FILE NAME: Jewelers (JEWEL)

DATE: 1979 Oct 2

DOC#: JEWEL005

DOCUMENT DESCRIPTION: Published Transcript of House Hearing

OCCUPATIONAL DISEASES AND THEIR COMPENSATION

Part 4: Jewelry Industry

HEARING

BEFORE THE

SUBCOMMITTEE ON LABOR STANDARDS

OF THE

COMMITTEE ON EDUCATION AND LABOR HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

FIRST SESSION

HEARING HELD IN PROVIDENCE, R.I., ON OCTOBER 2, 1979

Printed for the use of the Committee on Education and Labor

55-492 O

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1980

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OCCUPATIONAL DISEASES AND THEIR COMPENSATION

Part 4: Jewelry Industry

TUESDAY, OCTOBER 2, 1979

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON LABOR STANDARDS,
COMMITTEE ON EDUCATION AND LABOR,
Providence, R.I.

The subcommittee met, pursuant to notice, at 9:30 a.m., in the Rhode Island Health Department Building Auditorium, Providence, R.I., Hon Edward P. Beard (chairman) presiding.

Member present: Representative Beard.

Staff present: Earl Pasbach, counsel; Brenda Bergeron, staff assistant; Edie Baum, minority counsel for labor; and Bruce Wood, assistant minority counsel for labor.

Mr. BEARD. The Subcommittee on Labor Standards will now come to order.

This is one of a series of hearings that we have had. This is the first field hearing but we have had a series of hearings in Washington, D.C., covering occupational diseases. It is my pleasure, of course, to have the first field hearing of this committee in this Congress here in Rhode Island.

Today we will be covering a variety of occupational diseases and the problems that may be inherent to them. We are very happy to have a list of distinguished witnesses who will testify pro and con on problems that may or may not exist in the industry.

We are very happy to have here today representatives of the minority staff of the Labor Standards Subcommittee, Edie Baum and Bruce Wood.

We also have at my right Mr. Earl Pasbach who is the staff director on my committee.

Our first witness will be Dr. Philip J. Landrigan.

Dr. Landrigan, your testimony will be incorporated into the record in full. You can talk at random or read any portion of your statement that you wish.

Identify yourself and your particular position.

STATEMENT OF PHILIP J. LANDRIGAN, M.D., DIRECTOR, DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS AND FIELD STUDIES, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, CENTER FOR DISEASE CONTROL, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. LANDRIGAN. Thank you, sir.

My name is Dr. Philip Landrigan. I am a physician, a specialist in occupational medicine. I am employed by the U.S. Public Health Service at the National Institute for Occupational Safety and Health [NIOSH] in Cincinnati where I am the Director of the Division of Surveillance, Hazard Evaluations and Field Studies.

NIOSH is responsible for conducting research in occupational health, for developing recommended occupational safety and health standards, for providing technical assistance to employees and employers, and for conducting training and education programs aimed at protecting the health of workers. NIOSH has similar responsibilities to protect the health of miners under the Mine Safety and Health Act of 1977. I am pleased, Mr. Chairman, to have been invited here this morning to discuss with you some of the occupational hazards which confront workers employed in the jewelry industry.

As you know, southern New England has an enormous concentration of the jewelry manufacturing industry. According to NIOSH files, which are based on the Dun and Bradstreet Market Identifier File, Rhode Island alone has some 815 jewelry manufacturing establishments which employ over 31,000 workers, The costume jewelry industry is especially heavily represented and nearly one-half (13,437 of 30,819) of the costume jewelry workers in the country are employed in Rhode Island.

The jewelry industry in New England is an industry of small shops. Of the 815 jewelry manufacturing establishments in Rhode Island, 324 or 40 percent have fewer than 10 employees and another 411 or 50 percent have between 10 and 100 employees. In other words, approximately 90 percent of the jewelry manufacturing shops in the State have fewer than 100 workers employed. Only 6 percent of the plants in the State have from 100 to 500 employees and only 10 plants, according to our files, employ more than 500 workers. That information has important implications for the health of workers in the jewelry industry.

It has been shown repeatedly in NIOSH studies, and in studies of other investigators, that workers in small plants are often at greater risk of toxic occupational exposures and are at greater risk of suffering occupationally related illness and injury than are workers in larger plants. Certainly workers in small shops are less likely to be under adequate medical surveillance than workers in larger industrial establishments.

Workers in the jewelry industry may be exposed to a wide variety of toxic substances, including organic solvents, metal fumes, acid mists and asbestos. Jewelry workers may, in addition, be heavily exposed to noise and may be at high risk of physical injury, including amputation, as the result of working with improperly guarded machine tools and power presses. I would like to characterize the hazards faced by jewelry workers by describing in some detail the health effects of several substances used in the industry.

First of all I would like to talk about the solvent 1,1,1-trichloroethane, which is also known as methyl chloroform. 1,1,1-trichloroethane has come into increasing use in recent years as a degreasing or metal cleaning agent in the jewelry industry. Pieces of jewelry which are to be cleaned with trichloroethane are dipped into open tanks of the solvent or in some cases are suspended in containers of trichloroethane vapor. Trichloroethane is a highly volatile substance and in the absence of proper exhaust ventilation the exposure of workers to trichloroethane vapor can be intense.

Among the most harmful effects of trichloroethane exposure are those on the central nervous system. The chemical acts as a central nervous system depressant and at high doses has strong anesthetic properties. The neurologic symptoms commonly seen at lower doses of trichloroethane exposure include dizziness, nausea, vomiting, slowed reaction time and reduced manual dexterity.

Trichloroethane also has harmful effects on the circulatory system. Exposure to trichloroethane in animals produces a rapid drop in the blood pressure and a change in the heart rate. Continued exposure to high concentrations of trichloroethane has been noted to damage the heart muscle and to produce circulatory problems resulting in lung congestion. There have been occasional reports of serious cardiac arrhythmias—disturbances in the heart rhythm—in workers exposed to trichloroethane.

To protect workers against the harmful effects of trichloroethane, NIOSH has recommended that exposure to airborne vapors of the solvent not exceed 350 parts per million in any 15-minute period. NIOSH also has published a comprehensive list of recommendations for the proper ventilation of workshops in which trichloroethane is used and for the medical supervision of workers exposed to trichloroethane. These recommendations are included in the NIOSH "Criteria For a Recommended Standard on Occupational Exposure to 1,1,1-Trichloroethane" published in July 1976. That document is available from NIOSH and from the Government Printing Office. I am pleased to submit a copy for the hearing record.

Mr. BEARD. That will be accepted.

[The document to be furnished follows:]

exposure in excess of the recommended environmental limit, additional monitoring shall be promptly initiated. If confirmed, control procedures shall be instituted as soon as possible; these may precede and obviate confirmatory monitoring if the employer desires. Affected employees shall be advised that exposures have been excessive and be notified of the control procedures being implemented. Monitoring of these employees shall be conducted at least as often as every 30 days and shall continue until 7 successive samplings at least a week apart confirm that exposure no longer exceeds recommended limits. Normal monitoring may then be resumed.

For each TWA concentration determination, a sufficient number of samples to characterize each worker's exposure during each workshift shall be taken and analyzed. The number of TWA and ceiling concentration determinations for an operation shall be based on such factors as the variations in location and job functions of workers in that operation.

(c) Recordkeeping

Environmental monitoring records shall be maintained for at least 20 years. These records shall include methods of sampling and analysis used, types of respiratory protection used, and TWA and ceiling concentrations found. Each employee shall be able to obtain information on his own environmental exposures.

Pertinent medical records shall be retained for 20 years after the last occupational exposure to 1,1,1-trichloroethane. Records of environmental exposures applicable to an employee should be included in that employee's medical records. These medical records shall be made available to the designated medical representatives of the Secretary of Labor, of the Secretary of Health, Education, and Welfare, of the employee, and of the employee or former employee.

Dr. LANDRIGAN. Exposure to metal fumes is another occupational hazard in the jewelry industry. Fumes of zinc or copper liberated during soldering or metal pouring can cause an illness called "metal fume fever." In this condition a worker experiences chills, fever, and often chest pain and difficulty in breathing. The onset of symptoms is often delayed for 8 to 12 hours after exposure so that frequently the worker feels well during the working day but goes home in the evening after being exposed to metallic fumes and develops these symptoms at night.

If the worker is examined at the time when he is ill, he is usually found to have a low-grade fever and very frequently will have an elevated white blood cell count. Although the acute illness subsides spontaneously after a few hours, or at most in a day or two, repeated episodes of metal fume fever may cause permanent lung injury to workers.

Another serious hazard of the jewelry industry is exposure to lead. Exposure to the lead fumes may occur in jewelry manufacture. Such exposure can cause the full spectrum of lead poisoning, including abdominal cramps, tremor, anemia, neurologic damage and in severe cases chronic kidney disease.

Cadmium is another hazard faced by some jewelry workers. It is a toxic metal used frequently in soldering, particularly in silver jewelry. Acute exposure to cadmium fumes can cause intense irritation of the eyes, nose and respiratory tract, while chronic exposure may lead to lung and kidney damage and occasionally to lung cancer.

Several years ago our group was asked to investigate an epidemic of unusual illness in a small jewelry factory in Albuquerque, N. Mex., in which the prominent symptoms were fatigue, nasal congestion, cough, and chest pain. One or more of those symptoms was experienced by 27, or 75 percent, of the 36 workers in the plant, and all of the workers with symptoms were involved in soldering operations. We learned that the symptoms had begun to appear several months earlier, shortly after a new soldering material, labeled simply "silver brazing compound" had been introduced into the plant process.

In the course of our investigation we found that the so-called "silver brazing compound" was in fact an alloy which contained 15.6 percent cadmium. When this alloy was heated, toxic concentrations of cadmium fumes were liberated into the workroom air where ventilation was quite inadequate. We found increased concentrations of cadmium in the blood and urine of the exposed workers. Symptoms largely ceased when the "silver brazing compound" containing cadmium was removed from the plant process. When we reevaluated the workers approximately 1 year later, we found that symptoms had virtually disappeared.

That episode illustrates two points. First, it illustrates the hazards of cadmium exposure in a small shop, but also and perhaps more importantly it illustrates the dangers inherent in the widespread practice of not properly labeling commercial products and of not informing workers of the toxic components which are often found in industrial materials.

The effects of exposure to trichloroethane and metal fumes are often reversible. For the most part if the exposure is eliminated, the worker's health can generally be restored. There are, however, some

substances to which jewelry workers are exposed which can produce irreversible damage. Asbestos, my final example this morning, is such a substance.

Asbestos boards are used in many small jewelry shops on counter tops, for example, to provide a heat resistant surface. Asbestos fibers are used as an abrasive in sanding and polishing operations, and in many of these operations asbestos fibers can be liberated into workplace air. If inhaled by workers, these fibers can lodge in the lungs where they may produce serious and irreversible injury. Lung damage caused by asbestos includes asbestosis, a chronic debilitating lung disease in which the normal elastic tissue of the lung is replaced by fibrous scar tissue and of which the principal symptom is extreme difficulty in drawing breath. Other diseases caused by asbestos exposure are lung cancer and mesothelioma, a very rapidly fatal tumor of the external lining of the lungs.

