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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 also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

COIL WINDER II (elec. equip.) 724.884

S-220

U. S. Employment Service in
Cooperation with
Wisconsin State Employment Service

February 1963

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GATB #2366

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

COIL WINDER II (elec. equip.) 724.884

S-220

Summary

The General Aptitude Test Battery, B-1002A, was administered to a final sample of 65 women employed as Coil Winders II 724.884. Thirty-eight of these women were employed at the Industrial Coils, Incorporated, Baraboo, six at the Marathon Electric Company, Wausau, and twenty-one at Whitewater Electronics, Incorporated, Whitewater, Wisconsin. The criterion consisted of supervisory ratings. On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception, Q-Clerical Perception, F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the final test norms.

GATB Norms for Coil Winder II (elec. equip.) 724.884

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
Q	CB-1- B	90	Q	Part 1	90
F	CB-1- O CB-1- P	90	F	Part 11 Part 12	85
M	CB-1- M CB-1- N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 15 of the 22 poor workers, or 68 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 68 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 36 of the 43 workers who made qualifying test scores, or 84 percent, were good workers.

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TECHNICAL REPORT

I. Purpose

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 Coil Winder II (elec. equip.) 724.884

II. Sample

The General Aptitude Test Battery, B-1002A, was administered during August and October, 1958 to thirty-eight women employed as Coil Winders II 724.884 at the Industrial Coils, Incorporated, Baraboo, Wisconsin. This sample was increased with the testing of six women similarly employed at the Marathon Electric Company, Wausau, on August 1, 1960 and by testing twenty-one women at Whitewater Electronics, Incorporated, Whitewater, Wisconsin on March 30 and April 3, 1961. These 65 women represented all of the workers in the occupation at these three plants at the times of testing.

On the average it takes two months for a worker to reach satisfactory production. All of the workers in this sample had at least two months of experience. An 8th grade education is preferred, but this has not been a strict hiring requirement. The minimum age requirement is 18 years. The selection of applicants for employment is made on the basis of a personal interview and a check of references.

TABLE I

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

N = 65	M	σ	Range	r
Age (years)	37.2	10.2	20-57	-.336**
Education (years)	10.3	2.1	6-16	.047
Experience (months)	54.8	28.3	2-106	.121

**Significant at the .01 level

There are no significant correlations between education or experience and the criterion. The correlation between age and the criterion is significant negatively at the .01 level of confidence indicating that the younger workers were receiving the higher ratings. The data in Table I indicate that the sample is suitable for test development purposes with respect to age, education, and experience.

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III. Job Description

Job Title: Coil Winder II(elec. equip.) 724.884

Job Summary:-- Winds ½" to 14" electric coils from 44 to 2 gauge wire for use in equipment such as radio equipment, cigarette machines and brake clutches, on a single or multiple coil winding machine. Pulls wire from feeder spool around tension guides and attaches end of wire to the bobbin, tube or arbor with gum tape or by winding wire around arbor. Sets automatic counter to predetermined number of winds. Depresses pedal to start machine. Brushes acetate solution on bare wire coil to hold wires together. Inserts paper and/or gum tape between windings to insulate and hold other coils together. Cuts wire with knife or pliers. Removes coils from arbor and places on bench or in cardboard box. When winding bare wire coils, places them in small heated press to dry and harden acetate. Replaces empty spools on machines: may wind spools of wire for machine from supply spool. Works from oral instructions and work ticket. Notifies foreman of defective machine operation.

IV. Experimental Battery

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

V. Criterion

The criterion consisted of descriptive supervisory ratings. The descriptive rating scale used consisted of 8 items, each covering an important aspect of the job duties. Each item had five statements regarding the degree of adequacy of performance, one of which was checked by the rater. The total score for each rating is equal to the sum of the numbers checked for all eight items. First line supervisory ratings were obtained for all 65 workers. Each worker was rerated from three to eight weeks later by the same rater. These two ratings had a correlation of .922 indicating significant criterion reliability. The final criterion was obtained by totalling the scores of the two ratings. The range of final criterion scores was 26-77, with a mean of 58.9 and standard deviation of 11.1.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

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

Form Perception (P) - required to detect errors in winding coils.

Finger and Manual Dexterity (F and M) - required to attach end of wire to bobbin, to brush acetate solution on wire coil, to insert paper and gum tape between windings, to cut wire with knife or scissors, and to remove coil from arbor.

On the basis of the job analysis data, aptitude V-Verbal was rated as irrelevant for successfully performing the duties of this job.

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B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 65

Aptitudes	M	σ	r
G-Intelligence	96.6	14.0	.343**
V-Verbal Aptitude	97.8	13.6	.285*
N-Numerical Aptitude	96.6	14.3	.254*
S-Spatial Aptitude	95.1	16.9	.398**
P-Form Perception	99.2	17.4	.326**
Q-Clerical Perception	104.6	15.2	.246*
K-Motor Coordination	102.5	18.8	.353**
F-Finger Dexterity	101.7	19.2	.383**
M-Manual Dexterity	106.7	20.5	.322**

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

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					x			x	x
Irrelevant		x							
Relatively High Mean						x	x	x	x
Relatively Low Sigma	x	x	x						
Significant Correlation with Criterion	x	x	x	x	x	x	x	x	x
Aptitudes to be Considered for Trial Norms	G		N	S	P	Q	K	F	M

Trial norms consisting of various combinations of Aptitudes G,N,S,P,Q, K,F and M with appropriate cutting scores were evaluated against the criterion by means of the tetrachoric correlation technique. A comparison of the results showed that B-1002 norms consisting of P-80, Q-90, F-85 and M-85 had the best selective efficiency.

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VII. Validity of Norms (Concurrent)

The validity of the norms was determined by computing a tetrachoric correlation between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 34 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes P,Q,F and M with critical scores of 80, 90, 85, and 85, respectively, and the dichotomized criterion for Coil Winder II 724.884. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Coil Winder II (elec. equip) 724.884
(P-80, Q-90, F-85, M-85)

N = 65	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	36	43
Poor Workers	15	7	22
Total	22	43	65

$r_{tet} = .75$ $\quad \chi^2 = 15.269$
$\sigma_{r_{tet}} = .21$ $\quad P/2 < .0005$

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

VIII. Conclusions

On the basis of the results of this study, Aptitudes P, Q, F and M with minimum scores of 80, 90, 85 and 85, respectively, have been established as B-1002 norms for Coil Winder II 724.884. The equivalent B-1001 norms consist of P-80, Q-90, F-90 and M-90.

IX. Determination of Occupational Aptitude Pattern

Of the existing 35 OAP's (revised 10/61), a significant relationship between OAP-33 and the criterion for the experimental sample was obtained. The proportion of the sample screened out by OAP-33 was .21, which is within the required range of .10 to .60. Therefore, the occupation of Coil Winder II 724.884 has been incorporated in OAP-33.