	0.43	0.38	0.33	0.29	0.25	0.22	0.19	0.17	0.15	0.13	0.11	0.10	0.09	0.07	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.02
3	7.43	5.49	4.43	3.69	3.13	2.69	2.33	2.03	1.78	1.57	1.38	1.20	1.06	0.94	0.84	0.74	0.66	0.59	0.53	0.47	0.42	0.37	0.33	0.29	0.26	0.23	0.21	0.18	0.16	0.14	0.13	0.11	0.10	0.09	0.08	0.07
4		7.18	5.96	5.06	4.37	3.83	3.37	2.99	2.66	2.37	2.12	1.87	1.68	1.51	1.37	1.23	1.11	1.00	0.91	0.82	0.74	0.67	0.60	0.54	0.49	0.44	0.40	0.36	0.32	0.29	0.26	0.24	0.21	0.19	0.17	0.15
5		8.88	7.50	6.48	5.69	5.04	4.50	4.03	3.63	3.28	2.97	2.66	2.41	2.20	2.00	1.83	1.67	1.52	1.39	1.27	1.16	1.06	0.96	0.88	0.81	0.73	0.67	0.61	0.56	0.51	0.46	0.42	0.38	0.35	0.32	0.29
6				7.96	7.06	6.33	5.70	5.16	4.69	4.28	3.90	3.53	3.23	2.97	2.73	2.51	2.31	2.12	1.96	1.80	1.66	1.53	1.41	1.30	1.20	1.11	1.02	0.94	0.87	0.80	0.73	0.67	0.62	0.57	0.52	0.48
7					8.68	7.66	6.95	6.36	5.81	5.33	4.91	4.47	4.13	3.82	3.53	3.27	3.03	2.81	2.61	2.42	2.26	2.09	1.94	1.80	1.67	1.55	1.44	1.34	1.24	1.15	1.07	0.99	0.93	0.85	0.79	0.73
8							8.25	7.58	6.98	6.45	5.97	5.49	5.09	4.73	4.41	4.10	3.83	3.57	3.33	3.11	2.90	2.71	2.53	2.37	2.21	2.06	1.93	1.80	1.69	1.57	1.47	1.37	1.28	1.19	1.11	1.04
9									8.20	7.62	7.08	6.55	6.11	5.71	5.34	5.00	4.68	4.39	4.11	3.85	3.62	3.40	3.19	3.00	2.82	2.65	2.48	2.33	2.19	2.06	1.93	1.81	1.70	1.60	1.50	1.41
10											8.26	7.66	7.18	6.73	6.32	5.94	5.59	5.26	4.95	4.66	4.40	4.15	3.91	3.69	3.48	3.28	3.09	2.92	2.76	2.60	2.45	2.31	2.18	2.06	1.94	1.83
11											9.39	8.01	8.29	7.80	7.35	6.93	6.54	6.18	5.84	5.52	5.22	4.94	4.68	4.42	4.19	3.97	3.76	3.56	3.37	3.19	3.03	2.86	2.71	2.57	2.43	2.30
12															8.42	7.97	7.56	7.14	6.78	6.43	6.09	5.78	5.49	5.22	4.95	4.71	4.47	4.25	4.04	3.84	3.65	3.47	3.29	3.13	2.97	2.83
13																		8.15	7.75	7.37	7.01	6.67	6.35	6.05	5.76	5.49	5.24	4.98	4.75	4.53	4.31	4.11	3.92	3.74	3.56	3.39
14																				8.35	7.96	7.68	7.25	6.92	6.61	6.31	6.03	5.76	5.50	5.26	5.02	4.80	4.59	4.39	4.19	4.01
15																							8.18	7.83	7.49	7.17	6.86	6.57	6.29	6.03	5.77	5.53	5.30	5.07	4.86	4.66
16																									8.61	8.05	7.73	7.42	7.12	6.83	6.56	6.30	6.04	5.80	5.57	5.35
17																												8.30	7.98	7.67	7.36	7.09	6.82	6.56	6.31	6.07
18																															8.22	7.92	7.63	7.35	7.08	6.82
19																																		8.18	7.89	7.61

