

Physical examinations ✓

PHYSICAL EXAMINATIONS IN INDUSTRY



INDUSTRIAL HEALTH SERIES
NUMBER 2

METROPOLITAN LIFE INSURANCE COMPANY

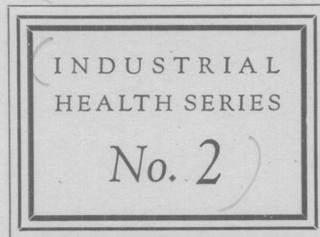
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Industrial Health Bureau

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PHYSICAL EXAMINATIONS IN INDUSTRY

THE ESSENTIAL basis for sickness and accident control in industry is the physical examination. Without knowledge of the physical condition of the individual it is difficult, if indeed not futile, to develop the facilities required for the conservation and betterment of health.

When there is a labor shortage, as for example during wartime, there is not only a marked trend toward employment of the physically substandard and the actually handicapped, but also greatly increased emphasis on the necessity for continuous production and the elimination of lost time due to preventable causes, such as ill health.

Following World War II there was a continued effort to place physically handicapped workers in order to re-employ disabled war veterans, and to continue in employment a considerable number of the handicapped who had contributed to the war effort by their work in the industries.

Adequate preplacement physical examinations and medical supervision on the job are important features of successful employment of handicapped workers, whose work capacity and loyalty have been shown to be equal to or greater than those of physically normal persons when they are appropriately placed in relation to the physical demands of the job and to their own potential skills.

Studies have shown that older people make satisfactory workers when properly placed in jobs where they can prove their worth as competent and efficient workers. Job analyses of the physical and environmental demands of the job and the physical capacities of the worker make it easy to fit the worker to the job. The employment of the older worker is becoming more and more important as the age of the population rises. Several States have enacted legislation dealing with the problem of discrimination against older workers in the labor market.

Therefore, the day of the superficial physical examination which is little more than an inspection is waning. In many of the larger industries examinations are of an increasingly searching type, not for purposes of eliminating those with physical impairments, but as a basis for proper job placement.

In a survey made in 1940 of 2,064 plants of all sizes and types, distributed over the country and operated by 1,500 representative companies, the National Association of Manufacturers reported that 72 percent of the total conducted pre-employment physical examinations, although 40 percent of the plants replying to the questionnaire employed fewer than 250 workers each. Periodic health examinations were carried out in 42 percent of the plants, but this procedure was shown to have had a rapid growth during the year of the survey.

Figures obtained in 1948 from a survey by the National Industrial Conference Board, covering 333 plants, showed that over 92 percent require hourly workers to take preplacement physical examinations. Examinations are compulsory for office workers in approximately 77 percent of the plants surveyed. Both large and small plants provide the examinations.

Purposes and Functions of Physical Examinations

The two classes of physical examinations with which industry is particularly concerned are: (1) the preplacement examination of applicants for employment, and (2) the subsequent periodic examination of some or all workers at regular intervals during their service in the organization. While in many instances both types are utilized, it is felt that they are so different in purpose and method that in any discussion of plans for organizing physical examinations in industry they may, to a certain extent, be treated separately.

The Council on Industrial Health, of the American Medical Association defines the objectives of industrial physical examinations as follows:¹

1. To facilitate placement and advancement of workers in accordance with individual physical and mental fitness.
2. To acquaint the worker with his physical status and to advise him in improving and maintaining personal good health.
3. To safeguard the health and safety of others.
4. To discover and control the effects of unhealthful exposure.
5. To promote cooperative support and understanding of industrial health practices by employer and employee alike.

¹COUNCIL ON INDUSTRIAL HEALTH OF THE AMERICAN MEDICAL ASSOCIATION: "Industrial Health Examinations," Revised. *Journal of the American Medical Association*, Chicago, Vol. 125, No. 8, (June 24, 1944.) Page 569.

When constructively used, the physical examination is an important means for the detection of remediable defects and for the early discovery of chronic disease or deterioration. Through its instrumentality, the handicapped worker can be usefully employed in work which is well within his physical capacity, with the result that a skilled worker may be recovered to the mutual gain of both employer and employee. Most large establishments can, with moderate care in placement and a flexible placement standard, make good use of any reasonably normal applicant, particularly those whose impairments are of a static nature, rather than of the nature of a progressive disease.

All workers whose work involves exposure to toxic hazards or requires unusual physical endurance should be physically examined not only prior to employment but periodically thereafter, as much for their own protection as for that of the employer. In these circumstances, a more careful examination is called for as well as more rigid physical requirements.

After 1930, during the period of economic depression, however, a temporary wave of increasing claims for compensation and negligence suits for damages alleging occupational diseases brought great concern to employers. This led, in some cases, to the introduction of physical examinations for the purpose of terminating the employment of all who were not found entirely sound. Whatever the provocation, it is needless to say that this policy was soon shown to be shortsighted and produced an antagonism to physical examinations on the part of labor that has taken a long time to overcome. On the other hand, the well-conducted and fairly administered physical examination has proved to be the soundest way to safeguard and improve the health of the worker. Appreciation of this fact is gradually being brought about through the cooperative efforts of industrial medical and hygienic authorities and progressive employers and labor leaders. The Wisconsin Industrial Commission, with the cooperation of the State Medical Society and representatives of industrial management and organized labor, designed a physical examination program which was recommended on a voluntary basis to Wisconsin industries in 1939 as one essential in the prevention and control of occupational diseases and accidents. Wisconsin has also adopted statutory provision under the workmen's compensation law for penalties of various kinds for employers who apply physical examinations in an oppressive manner

to reject or discharge workers.² (For physical examination forms suggested, see pages 32-34). These forms are being revised by a committee of the Wisconsin Industrial Commission and the State Medical Society.

In order to obtain the maximum value from the physical examination of employees, it should be performed in a manner that not only enables management to fit the workman to a suitable job, but also reveals the information requisite for guidance of the worker in the maintenance of his health to the end that he may continue on his job effectively. This implies an intimate first-hand knowledge on the part of the examining physician of the actual jobs, methods of work, and conditions surrounding the work throughout the plant for which he is examining applicants and workmen. This aspect of an examination program should be carefully considered by the individual plant management, before deciding upon the relative merits of setting aside space and equipment for a doctor to make examinations on the premises or arranging to send prospective workers to the doctor's outside office. The latter system is not conducive to sustained interest on the part of the physician in keeping constant watch over the correlation of the job requirements with the worker's physical condition, although it has its uses on certain types of scattered operations.

The personality, tact, and strictly unbiased attitude of the doctor and other medical department personnel are of crucial importance in industry just as in private practice; perhaps more so, since these services are in some degree urged upon the workers. The wise employer realizes that the work of his industrial physician has far more value if it serves the employees as well as the management, impartially and scientifically.

With sustained interest on the part of top management and consistent follow-up by the physician of those found physically ill or defective, the physical examination program often develops into a successful full-fledged industrial medical service. The emphasis in the more inclusive programs is on health maintenance, assuring that each worker secures remedial medical care from appropriate local physicians or other community health agencies, and that workers with permanent handicaps or impaired health are successfully placed at jobs within their physical capacity and tolerance. Without this sustained interest and effort, the whole

²Wisconsin Physical Examination Program: Industrial Commission of Wisconsin, Madison, 1939.

physical examination program is likely to deteriorate into a more or less empty routine.

The physical examination program is, therefore, the cornerstone of an industrial health program.

A comprehensive industrial medical service, according to the Division of Industrial Hygiene of the United States Public Health Service,³ may include some or all of the following functions:

1. Emergency medical care of all employees who are injured or become ill on the job, whatever the cause.
2. Continued treatment of employees suffering from occupational diseases or accidents.
3. Regular inspection of health and accident hazards in the shops, in cooperation with the safety department, engineering department, or other units, for the prevention of occupational disabilities.
4. Annual periodic examination of all employees and executives with a view to helping them improve and maintain health through the discovery and correction of ailments which they may not be aware of but which later may impair their health seriously.
5. Monthly physical examination, including laboratory tests, of workers who are exposed to poisonous materials on their jobs. Workers with unusual responsibilities, such as cranemen and hoistmen, should be examined every six months.
6. To maintain and analyze sickness records in order to know how, when, and where lost time due to disability occurs in the plant; to tabulate these records monthly, according to cause, nature, and duration of disabilities, and department or occupation of the patient.
7. To cooperate with the personnel department, employment office, or other responsible unit, in the proper job-placement of new workers, through the preplacement examination, and at the same time to give new workers the guidance mentioned in paragraph 4 above.
8. To make sure that employees returning to work after an absence due to illness or injury are capable of working safely and efficiently.
9. To promote and take part in a health education program for employees and their families.
10. To make detailed plans for handling large numbers of seriously injured workers in the event of disaster, such as an explosion or fire. Plans should include:
 - (a) Transportation and first-aid care of the injured.
 - (b) Transferral of the seriously injured to hospitals where operating rooms, blood plasma, and blood donors are available.
 - (c) Coordination of these plans with the safety department, guards, police, road patrols, and fire departments (civilian defense).

