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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

S-78

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SEAMER 6-27.513

B-324

(Supersedes B-73 and B-301)

U. S. Employment Service in
Cooperation with
North Carolina, Pennsylvania, and Virginia
State Employment Services

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
May 1960

GATB #2075C (641 and 2033) and 2133
June 1954, April 1955, and August 1956

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR SEAMER 6-27.513

B-324

Summary

The General Aptitude Test Battery was administered to two samples of Seamers. Sample I includes fifty-eight (58) women employed as Seamers 6-27.513 at the Berkshire Knitting Mills, Reading, Pennsylvania. The B-1002A edition of the GATB was administered to this sample. Production records expressed in dozens of stockings seamed per hour were used as the criterion.

Sample II includes two groups of women employed as Seamers 6-27.513 at two plants of the Chadbourn Hosiery Mills, Inc., of Charlotte, North Carolina. At the Siler City, North Carolina plant, forty-two (42) women were tested and at the Shenandoah Knitting Mills, Shenandoah, Virginia, fifty-nine (59) women were tested. Seven were eliminated from the first group and three from the latter group leaving a final experimental sample of ninety-one (91) women. The B-1001 edition of the GATB was administered to this sample. The criterion consisted of production records.

The two samples were analyzed separately and in combination. On the basis of the statistical and qualitative analysis of the data, Aptitudes P-Form Perception, K-Motor Coordination, F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Seamer 6-27.513 - B-324

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Seamer 6-27.513.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-324

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	80	P	Part 5 Part 7	80
T	CB-1-G CB-1-K	85	K	Part 8	90
F	CB-1-O CB-1-P	85	F	Part 11 Part 12	80
M	CB-1-M CB-1-N	80	M	Part 9 Part 10	80

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Seamer 6-27.513.

II. Sample

This study is based on two samples of workers engaged in the occupation of Seamer 6-27.513. One sample was tested with the B-1002A edition of the GATB and the other with the B-1001 edition of the GATB.

Sample I - Pennsylvania

The GATB, B-1002A, was administered on June 15, 16, and 17, 1954, to sixty women employed as Seamers 6-27.513 by the Berkshire Knitting Mills, Reading, Pennsylvania. Two women were eliminated from the sample because of language difficulties. The final sample, therefore, consisted of fifty-eight women.

The Berkshire Knitting Mills employs about 650 women in this occupation. Approximately 500 of these women had been test selected with aptitude test battery B-73. Therefore these people were excluded from the potential sample. This firm also employs a number of displaced persons who were unable to comprehend test instructions and were therefore excluded from the sample. The two women cited above were included through an oversight which was not discovered until the testing sessions were in progress. As has been noted above, their test scores were discarded and they were eliminated from the sample. Others were excluded because they did not meet age, education or experience requirements for test development studies.

The formal training period for Seamers has been set by the company at six months. Applicants were usually selected through an employment interview after they had been screened by the use of the B-73 Seamer battery. (Workers in this sample, however, had not been test selected.)

Sample II - North Carolina and Virginia

This sample includes two groups of women employed as Seamers 6-27.513 in two plants of the Chadbourn Hosiery Mills, Incorporated, of Charlotte, North Carolina:

1. Thirty-five women in the Siler City, North Carolina plant.
2. Fifty-six women in the Shenandoah, Virginia plant.

These two groups were combined to make a sample of 91 women.

The GATB, B-1001, was administered on March 22 and 23, 1955 to a group of 42 women employed as Seamers 6-27.513 at the Siler City plant. From this group one trainee was eliminated, another worker was eliminated because of insufficient education, two because their experience was not sufficient to reach peak efficiency as indicated by the Plant Superintendent, and three because data on the final criterion used were not available. Thus 35 of the workers in this plant were included in the final sample.

The GATB, B-1001, was administered on April 26, 1955 to 59 women employed as Seamers 6-27.513 at the Shenandoah Knitting Mills, Incorporated, Shenandoah, Virginia. Three of these women were excluded from the sample because of a lack of required education and inability to understand instructions. This left a final group of 56 women.

The formal training period for Seamers has been set by the company at six months. Comparability of the job duties, hiring methods, performance standards and criteria warranted combining the two groups. Therefore, the two groups were combined into one sample of 91 workers.

