The Revised Handbook for Analyzing Jobs

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CHAPTER 12

PHYSICAL DEMANDS AND ENVIRONMENTAL CONDITIONS

Physical Demands and Environmental Conditions are components of Worker Characteristics. Physical Demands analysis is a systematic way of describing the physical activities that a job requires. It is concerned only with the physical demands of the job; it is not concerned with the physical capacity of the worker. Environmental Conditions are the surroundings in which a job is performed. To be considered present an Environmental Condition must be specific and related to the job.

These concepts provide two of the important criteria for collecting and classifying information about jobs. The resulting data have a significant role in exposing workers to a maximum number of job opportunities.

The Physical Demands of a job are defined in terms of twenty factors. In addition, fourteen factors are used to express the important Environmental Conditions under which a job is performed. Illustrative job-worker situations for these factors are provided below to assist the analyst in collecting these data.

The USES method of job analysis provides the means to describe and evaluate a job as it exists. This method permits the matching of workers and jobs based upon the workers' capabilities. The method also permits the modification of the physical demands of a job to fit the capabilities of disabled workers. The extent to which any job is suitable for modification is an area that may be pursued as a special application of job analysis.

PHYSICAL DEMAND FACTORS, DEFINITIONS, AND EXAMPLES

1. STRENGTH

This factor is expressed by one of five terms: Sedentary, Light, Medium, Heavy, and Very Heavy. In order to determine the overall rating, an evaluation is made of the worker's involvement in the following activities:

Position

Standing: Remaining on one's feet in an upright position at a work station without moving about.

Walking: Moving about on foot.

Sitting: Remaining in a seated position.

Weight/Force

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

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

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

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

Lifting, pushing, and pulling are expressed in terms of both intensity and duration. Judgments regarding intensity involve consideration of the weight handled, position of the worker's body or the part of the worker's body used in handling weights, and the aid given by helpers or by mechanical equipment. Duration is the total time spent by the worker in carrying out these activities. Carrying most often is expressed in terms of duration, weight carried, and distance carried.

Care must be exercised in evaluating jobs in the strength categories, particularly in interpreting the force and the physical effort a person must exert. For instance, a worker in an awkward crouching position may experience as much difficulty exerting five pounds of force as when exerting thirty pounds at waist height while standing. Also, if one is required continuously to lift, push, and pull objects weighing 15 pounds or to carry these objects long distances, a worker may exert as much physical effort as would be exerted in occasionally or even frequently lifting, pushing, and pulling objects twice as heavy, or in occasionally carrying these objects over short distances.

Controls: Hand-Arm and Foot-Leg

Controls entail use of one or both arms or hands (hand-arm) or one or both feet or legs (foot-leg) to move controls on machinery or equipment. In this sub-item, the analyst must consider whether the worker moves controls on the machine or equipment by using either right-side body members, left-side body members, or members of either or both sides. In addition, the use of hand-arm controls is distinguished from the use of foot-leg controls. Controls include but are not limited to buttons, knobs, pedals, levers, and cranks.

Sedentary Work

Exerting up to 10 pounds of force occasionally or a negligible amount of force frequently to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are Sedentary if walking and standing are required only occasionally and all other Sedentary criteria are met.

S:1 Takes dictation and transcribes from notebook, using typewriter, while sitting at desk. Occasionally walks to various parts of department when called upon to take dictation.

S:2 Repairs defects in hosiery, using needle, thread, scissors, and mending cup while sitting at bench.

S:3 Examines watch jewels for defects, using microscope, while sitting at glass table.

S:4 Writes news stories for publication or broadcast from written notes supplied by reporting staff while sitting at desk. Occasionally walks to reference library to obtain supplemental material.

S:5 Drafts detailed drawings while sitting at drawing board. Occasionally walks to obtain items of negligible weight, such as paper, T-square, and other drafting supplies.

S:6 Telephones dealers to determine availability of type and model of automobile desired by customer and prepares papers for transfer of automobiles while sitting at desk.

S:7 Dispatches taxicabs in response to telephone requests for service while sitting at desk.

Light Work

Exerting up to 20 pounds of force occasionally, or up to 10 pounds of force frequently, or a negligible amount of force constantly to move objects. Physical demand requirements are in excess of those for Sedentary Work. Even though the weight lifted may be only a negligible amount, a job should be rated Light Work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing or pulling of arm or leg controls; or (3) when the job requires working at a production rate pace entailing the constant pushing or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.

L:1 Starts, stops, and controls speed of sewing machine, using pedal or knee lever, while sitting at table.

L:2 Pulls control lever of arbor press downward, exerting about five pounds of force to fit metal parts together, while sitting at bench.

L:3 Arranges records in file cabinets, drawers, and boxes. Walks to obtain records and stands while arranging them.

L:4 Wraps and bags articles for customers, standing and walking behind counter of variety store.

L:5 Lifts cans, jars, or bottles from cardboard box and places items on conveyor. Removes filled or capped containers, which weigh approximately 2 to 3 pounds, from one conveyor and places containers on another.