³Outline of an Industrial Health Program: Supplement No. 171 to the Public Health Reports, U. S. Public Health Service, Washington, D. C., 1943.

11. To cooperate with, and if desirable supervise, all other services in the plant which relate to the health of the workers, such as the food service, the welfare service, safety program, and recreation committees.

To obtain practical, measurable results from an industrial health program adequate records should be kept, from which data can be tabulated in a form showing exactly what the program is accomplishing or failing to accomplish. The confidential nature of the diagnosis or detailed findings of the physical examination, however, should be rigorously preserved and safeguarded. The form of the records and the uses to which they may properly be put are discussed under record forms (pages 26-35).

A number of very complete and instructive manuals on all aspects of industrial medical practice are available and will be found in the Reference List (pages 43-44).

Pre-employment Examination Rooms and Equipment

It is generally agreed that if good results are to be obtained from physical examinations, a suitable space with proper equipment and clerical assistance should be provided. The diagrams, Figure 3, on pages 24 and 25 show good arrangement.

Examination quarters of a type more or less peculiar to industrial plants consist of two or more dressing booths, perhaps no larger than 40 by 60 inches, in which applicants for examination remove their clothes; these booths open into or adjoin an examination room which need not be more than 8 by 10 feet in floor dimensions (see Plan A, Figure 3). In the examining rooms with two or more dressing booths to a room, two doors to each booth may be arranged so that the applicant may enter a booth from a hall or waiting room and lock himself in by the door entered, but may not enter the examining room by the second door until the doctor unlocks and opens it. That is, both doors lock on the side facing the examining room, but neither locks on the other side; thus the applicant or his clothing cannot be disturbed by others coming into his booth by mistake, nor can he burst into the examining room prematurely. Yet if he should be forgotten, which sometimes happens, he can still emerge into the waiting room.

The high cost of floor space in many factory and office buildings, especially those located in cities, makes it necessary to give conservation of space serious consideration in planning the layout for examination rooms. Dressing booths, though convenient in the opinion of many physicians, are not essential to proper

management of the examinations and may be dispensed with if desired.

Some industrial physicians advocate the use of examining rooms about 100 square feet in size, with a transverse dimension of between 7 feet and 8 feet. This gives a longitudinal diameter sufficient for vision tests on a 20-foot basis if a mirror is used on the opposite wall. The rooms are used alternately as dressing rooms and as examination rooms, the doctors going from one such examining room to another (see Plan B, Figure 3).

The number of examination rooms needed may be determined on the basis of the plant labor turnover. The time required for an average employment examination is about 10 to 15 minutes. Therefore, a physician may make at the most about four or five an hour, or 30 to 40 a day. In practice he seldom makes the estimated maximum. If a company has double this number of applicants for employment, or about 75 daily, two doctors and two rooms, with two booths to a room, will be needed, and if only the morning is given to physical examinations, this number must be doubled again.

Equipment

The following equipment is recommended for industrial examining rooms by the Council on Industrial Health of the American Medical Association*:

Examining table	Dynamometer
Stools, chairs, and couch	Centrifuge
Mirror	Microscope
Screen	Stethoscope
Scale and measuring rod	Ophthalmoscope
Metal measuring tape	Blood vacuum tubes
Spotlight	Otoscope
Distant and near reading cards	Reflex hammer
Color-sense testing cards	Rubber gloves and finger cots
Nose and throat mirror	Tuning forks
Transilluminator	Hemoglobin outfit
Blood-pressure instrument	Urinalysis equipment
Luer syringes (2 cc. and 10 cc.)	Garment racks
Thermometer	Standard office furniture

In addition there should be washable capes or other covering for examinations of women. The centrifuge is helpful if any

*See footnote 1, Page 6.

analyses are to be completed in the department. If space permits, a writing table and chair in each room are desirable.

For the more complete types of examining procedure, there may be added space and fluoroscopic and X-ray equipment, an electrocardiograph, an audiometer for testing hearing, and a basal metabolism outfit, and, if desired, a completely equipped laboratory with chemical reagents. It is considered preferable to have the pre-employment examination rooms and those where periodic examinations are made separated from the rooms where injuries and illnesses are treated so that new employees and those being routinely examined are not mingled with cases of illness or injury. In the small plant, where pre-employment examinations are few and the time can be arranged so that the periodic examinations do not conflict or interfere, it may be possible to use the same rooms for both types of examinations. It is convenient, of course, that both rooms should be accessible to such equipment and facilities as may be used in common, such as the X-ray apparatus.

Preplacement visual testing procedure has been rapidly developing in the past few years, and a number of plants have installed equipment for the rapid testing of visual efficiency consisting of a stereoscopic viewing apparatus with a battery of tests calculated to cover the important visual functions, including acuity of distant and near vision, depth perception, ocular muscle balance for near and far vision, color perception, and others if needed. Such apparatus can be handled by the nurse after special training or by other trained technicians, but any and all testing should be under professional guidance.⁴

Dr. J. S. Felton, Medical Director, Oak Ridge National Laboratory, Union Carbide & Carbon Corporation, has devised a combination examination-treatment unit.⁵ A photograph of this unit is reproduced in Figure 1, page 14.

Cost

According to the Council on Industrial Health of the American Medical Association, industry should supply, without charge, all medical and clerical assistance essential to a health examination program. The cost of examining applicants obviously varies with

⁴Hedwig S. Kuhn, M.D.: *Eyes and Industry*, formerly *Industrial Ophthalmology*, C. V. Mosby and Company, St. Louis, Second edition, 1950. 378 pages.

⁵Jean Spencer Felton, M.D.: *Space and Labor Saving Devices in the Industrial Dispensary*. 1. Combination Examination-Treatment Unit. *Occupational Medicine*, June 1947, Vol. 3, No. 6. Page 560.

the conditions of the examination and the locality in which it is undertaken. A general idea of the fees for which a competent doctor can probably be secured to do this work should be obtainable from the Committee on Industrial Medicine of the local State or county medical society. Information regarding salaries for nurses should be sought from the State or local nursing association, the State division of industrial hygiene, or from the State industrial nurses' association, if one exists. Provided that the physician's time is efficiently planned while he is at the plant and adequate assistance is given him, the average cost of the standard type of employment examinations should not, as a rule, exceed \$5 per person examined. A thorough, painstaking examination would cost more, depending upon the time and skill required.

Preplacement Examination of Applicants

As long ago as 1922, Dr. W. Irving Clark⁶, of the Norton Company, Worcester, Mass., suggested a detailed technique for conducting a physical examination for industrial employment purposes.

He advocated that the examination should be given before the employee is actually hired and that it should be conducted in private by the physician. The examination of women, unless done by a woman physician, should be carried out in the presence of a nurse or female attendant. The preliminary part of the examination, such as observing and recording the weight, height, temperature, and the results of eye and ear tests, may be made by a nurse or trained layman in order to save the doctor's time.

Since speed is often essential in preplacement examinations to avoid delay in the employment department and undue waiting in the medical department, a definite methodical order of procedure carried out by an experienced physician is highly desirable.

The scope of the examinations, as outlined by the Council on Industrial Health,^{*} includes:

1. Past medical, family, and occupational history.
2. Physical findings.
3. Personality appraisal.
4. Laboratory data.
5. Summary and recommendations.

⁶W. IRVING CLARK, M.D.: *Health Service in Industry*, The Macmillan Company, New York, 1922.

^{*}See footnote ¹. Page 6.

