Evaluation of the Industrial Hygiene Problem

of the

State of Colorado

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INTRODUCTION

Industrial Hygiene Service may be defined as the application of public health methods to the protection and improvement of the health of industrial workers. The elimination or control of industrial health hazards is the ultimate goal of all persons interested in the subject, since the worker is more interested in the maintenance of his health than in compensation for injuries to that health, and the employer knows that the cost of prevention of occupational disease injuries is far less than the cost of compensating for such injuries. The State Board of Health has a natural interest and concern in the problem since its primary function is the conservation and improvement of health among all classes of people in the state.

The first step toward solution of this problem is the evaluation of the problem. In order to determine the nature and extent of occupational diseases in the State of Colorado it would be necessary to conduct a study of the health of an adequate sample of the industrial population of the state. Such a study would include a complete medical examination of the workers involved, an engineering study of the working environment in order to determine the exact degree of exposure to certain materials and conditions of health significance, and a statistical study to determine if any relationship exists between the working environment and the health of the employees. In addition, all existing records concerning occupational disease prevalence and morbidity and mortality among workers would be analyzed. The magnitude of such an undertaking becomes apparent when we realize that the State of Colorado has approximately 402,894 gainful workers, of whom about 170,981 are employed in the mining, manufacturing, mechanical, transportation, and domestic and personal service industries. It is evident that, in order to conduct a comprehensive study in a representative sample of the above population, considerable time, funds, and trained personnel would be needed to achieve the desired objectives. In the absence of these necessary requisites and upon the advice of the United States Public Health Service, the problem was approached by means of a preliminary survey to secure information on the potential problems in industrial hygiene in Colorado. Similar surveys have been found to be of value in other states not only as a guide to constructive legislation but also as the basis for an applied program for the control of industrial health hazards.

This report, based on data which were secured during such a preliminary survey, furnishes information on industrial health service facilities and sanitary provisions in the various industries surveyed, shows the number of persons potentially exposed to various materials and environmental conditions in the different industry groups, and shows the relationship between the use of recognized control measures and potential exposures. It is desired to call attention to the limitations of the data which are presented here. Since no quantitative evaluations of the working environment or medical examinations of workers were made, the information obtained disclosed only the potentialities involved and does not necessarily indicate actual injury. Likewise, the reported presence of a control measure associated with a potential exposure merely indicates that such a control measure was available, but does not imply either that it was necessary, or that it was adequate or properly employed.

SUMMARY

As the first step toward evaluating the industrial health problem in Colorado the State Board of Health made a survey to determine the availability of health services and sanitary facilities in Colorado industrial establishments and to determine the extent to which workers were exposed to specified types of potentially hazardous materials. In all, 526 plants and mines, employing a total of 31,130 workers, were surveyed. This report is based on an analysis of the data which were collected during these plant surveys.

According to the 1930 census,[1] Colorado had 402,894 workers gainfully employed, and of this number 170,981 (42.5 per cent) were employed in the industrial and service groups from which the sample for study was selected. The industrial groups represented in the sample were: (1) extraction of minerals, (2) manufacturing and mechanical industries, (3) transportation and communication, and (4) domestic and personal services. Only limited sections of the last two groups were selected, and certain industries in the other groups as well as the remaining census classification groups such as agriculture, forestry, fishing, trade, etc., were omitted from the present survey due to time limitations and the realization that the application of the survey technique to these industries would give little information not elsewhere available. Moreover, experience has shown that workers engaged in the majority of the omitted occupations are not exposed to specific occupational disease hazards.

The industrial establishments surveyed were selected at random from a complete industrial index, but the sampling method insured a representative distribution according to size of plant, type of industry and geographical distribution by county.

Of the 526 plants surveyed, 92.4 per cent employed less than 500 workers, and 78 per cent of the total number of workers

surveyed were employed in these smaller plants. Since the survey was representative of the size distribution of all industrial plants in Colorado, and since the American College of Surgeons[4] has shown that establishments employing less than 500 persons could not carry on as economical a medical service as the larger plants, it is obvious that consideration should be given by a governmental agency to an industrial hygiene program which will take care of the workers in these smaller plants.

Data obtained regarding industrial health provisions in Colorado are presented for all industrial plants surveyed and also for plants employing 100 or more workers as compared with plants employing less than 100 workers. This comparison was made to emphasize the difference in facilities offered by small and large plants. This study showed that only 30.8 per cent of the workers had the services of a full-time safety director although nearly 92 per cent received some type of safety service from insurance companies. Only 24 per cent of the employees had the services of a full-time medical practitioner and 9 per cent the services of a part-time physician; and while 89 per cent had a first-aid kit available, only 47 per cent were employed in plants having a trained first-aid worker. Sick benefit associations were available to 44.5 per cent of the workers but less than 40 per cent of the workers were employed in plants keeping sickness records. Approximately 90 per cent of the workers were employed in plants keeping accident records in accordance with the provisions of the Colorado Compensation Law. Approximately 80 per cent of the plants studied received their drinking water supply from municipal systems, but the provisions for supplying safe drinking water to mine workers were inadequate. Moreover, while about 80 per cent of the workers were reported as having fountains for drinking purposes, over 11 per cent were permitted to use common drinking cups. Fifteen per cent of the plants employing 9 per cent of the workers surveyed provided no lavatory facilities and more than 20 per cent of the workers used common towels while an additional 25 per cent had no towels provided. It appears that those safety, medical, and sanitary services which are known to have such an important influence on the health of industrial workers need to be improved in this state.

An important phase of the investigation was the recording of the number of persons exposed to specified materials and conditions which might be injurious to health. The numerous materials and conditions encountered in industry were classified under fifty-one headings. The data presented show the number and per cent of workers in each industrial group who are exposed to the various materials. An estimate was made of the total number of exposed workers in the industrial groups from which the surveyed sample was selected. This estimate shows that in these Colorado industries one might expect to find more than 20,000 workers exposed to silica dust, more than 17,500 workers exposed to silicate dust and

over 10,500 exposed to bituminous coal dust. Over 7,600 workers were exposed to lead or lead compounds and nearly 27,000 exposures to other metal dusts or fumes were recorded. More than 26,000 workers had potential exposures to carbon monoxide gas, over 2,000 to sulphur dioxide gas, and over 27,000 were credited with exposures to gases not otherwise classified. Exposures to substances which may produce dermatitis or allergic reactions, to organic solvents, and to other toxic chemicals are also important industrial hygiene problems in Colorado.

Information was recorded regarding the methods used for controlling occupational exposures to toxic materials, i.e., methods for protecting potentially exposed workers. Since no scientific determinations of the efficiency of these control measures were made, the provision of such measures merely indicates that the hazard had been recognized and an attempt had been made to control it. The percentage of exposed workers receiving any one type of protection was extremely small. While the data on control measures must be considered with respect to individual material classifications to be interpreted correctly, it is interesting to note that of the 89,000 exposures recorded only 6.3 per cent were controlled by local exhaust ventilation, only 6.3 per cent by enclosure of process, and less than 1.3 per cent by some type of personal respiratory protection. While 12.4 per cent of the exposures were controlled by general pressure ventilation, 12.1 per cent by general exhaust ventilation, 4.1 per cent by wet methods and 12.9 per cent by use of protective clothing, it must be remembered that many exposures were provided with more than one control measure and that the majority of the exposures were not controlled in any way.

CONCLUSION

This survey has indicated that:

1. The information obtained regarding the various materials and conditions to which workers are exposed in Colorado industries shows a potential problem of sufficient magnitude to be of public health significance. Although it was not possible to determine the degree of exposure nor the effects of such exposure on health, it is felt that these data will be found useful as a guide in the consideration of occupational disease legislation.

2. The study discloses the fact that health services in Colorado industries are far from adequate when viewed in the light of present day standards. This is partly due to the fact that the majority of the plants are small and hence find it impractical and uneconomical for them to provide such services to their employees. Since over 75 per cent of the gainful workers are employed in plants employing 500 or less persons, the need for some practical method of furnishing industrial services to the majority of the gainful workers in Colorado is evident. One method now extensively employed in this country to meet this need is through gov-

ernmental agencies. It is of interest to note that other states have recognized this need for industrial hygiene services and today there are twenty-six state industrial hygiene units actively engaged in this work. Twenty-four of these units are in state departments of health, while two are in departments of labor.

3. A large percentage of the gainfully employed persons in Colorado is handling materials in the course of employment, which may be a health hazard. The study also showed that in most instances there has been little recognition of the need for controlling these potentially hazardous exposures. All of these data clearly lead to the conclusion that there is a need for a preventive program with regard to the protection of the health of the workers in Colorado industries.

DISCUSSION

The improvement of the general health of the industrial worker is an important phase of industrial hygiene. The control of occupational diseases is an important part of an industrial hygiene program, but only a part, and the field of industrial hygiene is important enough to justify its consideration as an integral portion of any public health program. Sufficient data have been published to indicate that morbidity and mortality rates are high in the industrial population and that excessive sickness and mortality are experienced by certain occupational groups. Information is available concerning specific occupational diseases caused by various toxic materials and environmental conditions and, what is more important, our knowledge of the methods for the control of these diseases has reached a point where it may be applied successfully.

The prevention of industrial health hazards, as indicated in the introductory remarks, should be the ultimate goal of all those interested in and concerned with this problem. The facts set forth in this report indicate clearly that industrial hygiene is primarily a program of health conservation and occupational disease prevention and that as such it is definitely a public health function. This fact is recognized by most students of the problem and the present trend is to bring public health programs to our adult population by using industrial groups as a point of approach.

One of the first steps in any program is to define the problem involved. This has been accomplished in Colorado, since this survey shows definitely the various health hazards associated with certain occupations, the methods now used for their control, and the health service facilities now provided in some of the industries in the state. This information is available for each industrial group, by plant, and by occupation, and should form the basis for a future program, when such a program is made possible.

The program should involve a systematic study of various industrial health hazards in order not only to evaluate these, but

also to perform the more important function of devising methods for their control. This program can best be accomplished with properly trained medical and engineering personnel working in close cooperation with the other public health services.

To supplement these epidemiological studies in industy, a complete and effective system of reporting absenteeism from various types of disabilities should be established. A knowledge of absenteeism with respect to frequency, duration, and cause in each numerically important occupational group would reveal to those responsible for the industrial health program the type of action which should be taken to obtain the maximum reduction in the amount of time lost from work because of disability. Furthermore, such data are necessary to enable one to judge the effectiveness of control methods applied to diseases occurring with excessive frequency.

The industrial hygiene program should also provide for rendering consulting services to various state governmental agencies, and industrial, labor, medical or other organizations interested in industrial hygiene.

Any program designed for the improvement of the health of a group of individuals will not become effective until the group under consideration has been convinced of the value and benefits of the plan. Consequently, an educational program designed to acquaint all those concerned with the importance and value of industrial hygiene should be of paramount consideration. The promotion of activities which will result in general health improvement reaching all the people in the state through the adult industrial population should be one of the objectives in a program of this type.

These fundamental activities in industrial hygiene are accepted today as the minimum requirements for an effective program of industrial health promotion. In spite of the fact that Colorado may not be classified as a highly industrialized state, one must not lose sight of the fact that the state has approximately 403,000 gainful workers, and, if we consider industrial hygiene as adult hygiene, it is evident that a program striving to bring public health to this group of workers is certainly warranted.

ACKNOWLEDGMENTS

This survey was made possible by Dr. Roy L. Cleere, Secretary and Executive Officer of the Colorado State Board of Health, who obtained the necessary funds and the assistance of the U. S. Public Health Service. It was directed and supervised by Mr. B. V. Howe, Colorado State Sanitary Engineer, and conducted by personnel of the Colorado State Division of Public Health and personnel from the following county and city health units who made surveys within their districts: Weld County Health Department, Otero County Health Department, Health Department of the

City and County of Denver, City Health Department of Colorado Springs, and City Health Department of Pueblo.

The United States Public Health Service detailed personnel from the Division of Industrial Hygiene of the National Institute of Health to assist and advise in planning and organizing the survey, training the personnel, analyzing the data and preparing the final report.

We are also indebted to the Unemployment Compensation Commission of Colorado for supplying information on the type, location, and population of industrial establishments, and to the State Coal Mine Engineer, the State Metal Mining Department, and the Denver Station of the U. S. Bureau of Mines for furnishing information as to type and location of metal and coal mines in the State of Colorado.

The officials of all the establishments covered by this survey cooperated wholeheartedly in furnishing the information requested and in opening the plants to the surveyors.

The State Board of Health wishes to express its appreciation to all these agencies and to all others who cooperated in this survey.

SCOPE AND PLAN OF SURVEY

This survey was performed to secure information regarding health conservation measures and sanitary facilities afforded Colorado workers in their industrial environment, the number of workers employed in each occupation in each industrial plant, the various materials potentially hazardous to health to which these workers might be exposed, and the control measures available for potentially hazardous exposures. Due to the limited time, funds, and personnel available for the conduct of the study, it was necessary to resort to a sampling procedure in selected industrial groups. According to the 1930 U. S. census[1] there were 402,894 gainful workers in the State of Colorado. Of this number, there were omitted from this study the following census classifications including a total of 231,913 persons: Agriculture (106,234), Forestry and Fishing (1,366), Trade (67,139), Public Service (8,716), Professional Service (36,238), and certain unspecified industries (12,220). It was felt that these industries or service groups could be eliminated from this study since experience indicated that the majority of the occupations connected with them are not exposed to specific occupational disease hazards. The remaining 170,981 workers were classified according to industrial and service groups and sub-groups (Bureau of Census Classification). The building industry (16,661 workers), independent hand trades (3,369 workers), all of the transportation and communication industry group except street railways, garages and automobile service stations (36,217 workers), and all domestic and personal services except laundries and dry cleaning shops (35,066 workers) were omitted

from the survey since few data, not elsewhere available, could have been secured by the application of this survey technique to these industries.

From the remaining 79,668 workers, a representative sample of 31,130 workers (39.1%) was surveyed. The method of classifying industries and service groups, and the technique used in the selection of a representative sample are discussed in Appendix A of Public Health Bulletin No. 236[2].

METHODS USED IN THE STUDY

The organization of the survey is shown graphically in Figure I. The methods employed in similar surveys have been described in detail in other publications[2]. Before starting the survey, the surveyors were given a series of lectures on industrial hygiene by J. J. Bloomfield of the U. S. Public Health Service, and instructed in securing information and filling out survey forms. Copies of the three forms used in making plant surveys (See forms 3, 3-A, and 4) show that form 3 dealt with health service data and form 3-A dealt with venereal disease data and data on sanitary facilities pertaining to the plant as a whole, while form 4 dealt specifically with the different occupations in an individual work room. Much of the information was supplied by the plant management but the surveyors inspected the plant, located each occupation and checked the information supplied by the person interviewed.

A personal letter signed by the Executive Secretary of the State Board of Health was sent to each establishment prior to the appearance of the surveyor, informing the management of the purpose of the survey and enlisting its cooperation.

Completed plant surveys were sent to a central office where they were checked, classified according to industrial groups, and edited to determine potential exposures associated with each occupation. The data on the edited surveys were transposed to special tabulation forms and the results of an analysis of these data form the basis for this report.

RESULTS OF THE STUDY

Type of Industries Surveyed

Table 1 shows the number of establishments in each industry or service sub-group, and gives the number of male and female workers in these establishments. It may be seen from this table that 50 establishments, employing 4,606 workers, were included under the Extraction of Minerals; 377 of the 526 establishments surveyed were in the Manufacturing and Mechanical group, and 22,972 of the 31,130 persons included in the survey were in this industrial group. The largest manufacturing groups studied were the Food and Allied Industries, consisting of 136 plants with

8,911 workers, and the Metal Industries including 55 plants with 6,878 workers—of which 41 plants with 6,272 workers were in the Iron and Steel Industries and 12 plants with 606 workers were in the Non-ferrous Metal Industries. The manufacturing and mechanical industries surveyed were divided into 11 broad classifications. The service groups were represented in this survey by a sample of 60 establishments with 2,020 workers in the Transportation and Communication group and 39 establishments with 1,532 workers in the Personal Service Classification. The surveys in this group were limited to the sub-groups specified in Table I, since experience has shown that these are the most important divisions from the viewpoint of occupational exposure to specific health hazards.

The data presented in Table I is summarized and compared with 1930 census data in Table II This table shows that the sample included 39 per cent of the total number of workers in the industrial sub-groups surveyed, although it included only 18 per cent of the workers in the census classification groups surveyed and slightly less than 8 per cent of the total number of gainful workers in the state.

SIZE OF PLANTS

Of the 526 plants surveyed, 92.4 per cent (522 plants) employed less than 500 persons, and 78% of the total number of workers surveyed were employed in these smaller plants. As shown in figure 2, the size distribution of plants in this sample approximately represents the size distribution of industrial plants in Colorado. The reason for selecting a plant of 500 workers as the dividing line in this discussion is based on the fact shown by the National Industrial Conference Board[3] and substantiated by the American College of Surgeons[4], that establishments employing less than 500 persons could not carry on as economical a medical service as the larger plants. It is obvious that in order to take care of the workers in these smaller plants, which in Colorado predominate not only in numbers but also employ over three-fourths of the total working population, consideration should be given by a governmental agency to an industrial hygiene program.

Since accurate size distribution data were not available except for manufacturing and mechanical industries, and since plants employing less than five workers had been intentionally omitted from the sample, insofar as possible, the comparison between census and survey data shown in Figure 2 is based on manufacturing and mechanical plants employing 5 or more workers. The Census Bureau also lists 844 Colorado manufacturing and mechanical plants employing less than 5 workers and 20 of these plants were included in the survey. Figure 2 shows the distribution of workers with respect to size of plant, and the distribution of plants with respect to the number of workers employed for the manufacturing and mechanical industries only.

The distribution of plants and workers in the various counties of the State of Colorado are shown in Figures 3 and 4 respectively. Data on total number of plants and workers in each county were supplied by the Unemployment Compensation Division of the Industrial Commission.

INDUSTRIAL HEALTH PROVISIONS

In view of the far-reaching and favorable influence which industrial health programs have exerted in industry, and since such programs are a very important industrial hygiene service, information was obtained on the extent of industrial health provisions in the plants under consideration. This information has been classified under the headings of safety provisions, medical provisions, benefits and records, and sanitary facilities. In addition to the general information regarding medical provisions specific information was recorded regarding the methods used by Colorado industries to control the venereal disease and other communicable disease problems.

SAFETY PROVISIONS—The services of a full-time safety director, one who devoted more than half his time to safety work, were available to 30.8 per cent of the workers, while 21.1 per cent had the services of a safety director who devoted at least part of his time to such work. Approximately 40 per cent of the workers had the benefit of some type of shop organization engaged in promoting safety. Safety service from an insurance company was reported for 91.6 per cent of the workers and some type of safety service from organizations other than insurance companies, such as the National Safety Council, etc., were reported for 35.3 per cent of the workers. Unfortunately, while reporting on insurance service was supposed to be limited to cases where the workers benefited from an organized safety program sponsored by an insurance company, the reports included all plants where any type of accident insurance, no matter how limited in scope, was available. Consequently we cannot assume that 90 per cent of the workers actually receive such a safety service. Analysis of these data for individual industrial groups (see Table 3) shows a wide range in the availability of safety provisions. However, in most instances, those industries known to have the highest accident hazards were found to have the best safety organizations.

Since it was not possible to interpret the significance of these data in terms of the number of lost-time accidents, no direct conclusion can be drawn as to the effect on accident rates of the safety services disclosed in this survey. However, students of this problem realize that adequate safety supervision during the past 20 years has more than paid for itself, especially due to the reduction in injuries and deaths. In fact, accident rates computed by the U. S. Bureau of Labor Statistics[5], for a group of steel companies which had followed the best practice and had

achieved the most pronounced success in accident prevention, showed that the accident frequency rate for this group of companies was 8.1 industrial accidents per million man hours worked against 18.1 for the industry as a whole. It is obvious that adequate accident prevention programs enable the attainment of minimum accident rates.

MEDICAL PROVISIONS—A company hospital was available to nearly 23 per cent of the workers in the sample studied, while 11.3 per cent were employed by companies having a definite service contract with some hospital which was not operated by the company (see Table 4). However, since in several cases the companies operating their own hospitals also had contracted service from general hospitals, only about 25 per cent of the workers had definite hospital services available. Of course this does not mean that the other 75 per cent would not receive necessary hospital service, but it does mean that no preparatory provision had been made for such service. A first-aid room was available to 36 per cent of the employees and nearly 90 per cent had the use of a first-aid kit. The services of a trained first-aid worker were available to less than half of the employees. However, due credit should be given to the mining, mineral processing and transportation industries for their extensive first-aid programs. This study showed that 24 per cent of the workers had the services of a full-time plant physician and 9 per cent had the services of a part-time plant physician. A physician on call was reported for 65 per cent of the workers. However, this last group includes the plants having a part-time physician who is also on call at all times, as well as all plants where some provision was made to call a special physician in case of accidental injury. Nearly 30 per cent of the workers had the services of a full-time nurse and an additional one per cent had the services of a part-time nurse. In practically all cases the service was rendered by a registered nurse.

CONTROL OF VENEREAL AND OTHER COMMUNICABLE DISEASES—Syphilis is a contagious and communicable disease and unless treated as such, it will continue to be second only to gonorrhea in prevalence in the United States. It attacks four times as many Americans as the next most common disease, scarlet fever; ten times as many as diphtheria, and one hundred times as many as infantile paralysis. In fact, we now have reasonable evidence to show that over 500,000 Americans contract syphilis each year. Every year in the United States there are 40,000 deaths from syphilitic heart disease, 4,500 deaths due to general paralysis, and another 1,100 deaths due to locomotor ataxia, all caused by syphilis. It is conservatively estimated that at least 25,000 babies are born dead each year due to the activity of this treacherous spirochete.

Because syphilis is such a major public health problem, the Colorado State Division of Public Health has attempted to deter-

mine how much interest industry has taken in this problem. Thus, in making the Industrial Hygiene Survey, plant owners or superintendents were asked the following questions pertaining to syphilis control:

1. Were serological (blood) tests made on all applicants for employment?

As noted in Table No. 6, out of a total of 526 plants surveyed, 41, or 7 per cent of the total number of plants require blood tests on applicants at the present time.

2. Were serological tests made on employees annually, every 6 months, or at other times? ("Other times" generally meaning whenever the industry deemed it advisable for the employee to take such an examination.)

It was found that 36 of the 526 plants, or 6.8 per cent answered this question in the affirmative. Of the 36 plants which required serological (blood) tests on employees, 7 plants require blood tests annually, 19 plants require blood tests every 6 months, and 8 plants require blood tests at other times.

3. What disposition was made of recognized cases?

Seven plants stated that infected employees were treated at the plant; 16 plants stated that infected employees were referred to family physicians; 7 plants stated that their employees were treated at clinics; only 3 plants stated that employees were discharged if found to be infected. In no instance were known infected employees ignored.

4. Were plants willing to cooperate with the State Board of Health in a Venereal Disease Prevention Program?

In answer to this question, 483 out of 526 plants, or 93 per cent, signified that they would cooperate with the State Board of Health in a Venereal Disease Control Program.

In conclusion, it is apparent that very little is being done by industry at the present time to discover and treat cases of syphilis. However, as has been pointed out already, the majority of plants surveyed indicated their willingness to cooperate with the State Board of Health in a Venereal Disease Control Program. Before starting a cooperative program of Venereal Disease Control between industry and the State Board of Health, it is deemed necessary to sound a voice of warning. Because an individual has a positive blood test does not mean that he or she is a public health menace. Even an early infectious case that has received five or six injections of arsphenamine and continues under treatment is not a public health menace. Only the person who refuses treatment for early syphilis or whose treatment is irregular, should be considered a public health menace to the community. At present, some employers are requesting blood tests on their employees

and then immediately dismissing all with positives, regardless of the duration of the infection or the amount of treatment which the individual has received. This practice is ill-advised enthusiasm, not based on scientific grounds. The patient who is being treated, or a late case of syphilis, is safe to employ as far as the spread of syphilis is concerned. Therefore, if the patient is taking proper treatment, for a sufficient length of time, and is not physically handicapped by the complications of late syphilis, the infected individual is as good a risk to the employer as the non-infected. Unless this attitude is assumed by the health worker, and instilled into the administrative personnel of industry, not only will any venereal disease control program in industry fail, but a grave injustice will also be done to the able worker.

Medical Science knows the cause of syphilis, how to discover cases, and how to adequately treat it. With this knowledge, it is possible through the cooperation of all agencies—professional, public and private, to eventually eradicate this devastating disease.

An attempt was also made by means of the Industrial Hygiene Survey to determine what was being done about the immunization of employees against contagious diseases. This phase of public health in industry has also received little attention, as there were only 13 plants out of a total of 526 that conducted any type of an immunization program against contagious diseases.

The data summarized in this discussion have been presented for individual industrial and service groups (see Table 5) and with respect to size of plant for all groups (see Table 6). Of the 31,130 workers and 526 plants surveyed, 37 per cent of the workers were employed in the 86.5 per cent of the plants employing less than a total of 100 workers per plant.

DISABILITY BENEFITS AND RECORDS — The value of keeping accident and sickness records is well recognized. Such records serve to indicate the extent of the problem and at times have been the means of initiating studies designed for the correction of those conditions revealed by an analysis of the records. A typical example of such a case is the study of the pneumonia problem in the steel industry, undertaken by the United States Public Health Service as the result of the information disclosed by an analysis of records furnished by a group of steel companies[6].

The existence of accident records was reported for only 90 per cent of the workers despite the fact that the compensation law for accidental injuries in Colorado requires the keeping of such records in all plants employing five or more workers (see Table 7). The existence of sickness records was reported for 39 per cent of the workers surveyed. Sick benefit organizations were found in plants employing 44.5 per cent of the surveyed workers.

