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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 and a personnel evaluation form are also included. (AG)

June 1970

U.S. Training and Employment Service Technical Report S-74 R

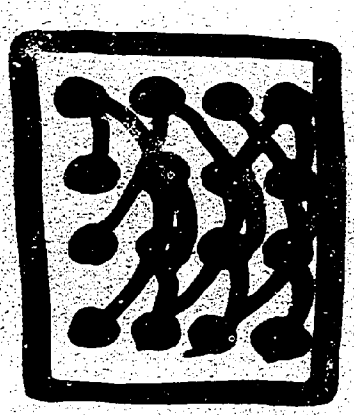
Development of USTES

APTITUDE TEST BATTERY FOR

CENTRAL-OFFICE REPAIRMAN

(tel. & tel.)
822.281

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For . . .

Central-Office Repairman (tel. & tel.) 822.281

S-74R

(Developed in Cooperation with the
North Dakota State Employment Service)

U. S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexerity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study #2041

Development of USTES Aptitude Test Battery

For

Central-Office Repairman (tel. & tel.) 822.281-014

S-74R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Central-office repairman (tel. & tel.) 822.281-014. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S-Spatial Aptitude	105
Q-Clerical Perception	85
M-Manual Dexterity	85

Research Summary

Sample:

64 male workers employed as Central-Office Repairmen in North Dakota.

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status is unknown.

Criterion:

Supervisory ratings.

Design

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .46 ($P/2 < .0005$)

Effectiveness of Norms:

Only 69% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 87% would have been good workers. Thirty-one percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 13% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1.

TABLE I

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	69%	87%
Poor Workers	31%	13%

SAMPLE DESCRIPTION

Size:

N = 64

Occupational Status:

Employed Workers.

Work Setting:

Workers were employed by the Northwestern Bell Telephone Company throughout the State of North Dakota.

Employer Selection Requirements:

Education: None required. High school education preferred.

Previous Experience : None required.

Tests: None used.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the final sample had at least four months job experience.

TABLE 2

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

	Mean	SD	Range	r
Age (years)	30.2	7.4	21-62	-.212
Education (years)	12.1	1.2	8-16	.276*
Experience (months)	34.5	41.9	4-317	-.060

*Significant at the .05 level.

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A, were administerd during the period of January through June 1954.

CRITERION

The criterion consisted of supervisory ratings. A descriptive rating scale based on an evaluation of the tasks of the occupation was developed. There were eight ratable traits included in the rating scale. The ratings were marked on a horizontal scale numbered in five-point steps from 0 to 100. Numerical ratings on each factor were assigned to correspond to the following qualitative categories:

Outstanding	- 90 to 100
Above Average	- 75 to 89
Average	- 45 to 74
Below Average	- 0 to 44

Since the workers in this sample were from various districts, there were several supervisors involved in rating them against the common standards on the rating scale. When two supervisors were acquainted with the workers, each rated the workers independently. However, when only one supervisor knew the workers, a second rating by the same supervisor, made approximately two weeks later, was obtained if possible. For forty-two of the workers two ratings were available. One rating was obtained for each worker in the remainder of the sample. The rating scale score for each individual was the numerical average of his rating for the eight job factors on the descriptive rating scale. The final criterion score for those workers who were rated twice consisted of the average of their first and second rating scale scores. The distribution of rating scale scores ranged from 45 to 94, with a mean of 73.7 and a standard deviation of 11.6.

Criterion Reliability: A correlation was computed between the first and second rating scale scores of the 42 workers in the sample for whom two ratings were available. The obtained correlation was .94, which indicates substantial agreement between the two sets of ratings.

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 31% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 71.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performance)

Aptitude	Rationale
G - General Learning Ability	Required to acquire the knowledge and understanding of the principles of electricity and electronics theory needed in the repair of equipment.
S - Spatial Aptitude	Required to read and interpret drawings which show construction plans and to illustrate how electrical telephone equipment circuits are operated.
F - Finger Dexterity	Required to handle and assemble parts of telephone equipment and small tools.
M - Manual Dexerity	Required in the skillful use of tools in adjusting, removing, installing and repairing telephone equipment.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB
N = 59

	Mean	SD	Range	r
G - General Learning Ability	112.7	16.4	77-150	.373**
V - Verbal Aptitude	105.7	14.2	74-149	.275*
N - Numerical Aptitude	109.6	15.0	76-139	.303*
S - Spatial Aptitude	116.0	18.9	71-156	.372**
P - Form Perception	110.4	15.2	75-151	240
Q - Clerical Perception	109.1	13.6	80-141	.354**
K - Motor Coordination	107.1	15.4	66-144	151
F - Finger Dexterity	106.7	16.1	63-143	240
M - Manual Dexterity	111.9	23.3	75-160	316*

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

TABLE 5

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
Irrelevant									
Relatively High Mean	X			X					X
Relatively Low Standard Dev.		X	X			X			
Significant Correlation with Criterion	X	X	X	X		X			X
Aptitudes to be Considered for Trial Norms	G	V	N	S		Q			M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G,V,N,S,Q, and M at trial cutting scores were able to differentiate between the 69% of the sample considered to be good workers and the 31% of the sample considered to be poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample; for two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of S-105, Q-85 and M-85 provided optimum differentiation for the occupation of Central-Office Repairman 822.281-014. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .46 (statistically significant at the .01 level).