Tables II-A and II-B show the means, standard deviations, ranges, and Pearson product-moment correlations with the criteria for age, education, and experience for Sample I and Sample II, respectively. Table II-C shows the means, standard deviations and ranges for age, education, and experience for the Combined Sample.

TABLE II-A

Means (M), Standard Deviations (σ), Ranges,
and Pearson Product-Moment Correlations with the Criterion (r)
for Age, Education, and Experience

Seamer 6-27.513

Sample I
N = 58

	M	σ	Range	r
Age (years)	29.6	5.9	23-44	-.277*
Education (years)	10.2	1.7	6-12	.044
Experience (months)	85.1	18.1	55-143	-.060

*Significant at the .05 level

TABLE II-B

Means (M), Standard Deviations (σ), Ranges,
and Pearson Product-Moment Correlations with the Criterion (r)
for Age, Education, and Experience

Seamer 6-27.513

Sample II
N = 91

	M	σ	Range	r
Age (years)	31.5	7.5	19-49	.112
Education (years)	10.6	1.9	5-14	.132
Experience (months)	59.6	43.7	13-192	.268*

*Significant at the .05 level

TABLE II-C

Means (M), Standard Deviations (σ), and Ranges for Age, Education, and Experience

Seamer 6-27.513

Combined Sample
N = 149

	M	σ	Range
Age (years)	30.6	6.9	19-49
Education (years)	10.6	1.9	5-14
Experience (months)	69.7	38.0	13-192

The data in Table II-A indicate that there are no significant correlations between education or experience and the criterion, but a negative correlation significant at the .05 level exists between age and the criterion for Sample I. Since the criterion consists of production records, the significant negative correlation between age and the criterion probably indicates that the younger workers in this sample tend to be more productive on this job than the older workers.

The data in Table II-B indicate that there are no significant correlations between age or education and the criterion, but a correlation significant at the .05 level exists between experience and the criterion for Sample II. Since the criterion consists of production records, the significant correlation between experience and the criterion probably indicates that the more experienced workers in this sample tend to be more productive on this job than the less experienced workers.

The two samples appear to be sufficiently similar with respect to age, education, and experience to permit combining the data whenever this would be statistically feasible.

III. Job Description

Job Title: Seamer 6-27.513

Job Summary: Joins the open edges of the foot, leg, and welt of women's full-fashioned hosiery, using a power driven seaming machine. Matches edges of hosiery at designated points and guides the matched edges into the machine. Depresses a treadle to start machine, which seams the stocking edges together. Trims threads and inspects hosiery.

Work Performed: Threads machine. Places cones of nylon thread on three posts and guides each thread through mechanism of machine with a pair of tweezers to prepare machine for the seaming operation.

Seams foot. Uncurls toe selvages with the thumb and fingers. Inserts matched edges into open guide, using both hands, and lowers guide with right forefinger which places toe of stocking into seaming position. Depresses treadle and guides the matched edges of the sole and heel into the feeding mechanism. Keeps uncurling selvages as stocking is fed into machine.

Seams leg and welt. Matches the edges of the hosiery leg to the full-fashioned markings. Uncurls the edges and guides hosiery into the feeding mechanism of machine which straightens and feeds the hosiery into the needle. Starts machine by depressing a treadle which seams the stocking together.

Trims hosiery. Cuts nylon thread by pulling it over a small blade attached to seaming machine to remove hosiery from machine. Cuts any visible threads from hosiery with small scissors.

Inspects hosiery. Inspects four seamed stockings out of each 24 to insure accurate matchings at the proper points, also to insure a fine pencil line seam.

May ravel out seams that are found to be defective, using scissors and fingers, and reseam stockings.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to Sample I.
All the tests of the GATB, B-1001, were administered to Sample II.

V. Criteria

Sample I

The criterion for Sample I consisted of production records expressed in numbers of dozens of stockings seamed per hour. The production records covered a period of 12 weeks and were selected as the criterion because they form a basis for the payment of the workers and, therefore, it was believed that they represent the most realistic measure of job proficiency available. For the computation of the statistics, the criterion was broken down from the number of dozens of stockings seamed per hour to the number of stockings seamed per hour (24 stockings, or 12 pairs, to the dozen). The number of stockings seamed per hour range from 47 to 126, with a mean of 77 and a standard deviation of 16. In terms of dozens of stockings seamed per hour, the range is 1.96 to 5.25, with a mean of 3.20 and a standard deviation of .67.

