

Appendix I-B

PHYSICAL DEMANDS

The physical demands listed in this publication serve as a means of expressing both the physical requirements of the job and the physical capacities (specific physical traits) a worker must have to meet those required by many jobs (perceiving by the sense of vision), and also the name of a specific capacity possessed by many people (having the power of sight). The worker must possess physical capacities at least in an amount equal to the physical demands made by the job.

The Factors

1. Strength: This factor is expressed in terms of *Sedentary*, *Light Medium*, *Heavy*, and *Very Heavy*. It is measured by involvement of the worker with one or more of the following activities:

a. Worker position(s):

(1) *Standing*: Remaining on one's feet in an upright position at a workstation without moving about.

(2) *Walking*: Moving about on foot.

(3) *Sitting*: Remaining in the normal seated position.

b. Worker movement of objects (including extremities used);

(1) *Lifting*: Raising or lowering an object from one level to another (includes upward pulling).

(2) *Carrying*: Transporting an object, usually holding it in the hands or arms or on the shoulder.

(3) *Pushing*: Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions).

(4) *Pulling*: Exerting force upon an object so that the object moves toward the force (includes jerking).

The five degrees of Physical Demands Factor No. 1 (strength), are as follows:

S Sedentary Work

Lifting 10 lbs. maximum and occasionally lifting and/or carrying such articles as docket, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

L Light Work

Lifting 20 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 10 lbs. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree, or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

M Medium Work

Lifting 50 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 25 lbs.

H Heavy Work

Lifting 100 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 50 lbs.

V Very Heavy Work

Lifting objects in excess of 100 lbs. with frequent lifting and/or carrying of objects weighing 50 lbs. or more.

2. Climbing and/or Balancing

- (1) Climbing: Ascending or descending ladders, stairs, scaffolding, ramps, poles, ropes, and the like, using the feet and legs and/or hands and arms.
- (2) Balancing: Maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces; or maintaining body equilibrium when performing gymnastic feats.

3. Stooping, Kneeling, Crouching, and/or Crawling:

- (1) Stooping: Bending the body downward and forward by bending the spine at the waist.
- (2) Kneeling: Bending the legs at the knees to come to rest on the knee or knees.
- (3) Crouching: Bending the body downward and forward by bending the legs and spine.
- (4) Crawling: Moving about on the hands and knees or hands and feet.

4. Reaching, Handling, Fingering, and/or Feeling:

- (1) Reaching: Extending the hands and arms in any direction.
- (2) Handling: Seizing, holding, grasping, turning, or otherwise working with the hand or hands (fingering not involved).
- (3) Fingering: Picking, pinching, or otherwise working with the fingers primarily (rather than with the whole hand or arm as in handling).
- (4) Feeling: Perceiving such attributes of objects and materials as size, shape, temperature, or texture, by means of receptors in the skin, particularly those of the fingertips.

5. Talking and/or Hearing:

- (1) Talking: Expressing or exchanging ideas by means of the spoken word.
- (2) Hearing: Perceiving the nature of sounds by the ear.

6. Seeing: Obtaining impressions through the eyes of the shape, size, distance, motion, color, or other characteristics of objects. The major visual functions are: (1) acuity, far and near, (2) depth perception, (3) field of vision, (4) accommodation, and (5) color vision. The functions are defined as follows:

- (1) Acuity, far--clarity of vision at 20 feet or more. Acuity, near--clarity of vision at 20 inches or less.
- (2) Depth perception--three-dimensional vision. The ability to judge distance and space relationships so as to see objects where and as they actually are.
- (3) Field of vision--the area that can be seen up and down or to the right or left while the eyes are fixed on a given point.
- (4) Accommodation--adjustment of the lens of the eye to bring an object into sharp focus. This item is especially important when doing near-point work at varying distances from the eye.
- (5) Color vision--the ability to identify and distinguish colors.

Appendix I-C

ENVIRONMENTAL CONDITIONS

Environmental conditions are the physical surroundings of a worker in a specific job.

1. *Inside, Outside, or Both:*

I Inside: Protection from weather conditions but not necessarily from temperature changes.

O Outside: No effective protection from weather.

B Both: Inside and outside.

