

PLAYING INDUSTRIAL HYGIENE TO WIN

Winter 2011 Update

By Eileen Senn, MS

***Author's Note:** Precious little in industrial hygiene has changed since this article was first published in **New Solutions** in spring 1991 - almost twenty years ago. Some industrial hygienists do practice using the principles outlined here, especially those working for unions, COSH groups, and occupational health clinics. However, most industrial hygienists, including those who work for OSHA, are still dependent on exposure limits and air sampling. Due to court action, the "updated" OSHA PELs never came to fruition. On the plus side, a few more comprehensive OSHA standards for chemicals have been promulgated. The OSHA standards on personal protective equipment, including respirators, have been revised. NIOSH has many new publications available. The Internet has dramatically increased access to health and safety information. These changes are reflected in this updated version of **Playing Industrial Hygiene to Win**.*

In the wider world during the past decade, progressive folks, especially within the environmental movement, have been working on the "Precautionary Principle". I believe this work has tremendous potential for application to occupational health and is quite relevant to playing industrial hygiene to win. The Precautionary Principle, proposed as a new guideline in environmental decision-making, suggests that when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established. The principle has four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making. For more information, please visit these web sites:

[Precautionary Principle FAQs](#)

[Lowell Center for Sustainable Production](#)

[Toxics Use Reduction Institute](#)

[Precautionary Principle and Chemical Exposure Standards for the Workplace](#), APHA Resolution, 1996

Related Articles by the Author:

1. [Finding Chemical Exposures and Negotiating Fixes](#) New Jersey Work Environment Council Checklist, October 2010
2. [Controlling Chemical Exposure: Industrial Hygiene Fact Sheets - Concise Guidance on 16 Components of Industrial Hygiene Controls](#), New Jersey Department of Health and Senior Services, 2000
3. **Clear and Complete Presentation of Air Sampling Data** – *New Solutions*, Volume 2, Number 2, 247-252, 1999
4. **Ending OSHA's Dependence on Exposure Limits**, *Applied Occupational and Environmental Hygiene*, 10 (6), 520-522, June 1995, in *OSHA Compliance Issues* column.
5. **Guest Editorial; Industrial Hygiene with No Limits**, *American Industrial Hygiene Association Journal*, Vol. 51, No. 1, January 1990, pg. A9-A10.

Your comments and suggestions on any of these articles are most welcome. Please e-mail me at eileensenn@gmail.com

ITEM - Numerous workers become sensitized to toluene diisocyanate (TDI) at a plant manufacturing foam automobile seats. Personal air sampling conducted by corporate industrial hygienists consistently shows levels of TDI to be within all legal and recommended standards.

ITEM - Dozens of workers in a new office building suffer eye, nose and throat irritation. Vendors who supplied the furniture, partitions and carpeting all reveal that they used formaldehyde in their products. Air samples collected by an indoor air quality consultant, however, show formaldehyde levels in compliance with the Occupational Safety and Health Administration (OSHA) standard.

ITEM - Workers at a construction site become ill and bulk samples of the soil reveal high levels of phenols and many other chemicals. Industrial hygienists from OSHA collect personal air samples but can find no violations of OSHA's Permissible Exposure Limits (PELs).

ITEM - Machinery noise levels at a carburetor-rebuilding factory create stressful working conditions and damage workers' hearing. An OSHA industrial hygienist measures noise levels high enough for management to require workers to wear earplugs but not high enough to require management to quiet the machinery.

INTRODUCTION

Industrial hygienists can be extremely helpful to workers by identifying, evaluating and recommending controls for health hazards on the job. Experience has shown, however, that industrial hygienists' personal exposure monitoring and exposure limits have been used to "scientifically prove" that working conditions are "safe" when they were not, even when workers were getting sick.

The idea of measuring how much of a chemical, radiation, noise or other hazard a worker is exposed to and comparing this to a level that has been proven to be safe is not a bad idea. But there are many problems with the way this has worked in practice.

- **Problem 1:** Most chemicals and other hazards have not had adequate long-term tests conducted to determine whether they can cause cancer, damage brain and nervous system function, lung function, immune and hormone systems function, reproductive system function or many other vital bodily functions.
- **Problem 2:** Legal or recommended limits are often thousands of times too high to protect health. Many limits were set using unscientific, irregular procedures and corporations have strongly influenced or even dictated the outcome.
- **Problem 3:** OSHA tried to "update" its PELs in 1988. However, it did not use the latest scientific methods or information to do so, and the new PELs were only slightly more protective than the old ones. The new rule was remanded by the U.S. Circuit Court of Appeals and these limits are not currently in force.
- **Problem 4:** Most measurements of worker exposure have been incomplete and inaccurate.
- **Problem 5:** Industrial hygienists' preoccupation with the ritual of air sampling has given the impression that this is the best way to approach an occupational health problem and detracted from other, more useful activities that industrial hygienists can perform such as evaluating controls.