In summary, it is clear that jewelry workers in New England and elsewhere can be exposed to a number of toxic substances in their work which can seriously affect their health. It is the responsibility of each employer to assure that these exposures do not exceed current OSHA standards. Furthermore, both employers and employees need to be informed as to the toxic components of the substances that are being used, they need to know safe handling practices, they have to know what emergency remedies are available and they have to know proper means for safe disposal of toxic materials.

Any employer or employee representative or any group of employees in the jewelry industry or, for that matter, in any shop in New England who suspects that he or his fellow workers are getting sick as a result of toxic occupational exposures can request a Health Hazard Evaluation of their workplace from NIOSH. A very simple 1-page form is all that is required to request such an evaluation, and in fact if the form is not available, a person need only give us a phone call.

We can get a team out within 24 hours in an emergency, and within 1 week in routine cases, to perform preliminary evaluations of the workplace to judge whether or not there are toxic hazards present. If there do appear to be toxic hazards, we can send back a complete team consisting of doctors, and industrial hygienists, to do a complete characterization of the workshop and to document the hazards and to make recommendations as to what preventive measure ought to be taken. I encourage any employers or employee representatives who are here today to get in touch with us if you would like to request a health hazard evaluation of any workplaces in Rhode Island or elsewhere in New England.

In the jewelry industry we recommend that operations involving cleaning, painting, glueing, soldering, brazing, plating, and grinding have local ventilation so that toxins are carried away from workers. Workers using toxic chemicals, such as cleaning compounds, should not only avoid inhalation of those compounds but should also be provided with and should wear impervious clothing, including gloves, boots, aprons, and eyewear that will protect against splashes.

Chemicals should be labeled and information on potential health hazards should be readily available on toxic substances used in the industry. Chemicals must be stored and mixed in ways that eliminate the hazards of explosion or formation of highly toxic compounds such as cyanide. Work areas should be separate from eating areas and restrooms, and workers should remove their protective clothing and wash their hands when leaving the work area. By keeping employee exposures to a minimum through adequate engineering controls and good work practices, employers can help assure that jewelry workers are not harmed by the potentially dangerous chemicals used in the industry.

Mr. Chairman, thank you. I will be pleased to try to answer any questions.

[The prepared statement of Dr. Landrigan follows:]

PREPARED STATEMENT OF DR. PHILIP J. LANDRIGAN, DIRECTOR, DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS AND FIELD STUDIES, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH CENTER FOR DISEASE CONTROL DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

My name is Dr. Philip J. Landrigan. I am a physician, a specialist in occupational medicine, and Director of the Division of Surveillance, Hazard Evaluations and Field Studies of the National Institute for Occupational Safety and Health (NIOSH). NIOSH is responsible for conducting research, developing recommended occupational safety and health standards, providing technical assistance to employees and employers, and conducting training and education programs. NIOSH has similar responsibilities to protect the health of miners under the Mine Safety and Health Act of 1977. I am pleased to have been invited to discuss some of the occupational hazards which confront workers employed in the jewelry industry.

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The jewelry industry in New England is an industry of small shops. Of the 815 jewelry manufacturing establishments in Rhode Island, 324 (40 percent have fewer than 10 employees and another 411 (50 percent have between 10 and 100 workers. Only 60 of the plants in the state have from 100 to 500 employees and only 10 employ more than 500 workers. That information has important implications for the health of workers in the jewelry industry. It has been shown repeatedly in NIOSH studies, and in those of other investigators, that workers in small plants are often at greater risk of toxic occupational exposure and are at greater risk of suffering occupationally-related illness and injury than are workers in larger plants. They are certainly less likely to be under adequate medical surveillance.

Workers in the jewelry industry may be exposed to a wide variety of toxic substances, including organic solvents, metal fumes, acid mists, and asbestos. Jewelry workers may, in addition, be heavily exposed to noise and may be a high risk of physical injury, including amputation, as the result of working with improper guarded machine tools and power presses. I would like to characterize the hazards faced by jewelry workers by describing in some detail the health effects of several substances used in the industry.

The solvent 1,1,1-trichloroethane (also known as methyl chloroform) has come into increasing use in recent years as a degreasing or metal cleaning agent in the jewelry industry. Pieces of jewelry to be cleaned are dipped into open tanks of this solvent or are suspended in containers of trichloroethane vapor. Trichloroethane is a volatile substance, and in the absence of proper exhaust ventilation the exposure of workers to chloroethane vapor can be intense.

Among the most harmful effects of trichloroethane exposure are those on the central nervous system. The chemical acts as a central nervous system depressant and at high doses has anesthetic properties. The neurologic symptoms commonly seen at lower doses of trichloroethane exposure include dizziness, nausea, vomiting, slowed reaction time, and reduced manual dexterity.

Trichloroethane also has harmful effects on the circulatory system. Exposure to trichloroethane in animals produces a rapid drop in the blood pressure and a change in the heart rate. Continued exposure to high concentrations of trichloroethane has been noted to damage the heart muscle and produce circulatory prob-

lems resulting in lung congestion. There have been occasional reports of serious cardiac arrhythmias (disturbances in the heart rhythm) in workers exposed to trichloroethane.

To protect workers against the harmful effects of trichloroethane NIOSH has recommended that exposure to airborne vapors not exceed 350 parts per million (ppm) in any 15-minute period. NIOSH also has published a comprehensive list of recommendations for the proper ventilation of workshops in which trichloroethane is used and for the medical supervision of exposed workers. These recommendations are included in the NIOSH "Criteria For a Recommended Standard on Occupational Exposure to 1,1,1-Trichloroethane," published in July 1976, which is available from NIOSH and from the Government Printing Office.

Exposure to metal fumes is another occupational hazard in the jewelry industry. Fumes of zinc or copper liberated during soldering or metal pouring can cause an illness called "metal fume fever." In this condition a worker experiences chills, fever, and often chest pain and breathing difficulty. The onset of symptoms is often delayed for 8 to 12 hours after exposure and thus frequently occurs during the nighttime hours. When the worker is examined he often has a low-grade fever and an elevated white blood cell count. Although the acute illness subsides spontaneously after a few hours, or at most in a day or two, repeated episodes of metal fume fever may cause permanent lung injury.

Exposure to the lead fumes may occur in jewelry manufacture, which can cause the full spectrum of lead poisoning, including abdominal cramps, tremor, anemia, neurologic damage, and in severe cases, chronic kidney disease.

Cadmium is another hazard faced by some jewelry workers. It is a toxic metal used frequently in soldering, particularly in silver jewelry. Acute exposure to cadmium fumes can cause intense irritation of the eyes, nose, and respiratory tract, while chronic exposure may lead to lung and kidney damage and occasionally to lung cancer.

Several years ago I was asked to investigate an epidemic of unusual illness in a small jewelry factory in which the prominent symptoms were fatigue, nasal congestion, cough, and chest pain. One or more of the symptoms was experienced by 27 (75 percent) of the 36 workers in the plant. All of the workers with these symptoms were soldering workers. We learned that the symptoms began appearing several months earlier shortly after a new soldering material, labeled simply "silver brazing compound," had been introduced into the plant process. In the course of our investigation we found that the so-called "silver brazing compound" was in fact an alloy which contained 15 percent cadmium, and that when this alloy was heated, toxic concentrations of cadmium were liberated into the workroom air where ventilation was quite inadequate. We also found increased concentrations of cadmium in the blood and urine of the exposed workers. One year later, following removal of the cadmium soldering compound from the plant, we found that symptoms had disappeared in most of the ill employees. This episode illustrates not only the hazards of exposure to cadmium fumes, but also demonstrates the dangers inherent in the widespread industrial practice of inadequate product labeling.

The effects of exposure to trichloroethane and metal fumes are often reversible. If the exposure is eliminated, the worker's health can generally be restored. However, some substances to which jewelry workers are exposed may cause irreversible damage. Asbestos, my final example today, is such a substance. Asbestos boards are used in many jewelry shops to provide a heat-resistant surface for soldering and metal pouring. Asbestos fibers are used as an abrasive in sanding and polishing operations. In many of those operations, asbestos fibers can be liberated into workplace air. If inhaled by workers, these fibers can lodge in the lungs where they may produce serious and irreversible injury. Lung damage caused by asbestos includes asbestosis, a chronic debilitating lung disease in which the normal elastic tissue of the lung is replaced by inelastic scar tissue. Other diseases caused by asbestos exposure are cancer and mesothelioma, a rapidly fatal tumor of the external lining of the lungs.

It is clear that jewelry workers can be exposed to a number of toxic substances which can seriously affect their health. It is the employer's responsibility to assure that exposures do not exceed current OSHA standards. Both employers and employees need to know what substances are being used, as well as symptoms of overexposure, safe handling procedures, emergency care and proper disposal methods.

Any employer or employee representative who suspects that workers are getting sick as a result of workplace exposures can request a health hazard evaluation from NIOSH. NIOSH will send out a team of occupational health specialists to determine whether workers are exposed to harmful levels of toxic substances and conduct medical examinations if necessary. NIOSH also generally makes specific recommendations for engineering controls and work practices to assure that employees are protected from hazardous exposures.

In the jewelry industry we recommend that operations involving cleaning, painting, glueing, soldering, brazing, plating and grinding have local ventilation so that toxins are carried away from workers. Workers using toxic chemicals, such as cleaning compounds, should not only avoid inhalation, but should also wear impervious clothing, including gloves, boots, apron, and eyewear that will protect against splashes. Chemicals should be labeled and information on potential health hazards be readily available. Chemicals must be stored and mixed in ways that eliminate the hazards of explosion or formation of highly toxic compounds. Work area. By keeping employee exposures to a minimum through adequate engineering remove their protective clothing and wash their hands when leaving the work area. By keeping employee exposures to a minimum through adequate engineering controls and good work practices, employers can help assure that jewelry workers are not harmed by the potentially dangerous chemicals used in the industry.

Mr. Chairman, I will be pleased to try to answer any questions you may have.

Mr. BEARD. Thank you very much for your excellent testimony and for making the trip here. I know you came quite a distance to be here today. Let me ask you about the jewelry industry in Rhode Island. Is there danger in electroplating?

Dr. LANDRIGAN. Yes, sir. I did not go into that in detail. It is my understanding that Mr. Hickey from the State health department will cover that. There are hazards that include exposures to acid mixtures, there is the hazard of electrocution, there are hazards of burns.

Mr. BEARD. How does the Rhode Island jewelry industry look to your organization?

Dr. LANDRIGAN. Well, I think the overall industry is made up of small shops, and we know through bitter experience that small shops are dirty shops. It is in small shops that health problems are most abundant. Though we have looked at only three jewelry plants in my experience—one in New Mexico, one in Attleboro, Mass., and one in Cincinnati—it is our experience that most small jewelry shops have problems of poor housekeeping, poor work practices, and inadequate ventilation.

Mr. BEARD. As far as monitoring jewelry shops, is it true that you have had just one visit to Rhode Island, the jewelry capital of this country?

Dr. LANDRIGAN. Right.

Mr. BEARD. Do you think that there should be a number of visits throughout the year since this industry has so many problems?