COMPARISON OF HEALTH SERVICES IN SMALL AND LARGE PLANTS—The data on health services in plants employ-

ing 100 or more persons have been compared with those for plants with less than 100 workers (see Table 8). The choice of plants employing 100 workers as the dividing line in this comparison is based upon the precedent established in reports on state-wide industrial hygiene surveys conducted in other states. It has been shown that the per capita cost for health services increases as the size of plant decreases below 500 employees, but since only four of the 526 establishments included in this study employed more than 500 persons, the comparison presented gives a more representative picture of Colorado conditions. The plants employing less than 100 workers comprised 86.5 per cent of the establishment surveyed and included 37 per cent of the workers surveyed.

For practically all the listed industrial health facilities previously discussed, the larger plants had the greater percentage of workers furnished with such provisions. However, even some of the larger plants are deficient in providing these services. In Colorado, as well as in the United States as a whole, the majority of the plants employ less than 100 workers; and it is the so-called small plant which is most noticeably lacking in those provisions which play an important role in a constructive program of industrial hygiene.

The industrial health services recorded in the present survey have been compared with similar records from five previous studies made by or in cooperation with the United States Public Health Service[2 7 8 9 10] (see Table 9). While in most instances the services for workers in Colorado compare favorably with those reported in these other studies, it is evident that there are still many workers in this State who are not provided with adequate medical care or safety services.

SANITARY FACILITIES—With the cooperation of the Sanitary Engineering Division of the State Board of Health, information was obtained relative to water supply, sewerage systems, and general sanitation. Specific information was obtained regarding drinking, washing and toilet facilities; the type of sewerage system in use; the methods of disposal of such discharge into a stream, lake, or lagoon; and whether separate lunch rooms and individual lockers were provided for employees. This information is presented in tabular form for industrial and service groups (see Table 10) and on the basis of plant size (see Table 11).

Approximately 80 per cent of all the plants studied received their water supply from municipal systems. Practically all the municipal water supplies in Colorado are safe for domestic uses. Workers listed as having a chlorinated water supply include only those using water for human consumption other than that coming from a municipal water system, in other words, workers in plants that maintain their own water supply and see to it that it is chlorinated. With one exception, there were no provisions for supplying safe drinking water to mine workers, and while individual bottles of water are generally carried, miners often drink water

directly from the mine tunnels, and these tunnels are subject to contamination with human excreta.

Approximately 80 per cent of the workers were reported as having fountains for drinking purposes, 8 per cent were provided with individual cups, and over 11 per cent were permitted to use common cups. Other drinking facilities, such as the use of a hose or hydrant were reported for 4 per cent of the workers. Many plants, particularly the larger ones, were found to have all of the first three types of drinking facilities, namely, fountain, individual cups and common cups. It is almost unnecessary to state that the use of the common cup contributes to the spread of various diseases and infections.

Approximately 9 per cent of the workers were without lavatory facilities. In fact, no lavatory facilities for the employees were provided in 15 per cent of the plants surveyed. Moreover, more than 20 per cent of the workers used common towels and 25 per cent more had no towels provided—only 56 per cent of the workers having individual or sanitary towels provided at the plant. The use of towels in common by several workers is a potential method for spreading infection.

The majority of the plants were found to have flush toilets, more than 82 per cent of the workers being so provided. The establishments using pit privies or other means of disposal were mainly mining; clay, glass and stone; or lumber industries. However, 34 per cent of the workers in the metal industries other than iron and steel were reported as having pit privies as well as flush toilets available. While pit privies were available to many of the mining camps, the majority of these camps did not even have this type of disposal. In some of the mines no means of disposing of sewage was provided, and it was found that excreta was deposited at any convenient place in the mines, which contributed a very definite health hazard.

It was determined whether plants had municipal sewerage systems, their own treatment plants, or discharged sewage directly to streams, lakes, lagoons or other places. Over 64 per cent of the workers were employed in plants connected to municipal sewerage systems, but all of these systems cannot be classed as proper disposal methods since all municipalities have not conformed to the Colorado State Health Department's requirements as to sewage disposal. Those plants that discharge raw sewage into streams, etc., create a definite hazard to community health since people working in these industries may be carriers of typhoid or other intestinal diseases. This type of sewage disposal may affect not only people near the plant but also people farther down the stream at points where the same water is used for drinking purposes.

Of the plants employing 100 or more workers, 37 per cent had separate lunch rooms, while only 9.9 per cent of the plants employ-

ing less than 100 workers had this service. Of all workers surveyed, only 30.5 per cent had this facility.

68.2 percent of the plants employing 100 or more workers had individual lockers, while only 26.7 per cent of the plants employing less than 100 workers provided such lockers. However, 65.4 per cent of all workers surveyed were reported as having individual lockers and these workers included 79.7 per cent of the workers in the larger plants and 37.3 per cent of the workers in the smaller plants.

When interpreting the data shown in Tables 10 and 11, it will be necessary to remember that some plants had more than one type of facility under each division. Consequently, the per cent or number of workers receiving any type of service under each main heading will in practically all cases, be less than the sum for those receiving each individual type of service.

OCCUPATIONAL EXPOSURE TO SPECIFIED MATERIALS

Numerous materials incidental to industrial processes are at times causative factors in the production of occupational diseases. In view of the possible influence of these materials on the health of workers, one of the important objectives of this survey was the recording of processes, raw materials and by-products and environment associated with each occupation, in the plants studied. In order to simplify the tabulation the numerous materials and environmental conditions encountered in industry were classified under 51 main groups. For further information on the grouping of materials the reader is referred to Appendix A.

In the following tables (Tables 12-45) the data are presented for industrial or service subdivisions in sufficient detail to give a broad perspective of the entire problem. The listed material exposures are based upon observation of possible contact between the worker and these materials. Since no engineering determinations of exposure or medical studies of actual damage were possible at this time, these findings are presented only as an indication of the location and extent of potential hazards. In other words, a material exposure as recorded in this survey indicates a possible source of danger, but an engineering study of each potential hazard would be necessary to show whether or not the exposure was of sufficient concentration and duration to be an actual hazard; and a medical examination of each worker would be necessary to show whether or not the hazardous exposure had caused actual injury.

Although exposures to materials have been tabulated in decreasing order of the number of workers exposed, it must be remembered that the different groups of materials vary in toxicity, and the material causing the greatest number of exposures is not necessarily the greatest potential industrial health hazard. More-

over, certain materials have been given separate specific grouping while other similar materials are listed under one general heading. For example, we have listed specific exposures to "sulphur dioxide gas," "chlorine gas," "hydrogen sulphide" and "carbon monoxide," while other toxic gases have been grouped under the heading of "other gases."

Table 12 presents, by industrial or service group classification, the number of workers exposed to the 51 classes of materials and conditions encountered in this study. Potential exposure to only 47 of these classes of materials were recorded, since no exposures to "amines," "Selenium and its compounds" or "anthracite coal dust" were reported, and exposures to "accelerators" used in the rubber industry were tabulated under more specific classifications. High percentages of workers surveyed were found to be potentially exposed to certain mineral dusts such as silica dust—20.5 per cent; silicate dust—17.1 per cent, nonsiliceous dust 9.4 per cent; ore dust—7.9 per cent; metal dusts such as lead—8.9 per cent, metals not otherwise specified—28.5 per cent, and dermatitis producers such as petroleum products—15.2 per cent, organic dust 18.5 per cent, and dermatitis producers not otherwise specified—22.0 per cent, but a sufficient number of workers were found to be in contact with the other classes of materials to show the need of consideration of these materials as an industrial hygiene problem.

The percentage of persons in each industrial group exposed to each specified material is shown in Table 13, and the percentage distribution of the exposures to each specified material among the various industrial groups is shown in Table 14. For example, 2,546 of the 6,374 workers exposed to silica dust were employed in the extraction of minerals industry (Table 12); and this was equivalent to an exposure rate of 55.3 per cent in the extraction of minerals industry (Table 13), although this industry contributed only 39.9 per cent of the total number of observed exposures to this dust (Table 14). (The material contained in Table 14 is, obviously, merely applicable to the distribution of exposures observed in this survey, since the ratio of workers surveyed to workers employed varied for each industrial group—see Table 2.)

The following tables (Tables 15 to 42 inclusive) present in more detail the problems pertaining to each industry investigated. Since many individual workers had potential exposures to several materials, the total number of "exposures" is considerably greater than the total number of workers in several instances, and in all cases the total number of exposures is greater than the total number of workers having one or more exposures.

EXTRACTION OF MINERALS—The number of workers exposed to various materials in the different subdivisions of the mining and quarrying industry is shown in Table 15. For this industry, four subdivisions are presented. The classification "other mines" includes a zinc mine, a molybdenum mine, and a

vanadium mine and vanadium concentrating mill. These establishments were included under one heading to avoid revealing statistics for an individual plant. The establishments classified under the heading of "Petroleum" were primarily oil refineries which could have been as readily included in the Chemical and Allied Industry group. In these industries, 36 types of exposure, of a possible 51, were observed. The principal exposures were to mineral dusts, gases, and dermatitis producers. Of special interest are the 76 workers exposed to radioactive substances, which in this case refers to radium and allied compounds. Colorado is almost unique in these United States in being a prime producer of the radioactive elements.

The percentage of workers in each industrial subdivision exposed to the specified materials is shown in Table 16.

In this group, as well as in the other groups considered, industrial establishments have been classified according to their chief product. Consequently, all the operations in an industry will not be common to that industry alone. Coal mines include not only underground workers but also outside workers in machine shops and offices. Moreover, while we have considered most of the ore refining plants under the metal industry classifications, several crushing and flotation mills were operated in such close connection with the mines that they were necessarily included as an integral part of the mine survey. No attempt has been made to subdivide industries into departmental divisions, or to present information on individual occupational exposures in this report, since the consideration of the exposures peculiar to each industry as a whole is of primary importance at this time.

CHEMICAL AND ALLIED INDUSTRIES—The findings on exposure to specified materials for the chemical and allied industries show that over 60 per cent of the surveyed workers were included under the classification of "Other Chemical Factories." These other chemical factories included a soap factory, three plants preparing compressed gases, three plants manufacturing drugs and patent medicines, a wood preserving plant, a plant making roofing and coal tar products, a plastics manufacturing plant, a cinema production company, and plants manufacturing chemicals for fire extinguishers, sheep dip, vinegar, tree spray, insecticides, ammonia and mineral acids.

Potential exposures to 41 of the 51 specified material groups were recorded. While organic dust exposures (23.0 per cent), dermatitis producers not otherwise specified (16.8 per cent), and organic solvents (16.2 per cent) were the most prevalent, the wide variety of exposures observed is of primary importance. (See Tables 17 and 18.)

CLAY, GLASS AND STONE INDUSTRY—Exposures to 22 classes of materials were reported for the Clay, Glass and Stone Industry. Exposures to silica, silicate, and nonsiliceous inorganic

dusts are the major considerations in this industry. (See Tables 19 and 20.) It is also of interest to note that 18.3 per cent of the surveyed workers had a potential exposure to carbon monoxide gas, and 17.1 per cent to other gases (not otherwise classified).

CLOTHING INDUSTRY—Organic dusts were recorded as an exposure for 39 per cent of the 367 workers surveyed in this industry, and 7.9 per cent were found to be exposed to occupational sources of infection. (See Tables 21 and 22.) Other exposures, of special importance due to the toxicity of the material more than due to the number of workers exposed, are to arsenic, organic solvents and coal tar products.

FOOD AND ALLIED INDUSTRIES — The importance of these industries in Colorado was realized and a sample consisting of 8,911 workers was surveyed. This industry was divided into 11 subdivisions to facilitate presentation of the data. (See Tables 23 and 24.) Exposures to 30 different classes of materials were recorded. A majority of the workers were found to be exposed to dermatitis producers (20.6 per cent to organic dust and 60.3 per cent to dermatitis producers not otherwise classified, and 20.4 per cent to possible sources of infection—presumably skin infections in most cases). Fruit and vegetable canning plants, sugar refineries, bakeries and slaughter and packing houses included the greatest number of workers and contributed the majority of the exposures. The first two of these subdivisions included plants which are in operation only during part of the year.

IRON AND STEEL INDUSTRY—The survey of 6,272 workers in the Iron and Steel Industries has been analyzed on the basis of four subdivisions, of which the miscellaneous group consists of 5,364 workers. (See Tables 25 and 26.) This "Other Iron and Steel Industries" group included a blast furnace, employing nearly 4,000 workers, as well as steel fabrication plants, machine shops, foundries, plants manufacturing light machinery and tools, and plants manufacturing heavy machinery. While a breakdown of this group was desired, it could not have been presented without revealing information on individual plants. While 75 per cent of the workers were recorded as exposed to "other metals" it is realized that many of these exposures were to comparatively nontoxic substances. However, exposures to carbon monoxide gas (47.0 per cent), other gases (50.6 per cent) and silica dust (34.6 per cent) show a very high exposure rate. Moreover, one-third of the workers were subject to extreme temperature changes, and the importance of this environmental factor in relation to the high pneumonia rate in this industry is recognized.[6]

METAL INDUSTRIES EXCEPT IRON AND STEEL—This industrial classification includes brass mills, lead and zinc factories and a sub-group of miscellaneous metal industries including two electroplating shops; plants manufacturing precision instruments, gunsights, telescope mountings, jewelry, hose clamps and

a lead, cadmium and thallium refinery. (See Tables 27 and 28.) Extremely high percentages of workers were exposed to other metals (64.5 per cent) and lead (57.6 per cent), but half of the surveyed workers in this group were employed in lead and zinc factories. Exposures to 32 groups of materials were recorded, the most important being to toxic metals, gases, mineral dusts, and adverse environmental conditions.

LEATHER INDUSTRIES—This is a minor industry in Colorado. It includes manufacturing of saddlery and harness, leather goods and belts, and trunks and suitcases. Only 163 of the surveyed workers were in this group. Organic dust exposures were recorded for 53.4 per cent of the workers, while 25.8 per cent were exposed to sources of infection, primarily in handling untreated hides. (See Tables 29 and 30.)

LUMBER AND FURNITURE INDUSTRIES — The lumber and furniture industries were divided into furniture factories, sawing and planing mills, and other woodworking factories. A reanalysis of the industries included in the last classification shows that most of these were plants which contained both sawing and planing mills and woodworking shops. Among the products manufactured were caskets, incubators, skis, barrels, crates, baskets and saddle trees. As was naturally expected, the most prevalent exposure was to organic dust (68.4 per cent), but, due to sanding and finishing operations 17.9 per cent of the workers had potential exposures to silica dust. (See Tables 31 and 32.)

PAPER, PRINTING AND ALLIED INDUSTRIES—This industry was divided into three subdivisions, of which printing, publishing and engraving contributed nearly 70 per cent of the workers and most of the exposures. (See Tables 33 and 34.) Metals, including lead and antimony; dermatitis producers such as organic dusts and ink; and organic solvents are the most important potential hazards. Less than 1.0 per cent of the workers surveyed in the paper, printing and allied industries were reported to have a potential exposure to carbon monoxide gas. It is possible that the reporting of potential exposures to carbon monoxide in this Colorado industry was incomplete in view of surveys in other States.[2] This gas, even when originally absent in natural gas, can be produced by the incomplete combustion of such natural gas, especially if the gas flame strikes cold metal.

TEXTILE INDUSTRIES—Organic dust was the most prevalent of the 19 materials to which exposures were reported in this industry. (See Tables 35 and 36.) While exposure to organic dust is almost universal, it is believed that exposures to high concentration of dust from animal and vegetable fibers may cause respiratory irritation and predispose to respiratory infections such as colds, bronchitis and pneumonia. Under the "other textile mills" classification were included mattress manufacturing, upholstering and bedding manufacturing.

MISCELLANEOUS MANUFACTURING INDUSTRIES — This group includes electrical machinery and supply factories, plants manufacturing signs, makers of optical equipment, a heterogeneous group called "other miscellaneous industries," and a group of 684 workers in Electric Light and Power Companies. While this last group is obviously a public utility, and it has been stated that public utilities were omitted from the survey, an exception was made in this case. The "other miscellaneous industries" group included dental supply factories, broom and brush factories, plants manufacturing fishing tackle, a "Celotex" plant, plants salvaging paper and junk, a plant making hand-woven cravats, and a rubber factory. (This rubber factory, a large establishment, was included here to avoid separate classification.) Exposures were recorded for 36 of the material classifications. (See Tables 37 and 38.)

TRANSPORTATION AND COMMUNICATION—Surveys in this industry were limited to automobile garages and service stations and to street railway companies. (See Tables 39 and 40.) A total of 2,020 workers were surveyed in this industry. Petroleum products not otherwise specified (mainly dermatitis producers) were a potential hazard to 34.3 per cent of the workers, while carbon monoxide gas is an important problem (32.3 per cent exposed) and organic solvents (21.1 per cent exposed) must also be considered.

DOMESTIC AND PERSONAL SERVICE INDUSTRIES — Two subdivisions of this industry, Laundries and Dry Cleaning plants, were surveyed. Limited exposures to a wide variety of substances were recorded. (See Tables 41 and 42.) The potential hazards from exposure to organic solvents (including benzene and the halogenated hydrocarbons such as carbon tetrachloride), alkaline compounds, organic dusts, and dermatitis producers such as soaps and inks must be considered in this industry, and the possibility of contracting infectious diseases from handling soiled clothes should not be overlooked. Exposure to "ink" took numerical precedence, presumably due to the ease with which this substance is detected, but available data do not justify its consideration as the most important dermatitis producer encountered in this industry.

Tables 12 to 42, inclusive, present in detail the exposures to various materials by industrial or service classifications. Table 43 shows the materials in each industry or service group to which 10 per cent or more of the persons in that industry were potentially exposed.

Table 44 shows the number and percentage of persons surveyed who were exposed to the important materials, irrespective of the industry in which the exposure occurred. It is evident that a large number of persons are exposed to mineral dusts; such as silica dust (20.5 per cent), silicate dusts (17.1 per cent), bituminous coal dust (10.1 per cent), nonsiliceous dust (9.4 per cent).

Exposures to metal dusts and vapors are an important problem. Potential exposures to noxious gases occur frequently, nearly 28 per cent of the workers being exposed to carbon monoxide and 28.3 per cent to gases not otherwise specified.

Several of the remaining items and also some of the metals are important sources of dermatitis. Experience has shown that dermatitis is the most frequent occupational malady, and we have no reason to assume that Colorado industries are exceptions to this rule.

In each industrial subdivision, the number of workers to be surveyed was determined after considering the diversity of occupations in that subdivision and the estimated importance of the health hazards in the industry. It is believed that the sample for each group was adequate in size and representative of that industry in Colorado. However, an estimate of the total number of Colorado workers potentially exposed to the various materials requires an accurate knowledge of the total number of workers employed in each industry. In the absence of such data, and with the knowledge that such figures, if accurate at the time of collection, are subject to constant change, we based the estimate of the total number of workers exposed to each material, as shown in Table 45, on the 1930 United States Population Census, corrected according to the industrial classification used in this survey. The choice of the 1930 census figures instead of those of a more recent biennial census was due to the greater accuracy of the decennial census, and to the belief that the 1930 census figures most closely approached the actual employment at the time of the survey.

Table 45 shows the number of persons, in the industries studied, who are expected to have potential exposure to some of the important materials. These estimates of expected exposures are based on the total working population in those industries sampled, but since those industries omitted from the survey will contribute some exposures, it is probable that the expected number of potential exposures for all gainful workers in Colorado will be slightly higher than the values shown in Table 45.

From Table 45, it appears that, in the State of Colorado, one might expect to find more than 20,000 workers exposed to silica dust, more than 17,500 workers exposed to silicate dust and over 10,500 exposed to bituminous coal dust. We also find that exposure to metal dust and fumes is very common in Colorado industries. Over 7,600 workers were exposed to lead or lead compounds and over 24,000 workers were recorded as having a potential exposure to metals not otherwise classified in the material classification. The other two general groups of classified material which were numerically important were exposures to gases and exposures to dermatitis-producing substances. More than 26,000 workers had potential exposures to carbon monoxide gas, over 2,000 had exposures to sulphur dioxide gas, and over 27,000 workers were credited with exposures to gases not otherwise classified.

While practically all substances will produce dermatitis in susceptible individuals, exposures were credited only to materials which are known to frequently cause industrial dermatitis. The most important listings were to organic dust (over 13,600 exposures). Other dermatitis producers not elsewhere classified were credited with over 10,000 exposures.

It is obvious from a study of these data that silica and other non-metallic dusts, dermatitis producers, carbon monoxide and other gases, certain metallic dusts and vapors, and organic solvents and other hazardous chemicals comprise the most important industrial hygiene problems in Colorado. Any preventive program which may be instituted in the future should give serious consideration to the handling of these substances in a manner to eliminate the possibility of injury to health.

APPLICATION OF CONTROL METHODS—As stated previously, while association with hazardous materials has been classified as a potential exposure, it is impossible to determine the number of persons actually exposed to hazardous concentrations of any material unless accurate engineering studies are made of the workers and their environment. Likewise, the data which were collected on the use of methods for controlling occupational exposures, i. e., protection of workers who were potentially exposed, can only be interpreted as meaning that the hazard had been recognized and some attempt had been made to control it. While, in many cases, the worker may have been receiving adequate protection it must be remembered that even the most efficient control method can be incorrectly applied, and no scientific determinations of the efficiency of these provisions were made.

Table 46 shows the total number of workers surveyed who were exposed to each specified material, and the percentage of these workers having each of the indicated types of protection against exposure. It is obvious that the per cent of exposed workers receiving any one type of protection is extremely small. In tabulating these data, credit for control was given where a control method was available, whether or not the surveyor considered it adequate or properly applied. Likewise, single exposures were frequently credited with more than one type of control.

No attempt has been made to analyze these data in such a manner as to show the actual extent of control available to exposed workers, irrespective of the number of potential exposures of any individual worker or the number and type of control methods at his disposal, but it is reasonable to assume that such an analysis would have shown conditions similar to those found in a neighboring state where 87 per cent of the surveyed workers were potentially exposed to one or more of the specified materials, and only 44 per cent of these exposed workers had any one of the specified control methods available.[8]

There is obvious need for an administrative unit in the State of Colorado not only to determine the magnitude and importance of industrial health hazards, but also to advise and assist both employers and employees in the protection of the health of industrial workers.

APPENDIX A

Materials and physical conditions of a potentially hazardous nature, encountered by workers in the occupations surveyed, were grouped under the following class designations:

1. Accelerators
2. Alcohols, esters and ethers
3. Aldehydes
4. Alkaline compounds
5. Amines
6. Aniline
7. Antimony
8. Arsenic
9. Asbestos dust
10. Benzene
11. Cadmium
12. Carbon monoxide
13. Chemicals
14. Chlorine
15. Chromium
16. Coal dust, anthracite
17. Coal dust, bituminous
18. Coal tar products
19. Cyanides
20. Dyes
21. Fluorine
22. Halogenated hydrocarbons
23. Hydrogen sulphide
24. Infections
25. Inks
26. Lacquer and varnish
27. Lead
28. Manganese
29. Medicines
30. Mercury
31. Mineral acids
32. Nonsiliceous dust
33. Oils, fats and waxes
34. Ore dust
35. Organic acids
36. Organic dusts
37. Organic solvents
38. Other dermatitis producers
39. Other gases
40. Other metals
41. Paint and enamel
42. Petroleum products
43. Phosphorus
44. Radioactive substances
45. Salts, inorganic
46. Selenium
47. Silica dust
48. Silicate dust
49. Sulphur
50. Sulphur dioxide
51. Temperature change

The following are examples of materials included under each specific or general classification:

1. **Accelerators:** In some other surveys, there have been classified under this heading those chemical compounds used in the rubber industry to promote chemical reactions. Since all materials of this type encountered in this survey could be readily classified in other more specific groups, no exposures were recorded under the classification of "accelerators."

2. **Alcohols, Esters and Ethers:**
   Alcohols: Amyl, Butyl, Ethyl, Methyl
   Ethers: Ethyl, Methyl, etc.
   Esters: Amylacetate, Butyl acetates, Ethyl acetate
3. **Aldehydes:**
   Acrolein
   Formaldehyde
4. **Alkaline Compounds:**
   Ammonium hydroxide
   Barium hydroxide
   Barium oxide
   Calcium hydroxide
   Caustic soda
   Cleaning compounds (alkaline)
   Lime (calcium oxide)
   Potash
   Potassium carbonate
   Potassium hydroxide
   Sal soda
   Soda ash
   Sodium carbonate
   Sodium hydroxide
   Stripping compounds (alkaline)
   Trisodium phosphate
   and washing powders and commercial cleaners, such as Oakite or Wyandotte when they contain caustic alkalies.
5. **Amines:** No exposures were recorded under this heading.
6. **Aniline:** (Aniline and its compounds)
   Aniline
   Acetanilide
   Dimethylaniline
   Paranitroaniline
7. **Antimony:** (Antimony and its compounds)
8. **Arsenic:** (Arsenic and its compounds)
9. **Asbestos Dust:**
   Asbestos fiber
   Asbestos roofing and insulation dust
10. **Benzene:** (Benzene and similar compounds)
    Benzene (benzol)
    Toluene (toluol)
    Xylene (xylol)
11. **Cadmium:** (Cadmium, its compounds and alloys)
12. **Carbon Monoxide**
13. **Chemicals:** (Chemicals not otherwise specified, or an exposure to a wide variety of chemical compounds)

14. **Chlorine**: (Chlorine gas only)

15. **Chromium**: (Chromium and its compounds)
Chrome ore
Chromic acid
Chrome alum
Potassium dichromate
Other chromates

16. **Coal Dust, Anthracite**: (No exposure recorded in Colorado Survey)

17. **Coal Dust, Bituminous**:
Bituminous coal, coke

18. **Coal Tar Products**: (When not covered by other specific groups)
Coal tar
Coal tar products, not otherwise specified
Creosote
Cumar resin
Hydroquinone
Naphthalene
Phenol and Phenol resins
Pyridine

19. **Cyanides**:
Cyanogen
Hydrocyanic acid
Potassium cyanide
Sodium cyanide
Zinc cyanide

20. **Dyes**:
All dyes except aniline or coal tar products classified elsewhere
Stains

21. **Fluorine**: (Fluorine and its compounds)
Fluorine gas
Hydrofluoric acid
Calcium fluoride
Cryolite
Fluorspar

22. **Halogenated Hydrocarbons**:
Chloroform
Carbon tetrachloride
Tetrachlorethane
Dichlorethylene
Chlorinated waxes

23. **Hydrogen Sulphide**

24. **Infections:**
Anthrax
Tetanus
Tularemia
All cases where the occupation caused a definite risk of contracting a specific disease

25. **Inks:**
Printers' inks
Stencil inks

26. **Lacquer and Varnish:**
Duco
Shellac
Other lacquers and varnish

27. **Lead:** (Lead and its compounds)
Lead
Babbitt metal
Litharge
Type metal
White lead
Tetraethyl lead
Other lead alloys and compounds

28. **Manganese:** (Manganese and its compounds)

29. **Medicines:**
Drugs and pharmaceuticals, not otherwise specified

30. **Mercury:** (Mercury and its compounds)

31. **Mineral Acids:**
Nitric acid
Hydrochloric acid
Sulphuric acid
Phosphoric acid
Other inorganic acids, not elsewhere classified

32. **Nonsiliceous Dust:** (Nonsiliceous inorganic dust)
Under this heading were listed minerals, metal oxides and mineral salts not elsewhere classified.
Aluminum oxide
    Emery
    Alundun
    Corundun
    Aloxite
Fuller's earth
Calcium carbonate
    Limestone
    Marble
Magnesite
Plaster of Paris (Gypsum)
Polishers' rouge

33. **Oils, Fats and Waxes:**
Vegetable and animal oils, etc.
Lard
Tallow
Cottonseed oil

34. **Ore Dust:** Recording of this exposure shows presence of dust from mining or mineral concentrating operations. Its only significance is in showing need for study of the composition of atmospheric dusts in relation to these operations, since the proportion of the various mineral constituents of the dust may be quite different from that in the ore.