Sample II

Two sets of criteria were obtained for Sample II: supervisory ratings and production records. The supervisory ratings were in three broad categories based upon quantity and quality of production and the skill involved. The production records were based on a six-month period in each plant. The base production of 28 dozen stockings seamed per eight-hour day (three and one-half dozen per hour) is the accepted norm and is assigned a standard numerical rating of 100. The production records provided for test validation purposes consisted of the plant's standard numerical ratings, which ranged from 74 to 183 with a mean of 111.7 and a standard deviation of 22.8.

Production records were selected as the criterion to be used for this study for the following reasons: (1) they tend to provide a more objective and more meaningful evaluation of the workers than the supervisory ratings; (2) they provide a meaningful point of dichotomy between satisfactory and marginal performance; (3) they enable greater comparability with the criterion of Sample I, which also consists of production records.

VI. Statistical and Qualitative Analyses

Both samples consist of Seamers who have undergone substantially the same type of training and who perform comparable job duties. Examination of available data has shown that the two samples are sufficiently similar with respect to age, education, and aptitude level to warrant combining the data whenever statistically feasible. Therefore, data for the samples have been analyzed separately and in combination on the basis of both statistical and qualitative considerations. Means, standard deviations, and correlations with the criterion were calculated for the aptitude scores for each sample separately. Means and standard deviations of the aptitude scores were also calculated for the Combined Sample.

A. Statistical Analysis:

Since Sample I was tested with the B-1002A edition of the GATB and Sample II was tested with the B-1001 edition of the GATB, it was necessary to convert the B-1001 aptitude score means and standard deviations of Sample II to equivalent B-1002 means and standard deviations before combining the data of these two samples. The conversions were based on standard score equations for B-1001 and B-1002 aptitude scores. Appropriate formulae were used to combine the data to obtain means and standard deviations of the B-1002 aptitude scores for the combined sample of 149 Seamers.

Table III-A shows the B-1002 means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB, for Sample I. Table III-B shows the B-1001 means and standard deviations, equivalent B-1002 means and standard deviations and Pearson product-moment correlations with the criterion for the aptitudes of the GATB for Sample II. Table III-C shows the means and standard deviations for the aptitudes of the GATB, B-1002, for the Combined Sample.

The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III-A

B-1002 Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Seamer 6-27.513

Sample I
N = 58

Aptitudes	M	σ	r
G-Intelligence	90.3	13.0	.237
V-Verbal Aptitude	93.3	13.1	.210
N-Numerical Aptitude	93.4	15.1	.254
S-Spatial Aptitude	88.3	14.7	.157
P-Form Perception	100.9	16.7	.410**
Q-Clerical Perception	103.6	15.5	.295*
K-Motor Coordination	109.0	14.7	.155
F-Finger Dexterity	106.2	16.4	.040
M-Manual Dexterity	106.2	17.1	-.078

**Significant at the .01 level
*Significant at the .05 level

TABLE III-B

B-1001 Means (M) and Standard Deviations (σ), Equivalent B-1002 Means and Standard Deviations and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Seamer 6-27.513

Sample II
N = 91

	B-1001		Equivalent B-1002		
Aptitudes	M	σ	M	σ	r
G-Intelligence	91.4	14.2	87	13	.105
V-Verbal Aptitude	89.6	14.5	89	15	.066
N-Numerical Aptitude	91.5	15.1	87	14	.123
S-Spatial Aptitude	93.0	15.8	89	16	.064
P-Form Perception	100.1	15.7	98	15	.080
Q-Clerical Perception	92.1	13.6	93	13	.098
A-Aiming #	96.7	15.3	98	14	.136
T-Motor Speed #	94.3	16.5	97	16	.186
F-Finger Dexterity	100.0	15.6	96	16	.237*
M-Manual Dexterity	107.1	16.9	104	17	.130

*Significant at the .05 level
#Converts to equivalent B-1002 score on Aptitude K - Motor Coordination