TABLE II: r=5

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d_c \ d_s	0	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
0	1.53	0.88	0.63	0.48	0.38	0.31	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
1	4.12	2.88	2.17	1.77	1.48	1.26	1.08	0.94	0.82	0.72	0.63	0.55	0.49	0.44	0.39	0.35	0.32	0.28	0.26	0.23	0.21	0.19	0.17	0.15	0.14	0.13	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.05	0.04
2	6.53	4.82	3.92	3.31	2.85	2.49	2.20	1.95	1.74	1.56	1.41	1.22	1.11	1.01	0.92	0.83	0.76	0.70	0.64	0.58	0.53	0.49	0.45	0.41	0.38	0.35	0.32	0.29	0.27	0.24	0.22	0.21	0.19	0.17	0.16	0.14
3	8.88	6.09	5.77	4.99	4.39	3.90	3.49	3.15	2.86	2.60	2.37	2.10	1.92	1.77	1.63	1.51	1.39	1.28	1.19	1.10	1.02	0.94	0.87	0.81	0.75	0.70	0.65	0.60	0.56	0.52	0.48	0.45	0.41	0.38	0.34	0.33
4		8.98	7.69	6.75	6.02	5.42	4.92	4.48	4.11	3.78	3.48	3.13	2.90	2.69	2.50	2.33	2.16	2.02	1.88	1.76	1.65	1.54	1.44	1.35	1.26	1.18	1.11	1.05	0.97	0.91	0.85	0.80	0.75	0.70	0.65	0.61
5				8.58	7.73	7.03	6.44	5.92	5.47	5.07	4.71	4.28	4.00	3.74	3.50	3.28	3.07	2.88	2.71	2.55	2.40	2.25	2.12	2.00	1.88	1.78	1.68	1.58	1.49	1.41	1.33	1.25	1.18	1.11	1.05	0.99
6						8.71	8.03	7.44	6.92	6.43	6.03	5.54	5.20	4.88	4.60	4.33	4.08	3.85	3.63	3.44	3.25	3.08	2.92	2.76	2.62	2.48	2.35	2.23	2.11	2.00	1.90	1.81	1.71	1.62	1.54	1.47
7								9.02	8.43	7.90	7.42	6.88	6.48	6.11	5.78	5.47	5.18	4.91	4.66	4.42	4.20	3.99	3.80	3.61	3.44	3.27	3.12	2.97	2.83	2.70	2.57	2.45	2.34	2.23	2.12	2.02
8											8.88	8.27	7.83	7.42	7.04	6.68	6.35	6.04	5.76	5.48	5.23	4.99	4.76	4.55	4.36	4.15	3.96	3.79	3.63	3.47	3.32	3.17	3.04	2.91	2.78	2.66
9															8.36	7.96	7.59	7.25	6.92	6.62	6.33	6.05	5.80	5.55	5.31	5.10	4.88	4.68	4.49	4.31	4.14	3.97	3.81	3.66	3.51	3.38
10																			8.15	7.81	7.48	7.10	6.89	6.62	6.35	6.11	5.87	5.64	5.43	5.22	5.02	4.83	4.65	4.47	4.31	4.15
11																			9.42	9.05	8.70	8.36	8.04	7.74	7.45	7.18	6.91	6.66	6.42	6.19	5.97	5.76	5.55	5.36	5.17	4.99
12																									8.60	8.29	8.01	7.73	7.47	7.21	6.97	6.73	6.51	6.30	6.08	5.89
13																													8.56	8.28	8.02	7.76	7.51	7.28	7.05	6.83
14																																		8.31	8.06	7.82

TABLE II: r=8

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTIONS

d_c \ d_s	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1.10	0.50	0.29	0.19	0.12	0.09	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00
1	2.85	1.63	1.10	0.78	0.57	0.43	0.32	0.24	0.19	0.14	0.11	0.09	0.07	0.05	0.04	0.03
2	4.45	2.85	2.06	1.57	1.21	0.95	0.75	0.60	0.48	0.38	0.31	0.25	0.20	0.16	0.13	0.10
3	5.98	4.12	3.13	2.46	1.98	1.61	1.32	1.08	0.89	0.74	0.61	0.51	0.42	0.35	0.29	0.24
4	7.48	5.40	4.24	3.44	2.84	2.36	1.98	1.67	1.41	1.20	1.02	0.86	0.73	0.62	0.53	0.45
5	8.96	6.71	5.40	4.47	3.76	3.20	2.73	2.35	2.02	1.74	1.51	1.29	1.12	0.97	0.84	0.73
6		8.02	6.59	5.55	4.74	4.09	3.55	3.09	2.70	2.36	2.07	1.81	1.58	1.39	1.22	1.07
7			7.80	6.66	5.76	5.03	4.41	3.89	3.44	3.04	2.70	2.38	2.12	1.88	1.67	1.49
8				7.80	6.82	6.01	5.32	4.74	4.23	3.78	3.38	3.02	2.71	2.43	2.18	1.96
9					7.90	7.02	6.28	5.62	5.06	4.56	4.11	3.70	3.35	3.03	2.74	2.48
10						8.07	7.26	6.55	5.93	5.38	4.87	4.42	4.03	3.67	3.35	3.05
11						9.13	8.26	7.50	6.82	6.22	5.68	5.20	4.76	4.36	4.00	3.67
12									7.76	7.11	6.53	6.00	5.52	5.08	4.68	4.31
13										8.03	7.40	6.83	6.31	5.84	5.40	5.00
14												7.69	7.14	6.63	6.16	5.72
15													7.99	7.46	6.94	6.48
16															7.75	7.25

