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POINT SYSTEM FOR EVALUATING QUALITY IN TEXTILES

by

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FOREWORD

With the adoption of the Point System for defining quality of textiles, the Military Services have aligned the quality control aspects of their procurements more closely with those of suppliers. This system has been hailed by the textile industry as a significant breakthrough in communicating to them the quality of product required by the Government.

The U. S. Government, as the largest single purchaser of textile fabrics, has a clear and vital obligation to assure that the commodities we buy are at the lowest overall cost commensurate with the needs of the Military Services. One of the ways we can accomplish this is to align our requirements within the framework of commercial practice whenever possible. The extension of the point system beyond the limited range of fabrics originally considered for it, to the whole range of Government procured textiles has been most gratifying.

Currently, we are extending the applicability of the point system to clothing items. Initial studies have indicated that the potential benefits from this system should surpass even those of the fabric point system. We look forward with great enthusiasm to the completion and implementation of the study results.

As one reads this very comprehensive report, the benefits which have been derived from the point system will become quite apparent. We are most appreciative of the efforts of Mr. Harold J. McIsaac, whose untiring efforts and leadership have brought about the acceptance of the point system by both the Government and the textile industry. Credit is also due to a number of members of Mr. McIsaac's staff, especially Mr. Edward F. Levell, his assistant for Quality Control; representatives of the Defense Personnel Support Center, especially Mr. James Shanahan, Assistant Chief of the Textile Branch, Technical Operations Directorate; and representatives of the other Military Services.

In addition, we are grateful to many people in the textile industry for their willing support throughout the development and testing of the standards ultimately adopted. This project has again revealed the progressive attitude of our industry toward innovations, and the dedicated support which so many firms accord to the defense program of our country.

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ABSTRACT

The major and minor evaluation system used to establish the quality of fabric required by the Government was never totally understood by the textile industry. The reason, apparently, was poor communication between the supplier and the purchasers, as to desired quality. This evaluation system was different from the many quality analyses used for commercial fabrics.

The Textile Laboratories realized the great need for a standard method of evaluating quality of fabric that would be agreeable to both the textile industry and the Government and initiated action to fulfill this need. The "point system" herein described, was proposed as the standard method of evaluating quality of fabrics and was discussed at three Industry Advisory Committee meetings. Various tests were run. Results of inspections conducted by the industry were compared with results of verification inspections. Areas of difference were resolved. In 1961 the Government and the industry adopted a standard method of defining and scoring defects, thereby assuring that goods delivered on contracts were of the quality stipulated as acceptable by the specification. The first mass procurement of 26 million yards of carded sateen, employing the point system method of evaluating defects, was extremely successful. The point system is simple, easily understood, and has been hailed by the textile industry as the necessary bridge in the communication of quality required by the Government.

POINT SYSTEM FOR EVALUATING QUALITY IN TEXTILES

I. Introduction

Any historical account of quality evaluation requirements for textiles must, of necessity, start by quoting the "workmanship" paragraph used in specifications prior to World War II. This paragraph states, "The finished cloth shall be clean, evenly woven and free of any defects which may affect appearance or serviceability"(1). This was the sole statement of quality evaluation in specifications. Together with this statement was the requirement for 100 percent inspection of all yard goods purchased, which at the time was in accord with standard commercial practice.

The intent of this paragraph, as the title "workmanship" might imply, was to make known to prospective bidders the degree of workmanship desired by the Government. The statement was challenged, however, and a committee of renowned reputation rendered the decision that the paragraph could only be interpreted literally. By the phrase "Free of defects", the Government was asking for perfect goods.

Also required of Government contractors during this 100 percent examination was the identification of the location of all defects by means of a string placed along the edge of the cloth. Stringing of defects, which was then being practiced commercially, made it possible for garment manufacturers to locate the defects and to replace parts cut from the defective portion. Contractors were assessed a predetermined penalty in the form of a yardage deduction for defects so strung.

During World War II, when the volume of textiles procured by the Military increased to enormous quantities, it became necessary to find a more appropriate method of determining fabric quality. Statistical sampling provisions were adopted by the Military as the immediate solution to this problem.

II. Statistical Sampling Provisions

The textile inspection provisions adopted included a classification of defects, an acceptable quality level to control each class of defects, and statistical sample sizes depending upon the lot size of the material. Statistical sampling, at the time a fairly recent development, is a method of accepting material with predetermined risks to both the producer and consumer, based on the results of inspection of a random sample of items, representative of the lot. Risks generally used are a 10% producer's risk and a 5% consumer's risk. These were embodied in the provisions adopted by the Government. The producer's risk means that lots which truly are of acceptable quality will be rejected 10% of the time. On the other hand, consumers will accept lots of undesirable quality 5% of the time. Statistical sampling, while possessing "built-in" risks, does yield tremendous economic advantages in the form of

reduced inspection. The classification was a listing of defects inherent in the fabric, with each defect classified as major or minor. Defects were classified as major when their effect on the fabric was considered serious; and minor when the effect was not severe. The classification varied from fabric to fabric (2,3,4), acceptable quality levels being the established limits on the number of inherent defects acceptable in a lot of fabric. These acceptable quality levels were the criteria for accepting the quality product of a well-controlled industry.

In the classification of defects, some defects were specified in a manner which demanded suppositions on the part of the inspector. These defects were called "judgment defects". For instance, a "slub" is a judgment defect. If the inspector thought a slub would develop into a hole, it would be scored a major defect; if he thought it would not develop into a hole, it would be scored a minor defect. Differences of opinion were possible between contractor and Government inspectors as to the classification of the slub; in fact, it is a prime example of the difficulty of classifying defects subjectively.

The use of statistical sampling methods yielded benefits to the Government in the form of reduced inspection time. However, with this procedure there were considerable uncertainties as to whether or not a significant number of contractors really understood the theoretical basis for this method of quality definition. The sampling and inspection procedures adopted are based upon comparatively sophisticated statistical techniques and are not grasped readily without a substantial background in mathematics. A major point of contention on the part of the contractor was the great amount of variation in results of end item examination. The main cause of this variation was as mentioned, in the interpretation of "judgment defects." In the textile fabric mills, particularly, many manufacturers expressed themselves as being more concerned with producing the quality of fabric that would pass the inspection than with the quality called for by the specification. This indicated that the method of quality control left something to be desired. The fairness of the system was constantly in contention. The Government sought reconciliation by trying to convince the contractor that the primary objective was the production of the quality called for by the specification, precluding the uncertainty of acceptance or non-acceptance, based upon what the random sample exposed.

III. Initial Action Towards Point System

The principles employed in the preparation of specifications at the U.S. Army Natick Laboratories are that requirements be established which reflect the product of a well-controlled industry and that workmanship standards be specified in terms that are familiar to the industry. For this reason, particularly, NLABS personnel intently studied the responses to a proposal made by the National Association of Shirt, Pajama, and Sportswear Manufacturers and by the Textile and Needle Trade Division of the American Society of Quality Control (5). This proposal attempted to define, in terms of point values, the

standard quality of a fabric. The Natick Laboratories collaborated with these two organizations in developing a point system to evaluate the quality of textiles (6). Under the provisions of this system, it would be possible to establish levels which the industry would recognize as standards of commercial quality. With this in mind, steps were taken prior to including in Government specifications a point system for defining fabric quality.

An Industry Advisory Committee (IAC) on Carded Yarn Fabrics was formed to study the feasibility of evaluating the quality of textiles by means of a point system. The IAC meetings were held on 23 March 1960 (7), 2 June 1960 (8), and 14 February 1961 (9). Representatives from all the Military Services and the Defense Personnel Support Center attended so that the Department of Defense could move as a unit. The outstanding men of the textile field who served on the committee are listed in Appendix A.

At the first IAC meeting, when the work preliminary to the adoption of a new quality evaluation system was planned, Dr. Kennedy urged the Services to move together in replacing the major-minor system of evaluating fabric quality by a system that would be complementary to that of the present standard commercial practice. It was emphasized that no attempt was being made to change the quality of delivered fabrics, rather the emphasis was on changing the method of defining quality.

Guidelines were established for this new system as follows:

- a. It should be a system widely used by the majority of the industry.
- b. It should be a system where variability in results is held to a bare minimum.
- c. It should be comparatively simple and devoid of complex or ambiguous terminology.
- d. It should be a system that would meet the requirements of the Government for a specific quality level.

Following this meeting, the many diversified proposals were studied in order that a specific point system could be presented at the next meeting of the committee.

At the second meeting held in June of 1960, the following provisions were agreed upon:

- a. All defined defects that are clearly noticeable at normal inspection distance would be assigned penalty points as follows:

Defects up to 3 inches in any dimension	- one point
Defects from 3 inches to 6 inches	- two points
Defects from 6 inches to 9 inches	- three points
Defects exceeding 9 inches in any dimension	- four points

- b. The maximum number of penalty points for any one yard would be four.
- c. Defects of the "overall" type would be assigned four penalty points for each yard in which they occur. (Examples of "overall" type defects are off-shade, baggy, ridgy, or wavy cloth, or any other defect not usually confined to a small area.)
- d. Calculations would be made on the basis of 100 square yards.
- e. The following formula would be used in determining fabric quality:

$$\text{Points per 100 square yards} = \frac{\text{Total points scored in sample size} \times 36 \times 100}{\text{Sample size (yds)} \times \text{contracted width of material}}$$

Descriptions of fabric defects are contained in Federal Standard No. 4 (10).

IV. Trial Inspection Prior to Procurement

While the industry representatives at these meetings agreed that there was a need for a new quality evaluation system, there was a general feeling, nevertheless, that there was too much variation among Government inspectors and that the Government inspector was not able to score a defect in the same manner twice. The representatives felt that everyone in the industry knew what a defect was and which defects should determine quality.

Plans were therefore made to conduct an experimental inspection to determine if the criticisms were valid and if the point system could be evaluated without any specific fabric defect definitions. It was agreed to take 2,000 yards of uniform twill fabric out of stock and have it graded by the quality control personnel of the IAC members' mills as well as by Government inspectors. The results of this examination would be compared to determine whether all mills and the Government were grading defects in the same manner.

The J. P. Stevens Company made their inspection facilities at 350 Hudson Street, New York, available for this inspection (11). On 31 August, 1960, 2,000 yards of uniform twill were examined by thirteen of the leading quality control personnel of the textile industry. The results of this examination are given in Table I. The participants are listed in Appendix B.

TABLE I
Results of Quality Evaluation by Leading
Textile Quality Control Personnel

<u>Piece No.</u>	<u>Yards per Piece</u>	<u>Total Points Scored on the Individual Piece</u>		
		<u>Range</u>	<u>Variance</u>	<u>Average</u>
11740	42	12-21	9	18
11741	42	53-60	7	58
11743	40	18-36	18	27
11747	40	10-30	20	20
11749	41	27-47	20	40
11752	42	27-34	7	30
11753	46	24-51	27	40
11754	45	24-50	16	33
11758	40	18-50	32	34
11757	48	17-42	25	32
11795	40	25-48	23	35
11796	40	13-30	17	23
11738	51	21-56	35	38
11739	86	31-57	26	39
11737	127	71-97	26	85
27394	105	73-114	41	99
27395	132	44-90	46	65
27393	126	93-139	46	113
27392	58	23-56	33	39
27391	78	35-80	45	55

Although the averages, in most cases, were within an acceptable limit, the individual ratings were far apart indicating that, unless defect definitions were standardized, the required quality could not be evaluated properly. On one 40-yard piece (No. 11795) there was a 23-point variance in grading among the mills. At this rate a sample size of 750 yards would show a variance of 431 points. A 46-point variance was found in grading the 126 yards of No. 27393.

An analysis of the individual results showed that the quality control personnel of the textile industry had not referred to the same defects. There was consistency in grading the 4-point, 3-point, 2-point, and half of the 1-point defects, but within the other half of the 1-point defects, there was a very serious variation since each point difference represented a single defect. The defects which caused the widest variance in grading were knots, slubs and stains. Some of the mill representatives included anything that was visible to the naked eye, while others included only what they believed would cause a defective end item.

In order to have a quality evaluation system allowing a minimum of variation in results, it was obvious that a standard procedure for scoring slubs, knots, and stains should be established. It was agreed that only those slubs and knots that exceeded a specific dimension would be counted as defects. Illustrations depicting these specified limits would be made a part of the purchase documents. Stains clearly noticeable at a normal inspection distance (3 feet) would be scored as defects. An allowance in specified point values would be made for undyed cloth as opposed to dyed cloth to compensate for the additional stains that might be prevalent in undyed cloth. When Pieco No. 11795 was re-examined on the basis of these new criteria, all of the inspectors came up with exactly the same point count. As a result of this re-examination, it was felt that the new system provided the necessary means of communication on quality between the Government and the textile industry. This re-examination pointed up the advantage of a glossary of fabric defects. Federal Standard No. 4 was adopted as the standard for defining fabric imperfections.

On February 14, 1961, a third meeting of the IAC was held with the purpose of soliciting the views of the members on the proposed quality assurance provisions prepared by the Standardization Branch, Clothing and Organic Materials Division, U. S. Army Natick Laboratories, for cotton uniform twill cloth, based on the new point system. A further purpose was to solicit the general view of the members on the applicability of this system for determining fabric quality in all cotton fabric specifications.

Each member received a copy of the proposed quality assurance provisions. These provisions stipulated a sample size of 450 yards, regardless of lot size. Salvage defects were not to be scored unless the body of the cloth was affected. No one yard was to be penalized more than four points, the measuring of the yard to begin at the last scored defect (this was later referred to as a "floating yard"). An acceptable point level and the formula for determining this level were given, and the severity of defects, by measurement, was stipulated.

At this meeting, it was agreed that the sample size should be increased to 750 yards. It was also agreed that the point system presented could be adopted, with varying point levels, for all cotton fabrics.

V. Production Test Using the Point System

The first procurement document to incorporate the point system of evaluating quality of fabric was Limited Purchase Description 5-61 (12). The quality level established for this fabric was 30 points per 100 square yards.

