

Effective Personal Protective Equipment Programs: Their Role and Implementation

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THE ROLE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

Planning a Protection Strategy

When it is recognized that a hazard exists, then a strategy that removes or controls the unacceptable conditions must be developed.

The selection of an appropriate control should be based on three elements:

1. protection of workers,
2. compliance with applicable laws/regulations and internal company standards, and
3. technical feasibility

In practice, only a limited number of options are available, including:

- engineering controls
- process change
- equipment change
- administrative controls
- material substitution
- revised work practices
- use of personal protective equipment (PPE)

Frequently, a single option is used with no attempt to integrate a group of controls into the protection strategy. But a good comprehensive strategy considers the hazards, evaluates all possible control methods, integrates various approaches, and reexamines them frequently to ensure a safe work operation.

An effective strategy requires that conscious decision-making, evaluation and reevaluation be done at various stages throughout the program.

A chart such as the one in Figure 1 can assist by systematically guiding the user through each stage in the development of an appropriate protection strategy. The evaluation of these controls should include monitoring for a change in operations or breakdown of existing control methods (for example, breakdowns of exhaust fans).

When hazards are identified, fundamental control principles should be followed. These

control principles can be categorized in two fundamental groups, "pre-contact" or "post-contact."

Protection Strategy Flow Chart

Pre-Contact

Pre-contact control is the primary method because it prevents the hazard from reaching the worker. Various methods for accomplishing pre-contact control include acquiring safer equipment, retrofitting existing equipment, isolating hazardous processes, or substituting materials or processes that are less hazardous. A pre-contact control can also be accomplished by providing protection along the path to the worker by means of local exhaust ventilation, better housekeeping, and safe work practices for example.

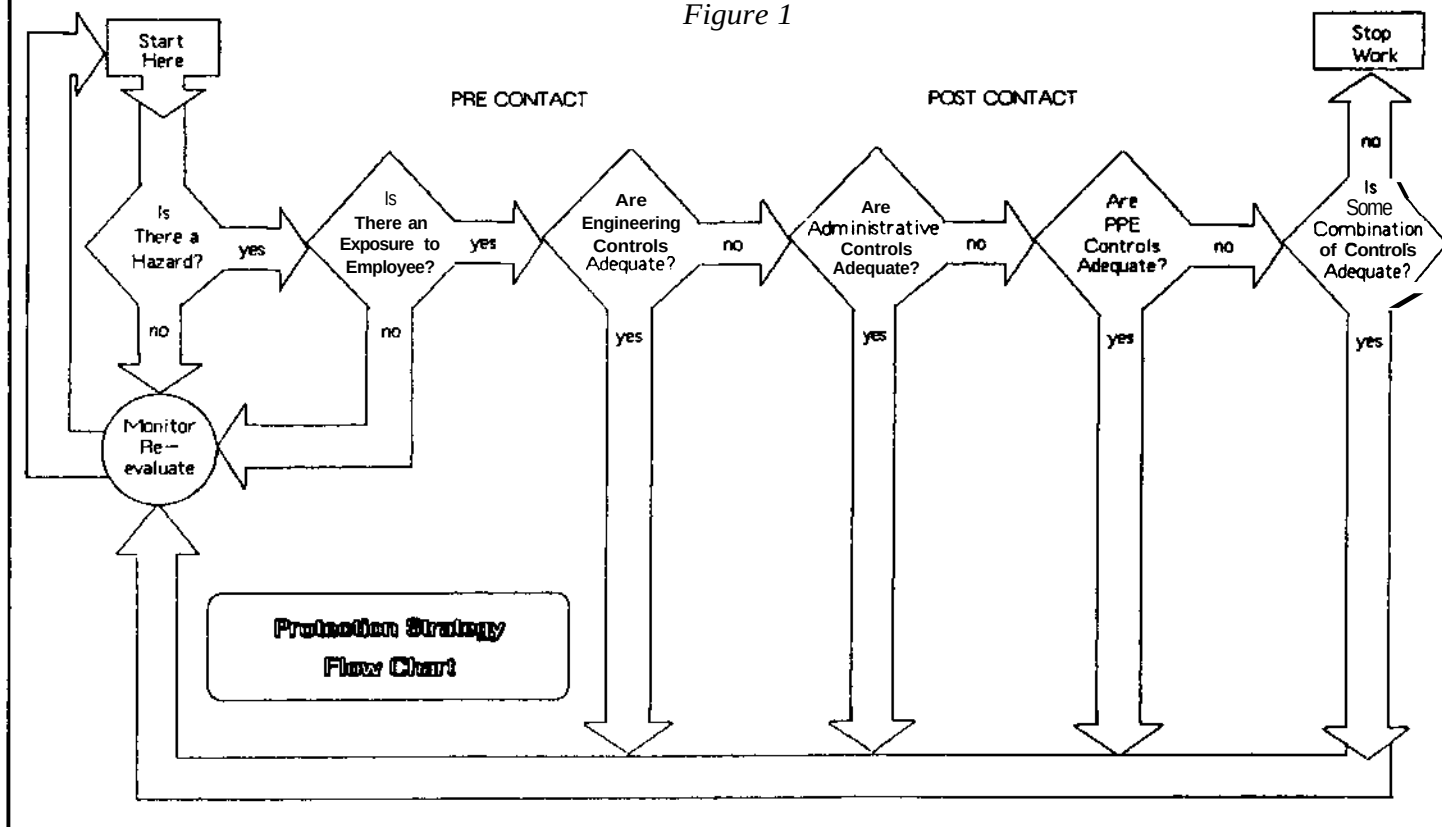
Many Canadian jurisdictions legislate pre-contact controls. One law states:

An employer shall take reasonable measures to institute engineering techniques, systems, work practices or administrative controls that eliminate or reduce to a practical minimum those hazards for which personal protective equipment is or would otherwise be required.

While many hazards are easily anticipated and avoided through effective engineering at the pre-contact stage, some others will be missed. A genuine effort to identify hazards is essential so that they may be reduced or eliminated at the source.

Where pre-contact controls are not practical, feasible, or totally effective, then post-contact controls must be used.

Figure 1



Post-Contact

The post-contact control manages the hazard at the point of contact with the worker, primarily through Personal Protective Equipment (PPE). This type of control is to be used when pre-contact controls are not totally effective, such as in the case with workers exposed to radiant heat from furnaces, ultra violet or infrared rays from welding, or carbon monoxide buildup in enclosed spaces.

Many Canadian jurisdictions legislate post-contact methods. One law states:

If the measures do not eliminate or reduce a hazard to a point where there is no danger to the safety or health of workers, then

(a) *the employer shall ensure that workers use the appropriate personal protective equipment specified in this regulation, and*

(b) *workers shall use that equipment.*

The Use Of Personal Protective Equipment (PPE)

PPE is equipment worn by a worker to eliminate or minimize the exposure to injurious physical or chemical agents. A hazard would not

be eliminated, but risk of injury would be eliminated or greatly reduced. The wearing of a hearing protection would eliminate or reduce the possibility of hearing damage, but would not eliminate the noise. PPE should only be used:

- as an interim measure before controls are implemented,
- where pre-contact control technology is not available,
- where pre-contact controls are inadequate,
- during activities such as maintenance, clean up, and repair where pre-contact controls are neither feasible nor an effective means of protection, or
- during emergency situations.

PPE is categorized by the area of the body which is protected. PPE is designed to meet criteria which can only approximate real working conditions. PPE should not be used when hazards are greater than those for which they are designed. It is not always possible to predict the unexpected. When it comes to the evaluation of potential hazards, take uncertainties into account. As PPE design criteria does not always allow for this, the use of PPE cannot be a primary control of hazards.

The use of multiple protection must not

increase the danger to other hazards or decrease the user's ability to do the assigned job. The wearing of PPE should not in itself create a greater danger. The wearing of gloves prevents skin contamination while working with moving equipment.

PPE can be a contributing factor in causing workplace accidents, it is a definite factor as it can affect human performance.

For various reasons, the use of PPE is often dictated by legislation. Most regulatory agencies require that PPE not be used until the employer has taken all the necessary measures in terms of engineering controls, work practices, administrative controls, and hygiene to control the hazard.

Since the goal is to prevent occupational injury and illness, PPE cannot be the first protection option. PPE does not prevent an accident from happening. It does not eliminate the hazard. It does not influence any pre-contact activities. It only minimizes the exposure or reduces the severity of injury or illness. PPE is a good post-contact accident control strategy. However, even at its best, PPE cannot achieve its full protection potential without a degree of worker knowledge and cooperation that is something seldom achieved in practice. PPE is only to be used as the last line of defense.