Because of these problems, industrial hygiene monitoring usually paints a rosy picture of conditions in the workplace by giving it a "Clean Bill of Health." Even though this is often

false, it is hard to dispute because it appears to be quantitative and scientific.

BEWARE THE “CLEAN BILL OF HEALTH”

Workers and their unions should be aware of the potential use of industrial hygiene monitoring against them. Certain wording in an industrial hygiene report is often a tip-off that a “Clean Bill of Health” is in the making. Two examples are:

1. **“No violations of OSHA standards were found.”** This statement seems designed to give peace of mind to those unfamiliar with the inadequate nature of most OSHA standards. It also implies that compliance with every standard was checked - a highly unlikely possibility
2. **“The concentrations of; y and z were found to be well below any legal or recommended standard.”** This statement is easily misinterpreted to mean that no adverse health effects are expected at the levels found. The statement also implies that exposure to these particular chemicals is the only health concern at the workplace.

DEALING WITH THE INDUSTRIAL HYGIENIST

For whom the industrial hygienist works greatly influences how willing and able he or she will be to listen

to and assist workers and unions. The majority of industrial hygienists work for corporations/employers either directly or as hired consultants. Many want to do a good job but are hampered by their employer. Some are used as little more than technicians to measure air contaminants. Their professional judgment and experience rarely are called upon to make recommendations for improvement in the workplace. In some cases, a union may be powerful enough to have a corporate industrial hygienist do a proper evaluation and make useful recommendations. The tendency, however, of a corporate industrial hygienist will be not to talk to the union unless it demands involvement. Contract language that mandates union involvement is therefore, very helpful.

The courts have ruled that, under the National Labor Relations Act, unions have the right to have their own health and safety expert make workplace surveys and recommend improvements. Ongoing relations between the union health and safety committee and the industrial hygienist are necessary to evaluate the workplace, make educated tactical choices and educate members. These judgments require union committees to think about priority setting both to get victories and to confront the most serious hazards.

Obviously, it is ideal if the industrial hygienist works for the union directly or is hired as a union consultant. The courts have ruled that, under the National Labor Relations Act, unions have the right to have their own health and safety expert make workplace surveys and recommend improvements. Ongoing relations between the union health and safety committee and the industrial hygienist are necessary to evaluate the workplace, make educated tactical choices and educate members. These judgments require union committees to think about priority setting both to get victories and to confront the most serious hazards.

Because of their dependence on air sampling, poor quality exposure limits, and other problems discussed later, government industrial hygienists working for OSHA really have their hands tied at this time unless the problem is one of the few where OSHA has a useful standard (see Appendix 2). In most cases involving chemical exposure, they will be unable to issue citations. However, they should be asked to write a letter describing the hazards they observed but could not cite and making control recommendations.

Hygienists working for the National Institute for Occupational Safety and Health (NIOSH) or state governments usually have the freedom to write reports containing strong recommendations and should be asked to do so. It will be totally up to the union to negotiate with management to implement the recommendations, however, since these agencies have no enforcement powers.

MISINTERPRETATION OF OSHA HEALTH INSPECTIONS

OSHA health inspections that do not result in citations are especially subject to misinterpretation as a “Clean Bill of Health.” When OSHA cannot find violations of its exposure limits for chemicals, radiation or noise, it is not permitted to issue a citation ordering the employer to correct the problems. The employer is then likely to claim that there are no health hazards in the workplace even when workers are experiencing health problems. Even if a citation is issued, people mistakenly may believe that the citation lists everything wrong in the workplace.

In reality, there may be many hazards in the workplace that OSHA did not observe or OSHA’s industrial hygiene sampling did not pick up. Some of the reasons for this could be:

- The process used by OSHA is backwards. Instead of focusing on health complaints, the OSHA industrial hygienist looks at exposure numbers. For workers, this adds insult to injury.
- OSHA sampling only evaluates how much of a chemical enters the body by being breathed in. But many chemicals also are absorbed through the skin or accidentally eaten due to contaminated lunchrooms.
- OSHA most often measures only for one or two chemicals, rather than for all those to which workers are exposed.
- OSHA does not consider the combined effects of chemicals and other hazards such as heat and noise.
- OSHA usually collects air samples for only one day and may easily miss peak exposures occurring during maintenance, leaks, and emergencies, especially if they occur after first shift.
- Variations due to season or production schedules also may be missed.
- During the OSHA inspection, the employer may slow down production or change the chemicals or procedures used to try to hide bad conditions.

CHOOSING WHEN TO FILE OSHA HEALTH COMPLAINTS

Before filing an OSHA health complaint you should be fairly sure that there are violations of OSHA standards in your workplace. Otherwise, there is a good chance that the problems you are concerned about will not be cited by OSHA, giving the impression that everything is fine.

There are several chemical-related OSHA health standards that apply to all workplaces and that are widely violated. These include 1910.1200 - Hazard Communication, 1910.1020 - Access to Medical and Monitoring Data, and 1904 - Recording and Reporting Illnesses. Whenever you file a complaint, these should be mentioned if you have reason to believe the employer is out of compliance.

