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PERSONAL PROTECTIVE EQUIPMENT FOR BIOHAZARDS AS A CASCADE FOR SAFETY MEASURES

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ABSTRACT

Safety equipment issued to help employees in protecting themselves from the hazards of their work environments. PPE includes fire retardant or chemical-proof clothing, gloves, hard hats, respirators, safety spectacles, etc. Food hygiene equipment (aprons, caps, plastic gloves, etc.) are not included in this category. PPE (or Personal Protective Equipment) is of fundamental importance in the workplace to keep workers safe and to enable workers to do their job properly. PPE can include boots, overalls, high visibility vests, gloves, hearing protection, hard hats etc. Without PPE the chances of injury are undoubtedly increased. The purpose of PPE is to ensure workers are kept as safe as possible. The PPE relevant to anyone would depend on one's role and the environment that he/she work in. If anyone thinks of a building site, the typical PPE is usually hard hats, high visibility vests and boots. On a building site there may be loose bricks overhead so one can see why hard hats are required. High visibility vests are also useful as there may be vehicles coming in and out of the building site. Boots are also necessary and would help prevent injury if anything was dropped onto the workers foot. If anyone thinks of an alternative environment, such as a train depot or power station, PPE should include hearing protection as noise levels may reach levels that could potentially be harmful. On a train depot anyone would also expect high visibility vests so people can be seen. If a person uses vibratory tools as part of their job, such as jack hammers, gloves may be necessary to help prevent hand arm vibration syndrome (also known as vibration white finger). The importance of PPE in the workplace cannot be underestimated. PPE is required in many working environments to avoid injury and to keep workers safe.

KEYWORDS: Physical hazards, Electrical hazards, Heat hazards, Chemical hazards, Biohazards, Airborne hazards.

INTRODUCTION

Personal protective equipment (PPE) is protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include **physical, electrical, heat, chemicals, biohazards, and airborne particulate matter**. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities. "Protective clothing" is applied to traditional categories of clothing, and "protective gear" applies to items such as pads, guards, shields, or masks, and others. PPE suits can be similar in appearance to a cleanroom suit. The purpose of personal protective equipment is to reduce employee exposure to hazards when engineering controls and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present. PPE has the serious limitation that it does not eliminate the hazard at the source and may result in employees being exposed to the hazard if the equipment fails.

Any item of PPE imposes a barrier between the wearer/user and the working environment. This can create additional strains on the wearer; impair their ability to carry out their work and create significant levels of discomfort. Any of these can discourage wearers from using PPE correctly, therefore placing them at risk of injury, ill-health or, under extreme circumstances, death. Good ergonomic design can help to minimise these barriers and can therefore help to ensure safe and healthy working conditions through the correct use of PPE.

Practices of occupational safety and health can use hazard controls and interventions to mitigate workplace hazards, which pose a threat to the safety and quality of life of workers. The hierarchy of hazard controls provides a policy framework which ranks the types of hazard controls in terms of absolute risk reduction. At the top of the hierarchy are elimination and substitution, which remove the hazard entirely or replace the hazard with a safer alternative. If elimination or substitution measures cannot apply, engineering controls and administrative controls, which seek to design safer mechanisms and coach safer human behavior, are implemented. Personal protective equipment ranks last on the hierarchy of controls, as the workers are regularly exposed to the hazard, with a barrier of protection. The hierarchy of controls is important in acknowledging that, while personal protective equipment has tremendous utility, it is not the desired mechanism of control in terms of worker safety.

PPE: it's an acronym that you've likely heard a lot in the past few weeks—particularly in terms of shortages for medical professionals. It stands for personal protective equipment, and it's one crucial way to both stop the spread of COVID-19 and keep the healthcare workers (doctors, nurses, other caregivers) currently on the pandemic's frontlines safe.

While the equipment is necessary for both public and personal health, there's one glaring issue in the US right now concerning PPE: a major shortage—and its putting any one who comes into contact with COVID-19 patients at risk.

“Doctors cannot maintain social distancing when seeing patients, that’s why doctors and nurses need PPE. "They need to be close to patients often for often prolonged periods of time, whether that is to take a history of what a patient's symptoms are, do a physical exam to look for clues about what is going, or do a procedure."