L:6 Serves food and refreshments to patrons in railroad car, walking from car to kitchen to obtain and relay orders and carrying food trays weighing up to 10 pounds.

Medium Work

Exerting 20 to 50 pounds of force occasionally, or 10 to 25 pounds of force frequently, or greater than negligible up to 10 pounds of force constantly to move objects. Physical demand requirements are in excess of those for Light Work.

M:1 Locates and moves materials and parts between work areas of plant to expedite processing of foods, lifting material usually weighing 15-20 pounds and occasionally weighing up to 50 pounds to place in car or handtruck.

M:2 Fastens metal objects to plating racks, carries filled racks weighing up to 20 pounds to cleaning, plating, and rinsing tanks, and immerses them in tanks.

M:3 Fabricates sheet metal articles, occasionally carrying tools and sheet metal weighing 50 pounds maximum to workbench. Lifts sheet metal to workbench and machine and pushes and pulls it into proper positions.

M:4 Carries lumber weighing occasionally up to 50 pounds from supply room to workbench, a distance of approximately 20 feet. Stands and bends most of time to lift lumber and pushes and pulls lumber to position on workbench or machine.

M:5 Lifts, pushes, and pulls tools to raise automobile, to remove tire from wheel, and to remount tire. Rolls tires, usually weighing approximately 20 pounds and occasionally weighing up to 50 pounds, to repair work area.

M:6 Dismantles, tests, adjusts, repairs, and installs engine parts of aircraft, walking and standing continuously. Frequently lifts and carries parts weighing up to 25 pounds for inspection and repair and pushes and pulls components into position on workbench.

Heavy Work

Exerting 50 to 100 pounds of force occasionally, or 25 to 50 pounds of force frequently, or 10 to 20 pounds of force constantly to move objects. Physical demand requirements are in excess of those for Medium Work.

H:1 Digs trench to specified depth and width, constantly pushing shovel into earth and lifting, carrying, and throwing shovelfuls of earth onto pile. Shovel often is raised to shoulder height and weight lifted is concentrated at its end. Shovel and earth weigh approximately 20 pounds, but the continuous effort involved requires strength comparable to that required by frequent lifting up to 50 pounds and occasional lifting up to 100 pounds.

H:2 Charges furnaces, lifting and carrying metal weighing 35-50 pounds. Frequently pushes and pulls from awkward crouching position to turn metal in furnace with tongs. Periodically withdraws metal from furnace and carries it, with assistance, to forge.

H:3 Fits pipe assemblies into place, frequently lifting and carrying pipe and pipe connections weighing 50 pounds and occasionally up to 100 pounds, with aid of helpers. Stands, stoops, and crouches while reaching above and below shoulder height to pull pipes into position.

H:4 Mixes pastry, standing almost continuously. Occasionally lifts and carries 100-pound bags of flour about 20 feet from stack to mixing bowl. Frequently turns and stoops to lift bags of sugar and shortening, each weighing 50 pounds.

H:5 Pushes handtruck up and down warehouse aisles, lifts cartons of items weighing an average of 65 pounds from storage shelves, and places cartons on handtruck to fill orders. Lifts cartons from handtruck in order to complete packing, wrapping, sealing, and labeling for shipping. Lifts and carries cartons to skids for shipping.

Very Heavy Work

Exerting in excess of 100 pounds of force occasionally, or in excess of 50 pounds of force frequently, or in excess of 20 pounds of force constantly to move objects. Physical demand requirements are in excess of those for Heavy Work.

V:1 Lifts lumber and other material weighing 50 pounds or more and carries to handtruck.

V:2 Transfers adult patients between bed and conveyance, frequently lifting them without assistance, and pushes wheelchair or wheeled stretcher to transport patients to hospital areas.

V:3 Loads and unloads truck when transporting or delivering articles, such as furniture, refrigerators, and machinery, many of which weigh in excess of 100 pounds.

V:4 Loads and unloads trailers and semitrailers with crates of produce weighing from 80 to 110 pounds.

V:5 Performs machine and hand operations necessary to fabricate and assemble boilers, tanks, vats, and other vessels made of heavy steel plates weighing up to 120 pounds.

V:6 Installs ship's steam, diesel, or electric propelling and auxiliary machinery and equipment, such as pumps, cargo-handling machinery, anchor-handling gear, ventilating and fire-fighting equipment, steering gear, and armament.

2. CLIMBING

Ascending or descending ladders, stairs, scaffolding, ramps, poles, and the like, using feet and legs or hands and arms. Body agility is emphasized. Describe in Physical Demands comments section in terms of height, steepness, duration, and type of structure climbed.

C:1 Climbs ladder to attach advertising posters on elevated billboards.

C:2 Ascends poles to install, maintain, and repair telephone, telegraph, and electrical power lines.

C:3 Climbs fire escapes and ladders to gain access to upper levels of buildings or to assist individuals from burning structures.

C:4 Climbs trees to reach and trim branches interfering with transmission wires.

C:5 Climbs ladder to plaster ceilings.