TABLE III-C

Means (M) and Standard Deviations (σ)
for the Aptitudes of the GATB, B-1002

Seamer 6-27.513

Combined Sample
N = 149

Aptitudes	M	σ
G-Intelligence	88.2	13.1
V-Verbal Aptitude	90.6	14.4
N-Numerical Aptitude	89.3	14.6
S-Spatial Aptitude	88.6	15.6
P-Form Perception	99.2	15.9
Q-Clerical Perception	97.3	15.2
K-Motor Coordination #	101.7	16.7
F-Finger Dexterity	99.9	16.7
M-Manual Dexterity	104.8	17.0

#Based on combination of converted Aptitude T data for Sample II and Aptitude K data for Sample I

The highest mean scores in descending order of magnitude for the Combined Sample were obtained for Aptitudes M, K, F, and P, respectively. All the aptitudes have standard deviations of less than 20. Aptitude G has the lowest standard deviation for the Combined Sample.

For Sample I, Aptitude P correlates significantly with the criterion at the .01 level and Aptitude Q at the .05 level. For Sample II, Aptitude F correlates significantly with the criterion at the .05 level.

B. Qualitative Analysis:

The job analysis data indicated that the following aptitudes measured by the GATB appeared to be important for the occupation of Seamer:

Form Perception (P) - required to match the edges of the leg of hosiery to the full fashioned markings, to observe the hosiery for matchings and fine seams and for determining condition of picot after seaming operation.

Motor Coordination (K)--B-1001 edition, or Aiming (A) and Motor Speed (T)--B-1001 edition - required to guide the matched edges of the hosiery into the feeding mechanism of the machine and to thread the machine; also needed in meeting production schedule.

Finger Dexterity (F) and Manual Dexterity (M) - required in threading the machine, guiding thread through tension devices and guides, uncurling selvages and holding the matched edges in position, and in guiding the stocking into the machine.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes P, K, F, and M (P, T, F, and M for B-1001) warranted further consideration for inclusion in the test norms. It was found that Aptitude A did not discriminate as effectively between the high and low criterion groups for Sample II as did Aptitude T. Therefore, Aptitude A was excluded from further consideration. The evidence for each of these aptitudes is indicated below.

Aptitude	Relatively High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
P	X	X (for Sample I)	X
K	X		X
F	X	X (for Sample II)	X
M	X		X

Although Aptitude Q correlates significantly with the criterion for Sample I, it was not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance.

Various combinations of Aptitudes P, K, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in Section VII) was determined for each sample separately and for the Combined Sample.

A comparison of the results showed that B-1002 norms consisting of P-80, K-90, F-80, and M-80 had the best selective efficiency for the Combined Sample.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 8 points of one standard deviation below the aptitude mean of the sample of the Combined Sample.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficients between the test norms and the criteria and applying the Chi Square test, the criteria for Samples I and II were dichotomized.

Sample I

The Berkshire Knitting Mills considers a production record of 2.5 dozen stockings per hour as the break-even point for the company and the employee. The company's expressed desire, however, is a production average of 3 dozen stockings per hour.

A criterion critical score of 3 dozen stockings per hour seemed to be too far above the company's break-even point and tended to place a relatively high proportion (41 percent, or 24 of the 58 women) of the sample in the low criterion group. In view of this, the criterion was dichotomized with a critical score of 2.9 dozen stockings per hour, which is slightly lower than the company's expressed desire and which placed 18, or 31 percent, of the 58 workers in the low criterion group. Those women who seamed an average of 2.9 dozen stockings or more an hour were placed in the high criterion group, and those who had an average production record of 2.8 dozen stockings or less per hour were placed in the low criterion group.

Sample II

At the Chadbourn Hosiery Mills, Incorporated, the base production of 28 dozen stockings per eight-hour day ($3\frac{1}{2}$ dozen per hour) is the accepted norm and is assigned a numerical rating of 100. In view of this, the criterion was dichotomized by placing those workers with a numerical rating of 100 and above in the high criterion group and those with a numerical rating of 99 and below in the low criterion group. This placed 31, or 34 percent, of the 91 workers in the low criterion group.