Dr. LANDRIGAN. Of course the State health department is doing monitoring. We would be more than happy to come in whenever requested and to come in on short notice.

Mr. BEARD. I see. What about, for example, the lead? How much of a problem is lead as far as this industry goes?

Dr. LANDRIGAN. Lead certainly is used in the industry, especially in soldering operations. I don't have numbers of how many cases of lead poisoning occur each year.

Mr. BEARD. Are you familiar with polishing?

Dr. LANDRIGAN. Yes.

Mr. BEARD. What about the rouge?

Dr. LANDRIGAN. Some of those contain lead, that is right.

Mr. BEARD. I would like to recognize at this time Edie Baum, the minority counsel of our committee. Edie, do you have some questions?

Ms. BAUM. Thank you very much for your testimony.

I want to ask you one thing. You say employers can request your assistance to come in. Does NIOSH make any effort to notify employers by letter or publications of the dangers of these substances in the jewelry industry?

Dr. LANDRIGAN. NIOSH has produced various books relating to specific substances that are used in the jewelry industry, such as the book on trichloroethane that I submitted for the record a few moments ago. We have not put out any publication that relates specifically to the jewelry industry. The best report that I have seen summarizing hazards in the jewelry industry is an article, with which you may be familiar, by Gail Martin called Hidden Jeopardy to Jewelry Workers. This article appeared recently in one of the professional occupational and health safety journals

Ms. BAUM. In relation to your publication that is available, is that an OSHA standard?

Dr. LANDRIGAN. The document is in the form of a NIOSH recommendation to OSHA, for a standard.

Ms. BAUM. Thank you.

Mr. BEARD. Mr. Bruce Wood, minority assistant counsel.

Mr. WOOD. Doctor, you mentioned the NIOSH recommendation for trichloroethane, 350 parts per million. What is the basis of NIOSH's recommendation?

Dr. LANDRIGAN. Well, it is based fundamentally on the observation that trichloroethane can produce central nervous system disorders and can produce circulatory disorders at high dosage. We try to extrapolate downward to determine what is a safe level of exposure. We have concluded on the basis of an extensive review of the evidence that 350 parts per million would represent such a safe exposure level in any 15-minute period.

Mr. WOOD. So as far as you know now there are no hazards of below 350 parts per million?

Dr. LANDRIGAN. As medical science advances and as additional details are learned about the toxic effects of any compound, it has been our frequent experience to learn that levels of exposure that have previously been considered safe turn out to be hazardous. I have had a great deal of experience with exposure to lead. It was not so long ago that 200 micrograms of lead was considered a safe level in lead workers, then 100. Now on the basis of quite careful research OSHA has said that blood lead level over 40 micrograms is sufficient to produce harm. Although the same amount of information is not yet available about trichloroethane, we always have to be suspicious that new, presently unrecognized toxic effects may come to be recognized at lower levels of exposure.

Mr. WOOD. Are there continuing NIOSH studies into the lower level?

Dr. LANDRIGAN. Probably the most important trichloroethane study that is going on in the country today is what is called a carcinogenesis bioassay which is proceeding at the National Cancer Institute. In that study rats are fed carefully measured concentrations of trichloroethane and they will be exposed to the compound daily for several years. It is a study that extends over the lifetime of the rats and at the end of that study the rats will be sacrificed and they will be examined to determine whether or not they have developed cancer as a result of exposure to trichloroethane. No results on that study are yet available.

Mr. WOOD. I had a question regarding your comments with respect to cadmium induced cancers. Is there any medical basis for being able to determine when an individual has a lung cancer that it was caused by one substance or another substance? Has this individual had a cadmium associated lung cancer?

Dr. LANDRIGAN. That is a difficult issue. Let me tell you how NIOSH reached the conclusion that cadmium was capable of causing lung cancer. Several years ago we did a study of workers in a large cadmium smelter in Denver. We obtained from the plant management a roster of all the workers who had been employed in the smelter over a 29-year period—1940–1969—and we traced their whereabouts as of January 1, 1974. We were able to locate the current whereabouts of 92 percent of the 292 workers in the plant. For those that were alive, we simply noted that they were alive and closed their files.

For those who had died we obtained death certificates and then we compared the distribution of their deaths with the distribution of deaths that would be expected in a population of American males of the same age and the same race. We found in the workers employed at the cadmium smelter that there was an excess of deaths due to lung cancer over what would be expected. We consider that finding to be quite good evidence to indicate that the cadmium had caused lung cancer in the workers.

Your point is well taken, however, that in the individual case when a person comes to the hospital with lung cancer or dies of lung cancer, it is impossible to tell by examining the tissues whether this particular cancer was caused by cadmium, whether it was caused by asbestos whether it was caused by trichloroethane or by smoking.

Mr. WOOD. You spoke about a NIOSH investigation or health evaluation effort. How many employers in the State of Rhode Island has NIOSH evaluated to date? Is it fairly extensive, do you know?

Dr. LANDRIGAN. I know that we have one evaluation that is pending right now of a firm in Rhode Island, not of a jewelry firm but of I believe it is a wire production firm.

Mr. WOOD. How long has this evaluation effort been ongoing in Rhode Island?

Dr. LANDRIGAN. We received the request for that one about 10 days ago.

Mr. WOOD. The whole evaluation in Rhode Island?

Dr. LANDRIGAN. The program is a national program, it has been available since 1972. Each year across the country we do between 100 and 200 evaluations strictly on request basis, either as requested by workers or by management. Two-thirds of the evaluations we do are sought by workers and by unions and about one-third by management.

Mr. WOOD. The information that you obtained from these evaluations, is it shared under any system with OSHA?

Dr. LANDRIGAN. Yes, it is quite widely distributed. It goes back to the workers, it goes back to plant management. It is also publicly available.

Mr. WOOD. And, therefore, it can be the basis for an OSHA investigation at a later date?

Dr. LANDRIGAN. It is OSHA's practice now under an interagency agreement with NIOSH to do two things. First of all upon their receipt of our report they make it a practice to notify the employer

that they have received the report and they usually inform the employer that they are going to do an inspection of the plant in either 4 or 6 months. Of course, in an emergency situation if there were a serious imminent hazard they would come in sooner, but in the routine course of events they will inspect in 4 to 6 months. As I say, they do give the employer several months forewarning of their intent to inspect.

Mr. WOOD. Thank you, Dr. Landrigan.

Thank you, Mr. Chairman.

Mr. BEARD. Just one last comment. I have personally been working on a bill that would require proper labeling of various chemicals or hazardous materials. Paint remover is a good example. The label says, "Do not take internally." Well, I just can't believe that someone would drink paint remover. I can understand this warning for children and even at that, paint remover should not be anywhere near children. Ninety-nine percent of the material is used by adults.

I think the label should cite the effects of inhaling paint remover—something that would make sense. No one is going to drink paint remover and that is basically the message you now have on a can of paint remover.

I would like to require that a respirator, for example, must be used and to take precautions. There should be some warning on the label that is going to make sense to the person that works with that material. Would you be in favor of that type of information?

Dr. LANDRIGAN. Yes. I think the problem of inadequate labeling on paint remover is a good example, because depending upon the brand it can contain wood alcohol or other very toxic solvents. A few years ago many home products contained benzene. I think proper labeling is essential.

Mr. BEARD. That is just one example. There are a variety of materials the labels of which just fail to reflect the many serious problems that it could cause the worker.

Thank you very much. We appreciate your taking the time to come here. Your testimony certainly has been a help to this committee.

Dr. LANDRIGAN. Thank you, Mr. Chairman.

Mr. BEARD. The next witness is Mr. James Hickey, chief, division of occupational health and radiation control for the Rhode Island Health Department.

Mr. Hickey, if you have a prepared statement, it will be received in total in the record and you may proceed at your leisure.

STATEMENT OF JAMES HICKEY, CHIEF, DIVISION OF OCCUPATIONAL HEALTH AND RADIATION CONTROL, RHODE ISLAND HEALTH DEPARTMENT, PROVIDENCE, R.I.

Mr. HICKEY. Thank you very much.

I am James Hickey, Chief of the Division of Occupational Health and Radiation Control in the Rhode Island Health Department. Others, including Dr. Weisberg of our division, will testify concerning specific health hazards in the jewelry industry in Rhode Island and various activities of our division in the field of occupational health. Therefore, I shall not comment on specific hazards in my statement. Rather, I shall discuss some reasons why I believe the average employer in the jewelry industry in Rhode Island has difficulty in meeting his employees' occupational health needs and in controlling employee exposures to hazardous chemicals and physical agents. I shall also mention a new consultation service provided by the department of health to assist employers to meet occupational health and safety needs.

The problems to which I refer are those which seem to be characteristic of most small businesses. In Rhode Island over 90 percent of the jewelry manufacturing businesses employ less than 100 people. Almost 55 percent of all employees in jewelry manufacture work for small plants. As a rule, the smaller the employer, the less time and resources are devoted to health and safety programs, and issues, although there are many exceptions on both sides.

What are some of the common problems of these small businesses? One relates to health programs for employees. In these plants a large percentage of workers are unskilled, non-English speaking, and have low incomes. There is also a large percentage of women, raising the potential that unborn children may be exposed to hazards. This population might be assumed to be at a greater risk from health hazards due to poor general health, lack of general education, as well as specific training and communication difficulties. They are also less likely to complain about conditions.

Very few are represented by labor organizations of any kind. They are more likely to suffer from chronic conditions related to poor nutrition, poor health care and practices, poor smoking, drinking and drug habits, and greater life stress than other groups of employees. Good comprehensive employee health programs, including health education and counseling, would undoubtedly benefit many of these employees. However, employee medical programs are practically nonexistent in small businesses in Rhode Island.

A promising approach to this problem is the community based occupational health service. The Rhode Island Group Health Association is presently studying the feasibility of this approach. We encourage and support this concept. Funding is a major issue, and it may be that government subsidies in some form are required to establish these services.

Another major factor affecting small businesses is that while they frequently have greater health and safety needs than larger companies, they have little or no technical expertise to deal with these problems. Examples include: Poor physical plant creating safety and health problems; improper and inadequate ventilation systems and other engineering controls; lack of environmental monitoring capabilities; lack of knowledge relating to toxicity of materials in use; lack of attention to safety and health programs, including those to provide personal protective equipment; and lack of knowledge of regulatory requirements with the result that compliance with safety procedures is not demanded on a continuing basis.

To assist small employers with technical problems and other problems, the Rhode Island Department of Health is offering a new onsite consultation service. This is a professional service staffed by industrial hygienists and a safety engineer. It is not an enforcement program but is designed to provide direct assistance to the small employer without fear of citations and fines. The program is confidential and services are provided at no charge to the employer. Employers must make a request to the department of health to receive these

Mr. Wood. I see. Thank you.
Mr. Beard. Thank you very much, Doctor.
Is Mr. Weisberg going to testify also?
Mr. Hickey. Yes.
Mr. Beard. Well, thank you for your testimony.
Next I would like to call on Dr. Robert Weisberg, occupational health specialist, Division of Occupational Health and Radiation Control, Rhode Island Health Department, Providence, R.I.
Welcome to the committee. You may proceed at your leisure.