3. 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. Describe in Physical Demands comments section in terms of type or condition of surface and activities during which balance must be maintained.

B:1 Balances to avoid falling or spilling food when serving passengers on airplane in flight.

B:2 Balances on slippery, erratically moving, floating barrier (boom) of logs while sorting logs according to species, size, and owners' markings.

B:3 Maintains equilibrium while dancing and performing difficult gymnastic feats.

B:4 Balances on narrow steel girders of building under construction while catching hot rivets tossed by Rivet Heater in bucket and inserting rivets in holes, using tongs.

B:5 Balances on scaffolding when installing glass on upper stories of building front.

4. STOOPING

Bending body downward and forward by bending spine at the waist, requiring full use of the lower extremities and back muscles. Describe in Physical Demands comments section in terms of duration.

S:1 Stoops between plant rows to reach for and pull, twist, or cut harvestable crops.

S:2 Stoops while shoveling snow into truck.

S:3 Stoops while cleaning, waxing, and polishing floors, using waxing machine.

S:4 Stoops to gather worms in grassy areas for use as fish bait.

S:5 Stoops to refinish bodies of automobiles, to remove and replace damaged fenders, and to straighten and realign automobile frames.

5. KNEELING

Bending legs at knees to come to rest on knee or knees. Describe in Physical Demands comments section in terms of duration.

K:1 Kneels while pressing carpet firmly in place over tackless strips, using handtools.

K:2 Operates concrete-wall grinder to remove bumps and rough spots from exposed concrete surface, working in kneeling position for sustained periods.

K:3 Kneels to connect wiring to fixtures and power equipment located in cramped places.

K:4 Kneels while examining rocks, minerals, and fossils to identify and determine sequence of processes affecting development of earth.

K:5 Kneels to adjust and repair electrically powered, automatic pinsetting bowling machines.

6. CROUCHING

Bending body downward and forward by bending legs and spine. Describe in Physical Demands comments section in terms of duration.

C:1 Crouches over rows of rose plants to reach and cut plant rootstock.

C:2 Crouches to secure post and attach lead-in wire to antenna.

C:3 Crouches to spread mortar and position bricks on lower parts of walls.

C:4 Crouches to remove catch from and reset traps.

C:5 Crouches when filing correspondence in lower drawers of filing cabinets.

7. CRAWLING

Moving about on hands and knees or hands and feet. Describe in Physical Demands comments section in terms of distance and duration.

C:1 Crawls underneath building to remove debris prior to spraying insecticide.

C:2 Crawls while smoothing and finishing surface of poured concrete sidewalks, using straightedge.

C:3 Crawls while cleaning, waxing, and polishing floors, using rags and brushes.

C:4 Crawls through narrow spaces to reach all parts of furnace when cleaning or repairing furnace.

C:5 Crawls into low attics and under buildings to inspect buildings for presence of vermin.

8. REACHING

Extending hand(s) and arm(s) in any direction.

R:1 Reaches for ledgers, tax tables, and writing instruments.

R:2 Reaches for drawings, chemically treated paper, and controls on machine to make blueprints.

R:3 Reaches for individual wires and winds them around pegs on harness board.

R:4 Reaches for knives, tubes, and other equipment while preparing body for burial.

R:5 Reaches for high branches to pick fruit.

9. HANDLING

Seizing, holding, grasping, turning, or otherwise working with hand or hands. Fingers are involved only to the extent that they are an extension of the hand, such as to turn a switch or shift automobile gears.

H:1 Handles tools, parts, and test instruments used to service and repair aircraft engines.

H:2 Grasps handtools and powered handtools when fitting and fastening automobile and truck components.

H:3 Handles and grasps combs, scissors, razors, and lotions while providing barbering services.

H:4 Uses arms and hands to turn steering wheel, operate gearshift, and handle baggage.

H:5 Holds parts and handles tools and lumber when building and repairing wooden articles.

10. FINGERING

Picking, pinching, or otherwise working primarily with fingers rather than with the whole hand or arm as in handling.

F:1 Fingers keys accurately when using adding and calculating machines.

F:2 Uses fingers constantly to count and sort coins and paper money and operate keys on cash register.

F:3 Squeezes and stretches sample of curd with fingers to determine firmness or texture of cheese.

F:4 Uses fingers to cut, pin, and sew sample garments.

F:5 Picks up and places rivets into holes of metal cabinets.

F:6 Positions pinion in machine holder, using tweezers.

11. FEELING

Perceiving attributes of objects, such as size, shape, temperature, or texture, by touching with skin, particularly that of fingertips.

F:1 Slides fingers over braille characters to feel discrepancies in proof.

F:2 Strokes fur to feel density of pelts in order to select pelts that have same thickness and length of fur.

F:3 Feels upholstery padding to determine conformance to specified degree of firmness.

F:4 Feels dough in dough-mixing machine for desired consistency before ending mixing cycle.

F:5 Feels poultry for presence of bruises, deformities, and pinfeathers and grades accordingly for quality.