TABLE II: r=3, d_s= 0 15 (ENLARGED SECTOR)

d_c \ d_s	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1.32	0.68	0.45	0.32	0.24	0.18	0.14	0.11	0.09	0.07	0.05	0.05	0.04	0.03	0.02	0.02
1	3.49	2.21	1.62	1.26	1.00	0.81	0.66	0.54	0.45	0.38	0.32	0.27	0.23	0.19	0.17	0.14
2	5.49	3.83	2.98	2.41	1.99	1.67	1.41	1.21	1.04	0.89	0.77	0.66	0.57	0.50	0.43	0.38
3	7.43	5.49	4.43	3.69	3.13	2.69	2.33	2.03	1.78	1.57	1.38	1.20	1.06	0.94	0.84	0.74
4		7.18	5.94	5.06	4.37	3.83	3.37	2.99	2.66	2.37	2.12	1.87	1.68	1.51	1.37	1.23
5		8.88	7.50	6.48	5.69	5.04	4.50	4.03	3.63	3.28	2.97	2.66	2.41	2.20	2.00	1.83
6				7.96	7.06	6.33	5.70	5.16	4.69	4.28	3.90	3.53	3.23	2.97	2.73	2.51
7					8.48	7.66	6.95	6.34	5.81	5.33	4.91	4.47	4.13	3.82	3.53	3.27
8							8.25	7.58	6.98	6.45	5.97	5.49	5.09	4.73	4.41	4.10
9									8.20	7.62	7.08	6.55	6.11	5.71	5.34	5.00
10											8.24	7.66	7.18	6.73	6.32	5.94
11											9.39	8.81	8.29	7.80	7.35	6.93
12															8.42	7.97

TABLE II: r=5, d_s= 0 TO 15 (ENLARGED SECTOR)

d_c \ d_s	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1.53	0.88	0.63	0.48	0.38	0.31	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.08	0.07	0.06
1	4.12	2.80	2.17	1.77	1.48	1.26	1.08	0.94	0.82	0.72	0.63	0.55	0.49	0.44	0.39	0.35
2	6.53	4.82	3.92	3.31	2.85	2.49	2.20	1.95	1.74	1.56	1.41	1.22	1.11	1.01	0.92	0.83
3	8.88	6.89	5.77	4.99	4.39	3.90	3.49	3.15	2.86	2.60	2.37	2.10	1.92	1.77	1.63	1.51
4		8.98	7.69	6.75	6.02	5.42	4.92	4.48	4.11	3.78	3.48	3.13	2.90	2.69	2.50	2.33
5				8.58	7.73	7.03	6.44	5.92	5.47	5.07	4.71	4.28	4.00	3.74	3.50	3.28
6						8.71	8.03	7.44	6.92	6.45	6.03	5.54	5.20	4.88	4.60	4.33
7								9.02	8.43	7.90	7.42	6.88	6.48	6.11	5.78	5.47
8											8.88	8.27	7.83	7.42	7.04	6.68
9															8.36	7.96

TABLE II: r=8, d_s = 0 TO 15 (ENLARGED SECTOR)

CHECK RATINGS FOR PAIRED ATTRIBUTE SAMPLING INSPECTIONS

TABLE III

Critical Limits for Cumulative Check Ratings

No. Lots Verified	Median Value	Critical Values	
		Warning	Action
3	2.67	6.30	8.41
4	3.67	7.75	10.05
5	4.67	9.15	11.60
6	5.67	10.51	13.11
7	6.67	11.84	14.57
8	7.67	13.15	16.00
9	8.67	14.43	17.40
10	9.67	15.70	18.78
11	10.67	16.96	20.14
12	11.67	18.21	21.49
13	12.67	19.44	22.82
14	13.67	20.67	24.14
15	14.67	21.89	25.45
16	15.67	23.10	26.74
17	16.67	24.30	28.03
18	17.67	25.50	29.31
19	18.67	29.69	30.58
20	19.67	27.88	31.84
21	20.67	29.06	33.10
22	21.67	30.24	34.36
23	22.67	31.42	35.60
24	23.67	32.59	36.84
25	24.67	33.75	38.08
26	25.67	34.92	39.31
27	26.67	36.08	40.54
28	27.67	37.23	41.76
29	28.67	38.39	42.98
30	29.67	39.54	44.19

TABLE IV

Probability of Acceptance of Homogeneity in Each of K Verification Trials for a Specified Acceptance Probability in a Single Trial