The OSHA noise standard, 1910.95, is also widely violated and may be something you will have success with in an OSHA complaint.

When the problem you face is reducing exposure to chemicals, however, you come right

up against the problem of PELs that are too high to protect workers from health effects. There are only a few chemicals for which OSHA has even a small chance of finding overexposures when it collects air samples. These are listed in **Appendix 4**. There are no solvents on this list; OSHA has virtually no chance of finding solvent exposures above the solvent PELs because they are hundreds of times too high to protect health.

There is another group of chemicals that has comprehensive OSHA standards. These are listed in **Appendix 2**. Comprehensive standards specify a whole range of requirements for air monitoring, personal protective equipment, engineering controls and work practices, medical monitoring and employee education and training. Most of these requirements go into effect only when the PEL or half of the PEL (the “action level”) is exceeded but some provisions apply even when exposure limits are not exceeded. The PELs in comprehensive standards are, on the whole, much more protective than PELs in the OSHA Z tables. So if you have a problem with one of the chemicals with a comprehensive standard, an OSHA inspection may be helpful.

If employees are required to wear personal protective equipment such as respirators or eye or face protection, check to see if the provisions of 1910.132, 1910.133, 1910.134, 1910.136, and 1910.138 are being followed. General requirements for all personal protective equipment are contained in 1910.132.

Some helpful provisions of the other chemical-related standards are given in **Appendix 2**. The full text of these standards should be consulted to see if the employer is violating any provisions. These are available at www.osha.gov.

WRITING YOUR OWN RULES FOR THE CORPORATE NUMBERS GAME

Because corporate industrial hygiene monitoring is most often used against workers, it should be approached with extreme caution. The union must do its best to assure that monitoring will benefit workers and not undermine their demands to clean up the workplace. The union should take full advantage of its legal right to bargain over health and safety that is provided by the National Labor Relations Act.

Certainly there is little need for corporate exposure monitoring with carcinogens, mutagens or teratogens since the position of labor and many health professionals is that there is no “safe” level for these. Instead, insist that the emphasis be put on reducing exposures to such chemicals to the lowest possible level.

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In deciding whether sampling may be justified, the union should determine whether the following circumstances exist.

- The employer plans to install engineering controls and wishes to compare exposures before and after controls. This is a legitimate purpose and usually can be accomplished using area samples or direct reading instruments, rather than personal samples worn by workers.
- Personal samples worn by workers to evaluate exposures will be used for one or more of the following:
 - To decide where controls are needed.

- To create a record of current exposures.
- To compile exposure data for future use in epidemiology studies or other research.

The union will want to seriously consider whether it will support sampling for the last two purposes. These are in the realm of research and may not ever actually benefit workers. Sampling to decide where controls are needed is much more legitimate and likely to result in immediate improvement of working conditions.

In all cases, it is important to assure that the following conditions are met:

- All of the chemical exposures in question are identified and will be sampled.
- The union will observe monitoring and can assure that sampling will take place during the worst exposures.
- The employer agrees that exposure data will be given in full to the union and applicable parts to all workers who have been sampled or have similar exposures, with a copy to these workers' permanent personnel files.
- The employer commits in writing to make the data available to public health professionals acceptable to the union who wish to use it for epidemiology or other research purposes.

Exposure limits that are protective of health will be used to evaluate the samples. Unions and workers will get more protection if they use health guidelines based on an excellent EPA database rather than OSHA or other exposure limits. For example, [EPA IRIS inhalation Reference Concentrations \(RfC\)](#) and [EPA Acute Exposure Guideline Levels \(AEGL\)](#).

If the above outcomes and conditions cannot be assured, the union should devise a strategy to change the situation. The following may assist union attempts to negotiate an acceptable agreement with management:

- Advising management that the union will label all sampling results as fraudulent and will give no credibility to them.
- Advising management that the union will boycott the sampling by advising workers not to wear sampling devices.
- Other actions designed to motivate management to re-negotiate.

Obviously, the union must be confident of its ability to protect workers from discipline if some of these actions are actually carried out.

The union should also bear in mind that some workers might decide on their own to contaminate, destroy or otherwise sabotage samples. This is likely to happen especially where workers have had past experiences where sampling resulted in no improvements in the workplace. Such sabotage may arise out of curiosity about how bad things have to be before management acts and frustration that poor working conditions are not recognized as needing improvement. Such workers may need union guidance and protection.

USEFUL ACTIONS FOR THE INDUSTRIAL HYGIENIST

Have the industrial hygienist spend time looking at the work as it is carried out, evaluating controls, and talking with workers to find out when they experience irritation, smell odors, see dust; in this way, the worst exposure periods can be pinpointed. **Appendix 1** contains a checklist for evaluating the potential for chemical exposure by each route of entry.