The B-1002 norms were used to compute the tetrachoric correlation and apply the Chi Square test for Sample I, and the equivalent B-1001 norms were used when these computations were made for Sample II. The tetrachoric correlation and Chi Square test for the combined sample are based on a table which is a composite of the tables obtained for each sample for its respective norms.

Table IV-A and IV-B show the discriminative value of the B-1002 norms and B-1001 norms for Samples I and II, respectively. Table IV-C shows the discriminative value of the norms for the combined sample. In each table workers in the low criterion group were designated as "poor workers" and those in the high criterion group were designated as "good workers."

TABLE IV-A

Relationship between B-1002 Test Norms Consisting of Aptitudes P, K, F, and M with Critical Scores of 80, 90, 80, and 80, Respectively and the Criterion for Sample I

Seamer 6-27.513
N = 58

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	34	40
Poor Workers	11	7	18
Total	17	41	58

$r_{tet} = .70$ $\quad X^2 = 10.611$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .005$

Data in the above table indicate a significant relationship between the norms and the criterion for Sample I.

TABLE IV-B

Relationship between B-1001 Test Norms Consisting of Aptitudes P, T, F, and M with Critical Scores of 80, 85, 85, and 80, Respectively and the Criterion for Sample II

Seamer 6-27.513
N = 91

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	14	46	60
Poor Workers	22	9	31
Total	36	55	91

$r_{tet} = .68$ $\quad X^2 = 17.455$

$\sigma_{r_{tet}} = .17$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for Sample II.

TABLE IV-C

Relationship between Test Norms and the Criterion for the Combined Sample

B-1001 Norms: P-80, T-85, F-85, M-80
B-1002 Norms: P-80, K-90, F-80, M-80

Seamer 6-27.513
N = 149

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	20	80	100
Poor Workers	33	16	49
Total	53	96	149

$r_{tet} = .69$ $\quad X^2 = 30.135$

$\sigma_{r_{tet}} = .14$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Combined Sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, it is recommended that Aptitudes P, K, F, and M with minimum scores of 80, 90, 80, and 80, respectively, be used as B-1002 norms for Seamer 6-27.513. Equivalent B-1001 norms consist of P-80, T-85, F-85, and M-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include four aptitudes, only those occupational aptitude patterns which include three of those four aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. Three of the existing 23 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-15, P-85, K-80, M-80; OAP-16, P-75, F-80, M-80; and OAP-17, K-85, F-80, and M-80. The selective efficiency of each of these OAP's for this sample was determined by means of the tetrachoric correlation technique. A significant relationship was obtained between each of the three OAP's and the dichotomized criterion and each OAP screened out a proportion of the sample that was within the required range of .10 and .60. However, the highest tetrachoric correlation, .61 with a standard error of .15, was obtained for OAP-17. The proportion of the sample screened out by OAP-17 was .23. Therefore, it is recommended that OAP-17 be used in counseling for the occupation of Seamer 6-27.513.

PART II

I. Summary

After the analysis for the two samples covering the occupation of Seamer 6-27.513 was completed and the B-324 norms were established, test development data became available for an additional sample of Seamers 6-27.513. This sample has been designated as Sample III. It was found that the B-324 norms showed good selective efficiency for Sample III as well as for the Combined Sample. The data in Table VII-B show the relationship between the test norms and the Combined Sample. The data in this table indicate that 44 of the 66 poor workers, or 67 percent of them did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 67 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 105 of the 127 workers who made qualifying test scores, or 83 percent, were good workers.

II. Sample III

The GATB, B-1002A, was administered August 20, 21, and 22, 1956 to a sample of 51 women employed at the J. W. Landenberger Company, Philadelphia, Pennsylvania. All available workers were tested.

Training consists of on-the-job instruction given by the supervisor of the Training Department and two assistants. The training time consists of a period of three or four weeks or a minimum of 240 hours. Most of the applicants are referred by the local office. About ten percent of new hires are friends of employees.

The company had been using the B-324 norms for selection but this had not proved to be entirely satisfactory. The B-324 norms were developed on a sample of Seamers on full-fashion hosiery. Seamers at the J. W. Landenberger Company make footlets and the operations on footlets are much smaller and more difficult because of the size and lightness of the material.