Probability of Acceptance in a Single Trial	Probability of Acceptance of Hypothesis of Homogeneity in All K Trials		
	K = 3	K = 5	K = 10
0.95	0.86	0.77	0.60
0.90	0.73	0.59	0.35
0.85	0.61	0.44	0.20
0.80	0.51	0.33	0.11
0.75	0.42	0.24	0.06
0.70	0.34	0.17	0.03
0.65	0.28	0.12	0.01
0.60	0.22	0.08	0.01
0.55	0.17	0.05	0.00
0.50	0.12	0.03	0.00
0.45	0.09	0.02	0.00
0.40	0.06	0.01	0.00
0.35	0.04	0.00	0.00

TABLE V

Probability of Acceptance of Homogeneity of
Paired Attribute Samples Proportional in Size

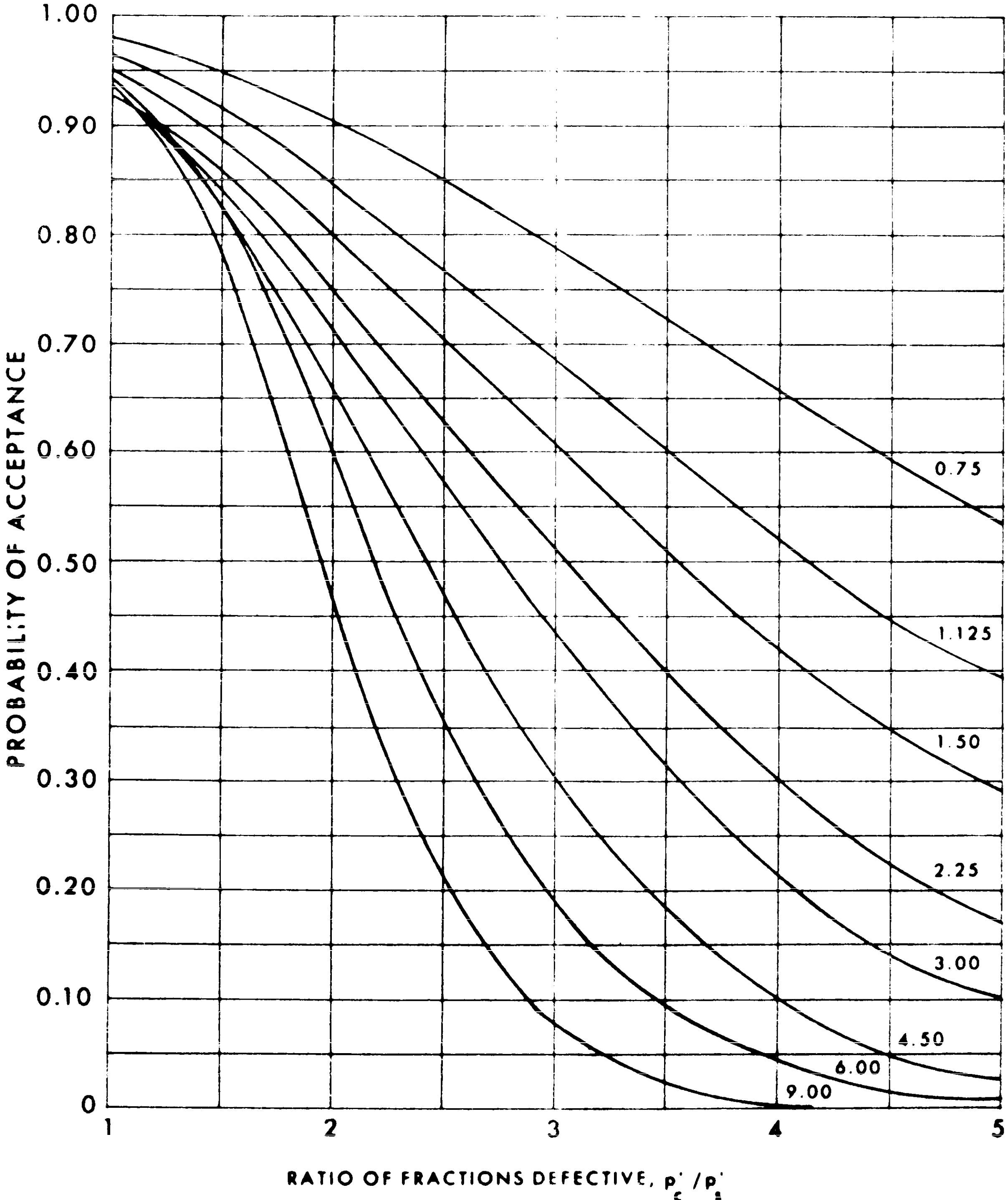
$p'_s n_s$	r = 1 p'_c/p'_s				r = 2 p'_c/p'_s				r = 3 p'_c/p'_s				r = 5 p'_c/p'_s				r = 8 p'_c/p'_s			
	1	2	3	4.5	1	2	3	4.5	1	2	3	4.5	1	2	3	4.5	1	2	3	4.5
0.75	.98	.90	.79	.59	.97	.90	.81	.65	.99	.95	.90	.80	.93	.86	.80	.72	.96	.91	.86	.80
1.125	.96	.84	.68	.45	.96	.86	.73	.54	.98	.92	.84	.69	.93	.85	.78	.67	.95	.90	.84	.76
1.50	.95	.80	.61	.35	.95	.82	.66	.45	.97	.89	.78	.59	.93	.85	.76	.64	.95	.89	.82	.72
2.25	.94	.75	.51	.23	.93	.77	.57	.32	.96	.84	.68	.45	.94	.85	.74	.57	.95	.88	.79	.65
3.00	.94	.72	.44	.14	.93	.74	.50	.24	.95	.80	.61	.35	.94	.84	.68	.48	.95	.86	.74	.58
4.50	.94	.66	.30	.04	.93	.69	.41	.13	.94	.75	.50	.21	.95	.81	.61	.35	.95	.83	.68	.46
6.00	.95	.59	.19	.01	.94	.66	.32	.06	.94	.71	.40	.12	.95	.77	.54	.26	.95	.80	.63	.38
9.00	.95	.46	.07	.00	.95	.58	.19	.01	.94	.62	.26	.04	.95	.72	.41	.14	.95	.77	.53	.25