STATEMENT OF ROBERT F. WEISBERG, Ph.D, OCCUPATIONAL HEALTH SPECIALIST, DIVISION OF OCCUPATIONAL HEALTH AND RADIATION CONTROL, RHODE ISLAND HEALTH DEPARTMENT, PROVIDENCE, R.I.

Mr. Weisberg. My name is Robert F. Weisberg, Ph. D., and I am an occupational health specialist in the Division of Occupational Health and Radiation Control in the Rhode Island Department of Health.

The true extent of the problem of occupational disease in the jewelry industry is essentially unknown. The availability of records in Rhode Island is so sparse that, although most of the U.S. made costume jewelry is manufactured here, the National Cancer Institute decided to conduct a mortality study in New York where there is better employment information.

In order to appreciate the problems, table 1 lists some 55 substances that have been found in the workplace in jewelry and electroplating firms. This has been accumulated in our files, and, since we have not visited every establishment, the list could probably be expanded. The potential disease outcomes due to exposure to the various substances are well documented in the NIOSH publication, Occupational Diseases: A Guide to Their Recognition.

The question is how many people are employed in the industry. The answer shown in table 2 is that close to 38,000 people work in the industry. The next logical question is what is the size of the establishments, since large firms often have more available expertise and cash flow for dealing with health and safety problems. The answer, shown in table 3, is that the vast majority of plants are small. Combined with the socioeconomic conditions of the State, it is difficult for our division to exert a great impact on conditions at this time as has been mentioned by Mr. Hickey.

Our activities are primarily directed at responding to complaints. Looking through our files presents an astounding fact: We have no documentation of occupational disease in the jewelry industry. We have heard testimony in previous hearings and will hear more later on today, I am sure, which claims to refute such a conclusion. Apparently we don't receive the information in our office.

Occupational disease in Rhode Island is reportable by law with the confidentiality of the report from the physician being maintained. In the past year we have received three forms, two of them concern people who work out of State, and one of them concerns a person who died, but worked in a plant out of State, so in essence we have no information on this reporting system of occupational disease.

The difficulty that we then are presented with is identifying the

of action. First, in conjunction with the occupational carcinogen project of the Rhode Island cancer control program, workplace exposures in the jewelry industry will be quantified by traditional industrial hygiene techniques.

The second approach is the development of a comprehensive health data system on the workers in the State. The proposal is being developed by the department of health in conjunction with the division of worker compensation and the temporary disability insurance program of the department of employment security to set up such a program. We hope to be able to determine the prevalence of all the health problems experienced by workers in our State. Then, based on documented information on occupational disease, programs can be initiated which are directed at target problems identified by the system.

With regard to compensation, our function is one of impartially gathering monitoring data. If our data system becomes operational, it may help to speed up the process by demonstrating disease associations and occupations. However, proof of causality will remain the burden of the worker and his lawyer, with the decision to be made by the commission.

That is really all I had to say. I appreciate your consideration. I am willing to answer any questions you may have.

[Tables 1, 2, and 3 referred to above follow:]

TABLE 1—POTENTIAL EXPOSURES ENCOUNTERED DURING HEALTH DEPARTMENT INVESTIGATIONS

JEWELRY INDUSTRIES SIC'S 3911, 3914, 3915, 3916

Acetic acid, pentyl ester, acetone, acrylate resins, aerylic acid, methyl ester, adhesive, alcohols, aluminum, ammonia, antimony, asbestos, beryllium, boric acid, brass, butanone, peroxide, carbon monoxide, caustics, chromium, cobalt, copper, cutting oils, cyanides, dust, ethane, 1,1,1-trichloro-ethanol, 2-methoxy acetate, ethylene, tetrachloro-ethylene, trichloro-fiberglass gold, hydrogen, hydrogen peroxide, iron oxide, lacquer, lead, methacrylic acid, methyl ester, methane, chloro difiouro-methyl ethyl ketone, methyl isobutly ketone, mica, nickel, noise, petroleum spirits, polyethylene, polypropoylene, resins, rhodium, silica, silver, sodium hydroxide, solder, stripper, styrene, polymer, styrene, monomer, talc, tin, toluene, xylene, zinc, zinc oxide.

ELECTROPLATING SIC'S 347

Acetic acid, (ethylene ainitrilo) tetra-acetone, acids, aluminum, ammonia, antimony, bismuth, brass, cadmium, carbon monoxide, chromic acid, copper, cvanides, dust, ethane, 1,1,1-trichloro-ethylene, tetrachloro-ethylene, trichloro-fluoride, gold, hydrogen fluoride, iron oxide, isopropanol, lacquer, lead, methane, chloro, difluoro-methane dichloro-methylethylketone, nickel, petroluem spirits, rhodium, silica, sodium chloride, sodium hydroxide, solder, stryene, monomer, tin, toluene, toluene, vinyl, xylene, zinc.

TABLE 2.—EMPLOYMENT IN JEWELRY AND ELECTROPLATING IN RHODE ISLAND, SEPTEMBER 1978

SIC	Number of firms	Total covered employment
3471	134	3,096
3479	53	534
3911	261	8,836
3914	12	1,058
3915	133	4,044
3961	781	20,055
Total	1,374	37,625

TABLE 3 – DISTRIBUTION OF EMPLOYMENT IN JEWELRY AND ELECTROPLATING IN RHODE ISLAND, MARCH 1978[1]

SIC	0 to 3		4 to 9		10 to 19		20 to 49	
	Firms	Employees	Firms	Employees	Firms	Employees	Firms	Employees
3471	28	33	32	201	35	462	27	778
3911	92	127	76	442	37	478	9	604
3914	(2)	(2)	(2)	(2)	3	40	5	132
3915	25	25	25	245	27	358	27	895
3961	264	326	194	1,205	113	1,574	109	3,196

SIC	50 to 99		100 to 249		250 to 499		500 to 999	
	Firms	Employees	Firms	Employees	Firms	Employees	Firms	Employees
3471	12	868	(3)	(3)	(3)	(3)		
3911	15	2,319			(3)	(3)		
3914							(4)	(4)
3915	18	1,170	(5)	(5)	(5)	(5)	(5)	(5)
3961	42	2,763	28	3,845	11	3,875	3	1,776

[1] Rhode Island Department of Employment Security, Division of Research and Statistics.
[2] Combined for purposes of confidentiality: 3 firms, 679 employees.
[3] Combined with firms of more than 1,000 employees: 4 firms, 3,746 employees.
[4] Combined for purposes of confidentiality: 4 firms, 800 employees.
[5] Combined for purposes of confidentiality: 4 firms, 1,367 employees.

Mr. BEARD. So really with the thousand shops you mentioned, you have only, I think you mentioned, two cases that are actually on file?

Mr. WEISBERG. We don't have any cases of disease.

Mr. BEARD. No cases at all?

Is it a problem of not having the ability to identify the workers in an area who have a particular problem of which they are not aware? For example, it was only recently, in the last 10 years maybe, that one Dr. Selikoff of Mount Sinai related asbestosis to asbestos materials and ultimately to the shipyards. Of course you know from our hearings in Washington that we have had a number of hearings that have covered a variety of occupational diseases that were unknown in the Navy shipyards, Kaiser shipyard in Providence and so on.

It has been indicated here that we don't know the size of the shops—and I even question the number of shops—and what kind of health standards they have. Because of the small staff that you people have, we don't know what the situation is. That is basically the bottom line here in Rhode Island.

Mr. WEISBERG. That is right.

Mr. BEARD. We really don't know what the conditions are that people are working under and I doubt very much if the industry or the association itself would know. I have to say this, though. I have toured recently some of the jewelry shops in Rhode Island that were members of the jewelry association and they were very clean shops from what I could observe, although I am not a professional person in that area as far as the chemicals and so on. On the other hand, from tours in previous years to various shops, I have found that noise pollution is a definite problem.

As a youngster I worked in a shop with acids and so on, where few or no precautions were taken, but that may be small- or medium-sized shops I think we have to do an awful lot. One thing this hearing is bringing out today is that we are just finding out how extensive the problem may be.

From the manufacturing point of view, the labeling is extremely important not just to jewelry workers but to a variety of people that work with chemicals that could cause harm and this is really not

about compensating occupational disease in that symposium were valid. Will you review for us what those points are?

Mr. WEISBERG. Yes, if I may read them.

It says that there is a potential coverage in liability through interpretations of existing laws which leads to a concern over three major subissues:

First: Whether the individual employer should bear the cost where the incidence of disease is widely evident throughout a single industry;

Second: Problems of dual causation as in the case of asbestos workers who smoke thereby exacerbating an original exposure; and

Third: The impact of the natural aging process and the decline of organic ability.

Eight reasons have been given why occupational information does not get to the workers:

One: Frequently because of lack of awareness of possible hazards and of the worker compensation process.

Two: Worker compensation agencies have not educated management, labor, or the public about occupational disease hazards and rights under State laws.

Three: Statutes of limitation for filing of claims are often too short. This is particularly in regard to the idea of latency with asbestos which is 20 years or more.

Four: Problems of establishing the causal connection between the work environment and a particular disease. This is often a question of adequate recordkeeping or environmental analysis.

Five: Participate in the adversary workers adjudicary process.

Six: Lack of clear, contemporary definitions of compensable disabilities.

Seven: Workers compensation administrative delays which discourage filing of claims

Eight: Employee fears of economic sanctions against them by their employer.

Mr. WOOD. Is it your impression that the statute of limitations under the Rhode Island Workers Compensation Act is preventing workers from being adequately compensated at all for occupational diseases in this State?

Mr. WEISBERG. The odds are that for some diseases, as we learn more about the disease process, the latency period will exceed the limitation. It is a matter of how the laws are written. In some States the laws are written from the time of last exposure to when this period of ability to file for a claim is exerted. In other States it is from the time that the disease is first demonstrated or that the potential of disease is first demonstrated. So in the case of, say, an asbestos worker who just found out that he was exposed to asbestos and could be developing the disease, it is from that point that the statute of limitations runs. In each State it is different. I am not exactly sure of what the law is in the State here.

Mr. WOOD. Thank you, Mr. Weisberg.

Thank you, Mr. Chairman.

Mr. BEARD. Thank you very much for your testimony.

Mr. WEISBERG. Thank you.

being done. I hope that your Department again would support legislation that we are working on in the Congress. I will introduce shortly a bill that would require labels to represent the true facts and even contain advice on how to avoid the pitfalls of a particular chemical.

Mr. WEISBERG. We would be very supportive of that. We have also discussed that possibility for the State to try to pursue such legislation.

Mr. BEARD. Through the general assembly here in our own State of Rhode Island.

Mr. WEISBERG. Yes.

Mr. BEARD. Edie Baum.

Ms. BAUM. Thank you, Mr. Chairman.

Thank you very much for your testimony today.

People keep talking about the socioeconomic conditions of the jewelry workers and the fact that the workers may be unskilled and they receive low wages and things like that, the small employers may be "dirty" employers. What about the workers in the industry, these unskilled workers? Do they stay in the industry any length of time or are they transient or do we know that?

Mr. WEISBERG. We don't have any hard data on that. The odds are when we go into plants we get some idea of the turnover rate within a particular place and oftentimes there can be a high turnover but as they develop certain skills these may be the only skills they have so they may take the skill to another jewelry place. So although there may be a high turnover at a particular plant, it may be that that person is staying in the industry per se in that job and going to other places.