The company was using Ladham's Test to screen applicants but wanted something better so that applicants could be screened at the local offices. Ladham's Test was made up by an English firm who took three months to determine the elements needed and the tests to be used. It consists of five points:

1. Eye Test - Uses sterescopic cards looking through a sterescope. There are 7 cards which are so placed to test each eye for visual acuity. (This is an instrument similar to the one used by oculists.)

2. Pin Board - Applicant picks up three pins at a time and inserts them into one hole on the board. Works first with right hand and then with left hand. Time limit for each, 1½ minutes. Cut-off score between 63 - 73.

3. Form Board - Places shaped pieces on left side of board into shaped holes on right side using one hand.

4. Form Board - Some pieces are cut in two and with the two parts rearranged. Applicant must arrange the two pieces and place them in the correct shaped hole on the right. Time in seconds for both 3 and 4 in 120 minutes.

5. Perception of hidden letters and numbers in squares.

Table V-A shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience, for Sample III. Table V-B shows the means and standard deviations for the Combined Sample.

TABLE V-A

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience for Sample III

Seamer 6-27.513
N = 51

	M	σ	Range	r
Age (years)	27.1	9.4	17-47	.135
Education (years)	9.6	1.6	6-13	.083
Experience (months)	25.0	17.4	3-72	.155

There are no significant correlations with the criterion for age, education, or experience. The data indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

TABLE V-B

Means (M), Standard Deviations (σ) and Ranges for Age, Education, and Experience for the Combined Sample

Seamer 6-27.513
N = 200

	M	σ	Range
Age (years)	29.8	7.8	17-49
Education (years)	10.2	1.8	5-14
Experience (months)	59.2	39.2	3-192

III. Job Description

Job Title: Seamer 6-27.513

Job Summary: Operates a power driven single needle sewing machine to sew seams on a Singer or Merrow Overlock Machine with trimming attachment to sew elastic thread around edges of footlets, to make toe guards, or to make overlock seams on footlets without elastic thread.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion used for this study consisted of average hourly earnings for a four week period. The average hourly earning for each worker was computed from the weekly wage and number of hours worked. The hourly earning was multiplied by 100 to remove the decimal and the actual figures were used in all computations.

VI. Statistical and Qualitative Analyses

Data for Sample III were analyzed separately and in combination with Combined Sample of Sample I and II on the basis of both statistical and qualitative considerations.

A. Statistical Analysis:

Table VI-A shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB for Sample III. Table VI-B shows the means and standard deviations for the aptitudes of the GATB for the Combined Sample. The means and standard deviations are comparable to general working population norms with a mean of 100 and a standard deviation of 20 for each aptitude.

TABLE VI-A

Means (M), Standard Deviations (σ), and
Pearson Product-Moment Correlations with the Criterion (r)
for the Aptitudes of the GATB for Sample III

Seamer 6-27.513
N = 51

Aptitudes	M	σ	r
G-Intelligence	80.6	14.5	.375**
V-Verbal Aptitude	82.9	11.4	.335*
N-Numerical Aptitude	82.4	15.7	.349*
S-Spatial Aptitude	85.7	17.9	.237
P-Form Perception	96.2	16.0	.234
Q-Clerical Perception	95.7	12.3	.262
K-Motor Coordination	97.5	13.7	.133
F-Finger Dexterity	101.0	18.6	.274
M-Manual Dexterity	103.5	18.3	.208

**Significant at the .01 level
*Significant at the .05 level

TABLE VI-B

Means (M) and Standard Deviations (σ)
for the Aptitudes of the GATB for the Combined Sample

N = 200

Aptitudes	M	σ
G-Intelligence	86.3	14.0
V-Verbal Aptitude	88.6	14.0
N-Numerical Aptitude	87.5	15.4
S-Spatial Aptitude	87.9	16.3
P-Form Perception	98.4#	16.0
Q-Clerical Perception	97.0	14.4
K-Motor Coordination	100.5#	16.1
F-Finger Dexterity	100.2#	17.4
M-Manual Dexterity	104.3#	17.3

Table VI-A, which presents data for Sample III, shows that the high mean scores in descending order of magnitude were obtained for Aptitudes M, F, K, and P, respectively. All the aptitudes have standard deviations of less than 20. Aptitude V has the lowest standard deviation. For a sample of 51 cases, correlations of .358 and .276 are significant at the .01 level and the .05 level of confidence, respectively. Aptitude G correlates significantly with the criterion at the .01 level and Aptitudes V and N at the .05 level.