PPE works as a barrier between an individual’s skin, mouth, nose, or eyes and viral and bacterial infections. In order to be used in a medical setting, most PPE—medical gloves, gowns, and N95 respirators—is regulated by the government agency and must meet their regulations.

“When used properly and with other infection control practices such as hand-washing, using alcohol-based hand sanitizers, and covering coughs and sneezes, [PPE] minimizes the spread of infection from one person to another,” the FDA explains on its website.

PPE also varies situationally, per the World Health Organization (WHO). For example, the sufficient gear needed to treat patients with the flu varies from that which is crucial when dealing with those infected with Ebola. In the context of COVID-19—which is spread primarily between people through close contact and droplets, not by airborne transmission—PPE includes the following, but can vary between medical professionals, hospital cleaners, and patient visitors:

Gloves and Medical masks


Respirators (N95 or FFP2 standard, or equivalent) and Eye protection

Gowns Aprons and Boots or closed-toe work shoes

Certain procedures also necessitate a greater need for PPE, pointing to intubation (the process of inserting a tube through a patient's mouth and into their airway) and nebulizer treatments (a machine that delivers medicated mist to the lungs). "These procedures create a large amount of virus in the air so anyone around would need to wear PPE." Anyone who is entering into a patient's room with known COVID-19," is in need of the recommended protective gear.

Can PPE be reused or shared?

The issue with most PPE items stems from the first word of the acronym: personal. With few exceptions, "in general, most PPE is designed to be used only one time and by one person prior to disposal," explains the FDA. Therefore, washing and reusing or sharing equipment with other users is not intended. N95 masks can be reprocessed, using vaporized hydrogen peroxide to sterilize them for reuse. In short, they were able to clean a room full of N95s all at once using a system used to fumigate hospital rooms after patients with the hospital infection *C. diff* are discharged. The results were replicated three times.

While various companies that don't usually produce PPE are working hard to make supplies for medical professionals, and government leaders are trying to supply hospitals with shipments of PPE, it's still not enough—yet. If you're currently in possession of extra masks, or know a company that is, you can donate them to various initiatives including PPE Link and the website #FindtheMasks, among others.

CONCLUSION

Infection prevention and control measures include, among other measures: hand hygiene, personal protective equipment and waste management materials. The Protective equipment consists of garments placed to protect the health care workers or any other persons to get infected. These usually consist of standard precautions: gloves, mask, gown. If it is blood or airborne high infections, will include: Face protection, goggles and mask or faceshield, gloves, gown or coverall, head cover, rubber boots.

Employers have duties concerning the provision and use of personal protective equipment (PPE) at work.

PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

Why is PPE important? Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly. Even where engineering controls and safe systems of work have been applied, some hazards might remain. These include injuries to: (1) the lungs, eg from breathing in contaminated air (2) the head and feet, eg from falling materials (3) the eyes, eg from flying particles or

splashes of corrosive liquids (4) the skin, eg from contact with corrosive materials (5) the body, eg from extremes of heat or cold. PPE is needed in these cases to reduce the risk.

What do I have to do? Only use PPE as a last resort. If PPE is still needed after implementing other controls (and there will be circumstances when it is, eg head protection on most construction sites, you must provide this for your employees free of charge. You must choose the equipment carefully and ensure employees are trained to use it properly, and know how to detect and report any faults.

Selection and use: You should ask yourself the following questions: (1) Who is exposed and to what? (2) How long are they exposed for? (3) How much are they exposed to?

When selecting and using PPE: (1) Choose products which are CE marked in accordance with the Personal Protective Equipment Regulations 2002 – suppliers can advise you. (2) Choose equipment that suits the user – consider the size, fit and weight of the PPE. If the users help choose it, they will be more likely to use it. (3) If more than one item of PPE is worn at the same time, make sure they can be used together, eg wearing safety glasses may disturb the seal of a respirator, causing air leaks. (4) Instruct and train people how to use it, eg train people to remove gloves without contaminating their skin. Tell them why it is needed, when to use it and what its limitations are.

Other advice on PPE: (1) Never allow exemptions from wearing PPE for those jobs that ‘only take a few minutes'. (2) Check with your supplier on what PPE is appropriate – explain the job to them. (3) If in doubt, seek further advice from a specialist adviser.