A production test contract for 630,000 yards of cotton uniform twill was evenly distributed among six contractors with the basis of procurement LP.F/DES-5-61. The major objectives of the production test were:

- a. To determine the degree of comparability between the contractor's inspection results and the Government's inspection results.
- b. To analyze the quality of cloth supplied when the new point system was used.
- c. To orientate the cotton textile industry to the new point system prior to mass procurement based on the new inspection procedure.
- d. To eliminate any possible source of trouble or misinterpretation in the mechanics of the new point system prior to mass procurement based on the new inspection procedure.

Table II contains a summary of the results of the contractor and Government inspections for the production test:

TABLE II

Inspection Results of Production Test

<u>Contract No.</u>	<u>No. of Lots</u>	<u>Avg of the total contract inspection results (points/100 sq yd)</u>		<u>Variance</u>
		<u>Government</u>	<u>Contractor</u>	
QM-10134-T-61	5	20.5	19.5	1.0
QM-10294-T-61	6	9.5	11.9	2.4
QM-10295-T-61	3	13.6	14.5	0.9
QM-10437-T-61	5	10.5	12.1	1.6
QM-10438-T-61	4	9.8	11.6	1.8
QM-10439-T-61	4	13.8	13.9	0.1

The nonsignificant variability found in all six contracts of the production test was noted with enthusiasm by all participants. The variability in average contract inspection results ranged from 0.1 points per 100 square yards to 2.4 points. It was apparent that the contractor and Government inspection personnel were evaluating quality in a similar manner. The new point system had eliminated "judgment" type defect classification and penalized a defect objectively, that is, on the basis of the length of its largest dimension.

A comparison of the actual inspection results of this production test was made with the acceptance criteria of the major-minor inspection provisions. The purpose of this comparison was to determine that the new point system afforded to the Government protection similar to that afforded by the previous major-minor system. A summary of this comparison is presented in Table III.

TABLE III

Inspection Results from Production Test
Using Point System and Major-Minor Provisions

<u>Contractor</u>	<u>Lot No.</u>	<u>Point Value</u>	<u>No. of Defects found in Sample</u>	
			<u>Major</u>	<u>Total</u>
1	1	26.3	1	60
	2	26.3	1	70
	3	19.5	2	58
2	1	12.5	3	39
3	1	17.0	7	49
	2	12.8	10	47
	4	12.3	11	37
4	1	22.0	6	58
	5	17.0	0	40
5	2	15.1	1	37
	3	13.6	1	26
6	1	15.0	7	67
	3	13.8	1	30

The acceptable point limit specified in LP.P/DES 5-61 was 30.0 points per 100 square yards. The acceptable quality levels previously specified for uniform twill fabric would have permitted 20 major defects and 98 total (major and minor combined) defects in a sample of 750 yards. An analysis of the results shows that all lots that were found to be acceptable under the point system would have been accepted under the major-minor system which negates any claim that the point system would permit an inferior fabric to enter the supply system.

The response from the textile industry and the quality of cloth supplied in the initial point system contract were most encouraging. Because of the successful results of the production test, it was determined to procure all woven cotton cloth on the basis of the point system of determining quality rather than as the basis of the major-minor system. The textile industry hailed this new quality evaluation system as the best ever developed primarily because of its preciseness and simplification in communicating the quality required by the Government. The use of photographs in lieu of a drawn figure to illustrate the maximum acceptable limits for knots and slubs and the revision of the phrasing of the defect criteria were refinements made in the point system as a result of the production test.

VI. First Mass Procurement Using the Point System

On 17 August 1961, an invitation for bid was issued for twenty-seven million yards of carded sateen fabric to be procured by means of the point system. This was the first mass procurement using the new quality evaluation system. Interim Purchase Description S-220-1 (13) was the basis for this procurement. The significant results from this invitation for bids were:

1. On the first procurement of 27 million yards a savings of \$300,000 resulted because of reduced administrative and inspection cost. This saving was attributed to the new point system (14). All subsequent procurement of textiles using the point system should reflect similar savings.
2. Full coverage of the entire 27 million yards was achieved and 17,655,564 yards were awarded to the participants of the production test of the point system.
3. More bids were received than at any previous time in the procurement history of this fabric.
4. The percentage response was the highest since 1957 and more than twice the average percentage response during 1960 and 1961.

Table IV lists the number of invitations for bid for Cloth, Cotton, Sateen Carded from 1958 to 1961 and the response to these invitations.

TABLE IV
Invitations for Bids and Responses -
Cloth, Cotton, Sateen, Carded

<u>Width</u> <u>(Inch)</u>	<u>IB Date</u>	<u>Bids Solicited</u>	<u>Response</u>	<u>Responses</u>
		Number	Number	%
40	Mar 1958	45	11	24.44
36	Apr 1958	48	11	22.92
36	May 1958	35	9	25.90
40	Jul 1958	34	10	29.41
40	Aug 1960	42	10	23.81
40	Oct 1960	47	10	21.28
40	Feb 1961	41	9	21.98
40	May 1961	114	6	5.26
40	May 1961	121	10	8.26
40	Aug 1961	58	23	39.66

VII. Operating Characteristic Curve For Carded Sateen

The Operating Characteristic curve shown in Figure 1 was derived from the examination records of 342,000 yards of 40-inch wide carded sateen (456 lots at 750 yards per lot representing approximately 45,000,000 yards of fabric). The values on which the Figure 1 data were based are given in table V. A total of 28,708 defects with an assigned demerit point value of 75,257 points was found. The average point value per defect was 2.62. The assigned demerit point classification of the defects was as follows:

	1-point	2-point	3-point	4-point
Total defects scored	11,649	1,696	1,236	14,127
% of total defects scored	40.6	5.9	4.3	49.2

The mathematical derivation of this O.C. curve is presented in Appendix C (15).

Probability of
acceptance

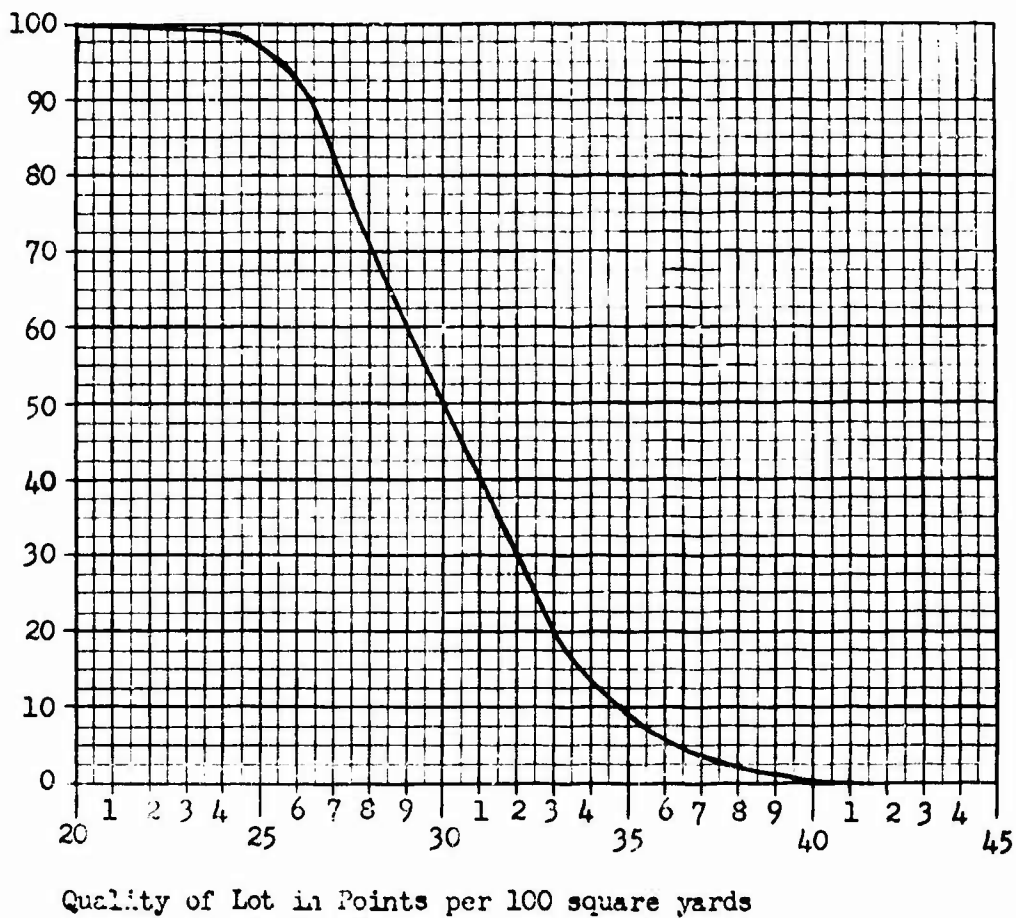


Figure 1 - Operating Characteristic Curve for
Cloth, Cotton, Sateen, Carded

TABLE V

Tabulated Values of Operating Characteristic Curve

<u>Quality of Presented Lot</u>		<u>Probability of Acceptance (%)</u>
<u>Pts/100 sq yd</u>	<u>Defects/100 sq yd</u>	
22	8.40	99.8
24	9.16	97.3
25	9.54	94.3
27	10.31	81.8
29	11.07	61.1
30	11.45	50.0
31	11.83	39.4
33	12.60	20.6
35	13.36	9.2
37	14.12	3.6

VIII. Cloth Defects - Fabricated End Item Study

With such a widely accepted means of defining fabric quality available, it was possible to study the effect of cloth defects on fabricated items. This was done by examining the fabrics under the point system and noting all defects, covering the entire defect area with masking tape, listing the defects on a tally sheet and coding the defects on the masking tape. The five fabrics and end items studied were:

Group I	Fabric:	Cloth, Cotton, Wind Resistant Sateen, 9 ounce, OG-107
	End Item:	Coat, Man's, Field, OG-107
Group II	Fabric:	Cloth, Cotton, Sateen, Carded, 8.8 ounce, OG-107
	End Item:	Shirt, Man's, Utility, OG-107
Group III	Fabric:	Cloth, Cotton, Uniform Twill, 6 ounce, Tan 505
	End Item:	Trousers, Men's, Summer, AF, Tan 505
Group IV	Fabric:	Cloth, Cotton, Poplin, 4 ounce, Tan 46
	End Item:	Shirt, Man's, Cotton, Poplin, Tan 46
Group V	Fabric:	Cloth, Cotton, Chambray, 3 ounce, Tan 130
	End Item:	Shirtwaist, Woman's, Chambray, Tan 130

One-hundred and twenty-five dozen garments were made from each fabric. The garments having tape on them were inspected to evaluate the effect of the defect on the quality of the garment.

The data accumulated during this study are given in Appendices D, E, F and G as follows:

Appendix D - Fabric Examination Results
Appendix E - End Item Examination Results
Appendix F - Analysis of End Item Results
Appendix G - Accumulation of Fabric Examination Data

The results of the examination of the fabric (App. D) were gathered by the combined efforts of all the Services and of the Defense Personnel Support Center. The fabric was taken from Government stock. Prior to processing into garments, it was examined and taped in accordance with the procedure outlined. The examination took place at the facilities of the Defense Personnel Support Center under standard inspection conditions.

The results of the end item inspection (App. E) were also gathered through the combined efforts of the Military representatives. The fabric technologists participating in the study were joined by garment specialists to insure total competence during the inspection.

Analysis of the results of the end item examination (App. F) was designed not only to show the relationship between the point value of the fabric and the resultant garment, but also to provide other pertinent information, such as the number of garments affected, the number of imperfect garments for each point value category, the number of garments affected and number of imperfect garments for each sub-group, and the number of imperfect garments per 100 points for each point value category and for each sub-group.

The accumulation of data gathered during the fabric examination (App. G) was a by-product of the study.

In Appendix D, which reflects the examination of all five lots of fabric (20,000 yards), there is an attempt to determine which features remain consistent irrespective of the fabric. It is believed that the most significant fact emanating from this accumulation of data is the percentage of 1-and-4-point defects, separately and collectively, particularly the latter. A brief perusal of the report reveals the following significant features of each fabric by group, cumulative for each fabric and cumulative for the entire yardage examined:

1. The number and percentage of defects for each class of point values.

2. The number and percentage of "A" defects for each class of point values. ("A" defects are defects that appear in the fabric but would not be counted in determining the lot quality. The provision that no yard be penalized more than 4 points is the factor that establishes "A" defects)
3. The total point value and the percent of total points for each point value.
4. The total number and percentage of "A" defects.
5. The total number and percentage of 1- and 4-point defects combined.
6. The number and percentage of the most frequently occurring defects.

Another extremely significant piece of data that emerged from the study was the percentage of one-point defects that occurred in the fabric yet did not occur in the end item having either been lost in the cutting or hidden in seams. Percentages of one-point defects are below:

<u>Fabric</u>	<u>1-point defects lost</u> <u>%</u>
Cloth, Cotton, Wind Resistant Sateen, 9 ounce, OG-107	49.4
Cloth, Cotton, Sateen Carded, 8.8 ounce, OG-107	59.4
Cloth, Cotton, Uniform Twill, 6 ounce, Tan 505	53.7
Cloth, Cotton, Poplin, 4 ounce, Tan 46	60.8
Cloth, Cotton, Chambray, 3 ounce, Tan 130	78.5

At the end of the study it was concluded that:

- a. The number of imperfect garments can be predetermined by the use of a fabric with a known point value. This was validated by a later study.
- b. A definite range of 1- and 4-point fabric defects will show up in imperfect garments.
- c. Even a known fabric value, a predictable number of 1-point fabric defects will not appear in the finished item. They are either discarded by cut-outs or are hidden in seams.

- d. The use of fabrics evaluated under the point system yields consistent results.

A study to determine the effect of fabric quality on end item quality was performed as a result of the previous study. In this previous study, 36 point carded sateen cloth had resulted in 2 percent of the utility trousers being second quality because of weaving defects. It was felt that if all factors other than the quality of the fabric were held constant then the quality of the fabric could be determined by this approach. One hundred and twenty-five dozen utility trousers were made in a manner identical with that used for the trousers made for the previous study. One percent of these trousers were of second quality because of weaving defects. Also utility trousers were made in the same manner using 9 point carded sateen. One-half of one percent of these trousers were of second quality because of weaving defects. To summarize:

36 point fabric yielded	2%	defective trousers (weaving defect)
18 " " " "	1%	" " " "
9 " " " "	$\frac{1}{2}\%$	" " " "

This study indicated that quality of the end item resulting from weaving defects can be forecast if the point quality of the fabric is known and the cutting procedure for the end item has been evaluated.