A job is considered “inside” if the worker spends approximately 75 percent or more of the time inside, and “outside” if the worker spends approximately 75 percent or more of the time outside. A job is considered “both” if the activities occur inside or outside in approximately equal amounts.

2. *Extremes of Cold Plus Temperature Changes:*

(1) Extremes of Cold: Temperature sufficiently low to cause marked bodily discomfort unless the worker is provided with exceptional protection.

(2) Temperature Changes: Variations in temperature which are sufficiently marked and abrupt to cause noticeable bodily reactions.

3. *Extremes of Heat Plus Temperature Changes:*

(1) Extremes of Heat: Temperature sufficiently high to cause marked bodily discomfort unless the worker is provided with exceptional protection.

(2) Temperature Changes: Same as 2(2).

4. *Wet and Humid:*

(1) Wet: Contact with water or other liquids.

(2) Humid: Atmospheric condition with moisture content sufficiently high to cause marked bodily discomfort.

5. *Noise and Vibration:* Sufficient noise, either constant or intermittent, to cause marked distraction or possible injury to the sense of hearing, and/or sufficient vibration (production of an oscillating movement or strain on the body or its extremities from repeated motion or shock) to cause bodily harm if endured day after day.

6. *Hazards:* Situations in which the individual is exposed to the definite risk of bodily injury.

7. *Fumes, Odors, Toxic Conditions, Dust, and Poor Ventilation:*

(1) Fumes: Smoky or vaporous exhalations, usually odorous, thrown off as the result of combustion or chemical reaction.

(2) Odors: Noxious smells, either toxic or nontoxic.

(3) Toxic Conditions: Exposure to toxic dust, fumes, gases, vapors, mists, or liquids which cause general or localized disabling conditions as a result of inhalation or action on the skin.

(4) Dust: Air filled with small particles of any kind, such as textile dust, flour, wood, leather, feathers, etc., and inorganic dust, including silica and asbestos, which make the workplace unpleasant or are the source of occupational diseases.

(5) Poor Ventilation: Insufficient movement of air causing a feeling of suffocation; or exposure to drafts.

Appendix I-D

MATHEMATICAL DEVELOPMENT AND LANGUAGE DEVELOPMENT (TRAINING TIME)

Commonly referred to as “tool knowledges,” these embrace those aspects of education (formal and informal) of a general nature that contribute to the acquisition of such skills but do not have a recognized, fairly specific, occupational objective, ordinarily obtained in elementary, high school, or college environs, and augmented by past experiences and self-study. They provide linkage between norms used for interpretation of the Basic Occupational Literacy Test (BOLT) scores and level requisites for DOT occupations. Following are the definitions and scale levels applicable to each:

a. Mathematical Developmental or Arithmetic Computation (M): The acquisition of basic mathematical skills, not specifically vocationally oriented, such as the ability to solve arithmetic, algebraic, and geometric problems ranging from fairly elemental to dealing with abstractions

b. Language Development or Literacy Training (L): The acquisition of language skills, not specifically vocationally oriented, such as mastery of an extensive vocabulary; use of correct sentence structure, punctuation, and spelling; and an appreciation of literature.

<u>Level</u>	<u>Mathematical Development</u>	<u>Language Development</u>
6	<p><i>Advanced calculus:</i> Work with limits, continuity, real number systems, mean value theorems, and implicit function theorems</p> <p><i>Modern algebra:</i> Apply fundamental concepts of theories of groups, rings, and fields. Work with differential equations, linear algebra, infinite series, advanced operations methods, and functions of real and complex variables.</p> <p><i>Statistics:</i> Work with mathematical statistics, mathematical probability, and applications, experimental design, statistical inference, and econometrics.</p> <p>Algebra: Work with exponents and logarithms,</p>	<p><i>Reading:</i> Reading literature, book and play reviews, scientific and technical journals, abstracts, financial reports, and legal documents.</p> <p><i>Writing:</i> Write novels, play, editorials, journals, speeches, manuals, critiques, poetry, and songs.</p> <p><i>Speaking:</i> Conversant in the theory, principles, and methods of effective and persuasive speaking, voice and diction, phonetics, and discussion and debate.</p> <p>Same as level 6</p>

