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In the name of god

Personal protective equipment

Compiler:
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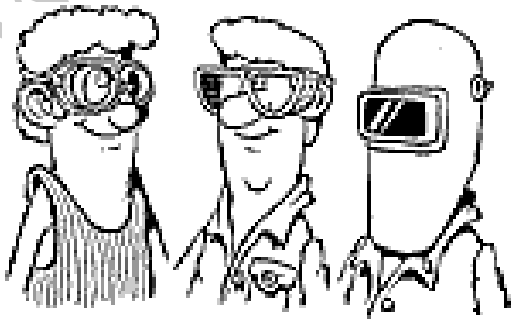

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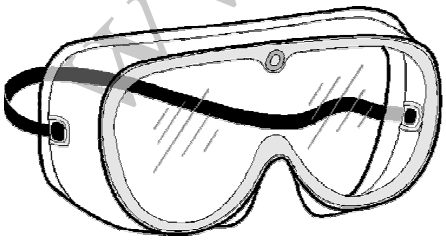

What is personal protective equipment (PPE)?

PPE is equipment worn by a worker to minimize exposure to specific occupational hazards. Examples of PPE are respirators, gloves, aprons, fall protection, and full body suits, as well as head, eye and foot protection. Using PPE is only one element in a complete safety program that would use a variety of strategies to maintain a safe and healthy occupational environment. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection.

What is the role of personal protective equipment (PPE)?

Hazards exist in every workplace so strategies to protect workers are essential. The priority should be the elimination and control of hazards at their source or along the path between the source and the worker. Many methods are available, and those most appropriate to the specific situation should be used.

Controlling a hazard at its source should be the first choice because this method will eliminate it from the workplace altogether or isolate it from the worker. This "safe place" approach may require substitution of a material with nonhazardous ones, isolation of hazards, addition of safety features to existing equipment, redesign of the work processes, or purchase of new equipment. When the hazard cannot be removed or controlled adequately, Personal Protective Equipment (PPE) must be used if the work process is to continue.

How do I begin planning a protection strategy?

Before any decision is made to begin or to expand a PPE program, it is important to understand the underlying principles of protection strategies.

There are three elements that must be considered:

- protection of workers
- compliance with applicable laws / regulations and internal company standards
- technical feasibility

In practice, only a few strategies are available. These include:

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

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. It does these things by requiring that conscious decision-making, evaluation, and reevaluation be done at various stages throughout the program.

When is the best time to provide protection from hazards?

When hazards are identified, it is useful to consider general principles of control, which can be thought of as two basic categories: "pre-contact" or "point-of-contact."

Pre-contact:

Pre-contact control is the first and most important method because it prevents the hazard from reaching the worker. Pre-contact control methods include substituting materials or processes that are less hazardous, isolating hazardous processes, retrofitting existing equipment, or acquiring safer equipment. Pre-contact control can also be achieved by providing protection to the worker with local exhaust ventilation, machine guarding, better housekeeping, and safe work practices. Many Canadian

jurisdictions legislate pre-contact controls. While many hazards can be anticipated and avoided through effective engineering at the pre-contact stage, others may not be recognized before an accident occurs. 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 point-of-contact controls must be used.

Point-of-contact:

The point-of-contact control is important but secondary because it cannot eliminate the hazard. It only manages the hazard at the point of contact with the worker. This form of control is primarily accomplished through personal protective equipment. It is to be used when pre-contact controls are not totally effective. Many Canadian jurisdictions also legislate point-of-contact control methods.

When should PPE be used?

PPE is used to reduce or minimize the exposure or contact to injurious physical, chemical or biological agents. A hazard cannot be eliminated by PPE, but the risk of injury can be eliminated or greatly reduced. For example, wearing hearing protection reduces the likelihood of hearing damage when the ear plugs or muffs are appropriate for the kind of noise exposure and they are used properly. However, hearing protection does not eliminate the noise.