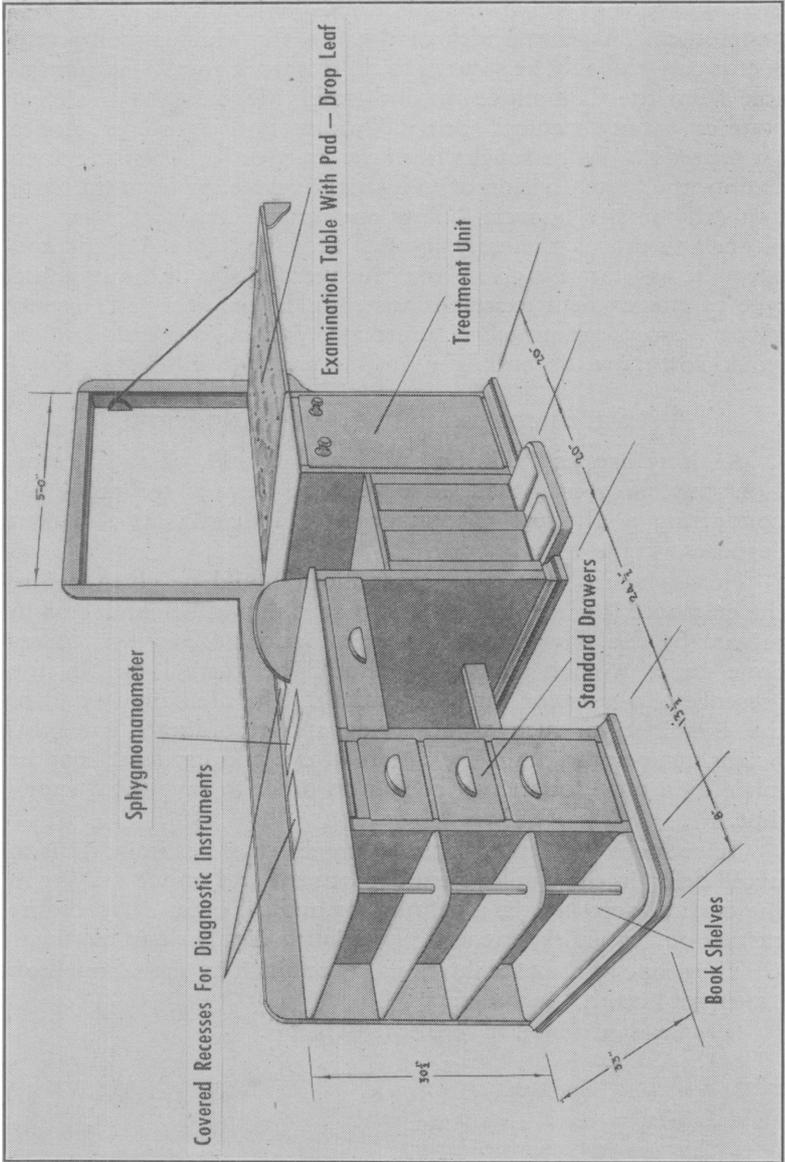


FIGURE 1
Courtesy of Dr. Jean S. Felton

The first part of the examination, the recording of identification and job data, and the personal history can be taken by a well-trained assistant, either a medical record clerk or a nurse, to save the time of the physician, but under no circumstances should anyone except the physician himself undertake the actual physical examination. The personal and family medical history is frequently unreliable in the case of applicants for employment, not only because of fear of rejection, but often because of lack of knowledge; consequently, many industrial physicians feel that an elaborate questionnaire on the subject is of very limited value. On the other hand, the record of past occupations, past illnesses, serious injuries, hospital or sanatorium care, and repeated sicknesses or accidents, is very important and should be taken carefully. Women are generally questioned concerning menstrual difficulties, pelvic conditions, and history of pregnancies.

Applicants may be classified as follows into three or four broad groups (see page 26) as a result of these examinations:

1. Applicant physically fit for any work in the plant
 - (a) without physical defects or impairments.
 - (b) with slight physical defects, insignificant or correctible.
2. Applicant physically fit only for selective placement under medical supervision.
3. Applicant physically unfit for any work in the plant.

When the physically standard applicants, who represent the great majority, are separated from the substandard, the latter may subsequently be given a more detailed examination to discover the extent of their disabilities and their requirements for careful job placement and future medical supervision. It should be clearly understood that the substandard classification does not necessarily imply rejection; but that each applicant in the class should be judged individually by the physician, with the purpose of assessing his working capacity in relation to the jobs available. This is one reason why it is so important for the physician to be familiar with the types of jobs performed in the plant and their respective physical and mental requirements. This knowledge is best obtained by first-hand observation and study, but in any event, a competently prepared job analysis and job classification with emphasis on physical requirements should be made available to the examining physician.

Adequate follow-up of all physically substandard workers placed in industry implies that definite measures will be adopted

by the industrial physician to see that remedial treatment is secured for correctible defects, and that those with irremediable defects or chronic impairments not yielding readily to treatment are seen again at suitable intervals to make sure that their jobs are still within their physical capacity and are not aggravating their conditions. All workers classed as substandard should be re-examined or medically approved for a transfer before they are permitted to change to a different job which may be more arduous or more hazardous for them than the one at which they were placed originally.

Physical impairments giving rise to a substandard classification are most frequently due to chronic diseases of the cardiovascular system, pulmonary diseases, diseases or defects of the bones and joints, hernia, defects or diseases of the eyes and ears, and various general diseases such as syphilis, rheumatism, alcoholism, and diabetes. Mental disturbances of varying degrees of severity and epilepsy are also extremely common, and these are not always recognized on pre-employment examination. In recent years more stress has been placed upon the need for attention to this point in the examining technique.

As better understanding has been acquired of the factors which contribute to accidents and ill health among industrial workers, the interrelationship of mental health and physical health has become clearer. Wherever possible, physical examinations should be performed with this broader concept of health in mind. Even the necessarily brief, rapid preplacement examination can include some appraisal of the mental and emotional status of the applicant. When this is done there is less likelihood that serious and obvious mental disorders will be overlooked, but, more important, the plant physician may be able to make more intelligent recommendations regarding the job placement of the worker.

In each plant the industrial physician usually develops his own technique or adapts existing techniques to the existing conditions on the basis of his own experience and the industrial management policies involved in the particular industry. Certain general standards have been drafted or suggested from time to time which may be useful for guidance. The earliest standard adopted by the Conference Board of Physicians in Industry⁷ many years ago is still in more or less general use by industrial physicians, with various modifications.

⁷*Medical Supervision and Service in Industry*, Appendices D and E, National Industrial Conference Board, Inc., New York, 1931. Pages 116-121.

Dr. C. H. Watson,⁸ formerly and for many years Medical Director of the American Telephone and Telegraph Company, has outlined the following general physical standards as applying to employability in all occupations:

Temperature—The temperature should be within normal limits.

Pulse Rate—The pulse rate should be within normal limits except in recognized old heart block—that is, up to a rate of 90 beats per minute in the absence of other organic disease. If the rate is above normal, the candidate should receive special study, on the basis of which his acceptance or rejection should be determined.

Weight—Weight is not particularly significant except in extreme cases and when associated with definite signs of disease.

Blood Pressure—If it is within the following limits, the blood pressure should be acceptable. Hypertension: systolic between 130 and 140 mm. in applicants 20 to 30 years of age; between 140 and 150 mm. in applicants 30 to 40 years of age; up to 180 mm. in applicants over 40 years of age, provided there are no peripheral signs of vascular or organic disease.

In systolic pressure range between 130 and 140 mm. there should be established an arbitrary diastolic range of from 65 to 100 mm., according to the relationship with the corresponding systolic pressure.

It should be pointed out that some industries, particularly those engaged in certain chemical work, will not accept employees with blood pressure readings as high as these.

In instances of hypertension, or hypotension, if there is no symptomatology and the general physical condition is satisfactory, determination of acceptance should be a matter of judgment on the part of the examining physician. Owing to economic and management restrictions, it will be found difficult to determine the underlying causes of pathologic blood pressure phenomena. Hence, bearing in mind the element of relative disability of particular individuals, the war production needs, and perhaps also the war duration factor, a liberal interpretation may well be considered.

Eyes and Ears—Auditory and visual impairments should be judged on an individual basis, both with respect to the impairment and to the job. . . . In noisy trades, such as riveting, applicants with a history of total nerve deafness or with a partial nerve deafness are not acceptable, but applicants with partial deafness which is due to an obstructive middle ear condition are acceptable.

Chest—A routine 35-mm. chest film is desirable as a screening process. Definitely arrested tuberculosis is acceptable for certain occupations. The Westinghouse Electric and Manufacturing Company produces a 35-mm. X-ray for chest films and the General Electric Company makes a smaller outfit for 4 by 5 inch chest films. This type of equipment is expensive and can be obtained only under the higher priority ratings. It has also been suggested that a routine Mantoux test be done on all applicants.

Heart—Applicants with organic heart disease who have compensation judged to be adequate for certain employment requirements,

⁸CASSIUS H. WATSON, M.D.: "What Plan Shall We Pursue Concerning Physical Defects in the General Population?" *New York State Journal of Medicine*, Vol. 43, No. 22 (November 15), 1943. Pages 2169-2173.

should be acceptable if they have shown no peripheral signs and have experienced no pain episodes for a period of six months.

Serology—A serologic test should be made if facilities are available. Positive findings with no open or disabling lesion or sign of neurosyphilis are acceptable provided proper therapy is received under the supervision of the medical office. Positive serology (4 plus) in asymptomatic individuals should require a Kahn verification test.

Urine—The presence of sugar, marked traces of albumin, pus, blood, or casts calls for further investigation to determine the cause. Such applicants should be acceptable for special assignment if the sugar threshold has been determined and insulin therapy established. Those with moderate serum albumin with hyaline and granular casts and a high total blood nitrogen should be deferred for more complete investigation if industrial needs justify. Persistent pus with intracellular diplococci should be regarded as indicative of active disease, and applicants should be deferred until this condition is cured. Persistent pus without demonstrable source should be cause for deferment for more complete investigation if industrial needs justify.