Table VI-B, which presents the means and standard deviations of the aptitudes of the GATB for the Combined Sample, shows that the highest mean scores in descending order of magnitude were obtained for Aptitudes M, K, F, and P, respectively.

B. Qualitative Analysis:

The job analysis for Sample III indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Form Perception (P) - required to match the edges of the footlets, attach elastic at proper places and to attach heel pads in proper position.

Motor Coordination (K) - required to guide the matched edges of the footlets into the feeding mechanism of the machine and to thread the machine.

Finger Dexterity (F) and Manual Dexterity (M) - required to thread machines; guide thread through tension devices and guides; to hold the matched edges in position; and to guide the stocking into the machine.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes P, K, F, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

Aptitude	Relatively High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
P	X		X
K	X		X
F	X		X
M	X		X

Although Aptitudes G, V, and N showed significant correlations with the criterion, these aptitudes were not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance and these aptitudes had been eliminated from final consideration for the other two samples in B-324 on the basis of the reasons cited in the Statistical and Qualitative Analyses of those data. Various combinations of Aptitudes P, K, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in Section VII) was determined for Sample III separately and for the combined sample.

A comparison of the results showed that B-1002 norms consisting of P-80, K-90, F-80, and M-80 had the best selective efficiency for the combined sample.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test for Sample III, the criterion was dichotomized by placing one-third of the sample in the low criterion group. This was accomplished by using an average hourly rate of $1.06 as the criterion critical score, and resulted in 17 of the 51 workers, or 33 percent of the sample, being placed in the low criterion group.

Table VII-A shows the relationship between test norms consisting of Aptitude P, K, F, and M with critical scores of 80, 90, 80, and 80 respectively, and the dichotomized criterion for Sample III. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE VII-A

Relationship between Test Norms Consisting of Aptitudes P, K, F, and M with Critical Scores of 80, 90, 80, and 80 Respectively, and the Criterion for Sample III

Seamer 6-27.513
N = 51

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	25	34
Poor Workers	11	6	17
Total	20	31	51

$r_{tet} = .57$ $\quad X^2 = 5.439$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .01$

The data in the above table indicate a significant relationship between the test norms and the criterion for Sample III.

Table VII-B, a composite of tables for the three samples, shows the relationship between test norms consisting of Aptitudes P, K, F, and M with critical scores of 80, 90, 80, and 80 respectively, and the dichotomized criteria for the Combined Sample. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE VII-B

Relationship between Test Norms Consisting of Aptitudes P, K, F, and M with Critical Scores of 80, 90, 80 and 80 Respectively, and the Criterion for the Combined Sample

Seamer 6-27.513
N = 200

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	29	105	134
Poor Workers	44	22	66
Total	73	127	200

$r_{tet} = .66$ $\quad X^2 = 36.759$

$\sigma_{r_{tet}} = .12$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Combined Sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes P, K, F, and M with minimum scores of 80, 90, 80, and 80 respectively, are recommended as B-1002 norms for the occupation of Seamer 6-27.513. The equivalent B-1001 norms consist of P-80, T-85, F-85, and M-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include four aptitudes, only those occupational aptitude patterns which include three of those four aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. Three of the existing 23 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-15, P-85, K-80, and M-80; OAP-16, P-75, F-80, and M-80; and OAP-17, K-85, F-80, and M-80. The selective efficiency of each of these OAP's for the Combined Sample of 200 was determined by means of the tetrachoric correlation technique. A significant relationship was obtained between each of the three OAP's and the dichotomized criteria for the combined sample and each OAP screened out a proportion of the sample that was within the required range of .10 and .60.

The same tetrachoric correlation (.58) with a standard error of .13 was obtained for OAP-16 and OAP-17. However, the OAP-17 norms failed a proportion of the sample closer to the proportion of the sample in the low criterion group. The proportion of the sample screened out by OAP-17 was .24. Therefore, it is recommended that OAP-17 be used in counseling for the occupation of Seamer 6-27.513.