35. **Organic Acids:**
Acetic
Formic
Oxalic
Picric
Tannic

36. **Organic Dust:**
Dust from all organic substances not elsewhere classified, as cotton, dextrin, felt, fiber, fur, grain, gums, Kapox, leather, paper, rags, rayon, resin, rosin, rubber, sawdust, sisal, spices, straw, starch, wool.

37. **Organic Solvents:**
Acetone
Cleaners' liquids not elsewhere classified
Gasoline
Kerosene
Naphtha
Ethylene glycol
Turpentine

38. **Other Dermatitis Producers:**
Under this heading were classified a group of substances important in industrial hygiene because they may produce dermatitis. Many of the other materials may produce dermatitis but were classified under different headings because they also have other hygienic significance. Examples of materials included under this heading are:
Animal products
Chocolate
Organic cutting compounds
Dough
Sugar
Vanilla
Vegetable products

39. **Other Gases:**
Gases not elsewhere classified, as:
Acetylene
Ammonia
Carbon dioxide
Oxides of nitrogen
Ozone
Phosgene

40. **Other Metals:**
Metals, not elsewhere classified
Toxic metallic oxides, not elsewhere classified

41. **Paint and Enamel:**
Zinc paint
Japan compounds
Lithopone

42. **Petroleum Products:** (Not elsewhere classified)
Asphalt
Lubricating greases and oils
Mineral oils
Paraffin
Petroleum tar and pitch

43. **Phosphorus:**
Red phosphorus
White phosphorus
Phosphorus sesquisulphide

44. **Radioactive Substances:**
While this group should include only the radioactive elements and their compounds, such as radium, uranium, etc., extensive exposures to Roentgen rays (X-rays) were classified under this heading, since these exposures occurred only in the Miscellaneous Manufacturing Industry Group.

45. **Salts, Inorganic:**
Industrial exposures to technical and analytical grades of chemical salts, such as:
Alum
Ammonium chloride
Brine
Calcium chloride
Nitrecake
Sodium bisulphite
Sodium hypochlorite
Sodium chloride
Sodium nitrate, etc.

46. **Selenium**: (Selenium and its compounds)
No exposures to this extremely toxic material were recorded, although its nonindustrial significance is well recognized in Colorado. Although not recorded in this survey, industrial exposures to this material are increasing in the United States.

47. **Silica Dust**:
Exposure to dust of the various forms of silicon dioxide or mineral dusts containing this compound, as:
Agate
Chalcedony
Cristobalite
Diatomaceous earth
Flint
Gannister
Granite
Infusiorial earth
Jasper
Onyx
Opal
Quartz
Sand
Trichymite
Tripoli

48. **Silica Dusts**: (Silicate dusts and other silicon compounds, such as carborundum), not elsewhere classified
Ashes
Carborundum
Clay
Feldspar
Ferrosilicon
Fireclay
Glass
Mica
Portland cement
Pumice
Slate
Soapstone
Talc

49. **Sulphur**: (Sulphur and alkaline sulphides)
Sulphur
Barium sulphide
Calcium sulphide
Sodium sulphide
Potassium sulphide

50. **Sulphur Dioxide**

51. **Temperature change**:
Exposure to extreme temperature change or extremely high or low temperatures.

APPENDIX B

CONTROL MEASURES

The following definitions of control measures are presented to explain the column headings given in Table 46.

Positive Ventilation: This applied to general ventilation of a workroom where air was supplied under positive pressure (blown in by a fan-blower).

Negative Ventilation: This applied to general ventilation of a workroom where air was removed under negative pressure (drawn out by an exhaust fan).

Local Exhaust Ventilation: This referred to provisions for ventilating a particular section of the workroom through air suction ducts, for example, an exhaust system attached to a grinding wheel.

Enclosure: This referred to physical enclosure of an operation, machine, or process so that the operator could not come in contact with the materials used or produced by the process. For example, use of a sealed chamber for the mechanical mixing of chemical compounds.

Wet Methods: This referred to the use of water or other liquids, as in rock drilling or hydraulic knock-outs for the purpose of allaying dusts in the process.

Respirators: This referred to the provision of filter type dust masks.

Gas Masks: This referred to the provision of chemical cartridge type face masks for protection against gases, fumes and vapors.

Air Line Respirators: This referred to the provision of protective masks to which fresh air is supplied through a hose or tube from a source outside the workroom.

Protective Clothing: This referred to the use of goggles, aprons, gloves, rubber boots, etc.

Other Protective Measures: This refers to any type of control measure not listed above, such as protective salves or ointments, prophylactic treatment for infections, etc.

REFERENCES

1. Fifteenth Census of the United States: 1930. Population Reports by States. Vol. III, Part I, Table 10, p. 299.

2. Evaluation of the Industrial Hygiene Problems of a State. Bloomfield, J. J., and Peyton, M. F. Public Health Bulletin No. 236, Washington, June, 1937.

3. Medical Supervision and Service in Industry. National Industrial Conference Board, Inc., New York, 1931.

4. Medical Service in Industry. Newquist, M. N. American College of Surgeons, Chicago, 1938.

5. Accident Experience in the Iron and Steel Industry. Monthly Labor Review. Bureau of Labor Statistics, U. S. Department of Labor. Vol. 37, No. 3, September, 1933.

6. The Pneumonia Problem in the Steel Industry. Brundage, D. K., and Bloomfield, J. J. Journal of Industrial Hygiene, Vol. 14, No. 10, December, 1932.

7. The Potential Problems of Industrial Hygiene in a Typical Industrial Area. Bloomfield, J. J., Johnson, W. S., and Sayers, R. R. Public Health Bulletin No. 216, Washington, December, 1934.

8. Evaluation of the Industrial Hygiene Problem of the State of Utah. Page, R. T., and Bloomfield, J. J. U. S. Public Health Service, Washington, 1938.

9. Evaluation of Industrial Hygiene Problems of Virginia. Tillson, W. D., Homewood, R. T., and Worsham, H. I. Virginia Bureau of Industrial Hygiene, 1938.

10. An Evaluation of the Industrial Hygiene Problem in South Carolina. Wilson, H. F., and Brown, R. M. South Carolina Bureau of Industrial Hygiene, 1938.

COLORADO INDUSTRIAL HYGIENE SURVEY

ORGANIZATION

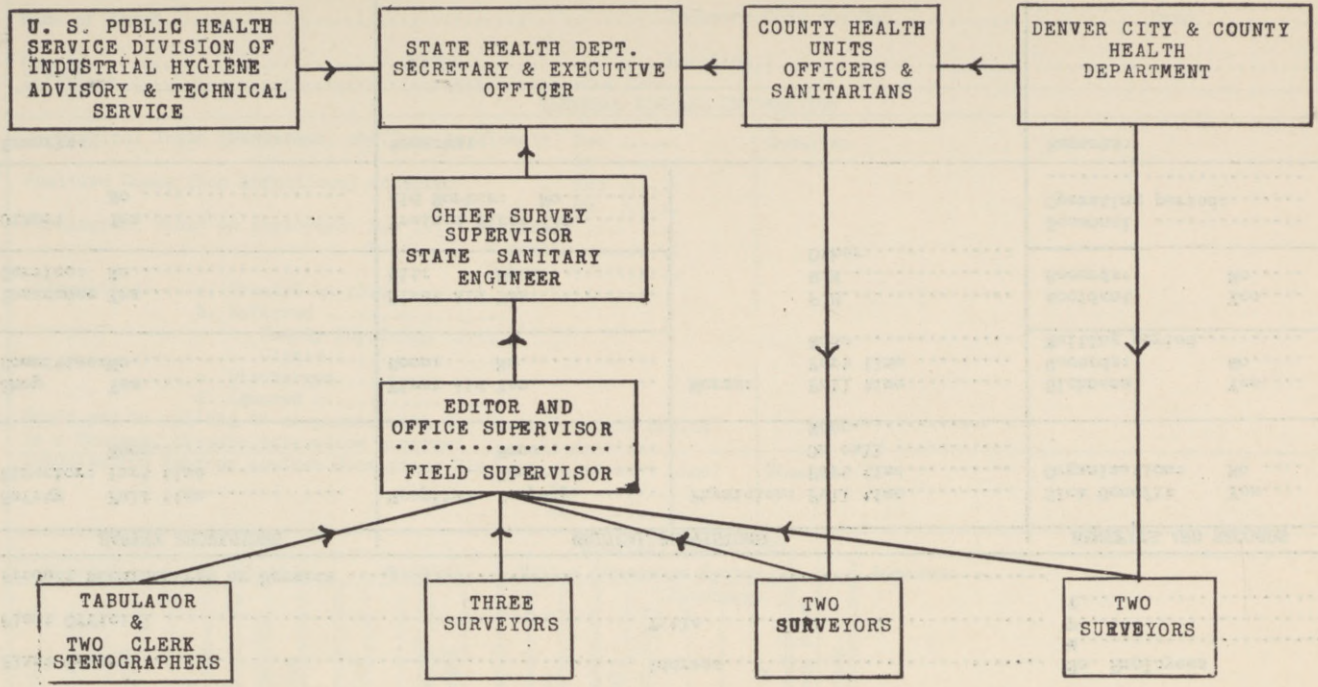


FIGURE 1

Form 3. COLORADO INDUSTRIAL HYGIENE SURVEY
Industrial Health Service Data

Page.....of.....
Surveyed by.....

Name of Plant..... .....Industry Code and No..... .....Date..... ..

County..... .. ..City.....Location.....

Plant Owner..... Address..... No. Employees
M.....
Plant Official ..... Title..... ..... F.....
T..... ....

Product Manufactured or Service ....

SAFETY PROVISIONS	MEDICAL PROVISIONS		BENEFITS AND RECORDS
Safety Director: Full time..... Part time ..... None.....	Hospital: Company..... Contract..... None.....	Physician: Full time..... Part time..... On call ..... None.....	Sick Benefit Organization: Yes.... No ....
Shop Committee: Yes..... No.....	First Aid Room: Yes..... No.....	Nurse: Full time..... Part time ..... None.....	Sickness Records: Yes.... No..... Waiting period.....
Insurance Service: Yes..... No.....	First Aid Kit: Yes..... No.....	P.H..... R.N..... Other.....	Accident Records: Yes.... No.....
Other: Yes..... No	Trained First Aid Worker: Yes..... No.....		Seasonal: ..... Operating period:..... .....
Remarks:	Remarks:		Remarks:

Check in blank which applies 'Colorado State Board of Health, Division of Industrial Hygiene.

Form 3-A

COLORADO INDUSTRIAL HYGIENE SURVEY
Industrial Health Service Data (continued)

Page.....of.....
Surveyed by.....

Name of Plant.....Industry Code and No.....Date.....

County.....City.....Location.....
Informant.....

VENEREAL DISEASE INFORMATION

Serological Tests (Wasserman, etc.) on applicant: Yes .....
No .....

Positive Cases (Non-infectious) accepted Yes .....
No .....

Serological Tests on employees: Yes ..... Annually .....
No ..... 6 months .....
Other .....

Disposition: a. Treated at plant .....
b. Referred .....
Family Physician .....
Clinic .....
c. Discharged .....
d. Ignored .....

Would you be willing to cooperate with the State Board of Health in a Venereal Disease prevention program?

Remarks:

Immunization Program against Contagious Diseases at present time?
Yes .....
No .....

Remarks:

SANITARY FACILITIES

Water Supply						Drinking				Washing					Toilet			Sewerage System							Remarks:
Municipal	Well	Stream	Chlorinated	Settled	Filtered	Fountain	Individual cup	Common cup	Other	Lavatories	Other	Common towel	Other towel	Showers	Flush	Pit privy	Other	Municipal	Treatment plant	Discharge: Stream	Lake	Lagoon	Other	Sep. lunch room	Ind. locker	

Check in blank which applies

Colorado State Board of Health, Division of Industrial Hygiene.

Form 4

COLORADO INDUSTRIAL HYGIENE SURVEY
WORK ROOM SURVEY DATA

Page ..... of .....

Name of Plant.....Location.....Industry Code and No.....

Department.....Work Room .....

Informants Name.....Surveyed by .....Date.....

Occupation	Number of Persons			Nature of Job	General Ventilation		Control Measures							Material Code
	M	F	T		Positive	Negative	Local Exhaust	Enclosure	Wet Method	Gas Mask	Respirator	Air Line Resp.	Prot. Clothing	Other
					Raw Materials and By-Products									
Total														

Colorado State Board of Health, Division of Industrial Hygiene

TABLE I. NUMBER OF PLANTS AND EMPLOYEES SURVEYED IN COLORADO MINING, INDUSTRIAL AND SERVICE GROUPS

Industry or Service Group	Number of Plants	Number of Workers		
		Total	Male	Female
MINING				
Extraction of Minerals				
Coal Mines	18	1525	1525	0
Gold and Silver Mines	20	1202	1198	4
Other Mines	3	1568	1540	28
Quarries	7	235	231	4
Petroleum Refineries	2	76	75	1
Total	(50)	(4606)	(4569)	(37)
MANUFACTURING & MECHANICAL INDUSTRIES				
Chemical and Allied Industries				
Explosives, Ammunition, Fireworks	2	141	131	10
Fertilizer Factory	4	56	56	0
Paint and Varnish	4	102	79	23
Other Chemical Factories	18	462	343	119
Total	(28)	(761)	(609)	(152)
Clay, Glass and Stone Industries				
Brick, Tile and Stone Industries	11	545	539	6
Glass	3	35	34	1
Lime, Cement and Artificial Stone	2	133	131	2
Marble and Stone Yards	2	39	39	0
Pottery	2	192	103	89
Total	(20)	(944)	(846)	(98)
Clothing Industries				
Coats, Suits & Overalls	5	227	57	170
Furs	3	80	36	44
Other Clothing Factories	3	60	13	47
Total	(11)	(367)	(106)	(261)
Food & Allied Industries				
Bakeries	20	1185	850	335
Dairy Products	27	886	706	180
Candy Factories	6	309	123	186
Flour and Grain Mills	21	387	367	20
Fruit and Vegetable Canning	19	2243	1193	1050
Slaughter & Packing Houses	8	1026	824	202
Sugar Factories & Refineries	11	1979	1963	16
Ice Manufacturing	5	254	248	6
Spices, Coffee, etc.	3	63	41	22
Other Food Factories	5	186	95	91
Liquor & Beverage Industries	11	393	373	20
Total	(136)	(8911)	(6783)	(2128)
Iron and Steel Industries				
Auto Repair Shops	3	34	32	2
Automobile Factories	4	135	132	3
Car and Railroad Shops	6	739	731	8
Other Iron, Steel & Machinery	28	5364	5245	119
Total	(41)	(6272)	(6140)	(132)

(continued)

TABLE I. NUMBER OF PLANTS ANS EMPLOYEES SURVEYED IN COLORADO MINING, INDUSTRIAL AND (Con't) SERVICE GROUPS.

Industry or Service Group	Number of Plants	Number of Workers		
		Total	Male	Female
Metals other than iron and steel				
Brass mills	2	17	16	1
Lead and zinc	4	303	299	4
Other metal products	8	286	267	19
Total	(14)	(606)	(582)	(24)
Leather Industries				
Saddlery & Harness Goods	3	40	2	38
Leather belts & Leather Goods	2	46	11	35
Tanneries	3	54	47	7
Trunks and Bags	2	23	21	2
Total	(10)	(163)	(81)	(82)
Lumber and Furniture Factories				
Furniture Factories	6	97	86	11
Saw and Planing Mills	8	400	393	7
Other Woodworking Factories	17	380	328	52
Total	(31)	(877)	(807)	(70)
Paper, Printing & Allied Industries				
Blank Books, Envelopes	5	321	211	110
Paper Box Factories	3	70	59	11
Printing, Publishing & Engraving	37	890	708	182
Total	(45)	(1281)	(978)	(303)
Textile Industries				
Tents and Awnings	3	64	43	21
Other Textile Mills	7	212	113	99
Total	(10)	(276)	(156)	(120)
Miscellaneous Manufacturing Industries				
Electric Light & Power	7	684	663	21
Electrical Machinery	5	57	50	7
Miscellaneous Industries	14	1637	1122	515
Signs	2	66	58	8
Optical	3	70	51	19
Total	(31)	(2514)	(1944)	(570)
Total Manufacturing & Mechanical Industries	(377)	(22972)	(19032)	(3940)
TRANSPORTATION & COMMUNICATION				
Garage, Auto Laundries, and Greasing Stations	58	1149	1047	102
Street Railroads	2	871	818	53
Total	(60)	(2020)	(1865)	(155)
PERSONAL SERVICE				
Cleaning, Dyeing & Pressing Shops	15	543	238	305
Laundries	24	989	308	681
Total	(39)	(1532)	(546)	(986)
GRAND TOTAL	(526)	(31130)	(26012)	(5118)

Table No. 2. - Number and percentage of Workers surveyed by industry or service group. (Percentage based on comparison with data from the 1930 U. S. Population Census for Colorado).

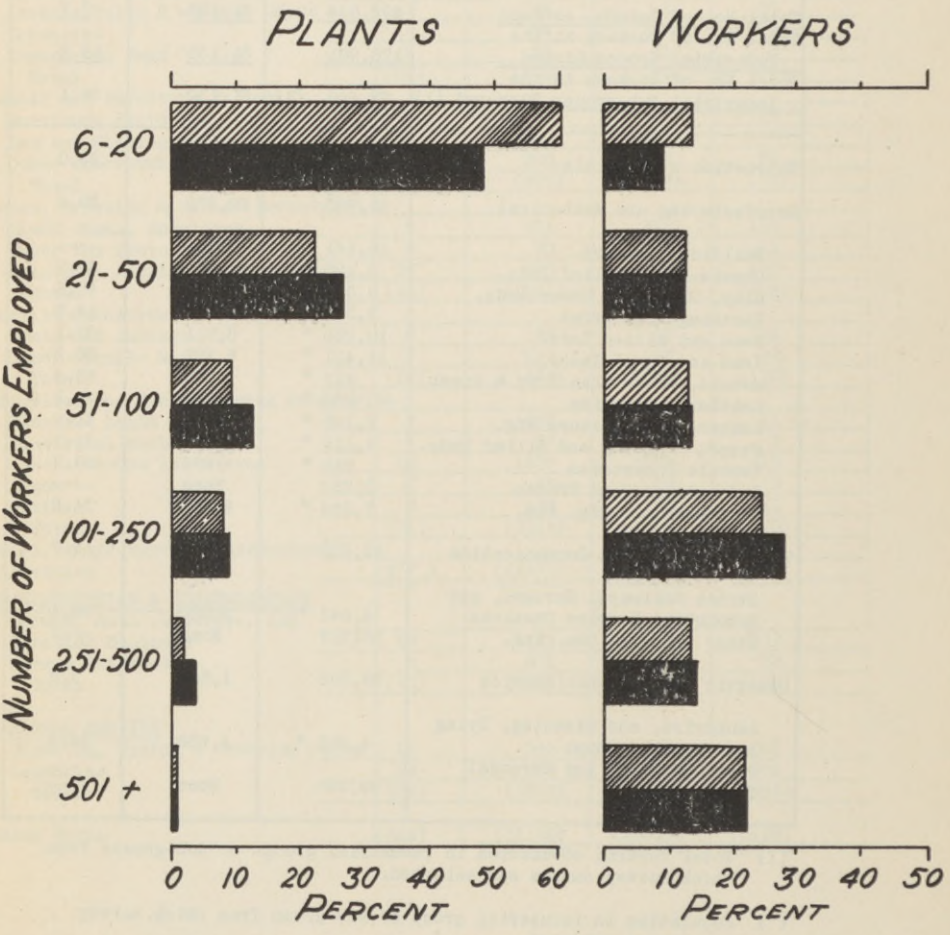
Industry or Service Group	Gainful Workers		
	1930 Census	Number Surveyed	Percent Surveyed
Total No. of Gainful Workers	402,894	31 130	7.7
Total No. of Workers in the Industrial Groups Listed	170,981	31,130	18.2
Total No. of Workers in the Industrial Sub-groups Surveyed (1)	79,668 (1)	31,130	39.1
Extraction of Minerals	20,045 *	4,606	23.0
Manufacturing and Mechanical	68,785	22,972	33.4
Building Industry	16,661	None	----
Chemical and Allied Inds.	2,120 *	761	35.9
Clay, Glass and Stone Inds.	2,070 *	944	45.6
Clothing Industries	2,527 *	367	14.5
Food and Allied Inds.	10,236 *	8,911	87.1
Iron and Steel Inds.	16,411 *	6,272	38.2
Metals, other than Iron & Steel	913 *	606	66.4
Leather Industries	559 *	163	29.1
Lumber and Furniture Mfg.	2,109 *	877	41.6
Paper, Printing and Allied Inds.	4,116 *	1,281	31.1
Textile Industries	342 *	276	80.7
Independent Hand Trades	3,369	None	----
Miscellaneous Mfg. Ind.	7,352 *	2,514	34.2
Transportation and Communication	42,859	2,020	4.7
Street Railways, Garages, and Automobile Service Stations	6,642 *	2,020	30.4
Other Trans. & Com. Ind.	36,217	None	----
Domestic and Personal Service	39,292	1,542	3.9
Laundries, and Cleaning, Dying and Pressing Shops	4,226 *	1,532	36.3
Other Domestic and Personal Services	35,066	None	----

(1) Total working population in industrial groups or sub-groups from which survey sample was selected.

(*) Population in industrial group or sub-group from which survey sample was selected.

FIGURE 2

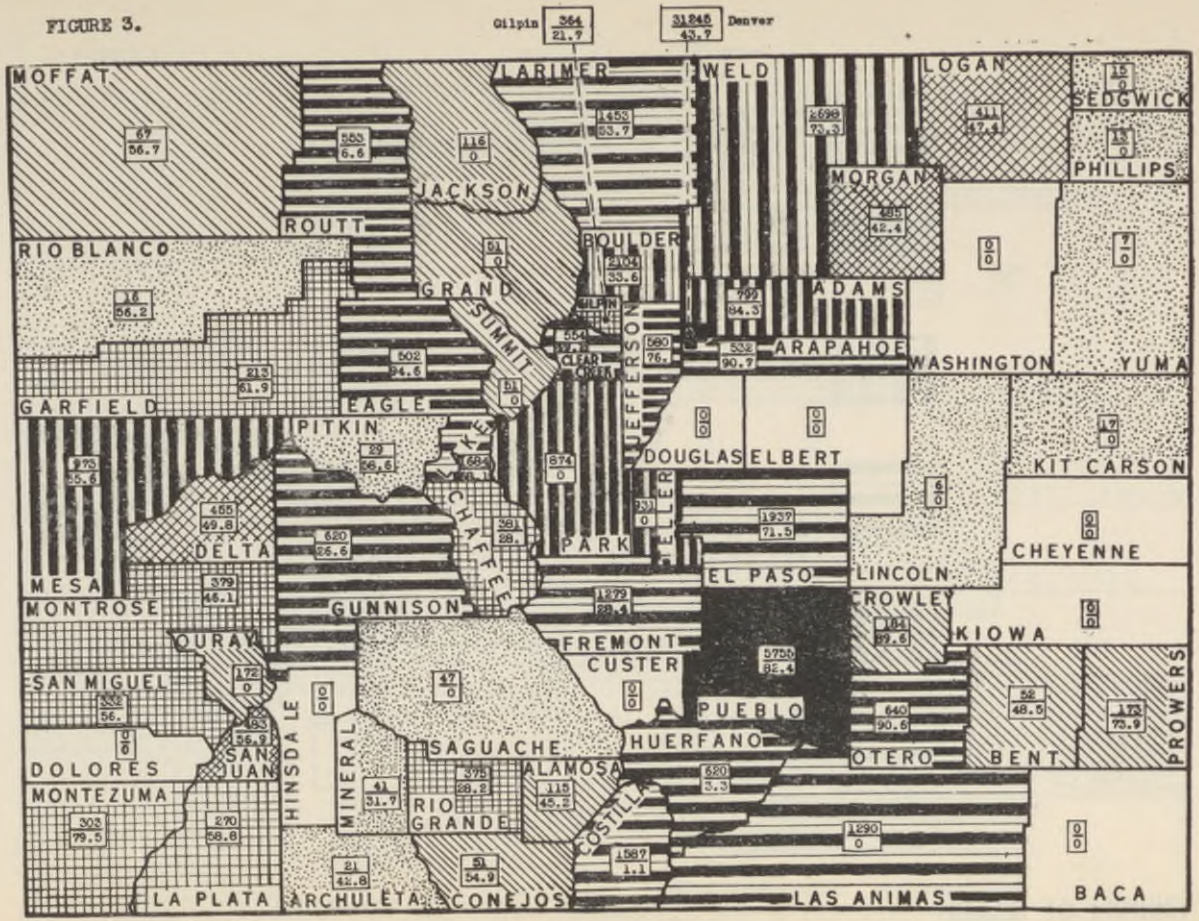
PERCENTAGE DISTRIBUTION OF PLANTS AND WORKERS IN MANUFACTURING INDUSTRIES ACCORDING TO THE NUMBER OF WORKERS EMPLOYED



[* U.S. BUREAU OF THE CENSUS - 1929 MFG. CENSUS - STATE SERIES: COLORADO]

Census data based on wage earners only while survey data is based on both salaried employees and wage earners

FIGURE 3.