F:6 Turns dial of micrometer until contact points touch surface of part to be measured, working to tolerances of .001 inch, and compares measurement with specifications.

12. TALKING

Expressing or exchanging ideas by means of the spoken word to impart oral information to clients or to the public and to convey detailed spoken instructions to other workers accurately, loudly, or quickly.

T:1 Speaks clearly and distinctly to instruct pilots.

T:2 Exhorts passing public to attend show.

T:3 Speaks in pleasant, well-controlled voice to present radio and television programs to audience.

T:4 Answers inquiries regarding departures, arrivals, stops, and destinations of scheduled buses or trains.

T:5 Interprets specifications, blueprints, and job orders to workers.

13. HEARING

Perceiving the nature of sounds by ear.

H:1 Test-drives vehicle and listens for rattles, squeaks, or other noises reported by customer, indicating malfunctioning or loose components.

H:2 Listens intently to sounds of safe locks while turning dial to open safe.

H:3 Listens attentively to take dictation and answer telephone.

H:4 Listens to sounds of running engine to detect possible faulty operation.

14. TASTING/SMELLING

Distinguishing, with a degree of accuracy, differences or similarities in intensity or quality of flavors or odors, or recognizing particular flavors or odors, using tongue or nose.

TS:1 Tastes and smells food being cooked to determine if it is cooked sufficiently.

TS:2 Determines, by smell, odor qualities of prepared materials used in the production of perfume.

TS:3 Tastes samples of food or beverages to determine palatability of product or to prepare blending formulas.

TS:4 Tastes baked pretzels and adjusts speed of conveyor or temperature of cooler, oven, or kiln to ensure pretzels conform to taste standards.

TS:5 Walks along pipelines to detect gas odor indicating leaks and notifies maintenance department of location of leaks.

15. NEAR ACUITY

Clarity of vision at 20 inches or less.

NA:1 Enters numerical data in bookkeeping ledgers.

NA:2 Sketches and paints, in minute detail, illustrations of anatomical and pathological specimens.

NA:3 Reads, compiles, computes, and records numerical and statistical data.

NA:4 Guides material under needle and continuously checks alignment and accuracy of stitching.

NA:5 Examines components for scratches, chips, and other defects, using magnifier.

16. FAR ACUITY

Clarity of vision at 20 feet or more.

FA:1 Watches for landmarks when taking off and landing airplane.

FA:2 Reads traffic signs at distances up to 200 feet while driving taxi.

FA:3 Identifies machine jams at distances of 20 to 35 feet.

FA:4 Observes forests from remote fire-lookout station to locate forest fires, and reports fires, using radio or telephone.

17. DEPTH PERCEPTION

Three-dimensional vision. Ability to judge distances and spatial relationships so as to see objects where and as they actually are.

DP:1 Observes farm machinery in operation to detect malfunctioning or defective units.

DP:2 Judges distances and space relationships of stationary and moving objects to avoid accidents while driving bus.

DP:3 Dismantles and reassembles engines, using handtools.

DP:4 Operates power derrick to load and unload loose materials from railroad cars, moving controls to raise, lower, and rotate boom and to raise and lower load line in response to signals.

DP:5 Observes products moving on conveyors to monitor flow and operation of automated conveyor system.

18. ACCOMMODATION

Adjustment of lens of eye to bring an object into sharp focus. This factor is required when doing near point work at varying distances from the eye.

A:1 Guides electric cutter through layers of fabric, continually keeping cutting lines in sharp focus.

A:2 Shifts gaze from viewing screen several feet distant to compare with data on correspondence and forms at near distance.

A:3 Inspects and adjusts minute parts, using unaided vision as well as magnifiers and precision gauges.

A:4 Reads typescript or proof of type setup to detect and mark for correction.

A:5 Examines tissue samples under microscope for atypical characteristics and records findings on data sheet.

19. COLOR VISION

Ability to identify and distinguish colors.

CV:1 Performs pH titration test to ascertain if material is within specified limits, requiring ability to observe subtle color changes.

CV:2 Makes discriminating comparison of color hue and color brightness in lipsticks.

CV:3 Identifies resistors by color code and connects colored wires to specific terminals.

CV:4 Assists customers in color-coordinating selection of wall coverings.

CV:5 Mixes inks to obtain proper color and shade, comparing results with sample.

20. FIELD OF VISION

Observing an area that can be seen up and down or to right or left while eyes are fixed on a given point.

FV:1 Rides racehorse at racetrack, relying on peripheral vision to observe relative positions of nearby horses during race.

FV:2 Monitors control-board panels and TV monitors from desk and notifies supervisor when machine maintenance is required.

FV:3 Observes actions of participants of sporting event to detect infractions of rules.

FV:4 Drives taxicab in city traffic.

FV:5 Observes racing cars passing start-finish line of track to obtain count of laps completed by each competitor.

ENVIRONMENTAL CONDITION FACTORS, DEFINITIONS, AND EXAMPLES

1. EXPOSURE TO WEATHER

Exposure to outside atmospheric conditions.