PPE should only be used:

- as an interim (short term) 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 not feasible or effective, and
- during emergency situations.

How do I design 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, and workers. A good PPE program consists of these essential elements:

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

The organization's occupational health and safety policy should be a statement of principles and general rules which serve as guides to action. Senior management must be committed to ensuring that the policy and procedures are carried out. PPE programs must be, and must be seen to have equal importance with all other organizational policies, procedures, and programs.

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

In the introductory phase, a program must be planned carefully, developed fully and implemented methodically. It should be introduced gradually and in phases. The intention should be stated

and time allowed for workers to become accustomed to wearing the PPE. The beneficial effects of the program should be publicized widely, and the target date set well ahead for compliance. Time should be allowed for workers to comply with the program, with no enforcement action taken until the target date. After the program is introduced, but only after adequate consultations with the workers and their representatives, the use of PPE may become a required condition of employment.

It would not be acceptable to gradually phase in a PPE program when there is a need to enter hazardous atmospheres, or where failure to use the equipment poses a significant risk of major injury.

The greater the workers' 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 how to properly use it. The method of implementation affects the acceptance and effectiveness of the whole program.

In addition, worker compliance with the PPE program is likely to be poor if a PPE device is unattractive, uncomfortable, or is imposed on the worker with little choice in the selection.

The protection provided will be dramatically reduced if workers remove the PPE for even short periods of time. The loss of protection during the periods when the PPE is not worn may easily outweigh the protection when it is used.

For example, in order to get full benefit, hearing protectors must be worn all the time during noisy work. If hearing protectors are removed only for a short duration, the protection is substantially reduced. The following table gives a maximum protection provided for non-continuous use of an ideally fitted "100%" efficient hearing protector. For example if one takes off his/her hearing protector for 5 min in a 8-hour shift, the maximum protection will be 20 dB.

Table 1 Maximum protection provided by non-continuous use of Hearing Protection	
Percent time used	**Maximum Protection**
50%	3 dB
60%	4 dB
70%	5 dB
80%	7 dB
90%	10 dB
95%	13 dB
99%	20 dB
99.9%	30 dB

Ear protectors must be used ALL THE TIME to get full benefit.

Flexibility in the choice of protective equipment is important (for example, the choice between more than one respirator for personal use) provided that it conforms to proper safety standards.

Why should I do a workplace survey first?

The first step in the development of a PPE program is to identify the particular hazards at the worksite. Some of these may be obvious, but an onsite 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. Recognizing potential hazards should include reviewing the manufacturing or other processes, maintaining an inventory of physical and chemical agents encountered routinely or periodically, examining all 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 requirements that may have important consequences for the PPE selected because some types of hazards require complicated PPE solutions. For example, working with chlorine requires respiratory and eye protection because chlorine irritates both the respiratory system and the mucous membranes of the eyes. It is important to continually review Material Safety Data Sheets (MSDSs) as part of the inspection, as they indicate the types of hazards associated with specific materials.

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

What steps are involved in the selection of PPE?

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

- The degree of protection required, and
- The appropriateness of the equipment to the situation (including the practicality of its being used and kept in good repair).

The degree of protection and the design of PPE must be integrated because both affect its overall efficiency, wear ability, and acceptance.

The following are guidelines for selection:

a) Match PPE to the hazard

There are no shortcuts to PPE selection. Choose the right 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 may require protection against welding gases, harmful light rays, molten metal and flying chips. In such

instances, multiple protection is needed: a welding helmet, welders goggles and the appropriate respirator, or an air-supplied welding hood.

b) Obtain advice

Make decisions based on thorough hazard evaluation, worker acceptance, and types of PPE available. Once you have determined 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 and test it to see that products meet all of your criteria before it is approved.

c) Involve workers in evaluations

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

d) Consider physical comfort of PPE (ergonomics)

If a PPE device is unnecessarily heavy or poorly fitted it is unlikely that it will be worn. Note also that if a PPE device is unattractive or uncomfortable, or there is no allowance for workers to choose among models, compliance is likely to be poor. When several forms of PPE are worn together, interactions must be borne in mind. Use every opportunity to provide flexibility in the choice of PPE as long as it meets required standards.

e) Evaluate cost considerations

The cost of PPE is often a concern. Some programs use disposable respirators because they appear to be inexpensive. However when the use is evaluated over time, it is possible that a more substantial dual cartridge respirator would be more economical.

