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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)

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

TUBE-MACHINE OPERATOR (elec. equip.) 7-00.216

~~B-615~~
S-335

U. S. Employment Service
in Cooperation with
Florida, Maryland, Michigan, New Jersey and Texas
State Employment Services

Key State Agency - New Jersey

March 1965

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

TUBE-MACHINE OPERATOR (elec. equip.) 7-00.216

B-615

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 84 men employed as Tube-Machine Operator 7-00.216 at various plants of the General Cable Corporation located in Florida, Maryland, Michigan and Texas. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, N-Numerical Aptitude and Q-Clerical Perception were selected for inclusion in the final norms.

GATB Norms for Tube-Machine Operator 7-00.216.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	95	G	Part 3 Part 4 Part 6	90
N	CB-1- D CB-1- I	80	N	Part 2 Part 6	75
Q	CB-1- B	70	Q	Part 1	75

Effectiveness of Norms

The data in Table IV indicate that only 70 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 78 percent would have been good workers. 30 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 22 percent would have been poor workers.

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 Tube-Machine Operator 7-00.216.

II. Sample

The General Aptitude Test Battery, B-1002B, was administered during the period December 1963 through September 1964 to 86 men employed as Tube-Machine Operator 7-00.216 at plants of the General Cable Corporation in the following cities: Tampa, Florida; Elkton, Maryland; Cass City, Michigan; Bonham, Texas. Of the 86 tested workers, 2 were eliminated from the final sample; one because of a hand injury which adversely affected his manual dexterity performance and one because of difficulty in taking the GATB. The final sample consisted of 84 men.

Entrance requirements for this job vary in the four plants. Individuals are selected on the basis of a standard interview at the Florida and Michigan plants. At the Maryland plant, selection of workers is based on a standard interview and a general mathematics test of computation. Workers at the Texas plant are selected on the basis of a standard interview, a multi-digit multiplication problem, a multi-digit division problem, and a color vision test. The training period at the four plants consists of six weeks to two months on-the-job training.

TABLE I

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

N = 84	M	σ	Range	r
Age (years)	30.6	7.2	20-51	.064
Education (years)	11.4	1.1	8-13	.065
Experience (months)	33.1	21.0	2-85	.025

III. Job Description

Job Title: Tube-Machine Operator, 7-00.216

Job Summary: Sets up and operates, in a series, extruding machine and auxiliary equipment which applies plastic around wire and cable for electrical insulation or for physical protection, or both, according to prescribed specifications.

Work Performed: Prepares for production run by setting up equipment and ascertaining specific product requirements from work order and specification sheet.

Loads and maintains specific quantity (i.e., type and color of plastic granules or dry blend)into machine hopper. Selects prescribed attachments (e.g., tip, die and screen pack) according to written process requirements and mounts on machine using hand wrench.

Presses and manipulates various electric controls to start and govern extrusion process and attain desired extrusion temperature and speed. Manually pushes selected sample length of conductor, wire or cable into tapered guide through extrusion head and pulls it out through die in order to obtain sample coating. Inspects and checks coated cable by measuring circumference and diameter using steel tape and micrometer, and visually inspects outer surface for finish characteristics. Checks cross section of insulation for center uniform thickness at all points around the wire or cable. Adjusts nuts of die holder with hand wrench to obtain extruded product of uniform center.

Rolls reel of cable or wire into position at payoff stand and positions it. Loads empty reel into take-up stand at opposite end of line. Attaches rope to cable end and threads rope through counter, guide, forming roll, extruder head, water cooling trough, spark tester, printer, around capstan, to take-up reel. Selects and inserts prescribed printing band into printing machine.

Manipulates manual and electric control switches to start feed of cable through continuous coating process. Patrols machine area to observe process. Inspects diameter of cable and makes proper adjustment of lever or wheel to govern capstan speed.

Checks water and process temperature and makes corrective adjustments to controls if necessary. Observes signals from testing device for breaks in insulation and inserts marker at windup reel to indicate defective area. Observes automatic wind-up of finished cable and adjusts traverse guide to insure even, tight wind. Removes filled reel from take-up stand. Disassembles and cleans extruder head. Maintains quality production, temperature and speed records.

IV. Experimental Battery

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

V. Criterion

The criterion data collected consisted of two sets of independent ratings made by the first and second-line supervisors on USES Form SP-21, "Descriptive Rating Scale." The rating scale consisted of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliability coefficient of .94 was obtained for the criterion. Therefore, the two sets of ratings were combined, resulting in a distribution of final criterion scores of 37-90, with a mean of 69.9 and a standard deviation of 10.7.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this occupation:

Intelligence (G) - required to read and understand prescribed specifications in order to make necessary adjustments and set-ups to control size of wire, thickness of coating, heat, rate of cooling speeds, etc.

Numerical Aptitude (N) - required to make computations for operational needs and to interpret readings from various measuring devices.

Form Perception (Q) - required to read and compare various guages and signaling devices and to record data on reports and on identifying reel tags.

Manual Dexterity (M) - required to load and unload reels; to manipulate manual and electric control switches and to start feed of cable; to thread ropes through various parts of machine.

Form Perception (P) - required to inspect and check cables; to observe signals from testing device for breaks in insulation; and to observe automatic wind-up of finished cable.

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 = 84

Aptitudes	M	σ	r
G-Intelligence	97.3	13.9	.184
V-Verbal Aptitude	91.4	12.9	.145
N-Numerical Aptitude	98.1	14.9	.246*
S-Spatial Aptitude	101.1	17.2	-.015
P-Form Perception	97.7	16.4	.013
Q-Clerical Perception	98.7	12.9	-.063
K-Motor Coordination	99.0	17.4	.108
F-Finger Dexterity	101.4	16.2	.029
M-Manual Dexterity	116.6	22.5	.060

*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	X			X
Irrelevant									
Relatively High Mean				X				X	X
Relatively Low Sigma	X	X	X			X			
Significant Correlation with Criterion			X						
Aptitudes to be Considered for Trial Norms	X		X			X			X

Trial norms consisting of various combinations of Aptitudes G, N, Q and M with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-90, N-75 and Q-75 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 30 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 G, N and Q with critical scores of 90, 75 and 75, respectively, and the dichotomized criterion for Tube-Machine Operator 7-00.216. 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 Tube-Machine Operator 7-00.216
(G-90, N-75, Q-75)

N = 84	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	16	43	59
Poor Workers	13	12	25
Total	29	55	84

Phi Coefficient = .239

$\chi^2 = 4.805$

$P/2 < .025$

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 G, N and Q with minimum scores of 90, 75 and 75, respectively, have been established as B-1002 norms for Tube-Machine Operator 7-00.216. The equivalent B-1001 norms consist of G-95, N-80 and Q-70.

IX. Determination of Occupational Aptitude Pattern

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.