The Implementation

Designing Of A PPE Program

After deciding that PPE will be one of the control methods, consideration will have to be given to the design and implementation of a PPE program.

A PPE program must be comprehensive. It requires commitment and active participation at the planning, development, and implementation stages from all levels - senior management, supervisors, workers. A good PPE program consists of these essential elements:

- workplace survey
- selection of appropriate controls
- fitting
- maintenance
- training
- support
- auditing the program

These are dealt with later in this article.

The organization's occupational health and safety policy should be enunciated in a statement of principles and general rules which serve as

guides to action. Senior management must be totally committed to ensuring that the policy and procedures are carried out. PPE programs must be, and must be seen to be, on par with all other organizational policies, procedures, and programs.

This can be accomplished by a policy statement that holds managers accountable for their health and safety performances in the same way that they are accountable for productivity and profit.

The appointment of a program coordinator who has the responsibility to ensure that each of the elements of a program are in place and operational will go a long way in ensuring the success of a program.

With any program, the method of implementation affects the acceptance and effectiveness of the whole program. The approach too often used has been to purchase PPE, issue it, demand that it be worn, and then discipline for noncompliance. There is little wonder that such programs have not worked.

The greater the worker's involvement in all stages of the program, the smoother the program will be to implement and operate. Users must be told why the PPE is to be worn and trained in its proper use.

If a PPE device is unattractive, uncomfortable, or imposed on the user with little choice in the selection, then compliance is likely to be poor. Flexibility in the choice of PPE, as long as it meets the safety standards, is important.

The introduction of a program must be carefully planned, fully developed and understood and methodically implemented. The program should be introduced gradually and phased in over time. The process should be to state the intention, then allow time for users to become accustomed to wearing the PPE, publicize the beneficial effects of the program, and set the target date for compliance. After the program is introduced, firmly enforce the use of PPE as a required condition of employment. In the phasing-in stage, although PPE would be "effective immediately", time should be given to comply to the program where no disciplinary action is taken for some fixed period of implementation (target date).

The phasing in of a PPE program would not be acceptable when there is a need to enter a hazardous atmosphere or where failure to use the equipment poses a significant risk of major injury, for example, where no adjustment period should be allowed.

Mandatory programs are becoming more popular because of the belief that they are easier to enforce. Mandatory programs have a place in the workplace where the variety and amount of hazards are great, such as hard hats on a construction project where it is almost impossible to protect by other means. As is the case with any program this perception may be dangerous, because complacency often breeds contempt. Mandatory programs often become ineffective because the constant reevaluating of the program and protection is often neglected.

Promotional Strategy

The overall goal of a safer workplace is supported by a careful promotional strategy. This strategy focuses on:

- management's commitment to the program and who is responsible for promulgation of the program,
- the reasons for the program, and
- how the program will work.

The success of this program, as with any program, will depend upon winning the cooperation and support of all those concerned. This support can best be achieved by helping workers understand the need to wear the PPE, and by encouraging them to want to wear it, rather than demanding that they do so. Cooperation is more likely to be accomplished if it is shown that controls at the source and along the path have been addressed. Implementation of an aggressive education program within the work environment, through the use of seminars, films, and best of all, one-on-one discussions will help. The use of posters and envelope stuffers can assist in the promotion of the program, but should not be used as the only means of promotion.

Many of the safety equipment suppliers or manufacturing companies can help in the administration of this type of promotion. So can a number of safety associations and government agencies. Naturally, this education process should be supported by a clear company policy that assigns responsibility regarding the use of PPE, firmly backed by all supervisory and management personnel.

Often the promotion of a PPE is assisted by some form of financial incentive, either in the form of personal subsidies to assist with the purchase of the PPE or in the form of company-supplied PPE. (This would not apply where people would have to pay for PPE because the company is

not required by legislation to supply it.)

Other types of incentives are sometimes used: The "Wise Owl" commendation is awarded to a worker who avoids injury in an accident because eye protection is worn. These incentives reinforce training and recognize employees for their positive actions. At the same time, this recognition serves as an example to other workers.

All PPE programs are plagued by the belief that once a piece of equipment is put on, the user is totally protected. This false sense of security must be addressed. Basic safety principles, housekeeping and environmental controls cannot be ignored in the belief that the worker is totally protected.

Program Elements

Workplace Survey

The first step in the development of a PPE program is to identify the different hazards that may be present. Some of these may be obvious, but an on site inspection should still be performed. Work practices, job procedures, equipment, workplace layout, and individual factors may play a deciding role in the type of controls recommended for a certain job.