IX. Comparison With Old System And Benefits of Point System

Differences between the "major-minor" system and the point system are as follows:

"Major-Minor" System

Each specification lists, under yard-by-yard examination, the defects to be counted in the examination. These defects are as defined in Federal Standard No. 4 and as further modified in the specification. Defects are classified as major or minor depending on their effect on the appearance or serviceability of the fabric.

Each specification lists, separate from yard-by-yard examination, those defects to be counted in the overall examination. Again, the definitions of Fed. Std. No. 4 apply, as modified in the specification.

Point System

Defects as defined in Federal Standard No. 4 are assigned penalty points from one to four, depending on their length. The only modification to the definition of the standards is in that for knots and slubs. The new system has reduced the size of Section 4 by fifty percent.

Overall-type defects as defined in Fed. Std. No. 4 are assigned four penalty points for each yard in which they occur.

"Major-Minor" System

Sample size for yard-by-yard examination is based upon the lot size in yards. The inspection levels are stipulated in the specification, and are derived from MIL-STD-105 (16). Sample size for overall examination is based on the number of pieces selected for yard-by-yard examination. Again, the number of pieces to be selected from a lot is obtained from MIL-STD-105.

Acceptance is based on the number of defects found in the fabric compared to the number permitted by the acceptable quality level stipulated in the specification. Yard-by-yard defects are considered separately from overall defects and each examination has a separate acceptance number.

Point System

Sample sizes for yard-by-yard and overall type defects are the same, and has been established at 750 yards, obviating the necessity of referring to the Standard.

Acceptance is based on the point value of the fabric examined compared to the point level stipulated. Since overall type defects are not considered separately, only one comparison is made.

X. Present Point System Provisions

The provisions of the present point system, which were evolved from Interim Purchase Description S-220-1 (13), are the product of the discussions, tests and evaluations that preceded the adoption of the system. The following are the point system provisions specified in MIL-C-507E, dated 29 April 1966 (17). All woven fabrics are procured over these provisions:

"4.2.2 Examination of the end item.-- Examination of the end item shall be in accordance with the provisions of 4.2.2.1 through 4.2.2.4.

4.2.2.1 Yard-by-yard examination.-- Thirty yards from each piece in the sample shall be examined on the face side. The sample shall consist of 25 pieces taken from 25 containers. All defects as defined in Section I of Fed. Std. No. 4, which are clearly noticeable at normal inspection distance (3 feet), shall be scored and assigned demerit points as listed in 4.2.2.1.1, except that only knots and slubs which exceed the limits shown in figure 1 shall be scored. No folded linear yard shall be penalized more than 4 points. The lot shall be unacceptable if the points per 100 square yards exceed the following values:

28.00 points for dyed fabric.
32.00 points for white fabric.

Point computation shall be as follows:

$$\frac{\text{Total points scored in sample size} \times 3,600}{\text{Contracted width of cloth (inches)} \times 750} = \text{Points per 100 square yards}$$

4.2.2.1.1 Demerit points.- Demerit points shall be assigned as follows:

- For defects 3 inches or less in any dimension - one point
- For defects exceeding 3 inches, but not exceeding 6 inches in any dimension - two points
- For defects exceeding 6 inches, but not exceeding 9 inches in any dimension - three points
- For defects exceeding 9 inches in any dimension - four points

NOTE: The following defects when present, shall be scored four points for each yard in which they occur:

- Baggy, ridgy or wavy cloth.
- Objectionable odor.
- Width less than specified.
- Poor dye penetration, mottles, streaky, or cloudy.
- Excessive neppiness.

4.2.2.2 Examination for length.-

4.2.2.2.1 Individual pieces.- During the yard-by-yard examination, each piece shall be examined for length. Any length found to be less than the minimum specified or more than 2 yards from the length marked on the ticket shall be considered a defect with respect to length. The lot shall be unacceptable if two or more pieces in the sample are defective in respect to length.

4.2.2.2.2 Total yardage in sample.- The lot shall be unacceptable if the total of the actual lengths of pieces in the sample is less than the total of the lengths marked on the tickets.

4.2.2.3 Examination for shade.- During the yard-by-yard examination, each piece shall be examined for shade. Any piece in the sample off shade, shaded side to side, side to center or end to end shall be cause for rejection of the entire lot represented by the sample.

4.2.2.4 Examination for identification of preshrinkage process and compliance with Textile Fiber Products Identification Act.- During the yard-by-yard examination, each piece in the sample shall be examined for these defects. The lot shall be unacceptable if two or more pieces in the sample contain identification of the preshrinkage process by name or trademark on the cloth or ticket, or not labeled or ticketed in accordance with the Textile Fiber Products Identification Act."

XI. Conclusions

The advantages of the point system are many. Some that were previously mentioned are repeated below:

- a. It is a system that is familiar and acceptable to the industry.
- b. It is a simple and easily understood system.
- c. It establishes better understanding and a common terminology between the Government and the industry.
- d. It provides for the examination of all fabrics under the same criteria, instead of using a different set of defects for each fabric.
- e. It is economical both to the industry and the Government; to the industry because the grading of the fabric is similar to their own, hence no special provisions or training of personnel is needed; and to the Government because of its clarity to the industry and the uniform inspection it allows for all fabrics.

From various evidences, it can be concluded that the point system of evaluating the quality of textiles, which has been extended to include synthetics and woolsens, is due to receive wide acceptance.

Thus, garment manufacturers have insisted that their fabric suppliers use the point system developed by the Natick Laboratories for evaluating quality. Blue Bell Manufacturing Company, one of the world's largest garment suppliers, is one such a company that practices this procedure (18).

Foreign countries have shown an interest in the point system for evaluating the quality of textiles. Inquiries as to the means of implementing this standard quality evaluation system have been received from England, Canada, Australia and the Philippines.

Miss Josephine Blandford, the U. S. delegate to the Pan-American Standard Commission, submitted material pertaining to the development, use, and advantage of the point system at the 1965 spring meeting of the Commission. The delegates of the Latin American countries were extremely interested and the Pan-American Standard Commission recommended to all member countries the use of the point system for evaluating the quality of textiles. The point system should thus become the international Standard for evaluation of fabric quality.

XII. Recommendations for Future Work

The pursuit of the potentials of the point system as a means of acceptance which would be used in lieu of a defect classification table, together with an acceptable quality level is a recommended area of future work. A group has been organized at Natick Labs to study the possibility of applying such a system to all Military clothing procurements.

After considerable study by this group, it was concluded that adoption of the point system for clothing will result in savings of a much greater magnitude than were achieved for textile fabrics. Further, in the clothing industry today, there is no meaningful standard by which garment quality can be described. The point system has the potential of becoming a universally accepted means of defining quality of clothing items and to fulfill the need of a standard within the industry.

The initial step in this study was the evaluation of massive quantities of inspection data generated from past procurements. Military clothing procurements are made over specifications which incorporate three classes of defects - major, minor A, and minor B. Acceptable quality levels were established in the specifications for the various combinations of these defects. Sample sizes depended on lot sizes.

For this study, members of this study group have translated the major-minor defects to point values by assigning to the garment defects listed on the inspection reports, the following point values: One point for all defects listed as minor B; two points for all defects listed as minor A; and three or four points, depending upon their severity, for all defects listed as major.

After this translation from the major-minor system to the point system, a proposal with the following provisions was developed and furnished to all Military Services for review and comment:

1. Quality assurance provisions shall be changed for Military clothing specifications to a point system basis for defining and determining the quality for garments required by the Military.

2. Penalty points shall be assigned to the present classification of defects in the manner previously stated.
3. All fabric defects shall be incorporated in a glossary of defects for generic groups of item (e.g., a standard, listing all defects for trousers has been proposed for preparation and will be referenced in all trouser specifications instead of incorporating an individual classification of defects in each specification).
4. Point values shall be expressed in clothing specifications as points per 100 garments.
5. Standard sample sizes shall be established regardless of lot size. The point system shall change only the method of determining quality, not the quality itself.

The following advantages are expected to be derived from the adoption of this new system:

1. The elimination of all pages of defects and the use of a referenced "standard" instead.
2. Greater familiarity with defects and with the point values for each group of garments.
3. A meaningful manner of expressing desired quality (i.e., a 50 point trouser).
4. A fairer and more realistic weighing of defects since four categories of severity would replace the current three categories.
5. A simpler and more readily understood system.
6. Like items would be examined under same criteria.
7. Standardization of sample size.
8. Achievement of better understanding between industry and the Government.

XII REFERENCES

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15. L. A. Seder, Analysis of New Acceptance System For Clothing Items, Aug 1963, Cont #01-792-64/MR
16. Military Standard MIL-STD-105D, Sampling Procedures and Tables for Inspection by Attributes, April 1965
17. Military Specification MIL-C-507E, Cloth, Cotton, Poplin, April 1966

APPENDIX A

List of Industry Representatives on the IAC on Carded Yarn Fabrics

Mr. J. D. Chandler	- Arista Mills Company
Mr. K. Chase	- Berkshire-Hathaway
Mr. C. Rich	- Calloway Mills, Incorporated
Mr. L. Malone	- Leslie Catlin & Company
Mr. G. Smith	- Cone Mills, Incorporated
Mr. W. Clements	- Dan River Mills
Mr. A. Morris	- Galey & Lord
Mr. S. Van Vliet	- Greenwood Mills
Mr. J. Holland	- Pepperell Manufacturing
Mr. R. S. Densberger	- Reeves Brothers, Incorporated
Mr. D. Kern	- Reigel Textile Corporation
Mr. N. Primrose	- Spring Mills, Incorporated
Mr. G. Dunn	- J. P. Stevens & Company, Incorporated
Mr. E. Seigler Jr.	- Woodward Baldwin & Company
Mr. J. W. Duskin	- Wellington Sears Company, Incorporated

APPENDIX B

List of Quality Control Representatives of the Textile Industry Who Participated in Trial Inspection at 350 Hudson Street, N.Y., N.Y.

Cone Brothers
Mr. G. Smith

Berkshire Hathaway
Mr. Krol

The Graniteville Company
Mr. Lowe

Spring Mills
Mr. Bromme

Dan River Company
Mr. Ragland

Riegel Brothers
Mr. Woods

J. P. Stevens Company
Mr. Gray

Pepperell Mfg Company
Mr. Holland

Greenwood Mills
Mr. Van Vliet

Woodward Baldwin Company
Mr. Seigler

Reeves Brothers
Mr. Densberger

Wellington Sears Company
Mr. Bealieu

Galey & Lord
Mr. Morris

APPENDIX C

Mathematical Derivation of O. C. Curve (Figure No. 1)

The O.C. Curve presented in Figure 1 was derived by using the following formula for the standard deviation:

$$np = \sqrt{n \cdot (W_1^2 P_1 + W_2^2 P_2 + W_3^2 P_3 + W_4^2 P_4)}$$

where:

np = standard deviation of distribution

n = sample size in yards

W_1, W_2, W_3, W_4 = weight value of defect

P_1, P_2, P_3, P_4 = fraction defective in distribution

once the standard deviation is derived the probability of acceptance (P_A) can be determined by calculating Z and then finding area under a normal curve at point Z :

$$\frac{\bar{X} - \bar{X}_1}{np}$$

where:

Z = the number of standard deviations from the mean

$\bar{X}$ = the mean - the acceptance value of a 750 linear yard sample; $30 (7.5) \frac{40}{36} = 250$

$\bar{X}_1$ = any value; for example to determine the P_A of a 24 point lot, $\bar{X}_1 = 24 (7.5) \frac{40}{36} = 200$

np = the standard deviation of the distribution

APPENDIX D

FABRIC EXAMINATION RESULTS

1. Cloth, Cotton, Wind Resistant Sateen, 9 ounce, OG-107
2. Cloth, Cotton, Sateen, Carded, 8.8 ounce, OG-107
3. Cloth, Cotton, Uniform Twill, 6 ounce, Tan 46
4. Cloth, Cotton, Poplin, 4 ounce, Tan 46
5. Cloth, Cotton, Chambray, 3 ounce, Tan 130

1. Cloth Cotton, Wind Resistant Sateen, 9 ounce, OG-107

Specification: MIL-C-557D

Width: 45 inches

Garment: Coat, Man's, Field, OG-107

Total Yards: 3508 1/4

Total Points: 352

Point Value: 8.03 points/100 square yards

GROUP I

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
1	Broken yarn	12				12
1A	Broken yarn	1				1
2	Slub	6				6
3	Hole	2				2
4	Crease				4	16
5	Coarse yarn			1		3
6	Shaded filling				3	12
7	Fine yarn				1	4
8	Coarse yarn				1	4
8A	Coarse yarn				15	60
9	Stain	2				2
10A	Streak				2	8
11	Jerk-in	1				1
12	Slub		2			4
13	Broken yarn		2			4
14	Broken yarn				2	8
15	Coarse yarn	3				3
15A	Coarse yarn	3				3
		30	4	1	28	153

Total Yards: 1166
Total Points: 153
Point Value: 10.50

GROUP II

Defect No.	Defect	Point Value				Total Points Scored
		1	2	3	4	
1	Jerk-in	3				3
2	Slub	4				4
3	Stain		1			2
4	Embedded crease				1	4
5	Droken yarn	4				4
6	Broken yarn		2			4
7	Stain	5				5
8	Loose yarn	3				3
9	Thick place				2	8
10	Jerk-in		1			2
11	Knot	4				4
12	Coarse yarn			1		3
13	Coarse yarn		2			4
14	Float	1				1
15	Jerk-in				1	4
16	Skips		2			2
17	Shade bar				2	8
17A	Shade bar				1	4
		24	7	1	7	69

Total Yards: 1166 3/4
 Total Points: 69
 Point Value: 4.73

GROUP III

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
1	Broken yarn	10				10
2	Hard crease			2		6
3	Heavy place				2	8
3A	Heavy place				1	4
4	Slub	7 <u>1/</u>				6 <u>1/</u>
4A	Slub	1				1
5A	Coarse yarn				2	8
6	Stain	5 <u>1/</u>				4 <u>1/</u>
7	Stain		2			4
8A	Skip			1		3
9	Broken yarn				10	40
9A	Broken yarn				2	8
10	Hard crease				2	8
11	Coarse yarn	1				1
12	Coarse yarn			1		3
13	Jerk-in				1	4
14	Broken yarn		3 <u>1/</u>			4 <u>1/</u>
15	Jerk-in	1				1
16A	Streak				1	4
17A	Streak			1		3
		25 <u>2/</u>	5 <u>3/</u>	5	21	130

1/ Defect masked, but not counted.
2/ Two 1 pointers not counted.
3/ One 2 pointer not counted.