A careful examination of the chest of each applicant is very important. The technique developed by Clark at the Norton Company Plant* was as follows and is still a generally useful method:

A quick method of determining the functional power of the heart and lungs is to run over the apices of the lobes of both lungs with a stethoscope, telling the patient to breathe in, breathe out, and then to cough. This expulsive cough at the end of expiration is of great service in bringing out rales. In hearts which show enlargement, irregularity, or produce murmurs, a quick test of function is to have the patient hop 25 or 50 times on one foot. Rapidity of expiration, breathlessness, and irregularity of pulse should be noted, and, if marked, indicate a myocardium insufficient for hard work.

The technique instigated by Dr. Clark for conducting pre-placement examinations is still carried out at the Norton Company Plant, with the addition of the use of an audiometer for hearing tests and a vision test by one of the binocular screening instruments.

Every worker at this plant is given a chest X-ray in order to have this as a permanent record.

It will be seen that there is a rapidly growing tendency to include, as part of the routine physical examination, an X-ray examination of the chests of all applicants. This procedure is particularly important in industries where exposure to dusts, which may affect the lungs, is involved. The X-ray examination not only confirms the physical findings of the chest, but detects incipient diseases of the lungs frequently before either symptoms or physical signs of disease appear. It protects the employer from

*See footnote †. Page 13.

hiring a worker whose lungs have already developed injury from industrial dusts in previous employments, and the workmen with injured lungs from being put to work in occupations which will aggravate this condition. It serves, also, as a graphic means of recording the changes that take place in the chest from time to time. Some of the important conditions brought to light through the use of the X-ray are: tuberculosis, chest tumors, enlargement or displacement of the heart and its associated large blood vessels, and occupational diseases of the lungs, such as silicosis and asbestosis.

Routine laboratory examination of the blood for syphilis is also being successfully practiced in many plants, with an adequate program of follow-up to see that cases of active, untreated infection are encouraged to obtain competent medical treatment (see page 18, *Serology*).

Another very important part of the examination is the careful testing of the joints, and Clark recommends the following as a rapid and efficient method long used in a large factory:

1. Applicant stands facing examiner, forearms flexed on arms, hands in supination.
2. Applicant spreads fingers apart and brings them together, closes fists, opens fists, apposes tips of thumbs to little fingers, pronates, and again supinates.
3. Flex forearms acutely until fingers touch shoulders. Raise elbows anteriorly as high as possible.
4. Abduct both arms in this position and rotate shoulders.
5. Raise hands straight up above head as high as possible.
6. Bend over touching ground.
7. Resume erect position.
8. Squat on heels and rise to original position.
9. Abduct first one leg and then the other.
10. Rotate the head from side to side.

If these motions are gone through rapidly, they can be accomplished in about three minutes, and every important joint in the body will have been tested. It has been found that defective joints are more apt to cause trouble than other apparently more serious disorders in other parts of the body.

Two conditions which may be very troublesome from the standpoint of aggravation and disability in some types of work are varicose veins and weak feet. The capacity for standing for long hours, climbing, operating machinery by pedal, and walking may be limited in such applicants, and those having a tendency to phlebitis and varicose ulcers may be severely handicapped and constitute a job placement problem.

A chart prepared by the medical unit of the U. S. Civil Service Commission to illustrate methods of testing for weak feet is reproduced on page 21.

The Placement of the Physically Handicapped

A number of plants have set up special committees or departments to oversee the appropriate placement of rehabilitated applicants, or to aid in rehabilitation job training. Many plans have been developed on a community-wide scale in industrial areas.

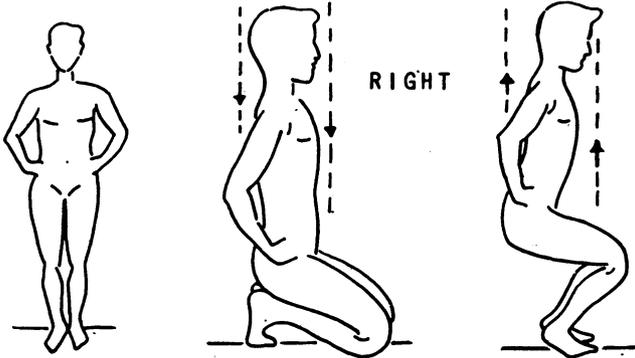
For example, under the leadership of the Caterpillar Tractor Company, Peoria, Ill., its own well-organized plan has been extended to the industrial employers of the community and is known as the "Peoria Plan."⁹ Other interested groups are represented on the executive committee. A central office has been provided, with a vocational counselor and clerical assistance for the purpose of investigating the case of each returned serviceman and placing him in the appropriate classification for employment. Each interested company contributes by organizing a program, usually with the cooperation of the personnel, training, medical, and safety divisions, and supervisors. The first and most important step is a job survey with job analyses drawn up to show minimum physical requirements for each job in the plant, and also the possibilities as to "breakdowns" in processes to permit the use of handicapped workers to advantage.

A useful conception concerning the working capacity of the physically handicapped was presented some years ago by Dr. Henry H. Kessler of the New Jersey State Rehabilitation Clinic at Newark, in which he decried the habit of setting up a more or less visionary ideal of anatomical and physiological perfection as "normal" and pointed out, on the basis of considerable experience, that judgment of physical fitness for work should be based on the ability to perform productive work continuously. He divided physical defects into (1) "static defects," such as paralysis of an arm or amputation of a leg, and showed that the majority of individuals with these defects can be adapted to normal productivity, and (2) "dynamic defects," meaning progressive illnesses of an infectious or chronic degenerative type, which may affect productivity through deterioration of mental and motor

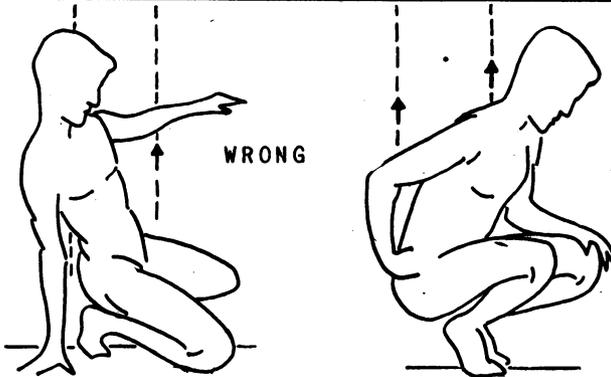
⁹H. A. VONACHEN, M.D.: "A Practical Program for Human Rehabilitation," *Industrial Medicine*, Chicago, Vol. 12, No. 12, December 1943. Page 807.

METHODS OF TESTING FOR WEAK FEET

CHART PREPARED FOR MEDICAL UNIT, U.S. CIVIL SERVICE COMMISSION
Washington, D.C.



1. Position: Body erect, hands on hips.
2. Body descends until knees rest on floor.
3. Body rises with hands still on hips and each leg comes up evenly without wobbling or excessive strain.



4. Weak feet cause the subject to assist himself in rising by placing hand on floor and leaning backward.
5. Subject may attempt to help himself by leaning forward and placing hand on one knee.

⑤

FIGURE 2

Courtesy of Verne K. Harvey, M.D., Medical Director, U. S. Civil Service Commission,
Washington, D. C.

functions. It is in this latter type of impairment that very thorough physical examinations are of especially constructive value.¹⁰

An important task has been accomplished along the lines of job classification, based upon direct observation by medical officers of actual employees performing their tasks in approximately 6,160 positions, indicating the types of work which may be suited to individuals having various types of physical impairments. This classification, entitled "A Guide for the Placement of the Physically Handicapped," Fourth Edition, October 1946, is the work of the Civil Service Commission, Washington, D. C., under the direction of Dr. Verne K. Harvey, Medical Director. It is used by the Commission's representatives in recruiting, training, and employment offices.

Harvey and Luongo suggest the following preliminary considerations in planning for placement of the handicapped:¹¹

The proper appraisal of physical requirements, the placing of individuals who are impaired physically or mentally, can best be accomplished provided there has been:

1. A reasonable appraisal of the physical needs of the various positions through job analysis of a limited number of the items of physical or mental fitness.
2. Coordination of training, recruitment, and placement programs.
3. An intelligent program for the purpose of convincing the employer of the prospective employee's qualifications, expressed in terms of ability to perform in contradistinction to the physical needs of the job.
4. Coordination between the medical office, the employment office, and the management heads of the main departments together with their medical and safety advisors.