Evaluating the occupational environment requires a multidisciplinary approach. This approach can involve coordinating engineers, chemists, physicians, nurses, hygienists, safety officers, production supervisors and workers to eliminate hazards through recognition, evaluation and control techniques. Obviously it is not always practical or feasible to enlist such a group. It is essential, however, that each person evaluating the work environment take a multidisciplinary approach.

One evaluation technique to overcome possible inexperience is a Job Hazard Analysis, sometimes called a Job Safety Analysis. A Job Hazard Analysis reviews job methods to uncover hazards and to provide for an integration of accepted safety and health principles and practices into a particular operation.

The recognition of potential hazards includes becoming familiar with the manufacturing processes, maintaining an inventory of any physical and chemical agents encountered periodically, reviewing the different job activities of a work area, and studying the existing control measures. Every effort should be made to control all hazards, where possible, at the source.

Particular attention should be paid to job criteria that may have a dramatic effect on the PPE selected. Some types of hazards require a more complicated solution. For example, working with chlorine requires both eye and respiratory protection because chlorine irritates the inhalation tract and mucous membrane. It is also important to review Material Safety Data Sheets (MSDS) as part of the inspection, as they indicate the type of hazards associated with the material.

A workplace evaluation should involve the joint health and safety committee as an integral part of the survey team.

Selection

When a workplace survey has been completed, the data gathered are used to decide the required engineering solutions and, if necessary, the required PPE. If pre-contact controls cannot completely resolve the problem, PPE becomes a viable solution.

Once the need for PPE has been established, the task is to select the proper type. Two criteria need to be determined:

1. the degree of protection required, and
2. the suitability of the equipment to the situation (the practicality of it being used and kept in good repair).

The degree of protection and the design of PPE must be integrated into a program because they affect the overall efficiency, wearability, and acceptance of all forms of PPE.

The measured degree of protection estimates the protection afforded by a PPE device and is based upon the efficiency and effectiveness of the PPE device. The maximum degree of protection can only be achieved when the actual performance of the PPE in use is equal to the PPE used in the original tests from which the performance data were derived. Fit, usage and state of repair affect the degree of protection given by all forms of PPE, but may be the most critical for hearing and respiratory protection. Improper fitting of PPE is the most common reason for reduced protection.

No matter how well a product is designed, if it is not worn, the degree of protection afforded will be zero. Glasses tucked snugly into their case in a pocket or lunch pail do not prevent injuries.

A 1984 study conducted by the US Bureau of Labor Studies indicated that 42% of all eye injuries

occurred while the worker was wearing some type of eye protection. Obviously, a factor in these accidents was that the type of protection being used was in some way inadequate or improperly worn for the hazard involved. The advice of PPE manufacturers and suppliers may be required for choosing the most effective and up-to-date equipment.

Guidelines for Selection

Match PPE to the Hazard

There are no shortcuts to PPE selection. Choose PPE to match the hazard. On some jobs the same task is performed throughout the entire job cycle, so it is easy to select proper PPE. In other instances, workers may be exposed to two or more different hazards. A welder, for instance, may require protection against welding gases, harmful light rays, molten metal and flying chips. In such instances, the worker should be provided with a welding helmet, or welder's goggles and the appropriate respirator or an air supplied welding hood, which provide such multiple protection.

Obtain Advice

Make decisions based on thorough hazard evaluation, user acceptance, and types of PPE. Once you have pinpointed your PPE needs, shop around. Discuss your basic needs with trained sales representatives; then ask for their recommendations. Always ask for alternatives, and check into product claims and test data. Try out PPE before approval to see that products meet all of your criteria. Only approved equipment should be introduced on a trial basis and purchased.

Institute Trials

It is extremely important to have individual workers involved in the selection of specific models. This can be achieved by introducing approved models into the workplace through selected trials in which workers are able to evaluate various models. Through this procedure, much information regarding fit, comfort, and user acceptability will be gained. When choosing PPE, workers should select among two or three models, allowing for personal preferences. PPE should be individually assigned.