Total Yards: 1175 1/2
 Total Points: 130
 Point Value: 8.85

2. Cloth, Cotton, Sateen, Carded, 8.8 ounce, OG-107

Specification: MIL-C-10296D

Width: 36 inches

Garment: Shirt, Man's, Utility, OG-107

Total Yards: 3199 1/2

Total Points: 1021

Point Value: 31.91 points/100 square yards

GROUP I

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
1	Slub	77 <u>1/</u>				74 <u>1/</u>
1A	Slub	5				5
2	Stain	3				3
3	Coarse yarn	3				3
3A	Coarse yarn	7				7
4	Knot	7 <u>1/</u>				6 <u>1/</u>
5	Coarse yarn				4	16
5A	Coarse yarn				18	72
6A	Mispick				7	28
7A	Skip				4	16
8A	Skip		1			2
9	Kink	1				1
10A	Thin yarn				2	8
11	Coarse yarn		1			2
11A	Coarse yarn		2			4
12	Broken yarn	28 <u>1/</u>				27 <u>1/</u>
12A	Broken yarn	11				11
13	Jerk-in	17 <u>1/</u>				15 <u>1/</u>
14	Crease				1	4
15	Coarse yarn			1		3
16	Slub				1	4

GROUP I (cont'd)

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
17	Broken yarn		1			2
18	Slub		2			4
19	Broken yarn				3 <u>1/</u>	8 <u>1/</u>
19A	Broken yarn				4	16
20	Jerk-in		3			6
21	Jerk-in			3 <u>1/</u>		6 <u>1/</u>
22	Jerk-in				3	12
22A	Jerk-in				6 <u>1/</u>	20 <u>1/</u>
		159 <u>2/</u>	10	4 <u>3/</u>	53 <u>4/</u>	385

1/ Defect masked, but not counted.
2/ Seven 1 pointers not counted.
3/ One 3 pointer not counted.
4/ Two 4 pointers not counted.

Total Yards: 1065
 Total Points: 385
 Point Value: 36.15

GROUP II

Defect No.	Defect	1	Point Value			Total Points Scored
			2	3	4	
1	Jerk-in			1		3
2	Broke yarn	34				34
3	Loose yarn	14				14
4	Slub	21				21
5	Jerk-in	28				28
6	Coarse yarn				7	28
6A	Coarse yarn				22	88
7	Jerk-in				5	20
8	Fine tight pick				5	20
9	Skips	1				1
10	Knot	6				6
11	Tear	1				1
12	Thin place				1	4
13	Slubby fill				1 <u>1</u> /	0 <u>1</u> /
14	Broken yarn				1	4
14A	Broken yarn				2	8
15	Coarse yarn			1		3
16	Broken yarn			3		9
17	Slough-off	4				4
18	Slough-off		2			4
19	Kinks	2				2
20	Kinks		1			2
		111	3	5	44 <u>2</u> /	304

1/ Defect masked, but not counted.

2/ One 4 pointer not counted.

Total Yards: 1068

Total Points: 304

Point Value: 28.46

GROUP III

Defect No.	Defect	1	Point Value		4	Total Points Scored
			2	3		
1	Coarse yarn		2 <u>2</u> /			2 <u>1</u> /
1A	Coarse yarn		1			2
2	Coarse yarn				14	56
2A	Coarse yarn				26	104
3	Jerk-in			1 <u>1</u> /		0 <u>1</u> /
3A	Jerk-in			1		3
4	Coarse yarn			5		15
4A	Coarse yarn			3 <u>1</u> /		6 <u>1</u> /
5	Broken yarn				13	52
5A	Broken yarn				4	16
6	Slub	16 <u>1</u> /				15 <u>1</u> /
7	Slub		1			2
8	Broken yarn	23 <u>1</u> /				22 <u>1</u> /
9	Broken yarn		3			6
10	Thin yarn				1 <u>1</u> /	0 <u>1</u> /
10A	Thin yarn				1	4
11A	Coarse yarn	2				2
12	Knot	3				3
13	Hole	1				1
14A	Thin place				1	4
15	Jerk-in				1	4
16	Jerk-in		1			2

GROUP III (cont'd)

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
17	Skip	1				1
18	Thin yarn		1			2
19	Kink	2				2
20	Abrasion	1				1
21	Stain	1				1
22	Hard crease				1	4
		50 <u>2/</u>	9 <u>3/</u>	10 <u>4/</u>	62 <u>5/</u>	332

- 1/ Defect masked, but not counted.
2/ Two 1 pointers not counted.
3/ One 2 pointer not counted.
4/ Two 3 pointer not counted.
5/ One 4 pointer not counted.

Total Yards: 1066 1/2
Total Points: 332
Point Value: 31.13

3. Cloth, Cotton, Uniform Twill, 6 ounce, Tan 505

Specification: MIL-C-26959A

Width: 44 inches

Garment: Trousers, Men's, Summer, AF, Tan 505

Total Yards: 4,726

Total Points: 829

Point Value: 14.35 points/100 square yards

GROUP I

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
1	Slub	29				29
1A	Slub	25				25
2	Knot	18				18
3A	Slub		2 1/			2 1/
4	Broken yarn	18 1/				17 1/
5	Jerk-in	3				3
6	Mispick				1	4
7	Coarse yarn				7 1/	24 1/
7A	Coarse yarn				1	4
8	Broken yarn				8	32
9	Float	1				1
10	Broken yarn		3			6
11	Stain	24				24
12	Thick place	4				4
13	Coarse yarn	5				5
14	Hole				13 1/	36 1/
15	Torn selvage	4				4
16	Speck	2				2
17	Jerk-in		1			2
18	Streak				1	4
		133 2/	6 3/		31 4/	246

1/ Defect masked, but not counted.
 2/ One 1 pointer not counted.
 3/ One 2 pointer not counted.
 4/ Five 4 pointers not counted.

Total Yards: 1502
 Total Points: 246
 Point Value: 13.40

GROUP II

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
1A	Coarse yarn				25	100
2A	Streak		2			4
3	Slub	26				26
3A	Slub	30				30
4	Spot, stain	57				57
4A	Spot, stain	3				3
5A	Jerk-in				5	20
6	Hitchback	2				2
6A	Hitchback	1				1
7A	Skips				1	4
8	Jerk-in			1		3
8A	Jerk-in			2		6
9	Knot	17				17
10A	Thin place				2	8
11	Broken yarn				6	24
12	Hitchback		1			2
13	Slub		1			2
14	Kink	7				7
15	Hole	14				14
16	Jerk-in	3				3
17	Broken yarn		2			4
18	Coarse yarn			1		3

GROUP II (cont'd)

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
18A	Coarse yarn			1		3
19	Streak		3			6
20	Broken yarn	2				2
		162	9	5	39	351

Total Yards: 1615
Total Points: 351
Point Value: 17.78

GROUP III

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
1	Coarse yarn				1	4
1A	Coarse yarn				11	44
2	Spot or stain	24 <u>1/</u>				23 <u>1/</u>
2A	Spot or stain	3				3
3	Broken yarn	10 <u>1/</u>				9 <u>1/</u>
4	Slub	40 <u>1/</u>				39 <u>1/</u>
4A	Slub	6				6
5	Spot or stain		1			2
5A	Spot or stain		1			2
6	Knot	16				16
7	Coarse yarn			1		3
7A	Coarse yarn			2		6
8	Hard crease		1			2

GROUP III (cont'd)

Defect No.	Defect	Point Value				Total Points Scored
		1	2	3	4	
9	Hard crease				6 <u>1/</u>	20 <u>1/</u>
10A	Tight end				3	12
11	Broken yarn				4	16
11A	Broken yarn				1	4
12	Slubby filling				1	4
13A	Thin place	1				1
14	Broken yarn		6			12
15	Kink	1				1
16	Coarse yarn		1			2
17	Cut	1				1
		102 <u>2/</u>	10	3	27 <u>3/</u>	232

- 1/ Defect masked, but not counted.
2/ Three 1 pointers not counted.
3/ One 4 pointer not counted.

Total Yards: 1609
Total Points: 232
Point Value: 11.80

4. Cloth, Cotton, Poplin, 4 ounce, Tan 46

Specification: MIL-C-507C

Width: 42 inches

Garment: Shirt, Man's, Cotton, Poplin, Tan 46

Total Yards: 4,768

Total Points: 679

Point Value: 12.21 points/100 square yards

GROUP I

Defect No.	Defect	1	<u>Point Value</u>			Total Points Scored
			2	3	4	
1	Slub	9				9
1A	Slub	37				37
2	Coarse yarn				6 $\frac{1}{2}$	20 $\frac{1}{2}$
2A	Coarse yarn				1	4
3	Broken yarn	24 $\frac{1}{2}$				4
3A	Broken yarn	4				4
4	Jerk-in	9				9
5	Stain	12 $\frac{1}{2}$				11 $\frac{1}{2}$
6	Knot	21				21
7	Coarse yarn		2			4
7A	Coarse yarn		3			6
8	Hole	5				5
9	Kink	2				2
10	Float	8				8
11	Coarse yarn			1		3
11A	Coarse yarn			1		3
12	Embedded waste	3 $\frac{1}{2}$				2 $\frac{1}{2}$
13	Jerk-in				1	4
14	Skip		1			2
15	Skip	1				1

GROUP I (cont'd)

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
15A	Skip	4 1/				2 1/
16A	Coarse yarn	5				5
17	Wrong draw				2	8
17A	Wrong draw				4	16
18	Jerk-in		1			2
19A	Skip				12	48
20A	Hitchback	4				4
21	Wrong draw	2				2
22A	Broken yarn				1	4
		150 2/	7	2	27 3/	268

- 1/ Defect masked, but not counted.
 2/ Six 1 pointers not counted.
 3/ One 4 pointer not counted.

Total Yards: 1591
 Total Points: 268
 Point Value: 14.44

GROUP II

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
1	Broken yarn	36 <u>1/</u>				33 <u>1/</u>
2	Knot	13				13
3	Hitchback				1	4
4A	Coarse yarn				7 <u>1/</u>	24 <u>1/</u>
5	Stain	27				27
6	Hitchback	2				2
6A	Hitchback	1				1
7	Jerk-in	3				3
7A	Jerk-in	2				2
8	Slub	15				15
9	Stain				1	4
10	Stain		3 <u>1/</u>			4 <u>1/</u>
11	Kink	4				4
12	Coarse yarn	1				1
12A	Coarse yarn	21				21
13	Smash				1	4
14	Float	9				9
15	Coarse yarn			1		3
15A	Coarse yarn			1		3

GROUP II (cont'd)

Defect No.	Defect	1	<u>Point Value</u>			Total Points Scored
			2	3	4	
16	Broken yarn		1			2
16A	Broken yarn		1			2
17	Colored fly	2				2
18A	Coarse yarn		1			2
19A	Tight end				1	4
20	Soiled pick				2	8
		136 <u>2/</u>	6 <u>3/</u>	2	13 <u>4/</u>	197

- 1/ Defect masked, but not counted.
2/ Three 1 point defects not counted.
3/ One 2 pointer not counted.

Total Yards: 1596
 Total Points: 197
 Point Value: 10.58

GROUP III

Defect No.	Defect	1	<u>Point Value</u>			Total Points Scored
			2	3	4	
1	Hitchback			1		3
2	Slub	23				23
2A	Slub	6				6
3	Hitchback	3				3
3A	Hitchback	1				1
4	Stain	33 <u>1/</u>				30 <u>1/</u>
5	Hitchback				1	4
6	Knot	7				7
7	Coarse yarn				2	8

GROUP III (cont'd)

Defect No.	Defect	1	<u>Point Value</u>			Total Points Scored
			2	3	4	
7A	Coarse yarn				5	20
8	Broken yarn	30				30
9A	Coarse yarn			3		9
10	Kink	5				5
11	Skip	5				5
11A	Skip	1				1
12	Coarse yarn	5				5
12A	Coarse yarn	4				4
13A	Skip				6	24
14	Stain		2			4
15	Hole	1				1
16	Jerk-in	3				3
16A	Jerk-in	2				2
17	Float	8 <u>1/</u>				7 <u>1/</u>
18	Skip			2		6
19	Kinky yarn		1			2
20	Colored fly	1				1
		138 <u>2/</u>	3	6	14	214

1/ Defect masked, but not counted.

2/ Four 1 pointers not counted.

Total Yard: 1581

Total Points: 214

Point Value: 11.60

5. Cloth, Cotton, Chambray, 3 ounce, Tan 130

Specification: CCC-G-231

Width: 36 inches

Garment: Shirtwaist, Woman's, Chambray, Tan 130

Total Yards: 3841

Total Points: 921

Point Value: 23.98 points/100 square yards

GROUP 1

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
1	Coarse yarn				5	20
1A	Coarse yarn				10	40
2	Hard crease				1	4
3A	Hitchback		2			4
4	Slubby filling				5	20
5	Slub	33 <u>1/</u>				31 <u>1/</u>
6	Coarse yarn			2		6
6A	Coarse yarn			2		6
7	Broken yarn	15 <u>1/</u>				14 <u>1/</u>
8	Thin place				6	24
9	Jerk-in		1			
10	Knot	3				3
11	Stain	5				5
12	Hole	1				1
13	Coarse yarn		2			4
14	Kink	1 <u>1/</u>				0 <u>1/</u>
15	Jerk-in	12 <u>1/</u>				9 <u>1/</u>
16A	Mispick				4	16
17	Hitchback	10				10
18	Skip			1 <u>1/</u>		0 <u>1/</u>
19	Broken yarn				9	36
20	Wrong draw				4	16

GROUP I (cont'd)

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
21	Shade bar				3	12
22	Colored yarn	1				1
23	Slubby filling			1		3
24	Broken yarn		2			4
25	Tear	1				1
		82 <u>2/</u>	7	6 <u>3/</u>	47	292

1/ Defect masked, but not counted
2/ Seven 1 pointers not counted.
3/ One 3 pointer not counted.

