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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)

EU U67014

# Development of USES Aptitude Test Battery for Stacker

(pottery & porc.) 774.884

914

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Technical Report on Development of USES Aptitude Test Battery

STACKER (pottery & porc.) 774.884

S-268

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

July 1966

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

STACKER (pottery & porc.) 774.884  
S-268

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of STACKER (pottery & porc.) 774.884. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB B-1002 Scores
K - Motor Coordination	85
F - Finger Dexterity	90

RESEARCH SUMMARY

Sample:

53 female stackers; 41 employed at American Lava Corporation and 12 employed at D. M. Steward Manufacturing Company, Chattanooga, Tennessee.

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 means scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity: Phi Coefficient = .30 ( $P/2 < .025$ )

Effectiveness of Norms: Only 68% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 79% would

have been good workers. 32% 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 21% would have been poor workers. The effectiveness of the norms is shown graphically in Table I:

TABLE I  
Effectiveness of Norms

	Without Tests	With Tests
Good Workers	68%	79%
Poor Workers	32%	21%

SAMPLE DESCRIPTION

Size: N=53

Occupational Status: Employed workers

Work Setting: Workers were employed at American Lava Corporation and  
D. M. Steward Manufacturing Company, Chattanooga, Tennessee.

Employer Selection Requirements:

Education: Prefer 8th grade education

Previous Experience: No requirements

Tests: None

Other: Personal interview; must pass company physical examination.

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 sample had at least 1 month total job experience.

- 3 -  
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)	34.2	7.7	19-51	.336*
Education (years)	10.1	1.9	6-12	.118
Experience (months)	40.1	38.9	1-180	.478**

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

#### EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, were administered in July, 1962 and March, 1966, concurrent with the collection of criterion data.

#### CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as test data were collected. Ratings and reratings were made by the first-line supervisor with approximately two weeks interval between ratings.

Rating Scale: USES Form SP-21, "Descriptive Rating Scale." This scale (see Appendix) consisted of nine items covering different aspects of job performance. Each item had five alternatives corresponding to different degrees of job proficiency.

Reliability: The correlation between the ratings and reratings was .91. The final criterion consisted of the two sets of ratings combined.

Criterion Score Distribution: Possible Range: 18-90  
Actual Range: 38-87  
Mean: 60.3  
Standard Deviation: 9.7

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 32% of the sample in the low group. This dichotomy seems to agree generally with both employer's concept of "good workers" and "poor workers." The criterion critical score is 56.

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. Aptitudes K, F, and M which do not have a high correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that these aptitudes are important for the job duties and the sample had relatively high mean scores for the three aptitudes. On the basis of the qualitative analysis, aptitudes V and N were considered to be irrelevant for success in this occupation. 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 performed)

Aptitude	Rationale
P - Form Perception	Important to inspect pieces for gross defects, to see if any rods slip and to select proper sappers, spacers, or other articles.
K - Motor Coordination	Important to reach for pieces, apply glue to pieces, position top to base piece and drop them through holes in flat plate.
F - Finger Dexterity	Important to pick up one to ten rods, position disks on plate using all fingers on both hands, pick up a handful of disks and stack them in piles and to handle small articles.

M - Manual Dexterity                      Important to clean sagger by using stiff brush, sprinkle sand and place sagger in position by passing piece over steam of compressed air, to place piece in sagger by dipping either piece and to stack sagger rings.

TABLE 4

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

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	86.8	14.8	50-122	.241
V - Verbal Aptitude	89.7	13.1	65-121	.173
N - Numerical Aptitude	84.2	18.7	38-119	.231
S - Spatial Aptitude	92.0	15.8	58-133	-.040
P - Form Perception	95.2	19.4	39-131	-.063
Q - Clerical Perception	97.0	15.8	59-132	.000
K - Motor Coordination	95.8	16.7	56-134	.061
F - Finger Dexterity	105.2	17.9	58-149	.002
M - Manual Dexterity	96.2	18.5	54-139	.231

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		0	0							
Relatively High Mean						X	X	X	X	
Relatively Low SD	X	X								
Significant Correlation with Criterion										
Aptitudes to be Considered							K	F	M	

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of aptitudes K, F and M at trial cutting scores were able to differentiate between the 68% of the sample considered "good workers" and the 32% of the sample considered "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 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 K-85 and F-90 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .30 (statistically significant at the .025 level).

TABLE 6

Concurrent Validity of Test Norms, K-85 and F-90

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	26	36
Poor Workers	10	7	17
Total	20	33	53

Phi Coefficient ( $\phi$ ) = .30  
Significance Level =  $P/2 < .025$

Chi Square ( $\chi^2$ ) = 4.717

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-34 which is shown in Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .22 is obtained with the OAP-34 norms of K-90, F-85, M-90.

SP-21  
Rev. 2/61

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE  
(For Aptitude Test Development Studies)

Score \_\_\_\_\_

RATING SCALE FOR \_\_\_\_\_  
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters," and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) \_\_\_\_\_  
(Last) (First)

Sex: Male \_\_\_\_\_ Female \_\_\_\_\_ Experience on Job \_\_\_\_\_  
Years - Months

Company Job Title: \_\_\_\_\_

How often do you see this worker in a work situation?