NOTE: (a) p'_c/p'_s is the ratio of the expected fractions defective in the consumer's and supplier's samples of size n_c and n_s, respectively.

(b) $p'_s n_s$ is the expected number of defectives in the supplier's sample size n_s, where $n_s = rn_c$.

OPERATING CHARACTERISTIC CURVES OF TWO-SAMPLE TEST FOR HOMOGENEITY

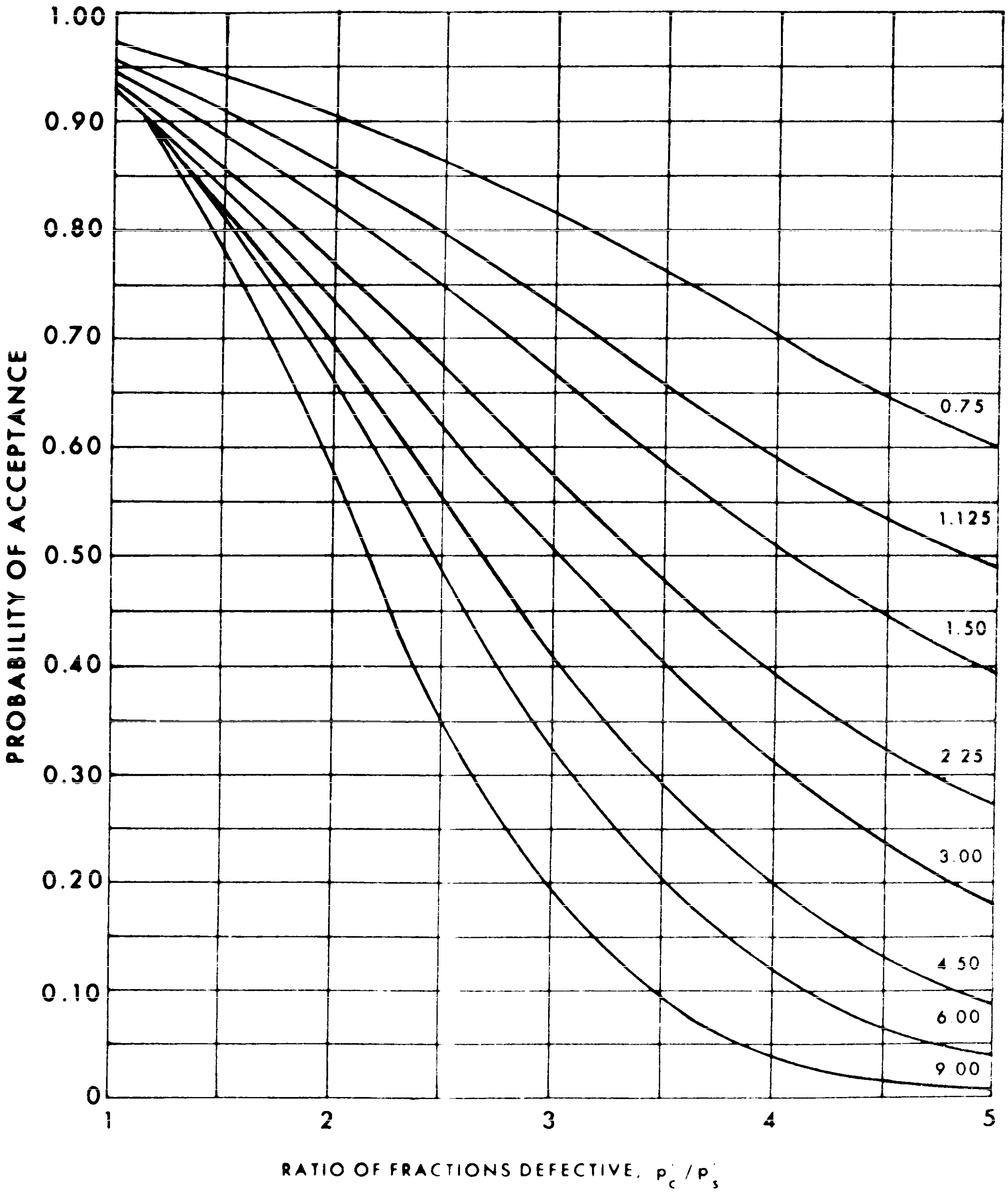
SAMPLE SIZE RATIO: r=1



NOTE:
Figures curves are the expected numbers of defectives (defects) in the supplier's sample