The industrial hygienist should note all potential exposures to chemicals, noise, radiation, heat, cold, vibration, repetitive trauma, bacteria, viruses and other biological hazards. In

order to document that exposure is taking place, it is helpful to have photographs or videotape showing skin contact or visible contaminants.

The hygienist can collect bulk or wipe samples for analysis when there is no other way (such as a Material Safety Data Sheet) to find out if a substance is present. These types of samples are useful if you can use a “yes” or “no” answer to act. Bulk samples often are taken of materials suspected to be asbestos. Wipe samples of surfaces such as lunch tables may be useful where contamination by chemicals that are toxic when ingested, such as lead, is suspected.

The hygienist should observe and investigate all of the following and note whether they are effective:

- Labeling, placarding and communication of hazards to employees.
- Level of health and safety expertise and staffing among management.
- Worker training and education in their job duties as well, as health and safety practices and controls.
- Confined space entry procedures and practices.

Have the industrial hygienist and/or the union interview workers in private concerning any health problems, symptoms or complaints they may have. Results of such interviews must be confidential. Any reports should reveal only the employees' job title, not names. A simple survey form for this purpose is provided in

Appendix 6.

DEMAND A GOOD REPORT

Unions and workers should insist that the industrial hygienist write a report and that they get a copy of it. Unions and workers are entitled to all reports under OSHA Regulation 1910.1020. The report should state clearly the limitations of their investigations. For example such a statement could read as follows:

“The findings and exposure data reported here are accurate only for the workplace conditions existing at the time of the evaluation. Not all potential occupational health problems or exposures were evaluated. Inadequate information is available concerning what exposures to most hazards are safe for workers.”

Unions and workers also should insist that the report fully describe the conditions that the industrial hygienist observed in the workplace. This in itself will go a long way towards combating management's claims that all is well and good.

Most importantly, the report should list all of the possible improvements that could be made in the workplace. The union can decide which ones it wants the most. Changes in the work environment should be stressed over personal protective equipment.

A listing of standard industrial hygiene recommendations is provided in **Appendix 3.**

If NIOSH has published control technology recommendations for specific operations, these should be highlighted in the report. Some industries and operations for which control technology reports have been published are identified in **Appendix 5.**

Non-technical recommendations should be included, such as increased health and safety staffing and training among management personnel and better worker training. If the union thinks it will be beneficial, a recommendation for a joint union-management health and safety committee can be made.

DOING YOUR OWN INDUSTRIAL HYGIENE

As we have seen, industrial hygiene often has misplaced an emphasis on technical sampling methods rather than good investigations into health hazards and innovative problem solving. The more we realize that the best industrial hygiene is problem-solving, the more accessible it is for union health and safety representatives and activists. Here is a review of the traditional concepts of industrial hygiene and how a labor union might approach them.

Industrial hygiene often has misplaced emphasis on technical sampling methods rather than good investigations into health hazards and innovative problem solving. The more we realize that the best industrial hygiene is problem-solving, the more accessible it is for union health and safety representatives and activists.

Hazard Recognition: The best way to recognize potential health hazards is to know work operations and the associated hazards in the particular workplace. Inspections that utilize visual observations of the workplace for those hazards and talking to the “experts” (workers) are the best ways to learn the hazards.

Hazard Evaluation. This currently is done by sampling. Instead, evaluation can be performed by observing visible contaminants, noting odors, predicting exposure from situations such as open containers or spraying operations, or from interviewing workers about their health symptoms and complaints.

Controlling Hazards. This requires problem-solving techniques, coupled with solutions. Some solutions, such as designing a ventilation system, require a certain amount of technical expertise, while others require job expertise to recognize ways to change work organization and work practices. All solutions need to be trial-tested and modified until they are workable.

ACKNOWLEDGEMENTS

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2003: Peter Montague brought my attention to the Precautionary Principle and its similarity to my work; he also encouraged me to arrange to have this article more widely distributed. I appreciate permission from [New Solutions](#) to place this article on the Internet and the [New York Committee for Occupational Safety and Health](#) for posting this article on their web sites.

Appendix 1
CHECKLIST FOR EVALUATING CHEMICAL EXPOSURE

1) EVALUATE THE POTENTIAL FOR AIRBORNE EXPOSURE

- a) Exposure Sources (rank high/medium/low)
 - i) Types and amounts of chemicals in use or created by combustion or decomposition.
 - ii) Visible leaks, spills or emissions from process equipment, vents, stacks or from containers.
 - iii) Settled dust that may be re-suspended into the air.
 - iv) Open containers from which liquids may evaporate.
 - v) Heating or drying that may make a chemical more volatile or dusty.
 - vi) Odors. Consult an odor threshold table to get an estimate of concentration.
 - vii) Do air monitoring where the presence of a contaminant is suspected but cannot be verified by sight or smell.
 - viii) Visualize exposure by taking photographs or videotape.
- b) Job Functions (estimate hours/day)
 - i) Manual handling in general.
 - ii) Active verb job tasks such as grinding, scraping, sawing, cutting, sanding, drilling, spraying, measuring, mixing, blending, dumping, sweeping, wiping, pouring, crushing, filtering, extracting, packaging.
- c) Control Failures
 - i) Visible leaks from ventilation hoods, ductwork, and collectors.
 - ii) Hoods that are located too far from the source or that are missing or broken.
 - iii) Ductwork that is clogged, dented, or has holes.
 - iv) Insufficient make-up air to replace exhausted air.
 - v) Contamination inside respirators.
 - vi) Improperly selected, maintained or used respirator.
 - vii) Lack or inadequate housekeeping equipment.
 - viii) Lack of or inadequate doffing and laundering procedures for clothing contaminated by dust.