W:1 Erects and repairs electric power lines and is exposed to hot, cold, wet, or windy conditions.

W:2 Delivers mail to residential areas, spending 75 percent of working time outdoors.

W:3 Picks field crops, frequently in heat of sun, continuing during periods of light rain.

W:4 Directs actions of school children and traffic at street intersections to ensure safe crossing.

W:5 Patrols assigned areas to prevent game law violations, investigates reports of damage to crops and property by wildlife, and gathers biological information. Works outdoors in all kinds of weather and travels by car, boat, airplane, horse, and on foot.

2. EXTREME COLD

Exposure to nonweather-related cold temperatures.

EC:1 Stores ice in cold-storage room.

EC:2 Works in cooler room, usually kept at approximately 40‘ F., while cutting beef carcasses into standard cuts.

EC:3 Stores ice cream in hardening room to solidify and keep ice cream in good condition. Enters and leaves room constantly.

EC:4 Packs dressed fish in ice. Shovels layer of ice in box and fills body cavity of each fish with ice. Places fish in box and fills remainder of box with ice. Room temperature must be below freezing to prevent ice from melting.

EC:5 Tends freeze tunnel to quick-freeze food products. Patrols tunnel to observe progress of food product to ensure freezing. Scrapes conveyor to remove excess ice or frost.

3. EXTREME HEAT

Exposure to nonweather-related hot temperatures.

EH:1 Works close to hot stove during cooking operations while performing various activities, such as agitating, testing, and draining cooking mixture.

EH:2 Charges furnace, turns billets in furnace, and withdraws heated billets.

EH:3 Works constantly around hot tumblers in laundry room, reaching in and removing partially cooled articles.

EH:4 Controls movement of machine that spreads hot asphalt on streets and roads and is subject to intense heat produced by heating mechanism of machine.

EH:5 Controls furnace to relieve internal stresses in metal objects and to soften and refine grain structure. Places metal objects directly into furnace. Reduces heat and allows objects to cool in furnace.

EH:6 Tends battery of preset final-drying chambers that automatically dry macaroni long goods. Pushes rack of macaroni into drying chambers and starts drying cycle. Removes rack of dried macaroni after completion of drying cycle.

4. WET AND/OR HUMID

Contact with water or other liquids or exposure to nonweather-related humid conditions.

WH:1 Presses garment, using pressing machine, and is constantly exposed to oppressive humidity resulting from steam emitted by pressing machine and by damp garments which are being ironed.

WH:2 Feeds food products into washing machine preparatory to cooking and canning. Handles wet food and works in wet area.

WH:3 Maintains kitchen work area and restaurant equipment and utensils in clean condition. Washes worktables, hoses out garbage cans, and washes pots, pans, trays, and dishes by hand. Hands are in constant contact with water.

WH:4 Dumps containers of fish into fresh water tank for cleaning; removes wet fish from tank and trims fins and tails, removes skin, and cuts fish into pieces of specified size. Constantly handles wet fish and works in wet area.

WH:5 Loads damp articles into tumblers and removes hot, dried articles from tumblers, working in humid atmosphere.

5. NOISE INTENSITY LEVEL

The noise intensity level to which the worker is exposed in the job environment. This factor is expressed by one of five levels. Consider all the benchmarks within a level as providing an insight into the nature of the specific levels.

Code	Level	Illustrative Examples
1	Very Quiet	isolation booth for hearing test; deep sea diving; forest trail
2	Quiet	library; many private offices; funeral reception; golf course; art museum
3	Moderate	business office where typewriters are used; department store; grocery store; light traffic; fast food restaurant at off-hours
4	Loud	can manufacturing department; large earth-moving equipment; heavy traffic
5	Very Loud	rock concert - front row; jackhammer work; rocket engine testing area during test

6. VIBRATION

Exposure to a shaking object or surface.

V:1 Operates compressed air, rock-drilling machine. Worker is exposed to continuous vibrations.

V:2 Operates tractor to scoop earth. Worker is subject to intense vibration while scraper is forced into ground and while tractor is driven forward to fill scraper with dirt.

V:3 Operates cylinder-type printing press. Worker is subject to continuous vibration when printing press is in operation.

V:4 Operates drilling equipment to drill holes in walls or slabs of concrete to facilitate installation and repair of utility systems and equipment. Continuous vibration is felt by worker.

V:5 Positions metal workpiece in lower die and presses pedal, causing ram to strike metal repeatedly, forcing it to shape of die impression. Vibration is caused by the repeated striking of the ram against the metal.

7. ATMOSPHERIC CONDITIONS

Exposure to conditions such as fumes, noxious odors, dusts, mists, gases, and poor ventilation, that affect the respiratory system, eyes, or the skin.

AC:1 Pours pigments, paint paste, and thinner into can and stirs mixture with paddle, working in metal-finishing plant. Worker breathes fumes and odors of paint ingredients.

AC:2 Stacks grain by hand or with pitchfork during harvesting and threshing and is exposed to heavy concentration of dust from movement of grain.