Engineering controls might prove an even more cost effective solution in the long term and should be considered before PPE.

f) Review standards

Performance requirements of all standards must be reviewed to ensure that exposure to injury will be minimized or eliminated by using PPE. If PPE is exposed to hazards greater than those for which it is designed, it will not deliver adequate protection.

In Canada, various standards exist and the most recent should be used for guidance in the selection process. Two of the more common standards include the Canadian Standards Association (CSA) and the Bureau de normalization du Quebec (BNQ). For example, the CSA Standard Z94.3-92 "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 the plant survey and these categories will help in the choice of the proper eye protection for each specific job hazard.

g) Check the fit

When the selection has been made, the "fitting" component should be put in place. The key is to fit each worker with PPE on an individual basis. At the time of fitting, show each worker how to wear and maintain PPE properly.

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 manufacturers' representative or a specially trained staff member, such as a nurse.

When safety glasses sit halfway down the nose, protection from the hazard of flying particles is reduced, sometimes to the point where no protection is given. 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.

h) Perform regular maintenance and inspections

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

Probably the most important part of maintenance is the need for continuing inspection of the PPE. If carefully performed, inspections will identify damaged or malfunctioning PPE before it is used. PPE that is not performing up to manufacturers specifications, such as safety glasses with scratched lenses that have lost their ability to withstand impact should be discarded.

Procedures should be set up to enable workers to obtain replacement parts for damaged PPE, and to keep it clean. Respiratory protection devices require an elaborate program of repair, cleaning, storage and periodic testing.

Wearing poorly maintained or malfunctioning PPE could be more dangerous than not wearing any form of protection at all. The workers think they are protected when, in reality, they are not.

i) Conduct training

No program can be complete without training to ensure the optimum use of PPE. Training should cover how to fit and wear PPE, how to adjust it for maximum protection, and how to care for 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 engineering controls have been considered as the primary prevention strategy. It is not good enough to tell someone to wear a respirator just because management and/or legislation requires it. If the respirator is intended to prevent lung disorders, the workers should be informed of the hazards.

Workers and their supervisors will require training in when, where, why, and how to use the equipment to achieve the necessary level of protection. The workers to be trained include those who are exposed on a regular basis and others 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 all these workers are essentially the same.

j) Obtain support from all departments

Once the program is under way 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. The most common reason for failure of a PPE program is the inability to overcome objections to wearing it. Each problem should be addressed on an individual basis.

k) Audit 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.

Annual audits are common but it may be advisable to review critical areas more frequently.

It would be useful to compare present production records and safety performance to those before the program began. This comparison would help determine the success or failure of a program. Without this detailed monitoring, recommendations concerning changes to a program or retention of the program could be unsupported.

How can I promote my PPE program?

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

- commitment by management and workers to the program and a sense of responsibility for it
- the reasons for the program, and
- How the program will work.

The success of the PPE program depends upon winning the cooperation and support of all those concerned. This 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. Success is more likely to be accomplished if it is shown that controls at the source and along the path have been addressed comprehensively and effectively. It may help to have an education program within the work environment, using seminars, films, and best of all, one-on-one discussions. 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 may be able to help with promotion as can safety associations and government agencies. Naturally, the education process should be supported by a clear company policy that assigns responsibility for the use of PPE and which is firmly backed.

Why are there so many precautions about using PPE?