TABLE 6

Concurrent Validity of Test Norms S-105, Q-85, and M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	34	44
Poor Workers	15	5	20
Total	25	39	64

Phi Coefficient = .46 Chi Square (X^2_y) = 13.7
Significant Level = P/2 $<$ .0005

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study did not meet the requirements for incorporating the occupation studied into an OAP. However, the occupation was placed in OAP-15 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery as a result of qualitative analysis.

FORM NDP - 4A

EMPLOYEE PROGRESS REPORT
Northwestern Bell Telephone Company

NAME _____ (Last) (First) (Middle)

LOCATION _____ (City) (State)

TITLE _____

DATE OF BIRTH _____

FORCE GROUP _____

EDUCATION (Circle Highest Year Completed)
High School 1 2 3 4
College 1 2 3 4

ON EQUIPMENT WORK SINCE _____ D. O. T. _____

DATE OF THIS RATING _____

TITLE AND CODE _____

THIS EMPLOYEE CAN BEST BE DESCRIBED AS:
- ☐ A–One who is fully qualified to handle all phases of central office maintenance and trouble clearing in the exchange to which he is assigned.
- ☐ B–One who is an average workman he can do most routine testing jobs and is fairly skillful in clearing trouble.
- ☐ C–One who efficiently performs routine central office duties but is limited in his ability to handle the more intricate and complex phases of the work.

ORAL EXPRESSION Ability to get understanding--testboard work with customer & installer, repairman--make clear concise report of trouble conditions.	Expresses self unusually well.	Has ability to express self well.	Experiences difficulty at times in expressing thoughts.	Unable to express self well.
JUDGMENT How effectively does he plan his work? Does he make sound decision?	Work shows a very good judgment and careful, planning. Can exercise independent judgment.	Judgment usually good.	Judgment fair on ordinary matters.	Makes many errors in judgment.
ACCURACY How accurately does he do his work? Freedom from error in preparing written report or in following instructions.	Work always good and according to instructions.	Work ordinarily good, with but few errors.	Careless work. Many errors.	Poor work.
QUICKNESS TO LEARN Ability to learn new methods, practices. --Training classes. --On-the-Job Training. --Job experience.	Learns quickly.	Learns fairly fast.	Has difficulty at times in grasping new ideas.	Slow to learn.
SKILL Proficiency in work performance. Fine touch on manual ability for good workmanship with small tools & gauges in making precise mechanical adjustments.	Displays considerable skill in all work operations.	Shows fair degree of skill.	Somewhat lacking in skill.	Very little skill. All thumbs.
PROGRESS Job interest. Efforts made for improvement in workmanship & knowledge.	Seeks opportunities to increase knowledge & improve workmanship.	Endeavors to improve himself on the job.	Efforts confined to make passable progress.	Indifferent. Poor progress.
SPEED Consistent with good and safe workmanship.	Fast and careful worker.	Works at a fair rate of speed.	Works only fast enough to get by.	Slow worker.
RESOURCEFULNESS Ability to apply knowledge & experience in clearing equipment trouble. Develops original solution to problems	Highly resourceful-- --Knows eqpt well enuf to effectively analyze & clear trble conditions. --Contributes practical suggestions for doing things in new & better ways.	Can handle most trouble conditions. Make some contributions toward improved testing procedures.	Somewhat lacking in resourcefulness. Makes very few suggestions. Occasionally needs help.	Very routine worker. Resists trying new ways.
KNOWLEDGE How much knowledge does he have of his particular job? His understanding of the methods & eqpt connected with his job.	Good understanding of the principles of electricity including the electronic theory & application to eqpt for he is responsible.	Has a good understanding of the technical aspects of his job.	Has a fair amount of knowledge related to his assignment but is lacking in knowledge of other equipment operation.	Understands only a limited phase of his job.

100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0

OUTSTANDING — ABOVE AVERAGE — AVERAGE — BELOW AVERAGE

NAME
LOCATION

- 9 -

FACT SHEET

Job Title: Central-Office Repairman (tel. & tel.) 822.281-014

Job Summary: Tests and repairs telephone or telegraph circuits and equipment. Locates trouble and makes repairs to central-office apparatus, switches and relays used in circuits and equipment. Places and removes cross connections on wire distributing frames. Makes precision adjustments on switches, relays, and other apparatus, using special tools and gages.

Work Performed:

Places, removes, or changes cross connections on central-office distributing frames. Tests and modifies central-office equipment. Installs and maintains Private Branch Exchange switchboards and teletypewriters, including power assemblies and signaling units. Clears trouble on and handles routine maintenance of manual central-office switchboards, dial central-office switching apparatus, central-office power apparatus, generators, rectifiers, storage batteries, etc. Clears local and toll line facilities, including central-office equipment. Works with outdoor repairmen in clearing local and toll line trouble. Dispatches men handling installation of station equipment on subscriber premises. Maintains records and prepares periodic summary reports. May install and maintain mobile radio service and micro-wave radio relay systems.

Effectiveness of Norms:

Only 69% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-74R norms, 87% would have been good workers. Thirty-one percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-74R norms, only 13% would have been poor workers.

Applicability of S-74R Norms

The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 898-813

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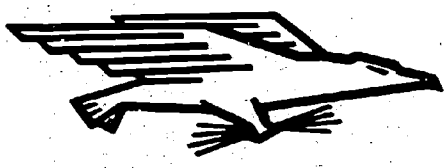

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