Total Yards: 1170
Total Points: 292
Point Value: 24.96

GROUP II

Defect No.	Defect	1	<u>Point Value</u>		4	Total Points Scored
			2	3		
1	Stain	15				15
2A	Stain		1			2
3	Knot	4				4
4	Slub	39 <u>1/</u>				37 <u>1/</u>
5	Coarse yarn			2		6
6	Thin place		3			6
7	Coarse yarn				24 <u>1/</u>	80 <u>1/</u>
8	Thin place				8	32
9	Broken yarn	4 <u>1/</u>				3 <u>1/</u>
10	Hitchback	11				11
11	Broken yarn				25	100

GROUP II (cont'd)

Defect No.	Defect	<u>Point Value</u>				Total Points Scored
		1	2	3	4	
12	Weak place	13 <u>1/</u>				8 <u>1/</u>
13	Hitchback		3 <u>1/</u>			4 <u>1/</u>
14	Weak place		3			6
15	Weak place				1	4
16	Weak place			1 <u>1/</u>		0 <u>1/</u>
17	Kink	5				5
18	Jerk-in	15				15
19	Additional yarn		1			2
20	Hole	7 <u>1/</u>				6 <u>1/</u>
21	Coarse yarn	2 <u>1/</u>				1 <u>1/</u>
22	Colored yarn	4				4
23	Pick out				1	4
24	Jerk-in		2			4
25	Broken yarn		3			6
26	Coarse yarn		1			2
27	Pick out					
		120 <u>2/</u>	17 <u>3/</u>	3 <u>4/</u>	59 <u>5/</u>	368

- 1/ Defect masked, but not counted.
2/ Ten 1 pointers not counted.
3/ One 2 pointer not counted.
4/ One 3 pointer not counted.
5/ Four 4 pointers not counted.

Total Yards: 1304
Total Points: 368
Point Value: 28.22

GROUP III

Defect No.	Defect	1	<u>Point Value</u>			Total Points Scored
			2	3	4	
1	Knot	6				6
2	Jerk-in	10				10
3	Hitchback	7				7
3A	Hitchback	4				4
4	Stain	8				8
5	Coarse yarn				25	100
5A	Coarse yarn				1	4
6	Slub		1			2
7	Slub	21 <u>1/</u>				18 <u>1/</u>
8	Coarse yarn			1		3
9	Weak place	6				6
10	Broken yarn				9 <u>1/</u>	32 <u>1/</u>
11	Stain				1	4
12	Hole	5				5
13	Shade bar				7	28
14	Broken yarn	5				5
15	Jerk-in			1		3
16	Jerk-in				1	4
17	Broken yarn			4		12
		72 <u>2/</u>	1	6	44 <u>3/</u>	261

1/ Defects masked, but not counted.
2/ Three 1 pointers not counted.
3/ One 4 pointer not counted.

Total Yards: 1367
Total Points: 261
Point Value: 19.09

APPENDIX E

End Item Examination Results

1. Coat, Man's, Field, OG-107
2. Shirt, Man's, Utility, OG-107
3. Trousers, Men's, Summer, AF, Tan 505
4. Shirt, Man's, Cotton, Poplin, Tan 46
5. Shirtwaist, Woman's, Chambray, Tan 130

1. Coat, Man's, Field, OG-107

Specification:

MIL-C-11448C

Fabric:

Cloth, Cotton, Wind Resistant Sateen

Number of Garments Cut:

1260

Fabric Point Value:

8.03 points/100 square yards

Percent Imperfect:

1.98%

INFORMATION SHEET

END ITEM: Coat, Man's, Field, OG-107

NUMBER OF GARMENTS CUT: 420

TOTAL YARDS: 1166

GROUP NUMBER: I

Defect No.	Defect Name	No. of Defects	No. of Points	Garments Appeared in	Imperfect Garments
11	Jerk-in	1	1	1	
13	Broken yarn	2	4	1	
1A	Broken yarn	1	1	2	
4	Hard crease	4	16	4	
8A	Coarse yarn	15	60	14	
2	Slub	6	6	4	
8	Coarse yarn	1	4	5	
1	Broken yarn	12	12	10	7
15A	Coarse yarn	3	3	1	
7	Fine yarn	1	4	2	1
5	Coarse yarn	1	3	1	
12	Slub	2	4	2	1
10A	Streak	2	8	3	
6	Shade bar	3	12	6	3
14	Broken yarn	2	8	3	1
15	Coarse yarn	3	3	2	

59 garments w/tape
51 garments appeared in
13 imperfect

INFORMATION SHEET

END ITEM: Coat, Man's, Field, OG-107

NUMBER OF GARMENTS CUT: 420

TOTAL YARDS: 1166 3/4

GROUP NUMBER: II

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
13	Coarse yarn	2	4	2	1
6	Broken yarn	2	4	2	
5	Broken yarn	4	4	2	
15	Jerk-in	1	4	2	
17	Shade bar	2	8	5	
2	Slub	4	4	2	1
17A	Shade bar	1	4	3	
9	Thick place	2	8	3	2
10	Jerk-in	1	2	1	
15	Jerk-in	1	4	1	
12	Coarse yarn	1	3	1	
4	Crease	1	4	2	
11	Knot	4	4	1	

26 garments w/tape

27 garments appeared in

4 imperfect

INFORMATION SHEET

END ITEM: Coat, Man's, Field, OG-107

NUMBER OF GARMENTS CUT: 420

TOTAL YARDS: 1175 1/2

GROUP NUMBER: III

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
5A	Coarse yarn	2	8	6	
1	Broken yarn	10	10	9	4
9	Broken yarn	10	40	18	2
9A	Broken yarn	2	8	5	
6	Stain	5 <u>1/</u>	4	3	
3	Heavy place	2	8	4	
10	Hard crease	2	8	5	
2	Hard crease	2	6	1	
17A	Streak	1	3	1	
3A	Heavy place	1	4	2	
14	Broken yarn	3 <u>2/</u>	4	3	
15	Jerk-in	1	1	1	
13	Jerk-in	1	4	1	
7	Stain	2	4	3	
4A	Slub	1	1	1	
16A	Streak	1	4	1	
4	Slub	7 <u>3/</u>	6	1	1
8A	Skip	1	3	1	1
12	Coarse yarn	1	3	1	

1/ A one-point stain masked, but not counted.

2/ A two-point broken yarn, masked, but not counted.

3/ A one-point slub, masked, but not counted.

57 garments w/tape

67 garments appeared in

8 imperfect

2. Shirt, Man's, Utility, OG-107

Specification:

MIL-S-3001D

Fabric:

Cloth, Cotton, Sateen, Carded, OG-107

Number of garments cut:

1320

Fabric point value:

31.91 points/100 square yards

Percent imperfect:

1.29%

INFORMATION SHEET

END ITEM: Skirt, Man's, Utility, OG-107

NUMBER OF GARMENTS CUT: 440

TOTAL YARDS: 1065

GROUP NUMBER: I

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
12	Broken yarn	28 <u>1</u> /	27	12	1
5A	Coarse yarn	18	72	18	
1	Slub	77 <u>2</u> /	74	43	3
1A	Slub	5	5	2	
19	Broken yarn	3 <u>3</u> /	8	1	
21	Jerk-in	3 <u>4</u> /	6	2	
14	Crease	1	4	1	
3A	Coarse yarn	7	7	4	
6A	Mispick	7	28	13	
3	Coarse yarn	3	3	2	
19A	Broken yarn	4	16	5	
20	Jerk-in	3	6	2	
7A	Skip	4	16	5	
22	Jerk-in	3	12	2	
13	Jerk-in	17 <u>5</u> /	15	6	
5	Coarse yarn	4	16	5	
11	Coarse yarn	1	2	1	
11A	Coarse yarn	2	4	2	
12A	Broken yarn	11	11	5	

INFORMATION SHEET

END ITEM: Shirt, Man's, Utility, OG-107

NUMBER OF GARMENTS CUT: 440

TOTAL YARDS: 1065

GROUP NUMBER I

PAGE 2 of 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
17	Broken yarn	1	2	1	
8A	Skip	1	2	1	
22A	Jerk-in	6 <u>6</u> /	20	4	
2	Stain	3	3	1	
4	Knot	7 <u>7</u> /	6	5	1
16	Slub	1	4	1	
10A	Thin place	2	8	3	
15	Coarse yarn	1	3	1	
18	Slub	2	4	2	

132 garments w/tape
150 garments appeared in
6 imperfect

- 1/ One 1-point broken yarn masked, but not counted.
- 2/ Three 1-point slubs masked, but not counted.
- 3/ One 4-point broken yarn masked, but not counted.
- 4/ One 3-point jerk-in masked, but not counted.
- 5/ Two 1-point jerk-in masked, but not counted.
- 6/ One 4-point jerk-in masked, but not counted.
- 7/ One 1-point knot masked, but not counted.

INFORMATION SHEET

END ITEM: Shirt, Man's, Utility, OG-107

NUMBER OF GARMENTS CUT: 440

TOTAL YARDS: 1068

GROUP NUMBER: II

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
6A	Coarse yarn	22	88	25	
3	Loose yarns	14	14	6	1
8	Tight pick	5	20	4	
18	Slough-off	2	4	1	
7	Jerk-in	5	20	4	
6	Coarse yarn	7	28	9	
2	Broken yarn	34	34	9	
10	Knot	6	6	3	
14A	Broken yarn	2	8	3	
4	Slub	21	21	8	3
5	Jerk-in	28	28	1	
12	Thin place	1	4	2	
15	Coarse yarn	1	3	1	
16	Broken yarn	3	9	1	
14	Broken yarn	1	4	2	2
1	Jerk-in filling	1	3	2	

79 garments w/tape
81 garments appeared in
6 imperfect

INFORMATION SHEET

END ITEM: Shirt, Man's, Utility, OG-107

NUMBER OF GARMENTS CUT: 440

TOTAL YARDS: 1066 1/2

GROUP NUMBER: III

PAGE 1 of 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
2	Coarse yarn	14	56	15	2
19	Kink	2	2	1	
3	Jerk-in	1 <u>1</u> /	0	2	
2A	Coarse yarn	26	104	26	
11A	Coarse yarn	2	2	4	
16	Jerk-in	1	2	1	
5A	Broken yarn	4	16	6	
5	Broken yarn	13	52	15	1
22	Hard crease	1	4	4	
8	Broken yarn	23 <u>2</u> /	22	9	2
6	Slub	16 <u>3</u> /	15	5	
4	Coarse yarn	5	15	4	
1A	Coarse yarn	1	2	1	
10A	Thin yarn	1	4	2	
15	Jerk-in	1	4	1	
18	Thin yarn	1	2	1	
4A	Coarse yarn	3 <u>4</u> /	6	1	

INFORMATION SHEET

END ITEM: Shirt, Man's, Utility, OG-107

NUMBER OF GARMENTS CUT: 440

TOTAL YARDS: 1066 1/2

GROUP NUMBER: III

PAGE 2 of 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
------------	-------------	----------------	---------------	----------------------------	-----------------------

12	Knot	3	3	2	
1	Coarse yarn	2 5/	2	1	
3A	Jerk-in	1	3	1	
13	Hole	1	1	1	
21	Stain	1	1	1	
7	Slub	1	2	1	
14A	Thin place	1	4	2	

103 garments w/tape
107 garments appeared in
5 imperfect

- 1/ One 3-point jerk-in masked, but not counted.
- 2/ One 1-point broken yarn masked, but not counted.
- 3/ One 1-point slub masked, but not counted.
- 4/ One 3-point coarse yarn masked, but not counted.
- 5/ One 2-point coarse yarn masked, but not counted.

3. Trousers, Men's, Summer, AF, Tan 505

Specification:	MIL-T-4955B
Fabric:	Cloth, Cotton, Uniform Twill, 6 oz. Tan 505
Number of garments cut:	2356
Fabric point value:	14.35 points/100 square yards
Percent imperfect:	1.53%

INFORMATION SHEET

END ITEM: Trousers, Men's, Summer, AF

NUMBER OF GARMENTS CUT: 775

TOTAL YARDS: 1502

GROUP NUMBER: I

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
8	Broken yarn	8	32	17	11
7A	Coarse yarn	1	4	3	
4	Broken yarn	18 <u>1/</u>	17	11	1
1	Slub	29	29	15	
14	Hole	13 <u>2/</u>	36	3	1
13	Coarse yarn	5	5	4	
2	Knot	18	18	12	
7	Coarse yarn	7 <u>3/</u>	24	7	
10	Broken yarn	3	6	1	1
1A	Slub	25	25	16	
11	Stain	24	24	8	
12	Thick place	4	4	3	
15	Torn selvage	4	4	1	
6	Mispick	1	4	3	
9	Float	1	1	1	
17	Jerk-in	1	2	1	
3A	Slub	2 <u>4/</u>	2	2	

101 garments w/tape
108 garments appeared in
16 imperfect

- 1/ One 1-point broken yarn masked, but not counted.
- 2/ Four 4-point holes masked, but not counted.
- 3/ One 4-point coarse yarn masked, but not counted.
- 4/ One 2-point slub masked, but not counted.