The general principles recommended by Robert H. Flinn, M.D., of the United States Public Health Service¹² as a basis for solving the problem of selective placement of the handicapped are:

1. *Handicaps suitable for immediate placement.*
 - (a) Symptomless hernia, varicocele, hydrocele, or varicosities.
 - (b) Defective vision due to refractive errors.
 - (c) Impaired hearing or deafness.
 - (d) Arterial hypertension, asymptomatic.
 - (e) Heart disease, compensated.
 - (f) Orthopedic defects, including amputations and ankyloses.

¹⁰HENRY H. KESSLER, M.D.: "The Determination of Physical Fitness," *Journal of the American Medical Association*, Vol. 115, No. 19 (November 9), 1940. Page 1591.

¹¹VERNE K. HARVEY, M.D., and E. P. LUONGO, M.D.: "The Physically Handicapped in Industrial Establishments of the Government," *Journal of the American Medical Association*, Vol. 121, No. 2 (January 9), 1943. Page 100.

¹²ROBERT H. FLINN, M.D.: "The Maximum Use of Manpower," *Manual of Industrial Hygiene*, prepared by Division of Industrial Hygiene, U. S. Public Health Service, W. B. Saunders Company, Philadelphia, 1943. Pages 390 and 391.

- (g) Dental defects.
- (h) Simple glycosuria or albuminuria.
- (i) Blindness.
- (j) Arrested pulmonary tuberculosis.
- (k) Latent syphilis, while taking treatment.

As noted previously, this list comprises the great majority of the reasons for rejection in many plants.

2. *Handicaps calling for temporary rejection until treated satisfactorily.*

- (a) Communicable syphilis, until four injections are given.
- (b) Acute gonorrhea.
- (c) Acute respiratory diseases.
- (d) Irreducible hernia.
- (e) Painful or prolapsed hemorrhoids.
- (f) Painful varicosities, varicocele, or hydrocele.
- (g) Severe refractive errors.
- (h) Symptomatic arterial hypertension.
- (i) Organic heart disease, symptomatic.
- (j) Clinical diabetes mellitus, unless severe.
- (k) Painful, crippling orthopedic defects.
- (l) Severe skin diseases.

These cases should be put to work as soon as the disability is relieved or controlled. Many will require continued medical supervision. All acute, limited diseases should be included in this classification of those temporarily ill.

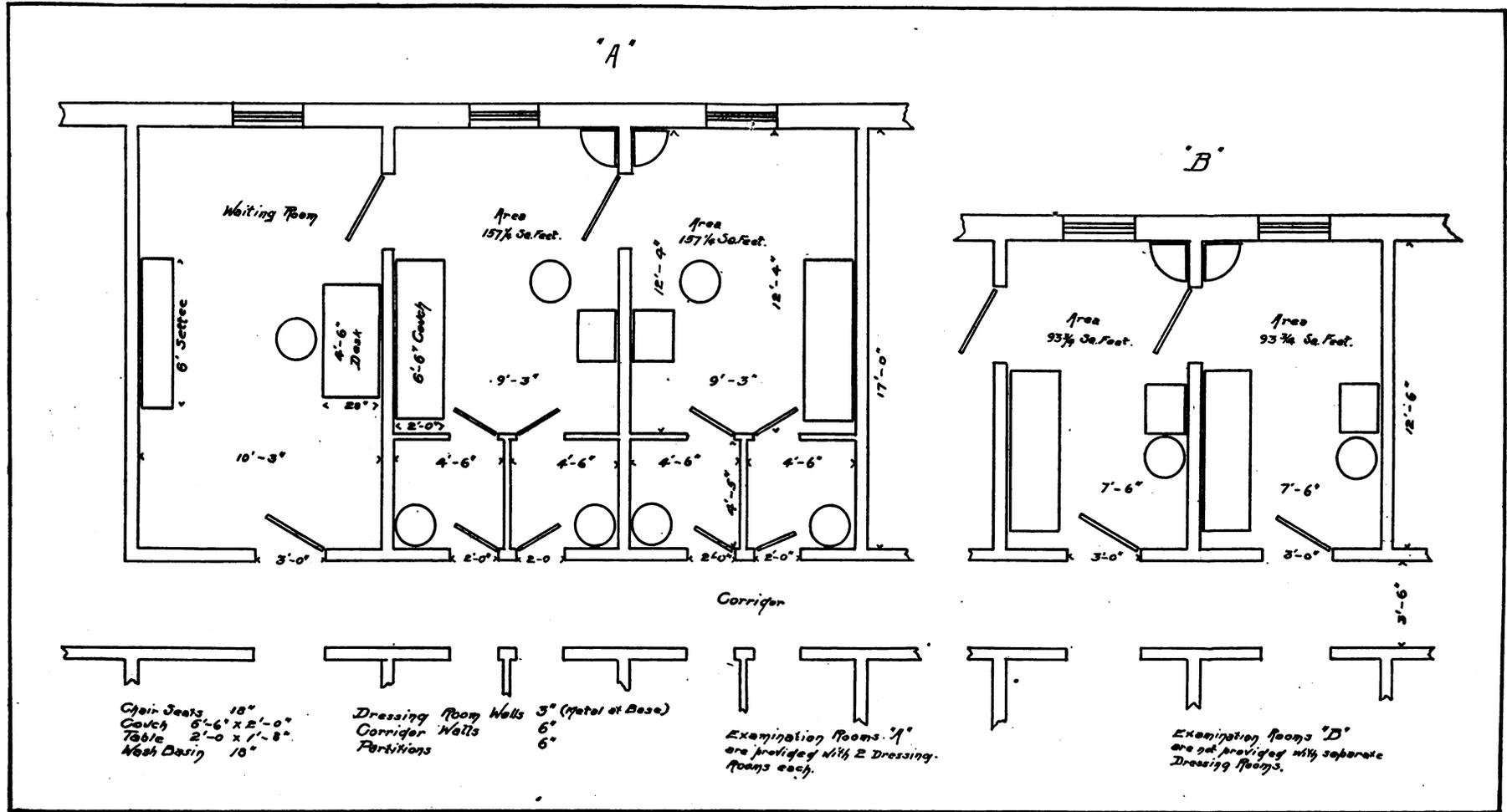
3. *Unfit for employment.*

- (a) Active tuberculosis.
- (b) Syphilis of central nervous system.
- (c) Frequent epileptic attacks.
- (d) Severe diabetes mellitus.
- (e) Decompensated cardiovascular disease.
- (f) Psychoses.
- (g) Cancer.
- (h) Active, painful arthritis.
- (i) Any serious active, progressive disease.

Some of these cases could be employed after adequate medical treatment. Others could do work in sheltered workshops or in the home.

On July 6, 1943, the Barden-LaFollette Bill was enacted as Public Law No. 113, providing for a greatly expanded Federal-State program for civilian vocational rehabilitation. Federal funds can now be made available to cover the costs in full of any services, including physical and mental restoration, necessary to render fit for a remunerative occupation certain United States civilian employees and civilian defense personnel with war-connected disabilities, and in part for other eligible disabled individuals.

PLANS SHOWING EXAMINING ROOMS ARRANGED WITH AND WITHOUT DRESSING BOOTHS



PLAN A

Two examining rooms, connected with each other and with a small waiting room or office. Each examining room has two adjoining dressing booths. The individuals to be examined enter the booths from the corridor and return by the same route. Examiners may remain in the examining rooms receiving cases alternately from dressing booths.

PLAN B

Two examining rooms, connecting with each other and adjoining a waiting room. The individual to be examined disrobes in the examining room. The examiner uses each room in turn. Rooms of this type, even when used to capacity, are not economical of space if many examinations are to be made and more than one physician is employed.

Record Forms for Physical Examinations

These forms should be:

1. Simple in arrangement but containing in full detail the questions which must be answered, with ample room for check marks or answers.
2. Made up so that every question which is to be put to the applicant appears on the form, but without superfluous questions which are usually not reliably or properly answered by the examined. Questions in regard to history of venereal and mental diseases, as well as conditions not generally known and understood, may well be omitted, since they are seldom answered accurately.
3. Made of durable material; cards are usually more conveniently handled than sheets of paper.

Supplementary forms consist of the following:

1. A printed slip with a request for a physical examination may be sent with the applicant to the plant physician from the employment department if desired.
2. A printed card, or portion of the examination record itself perforated so that it can be torn off, upon which the doctor can indicate his classification of the applicant when returning him to the employment department.

The results of the actual physical examination should be strictly confidential, and the full record of the examination should never leave the dispensary office. Therefore, the card which is to be filed for view by the employment and other departments usually divides applicants into three classes, designated by code symbols, such as the following recommended by the Council on Industrial Health of the American Medical Association:*

- (A) Fit for all work.
- (B) Fit for work under periodic medical review.
 1. With limited physical exertion.
 2. In nonhazardous work.
 3. With orthopedic defect.
 4. With defective vision.
 5. With defective hearing.
 6. With neuromental handicap.
- (C) Unfit for work at time of examination.