Ms. BAUM. I was wondering how we can say, well, we assume that there is a problem here and still we can't come up with evidence of occupational disease, we don't have it reported.

Mr. WEISBERG. This is the problem we have. We have case reports that are never documented. The physician may say, well, I know of someone who has this but it never gets into the system that we have of responding to these problems and we are trying to improve that system so that, No. 1, we are not so reliant on a physician, for example, to tell us about the disease, and second that we can find other alternatives so that we can get to all the problems.

Ms. BAUM. Then we would also have the difficulty in identifying it as an occupational disease if these socioeconomic conditions are as they have been testified here this morning.

Mr. WEISBERG. Yes. This is probably a problem for an epidemiologist. We are interested in health promotion in the State as well as worrying about the [illegible]. If we can improve the health status of the workers in any way [illegible] supportive of that.

Ms. BAUM. Do you [illegible] your program is in its genesis stage or do you think it is just getting started or do you think you are well on your way?

Mr. WEISBERG. I would say we are toward the end of the initiation stage, we are getting toward the meat of it in the near future.

Ms. BAUM. Thank you very much.

Mr. BEARD. Mr. Wood?

Mr. WOOD. Thank you, Mr. Chairman.

I have just one question. You mentioned the third national symposium on workers compensation in July. You believe the points

Mr. BEARD. The next witness is David Snapp, executive director of the Rhode Island Committee for Occupational Safety and Health, Providence, R.I.

Along with Mr. Snapp is Linda Peloquin, Rhode Island Committee for Occupational Safety and Health, Providence, R.I.

Mr. SNAPP. We are operating as a panel this morning so Linda Peloquin will be first and then I will follow.

STATEMENT OF LINDA PELOQUIN, RHODE ISLAND COMMITTEE FOR OCCUPATIONAL SAFETY AND HEALTH, PROVIDENCE, R.I.

Ms. PELOQUIN. My name is Linda Peloquin and I live in North Scituate, R.I. I worked at Electric Boat Division of General Dynamics at Quonset Point for 3½ years. I was terminated 2 months ago because of my inability to work in the production area. I would like to testify today because from my own personal experiences plus observations at Electric Boat Quonset Point. I feel the conditions at Electric Boat are detrimental to the workers' health and the current laws protecting workers' health are not adequate to protect us. Because Electric Boat is a defense contractor, public access by the press and State government agencies such as the Rhode Island Department of Health is severely limited.

I was an inspector at Electric Boat, and one of the unfortunate class known as "tank rats." I performed various inspection functions within tanks in accordance with written inspection criteria. A major portion of my time was spent in a closed environment along with welders, grinders, and welders doing back gouging. I worked most of the time with red magnetic particle powder which I dusted on welds being subjected to magnetic particle inspection.

As a result I was exposed to a variety of dusts, fumes, smoke, and chemical vapors. I wasn't there too long when I first started having trouble. What was, I thought at first, a chest cold late in 1976 developed further so that by the fall of 1977 I was being treated for an occupational lung disease. I have recently filed for workers' compensation and my doctor has warned me that the company will vigorously fight my case. Also my attorney told me to be very careful what I say today because the insurance company will try to use anything I say against me in my compensation case. For this reason I am not going to discuss my lung problems in detail. It should be noted however, that I am a nonsmoker and have never smoked.

After months of medical tests and examinations by my doctor, a respiratory specialist concentrating in occupational lung diseases, it was determined that for health reasons I could not continue to work in the production areas of the plant. At that point in time I requested that I be transferred from the production areas and informed my supervisor that I would like to remain in the inspection department if possible. I was transferred to the quality assurance records office.

I worked in quality assurance records for 2 years until this July at which time I was informed that I would have to go on second shift. At that time I reminded my general foreman of my lung condition and asked that he inform the second shift supervisor that the problem did exist and that I preferred to work on more "open" jobs, that is—jobs located outdoors or close to the building's doors and on the exterior of units rather than inside them.

their small staffs. In Rhode Island it was mentioned that there were only three, and it is that type of a dilemma that we are up against. Hopefully, the Federal legislation will improve working conditions for the people of this country regardless of what type of a job they do and what chemicals or materials they use. Everyone should be guaranteed information on the pitfalls of their jobs, and as the chairman of this committee in the House of Representatives I am committed to that goal. I want to let you know that.

Ms. LEPERE. Thanks.

Mr. BEARD. Did you work with chemicals, for example?

Ms. LEPERE. Yes, I did.

Mr. BEARD. In your short time working with chemicals, did you feel that the labels were representative of the situation? Was there enough information on the chemicals you worked with to warn you of problems?

Ms. LEPERE. Labels in my department were removed from the containers so that no one had access to what was in them.

Mr. BEARD. Or any of the potential dangers?

Ms. LEPERE. The labels were removed and the containers were stored in cabinets where the workers could not see them.

Mr. BEARD. Why were the labels removed?

Ms. LEPERE. I cannot think of any reason except to say that the workers would not know what they were working with. There was an incident where I got sulfuric acid in my eye. I was given a container with it in and my fingers were in it and I rubbed my eye. My boss told me to wash it out quickly because it was sulfuric acid. I was not told that when it was given to me.

Mr. BEARD. In what department did the injury occur?

Ms. LEPERE. It was the soldering department.

Mr. BEARD. In the soldering department.

Ms. LEPERE. Yes.

Mr. BEARD. I have no further questions.

Miss Edie Baum?

Ms. BAUM. I was wondering, the plant where you worked, is it represented by a union or was it at that time?

Ms. LEPERE. No. We did have a union going on at one time but the case is still in court at this time.

Ms. BAUM. The union case is still in court?

Ms. LEPERE. Yes.

Ms. BAUM. Did anybody make any complaints either to OSHA or to the Rhode Island Health Department or anything of that kind?

Ms. LEPERE. Yes. My doctor called the Rhode Island Health Department and I spoke with them as well. They did come into the plant and take out the asbestos boards. Unfortunately, the company was not required to tell workers that they were working with asbestos.

Ms. BAUM. Was that the cause of your lung condition?

Ms. LEPERE. Not at this point. I called OSHA three times and filed three separate complaints. They never did show up and finally I asked Mr. Snapp to go find out what happened. This was while they were still in Connecticut. They claimed they never got the complaint file.

Ms. BAUM. I think they just found out that employers are supposed to report any case of occupational disease to the Rhode Island Health Department. Did your employer make a report of your condition?

Ms. LEPERE. I really don't know whether they did or not. I know that during the union organizing campaign the company did post a list of accidents that had occurred in the plant and I guess they are required by law to do so. We came up with 10 or 15 more that were not actually listed on that list that actually had happened in the last year, accidents.

Ms. BAUM. You talk about your case, you talk about your second case.

Ms. LEPERE. Yes.

Ms. BAUM. What was the first case?

Ms. LEPERE. The first case was from the first time when I had bronchitis. I did win that case; the company acknowledged it was the chemicals that caused my condition. They settled rather than to bring the case to court. My second case which is in court is from the time I quit my job. The third case which will be with Rhode Island Hospital has not even been raised yet.

Ms. BAUM. Thank you.

Mr. BEARD. Mr. WOOD.

Mr. WOOD. No questions.

Mr. BEARD. Thank you very much for your testimony.

The next witness is Mr. Robert Jones, executive director of the Rhode Island Lung Association, Providence, R.I.

Mr. Jones, do you have a prepared statement?

STATEMENT OF ROBERT JONES, PROGRAM ASSOCIATE, RHODE ISLAND LUNG ASSOCIATION, PROVIDENCE, R.I.

Mr. JONES. No; I don't have a prepared statement right now.

Mr. BEARD. Do you have a presentation that you are going to make?

Mr. JONES. Yes; I have a presentation. What I would like to do is show you some slides on Rhode Island jewelry hazards. The Lung Association has a written monograph which describes the major health hazards within the jewelry industry which is now in final draft state; it is going through a committee. The monograph should be ready in 6 to 8 weeks and I would like to enter it into the record when it is ready.

Mr. BEARD. Also for the sake of the record, would you enter a description of the slides because I think it would be almost impossible for the reporter to do her work once the slides are shown with the lights out.

Mr. JONES. I will do my best to describe what is up there visually.

One of the themes that has come out in this hearing is a real dearth of information about actual exposures. While we have found that a lot more needs to be investigated regarding exposures to hazardous substances, there is a good basis of information which has been brought together largely through inspections by the Rhode Island Department of Health and OSHA.

Over the years, information has been accumulated on the types of hazards in our major industries and certainly the jewelry industry is a major industry. I would have to say that we have a reasonably good idea of where the problem areas are and we certainly have very good leads on where further research needs to be done. I would like to point out some of that information right now.

Before I actually describe the information we have collected on hazards within the jewelry industry, I would like to point out the diseases that we are particularly concerned about. We have been working with an advisory committee of about 12 experts in Rhode Island. These are people who are experts in pulmonary medicine, industrial hygiene, industrial engineering, and chemistry.

[Letter from Mr. Jones follows:]

RHODE ISLAND LUNG ASSOCIATION,
Providence, R.I., November 5, 1979.

Dr. EARL F. PASBACH,
Staff Director/Counsel, Congress of United States, Committee on Education and Labor, Subcommittee on Labor Standards, 617 House Office Building, Annex No. 1, Washington, D.C.

DEAR MR. PASBACH: Enclosed are modifications to my oral comments made Representative Beard's October 2nd hearing on occupational health problems. have made only grammatical changes without altering any factual material. addition, I have marked the text where information contained in the slides can inserted. The original copy that the slides were made from is attached.

I should have a written jewelry hazard monograph approved by our Occupational Health Advisory Committee by the end of the month. I will send a copy as on as it is ready.

I would be grateful if you could send a copy of the final hearing record to the ung Association once it is published.

Thank you for your concern and interest in improving worker health. Please ss our appreciation along to Representative Beard.

Sincerely,

ROBERT B. JONES, *Program Associate.*

Enclosure.

SLIDE 1

OBSTRUCTIVE LUNG DISEASES

(Bronchitis, emphysema)

Irritation/excess mucus secretion/impaired cilia.
- Acids (Sulfur oxides)
- Alkalis (Ammonia)
- Oxidants (Ozone)
- Cadmium (Emphysema)
- Benign dusts (Overwhelm defenses)

SLIDE 2

RESTRICTIVE LUNG DISEASE

(Fibrosis)

Scar tissue replaces normal tissue.
Mechanism unknown.
Progressive and disabling.
- Asbestos
- Silica
- Talc
- Beryllium (Granulomatosis often leading to fibrosis)

SLIDE 3

HYPERSENSITIVITY LUNG DISEASES

Occupational asthma (reversible narrowing of airways)

- Isocyanates
- Amine hardeners for epoxies
- Cotton dust

Reaction to non-specific irritants by individuals with pre-existing asthma

SLIDE 4

LUNG CANCER

Uncontrolled growth of cells.
Mechanism unknown.
- Asbestos
- Polycyclic aromatic hydrocarbons
- Arsenic
- Chrome VI
- Nickel
- Cutting oils
- Wood dusts

SLIDE 5

SYSTEMIC POISONS

Affect systems other than the lungs.
- Lead (inhibits red blood cell and hemoglobin formation; nervous system damage)
- Chlorinated hydrocarbon solvents (nervous system depression; heart; possibly carcinogenic)
- Mercury (nervous system damage)

SLIDE 6

ASPHYXIATING POLLUTANTS

Displacement of oxygen in atmosphere—(CO_2, N_2, Methane).
Chemical interference with blood—(CO, Cyanides, H_2S).