OPERATING CHARACTERISTIC CURVES OF TWO-SAMPLE TEST FOR HOMOGENEITY

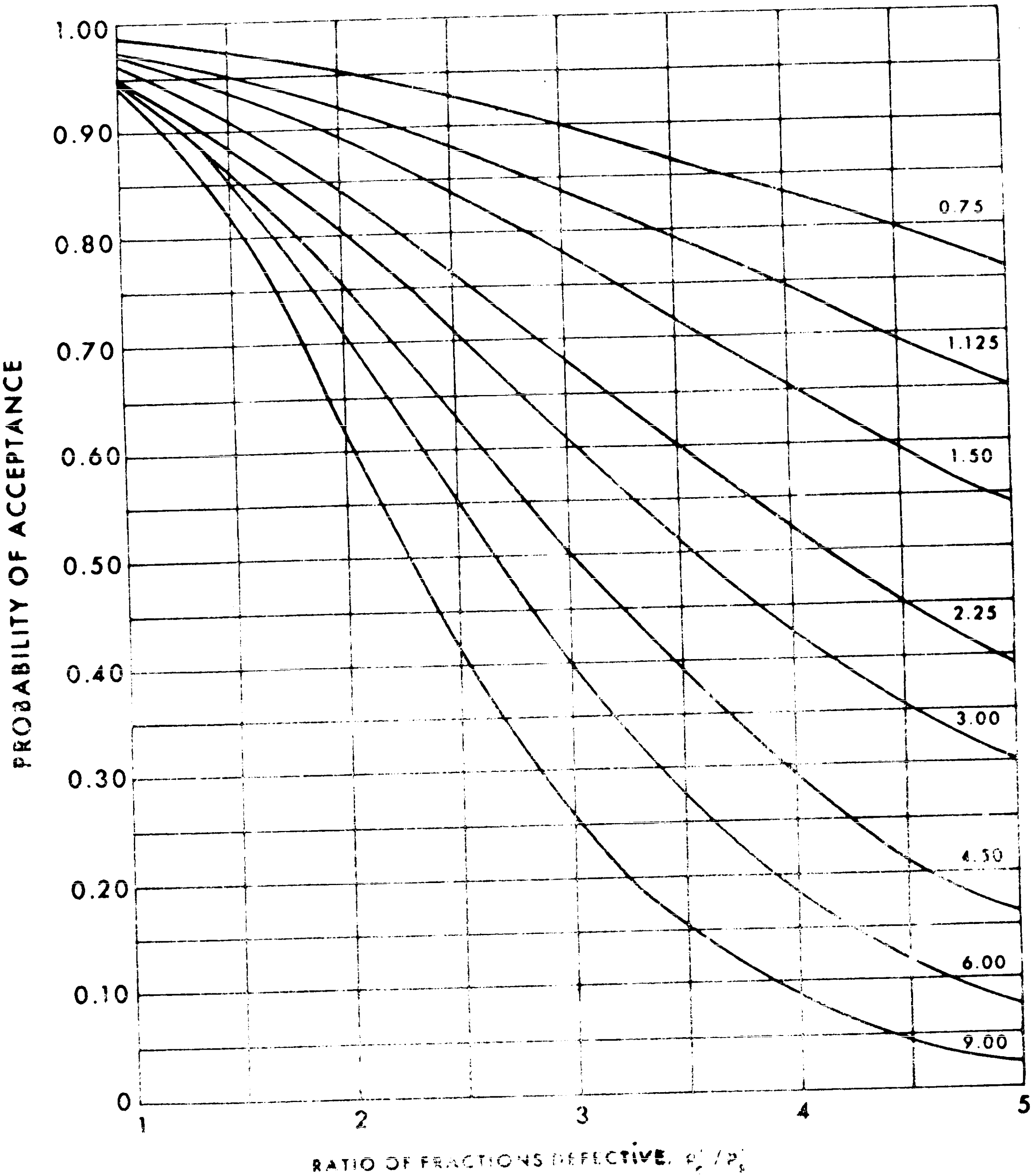
SAMPLE SIZE RATIO: r=2



NOTE:
Figures on curves are the expected numbers of defectives (defects) in the supplier's sample