Consider Physical Comfort of PPE

(Ergonomics)

Other important factors to be considered in the selection of PPE are physical comfort and cosmetic appeal. If a PPE device is unduly heavy or poorly fitted it is unlikely that it will be worn. It should also be noted that if a PPE device is unattractive, uncomfortable, and there is no allowance for workers to choose among models, compliance is likely to be poor. When several forms of PPE are worn their interactions on the effective use of PPE must be borne in mind. Every opportunity must be used to provide flexibility in the choice of PPE as long as it meets required standards.

Evaluate Cost Considerations

No one can put a price tag on worker safety, but cost is often a concern. Some programs use disposable respirators because they are inexpensive. But when the use is evaluated over time, it is possible that a more substantive dual cartridge respirator would be more economical. A permanent contaminant reduction solution might prove even more cost effective.

Review Standards

In Canada, various standards exist and should be used for guidance in the selection process. The Canadian Standards Association (CSA) has standards for many categories of PPE.

The CSA Standard z94.3M1982, "Industrial Eye and Face Protectors", outlines types of eye protectors recommended for particular work hazards. It classifies eye protection according to the hazard. It allows the wide variety of PPE on the market to be slotted into various categories. A review of your plant survey and these categories will help in the choice of the proper eye protection for each specific job hazard.

Performance requirements of the CSA standards must be reviewed to ensure that the exposure to injury will be minimized or eliminated by using PPE.

Efficiency and, therefore, degree of protection are dictated by the design of the PPE.

If PPE is exposed to hazards greater than those for which they are designed, they will not deliver adequate protection. This thesis really just restates the point that PPE is not a pre-contact strategy.

Fitting And Wearing

When the selection has been made, a fitting component should be put in place. The key to this part of the program is to fit each user with PPE on an individual basis, and to show each how PPE is to be properly worn and maintained. Individual fitting programs should be carried out by qualified personnel. For example, for eye protection, this qualified person could be an optometrist, an optician, a manufacturer's representative, or even a specially trained staff member, such as a nurse.

When safety glasses sit halfway down your nose, the protection from hazard of flying particles is reduced to some degree, sometimes to the point where no adequate protection at all is given. In this case, one must question the use of such equipment, since it has no protective function. The calculated degree of protection will not be achieved in practice unless the PPE is worn properly at all times when the worker is at risk. For example, the removal of hearing protection for even very short periods during exposure to noise drastically reduces the protection given. This reduction can totally outweigh any benefit obtained from the wearing of hearing protection.

Maintenance

Without proper maintenance, the effectiveness of PPE cannot be assured. The maintenance component should, at the least, include inspection, care, cleaning, repair, and proper storage.

Probably the most important part of maintenance is the need for continual inspection of the PPE. If conscientiously performed, inspections will identify damaged or malfunctioning PPE before being used. PPE that is not performing up to manufacturer's specifications should be discarded. Safety glasses with scratched glass lenses are an example. Once a glass lens is scratched, it loses its ability to withstand impact.

A procedure should be set up to enable users to obtain replacement parts for damaged PPE and to keep it clean. Certain forms of PPE, such as respirators, require a more detailed program of repair, cleaning and storage.

The calculated degree of protection will not be achieved in practice unless equipment is cleaned and well maintained. Wearing poorly maintained or malfunctioning PPE may be more dangerous than not wearing any form of protection at all. The users think they are protected when, in reality, they are not.

Training

No program can be complete without training to ensure the optimum use of PPE. The training components should cover how to fit and wear PPE, how to adjust it for maximum protection, and how to care for and maintain it.

Training can be done on an individual basis or in group meetings. Training programs should reemphasize the major goals of the program and reinforce the fact that the use of engineering controls have been considered as the primary prevention strategy. It is not good to tell someone to wear a respirator just because management and/or legislation requires it. If the respirator is intended to prevent lung disorders or death, the users should be informed of this in no uncertain terms.

Training programs require the presence of people with an appropriate level of competence in the use of PPE, if the conditions of use are to approximate the ideal protection levels as determined in the laboratories. The burden of training that is required to constitute a successful PPE program may be considerably greater than many organizations realize when they opt for the use of PPE over engineering controls.

The users will require training in when, where, why, and how to use the PPE to achieve the necessary level of protection. They will include those who are exposed on a regular basis and those who must work frequently or continuously in dangerous areas. They will also include those who might be exposed on an occasional basis, for example, in emergencies or when temporary work is performed in dangerous areas. The training needs and methods for these users would be similar. Training is needed not only for those who will wear the PPE and their supervisors, but also the selectors, buyers, and storekeepers of the equipment.