PPE programs are often plagued by the belief that once a piece of equipment is put on, the worker is totally protected. This is a false sense of security. Basic safety principles, such as housekeeping and environmental controls, must not be ignored.

PPE is designed to meet criteria which is only an approximation of real working conditions. PPE should not be used when hazards are greater than those for which it is designed. When it comes to the

evaluation of potential hazards, uncertainties need to be taken into account. Unfortunately, PPE design criteria cannot cover all eventualities.

Using several types of protection at the same time such as hard-hats, ear muffs and goggles, must not increase the danger or decrease the worker's ability to do the assigned job. Wearing PPE should not in itself create a greater danger. Gloves prevent skin damage while working with moving equipment, but can create an entanglement hazard with a drill press or metal lathe.

Most regulatory agencies require that PPE not be used unless 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 of an occupational health and safety program is to prevent occupational injury and illness, PPE cannot be the first protection option. The use of 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 point-of-contact injury control strategy. However, even at its best, PPE cannot achieve its full-protection potential without worker knowledge and cooperation. In practice, PPE is only to be used as the last line of defence.

Example of PPE program checklist:

The PPE program co-ordinator should consider the following:

Designing a PPE Program:

- Ensure engineering controls are considered first. PPE is the last line of defence.
- Secure the active participation of all parties.
- Ensure that a program coordinator has been appointed.
- Observe the gradual phasing in of the PPE program on a pre-arranged time schedule.
- Re-evaluate program on an ongoing basis.

Promotional Strategy:

- Publicize commitment to the program
- Ensure a clear, concise company policy has been formulated
- Examine the educational program

Workplace Survey:

- Review work practices, job procedures, equipment and plant layout
- Use job hazard analysis techniques to integrate accepted safety and health principles and practice into specific operations

Selection:

- Choose PPE to match the hazard
- Obtain advice on proper selection
- Institute workplace trials
- Consider the physical comfort of PPE
- Evaluate cost considerations of PPE usage
- Ensure PPE meets standards / certification (e.g., CSA, CGSB, NIOSH, ANSI)

Fitting and wearing:

- Ensure program includes the individual fitting of PPE
- Survey users to ensure PPE is worn properly

Maintenance:

- Ensure that workers know how to perform regular maintenance and inspection of their PPE

Training:

- Verify that all users, supervisors, selectors, buyers, and storekeepers are trained

Support:

- Ensure that education programs are ongoing

Auditing the Program:

- Review the program at least annually
- Review and compare production and safety performance records

Worker responsibilities include:

Use of proper PPE:

- Make sure you are wearing the right PPE for the job. Check with your safety representative if you are not sure.

Maintenance and inspection:

- Inspect PPE before and after each use
- Take care of PPE at all times
- Clean all PPE after use
- Repair or replace damaged or broken PPE
- Store PPE in clean dry air - free from exposure to sunlight or contaminants

Training:

- Ensure you have been trained in how to fit, wear, and maintain PPE
- Ensure training program includes information that explains when and what PPE should be worn, and why it should be worn

EPA Chemical Resistance Category Chart:

For use when PPE section on the pesticide label lists a chemical resistance category.
The Worker Protection Standard requires that labels of pesticides used on farms, and in forests, nurseries and greenhouses list the type of personal protective equipment (PPE) that must be worn with each product. Labels will refer to chemical resistance categories (A-H) for PPE. Items in these categories are made of materials that the pesticide cannot pass through during the times indicated below the chart. Choose the category of resistance which best matches the handling task duration. The categories are based on the solvents used in the pesticides, NOT the pesticides themselves. Therefore, there will be instances where the same pesticide with two different formulations (wettable powder-WP and emulsifiable concentrate-EC, for example) will require PPE from two different chemical resistance categories.