SLIDE 7

INFORMATION SOURCES ON PREVALENCE OF OCCUPATIONAL LUNG DISEASE

Workmen's compensation.
Temporary disability insurance.
Death certificates.
OSHA illness reporting system.
Insurance companies.
Hospital medical records.

SLIDE 8

KEY PROBLEMS WITH MEDICAL REPORTING SYSTEMS

Primarily identify traumatic injury.
Little or no work history.
Confounding factors (cigarette smoking) not considered.
No exposure data.

SLIDE 9

OHAC illness cases

Electroplaters—Chronic bronchitis	21
Welders—Chronic bronchitis	7
Solvent degreasers—Acute bronchitis	4
Insulation workers—Asbestosis	25
Shipyard workers—Mesothelioma	6
Rubber workers—Talcosis	4
Lead pigment and battery workers—Lead poisoning	5
Scientific instrument workers—Mercury poisoning	4

SLIDE 10

SUMMARY OF CHEMICAL EXPOSURES AND AFFECTED EMPLOYEES IN RHODE ISLAND, JULY 1 TO NOV. 26, 1976, INVESTIGATED CASES

Exposure	Total plants	Total employees	Estimated employees affected	Industry
Arsenic	2	603	8	Chemical manufacture.
Asbestos	7	238	131	Wire manufacture, construction.
Beryllium	1	70	10	Casting.
Chlorinated solvents	9	5,745	119	Jewelry, electronics.
Total dusts	1	250	15	Textile.
Epoxy	1	185	30	Jewelry.
Lead	7	1,149	144	Pigment manufacture, wire.
Mercury	3	1,170	110	Electrical manufacture.
Ozone	1	600	30	Textiles.
Silica	1	27	27	Refinery.
Solvents	15	2,640	530	Spray paint, jewelry.
Styrene	5	537	247	Fiberglass.
Vinyl chloride	1	400	20	Wire manufacture.

SLIDE 11

Occupations for OHAC study

	Employment
Jewelry electroplating	30,000
Textiles	12,000
Cable and wire	4,000
Chemicals	3,000
Shipbuilding	2,500
Welding	2,000
Foundries	2,000
Fire fighting, insulation, roofing, rubber	

SLIDE 12

Jewelry manufacturing

Metal casting: Lead, (anemia, CNS damage); Beryllium, (irritant, granuloma); Silica-Talc fibrosis.
Polishing: Metal dusts, silica.
Cleaning: Chlorinated solvents (CNS).
Plating: Acid and alkaline mists (irritants).
Soldering: Lead, asbestos (fibrosis, cancer).
Glueing: Epoxy curing agents (asthma).

Mr. JONES. Basically we have been asking ourselves the question of what is the nature and extent of occupational disease in Rhode Island. One of the main disease categories that we are concerned about is obstructive lung disease where the airways are physically obstructed and blocked. Two good examples would be chronic bronchitis and emphysema. Listed here are some typical substances which are found in Rhode Island industry that can cause irritation of the airways and eventually result in physical blockage of the airways and impaired breathing. Acids and alkaline materials are two very good examples of problem areas in the jewelry industry.

As slide 9 certain substances can cause restrictive lung disease or a fibrous hardening of the lung tissue. Rather than the lung tissue being elastic and being able to expand and contract easily, the lung tissue essentially turns to a scar-like tissue. The victim either suffocates to death or dies of heart failure because of the stress on the heart. Restrictive lung disease can be caused by asbestos, silica, talc, and beryllium. All of these substances are major problems in the jewelry industry.

Next slide. Another category of occupational lung problems is asthma or hypersensitivity lung diseases. Some examples of substances that can cause occupational asthma are isocyanates, amine hardners and cotton dust. In the jewelry industry, amine hardners in epoxy glues are the primary agent that trigger sometimes severe, asthma like reactions.

Next slide. We have also been taking a look at lung cancer and what the potential for lung cancer is in the Rhode Island industry. Asbestos is on the top of the list in the jewelry industry. The other substances which are listed here such as the polycyclic aromatic hydrocarbons do not appear to be a problem in the jewelry industry. However, all of the things which are listed here are hazards in other occupations in Rhode Island.

Next slide. While the main focus of our work has been things that can cause lung damage. We have come across a number of agents which can cause systemic poisoning and can affect other systems of the body. Two major ones which are problem areas in the jewelry industry, are exposure to lead in casting, soldering and polishing, and to chlorinated solvents in metal degreasing. There are two very large problem areas and ones that need a lot more investigation.

Next slide. Asphyxiating pollutants are another area of concern. The major problem in the jewelry industry is carbon monoxide poisoning which actually interferes with the uptake of oxygen in the blood, and it causes asphyxiation.

Next slide. One of the first things we took a look at was existing sources of information that might give us an idea of what the nature and extent of occupational diseases are in Rhode Island. We looked at some of the traditional reporting systems that have already been talked about here today. We ran into a lot of problems and and concluded that none of them are really very useful as far as detecting occupational disease.

Next slide. These are the major problems that we found with these reporting systems. In large part they identify traumatic injury. They are not sensitive to insidious illness which can develop over a long period of time. Usually little or no work history is taken. It is very difficult to establish any kind of a cause and effect relationship if you don't have work history information.

One of the big confounding factors in determing a cause and effect relationship is the fact that a lot of people smoke. In fact, the industrial work force in the United States are much heavier smokers than the general population. I cannot remember the figures right offhand but the new Surgeon General's report talks about this problem. If people are smoking cigarettes or other tobacco products, it is very difficult to identify whether a worker has an occupational disease, particularly if it is an obstructive type lung disease.

Next slide. We pretty much gave up on traditional information sources, but one of the things that we did do as a committee was to take a look at the experience of medical people on the committee. We have about five or six pulmonary physicians on the committee and we decided to pool the information which they might have to give us an idea of what the nature and extent of the problem is. This is a list of documented cases that they had and that they felt were occupationally related. It is interesting information, indicating some problems, but you certainly cannot use the information to draw any scientific, valid conclusions about what types of problems we have in the community so we had to go at this whole problem in a little bit different direction.

Next slide. The next thing that we did was to take a look at the question from a workplace toxic agent exposure point of view—in other words, what are people exposed to. This gives you a taste of the type of exposures that are experienced in Rhode Island. This is a summary of excessive exposures to air contaminants that have been identified by the Rhode Island Department of Health over a 5-month period—July 1, 1976 to November 26, 1976. The list ranges from arsenic to vinyl chloride. There are a very substantial number of workers that might be affected. Again these are excessive exposures, exposures that exceed health limits. We pursued this angle and we felt that the best way we could describe the type of problems in Rhode Island would be to take a look at excessive exposures to toxic air contaminants.

Next slide. We initially developed a list of about a dozen priority industries that we wanted to take an indepth look at. The committee already had a pretty good idea that problems either were present in these industries or might be present. To date we have taken a fairly good look at the jewelry and electroplating industry, foundry operations, welding and cutting operations, and we are in the process of evaluating worker exposures in textile processing. What I would like to do right now is talk about jewelry specifically, because that is the focus of this hearing.

Next slide. This is a summary list of major exposures which industrial hygienists here in Rhode Island feel are commonly recurring problems in jewelry manufacturing. They are not oddball exposures, they are exposures which might typically be found. Certainly no one firm would have all of these problems, I am not suggesting that, but over a period of years during inspections these are the problems that keep resurfacing time and time again.

Next slide. One of the basic processes in making a jewelry item is making a metal cast, and a lot of the metal castings are done in plaster-like molds which you can see are being made here. This is an investment casting that is being made. The mixture that is being poured is a plaster-like material, the investment.

Next slide. That material has to be mixed from a dry powder. You can see the powder being mixed here in a mixing bowl. The powder which this worker is mixing is largely silica. The percentage can go up to 70 percent silica. It is the type of silica that can cause fibrosis. Many times these operations have poor ventilation; in fact, this picture is a good example of improper ventilation. The hood above the worker and to this left is going to draw the powdery silica right past his breathing zone; he can easily inhale it except for the fact that he is wearing a respirator which is sometimes not done at all. What this operation should have is local ventilation right over that mixing bowl. Hygienists have found excessive exposures during mixing, during weighing operations, during transfer, and as the material is cleaned up in the work area at the end of the day.

Proper cleanup is another example of a control measure that is often not taken in investment casting operations. A lot of times it is a dry cleanup-type of operation and the powder becomes airborne again and is inhaled. Silica is so toxic that it very definitely should be wiped up with wet methods. This operation also should be isolated. Many times investment mixing operations are right next to another work area.

Next slide. Workers can be exposed to silica again when the investment is broken down. This is an example of a good operation. The worker is breaking the investment away from a solidified casting with water so that there is not going to be any powder and there is not going to be any airborne exposure. He is also doing it inside a ventilated hood. Sometimes the investment is broken down on tables where there is no ventilation and no wet control.

Next slide. This is a centrifugal metal casting operation. Lead is the main hazard with casting. Interestingly enough airborne exposures to lead don't seem to be a problem. When industrial hygienists do air measurements for excessive lead exposure they often can't find excessive exposures. However, the problem is that low-level lead fumes will settle all over the work area, contaminating the surfaces in the work area where workers get the lead on their hands, in their hair, on their clothes, and rather than inhaling it they ingest it. Over a period of time they can accumulate quite a high body burden of lead. This is one area that needs a lot of investigation, particularly medical investigation to detect actual lead levels in workers. This has never been done in Rhode Island to my knowledge.

Next slide. Another way of making a metal cast is to make it in a hard rubber mold.

Next slide. These rubber molds have to be dusted with talc in order to prevent the casting from sticking to the hard rubber mold. The dusting should take place on a device like this. This is down draft table, it pulls the air downward and will remove the talc powder from the worker's breathing zone. Unfortunately, most of the talc that is used in the jewelry industry is contaminated with asbestos and/or silica. Exposure to these two toxic substances have been measured in the industry.

Next slide. Polishing is another problem area. Most firms will have polishing wheel ventilation. However, the systems are often added on to and more and more polishing stations will be added to a ventilating system. What was originally designed to ventilate, say, five or six polishing wheels ends up ventilating a dozen polishing wheels and the system becomes overloaded. As a consequence, they really act as sand moving machines and not good ventilation. The main exposures are to silica from polishing compounds and also to two toxic metals, lead and beryllium.

Next slide. The first witness mentioned exposure to chlorinated solvents. I would have to say that solvent degreasing operations and

Operator to cleaning solvents is one of the most frequently occurring problems that has been reported in the jewelry industry. Workers often remove items from degreasers too quickly and as a consequence solvent is hauled out of the machine and there are excessive exposures. However, there are other problems with solvent degreasers such as malfunctioning cooling coils and location next to drafts.