<p>5</p>	<p>linear equations, mathematical induction and binomial theorems, and permutations.</p> <p>Calculus: Apply concepts of analytical geometry, differentiations and integration of algebraic functions with applications.</p> <p>Statistics: Apply mathematical operations to frequency distributions, reliability, and validity of tests, normal curve, analysis of variance, correlation techniques, chi-square application and sampling theory, and factor analysis.</p> <p>Algebra: Deal with system of real numbers; linear, quadratic, rational, exponential; logarithmic, angle, and circular functions, and inverse functions; related algebraic solution of equations and inequalities; limits and continuity, and probability and statistical inference.</p>	
<p>4</p>	<p>Geometry: Deductive axiomatic geometry, plane and solid; and rectangle coordinates</p> <p>Shop Math: Practical application of fractions, percentages ratio and proportion, mensuration, logarithms, slide rule, practical algebra, geometric construction, and essentials of trigonometry.</p> <p>Compute discount, interest, profit, and loss; commission, markups, and selling price; ratio and proportion, and percentages. Calculate surfaces, volumes, weights, and measures.</p>	<p>Reading: Reading novels, poems, newspapers, periodicals, journals, manuals, dictionaries, thesauruses, and encyclopedias</p> <p>Writing: Prepare business letters, expositions, summaries, and reports, using prescribed format, and conforming to all rules of functions, grammar, diction, and style.</p> <p>Speaking: Participate in panel discussions, dramatizations, and debates. Speaking extemporaneously on a variety of subjects.</p>

<p>3</p>	<p>Algebra: Calculate variables and formulas, monomials and polynomials; ratio and proportion variables; and square roots and radicals.</p> <p>Geometry: Calculate plane and solid figures, circumference, area, and volume. Understand kinds of angles, and properties of pairs and angles.</p> <p>Add, subtract, multiply, and divide all units of measure. Perform the four operations with like common and decimal fractions. Compute ratio, rate, and percent. Draw and interpret bar graphs. Perform arithmetic operations involving all American monetary units.</p>	<p>Reading: Read a variety of novels, magazines, atlases, and encyclopedias.</p> <p>Read safety rules, instructions in the use and maintenance of shop tools and equipment, and methods and procedure in mechanical drawing and layout work.</p> <p>Writing: Write reports and essays with proper format, punctuation, spelling, and grammar, using all parts of speech.</p> <p>Speaking: Speak before an audience with poise, voice control, and confidence, using correct English and well-modulated voice.</p> <p>Reading: Passive vocabulary of 5,000-6,000 words. Read at rate of 190-215 words per minute. Read adventure stories and comic books, looking up unfamiliar words in dictionary for meaning, spelling, and pronunciation.</p> <p>Read instructions for assembling model cars and airplanes.</p> <p>Writing: Write compound and complex sentences, using cursive style, proper end punctuation, and employing adjectives and adverbs.</p> <p>Speaking: Speak clearly and distinctly with appropriate pauses and emphasis, correct pronunciation, variations in word order, using present, perfect, and future tenses.</p> <p>Reading: Recognize meaning of 2,500 (two- or three-syllable) words. Read at a rate of 95-120 words per minute.</p> <p>Compare similarities and differences between</p>
<p>2</p>	<p>Add and subtract two digit numbers. Multiply and divide 10's and 100's by 2, 3, 4, 5. Perform the four basic arithmetic operations with coins as part of a dollar. Perform operations with units such as cup, pint, and quart; inch, foot, and yard; and ounce and pound.</p>	

1		<p>words and between series of numbers.</p> <p>Writing: Print simple sentences containing subject, verb, and object, and series of numbers, names, and addresses.</p> <p>Speaking: Speak simple sentences, using normal word order, and present and past tenses.</p>
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Appendix I-E

SPECIFIC VOCATIONAL PREPARATION (TRAINING TIME)

This represents the amount of time required to learn the techniques, acquire information, and develop the facility needed for average performance in a specific job-worker situation. The training may be acquired in a school, work, military, institutional, or a vocational environment. It does not include orientation training required of even every fully qualified worker to become accustomed to the special conditions of any new job. Specific vocational training includes training given in any of the following circumstances:

- a. Vocational education (such as high school commercial or shop training, technical school, art school, and that part of college training which is organized around a specific vocational objective);
- b. Apprenticeship training (for apprenticeable jobs only);
- c. In-plant training (given by an employer in the form of organized classroom study);
- d. On-the-job training (serving as learner or trainee on the job under the instruction of a qualified worker);
- e. Essential experience in other jobs (serving in less responsible jobs which lead to the higher grade job or serving in other jobs that qualify).