- ( ) See him at work all the time.
- ( ) See him at work several times a day.
- ( ) See him at work several times a week.
- ( ) Seldom see him in work situation.

How long have you worked with him?

- ( ) Under one month.
- ( ) One to two months.
- ( ) Three to five months.
- ( ) Six months or more.

Training Time \_\_\_\_\_  
Years - Months

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

- 1. Capable of very low work output. Can perform only at an unsatisfactory pace.
- 2. Capable of low work output. Can perform at a slow pace.
- 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.
- 4. Capable of high work output. Can perform at a fast pace.
- 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

- 1. Performance is inferior and almost never meets minimum quality standards.
- 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
- 3. Performance is acceptable but usually not superior in quality.
- 4. Performance is usually superior in quality.
- 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

- 1. Makes very many mistakes. Work needs constant checking.
- 2. Makes frequent mistakes. Work needs more checking than is desirable.
- 3. Makes mistakes occasionally. Work needs only normal checking.
- 4. Makes few mistakes. Work seldom needs checking.
- 5. Rarely makes a mistake. Work almost never needs checking.

- D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)
- 1. Has very limited knowledge. Does not know enough to do his job adequately.
  - 2. Has little knowledge. Knows enough to "get by."
  - 3. Has moderate amount of knowledge. Knows enough to do fair work.
  - 4. Has broad knowledge. Knows enough to do good work.
  - 5. Has complete knowledge. Knows his job thoroughly.
- E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)
- 1. Has great difficulty doing his job. Not at all suited to this kind of work.
  - 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.
  - 3. Does his job without too much difficulty. Fairly well suited to this kind of work.
  - 4. Usually does his job without difficulty. Well suited to this kind of work.
  - 5. Does his job with great ease. Exceptionally well suited for this kind of work.
- F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)
- 1. Cannot perform different operations adequately.
  - 2. Can perform a limited number of different operations efficiently.
  - 3. Can perform several different operations with reasonable efficiency.
  - 4. Can perform many different operations efficiently.
  - 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

- 1. Almost never is able to figure out what to do. Needs help on even minor problems.
- 2. Often has difficulty handling new situations. Needs help on all but simple problems.
- 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.
- 4. Usually able to handle new situations. Needs help on only complex problems.
- 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

- 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.
- 2. Slow to see new ways to improve methods. Contributes few practical suggestions.
- 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.
- 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.
- 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

- 1. Would be better off without him. Performance usually not acceptable.
- 2. Of limited value to the organization. Performance somewhat inferior.
- 3. A fairly proficient worker. Performance generally acceptable.
- 4. A valuable worker. Performance usually superior.
- 5. An unusually competent worker. Performance almost always top notch.

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July 1966

FACT SHEET

Job Title: Stacker (pottery & porc.) 774.884

Job Summary: Stacks in saggars, preparatory to kiln firing, technical ceramic pieces for electronic, mechanical, industrial and other uses.

Work Performed: Receives instructions: Receives oral instructions from supervisor or group leader as to what pieces are to be stacked; what size and type of sagger is to be used; and as to the method of stacking. Receives and prepares work and saggars for stacking operation. Receives trays of green ceramic pieces which have been pressed and/or machined, saggars, groove boards, flat plates or cylinders from material handler. Cleans saggars using stiff brush and/or compressed air to remove dirt, sand, or excess material from bottom of sagger. Sprinkles sand on the bottom of sagger to prevent part from sticking to sagger during the firing operation. Places sagger in position for stacking.

Stacks pieces in saggars. Reaches for pieces in tray; cleans piece by passing piece over a stream of compressed air from an air hose to remove excess material; inspects piece for gross defects, such as chips and breaks; places piece in sagger in manner prescribed by group leader or supervisor. Assembles two-piece work and stacks. Applies glue to top or base piece with brush or by dipping either piece in glue; positions top to base piece and stacks assembled piece on sagger. Hangs rods by stand-in method: Stacks sagger rings to form a bung and places rubber pad on bottom of bung and flat plate with holes on top of bung. Picks up one to ten rods and drops them through holes in flat plate (number of rods picked up and placed in one hole is determined by diameter of rods and size of holes in flat plate). Pours coarse sand over ends of rods sticking through top of bung to hold rods in place. Checks to make sure that rods will remain hanging when rubber mat is removed by lifting up one edge of flat plate and seeing if any rods slip. Stacks disks (ranging in size from 0.10" to 4.0" in diameter and 0.005" to 4.0" in thickness) on flat plate. Positions disks on plate using all fingers on both hands. Places spacers on corners of plate and positions another flat plate on top of spacers and repeats operation. Stacks disks in stacks: Picks up a handful of disks and stacks them in piles. Places a spacer on both ends of stack and applies glue to pieces to form a unit and lay unit on groove board.

Records number of saggars completed on job card, reports unusual conditions to supervisor, observes good housekeeping and safety rules, and performs other duties as assigned.

(This sheet is printed in duplicate. One copy should remain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

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