Next slide. Soldering has already been mentioned and major exposures are to lead and cadmium. Lead is definitely the most prevalent problem. Workers work very, very close to the operation. You can see this in this slide. Her nose is right down where the pollutants will be from this operation, and again local ventilation is the key. Sometimes this is not provided for or the ventilation is not working properly.

Next slide. Another type of soldering is oven soldering and the problem here is carbon monoxide. These are gas fired ovens and if the ovens are not properly ventilated really large amounts of carbon monoxide are produced and workers are and can be exposed to CO.

Next slide. I have mentioned a number of things that can be done to protect workers. The big one is ventilation, very definitely. However, one thing I would like to stress is the need for worker education. This has been mentioned today, and is one of the things that constantly comes to my attention particularly talking with workers. Too often they do not know what they are working with. They are not being given adequate information nor is adequate information available from community agencies on the types of hazards that they might face with the substances that they are working with.

I think we have got to go far beyond simply having pamphlets available for people. There has to be a broad based community outreach effort in the area of worker and management education. Educational efforts have received some seed funding from OSHA in their new directions program, however it is a very small funding effort right now. There needs to be a lot more funding and a lot more groups such as the Lung Association, RIOSH and so on need to get involved in worker education.

Next slide. I don't want to leave anyone with the impression that the jewelry industry is the only one that has problems. It is a fairly typical manufacturing industry. We have taken an indepth look at the foundry business in Rhode Island. Rhode Island has about 93 foundries, employing 2,000 workers, and there are some very serious problems in our foundries. In fact, they are much more serious in some cases than jewelry manufacturing.

Next slide. Welding is another area we have taken a look at. We have been involved with worker complaints about health hazards that are present at Electric Boat's Quonset facility. We have some very, very serious concerns about welder's health hazards.

Textile manufacturing is another area. As I said in the beginning, we are now investigating textile processing. Textile processing operations use far more chemicals than the jewelry industry ever thought of handling. While we don't know if problems exist I can say very definitely there is a large potential for problems if proper industrial hygiene controls are not used.

Next slide. Spray painting can be hazardous.

Next slide. Even something that is as seemingly innocuous as home construction and dry wall construction can be a problem. Until recently spackling compounds contained asbestos fibers.

That is all I really have to say about specific hazards. I would be glad to answer questions if there are any.

One thing that I would emphasize is that there needs to be far more industrial hygiene and medical surveillance. While we have collected a fair amount of information about exposures a lot more clearly needs to be done in that area. For example, OSHA has only three industrial hygienists which can go out and do inspections in the State. The health department has three people as well. That is a total of six people who are trained in recognition evaluation and control of occupational health hazards for the whole State of Rhode Island. We are a very heavily industrialized area. We have lots of industry and the monitoring capability is very, very weak at this point.

In addition to actually monitoring what people are being exposed to we need to set up medical surveillance systems. There is very little medical testing being done at all. The only kind of medical data we are getting is episodic reporting to physicians. There need to be industrialwide studies to evaluate worker health.

Mr. BEARD. I thank you, Mr. Jones. As you indicated, there is a lack of knowledge by the worker of his particular dangers and on the part of some of the employers also. There is no question about this. I can recall working as a youngster for a brief time in the jewelry shops. In some of these jewelry shops there was degreasing fluid. I had no awareness of the vapors that would come up from this particular chemical.

During most of my career as a painter—working with spackling, ripping out old plaster where it was loaded with asbestos—again I had no awareness of the potential danger. I am sure that is the case with thousands, if not millions, of workers across the Nation.

Mr. JONES. We get calls quite frequently from workers. Many times a worker suspects that there is something wrong. A lot of times when an OSHA inspector goes in or when the health department follows up on a complaint it is often not the thing that the worker is complaining of that is the problem. Many times the inspectors find that there are other problems so workers are not aware at all of what they are working with in large part. Even though a lot of the substances, for instance, in the jewelry industry are really old classic hazards—lead and asbestos are very well known hazards—workers are not very well informed.

Mr. BEARD. Ms. Baum?

Ms. BAUM. No questions.

Mr. BEARD. Mr. Wood?

Mr. WOOD. I have no questions.

Mr. BEARD. Thank you very much for your presentation.

Mr. JONES. Yes. I will submit a written report when that is in the final stage.

Mr. BEARD. All right. When it is received it will be made part of the record.

[The report referred to above follows:]

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Rhode Island Jewelry Operations and Associated Toxic Air Contaminants

This monograph is written for industrial management, workers, government agencies, the medical profession, students, and members of organizations interested in the prevention and control of occupationally-related lung disease. It is hoped that this report will be useful to them and serve as a stimulus and guide wherever preventive and corrective action is needed in Rhode Island industry. The contents of the report represent a composite of the opinions of the lung association's Occupational Health Advisory Committee (see last page of report).

While the Association's primary concern is for the control of toxic workplace substances which cause or exacerbate lung disease, this monograph also recognizes the respiratory system's importance as a route of entry for toxic air contaminants that affect other systems.

It will be noted quickly that far more is known about the variety of excessive exposures to air contaminants than with their actual impact on the health of Rhode Island workers. While much useful information about exposure has been gathered through local industrial hygiene surveys, data on the health status of Rhode Island workers is reported in an episodic manner and is often restricted to obvious acute cases. Therefore, health effects information in this monograph is reported in the context of what might be expected from excessive exposures. Despite the dearth of indisputable evidence, the actual exposures highlighted in this report indicate that a great illness and disability potential exists in this state and strongly supports the need for better definition of both exposures and their impact on health.

The wide variety of industrial processes, materials and conditions that may affect air contaminant exposures makes it impossible to talk in absolute terms about specific protective measures such as ventilation, personal protective equipment or housekeeping practices. Assessment of conditions thought to be hazardous require the services of industrial hygienists who are trained to recognize, evaluate and control industrial hazards.

Such expertise is available at either the Rhode Island Department of Health (277-2438) or the Occupational Safety and Health Administration (528-4894). Information as to other resources in the state may be obtained from the Rhode Island Lung Association (421-6487).

RHODE ISLAND JEWELRY OPERATIONS

ASSOCIATED TOXIC AIR CONTAMINANTS*

CASTING -
- SILICA (fibrosis - scarring of lungs)
- TALC (fibrosis and lung cancer)
- LEAD (blood formation and central nervous system effects)
- BERYLLIUM (lung irritation, chemical pneumonia, granulomatosis - tumor like masses of inflammatory tissue)
- PLASTIC FUMES INCLUDING: toluene, styrene, methyl methacralate (lung irritation)

POLISHING AND BUFFING -
- SILICA (fibrosis)
- DIATOMACEOUS EARTH (fibrosis)
- LEAD (blood and nervous system effects)
- BERYLLIUM (irritation, granulomatosis)

METAL CLEANING -
- TRICHLOROETHYLENE — nervous system depression
- PERCHLOROETHYLENE — cardiac effects
- 1,1,1-TRICHLOROETHANE — possibly carcinogenic
- ACIDS AND ALKALIS (lung irritation)

ELECTROPLATING -
- ACID MIST (lung irritation)
- CYANIDE MIST (asphyxiant)
- HYDROGEN CYANIDE GAS (asphyxiant)

*References to the physical forms of air contaminants such as dusts, vapors, gases and mists are made throughout this report. Because these terms can be confusing they are briefly defined on the last page of the monograph.

continued

SOLDERING -	LEAD (blood and nervous system effects)
	CADMIUM (lung irritation, possible carcinogen)
	CARBON MONOXIDE (asphyxiant)
	FLUORIDES (lung irritation)
	AMMONIA (lung irritation
	ASBESTOS (fibrosis, lung cancer)
LACQUERING AND ENAMELING -	SOLVENTS (central nervous system depression)
EPOXY GLUEING AND COATING -	HARDENING AGENTS (asthma, lung irritation)

Rhode Island Jewelry Operations

and

Associated Air Contaminants

EMPLOYMENT

Jewelry manufacturing accounts for approximately 30% of the state's total manufacturing employment. Rhode Island Department of Employment Security data for 1976 shows approximately 27,000 people employed in 1,000 firms.* The vast majority of firms are small, employing 10 or fewer people, making the provision of occupational health services particularly difficult. The following gives a more detailed employment breakdown.

costume jewelry -	15,720 people	770 firms
precious metal jewelry	5,460 "	193 "
electroplating and finishing specialists	2,700 "	138 "
needles, pins, hooks, etc.	1,060 "	14 "
silverware, stainlessware	1,020 "	11 "

CASTING

Three casting methods are used to form metal jewelry; rubber mold, lost wax or investment casting, and die casting. Health hazards are associated with investment and rubber mold casting. The metals commonly cast by these methods can be placed in three groups: 1) "white metal," composed principally of lead, zinc, and tin with small amounts (up to 3%) of antimony, arsenic or mercury; 2) copper alloys which can contain small amounts of arsenic or beryllium; and 3) precious metals such as platinum, gold and silver. Various plastics are also cast in the jewelry trade.

I. Rubber Mold Casting produces jewelry that is less precise than that from lost wax casting. Only metals with low melting temperatures (300-400°F) such as white metal can be used in rubber molds.

Talc is used to prevent the metal from sticking to the rubber mold. Talc powder is applied manually with brushes or occasionally by pounding with talc filled socks. In Rhode Island shops, dusting tables are not always equipped with local slot or downdraft type ventilation. The major hazards from breathing talc is that it is often contaminated with significant amounts of asbestos and silica. Excessive exposure to these materials has been measured in Rhode Island and much of the talc used in Rhode Island industry is not pure.

Both asbestos and silica can cause a scar-like hardening of the normally elastic lung tissue, conditions called asbestosis and silicosis. These very serious diseases progressively restrict the worker's ability to breathe and often result in death. Asbestos also causes lung cancer, especially in workers who smoke, and mesothelioma, a cancer of the chest and abdominal lining. The risk of lung cancer is especially great in workers who smoke and can be some 8 times greater among smokers exposed to asbestos and compared to all other smokers in the general population. (7)

*Because employment figures reflect the total number of jewelry workers they can not be used to predict the number of people at risk from high hazard operations. Such information would be very useful but is not available.

because metals are not heated to high temperatures in rubber mold casting, the potential for inhaling significant amounts of airborne fume is low during melting and pouring. The only excessive airborne metal exposures have been measured with workers who tend white metal pots that evolve lead fumes. Local exhaust ventilation to remove lead fumes rising from the pots is necessary.

Low levels of lead oxide fume are produced during casting and while not usually a threat from inhalation, settle as a dust over the work area and can be ingested from physical contact. In Rhode Island shops, even when airborne lead has been within current legal limits, poor ventilation and/or lack of good housekeeping measures have resulted in significant lead contamination of work areas. To minimize inhalation and/or ingestion of lead, casting machines should be equipped with local ventilation, surfaces in work areas should be kept clean and workers should not be allowed to eat in lead casting areas. A fruitful area for future investigation is medical testing of workers in casting areas to determine actual body burdens of this poison.