The following is an explanation of the various levels of specific vocational preparation.

Level	Time	
1	Short demonstration.	
2	Anything beyond short demonstration up to and including	30 days.
3	Over 30 days up to and including 3 months.	
4	Over 3 months up to and including 6 months.	
5	Over 6 months up to and including 1 year.	
6	Over 1 year up to and including 2 years.	
7	Over 2 years up to and including 4 years.	
8	Over 4 years up to and including 10 years.	
9	Over 10 years.	

Appendix I-F

OCCUPATIONAL APTITUDE PATTERNS

This listing represents the 1979 revision of the Occupational Aptitude Pattern (OAP) structure and is extracted from the Manual for the USES General Aptitude Test Battery. It consists of 66 OAP's that closely relate to 59 of the Work Groups of the Guide for Occupational Exploration, identifies the most important aptitudes for Work Groups to which each OAP applies, and establishes the limits of specific occupational coverage for each OAP. Development of the OAP structure is described in Section II A of the Manual for the USES General Aptitude Test Battery.

Aptitudes Measured by the GATB

The nine aptitudes measured by the GATB are listed below. The letter used as the symbol to identify each aptitude and the part or parts of the GATB measuring each aptitude are also shown.

Aptitude	Tests
G--Intelligence	Part 3--Three-Dimensional Space Part 4--Vocabulary Part 6--Arithmetic Reason
V--Verbal Aptitude	Part 4--Vocabulary
N--Numerical Aptitude	Part 2--Computation Part 6--Arithmetic Reason
S--Spatial Aptitude	Part 3--Three-Dimensional Space
P--Form Perception	Part 5--Tool Matching Part 7--Form Matching
Q--Clerical Perception	Part 1--Name Comparison
K--Motor Coordination	Part 8--Mark Making
F--Finger Dexterity	Part 11--Assemble Part 12--Disassemble
M--Manual Dexterity	Part 9--Place Part 10--Turn

The following are the definitions of the nine aptitudes measured by the GATB:

G--Intelligence. -- General learning ability. The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school.

V--Verbal Aptitude.--The ability to understand meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs.

N--Numerical Aptitude.--Ability to perform arithmetic operations quickly and accurately.

S--Spatial Aptitude.--Ability to think visually geometric forms and to comprehend the two

dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movements of objects in space.

P--Form Perception.--Ability to perceive pertinent detail in objects in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.

Q--Clerical Perception.--Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers and to avoid perceptual errors in arithmetic computation. A measure of speed of perception which is required in many industrial jobs even when the job does not have verbal or numerical content.

K--Motor Coordination.--Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly.

F--Finger Dexterity.--Ability to move the fingers, and manipulate small objects with the fingers, rapidly and accurately.

M--Manual Dexterity.--Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

Appendix I-G

DEFINITIONS OF INTEREST FACTORS

1.ARTISTIC:

Interest in creative expression of feelings or ideas.

2.SCIENTIFIC:

Interest in discovering, collecting, and analyzing information about the natural world and in applying scientific research findings to problems in medicine, life sciences, and natural sciences.

3.PLANTS AND ANIMALS:

Interest in activities involving plants and animals, usually in an outdoor setting.

4.PROTECTIVE:

Interest in the use of authority to protect people and property.

5.MECHANICAL:

Interest in applying mechanical principles to practical situations, using machines, hand tools, or techniques.

6.INDUSTRIAL:

Interest in repetitive, concrete, organized activities in a factory setting.

7.BUSINESS DETAIL:

Interest in organized, clearly defined activities requiring accuracy and attention to detail, primarily in an office setting.

8.SELLING:

Interest in bringing others to a point of view through personal persuasion, using sales and promotion techniques.

9.ACCOMMODATING:

Interest in catering to the wishes of others, usually on a one-to-one basis.

10.HUMANITARIAN:

Interest in helping others with their mental, spiritual, social, physical, or vocational needs.

11.LEADING-INFLUENCING:

Interest in leading and influencing other through activities involving high-level verbal or numerical abilities.

12.PHYSICAL PERFORMING:

Interest in physical activities performed before an audience.