The importance of keeping strictly confidential medical records ascertained at physical examination has often been disregarded. This fact may have contributed to the development of a feeling on the part of labor in some sections of the country that examinations are used for purposes of black-listing. The employer and his representatives in charge of personnel may quite naturally believe that if a worker is declared medically unfit for certain jobs they are entitled to know why. The employer now assumes broad liability for the disabling effects of all sorts of chronic diseases common to life in general on the ground that these

*See footnote 1, Page 6.

have been aggravated by work injury. He feels entitled to know what proportion of workers he is employing present potential liabilities of this sort. He is wise if he requires only information of a statistical type on these points and stops short of insisting upon detailed diagnosis with identification of the impaired worker. With the individual worker's expressed consent, preferably in writing, this information may, of course, be given to an interested employer by the physician. Otherwise the worker's relationship to the doctor should be that of any private patient.

The Council on Industrial Health of the American Medical Association lists the following uses to which the examining physician may properly put information derived from the individual records:*

1. All major findings should be discussed with the worker, with emphasis on the importance of obtaining immediate and adequate medical care.
2. A transcript may be supplied to the employee's personal physician or to other official community health agencies on request or consent of the employee.
3. The employer should be given information in accordance with the rating plan described in this report (see A, B, C above) to facilitate placement or promotion. A special simple form can be devised for this purpose. The employer should especially be notified of any condition or disability thought to be caused by faulty work environment.
4. Governmental agencies such as courts, workmen's compensation commissions, or health authorities should be supplied with information on legally enforceable official order or when required by law.

Suitable filing equipment should be provided, and all employees of the dispensary should be well trained to observe the rules about the confidential character of the records.

The industrial physical examination form suggested by the Council as a sample is shown in Figure 4.

One of a series of examination forms suggested by the American College of Surgeons, 40 East Erie Street, Chicago, Ill., is shown in Figure 5.

An example of a simple form of convenient size (5 by 8 inches), long in use for recording physical examinations in the Norton Company's plant, where several thousands are employed making abrasives and grinding machinery, is shown in Figure 6. This form omits recording the personal history. The essential physical examination findings are transferred to the face of a manila envelope

*See footnote 1, Page 6.

in which the entire subsequent sickness and accident history of the employee is kept until the termination of his employment.

The physical examination form (Form A) and the form for reporting findings to employer and to employee (Form B) recommended by the Medical Subcommittee on Physical Examinations in Industry to the Industrial Commission of Wisconsin are shown in Figures 7-A and 7-B and 8. In formulating the physical examination program for industry in that State (see page 7), both industry and labor collaborated with the State Division of Industrial Hygiene and the Industrial Commission.

A simple form for recording physical examinations of applicants for employment for use in plants where different doctors are engaged upon the work rather than one central medical department is shown in Figure 9. This form was worked out by a number of industrial physicians and was published by the Metropolitan Life Insurance Company as an example of a useful type. The form is printed on a moderately stiff card, size 8½ by 11 inches. The reverse is left blank and can be used for additional remarks or subsequent examination records.

A record form especially designed for recording physical findings on workers about to be employed in exposure to lead, and on periodic examinations during such exposure, is shown in the section on Special Examinations (see pages 38-39).

Special Examinations for Workers Exposed to Occupational Hazards

One of the most important functions of the physical examination in industry, after the assessment of the initial physical condition of applicants for employment, is the early detection of industrial diseases and intoxications in those whose work exposes them to health hazards. This presumes a first-hand knowledge on the part of the physician of the hazardous processes involved in each particular occupation. He should also be familiar with the toxic limits of injurious substances to which the workers are exposed, in so far as these have been established.

For such workers the initial pre-employment examination should be somewhat specialized, having in mind the potential toxic hazard, and there should be a very careful recording of the previous occupational history and a search for physical findings indicating previous exposure to injurious substances, as well as

INDUSTRIAL HEALTH EXAMINATION

Employer Name	City	State	
Address		Clock No.	
Age	Race	Marital Status	Sex
Personal Physician		Next of Kin	Social Sec. No.

Personal and Family History:

Immunization Record:

Occupational History:

Physical Examination: Date		Examiner	
Height	Weight	Chest Measurement	{ Inspiration Expiration
Temperature	Pulse	{ Resting After Exercise	Girth
Blood Pressure	Posture	Musculature	Nutrition
Skin	Glands	Hair	Scalp
Vision	{ Distant Near	{ Right Left Right Left	Corrected
			{ Right Left Right Left
Color Sense	Depth Perception	Eye grounds	
Hearing	{ Right Left	Nose-Throat	Tongue
Tonsils		Neck	
Teeth		Gums	
Lungs	{ Right Left		
Heart			
Abdomen		Hernia	
Genitalia		Rectum	Prostate
Spine			
Joints	Reflexes	Hands	Feet
Dysmenorrhea			

Laboratory Data: Date		Examiner	
Urine: Appearance	Specific Gravity	Sugar	Albumin
Blood: Hemoglobin	Smear	Sedimentation Rate	
Wassermann	Kahn	Kilne	
X-Ray: Chest		Other	

Personality Data:			
Appearance	{ Neat Careless Slovenly	Temperament	{ Aggressive Quiet Cooperative Noncooperative
			Intelligence
Comparative Schooling *	{ Advanced Average Retarded	Summary	{ High Medium Low

Summary and Recommendations: Rating:

* Comparative schooling refers to the level of education attained in comparison with other children in the family.

FIGURE 4

Courtesy of the American Medical Association, Chicago, Ill.

Classification: A B C D

PHYSICAL EXAMINATION RECORD

Name	Address			Check No.	Date
Sex: M / F	Nationality	M. S. W. D.	Children Over 18 Under 18	Dept.	
Age	Family History Cardio-Respir. Gastro-Intest.	OCCUPATIONAL HISTORY			
PERSONAL HISTORY					
Epidemic Typhoid		Epidemic Typhoid		Typhoid	
Diphtheria		Nervous Breakdown		Venereal Dis.	
Scarlet Fever		Gonorrhea		Syphilis	
Rheumatism		Gastric-Intest.		Diabetes	
Cold and Coughs		Fleas		Loss of Weight	
Other Diseases					
Dyspepsia		Constipation		Menstr.	
Leak (Small Bowel)		Accidents		Neuralgia	
Vaccination		Tetanus		Epilepsy	
Tuberculosis		Tetanus		Nervous Breakdown	
Tetanus		Tetanus		Typhoid	
Tetanus		Tetanus		Venereal Dis.	
Tetanus		Tetanus		Diabetes	
Tetanus		Tetanus		Loss of Weight	
PHYSICAL EXAMINATION					
Height		ft.		in.	
Weight		lb.		oz.	
Build		Poor		Development	
Robust		Average		Skin	
Color		Pink		Hair	
Scalp		Clean		Nails	
Eyes		Normal		Ears	
Nose		Normal		Throat	
Mouth		Normal		Lungs	
Lungs		Normal		Heart	
Heart		Normal		Spleen	
Spleen		Normal		Liver	
Liver		Normal		Gallbladder	
Gallbladder		Normal		Pancreas	
Pancreas		Normal		Kidneys	
Kidneys		Normal		Bladder	
Bladder		Normal		Rectum	
Rectum		Normal		Genitalia	
Genitalia		Normal		Hemorrhoids	
Hemorrhoids		Normal		Limbs	
Limbs		Normal		Reflexes	
Reflexes		Normal		Babinski	
Babinski		Normal		Romberg	
Romberg		Normal		Microscopic	
Microscopic		Normal		Other Lab.	
Other Lab.		Normal		Examinations	
Examinations		Normal		Mental Reaction	
Mental Reaction		Quick		Average	
Average		Slow		Other Findings and Remarks	

SAMPLE COPY

Examined by _____ M. D.

REMARKS AND ADDITIONAL INFORMATION MAY BE RECORDED ON REVERSE SIDE

FORM 1106-4C

FIGURE 5
Courtesy of the American College of Surgeons, Chicago, Ill.

MEDICAL DEPARTMENT

Name _____ Date: _____
No. Dept. Length of Service _____
Age: S M W Urinalysis _____
Wt.: Loss Ht. _____
Eyes: _____
Ears: _____
Nose: _____
Throat: _____ B/P _____
Teeth: _____
Neck: _____
Pulse: _____
Heart: _____
Temp. _____
LUNGS: _____
History _____
Cough _____
Expectoration _____
Hemoptosis _____
Dyspnoea _____
Night Sweats _____
Physical Exam: _____
Inspection: _____
 Chest Contour _____
 Holds breath _____
 Expansion _____
Percussion _____
Vital Capacity _____
M-440-1

Face

Reverse

Auscultation
Breathing
Voice
Rales
X-ray Report:

Abdomen:
Rectum:
Extrem.:

Ing. Reg.:

G.U.:
Spine:
Skin:
Joints:
Reflexes:

M-440-2

FIGURE 6

Courtesy of Dr. Karl T. Benedict, Medical Director, Norton Company, Worcester, Mass.