AC:3 Takes care of animals, such as dogs, mice, and monkeys, which are being used for medical tests. Cleans and sterilizes cages, pens, and surrounding areas, such as walls, windows, and floors, using steam or germ-killing solutions. Sprays or spreads insect-killing solutions or powders. Worker is subject to disagreeable odors and skin irritants from solutions.

AC:4 Repairs and overhauls automobiles. Worker is exposed to fumes and odors of grease, oil, gas, and engine exhaust.

AC:5 Shampoos hair and scalp with various ingredients and rinses. Applies bleach, dye, or tint to color customer's hair. Worker is exposed to strong odors and skin irritants from various hair preparations and lotions.

8. PROXIMITY TO MOVING MECHANICAL PARTS

Exposure to possible bodily injury from moving mechanical parts of equipment, tools, or machinery.

MP:1 Sets up and operates variety of woodworking machines to surface, cut, and shape lumber, and to fabricate parts for wood products. Worker is subject to possible cuts, abrasions, injury to eyes, and loss of extremities.

MP:2 Tends fabricating machines, such as shears, brakes, straightening presses, and punches to shape and bend metal plates, sheets, and structural shapes. Worker is subject to possible injury, such as cuts, fractures, crushed hands or feet, hernia, and eye injury from metalworking machinery.

MP:3 Constructs, erects, installs, and repairs structures and fixtures of wood, plywood, and wallboard. Worker is subject to possible bodily injury from power saws and other power tools.

MP:4 Inspects and adjusts automatic pinsetters. Worker is subject to possible bodily injury from machinery.

9. EXPOSURE TO ELECTRICAL SHOCK

Exposure to possible bodily injury from electrical shock.

ES:1 Repairs energized electric power lines. Worker is subject to possible severe burns or electrocution.

ES:2 Operates high voltage equipment and works with high voltage circuits while operating substation. Worker is subject to possible electrical shock and electrocution.

ES:3 Repairs and maintains electrical equipment in generating station or powerhouse. Worker is subject to possible electrical shock and electrocution.

ES:4 Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment. Worker is subject to possible electrical shock and electrocution.

10. WORKING IN HIGH, EXPOSED PLACES

Exposure to possible bodily injury from falling.

HP:1 Repairs energized electric power lines, working from bucket of cherry picker or after climbing pole. Worker is subject to possible bodily injury from falls.

HP:2 Climbs poles, ladders, or scaffolding to install rigging to raise, lower, or support equipment, such as scenery and lighting equipment for theatrical productions. Worker is subject to possible bodily injury from falls.

HP:3 Applies coats of paint, varnish, stain, or lacquer to exterior and interior surfaces, working from ladder or scaffolding. Worker is subject to possible bodily injury from falls.

HP:4 Constructs, maintains, and demolishes elevated structures, such as smokestacks, water tanks, and steeples. Worker is subject to possible bodily injury from falls.

11. EXPOSURE TO RADIATION

Exposure to possible bodily injury from radiation.

RE:1 Prepares, administers, and measures radioactive isotopes in therapeutic, diagnostic, and tracer studies, utilizing variety of radioisotope equipment. Worker is subject to possible bodily injury from exposure to radiation.

RE:2 Operates x-ray equipment. Worker is subject to possible bodily injury from exposure to radiation.

RE:3 Operates and maintains nuclear reactor. Worker is subject to possible bodily injury from exposure to gamma and neutron radiation.

RE:4 Monitors radiation in work environment where radioactive material is used. Worker is subject to possible bodily injury from exposure to radiation.

12. WORKING WITH EXPLOSIVES

Exposure to possible injury from explosions.

E:1 Maintains and repairs gas lines, equipment, and appliances. Worker is subject to possible bodily injury from gas fume ignition and explosions.

E:2 Maintains, repairs, and overhauls machinery that uses nitroglycerine. Worker is subject to possible bodily injury from nitroglycerine explosions.

E:3 Tests ammunition in ammunition manufacturing plant. Worker is subject to possible bodily injury from exploding ammunition.

E:4 Determines most effective and economical methods of extracting underground coal deposits. Worker is subject to possible bodily injury from gas explosions during the time worker is in underground mining areas.

13. EXPOSURE TO TOXIC OR CAUSTIC CHEMICALS

Exposure to possible bodily injury from toxic or caustic chemicals.

TC:1 Tends equipment that mixes chemicals for use in bleaching, cleaning, desizing, latexing, mercerizing, and finishing canvas goods, carpets, and rugs, felt goods, and textile yarns and fabrics. Worker is subject to possible chemical burns from strong acids or anhydrous ammonia.

TC:2 Studies effects of toxic substances on physiological functions of human beings, animals, and plants to develop data for use in consumer protection and industrial safety programs. Worker is subject to possible bodily injury from toxic substances.

TC:3 Loads conveyor of battery-crushing machine. Worker is exposed to possible bodily injury from acid in batteries.