Gilpin 364 21.9
31245 Denver 43.7
MOFFAT
LARIMER
WELD
LOGAN
SEDGWICK
PHILLIPS
MORGAN
JACKSON
ROUTT
RIO BLANCO
BOULDER
GRAND
SUMMIT
ADAMS
ARAPAHOE
WASHINGTON
YUMA
JEFFERSON
CLEAR CREEK
GILPIN
GARFIELD
EAGLE
PITKIN
DOUGLAS
ELBERT
KIT CARSON
CHAFFEE
PARK
DELTA
MESA
EL PASO
LINCOLN
CHEYENNE
CROWLEY
MONTROSE
GUNNISON
KIOWA
OURAY
FREMONT
CUSTER
SAN MIGUEL
PUEBLO
PROWERS
HUERFANO
SAGUACHE
OTERO
BENT
DOLORES
SAN JUAN
HINSDALE
MINERAL
ALAMOSA
MONTEZUMA
RIO GRANDE
COSTILLA
LA PLATA
ARCHULETA
CONEJOS
LAS ANIMAS
BACA

GEOGRAPHICAL DISTRIBUTION OF WORKERS IN COLORADO INDUSTRIES

REFER TO FIGURE 3

1938

INDUSTRIAL HYGIENE SURVEY

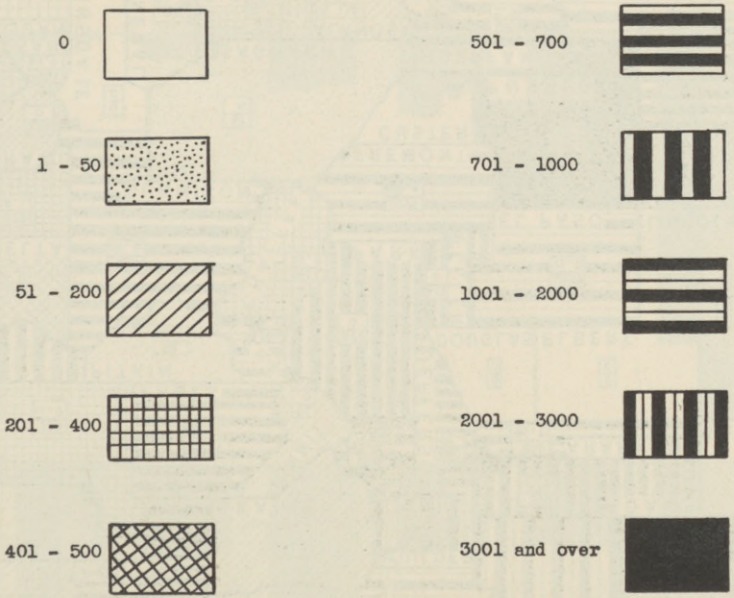
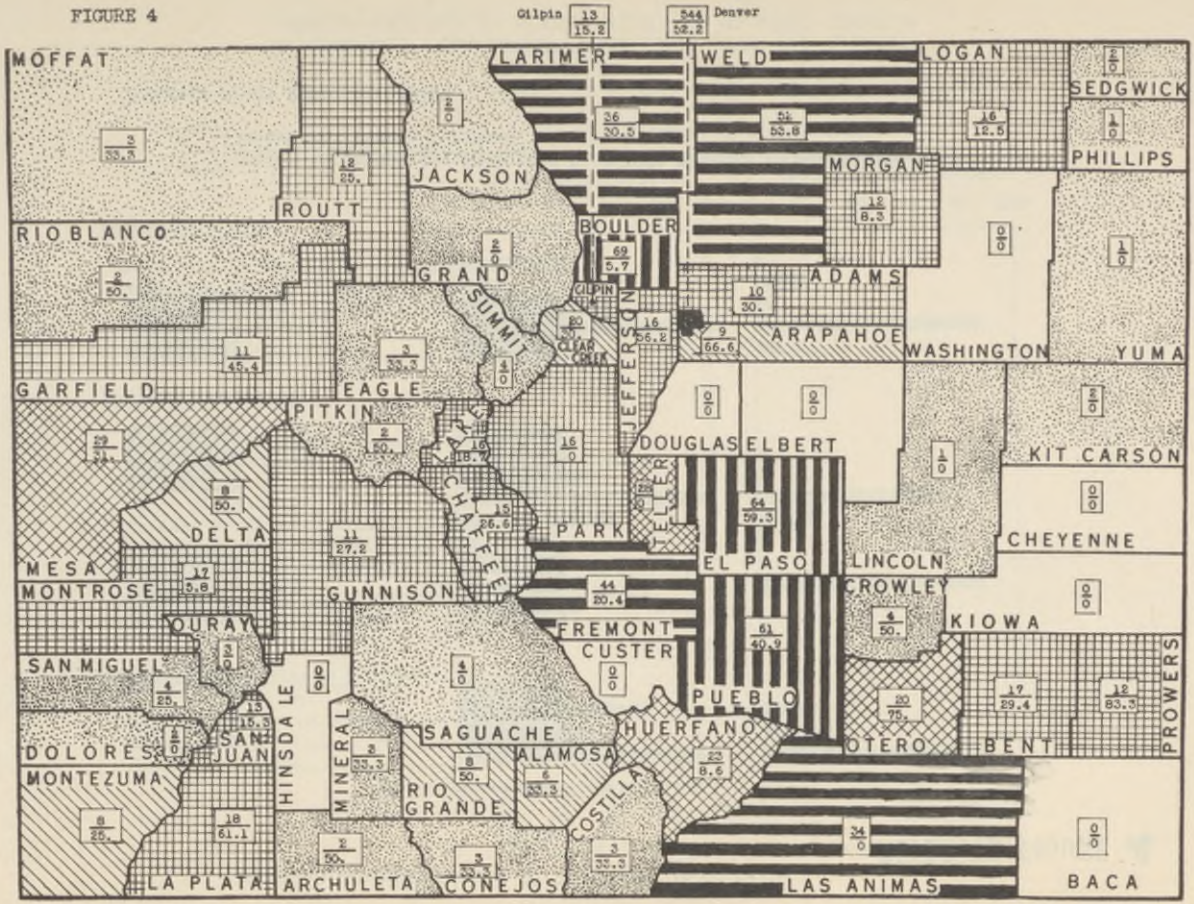


FIGURE 4

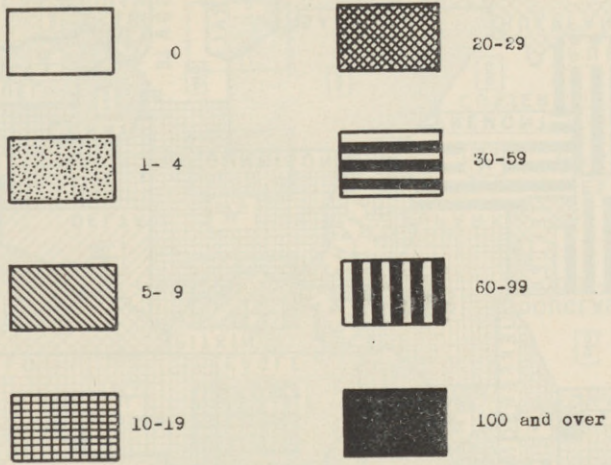

Gilpin 13 / 15.2
544 / 52.2 Denver
MOFFAT
LARIMER
WELD
LOGAN
SEDGWICK
PHILLIPS
MORGAN
ROUTT
JACKSON
BOULDER
RIO BLANCO
GRAND
SUMMIT
ADAMS
JEFFERSON
CLEAR CREEK
ARAPAHOE
WASHINGTON
YUMA
GARFIELD
EAGLE
PITKIN
LAKE
CHAFFEE
DOUGLAS
ELBERT
KIT CARSON
TELLER
DELTA
PARK
CHEYENNE
MESA
EL PASO
LINCOLN
CROWLEY
MONTROSE
GUNNISON
KIOWA
OURAY
FREMONT
CUSTER
SAN MIGUEL
PUEBLO
PROWERS
HINSDALE
SAGUACHE
HUERFANO
DOLORES
SAN JUAN
MINERAL
ALAMOSA
OTERO
BENT
MONTEZUMA
RIO GRANDE
COSTILLA
LA PLATA
ARCHULETA
CONEJOS
LAS ANIMAS
BACA

GEOGRAPHICAL DISTRIBUTION OF INDUSTRIES IN COLORADO

1938

INDUSTRIAL HYGIENE SURVEY

REFER TO FIGURE 4



Number of Industries employing 5 or more workers in Industrial Groups studied
Percent of Plants Surveyed.

Colorado State Board of Health

HEALTH SERVICE IN PLANTS WITH 100 OR MORE WORKERS
AS COMPARED WITH PLANTS WITH LESS THAN 100 WORKERS.

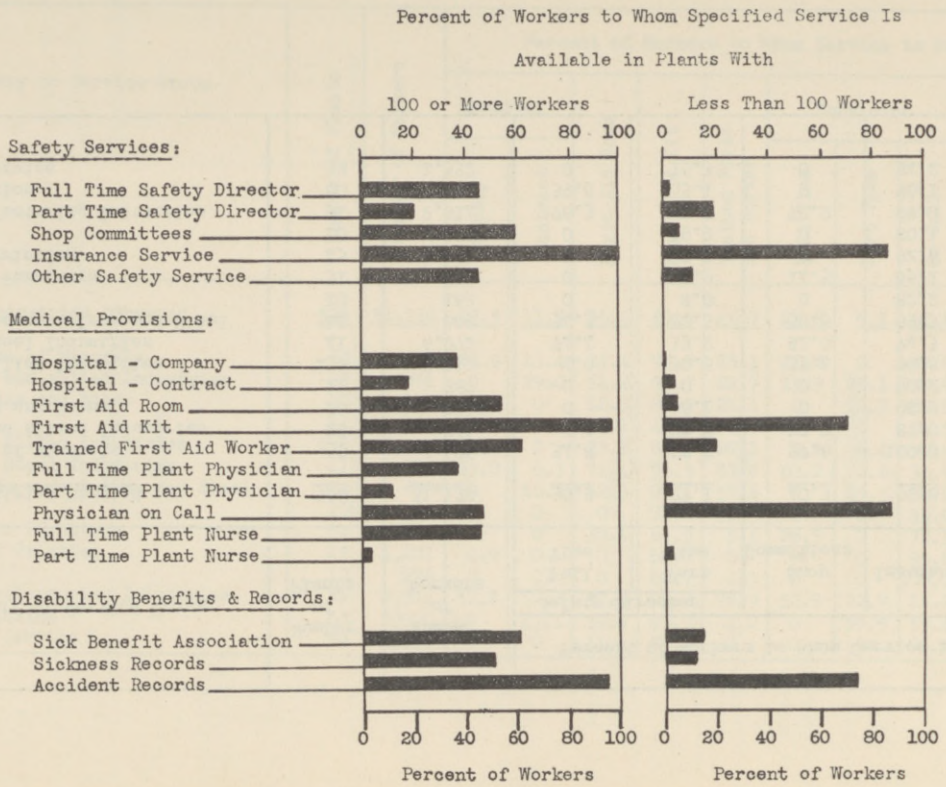


FIGURE 5

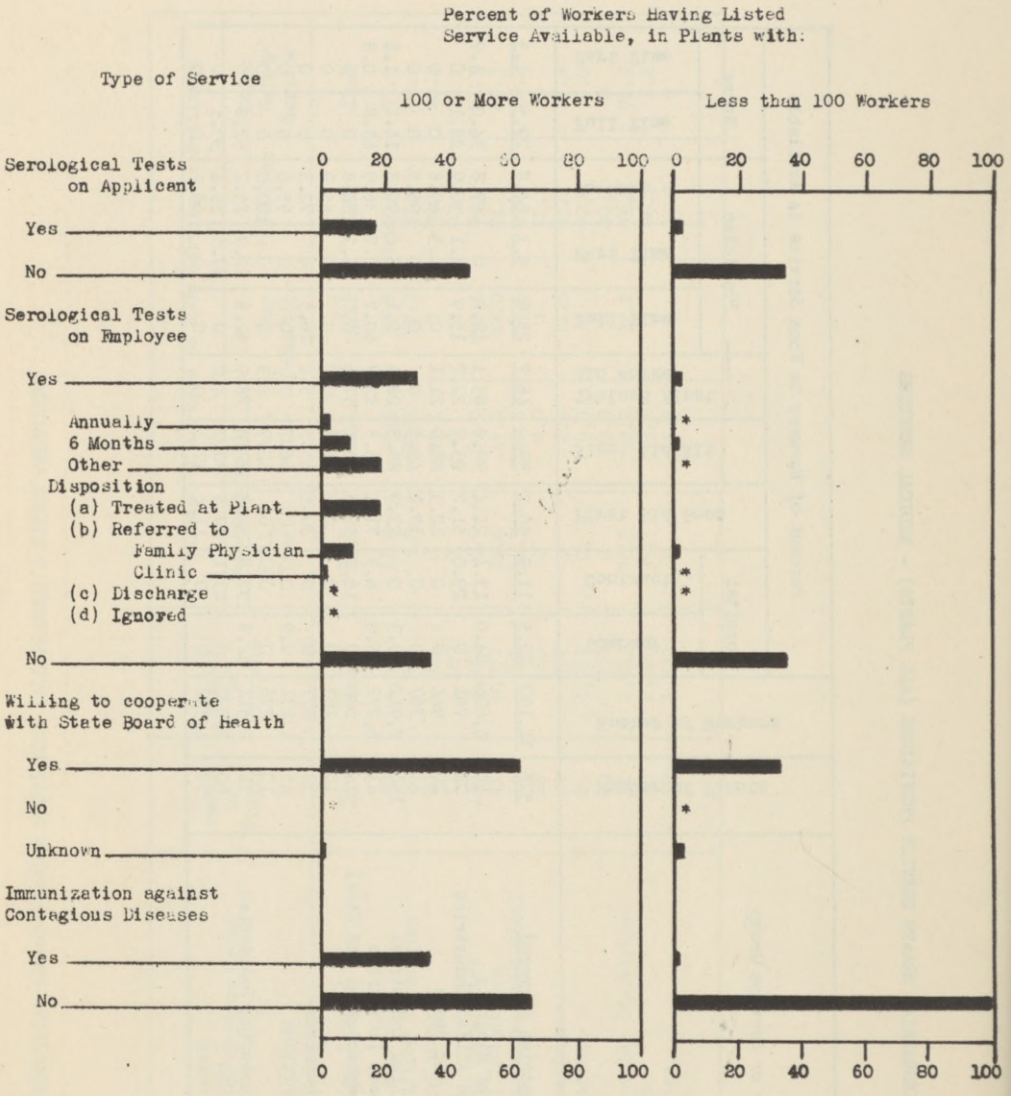
TABLE 3. INDUSTRIAL HEALTH SERVICE PROVISIONS (ALL PLANTS) - SAFETY SERVICES

Industry or Service Group	Number of Plants	Number of Workers	Percent of Workers to Whom Service is Available				
			Safety Director		Shop Committees	Insurance	Other Safety Service
			Full Time	Part Time			
All Industries Studied	526	31,130	30.8	21.1	40.3	91.6	35.3
Extraction of Minerals	50	4,606	34.8	25.5	37.6	100.0	37.6
Chemical and Allied Industries	28	761	5.0	73.2	17.7	87.0	59.1
Clay, Glass and Stone	20	944	0	46.4	0	98.3	20.2
Clothing	11	367	0	0	0	90.2	0
Food and Allied Industries	136	8,911	4.0	30.3	35.4	96.5	21.9
Iron and Steel Industries	41	6,272	74.4	13.2	82.0	74.3	68.3
Metal Ind. except Iron and Steel	14	606	34.3	40.3	50.5	99.3	16.2
Leather	10	163	0	8.0	0	82.2	0
Lumber and Furniture	31	877	0	2.9	14.5	85.2	21.8
Paper and Printing	45	1,281	0	9.3	0	92.6	5.0
Textile	10	276	0	19.9	0	80.1	0
Misc. Manufacturing Industries	31	2,514	76.3	2.2	77.2	98.0	76.9
Transportation	60	2,020	39.5	3.1	0	96.1	4.2
Personal Service	39	1,532	0	15.3	0	94.2	0

TABLE 4. INDUSTRIAL HEALTH SERVICE PROVISIONS (ALL PLANTS) - MEDICAL SERVICES

Industry or Service Group	Number of Plants	Number of Workers	Percent of Workers to Whom Service is Available									
			Hospital		First Aid Room	First Aid Kit	Trained First Aid Worker	Physician			Nurse	
			Company	Contract				Full Time	Part Time	On Call	Full Time	Part Time
All Industries Surveyed	526	31,130	22.5	11.3	36.2	89.2	46.7	23.8	9.1	64.8	29.5	1.3
Extraction of Minerals	50	4,606	34.0	13.4	24.4	98.8	85.1	42.2	0	57.8	34.0	4.9
Chemical and Allied Industries	28	761	0	29.0	51.2	93.7	22.7	15.9	28.1	50.9	28.1	0
Clay, Glass and Stone	20	944	0	0	12.3	88.9	21.1	0	12.3	69.8	0	0
Clothing	11	367	0	0	35.1	45.5	0	0	0	96.5	0	0
Food and Allied Industries	136	8,911	0.3	0	23.9	88.3	28.1	0.1	8.4	90.3	14.1	1.4
Iron and Steel Industries	41	6,272	65.0	6.3	71.4	96.5	83.7	60.2	0.2	36.9	63.8	0.8
Metal Ind. except Iron and Steel	14	606	0	16.2	52.3	90.1	57.6	0	63.3	34.8	0	0
Leather	10	163	0	0	0	71.8	0	0	0	85.9	0	0
Lumber and Furniture	31	877	0	0	30.4	65.5	5.4	26.5	0	72.3	0	0
Paper and Printing	45	1,281	0.9	0	0	66.7	0	0	0	95.6	0	0
Textile	10	276	0	0	0	62.7	8.3	0	0	100.0	0	0
Misc. Manufacturing Industries	31	2,514	52.8	52.8	52.8	92.8	78.9	52.8	22.9	25.2	52.8	0
Transportation	60	2,020	0	43.1	39.5	80.7	4.2	0	39.5	55.4	39.5	0
Personal Service	39	1,532	0	0	11.4	87.1	0	0	0	96.1	0	0

FIGURE 6 VENEREAL DISEASE SERVICE IN PLANTS WITH 100 OR MORE WORKERS COMPARED WITH PLANTS WITH LESS THAN 100 WORKERS



*Less than 1.0%

TABLE 5-A VENEREAL DISEASE
NUMBER OF PLANTS WITHIN SPECIFIED INDUSTRIAL GROUPS GIVING VENEREAL DISEASE SERVICE

Industry	Serological Tests on Applicants					
			Yes		No.	
	No. of Plants	No. of Workers	No. of Plants	No. of Workers	No. of Plants	No. of Workers
Extraction of Minerals	50	4606	1	475	49	4131
Chemical & Allied Industries	28	761	1	214	27	547
Clay, Glass & Stone Industries	20	944	1	126	19	818
Clothing Industries	11	367	-	-	11	367
Food & Allied Industries	136	8911	26	2348	110	6563
Iron and Steel, Mchy., Vehicle Industries	41	6272	5	750	36	5522
Metals other than Iron and Steel	14	606	1	78	13	528
Leather Industries	10	163	-	-	10	163
Lumber & Furniture Industries	31	877	-	-	31	877
Paper, Printing & Allied Industries	45	1281	-	-	45	1281
Textile Industries	10	276	-	-	10	276
Miscellaneous Mfg. Industries	31	2514	2	1892	29	622
Transportation and Communication	60	2020	1	73	59	1947
Domestic & Personal Service	39	1532	-	-	39	1532
TOTAL-ALL INDUSTRIES	526	31130	38	5946	488	25184

NUMBER OF PLANTS WITHIN SPECIFIED INDUSTRIAL GROUPS GIVING VENEREAL DISEASE SERVICE

TABLE 5-B.

Serological Tests on Employees

Industry	Yes		No		Annually		Six Months		Other	
	No. of Plants	No. of Workers	No. of Plants	No. of Workers	No.of Plants	No.of Workers	No. of Plants	No. of Workers	No. of Plants	No. of Workers
Extraction of Minerals	3	1568	47	3038	-	-	-	-	3	1568
Chemical & Allied Industries	2	335	26	426	2	335	-	-	-	-
Clay, Glass & Stone Industries	1	116	19	828	-	-	-	-	1	116
Clothing Industries	-	-	11	367	-	-	-	-	-	-
Food & Allied Industries	25	2057	111	6854	4	581	20	1446	1	30
Iron & Steel, Mchy., Vehicle Industries	3	4330	38	1942	-	-	1	339	2	3991
Metals other than Iron and Steel	1	78	13	528	1	78	-	-	-	-
Leather Industries	-	-	10	163	-	-	-	-	-	-
Lumber & Furniture Industries	-	-	31	877	-	-	-	-	-	-
Paper, Printing & Allied Industries	-	-	45	1281	-	-	-	-	-	-
Textile Industries	-	-	10	276	-	-	-	-	-	-
Miscellaneous Mfg. Industries	1	1327	30	1187	-	-	-	-	1	1327
Transportation and Communication	1	73	59	1947	-	-	-	-	1	73
Domestic and Personal Service	-	-	39	1522	-	-	-	-	-	-
TOTAL - ALL INDUSTRIES	37	9884	489	21246	7	994	21	1785	9	7105

NUMBER OF PLANTS WITHIN SPECIFIED INDUSTRIAL GROUPS GIVING VENEREAL DISEASE SERVICE

Table 5-C

Industry	Serological Tests on Employees Referred: Treated at Plant No. of Plants	Treated at Plant No. of Workers	Family Physician No. of Plants	Family Physician No. of Workers	Clinic No. of Plants	Clinic No. of Workers	Discharged No. of Plants	Discharged No. of Workers
Extraction of Minerals	3	1568	-	-	-	-	-	-
Chemical & Allied Industries	1	214	1	121	-	-	-	-
Clay, Glass & Stone Industries	1	116	-	-	-	-	-	-
Clothing Industries	-	-	-	-	-	-	-	-
Food & Allied Industries	-	-	21	1991	4	66	-	-
Iron and Steel, Mchy., Vehicle Industries	1	3775	-	-	2	555	-	-
Metals other than Iron and Steel	-	-	-	-	1	78	-	-
Leather Industries	-	-	-	-	-	-	-	-
Lumber & Furniture Industries	-	-	-	-	-	-	-	-
Paper, Printing & Allied Industries	-	-	-	-	-	-	-	-
Textile Industries	-	-	-	-	-	-	-	-
Miscellaneous Mfg. Industries	-	-	1	1327	-	-	-	-
Transportation and Communication	-	-	1	73	-	-	-	-
Domestic and Personal Service	-	-	-	-	-	-	-	-
TOTAL-ALL INDUSTRIES	6	5673	24	3512	7	699	-	-

NUMBER OF PLANTS WITHIN SPECIFIED INDUSTRIAL GROUPS GIVING VENEREAL DISEASE SERVICE

Table 5-B.

Plants willing to Cooperate with The State Board of Health in a Venereal Disease Prevention Program

Industry	Yes		No		No. of Plants Unknown	No. of Workers Unknown
	No. of Plants	No. of Workers	No. of Plants	No. of Workers		
Extraction of Minerals	44	4387	-	-	6	219
Chemicals & Allied Industries	24	695	-	-	4	66
Clay, Glass & Stone Industries	19	913	-	-	1	51
Clothing Industries	9	337	1	7	1	13
Food & Allied Industries	126	8460	1	14	9	437
Iron & Steel, Mchy., Vehicle Industries	38	5932	-	-	3	340
Metals other than Iron and Steel	14	606	-	-	-	-
Leather Industries	9	146	-	-	1	17
Lumber & Furniture Industries	28	862	-	-	3	15
Paper, Printing & Allied Industries	39	1139	1	25	5	117
Textile Industries	9	269	-	-	1	7
Miscellaneous Mfg. Industries	29	2488	2	26	-	-
Transportation and Communication	53	1902	4	53	3	65
Domestic & Personal Service	37	1437	2	95	-	-
TOTAL-ALL INDUSTRIES	478	29573	11	220	37	1337

NUMBER OF PLANTS WITHIN SPECIFIED INDUSTRIAL GROUPS GIVING VENEREAL DISEASE SERVICE

Table 5-E.