Support

Once the program is underway there will be a continuing need for involvement from management, safety and medical personnel, supervisory personnel, the health and safety committee, individual workers, and even the suppliers of the chosen PPE.

Education programs should continue on a regular basis. Top management's approval is no less important in PPE programs than in production, quality control, or cost control programs. Top management, like all other levels of the organization, must set an example. If eye protection is mandatory in a machine shop, everyone who enters there should wear it, with no exceptions.

The most common reason for failure of a PPE program is the inability to overcome objections to the wearing of PPE. This can lead to the complete breakdown of the program. Each problem should be addressed on an individual basis and may require outside professional help to be resolved.

Compliance results from a positive attitude. The attitudes of users have a strong emotional component which forms the basis upon which motivation grows. Negative attitudes toward the use of PPE could be caused by peer pressure, personal beliefs, lack of faith in the usefulness of the PPE, or bad experiences with the use of PPE. Management which ignores users concerns and complaints about PPE also weakens the program. So does apparent lack of commitment to enforce the program on the part of top management.

Improvement in compliance depends upon changing attitudes and is much easier to attain if there is constant concern about safety in the operation.

Auditing The Program

As with any program or procedure implemented in an organization, the effectiveness of the PPE program should be monitored by inspection of the equipment and auditing of procedures by the use of a checklist.

Annual audits appear to be the norm, but it may be advisable to review critical areas more frequently. The audit team, which should include representation from the joint health and safety committee, must receive appropriate training in audit procedures.

It would be useful to compare present production records and safety performance to those before the program began. This would help determine the success or failure of a program. Such evaluation should be carried out yearly. Without this detailed monitoring, all

recommendations concerning changes to a program or retention of the program would be unsupported.

The following checklist could assist in monitoring the success of a PPE program.

All too often, compliance receives more attention than any component of a program. Compliance should be put into its proper perspective. It is the last procedure to be implemented and not the first or only one chosen and put into effect. Once the program has been introduced, the task of maintaining PPE is futile if a worker will not comply with the wearing of the PPE. The program must be accepted and adhered to if it is to be successful. As with any other program, acceptance depends to a large degree upon the manner in which the program is introduced, the way in which it is conducted, and the receipt of the full cooperation of everyone concerned in maintaining the high standards expected in the program.

With any program the concept of compliance should be based upon the belief that the objective is to protect against injury, and to raise safety awareness.

Conclusion

The development, implementation, and maintenance of an effective PPE program is not easy. PPE is not in itself a simple method of solving the problem of prevention satisfactorily. It must be part of an integrated solution that consciously reviews and implements other solutions.

PPE involves a large burden of planning, organization, monitoring and supervision. Above all, major retraining is involved in the introduction and maintenance of a successful PPE program. Therefore, it is clear that such programs should be given greater consideration before being embarked upon as apparently cheap alternatives to control at the source.

Personal Protective Equipment

Checklist

A Personal Protective Equipment Standards

1. Is there a policy or practice governing the proper use and conservation of PPE?
2. Is proper PPE made available to workers?
 - a. Are these devices regularly maintained and in good condition?
 - b. Are they being used as prescribed?
 - c. Is the wearing of PPE when appropriate rigorously enforced?
 - d. Are proper storage and cleaning facilities provided?
3. Are workers fitted properly for PPE?
4. Are PPE standards/rules and procedures for specific jobs defined in writing?
5. Is there provision for workers to have input into identifying the needs for, and making the selection of, PPE?
6. Are workers properly instructed in the need for and use of protective equipment and is a record made of that instruction?
7. Are supervisors required to check PPE to ensure that it is in serviceable condition?
8. Are workers required to return used or damaged equipment to receive a reissue?

B. Personal Protective Equipment Record Keeping

1. Is the usage of PPE recorded?
 - a. Is an analysis made of usage?
 - b. Is there a record system to ensure proper cleaning and replacement of parts?

C. Enforcement of Rules And Procedures

1. Have the rules, procedures and disciplinary format been discussed with and made acceptable to the joint health and safety committee, safety and health representatives and/or the union?
2. Are commendations recorded for exemplary use of PPE?
3. Is recognition given/sought when PPE has prevented or minimized injury or illness?
4. Is there an established procedure that enables disciplinary action for violation of PPE rules and procedures?

D. Program Effectiveness Evaluated

Is there an established procedure to enable senior management to evaluate the consistency of enforcement of the PPE program?