2) EVALUATE THE POTENTIAL FOR ACCIDENTAL INGESTION

- a) Exposure Sources (rank high/medium/low)
 - i) Types and amounts of chemicals in use or created by combustion or decomposition. Solids are of primary concern.
 - ii) Contamination of work surfaces that may spread to food, beverage, gum, cigarettes, hands or face.
 - iii) Contamination of hands or face that may enter mouth.
 - iv) Do wipe sampling to verify the presence of a contaminant on work surfaces, hands, face, and so forth.
- b) Control Failures
 - i) Contamination of inside of respirator that may enter mouth.
 - ii) Contamination of lunchroom surfaces that may spread to food, beverage, gum, cigarettes, hands or face.

3) EVALUATE THE POTENTIAL FOR SKIN CONTACT AND ABSORPTION

- a) Exposure Sources
 - i) Types and amounts of chemicals in use or created by combustion or decomposition. Check dermal absorption potential. Do not rely upon OSHA SKIN notations. Assume most liquids will penetrate skin.
 - ii) Consider whether one chemical can act as a "carrier" for other chemicals.
 - iii) Visualize dermal exposure by taking photographs or videotape.
- b) Job Functions.
 - i) Dipping hands into material.
 - ii) Handling of wet objects or rags.

- c) Control Failures
 - i) Contamination of inside of gloves.
 - ii) Improperly selected, maintained or used gloves.
 - iii) Improperly selected, maintained or used chemical protective clothing.
 - iv) Lack of or inadequate facilities for washing of hands and face close to work areas.
 - v) Lack of or inadequate shower facilities.

Appendix 2 USEFUL OSHA HEALTH STANDARDS

CHEMICALS WITH COMPREHENSIVE STANDARDS

1910.1001	Asbestos
1910.1017	Vinyl chloride
1910.1018	Inorganic arsenic
1910.1025	Lead
1910.1025	Chromium (VI)
1910.1027	Cadmium
1910.1028	Benzene
1910.1029	Coke oven emissions
1910.1043	Cotton dust
1910.1044	1,2-dibromo-3-chloropropane
1910.1045	Acrylonitrile
1910.1047	Ethylene oxide
1910.1048	Formaldehyde
1910.1050	Methylenedianiline
1910.1051	1,3 Butadiene
1910.1052	Methylene chloride
1915.1001	Asbestos in Shipbuilding
1926.62	Lead in Construction
1926.1101	Asbestos in Construction
1926.1127	Cadmium in Construction

CHEMICAL-RELATED STANDARDS

1910.94	Ventilation
1910.107 materials	Spray finishing using flammable and combustible
1910.108 liquids	Dip tanks containing flammable or combustible
1910.120 response	Hazardous waste operations and emergency
1910.146	Permit-required confined spaces
1910.152	Process Safety Management
1910.252	Welding, capping and brazing
1910.1200	Hazard communication
1910.1450 labs	Occupational exposure to hazardous chemicals in

PERSONAL PROTECTIVE EQUIPMENT STANDARDS

1910.132	General requirements and payment
1910.133	Eye and face protection
1910.134	Respiratory protection
1910.135	Head protection
1910.136	Foot protection
1910.138	Hand protection.
1926.28	Personal protective equipment in construction

GENERAL

1910.141	Sanitation; lunchrooms
1910.151	Medical services and first aid

NON-CHEMICAL HAZARDS

1910.95	Occupational noise exposure
1910.96	Ionizing radiation
1910.97	Nonionizing radiation

RECORD KEEPING

1904 illnesses	Recording and reporting occupational injuries and
1910.1020	Access to medical and monitoring data

Appendix 3 STANDARD INDUSTRIAL HYGIENE RECOMMENDATIONS

- 1) Provide employees immediately with short-term protection against the toxic material(s) by providing the following properly selected, fitted and maintained personal protective and emergency equipment:
 - a) Respirators see OSHA Reg. 1910.134
 - b) Gloves see OSHA Reg. 1910.138
 - c) Chemical-protective clothing see OSHA Reg. 1910.132
 - d) Chemical splash goggles see OSHA Reg. 133
 - e) Chemical-protective boots see OSHA Reg. 1910.136
 - f) Eye-wash fountain — see OSHA Reg. 1910.151
 - g) Body-wash shower — see OSHA Reg. 1910.151
 - h) Spill clean-up kits
 - i) Other _____
- 2) Permanently reduce exposure to the toxic material(s) by instituting the following engineering and work Practice controls:
 - a) Substitute a less toxic material
 - b) Isolate or enclose the operation
 - c) Install local exhaust ventilation
 - d) Provide dilution ventilation
 - e) Eliminate skin contact
 - f) Other _____
- 3) The following elements of an effective respirator program should be instituted see OSHA Reg. 1910.134(b):
 - a) Written standard operating procedures governing the selection and use of respirators