Immunization Program against Contagious Diseases at present time

Industry	Yes		No	
	No. of Plants	No. of Workers	No. of Plants	No. of Workers
Extraction of Minerals	6	1225	44	3381
Chemical & Allied Industries	1	121	27	640
Clay, Glass & Stone Industries	1	116	19	828
Clothing Industries	-	-	11	367
Food & Allied Industries	1	30	135	8881
Iron & Steel, Mchy., Vehicle Industries	2	3826	39	2446
Metals other than Iron and Steel	-	-	14	606
Leather Industries	-	-	10	163
Lumber & Furniture Industries	1	232	30	645
Paper, Printing & Allied Industries	-	-	45	1281
Textile Industries	-	-	10	276
Miscellaneous Mfg. Industries	1	1327	30	1187
Transportation & Communication	-	-	60	2020
Domestic & Personal Service	-	-	39	1532
TOTAL - ALL INDUSTRIES	13	6877	513	24253

Table 6.

PLANTS AND PERCENTAGES OF WORKERS HAVING VENEREAL DISEASE SERVICE IN ALL PLANTS

PLANTS WITH 100 OR MORE WORKERS and PLANTS WITH LESS THAN 100 WORKERS

AVAILABILITY OF LISTED SERVICE

	IN PLANTS						TO WORKERS					
	No All Plants	No. Plants with more than 100 Workers	No. Plants with less than 100 Plants	% All Workers	% Plants with more than 100 Workers	% Plants with less than 100 Workers	No. in All Plants	No. in Plts with more than 100 Workers	No. in Plts with less than 100 Workers	% All Plants	% of Plts having more than 100 Workers	% of Plts having less than 100 Workers
Serological Test on Applicant												
Yes	38	14	24	7.2	2.6	4.6	5946	5125	821	19.1	16.5	2.6
No	488	53	435	92.8	10.1	82.7	25184	14461	10723	80.9	46.5	34.4
Serological Tests on Employee												
Yes	37	16	21	7.0	3.0	4.0	9884	9177	707	31.8	29.5	2.3
Annually	7	4	3	1.3	0.8	0.5	994	807	187	3.2	2.6	0.6
6 months	22	6	16	4.2	1.1	3.1	3112	2695	417	10.0	8.7	1.3
Other	8	6	2	1.5	1.1	0.4	5778	5675	103	18.6	18.3	0.3
Disposition												
(a) Treated at Plant	6	6	0	1.1	1.1	0.0	5673	5673	0	18.2	18.2	0.0
(b) Referred to												
Family Physician	24	8	16	4.6	1.5	3.1	3512	2949	563	11.3	9.5	1.8
Clinic	7	2	5	1.3	0.3	1.0	699	555	144	2.2	1.8	0.4
(c) Discharged	5	0	5	1.0	0.0	1.0	204	0	204	0.7	0.0	0.7
(d) Ignored	0	0	0	0.0	0.0	0.0	0	0	0	0.0	0.0	0.0
No	489	51	438	93.0	9.7	83.3	21246	10401	10845	68.2	33.4	34.8
Willing to cooperate with State Board of Health												
Yes	479	65	414	91.1	12.4	78.7	29580	19219	10361	95.0	61.7	33.3
No	14	0	14	2.7	0.0	2.7	235	0	235	0.8	0.0	0.8
Unknown	33	2	31	6.3	0.4	5.9	1315	367	948	4.2	1.2	3.0
Immunization against Contagious Diseases												
Yes	13	10	3	2.5	14.7	0.7	6877	6745	132	22.1	34.4	1.1
No	513	58	455	97.5	85.3	99.3	24253	12841	11412	77.9	65.6	98.9
TOTAL NO. & % OF PLANTS AND WORKERS	526	68	458	100.0	12.9	87.1	31130	19586	11544	100.0	62.7	37.1

TABLE 7. INDUSTRIAL HEALTH SERVICE PROVISIONS (ALL PLANTS) - DISABILITY BENEFITS AND RECORDS

Industry or Service Group	Number of Plants	Number of Workers	Percent of Workers With Listed Facility		
			Sick Benefit Association	Sickness Records	Accident Records
All Industries Studied	526	31,130	44.5	38.9	89.9
Extraction of Minerals	50	4,606	51.9	55.6	99.1
Chemical and Allied Industries	28	761	69.0	61.1	90.5
Clay, Glass and Stone	20	944	20.2	12.3	93.6
Clothing	11	367	0	0	96.5
Food and Allied Industries	136	8,911	26.6	16.9	87.1
Iron and Steel Industries	41	6,272	70.4	70.2	97.8
Metal Ind. except Iron and Steel	14	606	0	34.3	90.3
Leather	10	163	14.1	17.8	92.0
Lumber and Furniture	31	877	32.8	32.8	95.3
Paper and Printing	45	1,281	45.7	60.6	88.4
Textile	10	276	0	0	79.0
Misc. Manufacturing Industries	31	2,514	76.1	55.6	96.8
Transportation	60	2,020	43.7	4.2	46.0
Personal Service	39	1,532	17.7	18.3	87.2

TABLE 8. HEALTH SERVICES IN PLANTS WITH 100 OR MORE WORKERS COMPARED WITH PLANTS WITH LESS THAN 100 WORKERS.

Type of Service	Percent of Workers Having Listed Service Available, in Plants With:	
	100 or More Workers *	Less Than 100 Workers **
Safety Services:		
Full Time Safety Director	47.9	1.9
Part Time Safety Director	21.8	20.5
Shop Committees	61.9	6.5
Insurance Service	100.0	89.6
Other Safety Service	47.4	11.5
Medical Provisions:		
Hospital - Company	37.3	0.8
Hospital - Contract	16.6	4.7
First Aid Room	54.4	5.3
First Aid Kit	99.4	72.5
Trained First Aid Worker	62.7	19.5
Full Time Plant Physician	37.6	0.4
Part Time Plant Physician	11.6	2.0
Physician on Call	47.0	89.4
Full Time Plant Nurse	46.6	0.3
Part Time Plant Nurse	2.4	-
Disability Benefits & Records:		
Sick Benefit Association	62.2	13.7
Sickness Records	52.4	11.8
Accident Records	96.4	73.5

* Plants Employing 100 or More Workers Employed 19,575 Workers or 62.9 Percent of the Surveyed Population.

** Plants Employing Less Than 100 Workers Employed 11,555 Workers or 37.1 Percent of the Surveyed Population.

Table 9. Comparison of the Industrial Health Services in Colorado Industries, With Similar Data From Other States or Areas

Kind of Service	Percent of Workers with Listed Facility					
	Mary-land	Typical Indus-trial Area	Utah	Virginia	So. Car.	Colorado
Safety organization						
Safety director-Part time	20.8	21.0	17.4	27.6	4.1	21.1
Safety director Full time	37.6	23.8	38.8	17.8	0	30.8
Shop committees	59.3	33.6	46.3	61.5	55.7	40.3
Medical provisions						
Hospital (Co.)	25.8	(a)	25.5	(a)	(a)	22.5
First aid room	55.8	48.5	62.2	50.0	35.0	36.2
First aid kit	97.7	(a)	90.6	(a)	67.3	89.2
Trained first aid worker	65.4	(a)	72.6	(a)	(a)	46.7
Physician-part time	42.4	17.3	19.0	25.6	24.2	9.1
Physician-full time	30.7	15.3	30.5	21.0	0	23.8
Plant nurse-part time	0	2.7	4.9	1.9	3.7	1.3
Plant nurse-full time	40.3	34.1	25.2	30.6	23.8	29.5
Disability Benefits & Statistics						
Sick benefit ass'n	47.8	29.4	64.6	35.1	(a)	44.5
Sickness records	54.5	40.0	65.3	34.1	26.8	38.9
Accident records	96.9	98.1	98.9	98.5	98.2	89.9

(a) Data not available

INDUSTRIAL HEALTH SERVICE PROVISIONS
(ALL PLANTS)
SANITATION FACILITIES

WORK TABLE NO. 10.

PERCENT OF WORKERS TO WHOM INDICATED SERVICE IS AVAILABLE BY INDUSTRY GROUP.

Industry or Service Group.	Number of Plants	Number of Workers	Water Supply						Drinking Facilities				Washing Facilities					Toilet Facilities			Sewerage System							
			Municipal	Well	Stream	Chlorinated	Settled	Filtered	Fountain	Individual Cup	Common Cup	Other	Lavatories	Other	Common Towel	Other Towel	Showers	Flush	Pit Privy	Other	Municipal	Treatment Plant	Discharge				Separate Lunch Room	Individual Locker
																							Stream	Lake	Lagoon	Other		
All Industries Studied	(526)	(81,130)	(84.8)	(29.5)	(6.1)	(3.5)	(4.7)	(8.0)	(80.0)	(7.9)	(11.4)	(4.2)	(89.8)	(2.4)	(20.5)	(56.1)	(52.6)	(82.3)	(9.3)	(9.6)	(64.3)	(1.1)	(9.9)	(0.2)	(0.3)	(23.8)	(30.5)	(65.4)
Extraction of Minerals	50	4,606	30.94	17.95	11.78	19.93	24.49	28.27	52.52	28.14	10.81	18.61	43.48	4.17	0.56	65.18	60.77	64.24	37.43	59.01	0.56	0.82	22.40	--	--	37.47	42.14	68.13
Manufacturing and Mechanical Industries TOTAL	377	22,972	93.50	21.48	1.92	0.80	1.12	4.76	84.45	4.68	11.50	1.66	93.91	2.25	21.93	55.71	54.00	83.16	5.09	1.18	71.52	1.33	8.97	0.30	0.45	24.73	26.92	67.37
Chemical and Allied Industries	28	761	76.87	22.08	--	--	--	5.26	80.81	14.98	14.32	4.86	95.53	1.58	17.61	71.22	66.88	91.06	8.80	--	91.72	--	1.97	--	0.92	49.80	46.38	47.44
Clay, Glass and Stone	20	944	93.22	1.48	17.58	12.29	12.29	12.29	51.90	18.86	41.95	5.61	69.17	24.47	9.85	28.28	31.67	69.81	30.19	--	44.49	--	12.29	--	--	39.51	--	25.74
Clothing Industries	11	367	100.00	--	--	--	--	--	85.56	6.27	18.80	--	100.00	--	44.05	21.20	--	100.00	--	--	100.00	--	--	--	--	--	35.15	--
Food Industries	136	8,911	89.94	36.77	--	0.62	0.43	9.50	90.53	4.72	9.86	1.85	95.62	1.79	26.98	38.12	45.05	72.65	4.12	0.44	85.65	2.48	18.20	0.77	1.08	9.18	25.09	66.87
Iron and Steel, Machinery Vehicles	41	6,272	99.70	0.88	--	--	--	--	97.64	1.48	0.57	1.04	99.17	0.17	5.72	86.29	80.29	98.99	1.00	--	36.86	--	0.24	--	--	61.67	2.90	92.68
Metal Industries other than Iron and Steel	14	606	100.00	--	--	--	--	--	96.53	--	5.61	--	100.00	--	23.43	63.36	63.36	100.00	34.32	--	98.51	--	34.32	--	--	35.15	47.19	79.87
Leather Industries	10	163	100.00	14.11	--	--	--	--	11.66	31.90	56.44	--	85.89	14.11	74.23	14.11	14.11	100.00	--	--	100.00	--	--	--	--	--	--	--
Lumber and Furniture Industries	31	877	61.46	7.98	30.44	1.59	3.19	1.59	65.56	4.10	49.14	3.88	47.20	6.15	18.01	27.94	--	55.87	17.67	26.45	57.01	1.60	1.60	--	--	2.05	--	22.69
Paper and Printing Establishments	45	1,281	100.00	--	--	--	1.01	1.01	14.44	5.93	19.05	1.64	97.66	--	41.84	53.16	7.10	99.61	--	--	100.00	0.55	0.55	--	--	--	4.53	19.05
Textile Industries	10	276	100.00	--	--	--	--	--	73.55	--	23.91	2.54	100.00	--	55.80	44.20	6.88	100.00	--	--	--	--	--	--	--	--	5.43	14.49
Miscellaneous Manufacturing Industries	31	2,514	100.00	52.78	0.36	--	2.51	2.51	88.38	3.30	11.42	--	95.43	1.03	31.02	65.43	80.71	75.18	0.95	--	97.81	2.51	2.51	--	--	0.44	76.61	84.88
Transportation and Communication	60	2,020	99.45	0.54	--	--	1.14	1.24	87.87	2.08	12.62	1.93	97.77	--	34.25	61.29	50.10	100.00	--	--	100.00	--	--	--	--	--	39.45	72.52
Personal Service	39	1,532	97.13	19.84	--	--	3.79	4.63	86.42	3.00	9.40	2.48	96.21	2.81	40.34	28.26	11.75	100.00	--	--	100.00	--	--	--	--	--	38.25	17.36

TABLE 11. DISTRIBUTION OF SANITATION FACILITIES ACCORDING TO SIZE OF PLANT

Kind of Service	Percentage of Plants and Workers With Listed Service in Plants Employing 100 or More Workers as Compared to Plants Employing Less Than 100 Workers			
	Plants Employing		Workers in Plants Employing	
	100 or More	Less Than 100	100 or More	Less Than 100
Total No. of Plants & Workers	66	460	19,575	11,555
Percentage Total Plants & Workers	12.5	87.5	62.9	37.1
Water Supply:				
Municipal	78.8	90.2	82.0	89.5
Well	25.8	10.2	23.1	13.6
Stream	10.6	2.6	7.9	3.2
Chlorinated	3.0	2.2	5.3	1.9
Settled	3.0	2.8	5.3	1.9
Filtered	10.6	4.6	10.5	3.9
Drinking Water:				
Fountain	84.8	58.9	90.1	69.3
Individual Cup	10.6	13.3	5.1	12.6
Common Cup	9.1	27.4	4.8	22.4
Other	7.6	7.4	3.8	5.3
Washing Facilities:				
Lavatories	89.4	81.7	92.9	85.1
Other	3.0	5.0	1.7	3.6
Common Towel	13.6	40.7	11.5	35.7
Other Towel	56.1	34.3	69.6	39.0
Showers	43.5	19.6	67.0	23.0
Toilet Facilities:				
Flush	87.9	87.8	91.6	95.7
Pit Privy	16.7	10.2	9.0	9.8
Other	12.1	3.7	12.5	4.6
Sewerage System:				
Municipal	59.1	83.7	52.2	82.1
Treatment Plant	1.5	2.6	0.6	1.9
Discharge -				
Stream	15.2	3.5	11.9	3.8
Lake	-	0.2	-	0.6
Lagoon	-	0.4	-	0.9
Other	24.2	3.7	35.3	3.3
Separate Lunch Room	31.8	5.9	37.4	10.6
Individual Lockers	68.2	26.7	79.7	37.4

SANITARY FACILITIES IN PLANTS WITH 100 OR MORE WORKERS
AS COMPARED WITH PLANTS WITH LESS THAN 100 WORKERS

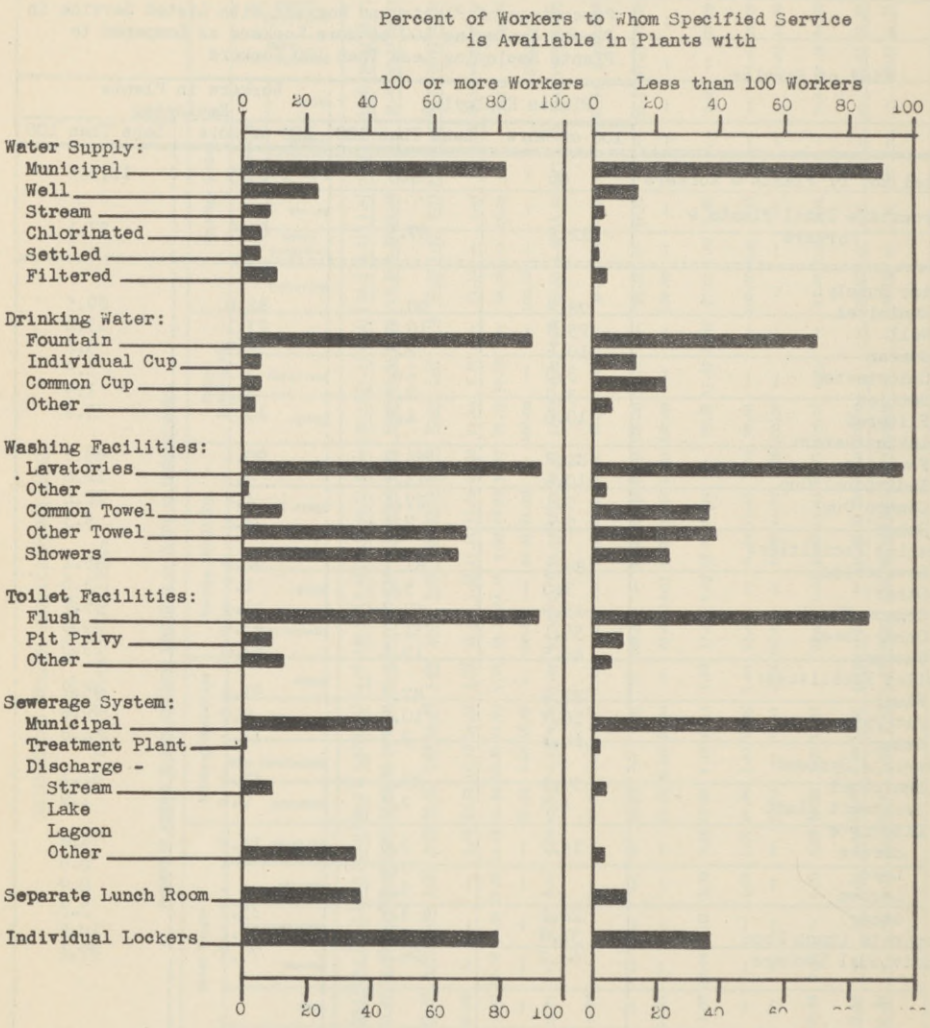


TABLE 12. NUMBER OF WORKERS IN EACH INDUSTRY OR SERVICE GROUP EXPOSED TO SPECIFIED MATERIALS

Materials	Number of Workers in Each Industry or Service Group Exposed to Specified Materials														
	All Industries Surveyed	Extraction of Minerals	Chemical & Allied Industries	Clay Glass & Stone	Clothing Manufacturing	Food & Allied Industries	Iron & Steel	Metals, Other Than Iron & Steel	Leather Industries	Lumber & Furniture	Paper Printing & Allied Industries	Textile Manufacturing	Miscellaneous Manufacturing	Transportation	Personal Service
Number of Workers in Surveyed Plants:	31130	4606	761	944	367	8911	6272	606	163	877	1281	276	2514	2020	1532
Total Number of Exposures:	89119	18601	1799	1935	293	17642	25065	2862	333	1355	2418	265	10418	3836	1307
Other Metals	8870	979	80	90	-	822	4705	391	-	41	442	9	876	439	2
Other Gases	8795	2943	105	161	1	831	3175	231	11	18	95	1	964	226	33
Carbon Monoxide	8581	2848	68	173	3	856	2947	168	-	20	7	2	797	653	39
Other Dermatitis Producers	6863	97	128	-	12	5377	838	13	17	1	6	-	347	3	24
Silica Dust	6374	2546	22	301	-	483	2171	144	9	157	8	3	407	112	11
Organic Dust	5750	298	175	66	143	1840	497	88	87	600	151	202	1448	69	86
Silicate Dust	5312	2232	60	619	10	45	1650	147	-	31	3	2	320	157	36
Petroleum Products	4728	529	86	62	2	521	1914	79	1	81	97	1	621	692	42
Coal Dust, Bituminous	3154	1712	38	86	1	399	669	91	-	26	5	1	20	72	34
Temperature Change	2923	52	-	-	-	217	2077	186	-	2	-	-	373	-	16
Non Siliceous Dust	2916	276	19	199	2	438	1280	99	-	70	1	2	164	306	10
Lead	2767	227	47	38	4	86	821	349	6	26	436	1	587	137	2
Alkaline Compounds	2485	522	75	4	-	889	393	56	12	22	12	7	213	122	153
Ore Dust	2451	2188	3	-	-	-	79	181	-	-	-	-	-	-	-
Organic Solvents	2415	64	123	4	14	70	276	18	15	49	292	6	921	426	137
Infection	2170	40	51	-	29	1815	-	-	42	9	-	7	5	5	167
Salts, Inorganic	1688	87	106	6	-	1204	3	3	15	4	12	1	210	2	35
Mineral Acids	1307	102	50	11	-	380	194	92	4	10	44	1	323	91	5
Oils, Fats & Waxes	1031	156	63	12	10	486	22	14	26	25	16	-	156	31	14
Inks	870	-	24	-	1	110	5	3	-	7	414	1	131	4	170
Sulphur Dioxide	796	80	30	5	-	33	456	132	-	2	-	-	58	-	-
Paints & Enamels	753	2	91	18	14	53	268	4	19	64	16	10	49	142	3
Sulphur	619	3	91	-	-	101	-	2	9	2	17	-	378	-	16
Other Chemicals	610	34	33	8	-	150	45	14	4	1	2	-	318	-	1
Coal Tar Products	492	123	56	-	10	6	204	-	7	14	10	-	27	31	4
Organic Acids	446	30	7	-	-	237	31	-	5	4	19	-	46	4	63
Halogenated Hydrocarbons	390	-	25	-	2	-	2	-	-	-	3	-	281	6	71
Lacquer & Varnish	356	-	21	8	13	6	84	17	19	36	18	5	35	93	1
Dyes	282	12	12	-	5	59	-	-	24	31	-	3	82	-	54
Cyanides	264	159	5	-	-	-	51	31	-	1	8	-	5	2	2
Cadmium	208	-	-	-	-	-	-	80	-	-	-	-	128	-	-
Hydrogen Sulphide	176	44	20	-	-	-	42	70	-	-	-	-	-	-	-
Antimony	172	-	6	-	-	-	-	4	-	-	145	-	17	-	-
Arsenic	157	-	4	-	17	-	-	136	-	-	-	-	-	-	-
Manganese	137	-	3	30	-	-	96	6	-	-	2	-	-	-	-
Radioactive Substances	126	76	13	-	-	-	-	-	-	-	-	-	37	-	-
Benzene	106	-	21	3	-	-	-	-	-	-	60	-	4	1	16
Chlorine	103	15	-	1	-	49	-	-	-	-	-	-	-	-	38
Asbestos Dust	98	8	5	-	-	-	31	-	-	-	-	-	45	9	-
Chromium	89	-	5	30	-	-	24	6	1	-	23	-	-	-	-
Phosphorus	63	56	-	-	-	-	-	7	-	-	-	-	-	-	-
Aniline	45	12	13	-	-	-	-	-	-	-	14	-	-	-	6
Medicines	44	9	6	-	-	-	-	-	-	-	8	-	21	-	-
Fluorine	42	23	-	-	-	-	-	-	-	-	3	-	-	1	15
Mercury	41	17	3	-	-	17	-	-	-	-	-	-	4	-	-
Aldehydes	29	-	9	-	-	12	-	-	-	-	11	-	-	-	1
Alcohols, Esters, Ethers	19	-	-	-	-	-	-	-	-	-	18	-	-	-	1