**Wisconsin Industrial Commission's
Physical Examination Program**

Designed to Aid in the Control and Prevention of Occupational
Diseases and Accidents and to Promote Industrial Health.

*Form A. To be retained. Copy to be furnished family
physician upon written request of person examined.*

To Be Signed by Person to Be Examined

I agree that all findings of this examination necessary for a determination as to my physical qualifications for employment
be submitted to ----- Company.

Signed -----

Employer ----- Address ----- Exam. No. -----
Name ----- Date of Birth ----- Age ----- M. S. W. D. M. F. -----
(Please type or print) Height ----- Weight -----

Occupational History (past jobs—exact occupation, and duration of each): -----

Medical History (respiratory diseases in past or any past disability due to employment): -----

	Original examination Date	Re-examination Date	Re-examination Date	Re-examination Date
Prospective employee? (State exact occupation)				
Old employee? (Exact occupation & yrs.)				
Present complaints				
Loss of weight				
Identifying marks or scars				
Vision rt. eye Official	Corrected to:	Corrected to:	Corrected to:	Corrected to:
Vision lt. eye eye chart	Corrected to:	Corrected to:	Corrected to:	Corrected to:
Hearing (rough estimate)				
Teeth				
Throat				

This approved form published by Committee on Industrial Health, State Medical Society of Wisconsin.

FIGURE 7-A: Face of Form A
Courtesy of Industrial Hygiene Division,
Wisconsin State Board of Health, Madison, Wis.

	Original examination Date	Re-examination Date	Re-examination Date	Re-examination Date
Heart (rate & abnormal findings)				
Blood pressure				
Chest & lungs				
Abdomen				
Back				
Hernias				
Skin				
Extremities				
Reflexes				
Varicose veins				
Glands				
Temperature				
Sputum (only when indicated)				
Blood count (Tallqvist and blood smear)				
Sedimentation in MM. (only when indicated)				
Urine, albumin & sugar				
Blood for syphilis taken?				
Findings of blood report				
Miscellaneous				
Comment				
X-ray of chest by whom?				
Examination of x-ray by whom				
X-ray findings and recommendations				
Special examinations where indicated in specific industries. Tabulate findings				

Name of Family Physician Date Contacted

FIGURE 7-B: Reverse of Form A
 Courtesy of Industrial Hygiene Division,
 Wisconsin State Board of Health, Madison, Wis.

Wisconsin Industrial Commission's
Physical Examination Program

Designed to Aid in the Control and Prevention
of Occupational Diseases and Accidents and to
Promote Industrial Health.

Form B

(Original for Employer)
(Duplicate for Employee)
(Triplicate for File)

Report of Examination

Name -----
Address -----
Employer -----
Age ----- Weight ----- Height ----- Characteristics -----

PHYSICAL DEFECTS (Other than Lungs)
(To be filled in by examining physician)

Vision (at 20 ft.): Rt. ----- Lt. ----- Corrected to: Rt. ----- Lt. -----
Glasses needed for work? -----

LUNG EXAMINATION

Chest X-ray read by: -----
Address: -----

SUGGESTIONS AND RECOMMENDATIONS

Date of examination: -----
Date of re-examination: -----
Date of report: ----- Examined by: -----
----- Address: -----

Family Physician may obtain detailed report (Form A) upon patient's written request.

This approved form published by Committee on Industrial Health, State Medical Society of Wisconsin.

FIGURE 8: Form B

Courtesy of Industrial Hygiene Division, Wisconsin State Board of Health, Madison, Wis.

REPORT OF PHYSICAL EXAMINATION

NAME _____ DEPARTMENT _____ DATE _____
 OCCUPATION _____ NATIONALITY _____ SEX _____ AGE _____ COLOR _____

DATE OF EXAMINATIONS

	R		L		R		L		R		L	
1 Vision with Glasses (if worn).....												
2 Vision without Glasses.....												
3 Eyes—Defects.....												
4 Hearing.....												
5 Ears.....												
6 Nose.....												
7 Tonilla.....												
8 Lungs.....												
9 Hernia.....												
10 Reflexes.....												
11 Deformities—Hands.....												
12 Deformities—Feet.....												
13 Deformities—Legs.....												
14 Deformities—Arms.....												
15 Deformed or Ankylosed Joints.....												
16 Height.....												
17 Weight.....												
18 Appearance.....												
19 Teeth—General Condition.....												
20 Sits.....												
21 Varicosities.....												
22 Heart.....												
23 Abdomen.....												
24 Back, Rigidity.....												
25 G. U.....												
26 Rectum.....												
27 Glandular Enlargement.....												
28 Goltre.....												
29 Blood Pressure.....												
30 Pulse Rate.....												
31 Nervous System.....												
32 Miscellaneous (including Scars and Identification Marks).....												
33 Date Last Vaccinated.....												
34 Urinalysis.....												
35 Wasserman.....												
36 Fluoroscope.....												
37 X-ray.....												

REMARKS

Use Back of Form for Further Remarks

CLASSIFICATION (For record where Classification System is in use):

Issued by Metropolitan Life Insurance Company

FIGURE 9

for the presence of disease or impairment which might render the worker unduly susceptible to the occupational disease in question. The periodic follow-up examinations of such workers are conducted at certain intervals depending upon the type and severity of the exposure, and in some cases determined by State regulations. These examinations are highly specialized, usually involving laboratory tests, and the routine physical examination is not necessarily repeated each time that these are done.

For example, where workers are exposed to dusty occupations, particularly those dusts containing fine silica, emphasis should be placed on chest examinations. The roentgenogram is an important aid, without which a positive diagnosis of diseases caused by the inhalation of dust is difficult if not impossible. This part of the examination may be referred to an experienced roentgenologist, as the diagnosis of dust diseases of the lungs depends upon the type of films taken and the experience of the reader who interprets them. An annual X-ray examination is recommended for such workers.

When X-ray equipment is installed, additional space depending upon the type of equipment must be provided. Equipment ranging from small portable units to large complex units costing from one thousand to several thousands of dollars is available, and the organization furnishing such equipment can best suggest the necessary requirements for its installation.

On account of the expense and certain technical problems involved in X-raying large numbers of employees, some organizations make use of the fluoroscope to select the proper cases for further X-ray study.

The fluoroscope is a device used for making internal organs visible to the eyes of the physician by means of the Roentgen rays. Any physician with normal eyesight, after a short period of instruction in its use, will be able to detect the presence of pathology in the chest. X-ray pictures will then be needed for further study or for permanent record purposes in those cases showing defects.

Some industrial occupations, although exerting no influence on the lung tissue, involve dusts, fumes, or gases of a toxic nature, and these poisons enter the body chiefly through the respiratory tract.

Where workers are exposed to lead dust or fumes, frequent examinations should be made of these workers for changes in the blood, which are often the first and most important sign of lead poisoning in man.

The pre-employment examination form and the form for periodic examinations of lead workers suggested by the Committee on Lead Poisoning of the American Public Health Association¹³ are shown in Figures 10A and 10B on pages 38-39. The full report of the Committee should be consulted for details of procedure.

Unless the plant medical department is provided with ample laboratory facilities and competent personnel, special examinations of the urine and blood are best referred to a reliable hospital laboratory. Samples collected and analyzed within the plant are very apt to become contaminated by the lead dust in the air.

For workers exposed to benzol, a valuable test is available for confirmation of the fact of exposure, consisting in the determination of the ratio of inorganic sulphates to total sulphates in the urine from samples taken during the worker's exposure. The test, however, is not diagnostic of poisoning, nor can it be used for diagnostic evidence after removal from the exposure.

Industrial dermatitis is responsible for a very large proportion of the occupational disease disability experienced in industry. It can be averted to some extent through the selective physical examination if those with a history or manifestation of allergy or eczema of any sort are eliminated from employment in skin hazardous processes. Exposures to fat solvents is contra-indicated for those with dry skins, and exposure to oils for those with acne or overactive sebaceous glands. Negroes appear to be resistant to most skin irritants. Following employment in contact with skin irritants or sensitizers, a valuable aid in differential diagnosis of skin troubles or in locating the offending substance is the patch test, performed according to the approved technique and interpreted by an experienced physician.