INFORMATION SHEET

END ITEM: Trousers, Men's, Summer, AF

NUMBER OF GARMENTS CUT: 775

TOTAL YARDS: 1615

GROUP NUMBER: II

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
4	Spot, stain	57	57	27	
11	Broken yarn	6	24	11	9
1A	Coarse yarn	25	100	27	
9	Knot	17	17	12	
14	Kink	7	7	5	1
3	Slub	26	26	13	2
6	Hitchback	2	2	1	
5A	Jerked-in fill	5	20	4	
8A	Jerked-in fill	2	6	2	
19	Streak	3	6	4	
2A	Streak	2	4	2	
3A	Slub	30	30	13	
17	Broken yarn	2	4	2	1
18A	Coarse yarn	1	3	1	
16	Jerked-in fill	3	3	1	
10A	Thin place	2	8	1	
18	Coarse yarn	1	3	1	
12	Hitchback	1	2	1	1
8	Jerked-in fill	1	3	1	1
20	Broken yarn	2	2	1	

125 garments w/tape
130 garments appeared in
15 imperfect

INFORMATION SHEET

END ITEM: Trousers, Men's, Summer, AF

NUMBER OF GARMENTS CUT: 806

TOTAL YARDS: 1609

GROUP NUMBER: III

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
12	Slubby filling	1	4	1	
11	Broken yarn	4	16	10	3
1A	Coarse yarn	11	44	10	
14	Broken yarn	6	12	6	2
9	Hard crease	6 <u>1</u> /	20	6	
3	Broken yarn	10 <u>2</u> /	9	4	
4	Slub	40 <u>3</u> /	39	12	
11A	Broken yarn	1	4	3	
2	Spot or stain	24 <u>4</u> /	23	13	
4A	Slub	6	6	3	
1	Coarse yarn	1	4	1	
6	Knot	16	16	6	
7A	Coarse yarn	2	6	2	
10A	Tight end	3	12	2	
13A	Thin place	1	1	1	
2A	Spot or stain	3	3	1	
5A	Spot or stain	1	2	1	

76 garments w/tape
82 garments appeared in
5 imperfect

- 1/ One 4-point hard crease masked, but not counted.
- 2/ One 1-point broken yarn masked, but not counted.
- 3/ One 1-point slub masked, but not counted.
- 4/ One 1-point spot or stain masked, but not counted.

4. Shirt, Man's, Cotton, Poplin, Tan 46

Specification:	MIL-S-14025B
Fabric:	Cloth, Cotton, Poplin, Tan 46
Number of garments cut:	3024
Fabric point value:	12.21 points/100 square yards
Percent imperfect:	1.36%

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1591

GROUP NUMBER: I

PAGE 1 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
17A	Wrong draw	4	16	2	
19A	Skip	12	48	7	
7	Coarse yarn	2	4	2	1
4	Jerk-in	9	9	2	
5	Stain	12 <u>1/</u>	11	5	1
20A	Hitchback	4	4	3	
6	Knot	21	21	7	
1A	Slub	37	37	18	1
16A	Coarse yarn	5	5	3	1
3	Broken yarn	24 <u>2/</u>	22	4	2
11	Coarse yarn	1	3	2	
14	Skip	1	2	1	
7A	Coarse yarn	3	6	2	
13	Jerk-in	1	4	1	1
2A	Coarse yarn	1	4	5	1
11A	Coarse yarn	1	3	1	
8	Hole	5	5	3	1

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1591

GROUP NUMBER: 1

PAGE 2 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
12	Embedded waste	3 <u>3/</u>	2	1	
21	Wrong draw	2	2	1	
15A	Skip	4 <u>4/</u>	2	3	
10	Float	8	8	2	
9	Kink	2	2	1	
3A	Broken yarn	4	4	1	
1	Slub	9	9	1	1

73 garments w/tape
78 garments appeared in
10 imperfect

- 1/ One 1-point stain masked, but not counted.
- 2/ Two 1-point broken yarns masked, but not counted.
- 3/ One 1-point embedded waste masked, but not counted.
- 4/ Two 1-point skip masked, but not counted.

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1591

GROUP NUMBER: I

PAGE 1 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
17A	Wrong draw	4	16	2	
19A	Skip	12	48	7	
7	Coarse yarn	2	4	2	1
4	Jerk-in	9	9	2	
5	Stain	12 <u>1/</u>	11	5	1
20A	Hitchback	4	4	3	
6	Knot	21	21	7	
1A	Slub	37	37	18	1
16A	Coarse yarn	5	5	3	1
3	Broken yarn	24 <u>2/</u>	22	4	2
11	Coarse yarn	1	3	2	
14	Skip	1	2	1	
7A	Coarse yarn	3	6	2	
13	Jerk-in	1	4	1	1
2A	Coarse yarn	1	4	5	
11A	Coarse yarn	1	3	1	
8	Hole	5	5	3	1

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1591

GROUP NUMBER: I

PAGE 2 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
12	Embedded waste	3 <u>3</u> /	2	1	
21	Wrong draw	2	2	1	
15A	Skip	4 <u>4</u> /	2	3	
10	Float	8	8	2	
9	Kink	2	2	1	
3A	Broken yarn	4	4	1	
1	Slub	9	0	1	1

73 garments w/tape
78 garments appeared in
10 imperfect

- 1/ One 1-point stain masked, but not counted.
- 2/ Two 1-point broken yarns masked, but not counted.
- 3/ One 1-point embedded waste masked, but not counted.
- 4/ Two 1-point skip masked, but not counted.

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1596

GROUP NUMBER: II

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points.	Garments Appeared in	Imperfect Garments
1	Broken yarn	36 <u>1</u> /	33	18	7
2	Knot	13	13	7	1
4A	Coarse yarn	7 <u>2</u> /	24	12	1
8	Slub	15	15	5	1
5	Stain	27	27	8	0
11	Kink	4	4	1	0
16A	Broken yarn	1	2	1	
7A	Jerk-in	2	2	2	
12A	Coarse yarn	21	21	6	2
19A	Tight end	1	4	2	
9	Stain	1	4	3	
10	Stain	3 <u>3</u> /	4	3	
20	Soiled pick	2	8	2	
14	Float	9	9	3	1
3	Hitchback	1	4	1	
13	Smash	1	4	3	2
17	Colored fly	2	2	2	
15	Coarse yarn	1	3	1	
6A	Hitchback	1	1	1	
18A	Coarse yarn	1	2	1	

74 garments w/tape
82 garments appeared in
15 imperfect

- 1/ Three 1-point broken yarns masked, but not counted.
- 2/ One 4-point coarse yarn masked, but not counted.
- 3/ One 2-point stain masked, but not counted.

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1581

GROUP NUMBER: III

PAGE 1 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
6	Knot	7	7	1	
1	Hitchback	1	3	1	1
11	Skip	5	5	2	1
8	Broken yarn	30	30	15	
3A	Hitchback	1	1	1	
18	Skip	2	6	2	1
5	Hitchback	1	4	3	
17	Float	8 1/	7	4	
4	Stain	33 2/	30	6	
2	Slub	23	23	13	1
7	Coarse yarn	2	8	3	1
10	Kink	5	5	4	1
19	Kinky yarn	1	2	1	
7A	Coarse yarn	5	20	9	2
11A	Skip	1	1	1	
12	Coarse yarn	5	5	2	
20	Colored fly	1	1	1	1
2A	Slub	6	6	2	

INFORMATION SHEET

END ITEM: Shirt, Man's, Cotton, Poplin

NUMBER OF GARMENTS CUT: 1008

TOTAL YARDS: 1581

GROUP NUMBER: III

PAGE 2 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
9A	Coarse yarn	3	9	2	
14	Stain	2	4	1	
3	Hitchback	3	3	2	1
16A	Jerk-in	2	2	1	
12A	Coarse yarn	4	4	2	
15	Hole	1	1	1	1

74 garments w/tape
80 garments appeared in
16 imperfect

1/ One 1-point float masked, but
not counted.
2/ Three 1-point stains masked,
but not counted.

5. Shirtwaist, Woman's, Chambray, Tan 130

Specification:	MIL-S-10836D
Fabric:	Cloth, Cotton, Chambray, 3 ounce, Tan 130
Number of garments cut:	1820
Fabric point value:	23.98 points/100 square yards
Percent imperfect:	1.92%

INFORMATION SHEET

END ITEM: Shirtwaist, Woman's, Chambray

NUMBER OF GARMENTS CUT: 540

TOTAL YARDS: 1170

GROUP NUMBER: I

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
8	Thin place	6	24	2	
16A	Mispick	4	16	2	1
6A	Coarse yarn	2	6	2	
12	Hole	1	1	1	1
1	Coarse yarn	5	20	2	2
5	Slub	33 <u>1/</u>	31	10	1
15	Jerk-in	12 <u>2/</u>	9	1	
7	Broken yarn	15 <u>3/</u>	14	4	1
1A	Coarse yarn	10	40	4	
20A	Wrong draw	4	16	1	
4	Slubby filling	5	20	4	2
17	Hitchback	10	10	3	2
21	Shade bar	3	12	1	
19	Broken yarn	9	36	1	1

31 garments w/tape
38 garments appeared in
11 imperfect

- 1/ Two 1-point slubs masked, but not counted.
- 2/ Three 1-point jerk-ins masked, but not counted.
- 3/ One 1-point broken yarn masked, but not counted.

INFORMATION SHEET

END ITEM: Shirtwaist, Woman's, Chambray

NUMBER OF GARMENTS CUT: 640

TOTAL YARDS: 1304

GROUP NUMBER: II

PAGE 1 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
8	Thin place	8	32	6	1
7	Coarse yarn	24 <u>1</u> /	80	12	4
27	Pick out	1	1	1	
4	Slub	39 <u>2</u> /	37	9	3
11	Broken yarn	25	100	15	4
6	Thin place	3	6	2	
9	Broken yarn	4 <u>3</u> /	3	1	
16	Weak place	1 <u>4</u> /	0	1	
12	Weak place	13 <u>5</u> /	8	2	
10	Hitchback	11	11	3	
25	Broken yarn	3	6	1	
5	Coarse yarn	2	6	5	1
14	Weak place	3	6	1	
18	Jerk-in	15	15	1	

INFORMATION SHEET

END ITEM: Shirtwaist, Woman's, Chambray

NUMBER OF GARMENTS CUT: 640

TOTAL YARDS: 1304

GROUP NUMBER: II

PAGE 2 OF 2

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
20	Hole	7 6/	6	1	1
3	Knot	4	4	1	
1	Stain	15	15	1	
22	Colored yarn	4	4	1	
15	Stain	1	4	1	

59 garments w/tape
65 garments appeared in
14 imperfect

- 1/ Four 4-point coarse yarns masked, but not counted.
- 2/ Two 1-point slubs, masked, but not counted.
- 3/ One 1-point broken yarn masked, but not counted.
- 4/ One 3-point weak place masked, but not counted.
- 5/ Five 1-point weak places masked, but not counted.
- 6/ One 1-point hole, masked but not counted.

INFORMATION SHEET

END ITEM: Shirtwaist, Woman's, Chambray

NUMBER OF GARMENTS CUT: 640

TOTAL YARDS: 1367

GROUP NUMBER: III

PAGE 1 OF 1

Defect No.	Defect Name	No. of defects	No. of points	Garments Appeared in	Imperfect Garments
7	Slub	21 <u>1</u> /	18	3	
12	Hole	5	5	1	1
5	Coarse yarn	25	100	20	1
10	Broken yarn	9 <u>2</u> /	32	4	1
3	Hitchback	7	7	3	
2	Jerk-in	10	10	3	
16	Jerk-in	1	4	1	1
1	Knot	6	6	3	
14	Broken yarn	5	5	2	2
13	Wade bar	7	28	6	1
17	Broken yarn	4	12	4	2
3A	Hitchback	4	4	2	
9	Weak place	6	6	2	1
11	Stain	1	4	1	
8	Coarse yarn	1	3	1	

56 garments w/tape
56 garments appeared in
10 imperfect

1/ Three 1-point slubs masked, but
not counted.
2/ One 4-point broken yarn, masked
but not counted.

APPENDIX F
ANALYSIS OF END ITEM RESULTS

1. Coat, Man's, Field, OG-107
2. Shirt, Man's, Utility, OG-107
3. Trousers, Man's, Summer, AF, Tan 505
4. Shirt, Man's, Cotton, Poplin, Tan 46
5. Shirtwaist, Woman's, Chambray, Tan 130

ANALYSIS BY POINT SCORE			Coat, Man's, Field, OG-107	
	Number of Defects	Total Points	Garments Appeared In Total	Imperfect Garments Total Per 100 pts.
1 Point	79 1/2	77	40	13 16.88
2 Points	16 2/3	30	14	2 6.67
3 Points	7	21	6	1 4.76
4 Points	56	224	95	9 4.01
Total or lot	158	352	155	25 7.10
Avg.				

1/2 - 1 point defects masked, but not counted.
2/1 - 2 point defects masked, but not counted.

ANALYSIS BY LOT				Imperfect Garments	
	Points per 100 sq. yds.	Total Points	Garments Appeared In Total	Total	Per 100 pts.
GROUP I	10.50	153	61	13	8.49
GROUP II	4.73	69	27	4	5.79
GROUP III	8.85	130	67	8	6.15
Total or lot	8.03	352	155	25	7.10
Avg.					

ANALYSIS BY % IMPERFECT GARMENTS				
	Total Yards	Total Points	Pts./100 sq. yds.	Imperfect Garments Total Percent
GROUP I	1166	153	10.50	13 3.09%
GROUP II	1166 3/4	69	4.73	4 0.97%
GROUP III	1175 1/2	130	8.85	8 1.90%
Total or lot	3508 1/4	352	8.03	25 1.98%
Avg.				

ANALYSIS BY POINT SCORE

Shirt, Men's Utility, OG-107

	Number of Defects	Total Points	Garments Appeared In		Imperfect Garments	
			Total	Per 100 pts.	Total	Per 100 pts.
1 Point	320 <u>1/</u>	311	130	41.80	11	3.54
2 Points	22 <u>2/</u>	42	15	35.71	None	0.00
3 Points	19 <u>3/</u>	48	15	31.25	1	2.08
4 Points	159 <u>4/</u>	620	178	28.71	5	0.81
Total or lot Avg.	520	1021	338	33.10	17	1.66

1/ 9 - 1 point defects masked, but not counted. 2/ 3 - 3 point defects masked but not counted.

2/ 1 - 2 point defects masked, but not counted. 4/ 4 - 4 point defects masked but not counted.