TABLE 13. PERCENTAGE OF TOTAL NUMBER OF WORKERS IN EACH INDUSTRY OR SERVICE GROUP EXPOSED TO SPECIFIED MATERIAL

Material	Percentage of Total Number of Workers in Each Industry or Service Group Exposed to Specified Material (Percentage, where less than 0.1, shown by (*))														
	All Industries Surveyed	Extraction of Minerals	Chemical & Allied Industries	Clay Glass & Stone	Clothing Manufacture	Food & Allied Industries	Iron & Steel	Metals Other Than Iron & Steel	Leather	Lumber	Paper & Printing	Textile Manufacture	Miscellaneous Manufacturing	Transportation	Personal Service
Number of Workers in Surveyed Plants:	31130	4606	761	944	367	3911	6272	606	163	877	1281	276	2514	2020	1532
Other Metals	28.5	21.3	10.5	9.5	-	9.2	75.0	64.5	-	4.7	34.5	3.3	34.8	21.7	.1
Other Gases	28.3	63.9	13.8	17.1	.3	9.3	50.6	38.1	6.7	2.1	7.4	.4	38.3	11.2	2.2
Carbon Monoxide	27.6	61.8	8.9	18.3	.8	9.6	47.0	27.7	-	2.3	.5	.7	31.7	32.3	2.5
Other Dermatitis Producers	22.0	2.1	16.8	-	3.3	60.3	13.4	2.1	10.4	.1	.5	-	13.8	.1	1.6
Silica Dust	20.5	55.3	2.9	31.9	-	5.4	34.6	23.8	5.5	17.9	.6	1.1	16.2	5.5	.7
Organic Dust	18.5	6.5	23.0	7.0	39.0	20.6	7.9	14.5	53.4	68.4	11.8	73.2	57.6	3.4	5.6
Silicate Dust	17.1	48.5	7.9	65.6	2.7	.5	26.3	24.3	-	3.5	.2	.7	12.7	7.8	2.3
Petroleum Products	15.2	11.5	11.3	6.6	.5	5.2	30.5	13.0	.6	9.2	7.6	.4	24.7	34.3	2.7
Coal Dust, Bituminous	10.1	37.2	5.0	9.1	.3	4.5	10.7	15.0	-	3.0	.4	.4	.8	3.6	2.2
Temperature Change	9.4	1.1	-	-	-	2.4	33.1	30.7	-	.2	-	-	14.8	-	1.0
Non Siliceous Dust	9.4	6.0	2.5	21.1	.5	5.5	20.4	16.3	-	8.0	.1	.7	6.5	15.1	.7
Lead	8.9	4.9	6.2	4.0	1.1	1.0	13.1	57.6	3.7	3.0	34.0	.4	23.4	6.8	.1
Alkaline Compounds	8.0	11.3	9.2	.4	-	10.0	6.3	9.2	7.4	2.5	.9	2.5	8.5	6.0	10.0
Ore Dust	7.9	47.5	.4	-	-	-	1.3	29.9	-	-	-	-	-	-	-
Organic Solvents	7.8	1.4	16.2	.4	3.8	.8	4.4	3.0	9.2	5.6	22.8	2.2	36.6	21.1	8.9
Infections	7.0	.9	6.7	-	7.9	20.4	-	-	25.8	1.0	-	2.5	.2	.2	10.9
Salts, Inorganic	5.4	1.9	13.9	.6	-	13.5	*	.5	9.2	.5	.9	.4	8.4	.1	2.3
Mineral Acids	4.2	2.2	6.6	1.2	-	4.3	3.1	15.2	2.5	1.1	3.4	.4	12.8	4.5	.3
Oils, Fats & Waxes	3.3	3.4	2.3	1.3	2.7	5.5	.4	2.3	16.0	2.9	1.2	-	6.2	1.5	.9
Inks	2.8	-	3.2	-	.3	1.2	.1	.5	-	.8	32.3	.4	5.2	.2	11.1
Sulphur Dioxide	2.6	1.7	3.9	.5	-	.4	7.3	21.3	-	.2	-	-	2.3	-	-
Paints & Enamels	2.4	*	12.0	1.9	3.8	.6	4.3	.7	11.7	7.3	1.2	3.6	1.9	7.0	.2
Sulphur	2.0	.1	13.0	-	-	1.1	-	.3	5.5	.2	1.3	-	15.0	-	1.0
Other Chemicals	2.0	.7	4.3	.8	-	1.7	.7	2.3	2.5	.1	.2	-	12.7	-	.1
Coal Tar Products	1.6	2.7	7.4	-	2.7	.1	3.3	-	4.3	1.6	.8	-	1.1	1.5	.3
Organic Acids	1.4	.7	.9	-	-	2.7	.5	-	3.1	.5	1.5	-	1.8	.2	4.1
Halogenated Hydrocarbons	1.3	-	3.3	-	.5	-	*	-	-	-	.2	-	11.2	.3	4.6
Lacquer & Varnishes	1.1	-	2.8	.8	3.5	.1	1.3	2.8	11.7	4.1	1.4	1.8	1.4	4.6	.1
Dyes	.9	.3	1.6	-	1.4	.7	-	-	14.7	3.5	-	1.1	3.3	-	3.5
Cyanides	.8	3.5	.7	-	-	-	.8	5.1	-	.1	.6	-	.2	.1	.1
Cadmium	.7	-	-	-	-	-	-	13.2	-	-	-	-	5.1	-	-
Hydrogen Sulphide	.6	1.0	2.6	-	-	-	.7	11.6	-	-	-	-	-	-	-
Antimony	.6	-	.3	-	-	-	-	.7	-	-	11.3	-	.7	-	-
Arsenic	.5	-	.5	-	4.6	-	-	22.4	-	-	-	-	-	-	-
Manganese	.4	-	.4	3.2	-	-	1.5	1.0	-	-	.2	-	-	-	-
Radioactive Substances	.4	1.7	1.7	-	-	-	-	-	-	-	-	-	1.5	-	-
Benzene	.3	-	2.8	.3	-	-	-	-	-	.1	4.7	-	.2	*	1.0
Chlorine	.3	.3	-	.1	-	.5	-	-	-	-	-	-	-	-	2.5
Asbestos Dust	.3	.2	.7	-	-	-	.5	-	-	-	-	-	1.8	.4	-
Chromium	.3	-	.7	3.2	-	-	.4	1.0	.6	-	1.8	-	-	-	-
Phosphorus	.2	1.2	-	-	-	-	-	1.2	-	-	-	-	-	-	-
Aniline	.1	.3	1.7	-	-	-	-	-	-	-	1.1	-	-	-	.4
Medicines	.1	.2	.8	-	-	-	-	-	-	-	.6	-	.3	-	-
Fluorine	.1	.5	-	-	-	-	-	-	-	-	.2	-	-	*	1.0
Mercury	.1	.4	.4	-	-	.2	-	-	-	-	-	-	.2	-	-
Aldehydes	.1	-	.3	-	-	.1	-	-	-	-	.9	-	-	-	-
Alcohols, Esters, Ethers	.1	-	-	-	-	-	-	-	-	-	1.4	-	-	-	.1

TABLE 14. PERCENTAGE OF TOTAL EXPOSURES TO SPECIFIED MATERIALS OCCURRING IN EACH OF THE INDUSTRIAL GROUPS STUDIED

Materials	Number of Exposures to Specified Materials in All Industries Surveyed	Percentage of Total Exposures to the Specified Material Occurring in Each Industrial Group (Percentage, where less than 0.1, shown by (*))													
		Extraction of Minerals	Chemical & Allied Industries	Clay Glass & Stone	Clothing Manu.	Food & Allied Industries	Iron & Steel	Metals Other Than Iron & Steel	Leather	Lumber	Paper & Printing	Textile Manufacturing	Miscellaneous Manu.	Transportation & Comm.	Personal
Number of Workers in Surveyed Plants:	31130	4606	761	944	367	8911	6272	606	163	877	1281	276	2514	2020	1532
Percentage of Workers in Surveyed Plants:	100.0	14.8	2.4	3.0	1.2	28.6	20.2	2.0	0.5	2.8	4.1	0.9	8.1	6.5	4.9
Other Metals	8876	11.0	.9	1.0	-	9.3	53.0	4.4	-	.5	5.0	.1	9.9	4.9	*
Other Gases	8795	33.5	1.2	1.8	*	9.4	36.1	2.6	.1	.2	1.1	*	11.0	2.6	.4
Carbon Monoxide	8581	33.2	.8	2.0	*	10.0	34.3	2.0	-	.2	.1	*	9.3	7.6	.5
Other Dermatitis Producers	6863	1.4	1.9	-	.2	78.4	12.2	.2	.2	*	.1	-	5.1	*	.3
Silica Dust	6374	39.9	.3	4.7	-	7.6	34.1	2.3	.1	2.5	.1	*	6.4	1.8	.2
Organic Dust	5750	5.2	3.0	1.2	2.5	32.0	8.7	1.5	1.5	10.4	2.6	3.5	25.2	1.2	1.5
Silicate Dust	5312	42.0	1.1	11.6	.2	.8	31.1	2.8	-	.6	.1	*	6.0	3.0	.7
Petroleum Products	4728	11.2	1.8	1.3	*	11.0	40.5	1.7	*	1.7	2.1	*	13.1	14.7	.9
Coal Dust, Bituminous	3154	54.3	1.2	2.7	*	12.7	21.2	2.9	-	.8	.2	*	.6	2.3	1.1
Temperature Change	2923	1.8	-	-	-	7.4	71.0	6.4	-	.1	-	-	12.8	-	.5
Non Siliceous Dust	2916	9.5	.7	6.8	.1	16.7	43.9	3.4	-	2.4	*	.1	5.6	10.5	.3
Lead	2767	8.2	1.7	1.4	.1	3.1	29.7	12.6	.2	.9	15.8	*	21.2	5.0	.1
Alkaline Compounds	2485	21.0	3.0	.2	-	35.8	16.0	2.2	.5	.9	.5	.3	8.6	4.9	6.1
Ore Dust	2451	89.3	.1	-	-	-	3.2	7.4	-	-	-	-	-	-	-
Organic Solvents	2415	2.7	5.1	.2	.6	2.9	11.4	.8	.6	2.0	12.1	.2	38.1	17.6	5.7
Infection	2170	1.9	2.4	-	1.3	83.7	-	-	1.9	.4	-	.3	.2	.2	7.7
Salts, Inorganic	1688	5.1	6.3	.4	-	71.3	.2	.2	.9	.2	.7	.1	12.4	.1	2.1
Mineral Acids	1307	7.8	3.8	.8	-	29.1	14.8	7.0	.3	.8	3.4	.1	24.7	7.0	.4
Oils, Fats & Waxes	1031	15.1	6.1	1.2	1.0	47.1	2.1	1.4	2.5	2.4	1.6	-	15.1	3.0	1.4
Inks	870	-	2.2	-	.1	12.6	.6	.3	-	.8	47.6	.1	15.1	.5	19.5
Sulphur Dioxide	796	10.0	3.8	.6	-	4.1	57.3	16.6	-	.3	-	-	7.3	-	-
Paints & Enamels	753	.3	12.1	2.4	1.9	7.0	35.6	.5	2.5	8.5	2.1	1.3	6.5	18.9	.4
Sulphur	619	.5	14.7	-	-	16.3	-	.3	1.5	.3	2.7	-	61.1	-	2.6
Other Chemicals	610	5.6	5.4	1.3	-	24.6	7.4	2.3	.6	.2	.3	-	52.1	-	.2
Coal Tar Products	492	25.0	11.4	-	2.0	1.2	41.5	-	1.4	2.9	2.0	-	5.5	6.3	.8
Organic Acids	446	6.7	1.6	-	-	53.1	7.0	-	1.1	.9	4.3	-	10.3	.9	14.1
Halogenated Hydrocarbons	390	-	6.4	-	.5	-	.5	-	-	-	.8	-	72.1	1.5	18.2
Lacquer & Varnishes	356	-	5.9	2.2	3.7	1.7	23.6	4.8	5.3	10.1	5.1	1.4	9.8	26.1	.3
Dyes	282	4.2	4.2	-	1.8	20.9	-	-	8.5	11.0	-	1.1	29.1	-	19.2
Cyanides	264	60.2	1.9	-	-	-	19.3	11.7	-	.4	3.0	-	1.9	.8	.8
Cadmium	208	-	-	-	-	-	-	38.5	-	-	-	-	61.5	-	-
Hydrogen Sulphide	176	25.0	11.4	-	-	-	23.8	39.8	-	-	-	-	-	-	-
Antimony	172	-	3.5	-	-	-	-	2.3	-	-	84.3	-	9.9	-	-
Arsenic	157	-	2.6	-	10.8	-	-	86.6	-	-	-	-	-	-	-
Manganese	137	-	2.2	21.9	-	-	70.1	4.4	-	-	1.4	-	-	-	-
Radioactive Substances	126	60.3	10.3	-	-	-	-	-	-	-	-	-	29.4	-	-
Benzene	106	-	19.8	2.8	-	-	-	-	-	.9	56.7	-	3.8	.9	15.1
Chlorine	103	14.6	-	1.0	-	47.5	-	-	-	-	-	-	-	-	36.9
Asbestos Dust	98	8.2	5.1	-	-	-	31.6	-	-	-	-	-	45.9	9.2	-
Chromium	89	-	5.6	33.7	-	-	27.0	6.7	1.1	-	25.9	-	-	-	-
Phosphorus	63	88.9	-	-	-	-	-	11.1	-	-	-	-	-	-	-
Aniline	45	26.7	28.9	-	-	-	-	-	-	-	31.1	-	-	-	13.3
Medicines	44	20.5	13.6	-	-	-	-	-	-	-	18.2	-	47.7	-	-
Fluorine	42	54.8	-	-	-	-	-	-	-	-	7.1	-	-	2.4	35.7
Mercury	41	41.5	7.3	-	-	41.5	-	-	-	-	-	-	9.7	-	-
Aldehydes	29	-	20.7	-	-	41.4	-	-	-	-	37.9	-	-	-	-
Alcohols, Esters, Ethers	19	-	-	-	-	-	-	-	-	-	94.7	-	-	-	5.3

TABLE 15. EXTRACTION OF MINERALS - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to Specified Materials					
	All Extraction of Mirerals	Coal Mines	Gold and Silver Mines	Other Mines	Quarries	Petroleum
Total Number of Workers Employed:	4606	1525	1202	1568	235	76
Other Gases	2943	1285	803	777	23	55
Carbon Monoxide	2848	1285	728	772	18	45
Silica Dust	2546	133	986	1282	144	1
Silicate Dust	2232	4	937	1257	34	-
Ore Dust	2188	-	1027	1161	-	-
Coal Dust, Bituminous	1712	1498	86	98	21	9
Other Metals	979	35	669	254	17	4
Petroleum Products	529	67	176	176	62	48
Alkaline Compounds	522	4	496	5	8	9
Organic Dust	298	81	135	66	10	6
Non Siliceous Dust	276	4	25	110	136	1
Lead	227	19	97	72	13	26
Cyanides	159	-	101	58	-	-
Oils, Fats & Waxes	156	-	75	81	-	-
Coal Tar Products	123	-	123	-	-	-
Mineral Acids	102	2	69	27	-	4
Other Dermatitis Producers	97	9	46	42	-	-
Salts, Inorganic	87	-	46	29	-	12
Sulphur Dioxide	80	-	67	13	-	-
Radioactive Substances	76	-	-	76	-	-
Organic Solvents	64	1	5	-	16	42
Phosphorus	56	-	56	-	-	-
Temperature Change	52	-	-	13	-	39
Hydrogen Sulphide	44	-	-	4	-	40
Infections	40	9	10	13	8	-
Chemicals	34	-	10	19	-	5
Organic Acids	30	-	16	-	14	-
Fluorine	23	-	23	-	-	-
Mercury	17	-	17	-	-	-
Chlorine	15	-	2	13	-	-
Dyes	12	-	-	-	-	12
Aniline Compounds	12	-	-	-	-	12
Medicines	9	-	-	9	-	-
Asbestos Dust	8	-	8	-	-	-
Sulphur	3	-	-	-	-	3
Paint & Enamel	2	-	-	2	-	-

TABLE 16. EXTRACTION OF MINERALS - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Percentage of Workers in Each Industrial Subdivision Exposed to Specified Materials (Percentage where less than 1.0 shown by (*))					
	All Extraction of Minerals	Coal Mines	Gold and Silver Mines	Other Mines	Quarries	Petroleum
Total Number of Workers Employed:	4606	1525	1202	1568	235	76
Other Gases	63.9	84.3	66.8	49.6	9.8	72.4
Carbon Monoxide	61.8	84.3	60.6	49.2	7.7	59.2
Silica Dust	55.3	8.7	82.0	81.8	61.3	1.3
Silicate Dust	48.5	*	78.0	80.2	14.5	-
Ore Dust	47.5	-	85.4	74.0	-	-
Coal Dust, Bituminous	37.2	98.2	7.2	6.3	8.9	11.8
Other Metals	21.3	2.3	55.7	16.2	7.2	5.3
Petroleum Products	11.5	4.4	14.6	11.2	26.4	63.2
Alkaline Compounds	11.3	*	41.3	*	3.4	11.8
Organic Dust	6.5	5.3	11.2	4.2	4.3	7.9
Non Siliceous Dust	6.0	*	2.1	7.0	57.9	1.3
Lead	4.9	1.2	8.1	4.6	5.5	34.2
Cyanides	3.5	-	8.4	3.7	-	-
Oils, Fats & Waxes	3.4	-	6.2	5.2	-	-
Coal Tar Products	2.7	-	10.2	-	-	-
Mineral Acids	2.2	*	5.7	1.7	-	5.3
Other Dermatitis Producers	2.1	*	3.8	2.7	-	-
Salts, Inorganic	1.9	-	3.8	1.8	-	15.8
Sulphur Dioxide	1.7	-	5.6	*	-	-
Radioactive Substances	1.7	-	-	4.8	-	-
Organic Solvents	1.4	*	*	-	6.8	55.3
Phosphorus	1.2	-	4.7	-	-	-
Extreme Temperature Change	1.1	-	-	*	-	51.3
Hydrogen Sulphide	1.0	-	-	*	-	52.6
Infections	*	-	*	*	3.4	-
Chemicals	*	*	*	1.2	-	6.6
Organic Acids	*	-	1.3	-	6.0	-
Fluorine	*	-	1.9	-	-	-
Mercury	*	-	1.4	-	-	-
Chlorine	*	-	*	*	-	-
Dyes	*	-	-	-	-	15.8
Aniline Compounds	*	-	-	-	-	15.8
Medicines	*	-	-	*	-	-
Asbestos Dust	*	-	*	-	-	-
Sulphur	*	-	-	-	-	3.9
Paint & Enamel	*	-	-	*	-	-

TABLE 17. CHEMICAL AND ALLIED INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS.

Materials	Number of Workers in Each Industrial Subdivision Exposed to Specified Materials.				
	All Chemical & Allied Industries	Explosives, Ammunition & Fire Works	Fertilizer Factories	Paint & Varnish Factories	Other Chemical Factories
Total Number of Workers Employed:	761	141	56	102	462
Organic Dust	175	83	16	15	61
Other Dermatitis Producers	128	60	44	1	23
Organic Solvents	123	-	-	20	103
Salts, Inorganic	106	58	30	13	5
Other Gases	105	30	5	-	70
Sulphur	91	57	-	5	29
Paint & Enamel	91	17	-	29	45
Petroleum Products	86	34	3	9	40
Other Metals	80	-	-	18	62
Alkaline Compounds	75	-	-	9	66
Carbon Monoxide	68	17	7	2	42
Oils, Fats & Waxes	63	22	7	24	10
Silicate Dust	60	8	-	18	34
Coal Tar Products	56	-	-	3	53
Infections	51	-	39	-	12
Mineral Acids	50	13	-	5	32
Lead	47	-	-	39	8
Coal Dust, Bituminous	38	8	5	3	22
Chemicals	33	2	-	2	29
Sulphur Dioxide	30	-	-	-	30
Halogenated Hydrocarbons	25	-	-	-	25
Inks	24	17	-	-	7
Silica Dust	22	1	1	12	8
Benzene	21	17	-	4	-
Lacquer & Varnish	21	-	-	16	5
Hydrogen Sulphide	20	-	-	-	20
Non Siliceous Dust	19	-	-	2	17
Aniline	13	-	-	1	12
Radioactive Substances	13	-	-	-	13
Dyes	12	-	-	8	4
Organic Acids	7	-	-	-	7
Aldehydes	6	-	-	1	5
Medicines	6	1	-	1	4
Antimony	6	-	-	3	3
Cyanides	5	-	-	3	2
Asbestos Dust	5	-	-	5	-
Chromium	5	-	-	4	1
Arsenic	4	-	-	-	4
Manganese	3	-	-	3	-
Mercury	3	-	-	3	-
Ore Dust	3	-	-	-	3

TABLE 18. CHEMICAL & ALLIED INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS.

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to Specified Materials (Percentage, when less than 1.0, shown by (*))				
	All Chemical & Allied Industries	Explosives Ammunition & Fire Works	Fertilizer Factories	Paint & Varnish Factories	Other Chemical Factories
Total Number of Workers Surveyed:	761	141	56	102	462
Organic Dust	23.0	58.9	28.6	14.7	13.2
Other Dermatitus Producers	16.8	42.6	78.6	1.0	5.0
Organic Solvents	16.2	-	-	19.6	22.3
Salts, Inorganic	13.9	41.1	53.6	12.7	1.1
Other Gases	13.8	21.3	8.9	-	15.2
Sulphur	12.0	40.4	-	4.9	6.3
Paint & Enamel	12.0	12.1	-	28.4	9.7
Petroleum Products	11.3	24.1	5.4	8.8	8.7
Other Metals	10.5	-	-	17.6	13.4
Alkaline Compounds	9.9	-	-	8.8	14.3
Carbon Monoxide	8.9	12.1	12.5	2.0	9.1
Oils, Fats & Waxes	8.3	15.6	12.5	23.5	2.2
Silicate Dust	7.9	5.7	0	17.6	7.4
Coal Tar Products	7.4	-	-	2.9	11.5
Infections	6.7	-	69.6	-	2.6
Mineral Acids	6.6	9.2	-	4.9	6.9
Lead	6.2	-	-	38.2	1.7
Coal Dust, Bituminous	5.0	5.7	8.9	2.9	4.8
Chemicals, N.O.S.	4.3	1.4	-	2.0	6.3
Sulphur Dioxide	3.9	-	-	-	6.5
Halogenated Hydrocarbons	3.3	-	-	-	5.4
Inks	3.2	12.1	-	-	1.5
Silica Dust	2.9	*	1.8	11.8	1.7
Benzene	2.8	12.1	-	3.9	-
Lacquer & Varnish	2.8	-	-	15.7	1.1
Hydrogen Sulphide	2.6	-	-	-	4.3
Non Siliceous Dust	2.5	-	-	2.0	3.7
Aniline	1.7	-	-	1.0	2.6
Radioactive Substances	1.7	-	-	-	2.8
Dyes	1.6	-	-	7.8	*
Organic Acids	*	-	-	-	1.5
Aldehydes	*	-	-	1.0	1.1
Medicines	*	*	-	1.0	*
Antimony	*	-	-	2.9	*
Cyanides	*	-	-	2.9	*
Asbestos Dust	*	-	-	4.9	-
Chromium	*	-	-	3.9	*
Arsenic	*	-	-	-	*
Manganese	*	-	-	2.9	-
Mercury	*	-	-	2.9	-
Ore Dust	*	-	-	-	*

TABLE 19. CLAY, GLASS & STONE INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS.

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials.					
	All Clay, Glass & Stone Industries	Brick and Tile	Glass Factories	Lime, Cement & Artificial Stone Factories	Pottery Plants	Marble & Stone Yards
Total Number of Workers Surveyed:	944	545	35	133	192	39
Silicate Dust	619	405	24	44	128	18
Silica Dust	301	105	16	97	57	26
Non Siliceous Dust	199	34	17	101	10	37
Carbon Monoxide	173	87	-	51	35	-
Other Gases	161	75	-	51	35	-
Other Metals	90	32	19	6	32	1
Coal Dust, Bituminous	86	66	-	17	2	1
Organic Dusts	66	55	-	-	11	-
Petroleum Products	62	28	-	22	1	11
Lead	38	27	3	6	2	-
Manganese	30	1	-	-	29	-
Chromium	30	1	-	-	29	-
Paint & Enamel	18	14	4	-	-	-
Oils, Fats & Waxes	12	1	-	-	-	11
Mineral Acids	11	1	10	-	-	-
Lacquer & Varnish	8	2	6	-	-	-
Chemicals	8	-	-	6	2	-
Salts, Inorganic	6	2	2	-	2	-
Sulphur Dioxide	5	5	-	-	-	-
Alkaline Compounds	4	-	2	-	2	-
Organic Solvents	4	1	3	-	-	-
Benzene	3	-	3	-	-	-
Chlorine	1	1	-	-	-	-

TABLE 20. CLAY, GLASS & STONE INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS.

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to Specified Materials (Percentage, when less than 1.0 shown by (*))					
	All Clay, Glass & Stone Industries	Brick & Tile	Glass Factories	Lime, Cement & Artificial Stone Factories	Pottery Plants	Marble & Stone Yards
Total Number of Workers Surveyed:	944	545	35	133	192	39
Silicate Dust	65.6	74.3	68.6	33.1	66.7	46.2
Silica Dust	31.9	19.3	45.7	72.3	29.7	66.7
Non Siliceous Dust	21.1	6.2	48.6	75.9	5.2	94.9
Carbon Monoxide	18.3	16.0	-	38.3	18.2	-
Other Gases	17.1	13.8	-	38.3	18.2	-
Other Metals	9.5	5.9	54.3	4.5	16.7	2.6
Coal Dust, Bituminous	9.1	12.1	-	12.8	1.0	2.6
Organic Dusts	7.0	10.1	-	-	5.7	-
Petroleum Products	6.6	5.1	-	16.5	*	28.2
Lead	4.0	5.0	8.6	4.5	1.0	-
Manganese	3.2	*	-	-	15.1	-
Chromium	3.2	*	-	-	15.1	-
Paint & Enamel	1.9	2.6	11.4	-	-	-
Oils, Fats & Waxes	1.3	*	-	-	-	28.2
Mineral Acids	1.2	*	28.6	-	-	-
Lacquer & Varnish	*	*	17.1	-	-	-
Chemicals	*	-	-	4.5	1.0	-
Salts, Inorganic	*	*	5.7	-	1.0	-
Sulphur Dioxide	*	*	-	-	-	-
Alkaline Compounds	*	-	5.7	-	1.0	-
Organic Solvents	*	*	8.6	-	-	-
Benzene	*	-	8.6	-	-	-
Chlorine	*	*	-	-	-	-

TABLE 21. CLOTHING INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials.			
	All Clothing Industries	Coats, Suits & Overalls	Furs & Fur Clothing	Other Clothing Factories
Total Number of Workers Surveyed:	367	227	80	60
Organic Dust	143	55	54	34
Infections	29	-	29	-
Arsenic	17	-	17	-
Organic Solvents	14	-	14	-
Paint & Enamel	14	-	14	-
Lacquer & Varnish	13	-	13	-
Other Dermatitis Producers	12	-	12	-
Coal Tar Products	10	-	10	-
Silicate Dust	10	-	10	-
Oils, Fats & Waxes	10	-	10	-
Dyes	5	-	5	-
Lead	4	-	4	-
Carbon Monoxide	3	2	-	1
Non Siliceous Dust	2	-	2	-
Halogenated Hydrocarbons	2	-	2	-
Petroleum Products	2	-	1	1
Coal Dust, Bituminous	1	1	-	-
Other Gases	1	1	-	-
Ink	1	-	-	1

TABLE 22. CLOTHING INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS.