- b) Proper selection on the basis of the hazards to which workers are exposed
 - c) Training of users in proper use and limitations of respirators
 - d) Assignment of respirators to individual workers for their exclusive use
 - e) Regular cleaning and disinfecting after each day's use
 - f) Storage in a convenient, clean and sanitary location
 - g) Inspection during cleaning and replacement of worn or deteriorated parts
 - h) Surveillance of work area conditions and degree of employee exposure or stress
 - i) Regular evaluation to determine the continued effectiveness of the program
 - j) Annual review of respirator user's medical status for physical ability to perform the work and use the equipment
- 4) Improve housekeeping as follows:
- a) Keep floors and work surfaces free of visible contaminants see OSHA Reg. 1910.22(a)
 - b) Eliminate dry sweeping
 - c) Eliminate the use of compressed air for cleaning - see OSHA Reg. 190.242(b)
 - d) Use a HEPA vacuum for cleaning
 - e) Use wet wiping or mopping for cleaning
 - f) Clean up spills promptly using properly trained and equipped employees see OSHA Reg. 1910.120
 - g) Eliminate vermin - see OSHA Reg. 1910.141(a)(5)
 - h) Other _____
- 5) Improve lunchroom, locker and lavatory facilities as follows:
- a) Prohibit eating in work areas see OSHA Reg. 1910.141(g)
 - b) Require vacuuming of clothing before entering lunchroom
 - c) Keep lunchroom clean see OSHA Reg. 1910.141(g)
 - d) HEPA vacuum lunchroom daily
 - e) Provide separate locker facilities for work and street clothing see OSHA Reg. 1910.141(e)
 - f) Assure that employees wash hands and face prior to eating, drinking or smoking
 - g) Keep lavatories clean
 - h) Provide soap, towels and warm water in lavatories — see OSHA Reg. 1910.141(c)(2)
 - i) Provide additional lavatories — see OSHA Reg. 1910.141(c)
 - j) Provide additional hand-washing facilities
 - k) Provide showers
 - l) Assure that employees shower before going home
 - m) Keep showers clean
 - n) Provide soap, towels and warm water in showers — see OSHA Reg. 1910.141(c)(3)
 - o) Provide potable drinking water - see OSHA Reg. 1910.141(b)
 - p) Other _____
- 6) Assure that employees receive comprehensive information and training concerning hazardous chemicals -- see OSHA Reg. 1910.1200 and state Right-to-Know Laws.
- 7) Maintain an OSHA Log of Injuries and Illnesses and post Summary every February - see OSHA Reg. 1904.
- 8) Notify employees of their rights to obtain copies of medical and monitoring data and provide such copies to employees upon their request— see OSHA Reg. 1910.1020.
- 9) Form and hold regular meetings of a joint worker-management health and safety committee.
- 10) Obtain information on the following comprehensive OSHA standards:
- a) 1910.1001 - Asbestos
 - b) 1910.1017 - Vinyl chloride
 - c) 1910.1018 - Inorganic arsenic
 - d) 1910.1025 – Lead

- e) 1910.1026 - Chromium (VI)
- f) 1910.1027 - Cadmium
- g) 1910.1028 - Benzene
- h) 1910.1029 - Coke oven emissions
- i) 1910.1043 - Cotton dust
- j) 1910.1044 - 1,2-dibromo-3-chloropropane (DBCP)
- k) 1910.1045 - Acrylonitrile
- l) 1910.1047 - Ethylene oxide
- m) 1910.1048 - Formaldehyde
- n) 1910.1050 - Methylenedianiline
- o) 1910.1051 - 1,3 Butadiene
- p) 1910.1052 - Methylene chloride
- q) 1915.1001 - Asbestos in Shipbuilding
- r) 1926.62 - Lead in Construction
- s) 1926.1101 - Asbestos in Construction
- t) 1926.1127 - Cadmium in Construction

Appendix 4
CHEMICALS FOR WHICH OSHA HAS BETTER THAN A 1 IN 10 CHANCE
OF FINDING EXPOSURES GREATER THAN THE PEL

OSHA Personal TWA Samples Collected - January 1985- December 1989

SUBSTANCE	PERCENT OVEREXPOSURES
1. Silver metal and soluble compounds	37.2
2. Coke oven emissions	31.1
3. Respirable silica	28.5
4. Lead - inorganic	27.5
5. Wood dust	22.9
6. Carbon monoxide	21.4
7. Chromic acid and chromates	20.4
8. Total dust	15.6
9. Beryllium and compounds	14.5
10. Coal tar pitch volatiles	13.9
11. Copper dusts and mist	12.9
12. Mercury	12.4
13. Welding fume, total particulate	11.2
14. Ethylene oxide	10.5
15. Arsenic and organic compounds	10.1