Selection Category Listed on Pesticide Label	**Types of Personal Protective Material**							
	Barrier Laminate	Butyl Rubber > 14 mils	Nitrile Rubber > mils	Neoprene Rubber > 14 mils	Natural Rubber > 14 mils	Polyethelene	Polyvinyl Chloride (PVC) > 14 mils	Viton > 14 mils
A(a dry and water-based formulation)	high	high	high	high	high	high	high	high
B	high	high	slight	slight	none	slight	slight	slight
C	high	high	high	high	moderate	moderate	high	high
D	high	high	moderate	moderate	none	none	none	slight
E	high	slight	high	high	slight	none	moderate	high
F	high	high	high	moderate	slight	none	slight	high
G	high	slight	slight	slight	none	none	none	high
H	high	slight	slight	slight	none	none	none	high

HIGH: Highly chemical-resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticides at rest breaks.
MODERATE: Moderately chemical-resistant. Clean or replace PPE within an hour or two of contact.

SLIGHT: Slightly chemical-resistant. Clean or replace PPE within ten minutes of contact.
NONE: No chemical-resistance. Do not wear this type of material as PPE when contact is possible.

Entry-Restricted Areas in Nurseries during Pesticide Applications:

During Application of a Pesticide	Workers and other persons are Prohibited In:
(1)(a) Applied: aerially, in an upward direction, or using a spray pressure greater than 150 psi (pounds per square inch), or (b) Applied as a: fumigant, smoke, mist, fog, or aerosol	Pesticide treated area plus 100 feet in all directions on the nursery
(2)(a) Applied downward using: a height of greater than 12 inches from the planting medium, a fine spray, or a spray pressure greater than 40 psi and less than 150 psi. (b) Not as in 1 or 2(a) above, but for which a respiratory protection device is required for application by the product labeling	Treated area plus 25 feet in all directions on the nursery
(3) Applied otherwise	Pesticide treated area

Interpreting PPE Statements on Pesticide Labels:

Label Statement	Acceptable PPE
Long-sleeved shirt and	Long-sleeved shirt and long pants long pants, or Woven or nonwoven coverall Plastic- or other barrier-coated coverall, or Rubber or plastic suit
Coverall worn over short-sleeved shirt and short pants	Coverall worn over short-sleeved shirt and short pants, or Coverall worn over long-sleeved shirt and long pants, or Coverall worn over another coverall, or Plastic-or other barrier-coated coverall, or Rubber or plastic suit
Coverall worn over long-sleeved shirt and long pants	Coverall worn over long-sleeved shirt and long pants, or Coverall worn over another coverall, or Plastic- or other barrier-coated coverall, or Rubber or plastic suit
Chemical-resistant apron worn over coverall or over long-sleeved shirt and long pants	no substitute
Waterproof suit or liquidproof suit	no substitute
Waterproof gloves	Any rubber or plastic gloves sturdy enough to remain intact throughout the task being preformed
Chemical-resistant gloves	Barrier-laminate gloves, or Other gloves that glove selection charts or guidance indicate are chemical-resistant to the pesticide for the period of time required to perform the task
Chemical-resistance gloves such as butyl or nitrile	Butyl gloves, or nitrile gloves, or Other gloves that glove selection charts or guidance indicate are chemical-resistant to the pesticide for the period of time required to perform the task
Shoes	Leather, canvas, or fabric shoes chemical-resistant shoes, or chemical-resistant boots, or chemical-resistant shoe coverings (booties)
Chemical-resistant footwear	Chemical-resistant shoes, or Chemical-resistant boots, or Chemical-resistant shoe coverings (booties)
Chemical resistant boots	Chemical-resistant boots
Chemical-resistant hood or wide-brimmed hat	Rubber- or plastic-coated safari-style hat or fire-fighter hat, or plastic- or other barrier-coated hood, or rubber or plastic hood

Reference:

www.ccohs.ca

www.publichealth.va.gov

www.lni.wa.gov.sumary

www.hssu.edu

www.bsi_glabal.com

www.ehso.com

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