Material	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Material (Percentage, where less than 1.0 shown by (*))			
	All Clothing Industries	Coats, Suits & Overalls	Furs & Fur Clothing	Other Clothing Factories
Total Number of Workers Surveyed:	367	227	80	60
Organic Dust	39.0	24.2	67.5	56.7
Infections	7.9	-	36.3	-
Arsenic	4.6	-	21.3	-
Organic Solvents	3.8	-	17.5	-
Paint & Enamel	3.8	-	17.5	-
Lacquer & Varnish	3.5	-	16.3	-
Other Dermatitis Producers	3.3	-	15.0	-
Coal Tar Products	2.7	-	12.5	-
Silicate Dust	2.7	-	12.5	-
Oils, Fats & Waxes	2.7	-	12.5	-
Dyes	1.4	-	6.3	-
Lead	1.1	-	5.0	-
Carbon Monoxide	*	*	-	1.7
Non Siliceous Dust	*	-	2.5	-
Halogenated Hydrocarbons	*	-	2.5	-
Petroleum Products	*	-	1.3	1.7
Coal Dust, Bituminous	*	*	-	-
Other Gases	*	*	-	-
Ink	*	-	-	1.7

TABLE 23. FOOD & ALLIED INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials											
	All Food & Allied Industries	Bakeries	Dairy Products	Confec-tionaries	Flour & Grain Mills	Fruit & Vegetable Canning	Slaughter & Packing Houses	Sugar Re-fineries & Refineries	Ice Manufac-turing	Spices & Coffee	Other Food Factories	Liquor & Beverages
Total Number of Workers Surveyed:	8911	1185	886	309	387	2243	1026	1979	254	63	186	393
Other Dermatitis Producers	5377	503	215	175	74	1860	856	1511	11	2	121	49
Organic Dust	1840	293	51	32	287	153	323	554	14	28	49	56
Infections	1815	-	-	-	10	1057	329	419	-	-	-	-
Salts, Inorganic	1204	156	88	6	29	566	201	50	19	-	74	15
Alkaline Compounds	889	27	135	-	14	123	61	418	-	-	7	104
Carbon Monoxide	856	245	48	44	5	23	130	330	8	3	4	16
Other Gases	831	42	16	3	5	15	217	465	16	2	-	50
Other Metals	822	10	9	-	4	540	15	215	1	-	-	28
Petroleum Products	521	42	38	3	22	43	62	192	42	-	3	74
Non Siliceous Dusts	488	2	5	-	20	3	14	438	1	2	-	3
Oils, Fats & Waxes	486	270	27	22	7	7	65	42	-	1	25	20
Silica Dust	483	-	-	-	2	9	1	471	-	-	-	-
Coal Dust, Bituminous	399	8	22	4	11	31	37	233	27	1	-	25
Mineral Acids	380	2	55	-	1	-	-	301	-	-	-	21
Organic Acids	237	-	3	7	-	90	22	92	-	-	7	16
Temperature Change	217	-	-	-	-	15	-	202	-	-	-	-
Chemicals	150	-	4	-	1	2	-	140	-	-	-	3
Ink	110	-	4	-	-	96	4	-	-	-	6	-
Sulphur	101	-	1	-	-	-	-	96	-	-	4	-
Lead	86	2	4	-	1	5	-	68	-	-	-	6
Organic Solvents	70	25	15	-	-	5	4	2	7	-	4	8
Dyes	59	-	-	3	-	-	56	-	-	-	-	-
Paint & Enamel	53	5	6	-	-	13	23	-	-	-	-	6
Chlorine	49	-	22	-	11	-	13	-	-	-	3	-
Silicate Dust	45	2	4	-	-	-	14	-	4	2	3	16
Sulphur Dioxide	33	-	-	-	-	-	-	33	-	-	-	-
Mercury	17	-	5	-	12	-	-	-	-	-	-	-
Aldehydes	12	-	-	-	-	-	12	-	-	-	-	-
Coal Tar Products	6	-	-	-	6	-	-	-	-	-	-	-
Lacquer & Varnish	6	1	5	-	-	-	-	-	-	-	-	-

TABLE 24. FOOD & ALLIED INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials /Percentage, where less than 1.0 shown by (*)/											
	All Food & Allied Industries	Bakeries	Dairy Products	Confectionaries	Floor & Grain Mills	Fruit & Vegetable Canning	Slaughter & Packing Houses	Sugar Factories & Refineries	Ice Manufacturing	Spices & Coffee	Other Food Factories	Liquor & Beverages
Total Number of Workers Surveyed:	2911	1185	886	309	387	2243	1026	1979	254	63	186	393
Other Dermatitis Producers	60.3	42.4	34.3	56.6	19.1	82.9	93.4	76.4	4.3	3.2	65.1	12.5
Organic Dust	20.6	24.7	5.8	10.4	74.2	6.2	31.5	28.0	5.5	44.4	26.2	14.2
Infections	20.4	-	-	-	2.6	47.1	32.1	21.2	-	-	-	-
Salt, Inorganic	13.5	13.2	9.9	1.9	7.5	25.2	12.6	2.5	7.5	-	30.8	3.8
Alkaline Compounds	10.0	2.3	15.2	-	3.6	5.5	5.9	21.1	-	-	3.8	26.5
Carbon Monoxide	9.6	20.7	5.4	14.2	1.3	1.0	12.7	16.7	3.1	4.8	2.2	4.1
Other Gases	9.3	3.5	1.8	1.0	1.3	*	21.2	23.5	3.3	3.2	-	12.7
Other Metals	9.2	*	1.0	-	1.0	24.1	1.5	10.2	*	-	-	7.1
Petroleum Products	5.8	3.5	4.3	1.0	5.7	1.9	6.0	2.7	16.5	-	1.6	13.8
Non Siliceous Dusts	5.5	*	*	-	5.2	*	1.4	22.1	*	3.2	-	*
Oils, Fats & Waxes	5.5	22.8	3.0	7.1	1.8	*	6.3	2.1	-	1.6	12.9	5.1
Silica Dust	5.4	-	-	-	*	*	*	23.8	-	-	-	-
Coal Dust, Bituminous	4.5	*	2.5	1.3	2.8	1.4	3.6	11.8	10.6	1.6	-	6.4
Mineral Acids	4.2	*	6.2	-	*	-	-	15.2	-	-	-	5.3
Organic Acids	2.7	-	*	2.3	-	4.0	2.1	4.6	-	-	3.2	4.1
Extreme Temperature Change	2.4	-	-	-	-	*	-	10.2	-	-	-	-
Chemicals	1.7	-	*	-	*	*	-	7.1	-	-	-	*
Ink	1.2	-	*	-	-	4.3	*	-	-	-	3.2	-
Sulphur	1.1	-	*	-	-	-	-	4.9	-	-	2.2	-
Lead	1.0	*	*	-	*	*	-	2.4	-	-	-	1.5
Organic Solvents	*	2.1	1.7	-	-	*	*	*	2.8	-	2.2	2.0
Dyes	*	-	-	1.0	-	-	5.5	-	-	-	-	-
Paint & Enamel	*	*	*	-	-	*	2.2	-	-	-	-	1.5
Chlorine	*	-	2.5	-	2.8	-	1.3	-	-	-	1.6	-
Silicate Dust	*	*	*	-	-	-	1.4	-	1.6	3.2	1.6	4.1
Sulphur Dioxide	*	-	-	-	-	-	-	1.7	-	-	-	-
Mercury	*	-	*	-	3.1	-	-	-	-	-	-	-
Aldehydes	*	-	-	-	-	-	1.2	-	-	-	-	-
Coal Tar Products	*	-	-	-	1.6	-	-	-	-	-	-	-
Lacquer & Varnish	*	*	*	-	-	-	-	-	-	-	-	-

TABLE 25. IRON & STEEL INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to the Specified Material				
	All Iron & Steel Industries	Automobile Factories	Automobile Repair Shops	Car & Railroad Shops	Other Iron & Steel Industries
Total Number of Workers Surveyed:	6272	135	34	739	5364
Other Metals	4705	88	14	444	4159
Other Gases	3175	24	10	182	2959
Carbon Monoxide	2947	58	11	204	2674
Silica Dust	2171	18	8	284	1861
Temperature Change	2077	-	-	-	2077
Petroleum Products	1914	49	9	409	1447
Silicate Dust	1650	66	14	113	1457
Non Siliceous Dust	1280	21	3	212	1044
Other Dermatitis Producers	838	20	-	116	702
Lead	821	18	3	215	585
Coal Dust, Bituminous	669	7	1	168	493
Organic Dust	497	39	7	166	285
Sulphur Dioxide	456	-	-	-	456
Alkaline Compounds	398	-	-	38	360
Organic Solvents	276	5	6	165	100
Paint & Enamel	268	19	8	23	218
Coal Tar Products	204	-	-	10	194
Mineral Acids	194	23	-	21	150
Manganese	96	-	-	-	96
Lacquer & Varnish	84	4	3	1	76
Ore Dust	79	-	-	-	79
Cyanide	51	-	-	6	45
Chemicals	45	-	-	-	45
Hydrogen Sulphide	42	-	-	-	42
Asbestos Dust	31	-	-	2	29
Organic Acids	31	-	-	-	31
Chromium	24	2	-	-	22
Oils, Fats & Waxes	22	-	-	-	22
Ink	5	2	-	-	3
Salts, Inorganic	3	2	-	-	1
Halogenated Hydrocarbons	2	-	-	-	2

TABLE 26. IRON & STEEL INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Percentage of Workers in Each Industrial Sub-division Exposed to the Specified Materials /Percentage, where less than 1.0, shown by (*)/				
	All Iron & steel Industries	Automobile Factories	Automobile Repair Shops	Car and Railroad Shops	Other Iron & Steel Industries
Total Number of Workers Surveyed:	6272	135	34	739	5364
Other Metals	75.0	65.2	41.2	60.1	77.5
Other Gases	50.6	17.8	29.4	24.6	55.2
Carbon Monoxide	47.0	43.0	32.4	27.6	49.9
Silica Dust	34.6	13.3	23.5	38.4	34.7
Temperature Change	33.1	-	-	-	38.7
Petroleum Products	30.5	36.3	26.5	55.3	27.0
Silicate Dust	26.3	48.9	41.2	15.3	27.2
Non Siliceous Dust	20.4	15.6	8.8	28.7	19.5
Other Dermatitis Producers	13.4	14.8	-	15.7	13.1
Lead	13.1	13.3	8.8	29.1	10.9
Coal Dust, Bituminous	10.7	5.2	2.9	22.7	9.2
Organic Dust	7.9	28.9	20.6	22.5	5.3
Sulphur Dioxide	7.3	-	-	-	8.5
Alkaline Compounds	6.3	-	-	5.1	6.7
Organic Solvents	4.4	3.7	17.6	22.3	1.9
Paint & Enamel	4.3	14.1	23.5	3.1	4.1
Coal Tar Products	3.3	-	-	1.4	3.6
Mineral Acids	3.1	17.0	-	2.8	2.8
Manganese	1.5	-	-	-	1.8
Lacquer & Varnish	1.3	3.0	8.8	*	1.4
Ore Dust	1.3	-	-	-	1.5
Cyanide	*	-	-	*	*
Chemicals	*	-	-	-	*
Hydrogen Sulphide	*	-	-	-	*
Asbestos Dust	*	-	-	*	*
Organic Acids	*	-	-	-	*
Chromium	*	1.5	-	-	*
Oils, Fats, & Waxes	*	-	-	-	*
Ink	*	1.5	-	-	*
Salts, Inorganic	*	1.5	-	-	*
Halogenated Hydrocarbons	*	-	-	-	*

TABLE 27. METAL INDUSTRIES EXCEPT IRON AND STEEL - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials.			
	All Non Ferrous Metal Industries	Brass Mills	Lead & Zinc Factories	Other Metal Factories
Total Number of Workers Surveyed:	606	17	303	286
Other Metals	391	13	239	139
Lead	349	11	236	102
Other Gases	231	4	204	23
Temperature Change	186	-	157	29
Ore Dust	181	-	161	20
Carbon Monoxide	168	11	134	23
Silicate Dust	147	-	63	84
Silica Dust	144	14	114	16
Arsenic	136	-	70	66
Sulphur Dioxide	132	-	132	-
Non Siliceous Dust	99	3	19	77
Mineral Acids	92	3	15	74
Coal Dust Bituminous	91	3	86	2
Organic Dust	88	11	11	66
Cadmium	80	-	-	80
Petroleum Products	79	1	39	39
Hydrogen Sulphide	70	-	-	70
Alkaline Compounds	56	2	46	8
Cyanide	31	3	-	28
Organic Solvents	18	-	1	17
Lacquer & Varnish	17	3	1	13
Oils, Fats & Waxes	14	1	4	9
Chemicals	14	-	10	4
Other Dermatitis Producers	13	-	10	3
Phosphorus	7	-	7	-
Manganese	6	-	6	-
Chromium	6	3	-	3
Antimony	4	-	4	-
Paint & Enamel	4	-	-	4
Salts, Inorganic	3	-	-	3
Ink	3	-	-	3
Sulphur	2	-	-	2

TABLE 29. METAL INDUSTRIES EXCEPT IRON & STEEL - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials [Percentage, where less than 1.0, shown by (*)]			
	All Non Ferrous Metal Industries	Brass Mills	Lead & Zinc Factories	Other Metal Factories
Total Number of Workers Surveyed:	606	17	309	286
Other Metals	64.5	76.5	78.9	43.6
Lead	57.6	64.7	77.9	35.7
Other Gases	38.1	23.5	67.3	8.0
Temperature Change	30.7	-	51.8	10.1
Ore Dust	28.9	-	53.1	7.0
Carbon Monoxide	27.7	64.7	44.2	8.0
Silicate Dust	24.3	-	20.8	29.4
Silica Dust	23.8	82.4	37.6	5.6
Arsenic	22.4	-	23.1	23.1
Sulphur Dioxide	21.8	-	43.6	-
Non Siliceous Dust	16.3	17.6	6.3	26.9
Mineral Acids	15.2	17.6	5.0	25.9
Coal Dust, Bituminous	15.0	17.6	28.4	*
Organic Dust	14.5	64.7	3.6	23.1
Cadmium	13.2	-	-	28.0
Petroleum Products	13.0	5.9	12.9	13.6
Hydrogen Sulphide	11.6	-	-	24.5
Alkaline Compounds	9.2	11.8	15.2	2.3
Cyanide	5.1	17.6	-	9.8
Organic Solvents	3.0	-	*	5.9
Lacquer & Varnish	2.8	17.6	*	4.5
Oils, Fats & Waxes	2.3	5.9	1.3	3.1
Chemicals	2.3	-	3.3	1.4
Other Dermatitis Producers	2.1	-	3.3	1.0
Phosphorus	1.2	-	2.3	-
Manganese	1.0	-	2.0	-
Chromium	1.0	17.6	-	1.0
Antimony	*	-	1.3	-
Paint & Enamel	*	-	-	1.4
Salts, Inorganic	*	-	-	1.0
Ink	*	-	-	1.0
Sulphur	*	-	-	*

TABLE 29. LEATHER INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials				
	All Leather Industries	Saddlery & Harness	Leather Goods & Belting	Tanneries	Trunks & Suitcases
Total Number of Workers Surveyed:	163	40	46	54	23
Organic Dust	37	13	45	11	13
Infections	42	-	-	42	-
Oils, Fats & Waxes	26	23	-	3	-
Dyes	24	14	10	-	-
Lacquer & Varnish	13	6	10	-	3
Paint & Enamel	19	6	10	-	3
Other Dermatitis Producers	17	-	-	17	-
Salts, Inorganic	15	5	-	10	-
Organic Solvents	15	-	10	4	1
Alkaline Compounds	12	-	-	12	-
Other Gases	11	11	-	-	-
Sulphur	9	-	-	9	-
Silica Dust	9	-	-	-	9
Coal Tar Products	7	-	-	7	-
Lead	6	6	-	-	-
Organic Acids	5	5	-	-	-
Mineral Acids	4	-	-	4	-
Chromicals	4	-	-	4	-
Petroleum Products	1	1	-	-	-
Chromium	1	-	-	1	-

TABLE 30. LEATHER INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Material	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials [Percentage, where less than 1.0, shown by (*)]				
	All Leather Industries	Saddlery & Harness	Leather Goods & Belting	Tanneries	Trunks & Suitcases
Total Number of Workers Surveyed:	163	40	46	54	23
Organic Dusts	53.4	32.5	97.8	20.4	73.3
Infections	25.8	-	-	77.8	-
Oils, Fats & Waxes	16.0	57.5	-	5.6	-
Dyes	14.7	35.0	21.7	-	-
Lacquer & Varnish	11.7	15.0	21.7	-	13.0
Paint & Enamel	11.7	15.0	21.7	-	13.0
Other Dermatitis Producers	10.4	-	-	31.5	-
Salts, Inorganic	9.2	12.5	-	18.5	-
Organic Solvents	9.2	-	21.7	7.4	4.3
Alkaline Compounds	7.4	-	-	22.2	-
Other Gases	6.7	27.5	-	-	-
Sulphur	5.5	-	-	16.7	-
Silica Dust	5.5	-	-	-	39.1
Coal Tar Products	4.3	-	-	13.0	-
Lead	3.7	15.0	-	-	-
Organic Acids	3.1	12.5	-	-	-
Mineral Acids	2.5	-	-	7.4	-
Chemicals	2.5	-	-	7.4	-
Petroleum Products	*	2.5	-	-	-
Chromium	*	-	-	1.9	-

TABLE 31. LUMBER & FURNITURE INDUSTRIES - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials			
	All Lumber & Furniture Industries	Furniture	Sawing & Planing	Other Woodworking Factories
Total Number of Workers Surveyed:	877	97	400	380
Organic Dust	600	61	353	186
Silica Dust	157	23	53	81
Petroleum Products	81	6	31	44
Non Siliceous Dust	70	7	5	58
Paint & Enamel	64	11	28	25
Organic Solvents	49	6	28	15
Other Metals	41	8	13	20
Lacquer & Varnish	36	10	6	20
Dyes	31	9	-	22
Silicate Dust	31	9	-	22
Coal Dust, Bituminous	26	2	21	3
Lead	26	8	6	12
Oils, Fats & Waxes	25	1	22	2
Alkaline Compounds	22	-	22	-
Carbon Monoxide	20	2	13	5
Other Gases	18	3	15	-
Coal Tar Products	14	-	14	-
Mineral Acids	10	8	2	-
Infections	9	-	-	9
Ink	7	-	1	6
Salts, Inorganic	4	-	-	4
Organic Acids	4	-	-	4
Sulphur Dioxide	2	2	-	-
Sulphur	2	-	-	2
Temperature Change	2	-	2	-
Benzene	1	1	-	-
Chemicals	1	-	1	-
Other Dermatitis Producers	1	-	1	-
Cyanide	1	-	-	1

TABLE 32. LUMBER & FURNITURE INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Material	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials /Percentage, where less than 1.0, shown by (*)/			
	All Lumber & Furniture Industries	Furniture	Sawing & Planing	Other Woodworking Factories
Total Number of Workers Surveyed:	877	97	400	380
Organic Dust	68.4	62.9	88.3	48.9
Silica Dust	17.9	23.7	13.3	21.3
Petroleum Products	9.2	6.2	7.8	11.6
Non Siliceous Dust	8.0	7.2	1.3	15.3
Paint & Enamel	7.3	11.3	7.0	6.6
Organic Solvents	5.6	6.2	7.0	3.9
Other Metals	4.7	8.2	3.3	5.3
Lacquer & Varnish	4.1	10.3	1.5	5.3
Dyes	3.5	9.3	-	5.8
Silicate Dust	3.5	9.3	-	5.8
Coal Dust, Bituminous	3.0	2.1	5.3	*
Lead	3.0	8.2	1.5	3.2
Oils, Fats & Waxes	2.9	1.0	5.5	*
Alkaline Compounds	2.5	-	5.5	-
Carbon Monoxide	2.3	2.1	3.3	1.3
Other Gases	2.1	3.1	3.3	-
Coal Tar Products	1.6	-	3.5	-
Mineral Acids	1.1	3.2	*	-
Infections	1.0	-	-	2.4
Ink	*	-	*	1.6
Salts, Inorganic	*	-	-	1.1
Organic Acids	*	-	-	1.1
Sulphur Dioxide	*	2.1	-	-
Sulphur	*	-	-	*
Temperature Change	*	-	*	-
Benzene	*	1.0	-	-
Chemicals	*	-	*	-
Other Dermatitis Producers	*	-	*	-
Cyanide	*	-	-	*

TABLE 33. PAPER, PRINTING & ALLIED INDUSTRIES - NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Materials	NUMBER OF WORKERS IN EACH INDUSTRIAL SUBDIVISION EXPOSED TO THE SPECIFIED MATERIALS			
	All Paper, Printing & Allied Industries	Blank Book Envelope & Tag Factories	Paper Box Factories	Printing Publishing & Engraving
Total Number of Workers Surveyed:	1281	321	70	890
Other Metals	442	64	7	371
Lead	436	57	4	375
Ink	414	46	4	364
Organic Solvents	292	45	4	243
Organic Dust	151	34	21	96
Antimony	145	-	-	145
Petroleum Products	97	3	3	91
Other Gases	95	-	-	95
Benzene	60	14	3	43
Mineral Acids	44	5	-	39
Chromium	23	5	-	18
Organic Acids	19	1	-	18
Lacquer & Varnish	18	-	-	18
Alcohols, Esters & Ethers	18	-	-	18
Sulphur	17	5	-	12
Oils, Fats & Waxes	16	8	2	6
Paint & Enamel	16	2	-	14
Aniline Compounds	14	-	-	14
Alkaline Compounds	12	5	2	5
Salts, Inorganic	12	-	2	10
Aldehydes	11	5	2	4
Coal Tar Products	10	5	-	5
Cyanide	8	-	-	8
Silica Dust	8	-	-	8
Medicines	8	-	-	8
Carbon Monoxide	7	-	-	7
Other Dermatitis Producers	6	-	-	6
Coal Dust, Bituminous	5	1	1	3
Silicate Dust	3	-	-	3
Fluorine	3	-	-	3
Halogenated Hydrocarbons	3	-	-	3
Manganese	2	-	-	2
Chemicals	2	-	-	2
Non Siliceous Dust	1	-	1	-

TABLE 34. PAPER, PRINTING & ALLIED INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials /Percentage, where less than 1.0, shown by (*)/			
	All Paper, Printing & Allied Industries	Blank Book, Envelope & Tag Factories	Paper Box Factories	Printing, Publishing & Engraving
Total Number of Workers Surveyed:	1281	321	70	890
Other Metals	34.5	19.9	10.0	41.7
Lead	34.0	17.8	5.7	42.1
Ink	32.3	14.3	5.7	40.9
Organic Solvents	22.8	14.0	5.7	27.3
Organic Dust	11.8	10.6	30.0	10.8
Antimony	11.3	-	-	16.3
Petroleum Products	7.6	*	4.3	10.2
Other Gases	7.4	-	-	10.7
Benzene	4.7	4.4	4.3	4.8
Mineral Acids	3.4	1.6	-	4.4
Chromium	1.8	1.6	-	2.0
Organic Acids	1.5	*	-	2.0
Lacquer & Varnish	1.4	-	-	2.0
Alcohols, Esters & Ethers	1.4	-	-	2.0
Sulphur	1.3	1.6	-	1.3
Oils, Fats & Waxes	1.2	2.5	2.9	*
Paint & Enamel	1.2	*	-	1.6
Aniline Compounds	1.1	-	-	1.6
Alkaline Compounds	*	1.6	2.9	*
Salts, Inorganic	*	-	2.9	1.1
Aldehydes	*	1.6	2.9	*
Coal Tar Products	*	1.6	-	*
Cyanide	*	-	-	*
Silica Dust	*	-	-	*
Medicines	*	-	-	*
Carbon Monoxide	*	-	-	*
Other Dermatitis Producers	*	-	-	*
Coal Dust, Bituminous	*	*	1.4	*
Silicate Dust	*	-	-	*
Fluorine	*	-	-	*
Halogenated Hydrocarbons	*	-	-	*
Manganese	*	-	-	*
Chemicals	*	-	-	*
Non Siliceous Dust	*	-	1.4	-

TABLE 35. TEXTILE INDUSTRIES - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials		
	All Textile Industries	Tent & Awning Factories	Other Textiles Mills
Total Number of Workers Surveyed:	276	64	212
Organic Dust	202	43	154
Paint & Enamel	10	8	2
Other Metals	9	8	1
Alkaline Compounds	7	-	7
Infections	7	-	7
Organic Solvents	6	1	5
Lacquer & Varnish	5	-	5
Silica Dust	3	-	3
Dyes	3	-	3
Silicate Dust	2	1	1
Non Siliceous Dust	2	1	1
Carbon Monoxide	2	-	2
Coal Dust, Bituminous	1	-	1
Other Gases	1	-	1
Mineral Acids	1	1	-
Ink	1	1	-
Lead	1	1	-
Petroleum Products	1	1	-
Salts, Inorganic	1	1	-

TABLE 36. TEXTILE INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS.

Material	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials (Percentage, where less than 1.0, shown by (*))		
	All Textile Industries	Tent and Awning Factories	Other Textile Mills
Total Number of Workers Surveyed:	276	64	212
Organic Dust	73.2	75.0	72.6
Paint & Enamel	3.6	12.5	*
Other Metals	3.3	12.5	*
Alkaline Compounds	2.5	-	3.3
Infections	2.5	-	3.3
Organic Solvents	2.2	1.6	2.4
Lacquer & Varnish	1.8	-	2.4
Silica Dust	1.1	-	1.4
Dyes	1.1	-	1.4
Silicate Dust	*	1.6	*
Non Siliceous Dust	*	1.6	*
Carbon Monoxide	*	-	*
Coal Dust, Bituminous	*	-	*
Other Gases	*	-	*
Mineral Acids	*	1.6	-
Ink	*	1.6	-
Lead	*	1.6	-
Petroleum Products	*	1.6	-
Salts, Inorganic	*	1.6	-

TABLE 37. MISCELLANEOUS MANUFACTURING INDUSTRIES - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials					
	All Misc. Manufacturing Industries	Electric Light & Power Companies	Electrical Machinery & Supply Factories	Signs	Optical Equipment	Other Miscellaneous Industries
Total Number of Workers Surveyed:	2514	684	57	66	70	1637
Organic Dust	1448	50	4	11	-	1383
Other Gases	964	259	16	2	-	687
Organic Solvents	921	206	9	16	10	680
Other Metals	876	510	13	1	-	352
Carbon Monoxide	797	171	13	1	-	612
Petroleum Products	621	426	16	1	2	176
Lead	587	251	24	2	-	310
Silica Dust	407	6	2	-	-	399
Sulphur	378	-	-	-	7	371
Temperature Change	373	-	-	-	-	373
Other Dermatitis Producers	347	100	-	-	7	240
Mineral Acids	323	200	17	-	-	106
Silicate Dust	320	221	6	-	28	65
Chemicals	318	-	-	-	-	318
Halogenated Hydrocarbons	281	3	-	-	-	278
Alkaline Compounds	213	29	-	8	-	176
Salts, Inorganic	210	-	-	-	7	203
Non Siliceous Dust	164	-	19	-	22	123
Oils, Fats & Waxes	156	18	-	-	-	138
Ink	131	30	-	-	-	101
Cadmium	128	-	-	-	-	128
Dyes	82	-	-	-	-	82
Sulphur Dioxide	58	58	-	-	-	-
Paint & Enamel	49	3	3	28	-	15
Organic Acids	46	2	-	-	7	37
Asbestos Dust	45	45	-	-	-	-
Radioactive Substances	37	-	-	-	-	37
Lacquer & Varnish	35	1	12	13	-	9
Coal Tar Products	27	16	-	-	7	4
Medicines	21	-	-	-	7	14
Coal Dust, Bituminous	20	-	4	-	-	16
Antimony	17	-	17	-	-	-
Cyanide	5	-	-	-	-	5
Infections	5	-	-	-	-	5
Mercury	4	-	3	1	-	-
Benzene	4	-	4	-	-	-

TABLE 38. MISCELLANEOUS MANUFACTURING INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS.