ANALYSIS BY LOT

	Points per 100 sq. yds.	Total Points	Garments Appeared In		Imperfect Garments	
			Total	Per 100 pts.	Total	Per 100 pts.
GROUP I	36.15	385	150	38.96	6	1.56
GROUP II	28.46	304	81	26.64	6	1.97
GROUP III	31.13	332	107	32.23	5	1.51
Total or lot Avg.	31.91	1021	338	33.10	17	1.66

ANALYSIS BY % IMPERFECT GARMENTS

	Total Yards	Total Points	Pts/100 sq. yds.	Total Garments		Imperfect Garments	
				Total	Percent	Total	Percent
GROUP I	1065	385	36.15	440		6	1.36
GROUP II	1068	304	28.46	440		6	1.36
GROUP III	1066 1/2	332	31.13	440		5	1.14
Total or lot Avg.	3199 1/2	1021	31.91	1320		17	1.29

ANALYSIS BY POINT SCORE			Trousers, Men's, Summer, AF, Tan 505		
	Number of Defects	Total Points	Total Garments Appeared In	Per 100 pts.	Imperfect Garments Total Per 100 pts.
1 Point	397 1/	393	184	46.82	4 1.02
2 Points	25 2/	48	20	41.67	5 10.42
3 Points	8	24	7	29.17	1 4.17
4 Points	97 3/	364	109	29.94	26 7.14
Total or lot	527	829	320	38.60	36 4.34
Avg.					

1/ 4 - 1 point defects masked, but not counted.

2/ 1 - 2 point defects masked, but not counted.

3/ 6 - 4 point defects masked, but not counted.

ANALYSIS BY LOT			Imperfect Garments		
	Points per 100 sq. yds.	Total Points	Garments Appeared In Total	Per 100 pts.	Total Per 100 pts.
GROUP I	13.40	246	108	43.90	16 6.50
GROUP II	17.78	351	130	37.04	15 4.27
GROUP III	11.80	232	82	35.34	5 2.16
Total or lot	14.35	829	320	38.60	36 4.34
Avg.					

ANALYSIS BY % IMPERFECT GARMENTS			Imperfect Garments		
	Total Yards	Total Points	Pts/100 sq. yds.	Total Garments	Imperfect Garments Total Percent
GROUP I	1502	246	13.40	775	16 2.06
GROUP II	1615	351	17.78	775	15 1.94
GROUP III	1609	232	11.80	806	5 0.62
Total or lot	4726	829	14.35	2356	36 1.53
Avg.					

ANALYSIS BY POINT SCORE			Shirt, Men's, Cotton, Tan 46 Poplin			
	Number of Defects	Total Points	Garments Appeared In		Imperfect Garments	
			Total	Per 100 pts.	Total	Per 100 pts.
1 Point	424 <u>1/</u>	411	166	40.39	30	7.30
2 Points	16 <u>2/</u>	30	12	40.00	1	3.33
3 Points	10	30	9	30.00	2	6.67
4 Points	54 <u>3/</u>	208	53	25.48	8	3.85
Total or lot	504	679	240	35.35	41	6.04
AVG.						
1/ 13 - 1 point defects masked but not counted.						
2/ 1 - 2 point defects masked but not counted.						
3/ 2 - 4 point defects masked but not counted.						

ANALYSIS BY LOT				Imperfect Garments			
	Points per 100 sq. yds.	Total Points	Garments Appeared In Total	Per 100 pts.	Total	Per 100 pts.	
GROUP I	14.44	268	78	29.10	10	3.73	
GROUP II	10.58	197	82	41.62	15	7.67	
GROUP III	11.60	214	80	37.38	16	7.48	
Total or lot	12.21	679	240	35.35	41	6.04	
Avg.							

ANALYSIS BY % IMPERFECT GARMENTS				Imperfect Garments			
	Total Yards	Total Points	Pts/100 sq. yds.	Total Garments	Total	Percent	Imperfect Garments Total
GROUP I	1591	268	14.44	1008	10	0.99	
GROUP II	1596	197	10.58	1008	15	1.49	
GROUP III	1581	214	11.60	1008	16	1.59	
Total or lot	4768	679	12.21	3024	41	1.36	
Avg.							

ANALYSIS BY POINT SCORE				Shirtwaist, Woman's, Chambray, Tan 130			
Number of Defects		Total Points	Garments Appeared In Total	Per 100 pts.	Imperfect Garments Total		Per 100 pts.
1 Point	274 $\frac{1}{2}$	254	59	23.23	13	5.12	
2 Points	25 $\frac{2}{2}$	48	4	8.33	None	0.00	
3 Points	15 $\frac{3}{2}$	39	13	33.33	3	7.69	
4 Points	150 $\frac{4}{2}$	580	83	14.31	19	3.28	
Total or lot	464	921	159	17.26	35	3.80	
AVG.							
$\frac{1}{2}$ 20 - 1 point defects masked, but not counted. $\frac{3}{2}$ 2 - 3 point defects masked, but not counted.							
$\frac{2}{2}$ 1 - 2 point defect masked, but not counted. $\frac{4}{2}$ 5 - 4 point defects masked, but not counted.							

ANALYSIS BY LOT				Imperfect Garments			
Points per 100 sq. yds.		Total Points	Garments Appeared In Total	Per 100 pts.	Total	Per 100 pts.	
GROUP I	24.96	292	38	13.01	11	3.77	
GROUP II	28.22	368	65	17.66	14	3.80	
GROUP III	19.09	261	56	21.46	10	3.83	
Total or lot	23.98	921	159	17.26	35	3.80	
AVG.							

ANALYSIS BY % IMPERFECT GARMENT				Imperfect Garments			
Total Yards		Total Points	Pts/100 sq. yds.	Total Garments	Total	Percent	
GROUP I	1170	292	24.96	540	11	2.04	
GROUP II	1304	368	28.22	640	14	2.19	
GROUP III	1367	261	19.09	640	10	1.56	
Total or lot	3841	921	23.98	1820	35	1.92	
AVG.							

APPENDIX G

Accumulation of Fabric Examination Data

CUMULATIVE - All Five Lots

Total Yards	20,042.5 (various widths)
Total Points	3,802
Total Number of Defects	2,173

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of Total	% of Total points
1 point defects	1,494	68.76	191	12.78	1,446	38.03
2 point defects	104	4.75	17	16.35	198	5.21
3 point defects	59	2.70	18	30.51	162	4.26
4 point defects	516	23.79	216	41.86	1,996	52.50

Number of A defects = 442; Percent of A defects 442 of 2,173 = 20.34

Number of 1 and 4 point defects combined = 2,010

Percent of 1 and 4 point defects combined = 92.50

Most frequent defects:

1 point defects	- Slub;	479 of 1,494 =	32.06%
	Broken yarn;	271 of 1,494 =	18.14%
	Stain;	223 of 1,494 =	14.93%
2 point defects	- Broken yarn;	32 of 104 =	30.77%
	Coarse yarn;	22 of 104 =	21.15%
3 point defects	- Coarse yarn;	31 of 59 =	52.55%
4 point defects	- Coarse yarn;	243 of 516 =	47.09%
	Broken yarn;	99 of 516 =	19.19%

3 oz. Chambray for Women's Shirtwaist

CUMULATIVE

Total Yards	3,841 (Width - 36 inches)
Total Points	921
Point Value	23.98 points per 100 sq. yd.
Total Number of Defects	464

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	274	59.05	5	1.83	254	27.58
2 point defects	25	5.39	3	12.00	48	5.21
3 point defects	15	3.23	2	13.33	39	4.23
4 point defects	150	32.33	19	12.67	580	62.98

Number of A defects = 29; Percent of A defects 29 of 464 = 6.25

Percent of 1 and 4 point defects combined = 91.38

Number of 1 and 4 point defects combined = 424

Most frequent defects:

1 point defects	- Slub;	96 of 274	= 35.04%
	- Jerk-in;	39 of 274	= 14.23%
	- Hitchback;	36 of 274	= 13.14%
	- Broken yarn;	24 of 274	= 8.76%
3 point defects	- Coarse yarn;	7 of 15	= 46.67%
4 point defects	- Coarse yarn;	68 of 150	= 45.33%
	- Broken yarn;	43 of 150	= 28.67%
	- Thin place;	15 of 150	= 10.00%

3 oz. Chambray for Women's Shirtwaist

GROUP I

Total Yards	1,170	(Width - 36 inches)
Total Points	292	
Point Value	24.95	points per 100 sq. yd.
Total number of defects	142	

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	82	57.75	0	0	75	25.69
2 point defects	7	4.93	2	28.57	14	4.79
3 point defects	6	4.22	2	33.33	15	5.14
4 point defects	47	33.10	18	38.30	188	64.38

Number of A defects = 22; Percent of A defects 22 of 149 = 14.77%

Number of 1 and 4 point defects combined = 129

Percent of 1 and 4 point defects combined = 90.85%

Most frequent defects:

1 point defects	- Slub;	33 of 82	=	40.24%
	Broken yarn;	15 of 82	=	18.29%
	Jerk-in;	12 of 82	=	14.63%
3 point defects	- Coarse yarn	4 of 6	=	66.67%
4 point defects	- Coarse yarn;	15 of 47	=	31.92%
	Broken yarn;	9 of 47	=	19.16%

3 oz. Chambray for Women's Shirtwaist

GROUP II

Total Yards 1,304 (Width - 36 inches)
 Total Points 368
 Point Value 28.22 points per 100 sq. yd.
 Total Number of defects 199

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	120	60.30	0	0	110	29.89
2 point defects	17	8.54	1	5.88	32	8.70
3 point defects	3	1.51	0	0	6	1.63
4 point defects	59	29.65	0	0	220	59.78

Number of A defects = 1; Percent of A defects 1 of 199 = 0.5%

Number of 1 and 4 point defects combined = 179

Percent of 1 and 4 point defects combined = 89.95%

Most frequent defects:

1 point defects

- Slub; 39 of 120 = 32.50%
 - Stain; 15 of 120 = 12.50%
 - Jerk-in; 15 of 120 = 12.50%
 - Weak place; 13 of 120 = 10.83%

4 point defects

- Broken yarn; 25 of 59 = 42.37%
 - Coarse yarn; 24 of 59 = 40.68%
 - Thin place; 8 of 59 = 13.56%

3 oz. Chambray for Women's Shirtwaist

GROUP III

Total Yards	1,367 (Width - 36 inches)
Total Points	261
Point Value	19.09 points per 100 sq. yd.
Total Number of defects	123

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	72	58.54	5	6.94	69	26.44
2 point defects	1	0.81	0	0	2	0.76
3 point defects	6	4.88	0	0	18	6.90
4 point defects	44	35.77	1	2.27	172	65.90

Number of A defects = 6; Percent of A defects 6 of 123 = 4.88%

Number of 1 and 4 point defects combined = 116

Percent of 1 and 4 point defects combined = 94.31%

Most frequent defects:

1 point defects	- Slub;	24 of 72 = 33.33%
	Hitchback;	15 of 72 = 20.83%
	Jerk-in;	12 of 72 = 16.67%
3 point defects	- Broken yarn;	4 of 6 = 66.67%
4 point defects	- Coarse yarn;	27 of 44 = 61.36%
	Broken yarn;	9 of 44 = 20.46%
	Shade bar;	8 of 44 = 18.18%

4 oz. Poplin Men's Tan Poplin Shirt

CUMULATIVE

Total Yards 4,768 (Width - 42 inches)
 Total Points 679
 Point Value 12.21 points per 100 sq. yd.
 Total Number of Defects 504

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	424	84.13	87	20.52	411	60.53
2 point defects	16	3.17	5	3.125	30	4.42
3 point defects	10	1.98	5	50.00	30	4.42
4 point defects	54	10.72	27	50.00	208	30.63

Number of A defects = 124; Percent of A defects 124 of 504 = 24.60%

Number of 1 and 4 point defects combined = 478

Percent of 1 and 4 point defects combined = 94.85%

Most frequent defects:

1 point defects	- Slub;	90 of 424	= 21.23%
	- Broken yarn;	94 of 424	= 22.17%
	- Stain;	77 of 424	= 18.16%
	- Knot;	42 of 424	= 9.91%
	- Coarse yarn;	36 of 424	= 8.49%
2 point defects	- Coarse yarn;	6 of 16	= 37.50%
3 point defects	- Coarse yarn;	7 of 10	= 70.00%
4 point defects	- Coarse yarn;	21 of 54	= 38.89%
	- Skip;	18 of 54	= 33.33%

4 oz. Poplin, Men's Tan Poplin Shirt

GROUP I

Total Yards	1,591 (Width - 42 inches)
Total Points	268
Point Value	14.43 points per 100 sq. yd.
Total Number of Defects	186

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	150	80.64	49	32.67	144	53.73
2 point defects	7	3.76	3	42.86	14	5.22
3 point defects	2	1.08	1	50.00	6	2.24
4 point defects	27	14.52	18	66.67	104	38.81

Number of A defects = 71; Percent of A defects 71 of 186 = 38.17%

Number of 1 and 4 point defects combined = 177

Percent of 1 and 4 point defects combined = 95.16%

Most frequent defects:

1 point defects	- Slub;	46 of 150	=	30.67%
	Broken yarn;	28 of 150	=	18.67%
	Knot;	21 of 150	=	14.00%
4 point defects	- Skip;	12 of 27	=	44.44%
	Coarse yarn;	7 of 27	=	25.93%
	Wrong draw;	6 of 27	=	22.22%

4 oz. Poplin, Man's Tan Poplin Shirt

GROUP II

Total Yards	1,596 (Width - 42 inches)
Total Points	197
Point Value	10.58 points per 100 sq. yd.
Total Number of Defects	157

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	136	86.63	24	17.65	133	67.51
2 point defects	6	3.82	2	33.33	10	5.08
3 point defects	2	1.27	1	50.00	6	3.05
4 point defects	13	8.26	8	61.54	48	24.36

Number of A defects = 35; Percent of A defects 35 of 157 = 22.29

Number of 1 and 4 point defects combined = 149

Percent of 1 and 4 point defects combined = 94.91%

Most frequent defects:

1 point defects	- Broken yarn;	36 of 136	=	26.47%
	Knot;	27 of 136	=	19.85%
	Coarse yarn;	22 of 136	=	16.18%
	Slub;	15 of 136	=	11.03%
4 point defects	- Coarse yarn;	7 of 13	=	53.85%

4 oz. Poplin, Men's Tan Poplin Shirt

GROUP III

Total Yards	1,581 (Width - 42 inches)
Total Points	214
Point Value	11.60 points per 100 sq. yd.
Total Number of Defects	161

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	138	85.71	14	10.15	134	62.62
2 point defects	3	1.86	0	0	6	2.80
3 point defects	6	3.73	3	50.00	18	8.41
4 point defects	14	8.70	11	78.57	56	26.17

Number of A defects = 28; Percent of A defects 28 of 161 = 17.39%

Number of 1 and 4 point defects combined = 152

Percent of 1 and 4 point defects combined = 94.41%

Most frequent defects:

1 point defects	- Stain;	33 of 138	= 23.91%
	Broken yarn;	30 of 138	= 21.74%
	Slub;	29 of 138	= 21.01%
4 point defects	- Coarse yarn;	7 of 14	= 50.00%
	Skip;	6 of 14	= 42.86%

6 oz. Uniform Twill, Tan 505

CUMULATIVE

Total Yards	4,726 (Width - 44 inches)
Total Points	829
Point Value	14.35 points per 100 sq. yd.
Total Number of Defects	527

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	397	75.33	69	17.38	393	47.41
2 point defects	25	4.74	5	20.00	48	5.79
3 point defects	8	1.52	5	62.50	24	2.89
4 point defects	97	18.41	49	50.52	364	43.91

Number of A defects = 128; Percent of A defects 128 of 527 = 24.29%

Number of 1 and 4 point defects combined = 494

Percent of 1 and 4 point defects combined = 93.74%

Most frequent defects:

1 point defects	- Slub;	156 of 397	= 39.29%
	Spot (stain);	111 of 397	= 27.96%
	Knot;	51 of 397	= 12.85%
2 point defects	- Broken yarn;	11 of 25	= 44.00%
4 point defects	- Coarse yarn;	45 of 97	= 46.39%
	Broken yarn;	19 of 97	= 19.59%

6 oz. Uniform Twill, Tan 505

GROUP I

Total Yards	1,502 (Width - 44 inches)
Total Points	246
Point Value	13.40 points per 100 sq. yd.
Total Number of defects	170

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	133	78.23	25	18.80	132	53.66
2 point defects	6	3.53	2	33.33	10	4.06
3 point defects	0	0	0	0	0	.0
4 point defects	31	18.24	1	3.23	104	42.28

Number of A defects = 28; Percent of A defects 28 of 170 = 16.47%

Number of 1 and 4 point defects combined = 164

Percent of 1 and 4 point defects combined = 96.47%

Most frequent defects:

1 point defects	- Slub;	54 of 133	=	40.60%
	- Stain;	24 of 133	=	18.05%
	- Knot;	18 of 133	=	13.53%
	- Broken yarn;	18 of 133	=	13.53%
4 point defects	- Hole;	13 of 31	=	41.94%
	- Coarse yarn;	8 of 31	=	25.81%
	- Broken yarn;	8 of 31	=	25.81%

6 oz. Uniform Twill, Tan 505

GROUP II

Total Yards	1,615 (Width - 44 inches)
Total Points	351
Point Value	17.78 points per 100 sq. yd.
Total Number of Defects	215

	No. of defects	% of defects	Nr. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	162	75.35	34	20.99	162	46.15
2 point defects	9	4.19	2	22.22	18	5.13
3 point defects	5	2.32	3	60.00	15	4.27
4 point defects	39	18.14	33	84.62	156	44.45

Number of A defects = 72; Percent of A defects 72 of 215 = 33.49%

Number of 1 and 4 point defects combined = 201

Percent of 1 and 4 point defects combined = 93.49%

Most frequent defects:

1 point defects	- Spot (stain);	60 of 162	=	37.04%
	Slub;	56 of 162	=	34.57%
	Knot;	17 of 162	=	10.49%
	Hole;	14 of 162	=	8.64%
4 point defects	- Coarse yarn;	25 of 39	=	64.10%
	Broken yarn;	6 of 39	=	15.38%

6 oz. Uniform Twill, Tan 505

GROUP III

Total Yards	1,609 (Width - 44 inches)
Total Points	232
Point Value	11.80 points per 100 sq. yd.
Total Number of Defects	142

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	102	71.83	10	9.80	99	42.67
2 point defects	10	7.04	1	10.00	20	8.62
3 point defects	3	2.11	2	66.67	9	3.88
4 point defects	27	19.02	15	55.56	104	44.83

Number of A defects = 28; Percent of A defects 28 of 142 = 19.72

Number of 1 and 4 point defects combined = 129

Percent of 1 and 4 point defects combined = 90.85%

Most frequent defects:

1 point defects	- Slub;	46 of 102 = 45.10%
	Spot (stain);	27 of 102 = 26.47%
	Knot;	16 of 102 = 15.69%
4 point defects	- Coarse yarn;	12 of 27 = 44.44%
	Crease;	6 of 27 = 22.22%

8.5 oz. Carded Sateen, Shirt, Utility (Fatigues)

CUMULATIVE

Total Yards	3,199.5 (Width - 36 inches)
Total Points	1,021
Point Value	31.91 points per 100 sq. yd.
Total Number of Defects	520

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	320	61.54	25	7.81	311	30.46
2 point defects	22	4.23	4	18.18	42	4.11
3 point defects	19	3.65	4	21.05	48	4.70
4 point defects	159	30.58	97	61.01	620	60.72

Number of A defects = 130; Percent of A defects 130 of 520 = 25.00%

Number of 1 and 4 point defects combined = 479

Percent of 1 and 4 point defects combined = 92.12%

Most frequent defects:

1 point defects	- Slub;	119 of 320 = 37.18%
	Broken yarn;	96 of 320 = 30.00%
	Jerk-in filling;	45 of 320 = 14.06%
2 point defects	- Coarse yarn;	9 of 19 = 47.37%
4 point defects	- Coarse yarn;	19 of 159 = 57.23%
	Broken yarn;	24 of 159 = 15.09%

8.5 oz. Carded Sateen, Shirt, Utility (Fatigues)

GROUP I

Total Yards	1,065 (Width - 36 inches)
Total Points	385
Point Value	36.15 points per 100 sq. yd.
Total Number of Defects	226

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	159	70.36	23	14.47	152	39.48
2 point defects	10	4.42	3	30.00	20	5.19
3 point defects	4	1.77	0	0	9	2.34
4 point defects	53	23.45	41	77.36	204	52.99

Number of A defects = 67; Percent of A defects 67 of 226 = 29.65%

Number of 1 and 4 point defects combined = 212

Percent of 1 and 4 point defects combined = 93.81%

Most frequent defects:

1 point defects	- Slub;	82 of 159	=	51.57%
	Broken yarn;	39 of 159	=	24.53%
	Jerk-in filling;	17 of 159	=	10.69%
4 point defects	- Coarse yarn;	22 of 53	=	41.51%
	Jerk-in filling;	9 of 53	=	16.98%

8.5 oz. Carded Sateen, Shirt, Utility (Fatigues)

GROUP II

Total Yards	1,068 (Width - 36 inches)
Total Points	304
Point Value	28.46 points per 100 sq. yd.
Total Number of Defects	163

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	111	68.10	0	0	111	36.51
2 point defects	3	1.84	0	0	6	1.97
3 point defects	5	3.07	0	0	15	4.93
4 point defects	44	26.99	24	54.55	172	56.58

Number of A defects = 24; Percent of A defects 24 of 163 = 14.72%

Number of 1 and 4 point defects combined = 155

Percent of 1 and 4 point defects combined = 95.09%

Most frequent defects:

1 point defects	- Broken yarn;	34 of 111	= 30.63%
	Jerk-in filling;	28 of 111	= 25.23%
	Slub;	21 of 111	= 18.92%
4 point defects	- Coarse yarn;	28 of 44	= 63.64%

8.5 oz. Carded Sateen, Shirt, Utility (Fatigues)

GROUP III

Total Yards	1,066.5 (Width - 36 inches)
Total Points	332
Point Value	31.13 points per 100 sq. yd.
Total Number of Defects	131

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	50	38.17	2	4.00	48	14.46
2 point defects	9	6.87	1	11.11	16	4.82
3 point defects	10	7.63	4	40.00	24	7.23
4 point defects	62	47.33	32	51.61	244	73.49

Number of A defects = 39; Percent of A defects 39 of 131 = 29.77%

Number of 1 and 4 point defects combined = 112

Percent of 1 and 4 point defects combined = 85.50%

Most frequent defects:

1 point defects	- Broken yarn; 23 of 50 = 46.00%
	Slub; 16 of 50 = 32.00%
3 point defects	- Coarse yarn; 8 of 10 = 80.00%
4 point defects	- Coarse yarn; 40 of 62 = 64.52%
	Broken yarn; 17 of 62 = 27.42%

9 oz. Wind Resistant Sateen for Coat, Man's, Field, OG-107

CUMULATIVE

Total Yards	3,508 (Width - 45 inches)
Total Points	352
Point Value	8.03 points per 100 sq. yd.
Total Number of Defects	158

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	79	50.00	5	6.33	77	21.88
2 point defects	16	10.13	0	0	30	8.52
3 point defects	7	4.43	2	28.57	21	5.97
4 point defects	56	35.44	24	42.86	224	63.64

Number of A defects = 31; Percent of A defects 31 of 158 = 19.62%

Number of 1 and 4 point defects combined = 135

Percent of 1 and 4 point defects combined = 85.44%

Most frequent defects:

1 point defects	- Broken yarn;	27 of 79	=	34.18%
	Slub;	18 of 79	=	22.78%
	Stain;	12 of 79	=	15.19%
2 point defects	- Broken yarn;	9 of 16	=	56.25%
4 point defects	- Coarse yarn;	18 of 56	=	32.14%
	Broken yarn;	12 of 56	=	21.43%
	Shade bar;	6 of 56	=	10.71%

9 oz. Wind Resistant Sateen for Coat, Man's, Field, OG-107

GROUP I

Total Yards	1,166 (Width - 45 inches)
Total Points	153
Point Value	10.50 points per 100 sq. yd.
Total Number of Defects	63

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	30	47.62	4	13.33	33	19.61
2 point defects	4	6.35	0	0	8	5.23
3 point defects	1	1.59	0	0	3	1.96
4 point defects	28	44.44	17	60.71	112	73.20

Number of A defects = 21; Percent of A defects 21 of 63 = 33.33%

Number of 1 and 4 point defects combined = 58

Percent of 1 and 4 point defects combined = 92.06%

Most frequent defects:

1 point defects	- Broken yarn;	13 of 30 = 43.33%
	Slub;	6 of 30 = 20.00%
4 point defects	- Coarse yarn;	16 of 28 = 57.14%
	Crease;	4 of 28 = 14.29%

9 oz. Wind Resistant Sateen for Coat, Man's, Field, OG-107

GROUP II

Total Yards 1,166.75 (Width - 45 inches)
 Total Points 69
 Point Value 4.73 points per 100 sq. yd.
 Total Number of Defects 39

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	24	61.54	0	0	24	34.78
2 point defects	7	17.95	0	0	14	20.29
3 point defects	1	2.56	0	0	3	4.35
4 point defects	7	17.95	1	14.29	28	40.58

Number of A defects = 1; Percent of A defects 1 of 39 = 2.56%

Number of 1 and 4 point defects combined = 31

Percent of 1 and 4 point defects combined = 79.49

Most frequent defects;

1 point defects	- Stain;	5 of 24	=	20.83%
	Slub;	4 of 24	=	16.67%
	Broken yarn;	4 of 24	=	16.67%
	Knot;	4 of 24	=	16.67%
4 point defects	- Shade bar;	3 of 7	=	42.86%

9 oz. Wind Resistant Sateen for Coat, Man's, Field, OG 107

GROUP III

Total Yards	1,175.5 (Width - 45 inches)
Total Points	130
Point Value	8.85
Total Number of Defects	56

	No. of defects	% of defects	No. of A defects	% of A defects	Point Value of total	% of Total points
1 point defects	25	44.64	1	4.00	23	17.69
2 point defects	5	8.93	0	0	8	6.15
3 point defects	5	8.93	2	40.00	15	11.54
4 point defects	21	37.50	6	28.57	84	64.62

Number of A defects = 9; Percent of A defects 9 of 56 = 16.07%

Number of 1 and 4 point defects combined = 46

Percent of 1 and 4 point defects combined = 82.14%

Most frequent defects:

1 point defects	- Broken yarn	10 of 25 = 40.0%
	Slub	8 of 25 = 32.0%
	Stain	5 of 25 = 20.0%
4 point defects	- Broken yarn	12 of 21 = 57.14%

Unclassified

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11 SUPPLEMENTARY NOTES	12 SPONSORING MILITARY ACTIVITY U. S. Army Natick Laboratories Natick, Massachusetts 01760	
13 ABSTRACT The major and minor evaluation system used to establish the quality of fabric required by the Government was never totally understood by the textile industry. The reason, apparently, was poor communication between the supplier and the purchasers as to desired quality. This evaluation system was different from the many quality analyses used for commercial fabrics. The Natick Laboratories realized the great need for a standard method of evaluating quality of fabric that would be agreeable to both the textile industry and the Government and initiated action to fulfill this need. The "point system" herein described, was proposed as the standard method of evaluating quality of fabrics and was discussed at three Industry Advisory Committee meetings. Various tests were run. Results of inspections conducted by the industry were compared with results of verification inspections. Areas of difference were resolved. In 1961 the Government and the industry adopted a standard method of defining and scoring defects, thereby assuring that goods delivered on contracts were of the quality stipulated as acceptable by the specification. The first mass procurement of 26 million yards of carded sateen, employing the point system method of evaluating defects, was extremely successful. The point system is simple, easily understood, and has been hailed by the textile industry as the necessary bridge in the communication of quality required by the Government.		

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KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Evaluation	3		8,9			
Standardization	8					
Quality	9					
Fabrics	9		9			
Point System	10		8,9			
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