Appendix 5
SOME INDUSTRIES AND OPERATIONS FOR WHICH NIOSH CONTROL
TECHNOLOGY REPORTS
AND HAZARD CONTROLS HAVE BEEN PUBLISHED

NIOSH Numbered Publications

- 74-100 - Lead Exposure at an Indoor Firing Range
- 74-114 - Cotton Dust Control in Yarn Manufacturing
- 75-108 - Development of Design Criteria for Exhaust Systems for Open Surface Tanks
- 75-115 - Engineering Control of Welding Fumes
- 75-165 - Compendium of Materials for Noise Control (revised: See 80-116)
- 76-130 - Lead Exposure and Design Considerations for Indoor Firing Ranges
- 76-179 - Abrasive Blasting Operations: Engineering Control and Work Practices Manual
- 76-180 - Engineering Control Research Recommendations
- 76-186 - Recirculation of Exhaust Air
- 78-109 - An Evaluation of Cotton Dust Control Systems
- 78-141 - The Recirculation of Exhaust Air ... Symposium Proceedings
- 78-159 - Engineering Control Technology Assessment for the Plastics and Resins Industry
- 78-165 - Control of Exposure to Metalworking fluids
- 79-114 - An Evaluation of Occupational Health Hazard Control Technology for the Foundry Industry
- 79-125 - Assessment of Selected Control Technology Techniques for Welding Fumes
- 79-143A - Validation of a Recommended Approach to Recirculation of Industrial Exhaust Air Vol. I
(Spring Grinding, Chrome Plating, Dry Cleaning, Welding and Vapor Degreasing Operations)
- 79-143B - Validation of a Recommended Approach to Recirculation of Industrial Exhaust Air Vol. II (Lead Battery, Woodworking, Metal Grinding and Enamel Blending Operations)
- 80-107 - CIB -33 - Radiofrequency (RF) Sealers and Heaters: Potential Health Hazards and Their Prevention
- 80-112 - Industrial Hygiene Characterization of the Photovoltaic Solar Cell Industry
- 80-114 - Control Technology for Worker Exposure to Coke Oven Emissions,
- 80-136 - Engineering Control Technology Assessment of the Dry Cleaning Industry
- 80-143 - Control Technology Assessment: The Secondary Nonferrous Smelting Industry
- 81-113 - Evaluation of Air Cleaning and Monitoring Equipment Used in Recirculation Systems
- 81-118 - Control of Emissions from Seals and fittings in Chemical Process Industries
- 81-121 - An Evaluation of Engineering Control Technology for Spray Painting
- 83-115 - Occupational Health Control Technology for the Primary Aluminum Industry
- 83-127 - Comprehensive Safety Recommendations for Land-Based Oil and Gas Well Drilling
- 84-102 - Engineering Control of Occupational Safety and Health Hazards: Recommendations for Improving Engineering Practice, Education and Research, Summary Report
- 84-106 - NIOSH Alert — Request for Assistance in controlling Carbon Monoxide Hazard in Aircraft Refueling Operations
- 84-110 - Health Hazard Control Technology Assessment of the Silica flour Milling Industry
- 84-111 - Control of Air Contaminants in Tire Manufacturing
- 85-102 - Control Technology Assessment: Metal Plating and Cleaning Operations
- 88-108 - Safe Maintenance Guide for Robotic Workstations
- 88-119 - Guidelines for Protecting the Safety and Health of Health Care Workers

89-107 - Guidelines for Prevention of Transmission of HIV Virus and Hepatitis B Virus to Health-Care and Public-Safety Workers
89-115 - Current Intelligence Bulletin 52— Ethylene Oxide Sterilizers in Health Care Facilities

Engineering Controls and Work Practices

89-120 - Control Technology for Ethylene Oxide Sterilization in Hospitals
89-121 - Control of Asbestos Exposure During Brake Drum Service

Hazard Controls

- 96-105 (January, 1996), HC1 Control of Dusts From Sanding in Autobody Repair Shops
96-106 (January, 1996), HC2 Control of Paint Overspray in Autobody Repair Shops
96-107 (January, 1996), HC3 Control of Nitrous Oxide in Dental Operatories
96-121 (September, 1996), HC4 Control of Wood Dust from Horizontal Belt Sanders
96-122 (September, 1996), HC5 Control of Wood Dust from Shapers
96-123 (September, 1996), HC6 Control of Wood Dust from Automated Routers
96-124 (September, 1996), HC7 Control of Wood Dust from Large Diameter Disc Sanders
96-125 (September, 1996), HC8 Control of Wood Dust from Random Orbital Hand Sanders
96-126 (September, 1996), HC9 Control of Wood Dust from Orbital Hand Sanders
96-127 (September, 1996), HC10 Control of Wood Dust from Table Saws
96-128 (September, 1996), HC11 Control of Smoke from Laser/Electric Surgical Procedures
97-103 (September, 1996), HC12 Control of Organic Dusts From Bedding Choppers in Dairy Barns
97-107 (April, 1997), HC13 Control of Dust From Powder Dye Handling Operators
97-113 (April, 1997), HC14 Control of Scrap Paper Baler Crushing Hazards