Lead is a cumulative poison that is stored in the body. It can affect the central nervous system and the formation of red blood cells causing anemia, tremor, muscle weakness and incoordination. In severe poisoning, paralysis of the muscles may occur. Gastrointestinal disorders can also be caused by lead with symptoms ranging from mild stomach ache to severe abdominal pain. Nerve damage can be permanent depending on the dose level.

II. Lost Wax or Investment Casting is usually used for high temperature metals (up to 3000°F), especially copper alloys and precious metals; however, low temperature white metal is sometimes cast by this method. It produces precise jewelry pieces that require little finishing.

In this process, molds are made from plaster called investment which contains a significant percentage (up to 70%) of silica. The plaster is poured into a flask which contains wax models of the jewelry pieces. After the investment hardens, heat is applied, vaporizing the wax form and leaving cavities into which metal is poured to become the jewelry cast.

Clearly, the most widespread casting hazard is exposure to investment powder containing silica. Excessive silica exposures occur as the flour-like investment is transferred from containers to scales for weighing, as the dry powder is mixed with water in open kettles, and when the investment is removed from the metal cast. Local exhaust ventilation is essential to control dust during weighing and mixing. Cleaning of the investment area must be by wet mopping rather than dry sweeping. An additional measure that can help minimize silica dust exposure is to physically contain or isolate investment casting operations. Removal of the investment after the metal has hardened requires local ventilation if a dry process is utilized. Fortunately, many metals can withstand water jet guns for removal of the investment.

Because metals are often heated to high temperatures in investment casting, metal fumes are generated. Beryllium exposure has been seen in Rhode Island due to poor casting ventilation. Beryllium is extremely toxic and in acute poisoning (less than one year) produces inflammation of the lung tissue ranging from a mild irritation similar to a cold to a sometimes fatal pneumonia. Chronic beryllium disease is often fatal and is characterized by development of microscopic tumor-like masses of inflammatory tissue called granulomas. The normally elastic lung tissue is eventually replaced by fibrosis. There is currently a debate as to the cancer causing ability of beryllium.

While the majority of casts are made of metal, some toxic plastics are also used. Potential exposure to biologically active materials include toluene and styrene whose vapors are irritating to mucous membranes and are narcotic at high concentrations. Another exposure is to methyl methacrylate vapor which is a skin and respiratory irritant and can also produce headache and irritability. Methyl methacrylate is the basis of lucite, which is used by jewelry firms to embed novelty items in clear plastic.

POLISHING AND BUFFING

Polishing and buffing involve mechanical abrasion of the jewelry surface to smooth it after casting. Polishing provides a preliminary smoothness to the metal surface; buffing imparts the final finish.

Polishing and buffing operations use cloth or leather wheels. Abrasives are applied to the wheel in solid cake or stick form. They may consist of fused aluminum oxide, silicon carbide, ground silica, iron oxide, and diatomaceous earth.

The most serious health hazards documented in polishing and buffing operations are from exposure to the toxic metal dusts, lead and beryllium, which have been discussed and fibrosis-producing ground silica and diatomaceous earth. Aluminum oxide, silicon carbide and iron oxide exposures also occur but are not as serious because these dusts do not appear to produce tissue reaction. Of course, excessive quantities of even inert dusts can overload the workers' lung-clearing mechanisms.

Industrial hygiene evaluations find that many exhaust systems are poorly designed, overloaded with too many polishing wheels or are poorly maintained and clogged with dust.

METAL CLEANING

Once the jewelry has been buffed and polished, it must be cleaned to remove abrasive compounds, grease, oil, and/or metal oxides before electroplating. Common cleaning materials which pose health hazards are organic solvents, acids and alkalies.

Vapor degreasing machines use the solvents trichloroethylene, perchloroethylene and 1,1,1-trichloroethane. Exposure to these present some of the most frequently observed health hazards in jewelry manufacture, along with excessive noise exposure and dermatitis. Excessive exposures are a result of one or more of the following conditions: inefficient coils which do not adequately cool and condense vapor; premature removal of articles by the operator before they have dried; poor exhaust design; and location of the degreaser where there is interference from cross drafts.

The predominant health effect from excessive exposure to degreasing solvents like trichloroethylene and perchloroethylene is depression of the central nervous system with such symptoms as visual disturbance, mental confusion, fatigue, nausea and vomiting, irregular heart beat, and intoxication similar to that induced by alcohol. Such effects can significantly increase the chance of accidents and injury in addition to decreasing productivity. Skin contact with chlorinated solvents can cause local irritation and blister formation. Of real concern is the possible cancer causing ability of trichloroethylene. Also, exposure to moderate levels of trichloroethylene seen in industrial operations has led to addiction.

production of phosgene gas should be diligently guarded against around degreasing operations. Phosgene is extremely toxic and can be produced when chlorinated solvents such as trichloroethylene are decomposed by heat in an open flame. Phosgene poisoning has not been recorded in Rhode Island but is possible if, for example, solvent vapors drifted into a soldering area. Phosgene can be inhaled deep into the lungs and cause a fatal delayed reaction in which the lungs fill with fluid and tissue is destroyed.

In addition to solvents, acid and alkaline solutions (e.g. hydrochloric, nitric, and sulfuric acid, sodium hydroxide and sodium cyanide) are used to clean jewelry. Excessive exposures to irritating and corrosive mists have been identified due to poor or no local exhaust ventilation on heated tanks. High level or repeated low level exposure to lung irritants contribute significantly to bronchitis, a chronic condition, characterized by excess mucous production and swelling of the airways. Another long term result of excessive chronic exposure to irritants can be distruction of the small airways and significant impairment of lung function.

ELECTROPLATING

Electroplating applies various metals to the base metal for such purposes as corrosion prevention, surface hardening or brightening. Copper, nickel, and precious metals are frequently utilized in jewelry plating.

An occupational hazard from plating operations is exposure to acid and alkaline mists which evolve from the surface of plating tanks whose baths are either acid or alkaline base. Mists become airborne at the tank surface by the electrolytic decomposition of water in the bath. Hydrogen and oxygen bubbles rise to the top of the bath forming a mist as they break the surface. High bath temperatures can also cause excessive evaporation adding to the inhalation hazard.

Because of the wide variety of plating baths and metals the reader in need of process specific hazard information is referred to pp. 1160 and 1161 of Patty's Industrial Hygiene and Toxicology available from the agencies listed on the cover of this report.

The greatest potential health problems observed in plating areas are improper storage of chemicals and the inadvertent mixing of acids and alkalis - offering the possibility of explosion, fire, or production of highly toxic hydrogen cyanide gas. This gas acts directly on a respiratory enzyme to prevent the uptake of oxygen by the tissues and can result in death by asphyxiation.

Typical problems seen by health inspectors in Rhode Island include the side-by-side storage of acids and cyanides and drums contaminated with cyanide used to store other materials. Other documented practices with potential for mixing of acid and alkali materials involve unmarked plating tanks, improper disposal of spent chemical solutions and poorly designed ventilation systems.

It must be mentioned that a common health problem found in electroplaters is dermatitis. Contact with corrosive acids and alkalis may result in dry, cracked and ulcerated skin.

An area for further investigation is potential health hazards associated with use of various brighteners which are added to baths to improve the luster of metals. Brighteners include such toxic substances as arsenic cobalt and selenium. These compounds can cause bronchitis and chemical pneumonia.

SOLDERING

Jewelry pieces are often joined by various soldering methods after electroplating. Soldering may be done by hand, machine or in ovens.

In hand and mechanical operations the major documented exposure is to lead which is a common solder constituent. Solderers work very close to the piece being soldered and exposures result from lack of local exhaust ventilation that is necessary to draw fumes away from the workers' breathing zone. Though not documented, there is a potential hazard from fluoride and cadmium fume exposure in silver soldering. Local exhaust ventilation is necessary because both pollutants are very toxic and can cause severe irritation and permanent damage to the lung tissue. Cadmium has been recently classified by the Federal government as a possible human carcinogen.

A fruitful area for further investigation in the jewelry industry would be better definition of the constituents of solders and solder fluxes. For example, it is known that many solder fluxes are acid based, however, specific constituents and associated health effects have not been studied.

Oven soldering and annealing can cause exposure to carbon monoxide and ammonia. The ovens are filled with either carbon dioxide or ammonia to provide an oxygen-free atmosphere to prevent metal discoloration.

When incomplete combustion occurs copious amounts of carbon monoxide are produced which are not always adequately ventilated. Excessive ammonia exposures, though not documented, are a potential problem. Ammonia is a typical lung irritant. Carbon monoxide, however, is a colorless, odorless, tasteless gas. Though it does not directly damage lung tissue, it reacts with the red blood cells to reduce their oxygen carrying capacity. The result is an oxygen deficient condition that can affect the workers' ability to perform manual tasks and impair mental performance. The symptoms of carbon monoxide poisoning include headache, dizziness, drowsiness and nausea. Several incidents of CO poisoning have occured in Rhode Island firms.

Soldering presents possible exposure to asbestos dust. Forms used in the ovens to hold jewelry items are made from dry powdered asbestos. Toxic dust levels have been recorded when the dry powder is mixed into a paste. Controls such as respirators and ventilation must be utilized during this procedure. Non-toxic ceramic soldering boards are available and should be used in place of asbestos boards. Heat resistant asbestos boards used for hand soldering are periodically scraped clean, releasing asbestos fibers.

LACQUERING AND ENAMELING

Jewelry finished with lacquer or enamel is usually dipped or sprayed. The major health hazard found with these operations is exposure to solvents in the coating. Solvents have been found to be an inhalation hazard when spraying is not isolated in ventilated booths and if open air drying operations are not ventilated. Excessive exposures are primarily from the aromatic hydrocarbons toluene and xylene and the ketones acetone and methyl isolbutyl ketone. Inhalation of excessive quantities of any of these solvents can cause central nervous system depression including dizziness, fatigue and temporary muscular incoordination. In addition they can cause irritation of the lungs, skin and eyes.

EPOXY GLUEING AND COATING

Jewelry pieces are sometimes glued together or coated with epoxy resins. The resin itself is not toxic; but the hardeners or curing agents used with the resin have produced adverse health effects. Hardener vapors irritate lung tissue and cause an allergic dermatitis in which the skin erupts with a rash and blisters. Polyamine hardeners have caused asthma, bronchiospasm and coughing episodes. The lack of exhaust ventilation is a common problem. Dermatitis is frequently observed in epoxy workers in Rhode Island when rubber gloves are not used. Epoxy skin reactions can be serious because individuals become sensitized and contact with even small amounts can trigger significant skin damage. These reactions may not appear until several hours after the exposure.

Physical Forms of Air Contaminants

Dusts are formed when solid matter is broken down by mechanical forces such as drilling, crushing and grinding. Some dusts are produced by industrial processes while others are already present in dust-like form.

Fumes are formed when solids have been heated to their gaseous state, cool rapidly and condense into very fine solid particles. Fumes are usually produced from high temperature metal operations such as welding and founding.

A Gas is defined as a formless fluid that expands to fill whatever space contains it.

A Mist is a fine suspension of liquid droplets in the air.

Smoke is a general term that describes a mixture of solid, liquid and gaseous materials resulting from the combustion of an organic substance.

A Vapor is the gaseous counterpart of the liquid over which it exists - just as water vapor exists over water.

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