These special examinations should disclose signs of excessive absorption of toxic substances by workers before evidence of disease is demonstrated. It is therefore necessary for the physician to use more accurate methods not only for detecting these signs of absorption of toxic substances in the body, but for determining the concentration in the atmosphere breathed in order to confirm his diagnosis and to indicate locations for controlling their sources of origin. It must be remembered that a single exposure, or even several exposures, to minute quantities of certain toxic substances that may be present in a plant atmosphere may not result in

¹³*Occupational Lead Exposure and Lead Poisoning: Report of the Committee on Lead Poisoning, American Public Health Association, New York, N. Y., 1943.*

LEAD EXPOSURE

MEDICAL EXAMINATION

(Front Side)

1. Name..... Identification No..... Date.....
2. Social Security No..... Birthplace..... Descent..... Age.....
3. Address..... Phone.....
4. *M.F..... W.B..... S.M..... W.D..... L.R. Average Wt..... Greatest Wt.....
5. Family Dr..... Wt. 1 year ago.....
6. What type work applied for.....
7. History of previous employment in this plant.....
8. History of previous employment in other plants.....

9. Family history.....
 - Goiter.....
 - Cardio-vascular disease.....
 - Nephritis.....
 - Tuberculosis.....
 - Diabetes.....
 - Anemia.....
10. Past history.....
 - Illnesses.....
 - Operations.....
 - Accidents.....
 - Veneral treatment.....
 - Remarks.....

11. Physical examination..... Employment..... Upon Exit.....

Date.....		
Weight..... Height.....		
Pulse..... Temperature.....		
Pallor.....		
Lead line.....		
Teeth (chart useful).....		
Right wrist extension.....		
Left wrist extension.....		
Lungs.....		
Glands and Thyroid.....		
Arteries.....		
Blood Pressure (sitting).....		
Heart.....		
Abdomen.....		
Reflexes.....		
Hernia.....		
Spine.....		
Extremities.....		
Vision—Right..... Left.....		
Vaccination.....		
12. Laboratory examination.....		
Stippling/mil. erythrocytes.....		
Hb.....		
R.B.C.....		
W.B.C.....		
Urine.....		
Serodiagnostic test.....		

13. Diagnosis.....

14. Rating and Recommendation.....

* M—male, F—female, W—white, B—black, S—single, M—married, W—widowed, D—divorced, L—left handed, R—right handed

FIGURE 10-A: Face of Form

Courtesy of the American Public Health Association, New York

LEAD EXPOSURE

PERIODIC REEXAMINATION

(Reverse Side)
Number.....

Name												
Date												
Occupation												
Duration												
Previous Lead Exposure												
History												
Weakness												
Drowsiness												
Insomnia												
Headache												
Vertigo												
Bowels, number of times												
without Cath.												
Constipation												
Diarrhea												
Metallic Taste												
Anorexia												
Nausea												
Vomiting												
Abdominal or chest pain												
Where												
When												
Weight												
Muscle weakness												
Muscle tremor												
Muscle tingling												
Muscle cramps												
Joint pains												
Acute illness												
Physical Examination												
Pulse—Temperature												
Pallor												
Lead line												
Right wrist extension												
Left wrist extension												
Lungs												
Glands												
Blood Pressure (sitting)												
Heart												
Abdomen												
Reflexes												
Hernia												
Spine												
Extremities												
Laboratory Examination												
Stippling/mil. erythrocytes												
Hb												
R.B.C.												
W.B.C.												
Urine												
Serodiagnostic test												
Recommendation or R.....												
.....												
.....												
.....												

FIGURE 10-B: Reverse of Form

Courtesy of the American Public Health Association, New York

demonstrable body damage, but exposure over a period of years very definitely leads to chronic diseases of occupational origin.

New analytical and diagnostic methods are being developed and are published from time to time in journals devoted to industrial health. The physician engaged in the examination of industrial workers will find many helpful suggestions in these articles. Spectroanalysis has become a valuable diagnostic aid. New instruments have been introduced recently for the detection of small quantities of some of the toxic substances, such as carbon monoxide and hydrogen sulphide, and mercury vapor, which may escape into the working environment. Control of exposure to trinitrotoluene has achieved great improvement over the experience during the first World War. An elaborate, but apparently successful, technique has been developed for the control of the dangerous exposures to radioactivity present in the process of making instrument dials painted with radium paint. Similar standards and methods adopted for X-ray protection are also useful in the protection of industrial technicians using this equipment. Protection from radiant energy and fumes in welding processes has received extensive study during the past few years, while the study of the physiology of work under abnormal atmospheric pressures has expanded to become practically a special branch of medical science.

Engineering and medical advice on the control of these special problems of industrial hygiene is now available in many States, through the industrial hygiene divisions established in either the State department of health or the department of labor, as well as from the Division of Industrial Hygiene of the United States Public Health Service. The Metropolitan Life Insurance Company also provides, for its Group-insured industries and others, the consultation services of its Industrial Health Bureau.

Examinations of Other Selected Groups

Physical examinations of a specialized type are also given in many industries to the following classes of workers:

Transport workers, including engineers and operators of motor equipment, trains, cars, trucks, elevators, hoists, loading machinery and cranes.

Other workers charged with great responsibility or work involving the safety of others.

Food handlers (in accordance with local health department regulations, if any exist).

Workers who have been absent due to illness before return to work; work certificates from the attending physician are often unreliable owing to unfamiliarity with the nature of the occupations.

Workers with physical impairments, classed as substandard upon initial examination, especially before transfer to work not medically approved for them.

Workers who request examination or who are prone to repeated illnesses.

Workers who are terminating their employment, at the time of discharge, to determine the presence or absence of any occupational injury or disease. This type of examination is not now done so frequently because of objections to it on the part of labor (see page 7).

Periodic Health Examinations of Entire Personnel

Some organizations having well-equipped plant medical departments desire to extend to employees, regardless of their occupational hazards, a more complete diagnostic and advisory service by means of a thorough periodic health inventory of the personnel. These periodic examinations may be given to each and every employee at one- or two-year intervals, or may be limited to those returning to work after illness, or to workers over 40 years of age, according to practicability.

The special value of this procedure, when it is sufficiently thorough, is twofold: (1) it is the most satisfactory method for assuring case-finding of such diseases as early tuberculosis and syphilis at a stage where treatment has every chance to be successful in returning the worker to normal, and before there has been long-continued exposure of others to the infected individual both at home and at work; (2) it is of great aid in the early detection of chronic degenerative conditions, especially those of the cardiovascular system, for which a modified living and working regime is indicated in order to prolong the period of useful activity for many highly skilled or responsible workers. In medical departments so equipped, diagnostic and laboratory tests are frequently offered the worker's personal physician upon request.

In some companies the system for examination of those returning to work after an illness is so conducted as practically to take the place of periodic examinations for the majority of those employed, the remainder who have not been ill being examined by appointment.

In instituting the plans for periodic examinations through the plant medical department in industry, there are several considerations of great importance to be borne in mind:

1. Examinations should be done with the cooperation, approval, and good will of the workers. A publicity campaign may help to enlist

the interest of the employees by teaching how great a benefit such examinations are to the workers themselves.

2. It is judicious, if the examination is an entirely new departure, to begin the program for physical examinations with the institution of employment physical examinations for new employees—offering “health examinations” to old employees as a voluntary measure. The older personnel has an important influence in a plant, and it is desirable that they should heartily believe in the idea before any compulsion is brought to bear.
3. The examination should always be planned in such a way that an opportunity is given for personal conversation of the applicant with a doctor or nurse in order that the object of the proceeding may be carefully explained in each case. Equally, the findings of the examination should be tactfully and patiently interpreted to the examined without unduly alarming him, of course, before he leaves the medical department.
4. The confidential relationship between patient and doctor should be kept, and all records of physical examinations should be filed in the medical department and be solely under the control of the medical personnel. Many misunderstandings may be averted if this rule is scrupulously regarded and constantly impressed upon the workers.
5. A good method for establishing in the minds of the workers conviction of the sincerity of the management’s motive as well as thorough confidence in the medical personnel, is to begin with the examination of the executives. Unless the service is good enough to command the respect of the executives it is not good enough for the employees. Moreover, this is sound procedure from many angles, since officials, managers, and keymen in the company benefit just as surely from the examination as any of the workers. A breakdown in health among the higher-paid personnel upon whom great responsibility rests is a more costly and more disastrous occurrence than physical disability of many of the less highly trained workers.
6. It is always advantageous, and, in many plants, essential to have the physician become familiar with the different jobs and processes in the establishment he serves and to work in close relation with the employment department.
7. The purpose of the periodic examination should not be lost sight of, and ample time and personnel must be provided for conducting it.

The American Medical Association¹⁴ offers admirable suggestions for the procedure of physicians in making health examinations, though some modification of the standards may be desirable for use in industry.

Plants which do not employ sufficient numbers to warrant such a program, can often obtain excellent case-finding surveys of the personnel through cooperation with the local tuberculosis and health associations and social hygiene associations.

¹⁴*Periodic Health Examination. A Manual for Physicians: American Medical Association, Chicago, 1947.*

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