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials (Percentage, where less than 1.0, shown by (*))					
	All Misc. Manufacturing Industries	Electric Light & Power Companies	Electrical Machinery & Supply Factories	Signs	Optical Equipment	Other Miscellaneous Industries
Total Number of Workers Surveyed:	2514	684	57	66	70	1637
Organic Dust	57.6	7.3	7.0	16.7	-	84.5
Other Gases	38.3	37.9	28.1	3.0	-	42.0
Organic Solvents	36.6	30.1	15.8	24.2	14.3	41.5
Other Metals	34.8	74.6	22.8	1.5	-	21.5
Carbon Monoxide	31.7	25.0	22.8	1.5	-	37.4
Petroleum Products	24.7	62.3	28.1	1.5	2.9	10.8
Lead	23.4	36.7	42.1	3.0	-	18.9
Silica Dust	16.2	*	3.5	-	-	24.4
Sulphur	15.0	-	-	-	10.0	22.7
Temperature Change	14.8	-	-	-	-	22.8
Other Dermatitis Producers	13.8	14.6	-	-	10.0	14.7
Mineral Acids	12.8	29.2	29.8	-	-	6.5
Silicate Dust	12.7	32.3	10.5	-	40.0	4.0
Chemicals	12.7	-	-	-	-	19.4
Halogenated Hydrocarbons	11.2	*	-	-	-	17.0
Alkaline Compounds	8.5	4.2	-	12.1	-	10.8
Salts, Inorganic	8.4	-	-	-	10.0	12.4
Non Siliceous Dust	6.5	-	33.3	-	31.4	7.5
Oils, Fats & Waxes	6.2	2.6	-	-	-	8.4
Ink	5.2	4.4	-	-	-	6.2
Cadmium	5.1	-	-	-	-	7.8
Dyes	3.3	-	-	-	-	5.0
Sulphur Dioxide	2.3	8.5	-	-	-	-
Paint & Enamel	1.9	*	5.3	42.4	-	*
Organic Acids	1.8	*	-	-	10.0	2.3
Asbestos Dust	1.8	6.6	-	-	-	-
Radioactive Substances	1.5	-	-	-	-	2.3
Lacquer & Varnish	1.4	*	21.1	19.7	-	*
Coal Tar Products	1.1	2.3	-	-	10.0	*
Medicines	*	-	-	-	10.0	*
Coal Dust, Bituminous	*	-	7.0	-	-	1.0
Antimony	*	-	29.8	-	-	-
Cyanide	*	-	-	-	-	*
Infections	*	-	-	-	-	*
Mercury	*	-	5.3	1.5	-	-
Benzene	*	-	7.0	-	-	-

TABLE 39. TRANSPORTATION AND COMMUNICATION - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Number of Workers in Each Industrial Subdivision Exposed to the Specified Materials		
	All Transportation & Communication Industries	Garages, Automobile Laundries, & Greasing Stations	Street Railway Companies
Total Number of Workers Surveyed:	2020	1149	871
Petroleum Products	692	576	116
Carbon Monoxide	653	598	55
Other Metals	439	341	98
Organic Solvents	426	383	43
Non Siliceous Dust	306	214	92
Other Gases	226	182	44
Silicate Dust	157	154	3
Paint & Enamel	142	127	15
Lead	137	90	47
Alkaline Compounds	122	104	18
Silica Dust	112	81	31
Lacquer & Varnish	93	86	7
Mineral Acids	91	80	11
Coal Dust, Bituminous	72	12	60
Organic Dust	69	55	14
Coal Tar Products	31	3	28
Oils, Fats & Waxes	31	31	-
Asbestos Dust	9	-	9
Halogenated Hydrocarbons	6	4	2
Infections	5	4	1
Organic Acids	4	4	-
Ink	4	4	-
Other Dermatitis Producers	3	-	3
Cyanides	2	-	2
Salts, Inorganic	2	1	1
Benzene	1	1	-
Fluorine	1	1	-

TABLE 40. TRANSPORTATION AND COMMUNICATION - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Materials	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Materials [Percentage, where less than 1.0, shown by (*)]		
	All Transportation & Communication Industries	Garages, Automobile Laundries, & Greasing Stations	Street Railway Companies
Total Number of Workers Surveyed:	2020	1149	871
Petroleum Products	34.3	50.1	13.3
Carbon Monoxide	32.3	52.0	6.3
Other Metals	21.7	29.7	11.3
Organic Solvents	21.1	33.3	4.9
Non Siliceous Dust	15.1	18.6	10.6
Other Gases	11.2	15.8	5.1
Silicate Dust	7.8	13.4	*
Paint & Enamel	7.0	11.1	1.7
Lead	6.8	7.8	5.4
Alkaline Compounds	6.0	9.1	2.1
Silica Dust	5.5	7.0	3.6
Lacquer & Varnish	4.6	7.5	*
Mineral Acids	4.5	7.0	1.3
Coal Dust, Bituminous	3.6	1.0	6.9
Organic Dust	3.4	4.8	1.6
Coal Tar Products	1.5	*	3.2
Oils, Fats & Waxes	1.5	2.7	-
Asbestos Dust	*	-	1.0
Halogenated Hydrocarbons	*	*	*
Infections	*	*	*
Organic Acids	*	*	-
Ink	*	*	-
Other Dermatitis Producers	*	-	*
Cyanides	*	-	*
Salts, Inorganic	*	*	*
Benzene	*	*	-
Fluorine	*	*	-

TABLE 41. PERSONAL SERVICE INDUSTRIES - NUMBER OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Material	Number of Workers in Each Industrial Subdivision Exposed to the Specified Material		
	All Personal Service Industries	Laundries	Dry Cleaning Establishments
Total Number of Workers Surveyed:	1532	989	543
Ink	170	118	52
Infections	167	154	13
Alkaline Substances	153	73	80
Organic Solvents	137	31	106
Organic Dust	86	79	7
Halogenated Hydrocarbons	71	26	45
Organic Acids	63	19	44
Dyes	54	40	14
Petroleum Products	42	24	18
Carbon Monoxide	39	32	7
Chlorine	38	29	9
Silicate Dust	36	33	3
Salts, Inorganic	35	21	14
Coal Dust, Bituminous	34	21	13
Other Gases	33	7	26
Other Dermatitis Producers	24	24	-
Benzene	16	16	-
Temperature Change	16	16	-
Sulphur	16	10	6
Fluorine	15	15	-
Oils, Fats & Waxes	14	10	4
Silica Dust	11	6	5
Non Siliceous Dust	10	4	6
Anilines	6	-	6
Mineral Acids	5	2	3
Coal Tar Products	4	-	4
Paint & Enamel	3	1	2
Cyanides	2	-	2
Lead	2	2	-
Other Metals	2	2	-
Alcohols, Esters & Ethers	1	1	-
Lacquer & Varnish	1	1	-
Chemicals	1	-	1

TABLE 42.- PERSONAL SERVICE INDUSTRIES - PERCENTAGE OF WORKERS EXPOSED TO THE SPECIFIED MATERIALS

Material	Percentage of Workers in Each Industrial Subdivision Exposed to the Specified Material /Percentage, where less than 1.0, shown by (*)/		
	All Personal Service Industries	Laundries	Dry Cleaning Establishments
Total Number of Workers Surveyed:	1532	989	543
Ink	11.1	11.9	9.6
Infections	10.9	15.6	2.4
Alkaline Substances	10.0	7.4	14.7
Organic Solvents	8.9	3.1	19.5
Organic Dust	5.6	8.0	1.3
Halogenated Hydrocarbons	4.6	2.6	8.3
Organic Acids	4.1	1.9	8.1
Dyes	3.5	4.0	2.6
Petroleum Products	2.7	2.4	3.3
Carbon Monoxide	2.5	3.2	1.3
Chlorine	2.5	2.9	1.7
Silicate Dust	2.3	3.3	*
Salts, Inorganic	2.3	2.1	2.6
Coal Dust, Bituminous	2.2	2.1	2.4
Other Gases	2.2	*	4.8
Other Dermatitis Producers	1.6	2.4	-
Benzene	1.0	1.6	-
Temperature Change	1.0	1.6	-
Sulphur	1.0	1.0	1.1
Fluorine	1.0	1.5	-
Oils, Fats & Waxes	*	1.0	*
Silica Dust	*	*	*
Non Siliceous Dust	*	*	1.1
Anilines	*	-	1.1
Mineral Acids	*	*	*
Coal Tar Products	*	-	*
Paint & Enamel	*	*	*
Cyanides	*	-	*
Lead	*	*	-
Other Metals	*	*	-
Alcohols, Esters & Ethers	*	*	-
Lacquer & Varnish	*	*	-
Chemicals	*	-	*

TABLE 43. MATERIALS IN EACH INDUSTRY OR SERVICE GROUP TO WHICH 10 PERCENT OR MORE PERSONS WERE EXPOSED

Industry or Service Group	Material	Potentially Exposed Persons	
		Percent	Number
Extraction of Minerals	Other Gases	63.9	2943
	Carbon Monoxide	61.8	2848
	Silica Dust	55.3	2546
	Silicate Dust	48.5	2232
	Ore Dust	47.5	2188
	Coal Dust, Bituminous	37.2	1712
	Other Metals	21.3	979
	Petroleum Products	11.5	529
	Alkaline Compounds	11.3	522
Chemical & Allied Industries	Organic Dust	23.0	175
	Other Dermatitis Producers	16.8	128
	Organic Solvents	16.2	123
	Salts, Inorganic	13.9	106
	Other Gases	13.8	105
	Paints and Enamel	12.0	91
	Sulphur	12.0	91
	Petroleum Products	11.3	86
	Other Metals	10.5	80
Clay, Glass and Stone	Silicate Dust	65.6	619
	Silica Dust	31.9	301
	Non Siliceous Dust	21.1	199
	Carbon Monoxide	18.3	173
	Other Gases	17.1	161
Clothing	Organic Dust	39.0	143
Food	Other Dermatitis Producers	60.3	5377
	Organic Dust	20.6	1840
	Infection	20.4	1815
	Salts, Inorganic	13.5	1204
	Alkaline Compounds	10.0	889
Iron and Steel	Other Metals	75.0	4705
	Other Gases	50.6	3175
	Carbon Monoxide	47.0	2947
	Silica Dust	34.6	2171
	Temperature Change	33.1	2077
	Petroleum Products	30.5	1914
	Silicate Dust	26.3	1650
	Non Siliceous Dust	20.4	1280
	Other Dermatitis Producers	13.4	838
	Lead	13.1	821
	Coal Dust, Bituminous	10.7	669
Metals Other Than Iron and Steel	Other Metals	64.5	391
	Lead	57.6	349
	Other Gases	38.1	231
	Temperature Change	30.7	186
	Ore Dust	29.9	181
	Carbon Monoxide	27.7	168
	Silicate Dust	24.3	147
	Silica Dust	23.8	144
	Arsenic	22.4	136
	Sulphur Dioxide	21.8	132

TABLE 43 (Continued).

Industry or Service Group	Material	Potentially Exposed Persons	
		Percent	Number
Metals Other Than Iron and Steel (Cont'd)	Non Siliceous Dust	16.3	99
	Mineral Acids	15.2	92
	Coal Dust, Bituminous	15.0	91
	Organic Dust	14.5	88
	Cadmium	13.2	80
	Petroleum Products	13.0	79
	Hydrogen Sulphide	11.6	70
Leather	Organic Dust	53.4	87
	Infection	25.8	42
	Oils, Fats, Waxes	16.0	26
	Dyes	14.7	24
	Paints and Enamels	11.7	19
	Lacquer and Varnish	11.7	19
	Other Dermatitis Producers	10.4	17
Lumber	Organic Dust	68.4	600
	Silica Dust	17.9	157
Paper	Other Metals	34.5	442
	Lead	34.0	436
	Inks	32.3	414
	Organic Solvents	22.8	292
	Organic Dust	11.8	151
	Antimony	11.3	145
Textile	Organic Dust	73.2	202
Miscellaneous Manufacturing	Organic Dust	57.6	1443
	Other Gases	38.3	964
	Organic Solvents	36.6	921
	Other Metals	34.8	876
	Carbon Monoxide	31.7	797
	Petroleum Products	24.7	621
	Lead	23.4	587
	Silica Dust	16.2	407
	Sulphur	15.0	378
	Temperature Change	14.8	373
	Other Dermatitis Producers	13.8	347
	Mineral Acids	12.8	323
	Silicate Dust	12.7	320
	Other Chemicals	12.7	318
	Halogenated Hydrocarbons	11.2	281
Transportation	Petroleum Products	34.3	692
	Carbon Monoxide	32.3	653
	Other Metals	21.7	439
	Organic Solvents	21.1	426
	Non Siliceous Dust	15.1	306
	Other Gases	11.2	226
Personal Service	Inks	11.1	170
	Infection	10.9	167
	Alkaline Compounds	10.0	153

TABLE 44. NUMBER AND PERCENTAGE OF PERSONS IN THE SAMPLE STUDIED EXPOSED TO SOME OF THE IMPORTANT MATERIALS

Materials	Number of Persons Exposed	Percent of Persons Exposed
Inorganic nonmetallic dusts:		
Silica dusts	6374	20.5
Silicate dusts	5312	17.1
Coal dust, bituminous	3154	10.1
Nonsiliceous dust	2916	9.4
Sulphur, and its compounds	619	2.0
Asbestos dust	98	0.3
Metallic dusts and fumes:		
Other metals	8876	28.5
Lead	2767	8.9
Cadmium	208	0.7
Antimony	172	0.6
Arsenic	157	0.5
Manganese	137	0.4
Chromium	89	0.3
Phosphorus	63	0.2
Mercury	41	0.1
Gases:		
Other gases	8795	28.3
Carbon monoxide	8581	27.6
Sulphur dioxide	796	2.6
Hydrogen Sulphide	176	0.6
Chlorine	103	0.3
Other dermatitis producers	6863	22.0
Organic dust	5750	18.5
Petroleum products	4728	15.2
Temperature change	2923	9.4
Alkaline compounds	2485	8.0
Organic solvents	2415	7.8
Infections	2170	7.0
Mineral acids	1307	4.2
Oils, fats, waxes	1031	3.3
Inks	870	2.8
Paints and enamels	753	2.4
Other chemicals	610	2.0
Coal tar products	492	1.6
Organic acids	446	1.4
Halogenated hydrocarbons	390	1.3
Dyes	282	0.9
Cyanides	264	0.8
Aniline	45	0.1

TABLE 45. EXPECTED NUMBER OF PERSONS IN THE INDUSTRIES STUDIED EXPOSED TO SOME OF THE IMPORTANT MATERIALS.*

Materials	Number of Persons Exposed	Materials	Number of Persons Exposed
Inorganic Non-metallic Dusts:		Other Exposures.	
Silica Dust	20,278	Organic Dust	13,635
Silicate Dust	17,538	Petroleum Products	13,132
Coal Dust, Bituminous	10,584	Other Dermatitis Producers	10,421
Non-Siliceous Dust	7,452	Temperature Change	7,312
Sulphur and its Compounds	1,586	Organic Solvents	7,142
Asbestos Dust	296	Alkaline Compounds	6,212
		Infections	3,273
		Mineral Acids	3,124
Metallic Dusts and Fumes.		Inks	2,451
Other Metals	24,062	Oils, Fats and Waxes	2,396
Lead	7,662	Paints and Enamels	1,995
Antimony	540	Coal Tar Products	1,603
Cadmium	496	Other Chemicals	1,520
Manganese	338	Halogenated Hydrocarbons	1,133
Arsenic	332	Cyanides	948
Phosphorus	251	Organic Acids	921
Chromium	233	Dyes	752
Mercury	123	Aniline	158
Gases:			
Other Gases	27,108		
Carbon Monoxide	26,577		
Sulphur Dioxide	2,045		
Hydrogen Sulphide	476		
Chlorine	219		

NOTE: Expected number of persons in all industries exposed to each material is obtained by adding the expected number of exposures in each industry. The latter were obtained by multiplying the percent of surveyed workers exposed to each material (Table 13) by the total population of that industry as shown in Table 2.

*(Total Population of Industries Studied = 79,668- See Table 2)

FIGURE 8

EXPECTED NUMBER OF PERSONS IN THE INDUSTRIES STUDIED EXPOSED TO SOME OF THE IMPORTANT MATERIALS

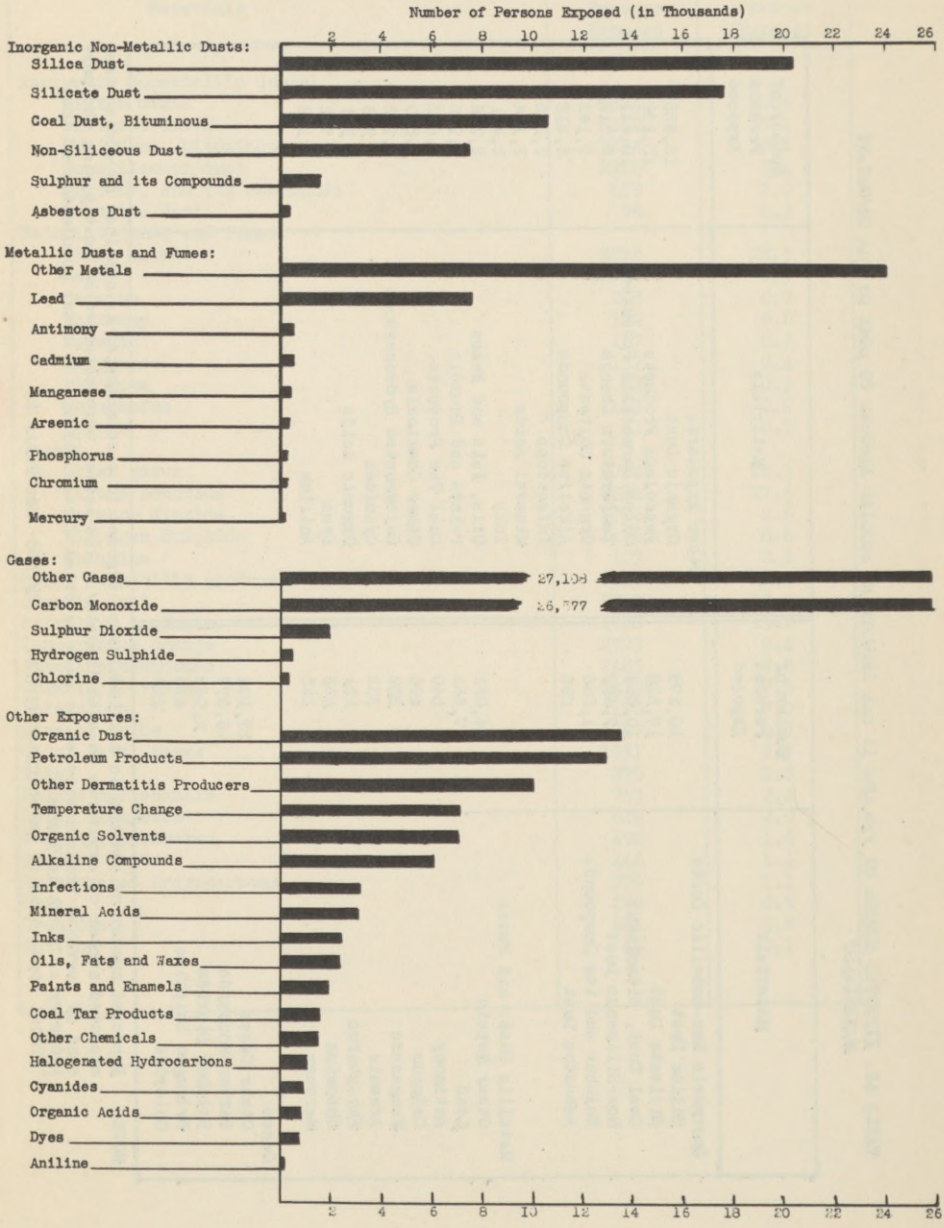


TABLE 46. PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL (FOR ALL INDUSTRIES SURVEYED)

Materials	Number of Exposures	Percentage of Exposed Workers Having Specified Control [Percentage, where less than 0.1, shown by (*)]									
		Positive Ventilation	Negative Ventilation	Local Exhaust	Enclosed Process	Wet Method	Gas Mask	Respirators	Air Line Respirators	Protective Clothing	Other
All Specified Materials	89119	12.4	12.1	6.3	6.3	4.1	.1	1.1	*	12.9	1.2
Other Metals	8876	6.3	7.2	5.9	1.8	4.1	-	.7	.1	26.9	.3
Other Gases	8795	24.1	18.6	9.1	17.3	-	.6	*	-	12.7	.3
Carbon Monoxide	8581	25.4	19.6	8.5	17.2	-	-	*	-	13.2	.3
Other Dermatitis Producers	6863	-	-	.6	.2	-	-	-	-	15.2	6.1
Silica Dust	6374	21.4	19.8	8.5	3.0	16.4	-	1.3	-	8.2	.4
Organic Dust	5750	8.0	12.4	11.8	5.8	1.8	-	1.1	-	2.4	1.2
Silicate Dust	5312	20.3	26.2	1.5	1.0	21.1	-	1.3	-	9.7	.5
Petroleum Products	4728	.6	1.1	.4	.2	-	-	*	-	11.3	-
Coal Dust, Bituminous	3154	38.2	24.5	2.8	.1	-	-	1.7	-	-	.1
Temperature Change	2923	6.4	-	-	-	-	-	-	-	18.9	-
Non Siliceous Dust	2916	9.5	10.0	8.9	1.8	6.0	-	2.6	-	9.2	.4
Lead	2767	3.8	5.9	16.7	9.2	-	-	1.7	-	10.2	3.5
Alkaline Compounds	2485	.5	1.8	5.2	3.5	.9	-	-	-	4.0	1.3
Ore Dust	2451	38.3	39.1	2.6	2.0	32.8	-	1.6	-	17.2	1.3
Organic Solvents	2415	9.7	16.9	8.7	6.6	-	*	2.3	.1	8.1	*
Infection	2170	-	-	-	.1	-	-	-	-	30.7	.1
Salts, Inorganic	1688	2.7	3.4	7.7	12.7	-	-	2.7	-	23.3	.7
Mineral Acids	1307	-	3.7	-	1.8	-	-	.1	-	14.2	3.5
Oils, Fats, Waxes	1031	.1	.1	16.0	14.3	-	-	-	-	12.4	.9
Inks	870	2.3	2.3	-	-	-	-	-	-	.8	-
Sulphur Dioxide	796	-	-	11.7	10.4	-	-	-	-	25.4	-
Paints & Enamels	753	6.0	23.0	1.6	1.9	-	.1	15.9	.3	4.4	.3
Sulphur	619	8.6	16.2	20.8	31.3	-	-	9.0	-	21.5	-
Other Chemicals	610	.5	7.2	27.4	21.3	-	-	-	-	21.5	.8
Coal Tar Products	492	-	1.4	2.8	.6	-	-	-	-	25.6	-
Organic Acids	446	2.7	9.0	-	3.8	1.6	-	-	.2	17.0	-
Halogenated Hydrocarbons	390	10.8	11.8	.8	5.9	-	-	-	-	-	.3
Lacquer & Varnish	356	1.1	22.8	7.6	7.3	-	.3	16.9	1.7	2.8	-
Dyes	282	1.1	1.8	1.8	7.8	5.3	-	.7	-	2.1	-
Cyanides	264	3.8	9.8	14.8	2.7	2.3	-	.4	-	11.7	4.2
Cadmium	208	-	-	61.5	63.5	-	-	13.0	-	61.5	38.5
Hydrogen Sulphide	176	-	2.3	11.4	5.1	-	-	15.3	1.7	9.1	37.5
Antimony	172	24.4	33.1	19.8	8.1	-	-	2.3	-	-	2.9
Arsenic	157	-	-	18.5	21.0	-	-	16.6	-	-	42.0
Manganese	137	-	-	1.5	1.5	-	-	30.7	-	10.2	-
Radioactive Substances	126	-	-	-	-	-	-	-	-	-	-
Benzene	106	3.8	34.0	3.8	-	-	-	17.0	-	-	-
Chlorine	103	23.3	14.6	2.9	38.8	14.6	-	-	-	1.9	-
Asbestos Dust	98	-	-	-	-	-	-	-	-	-	-
Chromium	89	-	3.4	6.7	-	-	-	-	-	25.8	2.2
Phosphorus	63	-	-	-	-	-	-	-	-	-	-
Aniline	45	-	26.7	-	-	-	-	-	-	6.7	-
Medicines	44	-	-	-	-	-	-	-	-	-	-
Fluorine	42	2.4	-	-	16.7	16.7	-	-	-	-	-
Mercury	41	-	-	7.3	34.1	-	-	-	-	2.4	-
Aldehydes	29	-	6.9	-	-	-	-	-	-	24.1	-
Alcohols, Esters, Ethers	19	94.7	94.7	-	5.3	-	-	-	-	-	-