TC:4 Tends equipment that chemically cleans semiconductor wafers used in manufacture of semiconductor components, such as transistors, diodes, and integrated circuits. Worker is exposed to possible bodily injury from cleaning solutions used, such as hydrogen peroxide, sulfuric acid, and hydrochloric acid.

14. OTHER ENVIRONMENTAL CONDITIONS

Explain other Environmental Conditions, not defined above, in Environmental Conditions Comments.

OC:1 Demolishes parts of buildings to reach and combat fires and rescue persons endangered by fire and smoke. Is exposed to burns, fumes, smoke, and falling objects.

OC:2 Mines ore or coal in underground mine. Cuts channel under working face to facilitate blasting; charges and sets off explosives to blast down material; and installs timbering to support walls and roof. Exposed to danger of mine collapse, explosion of natural gas, and suffocation.

OC:3 Patrols assigned beat to prevent crime or disturbance of peace. Worker is subjected to bodily injury or death from law violators.

OC:4 Dives in ocean to maximum depth of three hundred feet. Worker is subject to bends and other conditions associated with high water pressure and oxygen deprivation.

OC:5 Patrols ski slopes prior to allowing public use. Worker is exposed to danger of avalanches.

PROCEDURE FOR PREPARING

PHYSICAL DEMANDS AND ENVIRONMENTAL CONDITIONS

SECTION OF THE JAR

(Refer to Sample at End of Chapter)

ID Number

Enter the same number that appears on the front page of the JAR which this section accompanies.

PHYSICAL DEMAND AND ENVIRNOMENTAL CONDITION SYMBOLS

The following symbols are used to indicate the presence or absence of a Physical Demand or Environmental Condition. Enter the appropriate one for each activity.

Code	Frequency	Definition
N	Not Present	Activity or condition does not exist.
O	Occasionally	Activity or condition exists up to 1/3 of the time.
F	Frequently	Activity or condition exists from 1/3 to 2/3 of the time.
C	Constantly	Activity or condition exists 2/3 or more of the time.

STRENGTH

Position

Enter beside each activity, Standing, Walking, and Sitting, the percentage of time the worker spends in each activity rounded to 5% intervals of time. The percentages entered should add to 100%. When they do not, provide an explanation in the Physical Demands comments section. Also enter in the comments section information to substantiate and explain entries made for each of the three activities.

Weight/Force

Record in the appropriate frequency column for each activity the range of pounds the worker lifts or carries or the pounds of force the worker exerts to push or pull objects. When the activity is not present, record an "X" under N (Not Present). When the weight of incidental objects lifted or carried infrequently (paper, pens, pencils) or the force exerted to push or pull objects (switches, heat- or touch-sensitive buttons or keys) is negligible, record an "X" in the N column next to the activity. In this instance an entry of "X" in the N column can indicate negligible weights lifted/carried or force exerted for pushing/pulling an object as well as that the activity is not present. When objects of negligible weight are lifted/carried or a negligible pushing/pulling force is exerted and, in the analyst's opinion, the Strength factor is influenced by the frequency of this pushing/pulling or lifting/carrying of negligible weights, record "0-1" in the appropriate O, F, or C column. Enter in the Physical Demands comments section information to substantiate and explain entries in the frequency columns of the Weight/Force section. Also, Physical Demands 9-Handling, or 10-Fingering, and possibly 8-Reaching, must have positive entries (O, F, or C) to be in agreement with the positive entries in this section.

Controls

Record in the space beside "Hand-Arm" an "N" (Not Present) when the job does not require the use of arms or hands to move controls, or one of the following letters "R", "L", "B", or "E" to indicate the use of **R**ight or **L**eft hand or arm, **B**oth right and left hands or arms, or **E**ither right or left hand or arm, when it does. Follow the same procedure for supplying information regarding the use of "Foot-Leg" controls. When any activity is too complex to be noted in this way, explain them in the Physical Demands comments section. Also, record in the comments section information to substantiate positive

entries (R, L, B, E) in the Controls section and to explain how the use of controls affects the Strength Level rating. Positive entries for Hand-Arm in the Controls section usually require positive entries for Pushing/Pulling in the Weight/Force section and frequently require entries for Physical Demands Factor 10, Fingering, since all three are interrelated.

1. Strength Level

Evaluate the percentages of time spent standing, walking, and sitting (Position Section), the amount of weights lifted/carried, the force exerted for pushing/pulling (Weight/Force Section), and the use of controls (Controls Section) to determine the Strength Level rating for the job, according to the definitions for the Strength Levels listed above. Generally, the analyst will be able to determine the Strength Level rating from the frequency and weight/force matrix in the table below. There are, however, two other considerations which may affect the final rating. The weights recorded in the Weight/Force Section, considered alone, may suggest that the job is S, Sedentary, but when the worker performs tasks in an awkward position, job performance is more difficult; this causes the worker to expend more energy than when working in a less awkward posture. A second consideration for rating Strength Level occurs when the worker lifts, carries, pushes, or pulls objects of negligible weight at a rapid and prolonged pace, such as in production work. Even though the weights and forces are negligible, a Strength Level rating of L, Light instead of S, Sedentary is justified. In both cases, record information in the Physical Demands comments section to substantiate the rating. After determining the overall strength requirements of the job, select and enter a capital S, L, M, H, or V in the space beside 1. Strength Level.