97-137 (June, 1997), HC15 Control of Ergonomic Hazards from Squeegee Handles in the Screen-Printing Industry
97-154 (October, 1997), HC16 Control of Exposure to Perchloroethylene in Commercial Drycleaning
97-155 (October, 1997), HC17 Control of Exposure to Perchloroethylene in Commercial Drycleaning (Substitution)
97-156 (October, 1997), HC18 Control of Exposure to Perchloroethylene in Commercial Drycleaning (Machine Design)
97-157 (October, 1997), HC19 Control of Exposure to Perchloroethylene in Commercial Drycleaning (Ventilation)
97-158 (October, 1997), HC20 Control of Spotting Chemical Hazards In Commercial Drycleaning
97-159 (October, 1997), HC21 Control of Fire Hazards in Commercial Drycleaning Shops Using Petroleum-Based Solvents
97-160 (October, 1997), HC22 Control of Ergonomic Hazards in Commercial Drycleaning
98-106 (December, 1997), HC23 Controlling Silica Dust from Foundry Casting-Cleaning Operations
98-107 (December, 1997), HC24 Controlling Cleaning-Solvent Vapors at Small Printers
98-108 (December, 1997), HC25 Controlling the Ergonomic Hazards of Wiring Tasks for

Household Appliances

98-149 (October, 1998), HC26 Controlling Formaldehyde Exposures During Embalming

98-150 (November, 1998), HC27 New Shroud Design Controls Silica Dust from Surface Mine and Construction Blast Hole Drills

99-112 (January, 1999), HC28 Controlling Chemical Hazards During the Application of Artificial Fingernails

99-105 (January, 1999), HC29 Control of Nitrous Oxide During Cryosurgery

99-113 (June, 1999), HC30 Control of Drywall Sanding Dust Exposures

2001-142 (July, 2001), HC31 Dust Protection for Bag Stackers

Click on the underlined documents to connect to them.

A more extensive list of control technology documents and ordering information can be found online at www.cdc.gov/niosh/pubs/all_date_desc_nopubnumbers.html. Many of the older publications are no longer available from NIOSH and/or NTIS. There are links to all documents that are currently available on the NIOSH Homepage. NIOSH documents are sometimes available at no cost from NIOSH Publications. Call 1-800-35-NIOSH, 1-800-356-4674. Some OSHA and NIOSH offices, especially regional offices, have libraries that may have older NIOSH documents available for use.

Appendix 6
(Name of Local Union)
WORK-RELATED HEALTH PROBLEMS REPORT
This Report Is Confidential
Please print clearly and attach additional pages if necessary.

Name _____ Date _____

Job Title _____ Work Area _____

Home phone (_____) _____ Work phone (_____) _____

Date began your current job ____/____/____ Hours of work _____
month year

NOTE: Symptoms of work-related health problems may include but are not limited to: irritation of the eyes, nose, or throat; hoarseness or change in voice; cough, shortness of breath; burning, heaviness, tightness in the chest; skin irritation, itching, redness, rash; chills, indigestion, nausea, vomiting; weight loss; headaches, light-headedness, fainting, confusion, fatigue, drowsiness, reduced memory; muscle weakness, poor coordination, numbness, pins-and-needles feeling, tremors, seizures; swelling, pain or discomfort in a part of the body.

1. Please describe any health symptoms/problems that you feel may have been caused or made worse by your current job.

2. When did the symptoms/problem(s) begin or begin to occur more often than normal?

_____/_____
month year

3. Do the symptoms/problem(s) get better during:

Daily non-work time No Yes

Days off No Yes

Longer vacations No Yes

4. Have you had to leave work early because of these symptoms/problems?

No

Yes

Times in past year _____

5. Have you missed days from work because of these health symptoms/problem(s)?
 No Yes
Times in past year _____

6. Have you sought health care advice for any of these health symptoms/problem(s)?
 No Yes
Times in past year _____

7. What does your health care provider say about these symptoms/problems?

8. Have you filed for Workers Compensation for any of these health problem(s)?
 No Yes
If yes, which problem(s)?

If yes, were you awarded Workers Compensation? Yes No

9. What do you think is causing your health symptoms/problem(s)?

10. What do you think would improve your health symptoms/problem(s)?

***Place in a Sealed Envelope and Return to a
(Name of Local Union) Representative
Address of Local Union
Phone and Fax of Local Union***