Maintenance: PPE must be properly looked after and stored when not in use, eg in a dry, clean cupboard. If it is reusable it must be cleaned and kept in good condition. Using the right replacement parts which match the original, eg respirator filters. Keeping replacement PPE available. Who is responsible for maintenance and how it is to be done. Having a supply of appropriate disposable suits which are useful for dirty jobs where laundry costs are high, eg for visitors who need protective clothing.

Employees must make proper use of PPE and report its loss or destruction or any fault in it.

Monitor and review: (1) Check regularly that PPE is used. If it isn't, find out why not. (2) Safety signs can be a useful reminder that PPE should be worn. (3) Take note of any changes in equipment, materials and methods – you may need to update what you provide.

Types of PPE you can use: **Eyes.** Hazards: Chemical or metal splash, dust, projectiles, gas and vapour, radiation.

Options: Safety spectacles, goggles, face screens, faceshields, visors. Make sure the eye protection chosen has the right combination of impact/dust/splash/molten metal eye protection for the task and fits the user properly.

Head and neck. Hazards: Impact from falling or flying objects, risk of head bumping, hair getting tangled in machinery, chemical drips or splash, climate or temperature.

Options: Industrial safety helmets, bump caps, hairnets and firefighters' helmets. Some safety helmets incorporate or can be fitted with specially-designed eye or hearing protection. Don't forget neck protection, eg scarves for use during welding. Replace head protection if it is damaged.

Ears. Hazards: Noise – a combination of sound level and duration of exposure, very high-level sounds are a hazard even with short duration. Options: Earplugs, earmuffs, semi-insert/canal caps. Provide the right hearing protectors for the type of work, and make sure workers know how to fit them. Choose protectors that reduce noise to an acceptable level, while allowing for safety and communication.

Hands and arms. Hazards: Abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, radiation, biological agents and prolonged immersion in water. Gloves, gloves with a cuff, gauntlets and sleeving that covers part or all of the arm. Avoid gloves when operating machines such as bench drills where the gloves might get caught. Some materials are quickly penetrated by chemicals – take care in selection. Barrier creams are unreliable and are no substitute for proper PPE. Wearing gloves for long periods can make the skin hot and sweaty, leading to skin problems. Using separate cotton inner gloves can help prevent this.

Feet and legs. Hazards: Wet, hot and cold conditions, electrostatic build-up, slipping, cuts and punctures, falling objects, heavy loads, metal and chemical splash, vehicles. Options:

Safety boots and shoes with protective toecaps and penetration-resistant, mid-sole wellington boots and specific footwear, eg foundry boots and chainsaw boots. Footwear can have a variety of sole patterns and materials to help prevent slips in different conditions, including oil - or chemical-resistant soles. It can also be anti-static, electrically conductive or thermally insulating.

Appropriate footwear should be selected for the risks identified.

Lungs. Hazards: Oxygen-deficient atmospheres, dusts, gases and vapours. Options: respiratory protective equipment (RPE). Some respirators rely on filtering contaminants from workplace air. These include simple filtering facepieces and respirators and power-assisted respirators. Make sure it fits properly, eg for tight-fitting respirators (filtering facepieces, half and full masks). There are also types of breathing apparatus which give an independent supply of breathable air, eg fresh-air hose, compressed airline and self-contained breathing apparatus. The right type of respirator filter must be used as each is effective for only a limited range of substances.

Filters have only a limited life. Where there is a shortage of oxygen or any danger of losing consciousness due to exposure to high levels of harmful fumes, only use breathing apparatus – never use a filtering cartridge.

You will need to use breathing apparatus in a confined space or if there is a chance of an oxygen deficiency in the work area. If you are using respiratory protective equipment.

Whole body. Hazards: Heat, chemical or metal splash, spray from pressure leaks or spray guns, contaminated dust, impact or penetration, excessive wear or entanglement of own clothing. Options: Conventional or disposable overalls, boiler suits, aprons, chemical suits. The choice of materials includes flame-retardant, anti-static, chain mail, chemically impermeable, and high-visibility. Don't forget other protection, like safety harnesses or life jackets.

Emergency equipment. Careful selection, maintenance and regular and realistic operator training is needed for equipment for use in emergencies, like compressed-air escape breathing apparatus, respirators and safety ropes or harnesses.

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