The following table is provided as an aid in the determination of Strength Levels:

LIMITS OF WEIGHTS LIFTED/CARRIED OR FORCE EXERTED

RATING	Occasionally (O)	Frequently (F)	Constantly (C)
SEDENTARY	* - 10	*	-
LIGHT	* - 20	* - 10	*
MEDIUM	20 - 50	10 - 25	* - 10
HEAVY	50 - 100	25 - 50	10 - 20
VERY HEAVY	100 +	50 +	20 +

* negligible weight

The range excludes the lower number and includes the higher number, i.e, the range 10 - 25 excludes 10 (begins at 10 +) and includes 25. Overlapping ranges of * - 10 in the Occasionally (O) column for Sedentary and Light jobs are differentiated on the basis of the worker's posture and whether work is performed at a production rate. For example, all Sedentary jobs involve constantly sitting. However, in some jobs workers sit constantly but exert force of an amount or at a frequency rate that exceeds the limits for Sedentary. Such jobs are, therefore, rated at least Light.

2-20. All Other Physical Demands

Record the appropriate frequency symbol in the space provided opposite each activity. Record in the Physical Demands Comments section for each activity marked present, supplemental or clarifying information pertinent to each activity, such as apparatus used; dimensions of workspace, tools, and materials used; speed, distance, duration, and frequency of actions; sensory requirements; and complexity of communications. In each instance identify the comments with the numbered factor and the activity to which it pertains.

NOTE: Physical Demands factors other than those cited may affect the Strength Level rating for a job. In instances when such Physical Demands are of a degree that the Strength Level rating is affected, assign the rating that accurately reflects the strength requirement of the job. Enter in the Physical Demands Comments section the justification for the rating.

Environmental Conditions

Record opposite each condition the appropriate frequency symbol (N, O, F, C), except for factor 5, Noise Intensity Level. For factor 5, consider: 1) the various levels of noise in the job, 2) how often each particular level of noise occurs in the job, and 3) how long each particular noise level lasts. Record the number that represents the noise intensity level which most closely describes the general background noise, or sound, present in the job environment. When there are varying levels, explain in the Environmental Conditions Comments section the levels, their frequencies, and sources. Record in the comments section for each Environmental Condition marked present, supplemental or clarifying information, such as temperature, duration, length of time, and source of condition.

NOTE: When the employer has installed protective devices which effectively eliminate the condition and the worker has no choice regarding their use, the condition is considered to be eliminated and is not present. The analyst should note this fact in the Environmental Conditions Comments section. However, when a protective device is subject to the worker's discretionary use, the condition is not considered to be eliminated and is reported as present.

Protective Clothing and Personal Devices

When present, list any clothing or devices, such as earplugs, masks, goggles, steel-tipped shoes, insulated gloves, and hard hats, which the worker is required to wear in order to protect the worker or the product against injury, disease, or contamination. Describe any item that is unusual or special and with which the reader will not be familiar.

ID Block

Enter the name of the analyst who prepared the report, the date the written analysis was completed, the name of the Field Center analyst who reviewed it, and the date the review was made.

If the JAR is reviewed by an official of the establishment, an officer of a trade or professional association or union, or another informed person, enter the name of the person, the organization, and the person's title but do not enter the name of the establishment in which the job was analyzed.

The following two pages contain sample Physical Demands and Environmental Conditions Forms.

PHYSICAL DEMANDS

) NO. _____ Page _____ of _____

Physical Demands | Comments

Strength

Position

Standing _____ %

Walking _____ %

Sitting _____ %

Weight/Force

	N	O	F	C
Lifting				
Carrying				
Pushing				
Pulling				

Controls: Hand-Arm _____ Foot-Leg _____

1. Strength Level: _____

2. Climbing	
3. Balancing	
4. Stooping	
5. Kneeling	
6. Crouching	
7. Crawling	
8. Reaching	
9. Handling	
10. Fingering	
11. Feeling	
12. Talking	
13. Hearing	
14. Tasting/Smelling	
15. Near Acuity	
16. Far Acuity	
17. Depth Perception	
18. Accommodation	
19. Color Vision	
20. Field of Vision	

ENVIRONMENTAL CONDITIONS

ID NO. _____ Page _____ of _____

Environmental Conditions		Comments
1. Exposure to Weather		
2. Extreme Cold		
3. Extreme Heat		
4. Wet and/or Humid		
5. Noise Intensity Level		
6. Vibration		
7. Atmospheric Conditions		
8. Moving Mechanical Parts		
9. Electric Shock		
10. High, Exposed Places		
11. Radiation		
12. Explosives		
13. Toxic/Caustic Chemicals		
14. Other Environmental Conditions		

Protective Clothing or Personal Devices

Analyst _____ Date _____

Field Center Reviewer _____ Date _____

Additional Reviewer _____ Title _____