OPERATING CHARACTERISTIC CURVES OF TWO-SAMPLE TEST FOR HOMOGENEITY

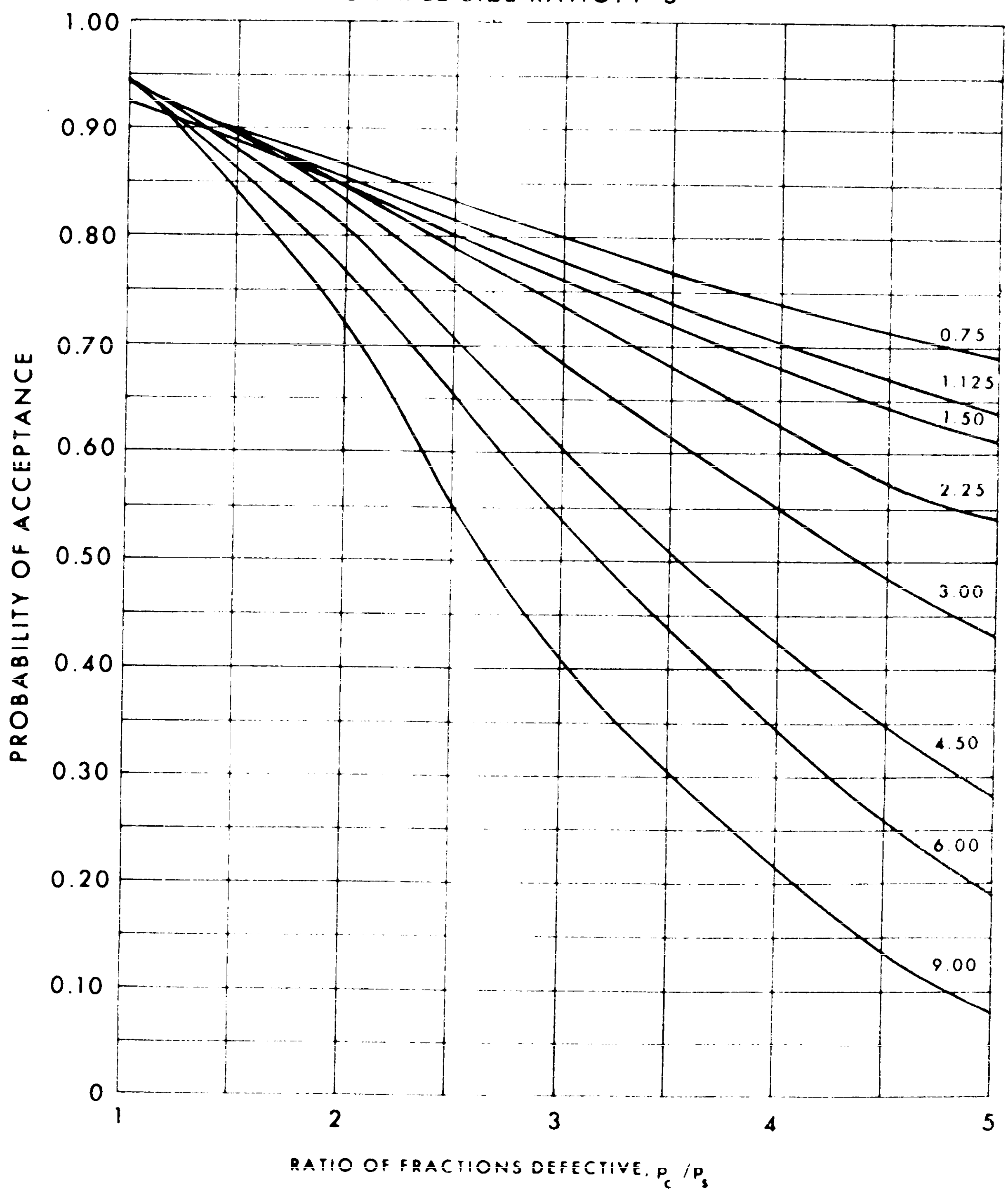
SAMPLE SIZE RATIO: r=3



NOTE:
Figures on curves are the expected number of [illegible] (defects) in the supplier's sample

OPERATING CHARACTERISTIC CURVES OF TWO-SAMPLE TEST FOR HOMOGENEITY

SAMPLE SIZE RATIO: r=5



NOTE:

Figures on curves are the expected numbers of defectives (defects) in the supplier's sample

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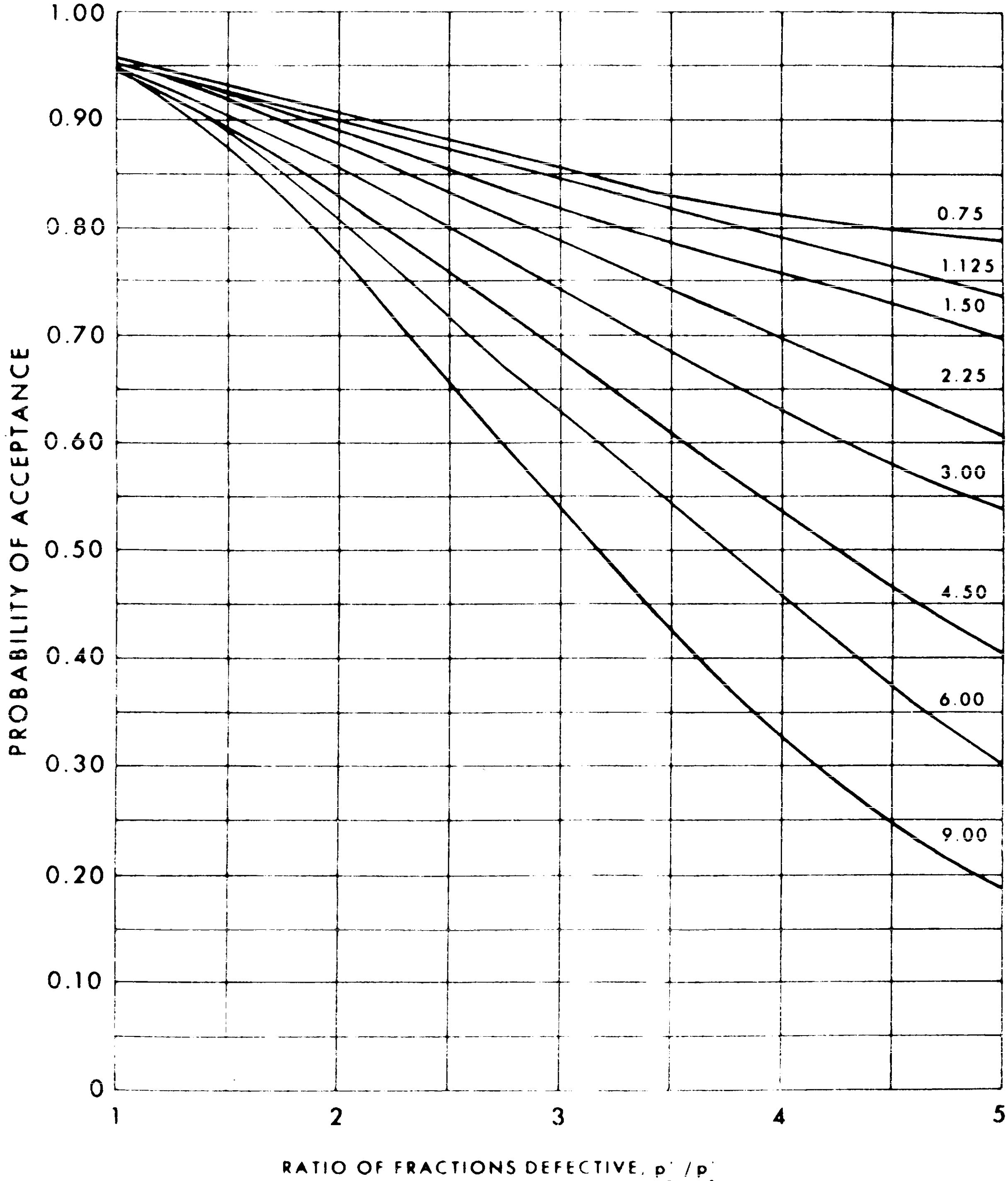
OPERATING CHARACTERISTIC CURVES OF TWO-SAMPLE TEST FOR HOMOGENEITY

SAMPLE SIZE RATIO: r=8



NOTE:
Figures on curves are the expected numbers of defectives (defects) in the supplier's sample

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